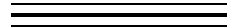


**OPERATING AND MAINTENANCE  
INSTRUCTION MANUAL**

**MODEL 510**

 **R-D-S** **DECODER / READER**  
RADIO DATA SYSTEM





— USER'S RECORD —

Model 510 – Serial No. \_\_\_\_\_

Date Purchased \_\_\_\_\_

Warranty Card Mailed? — o

# OPERATING AND MAINTENANCE INSTRUCTION MANUAL

## MODEL 510



## DECODER / READER

March 2004



1305 Fair Avenue • Santa Cruz, CA 95060

TEL: (831) 458-0552 • FAX: (831) 458-0554

Visit our Website: [www.inovon.com](http://www.inovon.com)



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## Section I

# INTRODUCTION

### MODEL 510 PRODUCT DESCRIPTION

**The “Radio Data System”** The Radio Data System allows the FM broadcaster to transmit certain digital data along with regular audio programming. Packets of data transmitted on a low-level subcarrier identify the station and its particular broadcasting format, allow for transmission of advertising or other text messages, and perform additional identification, control and ‘housekeeping’ functions.

**RDS vs. RBDS** The Radio Data System was developed in Europe and is abbreviated RDS there. The initial US implementation of RDS differed sufficiently from the European standard to warrant its being renamed the Radio *Broadcast* Data System, or RBDS. Differences between the two standards have been reconciled and minimized over the years, yet RBDS is still used as the US designation in many instances. For the sake of clarity and simplicity, the more generic and established term RDS will be used through this Manual, as indeed it is used throughout the rest of the world.

**Features** Features of the Inovonics 510 include:

- Display of all common RDS data groups.
- Easy installation, initial calibration and use.
- A unique “Glossary” utility to define the RDS abbreviations, and then to locate and display the subject data group.
- A built-in RS-232 port for computer interface.

# MODEL 510 TECHNICAL SPECIFICATIONS

## Standards Supported:

European CENELEC and United States NRSC standards are accommodated with appropriate firmware selection.

## Data Groups Supported:

0, 1, 2, 3, 4, 5, 6, 7, 9, 14, 15.

## Applications Displayed:

“Screen No.” refers to the various LCD screens of information that may be manually selected for display. These screens have been assigned for a best display efficiency. *Screen numbers do not necessarily agree with data group numbers.*

Some RDS groups have provision for separate “A” and “B” sets, or versions, of RadioData. Screen numbers with an “A” or a “B” indicate that separate versions of the application may be viewed independently.

Screen No.	Application*
01A, B	PI, PS, PIN, PTY
02A	TP, TA, M/S, DI, CT
02B	TP, TA, M/S, DI
03	AF
04A, B	RT
05A, B	IH
06A	TDC, RP
07	EWS
08A	EON (PI, PS, TA, AF)
08B	EON (PI, TA)
09	RDS subcarrier injection level measurement
10	List of groups received.

\* For an explanation of application abbreviations, see Pages 12-15.

## Front Panel Readout:

The backlighted LCD panel displays 2 lines of 40 characters, each. Data groups that carry plain-text messages are supported with a full set of ASCII characters, plus certain language-specific alternate characters.

## Display Select Buttons:

Front-panel up/down buttons manually cycle through the various LCD screens of RDS data. When both buttons are depressed simultaneously, the Model 510 displays a Glossary of RDS terms.

## Composite Input:

The BNC composite/multiplex input has a 10k-ohm unbalanced/bridging characteristic and accepts a 100% modulation ( $\pm 75\text{kHz}$  deviation) input between 1 and 10 volts, peak-to-peak.

## RS-232 Data Interface:

A rear-panel DB-9 female connector may be wired directly to the COM (serial) port of any PC.

## Power Requirements:

105–130VAC or 210–260VAC,  
50/60Hz; 10 watts.

## Size and Weight:

1 $\frac{3}{4}$ " H x 19" W x 12" D (1U);  
7 lbs. (shipping weight).



## Section II

# INSTALLATION AND SETUP

### UNPACKING AND INSPECTION

Immediately upon receiving the equipment, please make a careful inspection 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 in case return or reshipment becomes necessary. In the event of return for Warranty repair, shipping damage sustained as a result of improper packing for return *may invalidate the Warranty!*

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**IT IS VERY IMPORTANT** that the Warranty Registration Card found at the front of this Manual be completed and returned directly to Inovonics. Not only will this assure coverage of the equipment under terms of the Warranty and provide a means for tracing lost or stolen gear, but the user also will receive specific SERVICE OR MODIFICATION INSTRUCTIONS immediately and automatically when issued.

---

---

### MOUNTING

#### **Rack Requirement**

The Model 510 mounts in a standard 19-inch equipment rack and requires only 1¾ inches (1U) of vertical rack space. We heartily recommend the use of plastic washers to protect the painted finish around the mounting holes.

#### **Heat Dissipation**

Consuming about the same power as a cordless telephone base station, the Model 510, itself, generates an infinitesimal amount of heat. The unit is specified for operation within an ambient temperature range extending from freezing to 120°F, or 50°C. Heat from adjacent equipment must be factored into the installation, however, so make sure that the equipment rack is adequately ventilated and that its internal temperature does not exceed the specified maximum ambient.

## AC (MAINS) POWER

**Mains Voltage Selector** Unless specifically ordered for export shipment, the Model 510 is set at the factory for operation from 115V, 50/60Hz AC mains. This can be confirmed by checking the designation next to the fuseholder on the rear panel. The *inappropriate* voltage and fuse value will have been crossed out at the factory with an indelible felt marker.

To change the mains voltage, first remove the top cover of the unit. A clearly marked slide switch is next to the AC mains connector on the circuit board. *With power disconnected*, use a small screwdriver to set the switch for 115VAC or 230VAC operation.

Be sure to install the appropriate fuse as listed next to the fuseholder. You can remove the factory strikethrough with solvent and then cross out the inappropriate marking with an indelible felt pen.

**NOTE:** Fuseholder caps are available for either ¼-inch or 5mm fuses; contact the factory.

**Power Cord** The detachable IEC-type power cord supplied with the Model 510 is fitted with a North American-standard male plug. Nonetheless, the individual cord conductors are *supposed* to be color-coded in accordance with CEE standards; that is:

BROWN = AC "HOT"      BLUE = AC NEUTRAL  
GRN/YEL = EARTH GROUND

If this turns out *not* to be the case, we offer our apologies (cords come from many sources) and advise that US color coding applies:

BLACK = AC "HOT"      WHITE = AC NEUTRAL  
GREEN = EARTH GROUND

## RADIO FREQUENCY INTERFERENCE (RFI)

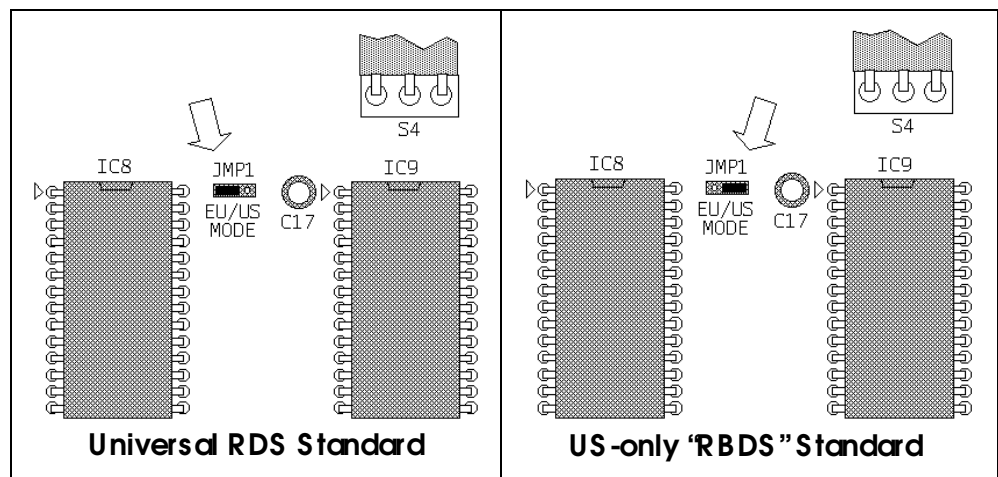
**Location** The Model 510 is designed to operate in proximity to high-power RF gear. Nonetheless, do please practice reasonable care and common sense in locating the unit away from *abnormally* high RF fields.

**Ground Loops** Because the composite input and the RS-232 data port of the Model 510 are referenced to chassis ground, a mains frequency or RF ground loop could be formed between cable grounds and the AC power cord ground. Though doubtful, a ground loop could manifest itself as a hum introduced into the receiver or mod-monitor audio output, becoming audible in the monitored program. A 'ground-lifting' AC adapter may well remedy such a situation, though the chassis somehow must be returned to local earth ground for safety considerations.

## FIRMWARE SELECTION

The Model 510 comes with appropriate firmware to decode both the European and the United States RDS standards. Though these have nearly merged into a single standard, a few differences such as program format identifiers still persist. It is therefore important that the proper firmware is selected to decode the RDS data stream properly.

Firmware is selected by a jumper on the circuit board. The 510 will have been factory-jumpered appropriately for the shipping destination. This can be confirmed, or changed if necessary, by removing the top cover of the unit and locating the jumper, JP1, just beside memory chip IC8. The two jumper options are illustrated below.



## COMPOSITE INPUT

The rear panel COMPOSITE INPUT BNC connector may be fed from the composite/multiplex output of an off-air receiver or the station's Modulation Monitor. This is an unbalanced/bridging input that will accept a composite signal between 1 and 10 volts p-p, corresponding to full carrier modulation of  $\pm 75\text{kHz}$  deviation.

### INPUT LEVEL Control

A rear panel multiturn trim control labeled INPUT LEVEL adjusts the sensitivity of the Model 510. For basic RDS decoding and display, the setting of this control is not at all critical. As long as the front-panel RDS LOCK indicator lights solidly when an RDS station is tuned, data should be decoded accurately. However, one important function of the Model 510 is to display the injection level of the RDS subcarrier directly in percent of total modulation. For this reading to be accurate the control must be adjusted properly.

### Input Calibration

The Model 510 is calibrated with reference to 100% ( $\pm 75\text{kHz}$  deviation) modulation. This requires a composite/multiplex input to the Model 510 that represents this 100% level. Some Mod-Monitors have an internal calibration source that will supply this signal from

the Mod-Monitor's composite output connection. Otherwise, the transmitter exciter should be modulated directly with a sine wave source in the 1kHz to 10kHz frequency range, the test oscillator being adjusted to bring the exciter precisely to 100% carrier modulation, as shown by the station's Mod-Monitor.

During this calibration, the Stereo Generator and any RDS or SCA subcarrier sources must be disconnected so that the sinewave test source is the *only* source of transmitter modulation.

Alternatively, the test oscillator may be fed directly into the Model 510, making certain that the output is set to a peak level that precisely matches the 100%-modulation level expected from the receiver or mod-monitor.

With the appropriate 100%-modulation test signal feeding the COMPOSITE INPUT of the Model 510:

- 1) Set the rear-panel toggle switch to SET 100% MOD. This will automatically bring the LCD display to 'page' (09).
- 2) Adjust the rear-panel INPUT LEVEL control for a display reading of 100%. This can also be done watching the + and - LED indicators on the rear panel and adjusting until both are lighted.
- 3) Return the toggle switch to OPERATE.

## SOFTWARE INSTALLATION (optional)

The Model 510 may also be connected to any IBM-compatible PC for computer analysis of RDS data. **NOTE:** Installation of software and connection to a computer is *not* necessary for routine decoding and display of RDS data.

### Installing the Software

The diskette packaged with the Model 510 contains software routines that run under DOS. These should install and run properly under any version of Windows.

This same software also may be downloaded from the Inovonics Website: [www.inovon.com](http://www.inovon.com). Install the software as follows:

- 1) Put the diskette into the A drive of the computer.
- 2) Double-click the My Computer icon on the Desktop, then double-click the icon for the floppy (A) drive. (If you have downloaded the software from the Inovonics Website, unZIP the download and navigate to the directory - usually a TEMP directory - where the individual, unzipped files are located.)
- 3) From the A drive (or from the temporary download folder) double-click the Application file: INSTALL.EXE. This will automatically open a DOS window for the installation. Follow the prompts, using the keyboard to execute the installation process. At the end of the installation, the readme.txt file will automatically open with the instructions shown at the top of the next page.

```
To run the RDS/RBDS software with the 510 and a standard IBM PC, connect the RS-232 DB9 output from the 510 to either the COM1 or COM2 serial ports of the computer. If you are using COM1, navigate to C:\510rds\ and type: RDS_48 or RBDS_48. If you have the 510 hooked up to com2 then type RDS_48/2 or RBDS_48/2. This will start the software.
```

- 4) Because we have reprinted the instructions here, and because this Manual will later guide you in running the software, you may exit the installation utility by pressing the Esc key twice. This will close the DOS window.

**Cabling to the Computer**

The Model 510 is connected to the PC with a DB-9 serial 'extension' cable. Connect to either the COM1 or the COM2 port of the computer.

**Running the Software**

This is covered under Decoder Operation, Section III. Refer to Page 15.

## Section III

# DECODER OPERATION

### AN RDS OVERVIEW

**The RDS System** RDS is a digital data channel transmitted as a low-level subcarrier above the range of the composite stereo program signal in the FM baseband. The data transmission (baud) rate is comparatively low, and it is quite robust because of data redundancy and error correction.

We assume that the user has some familiarity with the concept of RDS, for 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 EN 50067 Specification for Europe, or the United States NRSC Specification.

**RDS in Europe – RBDS in the US** The European Broadcasting Union (EBU) and its member countries originated the concept of “Radio Data” transmission. The European RDS specification, CENELEC Standard EN 50067, was first published in 1984. It was revised in 1986, 1990, 1991 and 1992.

European RDS has grown in use 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 RadioData 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 basic differences in broadcasting practices.

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, though for most of the broadcast day even NPR stations originate, or at least schedule, their own programs.

Much of European broadcasting is similar to “network” radio as practiced in the US prior to the 1950s. A central program originator may have as many as a dozen 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.

The European concept of a *service area* equates to a 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 make additional revenue from RDS.

## MODEL 510 FRONT-PANEL APPOINTMENTS

The Model 510 has a refreshingly uncluttered front panel. Aside from the ubiquitous POWER switch, only the RDS LOCK indicator, the backlighted LCD readout and its attendant DISPLAY SELECT buttons give the user access to the wealth of valuable information cleverly concealed within the RDS subcarrier signal.

**RDS LOCK** This LED is driven directly by the RDS decoder circuit. When the 57kHz subcarrier is present, the indicator lights. With an RDS station tuned, this indicator should be on solidly. A winking or blinking condition signals one of several possible problems:

- 1) A poor off-air signal; either a very low incoming signal level or excessive multipath distortion.
- 2) Excessive composite clipping in the audio processor or exciter.

In either event, the problem should be investigated and corrected. Although the RDS system is quite 'robust,' data may be corrupted or lost while being decoded under these conditions. Generally, the program audio will be severely degraded before the RDS data becomes unrecoverable.

**The LCD Screen and DISPLAY SELECT Buttons** The backlighted LCD panel displays two lines of 40 characters, each. The screen is scrolled through ten 'pages' of possible RDS data by the two up/down DISPLAY SELECT buttons. Many of these pages may be blank, as the RDS system is typically used far below its potential.

**The "Glossary" Utility** Beneath the two DISPLAY SELECT buttons, the word (GLOSSARY) appears. This is a special description and shortcut utility of the Model 510

Holding down both DISPLAY SELECT buttons brings this up on the display:

AF - list of Alternative Frequencies

Releasing the two buttons and using the right-hand  $\pi$  button, the Model 510 will scroll through an alphabetized list of RDS terms. The abbreviation and its description will remain on the display for about 3 seconds. At the end of this time the display automatically goes directly to the page where that particular RDS data group is located.

A listing of the pages and what data groups are displayed on them is shown under *Applications Displayed* in *Technical Specifications* on Page 4 of this Manual.

## THE RDS DATA GROUPS

The 'Glossary' utility of the Model 510 gives only the full names of the RDS data groups. What follows here is a further definition of these groups and their functions.

- AF List of Alternative Frequencies:** A "network" broadcaster, or one with low-power rebroadcast transmitters to fill 'holes' in his coverage area, can include a list of all frequencies where the identical program can be heard. The RDS receiver, particularly upscale car radios, constantly searches for the best signal that carries the very same program. When a better signal is found, the radio re-tunes with hardly any interruption. The principal utility of this RDS function is with European radio networks and US stations with 'translators.'
- CT Clock Time (and Date):** RDS can automatically update the clock in the listener's radio when the station carries this information. Of course the time signal must be accurate, otherwise the radio clock would reset itself each time the radio was tuned to another station. Not only is it necessary to have time base stability, but the proper offset for different time zones is part of the time setting equation as well. Because of the grave responsibility that this function implies, most US broadcasters do not provide time data.
- DI Decoder Information:** This is one of several "flags" that convey yes/no or other very basic data. This particular flag tells the receiver whether the broadcast is monaural, or is being transmitted in any of several methods of stereo or binaural broadcasting. As many as 16 encoding options may be accommodated! This is a rather esoteric function and, thus far, remains unused both in Europe and in the US.
- EON Enhanced Other Networks:** Used exclusively in Europe, this feature allows the RDS radio to be updated about stations other than the one being received. This feature finds utility in situations where, for instance, an important speech is being carried nationwide. Rather than relying on the AF feature to keep the radio tuned to the strongest local signal, EON can tune the receiver to another network that has the identical program.
- EWS Emergency Warning System:** EWS carries coded information regarding specific emergencies. Consumer RDS radios do not respond to this data, but "special entertainment radios" carried by emergency personnel would give an alert.
- IH In-House Applications:** This is a data channel set aside for proprietary use by the individual broadcaster. It can be used for transmitter or other plant equipment instrumentation, paging of station personnel, or transmission of special messages to be viewed by station management or even by employees of other stations at remote locations. This messaging has some security in that it requires a special decoder such as the Model 510. In-house



messages are not received by consumer RDS radios.

**M/S Music / Speech Switch:** This flag simply indicates whether music or speech is the primary broadcast programming. The purpose of this function is not well explained in the respective Standards, hence it comes as no surprise that it is not widely used.

**PI Program Identification:** This block of data identifies the broadcast station with a hexadecimal numerical code, which becomes the “digital signature” of the station. The code is assigned by the broadcasting authority in some countries, and in the US is calculated from a numerical encoding of station call letters. The receiver processes the PI code to assist automatic tuning features (station memories), and to prevent false switching to alternative frequencies that might be shared by broadcasters in nearby regions.

**PIN Program Item Number:** A PIN can be assigned to a particular program, becoming that program’s “digital address.” A properly equipped RDS radio can be set to ‘wake up’ when that program airs, or even begin recording the program in the listener’s absence.

**PS Program Service Name:** This is the station’s “street name” that will 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”). The Program Service Name is automatically displayed, even on automobile receivers, so it is intended to remain ‘static.’ Because of driving safety considerations, broadcasters are discouraged from making the PS ‘dynamic’; that is, to alternate it between different entries. Nevertheless, ‘scrolling PS’ is becoming more and more common.

**PTY Program Type:** The PTY data flag identifies the station format from a collection of pre-defined categories. Many RDS receivers are able to seek the listener’s preferred format automatically. This means that a car radio can switch from a fading station to a stronger one that carries the same *variety* of music, though not the very same program, as provided by AF switching. The PTY function of RDS helps a broadcaster catch ‘transient audience’ share.

The following listing defines Program Type identifiers (programming formats) for both the original European CENELEC standard and for the NRSC variation adopted in the US. PTY coding is the primary difference between the two standards. Check these out. The listing suggests that Americans are not as much into the serious aspects of human culture as their European cousins.

<u>PTY</u>	<u>CENELEC (Europe)</u>	<u>NRSC (United States)</u>
1	News	News
2	Current Affaris	Information
3	Information	Sports

4	Sports	Talk
5	Education	Rock Music
6	Drama	'Classic' Rock Music
7	Culture	Adult Hit Music
8	Science	Soft Rock Music
9	Varied	'Top-40' Music
10	Pop Music	Country Music
11	Rock Music	Oldies Music
12	Easy Listening Music	Soft Music
13	Light Classics Music	Nostalgia Music
14	Serious Classics Music	Jazz
15	Other Music	Classical Music
16	Weather	Rhythm and Blues Music
17	Finance	Soft R & B Music
18	Children's Programs	Foreign Language B'csts.
19	Social Affairs	Religious Music
20	Religion	Religious Talk
21	Phone-In	Personality
22	Travel	Public /Non-Commercial
23	Leisure	College Broadcasting
24	Jazz Music	(unassigned)
25	Country Music	(unassigned)
26	National Music	(unassigned)
27	Oldies Music	(unassigned)
28	Folk Music	(unassigned)
29	Documentary	Weather
30	Alarm Test	Emergency Test
31	Alarm!	Emergency!

Under some programming circumstances, the PTY identifier may be 'dynamic,' changing between categories for a station that "dayparts," or alters its format during specific periods. The PTY code is not meant to change from song to song or to accommodate a top-of-the-hour newscast, however.

- RP Radio Paging:** Originally, the RDS system included provision for nationwide personal paging. It was proposed to network RDS stations in this respect to assure wide coverage. This feature became somewhat moot in the age of cell phones and established paging services.
- RT Radiotext:** This is a 64-character block of plain text that the listener can select for visual display on the faceplate of the radio. This function is generally not available on automobile receivers for safety considerations, which has precipitated the frowned-upon practice of 'scrolling PS' instead. Most radios have limited alphanumeric display capability, so the 64 characters 'march' across the front panel, much akin those annoying LED advertising signs found in airport buses or fast food emporia. Like the 'scrolling PS,' Radiotext can announce song titles and performers, run special promotions or contests, or broadcast sponsors' messages.

<b>TA</b>	<b>Traffic Announcement:</b> This is a <i>temporary</i> flag added to the RDS data stream <i>only</i> as a traffic bulletin is being aired. Some RDS car radios can be set to search for traffic bulletins among various TP stations (see <b>TP</b> below) while tuned to a listener's preferred program, or even while playing a tape or CD. As soon as any TP station broadcasts a traffic bulletin, the receiver <i>temporarily</i> switches-over to receive it. When the bulletin is finished, the receiver switches back to the original program, tape or CD.
<b>TDC</b>	<b>Transparent Data Channel:</b> Conceived prior to common use of the Internet, the TDC would have allowed a continuous stream of broadcast data to be routed to a personal computer or to a printer. The listener could print merchants' money-saving coupons or even an abbreviated newspaper. It has been suggested that the TDC could be used for MP3 music downloads, though the low throughput of RDS would make this really quite tedious.
<b>TMC</b>	<b>Traffic Management Channel:</b> This is a data channel for advanced automobile traffic information and traffic management. The European CENELEC group has defined the coding for this service, though the group keeps this information close to its collective vest. TMC is not used in the US.
<b>TP</b>	<b>Traffic Program Identification:</b> The TP flag identifies the station as one that routinely broadcasts traffic bulletins for motorists as part of its normal, everyday programming. The TP flag is displayed on the receiver faceplate, indicating that the radio is searching for traffic announcements. The radio keeps track of TP stations offering this service to speed up the search-and-switch process.
<b>RDS Injection Level</b>	'Page' 9 of the LCD screen gives both a digital readout and an analog bargraph display of the RDS subcarrier injection level. For this measurement to be accurate, the Model 510 must be calibrated with reference to 100% carrier modulation, as described on Pages 7 and 8 of this Manual.
<b>Groups Displayed List</b>	'Page' 10 of the LCD screen lists the RDS groups being transmitted. Because some groups are sent infrequently, this listing is <i>cumulative</i> . If more groups are seen than are anticipated, reset the Model 510 by cycling the power off and back on. This will clear the register.

## RUNNING THE OPTIONAL SOFTWARE

The Model 510 Decoder/Reader can send raw RDS data to a PC. Output data contains everything encoded into the RDS data stream, including groups or special-purpose functions that are not decoded by the Model 510.

The software diskette that is included with the Model 510 provides only elementary decoding of the basic data groups, essentially duplicating the Model 510 front-panel LCD display. If further

## Starting the Software

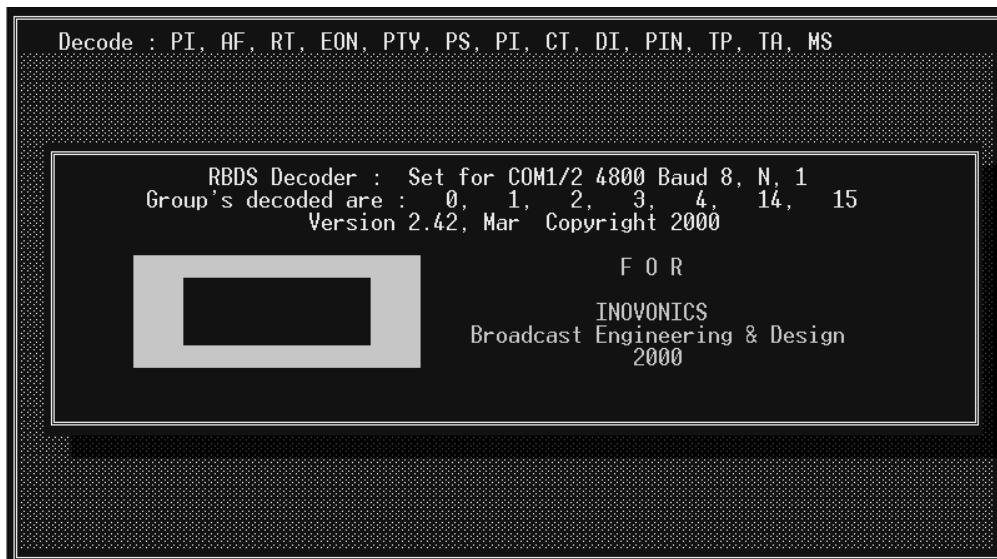
analysis of the data or archiving is required, the user will have to provide the requisite software.

Assuming that the software was successfully installed as described on Page 8, it can be started by one of two methods. If the Model 510 has been connected to the computers COM1 serial port, simply open Windows Explorer, open the file 510RDS under the (C:) directory, and double-click either RDS\_48.EXE (European RDS) or RBDS\_48.EXE (US "RBDS"). This should automatically open a DOS window. If this does not happen, or if the Model 510 is connected to a serial port other than COM1, the computer should be restarted in the DOS mode. This is usually an option under the Windows Shut Down menu, though with some operating system versions it may be necessary to restart while holding the Ctrl key or F8 key and selecting the proper startup option to obtain a DOS prompt.

At the DOS prompt, navigate to the file and start it by typing the appropriate command exactly as shown in the field below:

<u>To Start:</u>	<u>Type:</u>
European RDS on COM1	C:\510RDS\RDS_48.EXE
European RDS on COM2	C:\510RDS\RDS_48/2.EXE
US "RBDS" on COM1	C:\510RDS\RBDS_48.EXE
US "RBDS" on COM2	C:\510RDS\RBDS_48/2.EXE

This should open a DOS window (which can be maximized if running under Windows) that looks like this:



```
Decode : PI, AF, RT, EON, PTY, PS, PI, CT, DI, PIN, TP, TA, MS

RBDS Decoder : Set for COM1/2 4800 Baud 8, N, 1
Group's decoded are : 0, 1, 2, 3, 4, 14, 15
Version 2.42, Mar Copyright 2000

FOR
INOVONICS
Broadcast Engineering & Design
2000
```

This screen tells which RDS functions and groups will be decoded. Press the Enter key to open the decoding utility, which looks like the example shown on the following page.

```

RBDS Decoder V2.42 Inovonics (C) dB 2000
PI Code:      5322      KZLA 939      PIN: 0000
Programme Type 10      Country      Travel N

                                Radio Text Message
0: KZLA 93.9 ... AMERICAS MOST LISTENED TO COUNTRY STATION ...
1: _____

Alternative frequencies      None      Fill

Audio Decoder Information:      Stereophonic      transmission      Mu
MJD:
ESC quits

```

---

		Real time group arrival											
0A	2A	2A	2A	0A	2A	0A	2A	0A	2A	0A	2A	0A	0A
2A	2A	0A	2A	0A	2A	0A	2A	0A	2A	0A	0A	2A	0A
2A	2A	0A	2A	0A	2A	0A	2A	0A	0A	2A	0A	2A	2A

```

13 Error(s) detected

```

This illustration shows the decoded RDS data from the Los Angeles station, KZLA. This is the information cunningly gleaned from the display:

- The numerical PI value: 5322
- The PS: KZLA 939
- The PIN: 0000 ; that is, no PIN is specified
- The Program Type: 10 or Country
- This is: N (not) a station that broadcasts  
Travel Program information
- The Radiotext message: KZLA 93.9 ... AMERICAS  
MOST LISTENED TO COUNTRY STATION
- Alternative Frequencies: None (only 'Fill')
- Decoder Info: Stereophonic Transmission (of) Mu(sic)

The individual RDS groups are displayed continuously as they arrive, indicating how the RDS encoder was programmed to refresh the information. Note the occasional multiple transmission of the 2A group, probably to ensure solid reception of the 64-character RadioText message.

An error detector window at the bottom of the screen shows that 13 errors were received during the sample period. In this particular instance the errors arose from poor reception conditions, not because of encoder programming or formatting problems.

To close the software program, press the Esc key. Windows may then be restarted.



## Section IV

### APPENDIX

This section of the Manual contains a listing of component parts used in the Model 510 and an explanation of Inovonics' liberal Warranty Policy.

## NAVIGATING THE PARTS LISTINGS

This section contains listings of component parts used in the Inovonics 510. Not all components are listed by schematic reference designation; those that are considered 'generic' are qualified, however.

Descriptions may or may not specify a particular manufacturer. When no manufacturer is called out, the term (open) advises that any manufacturer's product carrying the given part number (or the same description in the case of a generic part) is acceptable.

If a part is not listed at all, this means that we do not consider it a typical replacement item. Should you need to order an unlisted part, call, write, fax or e-mail the factory with a brief description of what it is that you need. We'll then do our very best to figure out what to send you.

Components with reference designations below 500 are contained on the main printed circuit board. Designations in the 500s are associated with the front panel subassembly, and those in the 600s are chassis-mounted components.

## COMPONENT PARTS LISTINGS

Unless specifically noted by component reference designation, **capacitors** are specified as follows:

- a: Under 100pF** are general-purpose disc ceramic capacitors with no specific technical specification. The letter 'p' following the value indicates picofarads.
- b: 100pF to 0.47µF** are of the metalized Mylar or polyester variety. Whole number (XXp) values are picofarads, decimal values are microfarads. All capacitors in this category have 5% tolerance and are rated at 50VDC or better. The style used in the Model 510 is the "minibox" package with lead spacing of 0.2 inch. The preferred manufacturer is WIMA, their FKS-2 or MKS-2 series. Possible alternates are the CSF-Thompson IRD series or the Vishay-Roederstein KE-1808 or KT-1817 series.
- c: 1.0µF and above** are general-purpose aluminum electrolytics with radial leads. A safe voltage rating for any electrolytic in the Model 510 would be 25V, but because of size and other reasons a replacement capacitor should always carry the same rating as the one being replaced.

C1,2	Capacitor, Y-class Ceramic Disc, .0047µF, 440VAC; Murata/Erie DE7150 F 472M VA1-KC
C3	Capacitor, Axial Electrolytic, 1000µF, 35V; (open)
C11,12	Capacitor, DM-15 Mica, 33pF; (open)
CR1,2,4	Diode, Silicon Rectifier; (open) 1N4005



CR3	Diode, Power Schottky; (open) 1N5820
CR5-8	Diode, Silicon Signal; (open) 1N4151
F1	Fuseholder, PC-mounting; Littlefuse 345-101-010 with 345-101-020 cap for ¼-inch fuses or 345-121-020 cap for 5mm fuses. (The fuse itself is a normal “fast blow” type; the value should match the specification stated on the rear panel.)
I1	T1 Green LED; <i>Inovonics P/N 2021</i>
I2,3	T1 Yellow LED; <i>Inovonics P/N 2034</i>
IC1	Integrated Cct.; National LM2575 (with Aavid 574602V30700 Heatsink)
IC2	Integrated Cct.; (open) LM78L05
IC3	Integrated Cct.; Maxim MAX232
IC4	Integrated Cct.; Maxim MAX699
IC5	Integrated Cct.; Philips P80C31SBTN
IC6	Integrated Cct.; 22V10; <i>pre-programmed</i> , available only from Inovonics.
IC7	Integrated Cct.; (open) 74HC373
IC8	Integrated Cct.; 27C256; <i>pre-programmed</i> , available only from Inovonics.
IC9	Integrated Cct., (open) HM6264LP-70
IC10	Integrated Cct.; SGS TDA7330B
IC11	Integrated Cct.; (open) CD4053B
IC12,13	Integrated Cct.; Motorola MC34082
IC14	Integrated Cct.; National ADC0831-CCV
J1	AC Mains Connector; Switchcraft EAC303
J2	9-Pin “Sub-D” PC-mounting Female; (open)
J601	BNC Bulkhead; (open)
L1	Inductor, Switching Regulator; Renco RL1952
L2	Inductor, 100µH Molded; (open)
LCD501	Display Assembly; Apollo DMC40202NY-LY-AFE
Q1,2	Transistor, NPN; (open) 2N3904

Except as noted by reference designation, **all resistors** used in the Model 510 are of the value specified on the schematic, qualified per the following:

- a: Fixed Resistors** with values carried to decimal places implying a 1% tolerance (*example: 232, 3.01K, 10.0K, 301K*) are 1.4-watt, 1% metal film type.
- b: Fixed Resistors** with values typical of a 5% tolerance (*example: 220, 3.3K, 10K, 270K*) are ¼-watt, 5% carbon film type.
- c: Single-Turn Trimming Potentiometers** (circuit board) are Tocos GF06U1 series.

R10	Multi-Turn Potentiometer, 10K; Tocos RJC097P 103K
S1	Switch, Voltage-Selector; ITW 18-000-0022
S2,3	Switch, Pushbutton; C&K 8125-S-D9-A-B-E, with 8018 Black Cap
S4	Switch, SPDT Toggle; C&K 7101-M-D9-A-B-E
S501	Switch, Power Rocker; Carling RA911-VB-B-0-B

T1	Transformer, Power; Signal LP 34-340 (or direct cross-ref.)
Y1	Crystal, 11.0592MHz; Mouser 559-FOX115-20
Y2	Crystal, 4.332MHz; Standard Crystal 2AAKYM332000FLE20A /HC-18

## PARTS SUPPLIERS

Inovonics strives to maintain factory stock of all parts used in the products we manufacture. A large number of the components in the 510 are 'generic' and may be obtained from a wide variety of sources.

A few parts are more-or-less proprietary. These may either be: 1) manufactured specifically for Inovonics, 2) purchased directly from a manufacturer that sells only in production quantities, or 3) may require pre-installation service such as programming.

Inovonics does not depend on parts sales to fund our retirement program. We do not impose a minimum charge for parts, and in some cases we will elect to supply parts at no charge rather than to generate the necessary paperwork. Always check with the factory as we may well prove the best source for the exact replacement.

The electronic component distributors listed below have proven themselves reputable suppliers for small quantities of component parts for broadcasters and other commercial or professional users.

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With all due-diligence, please avoid the temptation to use cross-referenced hobbyist or TV/VCR Repair Shop "direct replacement (ha!) parts."

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Nearly any semiconductor, IC, capacitor, resistor or connector used in the Model 510 will be available from one or more of these firms. Each supplier maintains a Website and publishes a full-line printed catalog, which is free for the asking. Minimum-order restrictions may apply, and export orders may be somewhat problematical.

### **Mouser Electronics**

[www.mouser.com](http://www.mouser.com) — 1(800) 346-6873

### **Digi-Key Corporation**

[www.digikey.com](http://www.digikey.com) — 1-(800) 344-4539

### **Future-Active Industrial Electronics**

[www.future-active.com](http://www.future-active.com) — 1-(800) 655-0006

### **Allied Electronics**

[www.alliedelec.com](http://www.alliedelec.com) — 1-(800) 433-5700



# 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. The Warranty Registration Card supplied with this product *must* be completed and returned to Inovonics 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 ONE YEAR of the date of delivery will be repaired free of charge, or the equipment will be replaced with a new or remanufactured product at Inovonics' option.
  - B. Parts and labor for factory repair required after the one-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.