

OPERATION MANUAL

P3500 • P3501
Dual Channel Power Amplifiers

PK-xxx-A
Plug-In Controller Modules



RENKUS-HEINZ

Cautions

Sicherheitsvorschriften

CAUTION


TO AVOID ELECTRIC SHOCK, DO NOT INSERT FINGERS OR OBJECTS INTO ANY OPENINGS IN THE CABINET

VORSICHT


UM ELEKTRISCHEN SCHLAG ZU VERMEIDEN, KEINE FINGER ODER GEGENSTÄNDE IN ÖFFNUNGEN DES GEHÄUSES STECKEN

WARNING: TO PREVENT FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE


WARNUNG: ZUR VERMEIDUNG VON FEUER ODER ELEKTRISCHEN SCHLÄGEN DAS GERÄT NICHT MIT REGEN ODER FEUCHTIGKEIT IN BERÜHRUNG BRINGEN




Explanation of Graphical Symbols
The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous Voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to humans.



The exclamation point, within an equilateral triangle is intended to alert the users to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.




Erklärung der graphischen Symbole
Der Blitz mit nach untenzielendem Pfeil in einem gleichseitigen Dreieck weist den Benutzer auf das Vorhandensein einer unisolierten, "gefährlichen Spannung" im Gehäuse hin, die stark genug sein kann, einer Person einen gefährlichen elektrischen Schlag zu versetzen.



Das Ausrufezeichen in einem gleichseitigen Dreieck weist den Benutzer auf wichtige Betriebs- und Wartungsvorschriften in den beiliegenden Unterlagen des Gerätes hin.

CAUTION


**RISK OF ELECTRIC SHOCK
DO NOT OPEN**



CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE THE COVER. NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL

VORSICHT

GEFAHR EINES ELEKTRISCHEN SCHLAGES NICHT ÖFFNEN



VORSICHT! UM DAS RISIKO EINES ELEKTRISCHEN SCHLAGES ZU VERMINDERN, ABDECKUNG NICHT ENTFERNEN. KEINE BENUTZER BEDIENUNGSTEILE IM INNERN. BEDIENUNG NUR DURCH QUALIFIZIERTES BEDIENUNGSPERSONAL.

CAUTION

**RISK OF ELECTRIC SHOCK:
OPEN ONLY IF QUALIFIED AS
SERVICE PERSONNEL**

To reiterate the above warnings: servicing instructions are for use by qualified personnel only. To avoid electric shock, do not perform any servicing other than that contained in the Operation Instructions unless you are qualified to do so. Refer all servicing to qualified personnel.

VORSICHT

GEFAHR EINES ELEKTRISCHEN SCHLAGES: NUR VON QUALIFIZIEREM WARTUNGSPERSONAL ZU ÖFFNEN

Eindringliche Warnung: Wartungsvorschriften dienen nur der Benutzung durch qualifiziertes Personal. Zur Vermeidung eines elektrischen Schlages keine anderen als die in den Betriebsvorschriften beschriebenen Wartungsarbeiten ausführen, es sei denn Sie sind dafür qualifiziert. Wartungsarbeiten sind nur von qualifiziertem Wartungspersonal auszuführen.

Table of Contents

Warning Messages	2
Table of Contents	3
Introduction	4
Technical Specifications	5
Front Panel Features	
Protection LED's	6
Signal LED's	6
Output LED's	6
Standby LED	7
Output Attenuators	7
On/Off Switch	7
Rear Panel Features	
AC Power Cord	8
Output Connections	8
Input Connections	9
Mode Selector	9
Mono Mode	9
Stereo Mode	9
Bridge Mode	9
Loudspeaker Controller Modules	
P3500 Modules	10
PK-xxx-A Controller	10
PK-BLANK-A "blank"	10
Block Diagrams	
P3500 Amplifier	11
P3501 Amplifier	11
Amplifier Set-Up and Operation	
Mounting	12
Cooling	12
Wire Size	12
Performance Verification	12
Trouble Shooting	13
System Block Diagrams	
Typical Stereo System	14
Typical Two-Way System	14
Typical Bridge Mode Operation	15
Typical 3-Way/4-Way system (using 2 controllers)	15
Typical 4-Way System (Using 3 controllers)	16

Introduction

Congratulations on your purchase of a Renkus-Heinz model P3500 or P3501 dual-channel, professional power amplifier.

Your Renkus-Heinz amplifier has been designed to provide years of trouble-free, high performance operation. We hope you enjoy it.

If you purchased the model P3500, your amplifier will include either a PK-xxx-A loudspeaker controller module or a PK-BLANK-A "blank" card (see pages 8 to 13 for details).

The PK-xxx-A is a dual channel controller module that is a dedicated companion to a specific Renkus-Heinz loudspeaker. It provides protection circuitry, electronic crossover circuitry and response optimization for its associated loudspeakers.

The PK-BLANK-A "blank" card is used when a controller module is not included.

Caution: If your amplifier includes a PK-xxx-A, it is configured for use with a particular loudspeaker model and should not be used with any other model. Use of the wrong loudspeaker may result in loudspeaker damage.

Your Renkus-Heinz amplifier was completely tested and inspected before leaving our factory and should have arrived in perfect condition. Please carefully inspect your amplifier and its shipping carton for any noticeable damage, and if any damage is found, immediately notify the shipping company.

Only the consignee may institute a claim with the carrier for any damage incurred during shipping. Be sure to save the carton and all packing materials for the carrier's inspection.

It is also a good idea to save the carton and packing material even though the amplifier arrived in good condition. If shipping the amplifier should ever be required, it should be shipped only in its original factory packing.

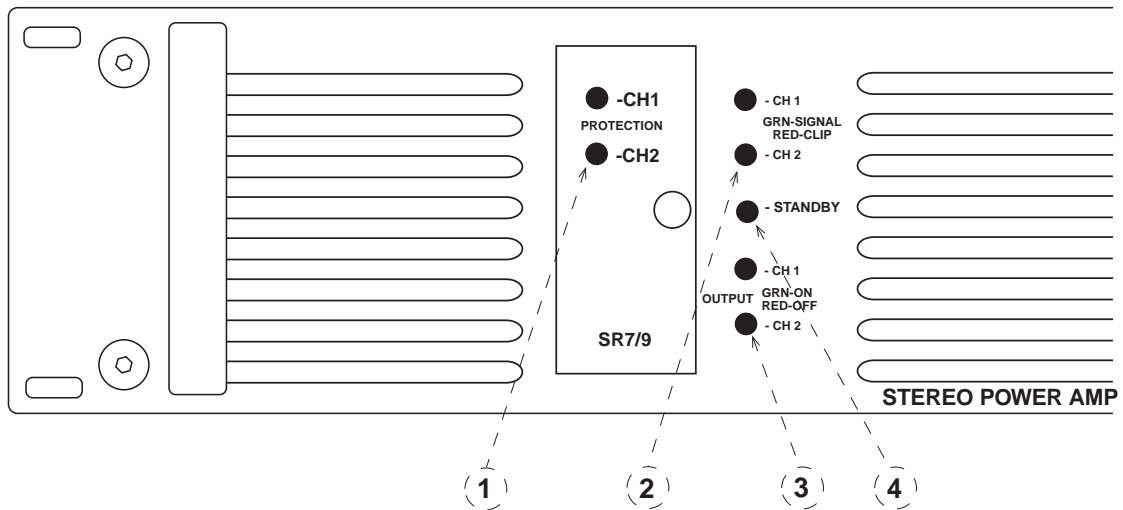
Important:

Your Renkus-Heinz amplifier contains no user-serviceable parts and all service should be referred to qualified service personnel. We recommend that it be returned to the factory in its original packing carton if factory service is required.

Technical Specifications

OUTPUT RATINGS:	500 w/ch at 8 ohms (20 Hz to 20 kHz < 0.25% THD)
	750 w/ch at 4 ohms 1000 w/ch at 2 ohms 2000 watts, 4 ohms bridged
FREQUENCY RESPONSE:	+0.0, -.5 dB, 20 Hz to 20 kHz @ RPO
THD (at 1kHz) DISTORTION:	< 0.1% at RPO (4 ohms)
SMPTE IMD:	< 0.2 %, 500 w at 8 ohms
HUM & NOISE:	-100 dB (referred to RPO @ 8 ohms, 20 Hz to 20 kHz)
CROSSTALK:	> 60 dB @ 400 Hz
INPUT SENSITIVITY:	1.5 V for RPO (at 8 ohms)
INPUT IMPEDANCE:	20 K ohms, balanced
VOLTAGE GAIN:	42
SLEW RATE:	> 35 v/usec
DAMPING FACTOR:	>100 for loads of 2 ohms or greater, 20 Hz to 20 kHz
MAX. VOLTAGE SWING:	+/-105 V Peak @ 8 ohms RPO
POWER REQUIREMENTS:	110/120/220/240 VAC, 50/60 Hz (1400 VA)
FEATURES:	Temperature, DC @ output, and short circuit protection Delayed turn-on w/output muting Subsonic and ultrasonic filters Anti clip circuit AC circuit breaker (no fuse) Signal & Status LEDs
COOLING:	2 rear-to-front 3-speed fans
CONSTRUCTION:	Closed box construction; 16 ga steel chassis, 3/16" aluminum face panel
FINISH:	Black (powder coat)
CONTROLS:	
FRONT MOUNTED:	Input level, power on/off,
REAR MOUNTED:	Stereo/mono/bridging switch
CONNECTORS:	Inputs; 3-pin female XLR (pin 2 +) Outputs; 4-pin Neutrik, binding posts Looping (controller outputs); 3-pin male XLR (pin 2 +)
DIMENSIONS (H X W X D):	3 1/2" H x 19" W x 17 1/4" D (behind panel) (8.9 x 48.2 x 43.2 cm)
NET/SHIPPING WEIGHT:	60 lbs (27.2 kg) / 65 lbs (29.5 kg)
ASSOC. EQUIPMENT:	
P3500:	PK-xxx-A plug-in controller module PK-BLANK-A blank card

Front Panel Features



Protection LED's

1. Plug-In Module/Protection LED's (on P3500 only)

If your amplifier is a model P3500, it will include either a PK-xxx-A loudspeaker controller module or a PK-BLANK-A 'blank' card. If the module is a PK-xxx-A, the model number of the associated loudspeaker will be included on the face of the module as shown in the above drawing. PK-BLANK-A cards carry no loudspeaker model number. Both the PK-xxx-A and PK-BLANK-A have two LED's (one for each amplifier channel) as shown above. These LED's light up (turn red) whenever the loudspeaker protective circuits are activated. The P3501 amplifier has no provisions for plug-in loudspeaker controller modules and does not have these two LED's.

Signal LED's

Note: The following instructions apply to both the P3500 and P3501.

2. Signal LED's

The two Signal LED's (one for each amplifier channel) glow green to indicate the presence of an audio signal in the amplifier and red to indicate clipping. Occasional operation of the red clip indication (flickering of the red light) is an indication of optimum system utilization. Extended illumination of the red clip light is a sign the system is being overdriven and should be avoided.

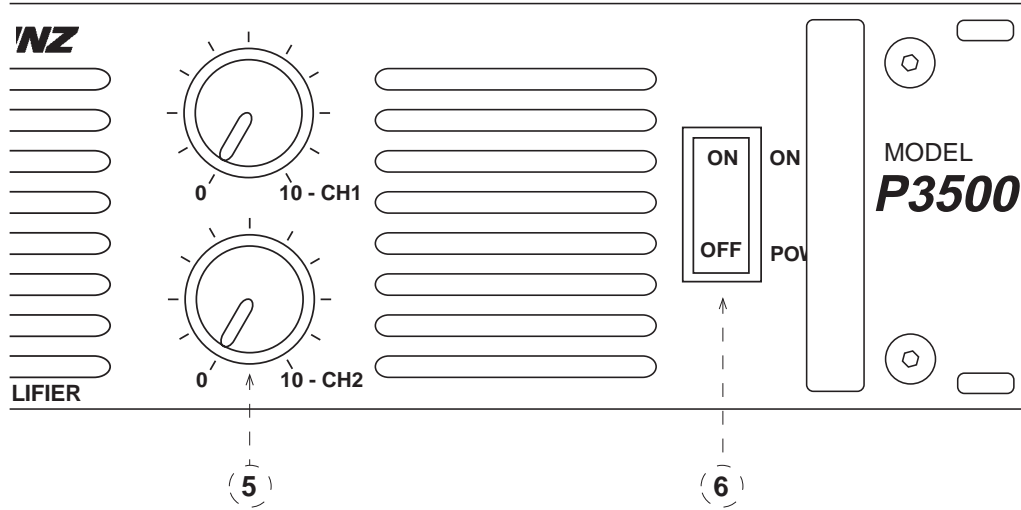
Output LED's

3. Output LED's

The two Output LED's (one for each amplifier channel) indicate the status of the amplifier's protective circuits by glowing red whenever one or more of the amplifier protective circuits has been activated. The amplifier contains separate over-temperature, DC on output and shorted-load protective circuitry for each channel. Whenever a fault is detected, the offending channel is "shut down" and the status light turned red to call attention to the problem. The over-temperature and shorted output protective circuits are self restoring and the channel will return to normal operation as soon as the problem is corrected. The circuit that protects against DC on the output is not self restoring and the channel will remain "off" until the circuit is reset by turning the amplifier "off" and then "on".

Note: If the status LED's remain red after the circuit is reset, the amplifier needs to be looked at

Front Panel Features



by service personnel.

It is normal for the Status LED's to be red when the amplifier is first turned on. They will then turn to green as a sign the amplifier is on and operating satisfactorily.

4. Standby LED

The Standby LED is active only when the amplifier is being operated under computer control. When the amplifier is being used in this fashion, the LED will glow green to indicate the amplifier is turned on, but operating in the "standby" mode.

5. Output Attenuators

The two Output Attenuators control the gain of their respective amplifier channel in all operating modes. When they are turned fully clockwise, the amplifier will have a voltage gain of 42 (a 1.5 volt input signal will give rated power). As a general rule, setting the attenuators in the full clockwise position provides maximum amplifier headroom; setting the attenuators at a lower level maximizes the system signal/noise ratio.

Important - - When the amplifier is being operated in the bridging output mode, both attenuators must be set in the same position to avoid a mismatch in the signal level being sent to each channel.

6. Power On/Off Switch and Circuit Breaker

This switch is used to turn power to the amplifier "on" and "off". It also acts as a protective power line fuse (circuit breaker) and in case of overload will automatically turn the power "off". If the switch shuts "off" during normal use, push it back to the "on" position just one time. If it will not stay "on", the amplifier needs service. Do not attempt to operate the amplifier by holding the switch in the "on" position.

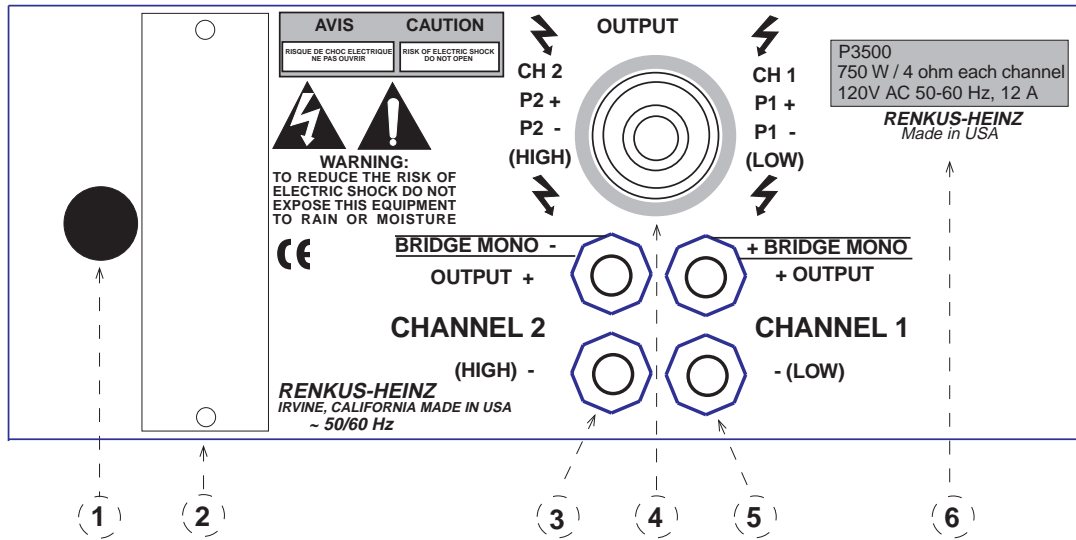
Before connecting the amplifier, check the AC voltage requirement and make certain the unit is connected to the proper voltage. Failure of the unit will result if a 120 volt amplifier is connected to a 220 volt power line.

Standby LED

Output Attenuator

On/Off Switch & Circuit Breaker

Rear Panel Features



AC Power Cord

1. AC Power Cord

A line cord with appropriate matching connector is supplied with the amplifier.

Before connecting the amplifier, check the AC voltage requirement listed on the name plate and make certain the unit is connected to the proper voltage. Failure of the unit will result if a 120 volt amplifier is connected to a 220 volt power line.

2. Blank Plate

The blank plate covers space reserved for an optional computer control module.

Output Connections

3. Channel 2 Output Connectors

The two binding posts marked 2- & 2+ are the output connectors for the Channel # 2 amplifier Terminal Post 2+ (the top red post) is considered the "hot" terminal while terminal 2- (the bottom black post) is "neutral".

4. Neutrik Output Connector

Provides single-connector, quick-disconnect facilities for both amplifier channels. Note that the number designations for the binding posts correspond to the connector pin numbers.

5. Channel 1 Output Connector

The two binding posts marked 1- & 1+ are the output connectors for the Channel # 1 amplifier Terminal Post 1+ (the top red post) is considered the "hot" terminal while terminal 1- (the bottom black post) is "neutral".

Note: The two top binding post terminals are the two output terminals when the amplifier is being operated in Bridge mode. Both are 'hot' and should not be grounded.

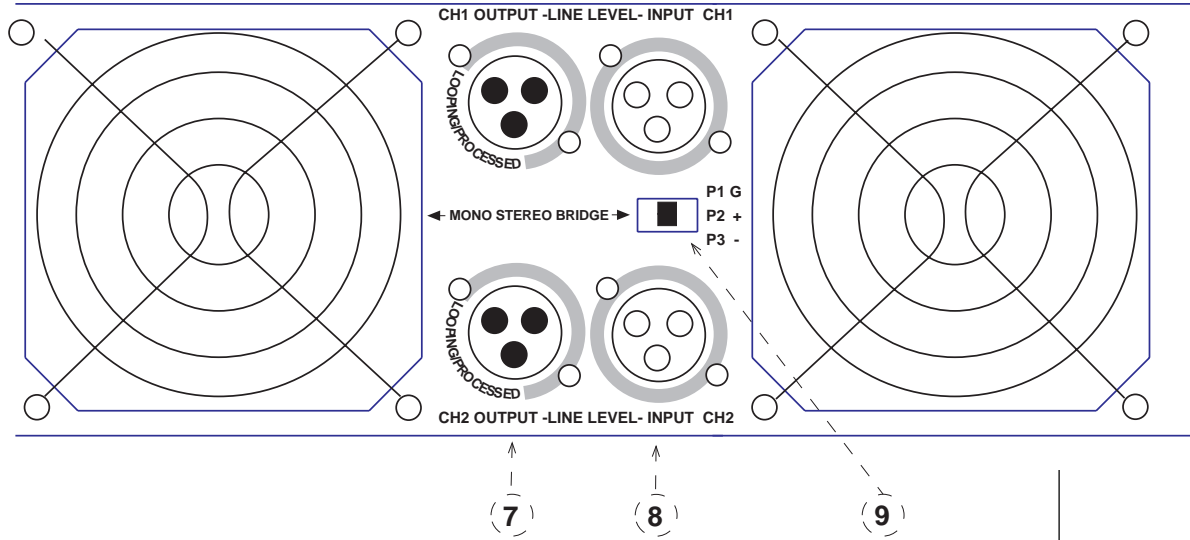
6. Name Plate

Provides the model number of the amplifier and lists its power and line voltage requirements.

7. Looping or Processed Outputs

These 3-pin male XLR connectors provide balanced low impedance outputs from the controller (processor) module for use in driving additional amplifiers or amplifier channels. Pin 1 is chassis ground, Pin 2 is the + (plus) or "hot" signal line and pin 3 is the - (minus) side. In a P3500 amplifier, these outputs are processed signals (controller output signals). In a P3501 amplifier, they are "looping" input circuits.

Rear Panel Features



8. Input Connectors

The audio inputs on the P3500 and P3501 are electronically balanced and use standard 3-pin female XLR connectors. We recommend the use of pin 2 as "hot" and pin 3 as "neutral". Pin 1 is chassis ground. When the amplifier is connected to a balanced source, the shield may either be lifted or connected at the source end. The choice should be made on the basis of minimum hum.

With an unbalanced source, connect the signal to pin 2, the shield to source ground (pin 1) and tie pins 1 & 3 together..

Note: Either pin 2 or pin 3 can be connected to the signal, but the other pin must be connected to source ground. Improper operation results when only pin 2 or only pin 3 and pin 1 (ground) are used for an unbalanced input.

9. "Mode" Selector

Allows the amplifier to be operated in either "stereo", "mono" or "bridged mono" modes.

Stereo Mode

When the Mode selector is positioned in the Stereo Mode (center position), the two amplifier channels operate independently as a stereo amplifier; i.e., input connector #1 drives amplifier channel #1 and input connector #2 drives amplifier channel #2. The outputs are separate and in phase. Both input attenuators are active to allow different level settings for each channel.

Mono Mode

In the Mono Mode (far right position), input # 2 is disabled and the two amplifier channels operate in parallel from a single input (input # 1). This eliminates the need to install a jumper cable to operate the amplifiers in parallel. The outputs are separate and in phase and both input attenuators are active to permit different level settings for each channel. Do not parallel the amplifier outputs!

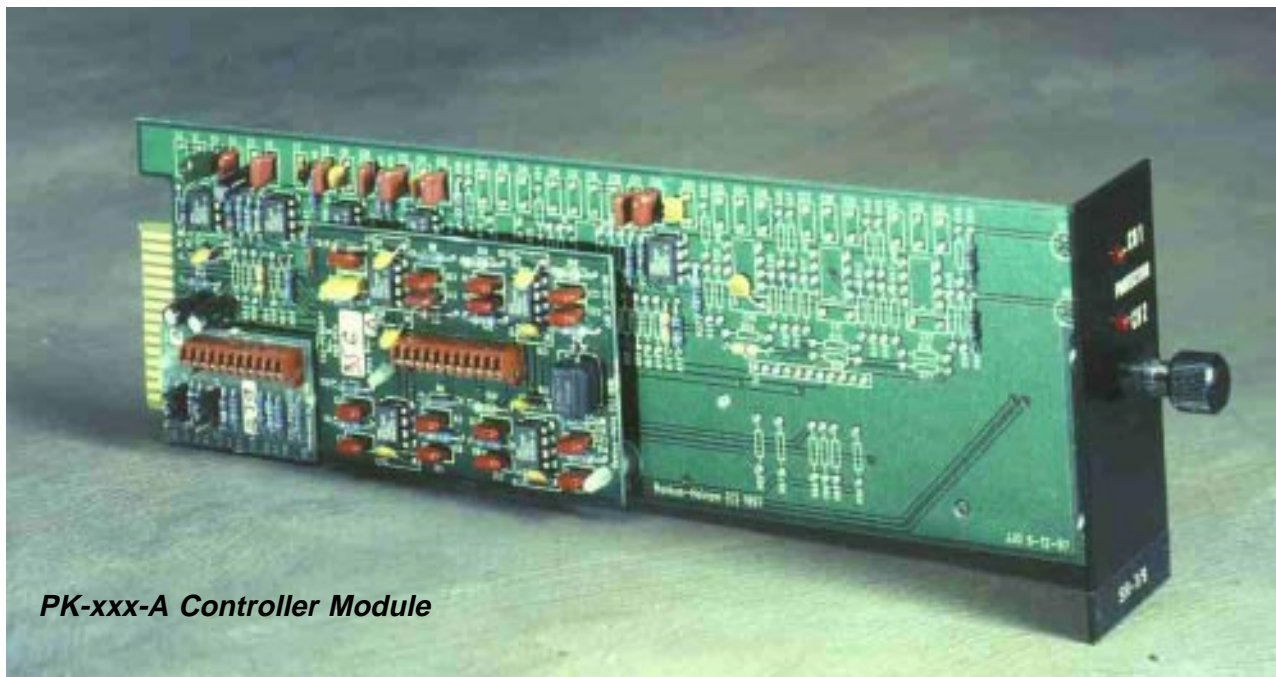
Bridge Mode

This mode allows the two amplifier outputs to be strapped or "bridged" to produce a single output with double the power capabilities of a single channel. Both channels are driven from a single input (input # 1), but out of phase. Input #2 is disabled. Both input attenuators are active and must be set to the same level. Note that in bridging mode both sides of the output should be considered hot and should not be grounded.

Input Connections

Output Mode Selector

Loudspeaker Controller Modules



P3500 Modules

If you have a model P3500 amplifier, it will include either a plug-in PK-xxx-A loudspeaker controller module (see above photograph) or a PK-BLANK-A "blank" card. If the module is a PK-xxx-A controller module, the model number of the associated loudspeaker will be labeled on the front of the module below the two loudspeaker protection LED's. If the module is a PK-BLANK-A "blank" card, there will be no loudspeaker model number on the face of the module.

PK-xxx-A Loudspeaker Controller Module

PK-xxx-A controller modules are loudspeaker specific modules (the xxx is associated with the model number of the associated loudspeaker). The modules provide protective circuitry for that specific loudspeaker model along with electronic crossover, response smoothing and, where appropriate, low/mid frequency time alignment. The protective circuitry protects the transducers from overheating (thermal overload) and the damage caused by high level transients. Protection against damage from over excursion, a problem associated with low frequency drivers is also provided.

The operating parameters of PK-xxx-A controller modules are preset during manufacture to match a specific loudspeaker and are not user adjustable. Do not attempt to change or modify them in any way.

PK-BLANK-A Blank Module

PK-BLANK-A cards are used when a controller module is not needed.

Note:

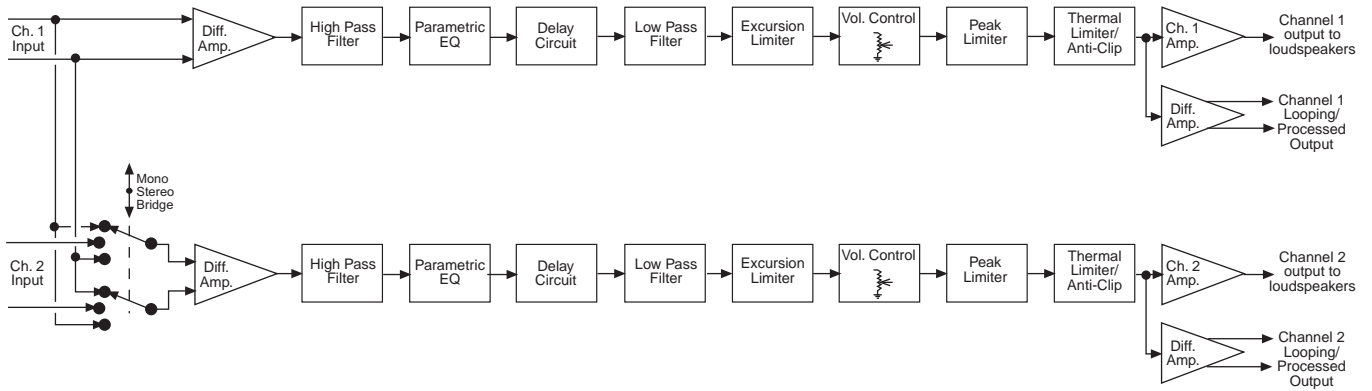
If your amplifier is a P3501, it will not have facilities for a plug in module and will not include the two loudspeaker protection LED's found on the P3500.

P3500/P3501 Block Diagrams

Block diagrams of the P3500 and P3501 are shown below.

Please notice that in the P3500, the Channel 1 and Channel 2 Looping/Processed Outputs are "processed" signals that can be used to drive other amplifiers.

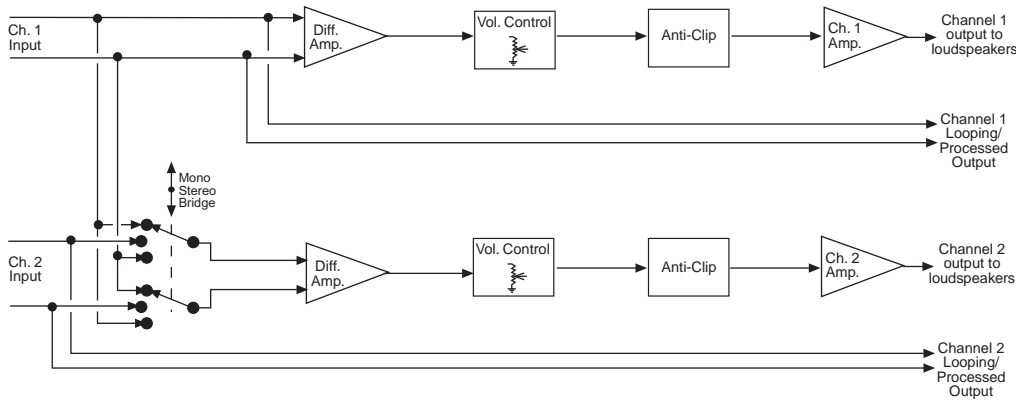
**P3500
Amplifier**



**Block Diagram
P3500 Amplifier with PK-xxx-A Controller Module**

In the P3501, these 2 outputs are strictly "looping" outputs that provide an easy means of paralleling the inputs of multiple amplifiers.

**P3501
Amplifier**



**Block Diagram
P3501 Amplifier**

Amplifier Setup and Operation

Mounting

The P3500 and P3501 amplifiers are designed to be mounted in a standard 19" rack. It has 4 front panel mounting screws and rear panel mounting ears. Because of its depth and weight it is imperative that the amplifier be supported at the rear in any portable application.

Cooling

Both amplifiers are fan cooled and it is important that an ample supply of air is provided at the amplifier rear and a free air exhaust space is provided in front of the amplifier. The two internal fans provide adequate cooling when the rack has an open back and the front is not obstructed. Closed back racks may need to be pressurized and provided with an air intake fan to ensure an adequate supply of cooling air to the internal amplifier fans.

Multiple amplifiers may be stacked directly on top of each other. There is no need to separate them with a blank (spacer) panel. Keep in mind that almost all amplifiers radiate a 50/60 Hz magnetic hum field from their power transformers. It is prudent to provide at least one rack-space between any signal processing equipment and the nearest amplifier to reduce the possibility of induced hum.

Using higher wattage amplifiers than actually needed is acceptable when the P3500 and a PK-xxx-A loudspeaker controller module are used as the protective circuits included in the plug-in module will keep peak power levels within the acceptable limits for each driver.

Wire Size

The size of the speaker wiring needed depends on the length of the cable. We generally recommend the use of 12 AWG for cables up to 30 meters (approximately 100 feet) in length.

The following table shows the signal loss in 30 meters of cable driving a 4 ohm load:

Wire Gauge (AWG)	10	12	14	16	18
Signal Loss (dB)	.44	.69	1.07	1.65	2.49

Verification of Proper Operation

Before applying power to the system, trace and verify all connections.

Caution: Operating the System at full level can damage your hearing. Wear ear protectors and do not position yourself in front of the loudspeakers.

Make certain Mode selector(s) are set in the desired mode and that outputs are properly connected. Loudspeaker damage may occur if, for example, the Sub outputs are connected to the high frequency drivers and not to the Subs!

Set the power amplifier gain controls to their minimum position.

Turn on the power amplifiers and slowly turn the amplifier level controls to their maximum position one at a time. While you are doing this, verify that as the amplifier gain is increased the appropriate response is obtained (i.e. the sub channel is connected to the subwoofers). Moderate level audio should be heard from the loudspeakers.

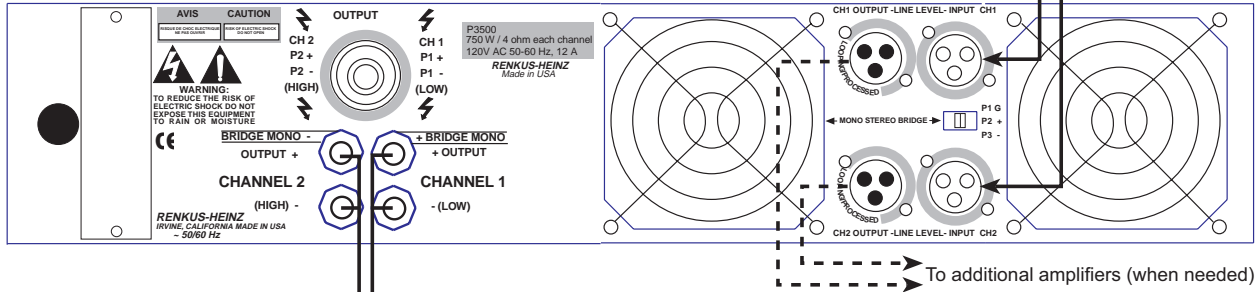
Gradually increase the signal level while observing the Signal LED's. As the level increases they should begin to flicker red. As the level continues to increase they will be on for longer periods of time. **Do not operate the system at a level where the protection LED's are illuminated continuously.**

Trouble Shooting

Possible Cause	Fault
<p>Indicates the amplifier is turned "off" or not receiving power. Check for proper connection of the power cord to a suitable outlet and verify proper voltage. Make sure the amplifier is turned "on".</p>	<p><i>Status LED's are not lit</i></p>
<p>Indicates the amplifier is not receiving a signal or is receiving a very low signal. Check that the source is sending a signal and that the interconnecting wiring is not faulty.</p>	<p><i>Signal LED's are not lit; no sound</i></p>
<p>Indicates the amplifier is being overdriven. Reduce system level and/or avoid extreme equalization. Add more amplifiers and/or loudspeakers to the system.</p>	<p><i>Signal LED's are red continuously</i></p>
<p>Indicates that the protective circuitry for that channel has been activated. Check for a shorted line on that channel. Turn the amplifier "off" and then "on" again to see if the protective circuitry will reset. If it does, overheating was probably the problem and the temperature has dropped to a safe level.</p>	<p><i>a single Status LED is glowing red; no sound from one channel</i></p>
<p>Indicates that the loudspeaker connected to that channel was receiving too much power and the controllers' protective circuitry has been activated and reduced the signal level.</p>	<p><i>a red Protection LED is lit; weak sound from one channel</i></p>
<p>The power switch is a combination power switch/circuit breaker. Not staying "on" is an indication the amplifier has failed and needs service. Remove the amplifier from operation (disconnect it) and have it serviced. Do not attempt to operate it by holding the switch "on" as this may cause extensive damage.</p>	<p><i>Power Switch won't stay "on"</i></p>
<p>Amplifier inputs may be incorrectly connected - check input connections; amplifier expects input across pins 1 & 2.</p>	<p><i>Low gain from one or both outputs</i></p>
<p>Blown drivers in loudspeaker system. Excessive signal at the amplifier input. 220 volt amplifier operating on 120 volts.</p>	<p><i>Distorted sound</i></p>

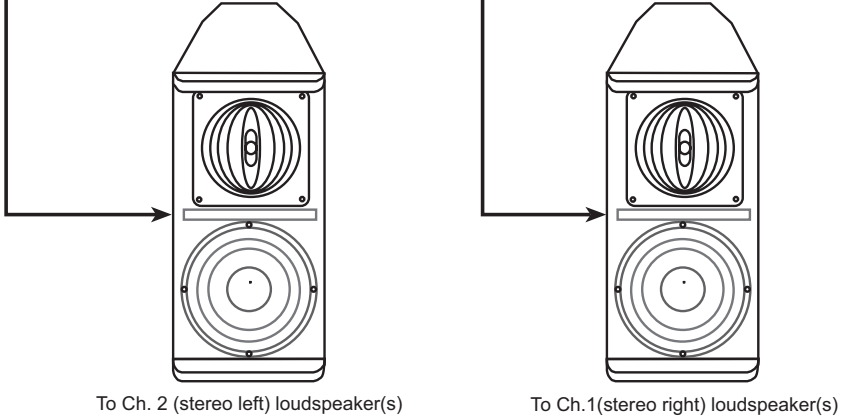
P3500/P3501 OPERATION MANUAL

Channel 2 (stereo right) from signal source (mixer output)
 Channel 1 (stereo left) from signal source (mixer output)



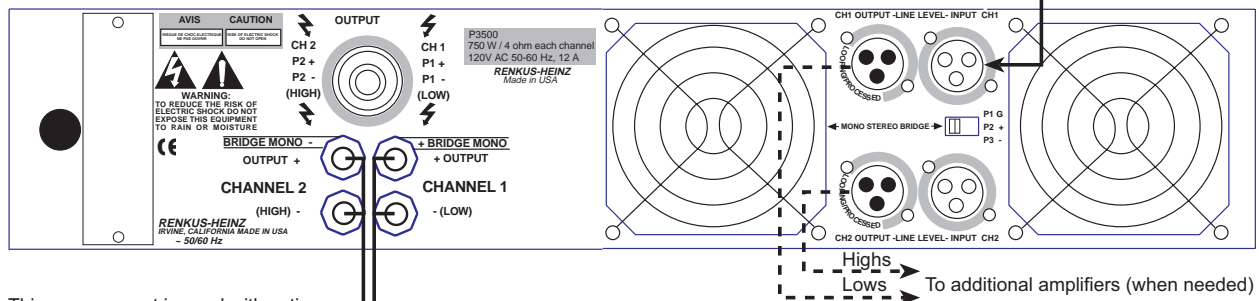
This arrangement is used in stereo loudspeaker systems having passive loudspeakers, such as the SR5 and TRC121. Notice that the amplifier's Mode Selector switch is set in the Stereo mode.

Although this drawing shows only the binding posts being used for the output connections, the Neutrik connector directly above the binding posts could also be used.



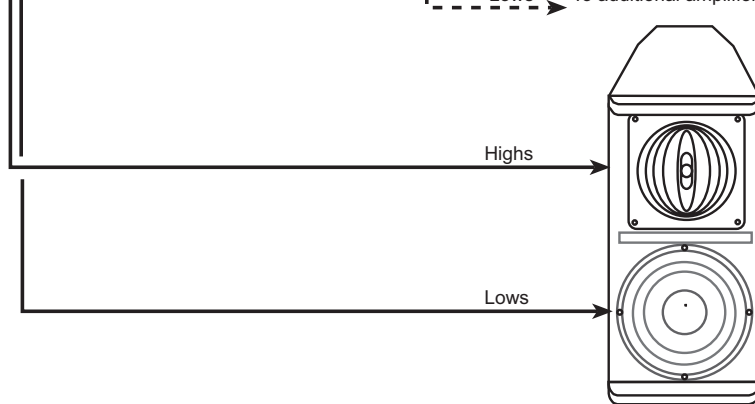
Typical Stereo System Wiring Diagram

From signal source (mixer output)

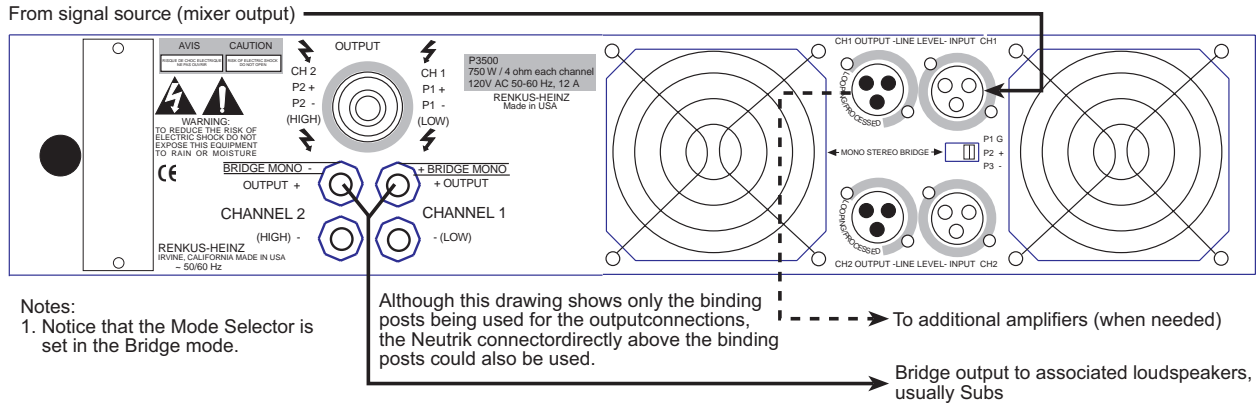


This arrangement is used with active 2-way loudspeaker systems, such as the SR5A, and with 3-way systems having a built-in mid/high crossover, such as the SR6 and SR7. Notice that the Mode Selector switch is set in the Mono mode.

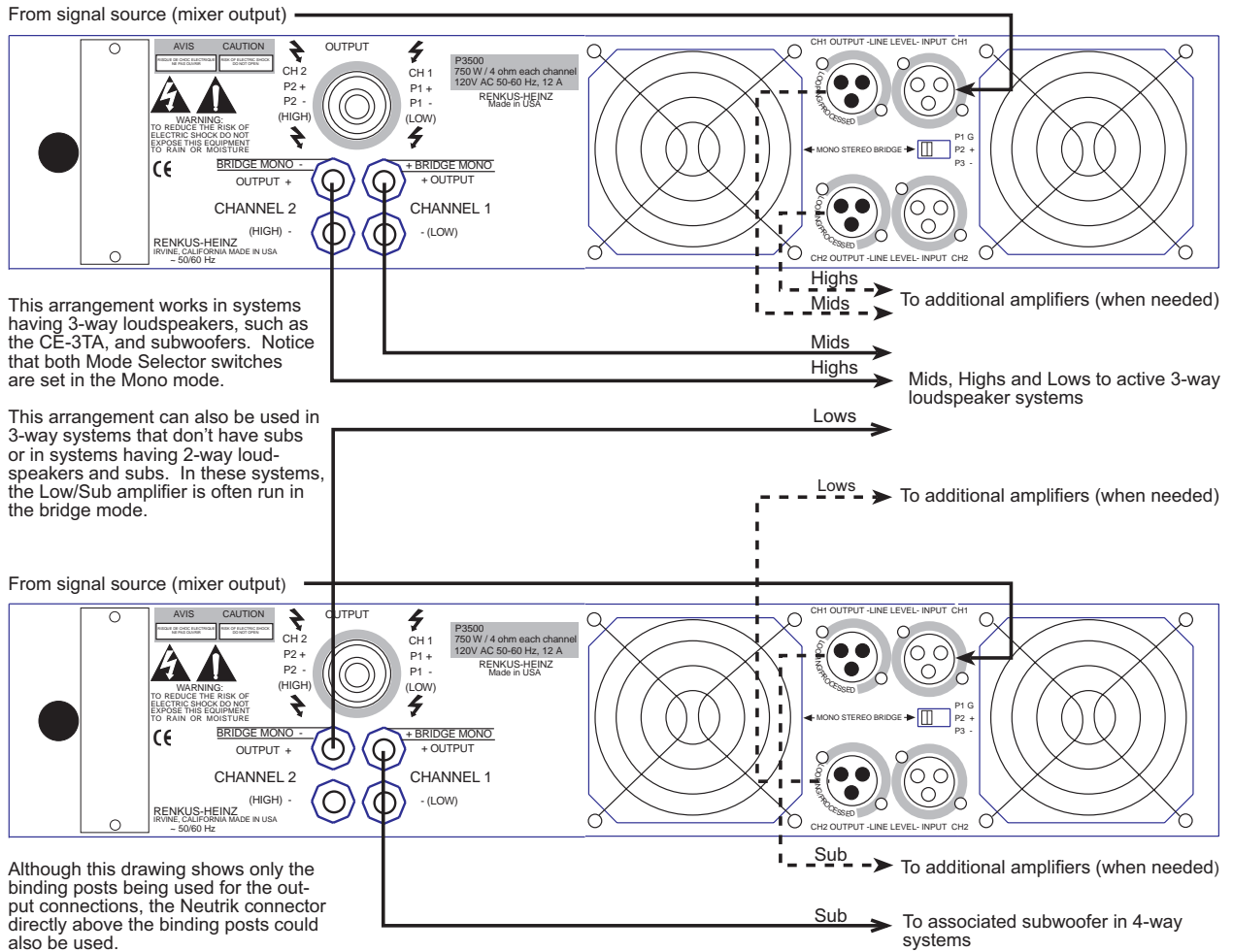
Although this drawing shows only the binding posts being used for the output connections, the Neutrik connector directly above the binding posts could also be used.



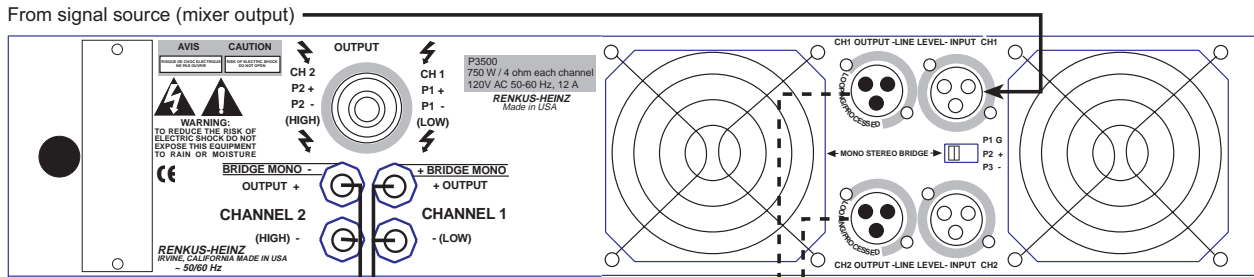
Typical Two-Way System Wiring Diagram



Typical Bridge Mode System Wiring Diagram

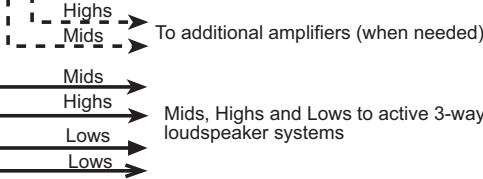


Typical 3/4-Way System Wiring Diagram
(using only 2 Controller Modules)

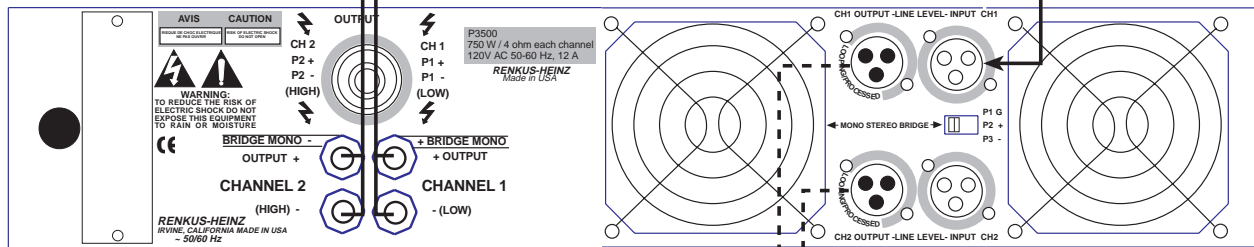


This arrangement works in systems having 3-way loudspeakers, such as the CE-3TA, and subwoofers. Notice that both Mode Selector switches are set in the Mono mode.

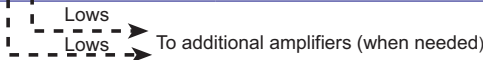
This arrangement can also be used in 3-way systems that don't have subs or in systems having 2-way loudspeakers and subs. In these systems, the Low/Sub amplifier can also be run in the bridge mode.



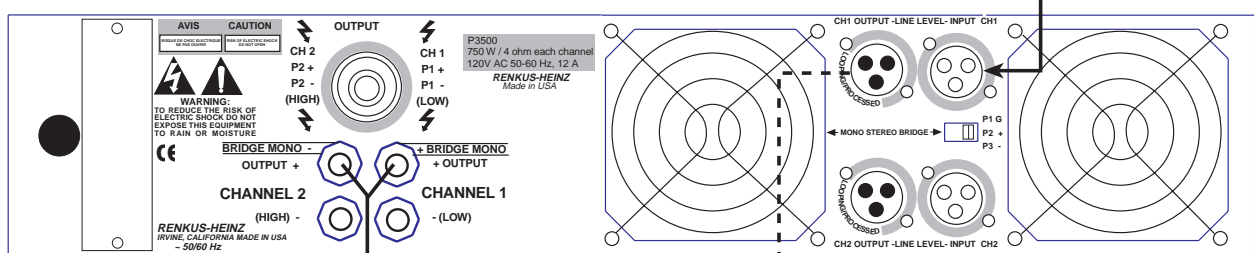
From signal source (mixer output)



Although this drawing shows only the binding posts being used for the output connections, the Neutrik connector directly above the binding posts could also be used.



From signal source (mixer output)



The "Bridge" mode is most often used with high power subwoofers such as the BPS12-2 and BPS15-2. Notice that the Mode Selector is set in the Bridge mode.



Bridge output to associated Subs

Typical 4-Way System Wiring Diagram (using three Controller Modules)