

Camera Slot UHF Receiver

Digital Hybrid Wireless™ US Patent 7,225,135



- Camera slot and stand-alone versions
- 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
- Balanced outputs with TA3 connectors

The SR 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, compressor-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.

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 the in-slot or stand-alone versions. The SR/5P stand-alone version provides outputs via a 5-pin connector next to the control panel and the rear panel slot connector simultaneously. The unit is powered from an external 6 to 18 volt DC source.

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, 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 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 the SR is equipped with a Smart Noise Reduction algorithm, which removes 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.

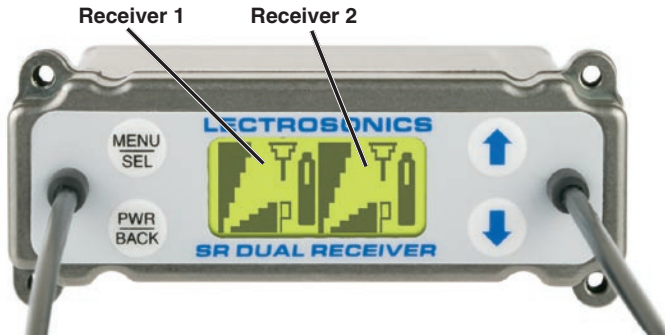
RF-Controlled Digital Noise Filter

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 μ V 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.

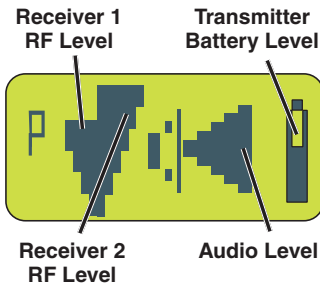
Automatic Power State Restoration

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.



NOTE: 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.

SR/5P Version

This 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 side of the control panel.



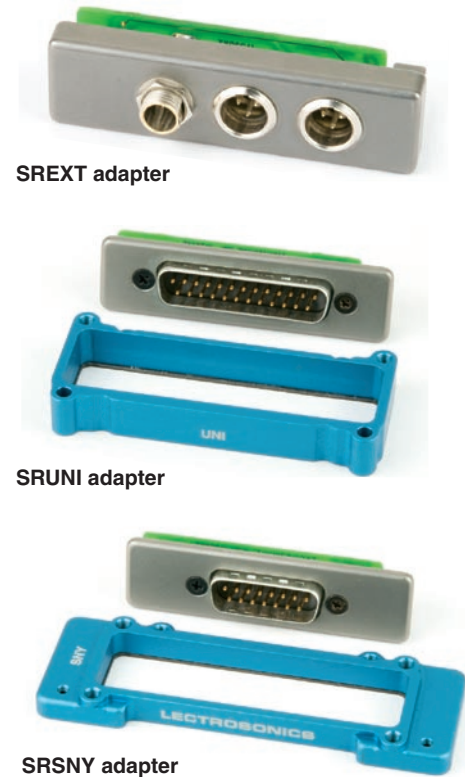
A standard TA5M connector provides two balanced outputs with the following pinouts:

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

NOTE: A standard SR receiver can be converted to the 5P version with the installation of the SR/5PRETROKIT assembly. The installation of the assembly should be completed by an authorized service center or the factory.

Rear Panel and Adapters

Several different panel adapters are available to configure the receiver for popular camera slots and for stand-alone use. The stand-alone adapter provides two TA3 balanced outputs and a locking power jack. Camera slot adapter kits include top panel bezels with hardware for a secure fit into the camera body.



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.



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 and 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
Block 944	944.100 - 951.900

(Frequency usage varies by country)

Frequency Adjustment Range:	25.5 MHz in 100kHz steps
Channel Separation:	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 µV (-101 dBm), A weighted
60 dB Quieting:	4 µV (-95 dBm), A weighted
(Single antenna measurement)	
Squelch Quieting:	Greater than 100 dB typical
AM Rejection:	Greater than 60 dB, 4 µV to 1 Volt
Modulation Acceptance:	85 kHz
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 flexible steel fixed whips
Audio Output Connectors:	<ul style="list-style-type: none"> • Interchangeable D connector plates; nominal 1k ohm unbalanced • Dual TA3 male (mini XLR) balanced output adapter • Balanced output adapter with fixed cables • (SR/5P version) Front panel TA5M with two balanced outputs
Audio Output Level:	<ul style="list-style-type: none"> • 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:	<ul style="list-style-type: none"> • 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 Controls and features:	XLR audio output jack; External DC input; Battery compartment access
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

