

FATSO EL7x

USERS MANUAL



**FULL
ANALOG
TAPE
SIMULATOR &
OPTIMIZER
WITH KNEE COMPRESSOR**



Empirical Labs
inc.

Technology for the Artist
empiricallabs.com

EMPIRICAL LABS FATSO EL7x

WARRANTY AND FACTORY SERVICE

This Empirical Labs Inc. product is covered by a limited warranty covering full parts and labor for 3 years from the purchase date. The warranty is only effective if the owner has returned his or her warranty card. See warranty card for further details.

Should problems arise, contact the factory at EmpiricalLabs@gmail.com or use the "Contact " button on our website. If it becomes necessary, pack the unit up well*, enclose a note explaining the problem and return to Empirical Labs for repair. Include your name, address, phone, and the date of purchase. Send the unit with freight prepaid to the address below.

Empirical Labs Inc. (Attn Service)
41 N. Beverwyck Rd. Lake Hiawatha, NJ 07034

**Please pack the unit in original carton if possible. Otherwise, pack with bubble pack and/or foam in a thick corrugated box. Shipping people are absolutely brutal to large packages and you must take every precaution to prevent damage to the edges of the front panel. We are not liable for products damaged during shipping.*

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OTHER EMPIRICAL LABS PRODUCTS

- **Distressor EL8** - Classic Knee Compressor. Used on thousands of major records!
- **Distressor EL8X** - The original Distressor on Steroids. Image Link and Brit Mod
- **Lil FrEQ** – An EQ with 8 Sections of unparalleled tonal contouring & De-essing.
- **Mike-E** – Digitally Controlled Mic Preamp with compression and saturation.
- **DerrEsser** – De-Esser and high frequency fixer for the API 500 format.
- **EL500** – Versatile Powered Horizontal rack for 2 API 500 compatible modules.
- **DocDerr** – API 500 Compatible EQ, Compressor/Saturator, & Instrument Preamp.
- **UA FATSO Plugin** – Acclaimed emulation of our FATSO, from Universal Audio.

UPGRADES

There are several elements inside the FATSO which were designed to be "modifiable". Empirical Labs may release information and hardware options that will allow owners to alter the curves and other important performance parameters of their FATSO. Most of these modifiable elements will not improve the performance, but will offer other very cool compressor variations. It may be possible for user to safely modify the FATSO and create unique sets of curves and filter options. The UBK FATSO is an example of simple compressor modifications. Check our Website from time to time for news: www.EmpiricalLabs.com

Attempting to modify or make adjustments to your FATSO may void warranty unless you have approval from Empirical Labs. There are a number of critical adjustments that cannot be made properly without the calibration tools we have here at the factory. Any sign of internal adjustment by the user will void your warranty with the exception of changing the fuses or line voltage selection. Empirical Labs Inc. takes no responsibility for the safety of anyone opening the FATSO for any reason. There are dangerous voltages present when unit is plugged in. Refer unit to properly qualified service center or return to factory.

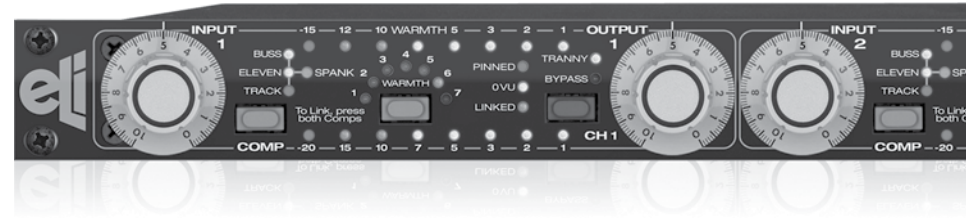


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FEATURES

DIGITALLY CONTROLLED ANALOG – Allows unique features and control to be packed into a single height unit. The new EL7x has improved logic, with “Button Hold” function, to compare settings.

SOFT CLIP FEATURES modeled after broadband tape saturation. WITHOUT THE NOISE! Smooth clipping up to 20% THD. This is “organic” analog saturation extending above 100KHz.

USER PROGRAMMABLE HIGH FREQUENCY SATURATION, simulating the “softening” for which analog tape and phonographs are known. This is the “Warmth” control on FATSO.

SWITCHABLE TRANSFORMER CIRCUITS, which can add the musical artifacts generated by classic devices like NEVE, API, etc. These artifacts include frequency “rounding”, low order clipping & intermodular distortion, transient clipping... and some other very musical non-linearities.

FOUR COMPRESSION MODES - One for TRACKing, one 1176 emulation, one “BUSS” compressor, and SPANK (see below). All LINKABLE! Classic knee compressor sound that really grabs.

SPANK!- An additional limiter that musically smashes the dynamic range, and can be used to stop clipping before digital recorders. There is a subtle knee followed by hard limiting.

HUGE “DISTRESSOR” KNOBS with high resolution numbering - For easy readability and repeatable settings. They also go to 10 ½!

DISTORTION INDICATOR LIGHTS - A 0 VU LED and a “Pinned” (3%) LED. No hard clipping until a few dB past “Pinned”.

SIDCHAIN JACKS - Allows for eq-ing or processing compressor control signals.

CALIBRATED OUTPUT LEVEL - Allows speed in setting tape and live mix levels.

FOOLPROOF OPERATION - it’s almost impossible to get a bad sound.

SINGLE HEIGHT AND PACKED FULL - Two channels of classic sound in a small, extremely reliable package. Stereo or Dual Mono operation.

DISCRETE AND INTEGRATED COMBINATION - The best of speed/linearity with repeatability. Hand tested & selected components. All metal film and Roederstein resistors in the audio path - top quality components, most being high temperature parts.

SWITCHABLE 115/230 VOLT OPERATION - Extra fuse provided inside unit.

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.

NO INTERNAL CONNECTORS, High reliability parts and military grade switches and relays. Three year unlimited warranty.

INTERFACE AND FEATURES FOUND NOWHERE ELSE.

HAND WIRED AND CALIBRATED IN USA.

SPECS

Freq. Response is 2 Hz to 60 kHz, +0, -3dB, no TRANNY

Dynamic Range - 110 dB from maximum output (20%THDsoft clipping) to minimum output. Greater than 100 dB signal to noise.

Distortion Ranges between .06% and 20% depending on mode and settings.

DC coupled Input and Outputs - High quality audio caps used internally.

Compressor Time Constants - Attack range .04mS - 60mS. Release range .05 sec to 3.5 seconds.

Attack and Releases are fixed by the compression type selected.

Power Consumption – Less than 28Watts Max. .25A @ 115. Original Fatso was 30Watts.

Shipping weight 13.25Lbs. Empirical Labs

WHAT IS THE FATSO? (Hmm, Not such an easy question!)

The EL7 FATSO is a modern digitally controlled analog device that offers many of the “musical non-linearities” exhibited by the older tube, class A discrete, and magnetic tape mediums. This two channel audio processor will musically integrate frequencies and transients, increasing the apparent volume without actual increase in peak levels. In addition, two channels of famous Empirical Labs compression are provided. There are several compressor “types” with fixed attacks and releases (if you want a fully controllable compressor, you will need the Empirical Labs Distressor!).

Users can enhance & soften the sound of digital mediums such as DAWs, Hard Disk Recorders, CD players, MP3s etc. Mixdown engineers will have an option not to use bulky, expensive, (and often flaky) analog tape recorders to get the warmth and sweet high end they’ve come to rely on for so many decades. Owners of modern digital recorders can finally put a stop to complaints about the “coldness” and “brittle edge” of their mixes and instruments with the “rounded” and “musically non-linear elements” of vintage analog. Audiophiles can bring back the warmth and cuddly sound of LP’s and tapes to their digital audio mediums.

FATSO’S FOUR TYPES OF PROCESSING

1) HARMONIC GENERATION AND SOFT CLIPPER (DISTORTION GENERATION) - Anytime you pass a signal thru the FATSO, it passes thru a smooth, “organic” saturation circuit, except in bypass. This processing is useful to softly but instantly round peaks and transients, allowing a higher average level. Analog Tape was known for this.

2) HIGH FREQUENCY SATURATION - WARMTH! - This circuit is meant to simulate the softening of the high end that occurs with analog tape. Basically as the warmth is increased, overly bright signals and transients will be quickly attenuated. The time constants are nearly instant, so the high freqs return very quickly after a loud, brittle burst.

3) TRANSFORMER & TAPE HEAD EMULATION - This provides the effect of input and output transformers of older devices and adds the low frequency harmonics that characterize analog tape. This is extremely useful on pure low frequency type tones that don’t cut thru small speakers. It adds upper “warm” harmonics to frequencies below 150Hz, especially those even lower such as 40Hz, the low string on a bass guitar, helping it to cut thru on smaller speakers. It is an actual transformer circuit.

4) CLASSIC KNEE COMPRESSION - Empirical Labs Style. This is your automatic leveling device that you find used on just about every modern instrument and vocal track, as well as on the overall buss. And it’s Empirical Labs Compression - smooth, warm and in your face. See the compression guide on page 11 for description of the 4 compressor types.

USING THE FATSO FOR THE FIRST TIME

Hookup is straightforward. Either the XLR’s or phone jacks 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! Connecting all input pins is preferred, but the unit will operate fine if unused Input pins aren’t tied to ground. Hookup directions are also located on the rear panel of unit, near the connectors. See page 14 for more detailed wiring instructions.

It’s advisable to mount in a cool rack position, as the FATSO can run quite warm. FATSO is ideal for sources that sound brittle, bright, or pointy or have excessive dynamic range. You will probably find so many uses for the FATSO as we did, but ...let’s just go over a couple quick scenarios here. Let’s say you have a vocal either live or in the studio that seems lifeless or needs presence and intensity. First lets set the compressor up. In fact you should always set the compressor up first because it interacts with the other processors in the FATSO.

For excessively dynamic vocals I would go right to the TRACKING compressor with the Red LED lit in the compressor select area. The ELEVEN is also excellent, but a bit more aggressive than the TRACKING compressor. Adjust the input til you get 5 dB of GR to start with and adjust the output knob until there’s not a great difference between the bypassed and un-bypassed levels. The Bypass switch is multiplexed and to cycle bypass, click twice quickly on older units, or hold button for 1 second on new units to cycle backwards. Next decide if the vocal has a brittle edge on the top end. If so, you have two other ways to soften. The most subtle is the TRANNY which engages a specially tweaked transformer circuit that enhances the midrange while softening extreme transients and fattens 200 hz and below. That may not be what one needs on vocals though. (Cont’d)

(Using the first time on Vocals, Continued)

Try the Warmth control for less subtle high end softening. This circuit is a unique dynamic filter not too far removed from de-essing except it is above most sibilant freqs and works on a different principle and filter type. (...ok, so it is far removed!). This circuit is really useful on vocals that are bright or have 10KHz and above boosted heavily with EQ. In fact warmth is really useful used in conjunction with high freq eq boost, as it will only grab the parts that are excessively bright or “plasticity” and get out of the way in less than a millisecond. Use it as an EQ tamer.

As you progress from 1 - 7 on the warmth control, more and more high frequencies will be “grabbed” and eventually you will start muffling the signal. DON'T DO THAT! Be very careful not to overuse the warmth control... 1 - 5 dB of Warmth is a lot. By now that distant, thin, vocal should be HOT and in your face. When using the compressor and warmth together, remember the interaction. Apply this same type of thinking to other sources/instruments. Don't be afraid to use the warmth without any other processing, or just the compressor, or just the TRANNY (to fatten low end). Also remember the unit is always passing the signal through the saturation circuits, with no LED's on whatsoever. Don't feel like you have to use all the FATS0 processing, when you may only need high frequency softening, or tightening on the low end, etc. SEE EXAMPLE SETTINGS BELOW.

EXAMPLE SETTINGS

DIGITAL MUSIC & BUSS FATTENING - This was almost the original intent of the FATS0. That is, it was a two-channel device that could make a stereo digital signal sound “analog” and integrate the different frequencies in a musical way. It could be used as a stereo device thru which one could mix or transfer to or from a digital medium to make it sound very analog tape-like. For those who aren't used to the Jargon... A “Buss” is usually a pair of channels that have pre mixed instruments or stereo music on them. The Left & Right outputs of your CD player could be considered a 2 channel buss. In the recording studio, it is more often applied to the final left and right channel mix, or to something such as all the drums mixed down to 2 tracks (a “submix”), so that instead of moving 12 faders at once to move drums up or down, you only have to grab those two.

MIXDOWN BUSS PROCESSOR - By placing the FATS0 immediately before a digital mixdown recorder such as a Hard Disk, RAM, or CD recorder, the recording engineer should be able to get the sweet high end and low frequency fatness that he could mixing to an analog tape recorder. Compression should usually be the BUSS type, use the warmth to soften the high end and the TRANNY to add some definition and warm harmonics to the low frequencies.

CD PLAYERS & OTHER DIGITAL RECORDERS - If the player has RCA output connectors, you'll need an adapter cable to get into the FATS0. A common goal is to make that CD player have the warmth and softness of the old tape recorders and records. Usually you won't use compression for this task, but if you do, set it up first since it interacts with the other settings. Set the input until the OVU LED glows on peaks from time to time. This will set up the saturation to emulate some nominal tape-like distortion. Try experimenting with the warmth control. Allow 1 - 10 dB of warmth to occur on peaks. When AB'ing it to the original signal, a new softness and fatness will be noticed immediately, making loud listening easy on the ears. The TRANNY may be useful for focusing sub frequencies.

DJ LEVEL CONTROLLER AND MASTER PA PROCESSOR - Place the FATS0 at the output of your DJ mixer before your power amps to level and fatten up the whole show. The BUSS compressor can level out volume differences while keeping the “smack” intact. Some house engineers use more aggressive FATS0 compressors. The TRANNY may help on smaller systems to get the low freqs clearer, but it does gently roll off subsonic content, whereas many venues want to “show off” subs below 40Hz. There are dozens of clubs around the world warming their House PA systems with FATS0s.

DISTORTION DEVICE - Folks have already used the FATS0 as a distortion box with great effectiveness and musicality. The warmth can roll off some harsh distortion grit if it crops up, enhancing the lower harmonics. The TRANNY can drastically distort sub frequencies below around 50Hz, as it adds 2nd and 3rd harmonics that can add clarity on those low tones. Keyboards are fantastic through the FATS0, and can be plugged directly in the rear inputs. Guitar and bass have been plugged directly in with great results for some applications... although the impedance and gain structure are more suited to line level, or a direct box output. See Example Settings.

EFFECTS WARMER - Try using the FATS0 as an analog effects simulator by putting it after a digital delay, reverb, etc. The Warmth can tame the edges so they don't conflict with the source, and soft saturation will bring an analog vibe. Try the BUSS compression. The TRANNY can roll off subs and pump harmonics into the low frequencies.

VOCALS - There are so many ways to use FATS0 here. During tracking, the initial recording of a source, try the Tracking Compressor which lights the Red LED in the compressor area. This is a pretty safe LN1176 type knee compressor with a pretty quick attack and release. That might be all you need. Using up to 10 dB of compression should be fine with really dynamic vocs during tracking. The BUSS is almost invisible on vocals unless you get over 5dB on peaks. It starts to saturate over 5 – 7 dB of compression. Alternately, you can try ELEVEN which is a steep curve, but good for skimming peaks during tracking. While tracking, be careful over-compressing with these compressors, especially ELEVEN and SPANK, as they are pretty aggressive. But even SPANK is useful to grab occasional peaks and then quickly get out of the way. During mixdown, you can get crazier and put on 14 to 20dB of compression on vocal peaks. Just be careful as there are records that are ruined from over compressed vocals.

If the top end is too sizzly or spitty, you can try the warmth control, maybe adding up to 6dB of warmth on the peaks. This is not a de-essing function since it affects freqs above the most trouble-some sibilant freqs, nonetheless, you may find it helps take some of the hissy sound out of a source.

TRANNY may be useful on exceptionally low vocals as it will warm the low tones to some degree. It will also roll the super subs off but generally, TRANNY will not radically affect most vocal sources.

PIANO/KEYS - Acoustic pianos often need less attack & more sustain to fit into a mix, but there are millions of exceptions. As far as the compression part... Old Beatle records started using drastic amounts of compression to keep a piano sitting inside a busy arrangement. Bruce Hornsby-ish pianos are often real or samples of real pianos with medium attack and medium release, that achieve a “bite” followed by sustained body. If you find the BUSS type compressor a bit gentle and too hot, and distorting some of the peaks, try the TRACKING or ELEVEN COMPRESSOR with the fast releases. If you have a dense mix and really need to make it take up a finite spot in the mix - go for the SPANK. This will slap the dynamic rangedown smoothly and quickly. It won't be an unfamiliar sound.

The saturator or soft clip part of the FATS0 will be very useful also on piano and keys. Pianos and synths can have quite a peaky transient and the instantaneous nature of the saturator can often give you 6db more peak headroom before your ear detects clipping. Synthesizers and samplers can benefit enormously since their envelope generators often create huge front peaks. The Warmth is also very useful here since it can soften the edges and also take care of the sharp treble plastic edge without affecting the low frequency amplitude. You will find subtle use of the Warmth on keys to be extremely pleasing once they are dropped back in the mix. Often you can take a thin lifeless keyboard part and bring warmth and reality to it with the FATS0.

Electric Keys can usually be plugged directly into the FATS0s rear connectors without a DI.

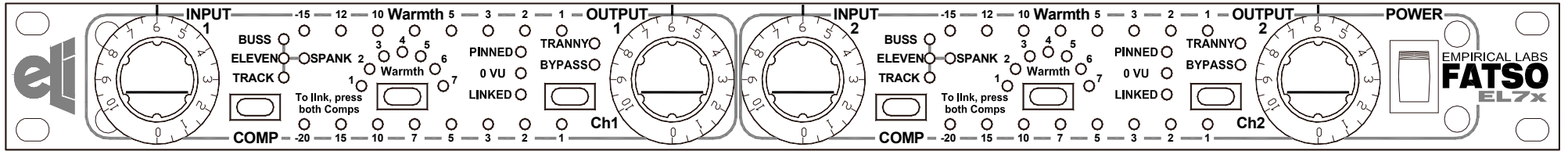
BASS - FATS0 is great on bass. Bass is notoriously hard to round out and clarify sometimes, but the FATS0 has many ways to help. First, if a low bass tone is too pure and sine-wave-like, it will “fall off” on small speakers. By this we mean, it will not be audible because most of the bass frequencies are below the range of the speakers. The TRANNY is one solution, combined with the saturator circuits. These will generate upper harmonics that will be musically related. These harmonics will be reproduced on small speakers and the human ear (and mind), will psycho-acoustically fill in the lower fundamentals. Great on direct bass.

The FATS0 compressors are fabulous on bass too. The BUSS compressor is good for an already compressed or very evenly played bass, since it will leave the transients and remaining dynamics in. It will also allow you to use varying amounts of grunge since it is such a gentle compressor that won't really nail the bass level in place. Just by turning the input up or down, one can add or remove distortion because of its low ratio. The TRACK and ELEVEN compressor are favorites again for bass (the Yellow or Red LED lit), and can be used subtly, or to totally squash. The TRACK compressor is the most Distressor-like compressor in the FATS0 with a fast attack and release, along with a smooth knee. SPANK is useful for a super aggressive level control on Bass, and can be used to distort low frequencies because of its speed.

As you can see, there are lots of options here. The WARMTH control may be useful for some trebly, over eq'd basses, but generally it may find limited use here. Again, be conservative when tracking. You can always blend the FATS0'd signal with the dry signal, to mellow out the effects and keep dynamics.

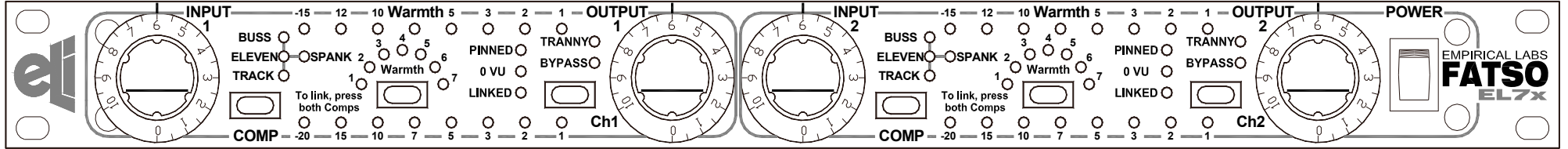
ELEC. GUITAR - A wide range of settings can be used. To get rid of edgy attacks, use the quick attack, fast release of the Tracking (TRACK) or ELEVEN compressor. If the guitar is too dynamic, the compressor combined with the saturator and TRANNY circuits may be the answer. Sometimes the guitar just needs a touch of fatness without losing attack. Try the BUSS compressor to maintain transients. Watch overwarming guitars with the saturators and the warmth circuits. Crunchy guitars which are full of harmonics, are notoriously sensitive to tonal changes. Over saturating or warming can take away the clarity or bite needed to cut thru. Other times, it's just what's needed to let the guitar be louder in a mix and stay out of

FATSO EL7X RECALL SHEET



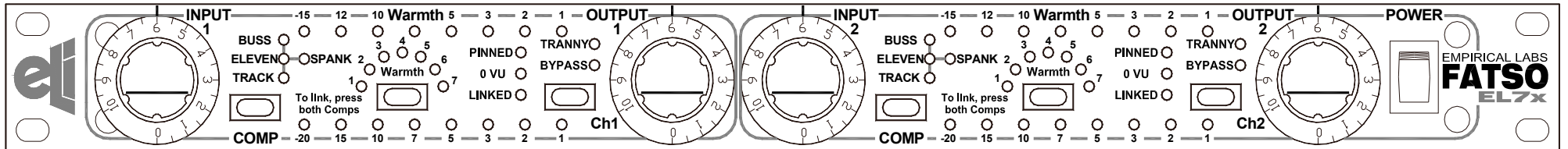
Track/Inst _____ Session/Song _____ Date _____

Notes: _____



Track/Inst _____ Session/Song _____ Date _____

Notes: _____



Track/Inst _____ Session/Song _____ Date _____

Notes: _____

Write in the Input and Output levels inside the Knobs, and color in any LED's that are lit to indicate section status

the way of vocals because the upper, spiky, harmonics are flattened a bit. When you are dealing with an occasional peaky guitar where certain chords or notes take your head off, the dynamic action of the WARMTH control can be very useful. Don't overdue this though, especially while tracking.

To smooth out solos, try the Tracking compressor with TRANNY and warmth. REMEMBER TO SETUP COMPRESSOR FIRST. The WARMTH heavily interacts with the compressor.

PLUCKED INSTRUMENTS & ACOUSTIC GUITAR - Plucked instruments can benefit greatly from the FATS0's processing. Back in 1998, a prototype FATS0 was taken to Greece and used on many very troublesome ethnic plucked instruments. At Grammys, a club in ATHENS, some bizarre FATS0 behavior was immediately noticed, when the extremely transient acoustic instruments "swamped" some internal circuits. The compressor needed a heavier knee with more "sponge" in the attack. The Tracking compressor (Red LED on) was tweaked first. The fast attack of the TRACK or ELEVEN Compressor can help get a "glassy" full sound since the pick noise will be attenuated and the sustain lengthened. Also the threshold of the warmth circuits were lowered so they could grab the transient picked edges easier. This allowed a solo instrument to be louder without the sharp attacks hurting.

Sometimes you may want to keep the dynamic range of a plucked instrument but need to smooth out just the hard front edge of the attack. Warmth processing is perfect here. Adjust the WARMTH until you have a smoother, more natural sound - usually 3 - 10 dB of HF attenuation is enough. It's important to listen very softly, and very loudly to the adjusted track to make sure it isn't too dull, or still in need of "softening".

Acoustic guitars can be so creamy. Many times you will have an acoustic part that is very even and you can nicely brighten it up with a top end EQ (high frequencies)... except for that one part where he really bangs it! Use the Warmth control to grab those clanky brash freqs. Usually 1 - 5 dB is enough but on really brittle parts, 10 - 15 dB on peaks may be ok on extreme peaks. Again don't over do it, especially during tracking. Listen really softly and really loudly to test evenness. Its often best to roll off subs or low frequencies to prevent mud before the FATS0. This keeps the compressor from reacting to them.

DRUMS - Without any processing activated, the saturator which is always inline, will pack those peaks down smoothly giving you 2 - 6 dB more average level. Distortion indicator LEDs, the 0 VU and the Pinned red LED give you a good idea of what's going on. On percussion, peaks can light up the Red Pinned LED without any nasty distortion, if they are short enough. Analog tape can not handle all the top end and will round out the sound... as will the FATS0's warmth processor and saturator. Don't use more than 5 - 10 dB of WARMTH on drums though... or you are probably asking for a dull sound! Try putting digitally recorded tambourines etc through the FATS0 and listen to the difference. That clacky front edge will become warm and easy to listen to - like the old analog tape and vinyl.

Snares/Kicks/Toms - If you don't want to lose the basic sound, try setting the compressor to BUSS compressor first. This is a very gentle slow compressor that will leave the transients untouched. If there are areas with over eq'd highs or unnatural transients, get into the WARMTH processing. On snares that have had 8 - 10K added and have some really overly dynamic hits, 5 - 10dB of WARMTH may fold the highs back (attenuate them) and smooth out the tonality. Use the High Frequency saturation that the WARMTH control provides on Kick drums that have the occasional clacky hit. The TRANNY will be useful also. If the Kick drum is too boomy or too thumpy without enough clarity, the TRANNY will add some upper harmonics to the low freqs, while rolling off some of the subsonics that could rumble in a mix.

Overhead Mics - Also for over dynamic and brash cymbals, the WARMTH processing can be a real sweetener. To soften the edge of cymbals try WARMTH on 4 or 5 setting and turn the input up to control the amount of warmth. Watch anything over 5 dB of WARMTH as this is really attenuating a lot of high end. But if it is just the front edge of the cymbals, it can be very pleasing. Of course compression may be used but if it is, set it up first.

Room mics - Again, the most gentle compressor for the room mics will be the BUSS compressor. However, radical room compression is currently in style. The TRACK or ELEVEN compressor will be useful over a wide range from 1 dB of GR to 20 dB depending on what you are going for, and what the tracks will allow. But for over the top treatment, try SPANK! The SPANK is not the NUKE of the Distressor yet it can add some of the same sustain and intense size to it. The bargraph can be run right offscale with the SPANK type compressor, and still be a very useful sound. Fifteen to twenty dB of compression is starting to have that John Bonham thing that the Distressor can do. Watch over-heating the tracks though. Also, any loud cymbal playing will become annoying with lots of compression on the room mic. Sometimes it may help to feed a compressed room signal back to the drummer while tracking to give him a feel for balancing his cymbals and drums.

SECTION DETAILS

Details of the four processors in each channel

THE COMPRESSORS

Each FATS0 compressor or compressor "TYPE" as we call them, sets the threshold, the ratio (in the standard sense of the word), the attack, and decay. This was done to provide an easy to set, yet versatile group of curves. There are essentially 4 discrete compressors with the fourth (SPANK) able to be combined with the other three.

THE FOUR FATS0 COMPRESSOR TYPES:

1. BUSS - Very gentle 2:1 type ratio with Slow attack and fast release. 1 - 4 dB of compression is usual for this compressor type. Very soft knee; Five or more dB of BUSS compression is hitting it hard!

2. ELEVEN - ELEVEN replaces the old GP Ratio, and emulates the famous UREI 1176LN in 20:1, with the slowest attack, and fastest release. This 1176 setting has been used on countless hit records through the decades. Can be used gently or aggressively.

3. TRACK Compressor - A Distressor type compressor is that's great for tracking instruments and vocals during the recording process or during mixdown. Mellow in ratio than ELEVEN. **This compressor now has its own LED, as the original FATS0 Jr used both the GP and the BUSS LEDs to indicate the TRACK Compressor, causing some people to think it was a combination of the BUSS & GP compressors, which it wasn't.**

4. SPANK - This is a radical limiter type compressor that was specifically designed to emulate the nice squeeze of the older SSL talkback compressors from the 70's & 80's. Quite a bit higher fidelity though. The SSL Talkback compressor was used on "In the Air Tonight" by Phil Collins on the drums.

By combining SPANK with any of the other 3 types of compressors, one really has 7 compressor types (or ratios), although the SPANK's aggressive nature will tend to dominate when combined. The release curve of all types is logarithmic, meaning it lets off quickly at first and then slows. This release curve is a big part of the FATS0's compressor sound.

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 the FATS0 compressor types have dominant knees except for SPANK. The BUSS Type Compressor has a knee that can be as long as 15 dB, it was setup for 3 - 5dB to sound HOT like tape.

VINTAGE COMPRESSOR EMULATION

Since the unit is based on the oldest compressor topology, the unit can be made to sound 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.

Some Examples:

- **LN1176 High Ratio** - The ELEVEN ratio closely emulates the 1176 on 20:1, slowest attack, fastest release. It is a deliberate emulation of this beloved setting.
- **LN1176 or Distressor Lower Ratio** - Use the Tracking compressor which emulates a lower ratio than the ELEVEN ratio. Good for tracking and Mixing.
- **DBX160 2:1 (for over easy)** - Try the BUSS for gentle compression, or ELEVEN Type Compressor for more aggressive treatment, no TRANNY.
- **SSL type BUSS compression** - Use the BUSS type Compressor. No TRANNY.
- **SSL Talk back compressor** - Use SPANK. Spank that track into submission.

DIFFERENCES IN THE NEW X VERSION AND THE OLDER FATSOS

Unlike the older units, the FATS0 is uniform and predictable from one unit to the next. Precise factory calibration assures that if you go from one FATS0 to the next, these settings will all sound the same. The only big variable is the input and output pots, which is why we use high resolution knobs, for recall. Differences in the new X version and the Older FATS0s The FATS0 Jr was redesigned to lower power consumption and heat, as well as make the interface operate more like it was originally envisioned. The controls can now step backwards one setting by holding the associated button for less than a second. This enables the Bypass to be accessed with one button press from any state, as well as compare compressor and WARMTH settings more easily.

SATURATION AND DISTORTION GENERATOR

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. But even before 2000AD, there were 35 cent op amps that were flat to 3 MHz, and produced distortion below .002%. Getting things accurate in the digital age is relatively cheap and easy, but getting a piece of gear to be “musical” and fun to use is whole different enchilada.

It is well known that the triode distortion in tube circuits produces lots of 2nd and 3rd harmonics, in some what 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 get increasingly 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 3rd harmonic is perceived more easily and often is the “BITE” that is added to midrange and the “warmth” to the low freqs by tube gear. Analog tape also saturates in this manner. The 3rd harmonic is induced in the FATS0 by increasing level thru the distortion circuits. It is usually the result of flattening the tops and bottoms of waveforms. Second harmonic is also added especially while compressing in the FATS0. 10% of second harmonic can be hard to perceive.

We have provided distortion indicator lights that indicate some reference operating levels. A “OVU” yellow LED light indicates just under 1% THD and the red “Pinned” LED indicates 3% THD or more. 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 a distorted mess. You will find that the harmonic distortion is generally more obvious on overall mixes and complex programs. On individual instruments, sometimes 10% distortion sounds “fat” and “analog” and isn’t heard as distortion at all.

WARMTH PROCESSOR

The Warmth circuit is by far the most complex part of the FATS0. Basically it is a very strange high frequency (HF) dynamic filter circuit, or High Frequency limiter. It operates very fast and should be very unobtrusive in operation since it gets in and out of the way very quickly. The desired result is akin to the HF saturation that analog tape exhibits when the high frequency amplitude interacts with the tape recorder bias to produce self-erasure of the higher frequencies. We provide a very accurate display of the HF attenuation, with the upper FATS0 bargraph showing the gain reduction at 20KHZ. The nature of the filter allows the corner frequency to move as attenuation occurs.

We provide just one control for the warmth but there are other ways to control the overall action of this circuit. If you do decide to use the compressor, set it up first because it affects the operation of the warmth. There is heavy interaction between the compressor and warmth settings. The warmth control is a step control with 8 ranges - no warmth action (no LEDs lit), on up thru the highest setting of 7. Perhaps the best way to think of the settings is as compressor threshold, with 7 having the lowest threshold, and the most warmth, responding quickly and often to high frequency content. Just remember that instead of controlling the overall level, this warmth “compressor” threshold only affects the high frequencies.

Hundreds of hours of experimentation were involved in developing the filter, to make it capable of large gain reduction at 20Khz without really dulling all the frequencies. Still, we remind you over and over in this manual to error on the side of less WARMTH... and Compression. The temptation is to say “oh wow that’s great, so fat and warm, let’s warm it more.” Resist temptation. Trust the meters when indoubt.... 3 - 5 dB is quite a bit of warmth on most signals. There may be times where over 10dB does the perfect job, but trust us that if you see all the LED’s light on the warmth bargraph - you really better know what you’re doing.

You will find the warmth to be useful all by itself many times without the compressor or TRANNY or much saturation. It can take some of the irritating ping and clickiness out of many sources. Originally the FATS0 was only going to have the saturation and this warmth circuit, but as our research went on, we decided the extra circuitry of the TRANNY and compressor would provide some of the other important nonlinear elements of tape compression, and “vintage” gear as well.

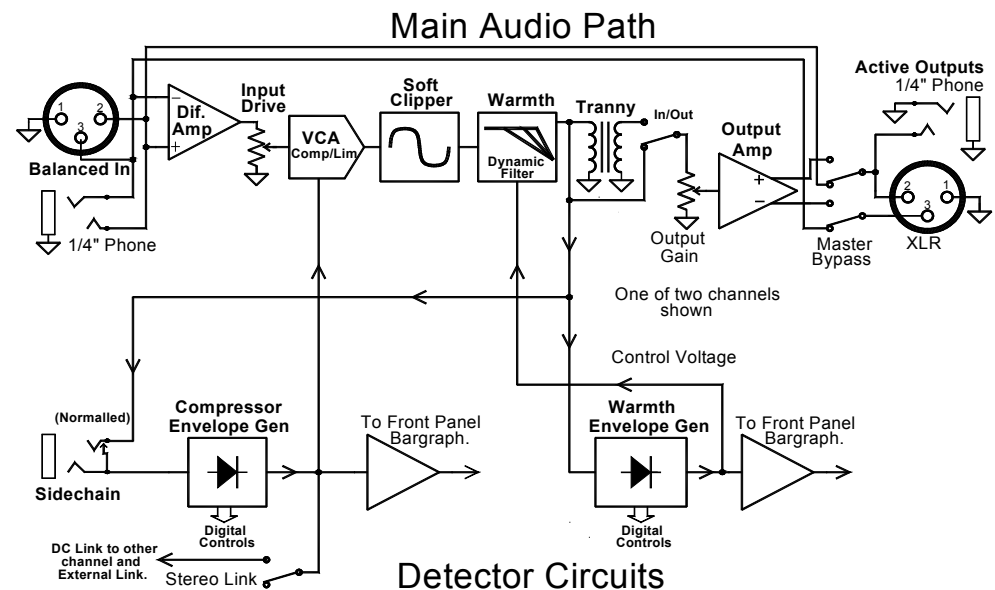
THE TRANNY

The TRANNY is short for transformer. In the old days, to interconnect between audio devices with low impedance cabling (i.e. noise resistant), the audio engineer used transformers on the input and outputs. Transformers isolate two signals using wire coils wound close to each other, but not actually touching. They were never that linear and often introduced saturation and LF distortion as well as changing the frequency response. Transformer design and use was an art (as demonstrated by folks like Rupert NEVE), and there were always tradeoffs. However, it has been widely known that a good audio transformer circuit can do wonderful things to an audio signal. This was the goal of our TRANNY circuit. We have tried to emulate the desirable characteristics of the good old input/output transformers in a consistent musical way, and in a selectable fashion.

Many of the older transformers had certain low frequency characteristics that some of our newer and more linear circuits and transformers have “overcome”. As frequency goes down, the audio signal gets more like DC (i.e. slower moving). Transformers don’t pass DC current thru them, so strange things start happening as the audio goes deeper. The addition of harmonics and peak saturation along with frequency and phase changes on the low frequencies occurs. We found that we could capture the low frequency effects of large and now expensive older output transformers in a weird, internally buffered switch-able design.

To sum up the musical results of our TRANNY circuit, there will be a little more edge in the midrange, and the super low frequencies will have been harmonically altered in a way that allows them to sound louder, even though the peaks are less than the original. Playback on small speakers will show an improved audibility of low end from the result of the psycho-acoustically-pleasing distortion the TRANNY adds. Something really interesting we noticed... even though fundamentals below 100Hz cannot show up on the little speakers... because of the natural way a transformer saturates, the harmonics give your ears enough clues that your mind somehow fills in the fundamental. If you have the time, try this experiment... put 40 Hz sine wave tone into the FATS0, and match the TRANNY level to the bypassed level, then put the output thru a small speaker. A/B the processed TRANNY signal with the bypassed signal in the small speaker. You will probably smile.

FATS0 BLOCK DIAGRAM



Note the position of the Warmth (and TRANNY) circuits after the Compressor, accounting for the large interaction between their controls.

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. The phone and XLR Input jacks are differential. 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 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, but there are times where a buzz can be introduced thru chassis grounds.

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 any modifications.

STEREO OPERATION & 5.1 SURROUND USE

To put the FATS0 into Stereo mode, press both COMP buttons simultaneously, or in older units, press both WARMTHS. The orange link LED will light on both channels. Let up on both buttons simultaneously. There are two main link effects: 1) The compressors are linked and their gain reduction will match, provided both are enabled. 2) The "Bypass" and COMP controls now controls both channels. It is usually best to match all front panel knob and switch 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 by using the old link (Pressing both Warmths simultaneously). This allows "hybrid" compressors. The new FATS0 EL7x adds the new COMP link, making either channel control the functions, but also provides the older Link (press both WARMTHs (instead of both COMPS) which enables different compressors on the two channels. Sometimes for room mics, keeping the units unlinked actually makes them sound more stereo.

For 5.1 surround where multiple units must be locked together, chain one unit to the next with a short phone plug cable in the "External Link" jacks, match controls, and put units in "Link" mode. Two interchangeable "External Link" jacks are provided to go to and from each FATS0. The gain reduction will now match on all units linked this way. For standard 5.1 processing, three FATS0es will be used.

The compressor bargraphs on the bottom will indicate that the two channels are responding together. Due to the high resolution of the bargraph there may be slight differences in the left/right bargraph response, mostly on the first few LED's (i.e. 1dB, 2dB, 3dB of gain reduction). New FATS0s (the EL7x) match better.

A NOTE ON BYPASS AND THE MULTIPLEXED CONTROLS

Multiplexed controls allowed us to fit everything into a 1.75" height chassis, with color-encoded indicator LED's arranged in an easy to read pattern, with Red LED's usually indicating more radical or distorted settings. To change compressor types, Warmth threshold, and the TRANNY/bypass, press the associated button and cycle through the options. To compare two close settings, hold the associated button for one second to step backwards. Press briefly again to go to first setting. The FATS0 uses a hardwired bypass relay enabling the user to compare processed and unprocessed signals accurately. When comparing the original signal from the processed signal, matching the output level with bypassed signal makes it very easy to hear the processing changes. The bypass on the FATS0 is multiplexed with the TRANNY control, and on the NEW "x" version, holding the TRANNY/Bypass button will step backwards, allowing a one button press to "Bypass" from any state.

FATS0 PET TRICKS

1) You can alter the standard thresholds of the FATS0 by inserting a level control in the Sidechain point. By turning the gain down there, the threshold will move higher, elevating operating distortion. Adding gain there will lower the threshold and lower Distortion/Saturation. See our website for more information. www.EmpiricalLabs.com

2) It is also possible to make the FATS0 have frequency dependant compression using the Sidechain insert Jack (was previously labeled INSERT on older FATS0s). Send the tip of the Sidechain jack to an EQ, and return EQ to the ring. The sidechain must not have appreciable delay nor be out of phase since it will affect the response time and possibly comb filter the control signals when in Stereo.

3) To set quick +4 tape levels, try setting output at 7.5 and "drive" input knob until compression occurs. For -10 input devices start at 5.5 to 7 output level.

TROUBLESHOOTING

UNIT FORGETS WHERE IT WAS WHEN POWER WAS SHUT OFF – Older units used a Non-Volatile memory cap that could fail after years of use, or possibly have some other type of logic failure. Contact the factory for suggestions or servicing. Newer units have a delay of 6 seconds before storing last control change. Wait 6 secs and turn off to test.

NO SIGN OF LIFE – Press any button to test. When no processing is engaged, the unit has no LEDs lit on the front panel. Check power cord for firm connection. If still no life unplug unit and open top cover by removing all top screws and check fuse toward rear next to transformer. If it is blown, pry it out and replace it with extra fuse provided in fuse holder toward front of chassis. Also, make sure your Voltage select switch is set to current wall outlet voltage (115, 230 VAC).

UNIT KEEPS BLOWING FUSES - Check internal voltage select switch for proper settings (115/230). Otherwise, suspect a short or power supply problem. Inspect internal components for burned or bulging parts. Try to make sure there is nothing trapped under the PC board, shorting to the metal case. Attentive visual inspection is still the most effective troubleshooting tool available.

UNIT RUNS HOT – Leave a space above or below it, or mount in cooler rack. New FATS0s run cooler.

UNIT IS ON BUT NOT DOING ANYTHING - The unit may be bypassed or operating subtly. If bypassed, you need to press the "BY-PASS" button so red LED goes off. The input and output levels should always affect it unless bypassed.

SLIGHT GAIN DIFFERENCE BETWEEN THE CHANNELS. Pots are like snowflakes: No two are exactly alike. We select pots and then improve channel to channel match by offsetting the knobs on the pot shafts.

UNIT SEEMS NOISY - Since the FATS0 is capable of lots of compression without sounding unnatural, you can often bring hiss levels up undesirably. If you have 20 dB of gain reduction on a room mic that has a 90 dB S/N, the noise floor will be raised 20 dB in quiet areas, bringing the noise floor up to 70 dB. Remember your current input level, and then test that the noise is coming from outside the unit by turning the input knob off (to 0). Try gating before compressing.

KNOB DON'T TURN TO EXACTLY 0 – When turned all the way down, the pointer is often a little above or below 0. We do this on purpose as a "calibration", so knob settings match better than their 10% rating. There are lots of knob ticks on the knobs for recall, even if you need slight adjustment. See above.

SIGNAL DISAPPEARS IN BYPASS – XLR pins 2 & 3 are probably switched in cabling or patch bay.

BARGRAPH SHOWS GAIN REDUCTION BUT VERY LITTLE OR NONE IS ACTUALLY OCCURRING - We use very stable trim pots and high quality components, but it is possible that long term component aging or failure may require factory re-calibration. Also, dampness or spills into the FATS0 can cause this phenomenon. At present you will have to return the FATS0 to factory, or certified repair center.

BARGRAPH LEDS FLICKER FOR A MINUTE OR TWO AT TURN ON. Unit simply needs to warm up.

DISTORTED OUTPUT - If there is severe, un-musical distortion, chances are you're hard clipping. Check that the output cable is properly wired and any unused output pins (2 or 3) on XLR output are floating (left unconnected). Shorting an output pin will not harm the unit but can show up as distortion in the output driver. The distortion this unit is meant to impart is harmonic and not crackly distortion caused by hard clipping. If the pinned LED stays on, you must lower the input. Compression can distort also.

NO OUTPUT - Make sure audio is getting to the unit, and the input and output levels are turned up.

UNIT POPS OR UNNATURALLY PUMPS WITH LOW FREQUENCIES Try a different compressor TYPE.

CHANGING THE FUSE

Caution: Always unplug unit before removing Top cover! Unplug unit, remove top cover, and ensure fuse closest to rear of the unit is blown. (Note: The fuse closer to the front panel is a spare fuse and is not connected to anything). Gently pry out one end of the fuse and then the other, replacing it with extra fuse provided near battery holder in front of unit. A small screwdriver may be helpful. Before putting cover on, plug in unit, keeping hands out of the box, ensure that the fuse doesn't blow again, indicating a possibly more serious problem (see troubleshooting). If OK, unplug unit, screw down top cover and return the unit to normal use. We use a .3A slo blo, but a .5A regular fuse should be fine, Replace spare fuse in front if available. We went to the expense to keep an extra fuse inside... you should too.

LINE VOLTAGE SELECT

Changing the voltage for 230 or 115 operation is easy, but involves unplugging the unit and removing top cover. Inside on the right (as the front of the unit faces you), is a switch with 115 or 230V showing on its face. Select the desired voltage by sliding the switch until it indicates that voltage and you're done. Replace cover and screws.

COMMENTS ABOUT THE DISTRESSOR

"Every once in a while a product comes along with 'classic' written all over it. And in a certain sense of the word, this product actually is a classic already." **Mix Magazine**

"Dear Empirical, I'm an LA based producer and an owner of a Distressor. The unit is really awesome! I've used it on guitars, bass, room mics, vocals it works great on everything. I've used it on records I've made with Beck, U2, Etta James, Hole and lots of others." **Joe Chicarelli**

"One piece of gear I definitely recommend is a compressor called the Distressor. It's really great for just about everything and if you had to use just one compressor you could probably get away with just using that." **Mitchell Froom**

"I sold a couple of 1176's and have replaced them with the Distressors, which do a great job of emulating the 1176's." **Michael Wagener (Ozzy Osbourne, Extreme, Metallica)**

"In general, I really like where Dave Derr's ear leads him; one of pro audios truly independent thinkers, I'm a huge fan of the box (the Distressor): I use it for bringing up the "goosh" on ambient sources, and for saturating snares, toms, and kicks." **George Massenburg**

COMMENTS ABOUT THE FATSO

"In a word, the FATSO is a very good answer to what a lot of people loathe about digital recording. It smoothes out the sharp, brittle edges to exactly the extent you choose, and fills in the hairline cracks just right. I use one on almost every mix I do. I could easily use one and possibly two more." **George Massenburg**

"People used to have to hunt for old, expensive gear to get the kind of sounds that the FATSO gives me."

Ed Cherney (The Rolling Stones, Bonnie Raitt, Bob Dylan, Eric Clapton, Jackson Browne, Susan Tedeschi, Etta James, ... et al)

Best new Signal Processor-EQ AES Awards - "Empirical Labs FATSO took this category, despite the introduction of a variety of cool new processors. Who can resist the best aspects of analog tape combined with great compression" **EQ Magazine**

"The winner of the highly coveted, 'I'm going to write you a check right after the show award' was picked up by Empirical Labs for its FATSO processor." **Craig Anderton**

COMMENTS ABOUT THE LIL FREQ

"Hey Dave... so I got the box, plugged it in on an Etta James vocal that I was having problems with... and it \$#\$%^&* rocks. This is a great box, my friend. I can see anybody with a DAW wanting to use this thing. I am using the shelving, DS'ing and transformer out, and I am just thrilled. Congratulations. It absolutely complements the digital crap that I am forced to use... woohoo." **Ed Cherney**

"I finally got to hear Empirical Labs' Lil FrEQ, a monster that will destroy the way you think about EQ. This single-channel unit has two shelving bands, tunable low cut, four parametric bands, dynamic EQ for de-essing and direct box input—all noiseless and distortion free. Best of all, its smooth processing is absolutely addictive. Sweet!"

George Peterson (Mix Magazine)

COMMENTS ABOUT THE MIKE-E

WOW. It just dawned on me I never sent the email in my head telling you HOW FRICKIN AWESOME the Mike-E is. Its freakishly awesome and beautiful. **Steve Berlin (Los Lobos)**

If you're looking for a WOW moment with a preamp, you should look into the EL9 Mike-E. I have some pretty nice gear here, and when I got one, I put in an order for another the next day (my girlfriend wasn't pleased, but...). Seriously. True story. **George Peterson (Mix Magazine)**

"We have used the Distressor pretty much since its inception and now use the Mike-E like we use our lungs!!!! Thanks Dave and everyone at Empirical Labs. You are amazing !!!" **Charles Roberts & Frank Cavanagh (SEIVE, FILTER)**



Empirical Labs
inc.

Technology for the Artist

empiricalaudio.com