SRa5P/E01 and SRa/E01

TECHNICAL DATA

Camera Slot UHF Receiver

- **Camera slot and stand-alone adapters**
- **Dual receiver design for two channel or single channel ratio diversity operation**
- **LCD with RF spectrum scanner**
- **SmartSquelch™ for noiseless muting**
- **256 selectable UHF frequencies**
- **Dual channel SmartDiversity™ reception**
- **Single channel Ratio Diversity reception**
- **Automatic Power State Restoration**
- **DSP-based pilot tone squelch**
- **Rear Panel and Front Panel Audio Outputs**

The design consists of two separate receivers built into a single, ultra compact housing with adapters for video camera receiver slots and for stand-alone use. Digital Hybrid Wireless® technology provides superb, compand-or-free audio quality and compatibility with other wireless systems. The RF performance is extremely stable over a very wide temperature range, making the receiver perfectly suited to the rough environmental conditions found in field production.

A DSP compatibility mode allows the receiver to be used with Lectrosonics IFB transmitters.

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)

The front panel features a menu-driven LCD interface and four membrane switches which are used to view and alter settings. The main LCD window displays the pilot tone indicator, diversity activity, RF level, audio level and transmitter battery status for both receivers. A built-in spectrum analyzer scans across the tuning range of the receiver to locate RF signals in the vicinity find clear operating frequencies.

The two internal receivers can be operated separately, each using switching, antenna combining diversity, or in tandem with ratio diversity reception. Clear frequencies are easily found with the built-in RF spectrum scanner and graphical LCD. The audio outputs of the receivers can be mixed internally, or left separated for discrete recording tracks or external mixing.

A variety of output adapters and mounting options are available for camera slot operation. On the SRa5P, a 5-pin connector next to the control panel provides audio output from both channels in addition to the camera slot outputs. The unit is powered from an external 6 to 18 volt DC source.

LECTROSONICS®
Rio Rancho, NM, USA
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RF Front-End and Mixer

Each antenna signal is first passed through a high quality SAW filter to reject high power RF signals above and below the operating frequency. A high current amplifier follows the SAW filters and passes the signal to an internal splitter so that both antenna signals are available to both receivers for SmartDiversity™ reception.

IF Amplifiers and SAW Filters

The first IF stage at 244 MHz employs two state-of-the-art SAW (surface acoustic wave) filters. The use of two filters significantly increases the depth of filtering while preserving sharp skirts, constant group delay, and wide bandwidth. Though expensive, this special type of filter allows primary filtering as early as possible, at as high a frequency as possible, before high gain is applied, to deliver maximum image rejection. Since these filters are made of quartz, they are very temperature stable.

After the SAW filter, the 244 MHz IF signal is converted to 250 kHz in receiver 1 and 350 kHz in receiver 2. Only then is the majority of the gain applied, just before the signal is converted to audio. Although these IF frequencies are unconventional in a wide deviation (±75 kHz) system, it offers outstanding AM rejection figure over a very wide range of signal strengths and produces an excellent noise improvement at low signal strengths.

Digital Pulse Counting Detector

The SR 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.

DSP-Based Pilot Tone

The system uses a DSP generated ultrasonic pilot tone to control the receiver audio muting (squelch). Brief delays are applied to eliminate thumps, pops or other transients that can occur when the power 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. The DSP generated pilot tone also eliminates fragile crystals, allowing the receiver to survive shocks and mishandling much better than older crystal-based pilot tone systems.

Smart Squelch™

The SR 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 technique 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 SR can deliver acceptable audio quality from otherwise unusable signals.

Smart Noise Reduction (SmartNR™)

The wide dynamic range of digital hybrid technology with a 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 4k bias resistor of many electret lavaliere mics is –119 dBV and the noise level of the microphone's electronics is even higher. In order to reduce this noise a Smart Noise Reduction algorithm is used to remove hiss without sacrificing audio 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." Because it much more than a sophisticated variable low pass filter, the transparency of the audio signal is preserved. Desired high frequency signals having some coherence are not affected, such as speech sibilance and tones.

The Smart Noise Reduction algorithm has three modes, selectable from a user setup screen. The optimal setting for each application is subjective and selected while simply listening.

Supersonic Noise-Based Dynamic Filter and Squelch

In addition to SmartNR, all hybrid receivers are equipped with a supersonic noise-based dynamic filter and squelch system. The incoming audio is monitored for energy above 22 kHz, pilot tone excepted. Excessive high frequency energy indicates that the received signal is too weak to achieve an acceptable signal-to-noise ratio. Under marginal conditions, a variable low pass filter is rolled in dynamically, masking the noise while preserving as much of the transmitted signal as possible. When the channel is too noisy even for the filter, the audio is squelched.

This noise-based filter and squelch system replaces a more or less equivalent analog system that was used for many years, which based its operation on RF signal strength. Performance of the two systems is essentially the same, but the noise-based system requires no calibration and there is no better way to track the signal-to-noise ratio than to measure it directly.

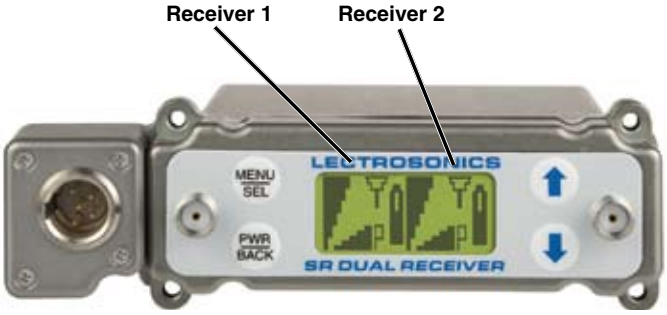
RF-Controlled Digital Noise Filter

In extremely weak signal conditions, an RF sensitive variable frequency filter is applied to reduce the high frequency response of the receiver. This filter does nothing until the RF signal strength drops below 3 uV 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.

Automatic Power State Restoration

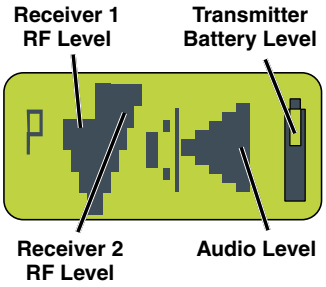
The firmware "remembers" whether it was turned on or off when power is disconnected and returns to that state when power is restored.

Front Panel Controls and Functions



The control panel is a rugged, dust and water resistant design with membrane switches for the control interface. A backlit, graphics-type LCD is used to set up and monitor the receiver. Navigation through the menus is straightforward with text prompts for value and mode selections. The Main Window shown here is used during operation to display RF and audio levels, transmitter battery status, pilot tone status and diversity activity for both receivers.

When RATIO DIVERSITY is enabled, both receivers are combined to pick up the same transmitter, so the Main Window will display a single audio channel as shown here.



The 5P version of the SR receiver is intended for use with cameras that do not have both audio channels enabled in the camera slot. In addition to the audio outputs on the rear panel, a second set of outputs are also provided through a 5-pin connector on an adapter on the left side of the control panel.

A standard TA5M connector provides two balanced outputs with the following pinouts:

Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
Shields	CH1 +	CH1 –	CH2 +	CH2 –

Rear Panel and Slot Adapter Kits

Several different rear panel adapters are available to configure the receiver for popular camera slots and for stand-alone use. The rear panels are held in place by two screws and are easily changed. Camera slot adapter kits include top panel bezels with hardware for a secure fit into the camera body.

SREXT adapter

SRUNI adapter

SRSNY adapter

Battery Adapter

The SR can be powered with an optional battery “sled” adapter that attaches to the SR unit (Lectrosonics Model SRBATTSLED). The adapter includes an integrated SREXT plate, and accepts L and M type rechargeable batteries.

The sled is available in a “top” or “bottom” version for mounting on top or underneath a camera.

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 - 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
Block 30	768.000 - 793.500
Block 31	793.600 - 819.100
Block 32	819.200 - 844.700
Block 33	844.800 - 861.900

(Frequency usage varies by country)

Frequency Adjustment Range: 25.5 MHz in 100kHz steps

Channel Seperation: 100 kHz

Receiver Type: Dual conversion, superheterodyne

IF Frequencies: Ch.1: 243.950 MHz and 250.000 kHz
Ch. 2: 248.450 MHz and 350.000 kHz

Frequency Stability: ±0.001 %

Front end bandwidth: 26 MHz @ -3 dB

Sensitivity
20 dB Sinad: 2 uV (-101 dBm), A weighted
60 dB Quieting: 4 uV (-95 dBm), A weighted
(Single antenna measurement)

Squelch quieting: Greater than 100 dB typical

AM rejection: Greater than 60 dB, 4 uV to 1 Volt

Modulation acceptance: ±50 kHz Deviation

Image and spurious rejection: 85 dB

Third order intercept: 0 dBm

Diversity method: SmartDiversity™ phased antenna combining or Ratio Diversity using both receivers for a single audio channel

FM Detector: Digital Pulse Counting Detector operating at 250 and 350 kHz

RF spectrum analyzer: Coarse and fine scanning modes for RF spectrum site survey

Antenna inputs: **Two** SMA jacks

Audio outputs connectors:
- Interchangeable D connector plates; nominal 1k ohm unbalanced
- Dual TA3 male (mini XLR) balanced output adapter
- Balanced output adapter with fixed cables
- (SR/5P vers ion) Front panel TA5M with two balanced outputs

Audio output level: Adjustable -50 to +5 dBu in 1 dB steps; unbalanced output is 6 dB lower

Audio channel crosstalk: -80 dB or better

Front Panel Controls and Indicators:
- Sealed panel with membrane switches
- LCD monitors pilot tone; antenna phase, receiver battery level; transmitter battery status; audio level, RF level

Transmitter battery level tracking: LCD display with "bottle" icon and timer readout

Audio test tone: 1 kHz, -50 dBu to +5 dBu output (bal); 1% THD

Transmitter battery type Selection: 9V alkaline, 9V lithium, AA alkaline, AA lithium, NiMH

Phase invert: Audio output phase normal or inverted

SmartNR (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: 32 Hz to 20 kHz (+/- 1dB)

THD: 0.3% (system) typical in 400 mode

Signal to Noise Ratio (dB): 95 dB or better (overall system, 400 Series mode)

Total Harmonic Distortion: 0.2% typical (400 Series mode)

Input Dynamic Range: 95 dB (with full Tx limiting)

Rear Panel Connections:
- DB15 camera slot adapter
- DB25 camera slot adapter
- Dual TA3 (mini XLR) and external DC

Powering Options (external DC): Min. 6 V to max. 18 Volts DC; 1.4 W
80 mA at 18 VDC
115 mA at 12 VDC
180 mA at 7.2 VDC
200 mA at 6 VDC

Operating temperature: -40° C to +75°C

LCD visible temperature range: -25° C to +75° C

Weight: 195 grams (7 ozs.) with SREXT adapter

Dimensions: 2.68" wide x .72" high x 3.52" deep
(68 mm x 18 mm x 89 mm)

Specifications subject to change without notice

CE 1313

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