

**INO** *mini*  
**634**

## AM Broadcast Receiver

### Installation & User Guide

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## INOVONICS WARRANTY

- I TERMS OF SALE:** Inovonics products are sold with an understanding of “full satisfaction”; that is, full credit or refund will be issued for products sold as new if returned to the point of purchase within 30 days following their receipt, provided that they are returned complete, and in “as received” condition.
- II CONDITIONS OF WARRANTY:** The following terms apply unless amended *in writing* by Inovonics, Inc.
- A. The Warranty Registration Card supplied with the product *must* be completed and returned to Inovonics, or the Warranty registered online at [www.inovonicsbroadcast.com](http://www.inovonicsbroadcast.com), within 10 days of delivery.
  - B. The Warranty applies only to products sold “as new.” It is extended only to the original end-user and may not be transferred or assigned without prior written approval by Inovonics.
  - C. The Warranty does not apply to damage caused by misuse, abuse, accident or neglect. This Warranty is voided by unauthorized attempts at repair or modification, or if the serial identification tag has been removed or altered.
- III TERMS OF WARRANTY:** Inovonics, Inc. products are warranted to be free from defects in materials and workmanship.
- A. Any discrepancies noted within THREE YEARS of the date of delivery will be repaired free of charge, or the equipment will be replaced with a new or remanufactured product at Inovonics’ option.
  - B. Parts and labor for factory repair required after the three-year Warranty period will be billed at prevailing prices and rates.
- IV RETURN OF GOODS FOR FACTORY REPAIR:**
- A. Equipment will not be accepted for Warranty or other repair without a Return Authorization (RA) number issued by Inovonics prior to its return. An RA number may be obtained by calling the factory. The number should be prominently marked on the outside of the shipping carton.
  - B. Equipment must be shipped prepaid to Inovonics. Shipping charges will be reimbursed for valid Warranty claims. Damage sustained as a result of improper packing for return to the factory is not covered under terms of the Warranty and may occasion additional charges.

(Nothing brilliant here either.)

## Section I

### INTRODUCTION

#### **Product Description**

The INOmini 634 is an off-air receiver for standard, medium-wave analog radio broadcasts and targets professional 'confidence-monitoring' applications.

The front-panel, back-lighted LCD display is host to various menu screens, which facilitate easy setup of the 634 and display various parameters of received signal quality.

#### **Product Features**

Features of the Inovonics 634 include:

- Sensitive and selective DSP-based receiver tunes in either 10kHz (American) or 9kHz (European) increments.
- Easy setup using the LCD screen and jog-wheel navigation of the receiver's menu tree.
- Accurate display of received signal strength and audio levels.
- Analog and AES-digital program line outputs.
- Front-panel alarms with rear-panel 'tallies' for Carrier Loss and Audio Program Loss.

## **Product Specifications**

**Tuning Range:** 520kHz - 1710kHz in 10kHz steps, or  
531kHz - 1611kHz in 9kHz steps

**Antenna Input:** High impedance (whip antenna) input (F),  
phantom-powered for optional active outdoor antenna

**Receiver Sensitivity:**  $\leq 10\mu\text{V}$  for 50dB S/N

**IF Bandwidth:** Selectable at 6kHz, 4kHz, 3kHz, 2kHz; see  
graph on Page 12

**Audio Frequency Response:** 50Hz - 6kHz at full band-  
width

**De-Emphasis:** NRSC ('truncated' 75 $\mu\text{s}$ ) or OFF

**Program Audio Output(s):** +4dBu balanced "dual monaural"  
Analog Left and Right, (XLR), 200-ohm source imped-  
ance; AES Digital (XLR), 44.1kHz sampling rate; Front-  
Panel Headphone Jack (3.5mm TRS)

**Alarm Tallies:** Individual open-collector NPN transistor  
outputs for Carrier Loss and Audio Loss

**Power Requirement:** 12VDC at 140mA. A 'wall-outlet  
transformer' (WallWart<sup>®</sup>) switching-type power supply  
appropriate to the destination AC mains voltage is pro-  
vided.

**Mounting Options:** An optional rack adapter accepts up to  
three INOmini modules in a 1U, 19-inch rack space, or  
the 634 may easily be fastened to any convenient surface  
with two small screws.

**Size and Weight:** 1.6"H x 5.5"W x 5.5"D; 4 lbs. shipping  
weight.

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## Section V

### TECHNICAL MATTERS

#### **Firmware Version**

With the 634 powered-up and operational, hold down the jog wheel knob for 5 to 10 seconds. The menu screen you have been viewing will be replaced by the 634 Firmware screen. This shows the firmware version installed in your unit, information that may prove important when communicating with the factory. Turning the knob will reveal the version of the DSP radio chip. Push the knob again to return to the Menu Screens.

#### **'Under the Hood'**

The Model 634 receiver is simple and small, utilizing mostly surface-mounted (SMD) components. Many of these are application-specific and/or pre-programmed at the factory, but all of them are impossibly tiny. This makes servicing the unit in the field a difficult proposition at best. For these reasons, and also because of the small format of this manual, we have dispensed with schematic diagrams, servicing instructions and a listing of component parts.

Having said that, our policy has always been one of 'full disclosure.' We feel that, unless we are doing something nefarious or in the interest of national security, there should never be a reason to hide information from the user. With a clear conscience, and upon request, we will cheerfully provide additional documentation and divulge all but the very darkest secrets concerning any Inovonics product.

Because it is so small and light, returning the 634 receiver for factory servicing or for firmware upgrades is an option that we encourage. Inovonics has never considered factory repair charges a significant source of revenue, and we are confident that you will be astonished at how reasonable our rates actually are!

## Section II

### INSTALLATION AND CONNECTION

#### **Unpacking and Inspection**

Immediately upon receipt of the 634 receiver, inspect for any possible shipping damage. If damage is found or suspected, notify the carrier at once, and then contact Inovonics.

We recommend that you set aside the original shipping carton in the event that return for Warranty repair is required. Shipping damage sustained as a result of improper packing for return may invalidate the Warranty!

#### **Warranty Registration**

Please complete the Warranty Registration process. Not only does registration assure coverage of the equipment under terms of the Warranty (printed inside the back cover of this manual), but the user automatically receives any specific service and modification instructions, including software/firmware updates. Register online at:

[www.inovonicsbroadcast.com/product-registration](http://www.inovonicsbroadcast.com/product-registration)

#### **Mounting**

The Model 634 receiver is packaged in a compact 'clamshell' chassis that defines the standardized Inovonics' INOmini module. The 634 may simply be set on top of an existing piece of rack-mounted equipment, as long as at least 1U of panel space is left open *above* the rack-mounted 'host' to access the receiver. Alternatively, a pair of mounting holes on the chassis base allows the 634 to be fastened to the inside of an equipment rack cabinet with two #4 screws.

An optional rack-mount kit is available for the 634, which can house up to three INOmini modules. The kit comes with blanking panels for unused spaces, and with two 'daisy-chain' power cables so that two or three INOmini modules may share a single supply.

## **AC Mains Power**

All Inovonics INOmini modules are supplied with an out-board switching-type power supply suited to the destination mains voltage. As the actual power consumed by the receiver is 140mA at 12 volts DC, a second DC connector on the rear panel of the 634 allows the user to 'daisy-chain' INOmini modules. This means that two or more units may be fed from the same AC supply, but with the caution that the total input power specification of a given assortment of INOmini modules must not exceed the current rating noted on the power supply label.

## **Battery Operation**

The 634 receiver may optionally be powered by either a wet or a sealed (gel) 12-volt lead/acid battery. The nominal input voltage should never exceed 15V, and protection should be afforded against voltage surges from charging circuits.

## **Radio Frequency Interference (RFI)**

Although we have anticipated that the 634 receiver may be used near broadcast transmitters, please do practice reasonable care in locating the unit away from *abnormally* high RF fields.

## **Optional Active Outdoor Antenna**

Despite the advanced technology afforded by software-defined DSP architecture, this revolutionary topology is not particularly good at rejecting strong signals at frequencies close to the target frequency. A strong carrier several channels away from the desired signal may desensitize the 634 markedly.

Inovonics offers a rugged outdoor active loop antenna with a 'figure-eight' pickup pattern that can null an interfering signal. The 634 automatically provides phantom power to the antenna circuitry.

## **The Front-Panel Display and Menu Knob**

The front-panel MENU knob scrolls the LCD through the various viewing and programming options. Please refer to Section III of this manual for easy setup and receiver programming instructions.

steep rolloff help preserve voice intelligibility even with the lowest, 2kHz, cutoff frequency.

## **Channel Spacing** (Menu Screen 9)

In medium-wave AM broadcasting, transmitting frequencies are ordered either at 10kHz intervals (in the Americas) or at 9kHz intervals (the rest of the world). This AM Spacing Menu Screen selects between the two standards.

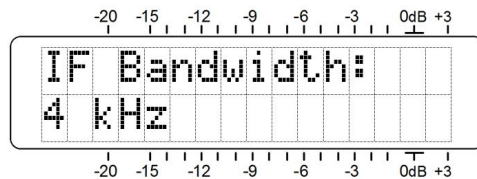
## NRSC De-Emphasis (Menu Screen 7)

Back in the 1990s, the National Radio Systems Committee (NRSC) defined a complementary high frequency pre-emphasis and de-emphasis characteristic for AM broadcasting in the US, similar to what's used in FM worldwide. The turnover and slope are actually a compromise between the 50 $\mu$ s (microsecond) European FM standard and the more precipitous 75 $\mu$ s American standard. It's called a 'truncated' 75 $\mu$ s curve.

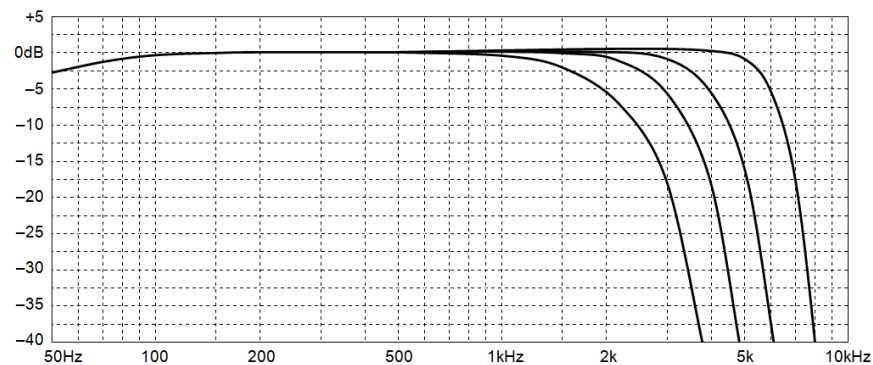
Menu screen 7 is used to set receiver De-Emph: to NRSC or to OFF. Your decision here should probably be based on how the audio sounds to you, rather than on orthodoxy, and on how you set the next variable discussed.

## Reception Bandwidth (Menu Screen 8)

Menu Screen 8 selects the receiver's reception bandwidth, imprecisely referred to here as 'IF' bandwidth, equating it with the more familiar analog-radio term.



The frequency choices are 6kHz, 4kHz, 3kHz and 2kHz. These are the approximate -6dB points in each case, with a very precipitous drop above the turnover frequencies as shown below.



Bandwidth restriction is used almost exclusively to reduce noise, the bane of AM radio broadcasting. 6kHz is the closest to a "Hi-Fi" setting for the 634. The rapid turnover and

## Headphone Jack

The front-panel PHONES jack will accommodate stereo headphones of virtually any impedance with a 3.5mm stereo plug. When headphones are plugged in, the LCD menu will automatically go to the HEADPHONE VOL screen, and the front-panel knob will adjust the listening level. When you have set the volume to a comfortable level, push the knob to return to the previous menu.

## Rear Panel Connections

### ANTENNA

The rear-panel 'F' connector is a high impedance antenna input. A short whip or random wire should prove acceptable in a high-signal situation, such as co-located with a transmitter. Otherwise we recommend the optional companion outdoor active loop antenna available from Inovonics.

### G +5 A C

These are alarm "tally" outputs for remote indication of reception problems. Designations are also noted on the rear panel and stand for Ground, +5 DC volts, Audio Loss and Carrier Loss.

The two alarm outputs are the collectors of NPN transistors that saturate to ground for an alarm condition. Up to 100mA may be 'sunk' by each of these outputs to operate relays or LED indicators using an external voltage source up to 24VDC, which must be returned to the G (Ground) terminal. The +5VDC supplied on the +5 terminal is current-limited with a 100-ohm series resistor and suitable only for optical couplers, LED indicators or small reed relays.

The plastic connector body may be unplugged from the chassis to make connection easier and for quick disconnect.

#### AES DIGITAL AUDIO OUTPUT

The balanced, transformer-isolated AES digital audio output has a fixed sampling rate of 44.1kHz. 100% carrier modulation equates to -3dBFS.

#### ANALOG LINE OUTPUTS L/R

The active-balanced analog line outputs are marked LEFT and RIGHT, but are in fact dual *monaural* outputs. They provide a program level of +4dBu at 100% carrier modulation and have a 200-ohm source impedance.

#### +12VDC POWER I/O

These two parallel connectors allow 'daisy-chaining' INOmni modules. This allows one DC supply to power up to three modules mounted in a single rack adapter, provided that the rating of the supply is not exceeded. Two short 'pig-tail' cables are provided with each rack adapter.

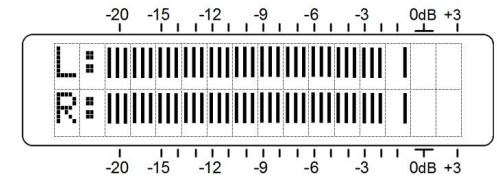
The Model 634 receiver draws 140mA. Check the rating on the label of the power supply to make sure it has enough oomph for the modules it must support.

These power connectors are not a locking type, and the mating plugs do pull out rather easily. A Ty-Wrap® will secure the cables to the plastic anchor above the jacks if this is foreseen as a problem.

used to actuate a relay, light an LED at a remote location or tie-in to a remote control system.

#### Program Audio Levels (Menu Screen 5)

Menu Screen 5 gives a redundant bargraph presentation of *monaural* program audio levels. This is a peak-responding meter with a floating peak-hold function.



Although L: and R: (Left and Right) levels are shown here, the "stereo" outputs are simply for interconnect convenience, as most broadcast plants are wired for stereo whether the programming is or not. The two 634 outputs are the same, and the meters will indicate identical levels as well.

100% carrier modulation is denoted by the large block opposite the 0dB marking on the panel. The meter resolves +1, +2 and +3dB above 0dB. Below 0dB the scale is linear in 0.5dB steps down to -15dB, and then in 1dB steps to -21dB.

0dB represents 100% *symmetrical* amplitude modulation of the carrier. 400Hz sinewave modulation of the transmitter to the 100% point would take the meters to 0dB. At higher audio frequencies the receiver audio response (IF bandwidth and de-emphasis) must necessarily be factored into the reading.

Indications above 0dB may be noted when asymmetrical modulation yields higher positive peaks, as allowed by FCC (and other authority) rulings, or by impulse noise riding atop the audio program.

#### Headphone Monitoring (Menu Screen 6)

A front-panel PHONES jack offers a convenient monitoring point for 634 setup and casual listening. Whenever a pair of headphones is plugged into the front-panel jack, the LCD screen automatically goes to Menu Screen 6. HEADPHONE VOL will begin blinking and the panel knob may be adjusted for a comfortable listening level.

The LCD shows an arbitrary numerical value and a bargraph representation of the headphone volume. Once volume is set, push the knob to save the preference to memory and to return the screen to the last menu on display.



LOW SIGNAL alarm, so be sure to verify a proper alarm setting when the station is legitimately off the air.

When the proper trigger point has been determined and set, push the knob again to fix the alarm point in memory and to release the menu.

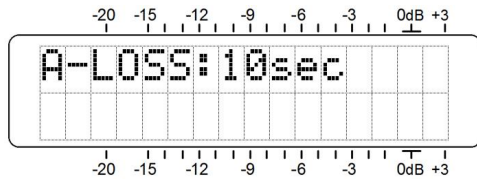
### **Signal-to-Noise** (Menu Screen 3)

SN gives a relative approximation of the signal-to-noise quality of the tuned signal. This measurement takes various signal quality factors into account, but is valid only when the carrier is unmodulated. Again a numerical value is assigned to the SN readout, but it only denotes the number of active bargraph segments.

No hard-and-fast rule can be derived from this display, except for “more is better.” Remember: this measurement is meaningless when the carrier is modulated by program audio.

### **The Audio Loss Alarm** (Menu Screen 4)

Navigate to this Screen and push the knob. A-LOSS will begin to blink. Turn the knob to dial-in the desired audio loss alarm delay time, which is the time in seconds between the onset of ‘dead air’ and a flashing LCD and rear-panel alarm. The delay may be programmed in one-second increments up to 2 minutes. You may turn the knob completely counterclockwise to OFF to deactivate the alarm altogether.



The trip point of the audio loss alarm is fixed at a program peak level about 15dB below 100% modulation. Even lightly-processed programming will have peaks that exceed this level regularly. Do consider the dynamics of the broadcast format when setting this delay, however. A phone-in talk format could have occasional long pauses and suggest a setting of 15 or 20 seconds. Most other AM fare (news, sports and syndicated talk programming) would allow a shorter timeout.

The rear-panel A (audio-loss) terminal is an NPN transistor saturation to ground for this alarm. This ground may be

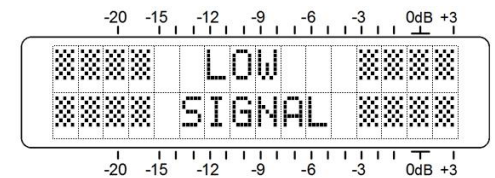
## Section III

# OPERATING THE 634 RECEIVER

### **Hey, why is the screen flashing?**

The 634 has two alarms that indicate reception problems. These are detailed later in this section, but you may encounter one or both as soon as you power up the receiver. These alarms identify a problem and flash lighted blocks on and off, making the alarm quite visible even across the room.

If the 634 has not yet been set up for use, the LOW SIGNAL and/or AUDIO LOSS alarms will begin to flash soon after the receiver is powered



up. If you push or turn the knob, you will get a few seconds respite from the flashing, enough time to navigate to any of the setup menus. Of course, once a station has been tuned-in properly the alarm condition will be reset.

Whenever you are in the ‘edit mode’; that is, you have entered a menu to edit (make a change to) a setup item, the front-panel flashing alarm is inhibited while that parameter is being programmed. The edit mode times out after 30 seconds if no entry is made, and a flashing alarm will cancel the edit mode as well.

The rear-panel tally outputs will always be active for the duration of an alarm, even when front-panel flashing is temporarily inhibited.

**NOTE:** Flashing alarms are not to be confused with ‘blinking’ menu callouts that indicate options for editing.

### **Menu Navigation Basics**

By the time you’ve read this, you’ve probably already figured out the 634 receiver menu for yourself; it’s really quite intuitive. Quite simply: 1) *turn* the knob to navigate from one menu to the next, 2) *push* the knob to enter any menu associated with receiver setup, 3) *turn* the knob to set a val-

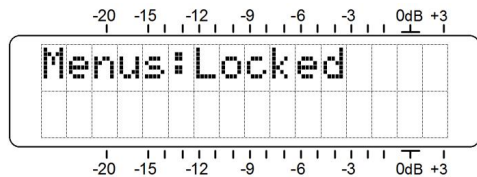
ue, and then 4) *push* again to accept the selection, send it to non-volatile memory, and return to menu navigation.

In setup menus, any parameter that can be edited will begin blinking when the knob is pushed. Blinking indicates that a different option or value may be selected. Turn the knob to make your choice, and then push once again to transfer that selection to memory.

Each Model 634 menu screen will be discussed separately and in order, except that the last menu is discussed first, as it could be a show-stopper!

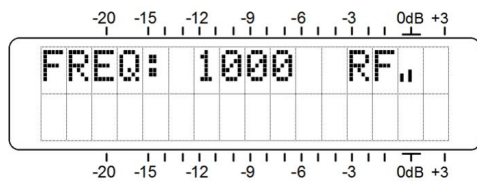
### Locked Menus (Menu Screen 10)

To guard against inadvertent menu editing or casual tampering, the very last menu in the sequence lets the user lock-out the knob from the editing mode. If you find that when you push the knob you are unable to enter the menu to change a receiver setup parameter, go all the way to Menu Screen 10, shown here. Push the knob and the word `Menus` will begin blinking. You can then turn the knob to select `Menus:Unlocked` and push the knob again to set this selection. From there you may navigate back to whichever screen you were trying unsuccessfully to edit.



### Tuning the Receiver (Menu Screen 1)

When power is applied to the 634 receiver, a 'splash screen' with the product ID pops up immediately on the LCD. Within a few seconds this will revert to Menu Screen 1, shown here as it might appear when the receiver is first powered-up, but before it has been programmed.



Push the knob and `FREQ` will begin to blink. Now the receiver may be tuned by turning the knob. A series of bars to the right of `RF` will give a rudimentary display of incoming carrier strength.

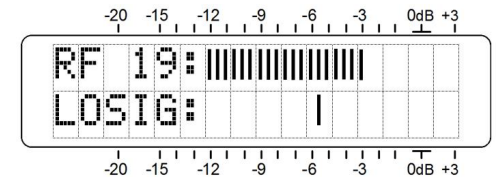
Once the receiver is tuned, push the jog wheel. `FREQ` will stop blinking and the tuned frequency will be transferred into non-volatile memory. This releases the jog wheel to navigate to other menus.

### Carrier Strength and Alarm (Menu Screen 2)

The `RF` bargraph at the top of this menu screen shows incoming signal level. There is an `RF` numerical value given as well, but this number merely represents the number of active bargraph segments. This number may nonetheless be used as a comparative reference.

The `RF` display is only a *relative* indication of the AM carrier strength and has no association with the dB scale beside the LCD window. The dB scales are used only for audio level measurements in Menu Screen 5.

The lower LCD scale is labeled `LOSIG:` and has a single tic mark off to the right. Push the jog wheel and `LOSIG` will begin to blink. As you turn the knob note that the single tic mark can be positioned anywhere beneath the upper `RF` bargraph.



During normal receiver operation, whenever the `RF` bargraph falls below the tic mark, `LOW SIGNAL` will flash on the LCD screen and a carrier-loss alarm will be sent to the rear-panel connector. The rear-panel C (carrier-loss) terminal gives an NPN transistor saturation to ground on this alarm, which may be used to actuate a relay, light a remote LED indicator or tie into a remote control system.

As a starting point, you might set the carrier-loss trigger point about a quarter of the way down from the top of the `RF` bargraph as is the illustration above. This should allow for typical signal fading as the station's sky wave kicks in at sundown, but will still alert the user to a valid carrier loss or transmitter power problem. Of course if you cut transmitter power at sundown you may have to select a compromise value between the two carrier levels.

Background noise level at the receiver location is another factor to consider too. Receiver AGC may bring up a distant co-channel signal or random noise enough to hold off the