INSTRUCTION MANUAL

R400A

UHF Diversity Receiver

Also part of IS400 and TM400 Systems

(Includes IFB Mode)

Featuring

Digital Hybrid Wireless® Technology

(US Patent 7,225,135)

Fill in for your records:

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LECTROSONICS®
Rio Rancho, NM, USA
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Introduction

The R400A is a high performance, triple-conversion, frequency synthesized UHF receiver fully compatible with all Lectrosonics 400 Series Digital Hybrid Wireless® transmitters, 200 Series and 100 Series analog transmitters and Lectrosonics IFB transmitters, plus some analog transmitters from other manufacturers (call Lectrosonics for details). The R400A features 256 user selectable frequencies and its proprietary audio processing includes a digital signal processor (DSP) for very low distortion, a superior signal to noise ratio and two independent audio outputs, one balanced and one unbalanced.

The receiver features a menu-driven LCD graphic display, a push-button POWER/PREV MENU control and a dual function (push/rotate) PUSH FOR MENU/ROTATE TO SELECT control (hereafter called the MENU control) as a convenient means of viewing and altering user settings.

The MENU control provides simple and intuitive access to change and adjust settings and operating levels. Pushing the MENU control from the Main Window enters the Top Menu which displays a choice of five submenu options: SetUpRx, LockSet, SmartTune™, Scan and Exit. Rotating the MENU control either highlights a menu option or sets a parameter. Pushing the MENU control either selects the highlighted menu option or enters (or reenters) a menu.

Digital Hybrid Wireless®

Lectrosonics Digital Hybrid Wireless® (US Patent 7,225,135) uses innovative technology to combine the new advantages of digital audio with the classic advantages of analog RF transmission. The result is the superior sound quality of a digital system and the excellent range of an analog system. A proprietary algorithm encodes the digital audio information into an analog format which can be transmitted in a robust manner over an analog FM wireless link. The receiver employs the latest filters, RF amplifiers, mixers and detector to capture the encoded signal and a DSP (Digital Signal Processor) recovers the original digital audio.

This digital/analog hybrid technique has some very beneficial properties. Because the information being transmitted is digitally encoded, immunity to noise is much higher than a compandor-based system can offer and no artifacts are introduced under strong RF conditions, and spectral and power efficiency and operating range are not compromised.

Diversity Reception

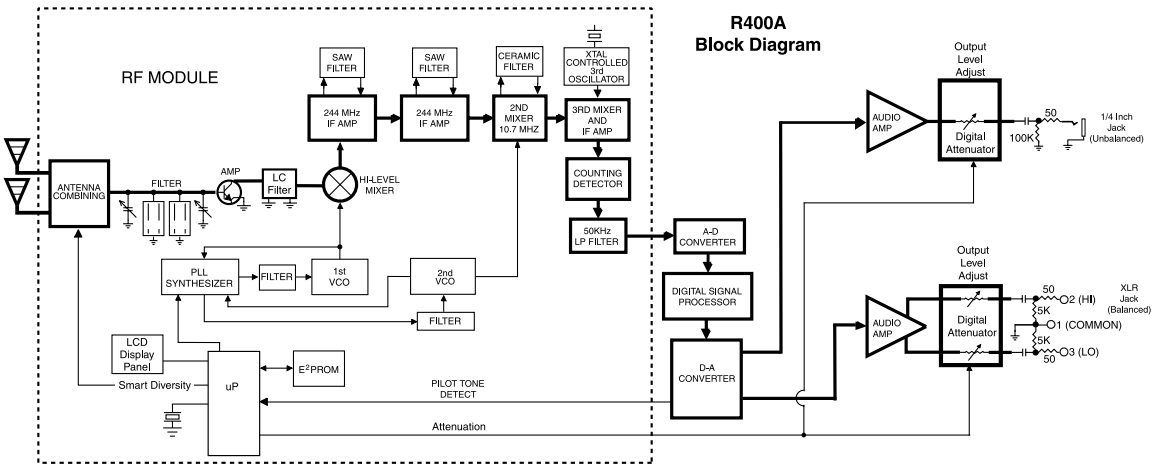
SMARTDiversity™ minimizes dropouts in situations where multi-path reflections can cause serious problems. The phase diversity network and PIN diode RF switches are controlled by the microprocessor using a sophisticated algorithm to use both antennas simultaneously.

RF Front-End and Mixer

The R400A is frequency agile and can be set to operate on any one of 256 frequencies within its tuning range. To significantly reduce unwanted interference and intermodulation problems, the R400A's front-end is tuned to the desired frequency band and rejects or "tunes out" unwanted out-of-band signals. Two tuned HI-Q ceramic transmission line resonators prior to a low noise, high current RF amplifier provide good selectivity. A robust RF amplifier and LC bandbass filter provide added insurance against strong RF interference. The overall design ensures stability, selectivity and precise gain in order to handle strong RF signals without input overload.

IF Amplifiers and SAW Filters

The first IF low noise amplifier is controlled with feedback regulation and drives a quartz SAW (Surface Acoustical Wave) filter. The 244 MHz SAW filter combines sharp tuning, constant group delay, wide bandwidth and excellent temperature stability, far superior to conventional LC filters. The second mixer converts the 244 MHz first IF signal down to 10.7 MHz. The second IF is filtered through two ceramic filters for sharp selectivity, then itself is converted down to 300 kHz and fed to the Digital Pulse Counting Detector.



Digital Pulse Counting Detector

The R400A receiver uses an elegantly simple, yet highly effective digital pulse detector to demodulate the FM signal, rather than a conventional quadrature detector. This unusual design eliminates thermal drift, improves AM rejection, and provides very low audio distortion. The output from the Digital Pulse Counter is an analog signal containing the digital audio information. This signal is fed through a low pass filter to an A-D Converter in the Digital Signal Processing section.

Frequency Tuning Groups

The R400A provides four "factory set" compatible frequency groups (A through D) and two user programmable frequency groups (U and V).

The factory groups have been selected to avoid intermodulation problems. Each group includes eight channels.

The user programmable frequency groups can have up to 16 frequencies per group.

Microprocessor, PLL and VCO Circuits

An 8-bit microprocessor monitors user command inputs from the front panel control buttons and numerous other internal signals such as RF level, audio levels, pilot tone levels and external power voltage. The microprocessor also drives the LCD display, controls the squelch and audio output attenuator, and operates the PLL/VCO circuits and the antenna phase switch.

Digital Signal Processor

The DSP reconstructs the original digitized audio from the A-D Converter and detects the ultrasonic Pilot Tone. The DSP also incorporates an RF-controlled digital noise filter (in addition to SmartNR™). This RF sensitive variable frequency filter reduces high frequency response under extremely weak RF conditions. The filter does nothing until the RF signal strength drops below 3uV, at which point it begins to roll off high frequencies. Usable audio remains unaffected, but noise-ups or "hits" occurring near the fringe of reception sound much less harsh.

The reconstructed original analog audio signal is then sent to the audio output section.

Smart Tuning (SmartTune™)

A major problem facing wireless users is finding clear operating frequencies, especially in RF saturated environments. SmartTune™ overcomes this problem by automatically scaning all the frequencies available in the receiver's frequency block and tuning the receiver to the frequency with the lowest RF interference, significantly reducing setup time.

Compatibility Modes

The R400A receiver was designed to operate with Lectrosonics 400 Series transmitters and will yield the best performance when doing so. However, due to the flexibility of digital signal processing, the R400A is also able to operate with Lectrosonics 200 Series, 100 Series and IFB transmitters, and certain non-Lectrosonics transmitters in special compatibility modes. (Contact the Lectrosonics Sales Department for a complete list of compatible transmitters.)

DSP-Based Pilot Tone

The 400 Series system design uses a DSP generated ultrasonic pilot tone from the transmitter to control the receiver audio muting (squelch). If the Pilot Tone is enabled, a Pilot Tone Detect signal generated by the DSP automatically controls the receiver's squelch. Built-in brief delays are also incorporated to eliminate the thumps, pops or other transients that can occur when the transmitter is turned on or off.

The pilot tone frequency is different for each of the 256 frequencies in the tuning range of a system (frequency block). This eliminates squelch problems in multichannel systems where a pilot tone signal can appear in the wrong receiver via intermodulation products. Using the DSP to detect the pilot tone also eliminates the need for fragile crystals, allowing the receiver to survive shocks and mishandling much better than older analog-based pilot tone systems.

Note: The above description applies only in 400 Series mode. In other modes requiring pilot tones, only one pilot tone frequency is used on all channels.

Smart Squelch™

The R400A employs a sophisticated squelching system in an attempt to deliver the cleanest possible audio during marginal conditions of reception. Any squelching system faces inevitable trade-offs: Squelch too much and valuable audio information may be lost, squelch too little and excessive noise may be heard; respond too rapidly and the audio sounds "choppy," respond too sluggishly and syllables or entire words can be cut off. The R400A combines several techniques to achieve an optimal balance, removing distracting noise without the squelching action itself becoming a distraction. One of these techniques involves waiting for a word or syllable to complete before squelching. Another incorporates recent squelching history and recent signal strength, adjusting squelching behavior dynamically for the most serviceable result under variable conditions. Using these and other techniques, the R400A can deliver acceptable audio quality from otherwise unusable signals.

In the PILOT TONE BYPASS mode, the squelch system is disabled. Received audio remains unmuted at all times with this setting.

Smart Noise Reduction (SmartNR™)

The wide dynamic range of digital hybrid technology, combined with flat response to 20 kHz, makes it possible to hear the –120 dBV noise floor in the mic preamp, or the (usually) greater noise from the microphone itself. (To put this in perspective, the noise generated by the recommended 4 k Ohm bias resistor of many electret lavaliere mics is –119 dBV and the noise level of the microphone's electronics is much higher.) In order to reduce this noise and thus increase the effective dynamic range of the system, the R400A is equipped with a Smart Noise Reduction algorithm, which removes hiss without sacrificing high frequency response.

The Smart Noise Reduction algorithm works by attenuating only those portions of the audio signal that fit a statistical profile for randomness or "electronic hiss." SmartNR™ offers significantly increased transparency over the sophisticated variable low pass filters used in previous designs. Desired high frequency signals having some coherence such as speech sibilance and tones are not affected.

The Smart Noise Reduction algorithm has three modes, selectable from a user setup screen: Off, Normal and Full.

OFF - No noise reduction is performed and complete transparency is preserved. All signals presented to the transmitter's analog front end, including any faint microphone hiss, will be faithfully reproduced at the receiver.

NORMAL (factory default) - Enough noise reduction is applied to remove most of the hiss from the mic preamp and some of the hiss from lavaliere microphones. The noise reduction benefit is dramatic in this position, yet the degree of transparency maintained is exceptional.

FULL - Enough noise reduction is applied to remove most of the hiss from nearly any signal source of reasonable quality, assuming levels are set properly at the transmitter. This additional noise reduction comes at the cost of some transparency for low-level room noise, yet the algorithm remains undetectable under most circumstances.

Note: The SmartNR™ setting is user selectable only in 400 Series mode. In other modes, noise reduction is applied in such a way as to emulate the original analog system as accurately as possible and is not user adjustable.

Noise-Controlled Digital Filter

In addition to SmartNR™, the R400A contains a supersonic noise-sensitive variable frequency filter, which reduces high frequency response under extremely weak RF conditions. This filter does nothing until the level of supersonic noise present in the received audio exceeds a predetermined threshold at which point it begins to roll off high frequencies. Usable audio remains unaffected, but noise-ups or "hits" occurring near the fringe of reception sound much less harsh.

Balanced and Unbalanced Audio Outputs

The R400A offers two audio outputs for the ultimate in flexibility: Balanced (XLR) and Unbalanced Line Out/Monitor (1/4-inch jack.) Both outputs operate independently and are controlled by their own digital attenuator.

LCD Screen

The LCD screen is used in conjunction with the MENU control to change and control the operational settings, and also provide a visual feedback of overall system operation. (See R400A MENU SELECTIONS.)

Power Supply

The R400A is operated from an external DC power source with a range of +8 VDC to +18 VDC, up to 0.20 amperes (200 milliamps) maximum. The receiver has a built-in Poly-Fuse to protect the unit. If a problem occurs that trips this fuse, it will reset after the power supply is disconnected for about 15 seconds. The power input section also has built-in protection circuits that prevent damage to the receiver if a positive ground power source is applied.

Note: The R400A requires external DC power and has no provisions for internal batteries.

Initial Setup

1. Connect the power cord from the power supply to the Power Input Jack.
2. Attach the antennas or antenna cables to the MAIN ANT and DIV ANT BNC connectors.
3. Press the POWER/PREV MENU button to turn on the unit on. Check to see that the LCD displays the three-screen Power Up Sequence:

   Lectrosonics

   R400A VXX where VXX is the current firmware version installed

   Block XX where XX is the frequency tuning range block number

   After the Power Up Sequence is displayed, the Main Window appears and the R400A is ready for operation.
4. Ensure the receiver and transmitter are set to the same Compatibility Mode, then locate a clear operating frequency (see Frequency Coordination.) Then set the Transmitter Frequency Select Switches to match the receiver's operating frequency. (See R400A Menu Options.)
5. Turn the transmitter on and verify that an RF signal is indicated on the LCD.
6. Connect an audio cable to the appropriate audio output jack. Because the audio outputs operate independently, external equipment can be connected to either, or both output jacks.
7. Locate a clear operating frequency. The easiest method is to use SmartTune™ and then set the transmitter frequency indicated on the display.

   Note: For more detailed instructions, see "Using SmartTune™ and the Scan Function" on page 16.
8. Refer to the associated transmitter operating instructions and adjust the transmitter gain.

   Warning: This is perhaps the most important step in the setup procedure.

   In general, adjust the transmitter gain so that the voice peaks will cause the audio modulation level indicators on both the receiver and transmitter to show full modulation on the loudest peak audio levels. Normal levels should cause the R400A's audio level bar to fluctuate fully resulting in the best possible signal to noise ratio for the system.

   Note: A common mistake is to use the transmitter audio gain control to set the overall audio level of the entire system. The transmitter gain control is not a volume control and must be set independently of the overall system audio level. The transmitter gain control is only used to set the proper modulation of the transmitter. It is used to match the transmitter to the type of microphone and the sound levels that will be present at that microphone. We encourage users to either disconnect the rest of the sound system or turn the sound system gain to minimum to prevent either feedback or overload as the transmitter gain is set. Only after the transmitter gain control is set should the gain of the rest of the audio system be adjusted to achieve the desired sound or signal levels.
9. Use the Level or Tone menus to adjust the audio output levels to match the required input level of any connected devices (camera, mixer, recorder, etc.). The adjustment range is from -50 dBu to +5 dBu in 1 dBu steps for the balanced output and -55 dBu to +0 dBu in 1 dBu steps for the unbalanced output.

   Note: The test tone output is especially useful for an exact level match. With the test tone running, adjust for the maximum desired peak level using the metering on the connected device.
10. If desired, access the LockSet menu to lock the R400A front panel controls to prevent inadvertently modifying the receiver settings during operation.

Front Panel Controls and Functions

LCD Screen

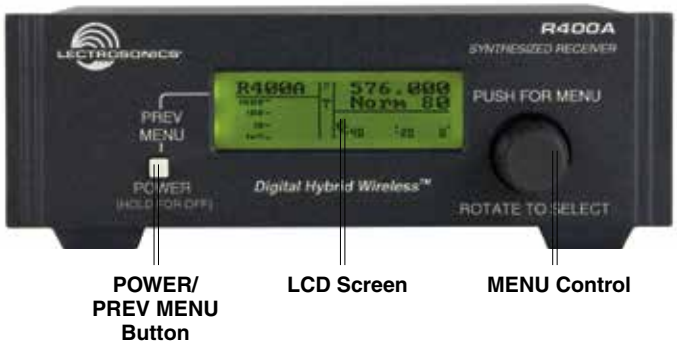
The LCD Screen is used to monitor system operation and display information while configuring the R400A. (See R400A Menu Options.)

POWER/PREV Menu Button

Dual function control providing a POWER On/Off function and a return to previous menu function. If the receiver is turned off, momentarily pressing this button turns the receiver on. If the receiver is already turned on, pressing this button causes the LCD to display the previous menu. Pressing and holding the button for at least two seconds turns the unit off.

MENU Control

The dual function MENU control is used to access menus and change receiver settings. Push the control to enter the TopMenu, or activate the selected menu option. Rotate the control to either select a menu option or to set an operating parameter.



Rear Panel Features

Balanced Audio Output

This is a standard XLR configuration with Pin 2 “positive” with reference to hand-held and plug-on transmitters. With lavaliere microphones and belt-pack transmitters, however, phase will vary with different types of microphones (2-wire vs. 3-wire for example). The audio output is balanced but not floating. An unbalanced signal is available using Pin 1 as ground, Pin 2 as signal and leaving Pin 3 open.

Unbalanced Audio Output

This is a standard 1/4-inch phone jack with the center pin positive and the sleeve connected to ground. This jack provides unbalanced line-level audio output.

Power Input Jack

The power input jack accepts +8 VDC to +18 VDC (center pin is positive and sleeve is ground). The input is diode protected to prevent damage if the power is applied with reversed polarity, and it will keep the unit from operating until the condition is fixed.

Main Antenna and Diversity Antenna Inputs

The MAIN ANT and DIV ANT inputs are both 50 Ohm, BNC connectors. In single antenna configurations, the antenna is connected to the MAIN ANT jack. (See Antenna Use and Placement.)

Antenna Use and Placement

The receiver is supplied with two right angle BNC antennas. In some circumstances remote antennas such as the SNA600 or ALP600 may be useful for improving reception. Position remote antennas at least three or four feet apart and not within three or four feet of large metal surfaces. If this is not possible, try to position the antennas so that they are 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's antenna. In situations where the operating range is less than about 100 feet, the antenna positioning is much less critical. The antennas can also be configured with one whip connected to one antenna input of the receiver, and a remote antenna connected to the other antenna input.

Be careful about the length of cabling from antenna to receiver. Long cable runs can have serious signal loss. Lectrosonics has in-line RF amplifiers suitable for compensating for long cable runs. Contact your dealer or the factory for more information.

A wireless transmitter sends a radio signal out in all directions. 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. If the direct and reflected signals are out of phase with each other a cancellation may occur. The result is a "dropout." A dropout can sound like audible noise (hiss or swishing), or in severe cases, it may result in a complete loss of both the carrier and the sound. Moving the receiver's antennas even a few inches will change the sound of the dropout, or often eliminate it. A dropout situation may also be either better or worse as a crowd fills or leaves the room, or when the transmitter or receiver is operated in a different location.

The R400A receiver offers a sophisticated diversity design which overcomes dropout problems in almost any situation. In the event, however, that you do encounter a dropout problem, try moving the receiver or antennas.

If the antennas are attached directly to the receiver, moving the receiver at least three to four feet from its current location. If dropouts are still a problem, try moving the receiver closer to the transmitter.

If remote antennas are used, try moving one or both of the remote antennas at least three or four feet from their current location. This may alleviate the dropout problem at that location. If dropouts are still a problem, try moving the remote antennas to an entirely different location.

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 or consult your dealer. There is probably a simple solution.

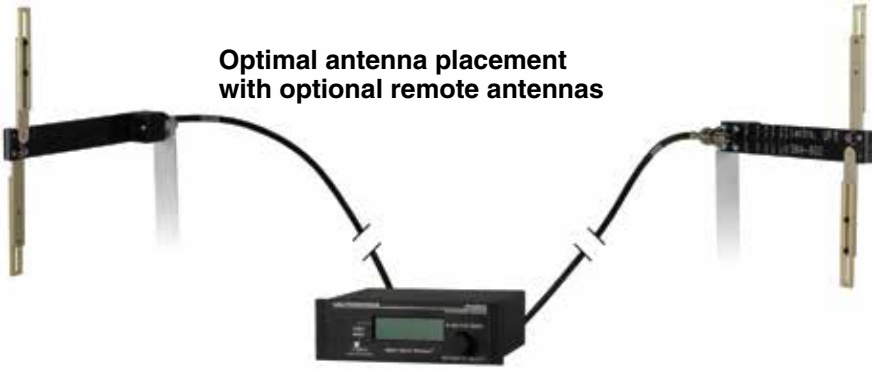
Poor antenna placement

Good antenna placement

Better antenna placement

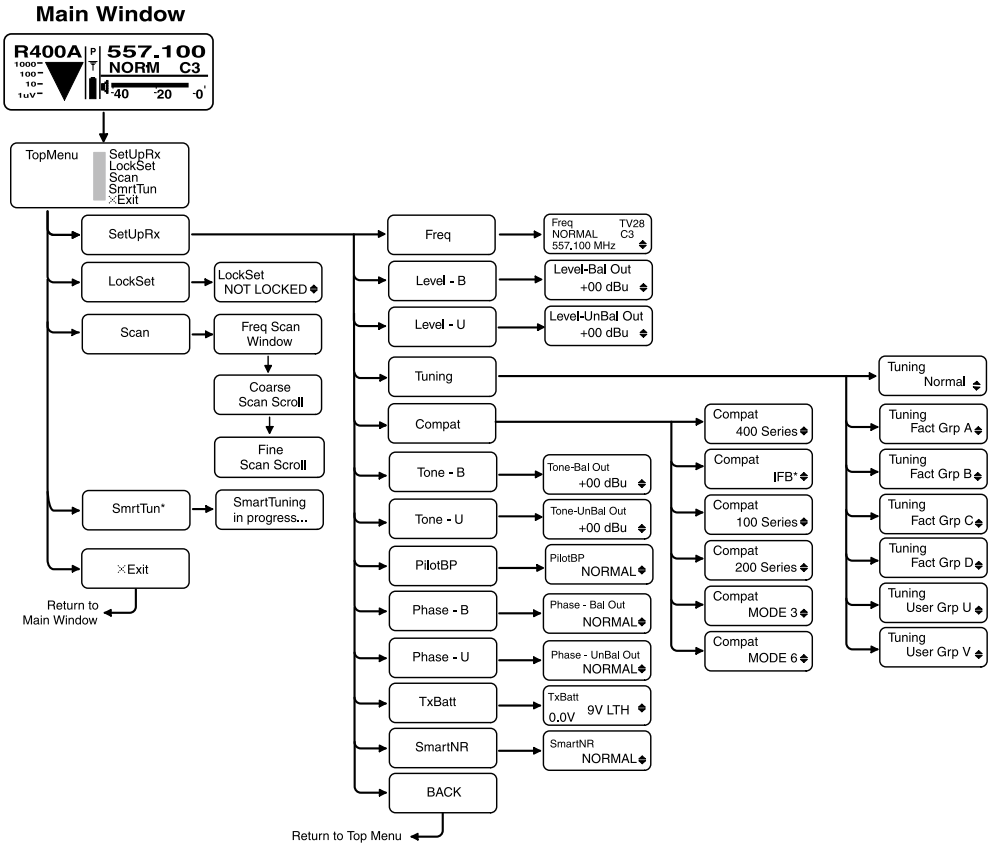
Front mounted whips with optional rack mount

Optimal antenna placement with optional remote antennas

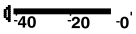


R400A Menu Options

R400A Menu Map



Main Screen Display

Icon	Description
P	**Pilot tone indicator -** A steady “P” is displayed when the transmitter pilot tone is present (in compatibility modes supporting pilot tones only). The icon flashes if no pilot tone is detected and changes to a small “b” if the pilot tone has been bypassed.
	**Antenna Phase indicator -** Displays antenna phase switching activity. As the DIV ANT phase is switched, the symbol will flip vertically.
	RF level - Displays the relative strength of the incoming RF. The icon grows taller as the strength of the incoming RF signal increases. RF level calibrations are shown from 1uV to 1000uV to the left of the RF level icon.
	**Audio Level -** The audio level bar changes in length horizontally to indicate the audio level (modulation) of the signal received from the transmitter. A vertical bar will appear at the right end when the audio signal is in limiting (maximum level) at the transmitter. Calibration marks in dB are displayed below the bar.
	Battery Level - Indicates the transmitter battery status or the transmitter battery use time, depending on the TXBAT setting. The transmitter battery status icon is available only in compatibility modes supporting battery telemetry (400 and 200 Series). In such cases, the transmitter battery status icon appears 5 to 10 seconds after the transmitter signal is acquired. If selected in the TXBAT setup screen, the transmitter battery timer is available in any compatibility mode. It accumulates hours and minutes that the communications link is active, retaining the timing even when the receiver is off.
557.100 NORM C3	**Operating Frequency/Tuning Mode/Switch Settings** - Displays the operating frequency, the tuning mode and the settings for the Frequency Select Switches in the associated transmitter(s). The Tuning Mode indicates whether the receiver is set for Normal tuning or Group tuning. (See Tuning Menu)

The R400A's menu functions are accessed via the top level menu, by pressing the MENU control. The control is then rotated to browse the available menu options, and pressed to make a selection.

Menu Functions

The R400A Menu functions can be divided into four main areas: setting up the receiver, automatic clear channel selection, locking the receiver and scanning for clear frequencies.

SetUpRx

The SetUpRx menu accesses the screens used to set up the receiver. These screens include: Freq, Level, Tuning, Compat, Tone, PilotBP, Phase, TxBatt and SmartNR.

Freq

The Freq setup screen displays the TV channel (which television broadcast channel this frequency falls within), the associated transmitter Frequency Select Switch settings and the selected operating frequency for the R400A. To change the operating frequency, rotate the MENU control. Exit this setup screen by pressing the PREV MENU button. The receiver will retain its tuning even when the power is off.

Note: If the operating frequency is changed, ensure that the Frequency Select Switch settings of the associated transmitter match the settings shown in the upper right hand corner of this screen.

Level-B

The Level-B setup screen displays the audio output level of the receiver in dBu at the balanced XLR jack. The output level range is -50dBu to +5dBu and can be adjusted in 1dB increments by rotating the MENU control. Pressing the PREV MENU button exits the setup screen. Output loads less than 100 ohms are not recommended.

Level-U

The Level-U setup screen displays the audio output level of the receiver in dBu at the unbalanced 1/4-inch jack. The output level range is -55 dBu to +0dBu and can be adjusted in 1dB increments by rotating the MENU control. Pressing the PREV MENU button exits the setup screens. Output loads less than 50 ohms are not recommended.

Tuning

The R400A offers 7 tuning modes: 4 factory set frequency groups (Fact Grp A thru D), 2 user programmable frequency groups (User Grp U and V), and normal tuning mode (the default).

In normal tuning mode, all 256 channels are available.

The four factory set groups limit tuning to specially selected intermod-free frequencies. (See Frequency Coordination section for more information.) User groups U and V similarly limit tuning to user-selected frequencies.

Note: Changing tuning modes does not directly change the receiver's tuning. It merely changes the behavior of the tuning knob the when the Freq setup screen is subsequently accessed. When switching to a new group tuning mode, it is to be expected that the receiver will be tuned (initially and temporarily) to a channel that is not a part of the newly selected group. Selecting a new frequency from the Freq screen clears this condition, as only frequencies in the group are offered.

Compat

The Compat setup screen is used to select the compatibility mode, allowing the R400A to operate with a variety of transmitters. The available compatibility modes are:

400 - This is the factory default setting and works with all Lectrosonics 400 Series Digital Hybrid Wireless® transmitters. This mode offers the best audio quality.

IFB - This mode works with all Lectrosonics IFB compatible transmitters.

100 - This mode works with all Lectrosonics 100 Series compatible transmitters.

200 - This mode works with all Lectrosonics 200 Series compatible transmitters.

MODE 3 and MODE 6* - These modes work with a number of non-Lectrosonics analog transmitters. Contact the company for a list of compatible transmitters for each mode.

**Mode 6 available on units with Serial Number 236 and up.*

Tone-B

The Tone-B setup screen switches from received audio at the balanced XLR audio output jack to an internally generated 1kHz audio test tone for precise level matching with other externally connected equipment without actually going "on the air."

The Tone level has a range of -50dBu to +5dBu and is adjusted in 1 dB increments by rotating the menu control. The test tone has 1% distortion and is intended for confirmation of output levels only. Pressing the PREV MENU button exits the setup screen.

Warning: There is only one audio output level setting for both received audio and the setup tone. The level set here will be retained in the receive mode (superseding settings made in the Level-B setup screen).

Tone-U

The Tone-U setup screen switches from received audio at the unbalanced 1/4-inch audio output jack to an internally generated 1kHz audio test tone for precise level

matching with other externally connected equipment without actually going "on the air."

The Tone level has a range of -55dBu to 0dBu and is adjusted in 1dB increments by rotating the menu control. The test tone has 1% distortion and is intended for confirmation of output levels only. Pressing the PREV MENU button exits the setup screen.

Warning: There is only one audio output level setting for both received audio and the setup tone. The level set here will be retained in the receive mode (superseding settings made in the Level-U setup screen).

PilotBP

The R400A always powers up with the pilot tone bypass mode disabled (a pilot tone is required from the transmitter to unsquelch the receiver). To enable pilot tone bypass mode, in the PilotBP window, rotate the MENU control to select BYPASS, then press the PREV MENU button.

To return to normal operating mode (pilot tone bypass mode disabled), rotate the MENU control to select NORMAL, then press the PREV MENU button Exit this setup screen by pressing the PREV MENU button.

Note: No pilot tone is used in 100 Series or Mode 3 Compatibility Modes, so therefore this function is not offered for those modes.

Phase-B

By default, the balanced audio output is driven IN PHASE in regard to the audio signal from the transmitter. To invert the receiver's balanced audio output, enter the Phase-B setup screen, rotate the MENU control to select INVERT. The phase of the audio signal is inverted at the balanced XLR jack. To restore the receiver's balanced audio output to "In Phase," select NORMAL. Exit this setup screen by pressing the PREV MENU button.

Phase-U

By default, the unbalanced audio output is driven IN PHASE in regard to the audio signal from the transmitter. To invert the receiver's unbalanced audio output, enter the Phase-U setup screen, rotate the MENU control to select INVERT. The phase of the audio signal is inverted at the unbalanced 1/4-inch jack. To restore the receiver's unbalanced audio output to "In Phase," select NORMAL. Exit this setup screen by pressing the PREV MENU button.

TxBatt

The TxBatt setup screen allows the selection of the exact battery type being used in the transmitter to provide more accurate battery level monitoring. Four different types of batteries are commonly used in Lectrosonics transmitters: 9 Volt alkaline, 9 Volt lithium, AA alkaline, and AA lithium. Rechargeable NiMH batteries can also be used in the transmitters (see TIMER below). Correctly set, this feature will ensure that adequate warning will be provided in advance of battery failure.

In 400 Series and 200 Series compatibility modes, the TxBatt menu offers five choices:

9V ALK - Transmitter using a 9V alkaline battery. Monitors voltage with battery icon in main window. The battery voltage is displayed in the TxBatt setup screen.

9V LTH - Transmitter using a 9V lithium battery. Monitors voltage with battery icon in main window. The battery voltage is displayed in the TxBatt setup screen.

AA ALK - Transmitter using a AA alkaline battery. Monitors voltage with battery icon in main window. The battery voltage is displayed in the TxBatt setup screen.

AA LTH - Transmitter using a AA lithium battery. Monitors voltage with battery icon in main window. The battery voltage is displayed in the TxBatt setup screen.

TIMER - Transmitter using any battery. Displays the cumulative time that the communications link is active. The time is displayed in two locations: the lower left corner of the TxBatt setup screen and the upper left corner of the Main Window display. No battery icon is displayed in TIMER mode.

The colon blinks when the TIMER is running, and also indicates that the communications link is active. When either the transmitter or the R400A receiver is powered OFF, the timer will retain the accumulated time and resume counting only when a signal is detected from the transmitter.

To reset the timer, navigate to the TIMER setup screen and quickly press and release the PREV MENU button and the MENU control simultaneously. The TIMER mode is most useful for NiMH batteries as they do not exhibit reliably identifiable voltage drops as they discharge.

For compatibility modes other than 400 Series and 200 Series, no battery telemetry information is available so the TxBatt setup screen offers TIMER as the only choice.

Exit this setup screen by pressing the PREV MENU button.

SmartNR

Available in 400 Series Compatibility Mode only, the SmartNR setup screen is used to select one of three noise reduction modes:

OFF - No noise reduction is performed and complete transparency is preserved. All signals presented to the transmitter's analog front end, including any faint microphone hiss, will be faithfully reproduced at the receiver.

NORMAL (factory default) - Enough noise reduction is applied to remove most of the hiss from the

mic preamp and some of the hiss from lavaliere microphones. The noise reduction benefit is dramatic in this position, yet the degree of transparency maintained is exceptional.

FULL - Enough noise reduction is applied to remove most of the hiss from nearly any signal source of reasonable quality, assuming levels are set properly at the transmitter.

Rotate the MENU control to select the noise reduction mode. Exit this setup screen by pressing the PREV MENU button.

Back

Rotate the MENU control to select BACK, then push the MENU control to return to the TopMenu window.

LockSet

LockSet is used to lock the R400A settings. When locked, the use of the MENU functions is limited to "view only" and attempts to change selections will result in a screen displaying the word "LOCKED! (To Unlock, Use LockSet Menu)" The Scan and SmartTune™ functions are disabled when the unit is in the LOCKED state.

To LOCK the R400A - Press the MENU control to enter the TopMenu, then rotate the MENU control to select LockSet. Press the MENU control to open the LockSet window, rotate the MENU control to select LOCK, then push either the MENU control or the PREV MENU button to exit to TopMenu.

To UNLOCK - Repeat the steps above and select NOT LOCKED.

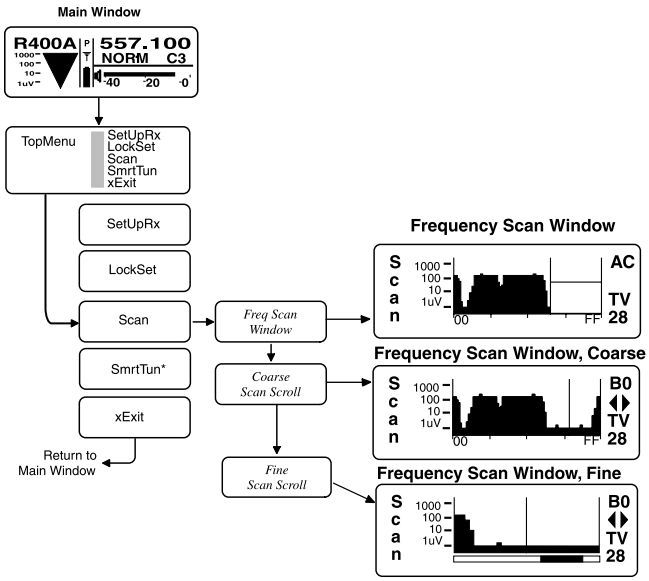
SmartTune™

SmartTune™ automates the discovery of a clear operating frequency. It does this by scanning all the available operating frequencies within the system's frequency block range (in 100 kHz increments) and then selecting the frequency with the least amount of RF interference. When SmartTune™ is complete, it returns to the Main Window displaying the operating frequency and transmitter switch settings for the clear channel discovered during scanning.

Scan

Navigate to the SCAN option from the menu, then press the MENU control to activate the scan function. The receiver begins scanning the receiver's frequency block. The receiver will continue to scan, accumulating the highest peaks with each subsequent scan, until stopped by the user. Data gathered during the scanning process is retained until Scan mode is exited.

To stop scanning (but not exit Scan mode), press the MENU control once. The display switches to the Coarse View window. In this mode, each vertical band of the display represents four frequencies (400 kHz). Rotate the MENU control to scroll the cursor across the tuning range. As the cursor scrolls across the



frequency band, Frequency Select Switch settings for the associated transmitter are shown in the upper right corner of the screen.

Double pressing the MENU control switches the display to Fine View which displays an expanded portion of the spectrum around a fixed, vertical cursor. In Fine View, each vertical band represents one frequency (100 kHz). As with the Coarse View, cursor movement across the frequency band results in the displaying of the associated transmitter Frequency Select Switch settings in the upper right corner of the screen.

In Fine View, the fixed vertical center bar in the center of the view serves as the cursor. Beneath the scan area is a scroll bar to remind you that this is a partial picture of the spectrum. Use the MENU control to scroll through the entire spectrum. Rotate counterclockwise to view lower frequencies, or clockwise to show higher frequencies.

Scroll through the screen and find a frequency where no RF signals are present (or in the worst case, only very weak RF signals). With the cursor on this frequency, press the PREV MENU button to exit from scan mode.

When exiting the scan mode, you are given the option to select either the frequency the unit was on before entering the scan mode, or the frequency just selected in the scan mode. The display shows "Use new freq?" to prompt you to make a frequency selection and also shows the new frequency. Rotate the MENU control to view the options. Select YES to set the receiver to the frequency chosen in scan mode. Select NO to return to the frequency that was set before entering the scan mode. Select SCAN to resume scanning.

Note: Ensure the transmitter's Frequency Select Switch settings are the same settings as shown on the display and your system will be ready for operation.

Pre-coordinated Frequencies

Interference from IM (intermodulation) is a potential problem in all multi-channel wireless systems, so proper frequency coordination is always required to avoid noise, range and dropout problems. Your options to accomplish this include:

- Using the pre-coordinated frequency groups
- Performing a system checkout (See Multi-channel System Checkout)
- Calling Lectrosonics for assistance

Compatible Frequency Table

Groupings of compatible frequencies have been created to minimize intermodulation problems in multiple channel wireless systems. The frequencies can be used with Digital Hybrid and analog Lectrosonics wireless equipment. Compatibility with other brands is likely, but not guaranteed by Lectrosonics.

The table provides two different sets of pre-coordinated frequencies for frequency blocks 470 through 29. The table is constructed to create a visual pattern of compatible frequencies to make it easier to use. The frequencies are stored in memory in various products and included in the VRpanel software.

Pre-coordinated frequencies are arranged in four groups as shown at right.

The uppermost eight frequencies comprise Grp a, the eight just below them comprise Grp b, and so on.

BLOCK 22

FREQ	SW SET	US TV CH	
563.700	0,5	tv29	
564.300	0,B	tv29	
565.200	1,4	tv29	
565.800	1,A	tv29	**Grp a**
567.100	2,7	tv30	
568.000	3,0	tv30	
568.500	3,5	tv30	
569.300	3,D	tv30	
575.700	7,D	tv31	
577.900	9,3	tv31	
578.600	9,A	tv32	
579.900	A,7	tv32	**Grp b**
581.700	B,9	tv32	
582.600	C,2	tv32	
585.200	D,C	tv33	
587.500	F,3	tv33	

BLOCK 22

FREQ	SW SET	US TV CH	
570.100	4,5	tv30	
570.700	4,B	tv30	
571.600	5,4	tv30	
572.200	5,A	tv31	**Grp c**
573.200	6,4	tv31	
574.400	7,0	tv31	
574.900	7,5	tv31	
575.500	7,B	tv31	
581.100	B,3	tv32	
582.100	B,D	tv32	
582.600	C,2	tv32	
584.300	D,3	tv32	**Grp d**
585.000	D,A	tv32	
585.600	E,0	tv32	
586.300	E,7	tv32	
588.100	F,9	tv32	

Displayed as "GROUP a" through "GROUP d" in the LCD and as "Grp a" through "Grp d" in VRpanel

BLOCK 470

	FREQ	SW SET	US TV CH
	NOT AVAILABLE		
	NOT AVAILABLE		
	NOT AVAILABLE		
Grp A	NOT AVAILABLE		
	NOT AVAILABLE		
	NOT AVAILABLE		
	NOT AVAILABLE		
	NOT AVAILABLE		
	473.300	2,0	TV14
	475.500	3,6	TV14
	476.200	3,D	TV15
Grp B	477.500	4,A	TV15
	479.300	5,C	TV15
	480.200	6,5	TV15
	482.800	7,F	TV16
	485.100	9,6	TV16

BLOCK 19 *

FREQ	SW SET	US TV CH
486.900	0,5	TV16
487.500	0,B	TV16
488.400	1,4	TV17
489.000	1,A	TV17
490.300	2,7	TV17
491.200	3,0	TV17
491.700	3,5	TV17
492.500	3,D	TV17
498.900	7,D	TV18
501.100	9,3	TV19
501.800	9,A	TV19
503.100	A,7	TV19
504.900	B,9	TV19
505.800	C,2	TV19
508.400	D,C	TV20
510.700	F,3	TV20

BLOCK 20

FREQ	SW SET	US TV CH
512.500	0,5	TV21
513.100	0,B	TV21
514.000	1,4	TV21
514.600	1,A	TV21
515.900	2,7	TV21
516.800	3,0	TV21
517.300	3,5	TV21
518.100	3,D	TV22
524.500	7,D	TV23
526.700	9,3	TV23
527.400	9,A	TV23
528.700	A,7	TV23
530.500	B,9	TV24
531.400	C,2	TV274
534.000	D,C	TV24
536.300	F,3	TV25

BLOCK 21

FREQ	SW SET	US TV CH
538.100	0,5	tv25
538.700	0,B	tv25
539.600	1,4	tv25
540.200	1,A	tv25
541.500	2,7	tv25
542.400	3,0	tv26
542.900	3,5	tv26
543.700	3,D	tv26
550.100	7,D	tv27
552.300	9,3	tv27
553.000	9,A	tv27
554.300	A,7	tv28
556.100	B,9	tv28
557.000	C,2	tv28
559.600	D,C	tv28
561.900	F,3	tv29

BLOCK 22

FREQ	SW SET	US TV CH
563.700	0,5	tv29
564.300	0,B	tv29
565.200	1,4	tv29
565.800	1,A	tv29
567.100	2,7	tv30
568.000	3,0	tv30
568.500	3,5	tv30
569.300	3,D	tv30
575.700	7,D	tv31
577.900	9,3	tv31
578.600	9,A	tv32
579.900	A,7	tv32
581.700	B,9	tv32
582.600	C,2	tv32
585.200	D,C	tv33
587.500	F,3	tv33

BLOCK 23

FREQ	SW SET	US TV CH
589.300	0,5	tv33
589.900	0,B	tv33
590.800	1,4	tv34
591.400	1,A	tv34
592.700	2,7	tv34
593.600	3,0	tv34
594.100	3,5	tv34
594.900	3,D	tv34
601.300	7,D	tv35
603.500	9,3	tv36
604.200	9,A	tv36
605.500	A,7	tv36
607.300	B,9	tv36
NOT AVAILABLE		
NOT AVAILABLE		
NOT AVAILABLE		

BLOCK 470

	FREQ	SW SET	US TV CH
	NOT AVAILABLE		
	NOT AVAILABLE		
	NOT AVAILABLE		
Grp C	NOT AVAILABLE		
	NOT AVAILABLE		
	NOT AVAILABLE		
	NOT AVAILABLE		
	NOT AVAILABLE		
	478.700	5,6	TV15
	479.700	6,0	TV15
	480.200	6,5	TV15
Grp D	481.900	7,6	TV15
	482.600	7,D	TV16
	483.200	8,3	TV16
	483.900	8,A	TV16
	485.700	9,C	TV16

BLOCK 19 *

FREQ	SW SET	US TV CH
493.300	4,5	TV17
493.900	4,B	TV17
494.800	5,4	TV18
495.400	5,A	TV18
496.400	6,4	TV18
497.600	7,0	TV18
498.100	7,5	TV18
498.700	7,B	TV18
504.300	B,3	TV19
505.300	B,D	TV19
505.800	C,2	TV19
507.500	D,3	TV20
508.200	D,A	TV20
508.800	E,0	TV20
509.500	E,7	TV20
511.300	F,9	TV20

BLOCK 20

FREQ	SW SET	US TV CH
518.900	4,5	TV22
519.500	4,B	TV22
520.400	5,4	TV22
521.000	5,A	TV22
522.000	6,4	TV22
523.200	7,0	TV22
523.700	7,5	TV22
524.300	7,B	TV23
529.900	B,3	TV23
530.900	B,D	TV24
531.400	C,2	TV24
533.100	D,3	TV24
533.800	D,A	TV24
534.400	E,0	TV24
535.100	E,7	TV24
536.900	F,9	TV25

BLOCK 21

FREQ	SW SET	US TV CH
544.500	4,5	tv26
545.100	4,B	tv26
546.000	5,4	tv26
546.600	5,A	tv26
547.600	6,4	tv26
548.800	7,0	tv27
549.300	7,5	tv27
549.900	7,B	tv27
555.500	B,3	tv28
556.500	B,D	tv28
557.000	C,2	tv28
558.700	D,3	tv28
559.400	D,A	tv28
560.000	E,0	tv29
560.700	E,7	tv29
562.500	F,9	tv29

BLOCK 22

FREQ	SW SET	US TV CH
570.100	4,5	tv30
570.700	4,B	tv30
571.600	5,4	tv30
572.200	5,A	tv31
573.200	6,4	tv31
574.400	7,0	tv31
574.900	7,5	tv31
575.500	7,B	tv31
581.100	B,3	tv32
582.100	B,D	tv32
582.600	C,2	tv32
584.300	D,3	tv32
585.000	D,A	tv33
585.600	E,0	tv33
586.300	E,7	tv33
588.100	F,9	tv33

BLOCK 23

FREQ	SW SET	US TV CH
595.700	4,5	tv34
596.300	4,B	tv35
597.200	5,4	tv35
597.800	5,A	tv35
598.800	6,4	tv35
600.000	7,0	tv35
600.500	7,5	tv35
601.100	7,B	tv35
606.700	B,3	tv36
607.700	B,D	tv36
NOT AVAILABLE		
NOT AVAILABLE		
NOT AVAILABLE		
NOT AVAILABLE		
NOT AVAILABLE		
NOT AVAILABLE		

* **NOTE: These frequencies can also be manually tuned with block 470 modules**

Compatibility Diagram

Compatibility follows the pattern illustrated in the diagram at right.

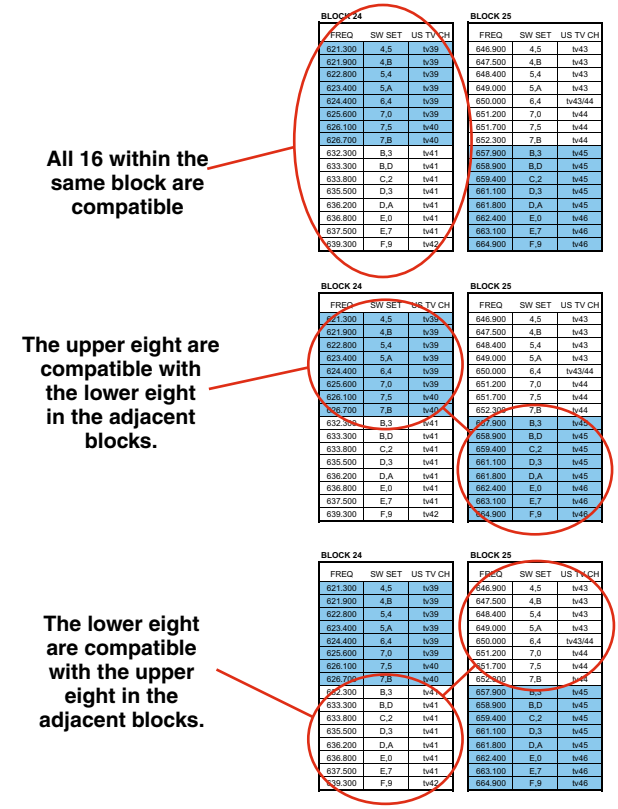
Grp a and **Grp b** contain the 16 frequencies shown in the table below (upper orange/white set).

Grp c and **Grp d** contain the 16 frequencies shown in the table below (lower blue/white set).

NOTE: There is no assurance that frequencies are compatible between the upper orange/white set and the lower blue/white set. Combined use of frequencies from both sets requires testing with the procedures outlined in the following section entitled Diagnostics - Multi-channel System Checkout

These frequencies share RF spectrum with TV channels. The upper orange/white set and the lower blue/white set of frequencies provide two different lists of TV channels. Use the set with fewer active TV stations in the area where you are operating.

Active TV station signals can be discovered by scanning with the Venue receiver, or researched in advance on this web site: www.fccinfo.com.



BLOCK 24

FREQ	SW SET	US TV CH
614.900	0,5	tv38
615.500	0,B	tv38
616.400	1,4	tv38
617.000	1,A	tv38
618.300	2,7	tv38
619.200	3,0	tv38
619.700	3,5	tv38
620.500	3,D	tv39
626.900	7,D	tv40
629.100	9,3	tv40
629.800	9,A	tv40
631.100	A,7	tv40
632.900	B,9	tv41
633.800	C,2	tv41
636.400	D,C	tv41
638.700	F,3	tv42

BLOCK 25

FREQ	SW SET	US TV CH
640.500	0,5	tv42
641.100	0,B	tv42
642.000	1,4	tv42
642.600	1,A	tv42
643.900	2,7	tv42
644.800	3,0	tv43
645.300	3,5	tv43
646.100	3,D	tv43
652.500	7,D	tv44
654.700	9,3	tv44
655.400	9,A	tv44
656.700	A,7	tv45
658.500	B,9	tv45
659.400	C,2	tv45
662.000	D,C	tv45/46
664.300	F,3	tv46

BLOCK 26

FREQ	SW SET	US TV CH
666.100	0,5	tv46
666.700	0,B	tv46
667.600	1,4	tv46
668.200	1,A	tv47
669.500	2,7	tv47
670.400	3,0	tv47
670.900	3,5	tv47
671.700	3,D	tv47
678.100	7,D	tv48
680.300	9,3	tv49
681.000	9,A	tv49
682.300	A,7	tv49
684.100	B,9	tv49
685.000	C,2	tv49
687.600	D,C	tv50
689.900	F,3	tv50

BLOCK 27

FREQ	SW SET	US TV CH
691.700	0,5	tv50
692.300	0,B	tv51
693.200	1,4	tv51
693.800	1,A	tv51
695.100	2,7	tv51
696.000	3,0	tv51
696.500	3,5	tv51
697.300	3,D	tv51
703.700	7,D	tv52
705.900	9,3	tv53
706.600	9,A	tv53
707.900	A,7	tv53
709.700	B,9	tv53
710.600	C,2	tv54
713.200	D,C	tv54
715.500	F,3	tv54

BLOCK 28

FREQ	SW SET	US TV CH
717.300	0,5	tv55
717.900	0,B	tv55
718.800	1,4	tv55
719.400	1,A	tv55
720.700	2,7	tv55
721.600	3,0	tv55
722.100	3,5	tv56
722.900	3,D	tv56
729.300	7,D	tv57
731.500	9,3	tv57
732.200	9,A	tv57
733.500	A,7	tv57
735.300	B,9	tv58
736.200	C,2	tv58
738.800	D,C	tv58
741.100	F,3	tv59

BLOCK 29

FREQ	SW SET	US TV CH
742.900	0,5	tv59
743.500	0,B	tv59
744.400	1,4	tv59
745.000	1,A	tv59
746.300	2,7	tv60
747.200	3,0	tv60
747.700	3,5	tv60
748.500	3,D	tv60
754.900	7,D	tv61
757.100	9,3	tv61
757.800	9,A	tv61
759.100	A,7	tv62
760.900	B,9	tv62
761.800	C,2	tv62
764.400	D,C	tv63
766.700	F,3	tv63

BLOCK 24

FREQ	SW SET	US TV CH
621.300	4,5	tv39
621.900	4,B	tv39
622.800	5,4	tv39
623.400	5,A	tv39
624.400	6,4	tv39
625.600	7,0	tv39
626.100	7,5	tv40
626.700	7,B	tv40
632.300	B,3	tv41
633.300	B,D	tv41
633.800	C,2	tv41
635.500	D,3	tv41
636.200	D,A	tv41
636.800	E,0	tv41
637.500	E,7	tv41
639.300	F,9	tv42

BLOCK 25

FREQ	SW SET	US TV CH
646.900	4,5	tv43
647.500	4,B	tv43
648.400	5,4	tv43
649.000	5,A	tv43
650.000	6,4	tv43/44
651.200	7,0	tv44
651.700	7,5	tv44
652.300	7,B	tv44
657.900	B,3	tv45
658.900	B,D	tv45
659.400	C,2	tv45
661.100	D,3	tv45
661.800	D,A	tv45
662.400	E,0	tv46
663.100	E,7	tv46
664.900	F,9	tv46

BLOCK 26

FREQ	SW SET	US TV CH
672.500	4,5	tv47
673.100	4,B	tv47
674.000	5,4	tv47/48
674.600	5,A	tv48
675.600	6,4	tv48
676.800	7,0	tv48
677.300	7,5	tv48
677.900	7,B	tv48
683.500	B,3	tv49
684.500	B,D	tv49
685.000	C,2	tv49
686.700	D,3	tv50
687.400	D,A	tv50
688.000	E,0	tv50
688.700	E,7	tv50
690.500	F,9	tv50

BLOCK 27

FREQ	SW SET	US TV CH
698.100	4,5	tv52
698.700	4,B	tv52
699.600	5,4	tv52
700.200	5,A	tv52
701.200	6,4	tv52
702.400	7,0	tv52
702.900	7,5	tv52
703.500	7,B	tv52
709.100	B,3	tv53
710.100	B,D	tv54
710.600	C,2	tv54
712.300	D,3	tv54
713.000	D,A	tv54
713.600	E,0	tv54
714.300	E,7	tv54
716.100	F,9	tv55

BLOCK 28

FREQ	SW SET	US TV CH
723.700	4,5	tv56
724.300	4,B	tv56
725.200	5,4	tv56
725.800	5,A	tv56
726.800	6,4	tv56
728.000	7,0	tv56/57
728.500	7,5	tv57
729.100	7,B	tv57
734.700	B,3	tv58
735.700	B,D	tv58
736.200	C,2	tv58
737.900	D,3	tv58
738.600	D,A	tv58
739.200	E,0	tv58
739.900	E,7	tv58
741.700	F,9	tv59

BLOCK 29

FREQ	SW SET	US TV CH
749.300	4,5	tv60
749.900	4,B	tv60
750.800	5,4	tv60
751.400	5,A	tv60
752.400	6,4	tv61
753.600	7,0	tv61
754.100	7,5	tv61
754.700	7,B	tv61
760.300	B,3	tv62
761.300	B,D	tv62
761.800	C,2	tv62
763.500	D,3	tv62
764.200	D,A	tv63
764.800	E,0	tv63
765.500	E,7	tv63
767.300	F,9	tv63

Frequency Coordination

Intermodulation interference is a problem constantly lurking in the background, especially when working in environments where simultaneous productions are taking place in close proximity. In these cases, proper frequency coordination is a must. There are basically three methods to coordinate frequencies:

- Use the built-in frequency groups
- Scan for clear channels (See SmartTune™ and Scan Function.)
- Call Lectrosonics

Frequency Compatibility Chart

Considering that multiple systems can be used in a production, coordinating frequencies to minimize interference between these channels can be a daunting process.

The Frequency Compatibility Chart was designed to assist in minimizing intermodulation problems for multiple channel wireless systems. It does this by identifying potential intermodulation problems and listing compatible frequencies and frequency groups. This chart can be used with all Digital Hybrid Wireless® (400 Series) receivers.

The chart divides the frequency blocks used in the North American market into Set 1 and Set 2, then further divides each row into two groups of eight frequencies each. These frequency groups are labeled A and B and C and D, and correspond to the factory set frequency groups (Groups A, B, C and D) described in the Tuning Setup Screen.

Understanding and using the Frequency Compatibility Chart is not as difficult as it first appears. There is a pattern of compatible frequencies that becomes apparent, as illustrated on the Frequency Compatibility Diagram on the next page.

The following guidelines should be observed when selecting compatible frequencies:

1. **Set 1 and Set 2 are NOT compatible.**

   Proper coordination requires that all frequencies be taken from either Set 1 or Set 2, but not a combination of the two.

   (The remaining guidelines make the assumption that you are choosing frequencies within one frequency set.)

2. **Frequencies within an individual frequency block in the same Set are compatible.**

   (Example: All 16 frequencies in Block 25, Group A and B)

3. **Frequencies from adjacent blocks, but different Groups are compatible.**

   (Example: Block 21, Group C frequencies are compatible with Block 22, Group D frequencies)

4. **Frequencies from adjacent blocks and the same Group are NOT compatible.**

   (Example: Block 26, Group B frequencies are NOT compatible with Block 27, Group B frequencies)

It is highly recommended that you choose frequencies that are in the same set and same group.

By following these guidelines, it is possible to locate a number of operating frequencies early in the production that are free from intermodulation, then refine the list during system setup.

Using SmartTune™ and the Scan Function

The SmartTune™ feature automatically scans the receiver's tuning range and tunes to the frequency with the least RF interference. The transmitter can then be tuned to match the receiver. If only one wireless channel is to be used, this simple one-step tuning is all that is required.

In the event that multiple wireless channels are to be used at the same location, it is still possible to use the SmartTune™ feature as a tuning aid, but it will be necessary to check for intermodulation interference. It is possible, for example, that the second transmitter, combined with another signal in the environment, could generate an intermodulation product that interferes with the first receiver. That interference would not have been present on the first channel until the second channel was powered up.

The basic procedure to test for intermodulation interference is as follows.

1. Start with all transmitters off.
2. For each channel, use SmartTune™ to choose a clear frequency. Tune the corresponding transmitter and leave it on, placing it as close to the receivers as it will be in actual use.
3. To check for intermodulation problems, turn each transmitter off briefly in turn, making sure that the corresponding receiver's RF meter shows little or no interference while its transmitter is off. For each trial, all transmitters must be on except the one being checked.
4. In the event that an intermodulation problem is detected, use SmartTune™ to retune the affected receiver and transmitter, and then repeat step 3. It will be necessary to redo all the trials in step 3, as the newly tuned transmitter may cause new intermodulation problems that did not exist during earlier trials.

Programming User Groups

For users who do their own frequency coordination, the R400A offers two user-configurable frequency groups. Up to 16 frequencies can be stored in a user group. Use the following procedure to add or remove frequencies from either user group (User Group U or User Group V).

Adding User Group Frequencies

1. From the Tuning setup screen, select one of the user group tuning modes (Group U or Group V).
2. Go to the Freq setup screen.
3. Rotate the MENU knob to navigate among the frequencies in the group. If the group is currently empty, rotating the knob will have no effect. Similarly, if the group has only a single entry, rotating the knob will move to that frequency but have no subsequent effect.

Note: An exclamation mark in the lower right corner indicates that the current frequency is not in the current group. If it persists when the knob is rotated that is only because the group is empty.

4. To add a frequency to the group, it is first necessary to be able to tune to it. Double-click (rapidly press twice) the MENU knob to gain access to all frequencies.
5. Rotate the knob to the desired frequency. Add the frequency to the group by holding down the PREV MENU button while pressing the MENU knob. A triangle will appear to the left of the frequency, indicating that it is a member of the group.
6. In a similar manner, rotate the knob to navigate to any frequencies you wish to add, then add them by holding down the PREV MENU button while pressing the MENU knob. If you accidentally add a wrong frequency, it can be removed the same way it was added, by holding down the PREV MENU button while pressing the MENU knob.
7. Once you are finished added frequencies, press the MENU button once to return to normal group tuning.

Deleting User Group Frequencies

1. From the Tuning setup screen, select one of the user group tuning modes (group U or group V).
2. Go to the Freq setup screen.
3. Rotate the MENU knob to navigate among the frequencies in the group, stopping on the one you wish to delete.
4. Delete the frequency by holding down the PREV MENU button while pressing the MENU knob. The arrow symbol in the lower right corner will change to an exclamation mark, indicating that the currently tuned frequency is no longer a member of the current group.
5. Continue in a like manner, repeating steps 3 and 4 until you have deleted all the frequencies you wish to remove from the group.

Call Lectrosonics

Lectrosonics uses a proprietary computer program to perform thousands of calculations and identify various interfering signals. Potential problems and trouble areas can be identified in advance, and proposed new frequencies or other solutions can be suggested. This service is offered to authorized Lectrosonics dealers and other customers who are using Lectrosonics® wireless microphone and wireless IFB systems.

Troubleshooting

Symptom	Solution
LCD display not active	External power supply disconnected or inadequate. Main power supply fuse tripped. Turn the receiver off, remove the cause of the overload and turn the receiver back on. Wrong polarity power source. The power input jack requires POSITIVE to be on the center pin.
LCD Message Appears:	
Fatal Error DSP Failed to Initialize	This indicates an internal error. Please contact the factory for assistance.
Warning - Supply Voltage Out of Range	External power supply voltage is too high or too low. Check external power supply.
Warning Check Freq, May Be Mistuned	If this message appears when the transmitter is turned off, it means interference was detected on the channel. The solution is to find a new frequency on which to operate. If this message appears when the transmitter is on, it usually means that the transmitter's tuning does not exactly match the receiver's. Double-check that the transmitter and receiver are on the same channel. If the message persists, it may mean that the transmitter or the receiver is out of alignment. Contact the factory for assistance.
PILOT indicator is solid "P", but no sound	Audio output cable bad or disconnected, or connected to the wrong audio output jack. Audio Output level set too low or wrong output used. Ensure the correct audio output is being used, then use the built-in test tone to verify levels.
PILOT "P" keeps flashing when transmitter power switch is turned on	Pilot tone detection can take several seconds. Turn on the transmitter power (and the audio switch on some models) and wait 3 to 5 seconds for the "P" to indicate steadily. Transmitter and receiver not on same frequency. Receiver compatibility mode does not match the transmitter in use.
Noise on audio and Pilot indicator is "b"	The pilot tone bypass has been activated. Set PilotBP to NORMAL.
Pilot indicator not present but audio is being received	Receiver is set to a compatibility mode that doesn't use pilot tone. Check that receiver compatibility mode matches the transmitter in use as any sufficiently strong signal can unsquelch the receiver in this mode, compatible or not.

Note**:** In 400 Series, 200 Series, IFB and Mode 6 compatibility modes, the PILOT indicator on the front panel shows as a solid "P" to indicate that the audio has been turned on at the transmitter, and that the audio output on the receiver is enabled. When the "P" is on, the audio is enabled. If the "P" is flashing the pilot tone is not detected and the audio will be muted (squelched). In the other compatibility modes, no pilot tone is used and the "P" is never displayed. Audio is present whenever the receiver detects a sufficiently strong signal.

Note**:** In 400 Series, 200 Series, IFB and Mode 6 compatibility modes, activating the "pilot bypass" function causes a lowercase "b" to appear in the pilot indicator position on the main window and forcibly unsquelches the audio.

Symptom	Solution
RF Level is weak	Receiver may need to be moved or reoriented. Antenna on transmitter may be defective or poorly connected - double check antenna on transmitter. Improper length of antenna, or wrong antenna on transmitter or receiver. UHF whip antennas are generally about 3 to 5 inches long. UHF helical antennas may be shorter, but are often less efficient.
No RF Signal	Make certain frequency switches on transmitter match the receiver frequency setting. Check transmitter battery.
Poor signal to noise ratio	Transmitter gain set too low. The noise may not be in the wireless system. Turn the transmitter audio gain all the way down and see if the noise remains. If the noise remains, then turn the power off at the transmitter and see if it remains. If the noise is still present, then the problem is not in the transmitter. If noise is still present when the transmitter is turned off, try lowering the audio output level on the R400A and see if the noise lowers correspondingly. If the noise remains, the problem is not in the receiver. Receiver output is too low for the input of the device it is feeding. Try increasing the output level of the R400A and lowering the input gain on the device the R400A is feeding.
Distortion	Transmitter input gain too high. Check and/or readjust input gain on transmitter according to the LEDs on the transmitter and then verify the setting with the audio meter in the main window. Audio output level too high for the device the R400A is feeding. Lower the output level of the R400A.
Bad frequency response or generally poor audio quality	Ensure the receiver is set to the compatibility mode that matches the transmitter in use.

Note: A number of symptoms may be caused by a strong interfering signal on the same frequency. The easiest way to determine if the transmitter and receiver are operating on a clear frequency channel is to switch off the transmitter and see if the RF meter on the receiver drops to zero. If an interfering signal exists, the meter will indicate it. Refer to the 'frequency coordination' section to establish a different operating frequency.

Replacement Parts and Accessories

DCR12/A4U

AC power supply with US type 2-pin plug on housing, 100 to 240 VAC input; 12 VDC 400 mA regulated output

A500RA(xx)

UHF flexible whip antenna with Right-Angle BNC Specify frequency block (last two digits (xx) specify frequency block, for example: A500RA21, A500RA22, etc.)

SNA600

Collapsible dipole antenna adjustable from 550 MHz to 800 MHz. Ideal for situations where a full 360 degree receiving pattern is required as opposed to a directional pattern.

ALP Series Antennas

The “Shark fin” Log Periodic Dipole Array (LPDA) provides useful directional pattern over 500 to 800 MHz range. Ideal for portable applications including temporary setups for field production. ALP Series antennas are not intended to be left outdoors permanently.

ARG15-ARG100

Coaxial cables for remote antennas are available from Lectrosonics in a variety of lengths - from 2 to 100 ft. Cables include Velcro tie wraps.

35664

Strip of four adhesive backed feet, 0.75 inches square.

RMPR400-1

Single-space rack conversion kit for single R400A receiver. Includes extension cables for mounting antennas on front panel.

RMPR400-2

Single-space rack conversion kit for dual R400A receivers. Includes extension cables for mounting antennas on front panel.

DCR12/A4U

A500RA(xx)

SNA600

ALP Series

RMPR400-1

RMPR400-2

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 the interconnecting cables and then go through the **Troubleshooting** section in this 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

For timely service, please follow the steps below:

A. DO NOT return equipment to the factory for repair without first contacting us by email 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 A.M. to 4 P.M. (U.S. 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.

Lectrosonics USA:

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

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

Telephone:
(505) 892-4501
(800) 821-1121 Toll-free
(505) 892-6243 Fax

Web:
www.lectrosonics.com

E-mail:
sales@lectrosonics.com

Lectrosonics Canada:

Mailing Address:
720 Spadina Avenue,
Suite 600
Toronto, Ontario M5S 2T9

Telephone:
(416) 596-2202
(877) 753-2876 Toll-free
(877-7LECTRO)
(416) 596-6648 Fax

E-mail:
Sales: colinb@lectrosonics.com
Service: joeb@lectrosonics.com

Specifications and Features

Operating Frequencies (MHz):

Block 470:	470.100 - 495.600
Block 19:	486.400 - 511.900
Block 20:	512.000 - 537.500
Block 21:	537.600 - 563.100
Block 22:	563.200 - 588.700
Block 23:	588.800 - 607.900
	614.100 - 614.300
Block 24:	614.400 - 639.900
Block 25:	640.000 - 665.500
Block 26:	665.600 - 691.100
Block 27:	691.200 - 716.700*
Block 28:	716.800 - 742.300*
Block 29:	742.400 - 767.900*

*Export Only

Frequency Adjustment Range: 25.5 MHz in 100 kHz steps

Channel Separation: 100 kHz

Receiver Type: Triple conversion, superheterodyne, 244 MHz , 10.7 MHz and 300 kHz

Frequency Stability: ±0.001 %

Front end bandwidth: 30 MHz @ -3 dB

Sensitivity

20 dB Sinad: 1 uV (-107 dBm), A weighted

60 dB Quieting: 1.5 uV (-104 dBm), A weighted

Squelch quieting: Greater than 100dB

AM rejection: Greater than 60 dB, 2 uV to 1 Volt (Undetectable after processing)

Modulation acceptance: 85 kHz

Image and spurious rejection: 85dB

Third order intercept: 0 dBm

Diversity method: Phased antenna combining - SmartDiversity™

FM Detector: Digital Pulse Counting Detector operating at 300 kHz

Antenna inputs: Dual BNC female, 50 Ohm impedance

Audio outputs: Rear Panel XLR adjustable from -50dBu to +5dBu in 1dB steps. Calibrated into a typical 10 k Ohm balanced load. Can drive 600 Ohm load.

Rear Panel 1/4 inch jack adjustable from -55 dBu to +0 dBu in 1dB steps.

FRONT PANEL CONTROLS AND INDICATORS

PUSH FOR MENU/ROTATE TO SELECT control: Combined push/rotate switch combination for menu selection and system configuration.

POWER/ PREV MENU button: Momentary press for power ON.

Press and hold several seconds for POWER OFF.

Momentary press (if unit is powered up) for return to previous window.

LCD Main window: Pilot tone; antenna phase, transmitter battery status; audio level, RF level; Battery timer; Frequency; and Transmitter switch setting.

Audio output level adjustment: -50 dBu to +5 dBu, (XLR) and -55 dBu to +0 dBu (1/4 inch), independently adjustable

Compatibility Modes: 400 Series (Digital Hybrid Wireless™), IFB, 100 Series, 200 Series and Mode 3 (non-Lectrosonics analog transmitters)

Battery level tracking: 1/10th volt steps, accuracy +/- 0.2V. Receiver and transmitter both track transmitter battery level. Transmitter (AA battery), accuracy +/- 0.05V. Timer option available.

Scanning mode: Coarse and fine modes for RF spectrum site scanning.

Audio test tone: 1 kHz, -50 dBu to +5 dBu, < 1% THD (XLR output); 1 kHz, -55 dBu to 0 dBu, < 1% THD (1/4" output)

Transmitter battery type selection: 9V alkaline, 9V lithium, AA alkaline, AA lithium, TIMER

Phase invert: Audio output phase normal or inverted.

Smart NR (noise reduction): OFF, NORMAL, FULL modes (available in 400 Series mode only)

AUDIO PERFORMANCE (OVERALL SYSTEM):

(These specs apply to 400 Series mode only.)

Frequency Response (Typ.): 30 Hz to 20 kHz (+/- 1 dB). System frequency response will vary depending on transmitter used.

THD: 0.2% (typical)

SNR at receiver output (dB):

SmartNR	No Limiting	W/ Limiting
OFF	103.5	108.0
NORMAL	107.0	111.5
FULL	108.5	113.0

Input Dynamic Range: 125 dB (with full Tx limiting)

Rear Panel Controls and features: XLR and 1/4-inch phone audio output jack; External DC input; BNC antenna connectors.

Power, Ext DC: Minimum 8 volts to maximum 18 volts DC; 1.6 W, 200 mA maximum.

Weight: 13 oz.

Dimensions: 5.50" (14 cm) wide, 1.75" (4.5 cm) high, 6.25" (16 cm) deep

Specifications subject to change without notice

Industry Canada Certification - 8024A-R400A

"Operation of this device is subject to the following tow conditions: (1) this device may not cause interference, and (2) this device must accept any interference , including interference that may cause undesired operation of the device"

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

This warranty applies only to items returned to Lectrosonics, Inc. or an authorized dealer, shipping costs prepaid, within one year from the date of purchase.

This Limited Warranty is governed by the laws of the State of New Mexico. It states the entire liablility of Lectrosonics Inc. and the entire remedy of the purchaser for any breach of warranty as outlined above. NEITHER LECTROSONICS, INC. NOR ANYONE INVOLVED IN THE PRODUCTION OR DELIVERY OF THE EQUIPMENT SHALL BE LIABLE FOR ANY INDIRECT, SPECIAL, PUNITIVE, CONSEQUENTIAL, OR INCIDENTAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THIS EQUIPMENT EVEN IF LECTROSONICS, INC. HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL THE LIABILITY OF LECTROSONICS, INC. EXCEED THE PURCHASE PRICE OF ANY DEFECTIVE EQUIPMENT.

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

LECTROSONICS®

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