UH200D

FREQUENCY-AGILE
PLUG-ON UHF TRANSMITTER

OPERATING INSTRUCTIONS
and trouble-shooting guide

LECTROSONICS, INC.

Rio Rancho, NM
www.lectrosonics.com

INTRODUCTION

Thank you for selecting the Lectrosonics UH200D frequency agile, plug-on transmitter. The UH200D combines over 80 years of engineering experience with the very latest components, in a design that addresses the most demanding professional applications.

The design of the UH200D was the direct result of numerous conversations with users, staging and touring companies and dealers across the US. The specific concerns and needs brought up in these conversations led directly to the development of the operational features offered on the UH200D. Two hundred fifty six frequencies are user selectable in 100kHz steps to alleviate interference problems in travelling venues.

The UH200D is a rugged, machined aluminum package. Selectable voltage phantom power is provided on pins 2 and 3. Level indicating LEDs are provided to make level settings quick and accurate, without having to view the receiver. The battery compartment accepts any 9 Volt alkaline or lithium battery and makes a positive connection via self-adjusting contacts.

Only the UH200D transmitter is covered in this manual. Companion receivers are covered in separate manuals. The UH200D will operate with any 200 Series Lectrosonics receiver in the same frequency group.

TABLE OF CONTENTS

INTRODUCTION 2

GENERAL TECHNICAL DESCRIPTION 3

CONTROLS AND FUNCTIONS 4

OPERATING INSTRUCTIONS 6

TROUBLESHOOTING 7

SPECIFICATIONS AND FEATURES 9

SERVICE AND REPAIR 10

RETURNING UNITS FOR REPAIR 10

WARRANTY ..... Back cover

The UH200D transmitter is FCC type accepted under Part 74: 470 - 608MHz and 614 - 806MHz

GENERAL TECHNICAL DESCRIPTION

The UH200D transmitters are comprised of a number of functional subsystems as shown in the block diagram below.

GENERAL

The 200 system uses 75kHz wide deviation for an extremely high signal to noise ratio. The transmitter circuits are all regulated to allow full output power from the beginning (9 Volts) to the end (6.5 Volts) of battery life. The input amplifier uses an ultra low noise op amp. It is gain controlled with a wide range input compressor which cleanly limits input signal peaks over 30dB above full modulation.

DUAL BAND COMPANDOR

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 200 system introduces an entirely new approach to solving this basic problem, called “dual-band companding.”

There are actually two separate compandors in the 200 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.

NO PRE-EMPHASIS/DE-EMPHASIS

The signal to noise ratio of the 200 system is high enough to preclude the need for conventional pre-emphasis (HF boost) in the transmitter and de-emphasis (HF roll off) in the receiver. Pre-emphasis and de-emphasis in an FM radio system usually provides about a 10dB improvement in the signal to noise ratio of the system, but the high frequency boost in the transmitter must be removed in a purely complementary manner or else the frequency response of the original audio signal will be altered.

Pre-emphasis can also cause distortion in the receiver. As this signal is passed through the IF filters in the receiver, distortion can be produced, most noticeable at full modulation. De-emphasis cannot be applied until the signal is converted into audio, so there is no way around this problem short of eliminating pre-emphasis altogether. Neither of these problems occur in the 200 system. The dual-band compandor in the 200 Series system essentially provides a dynamic pre-emphasis/de-emphasis function with extremely low distortion.

PILOT TONE SQUELCH

The 200 system utilizes an ultrasonic tone modulation of the carrier to operate the receiver squelch. This “pilot tone” consists of a 32kHz signal mixed with the audio signal after the compandor, to control the audio output muting of the receiver. The pilot tone is filtered out of the audio signal immediately after the detector in the receiver so that it does not influence the compandor or various gain stages. The basic benefit of the pilot tone squelch system is that the receiver will remain muted until it receives the pilot tone from the matching transmitter, even if a strong RF signal is present on the carrier frequency of the system. This is extremely important in applications that include an automatic microphone mixer.

WIDE-BAND DEVIATION

±75kHz deviation improves the capture ratio, signal to noise ratio and AM rejection of a wireless system dramatically, compared to the more commonly used ±15kHz deviation.

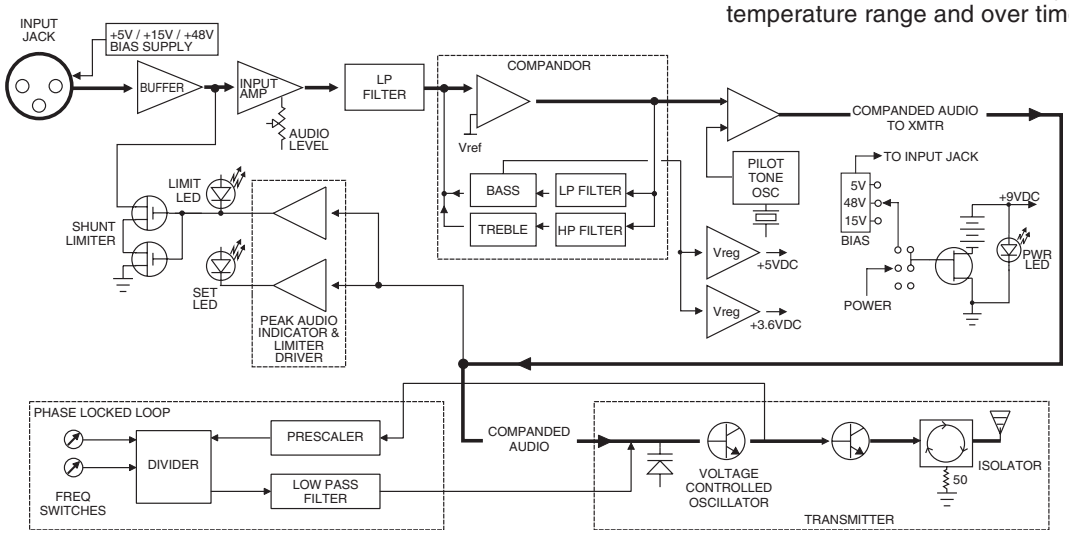
LONG BATTERY LIFE

High efficiency circuits throughout the design allow over 4.5 hours of operation using a single 9 Volt alkaline battery. (A 9V lithium battery will provide over 12 hours of operation.) The battery compartment is a unique mechanical design which automatically adjusts to fit any brand of battery. The battery contacts are spring loaded to prevent “rattle” as the unit is handled. The battery life will be affected by the amount of phantom power supplied to any microphones that require it. A high drain 48 Volt microphone can shorten battery life by 40% or more. A light drain 15 Volt microphone will make little or no difference in battery life. The only way to be sure is to test the transmitter and microphone combination with a brand new battery; then and only then will you be sure of the combination's battery life.

FREQUENCY AGILITY

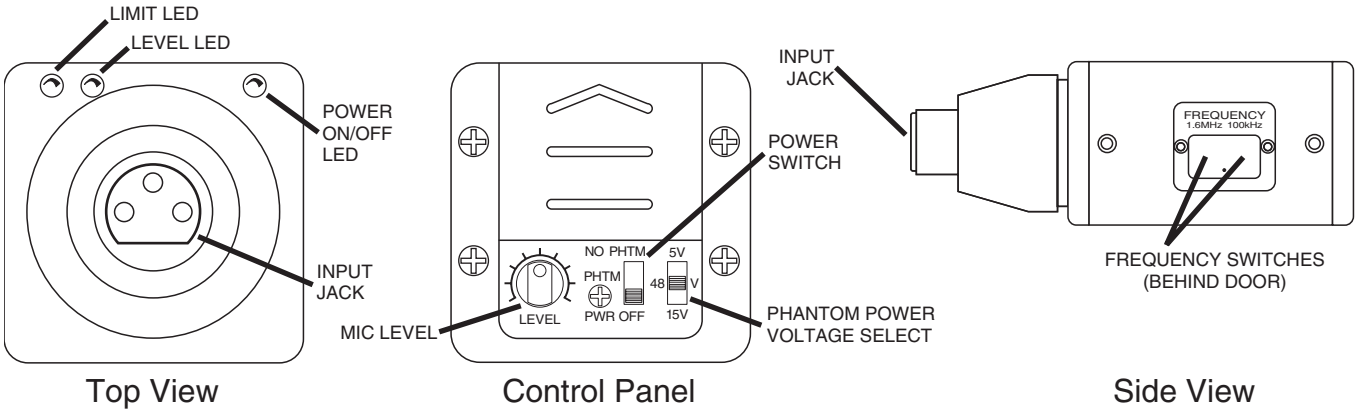
The transmitter section uses a synthesized, frequency selectable main oscillator. The frequency is extremely stable over a wide temperature range and over time.

Two rotary switches, located on the side panel of the unit, provide 256 frequencies in 100kHz steps over a 25.5MHz range. This alleviates carrier interference problems in mobile or travelling applications.



UH200D Block Diagram

CONTROLS AND FUNCTIONS



The UH200D may be used with a wide variety of microphones. The 3-pin XLR connector on the UH200D allows the transmitter to be used with any dynamic microphone, as well as many two wire positive bias lavaliere systems (such as those systems supplied by Lectrosonics).

POWER SWITCH

Turns the battery power on and off. Even when the switch is turned off or on abruptly, the pilot tone muting system prevents “thumps” or transients from occurring.

The PHTM (center) position of the power switch turns on the phantom power while the NO PHTM (fully on) position disables phantom power. Be careful to use the center position phantom power only when necessary and keep the voltage selector switch in the 5 Volt position for additional protection against accidents.

PHANTOM POWER VOLTAGE SELECT SWITCH

This switch selects from three voltages when the PWR switch is in the mid position. The voltages are:

- 5 Volts for lavaliere microphones,
- 15 Volts for some professional mics requiring high current and for many common stage mics that will operate over a wide phantom voltage range of 12 to 48 Volts. With the proper adapter, this position can also be used with T power microphones. See our web site for details on finding or making the proper adapter.
- 42 Volts for microphones that do in fact require a supply greater than 15 Volts. (See below for a discussion of why 42 and not a “true” 48 Volts.)

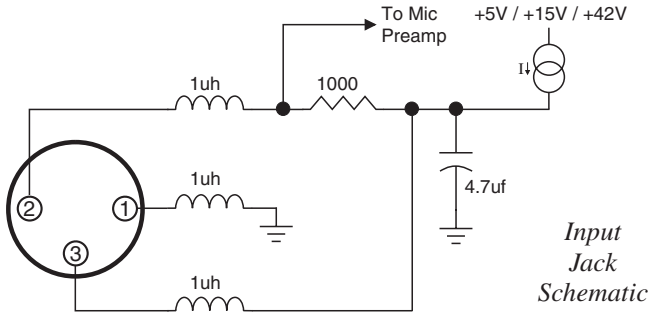
For longest battery life use the minimum phantom voltage necessary for the microphone. Many stage microphones regulate the 48 Volts down to 10 Volts or so internally anyway, so you might as well use the 15 Volt setting and save some battery power. If you are not using a microphone for the input device, turn the phantom power off (off is the fully up position of the power switch). The phantom power should only be used with a fully floating, balanced device such as almost any type microphone with a 3 pin XLR connector. If you use the phantom power with an unbalanced device or if pins 2 or 3 are DC connected to ground, then you will draw maximum current from the power supply. The UH200D is fully protected against such shorts but the 9 Volt battery will be drained at twice its normal rate.

The transmitter can supply 4 mA at 42 Volts, 8 mA at 15 Volts, and 8 mA at 5 Volts. The 42 Volts setting actually supplies the same voltage to a 48 Volt microphone as the DIN standard arrangement due to a dynamic biasing scheme that does not have as much voltage drop as the DIN standard. The 48 Volt DIN standard arrangement protects against shorts and high fault current with high resistance in the power supply feeds to pins 2 and 3. This protects the supply if the supply current is accidentally shorted to ground and also keeps the microphone from being attenuated by the power supply. The UH200D improves on those functions and is able to use less power from the battery by using constant current sources and current limiters. With this dynamic arrangement the UH200D can also supply more than twice the current of competing 48 Volt plug on units and provide 4 times the current to some very high end 15 Volt microphones.

The 5 Volt setting is provided for lavaliere microphones made by us and others. Do not power lavalieres from the 15 or 48 Volt setting as the microphone will be most likely destroyed. Lectrosonics makes an adapter, MCA5X, that will adapt our standard TA5F 5 pin microphones to the UH200D. This adapter also provides protection against excessive phantom voltage. If voltages higher than 5 Volts are applied to the adapter, a Zener will shunt excess voltage to ground. The microphone won't work until the voltage is correctly reduced to 5 Volts. If you have an older lavaliere mic that was wired directly to an XLR for use with the earlier UH200's, we strongly recommend building our protection circuit into the XLR to prevent accidental destruction of the lavaliere.

INPUT JACK

Standard 3-pin Switchcraft XLR type. Pin 2 is signal, pin 3 is a floating signal ground, and pin 1 is case ground (see schematic below). The UH200D is self-locking onto a standard microphone. **If severe noise is experienced when the microphone is moved with respect to the UH200D, the cause is an unbalanced condition between pins 2 and 3 of the microphone.**



Input Jack Schematic

POWER ON/OFF LED

Glows brightly when battery is good. A weak or dim LED means that the battery is weak, and has about an hour of operation left. If the LED fails to light, the battery should be replaced. The power LED should light up in both the “PHTM” and “NO PHTM” positions of the PWR switch.

The power LED is connected to a precision battery test circuit that continuously monitors battery voltage. The LED is at full brightness with a new 9 Volt alkaline battery. As the battery voltage drops during use, the LED brightness will also decrease. After 4.5 hours the battery voltage will be about 7 Volts. The LED will be completely extinguished. Since the internal circuits are all tightly regulated and the RF output stage has a separate discrete regulator, the transmitter will continue to operate to a battery voltage of 6.5 Volts. From 6.5 Volts to 6 Volts, the transmitter will still operate, but with degraded performance. Please note that a weak battery will sometimes light the power LED immediately after turn on, but soon will discharge to the point where the LED will extinguish.

The combination of an accurate battery condition indicator and regulation of all internal circuits guarantees much longer battery life, as well as consistent performance versus battery life.

MODULATION LEDS

These two LEDs indicate the proper setting of the MIC LEVEL control.

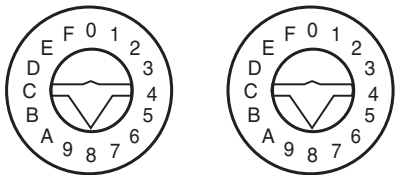
- **LEVEL LED:** Flickers or glows most of the time if the audio volume is adequate for normal operation.
- **LIMIT LED:** Lights up when the audio volume is high, indicating that the signal level is being limited by the compressor. Optimum signal-to-noise ratio is obtained when the limit LED lights occasionally.

MIC LEVEL

This knob is used to adjust the audio input volume for the proper modulation level. Rotate knob until the LEVEL LED flickers when there is an input signal. The LIMIT LED should light occasionally.

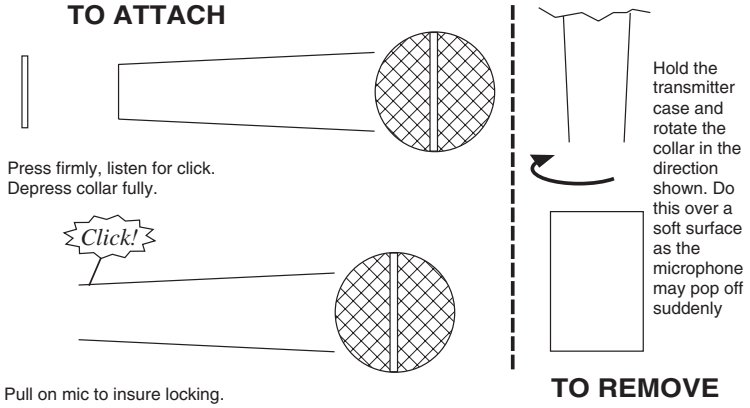
FREQUENCY ADJUST

These two rotary switches adjust the center frequency of the carrier. The 1.6M is a coarse adjustment and the 100K is the fine adjustment. Each transmitter is factory aligned at the center of its operating range. The default position of the frequency select switches is in the center of the transmitter’s range.



Frequency select switches, default position (8,8)

OPERATING INSTRUCTIONS



Attaching the Microphone

1. Insert the UH200D into the selected microphone. Listen for the "click" that indicates the UH200D has locked on to the microphone. Pull on the mic to insure proper locking has occurred.

2. Turn the power switch on and, if necessary, enable phantom power and select the proper voltage for your microphone.

3. Hold the microphone as you will when you will be using it.

4. Position the microphone in the location you will use in actual operation.

5. While speaking or singing at the same voice level that will actually be used, observe the MODULATION LEDs. Adjust the AUDIO LEVEL control knob until the LEDs begin to light. Start at a low setting where neither LED lights as you speak. Gradually, turn the gain up until one LED lights, then the other.

The LEVEL LED lights when the audio level is about 20dB below full modulation. The LIMIT LED lights when the limiter begins to operate. There is over 30dB of limiting range without overload above the LIMIT LED, so it is desirable that it lights up occasionally during use.

6. Once the gain has been adjusted, the audio system audio can be turned on to make level adjustments. Set the power switch to the ON position and adjust the receiver and/or sound system level as required. **Please note, there will be a delay between the moment the switch is thrown and the time when audio will actually appear at the receiver output.** This intentional delay eliminates turn on thumps, and is controlled by the pilot tone squelch control.

OPERATING TIPS

The AUDIO LEVEL control knob *should not* be used to control the volume of your sound system or recorder levels. This gain adjustment matches the transmitter gain with the user's voice level and microphone positioning.

If the audio level is too high -- both LEDs will light frequently or stay lit. This condition may reduce the dynamic range of the audio signal.

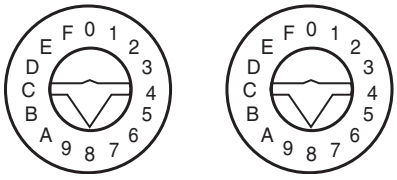
If the audio level is too low -- neither LED will light, or the LEVEL LED will light dimly. This condition may cause hiss and noise in the audio, or pumping and breathing in the background noise.

The first LED turns on 20dB below full deviation. The LIMIT LED turns on at full deviation and indicates that the input shunt compressor is operating. The input limiter will handle peaks over 30dB above full modulation, regardless of the gain control setting. The limiter uses a true absolute value circuit to detect both positive and negative peaks. The attack time is 5 milliseconds and the release time is 200 milliseconds. Occasional limiting is desirable, indicating that the gain is correctly set and the transmitter is fully modulated for optimum signal to noise ratio.

Different voices will usually require different settings of the AUDIO LEVEL control, so check this adjustment as each new person uses the system. If several different people will be using the transmitter and there is not time to make the adjustment for each individual, adjust it for the loudest voice.

ADJUSTING THE TRANSMITTER FREQUENCY

If you are experiencing interference from another signal on your frequency, you may want to change the operating frequency of your system. The left switch changes the operating frequency by 1.6 MHz per step and the right switch changes it 100 kHz per step. If you are experiencing interference, change the operating frequency in 100 kHz steps to find a clear channel. If it is not possible to find a clear channel using the 100 kHz switch, return it



Frequency select switches, default position (8,8)

to its original position and change the 1.6 MHz switch by one click then try the 100 kHz switch again.

To gain access to these switches, slide the access door open with a fingernail.

Note: With the UDR200A receiver, these switches also appear on the front panel of the receiver. Normally, you should set the transmitter switches to match the receiver switch settings. The switches are located on the rear panel of the UCR200D receiver.

With the UDR200B receiver, the front panel LED character display will indicate the correct transmitter switch settings.

BATTERY REPLACEMENT

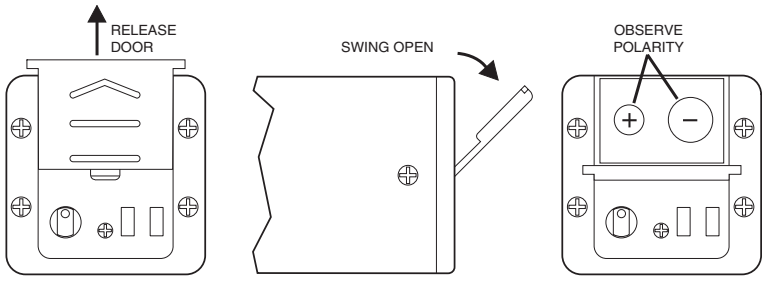
The UH200D transmitter is powered by a standard alkaline 9 Volt battery. It is important that you use ONLY ALKALINE OR LITHIUM batteries for longest life. Standard zinc-carbon batteries marked “heavy duty” or “long-lasting” are not adequate. They will provide only about 5 **minutes** of operation. Similarly, ni-cad rechargeable batteries only give 1 hour of operation, and will also run down quite abruptly. Alkaline batteries provide about 4.5 hours of operation while lithium batteries will run the unit for about 12 hours.

To open the battery compartment, press outward on the cover door in the direction of the arrow as shown in the drawing. Only slight, sliding pressure is needed to open and close the battery door.

Swing the door open and take note of the polarity marked inside showing the location of the positive (+) and negative (-) terminals. Insert the battery and close the cover by pressing in and across, reversing the opening procedure outlined above. Note that the battery door will NOT close if the battery is inserted incorrectly, since the terminals will hit a protective polarity barrier.

Don’t force the battery door closed. If it is difficult to close, the battery is in backwards.

The battery life will be affected by the amount of phantom power supplied to any microphones that require it. A high drain 48 Volt microphone can shorten battery life by 40% or more. A light drain 15 Volt microphone will make little or no difference in battery life. The only way to be sure is to test the transmitter and microphone combination with a brand new battery; then and only then will you be sure of the combination's battery life.



Battery Compartment Action

CAUTION

Lithium batteries will expand and swell if allowed to go into a deep discharge. Be sure to remove lithium batteries as soon as the display starts flashing DEAD BATTERY. If lithium batteries are allowed to fully discharge while still inside the battery compartment, they will be very difficult to remove.

Stuck lithium batteries can be avoided by removing the label wrapping around the battery before use. This will allow the battery to swell but will still leave enough room in the compartment for the battery to fall out normally.

TROUBLESHOOTING

Before going through the following chart, be sure that you have a good battery in the transmitter. It is important that you follow these steps in the sequence listed.

SYMPTOM	POSSIBLE CAUSE
TRANSMITTER BATTERY LED OFF	**1.** Battery is inserted backwards. **2.** Battery is dead.
NO TRANSMITTER MODULATION LEDs	**1.** Gain control turned all the way down. **2.** Battery is in backwards. Check power LED. **3.** Mic capsule is damaged or malfunctioning. **4.** Mic cable damaged or mis-wired. **5.** Phantom power not enabled for mic that requires it.

SYMPTOM	POSSIBLE CAUSE
RECEIVER RF LAMP OFF	**1.** Transmitter not turned on. **2.** Transmitter battery is dead. **3.** Receiver antenna missing or improperly positioned. **4.** Transmitter and receiver not on same frequency. Check switches/ display on transmitter and receiver. **5.** Operating range is too great.
NO SOUND (OR LOW SOUND LEVEL), RECEIVER MOD LEVEL LEDs ARE ON	**1.** Receiver output level set too low. **2.** Receiver output is disconnected; cable is defective or mis-wired. **3.** Sound system input is turned down.
NO SOUND (OR LOW SOUND LEVEL), RECEIVER MOD LEDs ARE OFF	**1.** Transmitter gain (audio level) set too low. **2.** Faulty microphone **3.** Phantom power not enabled for mic that requires it.
DISTORTED SOUND	**1.** Transmitter gain (audio level) is far too high. Check mod level lamps on transmitter and receiver as it is being used. (Refer to the Operating Instructions section for details on gain adjustment) **2.** Receiver output may be mismatched with the sound system or recorder input. Adjust output level on receiver to the correct level for the recorder, mixer or sound system. **3.** Excessive wind noise or breath “pops.” Reposition microphone and/or use a larger windscreen. **4.** Transmitter is not set to same frequency as receiver. Check that frequency select switches on receiver and transmitter match.
HISS AND NOISE – AUDIBLE DROPOUTS	**1.** Transmitter gain (audio level) far too low. **2.** Receiver antenna missing or obstructed. **3.** Operating range too great.
EXCESSIVE FEEDBACK	**1.** Transmitter gain (audio level) too high causing the limiter to reduce the dynamic range which in turn causes feedback. Check gain adjustment and/or reduce receiver output level. (Refer to the Operating Instructions section for details on gain adjustment) **2.** Transmitter too close to speaker system. **3.** Mic is too far from user’s mouth.

SPECIFICATIONS AND FEATURES

Operating frequencies:	537.600 to 607.900 MHz 614.100 to 767.900 MHz
Frequency selection:	256 frequencies in 100kHz steps
RF Power output:	100 mW (nominal)
Pilot tone:	32.764 kHz (± 2Hz); 5kHz deviation
Frequency stability:	± 0.002%
Deviation:	± 75 kHz (max)
Spurious radiation:	90 dB below carrier at frequencies less than 1GHz
Equivalent input noise:	-126 dBV
Phantom Power:	Selectable 5 Volts at 8 mA, 15 Volts at 8 mA, 42 Volts at 4 mA or OFF
Input level:	Nominal 2 mV to 300 mV, before limiting. Input greater than 2V, with limiting.
Input impedance:	1K Ohm mic load impedance
Input compressor:	Soft compressor, >30 dB range
Gain control range:	43 dB; semi-log rotary control
Modulation indicators:	Dual LEDs indicate modulation level 20 dB below limiting and at the onset of limiting.
Controls:	3-position “OFF-PHANTOM-ON” slide switch for noiseless turn on/turn off operation. Control panel knob adjusts audio gain. Rotary switches on side panel adjust transmitter frequency. 3-position voltage selector switch for 5, 15 or 48 Volt phantom mic power.
Audio Input Jack:	3-Pin XLR
Battery:	Precision compartment auto-adjusts to accept any known alkaline or lithium 9 Volt battery. (We’ve tried 150 different ones!)
Battery Life:	4.5 Hours with alkaline 9 Volt, 12 hrs with lithium (Battery life will vary with battery brand, phantom power voltage setting and mic current drain.)
Weight:	6.6 ozs. including battery
Dimensions:	1.5 x 1.5 x 4.2 inches
Emission Designator:	180KF3E

Specifications subject to change without notice.

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 interconnecting 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:
Lectrosonics, Inc.
PO Box 15900
Rio Rancho, NM 87174
USA

Shipping address:
Lectrosonics, Inc.
581 Laser Rd.
Rio Rancho, NM 87124
USA

Telephones:
Regular: (505) 892-4501
Toll Free (800) 821-1121
FAX: (505) 892-6243

World Wide Web: *http://www.lectrosonics.com*

Email: *sales@lectrosonics.com*

NOTES:

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

This warranty applies only to items returned to Lectrosonics, Inc. or an authorized dealer, shipping costs prepaid, within one year from the date of purchase.

This Limited Warranty is governed by the laws of the State of New Mexico. It states the entire liablility of Lectrosonics Inc. and the entire remedy of the purchaser for any breach of warranty as outlined above. NEITHER LECTROSONICS, INC. NOR ANYONE INVOLVED IN THE PRODUCTION OR DELIVERY OF THE EQUIPMENT SHALL BE LIABLE FOR ANY INDIRECT, SPECIAL, PUNITIVE, CONSEQUENTIAL, OR INCIDENTAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THIS EQUIPMENT EVEN IF LECTROSONICS, INC. HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL THE LIABILITY OF LECTROSONICS, INC. EXCEED THE PURCHASE PRICE OF ANY DEFECTIVE EQUIPMENT.

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
www.lectrosonics.com

July 31, 2003