



RENKUS-HEINZ

OPERATION MANUAL

X220 TSC CONTROLLER

Introduction

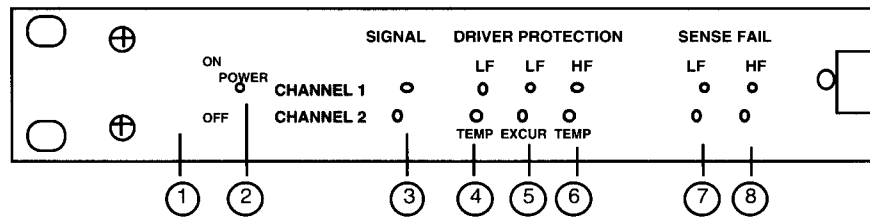
The X220 TSC controller, operating in conjunction with a PM220-XXX program module, provides two independent channels of two way crossover, equalization and specialized protection for specific Renkus-Heinz loudspeaker systems.

Each program module is matched to the specific characteristics of the Renkus-Heinz loudspeaker model it is intended to be used with. In general, the model of the program module will identify the particular loudspeaker or series with which it is to be used.

Caution: Do not use program modules with other than their intended loudspeakers as unsatisfactory performance or loudspeaker damage may result.

Please carefully read the following instructions to ensure proper connection and operation of your Renkus-Heinz System.

Front Panel Features



- 1) Power on / off switch
A muting circuit is automatically activated at power turn-on to prevent loud turn-on transients reaching the speakers, in case the power amplifier has already been turned on (the power amplifier should be turned on last for added safety).
- 2) Power LED
A green LED indicates that power is being supplied to the controller.
- 3) Signal LED
A green LED indicates that a signal is present at the controller input. A separate LED is provided for each channel.

These six yellow LED's (three per channel) indicate activation of the protective circuits. Occasional operation indicates optimum system utilization, however extended LED illumination indicates that the system is probably too small for its current use. Additional loudspeakers should be used to bring protection operation down to occasional activation.

- 4) Low Frequency Thermal LED
Indicates operation of the Low Frequency channel gain reduction circuit.
- 5) Low Frequency Excursion LED
Indicates operation of the Low Frequency excursion protection circuits.
- 6) High Frequency Thermal LED
Indicates operation of the High Frequency channel gain reduction circuits.

7) Low Frequency Sense Fail
Indicates that the low frequency channel is not receiving a sense signal. Also indicates activation of gain reduction on this output, to prevent possible component damage.

The circuit will continually attempt to reset so that a "pumping" audio signal from this channel will be heard. When the sense line is connected normal operation will be restored. Each sense fail function operates independently.

8) High Frequency Sense Fail
Indicates that the high frequency channel is not receiving a sense signal.

The X220 TSC uses "program modules" to provide the best possible performance for a variety of Renkus-Heinz loudspeakers. Each program module contains components which select the correct crossover frequency and protection thresholds; along with up to six bands per channel of fully-parametric factory hard-wired equalization. The correct phase of the loudspeaker drivers is also determined by the program module. Some program modules have "trim" controls for the high-frequency and low-frequency outputs. These allow minor

Driver Protection Indicators

Sense Fail Indicators

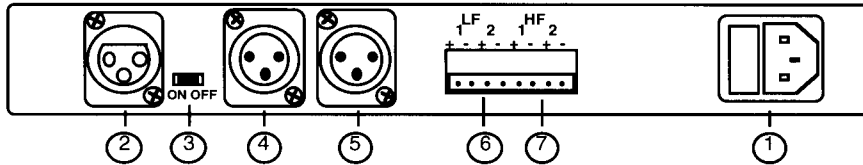
Program Module

adjustments to the relative levels of the high- and low-frequencies as particular situations warrant. In general, these controls provide + or - 3dB of adjustment.

Be certain to turn the AC power off before attempting to remove or change the Program Module. Damage to the system may result if the module is removed with the power on since this module controls all of the protective circuit threshold levels.

Note that program module is inserted into the controller "component-side down".

Rear Panel Features



1) AC Power Receptacle and Fuse
This receptacle accepts the IEC 320 / CEE-22 power connector. A line cord with appropriate matching connector is supplied with the controller.

Before connection check the noted AC voltage requirement on the rear panel and make certain that the unit is connected to the proper voltage. Failure of the unit will result if a 120 volt controller is connected to 220 volt power.

This receptacle also contains a 0.25 amp 5x20 mm mains fuse. The power cord must be removed to gain access to the fuse door. When the fuse door is opened the innermost fuse is the active fuse and the outer fuse is a spare.

2) Input Connector
The audio input is electronically balanced and uses a standard 3-pin female XLR connector. You may select either pin 2 or pin 3 as hot provided you do the same at the output. Note that pins 2 and 3 must both be con-

nected. Pin 1 is chassis ground. Connecting Pin 1 to source ground is optional and should be selected to minimize hum.

With an unbalanced source, connect the signal to pin 3 and source ground to pin 2 (See Page 6). Connecting the source ground to pin 1 is again optional. Either pin 2 or pin 3 can be connected to the signal, but the other pin must be connected to source ground.

A 20 dB loss of gain results if only pin 2 or only pin 3 and pin 1 (ground) are used for an unbalanced input.

3) Loudness Switch
This switch allows operation of the automatic loudness compensation. When "on", loudness equalization will automatically be added at low output levels. As the acoustic output increases this equalization is gradually reduced.

4) Low Frequency Output
The audio output is electronically balanced and uses a standard 3-pin male XLR connector. This output should be connected to a balanced input. Pin 1 is chassis ground; pins 2 and 3 are signal. Use the same polarity that you used at the input. If it is necessary to connect this output to a single-ended input, connect ground to pin 1 and use either pin 2 or pin 3 for signal. Single-ended connection of the output results in a 6 dB gain reduction.

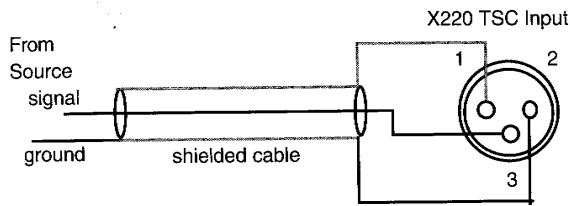
Do not telescope (lift) the ground between the controller and the amplifier, as this may cause oscillation, resulting in degraded performance or component failure (See Page Six).

5) High Frequency Output
A balanced male XLR connector provides signal to the high frequency power amplifier. Connections should be made as for the low frequency output above.

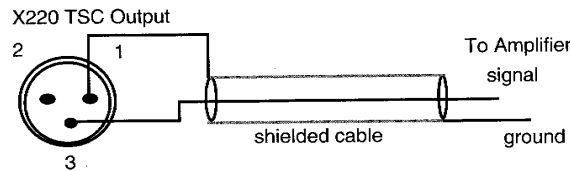
See warning about telescoped grounds under #4) Low Frequency Output".

Loudness Compensation

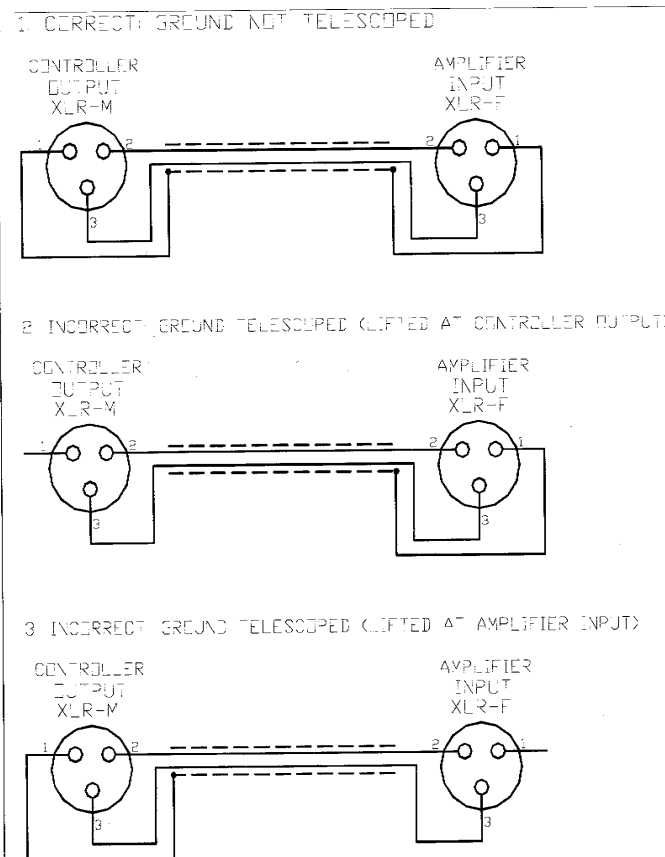
Unbalanced Input Connection



Unbalanced Output Connection



Balanced Output Connection



Sense Inputs

Two sets of Low Frequency and High Frequency sense inputs are provided. The controller provides two sense inputs for each output so both amplifier outputs can be sensed when two amplifier channels are being driven from one controller output; the summing circuit in the controller will automatically select the larger of the two signals. If only one sense input is needed either one may be used. Multiple amplifiers (in excess of two) may be used with a single controller as long as no amplifier's gain exceeds that of the two that are connected to the sense inputs.

Do not connect more than one amplifier to each sense input (for a total of two high-frequency and two low-frequency amplifiers). Otherwise, amplifier failure may result.

The terminal strip used for these connections will accept 14 to 22 AWG wire and can be unplugged from the chassis for ease of wiring or controller replacement.

If the sense inputs are not connected and the output level exceeds a nominal level, the controller will indicate a Sense Fail and limit the associated output channel.

6) Low Frequency Sense Input

Connects the output of the low frequency power amplifier to the controller sensing circuits. Each low frequency amplifier output should be connected to its appropriate controller. These inputs are balanced and insensitive to polarity.

7) High Frequency Sense Input

Connects the output of the high frequency power amplifier to the controller sensing circuits. Each high frequency amplifier output should be connected to its appropriate controller. These inputs are balanced and insensitive to polarity.

Set Up and Operation

The diagram on the rear cover of this manual shows a typical two-way system connection.

Standard Renkus-Heinz two-way Loudspeaker Systems use 4-pin Neutrik "Speakon" connectors or terminal strips. Low frequencies use pins 1+ (Hot) and 1- (Neutral). High frequencies use pins 2+ (Hot) and 2- (Neutral). 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. The following table shows the signal loss in 30 meters (approximately 100 ft.) 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 |

In larger systems it may be economical to use several amplifiers with each controller. The X220 TSC controller provides sense inputs for two amplifier channels per controller output. If more than two amplifier channels are connected to one controller output and both sensed channels fail, then the controller Sense Fail protection circuits will be activated and all remaining active amplifiers will be producing a low level, "pumping" audio signal.

In most installations it is best to mount the controller in the power amplifier rack. In this arrangement the sense connections are short and easy to verify. This also reduces the possibility of ground-loop problems between the controller and the amplifiers. Keep in mind that almost all amplifiers radiate a 50 / 60 Hz magnetic hum field from their power transformers. Some amplifiers are worse than others. It is therefore prudent to provide at least one rack-space between the controller and the nearest amplifier to reduce the possibility of induced hum.

Due to the depth and weight of the controller it is imperative that the controller be supported at the rear of the chassis if it is used in a portable application.

We strongly recommend use of the Renkus-Heinz P2000 and P2500 power amplifiers. These amplifiers, in addition to satisfying the power and sensitivity requirements, provide additional protection from clipping. Higher wattage amplifiers are acceptable as the Adaptive Limiter circuit will keep peak power levels within acceptable limits for each driver.

Renkus-Heinz two way systems require amplifiers capable of at least 200 watts into 8 ohms for both high frequency and low frequency channels. While some range on sensitivity can be accommodated by the controller, a voltage gain of 40 is the preferred value.

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

Before applying power to the Smart System trace and verify all connections. Make sure ground connections are not telescoped between controller and amplifier inputs (See Page Six).

Make certain the controller low frequency output is connected to the low frequency power amplifier and that the LF amplifier output is connected to both the LF speaker and the controller LF sense input.

Make certain that the high frequency controller output is connected to the high frequency power amplifier and that the HF amplifier output is connected to both the HF speaker and the controller HF sense input.

Set the power amplifier gain controls to their minimum position. Turn on the controller and adjust your signal source to just illuminate the signal-present LED's on the controller.

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. high frequency channel connected to high frequency speaker, etc.). Moderate level, full range audio should be heard from the speakers.

Gradually increase the signal level to the controller input until the yellow protection LED's start to illuminate. First thermal, and then excursion LED's should be intermittently lighting. As the level continues to increase the protection LED's will be on for longer periods of time. *Do not* operate the system at a level where the protection LED's are illuminated continuously.

Verification of Protection Circuit Operation

Mounting

Selection of Power Amplifiers

Technical Specifications

Trouble Shooting

If as you are increasing the level, you hear a sudden loss of one frequency band and see illumination of a red Sense Fail LED on the controller, this indicates that the noted sense circuit is not connected. Correct this before proceeding. (The Sense Fail LED will flash and the output in that frequency band will "pump" until the sense connection is properly made).

Important: In the event of service being required, we recommend that the product be returned to the factory in the original packing carton. The controller contains no user-serviceable parts. Please refer service to qualified service personnel.

Power LED is not lit

Check for proper connection of power cord to a suitable outlet and verify proper voltage. Check that mains fuse is intact.

Signal LED's not lit; no sound

Check that the source is sending a signal and that the interconnecting wiring is not faulty.

Protection LED's continuously lit

Reduce system level and/or avoid extreme equalization. Add more amplifier/loudspeaker systems.

Very low system gain

Controller input incorrectly connected - expects input across pins 2 and 3.

Low gain from one or both outputs

Controller outputs incorrectly connected - check for unbalanced connection.

Distorted sound

Blown drivers in loudspeaker system.
Excessive signal at controller input.
220 volt unit operating with 120 volts.

Sense Fail indicators lit; "pumping" sound from one or both channels

Connection to one or more sense inputs has been lost - trace and reconnect sense lines. One or more amplifiers has failed (in multi-amp systems).

SYSTEM CROSSOVER 3'rd Order Butterworth (18dB/octave) Frequency set by program module.

SYSTEM EQUALIZATION
LOW FREQUENCY Up to 3 bands, fully parametric hard-wired loudspeaker specific.

HIGH FREQUENCY Up to 3 bands, fully parametric hard-wired loudspeaker specific.

SYSTEM PROTECTION
LOW FREQUENCY Excursion Protection
Thermal Protection
Adaptive Peak Limiter
HIGH FREQUENCY Thermal Protection
Adaptive Peak Limiter

CONTROLLER
INPUT IMPEDANCE 12 K Ohms Balanced
NOMINAL INPUT LEVEL 1.23V
FREQUENCY RESP. +/-0.5dB 20-20kHz (no EQ)
THD & IM DISTORTION <0.01% 20-20kHz (no EQ)
HUM & NOISE <95 dBm 20-20kHz (no EQ)
OVERALL GAIN Unity, 20-20kHz (no EQ)

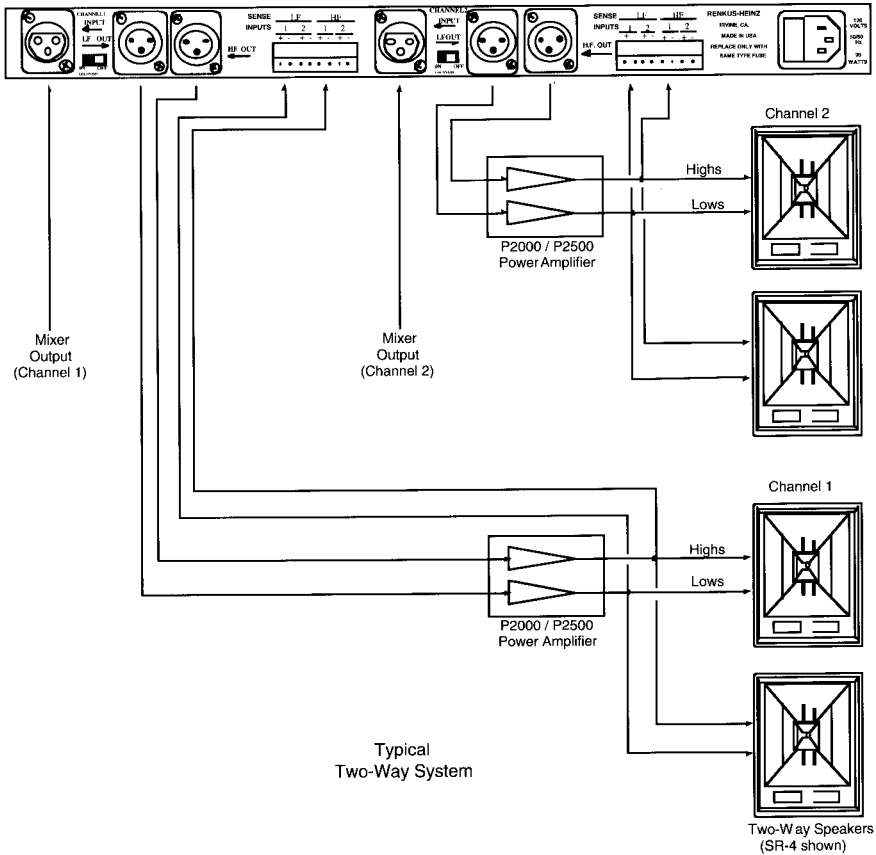
INDICATORS & SWITCHES
SWITCHES Power (front)
Loudness (rear)
INDICATORS Power On
Signal Present
Excursion & Thermal
Overload
Sense Fail

POWER REQUIREMENTS 105-130V 50/60 Hz
210-250V 50/60 Hz
30 Watts maximum

DIMENSIONS (W H D) 19" x 1.75" x 11"
(48.3 cm x 4.5 cm x 27.9 cm)

NET WEIGHT 8.5 lbs (3.9 kg)
SHIPPING WEIGHT 10 lbs (4.5 kg)

X220 TSC SYSTEM WIRING



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