R400A

TECHNICAL DATA

Digital Hybrid Wireless® Diversity Receiver

- **Digital Hybrid Wireless® Technology**
- **SmartTune™ auto frequency selection**
- **SmartDiversity™ enhanced reception**
- **256 selectable UHF frequencies**
- **Low Noise, High Gain RF Front End**
- **Independent Balanced XLR and Unbalanced 1/4 inch audio outputs**
- **Compatibility with analog transmitters**

The R400A is a high performance table-top UHF receiver fully compatible with all Lectrosonics 400 Series Digital Hybrid Wireless™ transmitters, 200 Series and 100 Series analog transmitters and IFB transmitters, plus some analog transmitters from other manufacturers (call Lectrosonics for details). It 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 graphic LCD display as a convenient means of viewing and altering user settings.

SmartTune™

A major problem facing wireless microphone users is finding clear operating frequencies, especially in RF saturated environments. SmartTune™ effectively overcomes this problem by automatically scanning 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.

SmartDiversity™

Microprocessor controlled antenna phase combining keeps the receiver small, yet still able to deal effectively with multipath dropouts. SmartDiversity™ analyzes both the incoming RF level and the RF level's rate of change to determine the optimum timing for phase switching, and the optimum antenna phase. This adaptive technique operates over a wide range of RF levels to anticipate dropouts before they occur. The system also employs "opportunistic switching" to analyze and then latch the phase in the best position during brief squelch activity.

Digital Hybrid Wireless® is a revolutionary design that combines digital audio with an analog FM radio link to provide both outstanding audio quality and exemplary, noise-free RF performance.

Using a patented algorithm to encode 24-bit digital audio information in the transmitter into an analog format, the encoded signal is then transmitted over an analog FM wireless link.

At the receiver, the signal is then decoded to restore the original digital audio. This process eliminates compandor artifacts and produces an audio frequency response flat to 20 kHz. *(US Patent 7,225,135)*

SmartSquelch™

Conventional squelch design faces several compromises:

- Squelch too aggressively and audio may be lost.
- Squelch too little and excessive noise may be heard.
- Respond too rapidly and the audio will sound "choppy."
- Respond too sluggishly and entire words or syllables can be cut off.

SmartSquelch™ overcomes these problems by:

- Waiting for a complete word or syllable before squelching.
- Assessing recent squelching history and RF signal strength.
- Assessing audio content to determine available masking.

By dynamically adjusting squelching behavior under varying conditions, the R400A delivers acceptable audio quality from otherwise unusable signals.

Compatibility Modes

The R400A receiver was designed to operate with Lectrosonics 400 Series transmitters and will yield the best performance when doing so. However, the flexibility of digital signal processing allows the unit to able to operate with Lectrosonics 200 Series, 100 Series and certain non-Lectrosonics transmitters in special compatibility modes.

SmartNR™

In order to 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. SmartNR™ 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.

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DSP-based Pilot Tone

The 400 Series system design uses a DSP generated ultrasonic pilot tone to control the receiver audio muting (squelch). By sensing the pilot tone and incorporating brief delays when the matching transmitter is turned on or off, thumps, pops and other transients are successfully eliminated.

The pilot tone frequency is different for each of the 256 frequencies in the tuning range (frequency block) of a system, which simplifies the coordination of multi-channel wireless systems. The DSP generated pilot tones also eliminates fragile crystals, allowing the receiver to survive shocks and mishandling much better than older analog-based pilot tone systems.

Independent Audio Outputs

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

Because the Unbalanced Output can drive Low-Z headphones to a modest level, it can can also be used for system monitoring.

Specifications

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 100 dB

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

Modulation acceptance: 85 kHz

Image and spurious rejection: 85 dB

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 -50 dBu to +5 dBu in 1 dB 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 1 dB steps.

FRONT PANEL CONTROLS AND INDICATORS

Rotary Control Knob: Combined push/rotate switch combination for menu selection and system configuration.

Pushbutton: 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 1/4 inch connectors independently adjustable

Battery level tracking: Receiver and transmitter (9 V battery) in 1/10th volt steps, accuracy +/- 0.2 V.
Transmitter (AA battery), accuracy +/- 0.05 V.
Timer option available.

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

Audio test tone: 1 kHz, -50 dBu to +5 dBu output, < 1% THD

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

Phase invert: Audio output phase normal or inverted

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

Audio Performance:

(These specs apply to 400 Series mode only.)

Frequency Response: 30 Hz to 20 kHz (+/- 1 dB)
(Overall 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

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