UR190
UHF COMPACT RECEIVER

OPERATING INSTRUCTIONS
and trouble-shooting guide

LECTROSONICS, INC.
Rio Rancho, NM

INTRODUCTION

Thank you for selecting the Lectrosonics Professional Series wireless microphone system. This system represents well over 10 years of manufacturing experience in wireless microphones, and almost 70 years of design experience.

The UR190 UHF receiver design is the result of surveying the needs of professional video producers, ENG cameramen and many others in the broadcast and pro video industry. Hundreds of conversations with dealers and end-users developed the final parameters for the design.

The UR190 receiver is a fixed frequency design that eliminates the need to "tune" or adjust the receiver every time it is used. This is the preferred design for a number of reasons, among them simplicity of operation, no adjustments in "high pressure" situations, and interference rejection by design rather than by trying to "tune" it out.

The UR190 miniature receiver was designed by professionals for outstanding performance and flexibility, while preserving ease of operation. It is compatible with all Lectrosonics high band transmitters. The UR190 receiver represents one of the best values in wireless, regardless of price.

TABLE OF CONTENTS

INTRODUCTION 1

GENERAL TECHNICAL DESCRIPTION 2

CONTROLS AND FUNCTIONS 4

RECEIVER FRONT PANEL 4

RECEIVER REAR PANEL 6

ANTENNA USE AND PLACEMENT 7

OPERATING INSTRUCTIONS 8

INDICATOR QUICK REFERENCE 8

TROUBLESHOOTING 9

UR190 REPLACEMENT PARTS AND ACCESSORIES 9

SERVICE AND REPAIR 10

RETURNING UNITS FOR REPAIR 10

SPECIFICATIONS AND FEATURES 11

WARRANTY . . . . . Back cover

GENERAL TECHNICAL DESCRIPTION

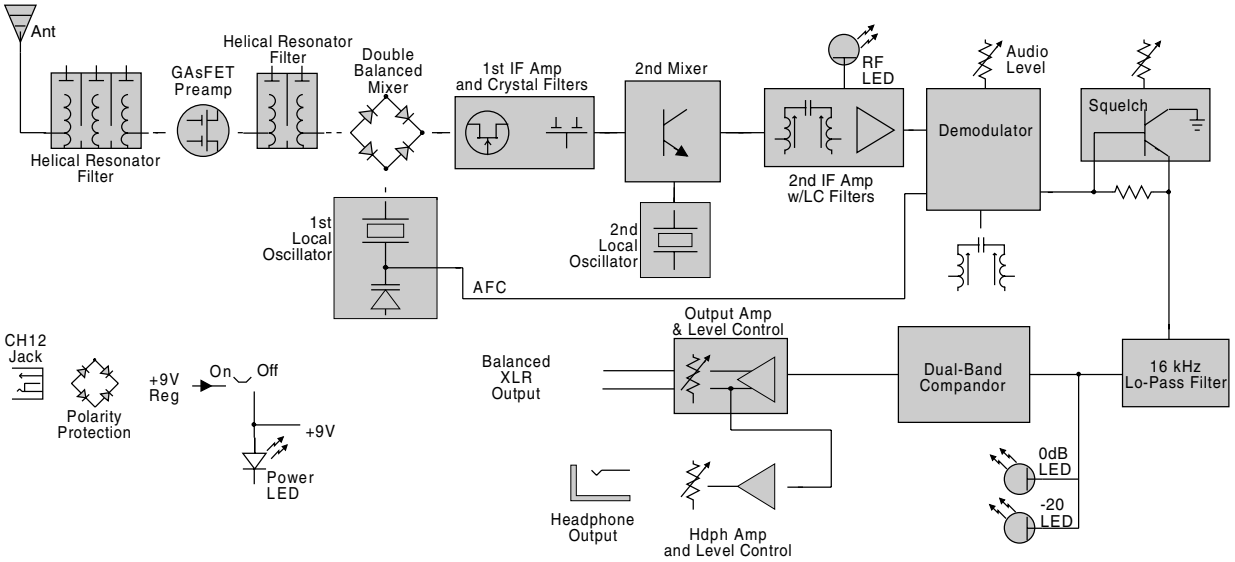

Figure 1 - UR190 Receiver Block Diagram

The UR190 receiver is comprised of six major functional subsystems: the RF front-end amplifier, the double balanced mixer/local oscillator, the first IF filter, the second IF filter and audio demodulator, the compandor, and the balanced microphone level output circuit.

The RF front-end amplifier consists of a 5-section helical resonator for high selectivity. Between the first and second helical resonators, is a low noise GAsFET amplifier. These amplifiers are designed to provide only enough gain to make up for the inherent loss through the helical resonators. This combination of low front-end gain, coupled with the extremely high selectivity of the cascaded helical resonators results in no overloading, even on extremely strong signals. Rejection of out of band signals is maximized, and intermodulation products are suppressed.

The mixer stage consists of a high level double balanced diode mixer. The oscillator is biased from a regulated supply, and includes Automatic Frequency Control (AFC) yielding stable performance over the normal variations in supply voltage. The local oscillator crystal operates at approximately 16 MHz, and can be adjusted above and below the nominal frequency in order to place the 21.4 MHz IF in the center of the crystal filter's narrow passband. The high selectivity of the IF crystal filter stage further minimizes the possibility of interference from signals on adjacent frequencies.

The second IF filter and the audio demodulator, as well as the squelch and RF output LED drive are provided by one monolithic integrated circuit. The second IF filter is centered on 1mHz, and drives a double tuned quadrature type FM demodulator. The squelch circuit is a supersonic noise detector type and is factory set for a -20dB SINAD level (about .5uV). The squelch level is regulated and temperature compensated to maintain a consistent squelch level under all conditions.

The Dual Band Compandor is driven by a multiple pole active low-pass filter. The filter ensures that supersonic noise will not cause the compandor to increase gain incorrectly. This filter also drives the -20dB and 0dB modulation LEDs.

Traditionally, compandors have been a source of distortion in wireless microphone systems. The basic problem with conventional systems is that the attack and decay times are always a compromise. If the time constants are fast, high frequency transients will not be distorted, but this will cause low frequency distortion. If the time constants are slower, low frequency audio distortion will be low, but high frequency transients will then be distorted. The 190 system introduces an entirely new approach to solving this basic problem, called "dual-band companding."

There are actually two separate compandors in the 195 system, one for high frequencies and one for low frequencies. A crossover network separates the frequency bands at 1kHz with a 6dB per octave slope, followed by separate high and low frequency compandors. The attack and release times in the high frequency compandor are fast enough to keep high frequency transient distortion at a low level, and the low frequency compandor uses slower time constants, reducing low frequency distortion to well below that of a conventional compandor.

The compandor senses the signal level, and dynamically increases the gain for loud signals or decreases the gain for soft signals. In this way, the original dynamic range of the transmitted signal is restored, while preserving a high signal-to-noise ratio. The expansion ratio is 2:1, which produces a 2dB change in output signal level for a 1dB change in input level.

The balanced microphone level output circuit generates a truly balanced signal at the XLR output connector. The volume control is a balanced attenuator, and gives a gain range from -20dBV (at full modulation) in the fully clockwise position to -50dBV in the fully counter-clockwise position. In addition, the headphone circuit is driven from the microphone circuit. This means that the headphone output level is dependent not only on the headphone volume control, but also the microphone level control.

CONTROLS AND FUNCTIONS

RECEIVER FRONT PANEL

MODULATION LEDs
Indicate the modulation (audio level) of the incoming signal, and can be used for proper adjustment of the transmitter's "MIC LEVEL" or "GAIN". The -20 LED glows when the transmitter modulation is at a high enough level to produce a good audio signal-to-noise ratio. It will normally flicker, or stay lit as you speak into the microphone. The 0dB lamp indicates a "peak," showing that the transmitter modulation is at maximum. Constant lighting may indicate that the audio gain in the transmitter may be set too high. It is normal and desirable that you see an occasional flicker of the 0dB lamp in typical use.

OUTPUT CONTROL
Attenuates the audio output level of the receiver to match the input requirements of the equipment with which it is used. The XLR output jack on the rear panel provides an audio output at microphone level for low impedance, balanced inputs. At the extreme counter-clockwise position of the control knob, the output level of this XLR jack will be 50dB at full modulation. In the fully clockwise position, the output level will be -20dB at full modulation. Intermediate settings are sometimes necessary due to the variations in different input compressors and ALC (automatic level control) circuits on various VCR's and audio inputs. The markings around the control knob are provided simply as "memory markers;" they are not calibrated with reference to a specific output level.

ON/OFF/ SWITCH
Turns the receiver power off and on.

POWER LED
Glows when the power switch is in the ON position and external 12 Volt DC power is properly supplied. If this LED is very dim or does not light up when the switch is turned on, check the connections from the external power source.

RF LED
Lights when the transmitter is turned on and the receiver has a good signal. When the carrier signal from the transmitter is too weak to produce a clean audio signal, the lamp will go out.

MINI PHONE JACK
Provides a monitor, separate from the rear panel XLR audio output. The output level from this jack is controlled by both the OUTPUT control and the recessed trim-pot on the side panel. Generally, the OUTPUT control would be set to provide the proper output level at the rear panel XLR jack, and then the side panel trim-pot adjusted to match the required level for your earphone.

The output at this mini connector is designed for a medium impedance earphone. An earphone with an impedance between 30 and 300 Ohms will usually provide adequate volume. The sound from a low impedance ear phone (ie. 8 Ohms) will not be very loud and may be distorted at higher listening levels.

ANTENNA JACK
Connects to any 50 ohm antenna with a BNC type connector (a flexible "rubber duckie" antenna is supplied). The A-185 Coax remote type antenna may also be used.

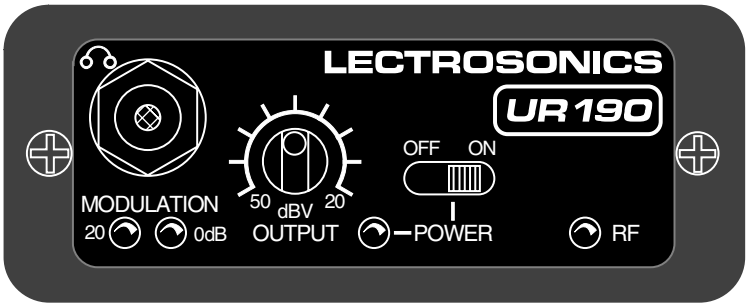

Figure 2 - UR190 Front Panel

RECEIVER REAR PANEL

12 VDC INPUT
Connects to the supplied CH-12 AC adapter for powering the receiver from a 110/120V AC source. The receiver may also be powered from external 12 volt DC sources using the correct plug (Switchcraft S-760 power plug). A diode bridge is used in the external power input, so that the UR190 will operate properly from either polarity.

AUDIO OUTPUT
Supplies a balanced, low impedance output at microphone level. The audio signal is output on pins 2 and 3, while pin 1 is ground. The output level of this jack is controlled by the OUTPUT control on the front panel of the receiver. The connector is a standard XLR type.

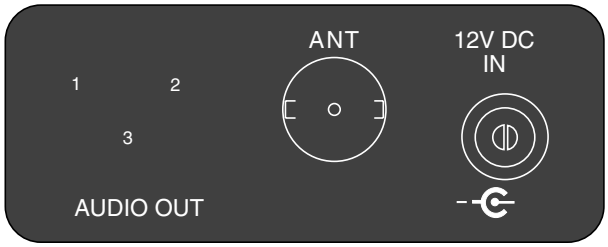

Figure 3 - UR190 Rear Panel

ANTENNA USE AND PLACEMENT

Connect the antenna to the front panel jack. Position the antenna so that it is not within 3 or 4 feet of large metal surfaces. If this is not possible, try to position the antenna so that it is 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 antenna. In situations where the operating range is less than about 50 feet, the antenna positioning is much less critical.

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 would be a "drop out." A drop out sounds like either audible noise (hiss), or in severe cases, may result in a complete loss of the carrier and the sound. Moving the transmitter even a few inches may eliminate it. A dropout situation may be either better or worse as the crowd fills and/or leaves the room, or when the transmitter or receiver is operated in a different location.

Dropouts can be avoided by careful placement of the receiver. If you are mounting the receiver on a video camera or camcorder, experiment with the location prior to going into the field. By placing the antenna above the body of the camera, you will increase your operating range. If the antenna is laid next to the camera, as shown in the illustration below, the body of the camera will serve as a shield and reduce range. This position may work but be certain at least part of the antenna extends above the camera. Alternate locations can include the back of the camera, the top of the camera or mounted vertically on the side.

If dropouts occur in the field, moving the transmitter or receiver slightly in any direction will usually eliminate the problem.

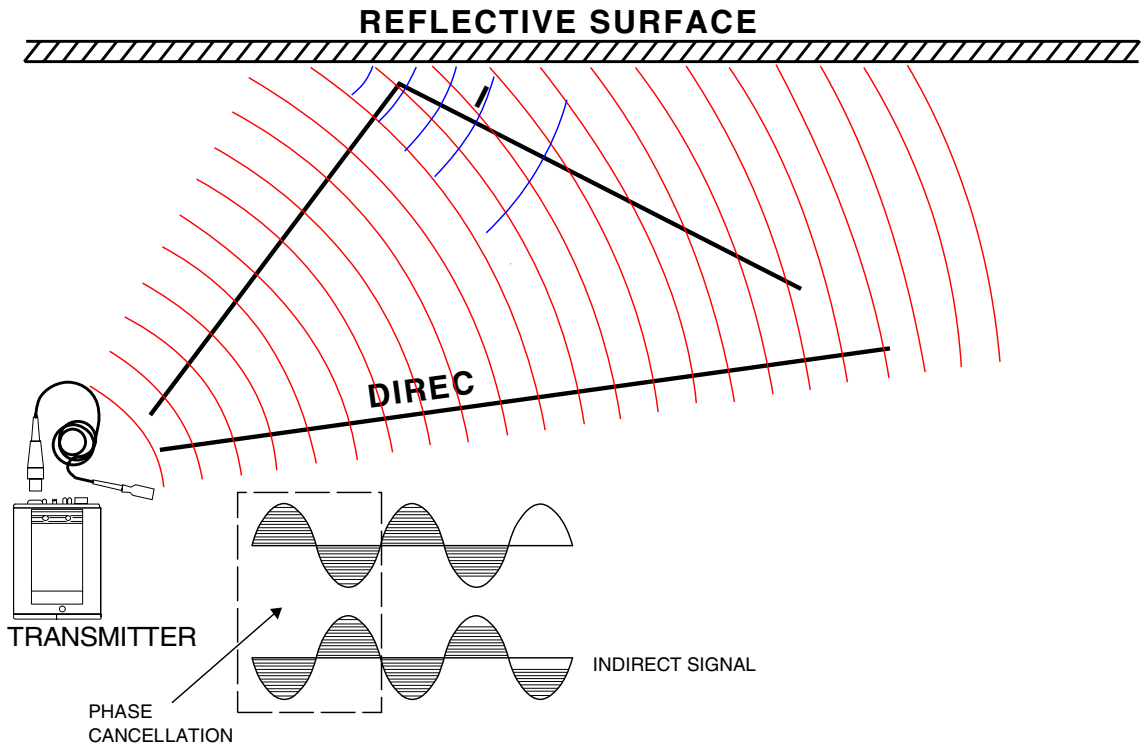

Figure 4 - Dropouts resulting from phase cancellation

OPERATING INSTRUCTIONS

1) Connect the power cord.

2) Attach and extend the antenna.

3) Connect the audio cable.

4) Set the front panel switch to either "EXT" or "INT", depending upon the power source. Check to see that the red POWER LED lights up.

5) THIS IS PERHAPS THE MOST IMPORTANT STEP IN THE SET UP PROCEDURE. Adjust the transmitter "gain". See your transmitter manual (Operating Instructions section) for specific directions on the proper gain adjustment of your particular transmitter.

6) Adjust the output control according to the type of input on your equipment. The input levels on different VCR's and PA equipment vary, which may require that you set the OUTPUT control in an intermediate position. Try different settings and listen to the results. If the output of the receiver is too high, you may hear distortion or a loss of the natural dynamics of the audio signal. If the output is too low, you may hear steady noise (hiss) along with the audio. The UR190 output was designed to drive microphone level inputs. The output signal level ranges from -50dBV with the output control fully counter clockwise to -20dBV with the output control fully clockwise when the transmitter signal is at full modulation.

INDICATOR QUICK REFERENCE

(Refer to Controls and Functions section for more detailed descriptions)

RF - This LED lights up when the transmitter is turned on. This indicates that the receiver is getting an adequate RF signal (carrier) from the transmitter.

POWER - This LED lights up when the receiver is properly connected to a power supply and switched on.

MODULATION - The "-20" LED lights up when an audio signal is present at an adequate level to produce a good signal to noise ratio. The "0dB" LED lights up when the audio level is high and the signal is being compressed in the transmitter. An extremely high audio level may cause distortion.

REVIEW THE TRANSMITTER INSTRUCTION MANUAL FOR PROPER ADJUSTMENT AND SETUP OF THE TRANSMITTER MIC LEVEL OR GAIN

TROUBLESHOOTING

Before going through the following chart, be sure that you have a properly connected AC adapter. The POWER LED should glow brightly.

SYMPTOM	POSSIBLE CAUSE
NO POWER LED	1) Receiver switch in "OFF" position 2) External 12 Volt power disconnected 3) Receiver switch in wrong position for the power source used
NO RF LED	1) Transmitter not turned on 2) Transmitter battery dead 3) No microphone on transmitter (the microphone serves as the antenna 4) Receiver antenna not connected
RF LED ON BUT NO SOUND AND NO MODULATION LEDS	1) Transmitter switch in "MUTE" position 2) Transmitter microphone not connected 3) Microphone switch in "OFF" position 4) Possible malfunction in the audio section of the transmitter See transmitter manual 5) Check transmitter modulation LEDs for possible transmitter problem
MODULATION LED's ON BUT NO SOUND	1) Receiver LEVEL control turned down 2) Audio cable disconnected 3) Recorder or sound system off, or not properly adjusted

UR190 REPLACEMENT PARTS AND ACCESSORIES

Part No.	Description
CH-12	110 Volt AC adapter for UR190 receiver
CC-MINI	System pouch, zippered, for compact wireless systems
A-500S	UHF Flexible whip receiver antenna, straight
A-500RA	UHF Flexible whip receiver antenna, right angle
PS-12	Power cable, Hi-rose 7-4 pin (Betacam) to DC power supply (UR190)
PS-212	Same as PS-12 except with dual plugs to power 2 UR190 receivers
UMC-190	Rackmount, space for four receivers, with RF dstribution amplifier

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 out the inter-connecting cords and then go through the TROUBLE SHOOTING section in the 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

You will save yourself time and trouble if you will follow the steps below:

A. DO NOT return equipment to the factory for repair without first contacting us by letter 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 am to 4 pm (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.

Mailing address:	Shipping address:	Telephones:
Lectrosonics, Inc.	Lectrosonics, Inc.	(505) 892-4501
PO Box 15900	581 Laser Rd.	(800) 821-1121
Rio Rancho, NM 87174	Rio Rancho, NM 87124	FAX: (505) 892-6243
USA	USA	

World Wide Web: *http://www.lectrosonics.com* ***email:*** *sales@lectrosonics.com*

SPECIFICATIONS AND FEATURES

Operating Frequencies:	470MHz to 608MHz, crystal controlled
Sensitivity:	Better than 0.35 uV for 20dB SINAD; 1.5 uV for 50dB S/N ratio
Signal/Noise Ratio:	106dB A-weighted
Squelch Quieting:	greater than 106dB
AM Rejection:	-60dB (10uV to 0.1 Volts)
Modulation Acceptance:	±15kHz
Image and Spurious Rejection:	greater than 100dB
Third Order Intercept:	-5 dBm
Audio Outputs:	
XLR:	200 Ohms balanced; 100mV max.
Headphone:	0.6 Volts RMS into 50 Ohms
Antenna Input:	BNC; 50 Ohms impedance
Controls:	Front panel attenuator controls XLR output Recessed trim-pot controls headphone 3 position power/function switch
Indicators:	Red LED for power "ON" 2 LEDs for modulation level "RF" LED for transmitter "ON"
Power Requirements:	12 Volts DC external (either polarity) 110 VAC via CH-12 AC adapter
Power consumption:	60mA at idle; 70mA at 15kHz deviation, with headphones
Weight:	11 ounces
Dimensions:	1.1" x 2.75" x 5.2"

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

This warranty applies only to items returned to us, shipping costs prepaid, within one year from the date of purchase.

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

LECTROSONICS, INC.

581 LASER ROAD
RIO RANCHO, NM 87124 USA

July 6, 1999