INOmini 673

FM/RDS Monitor Receiver

Installation & User Guide

June, 2019 - Rev. 1.0.0.0 Firmware

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INTRODUCTION

Product Description

The INOmini 673 is Inovonics' second-generation, small form-factor FM broadcast receiver for station 'confidence' monitoring and re-broadcast (translator) service. It receives standard analog FM broadcast transmissions and also decodes and displays program-associated text messaging and essential metadata from RDS/RBDS data groups.

Product Features

Features of the INOmini 673 Receiver include:

- Sensitive and selective DSP-based (SDR) receiver with extended-band coverage down to 64MHz.
- Receives worldwide-standard FM radio broadcasts and optional associated RDS data.
- Easy setup with LCD screen and jog-wheel navigation of the receiver's menu tree.
- Independently adjustable analog L/R and AES-digital program line outputs.
- Front-panel display of setup parameters, off-air signal metrics and essential FM RDS information including RT+ 'tagging' data.
- Front-panel alarms with rear-panel 'tallies' for RDS Loss or PI Code Mismatch, Low Signal and Program 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 64.0MHz-107.9MHz in 100kHz steps.

Antenna Input: 75-ohm (F).

Sensitivity/SNR: 10µV for 50dB monaural S/N; 35dB µV for 70dB monaural S/N.

IF Bandwidth: Auto (signal-adaptive) or manual selection of 110kHz, 84kHz, 60kHz, 40kHz.

Audio Bandwidth: 15kHz, or may be manually restricted in steps down to 2kHz.

Program De-Emphasis: 75µs or 50µs, menu-selectable.

FM Stereo Modes: Stereo, Auto-Blended Stereo (with front-panel stereo width display), Forced-Mono.

RDS Fields Displayed: AF, CT, DI, M/S, PI, PS PTY, PTYN, RT RT+, TA, TP, Groups Received; selectable RDS or RBDS protocols.

Program Audio Output(s):
    Balanced Analog: (XLR) Left and Right outputs are 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) has adjustable listening level.

Flashing Panel Alarms:
    RDS: Alarm signals the loss of RDS data or an error between the received PI code and a user-programmed PI code entry.
    Low Signal: Alarm and reset trigger levels are independently adjustable relative to the RF signal level display.
    Audio Loss: Alarm threshold is adjustable between 0dB and –40dB, and alarm delay interval is adjustable between OFF and 120 seconds.

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

USB Port: The front-panel mini-USB port enables easy firmware updates when issued.

Power Requirement: 12VDC at 290mA; a universal 90-240VAC inline switching power supply is supplied.

Mounting Options: An optional rack adapter accepts up to three INOmini modules in a 1U, 19-inch rack space. The INOmini 673 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 673, 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 673 FM/RDS 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 673 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

Every Inovonics INOmini module is supplied with an out-board universal, 90-240VAC switching-type power supply. As the actual power consumed by the INOmini 673 is 290mA 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 673 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 673 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 infallible in 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 the listening volume with the knob. Once you have set this 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 R L A	These are alarm "tally" outputs for remote indication of reception problems. Designations noted on the rear panel stand for Ground, RDS Error, Low Signal and Audio Loss.
	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.
	The plastic connector body may be unplugged from the chassis to make connection easier and for quick disconnect.
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.
AES DIGITAL AUDIO OUTPUT	The balanced, transformer-isolated AES digital audio output has a fixed sample rate of 44.1kHz. The audio level is

menu-adjustable between –30dBFS and 0dBFS, corresponding to 100% peak modulation of the FM carrier.

+12VDC POWER I/O

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 673 draws 290mA. 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 673

Hey, why is the screen flashing?

The INOmini 673 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.
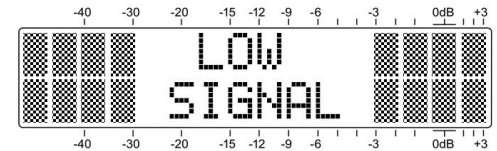
Whenever you are in the 'edit mode'; that is, you have entered a menu to edit (make a change to) a setup item, the front-panel flashing alarm is inhibited while that parameter is being programmed. The edit mode times out after 30 seconds if no change is made.

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 673 menu for yourself, 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 673 menu screen will be discussed separately and in order, except that the last menu is discussed first, as it could hinder your progress.

Locked Menus (Menu Screen 22)

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

Menus: Locked

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.
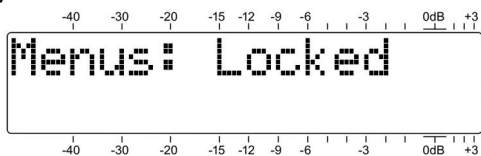
Tuning the Receiver (Menu Screen 1)

When power is applied to the INOmini 673, 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.

FREQ: 98.1   FM:M
              RF
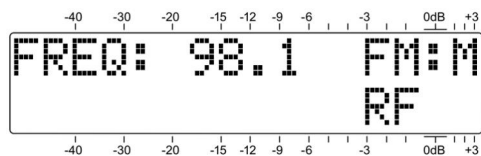
Push the knob and FREQ will begin to blink. Now the receiver may be tuned by turning the knob. The notation in the upper-right corner denotes FM:S (stereo), FM:B (blended stereo) or FM:M (monaural) transmissions. A series of bars to the right of RF will give a rudimentary display of incoming carrier strength.

If it is transmitting an RDS (Radio Data System) subcarrier, once a station is tuned-in the station's PI (Program Identification) hexadecimal code will appear on the LCD screen below FREQ. In North America, where the PI code is numerically derived from station call letters, those call letters will be decoded and displayed to the right of the PI hex value.


FREQ: 95.5   FM:S
2E8A KLOS   RF.ıll
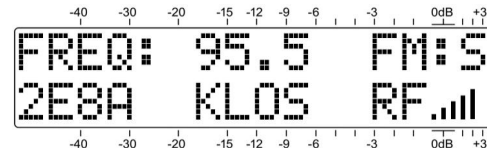
NOTE: In some cases, North American PI codes derived from call letters will conflict with use of the RDS TMC (Traffic Message Channel) function. These stations will have a reassigned PI code that will back-calculate to incorrect call letters. If the bogus call is the same as another station's legitimate call letter assignment, the two stations must necessarily be in widely-separated coverage areas.

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 upper line of this screen displays the signal strength of the FM carrier. The RF numerical value is the level at

RF 38:IIIIIIIIIII
LOSIG: | |

the antenna input in dBµV, and defines a range between 0dBµV (1 microvolt) and 75dBµV (about 5 millivolts). The bargraph gives a linear display of the level between 10dBuV and 75dBµV. 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.
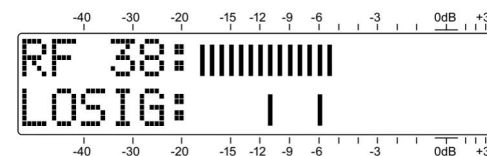
The lower LCD scale labeled LOSIG: has a pair of tic marks off to the right. Push the knob and LO and the left-hand tic

RF 38:IIIIIIIIIII
LO 26: | |

mark will begin to blink. Turn the knob to position the left tic mark anywhere beneath the RF bargraph. The tic mark level in dBuV is also displayed.
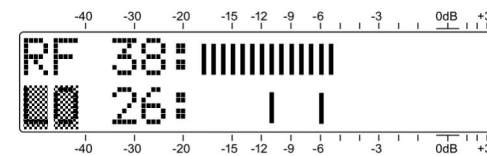
When the RF bargraph falls below this tic mark during normal receiver operation, it initiates a Low Signal alarm and causes LOW SIGNAL to flash on the LCD screen.

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 alarm flashes LOW SIGNAL on the front-panel LCD and activates the rear-panel L (low signal) terminal. Refer to Pages 8 and 24 for using and programming this terminal.

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 673 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 will not initiate a simultaneous Audio Loss alarm.

Signal-to-Noise and Multipath (Menu Screen 4)

These are two additional indicators of signal quality, 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, which introduce noise and distortion into the audio. 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 (Menu Screen 5)

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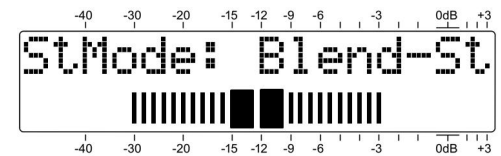
This mode will mitigate the noise situation substantially by progressively 'blending' the stereo image to mono as the FM signal deteriorates under low-signal, multipath or other reception handicaps. This mode is identified with FM:B in Menu Screen 1.

In the blended mode 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, which will display F-Mono on this menu and FM:M on Menu Screen 1. 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.

Program Audio Metering (Menu Screen 6)

Menu Screen 6 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.
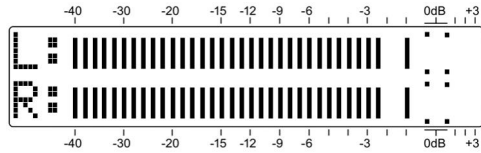
The 0dB panel marking represents ±75kHz monaural carrier deviation. A 400Hz mono test tone would take the meter to exactly 0dB. Receiver de-emphasis must necessarily be factored into the reading at higher frequencies, and of course the 19kHz stereo pilot consumes the top 1dB of stereo broadcast modulation. Aggressively-processed program audio should consistently peak the bars to about –1dB.

The Audio Loss Alarm (Menu Screen 7)

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 if you want to de-activate 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.
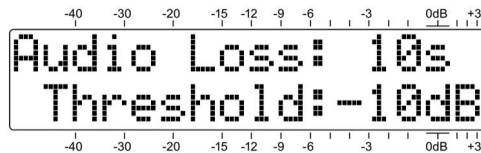
The trip point of the Audio Loss alarm is adjustable. The numerical value is the peak level that the program must fall below, and remain below, throughout the programmed delay interval to trigger an Audio Loss alarm. Because the alarm is peak-sensing, even lightly-processed programming will have frequent peaks reaching toward 0dB, or 100%

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modulation. A setting of –10dB will probably suffice for nearly any programming 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 an Audio Loss: setting of 15 or 20 seconds. Classical music programming may require a lower Threshold: setting.

The alarm flashes AUDIO LOSS on the front-panel LCD and activates the rear-panel A (audio-loss) terminal. Refer to Pages 8 and 24 for using and programming this terminal.

Headphone Volume (Menu Screen 8)

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 8. 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 9)

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.
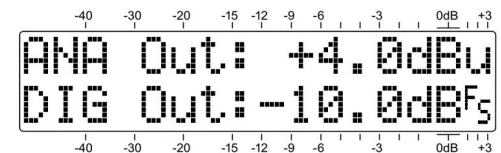
The indicated ANA Out: (analog output) number is the *average value* of the program waveform expressed in dBu. This will be the balanced, unloaded level at the analog output connectors. The DIG Out: (digital output) number, on the other hand, represents the *peak level* of the program signal with reference to dBf$_s$, or digital-full-scale at the AES3

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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.

PI, Call Letters and Time (Menu Screen 10)

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 or a display of ????. If 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.
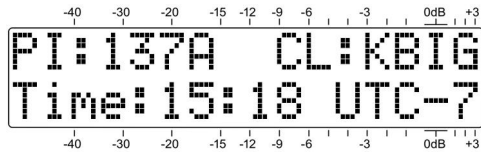
Another RDS utility sets the listener's radio clock to the current local time. This is a double-edge sword, however, if the broadcaster's primary coverage area incorporates two time zones. This could lead to confusion and alienate listeners. For this and other reasons, many broadcasters choose *not* to implement this RDS timekeeping utility.

The lower line Menu Screen 10 scrolls the RDS Clock/Time field, if transmitted. 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.

PTY and PTYN (Menu Screen 11)

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.
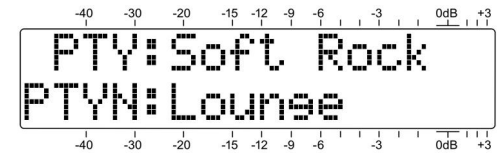
The PTY field is one important difference between the US RBDS and European RDS standards. The proper PTY list is selected automatically when the INOmini 673 Region: is set in one of the 'hidden' menus with explanations beginning on Page 23.

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 faceplate of some radios.

PS and RadioText (Menu Screen 12)

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.
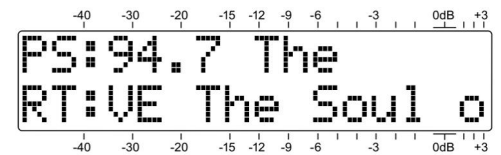
RT: (RadioText) is a 64-character message sent as a complete data block. It is displayed on consumer receivers that have a TEXT or INFO button. The INOmini 673 automatically scrolls the RT: message to display all 64 characters on the front-panel LCD screen.

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

RadioText Plus (Tagging) (Menu Screens 13 and 14)

'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 13 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.

```
RT+1:04 Artist
Boyz II Men
```
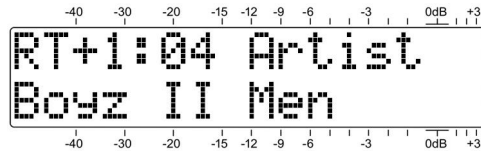
Tagging is not restricted to song information. Telephone numbers, e-mail addresses, station IDs and many other RT+ 'items' may be tagged. With tagging, a listener simply pushes a button on an appropriate radio to automate the purchase of a song download or to retain a phone number or Web address in his portable device memory. Later, when docked with an Internet connection, his radio can assist in downloading music, purchasing merchandise, or allowing the user to place a call or find a Website of interest with minimum effort.

The AF List (Menu Screen 15)

A feature of the Radio Data System is its ability to retune the listener's radio to a different frequency where the identical program is available under better reception conditions. This is probably more useful in Europe, where nationwide networks utilize a number of low-power transmitters to cover the entire country. In the US, "translators" are some-

times used to rebroadcast a station's program on another frequency to fill dead spots in the primary coverage area.

This useful feature is managed by the Alternative Frequency List. The main channel and all other appearances of the same program use RDS to send out a listing of all frequencies where the program can be received. The RDS radio constantly monitors these 'alternative' frequencies, and then decides which one might give better reception. The radio then seamlessly switches to the better signal.

In this example, Menu Screen 15 shows three AFs, two translators plus the station's main frequency, which must always be included in the list. Push the knob to scroll through this list and confirm that the proper frequencies have been entered into the RDS encoder.

```
AFs:    3
AF 1:  88.5
```
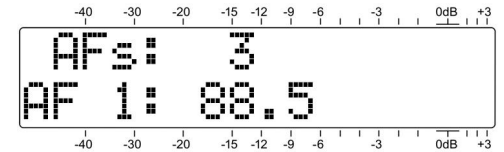
RDS 'Flags' (Menu Screen 16)

The Radio Data System performs certain housekeeping functions to convey simple status information to the receiver. These RDS 'flags' may be observed on this screen. A typical example is shown here and is explained as follows.

```
Flags: TA=0 DI=S
       TP=1 MS=M
```
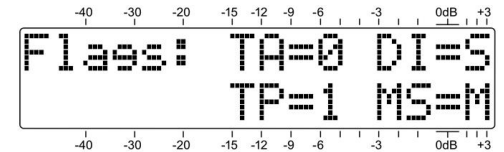
TA=0 means that no Traffic Announcement is currently being broadcast by the station. A Traffic Announcement is a short-duration verbal alert for road hazards, etc. Raising the TA=1 flag automatically tunes all TA-enabled RDS radios to the station broadcasting the alert.

TP=1 indicates that this is a station that carries traffic information as a normal element of its broadcast programming. If the station sends a TP=0 flag, it disregards traffic and thus cannot participate in the TA flag program.

DI=S signifies this is a typical stereo transmission. There are several, somewhat obscure alternatives, but this is what you'll see in any common instance.

MS=M shows the condition the 'music/speech' switch. This differentiates between broadcasts with mixed music and

speech, and all-speech programming. An all-news station might send: MS=S, but this would be very rare.

RDS Groups Received (Menu Screen 17)

This screen will show a listing of the RDS data groups that the station is transmitting. Groups are numbered zero to 15, with an A and a B version within each group.

Push and turn the knob to scroll through the active groups. The display will show what percentage of RDS overhead resources each group uses.

```
-40   -30   -20   -15 -12 -9  -6     -3        0dB  +3
 |     |     |    |  |  |   |    |  |  |   |   |   |
 Group %:
 Group 2A: 30.2%
 |     |     |    |  |  |   |    |  |  |   |   |   |
-40   -30   -20   -15 -12 -9  -6     -3        0dB  +3
```

The bulk of RDS functionality is handled by just a few groups, others may be employed sporadically.
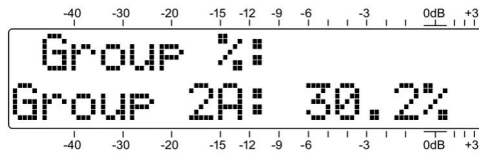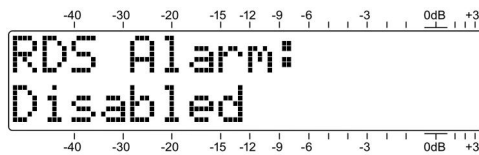
Only active groups will show on the list, but if an active group's usage drops to 0.0%, it will remain in the current list until the list is reset. In this menu only, you may hold-down the knob to manually clear groups from the list. Calculation will start over when the knob is released.

RDS Alarm (Menu Screens 18)

The INOmini 673 incorporates an alarm function associated with the Radio Data System (RDS or RBDS). This flashing alarm and rear-panel closure warns the user of one of two alarm condition choices: 1) a missing 57kHz RDS subcarrier, or: 2) an incoming PI code that differs from the code that the user can enter manually.

The default setting on Menu Screen 18 is Disabled. Push and turn the knob and two alarm options may be selected: RDS Loss or PI Error.

```
-40   -30   -20   -15 -12 -9  -6     -3        0dB  +3
 |     |     |    |  |  |   |    |  |  |   |   |   |
 RDS Alarm:
 Disabled
 |     |     |    |  |  |   |    |  |  |   |   |   |
-40   -30   -20   -15 -12 -9  -6     -3        0dB  +3
```

When RDS Loss is selected, after a 10-second delay the loss of the 57kHz RDS subcarrier will flash RDS LOSS on the front panel and activate the rear-panel R terminal.

With PI Error alarm selection, the INOmini 673 gives an alarm for a PI code mismatch between the received PI and a PI code entered into the 673 by the user in Menu Screen 19.

After a 10-second delay, a PI mismatch will flash PI CODE on the LCD and activate the R terminal.

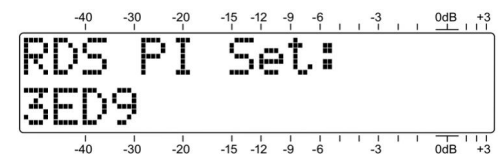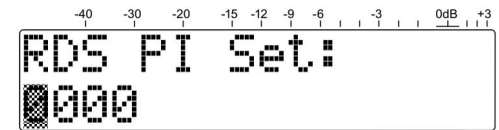Refer to Pages 8 and 24 for using and programming the R terminal.

The RDS PI Setting (Menu Screens 19)

When the INOmini 673 is programmed for a PI error alarm, a valid PI code for the received station must be entered on

```
-40   -30   -20   -15 -12 -9
 |     |     |    |  |  |
 FREQ: 101.1
 3ED9      KRTH
 |     |     |    |  |  |
-40   -30   -20   -15 -12 -9
```

Menu Screen 19. You can verify the PI code for your station on Menu Screen 1 in the lower-left corner of the LCD.
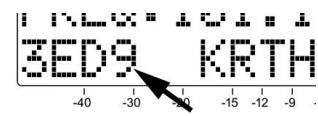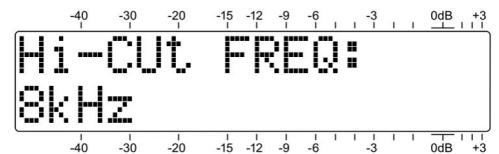
PI codes are hexadecimal values that use digits zero through 9 and letters A through F. Although these 'hex' values are derived from call letters in North America, you cannot simply enter call letters here.

On Menu Screen 19, push the knob and the first of four character blocks will begin to blink. Turn the knob to select the hexadecimal value corresponding to the first character of the station's PI code. Continue this operation until you have dialed-in the complete 4-character PI code. A final push will enter the code into memory and release the menu.

```
-40   -30   -20   -15 -12 -9  -6     -3        0dB  +3
 |     |     |    |  |  |   |    |  |  |   |   |   |
 RDS PI Set:
 ▓000
 |     |     |    |  |  |   |    |  |  |   |   |   |
-40   -30   -20   -15 -12 -9  -6     -3        0dB  +3
```

```
-40   -30   -20   -15 -12 -9  -6     -3        0dB  +3
 |     |     |    |  |  |   |    |  |  |   |   |   |
 RDS PI Set:
 3ED9
 |     |     |    |  |  |   |    |  |  |   |   |   |
-40   -30   -20   -15 -12 -9  -6     -3        0dB  +3
```

Audio High-Cut Filter (Menu Screen 20)

The 673 receiver incorporates a user-selectable, rather gentle low-pass filter to insert into the analog L/R and AES digital line outputs and the headphone monitor facility. This filter allows the user to roll off the higher audio frequencies at his discretion to reduce the audibility of hiss-character noise under poor reception conditions.

```
-40   -30   -20   -15 -12 -9  -6     -3        0dB  +3
 |     |     |    |  |  |   |    |  |  |   |   |   |
 Hi-Cut FREQ:
 8kHz
 |     |     |    |  |  |   |    |  |  |   |   |   |
-40   -30   -20   -15 -12 -9  -6     -3        0dB  +3
```

The default setting for this filter is `Disabled`. As may be judged appropriate, however, you can turn the knob counterclockwise for an HF cutoff of `11kHz`, `8kHz`, `6kHz`, `5kHz` `3kHz` or `2kHz`. Before implementing this fixed HF rolloff to reduce noise, you might first try the automatic stereo-to-mono 'blending' option afforded in Menu Screen 6, `StMode:Blend-St`. This is a program-controlled function that proportionally reduces stereo separation (and noise) as reception conditions deteriorate.

The cutoff frequency shown in this menu is approximately the –3dB point of the filter. The filter slope is not a straight-line function, but becomes steeper as the frequency increases.

IF Bandwidth Control (Menu Screen 21)

In the default `Auto` setting, receive bandwidth is automatically adjusted to progressively narrower settings when signal reception conditions degrade. The receiver pulls in the band edges as either the high-frequency noise component of the baseband signal increases, or as interference from an adjacent-channel station encroaches.

```
-40    -30    -20   -15 -12 -9  -6     -3      0dB   +3
IF Bandwidth:
Auto
-40    -30    -20   -15 -12 -9  -6     -3      0dB   +3
```
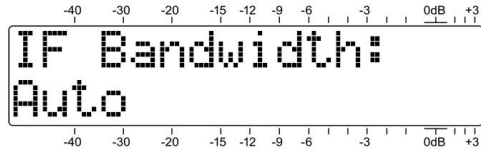
You also may select bandwidth values manually. Push and turn the knob counterclockwise to select: `110kHz`, `84kHz`, `60kHz` or `40kHz`. Unlike AM radio, you won't hear the high frequencies roll off as receiver bandwidth is reduced. Instead, stereo separation and harmonic distortion performance will be compromised as the bandwidth narrows. If the `Auto` setting is not effective in lessening 'splatter' from an adjacent channel, try the lower cutoff values to reduce the audible interference. When a setting is selected, push the knob again to fix it in memory.

HIDDEN MENUS

The INOmini 673 also has settings for little-used, set-and-forget functions. From most normal navigational menus, push and hold-down the knob to access these top-secret settings.

Firmware Version (Hidden Menu Screen 1)

The `673 Firmware` screen will apprise you of what firmware version is installed in your unit.

FM De-Emphasis and Region (Hidden Menu Screen 2)

`De-Emph:` displays the current setting for FM audio de-emphasis. `75us` (75 microseconds) is the standard for the Western Hemisphere, and `50us` for 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 `RBDS` for North America or `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 3)

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 the alarm.

Push the knob and `R` (RDS Alarm) will begin blinking. Turn the knob to select `G`, a ground for the alarm or `O`, an open

```
-40    -30    -20   -15 -12 -9  -6     -3      0dB   +3
Alarm Polarity
R:G   L:G   A:O
-40    -30    -20   -15 -12 -9  -6     -3      0dB   +3
```

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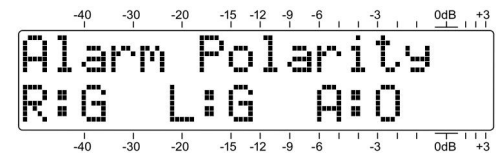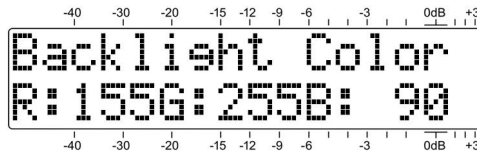
In the example above, the rear-panel R and L terminals will give closures to ground for their associated alarms, and the A terminal will be grounded and go open-circuit for Audio Loss.

Backlight Color (Hidden Menu Screen 4)

The INOmini 673 has a large, easy-to-read, backlit LCD display. An RDS Alarm, Low Signal or Audio Loss condition will cause the display to flash the alarm notification against a red background to further call attention to the matter.

The backlighting has a range of R/G/B color rendering, which can be applied universally to the menu trees, except for the flashing red alarm condition. This menu screen allows you to set the background to nearly any color you might fancy. 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 settings 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.

```
-40   -30   -20   -15 -12  -9  -6    -3     0dB  +3
 |     |     |     |   |    |   |     |      |    |
Backlight Color
R:155G:255B: 90
 |     |     |     |   |    |   |     |      |    |
-40   -30   -20   -15 -12  -9  -6    -3     0dB  +3
```

Loading Factory Defaults (Hidden Menu Screen 5)

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 673 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 673 Firmware) and push the knob.
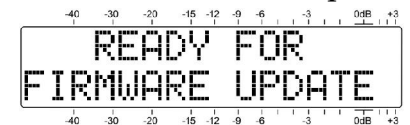
Section IV

UPDATING FIRMWARE

Firmware Files

INOmini 673 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 673 to your computer with a popular 'USB-A' to 'mini-B' USB cable.
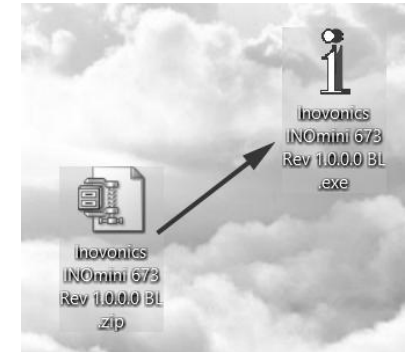
Next, download the zipped file to your Windows Desktop and unzip it in place, as was done here. Simply double-click the zipped BL.zip file and follow the unzip utility's instructions, placing the extracted .exe file on the desktop.

Next, place the INOmini 673 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.
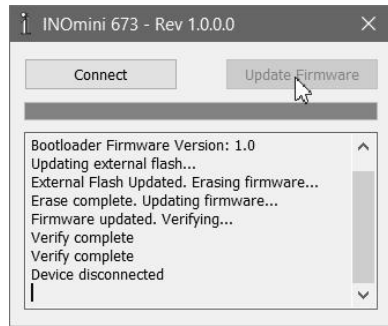
```
-40   -30   -20   -15 -12  -9  -6    -3   0dB  +3
 |     |     |     |   |    |   |     |    |    |
   READY FOR
FIRMWARE UPDATE
 |     |     |     |   |    |   |     |    |    |
-40   -30   -20   -15 -12  -9  -6    -3   0dB  +3
```

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 boot-loader utility window shown here.
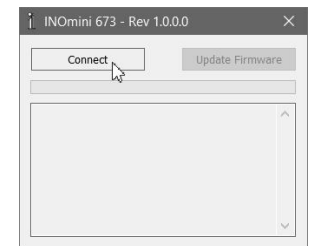
Click Connect and the utility should quickly advise you that it has found your INOmini 673. You can then click Update Firmware and the update process will begin. There are a few phases to this process, and a green bar will advise you of progress.

When the update is complete, the bootloader window will appear as shown in this illustration, and the INOmini 673 will reboot, returning you to whatever menu was showing before the update.

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 673 FM/RDS 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 673 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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ⅈ 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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ⅈ INOVONICS
BROADCAST

5805 Highway 9 • Felton, CA 95018 USA
Tel: (831) 458-0552 • Fax: (831) 458-0554
—— www.**inovonicsbroadcast**.com ——
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