

INO^{mini} 679

FM / HD Radio Receiver

Installation & User Guide



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Section I

INTRODUCTION

Product Description

The INOmini 679 is an FM and FM/HD Radio® receiver for professional off-air broadcast monitoring. It receives standard analog-FM broadcast transmissions as well as FM-band HD Radio HD1 through HD8 digital broadcasts.

Analog and digital FM programs are each accompanied by digitized text and housekeeping ‘metadata.’ Analog-FM RDS (Radio Data System) and digital-HD Radio PAD (Program-Associated Data) may be displayed on the front-panel LCD, along with incoming signal quality metrics and INOmini 679 setup parameters.

Product Features

Features of the Receiver include:

- Reception of all standard FM and FM-band HD Radio broadcasts.
- Stays on-channel and retains the reception mode through power and signal interruptions; *does not blend* between FM and HD1 programs.
- Easy setup using the LCD screen and jog-wheel navigation of the receiver’s menu tree.
- Direct display of RT+ ‘tagging’ data.
- Independently adjustable analog L/R and AES-digital program line outputs.
- ‘Split Mode’ audio monitoring aids transmission diversity delay setup
- Front-panel alarms with rear-panel ‘tallies’ for HD Loss, Low Signal and Audio Loss.
- Accurate front-panel program audio level display.
- Front-panel headphone jack with adjustable volume.
- When issued, free firmware updates are easily installed in the field.

Product Specifications

Tuning Range: Tunes 87.5MHz-107.9MHz in 100kHz steps.

HD Radio Channels: Selectable HD1 through HD8.

Antenna Input: 75-ohm (F).

Receiver Sensitivity: 10µV for 50dB monaural FM S/N

Audio Response:

Analog FM Mode: ±1dB, 30Hz-15kHz; 75µs or 50µs menu-selectable de-emphasis.

HD Radio Mode: ±0.25dB, 20Hz-20kHz.

FM Stereo Modes: Stereo / Stereo Auto-Blend / Forced-Mono.

Program Audio Output(s):

Balanced Analog: (XLR) balanced Left and Right, adjustable from -15dBu to +15dBu in 0.1dB steps.

AES Digital: (XLR) output at 44.1kHz is adjustable from -30dBFS to 0dBFS in 0.1dB steps.

Front-Panel Headphone Jack: (3.5mm TRS) with adjustable listening level.

Flashing Panel Alarms:

HD Loss: Responds with alarm when a monitored HD channel is lost.

Low Signal: Alarm and reset trigger levels are adjustable relative to the RF signal level display.

Audio Loss: Alarm threshold is adjustable between 0dB and -30dB; delay interval is adjustable between OFF and 120 seconds.

Alarm Tallies: Individual open-collector NPN transistor outputs for HD Loss, Low Signal and Audio Loss are programmable for logic polarity.

USB Port: A front-panel mini-USB port enables easy firmware updates.

Power Requirement: 12VDC at 325mA; a universal 90-240VAC inline switching power supply is provided.

Mounting Options: An optional rack adapter accepts up to three INOmini modules in a 1U, 19-inch rack space. The INOmini 679 may also 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.

Section II

INSTALLATION AND CONNECTION

Unpacking and Inspection

Immediately upon receipt of the INOmini 679, inspect for 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 materials should return for Warranty repair become necessary. 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 and firmware updates. Register online at:

www.inovonicsbroadcast.com/productRegistration

Mounting

The INOmini 679 FM/HD Radio Monitor Receiver is packaged in a compact 'clamshell' chassis that defines Inovonics' standardized INOmini module. The unit 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 679 to be fastened to the inside of an equipment rack cabinet with two #4 self-tapping screws.

An available optional rack-mount kit 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 power supply.

AC Mains Power

Each Inovonics INOmini module is supplied with an out-board universal, 90-240VAC switching-type power supply. As the actual power consumed by the INOmini 679 is 325mA at 12 volts DC, a second DC connector on the rear panel 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 INOmini 679 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 INOmini 679 will be used in a broadcast environment, please do practice reasonable care in locating the unit away from *abnormally* high RF fields.

Antenna Considerations

Despite the advanced technology afforded by software-defined DSP receiver architecture, this revolutionary topology is not particularly good at rejecting strong signals that are very close to the target frequency. A strong adjacent-channel carrier may require the use of a band-pass or band-reject filter to ensure solid reception of the desired signal.

The Front-Panel Display and Menu Knob

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

Headphone Jack

The front-panel mini-phone 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 switch to the HEADPHONE VOL screen where you can adjust listening volume with the knob. Once you have set the volume to a comfortable level, push the knob to return to the previous menu.

Rear Panel Connections

ANTENNA	The antenna input is a US-standard 75-ohm 'F' connector. Inexpensive, ready-made cables of various lengths are common in this format, and adapters for other RF connector types are readily available.
G H L A	<p>These are alarm "tally" outputs for remote indication of reception problems. Designations noted on the rear panel stand for Ground, HD Loss, Low Signal and Audio Loss.</p> <p>The three alarm outputs are the collectors of NPN transistors that saturate to ground. The output polarity is programmable for either a ground or an open circuit for an alarm condition. These outputs can sink up to 100mA to operate relays or LED indicators using an external voltage source up to 24VDC, which must be returned to the G (Ground) terminal.</p> <p>The plastic connector body may be unplugged from the chassis to make connection easier and for quick disconnect.</p>
ANALOG LINE OUTPUTS L/R	These are active-balanced analog line outputs with a 200-ohm source impedance. The program audio level is menu-adjustable from -15dBu and +15dBu, corresponding to 100% peak modulation of a monaural FM carrier, or 0dB (-3dBFS) HD Radio modulation.
AES DIGITAL AUDIO OUTPUT	The balanced, transformer-isolated AES digital audio output has a fixed sample rate of 44.1kHz, a rate common to most

+12VDC
POWER I/O

devices associated with HD Radio installations. The audio level is menu-adjustable between -30dBFS and 0dBFS, corresponding to 100% peak modulation of the FM carrier or 0dB (-3dBFS) HD Radio modulation.

Two paralleled coaxial power connectors allow 'daisy-chaining' INOmini 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 'pigtail' cables are provided with each rack adapter.

The INOmini 679 draws 325mA. Check the rating on the label of the power supply to make sure it has sufficient capacity for all modules it must support.

These power connectors are not a locking type, and the mating plugs pull out rather easily. A Ty-Wrap® can secure the cables to the plastic anchor above the jacks.

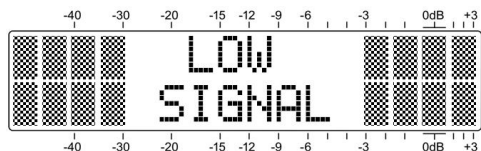
Section III

OPERATING THE INOmini 679

Hey, why is the screen flashing?

The INOmini 679 activates alarms for various reception problems, which are detailed later in this section. But you may encounter an alarm shortly after you power-up the unit. These alarms identify the condition, flashing their warning against a red background, quite visible even across the room.

If you have not yet set-up the unit for use, the LOW SIGNAL and/or the 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' breather 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 change is made.

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

NOTE: Do not confuse flashing alarms with 'blinking' menu callouts, which indicate options for editing.

Menu Navigation Basics

By the time you've read this, you've probably already figured out the INOmini 679 menu for yourself, being as intuitive as it is. Quite simply: 1) *turn* the knob to navigate from one menu to the next, 2) *push* the knob to enter any menu associated with setup, 3) *turn* the knob to make a selection

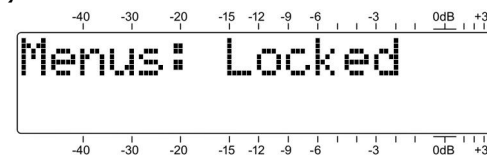
or to set a value, and then 4) *push* again to accept the selection and lock it into non-volatile memory and to return to normal menu navigation.

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 INOmini 679 menu screen will be discussed separately and in order, except that the last menu is discussed first, as it could hinder your progress.

Locked Menu (FM Menu Screen 17, HD Menu Screen 18)

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 setup selection, go all the way to the last Menu Screen, shown here. Push the knob and `Menus` will start to blink. 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 wanted to edit.



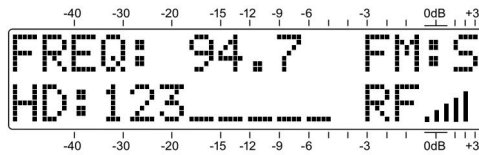
FM and HD Radio Menu Screens Explained

Some INOmini 679 menu screens are common to both the FM and HD Radio reception modes, and others are specific to one mode or the other. Common menus are at the beginning of the sequence. FM-specific and HD-specific menus are interspersed, FM menus generally detailed first.

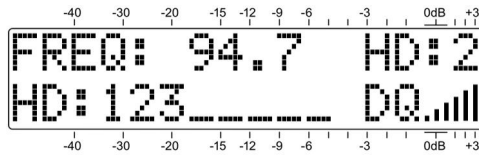
Setting the Frequency and Mode (Menu Screen 1)

When power is applied to the INOmini 679, a 'splash screen' with the product ID pops up immediately on the LCD. Within a few seconds this will revert to one version or the other of Menu Screen 1.

If the INOmini 679 was previously used in the FM reception mode, it will return to this same mode on power-up and show this FM version of Menu Screen 1.



However, if the unit had last been used to monitor an HD Radio channel, it will wake up in the HD Radio mode with this alternate Menu Screen 1.



The top line shows the frequency of the station and, if monitoring the FM broadcast, whether it is being received in FM:S (FM/stereo), FM:B (a 'blended,' noise-reducing mode for FM), or FM:M (FM/monaural). Selection of these options is discussed on Page 14.

The top line of the alternate, HD-mode screen replaces FM: with HD: and shows which HD Radio channel you are tuned to by number.

The second menu line lists all the HD Radio channels being broadcast by the station you are tuned to. If there is no HD Radio activity, HD:None will be indicated. HD:Sync... is displayed as the receiver acquires lock.

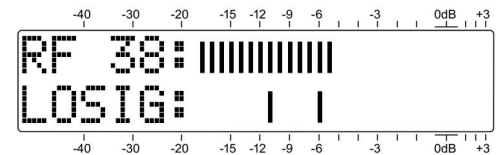
When receiving FM, the RF: bargraph is a rough measurement of incoming signal level. In the HD Radio reception mode RF: is replaced by DQ: (Digital Quality), an indication of digital reception integrity.

Push the knob once and FREQ will blink. Turn the knob to tune-in the desired station. Push the knob a second time to lock the frequency into memory. This maneuver will also cause FM (or HD) to begin blinking. At this point you can turn the knob to switch between analog FM and digital HD Radio reception (if available), and select among the available HD Radio channels, HD: 1 through HD: 8.

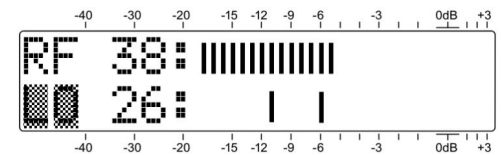
The INOmini 679 receiver does not blend between reception modes, nor does it default to FM when the digital HD1 Radio signal cannot be acquired, or simply is not there. What you manually select is what you hear.

Carrier Strength and Alarm (Menu Screen 2)

The upper line of this screen displays the signal strength of the FM carrier. The RF numerical value is the level at the antenna input in dB μ V, and defines a range between 0dB μ V (1 microvolt) and 75dB μ V (about 5 millivolts). The bargraph gives a linear display of the level between 10dB μ V and 75dB μ V. The signal strength display does not refer to the dB scaling above the display, which is used only for audio level measurements in Menu Screen 7.



The lower LCD scale labeled LOSIG: has a pair of tic marks off to the right. Push the knob and LO and the left-hand tic mark will begin to blink. Turn the knob to position the left tic mark anywhere beneath the RF bargraph. The tic mark level in dB μ V is also displayed.



When the RF bargraph falls below this tic mark during normal receiver operation, it initiates a Low Signal alarm and causes LOW SIGNAL to flash on the LCD screen.

As a starting point, you might set the low-signal trigger point about half the way down from the top of the RF bargraph, as shown above. This should allow for any signal fading effects over the receive path, but will still alert the user to a loss of carrier.

Push the knob again. HI and the right-hand tic mark will blink. Turn the knob to set that tic mark (and its numerical value) to a point that the carrier level must come back up to for the alarm to reset, maybe a few segments above the left tic mark. Push the knob again to set these points in memory and to release the menu.

The rear-panel L terminal gives an NPN transistor saturation to ground for a Low Signal alarm; the polarity (logic state) of the alarm is set on one of the hidden menu screens, which are explained beginning on Page 20. This ground may be used to actuate a relay, light an LED at a remote location or tie-in with a remote control system.

Audio Muting (Menu Screen 3)

Mute on Low Sig: is a ‘squelch’ function that mutes the audio outputs during a Low Signal alarm condition. This is most useful when the INOmini 679 is used as a rebroadcast ‘translator’ receiver in its FM reception mode. This prevents rebroadcasting the loud hissing sound characteristic of an FM receiver when no signal is present. To enable muting, push the knob and select either **On** or **Off** for this option.

Keep in mind that with this option set to **Off**, even a complete loss of carrier may not initiate a simultaneous Audio Loss alarm.

RF and HD Radio Signal Readouts (Menu Screen 4)

RF: duplicates the similar measurement on Menu Screen 2, a 0 to 75 numerical readout of the RF level in dB μ V at the antenna terminals. The bargraph indicates the entire signal level range here.

HD: is a somewhat nebulous readout of the ‘richness’ of the decoded HD digital carrier pairs; basically, a percentage of the OFDM symbols that appear valid measured over a given number of symbol periods. This should be considered a relative measurement only; numerical values and the bargraph represent scaling from 0 to 99.

Signal-to-Noise and Multipath (Menu Screen 5)

These are two additional signal-quality indicators, and numerical values are assigned to each of these readouts as well. The numbers are relative and take several metrics into account.

SN is a first-order approximation of the signal-to-noise ratio of the received FM signal. The number does not signify anything concrete, but certainly “more is better.”

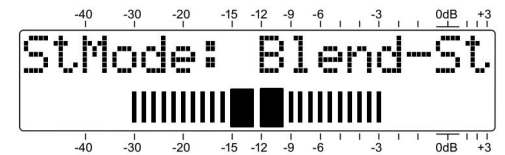
Likewise, **MP** gives a relative indication of multipath (signal reflection) effects that radio transmissions encounter on their trip to the receiver. Multipath effects introduce noise and distortion into FM programs and cause errors in digital signals that translate into dropouts and echoes. The object here is to keep **MP** as low as possible. **00** is ideal and should be attainable when receiving a solid signal.

RF, **SN** and **MP** numerical values are handy when installing a rooftop antenna. In locating and aiming the antenna, do everything you can to maximize **RF** and **SN**, and to minimize **MP**.

FM Stereo Mode (FM Menu Screen 6)

When monitoring the analog FM transmission, there is a choice of how the receiver handles FM-stereo decoding. **Stereo** is the default and obvious choice for a local, strong station. The graphic on the second line of this menu is a static graphic representation of the maximally-wide image that characterizes a normal stereo transmission. When the stereo pilot is lost, the display will collapse to the center.

Stereo-FM suffers a theoretical noise disadvantage of about 20dB when compared with monaural broadcasts. Push the knob and turn it to select **Blend-St**.



This mode will mitigate the noise situation substantially by progressively ‘blending’ the stereo image to mono as the FM signal deteriorates under low-signal, multipath or other reception handicaps. This mode is identified with **FM:B** in Menu Screen 1.

In this case the bargraph on the second line in this menu does, in fact, depict a ‘dynamic stereo image.’ As the circuit blends between full stereo and full mono, the actual blending action will be indicated by a proportional narrowing of the bargraph.

The degree of blending is not indicated on Menu Screen 1, nor will the screen indicate **FM:M** if the transmission reverts to full monaural when **Blend-St** is selected.

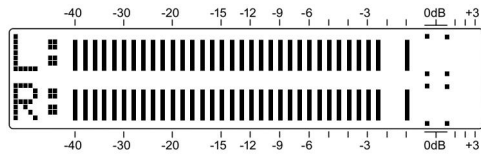
The stereo decoder may also be disabled, displaying **F-Mono** on the menu. This puts the receiver in a Forced Monaural mode, collapsing the stereo width display accordingly. This might be desirable when monitoring or relaying a station that never broadcasts in stereo.

Cd/No or Digital Signal Integrity (HD Menu Screen 6)

A number of HD Radio metrics are factored into the Cd/No figure displayed in this menu. The bargraph and the number don't relate to any specific measurement, but HD signal good should show here most of the time. When the HD Radio metrics degrade to a numerical value of 57, HD drops likely will be displayed. Anything below a 45 will show HD will not lock.

Program Audio Metering (Menu Screen 7)

Menu Screen 7 is a left- and right-channel bargraph presentation of the stereo program audio level. Meters are peak-responding with a floating peak-hold function.



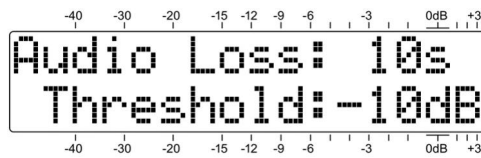
“Full” modulation is denoted by the large block opposite the 0dB marking on the panel. The meter resolves +1, +2 and +3dB above 0dB. Below 0dB the scale is linear in 1dB steps down to -20dB, and then in 2dB steps to -40dB.

For FM reception, the 0dB panel marking represents $\pm 75\text{kHz}$ monaural carrier deviation. A 400Hz mono test tone would take the meter to exactly 0dB. Receiver de-emphasis must necessarily be factored into the reading at higher frequencies, and of course the 19kHz stereo pilot consumes the top 1dB of stereo broadcast modulation. Aggressively-processed program audio should consistently peak the bars to about -1dB.

When HD Radio broadcasts are being received, 0dB corresponds to the iBiquity specification of -3dBFS for an absolute limit of program peak excursions.

The Audio Loss Alarm (Menu Screen 8)

Navigate to this Screen and push the knob. Audio Loss will begin blinking. Turn the knob to dial-in a desired alarm delay time; that is, the time in seconds between the onset of ‘dead air’ and a front-panel indication and rear-panel Audio



Loss tally. The delay may be programmed in one-second increments between 1s and 120s (two minutes). Turn the knob completely counterclockwise to Off to deactivate the alarm altogether. After setting this delay time interval, push the knob again to lock-in your setting. This action will cause the word Threshold to blink.

The trip point of the Audio Loss alarm is adjustable. The numerical value is the peak level that the program must fall below, and remain below, throughout the programmed delay interval to trigger an Audio Loss alarm. Because the alarm is peak-sensing, even lightly-processed programming will have frequent peaks nearly reaching 0dB, or 100% modulation. A setting of -10dB will probably suffice for nearly any format. Be sure to push the knob after making the selection to store the setting in memory.

Always consider the dynamics of the broadcast format when setting both the delay and the alarm threshold. A phone-in talk format could have occasional long pauses, suggesting a setting of 15 or 20 seconds. Classical music programming may require a lower Threshold setting.

An alarm flashes AUDIO LOSS on the front-panel LCD and activates the rear-panel A (audio-loss) terminal. Refer to Pages 7 and 22 for using and programming this terminal.

Headphone Monitoring (Menu Screen 9)

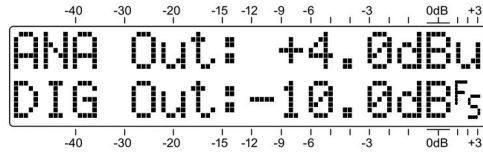
A front-panel mini-phone jack offers a convenient monitoring point for setup and casual listening. Whenever a pair of headphones is plugged into this jack, the LCD screen automatically switches to Menu Screen 9. Headphone Vol will blink and the panel knob may be adjusted for a comfortable listening level.

The LCD also 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 LCD to the last menu displayed.

Audio Output Levels (Menu Screen 10)

Audio output levels may be set independently for the rear-panel ANALOG OUTPUT (LEFT / RIGHT) and the DIGITAL OUTPUT (AES3). Levels can be set with 0.1dB resolution

over a 30dB range. As with the other menus, push the knob so that either **ANA Out** or **DIG Out** blinks, and turn the knob to set the level.



The indicated **ANA Out:** (analog output) number is the *average value* of the program waveform expressed in **dBu**. This will be the balanced, unloaded level at the analog output connectors. The **DIG Out:** (digital output) number, on the other hand, represents the *peak level* of the program signal with reference to **dBFS**, or digital-full-scale at the AES3 output. Considering that today’s broadcasters utilize heavy audio processing, the ‘crest factor’ (average-to-peak ratio) will be very low, meaning that the average and peak levels will be close to the same figure in both cases.

Split Mode (Menu Screen 11)

The INOmini 679 can help verify proper sync between the analog FM and the HD1 transmissions. Push and turn the knob to select **Split Mode: On** to hear the HD1 program in the left channel and the FM program in the right. The two programs you hear will each be L+R monaural, and any audible delay, echo or ‘hollowness’ will justify looking into your Diversity Delay exciter or processor settings. Be sure to turn **Split Mode: Off** after listening for program sync.

PI/CL/Time (FM Menu Screen 12)

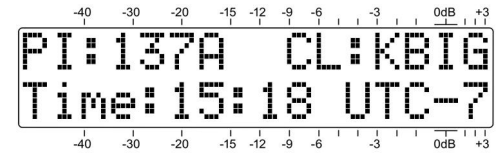
PI: is the station’s four-character, hexadecimal identifier, the station’s “digital address.”

In North America the PI code is numerically derived from station call letters. Proper ‘reverse-decoded’ call letters for the PI code will display in the **CL:** field if the station adheres to the RBDS standard.

In some instances, North American PI codes derived from call letters will conflict with use of the RDS TMC (Traffic Message Channel) function. In those cases stations may adopt a ‘bogus’ PI code that will back-calculate to incorrect call letters. If the incorrect call letters happen to be the same as another station’s legitimate assignment, the two stations must necessarily be in widely-separated coverage areas to avoid RDS housekeeping conflicts.

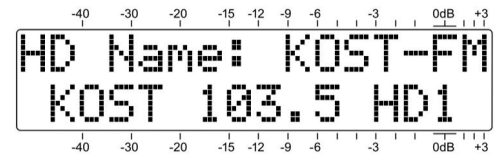
Another RDS utility sets the listener’s radio clock to the current local time. This is a double-edge sword, however, as a change in time zones within the broadcaster’s primary coverage area could cause trouble and alienate listeners. For this and other reasons, many broadcasters choose *not* to implement this RDS timekeeping utility.

The lower line of FM Menu Screen 11 will scroll the RDS Clock/Time field. This will include the date, the current time in 24-hour notation, and the offset from UTC (Universal Coordinated Time). It may take a short while to receive the RDS Time: ‘packet,’ as it is not sent continuously.



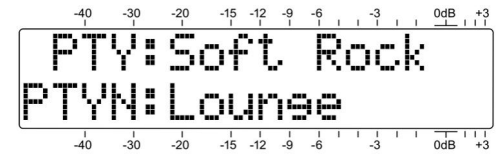
HD Name (HD Menu Screen 12)

This Menu Screen identifies the radio station by its assigned primary FM call letters, as shown on the upper line here. The lower line displays a chosen station slogan.



PTY/PTYN (FM Menu Screen 13)

The RDS PTY (Program Type) function identifies ‘programming type’ (or ‘format’ in the US) from a list of some thirty fixed categories. Some consumer radios can be programmed to search automatically for available programming based on the PTY sets of identifiers. The upper line on this screen identifies the decoded PTY by name from the appropriate list.



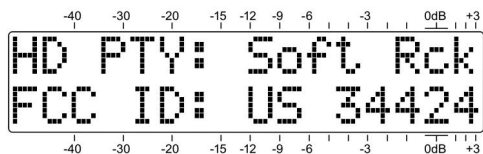
The PTY field is one important difference between the US RBDS and European RDS standards. The proper PTY list is selected automatically when the INOmini 679 **Region:** is set in one of the ‘hidden’ menus with explanations beginning on Page 20.

PTYN is an optional 8-character identifier used to further define the programming type or format. It is not used by the receiver to search for specific programming, but once

the receiver is tuned to the station PTYN can further detail the program content and present it on the radio faceplate.

HD PTY and FCC ID (HD Menu Screen 13)

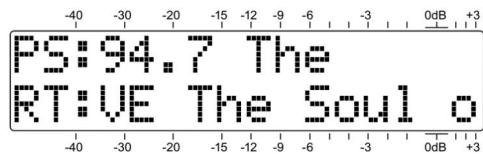
The HD Radio PTY code is similar to the RDS analog-FM PTY, and will identify the station's format. The FCC ID is a specific numerical code that identifies the station.



PS and Radio Text (FM Menu Screen 14)

The upper line of this menu shows the station's 8-character PS:, or Program Service Name. This can be a *static*-PS message, like the station's call letters: WREN-FM, or a familiar 'street name' such as LIVE-95.

Most stations now practice *dynamic*-PS messaging, actually transmitting a different 8-character block at quick intervals to create a scrolling display on the radio faceplate. This can convey song title and artist information, program promotions or even advertising.



RT: (RadioText) is a 64-character message sent complete, as a block. It is displayed on consumer receivers that have a TEXT or INFO button. The INOmini 679 automatically scrolls the RT: message to display all 64 characters on the front-panel LCD screen.

RT: may be used to present the same artist and title data is commonly scrolled in the PS: field, as shown above. RT: can also convey static information such as the station's telephone number, web address or program promotion.

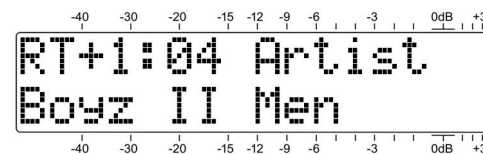
HD Artist, HD Title, HD Album, HD Genre (HD Menu Screens 14, 15, 16, 17)

These screens simply scroll the like-named fields of HD Radio metadata.

RadioText Plus (Tagging) (FM Menu Screens 15 and 16)

'Tagging' is the process of identifying certain data, such as song title and artist, within the RadioText field. The tagged info must appear as plain text within the 64-character message and is 'tagged' with a numerical code that defines its location within the 64-character block. This code is then transmitted in the two fields identified as RT+1: and RT+2: on these menu screens. In addition to artist and title, 'tags' may also be used for advertiser tie-ins or product promotion.

The 04 in this Menu Screen 15 example refers to the RT+ Item Number, which in this case is Artist. The second line names the performer. If the group name overruns the LCD display, it will scroll automatically.



Tagging is not restricted to song information. Telephone numbers, e-mail addresses, station IDs and many other RT+ 'items' may be tagged. With tagging, a listener simply pushes a button on an equipped radio to automate the purchase of a song download or to retain a phone number or Web address in his portable device memory. Later, when docked with an Internet connection, his radio can assist in downloading music, purchasing merchandise, or allow the user to place a call or find a Website of interest with minimum effort.

HIDDEN MENUS

The INOmini 679 also has settings for little-used, set-and-forget features. From any normal navigational menu, push and hold-down the knob to access these top-secret settings.

Firmware Version (Hidden Menu Screen 1)

The 679 Firmware screen will apprise you of what firmware version is installed in your unit.

TX Gain and TX BCTL (Hidden Menu Screen 2)

TX Gain: and TX BCTL: are active displays only in the HD Radio reception mode. When tuned to a station that is not transmitting HD Radio programming, both will show N/A.

With HD Radio transmissions, **T_X Gain:** will normally show +0dB. The HD Radio system can use a housekeeping command to ‘rescale’ the system’s nominal 100%-audio-modulation point. This adjusts receiver audio gain to complement a transmitter audio level offset.

T_X BCTL: describes the ‘blend mode’ for HD Radio broadcasts; that is, whether the analog FM signal will blend to the digital program once the HD Radio signal is acquired and buffered. This field will display **Normal** in most instances. An obvious exception would be during a baseball game, when the 8+ second ‘diversity delay’ would present a problem listening to the play-by-play in the stands. In this case the diversity delay is removed from the analog-FM channel to eliminate latency. **Ballgame** is the identifier that would pop-up (pun intended) in this event, but other, somewhat obscure options provided in the HD Radio Specification are **No Blend** and **Invalid**.

Codec Mode (Hidden Menu Screen 3)

Codec Mode: defines the composition of the HD Radio digital stream. As of this writing, with analog FM and HD Radio digital program channels broadcast concurrently and in sync, the first description in the following list will scroll in this field. Other options are for future use and are included here for reference:

- 0: FM hybrid single-stream on P1 channel
- 1: FM all digital dual-stream with mono core
- 2: AM hybrid/all digital dual-stream
- 3: FM all digital dual-stream with stereo core
- 10: FM dual-stream on SPS
- 13: FM hybrid/all digital single-stream

FM De-Emphasis and Region (Hidden Menu Screen 4)

De-Emph: displays the current setting for FM program audio de-emphasis. 75 μ s (75 microseconds) is used in the Western Hemisphere, and 50 μ s in Europe and the rest of the world. Push and turn the knob to change this selection.

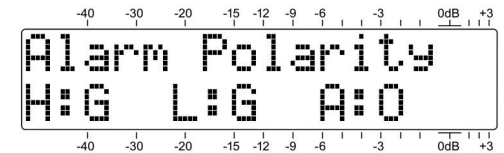
Highlight and enter **Region** to load the proper list of pre-defined RDS PTY classifications. Set this to **NA RDS** for North America or **EU RDS** for Europe and most of the rest of the world. If you are operating outside of the US, Canada or

the European Union, consult the appropriate Radio Authority to verify a proper choice.

Alarm Polarity (Hidden Menu Screen 5)

When an alarm is triggered, the rear-panel ‘tally’ outputs can take the form of either a closure to ground, or a fulltime ground that goes open-circuit for an alarm.

Push the knob and **H** (HD Loss) will begin blinking. Turn the knob to select **G**, a ground for the alarm, or **O**, an open circuit from a normally-grounded condition. Push the knob to save the setting, which will take you to a blinking **L** (Low Signal). Make your selection, push the knob and do the same for **A** (Audio Loss). Push the knob a final time to save settings and release the menu.



In the example above, the rear-panel **H** and **L** terminals will give closures to ground for their associated alarms, and the **A** terminal will be grounded and go open-circuit for Audio Loss.

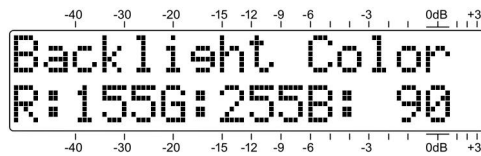
Backlight Color (Hidden Menu Screen 6)

The INOmni 679 has a large, easy-to-read, backlit LCD display. An HD Loss, Low Signal or Audio Loss condition will cause the display to flash with the alarm notification against a red background to further make the alarm visible.

The backlighting has a range of R/G/B color rendering, which can be applied universally to the menu trees, except for the alarm condition. This menu screen allows you to set the background to nearly any color you might wish to have. Simply push the knob to sequentially access the **R:** (red), **G:** (green) and **B:** (blue) backlights, and set them selectively to any of the 51 brightness levels offered, from 0 to 255 in increments of 5.

We have established factory values for a nominally-white background, although there may be variation in these settings from unit-to-unit as the LCDs vary a bit. The color set-

tings shown here are typical of the factory settings... just in case you lose your way and want to get back close to the original values.



BER Test (Hidden Menu Screen 7)

This is a special test to be used only in conjunction with iBiquity Digital test procedures, signals and metrics. Instructions will accompany documentation supplied by iBiquity Digital.

Loading Factory Defaults (Hidden Menu Screen 8)

With the exception of the backlight color settings, all main and hidden menu selections can be put back to as-shipped, factory values by invoking the Load Defaults? command. With that menu selected, push the knob and turn it from No to Yes. When you then push the knob, the INOmini 679 will reboot with factory defaults.

Returning to the Menu Tree

To get from hidden menu settings back to the normal, operating menu tree, navigate back to Hidden Menu 1 (showing 679 Firmware) and push the knob.

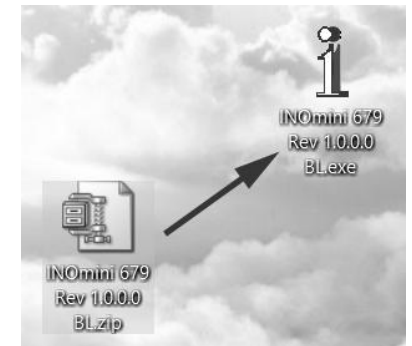
Section IV UPDATING FIRMWARE

Firmware Files

INOmini 679 firmware updates are issued at no charge whenever operating features are changed or added. These are small 'bootloader' files in a 'zipped' format that will be available as downloads on the Inovonics Website.

The first step is to connect your INOmini 679 to your computer with a popular 'USB-A' to 'mini-B' USB cable.

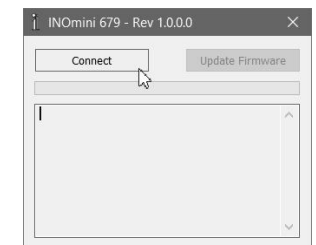
Next, download the zipped file to your Windows Desktop and unzip it in place, as was done here. Simply double-click the zipped BL.zip file and follow the unzip utility's instructions, placing the extracted .exe file on the desktop.



Next, place the INOmini 679 in its ready-state to accept firmware updates. Just unplug the 12VDC power connector from the rear panel, and then hold-down the front-panel knob as you plug the power connector back in. This should bring-up the wording shown at the right.

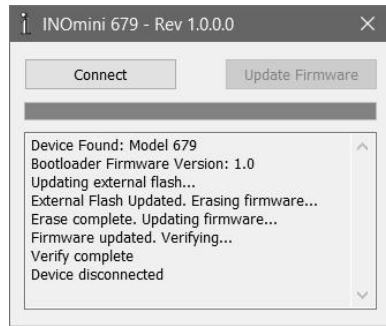


Double-click the extracted BL.exe file, which will include the product model number and firmware version in its full name. This will start the bootloader utility window shown here.



Click Connect and the utility should quickly advise you that it has found your INOmini 679. You can then click Update Firmware and the update process will begin. There are a few phases to this process, and a green bar will advise you of progress.

When the update is complete, the bootloader window will appear as shown in this illustration, and the INOmini 679 will reboot, returning you to whatever menu was showing before the update.



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The firmware update process will retain all the settings from the previous firmware version, unless the update includes new operational features, which may or may not require further setup.

'Under the Hood'

The INOmini 679 FM/HD Radio Monitor Receiver is very compact, 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.

Nevertheless, our policy has always been one of 'full disclosure.' We feel that, unless we are doing something either 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 lightweight, returning the INOmini 679 for factory servicing 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!

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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, 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.

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