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NOAA Weather Radio

Installation & User Guide



June, 2019 - Rev. 1 Firmware

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Section I

INTRODUCTION

Product Description

The INOmini 676 is Inovonics' second generation NOAA weather receiver in a small-format package. It tunes US and Canadian weather band frequencies and responds to the 1050Hz Warning Alarm Tone (WAT) with an alarm output.

The receiver gives front-panel and remote alarm indications for WAT, Low Signal and Audio Loss conditions, and delivers both analog and AES-digital audio outputs with adjustable level and automatic intelligibility enhancement for monitoring and rebroadcast.

Product Features

Features of the INOmini 676 include:

- A sensitive, DSP-based (SDR) receiver for the 162.400 to 162.550 North American weather band.
- Easy setup with LCD screen and jog-wheel navigation of the receiver's menu tree.
- Front-panel flashing alarms and rear-panel 'tallies' for WAT (1050Hz tone), Low Signal and Audio Loss.
- Front-panel metering of RF signal and audio levels
- Independently adjustable analog L/R and AES-digital program line outputs.
- Front-panel headphone jack with adjustable volume.
- When issued, free firmware updates are easily installed in the field.

Product Specifications

Tuning Range: 162.400MHz-162.550MHz in 25kHz steps; AFC follows transmitter frequency deviances.

Antenna Input: 75-ohm (F)

Receiver Sensitivity: 10 μ V for 40dB S/N; programmable Mute function silences the audio outputs under a Low Signal condition.

Reception Mode: Narrowband FM (NBFM).

Frequency Response: \pm 1dB, 50Hz-3kHz (normalized for de-emphasis).

Audio De-Emphasis: Cascaded first-order low-pass and high-pass filters, both with time constants of 720 μ s, giving bass and treble de-emphasis optimized for speech intelligibility.

Program Audio Output(s):

Balanced Analog: (XLR) balanced "dual monaural" Left and Right, adjustable from -15dBu to +15dBu in 0.1dB steps, relative to \pm 5% carrier deviation.

AES Digital: (XLR) output at 44.1kHz is adjustable from -30dBFS to 0dBFS in 0.1dB steps, relative to \pm 5% carrier deviation.

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

Flashing Panel Alarms:

WAT: Alarm signals the receipt of the 1050Hz Warning Alarm Tone.

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 WAT (1050Hz tone), 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 340mA; 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 676 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 receiving the INOmini 676, 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 676 NOAA Weather 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 676 to be fastened to the inside of an equipment rack cabinet with two #4 self-tapping screws.

An optional rack-mount kit is available that 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 676 is 350mA 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 676 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 676 will be used in the proximity of other radio gear, please do practice reasonable care in locating the unit away from *abnormally* high RF fields.

Antenna Considerations

The INOmini 676 is meant to be used with an outdoor antenna suitable for the 162MHz weather band. The NOAA Website gives hints for optimizing reception here:

<https://www.weather.gov/cae/reception.html>

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 T L A These are alarm “tally” outputs for remote indication of NOAA alerts and local reception problems. Designations noted on the rear panel stand for Ground, Tone (WAT), 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 The active-balanced analog line outputs are marked LEFT and RIGHT, but are in fact dual *monaural* outputs. These outputs have a 200-ohm source impedance and provide a program level that may be adjusted between -15dBu and +15dBu, corresponding to a ± 5 kHz peak deviation of the weather band NBFM 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 a ± 5 kHz peak deviation of the weather band NBFM carrier.

+12VDC POWER I/O

Two paralleled coaxial power connectors allow 'daisy-chaining' INOmini modules. This allows one DC supply to power as many as 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 676 draws 350mA. 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.

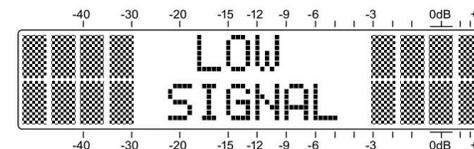
Section III

OPERATING THE INOmini 676

Hey, why is the screen flashing?

The INOmini 676 activates alarms for NOAA weather alerts and for signal reception problems. These alarms 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 weather frequency has been properly tuned-in, 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 intuitive INOmini 676 menu for yourself. 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,

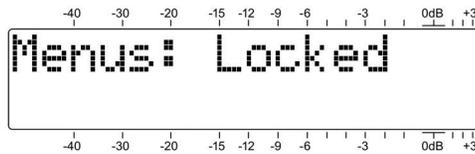
and then 4) *push* again to accept the selection and lock it into non-volatile memory. This will return you to normal menu navigation.

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

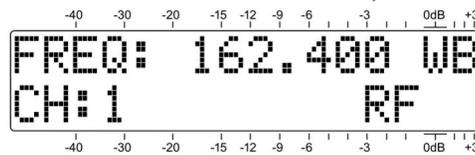
Locked Menus (Menu Screen 9)

To guard against inadvertent menu editing or casual tampering, the very last menu in the sequence allows you to 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 were trying to edit.



Tuning the Receiver (Menu Screen 1)

When power is applied to the INOmini 676, a 'splash screen' with the product ID pops up immediately on the LCD. Within a few seconds this will revert to Menu Screen 1, shown here as it might appear when the receiver is first powered-up, but before it has been programmed.



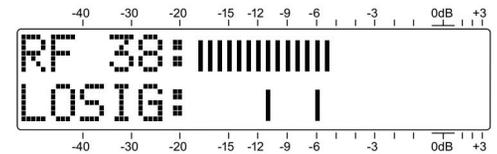
Push the knob and `FREQ` will begin to blink. Now the receiver may be tuned by turning the knob. The LCD shows the frequency, the channel, and will present a simple RF signal strength bargraph.

After tuning-in a weather broadcast, push the jog wheel. `FREQ` will stop blinking and the tuned frequency will be

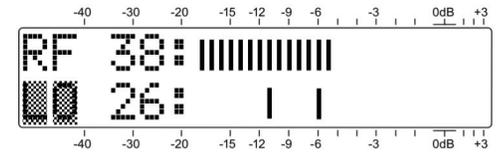
transferred into non-volatile memory. This releases the jog wheel to navigate to other menus.

Signal Strength and Alarm (Menu Screen 2)

The upper line of this screen displays the signal strength of the NBFM 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 5.



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 alarm flashes `LOW SIGNAL` on the front-panel LCD and activates the rear-panel L (low signal) terminal. Refer to Pages 6 and 13 for using and programming this terminal.

Audio Muting (Menu Screen 3)

Mute on Low Signal is a 'squellch' function that mutes the audio outputs during a Low Signal alarm condition. This is useful when audio from the INOMini 676 is utilized by other equipment that might misinterpret 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 due to un-quieted noise.

Signal-to-Noise (Menu Screen 4)

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."

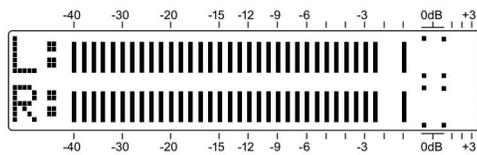
RF and SN numerical values are handy when installing a rooftop antenna. In locating and aiming the antenna, do everything you can to maximize both.

Program Audio Metering (Menu Screen 5)

Menu Screen 5 gives redundant left/right bargraph presentations of the *monaural* program audio level. Meters are peak-responding with a floating peak-hold function.

Although both L and R (Left and Right) levels are shown, the "stereo" outputs are provided for connection convenience, as radio broadcasting facilities are typically wired for stereo, whether the programming is or not. The two outputs carry the same audio and the meters will indicate identical levels.

±5kHz carrier deviation 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.

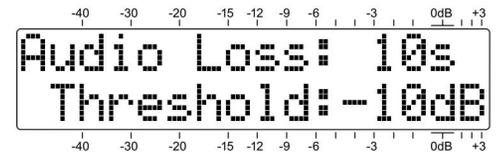


The Audio Loss Alarm (Menu Screen 6)

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 AUDIO LOSS indication and rear-panel 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 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.

The Audio Loss alarm responds to the recurring peak value of the announcement speech waveform. Go back to Menu Screen 5 to determine a good setting for this alarm function. Modulation appears to vary considerably from one NOAA frequency in an area to another, thus this setting is not as predictable as a similar alarm for a commercial broadcast station. Be sure to push the knob after making the selection to store the setting in memory.

The alarm flashes AUDIO LOSS on the front-panel LCD and activates the rear-panel A (audio-loss) terminal. Refer to Pages 6 and 13 for using and programming this terminal.

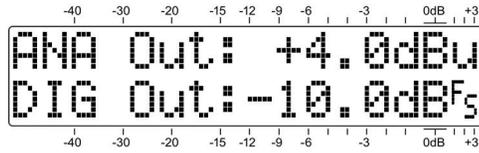
Headphone Volume (Menu Screen 7)

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 7. 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 dBFS, or digital-full-scale at the AES3 output.

The WAT Alarm

The WAT is a 1050Hz tone broadcast by NOAA for certain imminent weather or other emergency events. There is no menu associated with the Warning Alarm Tone, and no adjustments for threshold or delay parameters as are provided for the reception-error alarms. When received, the tone will flash ALARM TONE on the front-panel LCD and activate the T (tone) terminal on the rear panel. Refer to Pages 6 and 13 for using and programming this terminal.

HIDDEN MENUS

The INOmini 676 also has settings for little-used, set-and-forget functions. Push and hold-down the front-panel knob to access these top-secret settings.

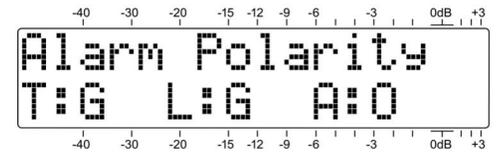
Firmware Version (Hidden Menu Screen 1)

The 676 Firmware screen will apprise you of what firmware version is installed in your unit.

Alarm Polarity (Hidden Menu Screen 2)

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 T (the WAT Alarm) 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.



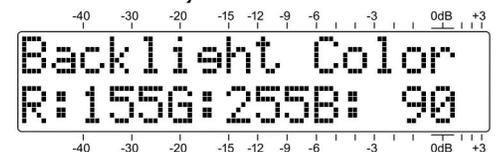
In the example above, the rear-panel T and L terminals will give closures to ground for their associated alarms, and the A terminal will be grounded and go open-circuit for Audio Loss.

Backlight Color (Hidden Menu Screen 3)

The INOmini 676 has a large, easy-to-read, backlit LCD display. A WAT 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.



Loading Factory Defaults (Hidden Menu Screen 4)

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 676 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 **676 Firmware**) and push the knob.

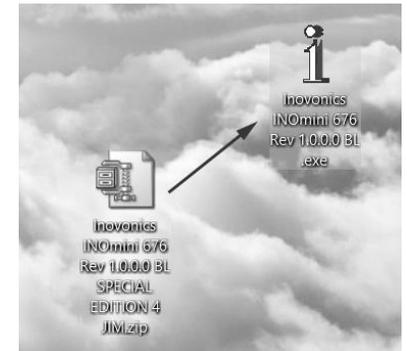
Section IV UPDATING FIRMWARE

Firmware Files

INOmini 676 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 676 to your computer with a popular ‘USB-A’ to ‘mini-B’ USB cable.

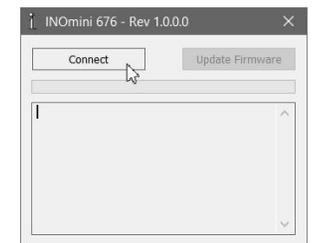
Next, download the zipped file to your Windows Desktop and unzip it in place, as was done here. Simply double-click the zipped BL.zip file and follow the unzip utility’s instructions, placing the extracted .exe file on the desktop.



Next, place the INOmini 676 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 676. 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 676 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 676 NOAA Weather 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 676 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.

Revised Sept. 2011



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