

QUICK START

In deference to the ecological movement, Rane has made a commitment to keep its manuals short and to the point. After all, we're in the electronics business, not the tree industry. In deference to your patience, we include this hurry-up section.

Inputs on the FPL 44 are 1/4" TRS balanced/unbalanced. Outputs are balanced 3-pin (XLR). Positive appears on the tip of the input and pin 2 on the output; negative is the ring of the input and pin 3 on the output. Signal ground is either sleeve or pin 1.

Front panel settings include four THRESHOLD controls, four BYPASS switches and four SLAVE switches. The THRESHOLD controls set the level at which output limiting occurs. BYPASS directly connects the input to the output. The AUTO-SLAVE switch connects the VCA in the channel to the "slave" bus. In this position all channels in AUTO-SLAVE limit by the same amount when any one channel exceeds its threshold level. The channels may be set at different thresholds to suit the requirements of each situation. If one channel is overdriven by, say, 10 dB, its gain and the gain of all others in the slave mode reduces by the same 10 dB.

NEVER CONNECT A NYTHING EXCEPT AN APPROVED RANE AC POWER SUPPLY TO THE THING THAT LOOKS LIKE A RED TELEPHONE JACK ON THE REAR OF THE FPL 44. This is an AC power input and requires special attention if you do not have a power supply EXACTLY like the one originally supplied with your unit. A Rane Model FRS 8 or RAP 10 power supply is acceptable as well. Please see the full explanation of power supply requirements elsewhere in this manual.

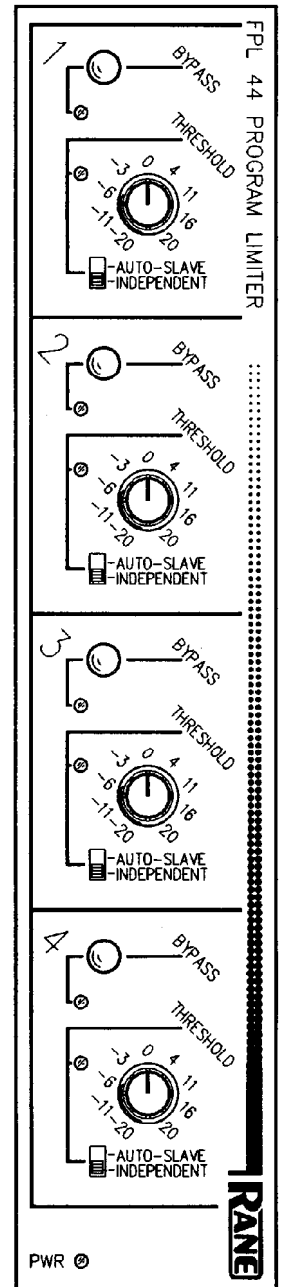
SYSTEM CONNECTION

When connecting the FPL 44 to other components of a sound system for the first time, LEAVE THE POWER SUPPLY FOR LAST. This allows for any mistakes to be identified by visual inspection and corrected before power is applied and it becomes too late.

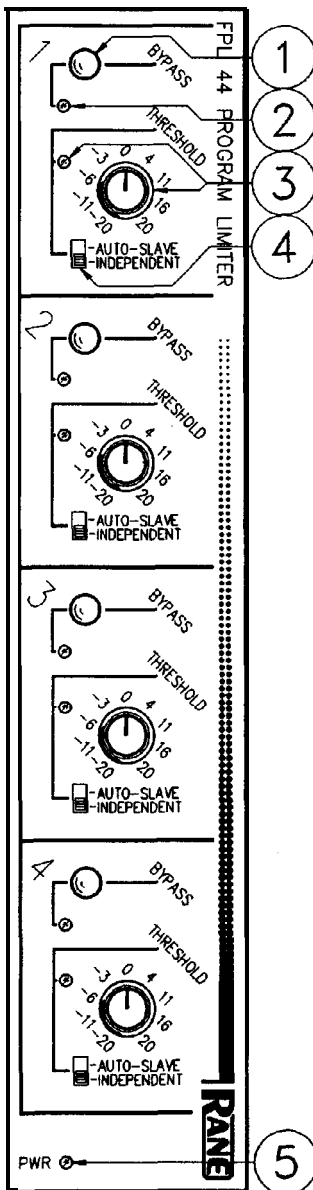
INPUTS on the FPL 44 are balanced. The hardware provided for input connectors are 1/4" tip-ring-sleeve jacks. The tip of the jack is the positive input, the ring is the negative input and the sleeve is signal ground. Unbalanced inputs may either ground the ring or leave it open while driving the tip with the unbalanced signal. The FPL 44's input circuitry is of the instrumentation variety, eliminating concern over open negative inputs, while ensuring equal differential and common-mode impedances.

OUTPUTS. The outputs on this device are balanced as well. They differ from the inputs only by way of their hardware implementation. The Flex philosophy dictates using 1/4" connectors for signal flow inside of a rack. Lines likely to exit a rack are of the 3-pin variety. If you read the "Quick Start" section above, you already know that pin 2 of the output connectors is positive, pin 3 is negative and pin 1 is signal ground.

POWERING UP. In the opening paragraph it was stated that a good visual inspection often eliminates disasters before applying power. It cannot be overstated how important it is to use the correct power supply with this and all Flex modules. The Rane RS 1 single AC power supply (included with each module) as well as the Rane FRS 8 and RAP 10 power supplies are the only power supplies certain to work properly with this limiter. If another power supply is to be considered, it must be an AC supply. It must have an 18 to 24 volt center-tapped output and be wired to a 6-pin mod connector in accordance with the requirements of the Rane standard.



FRONT PANEL DESCRIPTION



1. **CHANNEL BYPASS SWITCH.** This switch provides a passive bypass of each channel of the FPL 44. When pressed in, it directly connects the positive, negative and signal ground inputs to the positive, negative and signal ground outputs of the channel. It is provided to allow easy A/B comparison of limiter activity. It also serves to pass the audio signal around the active circuitry of the limiter in the event of power failure.

2. **BYPASS INDICATOR.** This red LED illuminates to advise the operator of a bypass condition, i.e., BYPASS switch pressed in.

3. **LIMIT THRESHOLD CONTROL & INDICATOR.** The calibrations (in dBu, 0 dBu = 0.776 Vrms) around this knob indicate the point at which the output limits. All levels higher than this setting are reduced to this preset amplitude. The indicator illuminates when the preset threshold is exceeded.

4. **AUTO-SLAVE SWITCH.** In the INDEPENDENT position ("down" in the vertical orientation, "right" when horizontally mounted) each limiter channel operates separately. In the AUTO-SLAVE position ("up" in the vertical orientation, "left" in the horizontal), each channel limits the same amount that any other channel in the slave mode does. If only one channel of the possible four is set to this mode, it operates independently. If two or more are set to AUTO-SLAVE, all slaved channels will attenuate the same amount when any one exceeds its THRESHOLD.

5. **POWER INDICATOR.** This yellow LED illuminates when an appropriate power supply is connected to the FPL 44 and is, itself, connected to an appropriate power source. For the definition of "appropriate power supply," please refer to the front page of this manual. It doesn't really make a lot of sense to beat this issue to death after having done so twice on the first page.

REAR PANEL DESCRIPTION

1. 3-PIN OUTPUT CONNECTOR. One of four, this connector provides either a balanced output on pins 2 and 3 or an unbalanced output between pins 2 and 1. Pin 2 is positive, pin 3 is negative and pin 1 is signal ground.

2. 1/4" TRS INPUT CONNECTOR. Each of the four channels of the FPL 44 makes use of one of these to supply either a balanced or unbalanced input to the limiter circuitry within. For balanced operation, the positive signal is applied to the tip, the ring receives the negative and the sleeve is to be used for signal ground connection. Unbalanced input may be applied to each channel by driving the tip and using both ring and sleeve for signal ground or the sleeve alone. The simplest unbalanced input connection is realized by using a tip-sleeve (often referred to as a mono) plug which eliminates the need for ring worry.

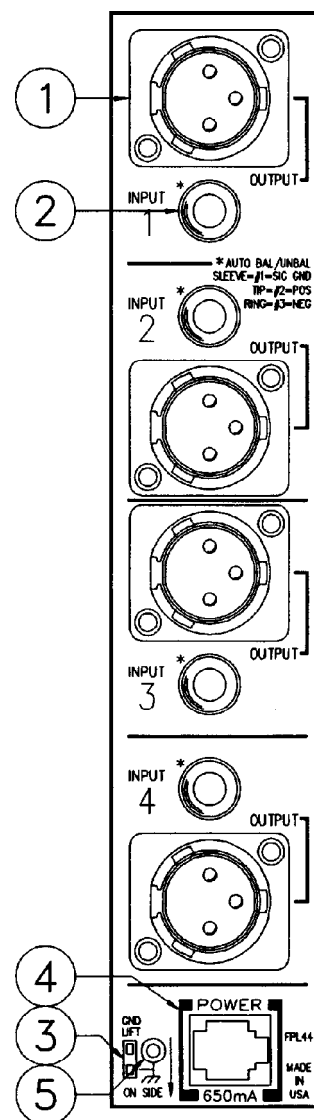
3. GROUND LIFT SWITCH. This switch (mounted on the side) provides the ability to separate chassis ground and signal ground. Normally, this switch should be in the LIFT position (pull toward the rear). In some circumstances it may be necessary to move it to the opposite position to eliminate stubborn hum and buzz problems.

We realize a scientific explanation of this switch would be helpful, unfortunately science doesn't seem to have much to do with it. See the CHASSIS GROUNDING note on the last page for details.

CAUTION: If you are tempted to try moving this switch with your power amplifiers turned on or turned up, DON'T BE. ALWAYS TURN YOUR AMPLIFIER LEVELS DOWN BEFORE CHANGING YOUR GROUNDS AROUND and then bring them up slowly.

4. POWER INPUT CONNECTOR. This is the spot where the "appropriate power supply" connects. Again, for a complete definition of the power supply, look across to the facing page for information concerning the location nearest you.

5. GROUND CONNECTOR. Since the FPL 44 is powered from a remote AC power supply which does not carry chassis ground through to the grounding pin of the AC cord, this threaded hole has been provided in case your system does not have another earth grounding means such as through rack rails, etc. Its use or disuse should be determined by your specific application.



OPERATING INSTRUCTIONS

To give you a better understanding about the operation of the FPL 44, a quick course in its design should be useful. Included as a part of this manual is the data sheet covering this product. This sheet includes a block diagram of one channel of the unit. You may want to consult this document to aid you in understanding the following.

The limiter circuit used in this module is what Rane refers to as a “servo-locked limiter.” This term derives from the similarity of this design to that of a servo motor such as is used in robotics and precision control systems. When the output of the circuit is below the setting of the THRESHOLD control, the FPL 44 channel acts only as a unity gain amplifier. The output is monitored at all times by a differential amplifier. One input of this differential amplifier has a reference voltage connected to it. The other input is driven by a full-wave rectifier whose level is a product of the RMS output voltage of the voltage controlled amplifier (hereafter VCA) and the THRESHOLD setting. The output of this circuit produces an error voltage any time the rectifier’s output exceeds the fixed reference. By nature, a differential amplifier’s output travels wherever necessary in terms of output voltage to keep its two inputs equal. Since the output of this amplifier connects to the control pin of the VCA, we have provided a means for this to occur. This scheme creates a servo-loop which will not allow the output of the VCA to increase above the THRESHOLD setting.

Any time the FPL 44 is limiting, the error signal created by the servo amplifier will be proportional to the amount of overdrive on its VCA’s output. This control voltage may be connected to other VCAs in the FPL 44 by setting the switch on the front panel to the AUTO-SLAVE position. Doing so connects the VCA’s control pin to the slave bus in the unit. In this way, when one channel limits, all channels on the bus attenuate the same amount. This preserves the spectral distribution of the signal.

This is a rather brief comment on the internal workings of each of the limiters in the module. Certain details regarding time-constants and other witchcraft necessary to make a limiter sound good have been eliminated in the interest of clarity.

The AUTO-SLAVE feature is most useful when the FPL 44 is being utilized to protect amplifiers and drivers connected to the outputs of an active crossover. Many feel when one driver is protected by limiting action, all drivers should be equally attenuated to preserve the spectral balance of the original program material. There are others who feel the opposite is the case. In an attempt to satisfy all, we include the option for either mode.

Operating the FPL 44 is quite simple. Simply set the THRESHOLD control to the level you never wish to ex-

ceed at the output. This may be accomplished either scientifically or empirically (what we used to call “trial and error”). The trial and error method is the simplest and also the most dangerous if the FPL 44 is being employed for system protection. Finding the point at which a driver or amplifier should be limited to prevent damage may produce the damage you are trying to avoid.

If you know that a driver can safely handle, say, 100 watts, and the limiter is to be connected directly to the input of the amplifier, the specifications of the amplifier may be consulted to determine the appropriate threshold setting on a given limiter channel. One must be certain that all variables are taken into account such as level control settings on amplifiers and so on. Failure to do so could result in disaster. The FPL 44 is also an invaluable signal processor for recording. Tape saturation on an analog machine can be tolerable within limits. Overloading the input of a digital recorder is quite another matter. The sonic characteristics of the FPL 44 make it a very suitable protection device in the studio. In this environment, a bit of trial and error in setting the THRESHOLD is far safer. Excessive levels during recording only damage the take, not the hardware.

CHASSIS GROUNDING

Rane Flex Series modules are supplied with either a rear, or a bottom/side mounted ground-lift switch. The unit is shipped with this switch in the “grounded” position, tying circuit ground to chassis ground. If after hooking up your system it exhibits excessive hum or buzzing, I there is an incompatibility in the grounding configuration between units somewhere. Your mission, should you accept it, is to discover how your particular system wants to be grounded. Here are some things to try:

1. Try combinations of lifting grounds on units that are supplied with ground lift switches or links.
2. If your equipment is in a rack, verify that all chassis are tied to a good earth ground, either through the line cord grounding pin or the rack screws to another grounded chassis.
3. Units with outboard power supplies do not ground the chassis through the line cord. Make sure that these units are grounded either to another chassis which is earth grounded, or directly to the grounding screw on an AC outlet cover by means of a wire connected to a screw on the chassis with a star washer to guarantee proper contact.

Please refer to Rane Note 110 (supplied with your unit and available on request at no charge if you lost your first one) for further information on system grounding.