MODEL 732 ∞ R·D·S
RADIO DATA SYSTEM

RDS/RBDS Dynamic RadioData Encoder

Installation & User Guide

Installation & Operation
User Guide

MODEL 732

RDS/RBDS Dynamic RadioData Encoder

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TABLE OF CONTENTS

Section III – SETUP AND OPERATION

PRELIMINARY INFORMATION

NAVIGATING THE FRONT PANEL

GETTING UP AND RUNNING

BASIC PROGRAMMING

'STATIC' RDS DATA

DATA PORTS

Section IV – ADDRESSING THE ENCODER

USING HEADERS

USING 'TAGS'

APPENDIX

Section I

INTRODUCTION

732 PRODUCT DESCRIPTION

What is the Radio Data System? The term RDS (European) or RBDS (North American) denotes data transmissions that accompany analog audio programming on the VHF FM broadcast band. Packets of data are transmitted on an FM subcarrier to carry program-related metadata, such as song title and artist info, as well as housekeeping functions to help listeners seek particular programming options, and to enable certain networking, timekeeping and public safety features. Inovonics' 732 is the latest generation in the company's long line of RDS/RBDS RadioData encoders.

732 Product Features Leading features of the Inovonics 732:

- Compatible with virtually all playout systems (station automation) for artist and title information; supports RT+ song tagging.

- Separate RDS and MPX+RDS outputs offer multiple hookup options to cover all interconnection possibilities with any FM processor, STL, exciter/transmitter, etc.

- The 732 is SNMP-compliant; an IP-based Webserver interface controls all encoder functions and is accessible with using any computer or mobile device from any worldwide location.

- The front-panel OLED display and jog wheel navigate an intuitive multilevel menu for quick local setup.

- A built-in scheduler can deliver static messages on specific dates at specific times for program promotion.

- An internal delay feature synchronizes text messaging with audio programming that may be subjected to profanity or diversity delays.

- Error and malfunction alarms guard against a 'stuck' playout system or repeater 'hijacking.' Alarms are logged and can dispatch instant email or text alerts to station personnel.

RDS APPLICATIONS SUPPORTED

PS (Program Service Name) An 8-character station 'street name' or a 128-character scrolling message (song info, promos, advertising, etc.).

PI (Program Identification) The 732 automatically calculates PI codes for US and Canadian stations.

PTY (Program Type) Your station's format.

PTYN (Program Type Name) A further refinement of your type or style of programming.

TP/TA (Traffic Program / Traffic Announcement) A utility that calls attention to critical traffic or other emergency situations. Some RDS radios automatically retune to these announcements, even overriding CD or MP3 playback.

AF (Alternative Frequencies) Up to 25 frequency entries for rebroadcast 'translators.'

RT (RadioText) A 64-character block of plain-text messaging that can be called-up on the faceplate of most RDS radios.

RT+ (RadioText Plus) An updated standard for song info display and a means of 'tagging' songs for purchase, etc.

CT (Clock Time and Date) The 732 sends the current time to RDS radios. The feature is set and updated automatically with an Internet connection.

DI (Decoder Information) The mono/stereo data flag.

M/S (Music/Speech Switch) The mixed-music or speech-only data flag.

INTERNAL SCHEDULER

Up to thirty PS or RadioText messages or commands may be programmed for transmission at specified times on prearranged dates or recurring days of the week.

OPTIONAL RDS DATA DELAY

Scrolling-PS, RadioText and RT+ message updates may be subjected to a delay programmable in 1 second increments to 200 seconds. This allows text messaging to match audio program profanity and transmission diversity delays.

SETUP AND DATA ENTRY

The front-panel OLED and jog wheel allow on-site setup of all operating parameters. The built-in Webserver also gives easy access to setup, control and monitoring functions.

SNMP

All setup and operating controls and alarm functions are under SNMP management.

INPUTS / OUTPUTS

MPX/PILOT Input: An unbalanced/bridging (BNC) input accepts either the complete composite-multiplex (MPX) stereo baseband signal or a 19kHz TTL-level pilot sync signal from the stereo generator. Maximum amplitude: 5Vpp. The 732 reverts to an internal crystal time base for monaural transmissions.

RDS Output: Unbalanced, 75-ohm (BNC); delivers the RDS subcarrier (only) to feed the RDS/SCA Input of an FM exciter. This output is used in the 'sidechain' encoder mode. Level is adjustable from zero to 3.7Vpp.

RDS+MPX Output: Unbalanced, 75-ohm (BNC). The RDS subcarrier is internally mixed with the MPX input signal, which is delivered to this output at unity gain. The RDS subcarrier level in the combined baseband signal is one-third the Vpp level set for the RDS (only) Output. This is the output for the loop-through encoder mode.

Serial Data Port: A rear-panel RS-232 connector (DB-9) accepts dynamic messaging from a direct connection with station automation or STL/satellite data link.

LAN (IP Network) Port: A rear-panel RJ-45 connector accepts multiple IP networking connections using both TCP and UDP protocols. Connected to a router, the 732 may be accessed over a station's Local Area Network or the Internet.

GPIO Ports: Two GPI (input) and two GPO (output) terminals may be programmed for local control and alarms.

TA SWITCHING

The temporary TA flag may be set either by a software command or with a contact closure through a rear-panel GPI terminal. The 732 has a TA-timeout utility to preclude TA flag violations.
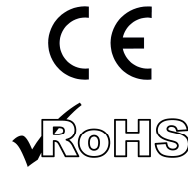
POWER REQUIREMENTS

88VAC-264VAC, 48Hz-63Hz; 12W.

SIZE AND WEIGHT

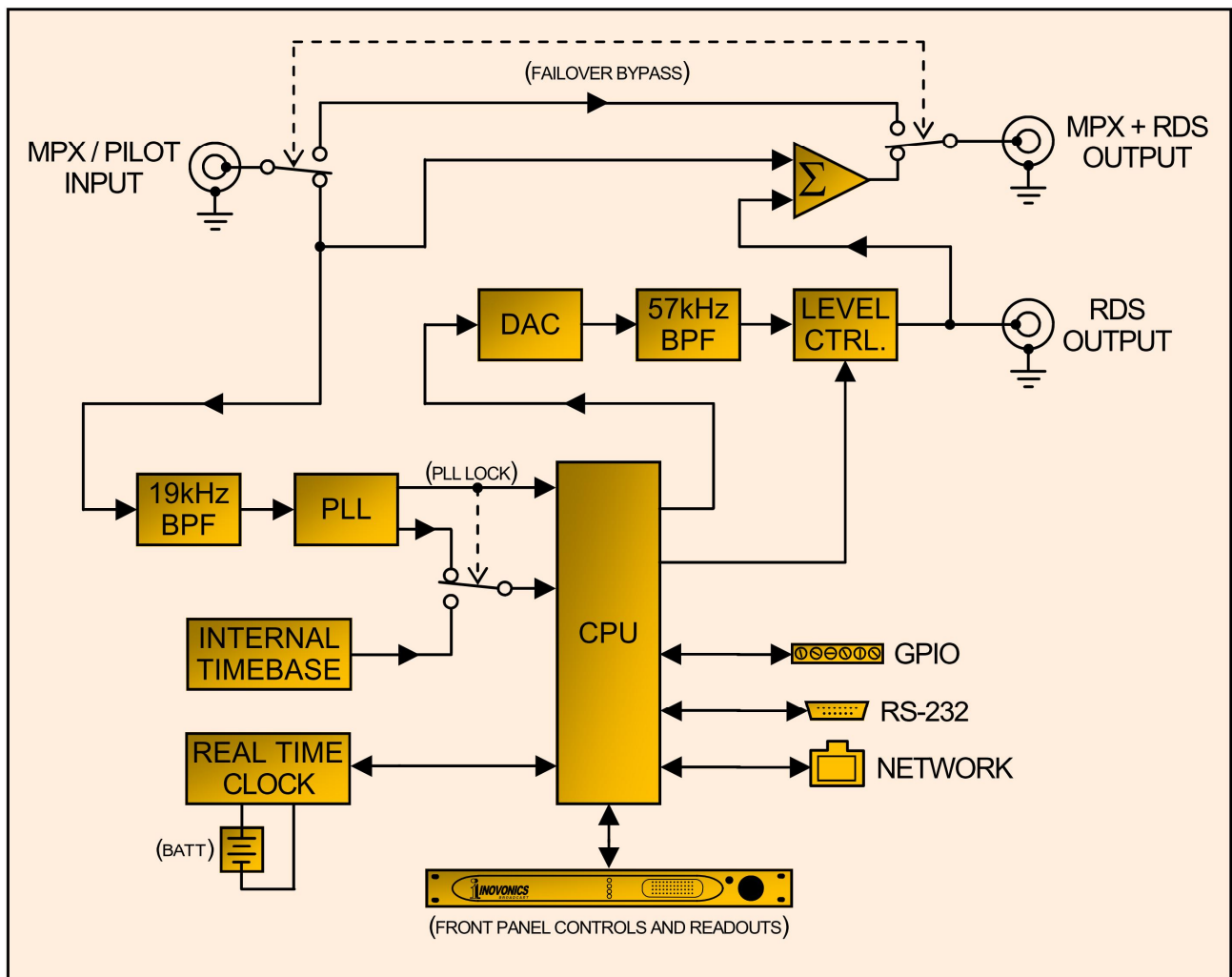H: 1¾"/44mm, W: 19"/483mm, D: 9½"/ 240mm (1U); 9 lbs/4kg (net), 12 lbs/5.4kg (shipping).

CONFORMANCES

CE

√RoHS

EN50081-1
EN50082-1
93/68/EEC

2002/95/EC

BLOCK DIAGRAM

Block Diagram – Inovonics 732 RDS Encoder

— 9 —

THE RADIO DATA SYSTEM DEFINED

RDS: Europe vs. North America (RDS vs. RBDS)

The European Broadcasting Union (EBU) and its member countries originated the concept of "Radio Data" transmission. The European RDS specification, CENELEC Standard EN50067, was first published in 1984, and was subsequently revised in 1986, 1990, 1991, 1992 and 1998.

Much of European broadcasting is similar to the concept of network radio that was common in the US prior to the 1950s. In Europe, a central program originator may feed many transmitting facilities of modest power situated throughout the country. The European disposition toward lower-power transmitters can be found on the 'local radio' level as well, with relay (re-broadcast) repeater transmitters at several different frequencies to blanket a designated service area.

Almost without exception, FM broadcasting in the United States is 'detached' and independent; that is, each station originates its own programming. One exception might be America's National Public Radio, although for most of the broadcast day even NPR stations originate, or at least schedule, their own programs.

RDS expanded rapidly in Europe following initial adoption of the Standard. RDS is nearly universal throughout Europe; it is almost impossible to find a European FM broadcasting station that does *not* carry a Radio Data subcarrier.

The popularity of RDS in Europe is very much in contrast with initial reluctance on the part of US broadcasters to embrace this technology. This can be ascribed to material differences in broadcasting practices.

The European concept of a *service area* equates to the US broadcaster's *market*. The subtle difference between these designations further characterizes broadcasting practices and ethics. RDS benefits the European broadcaster through almost an altruistic endeavor to be of *service* to his listeners. The US broadcaster is *marketing* his programming, and is primarily interested in how he can promote his station through RDS 'branding,' as well as creating additional revenue through song 'tagging,' sending GPS-linked traffic updates and other interactive applications.

As the Radio Data System was developed in Europe, it is understandable that it is abbreviated RDS there. The first US implementation of RDS differed sufficiently from the European standard to warrant its being renamed the Radio *Broadcast* Data System, or RBDS to differentiate it from its European counterpart. Differences between the two standards have been reconciled and minimized over the years, yet RBDS prevails as the US designation. For the sake of clarity and simplicity, the more generic and established term RDS will be used throughout this manual.

The RDS Signal   In a nutshell, RDS is a digital data channel transmitted as a low-level subcarrier above the range of the composite stereo program signal in the FM broadcast baseband. The data transmission (baud) rate is comparatively low, yet it is quite robust because of data redundancy and aggressive error correction routines. The injection level of the 57kHz RDS subcarrier is a relatively low 3% to 5%, thus it does not rob the broadcaster of significant program audio modulation (loudness).

It is not within the scope of this manual to cover the details of RDS subcarrier coding and modulation. For this the reader is directed to the Specification appropriate to his location, either the CENELEC EN50067 Specification for Europe, or the United States NRSC Specification for North America. It is assumed that the user has some familiarity with the concept of RDS as the balance of this manual will deal exclusively with encoder implementation.

In particular, the explanations of the various messaging and housekeeping functions afforded by RDS will help the reader become more familiar with what the system has to offer and how it can be used to the broadcaster's greatest advantage.

SUPPORTED RDS APPLICATIONS

The following is an alphabetical listing of RDS applications that are fully supported by the 732 encoder. The standardized RDS application abbreviation is followed by an expansion of the application name and a short explanation of the function.

AF   **List of Alternative Frequencies:** A broadcasting network, or a private broadcaster using low-power rebroadcast transmitters ('translators') to fill holes in his coverage area, can include a list of all frequencies where the identical program can be heard at that very time (synchronously). Upscale RDS receivers constantly search for the best signal that carries the common program in this case. When a stronger signal is found, the radio re-tunes to it with no audible interruption. The principal utility of this RDS function is with European radio networks and US stations with translators. The 732 can hold as many as 25 Alternative Frequencies.

CT   **Clock Time and Date:** The Radio Data System is capable of setting the date and time on RDS receivers equipped with a clock. The encoder will set itself to the time and date automatically, once connected to the Internet. Provision is included for automatic changeover between Standard Time and Daylight Saving Time (DST). This is detailed on Page 23

DI   **Decoder Information:** This is one of several 'flags' that convey yes/no or other very basic data. This particular flag is meant to tell the receiver whether the broadcast is monaural or is being transmitted in any of several methods of stereo or binaural

broadcasting. This is a rather esoteric and little-used function; only monaural and conventional stereo transmissions are supported by the 732 Encoder.

M/S **Music/Speech Switch:** This flag indicates whether music or speech is the primary programming. The purpose of this function is not covered well in the respective Standards, so it comes as no surprise that it is not widely understood. In general, only all-news or talk-radio stations would fly the Speech flag.

PI **Program Identification:** This block of data identifies the broadcast station with a hexadecimal numerical code representing the 'digital address' of the station. The receiver processes the PI code to assist automatic tuning features and to prevent false switching to alternative frequencies that might be shared by broadcasters in nearby regions. The code is assigned by the broadcasting authority in most countries, but in the US and Canada it may be calculated from a numerical encoding of station call letters. The encoder performs this function automatically as described on Page 24.

PS **Program Service Name:** This is the station's 'street name' that might typically appear on the receiver faceplate display. The PS can be up to eight characters in length (including spaces) and can be as simple as the station's call letters (KWOW or KWOW FM) or a slogan (NEWSTALK or LIVE 95). As the Program Service Name is displayed even on automobile receivers, it was really meant to remain 'static.'

Because of driving safety considerations, broadcasters have, from the beginning, been discouraged from making the PS 'dynamic'; that is, to send long messages in a succession of 8-character frames. As a matter of note, it remains a violation of both the CENELEC and the NRSC standards to flash or scroll the PS display. Nevertheless, this questionable practice of 'Scrolling-PS' has become ubiquitous, both in the US and abroad.

PTY **Program Type:** The PTY data flag identifies the station format from a list of pre-assigned categories. Many RDS receivers are able to seek the listener's preferred listening preferences automatically. This helps a broadcaster catch a certain transient audience share… long-distance truck drivers for instance. Two distinct lists, one for RDS and the other for RBDS, remain a major disparity between the two systems. A listing of all PTY categories is given in the Appendix.

Under some programming circumstances, the PTY identifier may be made dynamic, changing between categories for a station that 'dayparts' (changes its format for specific time periods). However, the PTY code is not meant to change from song to song or to accommodate a top-of-the-hour newscast.

PTYN   **Program Type Name:** This is an 8-character identifier that may be used to further define the Program Type. It is not used by the receiver to search for a specific format but, once the receiver is tuned to the station, the Program Type Name can further detail the type of programming. Further notes are found on Page 25.

RT   **RadioText:** This is a 64-character block of plain text that the listener is able to select for visual display, sometimes by pressing an INFO or a TEXT button. RadioText should not be confused with scrolling-PS, they are two separate and distinct messaging utilities that are available simultaneously.

The RadioText function is not always readily visible on automobile receivers for legacy safety considerations. This has precipitated the frowned-upon practice of instead scrolling the PS field for song titles and other 'dynamic' messages. RadioText is frequently relegated to the display of static information, such as the station's call-in phone number or Web address, unless the station runs RT+ applications.

RT+   **RadioText Plus:** RT+ allows newer RDS radios, as well as cell phones and MP3 players (equipped with FM receivers) to give the listener interactivity with specific elements within the RadioText message. For example, RT+ enables song 'tagging' or direct access to telephone numbers or Internet addresses that appear in RadioText.

TA   **Traffic Announcement:** This is a *temporary* flag added to the RDS data stream when (and *only* when!) a traffic bulletin is being aired. Some RDS car radios can be set to search for traffic bulletins among various TP stations (see **TP** below) while still tuned to a listener's preferred program, or even while playing a CD or MP3. As soon as any TP station broadcasts a traffic bulletin, the receiver *temporarily* switches-over to receive it. When the bulletin is finished, the receiver switches back to the original entertainment choice.

The 'takeover' nature of the TA function has spawned numerous abuses; most common is the misguided attempt to steal listeners. An unethical broadcaster might tease a listener he has just 'grabbed' by mentioning some hot pop star interview that's up next on his station as he goes into his traffic update. Or he might simply leave the TA flag on inadvertently (or not!). The 732 Encoder incorporates a TA countdown timer that limits the traffic announcement to a user-programmed maximum number of seconds.

TP   **Traffic Program Identification:** The TP flag identifies the station as one that routinely broadcasts traffic bulletins for motorists as part of its normal, everyday programming. When the TP flag logo is displayed on the receiver faceplate, the radio is searching for traffic announcements. The radio keeps track of TP stations offering this service to speed up the search-and-switchover process.

Section II

INSTALLATION

GENERAL

This section of the manual addresses the physical installation of the Model 732 encoder at its operating location; the 'nuts and bolts' of connecting the unit. This section also references pages where pertinent setup adjustments are discussed.

Unpacking and Inspection

As soon as the equipment is received, inspect carefully for any shipping damage. If damage is found or suspected, notify the carrier at once, and then contact Inovonics.

We recommend that you retain the original shipping carton and packing materials for return or transshipment if necessary. If returned for Warranty repair, shipping damage sustained as a result of improper packing for return may invalidate the Warranty!

IT IS IMPORTANT to register the Warranty of your Model 732. This assures coverage of the equipment under Warranty terms, provides a means of tracing lost or stolen gear, and adds the user to a database to receive specific service instructions or software/firmware updates when issued. Register online at:
   www.inovonicsbroadcast.com/support/productRegistration

NOTE: Many users choose first to familiarize themselves with equipment on the bench or at their desk, in which case they may immediately turn to Section III that describes encoder set-up and use. When the time comes, do please refer back to this section to confirm proper physical installation and interconnection with other station equipment.

MOUNTING, POWER & ENVIRONMENT

Rack Requirement

The 732 mounts in a standard 19-inch equipment rack and requires only 1¾ inches (1U) of vertical rack space. We recommend using plastic or fiber washers to protect the painted finish around the mounting holes.

Heat Dissipation

Consuming a virtual pittance of electrical energy, the 732 itself generates negligible heat, thus it has no noisy internal fan and bothersome filter to change or wash. The unit is specified for operation within an ambient temperature range between freezing and 120°F/50°C. Because adjacent, less-efficient gear may radiate substantial heat, be sure that the equipment rack is ad-

equately ventilated to keep internal temperature below the specified maximum ambient.

AC Mains Power   The 732 has an internal 'universal' switching power supply that accommodates mains voltages between 88VAC and 264VAC. Self-protection circuits obviate the need for an external fuse.

The detachable IEC-type power cord supplied with the product is fitted with a North-American-standard male plug. If you need to replace the mains plug with another, you will find that the individual cord conductors are color-coded in one of two ways. US standards specify black for AC 'hot,' white for AC neutral and green for earth ground. European CEE standards specify brown for AC 'hot,' blue for AC neutral and green with a yellow stripe for earth ground. For all our sakes, please do keep these straight.

RADIO FREQUENCY INTERFERENCE (RFI)

Location   Although it is expected that the Model 732 will be co-located with FM transmitters (and who knows what else!), do practice care and common sense in locating the unit away from *abnormally* high RF fields.

Ground Loops   Because the unbalanced encoder MPX/PILOT INPUT, RDS OUTPUT and RDS+MPX OUTPUT are referenced to chassis ground, a mains frequency or RF ground loop could be formed between cable shield grounds and the AC power cord ground. A 'ground-lifting' AC adapter may remedy such a situation, although the chassis must somehow be returned to earth ground for safety. Generally, being screwed-down in the equipment rack will satisfy the safety requirement.

ENCODER HOOKUP OPTIONS

Loop-Through and Sidechain   The 732 encoder may be connected in either a 'loop-through' or a 'sidechain' mode of operation. The separate RDS OUTPUT and RDS+MPX OUTPUT connections obviate the need to change circuit board jumpers to change modes. The drawing on the following page covers the most common installation options and illustrates the difference between 'sidechain' and 'loop-through.'
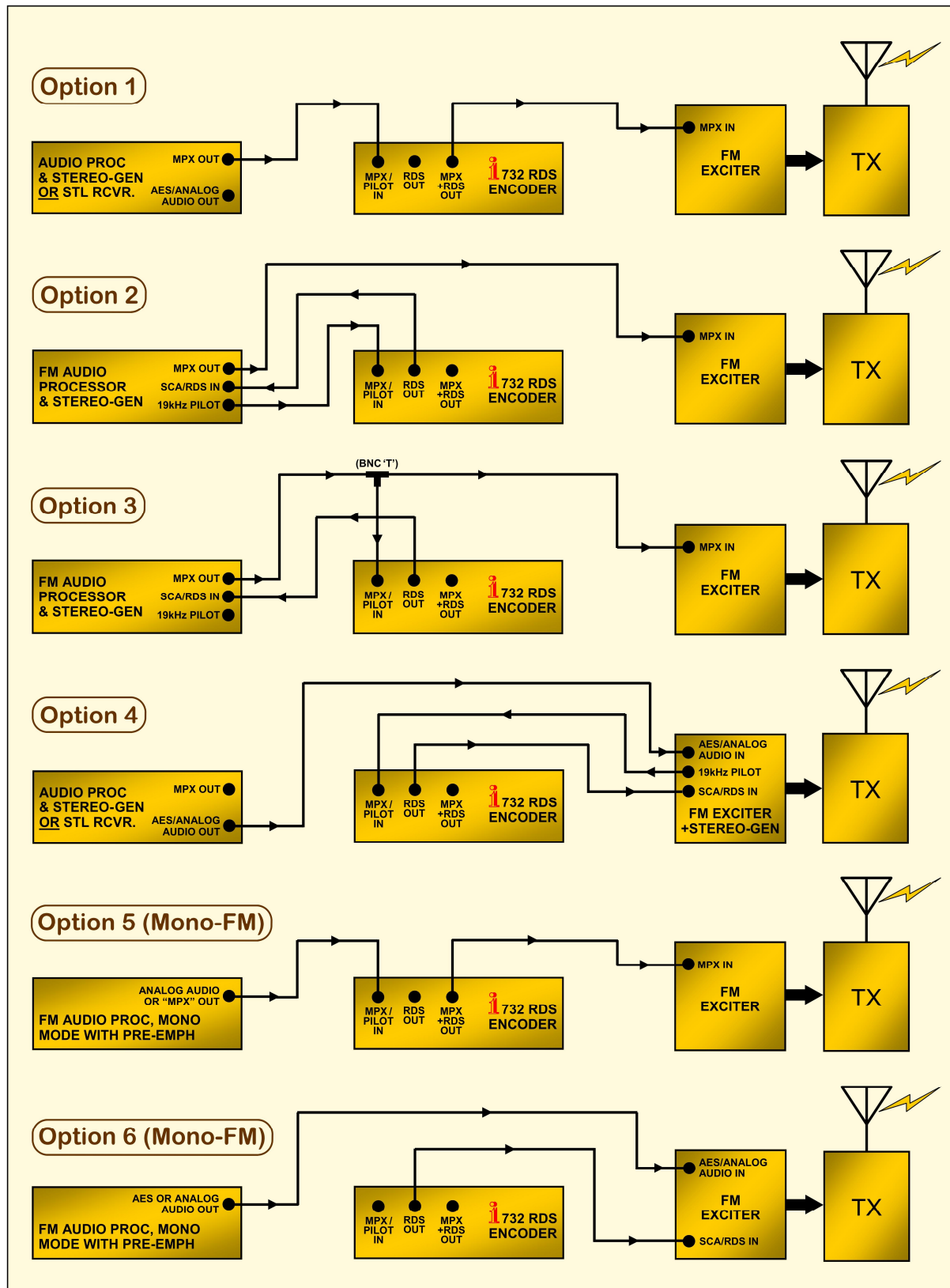
Common Hookup Options – Model 732 RDS/RBDS Encoder

INPUTS, OUTPUTS AND PORTS

MPX/Pilot Input   This input can accept either a TTL-level 19kHz sync signal from the stereo-gen or exciter, or the main composite/MPX output of the stereo-gen. In either case the encoder syncs with the 19kHz stereo pilot component. Note that both options are represented in the drawing on the preceding page.

With no sync signal connected, the encoder reverts to its internal crystal-controlled time base.

RDS (Only) Output   The RDS OUTPUT BNC connector delivers *just* the 57kHz RDS/RBDS subcarrier, whether the encoder is synchronized by a dedicated 19kHz sync signal, locks to the 19kHz pilot component of the composite/MPX baseband signal, or is clocked by the internal time base. This output is used in the 'sidechain' mode.

The peak-to-peak level of the subcarrier at the RDS OUTPUT is adjustable from the front panel or through the Web interface. The adjustment range runs from zero to 3.7Vpp.

RDS+MPX Output   When using this output, the 732 encoder serves as a unity-gain buffer amplifier between the MPX/PILOT INPUT and the RDS+MPX OUTPUT. This finds utility in the 'loop-through' mode. In loop-through, the composite/MPX output of the stereo-gen is applied to the MPX/PILOT INPUT, and the RDS+MPX OUTPUT feeds the FM exciter. The RDS subcarrier is injected into the output signal at a level one-third of, or about 10dB below, the level at the RDS-only output connector. This output is not used in the sidechain mode, as whatever sync reference is applied would be the major component of FM carrier deviation.

The p-p level values at both output connectors are displayed alongside their appropriate slider controls, both on the front-panel OLED and Web interface screens.

RS-232 Serial Port and Cabling   The rear-panel RS-232 SERIAL PORT can interface directly with station playout (automation) systems that are co-located with the 732 encoder and are equipped for simple serial communication. This is an alternative to network connection, and in some installations may be simpler. STLs and satellite receivers with RS-232 outputs may be connected here as well. This port is addressed in simple ASCII text.

The encoder accommodates multiple baud rates with a factory default setting of 19200 baud. Set automation for 19200 baud/8 data bits/no parity/one stop bit (19200,8,N,1).

Serial connection with station automation for dynamic messaging requires a 'straight-through,' pin-for-pin DB9 extension cable. Serial cable pinout is diagrammed on the left in the following illustration.

Modem Link When properly configured, a modem link will appear 'transparent,' as if the encoder were connected directly to the controlling computer or automation system. The drawing on the right shows proper pin connections for the cable used to connect the 730 Encoder to a conventional external modem. The three conductors shown are the only ones actually required in this case.

Computer or Automation Cable   **Modem Cable**
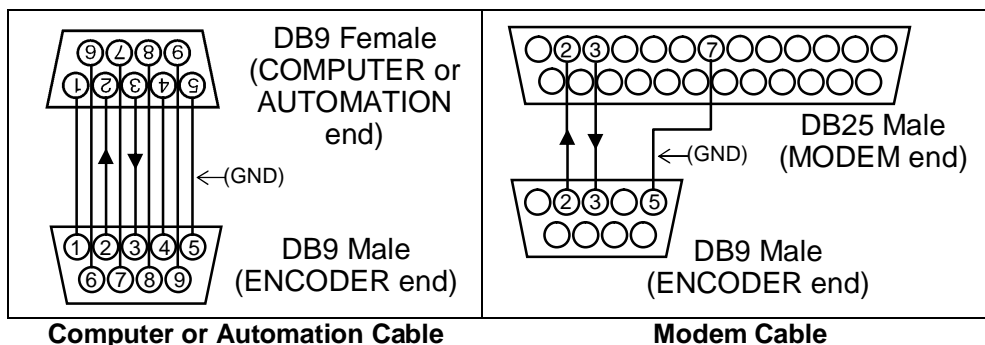
STL / Satellite Receiver Connection These are the connections typically required between the 732 and an STL or satellite receiver. Only three conductors are actually needed for this RS-232 interface, plus a pigtail jumper in the end that goes to the STL or satellite receiver to fool it into a proper 'handshake' routine.

STL Receiver Cable
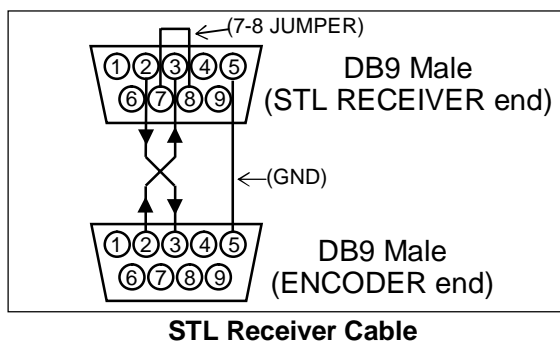
GPIO Ports A removable screw-terminal strip on the rear panel gives access to two GPI (General-Purpose Input) and two GPO (General-Purpose Output) terminals. +5VDC and ground are provided here too.

Inputs have an internal pull-up resistor to +5V and respond to a closure to ground. Logic polarity (trigger on ground or trigger on open) is programmable through a software command.

Outputs are NPN transistors that saturate to ground and can sink up to 100mA. Again, polarity (active for ground or active on open) is programmable through software.

Network Port A standard RJ-45 network jack is used to connect the Model 732 to a Local Area Network (LAN) or to the Internet. Networking permits full remote setup and control plus SNMP functionality. Initial connection to a network is outlined in the next section.

Section III

SETUP AND OPERATION

PRELIMINARY INFORMATION

Quick Boot
The 732 encoder 'boots' (starts up) in about one second. When AC power is first applied, or following a power interruption, the unit is back in full operation almost immediately. Setup and programming parameters in use previous to the power glitch are reloaded instantly from non-volatile memory into the processing core.

Flashing PI Warning
Programming the proper PI code into your 732 encoder is vitally important, primarily because of the auto-tuning, program-seeking features that RDS offers the radio listener. For the broadcaster, entering the proper PI code may well keep certain RDS radios from suddenly tuning *away* from your station. For these reasons, and in anticipation of forthcoming industry recommendations and standards, the Inovonics 732 incorporates a safeguard against transmitting a random, or the wrong PI code. The encoder is delivered with a factory-default hexadecimal PI code of 0000. This is an invalid code that would never be assigned anywhere in the world.

With the factory-default 'bogus' PI loaded, the upper message shown at the right will flash over the front-panel OLED display. A similar message will be superimposed over every Web interface screen as shown here. As implied, the RDS subcarrier from the 732 will be muted until a valid PI code has been entered, or in the case of North American operation, the station call letters entered into the proper spot. See Page 24 for additional details on this.
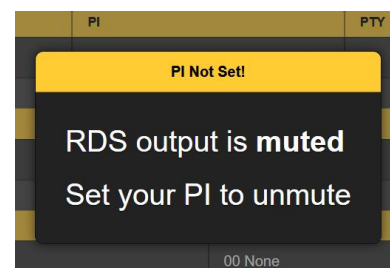
PI Codes for USA Translators
'Translator' installations in the USA require a PI code that differs from the primary FM channel being rebroadcast. Call letters obviously cannot be converted into more than one PI code, so the National Radio Systems Committee (NRSC) has worked out individual assignments for these translator PIs. Use the lookup table at: http://picodes.nrscstandards.org/.

**Front Panel vs. Web Setup** For the greater part of its functionality, the 732 encoder may be placed in service either through local, front-panel setup or over a network (LAN or Internet). Some familiarity with the jog wheel knob and menu tree is encouraged, as you'll need to gather certain information from the front panel before you can point your browser to the Web interface. But setup and operation are so much less tedious using a network connection that this section of the manual will first introduce you to the front panel, and then help you get connected for subsequent programming using the Web interface. Nevertheless, most everything that can be accomplished over a network can be done manually from the front panel, and the OLED and Web interface menus are arranged in very much the same order.

The 'responsive' design of the 732 Web interface provides an optimal viewing experience across a wide range of devices. A minimum of resizing, panning or scrolling is required with any device, from desktop computer monitors to tablets to mobile phones.

NAVIGATING THE FRONT PANEL

All setup and operating variables of the 732 encoder are under firmware control. There are no jumpers, switches or mechanical potentiometers, only the front-panel jog wheel knob A and Back button B identified in the illustration.
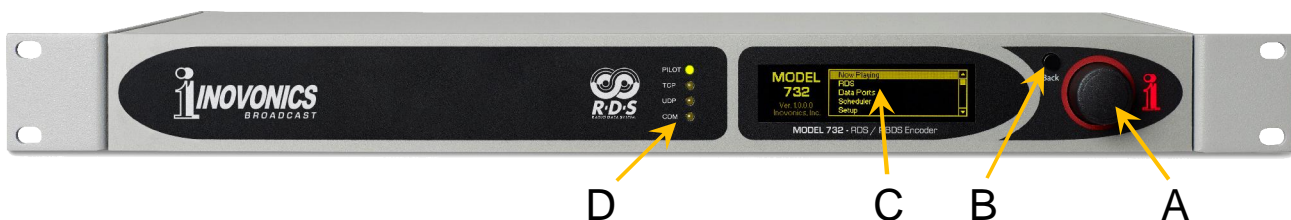
Graphic Display The OLED graphic display screen C presents an intuitive setup menu tree in an easy-to-follow format. The display has a screen saver, so if the screen goes dim or dark, simply *push* the jog wheel knob or Back button once to bring it back to life. No selection or change is made with this wake-up call.

LED Status Indicators A series of LEDs D indicate: 1) lock to the 19kHz stereo PILOT; 2) on-solid for connection to a TCP sender over a network connection; 3) blinking for reception of data over a UDP network port; 4) blinking as local RS-232 data is received over the serial COM port.

The Jog Wheel Knob *Turn* the jog wheel knob to cycle among the selection of available menu items, and then *push* it to select or adjust the highlighted item. There may be multiple menu levels for the item you need to reach. Once you do reach a submenu that allows control over a function, you *turn* the knob to position brackets around the adjustable function, then *push* it again to make a

selection or to gain control of an adjustable parameter.

After selecting a programming option or dialing-in a specific 'incremental' value (i.e. DPS & RT Delay or RDS Level), it's best to *push* the knob a final time to 'save' that value to memory.

Menu Timeout If you simply leave the current screen showing and walk away, in about 30 seconds the encoder will assume that the current setting is what you really want and will save the setting to memory. The screen will 'deselect' at that point and the knob will no longer respond to an adjustment command without re-selecting that screen.

Screensaver After a programmed timeout interval (see Display Settings on Page 42), the screen will either dim or go dark to prolong the health of the OLED display. At any time, however you can press the jog wheel knob or Back button to bring the menu back up.

The Back Button The Back button will always return you to the previous menu screen. Push it repeatedly to go back to the Main Menu.

If you make a mistake (for example, you might *push* the knob slightly off-center, which could also *rotate* the knob and bring up the wrong menu), just push the Back button to return to the previous menu and try again.

The Front-Panel Menu Tree The several levels of front-panel setup and operating menus are laid out in an intuitive and easy-to-follow fashion. The complete OLED Menu Tree is reproduced and explained in the Appendix of this manual.

Menu Titles are shown in the table in a font that mimics the OLED display font. Main Menu items are against the left margin, submenu levels are indented appropriately.

'Action' menu levels will indicate whether that menu level is a readout (display) of some parameter, or if it accepts some form of user entry. (set) generally signifies an on/off or enable/disable function, and (select) denotes multiple-choice selections or adjustment of an incremental value. (data entry or configure) calls for alphanumeric character entry into data fields. Data entry is admittedly cumbersome with the jog wheel knob, hence our endorsement of the Web interface.

GETTING UP AND RUNNING

The 732 encoder comes with a printed 'Quick-Start Guide' (QSG) that helps you get the unit up and running in very short order, with encoder programming set for basic, 'static' RDS messaging. Rather than repeat all that information here, we'll assume that you have chosen the proper hookup option (see Page 15) and are ready to access a local network for setting the unit up.

The PI 'Nag Screen'

As already noted, a PI 'nag screen' will remind you to set a proper PI code for your station as described on Page 24.

You can temporarily interrupt the overlaid 'nag' message. From the front panel, push the knob. On any Web interface screen, just click anywhere on the screen. RDS data may then be entered, but the RDS subcarrier output will remain muted until a valid PI code or station call has been programmed-in.

The Web interface and the OLED menus are so very similar in organization, that the procedure given from this point forward can be duplicated almost as easily using the front-panel jog wheel.

The Main Menu

If necessary, push the BACK button to bring up the OLED Main Menu. This is the gateway for encoder setup and operation.
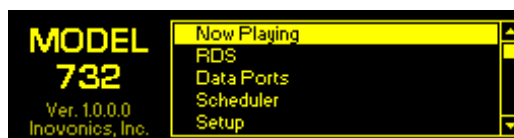
With the encoder connected to your local network (LAN), use the jog wheel to navigate from the Main Menu to: Setup / Network / IP Settings.

The Encoder IP Address

This image is typical of what your unit should now display. Under the default ⊙ DHCP control, your router should have assigned the encoder an IP address, which in this example is IP: 10.0.0.15.

From a computer on the same network, open a browser window and enter the encoder's IP address in the address bar. The encoder's Now Playing screen should pop up like this:
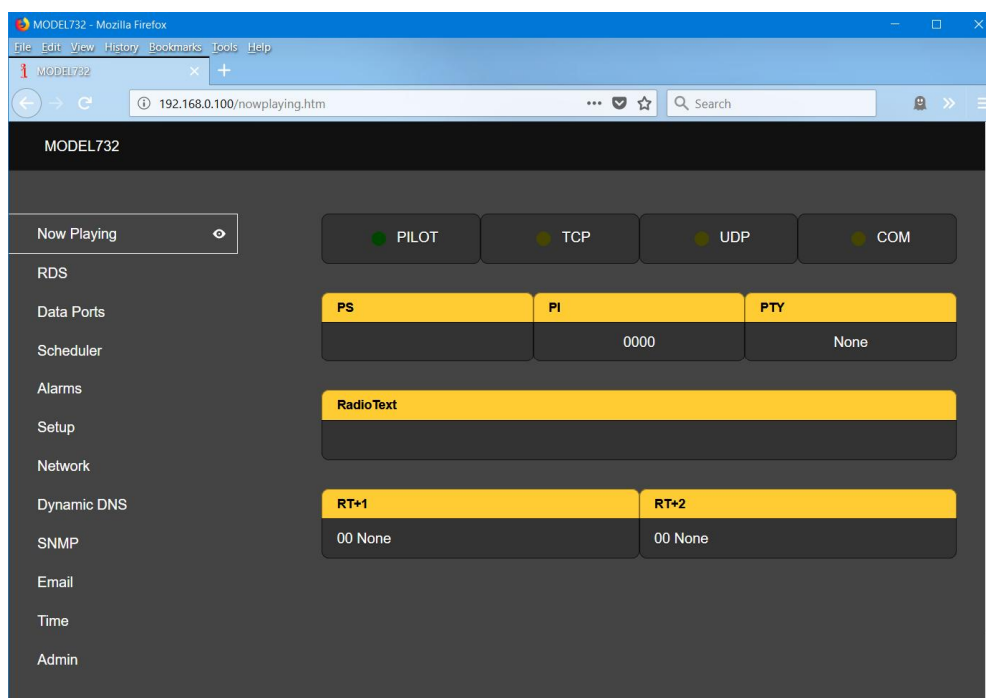
The left-hand column contains all the same sub-menu items under the OLED Main Menu. There are minor deviations that will be obvious, otherwise the OLED and Web interface menus are arranged in much the same manner.

Now Playing is a display-only screen. It shows in real time the primary RDS info and messaging that is being transmitted at the moment. The front-panel LED indicators are mirrored here as well, and alarms pop up on this screen too.

BASIC PROGRAMMING

Whether or not the 732 encoder will be used to provide dynamic messaging (artist & title, RT+ functions, etc.), it is nonetheless capable of providing interesting and informative information on the listener's radio faceplate in addition to its RDS 'housekeeping' duties.

Click on the RDS sub menu to display an array of setup options. There are three main headings on this screen; they will be explained in order.

Regional Setting

Prior to any other setup, it's essential to verify that the encoder has the proper regional setting. From the menu on the left, click: RDS and scroll down to the RDS/ RBDS setup option shown here.
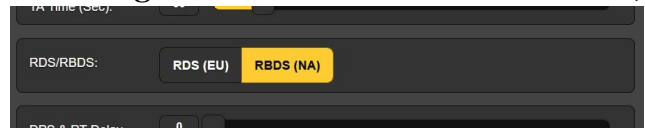
Make sure to select the proper option: **RBDS (NA)** for the United States and Canada, and **RDS (EU)** for Europe and for the rest of the world that adheres to the European standard. Simply click on the proper heading, which will become highlighted in yellow.

Timekeeping Setup

Whether or not you elect to send CT (time and date) updates to listeners' radios, it's important for your encoder to be synchronized to Internet time and set to the proper time zone for accurate error logging.

Click on the Time sub menu and set the zone slider for the proper offset from Universal Coordinated Time for your area. In this example, the **-8** represents West Coast US (Pacific) time.

Note also that the **Auto DST** utility is checked. You may

— 23 —
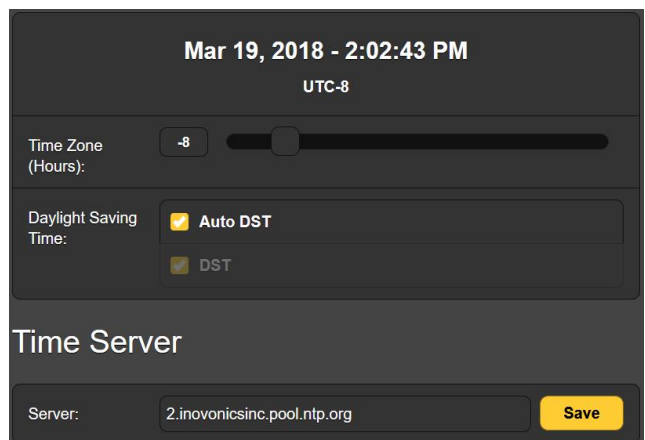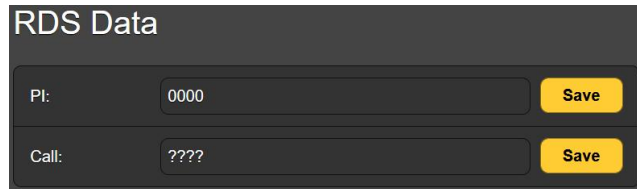
opt for this, or you may force Daylight Saving Time (**DST**), or by leaving both boxes unchecked you can ignore DST completely.

We have provided a reliable default Time Server. If you have a favorite, however, you may overtype the Server: entry with another and click **Save**.

When this feature is working properly, the correct date and local time will appear at the top.

'STATIC' RDS DATA

The PI Code The first and arguably the most important setting here is your station's PI code. Important enough, in fact, that the 732 has a built-in safeguard to avoid improper operation. This was discussed at the very beginning of this Section.
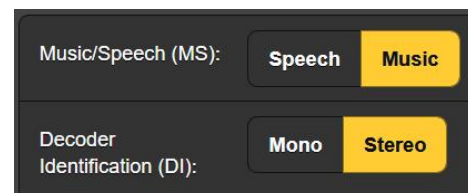
The PI (Program Identification code) is the 'Digital ID' that is unique to your station, and has importance in the automatic program-seeking feature provided by the Radio Data System.

In the US and Canada, just overtype the factory-default ???? entry with your own call letters, and then click **Save**. The 732 will compute the hexadecimal code automatically from a formula that's part of the RBDS standard.
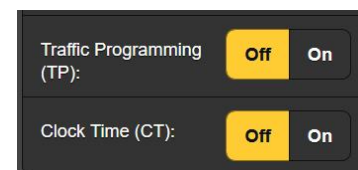
Outside North America, this call letter translation utility does not apply. Instead you must enter the 4-character hex code that will be assigned and provided to you by your country's broadcasting authority. Again, just overtype the factory default with your assigned code in the PI: field, and then click **Save**. In the RDS mode, where there is no correlation between call letters and the PI code, Call: will be a blank field.

MS and DI 'Flags' These two setup options should be obvious. Unless you are an all-talk or all-news station, or broadcast all your programming monaurally, the default entries shown here would be the proper choices.

TP and CT This next pair of options is tricky and deserves some careful consideration.

The TP (Traffic Program) function aids the motorist by having his RDS radio monitor all TP-flagged stations so that it can quickly cut-over and grab a TA (Traffic Announcement) from any flag-

— 24 —

ged station. Announcements warn of road closures, heavy traffic, etc. The sinister side to this useful feature is that a competing broadcaster can force *your* listener's radio to tune to *his station* temporarily, away from the program he chose: *your station*. Although there is no way to guard against such misuse, unless you dispense traffic information in your normal programming, leave (TP): set to **Off**. (See the related TA (Traffic Announcement) discussion a few paragraphs down.)
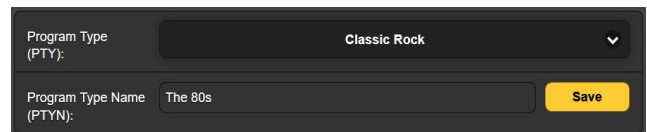
Another situation similar to the Traffic Program dilemma involves the CT (Clock Time) RDS function, another supposed 'convenience.' A station sending CT information will set the clock in a listener's radio to the correct local time. The 732 encoder sets itself to Internet time to guarantee an accurate reference. The downside is that, unless you take care to set the UTC and DST time offsets properly, or if you are close to a time zone boundary, you stand a good chance of making listeners irate when their clock is off by an hour or more, showing local time in Alabama when they're in Georgia. Keep motorists happy and let them set their own clocks.

If you do decide to provide time information, be sure that you have first set the proper zone and offset as described above.

PTY and PTYN
High-end RDS radios allow their users to preselect a preferred program genre, or station format. A long-haul trucker might select country music as a primary listening choice, and as the truck travels down the highway the radio will seek and select stations that feature country music.

The PTY (Program Type) RDS feature works with a built-in, fixed list of programming choices. The

list differs somewhat between the RDS and the RBDS standards. Click the down-arrow to bring up the list appropriate to your region, and then click on the genre that most accurately describes your station's format. The list is reproduced in the Appendix of this manual also.

The selected PTY category can be refined to home-in on a unique format variation. This won't help in the radio's automatic tuning process, but the radio will be able to display an 8-character description of your format specifics. In the example here, Classic Rock has been narrowed down to The 80s. First set Program Type (PTY):, and then type your 8-character format variation into the (PTYN): field. Finally, click **Save**.

The AF List
This is yet another RDS attribute that works with the receiver program-seeking feature. It has utility in station networking, once common in the US and still popular Europe, and with "translators" or rebroadcast repeaters that extend a station's coverage into rural or 'shadowed' areas. As a motorist drives into a fringe area, his radio seeks other frequencies where the

same programming is available, in sync with the primary station, and seamlessly tunes to the stronger signal.

For this to work, the radio must be supplied with a list of the various frequencies where the main station's program may also be found; this is the AF list.
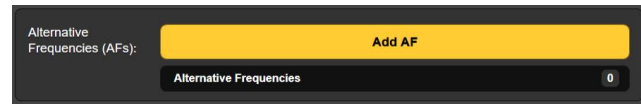
If you are a network of low-power stations (Europe), or have repeater/translators (US), click on the yellow **Add AF** bar. A pull-down entry box allows you to enter the frequency of every appearance of your program on the dial. Be sure to enter the station's main frequency as well. Once programmed, the AFs you've entered will display, along with a count of the total number of AFs programmed. Remove AFs by clicking the ✖ to the right of the entry.

RDS Messaging Delay

RDS transmission of both the DPS and RT messaging fields (discussed next) can be delayed in 1 second increments up to 200 seconds. This permits synchronizing the metadata display (song artist and title) with the audio program when HD Radio 'diversity' or intentional fixed profanity delays would otherwise cause an offset between metadata and the program audio transmission.

Delay may be adjusted by grabbing and sliding the slider knob, or you can overtype the number shown in the box. You may also click on the slider and use keyboard < and > cursor keys. In this example, the 8 seconds of delay selected just about equals the diversity delay inherent in HD Radio transmissions.

Dynamic PS

Every RDS radio displays the PS (Program Service Name) field. This is an 8-character field meant to show call letters or a station's 'street name.' But, wonder of wonders, it can be 'scrolled' to display song titles, program promotions or even advertising.

The PS field is usually populated automatically by station automation. Section IV of this manual gives instructions for connecting the 732 encoder with automation, and for formatting commands so that the function works properly.

But even without a playout system you may manually program this field with a static PS message, be it your call letters or a simple identifying slogan to repeat over and over. In a bit we'll

even teach you how to 'schedule' static PS and RadioText messages that can automatically pop up on certain days at a certain time. There's even a provision for default messages in case the automation system has a meltdown.

The DPS: field always shows the message currently being sent to scroll on all RDS

radio faceplates. Usually this is the artist and title information from station automation. Alternatively, you can enter this field and type-in a message with up to 128 characters and spaces. This static message will then scroll until replaced, either by another typed-in message, by incoming data from station automation, or ultimately the DPS default message following timeout.

DPS Tags   Station automation can address the encoder by either the 'Headers' or the 'Tags' method. Tagging is a somewhat more complex method that uses RT+ 'tags' to display playout and other data in both the DPS and RT fields. Headers and tagging are detailed in Section IV.

'Parsing'   When Parse is set to **Auto**, the 732 encoder automatically groups short words into 8-character blocks and breaks longer words to fit sequential frames. When Parse is set to **1**, the message will instead 'march' across the radio faceplate like a line of little soldiers, or a Times Square news 'ticker.' Other settings simply march the message across with a **2** to **8** characters 'jump.' **Auto** is the usual setting.

DPS Speed   DPS Speed (Sec): sets the dynamic DPS 'refresh rate,' or number of seconds between sequential frames of the scrolling (parsed or marching) message. Some RDS radios are not able to keep up with the fastest 1-second refresh interval, so it's best (and more readable) to use a 2- or 3-second setting. The longer settings are useful for pre-programmed static messages that you'd like to alternate slowly, such as the example below

A Static Programming Example   With these settings:

    DPS: 98.5 FM The WAVE (note: exactly 16 characters+spaces)
    Tags: **None**
    Parse: **Auto**
    DPS Speed (Sec): **5**

The RDS radio would display this:

    98.5 FM…(5 sec.)…The WAVE…(5 sec.)…98.5 FM…(5 sec), repeating indefinitely until updated.

When static PS messaging is used exclusively, it's still a good idea to repeat that same static message in the DPS Defaults area, discussed next. Then you can insert a temporary message as a dynamic PS entry, but your normal static message will resume after the programmed timout period.

DPS Defaults A 'default' message typed into this field will display on radios when an update to the regular station automation data is not received in a timely fashion. Rather than have some song from an hour ago confuse and confound listeners, why not show call letters or station ID? DPS Timer (Min): may be set for as much as two hours, but 5 minutes (something in excess of the longest song you are likely to encounter) is a more realistic setting.

The DPS Defaults message feature automatically resets when the DPS field is updated. In fact, if a default message has been sent, the only way to clear that message is to update the DPS field. This holds true for changing a default message as well. Change the default message, click the DPS Defaults Save button, and then refresh the DPS field by clicking the Dynamic PS Save Button. The new default message will be sent after the timeout interval.

RadioText (RT) Setting up the RadioText field is very similar to the DPS field discussed above. Since RadioText is transmitted all at once in its own RDS group, there is no parsing or speed to set. Otherwise the same rules for Dynamic PS settings apply to RT:, RT Tags:, RT Default: and RT Timer (Min): settings.

RadioText Plus **Group 5** is the factory default assignment for the RT+ Group: setting. This can be changed to another option here if it conflicts with use of Open Data Applications (ODAs) specific to your situation.

For an explanation of RadioText Plus and RT+ 'tagging,' please refer to Section IV.

DATA PORTS

Command Debugging A very useful feature of the 732 encoder is the ability to see incoming commands from station automation 'on the fly,' just as they are received. This recent history is useful in confirming simplex/duplex communication between automation and the encoder, and will tell you quickly if syntax, data rate and other protocols are configured properly. This display area will 'grow' to display the last 256 characters sent to the encoder and the encoder's response.

In this illustration, the playout system is addressing the 732 encoder by the simple 'headers' method.

Debugging
Received Data History
DPS=Call Me by Blondie on KRDS-FM↵[OK TCP1]

The header, DPS= tells the encoder that Call Me by Blondie on KRDS-FM wants to be put in the Dynamic PS field to scroll on radio faceplates. The ↵ ('carriage return') symbol that follows the text indicates the end of the message. The encoder then sends the acknowledgement OK back to the sender, (automation generally ignores this), and also notes here that the entire
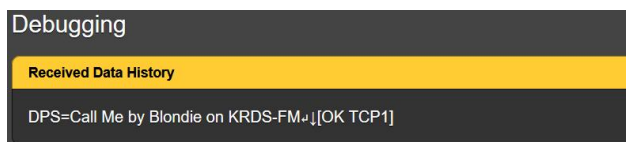
operation was carried out over the TCP1 port.

If the encoder receives a message that is not formatted properly, it will still be shown here, but the answerback will be NO, instead of OK.

The Legend & Command List Click the big ✚ next to this heading under the Data Ports submenu. The pull-down listing of information that appears will give you a comprehensive explanation of abbreviations and commands that you are likely to encounter when programming the 732 encoder. There are explanatory notes here that will help with message formatting also. The Legend & Command List is reproduced in the Appendix of this manual as well.

Port Status The five Port Status windows display the IP address of either current (or the most recent) equipment that is (or has been) communicating with the encoder. In this example, a computer with the IP address (10.0.0.3) was the last device to address the encoder over the TCP 1: port. That port is currently shown Idle.
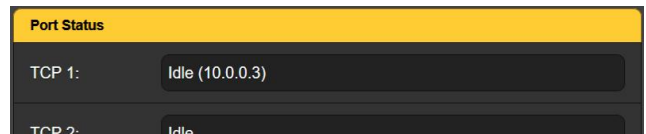
Port Specifics Each 732 data port has its own screen area where specifics can be viewed and addressed.

All four IP ports have Options: to ☑ Enable, ☑ Echo and ☑ Reply(to) incoming commands.

Port: numbers are shown, and the factory-default ones may be overtyped as necessary. The Status: field gives the state of each port; that is, whether it is idle, awaiting data, has received an invalid command, or if an update has been properly received. The IP address of the sender is also shown.
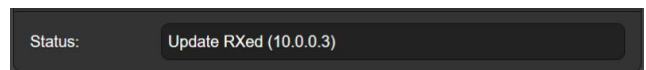
In addition, the UDP ports have a field to enter a Multicast Group, which will identify your encoder as a valid recipient of 'datagrams' to a specific group of encoders. Please refer this somewhat complex operation to your resident IT professional.

The IP Whitelist As the name implies, this utility provides a layer of security in specifying what sender IPs are allowed to address your encoder. This security feature may be used in addition to passwords. Whitelisting must first be enabled, and up to four IPs may be entered. When enabled, any IP *not* on the list will be ignored.

The Serial/COM Port This port is generally used for a direct, hardwired connection between the station playout system and the 732 encoder, or when using an RS-232 STL or satellite data link to forward RDS messaging.

In addition to the usual ☑ Enable, ☑ Echo and ☑ Reply checkbox options, the communication Baud Rate: may be selected here too. For a short, direct connection, the fastest rate that the encoder and your playout system have in common should be fine; the default rate is 19,200 baud. The RS-232 link of an STL or satellite system may demand a lower speed. As the RDS system, itself, runs at a comparatively slow rate, even a 1200 baud setting will load data within a reasonable time and with no discernable presentation delays.

'No Headers' Operation Third-party (e.g.: satellite) program providers cannot be expected to format RDS commands to accommodate every make and model of RDS encoder. They generally send artist and title information as simple, unformatted text strings. The 732 can accommodate metadata in this form with a unique 'no headers' option provided only on the RS-232 COM port.

Normally the Headers: ☑ **Headers Required** box remains checked to follow the same programming protocols as the IP ports, when addressed with headers. ('Headers' operation is defined and discussed in Section IV.) Basic, unformatted text strings are accommodated by unchecking the box, and then specifying which fields the text string will be copied into: **Copy to DPS**, **Copy to RT**, or **Copy to DPS & RT** (both fields). Incoming metadata will then display on the radio as directed, and all incoming characters will be shown exactly as received. Messaging will be parsed as selected under RDS / Dynamic PS. Keep in mind that any unrelated, extraneous characters received from the provider will be presented in those fields too.

THE SCHEDULER

The 732 encoder Scheduler lets the user select certain days, dates and times for special 'events.' Events can consist of text inserted into the PS and RT fields, and/or commands issued to modify encoder operation for certain timeframes.

For example, if station automation switches to satellite-delivered religious or public-service programming Sunday mornings between 6AM and 8AM, PS and RT field messages may be pre-programmed to identify that program, or perhaps to promote the usual programming that resumes afterward… or both! Encoder *commands* may be changed in like manner, from turning the TP/TA function on or off, or disabling an alarm; even changing the encoder's front-panel password temporarily to accommodate contract maintenance between certain hours.

Programming the Scheduler Programming events is straightforward and intuitive. Here's a simple guide:

1) Pick the next unused, sequential Select Event: number.

2) Select the Type:, either **Text to…** (a field), or a Command.

3) Specify a starting Time: in hours, minutes and seconds.

4) Set the Duration: of a **Text to…** event in hours and minutes. This sets the minimum time that the message will display on RDS radios. The Duration: function prevents automation from updating DPS or RT messages prematurely. In other words, the message with a programmed Duration: time will not be preempted.

Sending a **Command** event will gray-out the Duration: setting. **Command** events require a follow-up, second programmed **Command** event to change back to a previous or 'normal' situation.

5) Set the event to Trigger On:, either by **Date** or by selecting certain **Days** of the week

6) Type-in the selected Text: if it's a text message to scroll on the radio, or type-in an encoder operating command based on the Legend and Command List. This list appears under the Data Ports submenu and in the Appendix of this manual. A typical command might look like this example. This command has been in-serted at the start of a ball game to

Text:	DELAY=0

eliminate the customary delay that matches the HD Radio 'diversity' delay for the station's regular music programming.

7) Click **Save Event** to load this event into encoder memory. You may highlight any programmed Select Event: and click **Delete Event** to clear that event from encoder memory.

And… be sure that the Enable Scheduler: is set to **On** at the top.

ALARMS

The 732 encoder features alarms to warn of unusual operating conditions. Alarms show up on the OLED display on the front panel, as rear-panel 'tally' contact closures, and at the top of the Alarms submenu on the Web interface. Alarms can also send an SMS text message or an email to selected personnel.

DPS Not Updated When artist and title info is sent as a dynamic scrolling-PS message (and/or to the RadioText field), the playout system updates that info when the song changes. But if there's a hiccup in the automation system, and an update is not received within a preset interval, this situation can be used to trigger a DPS Not Updated alarm.

Alarm: must be set to On to trigger, and the missing-update Time On (Min): interval programmed. A suggested setting of 10 minutes would in all likelihood exceed the playing time of any pop-music selection, but a classical station might use a setting

of 40 minutes or even more. The alarm is automatically reset whenever the DPS field is updated.

RT Not Updated This alarm is identical to the one for the DPS field just discussed, and setup parameters are the same. Many stations use the RadioText field as a static 'barker' message, frequently showing the station's Web address, request line phone number, etc. Unless you periodically update the RT field, there's not much reason to use this alarm, as playout system hang-ups will be reflected by the DPS Not Updated alarm.

Pilot Loss The 732 encoder should always be sync'd to the 19kHz stereo pilot. If pilot is lost the encoder automatically defaults to an internal time base for uninterrupted RDS service and messaging. But an alarm for loss of stereo pilot has been included for your peace of mind, and as it can be programmed to send text and email messages, this might be the only indication you have that something just isn't right.

As with the other two alarms, Alarm: must be set to On. In addition, there are two timers involved: a Time On (Sec): that delays the alarm after it senses pilot loss, and a Time Off (Sec):, an interval that the pilot must stay back on, once it comes back, before the alarm is reset.

Note that the two timers associated with Pilot Loss are in seconds, not minutes. When setting these parameters, keep in mind that, if you are going to be receiving text messages for this fault event, and something in your stereo-gen is acting very erratically, with short durations set here you could be getting a flood of texts.

The Alarm Log *NOTE:* The time-stamp feature for e-mail notifications and the Alarm Log depends on sync with Internet time, and with the proper time offset for the encoder location. This setup is detailed on Page 23.

Click ✚ **View Alarm Log** to see a list of all alarms received since the log was last reset. Alarm gives the type of alarm, and Time and Date are given for each alarm event. Each alarm will have an entry, both when the alarm was logged and then again when (and if!) it was reset.

Status: X% Full at the top of this screen area is a notation of how full the log is at the moment. Although the log is capable of containing a couple of thousand alarm entries, it might be important to know when you have accumulated a certain number, as this could be an indication of some recurring problem that begs to be addressed. Email when % full refers to the slider that can be set to send notifications, either that the log has accumulated sufficient entries to suggest a technical issue, or has nearly reached its capacity.

Download Alarm Log creates a .csv text file that can be opened in Windows Notepad, or downloaded to the computer Desktop or other location. **Clear Alarm Log** does just that.

SETUP (SUBCARRIER LEVEL)

This Web interface subhead is abbreviated somewhat from the corresponding front-panel OLED display due to small organizational differences between the two menus. Nothing has been removed, however, and missing items should easily be found in the corresponding menu. Check the Front Panel Menu Tree in the Appendix.

RDS Output

RDS Enable: is simply a switch to turn the entire subcarrier generation and coding function **Off** or **On**. When set to **Off**, the normal encoder signal path remains intact; that is to say that the failsafe relay bypass is not engaged.

Setting the RDS Subcarrier Level

The RDS Level (Vpp): slider adjusts the level of the 57kHz subcarrier. The volts peak-to-peak notation to the left of the slider refers strictly to the subcarrier level from the RDS OUTPUT BNC connector on the encoder back panel. This is the output used with the encoder in the *sidechain* hookup mode (see Page 15). The level at the RDS OUTPUT may be set between zero and 3.7Vpp over 256 incremental values.

Below the slider, you'll find an alternate level readout that is nonetheless controlled by the same slider. This readout is the level of the RDS subcarrier as delivered at the rear-panel RDS + MPX OUTPUT BNC connector used in *loop-through* operation. When the composite/MPX signal is applied to the MPX / PILOT INPUT, that component passes through at unity gain, the same p-p level as applied. But the RDS subcarrier is attenuated to one-third its nominal figure (about 10dB down), to be more in keeping with traditional composite/MPX signal values. This attenuated RDS+MPX Level: level is adjustable between zero and 1.233Vpp over 256 increments.

The RDS subcarrier generally wants to represent about 5% of total carrier deviation. It's best to utilize a modulation monitor when setting RDS levels, but you can certainly ballpark the setting if you know the peak-to-peak output level of your stereo-gen at 100% modulation.

For example, if your stereo-gen is set to 3Vpp for full carrier deviation, then an RDS subcarrier level of 150mVpp would represent about 5% of the total. This would be your RDS+MPX Level: setting in the encoder's loop-through mode. However, if you are combining the subcarrier and composite/MPX externally, you'd use the RDS OUTPUT instead, and the setting would depend on your combining network or the sensitivity of an auxiliary SCA or other broadband input to the exciter.

Subcarrier Phase

According to the RDS and RDBS Specifications, the 57kHz RDS subcarrier may be either in phase or in quadrature with the 19kHz stereo pilot. These two phase relationships are shown

below. Note that the quadrature relationship yields a slightly lower peak level, which suggests the possibility of marginally greater carrier modulation by the program audio signal.

Subcarrier In Phase   **Subcarrier In Quadrature**
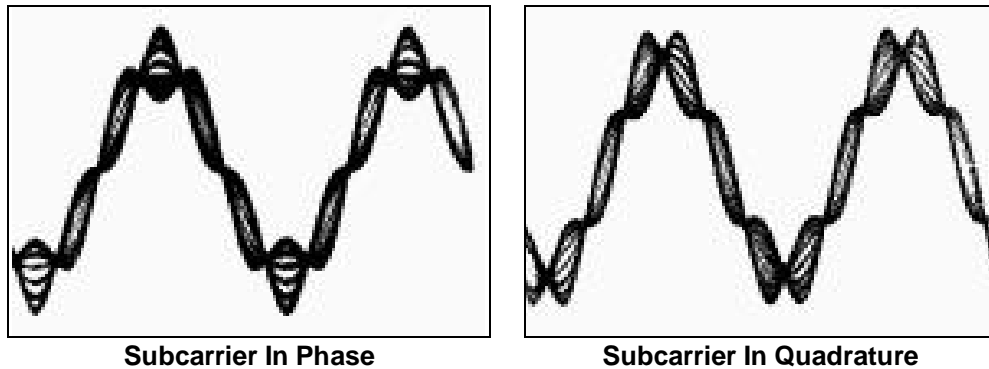
The 732 Encoder is meticulously aligned at the factory to ensure that the subcarrier has the proper phase relationship with the stereo pilot, whether the encoder is used in the sidechain or in the loop-through operating mode. Although many stereo generators supply a separate pilot-sync reference for RDS (typically a TTL-level square wave), this reference may or may not be in exact phase with the actual stereo pilot component in the composite/MPX signal. For this reason we recommend using the composite/MPX signal for synchronization. In the sidechain mode, the 732 simply bridges the output of the stereo generator and does not load or otherwise compromise the composite/MPX signal.

General Purpose Inputs

The two rear-panel GPIs respond to contact closures to ground. Polarity: may be programmed so that the selected function will be triggered when the rear-panel terminal is grounded (**Active Ground**), or when a normally-grounded terminal goes open (**Active Open**).

At present, the only triggerable event is the TA flag for a transitory Traffic Announcement (Page 13). Either Input 1, Input 2 or both may be assigned to this function by clicking in the Type: field and selecting TA Flag. Status: will indicate whether the GPI is inactive or active at the moment.

General Purpose Outputs

The two rear-panel GPOs are associated with the fault alarm functions (Page 31) and provide contact closures to ground. Polarity: may be programmed so that the selected alarm will deliver a ground to the rear-panel terminal (**Active Ground**), or will remove a normally-grounded condition (**Active Open**).
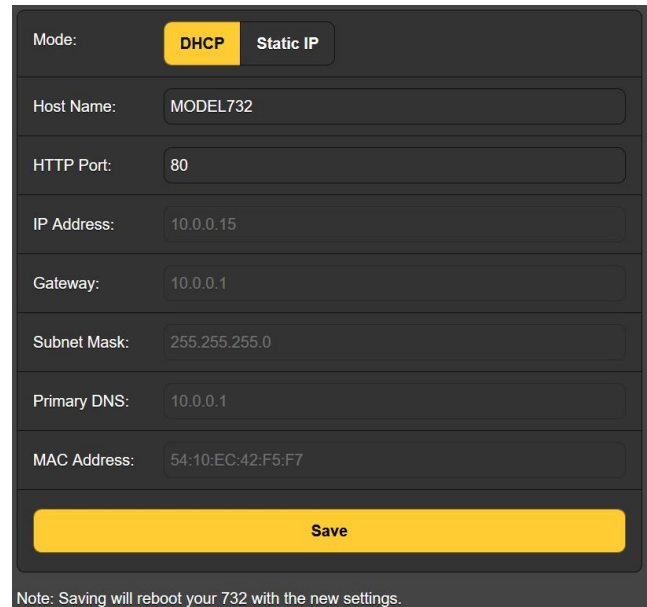
Type: assigns alarm closures (or opens) to both GPO terminals. Click the Type: field for a pull-down assignment menu listing: DPS Not Updated, RT Not Updated, DPS Or RT Not Updated and (stereo) Pilot Loss. These alarms must first be enabled and programmed per instructions starting on Page31. Status: will indicate whether the GPO is inactive or active at the moment.

NETWORKING

This submenu shows the current network settings and allows changes to the factory defaults. The initial "getting started" instructions back on Page 21 were based on the corresponding front panel OLED menu, and they covered the subject to the point of communicating between a computer and the encoder for the basic encoder setup thus far.

On the Network page shown here, encoder Mode: is set for DHCP assignment of the IP address by the network router. Note that many of the network setup options are grayed-out in this case. With the Mode: instead set for Static IP, grayed-out fields would be available to overtype the defaults. The MAC Address: is unique to each 732 encoder and cannot be changed.

Mode:	DHCP	Static IP
Host Name:	MODEL732	
HTTP Port:	80	
IP Address:	10.0.0.15	
Gateway:	10.0.0.1	
Subnet Mask:	255.255.255.0	
Primary DNS:	10.0.0.1	
MAC Address:	54:10:EC:42:F5:F7	
Save		

Note: Saving will reboot your 732 with the new settings.

Assigning a Host Name You may assign a specific name to your 732 to help identify it on your network. You may change the default Host Name: from MODEL732 to personalize the equipment name, or to differentiate one encoder from another on the same network.

Enter a Host Name: in all-capital letters. The name cannot include spaces. Be sure to **Save** the name once you've entered it.

Under Windows operating systems you may access the 732 encoder through a Web browser on the same network simply by typing its name and a forward slash into the browser address bar as shown here. All-caps is not required for this. Non-Windows browsers may require that you enter the complete IP address.

MODEL732 - Mozilla Firefox

File Edit View History Bookmarks Tools Help

MODEL732

model732/
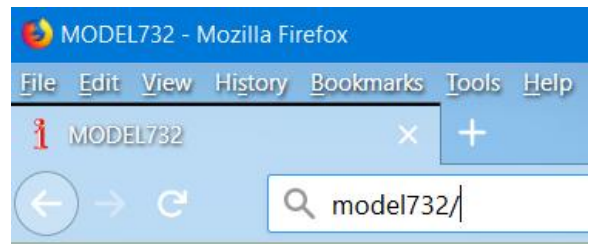
Accessing the Encoder Remotely

To 'dial into' the 732 encoder from the Internet, the unit must have a static IP address. If your router makes DHCP assignments for other equipment on the network, simply assign the encoder a static IP that is outside the router's DHCP range. This is an easy matter with the aid of the router's Help utility.

You also need to open a specific port for the 732 on the network router. Within the router's Port Forwarding utility you will be able to enter your static IP address for the unit (Internal IP), followed by a colon and a port number. The port number may be any number in the router's range. If your Internet Service Provider (ISP) assigns you a static IP address, then it is a simple matter to address the receiver from anywhere. Just type the IP address and port number into your browser as shown in this example.
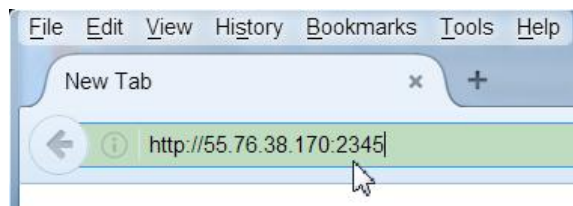
But if your ISP provides you a *dynamic* IP, which is most often the case, this mandates 'Dynamic DNS' operation, using the services of an IP-forwarding provider.

DYNAMIC DNS

IP-Forwarding Providers

Third-party IP-forwarding providers can be found on the Internet, and their service allows you to address equipment behind a dynamic IP address. The IP-forwarding utility allows the 732 to keep the provider apprised of its reassigned IP address each time your ISP updates it. The IP-forwarding provider intercepts transmissions attempting to connect with your 732 and automatically directs these to the updated IP.

There are three popular DNS service providers on the Internet. Their basic service (all you really need) may be free of charge, but advanced features may command a nominal annual fee. All services require registration on the appropriate Website.
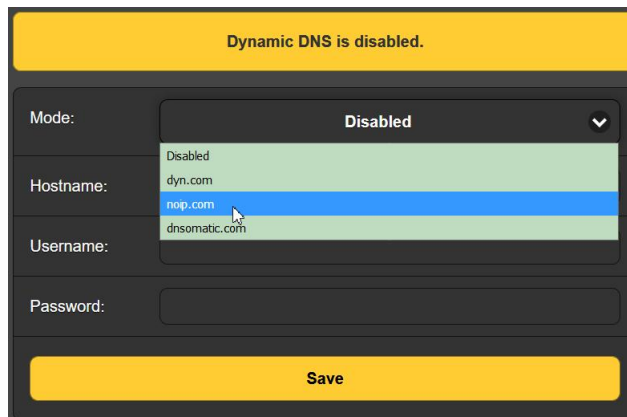
Under the Dynamic DNS submenu, the default Mode: selection is **Disabled**. Click the down arrow and scroll through the options. Jot down the three popular providers shown, and then do a Web search to learn more about what they offer and to register with your choice.

When you register, the provider will issue you a Hostname:, Username: and Password:, which will be specific to your encoder. Enter these into the appropriate fields, and then click **Save** to enable the Dynamic DNS function.

SNMP OPERATION

SNMP Overview   SNMP (Simple Network Management Protocol) allows other TCP/UDP/IP equipment on the same Local Area Network (LAN) to communicate directly with the 732, and for the unit itself to initiate an alarm on the network.

The 732 will interface directly with a network controller, technically known as the SNMP 'Manager.' The 732 has an embedded ASCII text file called a Management Information Base, or MIB. In setting up for SNMP operation, the MIB file will have to be downloaded from the 732 through the Web interface (see Page 37), and uploaded to the SNMP Manager.

SNMP Mode   The SNMP submenu default Mode: setting is **Disabled**, which inhibits communication between the 732 and the SNMP Manager.

Changing Mode: to **Read Only** allows the 732 to be interrogated by the SNMP Manager, so that programmed setup parameters, alarms, etc. can be integrated with other equipment on the network.

Setting the Mode: to **Read & Write** allows the SNMP Manager to send commands to the 732.

SNMP Security   SNMP 'Communities' serve as passwords for this function. In the Read Community: and Write Community: fields, overtype the factory defaults and enter text that is specified for the read/write strings on the SNMP Manager monitoring device. You must ultimately execute a **Save** after entering.

SNMP Ports   The default SNMP Ports, General Port: 161 and Traps Port: 162, are customary for a majority of SNMP operations. These may be overtyped to change them as required.

Trap Destinations   When the 732 *initiates* an alarm, rather than being *queried* or *polled* for one, the alarm is known as a 'trap.' Three local network IP addresses may be entered in the Trap Destination 1:, 2:, and 3: fields, each corresponding to other devices on the LAN that need to be apprised of alarms.

The MIB File   A MIB file is a small text file required by the SNMP Manager. From the SNMP menu, click: **Download MIB** to save this file in the usual Windows manner. The MIB file is in plain text with a .mib extension, and may be read with Windows Notepad.

NOTE: This is an abbreviated discussion of SNMP operation. SNMP is a complex utility, managed exclusively by whatever SNMP 'Manager' (monitoring equipment) is employed. Refer to

all instructions supplied with, and for, the SNMP Manager hardware in setting-up the 732.

EMAIL

Email & Text Notifications

NOTE: The time-stamp feature for email notifications and the Alarm Log depends on a network connection to sync with Internet time, along with setting the proper time zone and other options. This was detailed on Page 23.

Connected to the Internet, the 732 can send email or SMS/text notifications of malfunctions to one or more recipients. Which alarms go to whom is a separate setup routine.
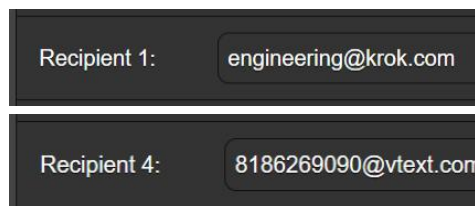
SMTP Setup

The 732 must first be properly programmed to send mail under SMTP Settings. You need to set up an actual email account, the elements of which are just like setting up any conventional email account. Information to be entered here depends on the provider you choose. When you apply for the account, much of this information will be assigned to you.

Under SMTP Server:, enter the provided outgoing mail server info (e.g.: smtp.gmail.com), the required Port: number and whether SSL: is **On** or **Off**.

From: is the 'friendly' name that will identify the 732 to the email or SMS/text recipient; like station call letters, or RDS Alarm. User: is the full email address of the unit. You also may assign a Password: to the account.

The Email List, (Send To)

Next enter up to ten email recipients, typing-in the full email address. After this you'll decide who gets what alert.

Email addresses typically take the form of the upper example here. If instead you wish to send a text message to a recipient's cell phone, the entry may look like the second image. In this instance the alarm notifications are being directed to Verizon subscriber's phone. Check with the wireless carrier to confirm the proper addressing protocol for Internet texting delivery.

When all recipients have been entered, click **Save**. You may also click Send test Email to message all recipients to confirm proper communications setup.

Notifications, (Send What)

You can assign any or all alarms to any or all email or text addresses in the Notifications section.

Referring to the illustration on the following page, choose recipients 1 through 10 by clicking the down arrow. With a Recipient: selected, click the Send Emails For: boxes to choose which alarm conditions will be reported to that individual.

In this example, the Chief Engineer will receive a text message on his phone whenever the DPS and RT fields are not updated by station automation within the time period programmed into the alarms. Moreover, the CE is scheduled to get a weekly log of all alarms too. (Chances are he'll later decide to get these by email instead!). When you've finished with this individual, proceed to the next. No 'save' command is necessary in this operation.

TIME SETUP

Time and DST Syncing to Internet time and the matter of Daylight Saving Time was addressed in the initial setup routine on Page 23.

ADMINISTRATIVE MATTERS

Security and Passwords Encoder access and settings may be protected by a password, which must then be entered before any changes can be made. Either the same or separate passwords may be assigned to lock out the front-panel jog wheel and Web interface access.

In addition to these passwords, security can be strengthened by 'whitelisting' the IP addresses that can access the encoder. This was described on Page 29.

On the Security submenu, enter the Front Panel: and Webpages: fields to type-in a password to limit access to either or both avenues of approach. Click **Save** to lock passwords in memory.

Passwords will be in clear text on both the front panel OLED and Web interface screens, but of course only authorized users will be able to open those screens.

Once the password is saved, the Now Playing screens will be the only menu item available without signing-in.

With respect to front-panel access, the 732 will lock any time the screen times-out (goes dim or dark) after the unit is untouched for the programmed timeout period. It may be locked immediately by holding down the Back button.

Once password protection is in place, you will be prompted to enter the password before any menu can be accessed and any

adjustments made. The Web interface password must be entered on the connecting computer. For front-panel access, enter the password using the jog wheel, highlight: Done and push the knob. This will be necessary each time the unit is awakened from a dark screen.

When working on a protected unit over an extended period, you can obviate the frustration of having to keep re-entering a password from the front panel by resetting the Admin/Display/Timeout setting to 60 min. From the Admin/Security screen you could also Backspace to delete the password, but of course jot it down first so you can re-enter it when finished.

Lost Password (Hard Reset)

To recover control of the 732 if the password is lost, you must do a "hard reset." This is accomplished by holding down the Back button as you power-cycle the unit (disconnect and then reconnect AC-mains power).

NOTE: A hard reset deletes not only the password, but will also return the 732 to all-factory-default values. *All User settings will be lost!* This illustrates the importance of keeping a Hardware Profile current, which is discussed next.

Saving the Hardware Profile

The entire 732 setup, including RDS settings, alarm notification preferences and SNMP options… all may be saved to your computer as a small text file. A Hardware Profile is useful for restoring a previous encoder setup or for cloning a second unit for backup service.

On the Admin Webpage, click: **Download Hardware Profile** to save the profile to your system. With the Firefox browser used in this example, this version of Windows first asks whether to <u>O</u>pen or <u>S</u>ave the file. After clicking the <u>S</u>ave button, the file is saved to a Downloads folder, and from there may be moved to a specified location. Other browsers may ask you directly to specify a 'Save as:' location. The file carries a default name of 732settings.ini.

To upload a saved setting, first click **Select Hardware Profile…**, navigate to the profile file location, and then click **Upload Hardware Profile**. This will replace all setup parameters
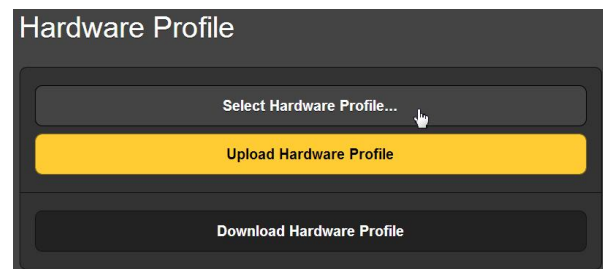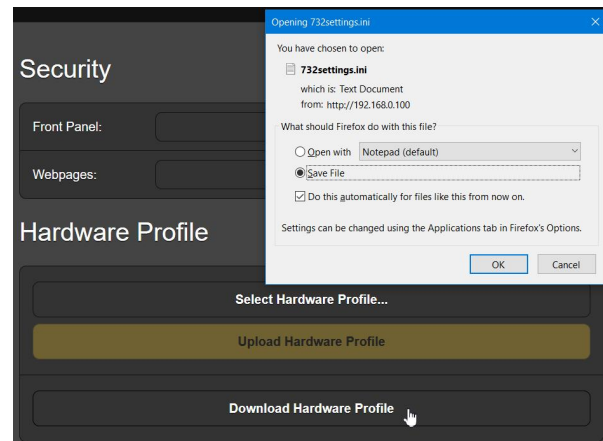
that are currently loaded and running in your 732 with the saved ones.

NOTE: Uploading a Hardware Profile reboots the 732. After the reboot, an information screen pops up to remind you of important operating procedures and to guide you through any problems that might have arisen after the reboot, or even gives you the option of restoring factory default settings.

Updating Firmware

732 firmware and Web interface pages are easily uploaded to the unit when updates are issued by Inovonics.

NOTE: It would be a very good idea to update your Hardware Profile, as a firmware update may affect some user settings.

Updates are issued as small .bin files which may be downloaded to your computer Desktop or placed in any convenient folder. From the Firmware Update utility at the bottom of the Admin screen, click **Select Firmware File…** and double-click the .bin file listing. This will transfer the file, name to the updater as shown here.
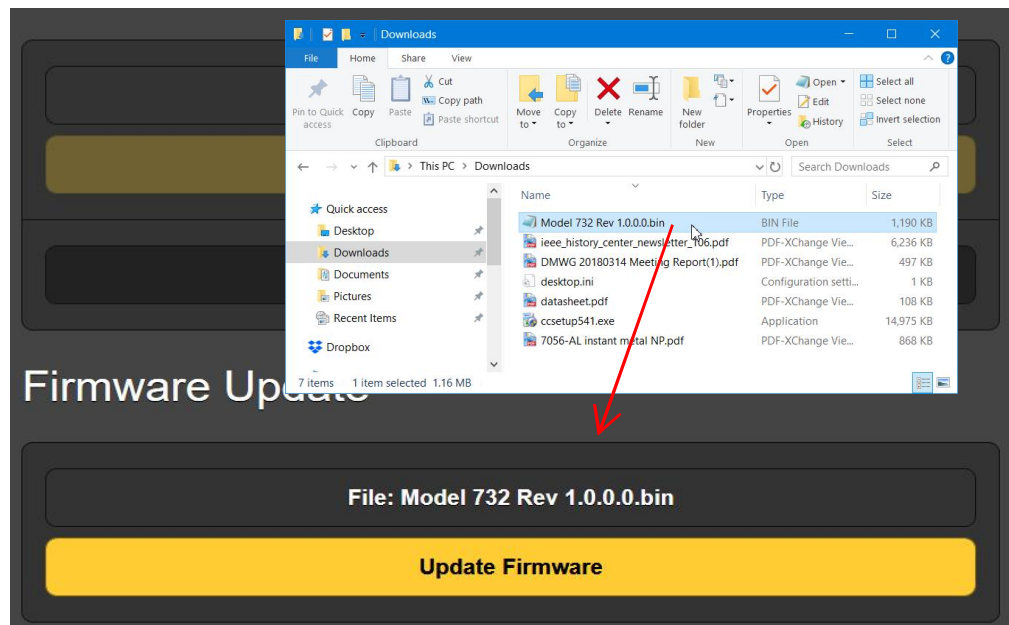
Click **Update Firmware** and follow prompts to complete the process. Updating takes a couple of minutes and will return you to the new Web interface pages once the operation is complete.

'About' Info

The bottom of the Admin screen shows the Serial Number: of your 732 encoder, gives the current Firmware Rev:, displays the Uptime: (how long your 732 has been running since power was last applied). You also may click **Check for Updates** to see if a new version of the firmware has been issued.

OTHER FRONT-PANEL SETTINGS

These are settings specific to the front-panel OLED display and the jog wheel.

Display Settings

The Admin/Display menu offers a Brightness choice for the OLED menu screen. You may change this from the 60% default value to a higher or lower setting. We don't recommend a much higher setting because this may shorten the life of the OLED graphic display module, and it doesn't really look much brighter anyway. A lower setting actually appears a bit sharper and kinder on the eyes in subdued lighting.

Timeout programs the interval between last use of the jog wheel knob and the screen's going into its 'screen-saver' dark or dim mode. This may be set in 5-minute increments between 5 min and 60 min. You may put the unit into the screen-saver mode manually by holding-down the Back button.

You may check ⊠ Dim to keep the screen from blacking-out entirely at the end of the Timeout interval.

About

The About screen shows the current Firmware Rev:, Serial #: of your unit, Ethernet: port status, the and Uptime:.

Section IV

ADDRESSING THE ENCODER

The 732 encoder is typically addressed by station automation to display artist and title info, station and program promotion, and perhaps even advertising. In this tutorial we will emulate the playout system with a 'dumb terminal,' using Telnet protocol with the freeware terminal software utility, 'PuTTY,' which may be downloaded from the Internet at putty.org. PuTTY is a replacement for Hilgraeve's HyperTerminal, which Microsoft so kindly supplied with Windows in years gone by.

Configuring a Telnet Terminal

Once it has been installed on your computer, launch PuTTY. Here is an example of the PuTTY window filled-in to communicate with the 732 encoder under the encoder's default settings.

Click Open to bring up a Telnet window, as shown below on the left. The top line of gibberish has to do with securing the initial connection. Typing ↵ (Enter) returns the expected NO answerback. The right-hand image displays the same information as Received Data History on the 732 Debugging screen.

— 43 —
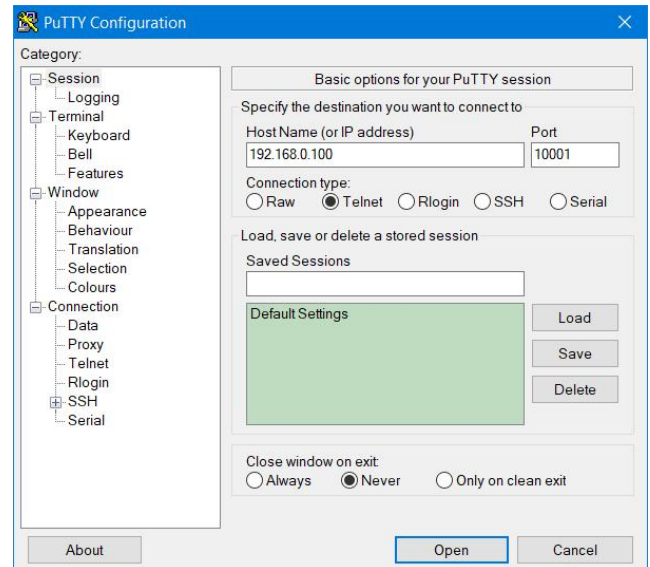
USING HEADERS

Inovonics' use of 'headers' dates back to the turn of the century and our first interactive RDS encoder.

A header is nothing more than a command 'identifier' ahead of a message or other programming request. The encoder reads the header and either assigns the message to the proper display field or changes an encoder operational setting.

The Command List

A complete listing of valid headers may be found in the manual Appendix, and can always be brought-up on the Data Ports Web interface page by clicking ✚ **Legend & Command List**.

Here is a Command List entry taken from the Web interface page.

Header/Command	Parameter	Details
DPS= PS_TAGGED_TEXT=	Dynamic PS	Up to 128 characters for scrolling messages in the PS field.

In this case there are two headers that can be used with this messaging command. The first one, DPS= is Inovonics' stream-lined header, abbreviated to be very convenient for users. PS_TAGGED_TEXT= is typical of an alternative command list and performs the exact same function. These alternative commands, shown below the abbreviated ones, have been enabled in the 732 to retain compatibility with certain older systems still in use.

Here is an example illustrating how text may be manually placed in the scrolling-PS field. **DPS=** precedes the text, and ↵ (an 'Enter' keystroke) follows. This tells the encoder that a command is coming, and then that the command is complete.

Here is what must be typed into the PuTTY terminal program: **DPS='ALONE' by HEART on K-105FM** ↵ . At the right it's shown as actually typed into PuTTY. The **OK** answerback indicates that the encoder accepted the text. The 732 ignores improperly formatted commands and returns a **NO** in response to them.
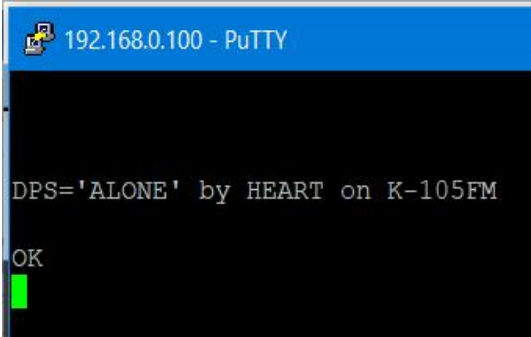
Here is how the incoming data shows-up as **Received Data History** on the Ports/ Debugging Web interface

page. The added arrows show that the 'Enter' keystroke is broken down into traditional mechanical teleprinter CRLF (car-

riage-return/line-feed) components. The Debugging screen further confirms that the commands and text were received OK over the TCP1 port.
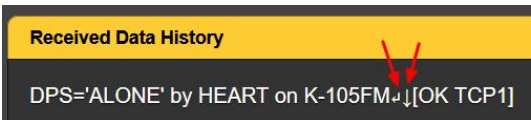
Had we wished to put this same artist and title information into the RadioText field instead, rather than **DPS=** we would have used the header, **TEXT=**, per the Command List. We also could have put the data into both the scrolling-PS and RadioText fields with the header, **DPSTEXT=**.

Station automation must be programmed to issue the same header command and 'Enter' keystroke for each artist and title display. This is usually a relatively simple matter to program into the playout system; consult the system instructions for the procedure. The 'tagging' method, discussed next, does provide some welcome shortcuts to playout system programming.

Similar header formatting applies to commands that change operating parameters of the 732 encoder. For example, we can adjust the RDS subcarrier output level to exactly 0.5Vpp by sending the Telnet command, **RDSLEVEL=500** ↵ . The figure, 500, represents the peak-to-peak level in millivolts as explained in the Command List. We could turn the RDS subcarrier off and on by sending **RDS=0** and **RDS=1**, respectively.

USING 'TAGS'

Although the header method is straightforward and intuitive, there is additional functionality and some simplification in addressing the encoder using 'tags.' These refer to the RT+ tags as defined in the NRSC Standard, which can be found here:

http://www.nrscstandards.org/nrsc/NRSCFiles/RUWG/
RUWG%20archive/R06_040_1%20final%20V2_1.pdf

What Are Tags? Historically, RT+ offered a means of 'tagging,' or marking certain elements within a RadioText message. A song could carry an RT+ tag so that a listener could simply push a button and order the song for automatic delivery to his phone as an MP3 file. The same could provide purchasing links to other advertised products as well, or a station's request-line or advertiser's phone number could be tagged to make calling the number just a matter of pushing a button.
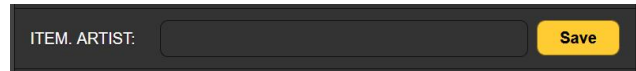
In this initially-conceived application, RT+ tagging is not used as widely as first anticipated. We even have omitted instructions for that particular use here, although they can be found in the NRSC Standard cited above.

But as the tagging 'language' was thoughtfully developed and universally integrated into the RDS system, the NRSC tagging command set can be used for consolidating and simplifying encoder addressability.

A big advantage of tagging is that the 732 encoder then handles most of the message formatting, eliminating the need to figure out how to reformat text in the automation system and, in fact, eliminating the added headers completely. The 732 inspects the DPS and RT fields for any tags, and replaces the tags with the associated text.

RT+ Tags Near the bottom of the RDS Web interface page, clicking ✚ **RT+ Tags** opens the many 'item' and associated fields of incoming data. These tags apply to addressing both the DPS and the RT fields.

The field shown here, ITEM.ARTIST: would define the tag for the

artist featured in the song being played. Normally, automation will load 'dynamic' tags into these fields, although you may also type-in tags for static message tagging. Using tags automatically generates the RT+ group, although the (historical) RT+ group can handle only two tags, the first ones in the RT field. The DPS and RT messaging fields can use any reasonable number of tags, considering the limitations of 128 scrolling characters for DPS and 64 characters for RadioText.
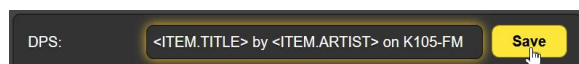
Tag Example Here's a step-by-step example of how to program messaging into the DPS and/or RT fields using tags. Both fields program in the same manner; we'll use the scrolling DPS field in this example.

1) Under Dynamic PS on the RDS Web interface page, click the Tags: down arrow. On the drop-down list click <ITEM.TITLE> and then click Add Tag. The tag will be transferred to the DPS: field.

2) Type the word 'by' into the DPS: field after the <ITEM.TITLE> tag. Enter spaces between tags and text to keep words from running together.

3) Click the down arrow again, select <ITEM.ARTIST> and Add Tag. You can further define your message by typing and adding, on K105-FM, or another identifier. Here's the example as it appears in the DPS: field.

— 46 —

The 732 encoder will replace the bracketed item callouts with the actual song information text sent by station automation, using the RT+ Commands described under the next heading. Bear in mind that this example was generated manually, so the encoder will not have received actual title and artist text from the playout system. But assuming that automation is properly set up, the radio faceplate would scroll something like this:

```
MEANT TO BE by BEBE REXHA & FGL on K105-FM
```

In addition to artist and title, automation needs to specify message duration. Duration applies not only to the scrolling-PS field, but to the RadioText and RT+ fields as well. Duration is set by automation to match the playing time of the song.

RadioText messaging is tag-mode programmed in exactly the same manner as the Dynamic PS. If the same <ITEM.TITLE> and <ITEM.ARTIST> tags are used here, song info will appear in the RadioText readout area of the radio without automation having to issue separate headers for this field. The RT: field can likewise be customized with customized wording between the tagged items, and of course the RT Default: message can be different from the PS Default: one.

Messaging Defaults

Default messages programmed into encoder memory (see Page 28) supply 'barker' (e.g.: station-promotion) 'backup' text displays. The default message will automatically begin when the song ends, that is at the end of the programmed Duration time.

This is a valuable feature, as it's better to have the default message scroll during a commercial cluster than to have radios show 'stale' info for a song that's been over for several minutes. An example default message might be:

```
K105... Best Music in the L.A. Basin... and beyond
```

Keep in mind that, with the encoder operating in the headers mode, the DPS Default message will also start after the interval programmed under DPS Timer (Min): under the RDS setup menu, if the DPS field is not updated within the programmed time period.

The Essential Duration Command

Setting the song duration is not just important, the tagging method of encoder operation will not work without a DURATION= setting as part of the incoming message command set.

Furthermore, DURATION=XX:XX:XX↵ , must be the final item in an update from automation. Once the actual message elements of the command set are received, the duration value actually triggers the update of both the DPS and RT fields containing tags.

Duration Command Exceptions

There are two exceptions to the DURATION= formatting rule.

Sending DURATION=0 will override the current DPS and Radio-Text messages and replace them with the pre-programmed DPS Default and RT Default messages. These default messages will then continue to display until new commands are received.
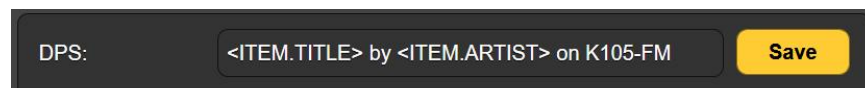
DURATION=1 is an alternative to entering a fixed message timeout value. When sent in a tagging-format command set, the messaging will be 'open ended' and will continue to display until a new command is sent to replace it. Messaging will not revert to defaults.

DURATION=1 may also be sent independently, not just as the final command in a messaging set. In this use, it effectively cancels the duration previously specified for the 'now playing' message, and causes that message to display indefinitely, until updated.

Use of RT+ Commands
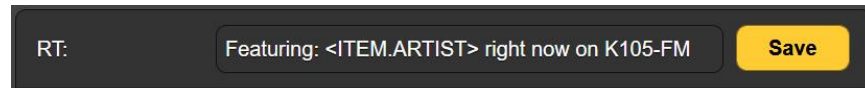
RT+ commands represent the mechanism that updates the RT+ tags with text from automation. The ITEM.TITLE: command SONGTITLE will be replaced with Fly Me to the Moon (or whatever) by the playout system. Here's a hypothetical example:

1) Assume the encoder has been set up like this:

| DPS: | <ITEM.TITLE> by <ITEM.ARTIST> on K105-FM | Save |

and:

| RT: | Featuring: <ITEM.ARTIST> right now on K105-FM | Save |

2) And the automation system sends this:

```
SONGTITLE=In My Blood↵
ARTISTNAME=Shawn Mendes↵
DURATION=3:34↵
```

3) The RDS radio would display:

   a. The scrolling-PS message:
      In My Blood by Shawn Mendes on K105-FM

   b. The RadioText message:
      Featuring: Shawn Mendes right now on K105-FM

   c. After 3 minutes and 34 seconds:
      the DPS Default Message and the RT Default Message would pop-up in their appropriate display areas.

RT+ commands do not conform to a published standard. Rather, they have evolved through usage and convention over many years. Each station automation 'playout' system will be configured to its manufacturer's default command set, which may, or may not, reflect this conventional usage.

The 732 incorporates a command 'translator' that can simplify playout system programming by abbreviating commands. It may prove much easier to adjust the encoder to match the automation system than to change automation commands to accommodate the encoder. Here's how to use this feature:

1) Click **✛ RT+ Commands** to open the list of default identifier names for each tagging category. The 732 allows you customize or abbreviate commands. This snapshot shows the default command for the ITEM:ARTIST tag.

ITEM. ARTIST:	ARTISTNAME	Save

2) Overtype the default ARTISTNAME, shown in this example, with a simple A, and then click **Save**.

ITEM. ARTIST:	A	Save

This abbreviates the command. The playout system only needs to deliver A=BRUNO MARS instead of the much more cumbersome ARTISTNAME=BRUNO MARS. Similarly, the ITEM.TITLE: command, SONGTITLE, could be shortened to T, and the ITEM.DURATION: command, DURATION, to D.

The foregoing example illustrates how a command can be abbreviated, but these commands can also be changed to conform to a playout system's native command set. This set-it-once 732 utility would then obviate having to make multiple and ongoing changes in playout system syntax. Again, let the encoder do the translation, the hard work, and leave the programming of the automation as simple as possible.

An RT+ Command Example

As an illustration of how the RT+ commands work in an actual playout system application, here's a hypothetical example using the PuTTY terminal program to emulate the output of station automation.

First of all, this is how the Dynamic PS and RadioText fields were set up to intersperse the tags and some fixed text:

Dynamic PS

DPS:	<ITEM.TITLE> By: <ITEM.ARTIST> on the BIG-92	Save
Tags:		Add Tag

RadioText

RT:	L.A.'s Big-92 now playing: <ITEM.TITLE> by: <ITEM.ARTIST>	Save
Tags:	None	Add Tag

The next screenshot shows how the RT+ Commands List had been updated to allow the shorter abbreviations (circled), as discussed on the previous page.

With PuTTY emulating the station's playout system, the left screenshot below shows transmission of title, artist and song duration, with an OK acknowledgement from the 732 encoder for each command. At the right is how these same data were received, as shown on the Data Ports / Debugging screen.

Finally, the Now Playing screen illustrates how the example playout information would be presented on the radio faceplate (plus some other fields that would not be seen). As Dynamic PS information is scrolling in the PS field, only one 8-character frame is visible here.

Section V

APPENDIX

The following pages contain tabulated, useful information, including a listing of address headers and commands in the syntax required for proper encoder programming. Inovonics' most generous 3-year Warranty policy appears on the inside of the back cover.

US AND EUROPEAN PTY CATEGORIES

PTY	US (NRSC) 'RBDS'	EUROPE (CENELEC) 'RDS'
0	None	None
1	News	News
2	Information	Current Affairs
3	Sports	Information
4	Talk	Sports
5	Rock Music	Education
6	Classic Rock Music	Drama
7	Adult Hit Music	Culture
8	Soft Rock Music	Science
9	Top 40 Music	Varied
10	Country Music	Pop Music
11	Oldies Music	Rock Music
12	Soft Music	Easy Listening Music
13	Nostalgia Music	Light Classics Music
14	Jazz	Serious Classics Music
15	Classical Music	Other Music
16	Rhythm and Blues Music	Weather
17	Soft R and B Music	Finance
18	Foreign Language	Children's Programs
19	Religious Music	Social Affairs
20	Religious Talk	Religion
21	Personality	Phone-In
22	Public Non-Commercial	Travel
23	College	Leisure
24	Spanish Talk	Jazz Music
25	Spanish Music	Country Music
26	Hip-Hop	National Music
27	(unassigned)	Oldies Music
28	(unassigned)	Folk Music
29	Weather	Documentary
30	Emergency Test	Alarm Test
31	Emergency!	Alarm!

FRONT-PANEL MENU TREE

Now Playing (display)
RDS
    PI/PTY/Flags
        PI (enter PI code manually)
        Call (enter to set RBDS PI automatically)
        PTY (select)
        PTYN (data entry & display)
        MS (set & display)
        DI (set & display)
        TP (set on/off)
        CT (set on/off)
    Dynamic Program Service (DPS)
        DPS/Parse/Speed
            DPS (data entry)
            Parse (select options)
            DPS Speed (set)
        DPS Defaults
            DPS Default (data entry)
            DPS Timer (set)
    RadioText (RT)
        RadioText
            RT (data entry)
        RadioText Defaults
            RT Default (data entry)
            RT Timer (set)
        RadioText Plus (RT+)
        RT+ Group
            RT+ Group (select)
        RT+ Tags
            Tag: (select)
            Text: (data entry)
        RT+ Tag Commands
            Tag: (select)
            CMD: (data entry)
    DPS & RT Delay
        Delay (Off or set)
    Alternative Frequencies
        AF #: (select)
        AFs: (display)
        Freq: (None or select)
        Clear AFs (clear all)
    Traffic Alert (TA)
        TA On (manual enable)
        TA Time (set timeout)
    RDS/RBDS
        RDS (EU) (toggle)
        RBDS (NA) (toggle)

Data Ports
    Received Data Histor(Debug) (display)
    TCP/UDP Ports
        TCP Port 1 (configure & status display)
        TCP Port 2 (configure & status display)
        UDP Port 1 (configure & status display)
        UDP Port 1 (configure & status display)
        IP Whitelist (enable & data entry)
        Serial COM Port
            Serial Enable & Baud (enable, set
                        & status)
            Serial Satellite/No Headers Mode
                    (select and specify)
Scheduler
    Scheduler Enable/Disable (select)
    Scheduled Events (set event type, time,
                    duration, date, enter text)
Setup
    RDS Enable & Level (set, display)
    General Purpose Inputs (select, set polarity,
                    assign)
    General Purpose Outputs (select, set polarity,
                    assign)
    Network
        IP Settings (configure, display)
        Hostname (data entry)
        Dynamic DNS (configure)
        Time (select & display)
            Time Zone & DST (configure)
            Time Server (data entry)
        SNMP
            Mode & Communities (configure)
            SNMP Ports (data entry)
            Trap Destinations (data entry)
        Status (display)
    Email Preferences
        SMTP Server (data entry & select)
        Sender (data entry)
        Recipients (select & data entry)
        Send Test Email (select, status)
Alarms & Notifications
    DPS Not Updated Alarm (set)
    RT Not Updated Alarm (set)
    Pilot Loss Alarm (set)
    Email Notifications (assign, configure)
    Alarm Log Settings (select)
    Alarm Log (display)
Admin
    Security (data entry)
    Display (set & select)
    About (display)

LEGEND AND COMMAND LIST

Legend

↵	Carriage return
↓	Line feed
←	Backspace
⊠	Unrecognized character
[OK *port*]	Valid command received from *port*
[NO *port*]	Invalid command received from *port*
n	Represents a range of variables

Header/Command	Parameter	Details
DPS= PS_TAGGED_TEXT=	Dynamic PS	Up to 128 characters for scrolling messages in the PS field.
DPSDEFAULT= PS_TEXT=	Dynamic PS Default	Up to 128 characters, used if the DPS Timer expires with no updates received for DPS.
DPSTIMER=	DPS Default Timer	0 = Disabled. 1-240 = The number of minutes between receipt of the last DPS message and the transmission of the DPS Default message.
PARSE=	DPS Parse Method	0 = Automatic parsing. 1-8 = Scrolling by this many characters at a time.
DPSS=	Dynamic PS Speed	1-10 = The number of seconds the PS will pause before showing the next PS segment
TEXT= RT= RT_TAGGED_TEXT=	RadioText	Up to 64 characters for display in the RadioText field.
RTDEFAULT= RT_TEXT=	RadioText Default	Up to 64 characters, used if the RT Timer expires with no updates received for RT.
RTTIMER=	RadioText Default Timer	0 = Disabled. 1-240 = The number of minutes between receipt of the last RT message and the transmission of the RT Default message.
DPSTEXT=	Dynamic PS and RadioText	Up to 64 characters for display in both the Dynamic PS and RadioText fields.
RTP=	RadioText+ Tagging	Six, comma-separated number groups of "tagging" data for the RadioText+ field. Ex: RTP=1,13,15,4,33,7
RTPCFG=	RadioText+ Group	Sets which ODA group A is used for RadioText+.
+<*tag*>=	RadioText+ Tag Command	Sets the command for modifying a given RT+ *tag*. Ex: +<ITEM.ARTIST>=A
DELAY= PS_RT_DELAY=	PS/RT/RT+ Delay	0-200 = The number of seconds to delay outgoing PS/RT/RT+ (to match any FM audio delay).
PI=	Program Identification	4 digit HEX number corresponding to the station's "digital address". Ex: PI=3D44
CALL=	Call Letters	For North American stations only. Call letters entered with this command will automatically convert to the proper PI code.

Header/Command	Parameter	Details
PTY=	Program Type	0-31 = Index in PTY list that describes the station broadcast format. Ex: 9 is "Top 40" in North America.
PTYN=	Program Type Name	8 characters to further define program format.
MS=	Music/Speech	0 = Speech only. 1 = Music programming.
DI=	Decoder Information	0 = Mono transmission. 1 = Stereo transmission.
TP=	Traffic Program	0 = Station does not carry traffic info. 1 = Station broadcasts routine traffic info.
TA=	Traffic Alert	0 = TA off. 1 = TA on (only possible when TP=1).
TATIME=	Traffic Alert Timeout	0-240 = Seconds between start of TA flag and automatic reset to OFF.
CT=	Clock Time	0 = Do not send clock time over RDS. 1 = Send clock time over RDS.
AF=	Alternative Frequencies	Enter a list of up to 25 frequencies separated by commas to set all AFs. Ex: AF=96.9,101.1,102.7 To clear all AFs: AF=0
AF*n*=	Alternative Frequency	To enter individual AFs, up to 25. Ex: AF1=101.1 To clear an AF: AF1=0
RDSLEVEL= LEVEL=	Subcarrier Level	0-3700 = RDS output level in millivolts peak-to-peak.
RDS=	57kHz RDS Subcarrier	0 = RDS subcarrier turned off. 1 = RDS subcarrier active.
RDSMODE=	RDS Mode	0 = RDS (Europe). 1 = RBDS (North America).

Header/Command	Parameter	Details
EAS=	EAS Message	Up to 64 characters for an Emergency Alert System message. This text will replace both the DPS and RT during the alert.
EASTIME=	EAS Message Timer	0-999 = Duration of the alert in seconds. This command triggers the display of the EAS message for the set duration. During the alert, updates to DPS and RT are blocked and the PTY is set to ALERT (31).

Header/Command	Parameter	Details
COM.ENABLE=	COM Port Enable	0 = COM port disabled. 1 = COM port enabled.
COM.ECHO=	COM Port Echo	Echo defines whether all data received by the port is transmitted back to the sender. 0 = Echo disabled. 1 = Echo enabled.
COM.REPLY=	COM Port Reply	Reply defines whether OK or NO is transmitted to the sender after the receipt of a valid/invalid command. 0 = Reply disabled. 1 = Reply enabled.
COM.SPEED=	COM Port Baud Rate	Sets the baud rate of the COM port (format is always 8,N,1). Valid baud rates are: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200.
COM.HEADERS=	COM Port Headers	0 = Headers/commands are not required - data received will be transferred to DPS/RT depending on No Headers Mode. 1 = Headers/commands are required.

Header/Command	Parameter	Details
COM.NOHEADERSMODE=	COM Port No Headers Mode	This defines how text is used if no headers are required. 0 = Text to DPS. 1 = Text to RT. 2 = Text to both DPS & RT.
TCP*n*.ENABLE=	TCP Enable	0 = TCP port disabled. 1 = TCP port enabled.
TCP*n*.ECHO=	TCP Echo	Echo defines whether all data received by the port is transmitted back to the sender. 0 = Echo disabled. 1 = Echo enabled.
TCP*n*.REPLY=	TCP Reply	Reply defines whether OK or NO is transmitted to the sender after the receipt of a valid/invalid command. 0 = Reply disabled. 1 = Reply enabled.
TCP*n*.PORT=	TCP Port	Sets the TCP port to receive data.
UDP*n*.ENABLE=	UDP Enable	0 = UDP port disabled. 1 = UDP port enabled.
UDP*n*.ECHO=	UDP Echo	Echo defines whether all data received by the port is transmitted back to the sender. 0 = Echo disabled. 1 = Echo enabled.
UDP*n*.REPLY=	UDP Reply	Reply defines whether OK or NO is transmitted to the sender after the receipt of a valid/invalid command. 0 = Reply disabled. 1 = Reply enabled.
UDP*n*.PORT=	UDP Port	Sets the UDP port to receive data.
UDP*n*.GROUP=	UDP Multicast Group	Sets a UDP multicast group to join for receiving multicast data. 0.0.0.0 disables multicast for this port.

Header/Command	Parameter	Details
WHITELIST.ENABLE=	Whitelist Enable	0 = IP whitelist disabled. 1 = IP whitelist enabled.
WHITELIST.IP*n*=	Whitelist IP Address	Sets IP addresses from which data will be accepted. Data received from any other IPs will be rejected.

Header/Command	Parameter	Details
ALARMS.DPS.ENABLE=	DPS Update Alarm Enable	0 = DPS update alarm disabled. 1 = DPS update alarm enabled.
ALARMS.DPS.TIMEON=	DPS Update Alarm Time On	1-240 = The number of minutes between receipt of the last DPS message and triggering of this alarm.
ALARMS.RT.ENABLE=	RT Update Alarm Enable	0 = RT update alarm disabled. 1 = RT update alarm enabled.
ALARMS.RT.TIMEON=	RT Update Alarm Time On	1-240 = The number of minutes between receipt of the last RT message and triggering of this alarm.
ALARMS.PILOT.ENABLE=	Pilot Loss Alarm Enable	0 = Pilot loss alarm disabled. 1 = Pilot loss alarm enabled.
ALARMS.PILOT.TIMEON=	Pilot Loss Alarm Time On	1-240 = The number of seconds between loss of pilot and setting this alarm.
ALARMS.PILOT.TIMEOFF =	Pilot Loss Alarm Time Off	1-240 = The number of seconds between recovery of pilot and clearing this alarm.
ALARMS.LOGEMAIL=	Alarm Log Email Threshold	1-100 = The percent fullness of the alarm log at which an email will be sent as a reminder about the alarm log fullness.

Header/Command	Parameter	Details
SCHEDULE=	Scheduler Enable	0 = Scheduler disabled. 1 = Scheduler enabled.
SCHEDULER*n*=	Set Scheduled Event	Sets up a scheduled event. Format is: type, time, duration, date, days, text. EX: SCHEDULER1=2,14:00:00,2:00,0/0,0111110,The Morning Show Result: DPS and RT will be "The Morning Show" for 2 hours every weekday at 2PM. If date is 0/0, days are used; otherwise date is used and days are ignored.
GPI*n*.POLARITY=	General Purpose Input Polarity	0 = Active ground. 1 = Active open.
GPI*n*.TYPE=	General Purpose Input Type	0 = None. 1 = TA flag.
GPO*n*.POLARITY=	General Purpose Output Polarity	0 = Active ground. 1 = Active open.
GPO*n*.TYPE=	General Purpose Output Type	0 = None. 1 = DPS not updated. 2 = RT not updated. 3 = DPS or RT not updated. 4 = Pilot loss.

Header/Command	Parameter	Details
NET.DHCP=	DHCP	0 = DHCP disabled (static IP). 1 = DHCP enabled.
NET.IP=	IP Address	Sets the network IP address.
NET.GW=	Gateway	Sets the network gateway.
NET.SUB=	Subnet Mask	Sets the network subnet mask.
NET.DNS=	DNS Server	Sets the network DNS server.
NET.HOST=	Hostname	Sets the NBNS hostname, which can be used on Windows PCs to access the unit instead of the IP address (when on a LAN).
NET.HTTP=	HTTP Port	Sets the port to use for the HTTP server. By default, HTTP uses port 80.

Header/Command	Parameter	Details
MAIL.SERVER=	SMTP Server	IP or domain name of the SMTP server used for sending emails.
MAIL.FROM=	From	The "From" text is used to help differentiate emails sent from this device (it is NOT the user, it is not a @ formatted email address).
MAIL.USER=	Sender Username	The email address from which emails will be sent.
MAIL.PASS=	Sender Password	The password for the user.
MAIL.PORT=	SMTP Port	The port to use for connecting to the SMTP server.
MAIL.SSL=	SMTP Security	0 = Connect without encryption. 1 = Encrypted connection using TLS 1.2.
MAIL.TO*n*.ADDRESS=	Recipient Email Address	Sets recipient email addresses to send to.
MAIL.TO*n*.DPS=	Recipient DPS Alarm	0 = This recipient will not receive DPS alarm emails. 1 = This recipient will receive DPS alarm emails.

Header/Command	Parameter	Details
MAIL.TO*n*.RT=	Recipient RT Alarm	0 = This recipient will not receive RT alarm emails. 1 = This recipient will receive RT alarm emails.
MAIL.TO*n*.PILOT=	Recipient Pilot Loss Alarm	0 = This recipient will not receive pilot loss alarm emails. 1 = This recipient will receive pilot loss alarm emails.
MAIL.TOn.DAILY=	Recipient Daily Logs	0 = This recipient will not receive daily log emails. 1 = This recipient will receive daily log emails.
MAIL.TO*n*.WEEKLY=	Recipient Weekly Logs	0 = This recipient will not receive weekly log emails. 1 = This recipient will receive weekly log emails.
MAIL.TO*n*.MONTHLY=	Recipient Monthly Logs	0 = This recipient will not receive monthly log emails. 1 = This recipient will receive monthly log emails.

Header/Command	Parameter	Details
TIME.SERVER=	SNTP Server	IP or domain name of the SNTP server used for acquiring the time.
TIME.UTC=	UTC Offset	Sets the offset from UTC time in hours. Ex: TIME.UTC=5.5
TIME.DST=	Daylight Saving Time	0 = Daylight saving time not in effect. 1 = Daylight saving time in effect.
TIME.AUTODST=	Automatic DST	0 = DST is adjusted automatically. 1 = DST is adjusted automatically at the appropriate times during the year.

Header/Command	Parameter	Details
SNMP.MODE=	SNMP Mode	0 = SNMP disabled. 1 = SNMP read only. 2 = SNMP read & write.
SNMP.READ=	SNMP Read Community	Sets the SNMP read community string.
SNMP.WRITE=	SNMP Write Community	Sets the SNMP write community string.
SNMP.PORT=	SNMP Port	Sets which UDP port to use for SNMP traffic.
SNMP.TRAPS.PORT=	SNMP Trap Port	Sets which UDP port to use for SNMP traps.
SNMP.TRAPS.IP*n*=	SNMP Trap Destination IP	Sets IP addresses to send traps to.

Header/Command	Parameter	Details
DDNS.MODE=	Dynamic DNS Mode	0 = DDNS disabled. 1 = dyn.com. 2 = noip.com. 3 = dnsomatic.com.
DDNS.HOST=	Dynamic DNS Hostname	Sets the hostname to match the URL set up in your DDNS account.
DDNS.USER=	Dynamic DNS Username	Sets the username to match DDNS account.
DDNS.PASS=	Dynamic DNS Username	Sets the password to match your DDNS account.

Header/Command	Parameter	Details
PASSFRONT=	Front Panel Password	Sets a password for restricting front panel access.
PASSWEB=	Web Password	Sets a password for restricting web access.

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 an "as received" condition.

II   **CONDITIONS OF WARRANTY:** The following terms apply unless amended *in writing* by Inovonics, Inc.

    A. Register the Warranty online at www.inovonicsbroadcast.com within 10 days of delivery.

    B. This 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. This 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 label 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 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   **RETURNING 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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