

### Digital Hybrid Wireless™ Instrument System

\*US Patent 7,225,135



#### Raising The Bar for Tone

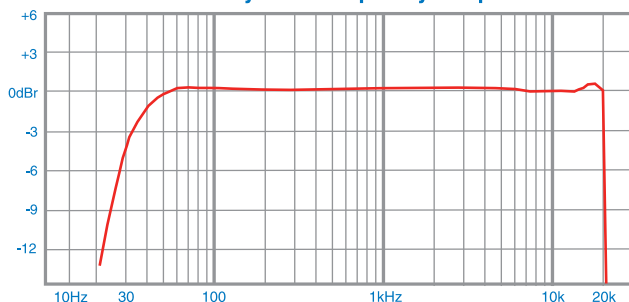
The IS400 sets a new standard for wireless instrument systems. Flat frequency response, low distortion and compandor-free operation provide the closest thing to using a high-quality, short instrument cable. The IS400 reproduces the lowest fundamental from a 5-string bass (low B) at 32Hz up to the very highest overtones and harmonics.

#### Rugged and Ultra Portable

Both the transmitter and receiver are all metal and provide 256 selectable frequencies in standard Lectrosonics frequency blocks. The input amplifier of the LMA transmitter uses an ultra low noise op-amp for quiet operation.

- 24-bit, Digital Hybrid™ audio stream for compandor-free audio and unmatched tone
- 256 selectable UHF frequencies
- Rugged all-metal construction
- Independent XLR and ¼" audio outputs
- SmartTuning™ with graphic display for easy selection of clear transmission frequencies
- Spring steel clip for secure transmitter mounting
- Level indicators for precise gain adjustment
- Greater than 50 mW RF output power for long range and dropout-free performance

Overall System Frequency Response



The LMA transmitter is powered by a single 9VDC battery and provides greater than 50 mW output over the life of the battery for extended operating range and resistance to dropouts.

Instrument pickups and microphones can be used with the LMA transmitter. When the MI33A or MI39A cable is used, the low frequency roll-off will automatically switch to a lower frequency for use with instruments.

## Digital Hybrid Wireless™

An industry first, Lectrosonics Digital Hybrid Wireless™ uses a proprietary algorithm\* to encode the digital audio information into an analog format which can be transmitted in a robust manner over an analog FM wireless link.

A 24-bit A-D converter digitizes the audio, and then filters supersonic audio above 21 kHz. The resulting signal is encoded with a proprietary algorithm to produce an analog data signal for RF transmission. The RF transmission is an optimized FM system with +/-75 kHz deviation for a high signal to noise ratio and a faithful representation of the original signal. At the receiver, the encoded signal is captured and a DSP recovers the original digital audio. This hybrid combination of digital and analog offers the superb audio quality of a pure digital audio system and the outstanding operating range of the finest analog FM wireless systems.

The digital audio chain eliminates a compandor and its artifacts, and provides audio frequency response flat to 20 kHz. The RF link takes advantage of the spectral efficiency and noise immunity characteristics of an aggressively optimized FM system.

## R400A Receiver

While any Lectrosonics hybrid receiver can be used with the LMa transmitter, the R400A is the most common choice. Features include 256 frequencies with Smart-Tune™ which automatically finds a clear channel and tunes the receiver to the new frequency.



A standard XLR balanced and an unbalanced 1/4" jack are provided, with independent volume control within the front panel menu for connection to a balanced input and a guitar amplifier simultaneously. The output level is adjustable in 1 dB steps for a precise match with other equipment.



Also on the rear panel are a locking power input jack that can accept 8-18 VDC and two antenna inputs. The power jack input is diode protected to prevent damage if the power is applied with reversed polarity.

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The R400A receiver is supplied with two UHF whip antennas with right angle BNC connectors for placement on any horizontal surface. A variety of remote antennas, coaxial cables and other accessories customize the antenna system to provide maximum operating range. Single and dual receiver rack mounts are available for a more permanent installation.

## LMa Transmitter

A machined aluminum housing and panels provide the ruggedness needed in travelling venues and for live performance on stage.



A 5-pin input jack provides taps for any microphone or line level instrument input. Input gain is continuously adjustable over a 43 dB range to precisely match the input signal, for maximum signal to noise ratio and minimum noise. Dual-color LEDs provide accurate level indications.

The whip antenna is made with woven steel cable with a custom insulation for an extremely rugged, flexible design. The antenna cable connects directly to the circuit board with a panel mounted strain relief.



The LMa is powered by a 9 volt battery. A machined aluminum door secures the battery in the compartment, and remains attached to the housing when opened.

Frequency is adjusted with two rotary switches on the side panel. The supplied spring wire clip can easily be removed for other mounting options.

# Musical Instrument Cables

- Adapts musical instruments to any Lectrosonics transmitter with a 5-pin input connector
- Available with straight or right angle plug
- Built-in JFET active preamp for optimum interface with instrument pickups
- Designed for active musicians who demand rugged, high performance equipment and the best sound quality available.

The MI cable assemblies allow an optimum match between musical instrument pickups and Lectrosonics transmitters with Servo Bias 5-pin inputs.

In "A" cables, the active preamp and low noise wire cable provide a "same as wire" experience in a wireless environment.

The 30 inch long cable ensures a comfortably link between the instrument and the wireless transmitter.

## Instrument cables are available in 3 different types:

- **MI33P** Cable for "active" pickups such as those made by EMG, or for instruments with low-impedance outputs, such as with 18V systems.
- **MI33A** Cable for passive pickups, used with older Lectrosonics transmitters such as IM, LM and UM400. (No longer available)
- **MI39A** Cable for passive pickups, used with newer Lectrosonics transmitters with current servo inputs such as LMa, UM400a, and SM Series. (Also replaces MI33A)

## All instrument cables are available with 2 plug options:

- **ST** Straight plug.
- **RA** Right-angle plug.



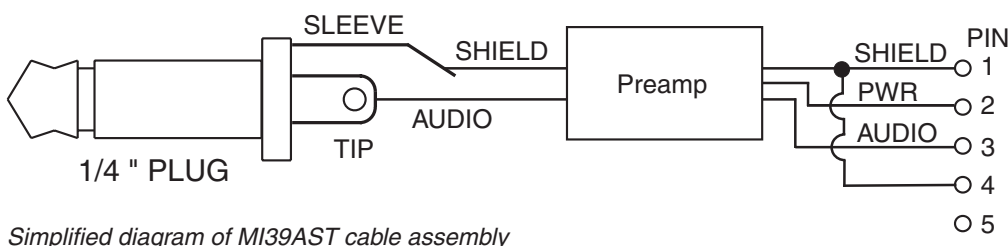
MI33PRA  
MI33PST



MI33ARA  
MI33AST



MI39ARA  
MI39AST



Simplified diagram of MI39AST cable assembly

## System Specifications

Operating Frequencies:

Block 470:	470.100 - 495.600	Block 23:	588.800 - 607.900 614.100 - 614.300
Block 19:	486.400 - 511.900	Block 24:	614.400 - 639.900
Block 20:	512.000 - 537.500	Block 25:	640.000 - 665.500
Block 21:	537.600 - 563.100	Block 26:	665.600 - 691.100
Block 22:	563.200 - 588.700		

Frequency Selection:	256 frequencies in 100 kHz steps
Channel Separation:	100 kHz
RF Power output:	Greater than 50 mW
Pilot tone:	25 to 32 kHz; 5 kHz deviation (400 Series only)
Frequency Stability:	± 0.002%
Deviation:	± 75 kHz max. (Digital Hybrid mode)
Spurious radiation:	60 dB below carrier
Equivalent input noise:	-120 dBV (A-weighted)

Frequency Response:	
With MI33P/MI39A cable:	40 to 20kHz; +/-1dB; -3 dB at 35 Hz
With microphone:	90 Hz to 20 kHz (+/-1dB); -3B at 70 Hz
	Low frequency roll-off is 12 dB per octave

THD: 0.2% (typical)

SNR at receiver output:	SmartNR	No Limiting	w/Limiting
	OFF	103.5	108.0
	NORMAL	107.0	111.5
	FULL	108.5	113.0

Note: The dual envelope "soft" limiter provides exceptionally good handling of transients using variable attack and release time constants. Once activated, the limiter compresses 30+ dB of transmitter input range into 4.5 dB of receiver output range, thus reducing the measured figure for SNR without limiting by 4.5 dB

## LMa Transmitter Specifications

Input level:	Nominal 2 mV to 300 mV, before limiting. Greater than 1V maximum, with limiting.
Input impedance:	2k Ohm
Input limiter:	DSP controlled, dual envelope "soft" limiter with greater than 30 dB range
Gain control range:	43 dB; semi-log rotary control
Modulation indicators:	Dual bicolor LEDs indicate modulation of -20, -10, 0 and +10 dB referenced to full modulation
Controls:	<ul style="list-style-type: none"> <li>• Two position "ON-OFF" power switch</li> <li>• Audio input gain control on front panel</li> <li>• Two 16-position rotary switches adjust transmitter frequency</li> </ul>
Audio Input Jack:	Switchcraft 5-pin locking (TA5F)
Antenna:	Galvanized steel, flexible wire
Battery:	Precision compartment auto-adjusts to accept any known alkaline 9 Volt battery.
Battery Life:	6 hours (alkaline); 13 hours (lithium); 7 hours LiPolymer
Weight:	6.3 ounces, including lithium 9 V battery and antenna
Dimensions:	3.1 x 2.4 x .75 inches
Emission Designator:	180KF3E

## R400a Receiver Specifications

Receiver Type:	Triple conversion, superheterodyne; IF: 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)
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

