Liability

WARNING: Empirical Labs assumes no liability for damage or injury occurring from prototypes or products made from the Proto500 kit. We guarantee there are no shorts, nor dangerous circuits on the Proto500 as shipped from the factory. But since the user/owner will be adding his own circuits and modifications to the product, any damage or injury to the owner or owners other equipment are the sole result and liability of the owner/user, and not Empirical Labs. Using an unapproved module in some manufacturers powered racks, can also void the warranty of these racks. API has created a standard, administered by the "VPR Alliance". See page 6 for more info.

Other Empirical Labs Products:

1) **Distressor EL8** - Classic Knee Compressor. Used on thousands of major records!
2) **Distressor EL8X** - The original Distressor on Steroids.
3) **Fatso Jr** – Two channels of Full Analog Tape Simulation and Classic Compression.
4) **Lil FrEQ –** An EQ with 8 Sections of unparalleled tonal contouring.
5) **Mike-**E EL9 Microphone preamplifier/compressor
6) **DerrEsser –** Dynamic high frequency fixer, De-esser, also for API 500 type racks.
7) **Ua Fatso –** Our first software plug-in, an emulation of our Fatso Jr.
8) **SmartAx –** API 500 Compatable compressor/EQ and/or preamp.

OUR BELOVED CUSTOMER COMMENTS:

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

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

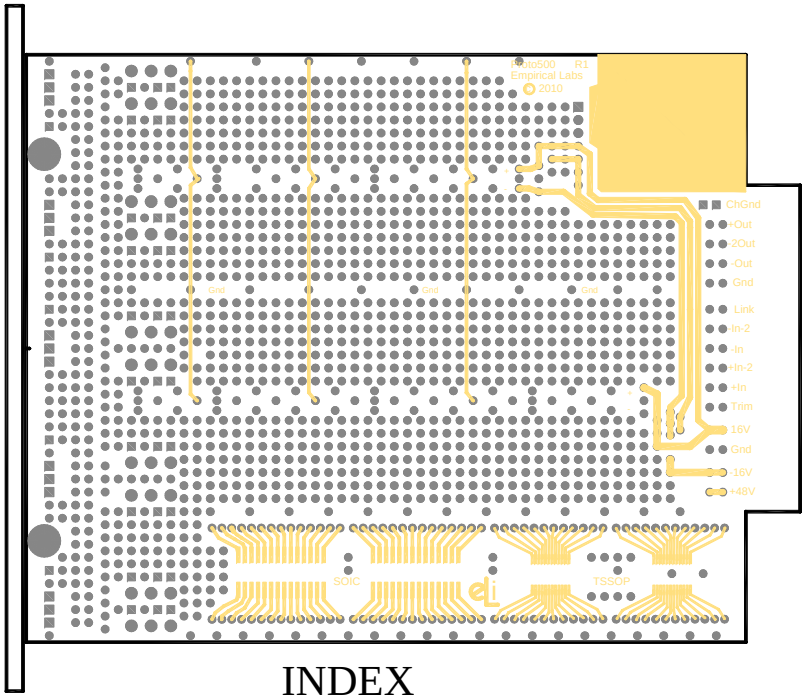
Lil FrEQ - "Hey Dave… so I got the box, plugged it in on an Etta James vocal that I was having problems with… and it $#$%^&* rocks. This is a great box, my friend. I can see anybody with a DAW wanting to use this thing. I am using the shelving, DS'ing and transformer out, and I am just thrilled. Congratulations.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

Mike-E - Oh and by the way I love this preamp it has such a nice sound. I have been running a sennheiser md 441 u on vocals and appreciate the gain this unit is capable of. The saturation circuit is really great as well as the compressor. Particularly when following the advice for vocals in your excellent manual. I just ordered the lil freq because of my love of this preamp, and am excited about the tranny out on the unit.

Empirical Labs - ELI really makes such great products; truly one of the most reliably awesome companies. they're ALWAYS bringing something new to the table. I mean, they never just settle for a typical comp or pre or eq - they have to add their trademark quirkiness and inventiveness to it, which always makes me curious and willing to throw down for gear I really don't need. and as usual, I can't wait to see what kind of crazy, brilliant, new ideas they came up with.

Visit our website for other product info at EmpiricalLabs.com.

Empirical Labs inc.



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Empirical Labs inc.

Empirical Labs - *Technology for the Artist*

What is the Proto500?

Ever wanted to try your hand at building an audio device that you could easily plug in and use in a professional recording or live environment. Well the Proto500 is a kit that makes it as about easy as it can get.

The Proto500 is a versatile prototyping system for the API 500 powered rack system. Included in our Proto500 is a PCB card, a metal front panel with mounting places, and 5 switches, as well as a manual. The simple yet elegant API 500 modular series is an extremely common hardware system that allows modules to be plugged in and out of a powered rack, such as the classic API Lunchbox (holds 6 modules/slots), or API 500VPR (10 slots). With over 2700 pads on the Proto500, and pre-layed out power supply traces, one can prototype relatively complex circuits for this system with much greater ease. The ground and power supply connections are "webbed" throughout the PCB, making it easy to test high performance circuits with low noise, and high reliability. The metal front panel has been painted with an impervious polyurethane paint, baked on like a car finish. With a little care, even front panel graphics can be pressed or silkscreened on for a finished looking product. In a few hours or less, a circuit designer or hobbyist can turn out a professional performance product.

The manual will provide you with all the pinout information, the power and ground supply connections, helpful hints, and lots of otherwise difficult-to-find information about the API 500 series modules. Even a novice will be able to create something fun and useable in a standard "recording studio quality" format. See our sample TILT CIRCUIT on page 5.

Features

- Versatile API 500 prototyping PCB Kit
- Includes PCB, metal Front panel, 5 switches, and a manual.
- Pre-wired power supplies and ground traces
- Regulator layout for +5 or other auxiliary supplies.
- Places for ½" pots or DPDT switches, spaced for front panel
- Pre-center-punched holes for switches and pots on rear of metal front panel.
- Surface mount pads for various footprints.
- 5 switches included
- Various pots available from factory at low cost

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Making Your Prototype a Finished Looking Product

NOTE: Do all drilling and lettering with the front panel removed from the PCB. IT will make things easier and prevent collateral damage from drills etc.

We have provided 5 positions for controls on the PCB and front panel. The back of the metal front panel has drill punch marks, placed to line up with pads on the PCB. The controls can be either switches or pots. One can also place controls in other positions with careful drilling. LED indicators can be added. T1 LEDs use a .1" hole. For these, it would be best to drill from the front so that the "burst thru" point doesn't mar the front panel and leave visible uneven holes. Buy a center punch and a hole reamer from Jameco, or other inexpensive supplier. These will help guide drills and even up holes. Pot and switch holes are larger and can usually be hidden or smoothed, if drilled from back to front. Also, a Sharpie pen can touch up scratches or shiny areas so they are not as visible when finished.

For the ½ PCB mount pots, ¼" holes can be drilled from the rear to front, using the guide punches we provide. The switch holes can be tricky since the drill will burst through and leave some burrs on the front side. You can trim these off with cutters, or use a conical reamer to smooth and enlarge the holes. Jameco has inexpensive reamers. Again, don't forget you can touch up unpainted or shiny metal areas around holes with a black sharpie.

Labeling and adding Graphics.
Graphics can be added using pressons or label systems like dymo or p-touch labels. Pressons by Letraset or other companies can be found online or at stores like Staples and Office Depot. 1/8" high text is nicely readable. Obviously you don't want to use black pressons over black paint, so white or another light color is recommended. Making pressons straight is always an issue, but a piece of masking/drafting tape positioned with a ruler as straight edge can help keep them in line and artistic looking. Sometimes an incredibly light pencil mark can be used, and then rubbed safely off later.

Coating the front panel with polyurethane or enamel spray can protect the lettering and graphics. Follow the directions on the can and apply at least 2 coats as recommended. Sometimes its advisable to ream out the potentiometer holes so there is metal to metal contact without paint or coating in between. This can prevent noise problems.

VPR Alliance – API founded this alliance to encourage standardizing, and to make guidelines for consistency. The program provides complete design specifications for manufacturers interested in producing 3rd party products that conform to API's rack specification. Go to www.apiaudio.com for more information on the VPR Alliance, and on all the classic API Products.

Helpful Hints

POWER SUPPLIES

❑ The power supply's are laid out and pre-run on two strips, each laid out so IC's can straddle them, as shown on the annotated drawing on page 2. As viewed from the front, +16V is on the left, ground in the middle, and –16V on the right. You can take a dual opamp (TL072 for instance), straddle the traces with pin 1 facing the front panel, and bend over pins 4 and 8, solder them to the power traces under the IC and voila, the chip is powered. All in under a minute! See page 2.

❑ When first powering, make sure you have tested for shorts between the supplies. Then insert module and do a quick power on and then off, to see if all the supplies come up (LED Indicators usually are provided on racks). If a supply LED doesn't light, you may have a short.

❑ Be careful with ALL polarized cap polarities. Most any cap above 1uF in value will be polarized and needs to be inserted in the circuit in the proper direction. If inserted backwards, it can short power supplies or cause poor performance.

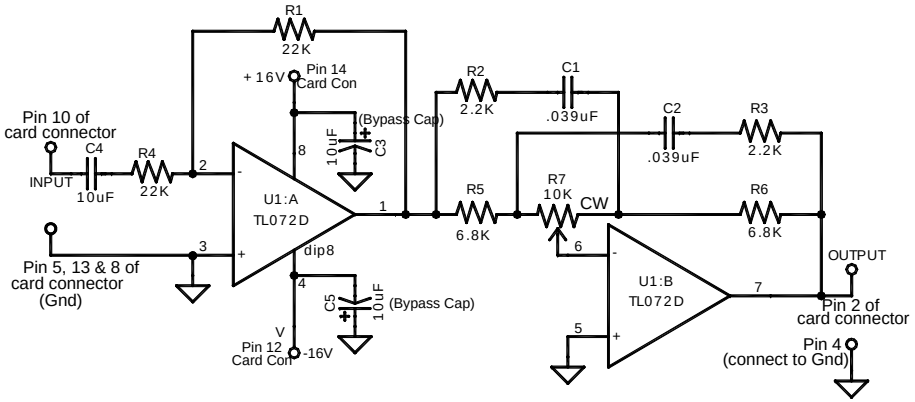
❑ The extra regulator can be easily wired as a positive regulator, after jumping +16V to pin one. +16V is run close to the regulator, terminating in handy pads. This makes it easy to get a +5V supply for instance. However, one can wire this TO-220 component in any configuration.

❑ Using sockets is recommended for novice prototypers. They allow power up tests with no ICs installed, preventing injury to expensive parts and possibly preventing power supply damage. One can also upgrade ICs such as OPAMPS later on, improving performance. Radio Shack, Jameco, Mouser and Digikey all have a slew of inexpensive parts, including sockets. Dual wipe or milled sockets are the most reliable.

❑ Drilling the front panel – On the rear of the front panel are pilot punches, for drilling holes to mount pots and switches. Holes for pots should be ¼" in diameter, while holes for switches can veary depending on switch cap size. Small bullet caps use .35" holes. See page 6.

❑ IC information, including pinouts, specs, etc is readily available with a quick online search. Same with other components, etc.

The Tone/Tilt Circuit – A fun, and Useful beginning project !



The above circuit has only 13 components and can take under a couple of hours to build. This type of circuit was used in the early 70s as the "Tone" control on radios and tape recorders (cassettes etc).. But this unbalanced circuit will have incredibly better performance. Use a socket for the 8 pin opamp. You will be able to change it for higher performance dual opamps later on. Put the bypass caps (C3 & C5) close to the opamp PS (Power Supply) pins. The 10K pot is the Tone/Tlt Control, with Clockwise rotation (CW) causing a high frequency boost/tilt, and CCW causing a low frequency boost/tilt. Corner Frequency is 850Hz. Making the .039uF caps larger will lower the corner frequency, and making them smaller will raise the corner frequency. One can lay this out so there is tons more room for adding more tone shaping circuitry, later on. The prototyper should attach pin 8 and pin 4 of the card connector to ground, for the best operation. This signal goes to pin 3 of the XLR Input and output connectors, and should be grounded. Pin 2 carries the main signal and 1 is usually ground (gnd). Additional support and protection components would probably be added for a "mass produced" product.

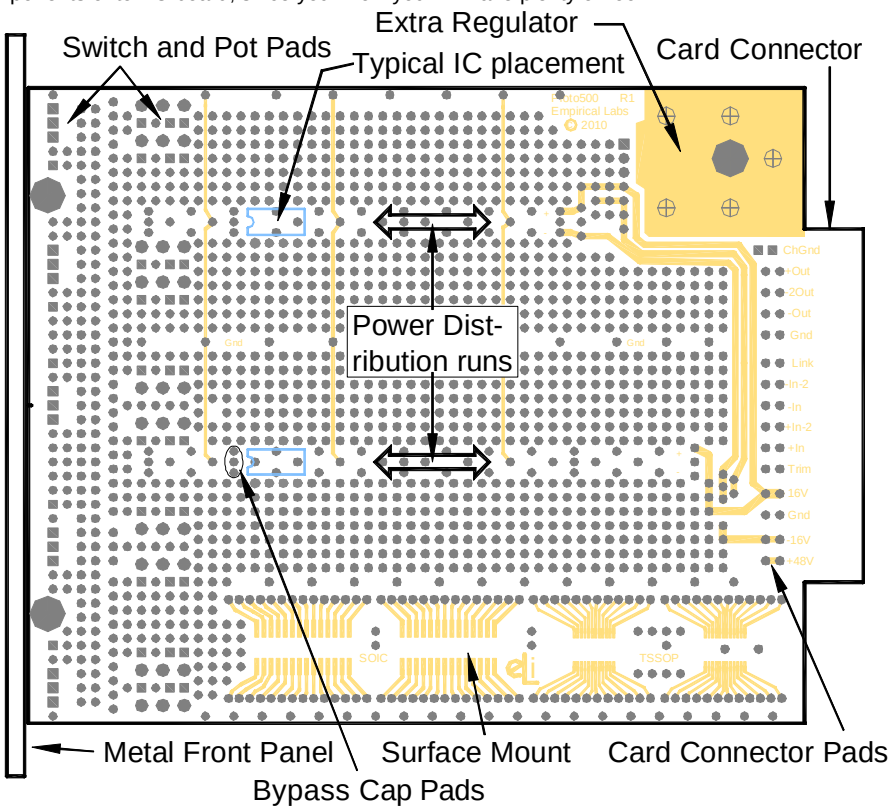
Getting Started

It's important to start with an accurate schematic of your circuit. With a sheet of the schematic in hand, a designer can make the connections one by one, putting a "slash" through each connection on the schematic, as it is made on the Proto500 PC Board. When all connections are made, one should double check the power supply connections for shorts, and preferably even "buzz" between the supplies with an ohm meter. Use an ohm meter between +16V & Gnd, -16V & Gnd, and +16V & -16V. Usually, the impedance will be much greater than 10 ohms between all three test points, even with a large complex circuit. If lower than 10 ohms, try switching the two ohmmeter leads, in case there is a diode connection in circuit. Diodes can look like a low impedance in one direction but not the other, so they may not be a threat to circuit operation. Shorting a supply can permanently damage not only your prototype, but also the racks power supply.

NOTE: Unfortunately, using a non-VPR-verified module in a rack can void the powered rack warranty. However, with a little thought and care, you should never cause a problem with your Proto500 circuit. Just double check for PS (power supply) shorts and backwards ICs, and caps.

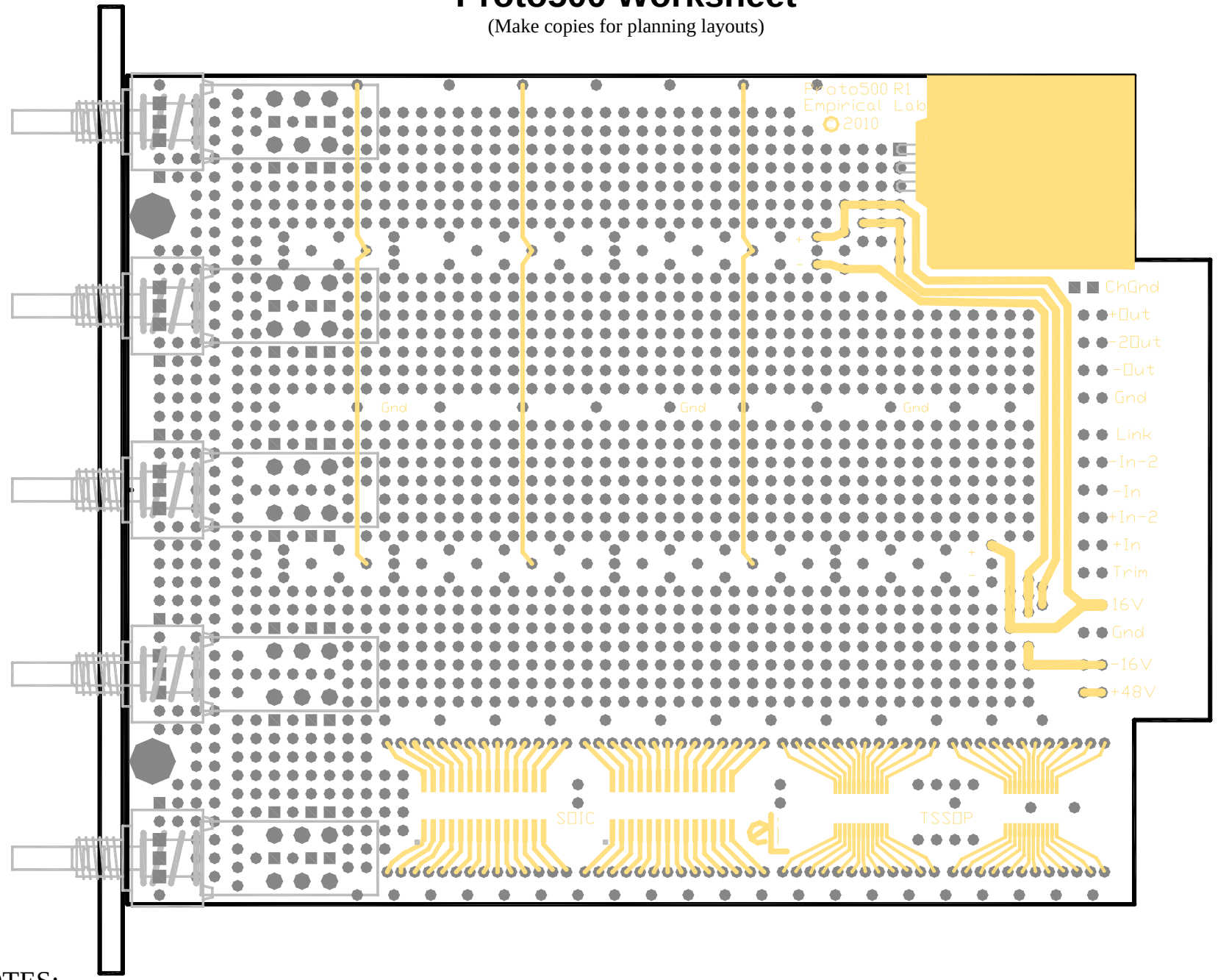
Plan a basic layout, using a Xerox-type copy of the middle pages of this manual. Pencil in a few large components and try to layout your board for shortest wire runs, and logical signal flow. Place U,R and C numbers on some components for "milestone" placement. These will help you find your way around and guide further component placement, etc.

When satisfied with the few placed large components (IC's and Caps), and checking to make sure you can fit the parts around these milestone components, start tacking in these components with one leg, slowly placing parts. By only tacking in one out of 8 legs (on an IC for instance), or one lead of a capacitor, components can be easily unsoldered and moved later on, if necessary. Sometimes with a really simple circuit, you can skip penciling in components on drawing, and go right to tacking components onto PC board, since you know you will have plenty of room.



Proto500 Worksheet

(Make copies for planning layouts)



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