



# RENKUS-HEINZ

PROFESSIONAL SOUND PRODUCTS

MODEL  
**P-1500**  
POWER AMPLIFIER



- **POWER-GARD CIRCUITRY**  
Protects speakers from sustained oscillation and heavy clipping.
- **HIGH POWER**  
500 watts/channel into 4 ohms.
- **COMPACT SIZE**  
Takes only 2 rack spaces.
- **EXCELLENT SOUND**  
"Super A" sliding bias, low negative feedback.
- **RUGGED CHASSIS**  
Solid construction for professional applications.

**Built For Reliability.** Designed for touring sound systems and concert sound reinforcement, the P-1500 performs equally well powering installations requiring substantial headroom, sonic fidelity, and trouble free operation.

**Power-Gard Protection.** Your speaker systems face many potential sources of damage. Even the best of processor-controlled systems available today cannot protect speakers from causes of damage that occur after the processor. Hard clipping of the amplifier and sustained high frequency oscillations are often the cause of speaker component failure. The exclusive Power-Gard circuitry in the Renkus-Heinz P-1500 eliminates these as potential problems for your speakers, yet the Power-Gard is sonically transparent under normal operating conditions.

**Natural Sound Reproduction.** The P-1500 uses identical ultra-linear NPN output devices connected in a "Super A" sliding bias configuration. Response is much more linear than conventional amplifiers using both NPN and PNP devices. The amplifier is designed with only 26dB of negative feedback for low transient intermodulation distortion (TIM). Excellent transient response and tight low frequency speaker reproduction are achieved with

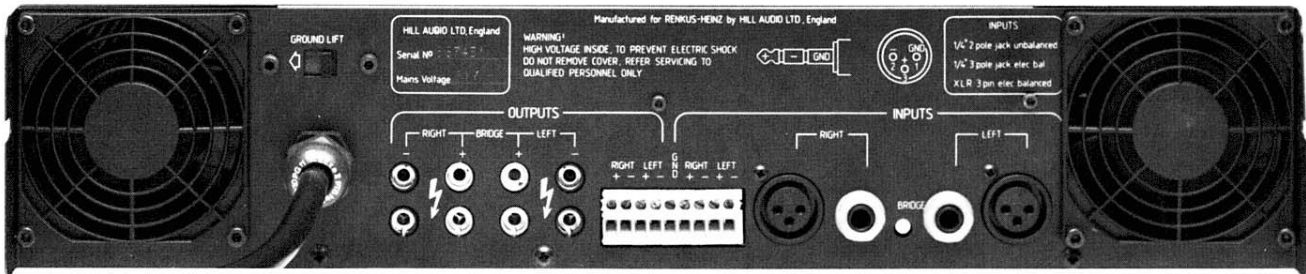
the high slew-rate circuitry and high damping factor at bass frequencies.

**Efficient Heat Dissipation.** Heat generated by high power amplifiers must be dissipated to ensure reliable operation. Unlike conventional amplifiers the P-1500 has the positive driven output devices from both channels on one heat sink, and all negatively driven devices on the other. So if you drive one channel at full output and the other at low output, the heat is still evenly spread between the heatsinks. The heat sinks are actually part of the enclosure, so the whole amplifier case helps dissipate heat. The continuously variable speed fans won't start until they are needed.

**Useful Convenience Features.** LED indicators on the front panel tell you if signal is present, the protection circuitry is activated, the bridge mode is selected, or the power is tripped off. Screw-clamp terminals on the rear panel take up to 14 GA wire for permanent installations; and banana plugs (outputs), phone jacks and XLR connectors (inputs) are available for portable use. A ground lift switch on the rear panel allows you to isolate the "audio ground" from the "AC ground". The AC safety ground remains permanently connected to the chassis.

## TECHNICAL SPECIFICATIONS

<p><b>OUTPUT POWER:</b> 300 watts/ch into 8 ohms 500 watts/ch into 4 ohms 750 watts/ch into 2 ohms</p> <p><b>BRIDGED MONO:</b> 1000 watts into 8 ohms 1500 watts into 4 ohms</p> <p><b>INPUT SENSITIVITY:</b> 1.55 V (+6dBm)</p> <p><b>INPUT IMPEDANCE:</b> 10 kohms unbalanced 20 kohms balanced</p> <p><b>FREQUENCY RESPONSE:</b> 20 Hz - 20 kHz, <math>\pm 0.5</math> dB</p> <p><b>THD (DIN):</b> within rated power, better than 0.1% at 8 ohms and 4 ohms</p> <p><b>IM DISTORTION (SMPTE):</b> 250mW to rated power 60Hz + 7kHz 4:1. Better than 0.1% at 8 ohms and 4 ohms</p> <p><b>SIGNAL TO NOISE RATIO:</b> 100dB below rated output</p> <p><b>COMMON MODE REJECTION:</b> 60dB</p> <p><b>RISE TIME:</b> 3 microseconds</p> <p><b>SLEW RATE:</b> &gt; 40 V / microsecond</p> <p><b>PHASE RESPONSE:</b> 18° at 10kHz</p> <p><b>DAMPING FACTOR:</b> 600 at 8 ohms, 20 Hz - 20kHz</p> <p><b>AMPLIFIER PROTECTION:</b> 20A on/off circuit breaker Thermal sense activates protection relay at 80°C</p>	<p><b>LOAD PROTECTION:</b> Power-Gard circuitry reduces amplifier gain when output clipping is detected. Protection relay activated if sustained high frequency oscillation detected.</p> <p><b>COOLING:</b> Two 3" fans, rear to front air flow. Automatic speed control starts at 40°C, full airflow reached at 70°C</p> <p><b>OPERATING TEMPERATURE:</b> -10°C (14°F) to 50°C (122°F)</p> <p><b>CONTROLS, FRONT:</b> On/off power switch Input level control, 1 per channel</p> <p><b>REAR:</b> Bridge switch Ground lift switch</p> <p><b>INDICATORS:</b> Power on Signal present Onset of limiting Protection activated Bridge mono</p> <p><b>REAR PANEL CONNECTORS:</b> XLR balanced input (pin 3 +, pin 2 -, pin 1 Gnd), 1/4" balanced phone jacks (tip +, ring -, sleeve Gnd). 5 way binding post outputs. All inputs and outputs available on screw clamp terminals for fixed installations.</p> <p><b>DIMENSIONS:</b> 19" rack mount 3 1/2" high 13 3/4" behind front panel</p> <p><b>WEIGHT:</b> 40 lbs net 46 lbs shipping</p>
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## ARCHITECT'S AND ENGINEER'S SPECIFICATIONS

The power amplifier shall be two channel type rated not less than 300 watts per channel into 8 ohms, and 500 watts per channel at 4 ohms, with not more than 0.1% THD from 20 Hz to 20 kHz. Bridged mono operation shall provide at least 750 watts into 8 ohms, 1500 watts into 4 ohms, and up to 625 watts into a 70 volt line. The amplifier shall contain circuitry to protect the speakers in the event of sustained high frequency oscillation and/or a clipped signal at the amplifier output. Noise level shall be no higher than -100dB. Cooling shall be provided by two servo-controlled variable speed fans. Size shall be 19" rack width, not more than 14" deep, and not more than 3 1/2" high. LED indicators shall be provided for signal presence and limiting on each channel, protection activated, bridged mode operation, and power on. Rear panel shall have a terminal block as well as phone, XLR, and banana plugs for flexibility in system wiring. The power amplifier shall be Renkus-Heinz Model P-1500.



**RENKUS-HEINZ, INC. Professional Sound Products Division**

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# P-1500 POWER AMPLIFIER

## OWNER'S MANUAL

### CONTENTS

INTRODUCTION	page 1
PANEL FEATURES	page 2
SPECIFICATIONS	page 3
OPERATION	page 4
COOLING	page 5
PROTECTION	page 6
BLOCK DIAGRAM	page 7



*manufacturers of professional audio components and systems*  
17191 Armstrong Ave • Irvine, CA 92714 • (714) 250-0166 • TELEX 705568 (R H INC UD)

Thank you for choosing a Renkus-Heinz power amplifier. We are sure it will give you many years of trouble free service: to help you achieve this, please read the following advice before turning on your amplifier.

Due to our policy of continuous development, we reserve the right to alter any specification without notice.

**WARNING**

**To prevent shock or fire hazard  
DO NOT EXPOSE to rain or moisture!**

**CAUTION**

**There are no user servicable parts inside the amplifier.  
Any and all controls needed for operation of the  
amplifier are accessible from outside the amplifier.**

**RACK MOUNTING YOUR AMPLIFIER**

It is recommended by Renkus-Heinz that you support the back of the amplifier when mounting in a rack. Renkus-Heinz will not be responsible for any damage (electronic or structural) caused from insufficient structural support when mounted.

## CONTROLS AND CONNECTORS

### BACK PANEL

POWER:	20 amp attached AC cord.
INPUT:	XLR - transformerless, balanced <b>pin #3 +, #2 -</b> 1/4" jack balanced <b>tip +, ring -</b>  Terminal block for installations
OUTPUT:	8 banana sockets on 3/4" centres Terminal block for installations
FANS:	2 x 3" fans, thermal-servo controlled
GROUND:	Ground isolation switch
BRIDGE:	Switch to turn on the MONO bridging circuit

### FRONT PANEL

INPUT LEVEL:	Sensitivity control per channel Green LED indicating signal present Red LED indicating onset of limiting per channel
ON/OFF:	Power on circuit breaker LED indicating power on
PROTECTION:	LED indicating protect circuit on
BRIDGE:	LED indicating MONO BRIDGE active

## SPECIFICATIONS \*

<b>Size</b>	19" rack mount, 3-1/2" high (2 rack spaces) 13" behind back panel
<b>Weight</b>	34 lbs (15Kg)
<b>AC Supply</b> 50/60Hz	240/220 VAC - 5 amps - music 240/220 VAC - 10 amps - full power sine wave 120/110 VAC - 10 amps - music 120/110 VAC - 20 amps - full power sine wave The supply voltage is NOT switchable, so verify the voltage of your amplifier BEFORE you switch it on.
<b>AC Breaker</b>	240/220V - 10amp          120/110 V- 20 amp
<b>Noise</b>	-100dB
<b>Power</b>	r.m.s. per channel, both channels driven 300 watts into 8 ohms, 500 watts into 4 ohms 750 watts into 2 ohms bridged MONO: 1000 watts into 8 ohms 1500 watts into 4 ohms
<b>IMD SMPTE</b>	250mW to rated power 60Hz/7kHz 4:1 better than 0.015% at 8 and 4 ohms better than 0.02% at 2 ohms
<b>THD DIN</b> 1kHz:	within rated power better than 0.01% at 8 and 4 ohms better than 0.02% at 2 ohms
20Hz - 20kHz:	within 0.5dB of rated power better than 0.02% at 8 ohms better than 0.04% at 4 ohms better than 0.1% at 2 ohms
<b>Slew rate</b>	greater than 40V/microsecond
<b>Damping</b>	600 at 8 ohms < 1 kHz 300 at 8 ohms 1kHz-20kHz
<b>Rise time</b>	3 microseconds
<b>Frequency Response</b>	20Hz - 20kHz, +0dB, -0.5dB
<b>Phase Response</b>	18° @ 10khz
<b>Input Impedance</b>	10k unbalanced, 20k balanced
<b>Load Impedance</b>	2 - 16 ohms
<b>Input sensitivity</b>	1.55v, +6dBm center detent at 3.1v, +12dBm

\*Verification of specifications requires disconnection of the automatic limiter and frequency protection circuits.

## OPERATION

### CIRCUITRY - TOTAL SYMMETRY:

Using a unique transformer coupled driver stage, the P-1500 features identical ultra-linear NPN output devices connected in a 'Super A' sliding bias configuration exhibiting a much more linear response than conventional amplifiers using NPN and PNP devices. The negative feedback is a very low 26dB and, in addition, the transformer coupled drive interrupts the DC voltage chain - **eliminating many of the circumstances in which a conventional amplifier can introduce DC voltage onto the speaker.**

### INPUT SENSITIVITY - 1.55V (+6dBm):

This multi-position, center detent control is graduated in volts to signify the input signal voltage needed to produce the rated power at the output connectors. The center detent is at 3.1V (+12dBm)

Your P-1500 amplifier will develop rated output power as long as the signal input is at least 1.55 volts.

So as not to overdrive the amplifier, set the input sensitivity control to a setting that matches the output level of the device driving the amplifier.

**For example** : if you are wiring your system such that your crossover is driving your amplifier, and your crossover has a 3 volt maximum output, set the sensitivity control of your amplifier to the 3 volt position so that when your crossover develops rated output (3volts) your amplifier will develop rated output (rated power) without clipping. The automatic internal limiter will reduce amplifier gain if the input signal becomes large enough to cause output clipping.

### CONNECTING AN INPUT SIGNAL:

The P-1500 will accept balanced and/or unbalanced signals using 3 pin XLRs, stereo 1/4" jacks and mono 1/4" jacks. The connector not being used for signal input can be used to link input channels of different amplifiers to the same signal - e.g. with signal into the LEFT channel using an XLR connector, the 1/4" jack can be used to feed signal to the right channel input of the same amplifier, or one or both inputs of any other P-1500 amplifier by using a 1/4" to 1/4" cord (stereo or mono), or a 1/4" to XLR cord (balanced or unbalanced).

A terminal block is provided on the rear panel to allow users to permanently wire the amplifier into an installation. All the outputs and inputs are available on this block.

### BRIDGE:

When the mono bridging switch is depressed, the amplifier is in the BRIDGE (MONO) mode: both channels are now internally connected, so only the left channel signal input is needed to drive the amplifier.

The output connections should be between the RED terminals of the output sockets ( Left Red + , and Right Red -).

AC SWITCH: The AC circuit breaker is ON in the down position

GROUND: some ground-loop hum problems may require isolating the audio [technical] ground from the AC ground: moving the switch provided achieves this. The AC safety ground remains permanently connected to chassis.

## COOLING

### FANS:

The speed of the fans is servo-controlled by an automatic temperature sensitive circuit, which will automatically start the fans when your amplifier reaches a temperature of 40°C, gradually speeding up to full airflow at 70°C

It is recommended that the fan covers are cleaned of dust periodically.

### RUNNING TEMPERATURE:

Unlike other power amplifier manufacturers, Renkus-Heinz constructs amplifiers out of custom aluminium heatsink extrusion that is not 'hidden' inside the amplifier's outer box (in fact the whole amplifier casing acts as a heatsink).

Because of this, your amplifier will give the **appearance** of running hotter than other amplifiers, as the front panel and sides can be hot to the touch after continuous full power operation. This is normal.

One problem encountered by all power amplifiers is one of heat dissipation - and to protect amplifiers from overheating, a thermal switch to shut down the amp when it reaches a specific temperature is standard on most amplifiers. In the P-1500 the thermal sensing circuit will activate the protection relay when the heatsink temperature reaches 80°C

If an amplifier is driven at high output with a different signal in each channel (such as one channel driving bass frequencies at low impedances and the other channel driving high frequencies) it is possible for one side of the amplifier to reach 'shut down' temperature before the other - which is a waste of the thermal dissipation capacity of that amplifier.

To eliminate this problem, the P-1500 has all the positive driven devices on one heat sink and all the negative driven devices on the other, which allows any heat developed by either channel of the P-1500 to be uniformly distributed throughout the whole amplifier, such that in the above mentioned situation, the P-1500 will NOT shut down until the whole amplifier reaches 'shut down' temperature - NOT just one channel - maximizing the P-1500 thermal dissipation characteristics.



## PROTECTION

The DC isolation transformer coupling technique allows the amplifier circuitry to perform perfectly safely and reliably without any protection devices whatsoever in the audio signal path - with significant sonic benefit.

There are no internal fuses in the amplifier as all circuits are relay protected and the AC line is protected by the on/off circuit breaker.

### AUTOMATIC LIMITER:

The P-1500 amplifier is equipped with an internal limiter that automatically reduces the amplifier gain when output clipping is detected. This circuit will automatically prevent a long term clipped output. However, if the front panel level control is set lower than the center detent the differential input amplifier can be driven into clipping before the power amplifier reaches it's clipping point. The automatic limiter will not prevent this and the clipped signal will be amplified and sent to the output.

### RELAY:

Persistent overdriving, short circuit, component malfunction etc., will activate a protection relay, shutting down the entire amplifier.

The high frequency detection circuits will allow brief periods of full power output but will automatically turn off the amplifier if continuous levels exceeding 20 volts rms at 10kHz and above are experienced.

If the relay does trip, for example, after sensing continuous high level, high frequency feedback (to protect your high frequency drivers), it will automatically re-set within 3 seconds.

If it still senses a problem it will trip and try to re-set again.

After 3 attempts the relay will turn off the amplifier.

To reset the amplifier at this stage, you will have to turn the on/off breaker off and back on.

It should be noted that if specification verification of the amplifier is required the limiter and high frequency detection circuits must be disabled. This can be done by a qualified service technician.

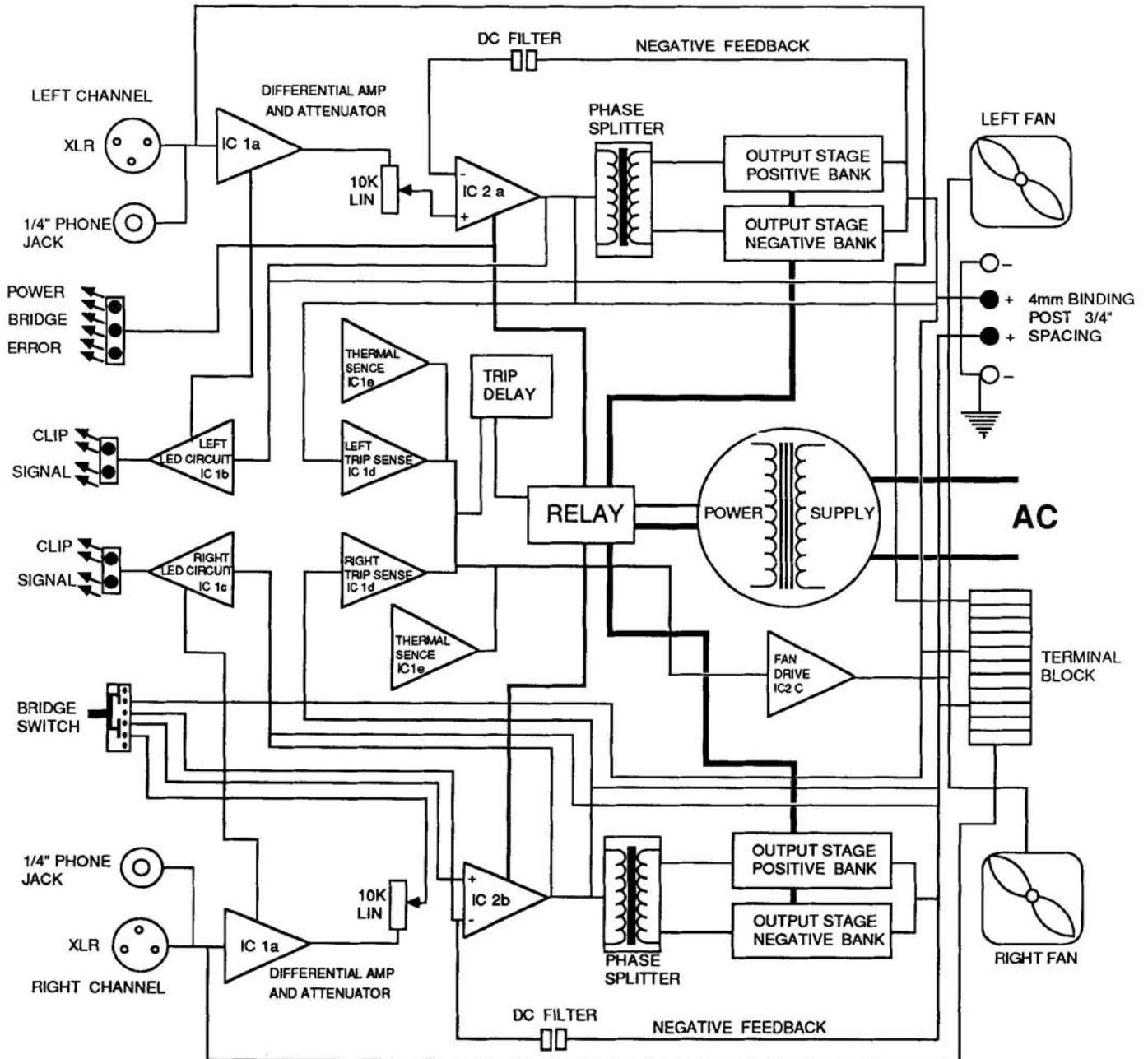
If the relay re-trips immediately when switched on, check that:

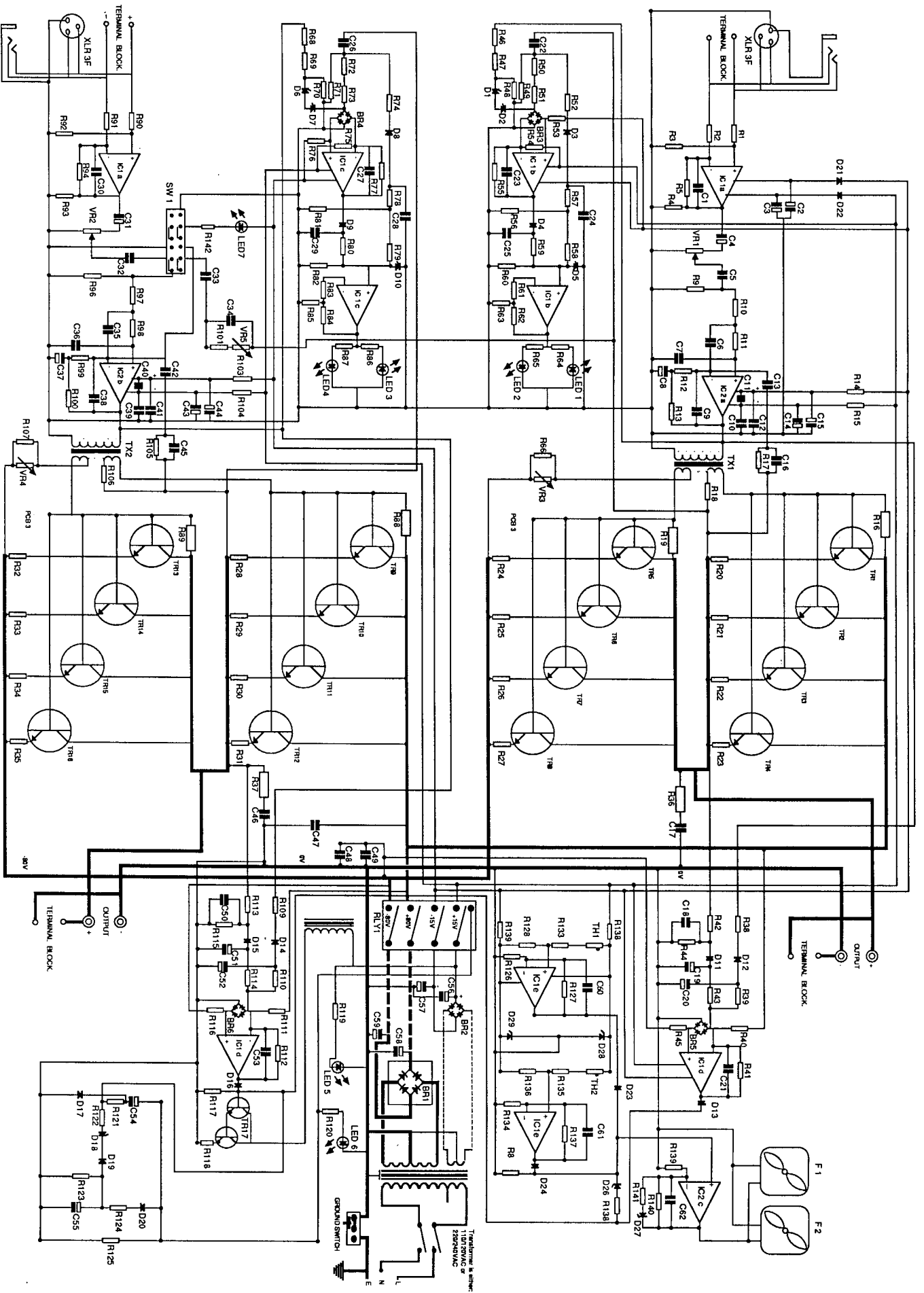
1. the P-1500 is not being overdriven or being driven with ultra high frequencies (such as an oscillating crossover) by turning down the input level controls before trying again.
2. the P-1500 is not driving a shorted speaker or speaker cable by removing the speaker cables before trying again.
3. the P-1500 is within normal operating temperature. If the amplifier has thermally tripped, it will stay off until it has cooled down to operating temperature.

If after trying all the above you still cannot turn on your P-1500, or the AC breaker continually trips, you should consult your Renkus-Heinz authorized dealer.

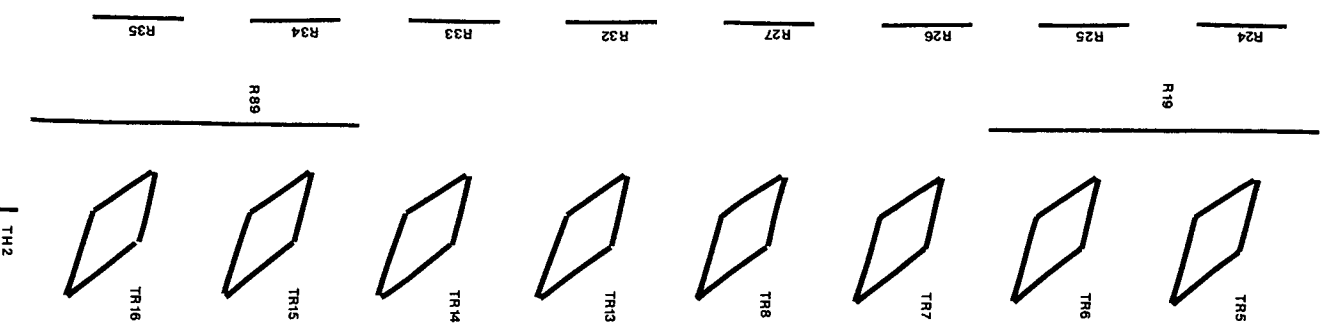
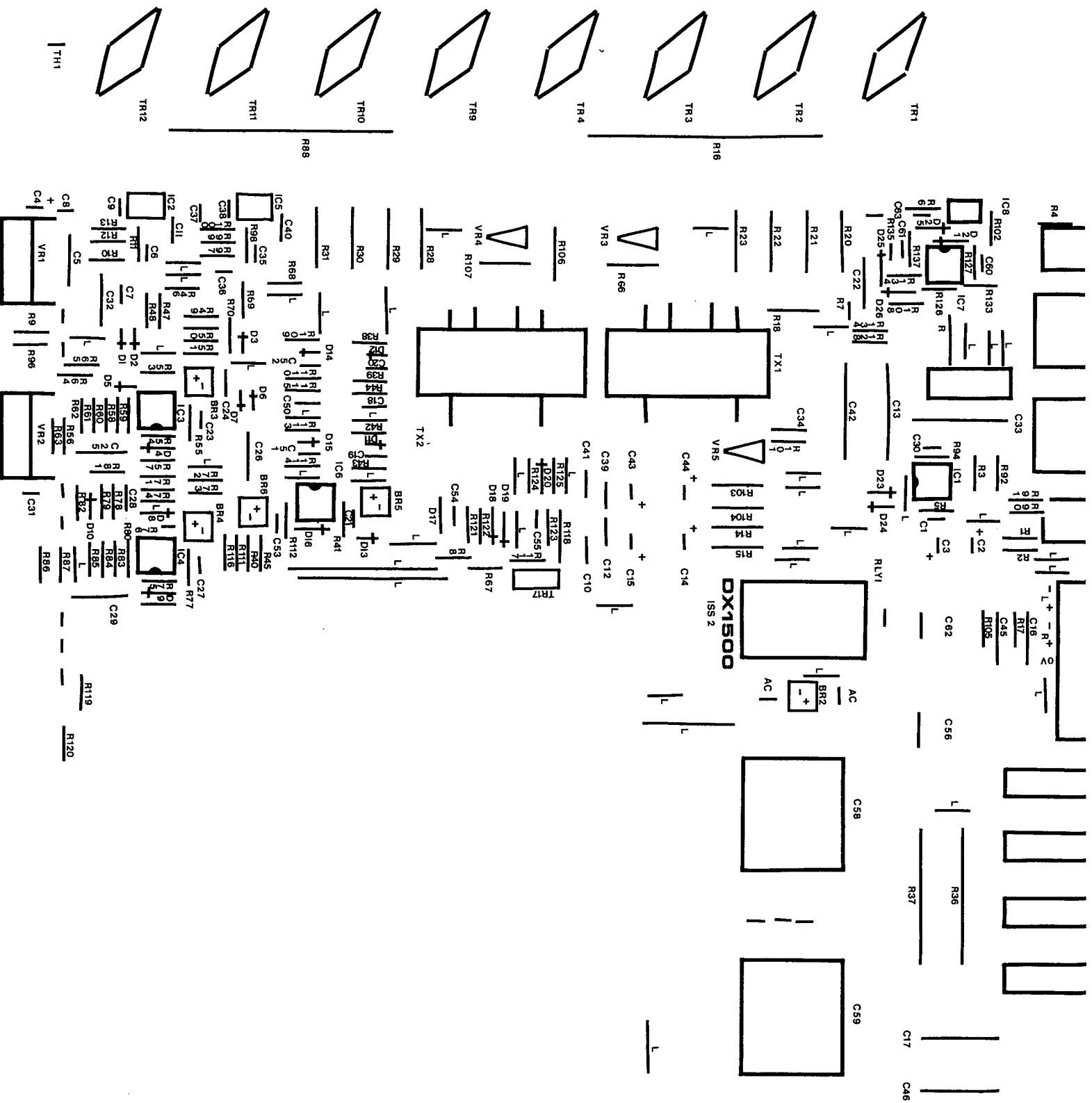
# BLOCK DIAGRAM

## P-1500









## Replacing TO-3 output devices in older amplifiers

It is a problem replacing TO-3 devices as many are no longer available. However, electrically equal or superior devices are available in plastic “tab” packages like the TO-218. The large format plastic package of devices such as the 2SC1302 are meant to mount in locations where TO-3 devices were formerly used.

In order to replace TO-3 devices with a large format tab device you need:

- A suitable TO-218 or similar device. In the case of the RH D1500, this device needs to have a  $V_{ce0}$  of 200V or better and an  $I_c$  of 15A or better
- An insulator washer for that replacement device. The old TO-3 one will not be suitable.
- In the case of a transistor where the mounting hole is not in a bare metal tab but is surrounded by plastic, you may need a solder lug where the mounting hole area is round and flat, not toothed.

To mount the replacement device you must:

- Bend the base and emitter leads (the two outer leads) 90° down exactly where the lead steps down in width so that the distance between the center of the mounting hole to the lead is 0.665” or 17mm
- Replace the TO-3 insulating washer with the new one. The alignment is such that the large hole in the washer will be around the TO-3 mounting hole furthest from the emitter and base leads.
- Insert the transistor. Note that at this time, the collector, or center lead will still be attached to the transistor and will not be bent. Be careful inserting the emitter and base leads as they are square or rectangular and the old leads were round. If a socket was used for the TO-3 device, you may have to force it a little and you may have to solder the pins in place to get a reliable connection.
- If the replacement device has **an exposed metal tab**, use the mounting screw you used for the TO-3 device to make the electrical connection for the collector. Then you can snip off the collector lead from the transistor. Please note that in some cases, the TO-3 device may have been connected to the other mounting hole. If this was the case, you may have to solder a short piece of insulated wire between the two mounting points of the TO-3 device.
- If the replacement device **does NOT have an exposed metal tab** and the mounting hold is surrounded by plastic, you may need a longer mounting screw. You will need to solder a flat solder lug to the collector lead and bend it over the top of the case so that the hole in the lug lines up with the mounting hole so that when you put in the mounting screw, the collector connection may be made. Please note that in some cases, the TO-3 device may have been connected to the other mounting hole. If this was the case, you may have to solder a short piece of insulated wire between the two mounting points of the TO-3 device.