

**HM**

# Plug-On Transmitter

With Digital Hybrid Wireless® Technology



**Digital Hybrid Wireless**  
**US Patent 7,225,135**

Fill in for your records:

Serial Number:

Purchase Date:



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Thank you for selecting a Lectrosonics HM Plug-On transmitter. The unique design provides several distinct features for professional applications:

- Outstanding RF operating range
- Superb audio quality
- Corrosion-resistant housing
- Programmable compatibility modes for use with a wide variety of different receivers

The Digital Hybrid Wireless® design (US Patent 7,225,135) combines 24-bit digital audio with analog FM resulting in a system that has the same operating range as analog systems, the same spectral efficiency as analog systems, the same long battery life as analog systems, plus the excellent audio fidelity typical of pure digital systems.

The HM transmitter uses a standard XLR input jack for use with most brands of handheld mics. An LCD, membrane switches and multi-color LEDs on the control panel make input gain adjustments and frequency and compatibility mode selection quick and accurate, without having to view the receiver. The battery compartment accepts AA lithium or rechargeable batteries. The HM is machined from a solid aluminum block to provide a lightweight and rugged package. A special non-corrosive finish resists salt water exposure and perspiration in extreme environments.

The DSP-based design works with all Digital Hybrid receivers, and is backward compatible for use with Lectrosonics 200 and 100 Series and IFB receivers and some other brands of analog wireless receivers. Companion receivers are covered in separate manuals.

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# General Technical Description

## Wideband Design

The HM transmitter uses  $\pm 75$  kHz wide deviation for an excellent signal to noise ratio and wide dynamic range. The DSP controlled input limiter features a wide range dual envelope design which cleanly limits input signal peaks over 30 dB above full modulation. Switching power supplies to provide constant voltages to the transmitter circuits from the beginning (3 Volts) to the end (1.7 Volts) of battery life, and an ultra low noise input amplifier for quiet operation.

## Digital Hybrid Wireless® Technology

All wireless links suffer from channel noise to some degree, and all wireless microphone systems seek to minimize the impact of that noise on the desired signal. Conventional analog systems use companders for enhanced dynamic range, at the cost of subtle artifacts (known as “pumping” and “breathing”). Wholly digital systems defeat the noise by sending the audio information in digital form, at the cost of some combination of power, bandwidth and resistance to interference.

Lectrosonics Digital Hybrid Wireless® systems overcome channel noise in a dramatically new way, digitally encoding the audio in the transmitter and decoding it in the receiver, yet still sending the encoded information via an analog FM wireless link. This proprietary algorithm is not a digital implementation of an analog compander but a technique that can be accomplished only in the digital domain, even though the inputs and outputs are analog.

Channel noise still impacts received signal quality and will eventually overwhelm a receiver. Digital Hybrid Wireless® simply encodes the signal to use a noisy

channel as efficiently and robustly as possible, yielding audio performance that rivals that of wholly digital systems, without the power and bandwidth problems inherent in digital transmission.

Because it uses an analog FM link, Digital Hybrid Wireless® enjoys all the benefits of conventional FM wireless systems, such as excellent range, efficient use of RF spectrum, and resistance to interference. However, unlike conventional FM systems, it does away with the analog compander and its artifacts.

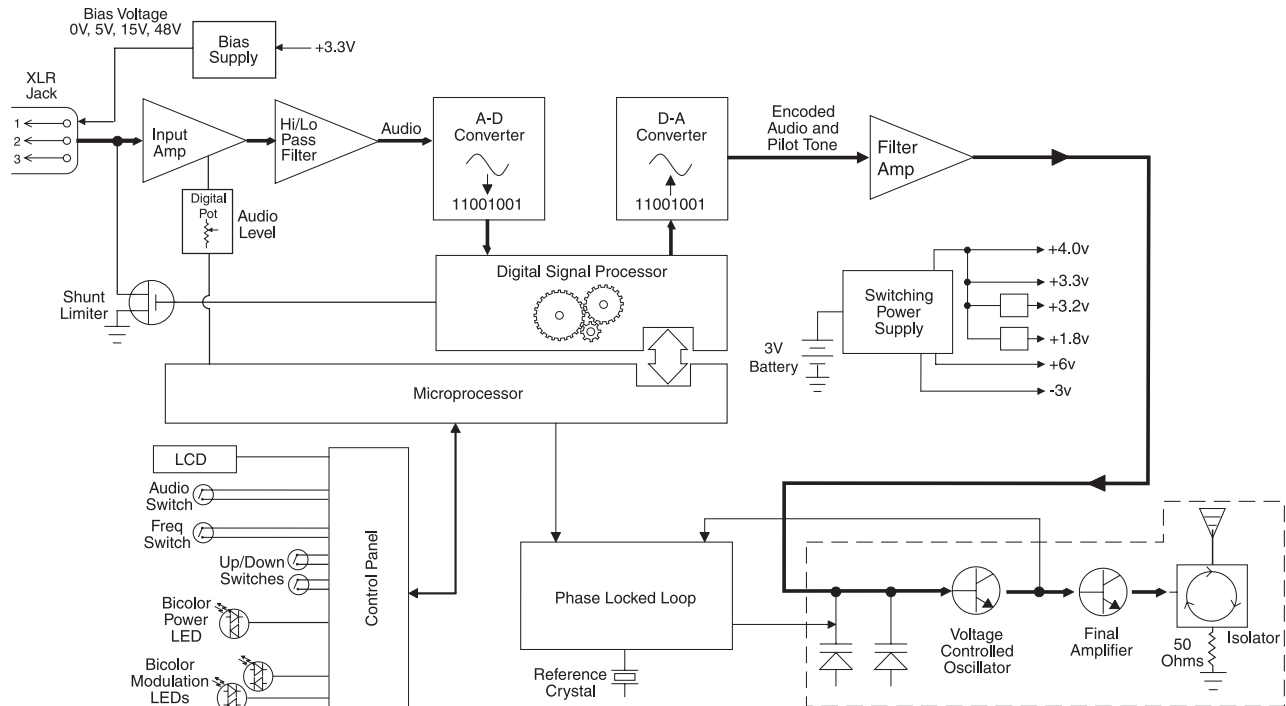
## No Pre-Emphasis/De-Emphasis

The Digital Hybrid Wireless® design results in a signal-to-noise ratio high enough to preclude the need for conventional pre-emphasis (HF boost) in the transmitter and de-emphasis (HF roll off) in the receiver. This eliminates the potential for extreme distortion on signals with abundant high-frequency information.

## Low Frequency Roll-Off

The low frequency roll-off can be set for a 3 dB down point at 35, 50 or 70 Hz to control subsonic and very low frequency audio content in the audio. The actual roll-off frequency will vary slightly depending upon the low frequency response of the microphone.

Excessive low frequency content can drive the transmitter into limiting, or in the case of high level sound systems, can even cause damage to loudspeaker systems. The roll-off is normally adjusted by ear while listening as the system is operating.



## Input Limiter

A DSP-controlled analog audio limiter is employed before the analog-to-digital (A-D) converter. The limiter has a range of more than 30 dB for excellent overload protection. A dual release envelope makes the limiter acoustically transparent while maintaining low distortion. It can be thought of as two limiters in series, a fast attack and release limiter followed by a slow attack and release limiter. The limiter recovers quickly from brief transients, with no audible side effects, and also recovers slowly from sustained high levels, to keep audio distortion low and while preserving short term dynamics.

## Signal Encoding and Pilot Tone

In addition to controlling the limiter, the DSP also encodes the digitized audio from the A-D converter and adds an ultrasonic pilot tone to control the receiver's squelch. A pilot tone squelch system provides a reliable method of keeping a receiver output muted (squelched) even in the presence of significant interference. When the system is operating in the hybrid mode, a different pilot tone frequency is generated for each carrier frequency to prevent inadvertent squelch problems and simplify multi-channel coordination.

## Microprocessor and DSP

A microprocessor monitors user command inputs from the control panel buttons and numerous other internal signals. It works intimately with the DSP to ensure the audio is encoded according to the selected Compatibility Mode and that the correct pilot tone is added to the encoded signal.

## Compatibility Modes

The HM transmitter was designed to operate with Lectrosonics Digital Hybrid receivers and will yield the best performance when doing so. However, due to the flexibility of digital signal processing, the transmitters can also operate in various compatibility modes for use with Lectrosonics 200 Series, Lectrosonics 100 Series, IFB and certain non-Lectrosonics receivers. Contact the Lectrosonics sales department for a complete list of compatible non-Lectrosonics receivers.

## Control Panel

The control panel includes four membrane switches and an LCD screen to adjust the operational settings. Multi-color LEDs are used to indicate audio signal levels for accurate gain adjustment and for battery status.

## Wide-Band Deviation

$\pm 75$  kHz deviation improves the signal to noise ratio and audio dynamic range of a wireless system dramatically, compared to other designs that use  $\pm 30$  kHz to 40 kHz deviation. Wide deviation combined with a high powered transmitters makes a significant improvement in signal to noise ratio and operating range.

## Battery Options and Operating Time

Switching power supplies convert battery voltages to operate various circuit stages with maximum efficiency. With the variety of alkaline, lithium and rechargeable NiMH batteries available today in the AA format, there are many choices to maximize operating time or minimize cost as needed for any application.

## Frequency Blocks

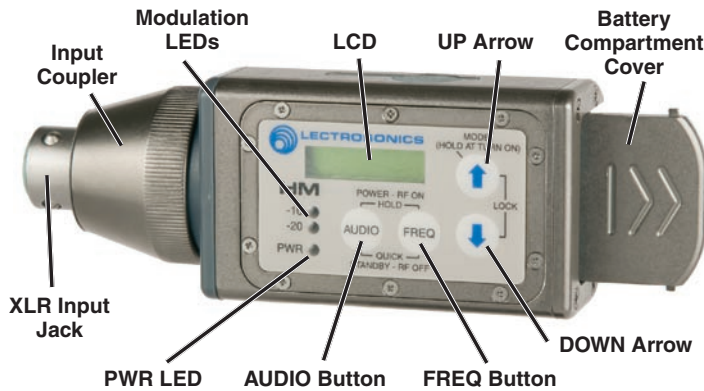
Lectrosonics established a "block" numbering system years ago to organize the range of frequencies available from the low 500 MHz band to the upper 700 MHz band. Each block includes 256 frequencies in 100 kHz increments. The block number is part of a simple formula to derive the frequency. The block number is multiplied by 25.6 to produce the lowest frequency in the block. For example, block 27 x 25.6 = 691.200.

## Circulator/Isolator

The RF output circuit includes a one way circulator/isolator using a magnetically polarized ferrite. This device greatly reduces the RF intermodulation produced when multiple transmitters are used in close proximity to one another (several feet apart). The isolator also provides additional RF output stage protection.



# Controls and Functions



## LCD Screen

The LCD is a numeric-type Liquid Crystal Display with several screens that allow settings to be made with the AUDIO, FREQ, UP and DOWN to configure the transmitter. Turn on and turn off countdowns appear in the LCD allowing the transmitter to be turned on for adjustments without the output stage enabled, and to prevent accidental turn off.

## Power LED

The PWR LED glows green when the batteries are good. The color changes to red when there is about 30 minutes of operation left with the recommended lithium batteries. Alkaline batteries will have about 20 minutes of life left. When the LED begins to blink red, there are only a few minutes of life.

*Note: NiMH batteries will give little or no warning when depleted. If you wish to use NiMH batteries in the HM, we recommend trying fully charged batteries in the unit, noting the length of time that the batteries will run the unit and then using the battery timer feature available on most Digital Hybrid receivers.*

A weak battery will sometimes cause the PWR LED to glow green immediately after being put in the unit, but will soon discharge to the point where the LED will go red or shut off completely.

## Audio Input Jack

The XLR input jack on the HM Series transmitters accommodates most hand-held microphones.

## Battery Compartment

The Battery Compartment Cover Plate slides open, allowing access to the battery compartment.

## Modulation LEDs

The Modulation LEDs provide a visual indication of the input audio signal level from the microphone. These two bicolor LEDs can glow either red or green to indicate modulation levels. 0 dB in the table below indicates full modulation.

Signal Level	-20 LED	-10 LED
Less than -20 dB	● Off	● Off
-20 dB to -10 dB	● Green	● Off
-10 dB to +0 dB	● Green	● Green
+0 dB to +10 dB	● Red	● Green
Greater than +10 db	● Red	● Red

## Audio Button

The AUDIO button is used to display the audio level setting, low frequency roll-off and phantom power mode. Repeated pressings cycle through the settings and the UP and DOWN arrows adjust the values.

The AUDIO button is also used with the FREQ button to enter standby mode and to power the transmitter on or off.

## Freq Button

The FREQ Button displays the selected operating frequency and also toggles the LCD between displaying the actual operating frequency in MHz and a two-digit hexadecimal number that corresponds to the equivalent Lectrosionics Frequency Switch Setting.

The FREQ button is also used with the AUDIO button to enter standby mode and to power the transmitter on or off.

## Up/Down Arrows

The Up and Down arrow buttons are used to select the operating frequency, adjust the audio level, or set the Compatibility Mode.

Pressing both arrows simultaneously enters the lock countdown. Holding the two arrow buttons until the countdown completes locks the control panel buttons so they can only be used to display current settings. "Loc" is displayed to indicate the controls are locked.

Once locked, the buttons can be unlocked only by removing the battery, or via the RM remote control (if this function was enabled in the transmitter setup).

## Antenna

An antenna is formed between the housing and the attached microphone, operating much like a dipole type. At UHF frequencies the length of the housing is similar to 1/4 wavelength of the operating frequency, so the antenna is surprisingly efficient, which helps extend the operating range and suppress noise and interference.



## Setup with the LCD

LCD screens and membrane switches are used to set the operating frequency, adjust the audio input level, select the Compatibility Mode, turn power on and off and to lock out the control panel.

### Audio Screen

The Audio screen is used to adjust input gain and low frequency roll-off, and to turn phantom power on and off. Repeatedly pressing the AUDIO button selects the setting. Press and hold the AUDIO button and use the Up and Down arrows to adjust the value.





### Frequency Screen

The Frequency Screen displays the operating frequency in MHz or as a two-digit hexadecimal number that corresponds to the equivalent Lectrosonics Frequency Switch Setting. Pressing the FREQ button toggles between the two displays.




### Compatibility Mode Screen

Holding down the Up arrow button while powering up the SM opens the Compatibility Mode screen. By using the Up or Down arrow buttons, the user can select one of six compatibility modes:



**Note:** RF transmission is prevented while selecting Compatibility Modes. Also, the HM exits the Compatibility Mode screen to Standby Mode.

- 400 - This is the factory default setting and works with all Lectrosonics 400 Series Digital Hybrid Wireless™ receivers, including the Venue. This mode offers the best audio quality.
- 200 - This mode works with all Lectrosonics 200 Series compatible receivers.
- 100 - This mode works with all Lectrosonics 100 Series compatible receivers.
- 3 - (Mode 3) This mode works with a number of non-Lectrosonics analog receivers. Contact the company for a list of compatible receivers.
- IFB - This mode works with all Lectrosonics IFB compatible receivers.
- 6 - (Mode 6) This mode works with a number of non-Lectrosonics analog receivers. Contact the company for a list of compatible receivers.

While in the compatibility mode screen, pressing either the AUDIO or FREQ button exits to standby mode. To power off from the compatibility mode screen, press and hold AUDIO and FREQ together.

### Turning the Power On

With the power turned off, simultaneously pressing and holding the AUDIO and FREQ buttons displays a timer with numerals on the right. The numerals count up from one and the boot sequence begins when the count reaches three. “LECTro” is displayed as the boot sequence begins. If either button is release prior to the screen reaching numeral three, the unit will enter the Standby Mode with no RF output (see Standby Mode below).



Initial Power On  
Timer Screen

### Turning the Power Off

With the unit turned on, simultaneously holding the AUDIO and FREQ buttons starts a countdown timer with numerals on the right. The screen counts down from three and the transmitter turns off when it reaches zero. Releasing either button prior to the Power Off Timer screen indicating zero returns the unit to normal operation and displays the previous screen.



Initial Power Off  
Timer Screen

### Entering the Standby Mode

With the power turned off, pressing the AUDIO and FREQ buttons for about one second places the unit in Standby Mode. In this mode the RF output is turned off so all setup adjustments can be made without interfering with other systems operating in the same location. The screen displays “rf OFF” to remind the user that the unit is not transmitting.



Standby Screen

Holding the FREQ button in Standby Mode displays the current operating frequency of the transmitter. The operating frequency can be changed by holding the FREQ button and pressing either the Up or Down button. Release the FREQ button, then press and hold it again to toggle the display between frequency in MHz and the hex code corresponding to the equivalent Lectrosonics Frequency Switch Setting.

Holding the AUDIO button in Standby Mode displays the current audio input level setting. This level can be changed by holding the AUDIO button and pressing either the Up or Down button.

Quickly pressing both the FREQ and AUDIO buttons simultaneously when the unit is in Standby Mode powers off the transmitter.

### Lock/Unlock Screen

Simultaneously pressing and holding both the Up and Down arrow buttons during normal operation starts the Lock timer. The timer starts at three and counts down to zero. When the timer reaches zero, the transmitter’s controls are locked.






The LCD will display the locked condition as long as the arrow buttons are held, then revert back to the previous screen when either button is released.

With the controls locked, the AUDIO and FREQ buttons can still be used to display current settings. Any attempt to change a setting by pressing either the Up or Down arrow button will result in an on-screen “Loc” reminder that the controls are locked. Remove the batteries to unlock the control panel.

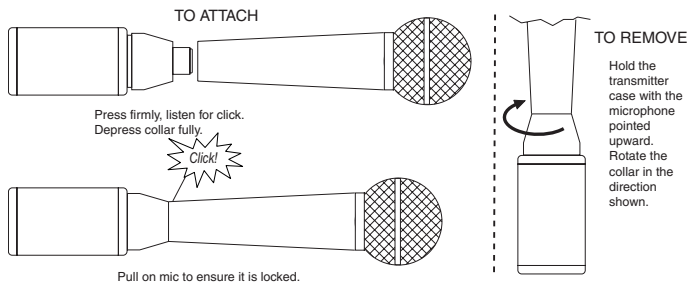
**Important:** *Once the transmitter is locked, it cannot be unlocked or powered off using the buttons. The only way to unlock a locked transmitter is to remove the batteries.*

## Attaching/Removing a Microphone

The spring loaded coupler under the XLR jack maintains a secure fit to the microphone jack with continuous pressure applied by an internal spring.

To attach the microphone, simply align the XLR pins and press the microphone onto the transmitter until the coupler retracts and latches. A click sound will be heard as the connector latches.

To remove the microphone, hold the transmitter body in one hand with the microphone pointing upward. Use your other hand to rotate the coupler until the latch releases and the coupler rises slightly.



**NOTE:** Do not hold or apply any pressure to the microphone body while trying to remove it, as this may prevent the latch from releasing.

## Battery Installation

The HM transmitter is powered by two AA batteries. We recommend using lithium batteries for longest life. Lithium batteries provide over X hours of operation at room temperature.

**Note:** Standard zinc-carbon batteries marked “heavy-duty” or “long-lasting” are not adequate.

The battery status circuitry is designed for the voltage drop over the life of lithium batteries.

To install new batteries:

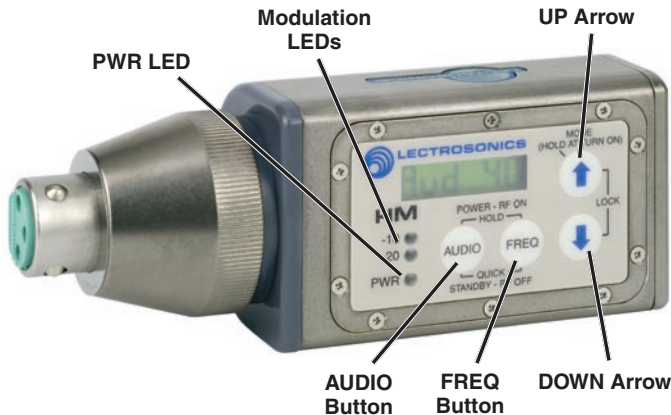
1. Slide open the Battery Cover and remove any old batteries.
2. Insert the new batteries into the housing. One battery goes in positive (+) end first, the other negative (-) end first. Look into the battery compartment to determine which end goes in which side. The side with the plastic ring is the side which accepts the positive end of the battery.
3. Slide the Battery Cover until it snaps securely shut.



# Operating Instructions

## Power Up and Boot Sequence

- 1) Ensure that good batteries are installed in the unit. (See *Battery Installation*.)
- 2) Simultaneously press and hold the AUDIO and FREQ buttons until the Power On Boot Sequence is initiated. (See Power On Timer.) As the unit turns on, the Modulation LEDs and PWR LED all glow red, then green, and then they revert to normal operation, i.e., the Modulation LEDs glow according to the audio level present at the Audio Input Jack and the PWR LED glows green (with good batteries).



The LCD displays a bootup sequence which consists of four screens:

Company Name:	Lectro
Frequency Block (bXX) and Firmware Version (rX.X):	b21r1.1 (typ)
Compatibility Mode:	CP 400 (typ)
Audio:	Aud 12 (typ)

## Power Down

- 1) Simultaneously press and hold the AUDIO and FREQ buttons while observing that the word "Off" appears in the LCD along with a counter.
- 2) When the counter reaches "0", the unit turns off.



Initial Power Off  
Timer Screen

**Note:** If the AUDIO and FREQ buttons are released before the LCD goes blank at the end of the countdown, the unit will not turn off. Instead, it will stay energized and the display will return to the previous screen.

- 3) If batteries are removed from the unit while it is turned on, the unit will be turned on when the batteries are replaced.

## Standby Mode

Standby Mode allows the user to verify or change the transmitter's operating frequency or audio input level without transmitting any signals. Standby Mode can only be invoked from a power off condition.

Quickly press and release both the AUDIO and FREQ buttons simultaneously to enter and exit this mode.

## Selecting the Compatibility Mode



400 Series or Digital  
Hybrid Wireless™  
Compatibility Mode

All Digital Hybrid Wireless® receivers are capable of working with the Lectrosonics HM transmitter. By selecting the proper compatibility mode, the SM will also work with 200 Series, 100 Series and IFB analog receivers, plus some other analog wireless receivers (contact the factory for details). Setting the Compatibility Mode of the transmitter to match the receiver is easily done via the Control Panel.

**Note:** RF transmission is prevented while selecting Compatibility Modes. Also, the HM exits the Compatibility Mode screen to Standby Mode. (See Standby Mode, this section.)

**Note:** The unit comes from the factory configured as a 400 Series transmitter.

- 1) Set the receiver's audio controls to minimum.
- 2) Power up the HM and observe the Boot Sequence. If the Compatibility Mode for the HM does not match the corresponding receiver, then power off the HM transmitter.
- 3) From a power off condition, hold down the Up arrow, then simultaneously press the AUDIO and FREQ buttons.
- 4) The LCD will display the current Compatibility Mode. Use the Up or Down arrow buttons to set the Compatibility Mode to match the corresponding receiver.

The following Compatibility Modes are available:

- 100 Series mode: CP 100
- 200 Series mode: CP 200
- Mode 3 (Contact dealer for details): CP 3
- 400 Series mode: CP 400
- IFB Series mode: CP IFB
- Mode 6 (Contact dealer for details): CP 6

- 5) The Compatibility Mode selected in Step 4 will be the current Compatibility Mode until reset using this procedure. Pressing the AUDIO or FREQ exits into Standby Mode. To power off from the compatibility mode screen, press AUDIO and FREQ together.

## Setting Transmitter Operating Frequency

The Operating Frequency of the HM can be displayed either in MHz or as a two-digit hexadecimal number. (See *Controls and Functions, FREQ Button.*) The HM's operating frequency can be set with the unit in Standby Mode or powered up for normal operation. Use the following procedure to change the Operating Frequency of the HM transmitter:



Frequency displayed in MHz



Frequency displayed as two-digit hexadecimal number

- 1) If the LCD is displaying something other than the Frequency Screen, press the FREQ button on the HM Control Panel to enter this screen.

*Note:* The default display is in MHz. Pressing the FREQ button again displays the operating frequency as a two-digit hexadecimal number that corresponds the equivalent Lectrosynics Frequency Switch Setting.

- 2) While holding the FREQ button, use the Up or Down arrow buttons to move the operating frequency up or down in 100 kHz increments from the current setting.

*Note:* The operating frequency displayed on the LCD wraps as it reaches the upper or lower end of its range. Thus, if you intend to move the operating frequency from the lower end of the range to the upper end, it may be faster to do this by using the Down arrow until the frequency wraps to the upper end.

Most Lectrosynics receivers indicate the operating frequency both in MHz and as a two digit hexadecimal number. This conforms to the Lectrosynics tradition of setting the operating frequency using two 16-position rotary switches. The HM offers the ability to set the operating frequency in a similar manner. Pressing the FREQ button while the LCD displays the operating frequency in MHz will change the display to show the equivalent two-digit hexadecimal frequency select switch setting. Simply use the UP or DOWN arrow to increase or decrease the operating frequency.

## Adjusting the Low Frequency Roll-off

Repeatedly press the AUDIO button until the LF roll-off adjustment screen appears. Then press and hold the AUDIO button while selecting the desired roll-off frequency with the UP and DOWN arrows.



The roll-off frequency can be set to 35, 50 or 70 Hz.

## Adjusting Gain

The control panel Modulation LEDs indicate the modulation level and limiter activity. Once set, the transmitter's audio level setting **should not** be used to control the volume of your sound system or recorder levels. This gain adjustment matches the transmitter gain with the microphone's output level, the user's voice level and the position of the microphone. The audio input level can be set with the unit in Standby Mode or while powered up in normal operation.

Signal Level	-20 LED	-10 LED
Less than -20 dB	● Off	● Off
-20 dB to -10 dB	● Green	● Off
-10 dB to +0 dB	● Green	● Green
+0 dB to +10 dB	● Red	● Green
Greater than +10 db	● Red	● Red

*Note:* Different voices will usually require different settings of the AUDIO 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.

- 1) With the HM powered off, insert the microphone plug into the Audio Input Jack, aligning the pins and ensuring that the connector locks.

*See the following page for suggestions on using the microphone connector and sleeve*

- 2) Place the transmitter in Standby Mode, or if the unit is to be powered up and adjusted, mute the main sound system prior to powering up the transmitter.
- 3) Position the microphone in the location where it will be used in actual operation.
- 4) Observe the audio level LEDs while speaking or singing into the microphone at the same voice level that will be used during the program. While holding the AUDIO button, press the UP or DOWN arrow buttons until the both the -20 and -10 LEDs glow green, with the -20 LED occasionally flickering red. This will maximize the signal to noise ratio of the system with full modulation and provide subtle limiting to prevent overload and audible compression of signal peaks.

*Note:* Setting the audio level too high reduces the dynamic range of the audio signal. Setting the audio level too low may cause hiss and noise in the audio.

- 5) If the unit was set up in Standby Mode, it will be necessary to turn the transmitter off, then power it up again in normal operation so the RF output will be on. Then the other components in the sound or recording system can be adjusted.

## About the Phantom Power Supply

Three phantom voltages are selectable from the control panel. The voltages are:

- 5 Volts for lavalier 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.
- 48 Volts for microphones that do in fact require a supply greater than 18 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 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, or are using a microphone that does not require phantom power, turn the phantom power off.

Phantom power should only be used with a fully floating, balanced device such as most microphones 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 HM is fully protected against such shorts but the batteries will be drained at twice the 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 HM 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 HM can also supply more than twice the current of competing 48 Volt plug on units and provide four times the current for some very high end 15 Volt microphones.

The 5 Volt setting is provided for lavalier microphones made by us and others. Do not power lavalieres from the 15 or 48 Volt setting as the microphone will most likely be destroyed. Lectrosonics makes an adapter, MCA5X, that will adapt our standard TA5F 5 pin microphones to the HM. This adapter also provides protection against excessive phantom voltage. If voltages higher than 5 Volts are applied to the adapter, a Zener diode 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 lavalier 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 lavalier.



## Accessories

### PHTRAN3

Replacement leather pouch with rotating belt clip and snap closure. Included with transmitter at purchase.



### MC5AX

Optional adapter for connecting a lavalier microphone to the HM transmitter. TA5M to XLR3-M connectors. Passes transmitter phantom power to bias the electret lavalier microphone. Includes zener protection to limit bias voltage to protect the microphone if transmitter phantom power is set too high.



# Troubleshooting

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

## SYMPTOM

## POSSIBLE CAUSE

### TRANSMITTER PWR LED OFF

- 1) Battery is inserted backwards or dead.
- 2) Transmitter not powered up. (See *Operating Instructions, Power UP and Boot Sequence.*)

### AUDIO LEVEL LEDs NOT LIGHTING

- 1) Gain control set to minimum.
- 2) Battery is dead or installed backwards. Check PWR LED.
- 3) Mic capsule is damaged or malfunctioning.
- 4) Mic cable damaged or mis-wired.

### RECEIVER RF INDICATOR OFF

- 1) Transmitter not turned on, or is in Standby Mode.
- 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) Transmitter and receiver not on same frequency block.
- 6) Operating range is too great.
- 7) Defective transmitter antenna - unit needs repair.

### NO SOUND (OR LOW SOUND LEVEL), RECEIVER INDICATES PROPER AUDIO MODULATION

- 1) Receiver output level set too low.
- 2) Receiver output disconnected, or cable defective or mis-wired.
- 3) Sound system or recorder input is turned down.

### DISTORTED SOUND

- 1) Transmitter gain (audio level) is far too high. Check HM LEDs and receiver audio levels as HM is being used.
- 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. (Use the receiver's Tone function to check level.)
- 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 operating frequency on receiver and transmitter match.
- 5) Receiver/Transmitter Compatibility Mode mismatched.

### EXCESSIVE FEEDBACK

- 1) Transmitter gain (audio level) too high. Check gain adjustment and/or reduce receiver output level.
- 2) Talent standing too close to speaker system.
- 3) Mic is too far from user's mouth.

**SYMPTOM****POSSIBLE CAUSE****HISS AND NOISE -- AUDIBLE DROPOUTS**

- 1) Transmitter gain (audio level) far too low.
- 2) Receiver antenna missing or obstructed.
- 3) Transmitter antenna broken or missing.
- 4) Operating range too great.
- 5) Signal interference. Turn off transmitter. If receiver's signal strength indicator does not drop to nearly zero, this indicates an interfering signal may be the problem. Try a different operating frequency.

**“Loc” APPEARS IN DISPLAY WHEN ANY BUTTON IS PRESSED**

- 1) Control Panel is locked. (See *Operating Instructions, Locking and Unlocking the Control Panel.*)

**“Hold” APPEARS IN DISPLAY WHEN ARROW BUTTONS ARE PRESSED**

- 1) Reminder that it is necessary to hold down the AUDIO or FREQ button to make adjustments to the audio gain or frequency settings.

**“PLL” APPEARS IN DISPLAY**

- 1) Indication that the PLL is not locked. This is a serious condition that requires factory repair. It may be possible to operate on another frequency far removed from the one that was selected when the unlocked condition was indicated.



# Specifications and Features

## Operating frequencies:

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

(Frequency usage varies by country)

<b>Frequency range:</b>	256 frequencies in 100 kHz steps for one 25.5 MHz wide block
<b>Channel Spacing:</b>	100 kHz
<b>Frequency selection:</b>	Control panel mounted membrane switches
<b>RF Power output:</b>	100 mW (nominal)
<b>Compatibility Modes (6)</b>	Digital Hybrid Wireless™ (400 Series), 200 Series, 100 Series, Mode 3 (other analog), Mode 6, and IFB
<b>Pilot tone:</b>	25 to 32 kHz; 5 kHz deviation (in 400 Series Mode)
<b>Frequency stability:</b>	± 0.002%
<b>Deviation:</b>	± 75 kHz max. (in 400 Series Mode)
<b>Spurious radiation:</b>	60 dB below carrier
<b>Equivalent input noise:</b>	-125 dBV, A-weighted
<b>Input level:</b>	
<b>If set for dynamic mic:</b>	0.5 mV to 50 mV before limiting. Greater than 1 V with limiting.
<b>If set for electret lavalier mic:</b>	1.7 uA to 170 uA before limiting. Greater than 5000 uA (5 mA) with limiting.
<b>Line level input:</b>	17 mV to 1.7 V before limiting. Greater than 50 V with limiting.
<b>Input impedance:</b>	300 Ohms
<b>Input limiter:</b>	Soft limiter, 30 dB range
<b>Gain control range:</b>	44 dB; panel mounted membrane switches
<b>Modulation indicators:</b>	Dual bicolor LEDs indicate modulation of -20, -10, 0, +10 dB referenced to full modulation.
<b>Controls:</b>	Control panel with LCD and four membrane switches.
<b>Low frequency roll-off:</b>	Selectable; -3dB at 35, 50 or 70 Hz.
<b>Audio Frequency Response:</b>	35 Hz to 20 kHz, +/-1 dB (The low frequency roll-off is adjustable)

<b>Signal to Noise Ratio (dB):</b> (overall system, 400 Series mode)	SmartNR	No Limiting	w/Limiting
(Note: the dual envelope "soft" limiter provides exceptionally good handling of transients using variable attack and release time constants. The gradual onset of limiting in the design begins below full modulation, which reduces the measured figure for <i>SNR without limiting</i> by 4.5 dB)	OFF	103.5	108.0
	NORMAL	107.0	111.5
	FULL	108.5	113.0

<b>Total Harmonic Distortion:</b>	0.2% typical (400 Series mode)
<b>Audio Input Jack:</b>	3-pin Female XLR
<b>Phantom Power:</b>	5V @ 18 mA max., 15V @ 15 mA max. and 48 V @ 4 mA max., plus "OFF"
<b>Antenna:</b>	Housing and attached microphone form the antenna
<b>Batteries:</b>	Two 1.5 Volt AA lithium or rechargeable NiMH recommended
<b>Battery Life:</b>	4.5 hours (alkaline); 12 hours (lithium), 8 hours with 2500mAh NiMH
<b>Weight:</b>	6.7 oz (190 grams) without batteries
<b>Overall Dimensions:</b>	4.25x1.62x1.38 inches

**Emission Designator:** 180KF3E

Specifications subject to change without notice.

The FCC requires that the following statements be included in this manual:

*For body worn operation, this HM Transmitter has been tested and meets the FCC RF exposure guidelines when used with the Lectrosonics accessories supplied or designated for this product. Use of other accessories may not ensure compliance with FCC RF exposure guidelines. Contact Lectrosonics if you have any questions or need more information about RF exposure using this product..*

*This device complies with FCC radiation exposure limits as set forth for an uncontrolled environment. This device should be installed and operated so that its antenna(s) are not co-located or operating in conjunction with any other antenna or transmitter.*

## 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 the interconnecting cables and then go through the **Troubleshooting** section in this 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

For timely service, please follow the steps below:

- A. DO NOT return equipment to the factory for repair without first contacting us by email 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 A.M. to 4 P.M. (U.S. 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.

#### Lectrosonics USA:

**Mailing address:**

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

**Shipping address:**

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

**Telephone:**

(505) 892-4501  
(800) 821-1121 Toll-free  
(505) 892-6243 Fax

**Web:**

www.lectrosonics.com

**E-mail:**

sales@lectrosonics.com

#### Lectrosonics Canada:

**Mailing Address:**

49 Spadina Avenue,  
Suite 303A  
Toronto, Ontario M5V 2J1

**Telephone:**

(416) 596-2202  
(877) 753-2876 Toll-free  
(877-7LECTRO)  
(416) 596-6648 Fax

**E-mail:**

Sales: colinb@lectrosonics.com  
Service: joeb@lectrosonics.com





## 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 liability 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.

