P132 RDS Encoders

Communication Ports and Internet Functions

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1 Using This Guide

1.1 Purpose

This guide covers data connection and communication topics of the **P132** and **P332** RDS encoders. It provides the information needed to setup the equipment in order to use the communication ports and built-in internet functions.

Please read this entire guide and familiarize yourself with the controls before attempting to use the device.

Where not otherwise indicated, any information mentioned in relation to the **P132** RDS Encoder applies in full also to the **P332** RDS Encoder.

Where not otherwise indicated, any information mentioned in relation to the **RDS** (Radio Data System) applies in full also to the **RBDS** (Radio Broadcast Data System).

If you have any questions or comments regarding this document, please contact us via email.
We welcome your feedback. A technical forum is provided at http://pira.cz/forum/

This document refers to firmware version 2.2b or later and embedded website version 2.2 or later.

1.2 Additional Documentation

Visit the Website for the latest documentation version and the following additional documentation:

- P132 RDS Encoder Quick Installation Guide (http://pira.cz/rds/p132inst.pdf)
- P132 RDS Encoder Technical Manual (http://pira.cz/rds/p132man.pdf)
- P332 RDS Encoder Quick Installation Guide (http://pira.cz/rds/p332inst.pdf)
- P332 RDS Encoder Technical Manual (http://pira.cz/rds/p332man.pdf)
- Windows software download (http://pira.cz/rds/show.asp?id=magic_rds_4)
- Support section (http://pira.cz/rds/show.asp?art=rds_encoder_support)
- X-Command for RDS Encoders (http://pira.cz/rds/xcmd.pdf)

1.3 Disclaimer

The device has been thoroughly tested and found to be in proper operating condition when shipped. The manufacturer is not liable for any damages, including but not limited to, lost profits, lost savings, or other incidental or consequential damages arising out of the use of this product.
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2 Basic Setup

2.1 Communication Port Overview

For configuration and control requirements, the RDS encoder is equipped with several communication ports. These ports include individual buffers and work in complete independence, i.e. all ports can be used at one time by different applications.

The port overview is given in following table:

Physical plug	Ports available	Port type	Description and purpose
Serial / USB	**Port 1**	Physical	This port is dedicated especially for local connection. It is accessible like any standard serial RS-232 port from the computer, using COMx name, where x is the port number assigned in operating system. Virtual COM Port driver ensures compatibility with older software although the connection is physically realized via USB cable. Primary configuration of the equipment should be made via this port. Port baud-rate (speed) is configurable in range 1200-19200 bps. Default speed is 2400 bps.
Ethernet	**Port 2**	Physical	All Ethernet activity is handled via this port, including HTTP, SNTP and SNMP. For example the user communicates via port 2 any time he's using the embedded website.
	Port 3	Logical	These ports are general purpose remote serial ports with support of following Ethernet protocols: • TCP (RDS encoder is a client) • TCP (RDS encoder is a server) • UDP (see the UDP mode limitations in section 3.9) A communication setup must be performed prior to use of these ports.
	Port 4	Logical	

All communication ports are universal. This means that <u>all</u> ports listed above accept complete set of ASCII commands, X-Command, UECP records and dynamic data from the broadcast automation system.

Individual access limitations can be configured for each port using the Port Access Control (PAC).
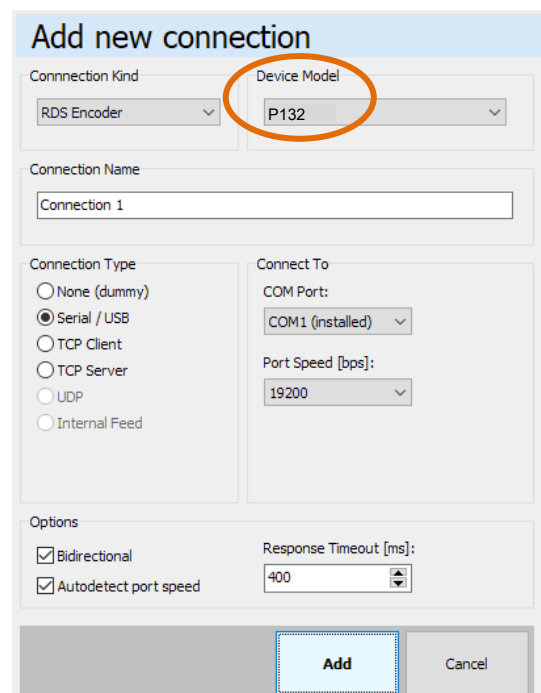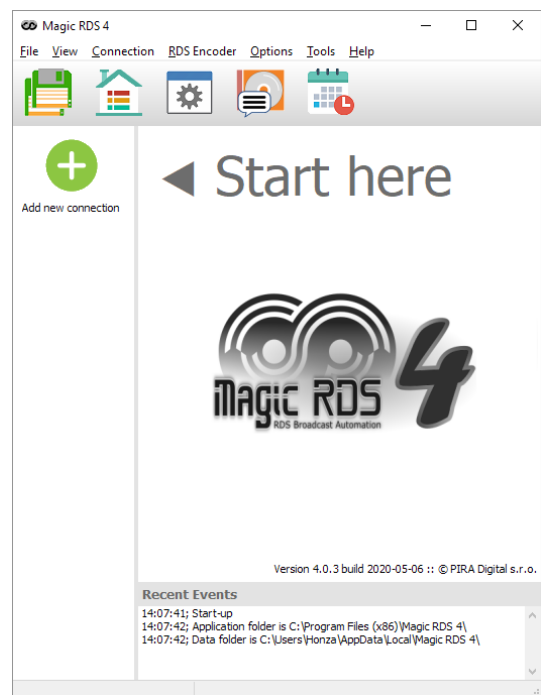
2.2 Communication Port Setup

2.2.1 Establishing a First Communication with the RDS Encoder

The RDS encoder should be configured via local port (port 1) before first use. Alternatively, the configuration can be made using the embedded website.

The encoder comes initialized from the factory. The Ethernet is pre-configured in order to obtain IP address from DHCP. Thus, in the DHCP enabled environment, the first connection with the encoder can be established using a web-browser and typing the assigned IP address into the address field. See more details in section 3.1.

For local configuration via Port 1, please follow these steps:

1. Install the Windows control software called 'Magic RDS 4', run the setup exe file and go through the simple installation wizard.

2. In the case of USB connection install the USB driver now.
    TIP: Latest operating systems already come with the USB driver included.

3. Make sure the RDS encoder is connected and powered, all connectors are seated completely.

4. Run the Magic RDS software using Windows Start button.

5. Double-click on the 'Add new connection' icon.

6. Select your device model (**P132** or **P332**). Choose the Serial/USB connection and select the COM port the RDS encoder is connected to.
    Note: You may find/change the assigned COM port number in Windows Control Panels - System – (Hardware) - Device Manager.

7. Finally click on the Add button. You should see "Connected" or "Opened" in the Recent Events box. Now you are ready. The settings are saved automatically.

8. Configure the basic RDS settings.
    Especially check the pages **RDS Content – Program, Device Setup – Analog Control and Device Setup – LAN Settings**.

9. The Recent Events box and status bar at the bottom of the window show whether the data was sent successfully. If an error is shown, check the connection to the RDS encoder, its power supply and whether a correct COM port is selected in the connection setup.

10. Follow the Magic RDS help for further details, tools and configuration options.

2.2.2 Device Setup from Magic RDS

For setting of some additional communication parameters, first open the Device Setup card. Depending on version, you'll see following or similar window:

Here's the port setup, Ethernet setup and UECP setup at one place. A description of each item follows:

Port 1

Port speed	Setting the Port 1 speed is required to maintain compatibility with older software or terminal application. Due to virtual COM port included in the USB driver the older software can access the RDS encoder the same way like in case of standard serial port. Default speed is 2400 bps.

Embedded Web-Server Control (Port 2)

Port number	Specifies the embedded web-server port number. Default port number is 80. Such number may be omitted when typing the URL in web browser.
Password	If a password is filled, it is required in order to enable any configuration changes using the embedded website. Default password is * (that means 'no password required').

Ethernet Configuration

Use DHCP	Embedded DHCP client allows for automated configuration of the Ethernet parameters like IP address or DNS server. This option should be set to Yes. Choose No if you want to enter the parameters manually or if there's no DHCP function contained in your network. See section 3.8.3 for more details.
Time synchronization	Enable this option in order to keep the RDS encoder's internal time accurate, using the SNTP server specified. Disable this option if internet is not accessible from your network or if there's other time keeping method applied (for example via UECP commands).
SNTP time server	Fill an active SNTP server. Default value is time.nist.gov
Local time offset	Your local time offset (the value added to UTC).
Daylight saving transition rule	See section 3 for details. Leave empty if there's no daylight saving time applied in your country or if this function is not required.

UECP Settings

UECP Enable/Disable	Enable the UECP if your broadcast automation system or RDS data provider uses this protocol. Leave disabled otherwise.
Site List	Up to two site address numbers in range 0 to 1023, separated by comma.
Encoder Address List	Up to two encoder address numbers in range 0 to 63, separated by comma.

The PSN for main program can be set in RDS Content – System – Miscellaneous.
The PSN for EON service can be set in RDS Content – Networking – EON.

Note: The PSN (Program Service Number) settings have effect for UECP control only. Selectable PSN for each program set allow easier integration of the RDS encoder into existing networks.

Port 3/4 TCP/UDP

Port 3/4 Enable	Check this box to enable the port.
Protocol	Select the protocol regarding to the protocol that is used by the RDS data provider. If the protocol is not specified, it is probably TCP. Using the UDP is deprecated.
Port number	Fill the port number in range 1 to 65535. It must match the port number of the RDS data providing application.
TCP Server/Client	For TCP protocol, the user may specify if the RDS encoder is a server (waiting for a client application connection) or a client (actively connects to the specified RDS data providing server). If host name or IP address needs to be specified in the RDS data providing application, the RDS encoder will be a server (most frequent option). The server side must be visible in the network. In internet that means the server requires public IP address and/or correct port forwarding setting on router (if present).
Host/IP address	Available only if the encoder is configured as a client. Specifies the remote server the encoder will connect to.
Prioritize new connections	Available only if the encoder is configured as a server. If enabled, new connection can be established immediately, although previous connection has not yet been released. Requires firmware version 2.1e or later. Disabled by default.

Once the configuration is done, click on the Apply button.

IMPORTANT! All settings related to the Ethernet functions will take effect after the device reset.

To reset the RDS encoder, select Device Setup – Special – RESET in the application window (or disconnect the power supply from the device and connect it again). The RDS encoder gets on-line in about 15 seconds.

2.2.3 Connection Setup from Terminal

Hint: This section is for advanced users only. You may skip it and go directly to **section 3**.

First Steps with the Terminal Application

This section explains how to make the settings above from a terminal application (and later also from embedded web-server).

All RDS encoder's settings and configuration incl. text messages etc. can be made from a terminal using a set of ASCII commands. (Any Windows GUI based application effectively does the same; it translates the user's data into the ASCII commands.)

1. In the case of USB connection install the USB driver now.

2. Make sure the RDS encoder is connected and powered, and all connectors are seated completely.

3. On the PC, run an application or program emulating or possessing an ASCII terminal. For example Windows HyperTerminal in Windows XP presents all the characteristics to easily communicate in ASCII mode with the RDS encoder.
   Latest Windows versions unfortunately no longer contain terminal application. That needs to be installed additionally from public resources. Suitable replacement for the Windows HyperTerminal is the PuTTY client that is available for free download at http://www.putty.org.

4. Configure the communication parameters as follows:

Transmission speed	2400 bps (default, see note)
Data bits	8
Parity	None
Stop bits	1
Flow control	None

   Note: If the RDS encoder was previously in use, there may remain any speed from 1200, 2400, 4800, 9600 or 19200 bps. Actual speed is showed on the encoder's LCD display.

Once configured, the terminal can be used. To check if the hardware and logic configuration work as planned, type for example `HELP` and press <Enter> to display the list of all commands. If no or unknown characters are displayed on the screen, try again a second time, otherwise, check the following points:

- RDS encoder turned on?
- Cable used (does the LED1 indicate incoming characters?)
- Configuration of the terminal application

To display the commands entered at the keyboard on the screen, type the command `ECHO=1` followed by <Enter>. If all characters written are displayed twice, type `ECHO=0` and press <Enter>.
To store this parameter into a non-volatile EEPROM memory, type `*ECHO` and press <Enter>.
To display actual parameter value, type `ECHO` and press <Enter>.

Now you made first steps with the RDS encoder command interpreter.

The RDS encoder command interpreter meets the following rules:

Any instruction sent to the RDS encoder must be **validated** by <Enter>.
Before validating you may correct the characters by pressing <Backspace>.

There are several methods of use for the commands:

- Query or command without argument, ex. HELP
  Shows the parameter value or performs the operation.
- Command with argument, ex. ECHO=1
  Assigns the value to the parameter.
- Memory store command, ex. *ALL
  Stores the parameter value(s) into the non-volatile EEPROM memory.
- Memory store command with argument, ex. *SITE=
  Assigns the value to the parameter and stores it immediately into the non-volatile EEPROM memory.
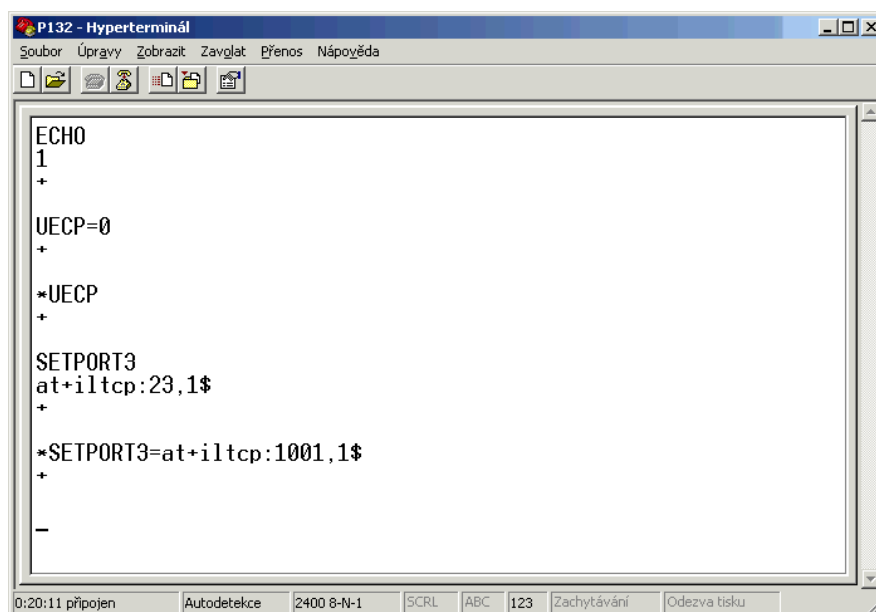
Not all methods are available for all commands, see Command Summary section in the Technical manual.

Depending on the command processing success, several characters (followed by two pairs of carriage return and line feed characters) can be returned by the RDS encoder:

+	Command processed successfully
!	Unknown command
-	Invalid argument
/	Command processed partially

The command interpreter is not case sensitive.

If you wish to retain change of any parameter value during power off, don't forget to store it into EEPROM memory!

Note: Besides the terminal application, there are two other methods how to control the RDS encoder using the ASCII commands. In the Magic RDS click on the Terminal button. In the embedded website: Tools – Terminal.

2.2.4 Port Setup Commands

Following ASCII commands can be used for the RDS encoder's port setup.
Note: The Windows GUI application or the embedded website can be used as well.

The command list follows in the form:

Command	Full command name	(values accepted)
Command description		
Examples of use	*Example description.*	

For complete list of commands supported by the P132 encoder, please follow the Technical manual.

SPEED	Port 1 Speed	(1200, 2400, 4800, 9600, 19200)

Sets the port 1 speed. The speed is changed immediately after validating by <Enter>.

```
SPEED=2400          Set new speed,
*SPEED              store to EEPROM.
```

SETLAN	Ethernet Setup

Configures the Ethernet functions, excl. port 3 and port 4 settings. Stores the configuration to non-volatile EEPROM memory.
This command serves for entering several values. Each value ends by '$' character.
at+ifd$ - Sets factory defaults. This value must be always the first.
at+idip=<IP_addr>$ - Default IP address. If specified, the DHCP is disabled.
at+iipg=<gate_addr>$ - Gate address. Specify only if DHCP is disabled.
at+isnet=<subnet_addr>$ - Subnet mask. Specify only if DHCP is disabled.
at+idns1=<DNS_IP_addr>$ - DNS1 IP address. Specify only if DHCP is disabled.
at+iwebp=<portnum>$ - Specifies port number for embedded web-server. 80 if not specified.
at+iwpwd=<password>$ - Specifies a password for embedded web server. * for no password.
at+irpg=<password>$ - Specifies a service password for embedded web server. * for no password.
at+intod=1$ - If specified, the SNTP time synchronization is enabled.
at+ints1=<sntp_server>$ - Specifies SNTP server.
at+igmto=<time_offset>$ - Specifies local time offset.
at+idstd=<transition_rule>$ - Specifies transition rule for daylight saving time.
Other values or usage is not allowed. Values must be typed exactly as described.
Note: the '' prefix may be omitted for this command. Maximum length is 255 characters.*

```
*SETLAN=at+ifd$at+irpg=*$at+iwpwd=*$at+ints1=time.nist.gov$at+igmto=+1$at+
intod=1$at+idstd=02.LSun.03;03.LSun.10$
SETLAN
```

SETPORTx	Port 3/4 Setup

Configures port 3 or port 4. Stores the configuration to non-volatile EEPROM memory.
Several options exist for this command:
*SETPORTx= for disabling the port.
*SETPORTx=at+iltcp:<portnum>,1$ for TCP protocol, the encoder is a server.
*SETPORTx=at+iltcp:<portnum>,2$ as above + prioritize new connections.
*SETPORTx=at+istcp:<host>,<portnum>$ for TCP protocol, the encoder is a client.
*SETPORTx=at+isudp:0.0.0.0,0,<portnum>$ for UDP protocol.
SETPORTx for showing actual setting.
Other values or usage is not allowed. Values must be typed exactly as described. The 'x' can be either 3 or 4.
Note: the '' prefix may be omitted for this command. Maximum length is 127 characters.*

```
*SETPORT4=
*SETPORT3=at+iltcp:23,1$
*SETPORT3=at+istcp:192.168.2.1,23$
*SETPORT3=at+isudp:0.0.0.0,0,25$
SETPORT3
```

SETCTO	Connection Timeout	(0-254[,0-254])

Specifies connection timeout in minutes for port 3 and port 4. If no character or command is received during this period, the device disconnects itself and the port resources are released for establishing a new connection on the port.

Typically the connection timeout applies when TCP connection terminates abnormally (without closing the connection) or when UDP client closes. In these cases the port becomes available again after the timeout specified.

For usual use, the timeout should be longer than the longest expected gap in incoming data.

Default value is 16 minutes.

If only one value is entered, it is used for both ports 3 and 4.

A value of 0 is reserved for special case of UDP communication - the data provider changes its local port dynamically with each datagram. In this case the limit of UDP packets/second reduces to 2.

Note: the '' prefix may be omitted for this command.*

`*SETCTO=16`	Set the connection timeout to 16 minutes for both ports 3 and 4. This is a default setting.
`*SETCTO=5,60`	Set the connection timeout to 5 minutes for port 3 and 60 minutes for port 4.

SETIPR	IP Registration URL	(<URL>, 1)

Specifies IP registration URL. That URL is accessed after IP address is assigned to the RDS encoder or when the IP address changes. The server may determine the remote encoder's IP address and use it for example for providing dynamic DNS service or for event logging purposes.

A special value of '1' causes accessing the URL immediately. This may be useful if called from the internal RDS encoder's Scheduler.

Note: Basic http authentication (http://usr:pwd@...) is not supported.

Note: The '' prefix may be omitted for this command.*

`*SETIPR=http://dynupdate.no-ip.com/ducupdate.php?username=myusername&pass=mypassword&host=mytest.no-ip.com`	Configure the IP registration feature for use with No-IP™ dynamic DNS provider (www.no-ip.com). *Note: A registration is required at first.*
`SETIPR=1`	Make the IP registration now.
`*SETIPR=`	Disable the IP registration feature (default).

UECP	UECP Enable	(0, 1)

Enables (1) or disables (0) the UECP support for all ports. ASCII commands are accepted regardless of this value.

`UECP=1`

SITE	Site List	(0-1023[,0-1023])

Up to two site address numbers in range 0 to 1023, separated by comma.

`*SITE=16`
`*SITE=125,1022`

ADR	Encoder Address List	(0-63[,0-63])

Up to two encoder address numbers in range 0 to 63, separated by comma.

`*ADR=56`
`*ADR=12,35`

RESET	Device Reset	

Required after using SETLAN and SETPORTx commands in order to take effect.

`RESET`

IPA	Actual IP Address	

Returns actual IP address of the RDS encoder in 'dot' form.

If no IP address is assigned or no network has been detected, returns '0.0.0.0' or 'No LAN or no IP'.

`IPA`

3 P132 Communication Features

3.1 Embedded Web-Server

The RDS encoder includes HTTP server and a complex web-based user interface. An internet browser may be directed to the encoder's IP address to bring up the encoder's configuration website. This interface can set up any parameter of the RDS encoder. Optional password protection is available to avoid unauthorized changes in settings. For proper operation, the web browser must support JavaScript.

To access the embedded website, type the RDS encoder's IP address into the web-browser:

The configuration website gives the user several choices. They are described below:

Device Status	Online status window showing PS, PI, TP, TA, RT and RT+ services, incoming data for each port, RDS group statistics and sequence etc. Following is a list of all important parameters related to the network communication. Any change of these parameters can be made solely using the LAN Settings choice.
LAN Settings	The LAN Settings choice results in three sub-items: General settings, Port 3 settings and Port 4 settings. For complete description of all options, follow section 2.2.2 in this manual or follow the website menu item Help.
Setup	Here you may set communication speed for port 1, UECP parameters, RDS signal characteristics, date and time and all other related features.
RDS Configuration	Allows configuring entire RDS content, from basic parameters like PS and PI to text settings, AF, EON, program set, group sequence etc.
Tools	A set of tools handled by the RDS encoder. Includes PI calculator, ASCII terminal, weekly scheduler and device reset.

3.1.1 Security Options for the Embedded Website

In public networks, to avoid unauthorized changes to the RDS encoder's settings, the user can:
- configure Port Access Control for port 2 (see section 3.7),
- change the port on which the website can be accessed (default value is 80),
- specify optional password for the internal website (default value is * which means no password).

If a password has been established for the website but no authorization has been made, the user cannot:
- change any settings,
- view any settings,
- reset the RDS encoder.

When authentication is required, the RDS encoder's internal web-server automatically issues an authentication form to the remote browser. Authentication needs to be submitted only once per session. In addition, authentication automatically expires after 10 minutes of inactivity.

3.2 Control via HTTP GET Commands

The RDS encoder can be controlled by accessing its HTTP server and specifying the command as a part of the URL (this technique is known as HTTP GET method). This feature is especially useful for sending programme information (artist and title) from the broadcast automation system via local network.

For example typing the following line in web-browser changes the PS to KISS FM:

```
http://<encoder's IP address>/send.htm?setrds=PS%3DKISS%20FM
```

The original RDS encoder's command `PS=KISS FM` is firstly URL-encoded and that string is then assigned to the *setrds* variable. The encoder supports UTF-8 character coding, i.e. characters typed as UTF-8 are automatically converted to the internal EBU Latin code table (G0).

If using this feature for sending more commands in sequence, it is necessary to ensure at least 2 sec. delay between the commands, otherwise some commands may be discarded.

Due to impossibility of authorization via URL string, the HTTP GET feature can only be used if the internal website is not password protected (i.e. in local network).

3.3 SNTP Client for Time Synchronization

SNTP is an acronym that stands for Simple Network Time Protocol. As its name suggests, it is a less complicated version of Network Time Protocol, suitable for embedded devices. It is a system for synchronizing the clocks of networked computer systems.

Note:
The time provided by any SNTP server is always UTC time. Thus the local time offset must be specified.

Enable this option in order to keep the RDS encoder's internal time accurate, using the SNTP server specified. Disable this option if internet is not accessible from your network or if there's other time keeping method applied (for example via UECP commands).

The P132 RDS encoder supports definition of daylight saving transition rule. That rule will be applied to the time retrieved from the SNTP server. In other words, the RDS encoder automatically switches between standard time and the daylight saving time (so called summer time).

The daylight saving transition rule syntax is as follows:

<HH1.DD1.MM1>;<HH2.DD2.MM2>

where

<HH1.DD1.MM1>	indicates the moment when Daylight Saving Time starts and
<HH2.DD2.MM2>	indicates the moment when Daylight Saving Time ends.
HH1, HH2	Hour in 24 hour clock format (two digits).
DD1, DD2	Either specific day in the range 01 to 31, or <F/L/1/2/3/4/5><Day of Week>, <F/L> represents First/Last occurrence in a month, <1/2/3/4/5> represents the 1st, 2nd etc. occurrence in a month, <Day of Week> = {Sun, Mon, Tue, Wed, Thu, Fri, Sat}. For example, FSun is First Sunday, while 3Sun is Third Sunday.
MM1, MM2	Month (two digits).

For European countries, the rule should be entered as 02.LSun.03;03.LSun.10

For disabling the daylight saving transition rule, leave the field empty.

Note:
After enabling the SNTP client, it may take a while before first time synchronization occurs. From that moment the time is kept accurate.

3.4 Remote RDS Output Monitoring

Want to see or verify the RDS output data? Basic online monitoring is available through the internal website. The encoder however supports also direct complete RDS output monitoring on any port in real time using a desktop application. This unique feature allows complete RDS output analysis either locally or remotely. No receiver or special equipment is required.

RDS data is provided as ASCII coded RDS groups in raw format at the RDS group rate (11.4 groups per second). The group content provided is equal to the group content being sent to output of the RDS encoder. This format of data is directly supported by some easy to use applications (for example freeware RDS Spy).
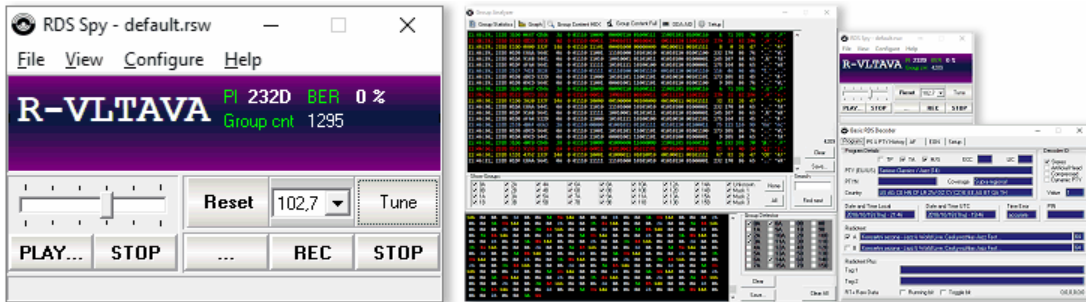

RDS Spy - Real-time freeware Radio Data System decoder and analyzer for Windows.

Note: Under certain conditions, depending on the data connection and actual workload, the monitoring may sometimes freeze for a short time or skip some groups. This is an inherent property that does not affect the real data sent to the output of the RDS encoder (the remote monitoring feature requires at least 300 bytes/s of free throughput capacity on appropriate port). Remember that your RDS encoder always sends RDS data correctly and continuously to your listeners.

3.4.1 Monitoring the RDS Output Step-by-Step

1. Configure the RDS encoder's port that will be used for monitoring (see also section 2.2.2).
   For local monitoring, configure port 1. Set port speed to **19200 bps**.
   For remote monitoring, configure port 3 or 4. Select **TCP** protocol and **Server** option. Reset the encoder if necessary.
2. Download and install the RDS Spy software (http://rdsspy.com), run the setup exe file and go through the simple installation wizard.
3. Run the RDS Spy and open the RDS Source dialogue box (Configure – Select RDS Source).
4. In this window select ASCII G Protocol and P132 RDS Encoder type:
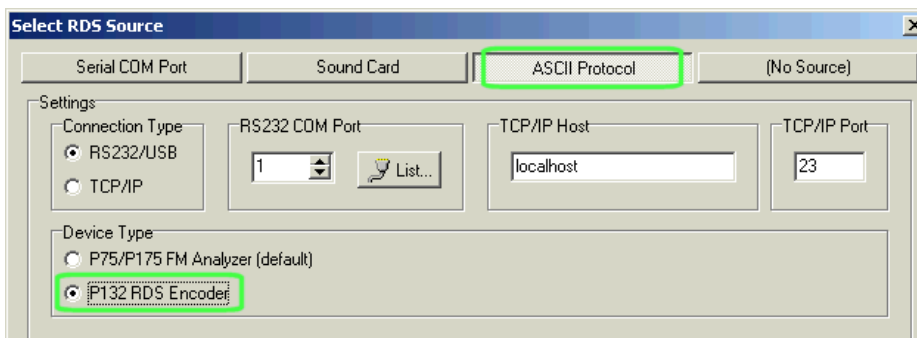
5. Configure the connection parameters, either USB for local monitoring via encoder's port 1 or Ethernet for remote monitoring, in accordance with step 1.
6. Confirm by pressing OK. The real-time RDS content will appear immediately.

3.4.2 Monitoring the RDS from Magic RDS

1. For monitoring via Port 1, set the port speed to ***19200 bps***.

2. In the Windows control software, select the device (connection) of interest.

3. Click on the RDS Spy button:

4. The real-time RDS content will appear immediately.

3.4.3 The Feature Background

The RDS output monitoring is initialized by the command `SETSPY` applied to the port where the output RDS data are expected:

SETSPY	Set RDS Monitoring Counter	(1-255)
Specifies how many output RDS groups will be copied to the port from which the command is called. For continuous monitoring, the command must be send again before the counter elapses. Note: For operation on port 1 the port speed must be 19200 bps.		

`SETSPY=114`   Send 114 RDS groups (that is, monitor the RDS output for 10 seconds)

RDS data is provided by the RDS encoder in ASCII representation in this format:

`"G:"+#13+#10+"AAAABBBBCCCCDDDD"+#13+#10+#13+#10`

where

> AAAA is PI,
> BBBB is block 2,
> CCCC is block 3,
> DDDD is block 4 of the RDS group.

No CRC or offsets are included.

3.5 Reading Internet Content

The RDS encoder includes a stand-alone HTTP client that can periodically update a text of selected RDS service (for example radiotext) by a dynamic internet content. A more general use of this feature allows update of any RDS encoder's parameter.

The user needs to configure several parameters:
- Update period – Specifies the interval in seconds between internet content readings.
- Destination – Specifies what RDS service is to be updated by the text read.
- URL – Specifies the address in internet (incl. http:// prefix) from which the reading will occur.

Maximum file length read from the URL is 240 bytes. Longer files will result in no action. Thus the feature can't be used directly for reading common internet sites but this limitation can be compensated if the URL points to a dynamically created content using PHP or similar technique. The RDS encoder removes all HTML tags and redundant spaces before placing the text to the destination. The encoder expects UTF-8 character coding, i.e. characters read as UTF-8 are automatically converted to the internal EBU Latin code table (G0).

Configuration of the feature is made by the command `READWEB`:

READWEB Reading of Internet Content	(0-65000[,<dest>[,<url>]])
Configures internal HTTP client for reading of internet content. Allows a text value from the internet to be assigned to selected RDS service. *Note: HTTPS protocol is not supported*.	

First parameter defines the update period in seconds.
Second parameter defines destination of the text read, according to the complete list of commands. For example `RT1` for Radiotext 1.
Third parameter defines URL, i.e. an address in internet from which the reading will occur. Maximum URL length is 64 characters (incl. 'http://' prefix). Maximum file length is 240 bytes, longer files will result in no action.

If no destination but URL is specified, the destination is taken from the text read, for example if the file contains PS=KISS FM, the Program Service name will change to KISS FM.
If no URL is specified, a previously entered URL stays in memory without change.
If the URL ends by '=' (equal sign), the second parameter (command) will be added to the URL and passed to the server.
The time of reading event is rounded towards nearest half of minute of the real-time clock.
If the update period is 1 (one), the reading will occur immediately and only once, then the update period is automatically set to 0 (zero).
If the update period is 0 (zero) or there's no url specified, the reading feature is disabled.

`READWEB=120,RT1,http://myweb.org/text.php`	Read a text from the php file periodically each 120 seconds, show the text as radiotext on receivers.
`READWEB=240,DPS1`	Changes period and destination, no url change.
`READWEB=180`	Changes the period only.
`READWEB=1`	Reads the text only once now (useful for scheduling)
`READWEB=60,XCMD,http://myweb.org/song.xml`	Read the file periodically expecting the X-Command format
`READWEB=120,,http://myweb.org/cmd.php`	Specifies the period and url, no destination specified (must be specified in the text returned by the cmd.php file).
`READWEB=240,RT1,http://myweb.org/cmd.php?c=`	The 'RT1' string is passed to the cmd.php file as the **c** variable value.
`READWEB=0`	Disable the reading feature.

3.6 IP Registration (Dynamic DNS)

When the RDS encoder is configured for using a DHCP server, under certain conditions a different IP address may be assigned to the RDS encoder next time it goes on-line. This may sometimes make difficulties if the RDS encoder has to be accessed as a server in the network, since the encoder's IP address becomes 'dynamic'.

To overcome this problem, the RDS encoder incorporates built-in procedure designed to register its IP address on another server system. Once registered, client system (for example automation system) may interrogate the server in order to retrieve the IP address currently assigned to the RDS encoder.

Several suitable services of that kind (IP forwarding providers) are also available in internet for public use. These services allow the RDS encoder to keep the provider apprised of its reassigned IP address whenever the address changes. Instead of addressing the encoder directly, the client system sends data to the IP forwarding provider, which automatically keeps track of encoder's changing IP address and sends the data to the encoder's current IP address. The No-IP™ (www.no-ip.com) is a typical service of that kind.

However the usage is not limited to any specific service, i.e. any service may be used or created if this accepts authentication via HTTP GET query string and IP address detection from the incoming HTTP request.

The IP registration process is governed by accessing a specified URL and providing the parameters necessary using HTTP GET query string. Once the URL is configured in the RDS encoder, the device registers its IP address accordingly when an IP address is assigned to the device or when the IP address changes.

Everything the user has to do to enable the IP registration and forwarding, is to register himself on the IP forwarding provider's website and configure the IP registration URL in the RDS encoder.

Format of the URL is given by the IP forwarding provider. Take note that the RDS encoder does not send its IP address as a part of this URL. If the RDS encoder is placed behind NAT, for example, providing its local IP address gives no sense. Instead of this, the IP forwarding provider gets the public IP address automatically from the HTTP request.

Configuration of the URL is made by the command `SETIPR`.

When does the IP registration process occur?
- On power-up, after getting IP address
- After any change of assigned IP address
- On scheduling event (optional)

Important note: The IP forwarding providers, especially in their free-of-charge service variants, usually implement an abuse policy. If the provider receives too many unnecessary IP updates for a host, the host is blocked and cannot receive additional updates until it is unblocked.

Is there any preferred alternative?

Many routers with DHCP function allow static IP address assignment to a device with specified MAC address. The function is usually called 'Address Reservation'. Please follow the router's documentation. The RDS encoder's MAC address can be found for example on its internal website.

For final installation, if need to know the RDS encoder's IP address, it is always preferred to assign a static IP address to the RDS encoder rather than leaving the DHCP function to assign an IP address.

3.7 Port Access Control

The Port Access Control (PAC) is a security feature that restricts the RDS encoder control via each port by means of a command code and associated enable/disable flag. The user may specify for each port which RDS services are allowed to be sent, configured and viewed via that port.

The port is identified by its number from 1 to 4 (see section 2.1). The command is identified by its code (see Annexes). The RDS encoder is set from factory so that all commands are accepted (enabled) on all ports.

The PAC feature applies to both the ASCII commands and the UECP commands on all ports.
An exception from this rule exists for USB port (P132, P164, P232U) or for RS-232 port (P232, P332): ASCII commands on these ports cannot be disabled so local configuration is always possible.

If the UECP commands are completely disabled by ASCII command `UECP=0`, the PAC has no effect on UECP commands.

The Port Access Control feature can be configured via ASCII command `PAC`.

PAC	Port Access Control	(0-4),H(00-FF),(0,1)
Restricts the RDS encoder control via each port by means of a command code and associated enable/disable flag. Applies to both the ASCII commands and the UECP commands. First argument specifies the port number (1 to 4, or 0 for all ports). Second argument specifies the command code (see Annexes for complete table of command codes). A command code 00 means all commands on that port. The value specifies whether the command is enabled (1) or disabled (0) on that port. The `PAC` command does not apply to ASCII commands on the port which is primarily intended for local configuration. Full ASCII control is provided via that port regardless of the PAC settings. The `PAC` command cannot disable itself on the port from which the command is entered. By default, all commands are enabled on all ports.		
`PAC 3,00=0`	Access denied on port 3, no command accepted on this port	
`PAC 3,AB=1`	Radiotext command accepted on port 3 (ASCII commands `RT1` and `RT2`)	
`PAC 1,01=0`	UECP PI command (MEC 01) not accepted on port 1	
`*PAC`	Store all PAC settings to EEPROM	
`PAC 1,01`	Ask for actual value – port 1, UECP command PI enabled?	
`PAC 0,00=1`	Enable everything (factory default)	

Useful notes for Port Access Control

- Commands executed using internal scheduler, are never restricted by the PAC.
- The PAC does not affect transmission of any service. For example, if Radiotext is being transmitted, disabling the Radiotext command (code AB) does not stop its transmission. Use appropriate commands for that purpose.
- A command executed inside `READWEB` or `SETRDS` commands or entered using the embedded website is effectively processed via port 2 so the PAC may apply to that command.
- Access from the embedded website can be also restricted using the Password option (see section 2.2.2).

3.8 Simple Network Management Protocol (SNMP)

The Simple Network Management Protocol (SNMP) is used mostly in large networks to monitor network-attached devices for conditions that warrant administrative attention. The RDS encoder supports SNMP in version 1, and listens on standard UDP port 161.

Following commands are supported:
- GetRequest
- GetResponse

The community string is ignored.

Following OID's are supported:

OID	Type	Description
1.3.6.1.2.1.1.1	string	Returns "P132" (for both the P132 and the P332 encoders)
1.3.6.1.2.1.2.2.1.9.1 to 1.3.6.1.2.1.2.2.1.9.4	integer	Returns minute count from last data receive on port 1 to 4.
1.3.6.1.2.1.1.5	string	Returns actual PI
1.3.6.1.2.1.1.6	string	Returns static PS
1.3.6.1.2.1.2.2.1.8.5	integer	Returns RDS output enabled (1) or disabled (2).
1.3.6.1.2.1.2.2.1.8.6	integer	Returns pilot tone present (1) or not (2).
1.3.6.1.2.1.2.2.1.5.5	integer	Returns output RDS level 0 to 255, equal to ASCII command LEVEL.

For other (unknown) OID's the return value is NULL.

Limitations of the SNMP implementation:
- Entire SNMP message must not be longer than 200 bytes.
- After receiving UDP packet, its source IP and port is latched. That information is then used for sending the response. The information is still remembered, i.e. if immediately following request is sent from another port, it is not accepted. The timeout for the source IP and port reset is internally set to about 3 seconds.

The SNMP support must be enabled using the internal website or by the command SETSNMP:

SETSNMP	**SNMP Enable**	**(0, 1)**

Enables (1) or disables (0) the SNMP support for the RDS encoder.
Note: the '' prefix may be omitted for this command.*

```
*SETSNMP=1
```

3.9 Other Features and Characteristics

3.9.1 Ethernet Fail-Safe Monitor

Due to complex nature of the Ethernet environment combined with demands on high reliability, there's a fail-safe monitor implemented in the P132 RDS encoder. If the Ethernet communication entirely crashes for some reason or some key parameters are not within standard boundaries for a longer time, a software or hardware reset will occur to the Ethernet module, allowing re-initialization and self-reconnection. Associated reset timeout periods are fixed in range of 3 to 20 minutes, depending on conditions.

This reset operation applies only to the Ethernet functions; it does not affect the RDS encoder's operation, RDS content nor communication on port 1.

The parameters monitored include:
- Current IP address
- Ethernet carrier presence
- Buffer overrun
- Bytes received via TCP/UDP ports
- Bytes received via port 2
- Unsuccessful attempts to access remote servers

3.9.2 Command vs. Network Packet Alignment

Since UDP packets can naturally get lost or change order, each UDP packet should contain only complete command(s). For the TCP protocol there's no restriction.

Packet

ASCII command or UECP frame

TCP protocol

✓ **OK**

✓ **OK**

✓ **OK**

UDP protocol

✓ **OK**

✓ **OK**

✗ **Not recommended**
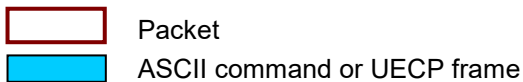
Maximum UDP packet data length is 90 bytes (applies to the P132 and P332 only).

3.9.3 DHCP Client

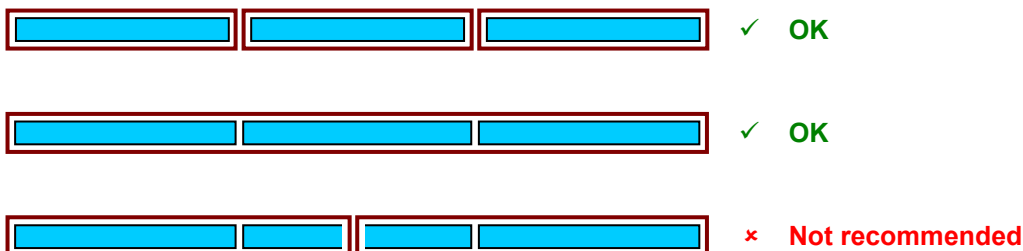A DHCP client component in the RDS encoder supports IP and server name acquisition from a standard DHCP server. If the DHCP function is enabled, the RDS encoder attempts to contact and acquire IP address and server names from a DHCP server. When the DHCP acquisition procedure is successful, the RDS encoder's IPA (IP Address) parameter contains the assigned IP address retrieved from the DHCP server. In addition, relevant server names are retrieved from the DHCP server. These include gate address, subnet mask and DNS server names.

All values acquired from the DHCP server are not retained as nonvolatile values. New values are acquired during the next DHCP session, which is activated
- during the next RDS encoder's power-up or
- following a software or hardware reset or
- after the DHCP lease time expires.

The DHCP client has two associated points in time when the DHCP server is contacted for additional negotiations. At time T1 (usually after half of the original lease period), the RDS encoder attempts to renew the lease period. If the renew procedure fails, at T2 (usually after 7/8 of the original lease period) the RDS encoder attempts to renegotiate the lease. If the procedures at T1 and T2 fail and the lease expires, the RDS encoder reverts parameter values to their pre-DHCP state and continuously attempts to locate a DHCP server for re-negotiation. When this is the case, the RDS encoder stores 0.0.0.0 in the IPA parameter and cannot communicate on the LAN until a DHCP server is found and IP and server names are acquired. In some cases the Ethernet fail-safe monitor may take action prior to this scenario.

4 Annexes

4.1 Technical Specifications

Port throughput

Port (protocol)	Max. bytes/s	Max. packets/s
Port 1	1920	
Port 2	1920	
Port 3 (TCP)	800	no limit
Port 3 (UDP)	800	28
Port 4 (TCP)	800	no limit
Port 4 (UDP)	800	28
Port 3 + Port 4 total	1000	

Receive Buffer Size [bytes]

Port	TCP buffer	Port buffer	Command buffer
Port 1		90	280
Port 2		90	280
Port 3	1000+8000 (typ.)	90	280
Port 4	1000+8000 (typ.)	90	280

Character Coding

Port	Coding	Note
Port 1	Transparent (EBU Latin G0)	
Port 2	Unicode UTF-8	Internal website and commands `SETRDS`, `READWEB`
Port 3	Transparent (EBU Latin G0)	
Port 4	Transparent (EBU Latin G0)	

Notes:

1. The EBU Latin G0 code-table represents default character coding scheme as defined in the RDS standard. See the Technical Manual for more details.
2. Where applicable, the RDS encoder makes automatic conversion between UTF-8 and EBU Latin G0.
3. The X-Command and LPS command always expects UTF-8 encoding on all ports.

Other Parameters

Parameter	MIN	TYP	MAX	Unit
TCP Timeout [1]		6		s
Port Timeout [2]		2		minutes
Connection Timeout [3]	0	16	254	minutes
UDP packet size (P132 and P332 only)			90	bytes
TCP clients connected to each port			1	
HTTP clients browsing the website			1	
HTTP GET command rate			0.5	s^{-1}

Ethernet controller type	CO2144 (Connect One)
USB controller type	FT232R (FTDI Chip)
USB driver support (virtual COM port)	Windows, Linux, Mac OS

Notes:

1. Maximum time allowed for the device for establishing a connection with a remote server.
2. If no character is received during this period, internal command buffer associated with the port is cleared.
3. If no character or command is received during this period, the device disconnects itself and the port resources are released for establishing a new connection on the port. Applies only to port 3 and 4. The timeout is user configurable via command SETCTO. Factory default value is 16 minutes.

4.2 Command Codes

Following table represents command codes for use with Port Access Control feature.

Code	Command	Code	Command	Code	Command
01	PI	9E	RTPER	CF	GRPSEQ
02	PS	9F	Sxxx	D0	LIC
03	TA/TP	A0	MSGxx	D1	(no effect)
04	DI/PTYI	A1	COMSPD	D2	VER
05	MS	A2	LABPER	D3	PS_SCROLL
07	PTY	A3	PTYNEN	D4	DPS
0A	RT	A4	RDSGEN	D5	UECP
0D	Real time clock	A5	RSTDPS	D6	SITE
13	AF	A6	RT2MSG	D7	PSW
1C	Data set select	A7	SPSPER	D8	LEVEL
24	Free-format group	A8	MSGxxD	D9	RTP
2D	X-Command	A9	DPSxMOD	DA	RTPRUN
30	TMC	AA	DPSxREP	DB	SETSPY
40	ODA MEC 40	AB	RTx	DC	(reserved)
42	ODA MEC 42	AC	DPS1ENQ	DD	(no effect)
		AD	DPS2MSG	DE	(reserved)
		AE	EXTSYNC	DF	(no effect)
		AF	PROGRAM	E0	SETLAN, PORTx, IPR, CTO, SNMP, FEAT
		B0	RT2TYPE	E1	PSNMAIN
		B1	SCRLSPD	E2	EONxPSN
81	G, H	B2	SHORTRT	E3	(no effect)
82	AF	B3	TATMOUT	E4	XCMD
83	CT	B4	EON	E5	EAS, EASTIME
84	DI	B5	EONxEN		
85	MS	B6	EONxAF		
86	PI	B7	EONxPI		
87	PS	B8	EONxPS		
88	TA	B9	EONxTP		
89	TP	BA	EONxTA		
8A	ECC	BB	EONxPTY		
8B	LTO	BC	Rxxxxx,xx		
8C	MJD	BD	EONxAFCH		
8D	LPS	BE	INIT		
8E	PTY	BF	ALL		
8F	SEN	C0	HELP		
90	TPS	C1	SLIST		
91	CC	C2	DTTMOUT		
92	ADR	C3	PILOT		
93	AFCH	C4	RESET		
94	DATE	C5	STATUS, ??		
95	DPSx	C6	TEXT		
96	ECHO	C7	MSGLIST		
97	PTYN	C8	DPSxEN		
98	TIME	C9	EQTEXT1		
99	UDGx	CA	MEM		
9A	ECCEN	CB	RTTYPE		
9B	PHASE	CC	READWEB		
9C	RDS2MOD	CD	PAC		
9D	RTxEN	CE	SPEED		

▭ UECP   ▭ ASCII

Other codes are reserved. They may be assigned in future.

4.3 Frequently Asked Questions

Q: How to find out actual RDS encoder's IP address?

A: Actual IP address can be determined from several sources:
- front panel LCD display
- `IPA` ASCII command
- Device Setup dialogue box in Windows GUI
- your network router's configuration website, section 'DHCP, List of clients'

Q: How to configure the RDS encoder in order to control it remotely using the Windows control software?

A: The Magic RDS control software supports remote control of the RDS encoder over TCP protocol. The RDS encoder must be configured first (either via local port or using the embedded website).
1. In RDS Encoder – Device Setup or in LAN Settings configure either port 3 or port 4 as follows: Enabled, TCP Protocol – Server, TCP port as required.
2. Confirm the settings and reset the device.
3. In Magic RDS, open the Connection, select Ethernet connection type and fill the encoder's IP address and TCP port from the step 1.

**Q: Our application will communicate with the RDS encoder over network.
How to select right protocol for appropriate port in the RDS encoder?
(TCP – server, TCP – client, UDP ?)**

A: If your application asks for "connect to" host address or IP address, your application is TCP client, so the RDS encoder must be TCP server.
If you do not specify "connect to" host address or IP address anywhere in your application, your application is TCP server, so the RDS encoder must be TCP client. This option is not very often, because conventional RDS encoders usually don't support it; however it may be useful in many cases.
UDP is a connectionless protocol provided only for compatibility with very old applications. Its use should be always indicated explicitly. Where possible, always prefer TCP instead of UDP.

Q: How to configure the data format template in our broadcast automation system in order to see information about current song in Radiotext?

A: The P132 RDS encoder supports several formats (protocols) for input data and it's designed to be compatible with all broadcast automation software equipped with direct RDS encoder control.
The support includes:

- UECP protocol (format given by UECP specification)
- ASCII commands
- X-Command

Basic data format for ASCII command is as follows:

Prefix (ASCII command): `TEXT=`
Terminating character: <CR> (Carriage return). <CR><LF> accepted as well.
Example: `TEXT=Now Playing: Artist - Title↵`

Q: What's the difference between the P132 and P332 RDS encoders?

A: Except the USB/RS-232 interface, these units are functionally identical.

**Q: Our broadcast automation system outputs the data to serial port only.
How to send the data to several P132 RDS encoders at once?**

A: The solution may be using a virtual serial port driver (redirector) with multiple TCP client functionality.
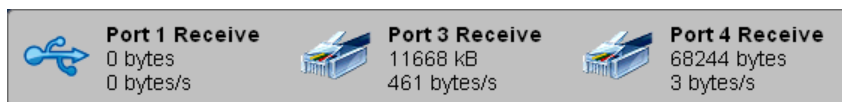A commercial application of that kind is available from http://www.eltima.com

4.4 Troubleshooting

Problem: **Our application can't connect to the RDS encoder remotely via port 3 or 4.**
(Connection refused or connection timed out.)

Solution: This problem may have several reasons:

- The RDS encoder is not powered:
  Check the encoder's power supply and common functionality.
- Some network element has failed:
  Check other services, especially the internal RDS encoder's website.
- Network configuration has changed but appropriate timeouts have not applied yet:
  Reset the RDS encoder.
- The RDS encoder's port is not configured properly or configuration has been done but it was not followed by the device reset:
  Check the port configuration and reset the RDS encoder if necessary.
- The port you're using is blocked by firewall or it is not included in port forwarding rules (if you access the encoder from public network via router):
  Check settings of your OS or router.
- The RDS encoder's port is already used by another connection:
  Close the unwanted application in order to release the port resources.
- Previous connection was interrupted abnormally and the port resources have not been released yet:
  Wait until connection timeout elapses (16 minutes by default, configure this value via the internal website or by the command `SETCTO`) or reset the RDS encoder.

There's a simple diagnostics available through the internal website. You can see data being sent via each port:

Port 1 Receive	Port 3 Receive	Port 4 Receive
0 bytes	11668 kB	68244 bytes
0 bytes/s	461 bytes/s	3 bytes/s

Actual data traffic on each communication port.

At the bottom of the page an extended diagnostics for port 3 and port 4 is available using the Socket status function, which allows detecting actual connections opened. The 'socket' means a set of resources associated with an opened TCP connection or a UDP session.

Note: If SNMP is enabled, it occupies one extra socket.

Problem: **After trying different configurations and settings I'm now unable to access the RDS encoder's internal website. The RDS encoder indicates IP address on the LCD.**

Solution: This problem may have several reasons:

- The website has been disabled or a non-standard port has been configured for the website:
  Original network configuration can be restored via the RDS encoder's Port 1. In Magic RDS control software, configure the serial/USB connection in. Then select RDS Encoder – Device Setup and follow the section 2.2.2 in this document.
  Finally reset the RDS encoder.
- The encoder is placed behind a network router with NAT, virtual server or port forwarding feature enabled:
  Type the router's WAN IP address to the web browser address bar instead of the RDS encoder's local IP address.

Useful tip:
Always use the website password protection if the encoder can be accessed from public internet!

Problem: **I'm trying to communicate with the RDS encoder via Port 1 (local USB or serial port) using the Magic RDS application. The app indicates 'Port opened' but any attempt to communicate with the encoder results in 'Communication error' message.**

Solution: This problem may have several reasons:

- The RDS encoder is not powered:
  Check the encoder's power supply and common functionality.
- The RDS encoder is connected to another COM port:
  Usually there are more COM ports in the system. Make sure you've selected the right one in the Connection.
- The port speed is different:
  Check if the 'Autodetect port speed' is enabled in the Connection options.
- The cable wiring is not correct (P332 only):
  The P332's serial connector has a pin assignment according to the UECP specification. For connection to a PC or a USB adapter, you'll need a signal crossing element - serial laplink cable, also called as "null-modem". That cable is supplied with the encoder. You can find the cable wiring diagram in the Technical manual.
- Backward channel is not implemented but the application is configured for bidirectional communication (P332 only):
  Some methods of communication are unidirectional by principle (for example serial communication over satellite). In that case disable the 'Bidirectional' flag in Options – Preferences – General.
- The USB or serial cable is bad:
  Use another cable of appropriate type.

Problem: **I was able to connect to the encoder via Ethernet on our LAN and set an IP address of our choosing. Then suddenly the unit will not connect.**

Solution: It is not recommended to assign fixed IP address to any device if DHCP function is available from the router. The reason is that such an approach requires a deeper knowledge of networking - you cannot freely choose an IP address. Additionally, the router's restrictions may exist.

Instead of that, use the router's DHCP function 'IP Address Reservation' and leave the RDS encoder to get the IP address by DHCP. To restore that setting, connect to the unit via Port 1 and in the Magic RDS, select RDS Encoder – Device Setup. See section 2.2.2 for more details.

Problem: **I mistakenly set wrong network parameters. After the device reset I'm not able to connect and the unit shows "No LAN or No IP" on the LCD. How to restore correct network settings?**

Solution: Connect to the unit via local port 1 (either using USB cable or supplied serial cable, depending on the model). Then continue using instructions from section **4.1** and **4.3.1** of the document **Quick Installation Guide**.