RENKUS-HEINZ

OWNER'S MANUAL

X12 • X14 • X24

Loudspeaker Controllers

Cautions

CAUTION

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

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

Explanation of Graphical Symbols
The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the use 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 exclamanation 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.

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

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

Sicherheitsvorschriften

VORSICHT

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

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

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.

VORSICHT

GEFAHR EINES ELEKTRISCHEN SCHLAGES NICHT ÖFFNEN

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

VORSICHT

GEFAHR EINES ELEKTRISCHEN SCHLAGES: NUR VON QUALIFIZIEREM WARTUNGSPERSONAL ZU ÖFFNEN

Eindrigliche Warnung: Wartungsvorschriften dienen nur der Benutzung durch qualifizieres 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

Introduction

Congratulations on your purchase of a Renkus-Heinz loudspeaker controller. It has been designed to provide years of trouble-free, high performance operation. We hope you enjoy it.

The X12, X14 and X24 are a series of loudspeaker controllers designed to be used specifically with speakers produced by Renkus-Heinz. These loudspeaker controllers provide electronic crossovers, equalization, delay, and loudspeaker protection circuitry tailored specifically to a particular model loudspeaker. By using one of these controllers, you are assured of obtaining the optimum in loudspeaker performance and protection.

Caution: The X12, X14 and the X24 are configured for a particular Renkus-Heinz loudspeaker model. Do not use with any other loudspeaker model other than the internally programmed intended loudspeaker model. Use of the wrong loudspeaker model may result in loudspeaker damage.

Your Renkus-Heinz controller was completely tested and inspected before leaving our factory and should have arrived in perfect condition. Please carefully inspect your controller 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 controller arrived in good condition. If shipping the controller should ever be required, it should be shipped only in its original factory packing.

Important:
Your Renkus-Heinz controller 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.

Overview

The X12, X1 and the X24 are designed to be all encompassing units. They include crossovers, equalization, time alignment delay, and protective circuitry for specific loudspeakers in a single compact unit. This simplifies system design, reduces racks space requirements and lowers overall system costs.

A block diagram of the X12 controller is shown below in Figure 1. The X14 and X24 controllers are the same, except for the number of channels and/or the number of outputs.

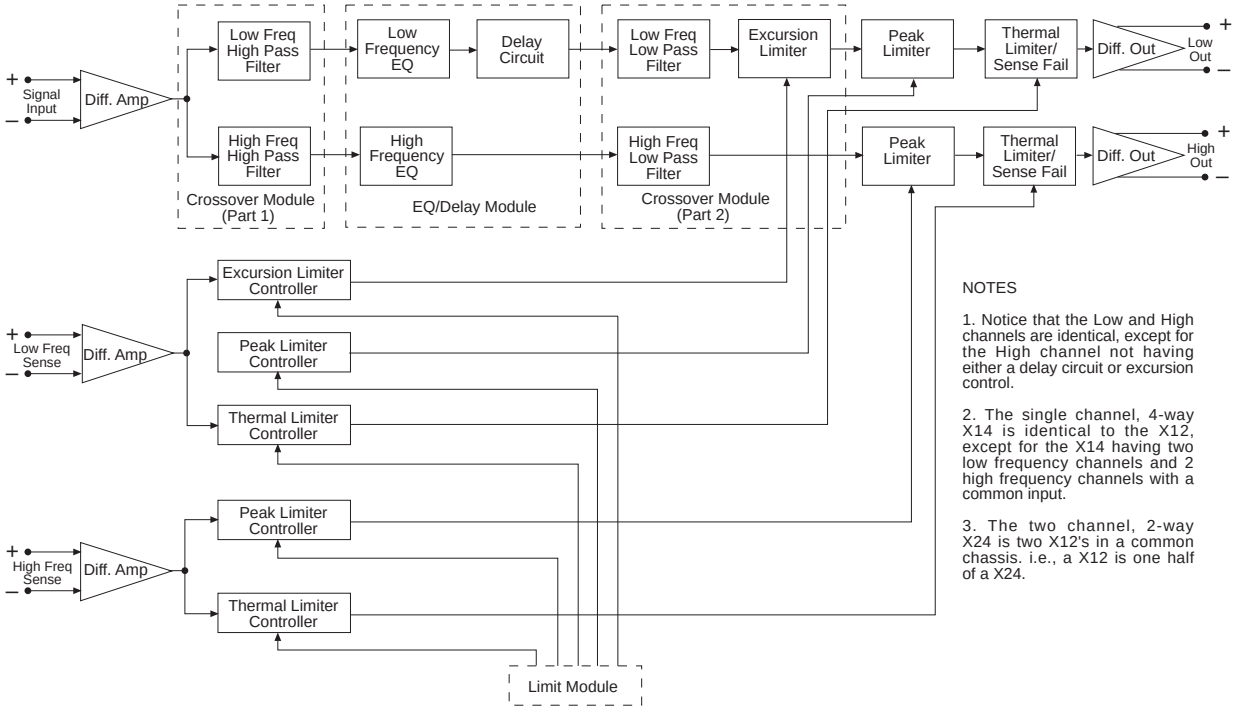


Figure 1: X12 Block Diagram

Each controller is specifically “programmed” for a particular Renkus-Heinz loudspeaker. The model number(s) for the loudspeaker(s) your controller is programmed for are shown on the rear panel.

This “programming” is accomplished using plug-in Crossover, EQ/Delay and Limit modules. This allows the controller to be re-programmed for different loudspeakers by changing modules.

All three controller models use the same circuitry and same plug-in modules. The only difference between the three models is the number of input and output channels.

Model X12 (1 channel 2-way)
The X12 is a single channel 2-way (1 in 2 out) controller designed for use with active 2-way loudspeakers (or 3-way loudspeakers set up for bi-amp operation) in single channel (mono) systems. It is also often used as a "sub controller" and as a controller for passive 2-way loudspeakers. Typical system wiring diagrams for the X12 can be found on the next page.

Model X14 (1 channel 3-way plus sub)
The X14 is a single channel 4-way (1 in 4 out) controller designed for use with active 3-way loudspeakers (plus the possible addition of a subwoofer) in single channel (mono) systems. It is also used with active 2-way loudspeakers in single channel systems having subwoofers. Refer to page 7 for system wiring details.

Model X24 (2 channel 2-way)
The X24 is a dual channel 2-way (2 in 4 out) controller designed for use with two-way loudspeakers in dual channel (stereo) systems. It is also used in stereo systems having 3-way loudspeakers that are set up for bi-amp operation. Typical system wiring diagrams are shown on page 8.

X12 System Wiring

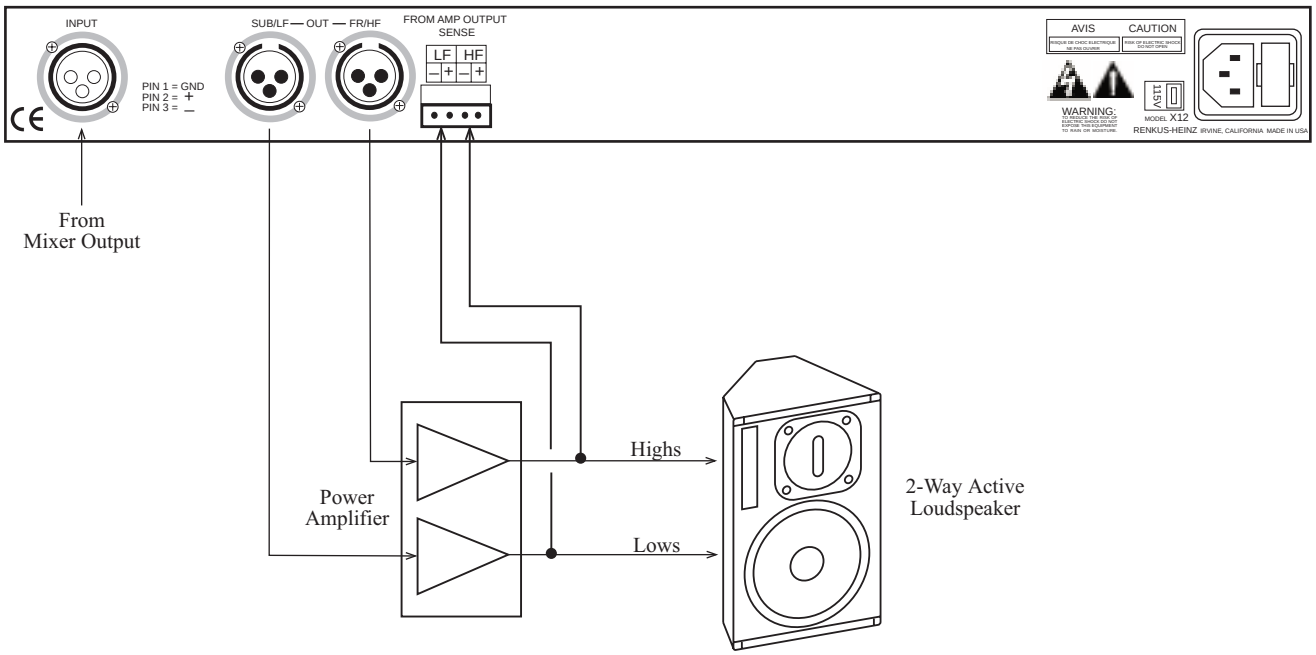
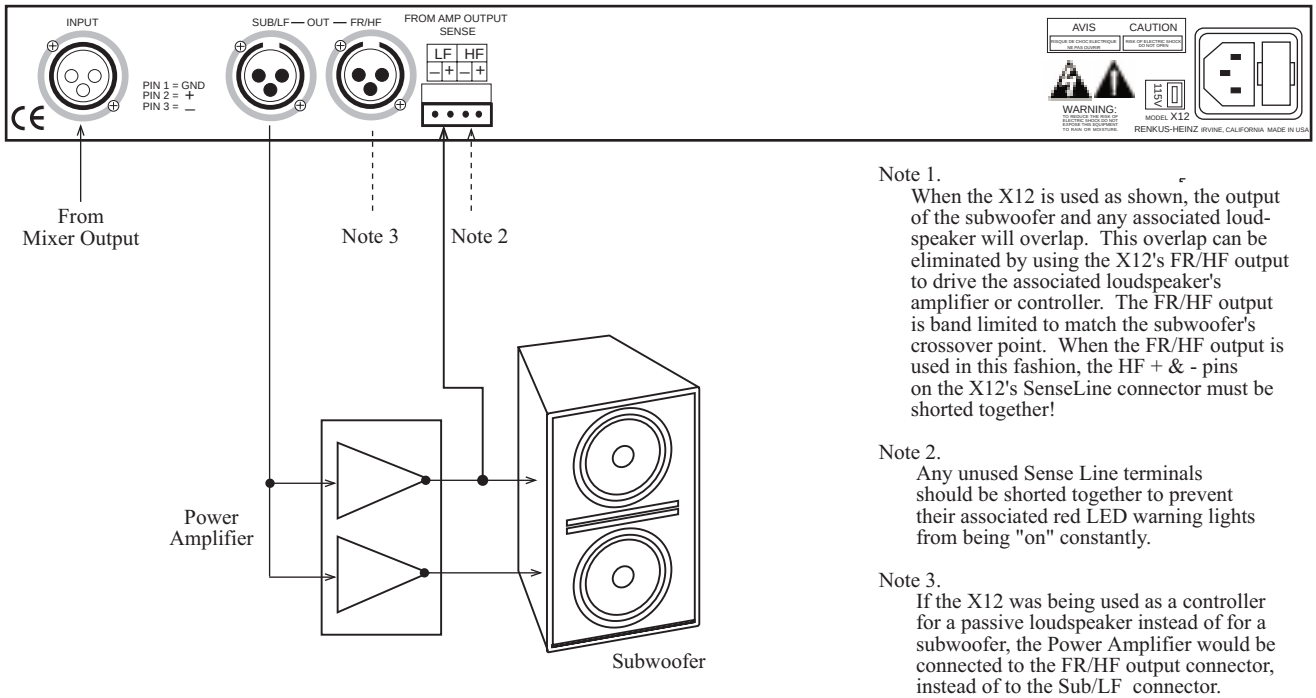


Figure 2
Typical wiring for a X12 used with 2-way active loudspeakers.



Note 1.
When the X12 is used as shown, the output of the subwoofer and any associated loudspeaker will overlap. This overlap can be eliminated by using the X12's FR/HF output to drive the associated loudspeaker's amplifier or controller. The FR/HF output is band limited to match the subwoofer's crossover point. When the FR/HF output is used in this fashion, the HF + & - pins on the X12's SenseLine connector must be shorted together!

Note 2.
Any unused Sense Line terminals should be shorted together to prevent their associated red LED warning lights from being "on" constantly.

Note 3.
If the X12 was being used as a controller for a passive loudspeaker instead of for a subwoofer, the Power Amplifier would be connected to the FR/HF output connector, instead of to the Sub/LF connector.

Figure 3
Typical wiring for a X12 used as a Subwoofer controller.

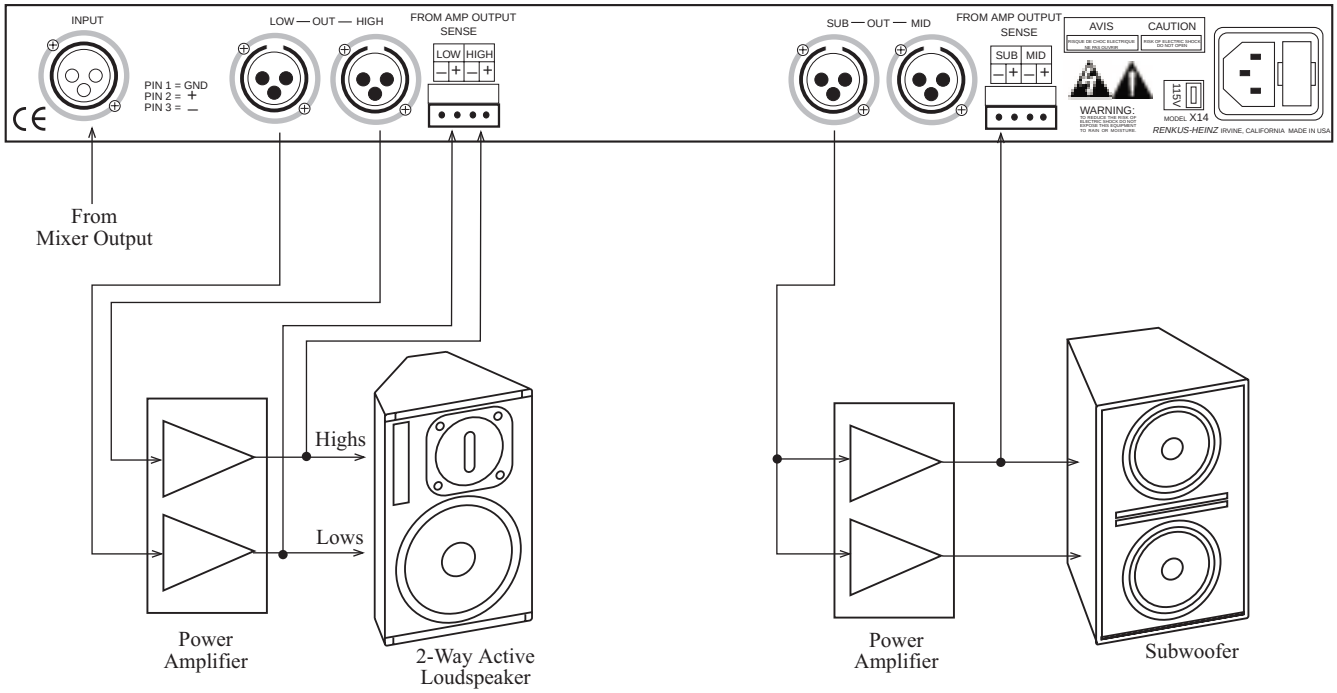


Figure 4
Typical wiring for a X14 System used with 2-way active loudspeakers and a subwoofer.

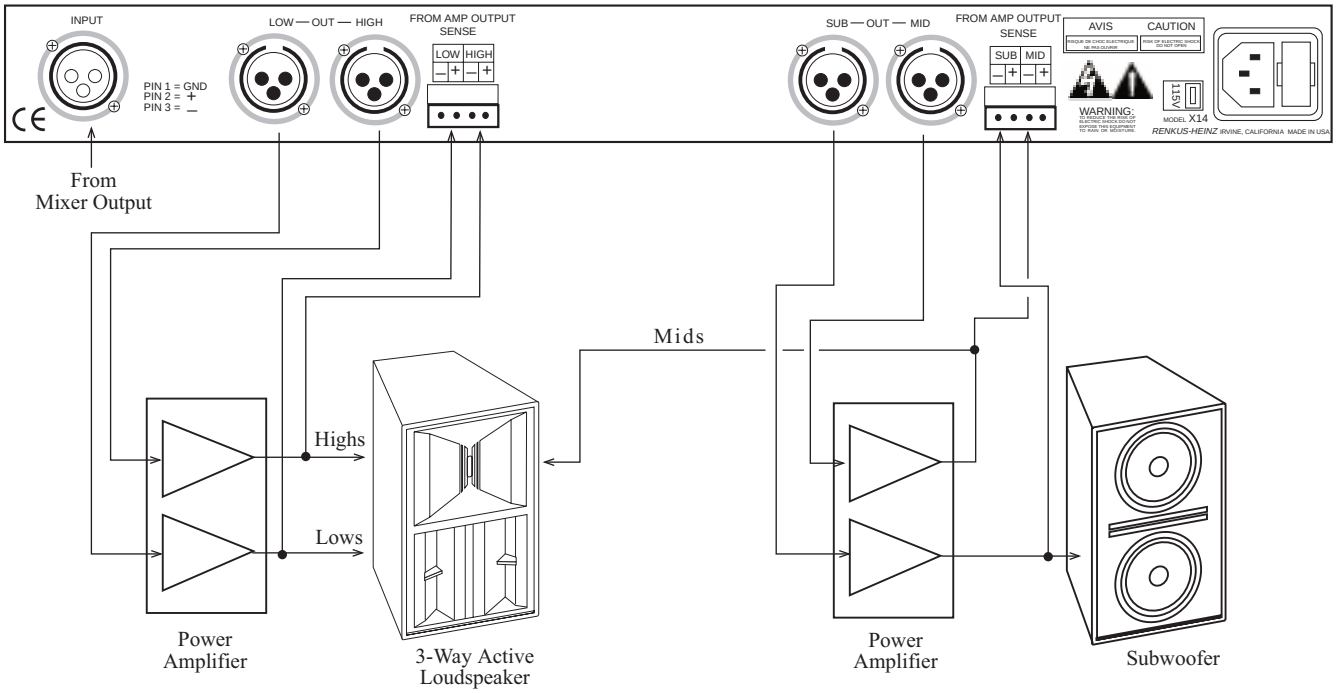


Figure 5
Typical wiring for a X14 used with 3-way active loudspeakers and a subwoofer.

X24 System Wiring

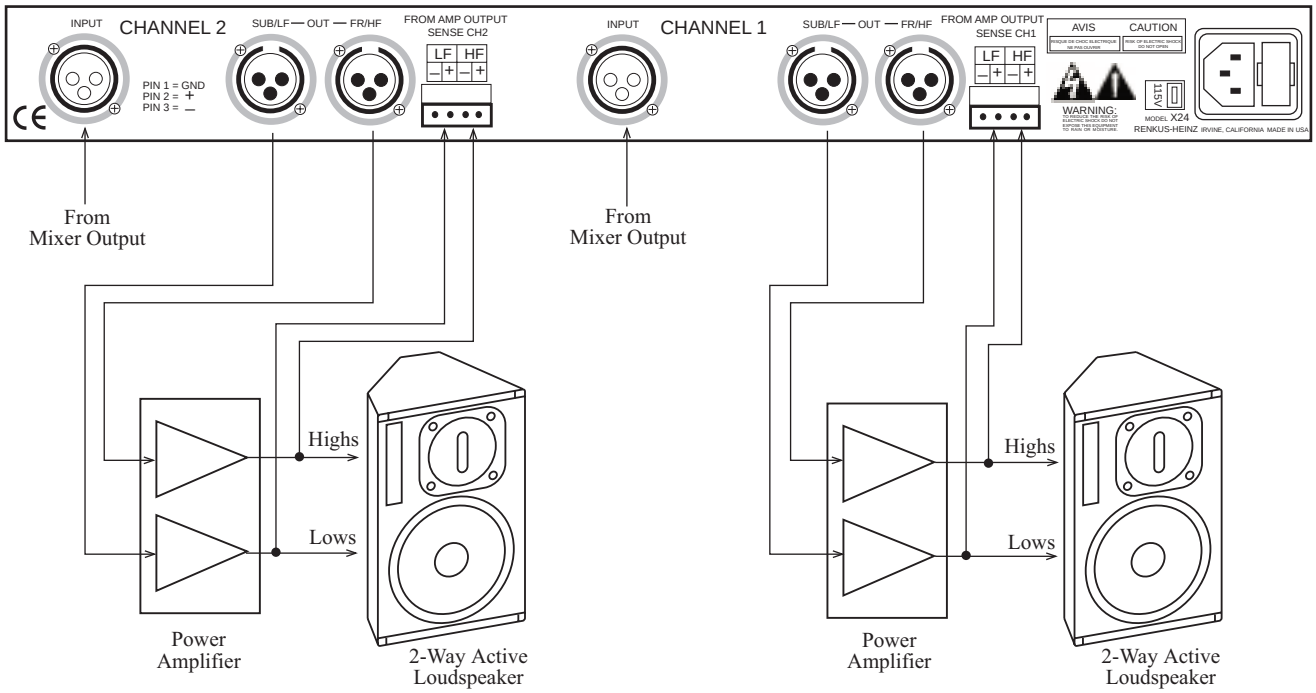


Figure 6
Typical wiring for a X24 used in a stereo system with 2-way active loudspeakers.

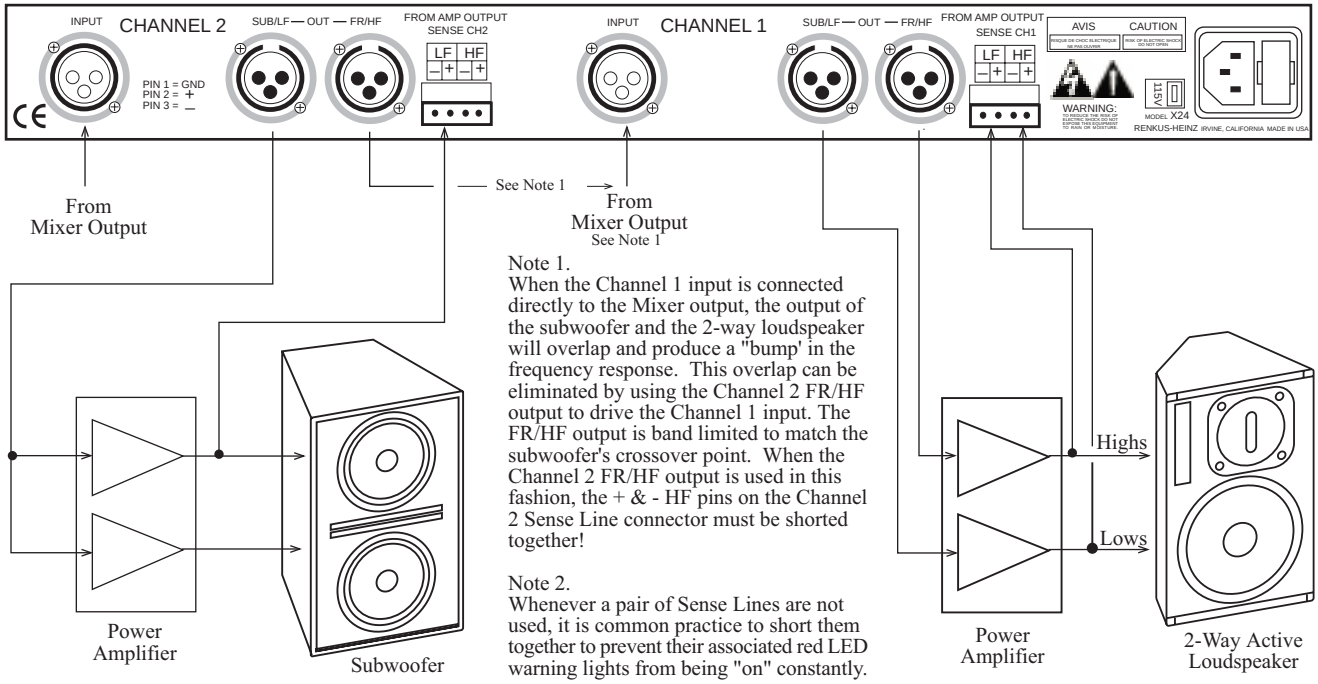


Figure 7
Typical wiring for a X24 used with 2-way active loudspeakers and a subwoofer.

Plug-In Modules

Plug-In Modules
To insure the highest possible loudspeaker performance while still providing optimum protection for the loudspeaker, each Renkus-Heinz controller is specifically configured for a particular Renkus-Heinz loudspeaker model.

This configuration is accomplished by three “plug-in” PC boards or modules used inside the controller. These modules are the Crossover, EQ/Delay, and Limit boards. The combination of these three boards is unique for each loudspeaker model.

Figure 4 shows the plug-in boards and their location on the main "mother" boards inside the controller.

Crossover Board:
The crossover board contains the active filters required for creating the crossover points. The filters are either 3rd or 4th order (18dB/octive or 24dB/octive) electronic filters. The corner frequency and filter order is selected to optimize the performance of the associated loudspeaker model.

EQ/Delay Board:
The EQ/Delay board provides up to 3 bands of parametric equalization per channel. This equalization is used to smooth and extend the frequency response of its associated Renkus-Heinz loudspeaker.

When a particular loudspeaker model requires time offset alignment, the delay section of this board is utilized. It provides the desired signal delay.

Limit Board:
The limit board sets the maximum safe allowable excursion, thermal, and peak audio levels for its associated loudspeaker.

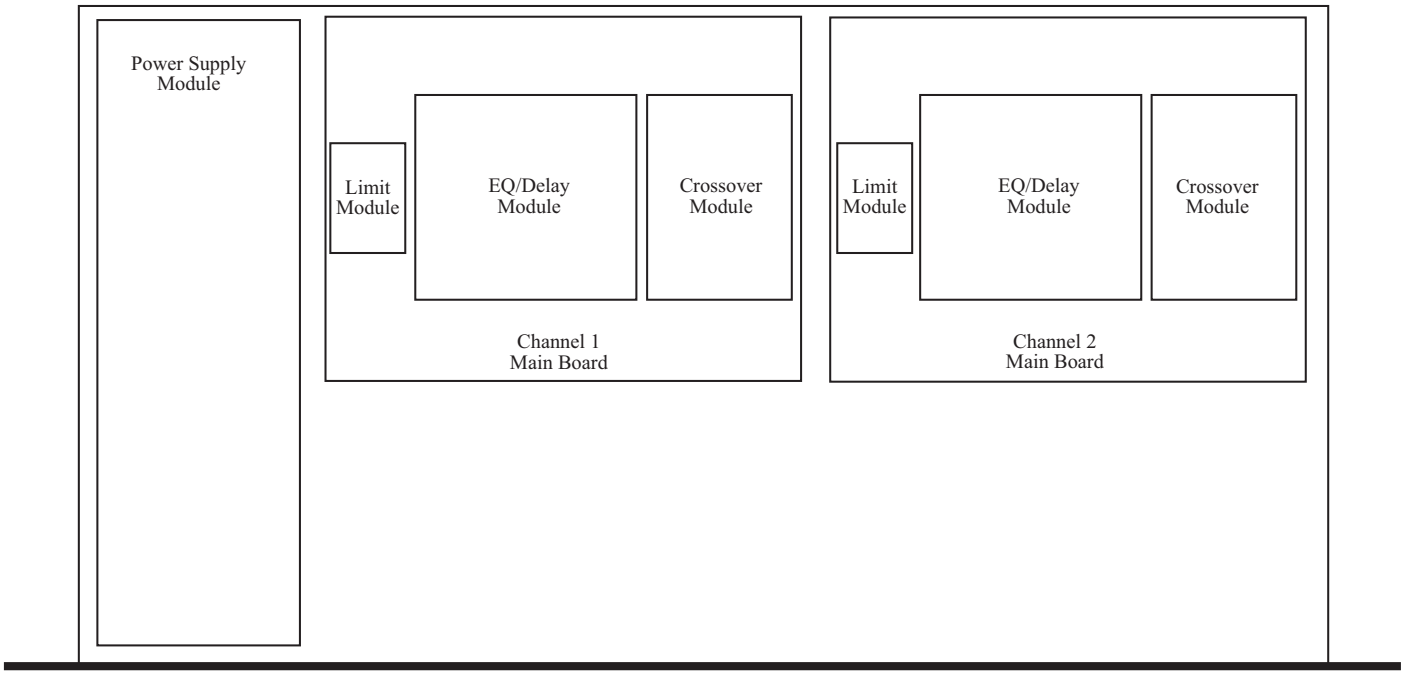


Figure 4: X14/X24 Chassis Layout

The model number(s) of the loudspeaker(s) associated with your controller are listed on the controller's rear panel.

Front Panel Features

Front Panel Features

Power Switch:
The power switch turns on and off the main ac power to the controller. A delay circuit inside the controller mutes the audio for a short duration during power-up. For safety, always power up the controller before turning on your audio power amplifier.

Power Indicator:
This green LED indicates the controller's power is on.

X12 and X24 Models:
The front panels for the X12 and X24 are identical, except for the X24 having two channels while the X12 has only one channel. The X12 and X24 controller front panels are shown below in Figure 5.

X12 & X24

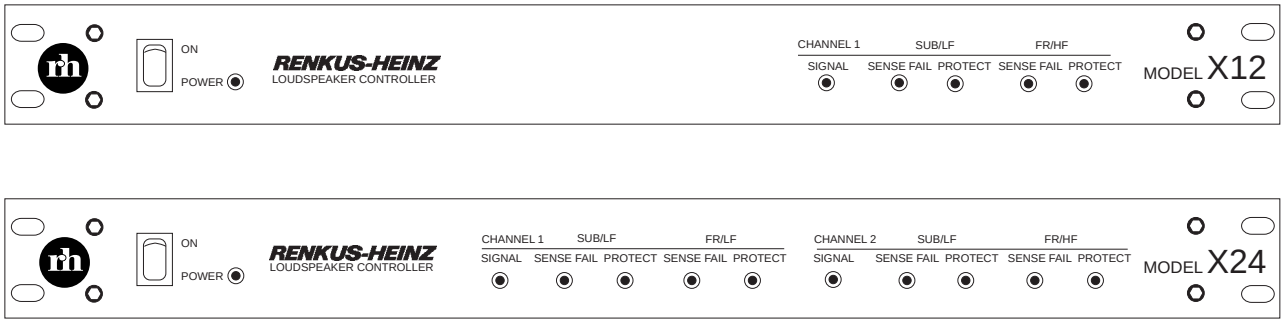


Figure 5: X12 & X24 Front Panels

Status Indicators

Signal Indicator
This green LED indicates if an audio signal is present at the input of the controller.

SUB/LF (Subwoofer / Low Frequency) Sense Fail Indicator:
This red LED will indicate if the sense line coming from the output of the SUB/LF amplifier has become disconnected. If the sense line becomes disconnected, the controller will mute the output audio for the SUB/LF channel.

SUB/LF (Subwoofer / Low Frequency) Protect Indicator:
This red LED will indicate the operation of the speaker protection circuitry. This LED will illuminate because of any one or combination of the following reasons:

1. Sense line missing.
2. Thermal protection activated.
3. Excursion protection activated.

FR/HF (Full Range / High Frequency) Sense Fail Indicator:
This red LED will indicate if the sense line coming from the output of the FR/HF amplifier has become disconnected. If the sense line becomes disconnected, the controller will mute the output audio for the FR/HF channel.

FR/HF (Full Range / High Frequency) Protect Indicator
This red LED will indicate the operation of the loudspeaker protection circuitry. This LED will illuminate because of any one or combination of the following reasons:

1. Sense line missing.
2. Thermal protection activated

.

The front panel for the X14 controller is shown below in Figure 6. **X14**

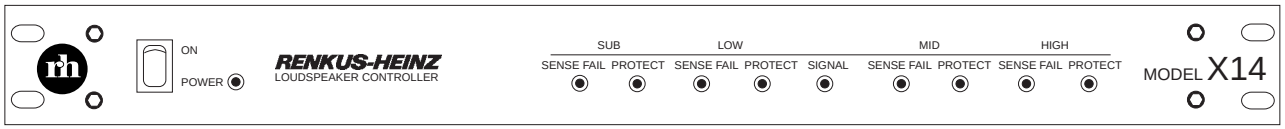


Figure 6: X14 Front Panel

Signal Indicator:
This green LED will indicate if an audio signal is present at the input of the controller.

Status Indicators

SUB (Subwoofer) Sense Fail Indicator:
This red LED will indicate if the sense line coming from the output of the SUB amplifier has become disconnected. If the sense line becomes disconnected, the controller will mute the output audio for the SUB channel.

SUB (Subwoofer) Protect Indicator:
This red LED will indicate the operation of the speaker protection circuitry. This LED will illuminate because of any one or combination of the following reasons:

1. Sense line missing.
2. Thermal protection activated.
3. Excursion protection activated.

LOW (Low Frequency) Sense Fail Indicator:
This red LED will indicate if the sense line coming from the output of the LOW frequency amplifier has become disconnected. If the sense line becomes disconnected, the controller will mute the output audio for the LOW channel.

LOW (Low Frequency) Protect Indicator:
This red LED will indicate the operation of the loudspeaker protection circuitry. This LED will illuminate because of any one or combination of the following reasons:

1. Sense line missing.
2. Thermal protection activated.
3. Excursion protection activated.

MID (Midrange Frequency) Sense Fail Indicator:
This red LED will indicate if the sense line coming from the output of the MID frequency amplifier has become disconnected. If the sense line becomes disconnected, the controller will mute the output audio for the MID channel.

MID (Midrange Frequency) Protect Indicator:
This red LED will indicate the operation of the louspeaker protection circuitry. This LED will illuminate because of any one or combination of the following reasons:

1. Sense line missing.
2. Thermal protection activated.

HIGH (High Frequency) Sense Fail Indicator:
This red LED will indicate if the sense line coming from the output of the HIGH frequency amplifier has become disconnected. If the sense line becomes disconnected, the controller will mute the output audio for the HIGH channel.

HIGH (High Frequency) Protect Indicator:
This red LED will indicate the operation of the louspeaker protection circuitry. This LED will illuminate because of any one or combination of the following reasons:

1. Sense line missing.
2. Thermal protection activated.

Rear Panel Features

AC Receptacle / Fuse Holder:
This receptacle accepts an IEC 320/CEE-22 AC power connector. A line cord with the appropriate matching connector is supplied with the controller.

Before plugging in the AC power cord, make sure the AC voltage selector switch is set to the correct position. ***An incorrect setting of the AC voltage select switch may result in unit failure.***

The fuse holder is integrated into the AC power cord receptacle. The fuse can only be accessed by first unplugging the AC power cord from the AC receptacle. When the fuse drawer is opened, the innermost fuse is the active fuse, the outer fuse is a spare fuse. The controllers use a 5 x 20mm 0.400A slow blow fuse. ***Caution: Replace fuse only with same type fuse.***

AC Voltage Selector Switch:
This switch allows the controller to be configured for the appropriate AC line voltage. The unit can either be set for 115VAC or 230VAC. Use the 115VAC position for AC line voltages ranging from 100 to 120VAC. Use the 230VAC position for voltages ranging from 220 to 240VAC.

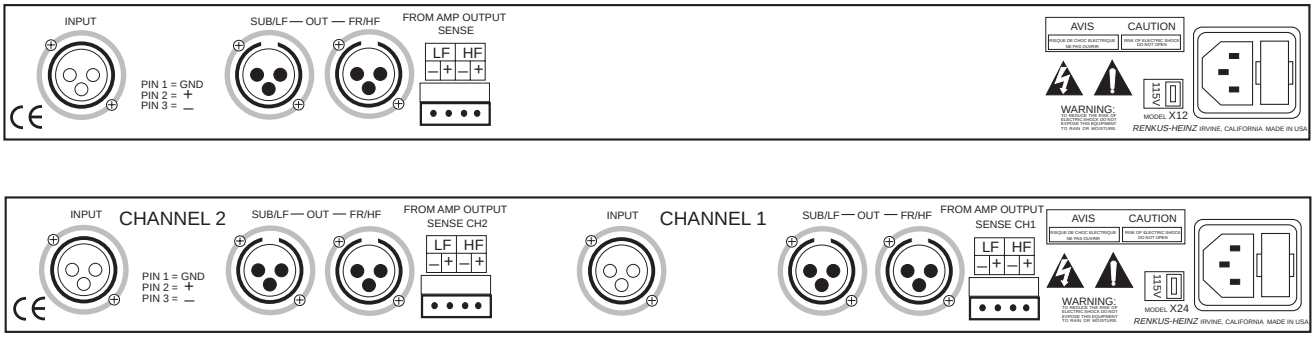


Figure 7: X12 & X24 Rear Panels

X12 & X24

X12 and X24:
The rear panels for the X12 and X24 are identical, except the X24 has two channels where the X12 has only one channel. The X12 and the X24 rear panels are shown above in Figure 7.

Input:
This female XLR connector is the audio input to the controller. The input is electronically balanced with pin 1 as chassis ground. Either pin 2 or pin 3 can be used as hot. Whichever pin is selected as hot, select the same pin on the output connectors as hot. This input signal comes from the output of the mixing board.

SUB/LF (Subwoofer / Low Frequency) Out:
This male XLR connector provides the low audio channel output signal. Its output is electronically balanced with pin 1 as chassis ground. Either pin 2 or pin 3 can be used as hot. Use the same pin for hot as was selected on the input connector. This output connects to the input of the low channel amplifier.

FR/HF (Full Range / High Frequency) Out:
This male XLR connector provides the high audio channel output signal. Its output is electronically balanced with pin 1 as chassis ground. Either pin 2 or pin 3 can be used as hot. Use the same pin for hot as was selected on the input connector. This output connects to the input of the high channel amplifier.

From Amp Output Sense:
The sense connector is used for monitoring the output level of the amplifier. By monitoring the amplifier's output signal, the controller can accurately control the audio signal for safe loudspeaker operating levels. If the sense cable becomes disconnected, the controller will automatically mute the output channel associated with that sense line.

LF- and LF+ (Low Frequency):
Connects to the low frequency channel amplifier output.

HF- and HF+ (High Frequency):
Connects to the high frequency channel amplifier output.

Figure 8: X14 Rear Panel

X14

X14
The rear panel for the X14 controller is shown above in Figure 8.

Input:
This female XLR connector is the input audio to the controller. The input is electronically balanced with pin 1 as chassis ground. Either pin 2 or pin 3 can be used as hot. Which ever pin is selected as hot, select the same pin on the output connectors as hot. This input signal comes from the output of the mixing board.

SUB (Subwoofer) Out:
This male XLR connector provides the subwoofer audio channel output signal. Its output is electronically balanced with pin 1 as chassis ground. Either pin 2 or pin 3 can be used as hot. Use the same pin for hot as was selected on the input connector. This output connects to the input of the subwoofer channel amplifier.

Low (Low Frequency) Out:
This male XLR connector provides the low audio channel ouput signal. Its output is electronically balanced with pin 1 as chassis ground. Either pin 2 or pin 3 can be used as hot. Use the same pin for hot as was selected on the input connector. This output connects to the input of the low channel amplifier.

Mid (Mid Frequency) Out:
This male XLR connector provides the mid audio channel output signal. Its output is electronically balanced with pin 1 as chassis ground. Either pin 2 or pin 3 can be used as hot. Use the same pin for hot as was selected on the input connector. This output connects to the input of the mid channel amplifier.

High (High Frequency) Out:
This male XLR connector provides the high audio channel signal. Its output is electronically balanced with pin 1 as chassis ground. Either pin 2 or pin 3 can be used as hot. Use the same pin for hot as was selected on the input connector. This output connects to the input of the high channel amplifier.

From Amp Output Sense
The sense connector is used for monitoring the output level of the amplifier. By monitoring the amplifier's output signal, the controller can accurately control the audio signal for safe speaker operating levels. If the sense cable becomes disconnected, the controller will automatically mute the output channel associated with that sense line.

Sense Lines

SUB- and SUB+ (Subwoofer Frequency):
Connects to the subwoofer frequency channel amplifier output.

LOW- and LOW+ (Low Frequency):
Connects to the low frequency channel amplifier output.

MID- and MID+ (Mid Frequency):
Connects to the mid frequency channel amplifier output.

HIGH- and HIGH+ (High Frequency):
Connects to the high frequency channel amplifier output.

Set-Up

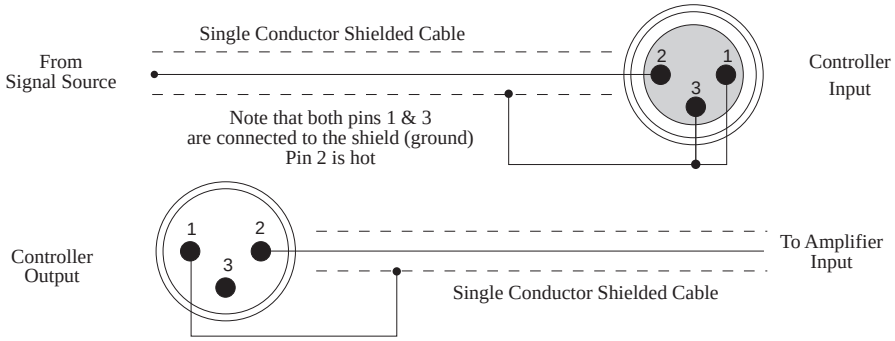
Mounting

Mounting:
For most applications, mount the controller in the amplifier rack. This will allow short sense cables from the amplifier to the controller. This also reduces the possibility of ground loops between the controller and the amplifier.

Allow at least one rack space between the top of the amplifier and the bottom of the controller. This will allow space for the heat to escape from the amplifier and also reduce the coupling of AC hum from the amplifier into the controller. Always support the rear of the controller chassis in the rack especially if used in a portable application.

Balanced and Unbalanced Cabling:
The inputs and outputs for the controllers are electronically balanced and use standard XLR type connectors. You can use either pin 2 or pin 3 hot on the input provided you follow the same convention on the output audio connectors. Pin 1 is chassis ground and its use is optional. Whether to connect pin 1 or not will depend upon your application. Use the method which minimizes system hum.

If it is necessary to connect the controller to a single ended system, connect pin 1 to ground and use either pin 2 or pin 3 for the audio signal (see drawings below). Single-ended connection results in a gain reduction of 6dB.



Audio Inputs:
Connect the input audio from the audio output on the mixing board. This can either be a balanced or an unbalanced signal. Refer to previous section regarding balanced and unbalanced connections.

Audio Outputs:
Connect the audio outputs to their respective audio amplifier input. This can either be balanced or an unbalanced signal. Refer to previous section regarding balanced and unbalanced connections.

Amplifier Selection

Amplifier Selection:
The selection of the wattage of the amplifier is not critical. If the amplifier has higher wattage than required, the controller will limit the amplifier output to a safe speaker operating level. When using more than one amplifier on the same controller output, all amplifiers require the same gain. While some range of sensitivity can be accommodated by the controller, an amplifier voltage gain of 40 is preferred. For best results, always run every amplifier at full gain.

Sense Connectors

Sense Connector:
For connecting the sense lines a mating 4 pin solderless type mating connector has been supplied with the controller. This connector will accept 14 to 22 AWG size wire. To connect a wire to the connector, insert a small screwdriver in one of the screwdriver slots, press and hold down the spring clip while inserting a stripped wire into the corresponding wire opening. See Figure 9 below for details.

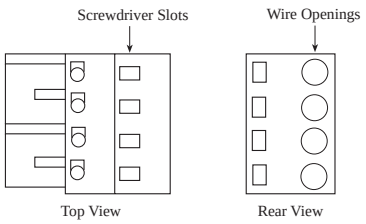


Figure 9: Sense Connector

Caution: ***Do not connect more than one amplifier output to one sense input. Damage to the amplifier may result.***

Note: ***If the sense line is not connected, that audio channel output will be muted and all the red LED's associated with that channel will light.***

Trouble Shooting

All red LED's on and no sound out	No sense lines connected.
Distorted sound	Amplifier volume control turned down to far, resulting in inadequte gain Excessive signal input level to the controller.
Erratic protection triggering	Sense lines inproperly connected, crossed between low and high outputs.
No lights on	Check fuse.
Signal LED not lit and no sound out	Check signal source and verify input wiring.
Protection LED's lit continously	Reduce system level and/or avoid extreme equalization. Add more amplifiers/loudspeakers to the system.

Important:
Your Renkus-Heinz controller 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

TYPE:	
X12:	Single-channel, 2-way
X14:	Single-channel, 4-way
X24:	Dual-channel, 2-way
SIGNAL INPUTS:	100 k ý bal., +4 dBm nominal
SENSE LINES:	100 k ý floating
FREQUENCY RESPONSE:	±0.5 dB, 20 Hz to 20 kHz (no EQ)
THD & IM DISTORTION:	< 0.01% @ 1 kHz
HUM & NOISE:	-100 dBV, 20 Hz to 20 kHz
COMMON MODE REJECTION:	> 60 dB @ 400 Hz
OVERALL GAIN:	Unity, 20 Hz to 20 kHz (no EQ)
OUTPUTS:	400 ý bal., +20 dBm max.
CROSSOVERS:	Fourth order, 24 dB per octave
POWER REQUIREMENTS:	Selectable115/230 V, 50/60 Hz; 25 watts max.
FUSE:	5 x 20 mm, 0.400 Amp Slow Blow
PROTECTION CIRCUITRY:	
TRANSIENTS:	Fast acting limiter
EXCURSION:	Frequency dependent gain reduction
THERMAL:	Soft limiting; controlled by long term detectors.
SENSE FAIL:	Loss of sense line activates muting of affected output.
INDICATORS:	
POWER:	Green LED
SIGNAL PRESENT:	Green LED
PROTECTION:	Red LED
SENSE FAIL:	Red LED
REAR PANEL CONNECTORS:	XLR-3 for inputs (female) and outputs (male). Plug-in screw terminals for sense inputs
DIMENSIONS (H X W X D):	1.75" x 19" x 9.25" (4.4 cm x 48.2 cm x 23.5 cm)
NET / SHIPPING WEIGHT:	8.0 lbs (3.6 kg) / 12 lbs (5.4 kg)

RENKUS-HEINZ

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