# R170
## RECEIVER

## OPERATING INSTRUCTIONS
## and trouble-shooting guide

**LECTROSONICS, INC.**
**Rio Rancho, NM**

# INTRODUCTION

Thank you for selecting the Lectrosonics R170 receiver. This system provides reliable performance and flexibility for a wide range of uses. The high selectivity provides protection from interference while the high sensitivity increases the operating range and resistance to dropouts. A unique automatic squelching system eliminates excess noise output from the receiver when the transmitter is turned off.

The R170 receiver was packaged for use with sound reinforcement and recording systems utilizing balanced audio lines. Outputs for high or low impedance, balanced or un-balanced audio signals via 1/4", XLR and RCA jacks are provided. The versatile audio output section makes the R170 ideal for applications where multiple audio feeds are required, such as providing PA system feed, "overflow room" feed and tape recording signals simultaneously. This can be accomplished directly from the rear panel connectors without external equipment.

In addition to the output jacks, a unique audio input on the rear panel allows "stacking" the receivers together (up to three channels) in multi-channel applications without having to use a separate audio mixer. This audio input jack also permits connection of a tape player to the receiver to mix tape playback with the receiver output.

Matching FREEDOMIKE transmitters are available in several configurations for a wide variety of applications in pro sound, pro video, theater/stage, and audio visual applications.

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# GENERAL DESCRIPTION

The R170 receiver utilizes a two stage quartz crystal oscillator to assure that the frequency will not drift. Custom made high Q toroidal filters in the RF and IF stages reject interfering adjacent signals and provide over 100 dB of image rejection. Dual gate MOS FET semi-conductors in the RF amplifier and mixer provide excellent sensitivity and resistance to RF overload. A two stage, crystal controlled oscillator is individually trimmed to the exact operating frequency when each receiver is manufactured to insure that the frequency will not drift.

The audio section contains a noise reduction "compandor" to suppress audible noise without impairing the natural dynamics of the audio signal. A 6-pole active filter in the audio path eliminates all supersonic and subsonic noise in order to increase the compandor tracking accuracy in weak signal conditions. A time delayed, correlation squelch system is employed in the R170. This circuit is highly stable and never needs adjustment by the user.

A standard XLR jack provides a balanced 200 Ohm output, variable from -20dBm to -70dBm (microphone level). A 1/4" phone jack provides a balanced 600 Ohm output, variable from 0dBm to -50dBm (line level). An RCA phono jack provides a 1K Ohm output at 1 Volt maximum (line level) for tape recorders or other PA systems. The output level control is a balanced "H" pad attenuator network using precision resistors. It reduces the output of the XLR and 1/4" jacks, but does not affect the output of the RCA jack. Noise and distortion are very low and not affected by the setting of the output level control.

The CH-12 remote DC power supply isolates the R170 receiver audio circuitry from AC ground, which eliminates ground loops. This also allows the R170 to be powered from external 12 Volt power sources other than the CH-12 AC adapter.

The R170 receiver is compatible with all Lectrosonics 170 and 185 series transmitters.

# RECEIVER FRONT PANEL

**MODULATION** - Indicates the modulation (audio level) of the incoming signal. The green LED indicates an adequate modulation level. The red LED indicates maximum or "peak" modulation.

**OUTPUT - VOLUME ATTENUATOR** - An output attenuator is used to adjust the output level of the two balanced outputs (XLR and 1/4") on the rear panel of the receiver. When the knob is in a fully clockwise position, the output at the jack will be 100mV when the signal is at full modulation. The attenuator knob works like a regular volume control. As you turn the knob counter clockwise the audio output of the receiver will be lowered.

NOTE: This control does not affect the MOD LEVEL display, the RF LED or the POWER LED -- it also does not affect the output level of the "LINE OUT" RCA jack.

**OFF - AUDIO MUTE - ON** -- This slide switch turns the power off and on and provides a "mute" function in the center position. This switch should be in the AUDIO MUTE position when the transmitter MIC LEVEL or GAIN adjustment is being made. This muting function also prevents turn-on and turn-off transients ("thumps" or "pops" in the sound system) that can occur when switching the receiver on and off.

**RF** lamp -- Lights when the transmitter is turned on. If the carrier signal is too weak to produce a quality signal, the lamp will go out.

**POWER** lamp -- Lights when the receiver is turned on.

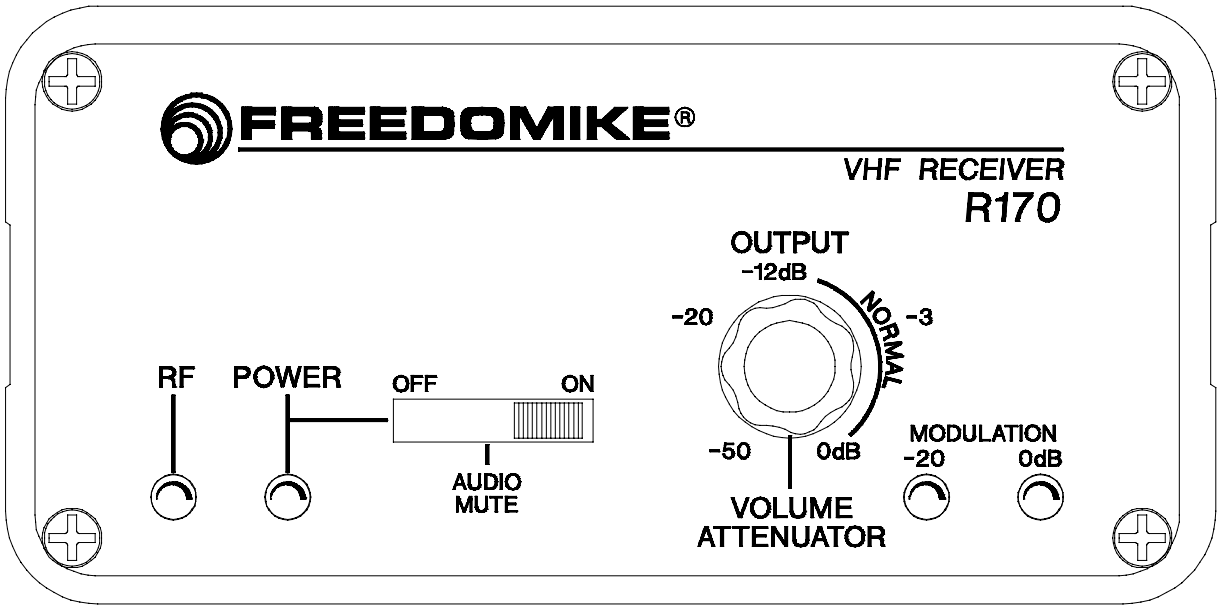



**Figure 1** - R170 Front Panel

# RECEIVER REAR PANEL

**ANTENNA** terminal -- A standard PL 259 connector for mounting the A-185PL antenna, or connecting the A-185Coax remote antenna.

**12V DC INPUT** -- Connect the power supply here -- the CH-12 AC adapter is supplied with the receiver for powering the unit from a 110V AC outlet -- the receiver may also be powered from 12 Volt DC sources using the correct plug; the center pin is positive(+). (Switchcraft S-760 power plug)

**AUDIO OUTPUTS**

**BAL MIC LEVEL** -- 3 pin XLR at microphone level (100mV max.); 200 Ohm impedance for either balanced or unbalanced inputs

**BAL 600 OHM** -- 1/4" phone jack at "line" level (700mV max.); 600 Ohm impedance for either balanced or unbalanced inputs

**LINE OUT** -- RCA phono jack at "line" level (1 Volt max.); 1K Ohm impedance for unbalanced inputs. The output level of this RCA jack is not affected by the front panel VOLUME ATTENUATOR control.

**AUDIO INPUT** (mixing bus)
**AUDIO IN** -- RCA phono jack input accepts external tape deck or other audio source; mixes audio with receiver output. Also allows "stacking" multiple receivers (see page 8).

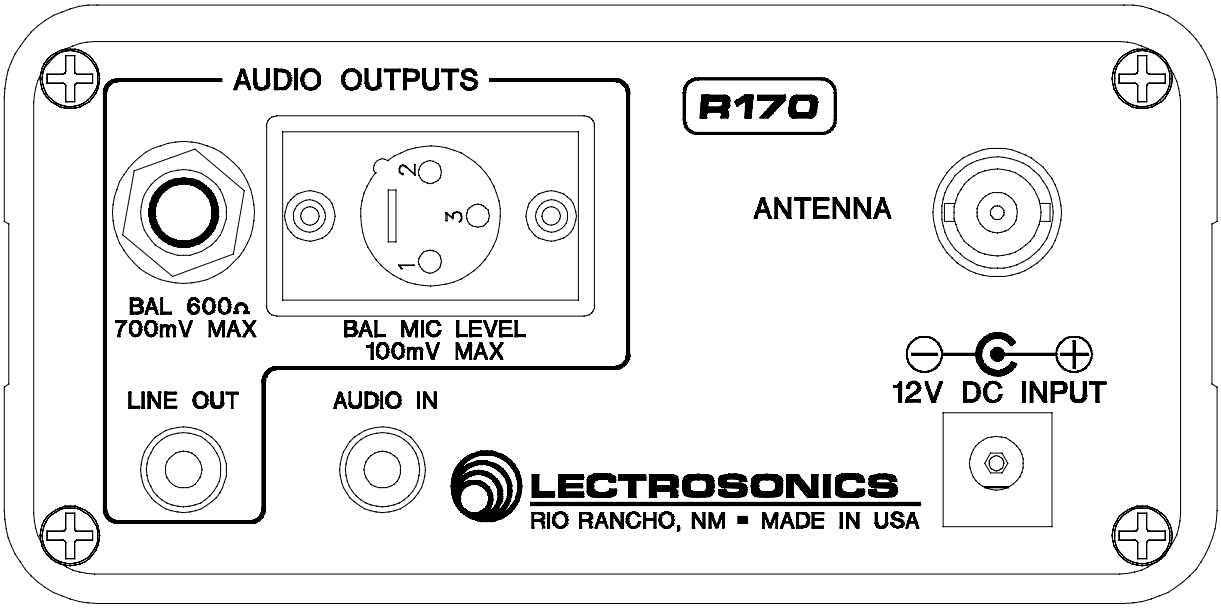



**Figure 2** - R170 Rear Panel

# USE AND PLACEMENT

A wireless transmitter sends a radio signal out in all directions. Indoors, this signal will often bounce off nearby walls, ceilings, etc. and a strong reflection can arrive at the receiver antenna along with the direct signal. Outdoors, reflections can occur from nearby cars, trucks or metal buildings. If the direct and reflected signals are out of phase with each other, a cancellation may occur. The result would be a "drop out." A drop out sounds like either audible noise (hiss or hum as the transmitter is moved around), or in severe cases, may result in a complete loss of the sound when the transmitter is positioned in certain locations in the room. A dropout situation may be either better or worse as the crowd fills and/or leaves the room, or when the transmitter or receiver is operated in a different location.

The illustration below depicts a simplified multi-path dropout. This drawing is overly simplified to emphasize the phase cancellation that results in a low RF signal at the receiver antenna. In actual use, there are numerous different paths that the radio signal can take simultaneously, causing a multitude of different signals arriving at the receiver antenna. The high sensitivity of the R170 minimizes dropouts in multi-path environments, since it will continue to operate with a usable audio signal to noise ratio even with weak RF signal inputs.

Position the antenna so that it is not touching or within 3 or 4 feet of large metal surfaces. If this is not possible, try to position the antenna so that it is as far away from the metal surface as is practical. It is also good to position the receiver so that there is a direct "line of sight" between the transmitter and the receiver antenna. In situations where the operating range is less than about 50 feet, the antenna positioning is much less critical. In the event that you do encounter a dropout problem, first try moving the receiver/antenna at least 3 or 4 feet from where it was. This may alleviate the dropout problem. If dropouts are still a problem, try moving the receiver and/or the antenna to an entirely different location in the room.

Lectrosonics transmitters radiate power very efficiently, and the receivers are very sensitive. This reduces dropouts to an insignificant level. If, however, you do encounter dropouts frequently, call the factory. There is probably a simple solution.

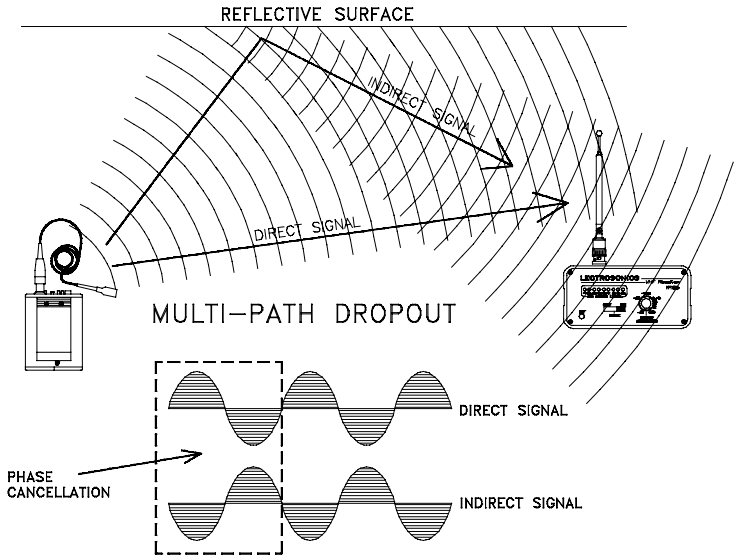



**Figure 3** - Antenna Placement

# OPERATING INSTRUCTIONS

**SET UP AND OPERATION SEQUENCE**

1) **CONNECT POWER CORD** -- Plug the connector into the jack labeled "12 VDC ". Insert the plug fully into the jack.

2) **ATTACH AND EXTEND THE ANTENNA FULLY**

3) **CONNECT THE AUDIO CABLE/S**
   A. For playback from a tape player, plug into "AUDIO IN"
   B. The sound system plugs into "BAL MIC"
   C. An alternate plug for the sound system is "HI Z BAL"
   D. To record, plug a tape recorder into "LINE OUT". Multi-channel applications are also possible using "LINE OUT" and "AUDIO IN".

4) **SET FRONT PANEL SWITCH TO "AUDIO MUTE"**
   Check to see that the red POWER LED lights up

5) **ADJUST TRANSMITTER "MIC LEVEL"** (See transmitter manual)
   This is perhaps the most important step in the set up procedure. See your transmitter manual for specific instructions on the proper gain adjustment of your transmitter. With some transmitter models you will need to observe the MOD LEVEL LED's on the receiver front panel as you adjust the gain on the transmitter.

6) **SET FRONT PANEL SWITCH TO "ON" POSITION**

7) **SET THE OUTPUT VOLUME ATTENUATOR KNOB IN THE MIDDLE OF THE "NORMAL" RANGE**
   The input levels on different recording and PA equipment vary. Try different settings and listen to the results. The volume attenuator works like a basic volume control knob. If the output of the receiver is too high, you may hear distortion or a loss of the natural dynamics of the audio signal. Turn the control knob down or counter clockwise. If the output is too low, you may hear steady noise (hiss or hum) along with the audio. Turn the control knob up or clockwise from the midpoint of the normal range.

# INDICATOR QUICK REFERENCE

**RF** -- Lights up when the transmitter is turned on. This indicates that the receiver is getting an adequate RF signal (carrier) from the transmitter.

**POWER** -- Lights up when the receiver is properly connected to a power supply and switched on.

**TRANSMITTER MOD LEVEL** -- The green LED lights up when an audio signal is present at a high enough level to produce a good signal to noise ratio. The red LED lights up when the audio level is too high and is being compressed in the transmitter. Extremely high audio levels may cause distortion. A very low audio level will produce a poor signal to noise ratio (audible hiss will be heard along with the sound).

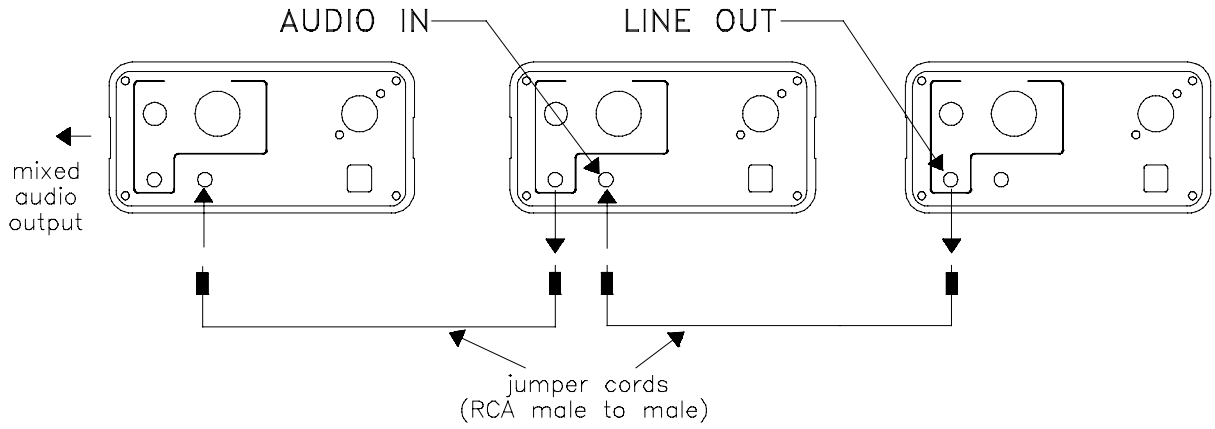
**REVIEW THE TRANSMITTER INSTRUCTION MANUAL FOR PROPER ADJUSTMENT OF THE TRANSMITTER MIC LEVEL OR GAIN**

## MULTI-CHANNEL AUDIO MIXING

The R170 receiver offers a unique feature that eliminates the necessity of using an external audio mixer in multi-channel applications. When using two or three R170 receivers together, the LINE OUT and AUDIO IN jacks provide "unity gain" mixing of the audio signals. This means that the audio output of the receivers may be mixed together through these connectors without affecting the volume levels. Connect the LINE OUT jack of one receiver to the AUDIO IN jack of the next receiver, then connect its LINE OUT jack to the AUDIO IN jack of the next receiver, forming a "chain" as shown in the illustration.

Up to three (3) receivers may be interconnected in this manner (combining the audio outputs of all three) so that a single audio output is available from the output of the last receiver in the "chain".

The output level of the LINE OUT RCA jack is not affected by the VOLUME ATTENUATOR control. The VOLUME ATTENUATOR control on the last receiver in the "chain" will control the combined volume of all the receiver outputs. In order to control the receiver outputs independently, you will need to use an external microphone mixer without the "jumper" cords shown below.




## MIXING AN EXTERNAL TAPE DECK WITH RECEIVER OUTPUT

A tape player may be connected to the AUDIO IN jack on the rear panel to mix the tape player output with the receiver output. Adjust the volume of the tape player with the volume control on the tape player since there is not a separate control for this purpose on the receiver.

# TROUBLESHOOTING

Before going through the following chart, be sure that you have a good battery in the transmitter. It is important that you follow these steps in the sequence listed.

| SYMPTOM | POSSIBLE CAUSE |
|---|---|
| TRANSMITTER BATTERY LED OFF | 1) External LED is turned off. Check internal slide switch.<br>2) Battery is inserted backwards.<br>3) Battery is dead. |
| NO TRANSMITTER MOD LEVEL LEDs | 1) Gain control turned all the way down.<br>2) Battery is in backwards. Check power LED.<br>3) Mic capsule is damaged or malfunctioning. |
| RECEIVER RF LAMP OFF | 1) Transmitter not turned on.<br>2) Transmitter battery is dead.<br>3) Receiver antenna missing or improperly positioned.<br>4) Transmitter and receiver not on same frequency. Check labels on transmitter and receiver.<br>5) Operating range is too great. |
| NO SOUND AND RECEIVER MOD LEVEL LEDs ARE OFF | Transmitter audio muted. Check to see that the audio is not muted on your transmitter, if this feature is available on your model transmitter. |
| NO SOUND BUT RECEIVER MOD LEVEL LEDs ARE ON | 1) Receiver audio is muted. Refer to receiver manual.<br>2) Receiver audio output is disconnected or cable is defective or mis-wired.<br>3) Sound system or recorder input is turned down. |
| DISTORTED SOUND | 1) Transmitter gain (audio level) is too high. Speak or sing into the transmitter and check mod level lamps on transmitter and receiver.<br>2) Receiver output may be mis-matched with the sound system or recorder input.<br>3) Excessive wind noise or breath "pops." |
| HISS AND NOISE -- AUDIBLE DROPOUTS | 1) Transmitter gain (audio level) too low.<br>2) Receiver antenna missing or obstructed.<br>3) Operating range too great. |
| EXCESSIVE FEEDBACK | 1) Transmitter gain (audio level) too high. Check gain adjustment and/or reduce receiver output.<br>2) Transmitter too close to speaker system.<br>3) Transmitter too far from the user's mouth. |

# REPLACEMENT PARTS and ACCESSORIES

| Part No. | Description |
|---|---|
| CH-12 | 110 Volt AC adapter for R170 receiver |
| A-185PL | Swivel-mount antenna with PL259 connector |
| A-185Coax | Remote coaxial cable antenna |
| CCFP | Molded carrying case for wireless systems |
| MM-18 | 18" male RCA to male RCA cord for "stacking" receivers (see page 7) |

# SERVICE AND REPAIR

If your system malfunctions, you should attempt to correct or isolate the trouble before concluding that the equipment needs repair. Make sure you have followed the setup procedure and operating instructions. Check out the inter-connecting cords and then go through the TROUBLE SHOOTING section in the manual

We strongly recommend that you **do not** try to repair the equipment yourself and **do not** have the local repair shop attempt anything other than the simplest repair. If the repair is more complicated than a broken wire or loose connection, send the unit to the factory for repair and service. Don't attempt to adjust any controls inside the units. Once set at the factory, the various controls and trimmers do not drift with age or vibration and never require readjustment. **There are no adjustments inside that will make a malfunctioning unit start working**.

LECTROSONICS service department is equipped and staffed to quickly repair your equipment. In-warranty repairs are made at no charge in accordance with the terms of the warranty. Out of warranty repairs are charged at a modest flat rate plus parts and shipping. Since it takes almost as much time and effort to determine what is wrong as it does to make the repair, there is a charge for an exact quotation. We will be happy to quote approximate charges by phone for out of warranty repairs.

# RETURNING UNITS FOR REPAIR

You will save yourself time and trouble if you will follow the steps below:

A. DO NOT return equipment to the factory for repair without first contacting us by letter or by phone. We need to know the nature of the problem, the model number and the serial number of the equipment. We also need a phone number where you can be reached 8 am to 4 pm (Mountain Standard Time).

B. After receiving your request, we will issue you a return authorization number (R.A.). This number will help speed your repair through our receiving and repair departments. The return authorization number must be clearly shown on the outside of the shipping container.

C. Pack the equipment carefully and ship to us, shipping costs prepaid. If necessary, we can provide you with the proper packing materials. UPS is usually the best way to ship the units. Heavy units should be "double-boxed" for safe transport.

D. We also strongly recommend that you insure the equipment, since we cannot be responsible for loss of or damage to equipment that you ship. Of course, we insure the equipment when we ship it back to you.

Mailing address:
Lectrosonics, Inc.
PO Box 15900
Rio Rancho, NM 87174
USA

Shipping address:
Lectrosonics, Inc.
581 Laser Rd.
Rio Rancho, NM 87124
USA

Telephones:
Regular: (505) 892-4501
WATS: (800) 821-1121
FAX: (505) 892-6243

# SPECIFICATIONS AND FEATURES

**R170 RECEIVER**

| | |
|---|---|
| **Operating frequencies:** | 150 to 216 MHz crystal controlled |
| **Sensitivity:** | 1.0uV for 20dB SINAD<br>2.0uV for 50dB S/N ratio |
| **Signal/noise ratio:** | 96 dB flat; 100 dB A-weighted |
| **Squelch quieting:** | greater than 100 dB |
| **AM rejection:** | -40 dB (10uV to 0.1 Volts) |
| **Modulation acceptance:** | ±15kHz |
| **Image/spurious rejection:** | greater than 100 dB |
| **Audio outputs:** | * XLR: 200 Ohm balanced; 100mV max.<br>* ¼ inch: 600 Ohm; 700 mV max.<br>(500 mV max. unbalanced)<br>* RCA: 1k Ohm unbalanced; 1 Volt max. |
| **Audio input:** | RCA jack for unity gain audio mixing bus |
| **Antenna input:** | PL259 female; 50 Ohm impedance |
| **Controls:** | Front panel attenuator controls balanced outputs; 3 position power/function switch |
| **Indicators:** | LED for power "ON"<br>2 LEDs for modulation level<br>"RF" LED for transmitter "ON" |
| **Power requirements:** | * 12 Volt DC direct to panel mounted jack<br>* 110 Volt AC via CH-12 AC adapter |
| **Power consumption:** | 125 mA max. |
| **Weight:** | 2.1 lbs |
| **Dimensions:** | 2.9 x 7.4 x 5.3 inches |

# LIMITED ONE YEAR WARRANTY

The equipment is warranted for one year from date of purchase against defects in materials or workmanship provided it was purchased from an authorized dealer. This warranty does not cover equipment which has been abused or damaged by careless handling or shipping. This warranty does not apply to used or demonstrator equipment.

Should any defect develop, we will, at our option, repair or replace any defective parts without charge for either parts or labor. If we cannot correct the defect in your equipment, we will replace it at no charge with a similar new item. We will pay for the cost of returning your merchandise to you.

This warranty applies only to items returned to us, shipping costs prepaid, within one year from the date of purchase.

This warranty gives you specific legal rights. You may have additional legal rights which vary from state to state.

**LECTROSONICS, INC.**

**581 LASER ROAD**
**RIO RANCHO, NM 87124 USA**

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