MAINTENANCE AND OPERATION
INSTRUCTION MANUAL

Band Scanner GPS

FM Band Spectrum Analyzer
and RDS/RBDS Decoder-Reader

12 Channel GPS Receiver

DEVA®
BROADCAST

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Contents

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Introduction

DEVA Broadcast Ltd. is an international communications and high-technology manufacturing organization, its corporate headquarters and facility located in Burgas, Bulgaria. The company serves the broadcast and corporate markets worldwide – from consumers and small businesses to the largest global organizations. It is dedicated to the research, design, development and provision of advanced products, systems and services. DEVA Broadcast launched its own brand back in 1997 and has nowadays evolved to become known as a market leader and internationally reputed manufacturer of user-friendly, cost-effective and innovative broadcast products.

Creativity and innovation are deeply woven into DEVA Broadcast corporate culture. Through successful engineering, marketing and management our team of dedicated professionals creates future-oriented solutions to improve customers' performance. You may rely that all issues communicated to our crew would be addressed accordingly. We pride ourselves on our pre and post-sales support and purchase services, which along with the outstanding quality of our radio gear have won us due respect and the market authority position.

DEVA Broadcast best-of-breed solutions have become the best sellers for our partners. The strategic partnerships which have been formed with industry leaders during all these years that we have been operating on the broadcasting market, have proved us a reliable business partner and a valuable asset, as our dealers worldwide would confirm. In constant pursuit of precision and long-term satisfaction, DEVA Broadcast enhances the reputation of our partners and clients alike. Furthermore, we have already a proven merit as a credible partner provider.

Our portfolio offers complete line of high quality and competitive products for FM and Digital Radio, Radio Networks, Telecommunication Operators and regulation authorities. For almost two decades of intensive software and hardware development, we have achieved a unique price-performance and endurance of our product lines. Our company's multitude of equipment and services is in line with the latest technologies and key trends. The most recognizable characteristics attributed to DEVA Broadcast products are their clear-cut, streamlined design, easiness of use and cost-effectiveness: simplicity of forms but multiplicity of functions.

For us there is no stage when we deem that we have reached the most satisfactory level in our work. Our engineers are in constant pursuit of new ideas and technologies to be captured in DEVA Broadcast solutions. Simultaneously, a strict control is being exercised at each step of any new development. Experience and hard work are our fundament but the continuous improving process is what we never leave aside. DEVA Broadcast participates on a regular basis in all landmark broadcasting events, not only to promote its products, but to exchange valuable know-how and experience. We are also engaged in international large-scale projects involving radio and audio solutions which makes us even more competitive on the global market.

All DEVA Broadcast products are developed and produced in accordance with the latest ISO 9001 quality control standards.

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Typographic conventions

The following table describes important conventions used in the manual.

Convention and Style	Description	Examples
Menu > Sub Menu > Menu Command	A menu item(s) and menu command that you need to click in sequence	Click ***Settings > General***
[Button]	Interface Interactive buttons	Press [OK] to save the changes
NOTE	Important notes and recommendations	**NOTE:** The notification will appear only once
"Reference Name" on Page XXX	References and links	refer to "New Connection" (see "Monitoring" on page 56)
`Example`	Used when example text is cited	Example for E-mail Notification: `Date: 04 Nov 2013, 07:31:11`

General Information

Band Scanner GPS is a tool to evaluate FM broadcast band congestion and to log station identification parameters. Band Scanner GPS is a Google Earth compatible tool for visualisation of collected FM Radio measurements. When running any campaign with the Band Scanner GPS, results will be saved in a Log file. Band Scanner GPS can then convert this file into KMZ format an view the results in Google Earth. The Log file can be exported also as transitional format for future analyze or to keep it in record. The Band Scanner GPS can measure RF level, MPX deviation, Left & Right Audio levels, RDS and Pilot injection levels. The system is powered by the USB port of any Windows PC. Supplied free of charge Windows software sweeps the receiver across the FM band, logging every carrier and generating a spectrum display of carrier level vs. frequency. It then analyzes each carrier and creates a station list. Stations with an RDS presence are further refined to show all the radio data groups being transmitted. Its interface is like a portable radio: It may be tuned manually through the receiver screen or by double-clicking a point on the spectrum plot or an entry on the station list. Spectrum plots may be saved as jpg or bmp files. The RDS data error level is graphed in a separate window on the receiver screen. The program can be monitored with headphones plugged into a standard 1/8” jack.

PRODUCT FEATURES

- FM Band 87 – 108 MHZ Spectrum analyzer
- MPX, PILOT & RDS deviation meters
- Built-in Stereo decoder; LEFT and RIGHT level meters
- Built-in 12-channels GPS Receiver
- Measurement results visualisation in Google Earth
- Auto search tuning
- Headphones audio output
- Full feature RDS and RBDS decoder
- RDS/RBDS Groups Detector
- RDS/RBDS Groups Analyzer
- RDS/RBDS stream BER meter
- FM/RDS/RBDS Data Logger
- View playlists of the competitive stations
- Saving and exporting the playlists to Excel file
- Compare the signal strength to competitors and other stations
- Pocket size USB powered box. No external power supply required
- Tracking all the detailed histories saved in the RDS Data Log

TECHNICAL SPECIFICATIONS

FM RECEIVER	
FM frequency	87.0-108.0 MHz
RDS sensitivity	0 error at Vrf=-90dBµV, 4kHz RDS deviation, no modulation
Strong fields	AGC
RF level evaluation	±4dB from 20°C to 30°C, from 20dBµV to 80dBµV without modulation
Dynamic	0 to 84dBµV
Attenuator	6dB built-in
AUDIO, MPX, PILOT, RDS LEVELS	
Measurement validity	RF level preferably > 50dB
Multiplex level	Peak level displayed, 1000 samples over 1 second
Audio level	Peak level displayed, 1000 samples over 1 second
Pilot level	Mean peak level, 1000 samples over 1 second
RDS level	Mean peak level, 1000 samples over 1 second
Accuracy of MPX deviation display	±5kHz, ±2kHz typ
Accuracy of audio level display	±5%
Accuracy of sub-carrier level displays	±10% typical and not guaranteed
FM ANTENNA INPUT	
Connector	‘F’ on rear panel, Impedance = 75 Ω
External attenuator	No
STEREO DECODING	
Stereo separation	>20dB
Typical separation	Approximately 26dB to 35dB
RDS DATA DECODING	
Standards	European RDS CENELEC, United States RBDS NRSC
Error Correction	Yes
Group counting	Yes
Error counting	Yes
AF decoding	Yes
PI, PTY, DI, MS	Yes
TA/TP	Yes
RT, PS, CT	Yes
EON, PTYN, SLC, ODA	Yes
GPS RECEIVER	
Number of channels	12
Antenna	Pre-amplified, 5m of cable, magnetic
Connector	SMA, rear panel
USER INTERFACE	
Indicators	4 LEDs, front panel
Headphone output	1/8” (3.5mm) phone jack, rear panel

OPERATING CONDITIONS	
Equipment operational	between 10° and 40°C
EMC immunity	6V/m
HEADPHONES OUTPUT	
Connector	Stereo, 1/8” (3.5mm) phone jack
Volume	Fixed
COMMUNICATION	
Type	USB 2.0 compatible
Connector	B-type, front panel
POWER REQUIREMENT	
Power supply	USB powered
Connector	B-type, front panel
SIZE AND WEIGHT	
Dimensions (W x H x D)	2.9” x 1” x 4.3”, 73.6mm x 25.4mm x 109mm
Shipping Weight	230 x 70 x 172 mm / 0.5kg

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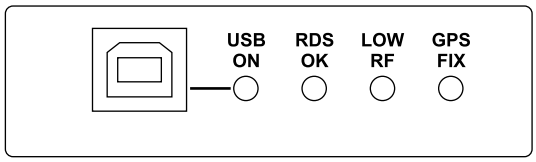
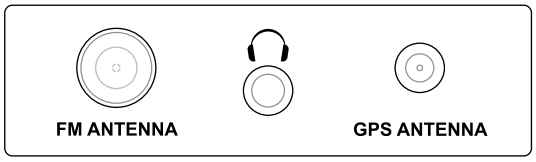
FRONT PANEL



USB ON This LED lights whenever the unit is connected to the PC trough USB.
RDS OK This indicator shows that the 57kHz RDS subcarrier is present and RDS data is actually received.
LOW RF This LED shows that the incoming RF signal of the defined frequency is less that 19dBµV.
GPS FIX This LED blinks when GPS Receiver gains GPS FIX.
In case of bad GPS reception or insufficient satellites this LED remains unlit.

REAR PANEL



FM ANTENNA The consumer-standard F connector is the ANTENNA IN port.
PHONES OUT The 1/8” (3.5mm) phone jack provides the audio signal of tuned station for listening.
GPS ANTENNA The consumer-standard SMA connector is the GPS ANTENNA IN port.

Safety Warning

ALWAYS OBSERVE THE SAFETY PRECAUTIONS.

Careful observance of the safety precautions will help prevent physical injury, damage of the equipment, and extend the equipment life.

- The servicing of electronic equipment should be performed only by qualified personnel;
- Before removing the covers the unit must be switched off and the mains cable unplugged;
- When the equipment is open, the power supply capacitors should be discharged using a suitable resistor;
- Never touch the wires or the electrical circuits;
- Use insulated tools only;
- Never touch the metal semiconductor. They might carry high voltages;
- For removing and installing electronic components, follow the recommendations for handling MOS components.
- Do not remove the factory sticker from the equipment. It contains information as regards the name, serial number and MAC address of the device.
- To join the equipment to the mains supply, use the power cord purchased with the equipment.

Unpacking and inspection

Upon receipt, the equipment should be inspected for possible shipping damages. If such are found or suspected, notify the carrier at once and contact DEVA Broadcast Ltd. The original shipping carton box and packing materials should be kept for possible reuse, in case of return for Warranty repair, for example. Shipping damages as a result of improper packing for return may invalidate the Warranty!

The packing material (plastic bags, polystyrene, nails, etc.) must never be left within reach of children, as these items are potential sources of danger.

IT IS VERY IMPORTANT that the "Product Registration Card" included in the Manual be completed accurately and returned. This will assure coverage of the terms of the Warranty and it will provide a means of trace in case of lost or stolen equipment. In addition, the user will automatically receive SERVICE OR MODIFICATION INSTRUCTIONS from DEVA Broadcast Ltd.

Mounting

RACK REQUIREMENTS 1U

The unit mounts in a standard 19-inch equipment rack and requires only 1¾ inches (1U) of vertical rack space. In order the painted finish around the mounting holes to be protected, the use of plastic washers is recommended.

RACK REQUIREMENTS COMPACT UNITS

Our customized 1U 19-inch rack accessory provides a professional mounting option for up to three compact size DEVA units. It is made of milled aluminum and finished in black powder coat. Two extra blanking panels and set of mounting screws are provided with each rack bracket kit.

STAND-ALONE DEVICES

DEVA's stand-alone units (Radio Explorer series, BandScanner series, DVB Explorer) do not require additional tools or installation brackets.

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Loading and Running The Software

MINIMAL SYSTEM REQUIREMENTS

Pentium(R) Processor or Compatible
Windows XP and above
512MB RAM
20MB free hard drive space for installation
16 or 32-bit graphics color depth
1024 by 768 pixels screen resolution
Screen DPI setting to 96 dpi
Universal Serial Bus 2.0

NOTE: To avoid hardware conflicts and connection problems, install the software before attempting to connect the Band Scanner GPS with the computer.

INSTALLING THE SOFTWARE

Download the software from www.devabroadcast.com . Open the Band Scanner GPS folder and double click the installation file to launch the Wizard (shown here) that will guide you through the several installation steps.

Unless you have a specific reason to make changes, simply accept the default recommendations and click Next> at each step.

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INSTALLING THE USB PORT DRIVER

Once the programming software has been installed on the computer, a special USB port driver must also be installed if that particular computer is ever to address the Band Scanner GPS through the front-panel USB port.

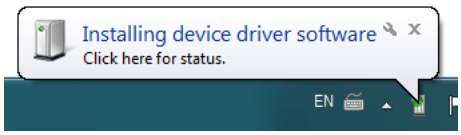
Unless you have deselected the “Install drivers automatically” option from installation wizard, or something went wrong during the installation process, the USB port drivers will be installed automatically and will be ready for use.

When the software was installed, the USB driver was put into a folder within the Band Scanner GPS program folder. With a normal installation (as described above) the driver will have been located here: My Computer \ Local Disk (C:) \ Program Files \ Band Scanner \ Drivers.

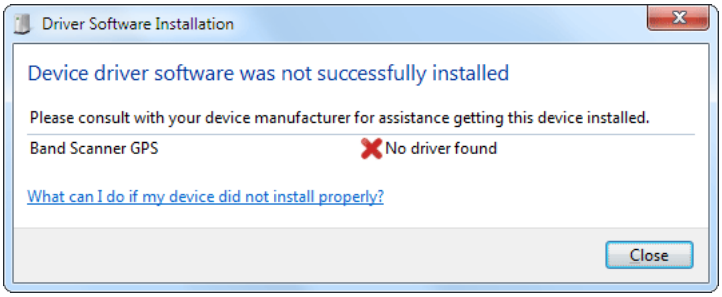
Manual installation under Windows 7

1. With the Band Scanner GPS powered-up, connect the front-panel USB port to the computer using the cable supplied. This should immediately bring up a “Installing driver” balloon notification above the computer Taskbar. Click on balloon for status or proceed to step 3.

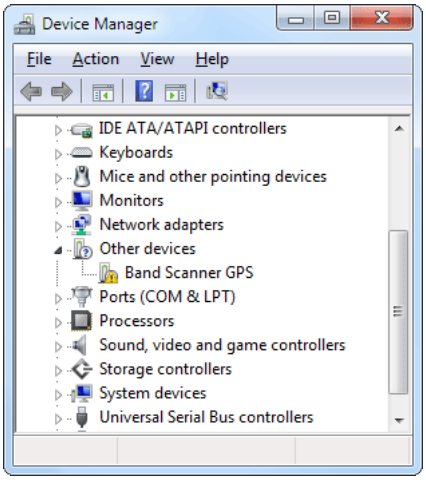
NOTE: notification will bring up only once on first device connection. Subsequent connections will not be notified.



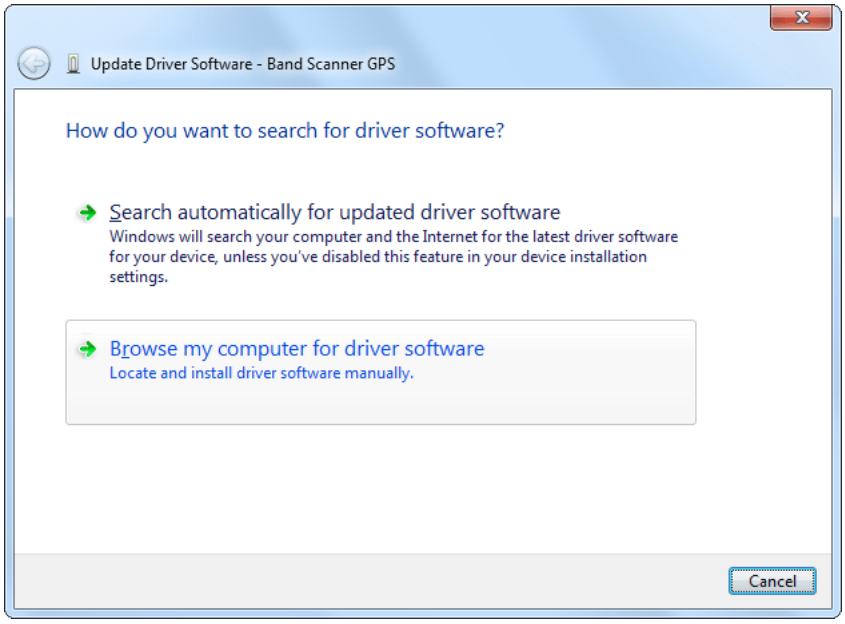
2. Under installation failure, the following status will be shown:



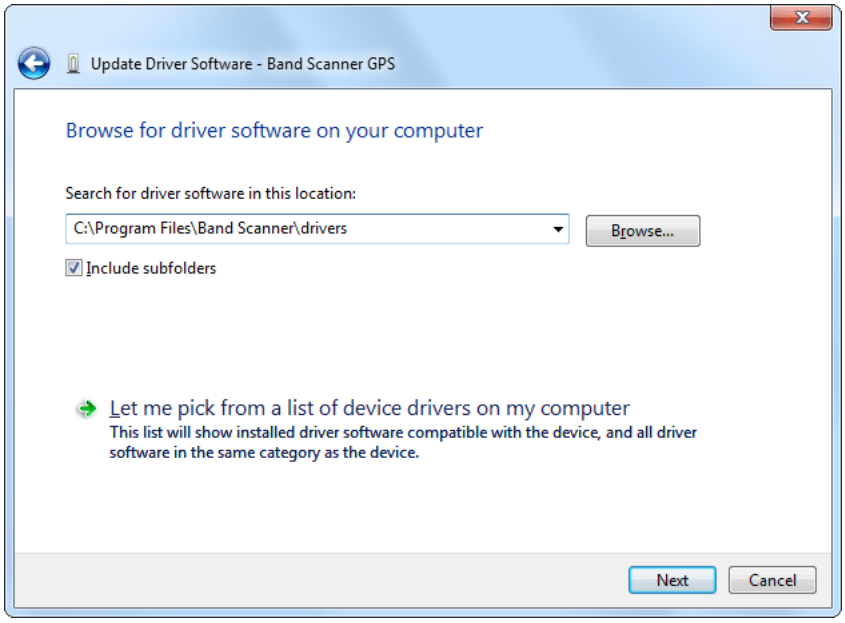
3. Start the Device Manager - Start > Control Panel > Device Manager.



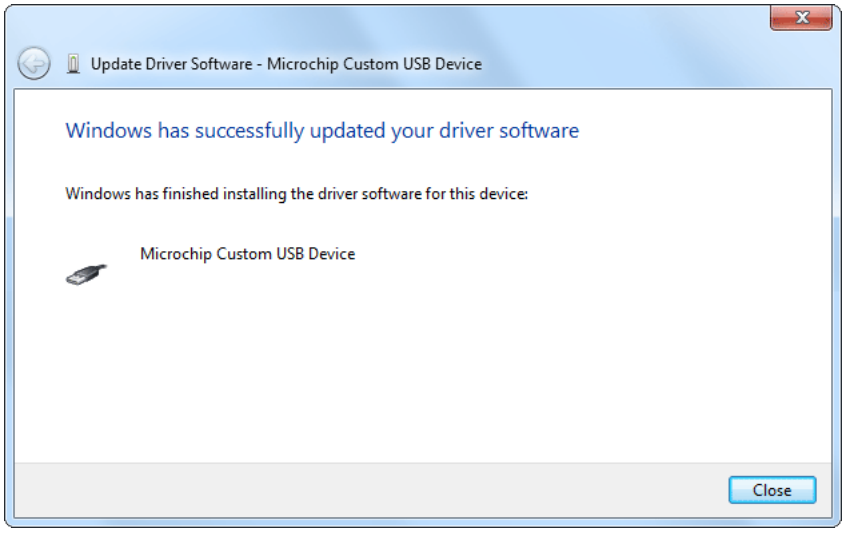
Locate the Band Scanner GPS under the “Other devices” section. Right click on it and select “Update Driver Software”. This should bring up Update Driver Wizard. Select “Browse my computer for driver software”.



4. Click “Browse...” and select the folder where the drivers reside (typically: C:\Program Files \Band Scanner\Drivers.) Click “Next”.



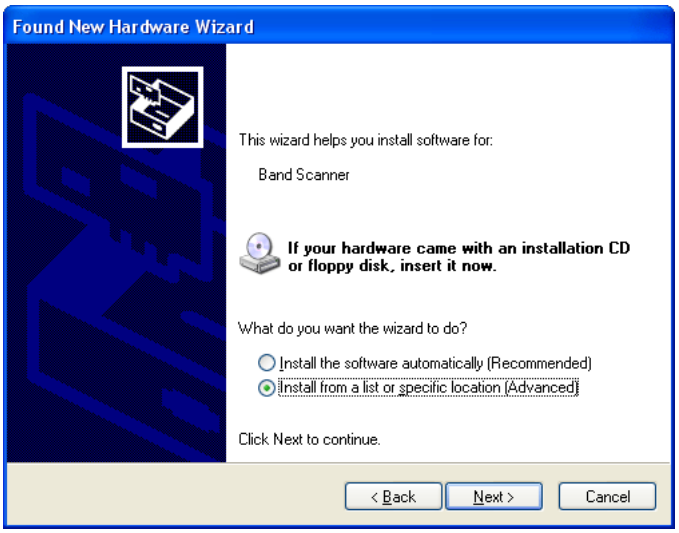
5. Under success the following notification will be shown and the device is ready for use.



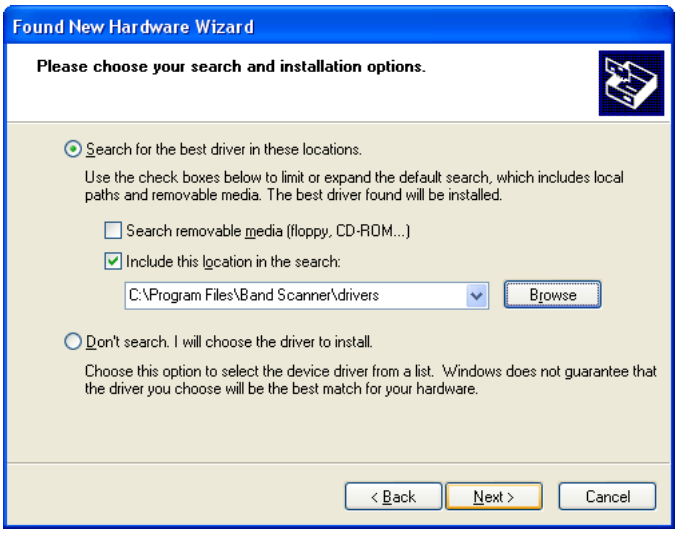
The software installation will have placed an icon on your computer Desktop. Double-click the icon to start the software.

Manual installation under Windows XP

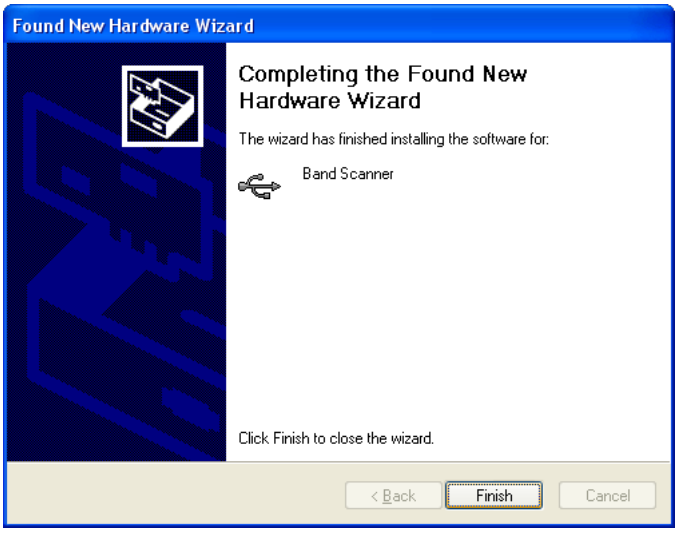
1. With the Band Scanner GPS powered-up, connect the front-panel USB port to the computer using the cable supplied. This should immediately bring up a New Hardware notification above the computer Taskbar and start the Found New Hardware Wizard. Select “No, not this time” and then “Next>”. Select “Install from a list or specific location (Advanced)” and then “Next>”.



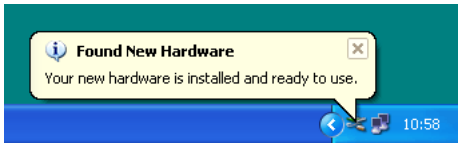
2. This next screen verifies the location of the driver, which resides in folder where the software is installed. Click: “Next>”.



3. Hardware Wizard will inform you when installation is complete. Click: “Finish>”.



4. The driver will be installed, and a notification that the hardware is ready to use will appear above the Taskbar.



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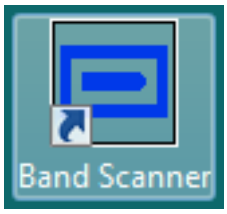
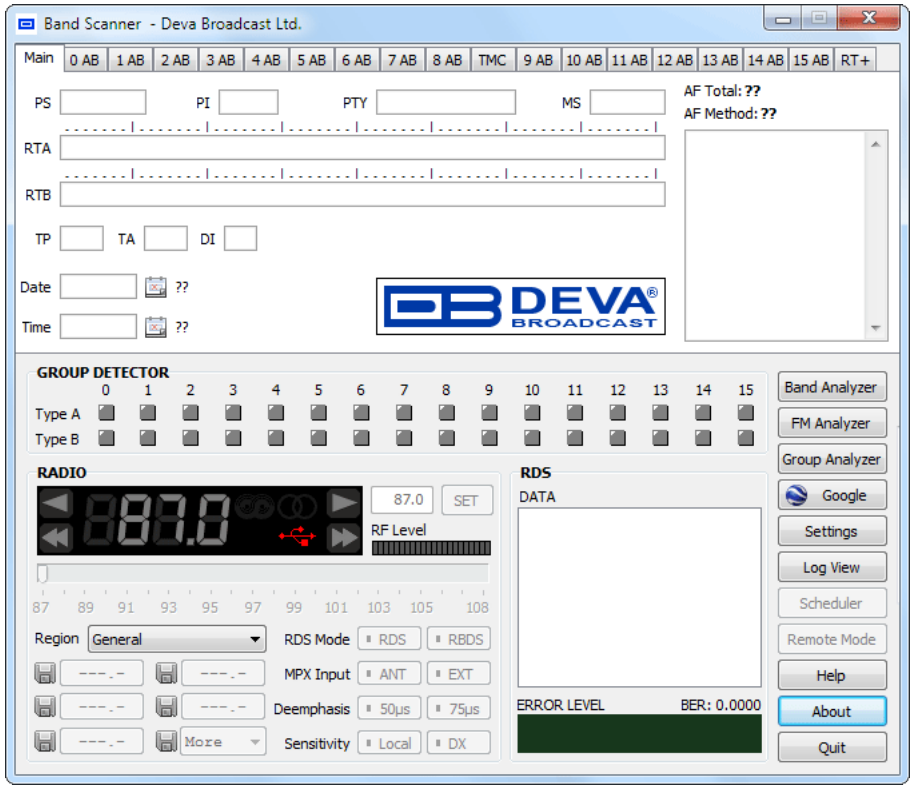
Using the Band Scanner Software

After the installation process is completed, a shortcut to software will appear on the desktop of your PC. Double click on the shortcut will run the Software. In case you would like to measure the band off-air, please connect any external FM antenna to the Antenna In. In case you would like to obtain GPS information, please connect external GPS antenna to the GPS Antenna In.

NOTE: The maximum input RF signal to the Antenna Input is 100 dBµV. Do not connect the Band Scanner GPS directly to any FM Transmitter's MONITOR Output

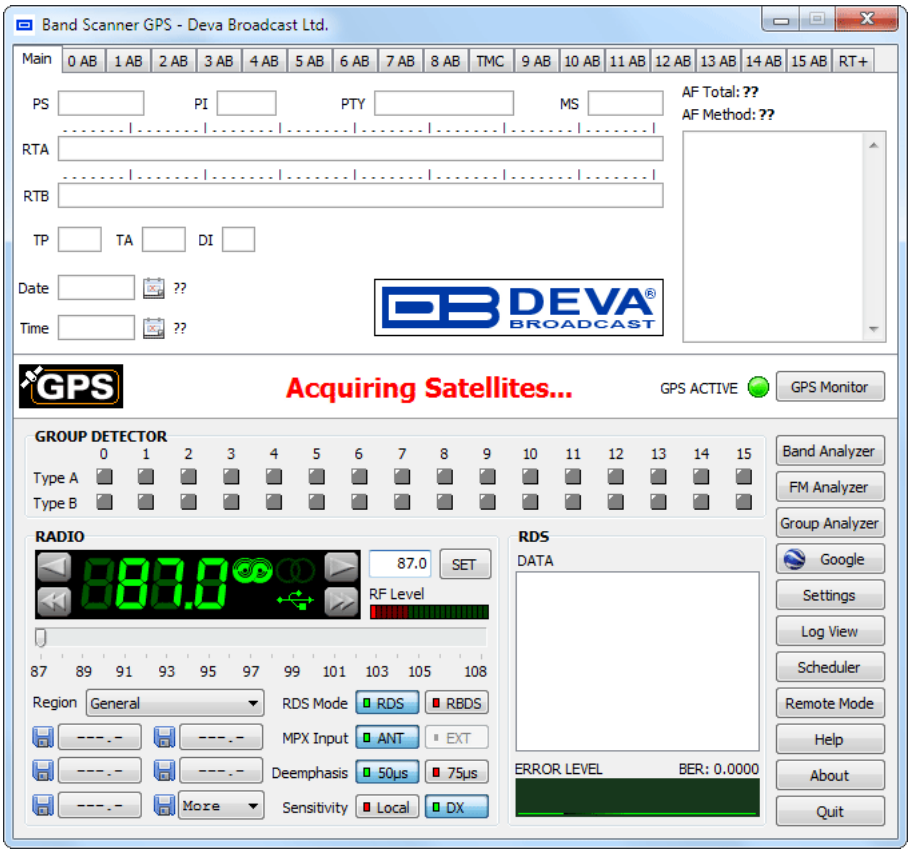


If device is not detected, the application software will look like this:

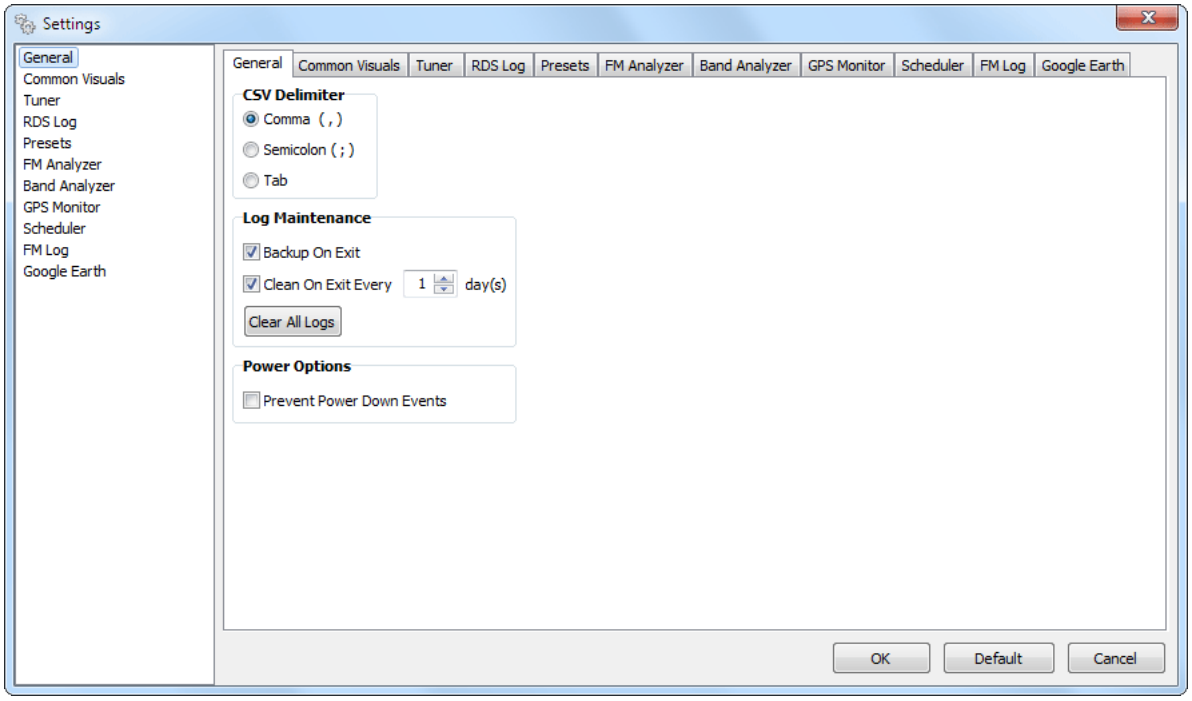


Some of the buttons and functions will be disabled. The USB connectivity indicator will be colored in red.

Upon connecting a device to the PC where the software is installed, the software will adjust the unit with the initial data. In case of previous usage of the device, the last settings like frequency and signal input will be assigned in the device. If everything is Okay and no problems are detected the software will look like this:



General Settings



CSV Delimiter

- choose delimiter which will be used while exporting to CSV-compatible format.

Power Options

- **Prevent Power Down Events** – if the option is enabled, the program will try to prevent system events which could power down the USB device. Useful for laptops.

Log Maintenance

- **Backup On Exit** – will create a backup copy of entire Data Module when program is closed.
- **Clean On Exit** – will perform clean routines when the program is closed. Additional option for process recurrence is available, because cleaning is slow process and is unnecessary to be done frequently.
- **[Clear All Logs]** – will clear all logs. We recommend you to export the data before commencing the process (see “Log Export” on page 93) **HAVE IN MIND** that once the logs are cleared, the process cannot be undone (see “Automatic Log Maintenance” on page 94).

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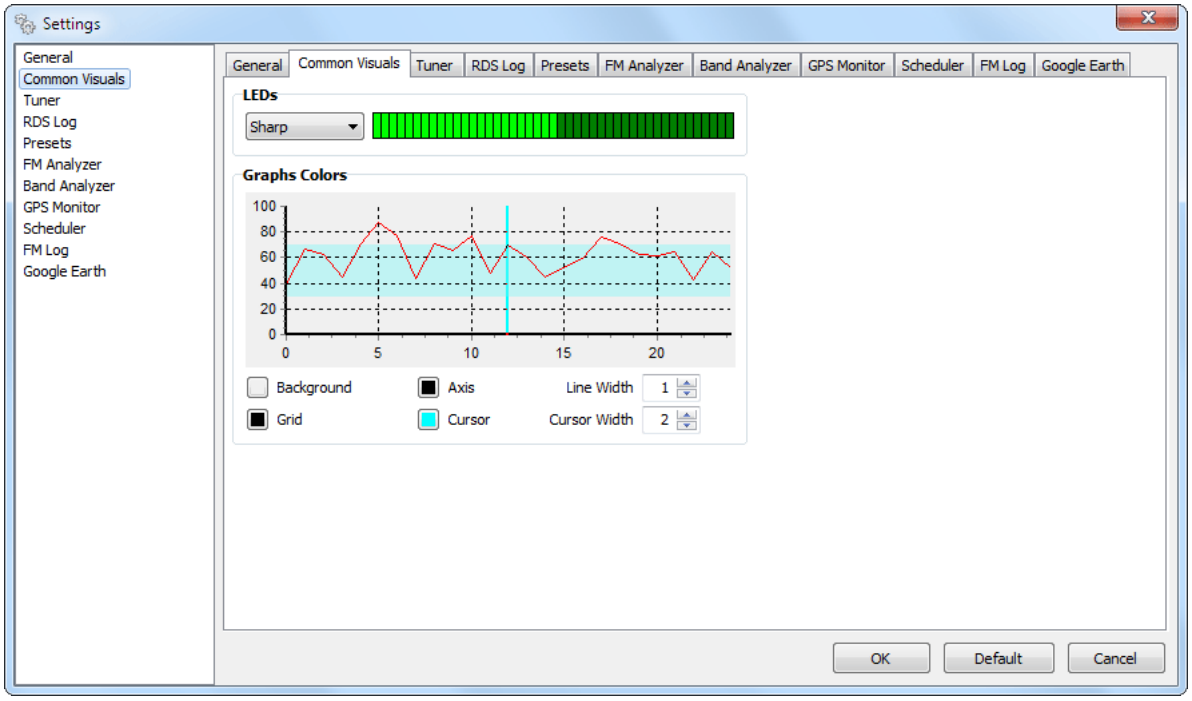
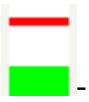
Common Visuals



Having in mind that visual perception differs from one person to another, the program offers different visual appearances to be set.

LEDs - select visual appearances for LEDs

 - Sharp  - Semi-Sharp  - Semi-Clear  - Clear

Graphs Colors - combine different visual appearances to achieve desired look for Graphs.

NOTE: Some visual settings are only applicable on particular tool. Look in the appropriate settings section.

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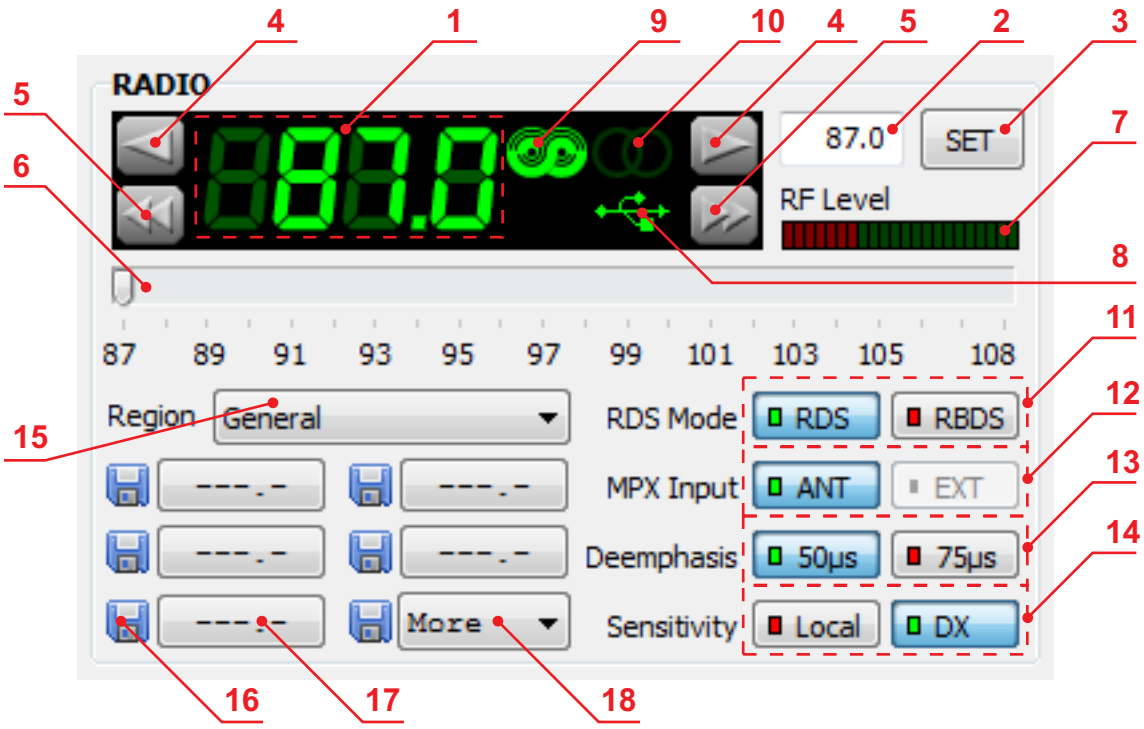
FM Tuner, Modes and Presets



The general management and the most important indications of the Band Scanner GPS are located in this section.

1. Frequency Indicator – Shows the working frequency of the unit.

2. Working frequency entering cell. (press ENTER to set)

3. This button will set the unit at the frequency defined in cell [2].

4. UP and DOWN buttons are used to adjust the tuner's frequency. For detailed information, please refer to "FM Tuner Settings" on page 26.

5. SEEK UP and SEEK DOWN Buttons. (see also "FM Tuner Settings")

6. Slider for manual adjustment of the frequency. The tuner will accept the newly set frequency a few seconds after the changes are made.

7. Field Strength Indicator.

8. USB connection indicator.

9. RDS Signal Presence.

10. Stereo Signal Presence.

11. RDS/RBDS Mode Selector.

12. MPX INPUT Signal Selector – Band Scanner GPS has no Composite/MPX input, thus Antenna In is the only choice.

13. Deemphasis Selector for the Demodulator - 50µs or 75µs

14. Sensitivity Selector - Local (6dB Att.) or DX (no Att.)

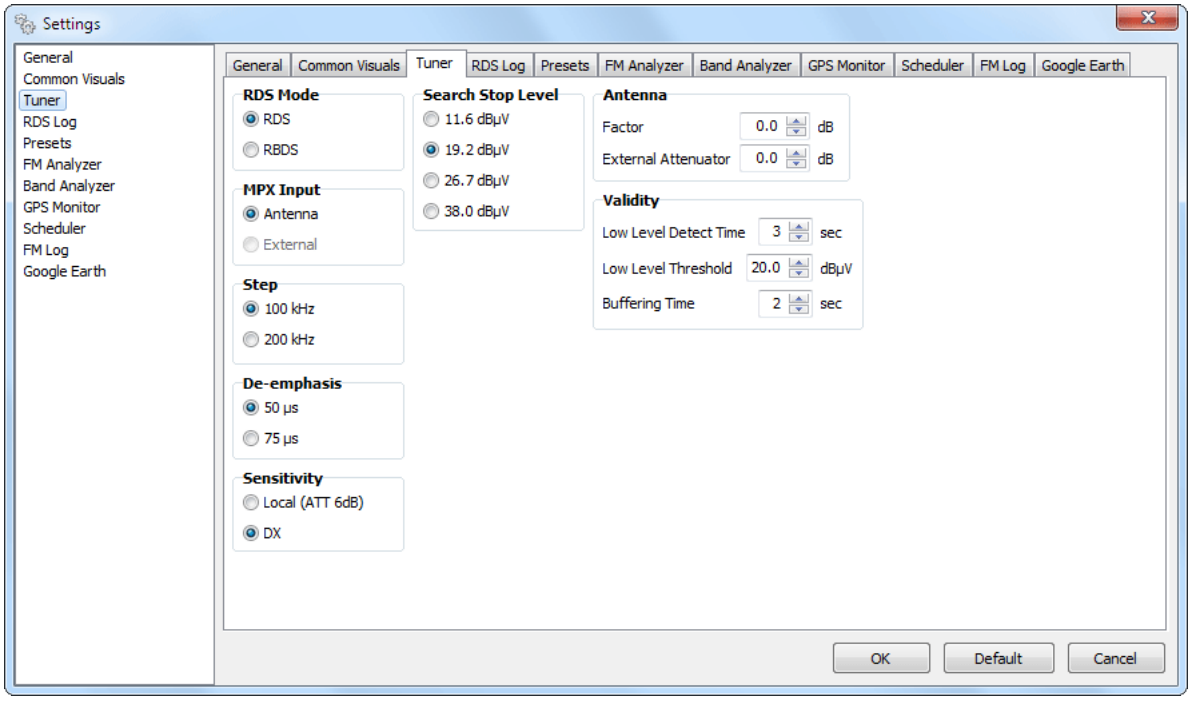
15. Region Selector. (see "Memory Presets" on page 27)

16. Quick Preset Save buttons.

17. Quick Preset Recall buttons.

18. Quick Preset Recall List.

FM TUNER SETTINGS



Step – You can choose the frequency adjustment step. Usually it is 100kHz for Europe and 200kHz for the US

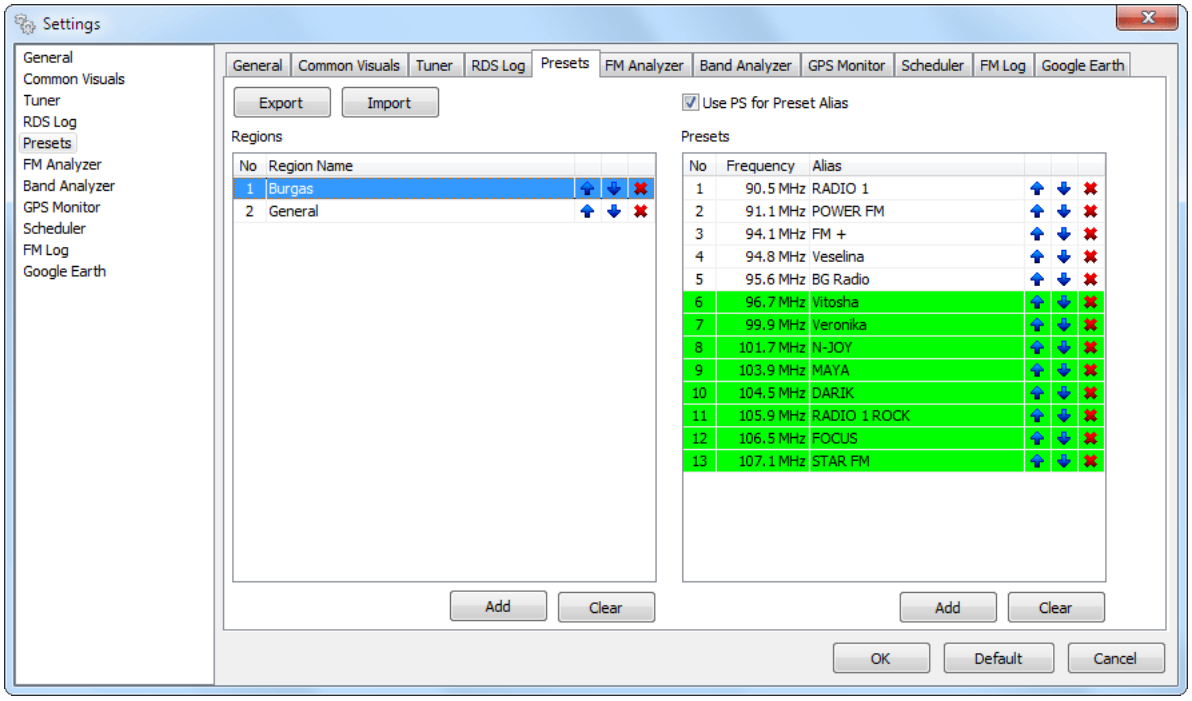
Sensitivity – Sensitivity mode of the input RF signal. The Local mode is recommended in case the unit is used close to the transmitter sites. It will enable 6 dB attenuation of the RF input stage. The DX mode is used when weak signal must be received and analyzed. Using this mode will disable any input attenuation of the RF input.

Search Stop Level – Tuner sensitivity threshold in Auto Search Mode

Antenna - If known, Antenna Factor and/or External Attenuator could be specified here.
ATTENTION: These are not hardware properties of Band Scanner and will adjust only final readings.

Validity - Low Level Detect Time is minimum required time to announce RF Level for High or Low according to Low Level Threshold. Buffering Time gives hardware time to smooth after switching over.

MEMORY PRESETS

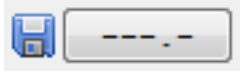


This part of the settings section allows you to create easy to access frequency presets. (see "FM Tuner, Modes and Presets" on page 25)[15,16,17,18]. Frequencies assigned here, correspond directly to the quick preset buttons situated along with the rest of the tuner controls. Intended to serve as a quick access to favorite stations, preset button on the main page of the software. Presets can be assigned from here as well as from Quick Save buttons.

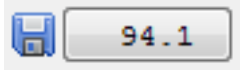
Here is an example:

1. Tune to desired station

2. Press one of the Save Preset buttons



3. Station is saved and Recall button (right next to pressed Save button) is changed immediately



4. To recall saved station, simply press Recall button which holds the frequency of the desired station.

As the station frequencies may differ from location to location, a region selector is also available.

The first 5 frequencies set will be listed in the recall buttons on main page. The other ones, will be available for selection in Recall List button. The rest (which are colored in green) will be placed under Recall List button.

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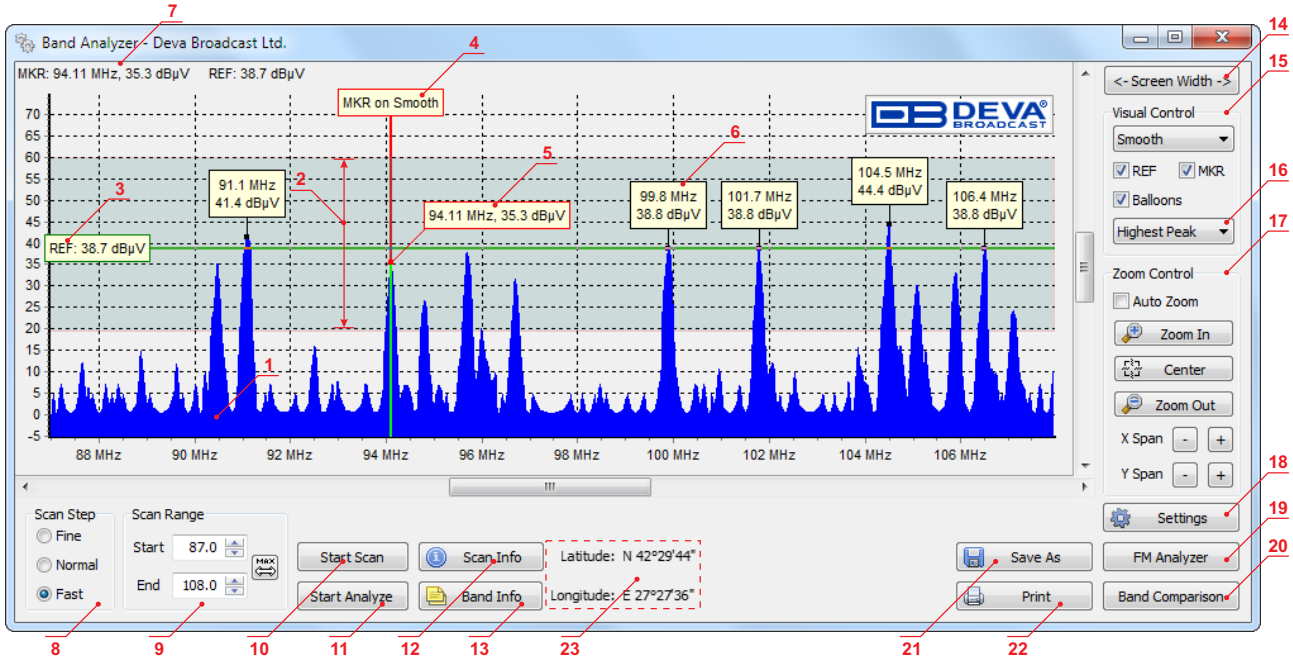
FM Band Spectrum Analyzer



1. FM Band Spectrum. The horizontal scale shows the frequencies. The vertical their measured levels.

2. Sensitivity zone. This is the zone where the tuner is under seeking mode. (see "FM Tuner Settings" on page 26)

3. Reference Level Marker. (see "Band Analyze" on page 31)

4. Marker. By moving Marker along the Band Spectrum displays corresponding level for the frequency under it. (see also "Band Info Table")

5. Marker Cross-point - shows corresponding level under Marker.

6. Peak Balloon - Holds information about peak. (see "Band Analyze" on page 31)

7. Information for current Markers - MKR - frequency and corresponding level, REF - chosen reference level

8. Band Scanning mode. The software provides three different types of Band Scan:

- *Fine* – Scanning mode with fine frequency resolution;
- *Normal* – mode with satisfying resolution;
- *Fast* – mode for quick scanning with maximum frequency step.

The selected scanning mode defines the scan speed vs. scan details.

9. Scan Range - Allows to customize band scanning by setting in and out frequency of the band.

10. Button for **starting scanning process**. It changes to "Stop Scan" hence allowing the user to stop the process at any time. Otherwise the scanning ends at the end of the band. (See [9], "Band Analyzer Settings")

11. Button for **starting analyzing process**. The button is inactive if the scanning process is not commenced. The button changes to "Stop Analyze" hence allowing the user to stop the process at any time.

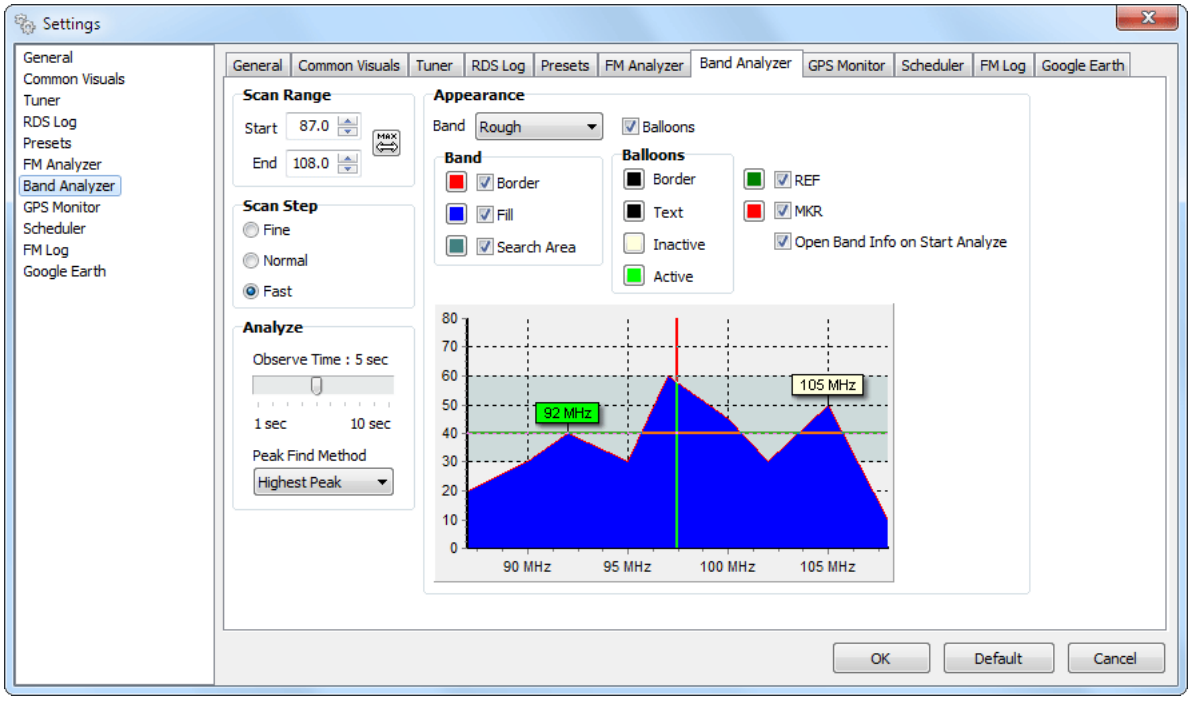
12. Scan Info - information on all the parameters of the previous scan is available here: Scan Date and Time, Scan Range, Scan Step, Tuner Sensitivity, Extrenal Attenuator, Antenna Factor, Tuner Deemphasis.

13. Band Info - Pressing this button will show the information collected from Band Analyze. (see "Band Info Table" on page 33)

14. Screen Width - the software window will match the width of the screen.

15. Appearance buttons (see “Band Analyzer Settings” on page 30)
16. Peak Find Method Selector
17. Zoom Controls.
18. Settings. (see “Band Analyzer Settings” on page 30)
19. Button for fast recall of the **FM Analyzer** Tool. (see “FM Analyzer” on page 37)
20. Button for fast recall of the **Band Comparison** Tool. (see “Band Comparison” on page 35)
21. Button for **Saving** the current graphic. (see “Band Analyzer Results Saving” on page 34)
22. Button for **Printing** the current graphic. (see “Print Capabilities” on page 85)
23. Current position (Latitude, Longitude) from GPS module when GPS fix is available.

BAND ANALYZER SETTINGS



Scan Range – Sets the Range of the Scanning Process.

Max - is equal to full band range - 87.0 - 108.0 MHz.

Scan Step - Band Scanning Mode (See [8])

Analyze Observe Time - Defines observation time for each peak (station) before switching to the next frequency.

Analyze Peak Find Method - Defines the method used for finding peaks. (see “Peak Find Methods” on page 32)

Smooth - Smooths the Band Spectrum and removes jagged parts.

Show Balloons - Show/Hide balloons above peaks.

REF - Show/Hide Reference Level Marker

MKR - Show/Hide Frequency Marker

Open Band Info on Start Analyze - If enabled, a Band Info Table Analyze process is started. (see “Band Info Table” on page 33)

Band, Balloons - Settings for better visual customization.

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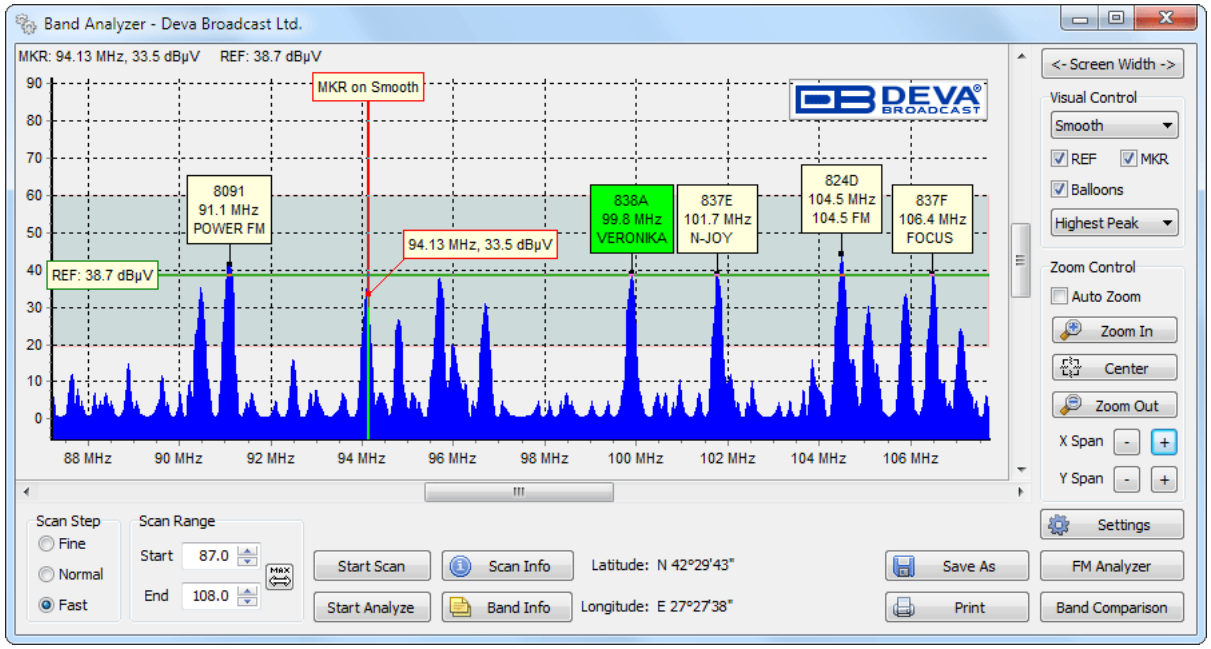
BAND ANALYZE



"BAND ANALYZE" - WHAT IS IT ALL ABOUT?

In order for a proper band analyze process to be commenced, following steps should be completed.

To start BandScan follow the instructions below:

1. Define sweeping range by adjusting **Start** and **End** frequency. You can apply the maximum possible range by pressing the [Max] button.
2. Select **Scan Step** which defines the precision of the BandScan.
3. Press [Start Scan], and wait for the process to be completed.

Pressing [Scan Info] will open a balloon with all the gathered information.

NOTE: While the process is running, all the other options except for [Stop Scan] will be disabled. You can stop the process any time by pressing [Stop Scan].

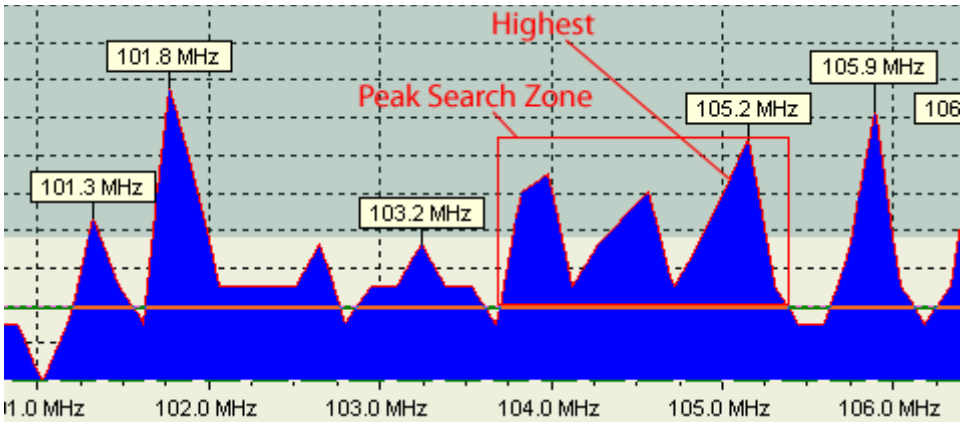
To Start Band Analyze follow the instructions below:

1. Perform a Band Scan first;
2. Press [Start Analyze] and wait for the process to be completed.
3. While the process is running, a report for frequency and RDS data will be generated (if any available - PI/CALL and PS are shown).
4. Once the process is completed, press [Band Info] button, a new section containing information as regards the analyzed Frequencies will appear.

PEAK FIND METHODS

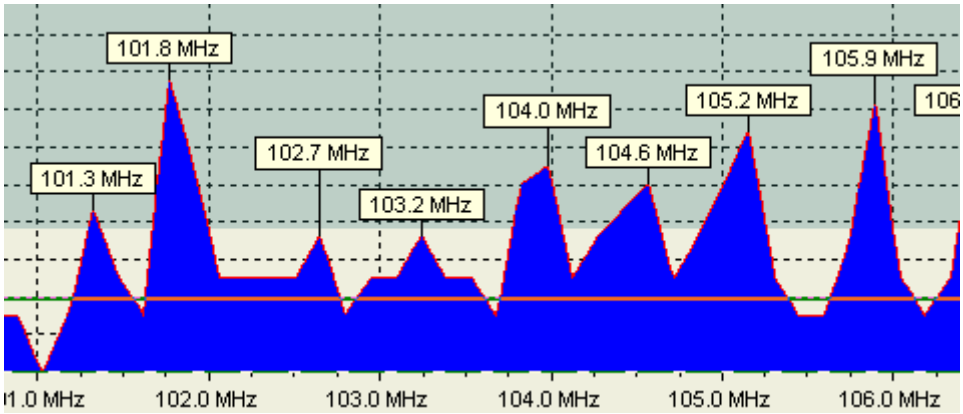
Highest Peak

Only highest peak within defined zone is used, the rest are ignored.



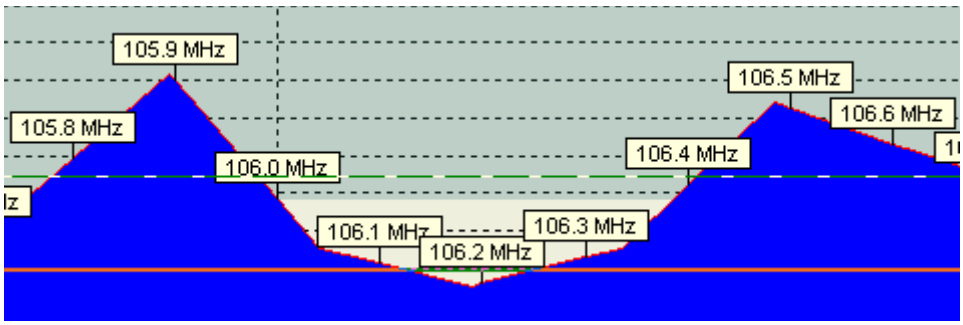
All Peaks

All peaks within defined zone are used.



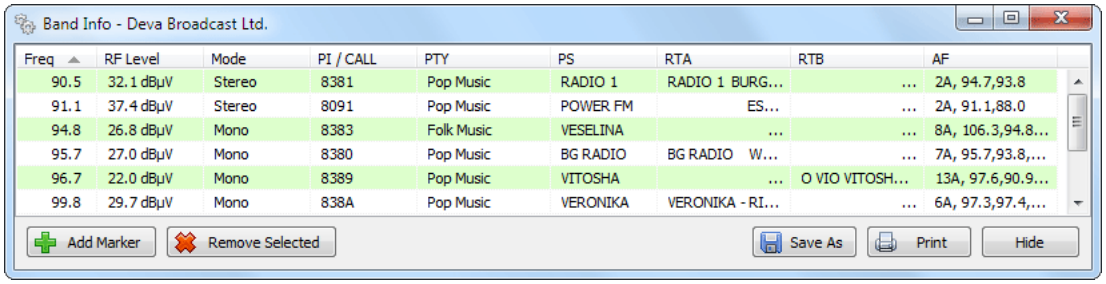
Every 100 kHz

Peak is placed at every 100 kHz, regardless of the selected Reference level



ATTENTION: Analyzing process may be prolonged, considering peak count multiplied by observation time ("Band Analyzer Settings" - Observe Time).

BAND INFO TABLE



Band Info Table gathers all the additional information from the Analyze process.

Besides frequency, information on the following parameters is also available: PI/CALL, PTY and PS, station mode (stereo or mono), RF Level, Radio Text A&B and AF List if during the period of peak analyze there were enough RDS data to extract AFs.

[Add Marker] button allows the user to add other frequencies. The desired frequency is selected by the Marker (See [4]).

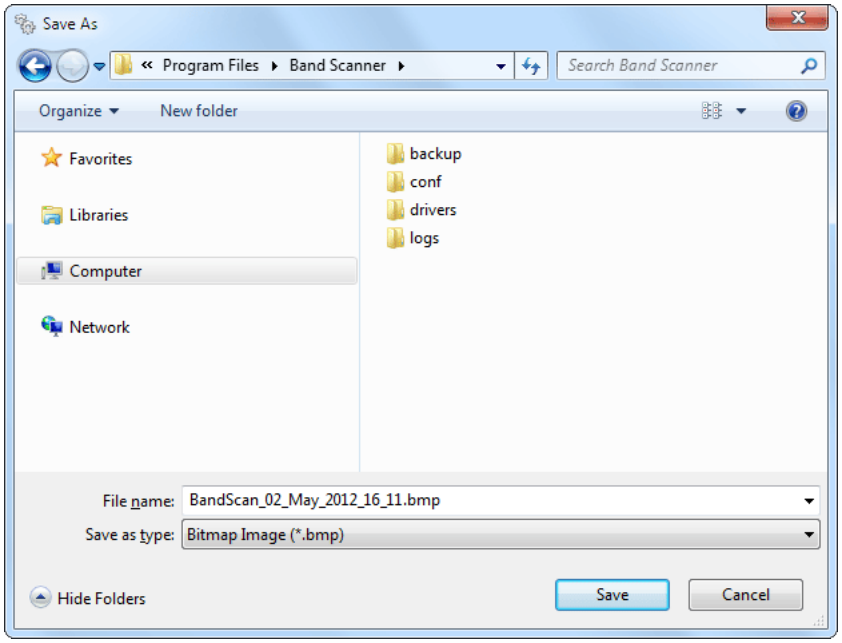
The button [Remove Selected] will delete the selected entry from the table.

NOTE: Adding or Removing frequencies manually is irrelevant to analyzing process.

Band Info Table could be Saved As CSV (Comma Delimited) format (see “General Settings” on page 22) and can be opened and used with Microsoft Excel or any CSV-compatible software.

Double click with the mouse cursor on some of the rows in the table switches to Real-time Watching of the corresponding frequency. (see “Band Analyzer Extras” on page 36)

BAND ANALYZER RESULTS SAVING



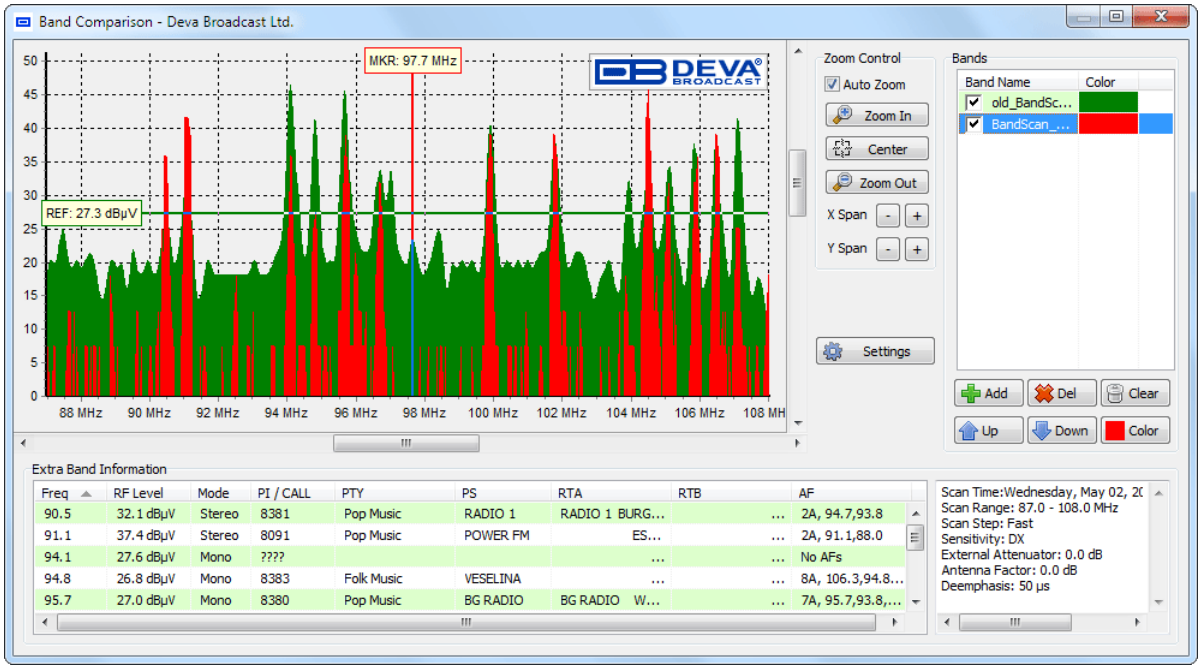
Select the desired folder. If needed specify user-defined name or use the default one (it consists of current date and time).

Select file type from the “Save as type” drop-down menu. Pressing the [Save] button will save in the selected folder a file representing the current graphic from Band Analyzer.

In addition Band Spectrum could be saved as proprietary format BND, compatible with Band Comparison tool (see “Band Comparison” on page 35). BND format will hold information from Band Info Table (if any exists) along with spectrum data.

NOTE: Possible Graphical file types are: JPG, BMP, PNG, WMF and EMF.

BAND COMPARISON



The main purpose of this tool is to provide easy way for visual comparison between different spectrum plots. The tool utilizes BND files, which are saved previously from Band Analyzer (see "Band Analyzer Results Saving" on page 34). The tool overlays different spectrums but is indifferent about comparison itself, which is granted entirely to user.

To Add spectrum use [**Add**] button. Upon addition each spectrum is associated with random color.

To Remove spectrum from list, first you have to select it and then and press [**Del**] button.

For temporary show/hide use check-boxes in front of each spectrum.

Different spectrums can be colored for visual comparison and easy recognition. In order for that to happen, select the appropriate band from list and click on [**Color**] button.

To Remove all spectrums from list press [**Clear**] button.

To rearrange spectrums use [**Up**] and [**Down**] buttons.

Extra Band Information will be filled with conditions related to each spectrum, as well as supplementary info from Band Analysis. (see "Band Info Table" on page 33)

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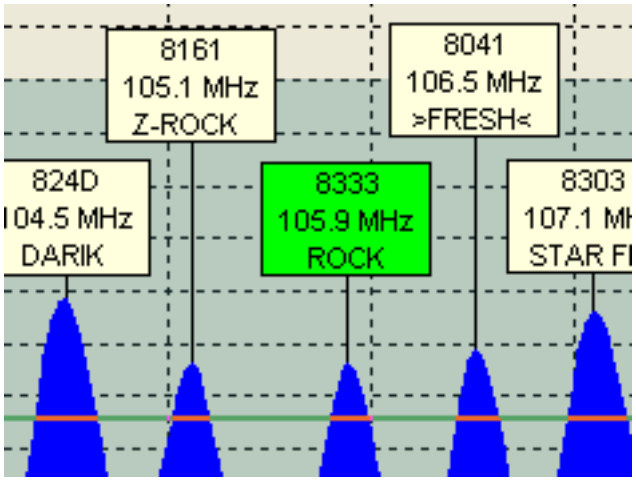
BAND ANALYZER EXTRAS

The Band Analyzer provides the user with the opportunity to watch in real-time every selected channel. Selecting the channel happens by double clicking over the peak from the Band Spectrum or by double clicking on any station from the Band Info Table. If the Reference Level line does not cross the selected peak, no selection will occur.

After selecting the station the tuner will automatically set the peak frequency and will enable the real-time watching of the channel. All the incoming data will appear in the Band Info Table and in the Balloon over the analyzed / watched channel. The Balloon color will change to green (customizable under "Band Analyzer Settings") which indicates the currently selected channel.

Balloons are automatically rearranged vertically if some overlapping occurs.



FM Analyzer

The Band Scanner GPS has MPX, PILOT & RDS deviation meters built-in. It allows to measure and display the RF Level, MPX deviation, Left & Right Audio Levels, RDS and Pilot injection levels.

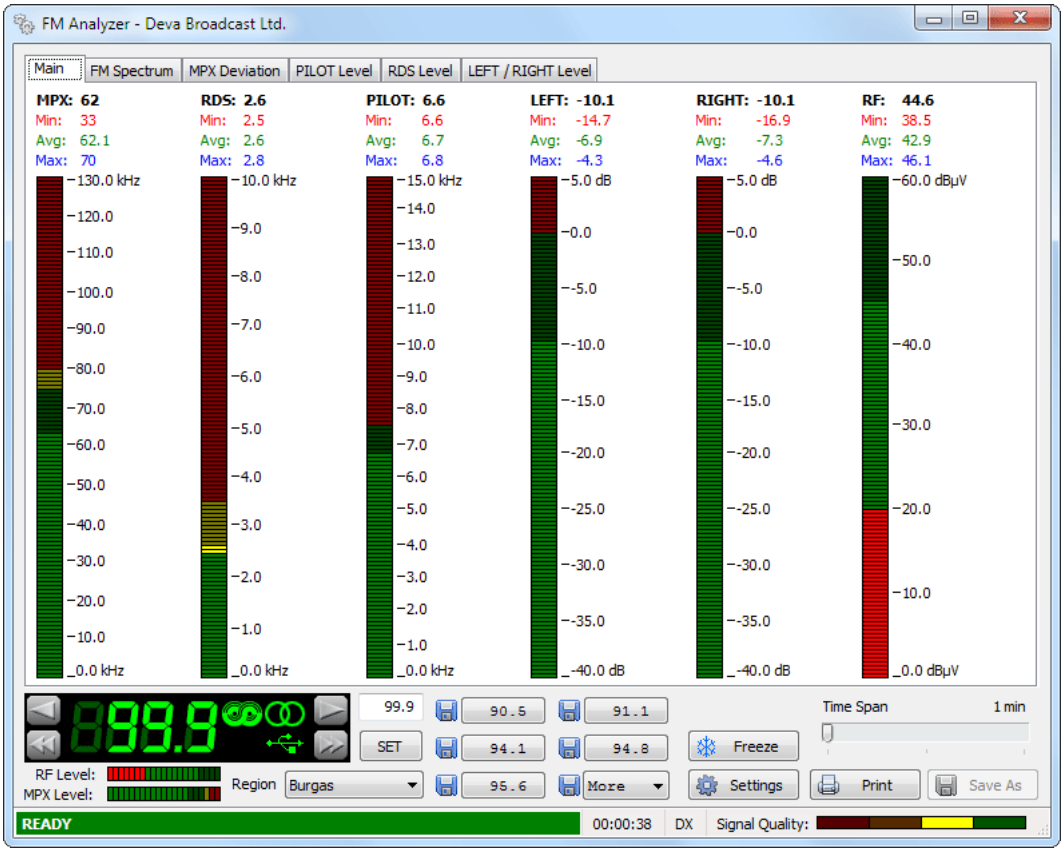
INTEGRATION DEFINED

"Peak Integration" is a euphemistic reference to the practice of allowing brief overdeviations of the FM carrier to sneak by unnoticed. In the case of the Band Scanner, non-repetitive modulation peaks lasting less than a predetermined period will not be displayed on the CARRIER MODULATION Time Graph display. Broadcasting regulations, including those of the FCC in the US, are often a bit vague on the subject of peak integration. Nearly all Modulation Monitors include some provision for ignoring exceedingly fast program peaks, sometimes called "peaks of infrequent occurrence" or other similarly tenuous term. Certainly, non-repetitive overshoots that do not materially increase the broadcaster's occupied bandwidth, and thus pose no threat of interference to an adjacent-channel signal, may legitimately be ignored in a measurement of total carrier deviation. But by allowing peaks resulting from, and directly related to, the dynamics of the program signal to "slide on by", the broadcaster is courting the wrath of his appropriate regulatory agency.

US FCC MEASUREMENT METHOD

One reliable guideline in determining just how far you can go with respect to total carrier modulation is to be aware of how at least one government authority monitors a broadcaster's signal. As far as we have been able to determine, the United States FCC does not use a commercial Modulation Monitor with a metered readout. Instead they connect an oscilloscope to the composite baseband output of a wideband FM receiver and look for deviations beyond a predetermined peak-to-peak amplitude. As divulged by one Field Engineer, the FCC is not looking for the occasional overshoot, but for consistent and flagrant overmodulation, which is invariably noticed and complained about before the station is flagged for scrutiny.

MAIN SCREEN



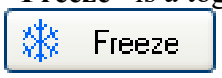
This screen shows all mandatory parameters represented as LED readings.

Above every LED indicator are shown four values. First is the current measured value, followed by its minimum peak, average and maximum peak values for the period since last frequency change.

RADIO section have the same functionality as RADIO section from main program screen (see "FM Tuner, Modes and Presets" on page 25)

"**Settings**" button is described in FM Analyzer Settings section.

"Freeze" is a toggle button with two states:



- freezes all screen readings

- unfreezes all screen readings

NOTE: Freeze makes motionless only visualisation, measurements are active in background.

"Time Span" defines the time span that will be represented in every graph.

"Print" buttton will open the print dialog window, allowing the user to print needed graphic (see "Print Capabilities" on page 85)

"Save" button will save the current graphic as picture. Possible Graphical file types are: JPG, BMP, PNG, WMF and EMF.

NOTE: The FM Spectrum could additionally be saved in CSV format.

The status line (located on the bottom of the software window) shows Band Scanner GPS's current status.

Status	Description
	RF Level is above Low Level Threshold and has become stable.
	RF Level is below Low Level Threshold, thus all the readings are frozen because of the bad reception.
	Waiting for device to become stable.
	Band Scan process is underway.
	Band Analyze process is underway.
	Schedule process is underway.
	All screen readings are freezed
	Device is disconnected from PC.

Upon changing the frequency, the FM Analyzer switches to BUFFERING and clears all collected data.

Information on the time elapsed since the last frequency change, sensitivity setting (DX or Local) and Signal Quality indicator are also available next to the Status line.

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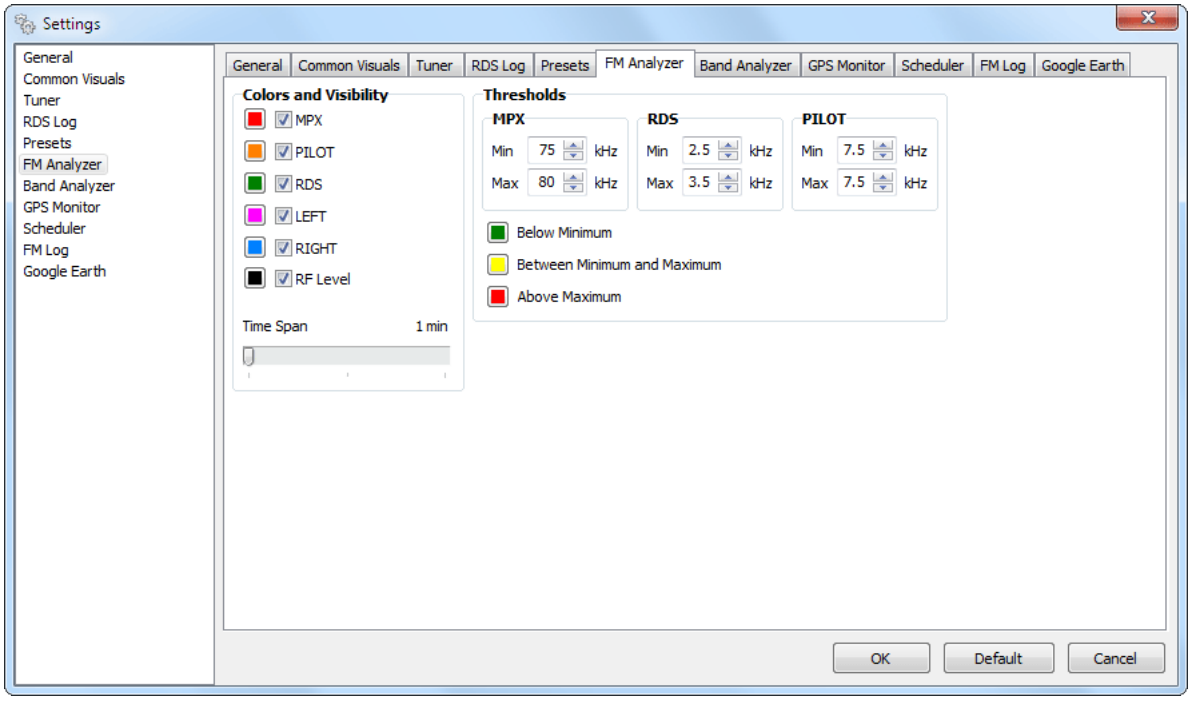
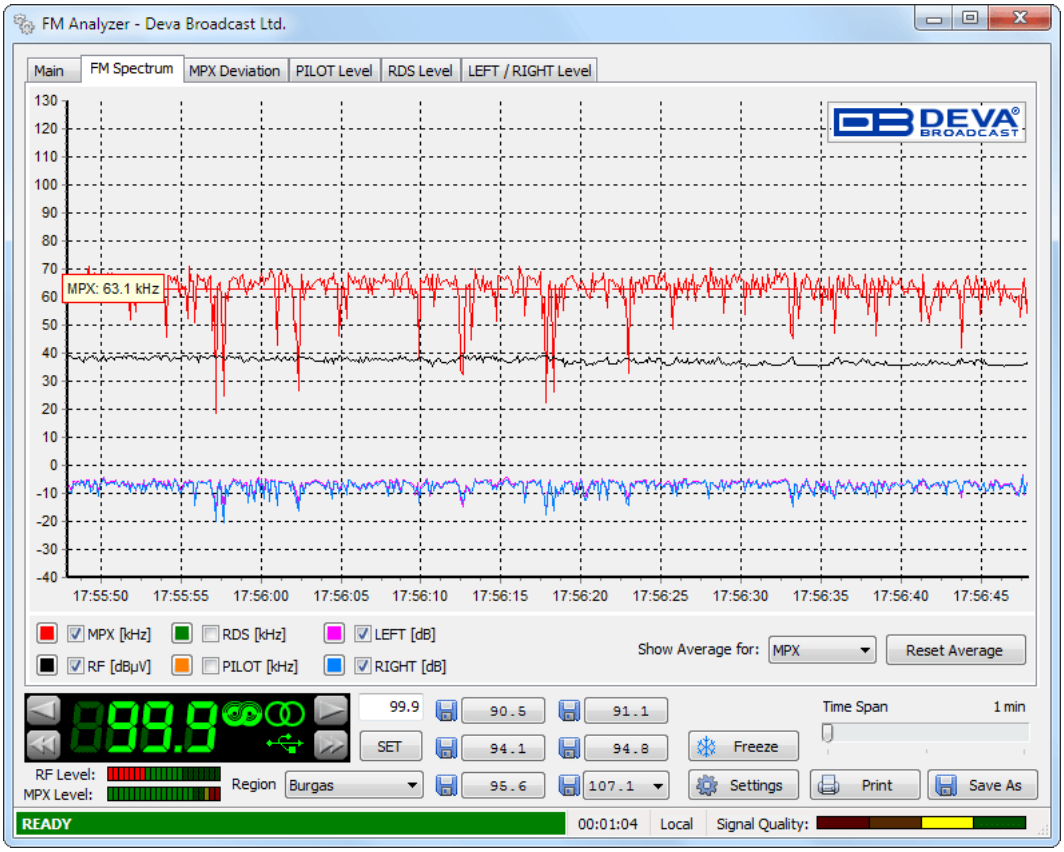
FM ANALYZER SETTINGS



Colors and Visibility - The signals represented at the FM Graphics can be color coded as per the user's preferences.

Thresholds - MPX, RDS and PILOT signals have minimum and maximum threshold levels, which affects their graphical representation on the deviation graphics, as well on the LED indicators. **Below**, **Between** and **Above** areas are close related to the threshold levels and their color representation could be changed as well.

FM SPECTRUM



This screen represents all mandatory parameters over the selected time slice.

Every parameter has its own color representation and measurement units, which are visible below the graph. Colors can be changed upon clicking on square button in front of parameter's name. Units are tuner-depending i.e. when in RDS mode - MPX, RDS and PILOT reading are in kHz, RBDS mode - %. LEFT and RIGHT are always shown in dB. RF Level is always shown in dBµV.

Parameters can be visible or hidden by clicking on corresponding check-box.

Average value will be shown upon selecting desired parameter from drop-down box next to "**Show Average for**". Average value is calculated from all measured parameter's values, until changing the Tuner's frequency.

"**Reset Average**" button resets average counters. Usable, when unexpected signal fluctuation occurs.

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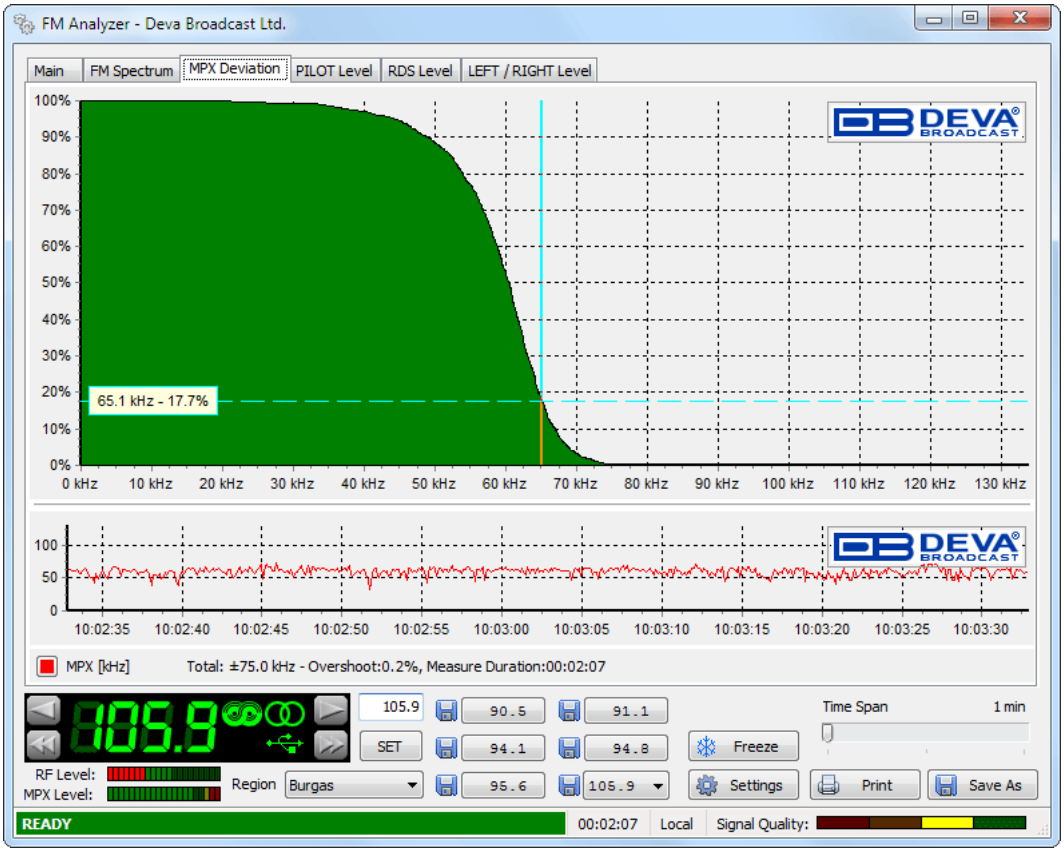
MPX DEVIATION



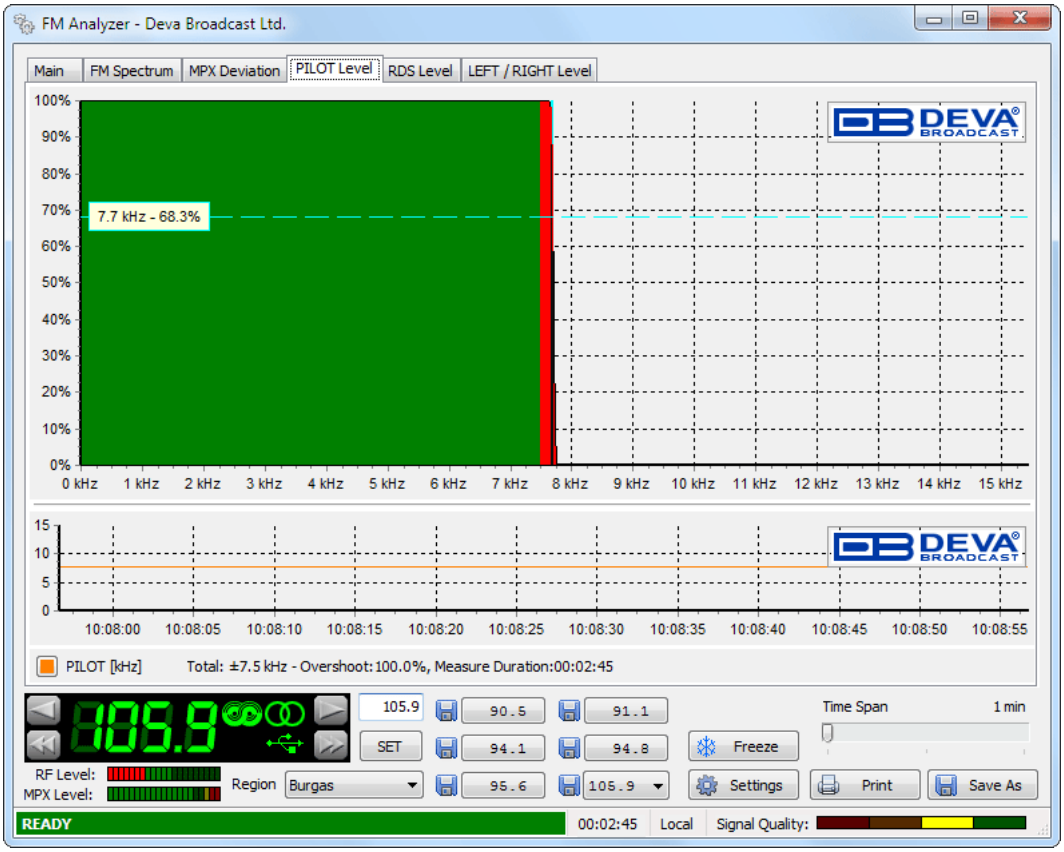
This screen represents MPX Deviation.

The graphic above represents MPX Deviation overshoot (in percent) over time.

Standard overshoot is measured at 75 kHz and is indicated below the graphic. User-defined frequency can be selected by moving vertical marker along the horizontal scale. Overshoot will be indicated at the cross-point with the horizontal dotted line.

The graphic below represents MPX over the selected time slice.

PILOT LEVEL



This screen represents PILOT Level.

The graphic above represents PILOT overshoot (in percent) over time.

Standard overshoot is measured at 7.5 kHz and is indicated below the graphic. User-defined frequency can be selected by moving vertical marker along the horizontal scale. Overshoot will be indicated at the cross-point with the horizontal dotted line.

The graphic below represents PILOT Level over the selected time slice.

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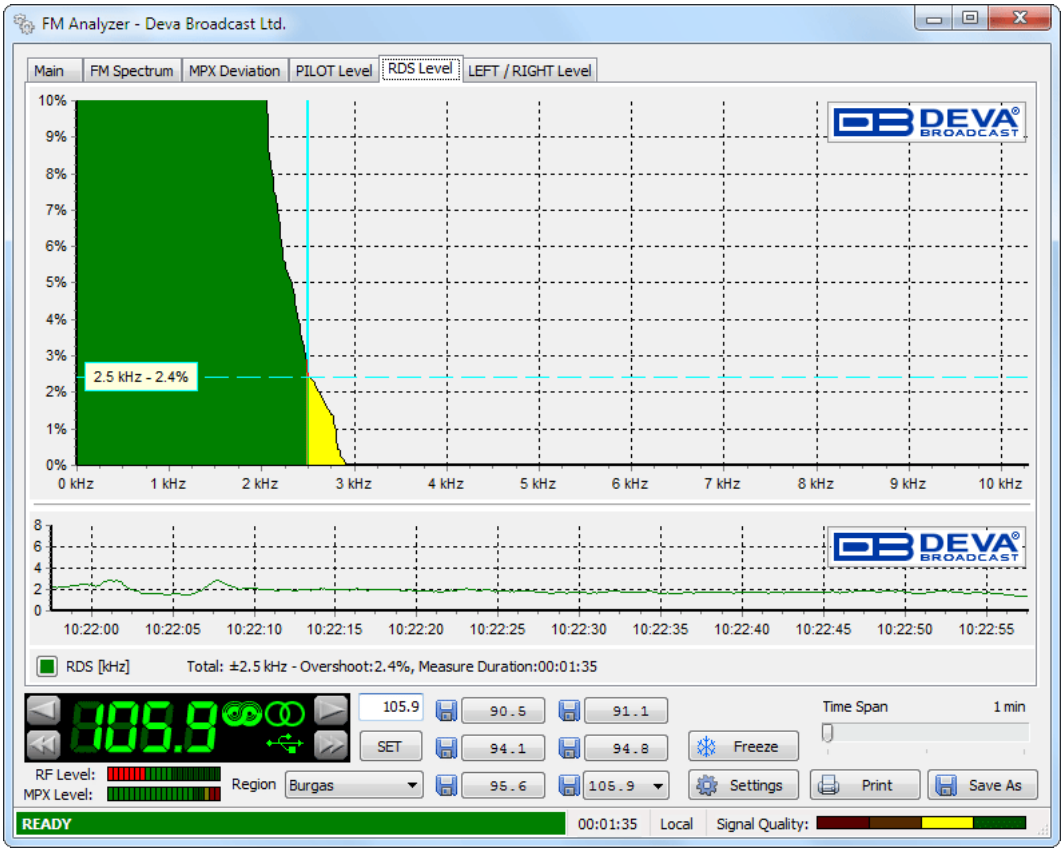
RDS LEVEL



This screen represents RDS Level.

The graphic above represents RDS overshoot (in percent) over time.

Standard overshoot is measured between 2.5 and 3.5 kHz and is indicated below the graphic. User-defined frequency can be selected by moving vertical marker along the horizontal scale. Overshoot will be indicated at the cross-point with the horizontal dotted line.

The graphic below represents RDS Level over the selected time slice.

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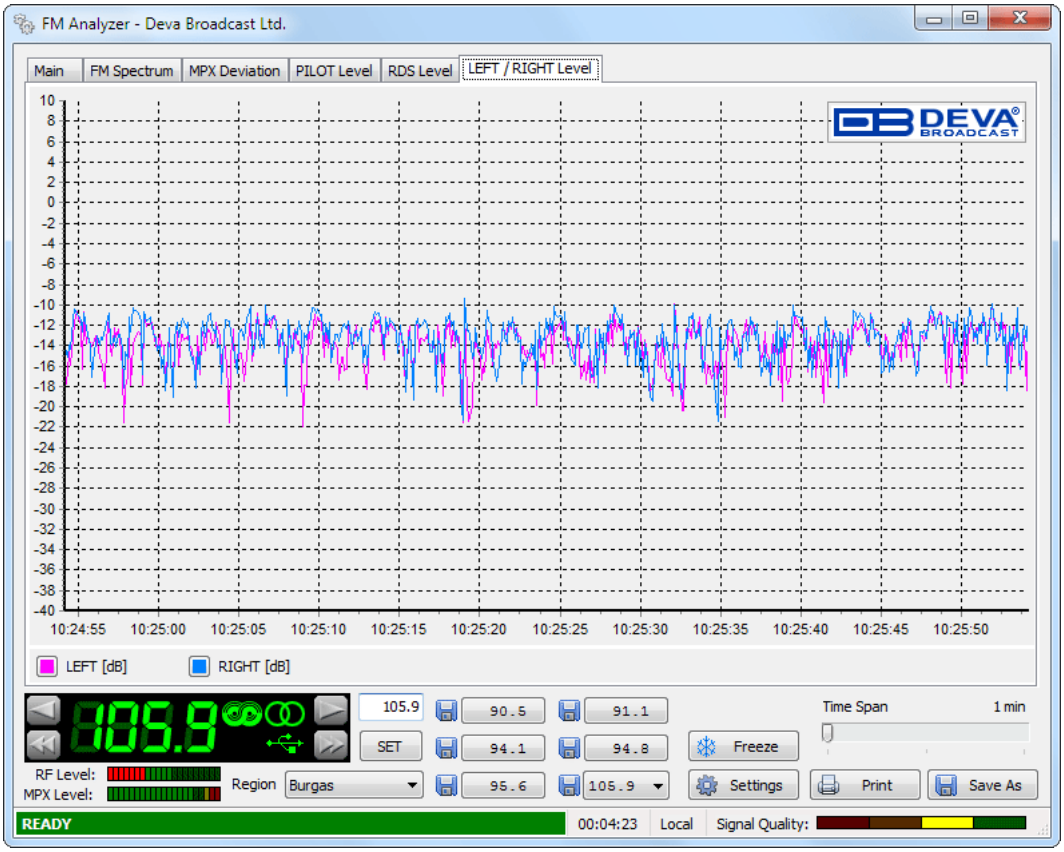
LEFT & RIGHT LEVEL



This represents LEFT and RIGHT Audio Levels over the selected time slice.

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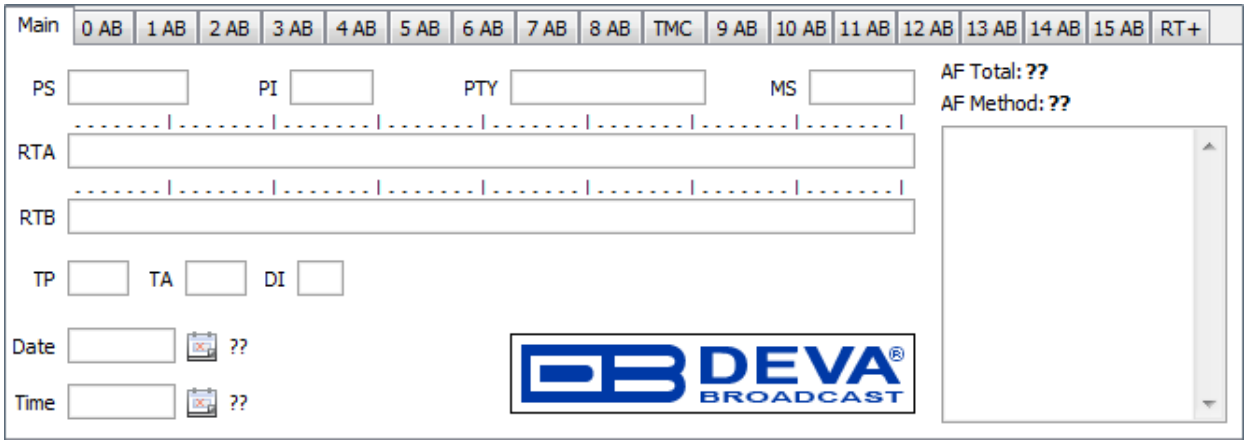
RDS Data and Detailed RDS Group's Analyzer

SECTION "MAIN" WITH ALL MANDATORY RDS FUNCTIONS

In this section the Band Scanner Software visualizes the main RDS features like PS, Radio Texts, PI, PTY, MS, TP, TA, DI and Alternative Frequency Table giving information about the AF method used.



PS – This is the label of the program service consisting of not more than eight alphanumeric characters, which is displayed by RDS receivers in order to inform the listener what program service is being broadcast by the station to which the receiver is tuned. An example for a name is "Radio 21".

PI - This information consists of a code enabling the receiver to distinguish between countries, areas in which the same program is transmitted, and the identification of the program itself. The code is not intended for direct display and is assigned to each individual radio program, to enable it to be distinguished from all other programs. One important application of this information would be to enable the receiver to search automatically for an alternative frequency in case of bad reception of the program to which the receiver is tuned; the criteria for the change-over to the new frequency would be the presence of better signal having the same Program Identification code.

PTY - **P**rogram **TY**pe codes - This is an identification number to be transmitted with each program item and which is intended to specify the current Program Type (detailed description follows in Appendix A and B). This code could be used for search tuning. The code will, moreover, enable suitable receivers and recorders to be pre-set to respond only to program items of the desired type.

Music/Speech (M/S) switch code.

This is a 1-bit code. A "0" indicates that speech, at present, is being broadcast and a "1" indicates that music, at present, is being broadcast. When the broadcaster is not using this facility the bit value will be set at "1".

Use of the **TP** and **TA** features (Type 0, 15B and 14 groups).

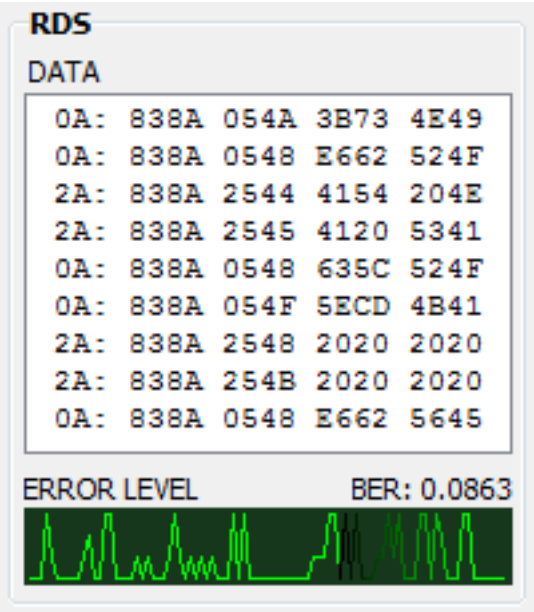
For the tuned program service, the code TP=0 in all groups and TA=1 in type 0 and 15B groups indicates that this program broadcasts EON information which cross-references at least to one program service which carries traffic information. RDS receivers which implement the EON feature may use this code to signify that the listener can listen to the tuned program service and nevertheless receive traffic messages from another program service. RDS receivers which do not implement the EON feature must ignore this code. Program services which use the code TP=0, TA=1 must broadcast type 14 B groups (at the appropriate times) relating to at least one program service which carries traffic information, and has the flag TP=1. The TA flag within variant 13 of a type 14A group is used to indicate that the cross-referenced service is currently carrying a traffic announcement. This indication is intended for information only (e.g. for monitoring by broadcasters) and must not be used to initiate a switch even if traffic announcements are desired by the listener. A switch to the cross-referenced traffic announcement should only be made when a TA=1 flag is detected in a type 14B group.

CT – **C**lock **T**ime and date

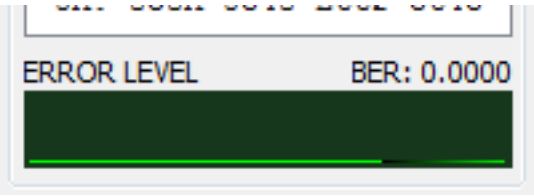
Time and date codes should use Coordinated Universal Time (UTC) and Modified Julian Day (MJD). If MJD = 0 the receiver should not be updated. The listener, however, will not use this information directly and the conversion to local time and date will be made in the receiver's circuitry. CT is used as time stamp by various RDS applications and thus it must be accurate.

RAW RDS DATA STREAM

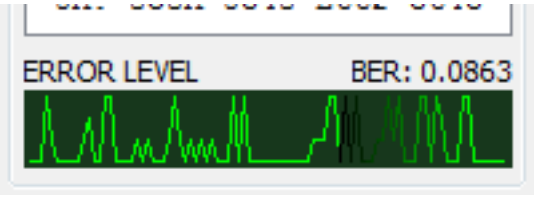
This section contains data about the RDS stream, in case the incoming stream carry RDS data.



The **ERROR LEVEL** indicator shows the Stream's quality. In case of 100% errors free stream the indicator will draw flat line like this:



In case the stream is coming with errors, the line will indicate the error's level like this:



In the **DATA** field the last 9 decoded groups appear in raw format.

BER (**B**it to **E**rror **Ratio**) is the ratio between all the valid and non valid RDS data. In case the RDS is coming with 100% valid data stream, the BER indicator will measure 0. If some errors are detected, the BER reading may rise.

GROUP DETECTOR

The **Group Detector** function is located in the center of the screen for immediate reading of the existing groups. When group presence is detected, corresponding LED illuminates in green.

Using this feature the user will have information about groups being transmitted and their appropriate frequency. In case more information is required, it can be found in the tabs where all the information about the selected group is analyzed or within **Group Analyzer**.

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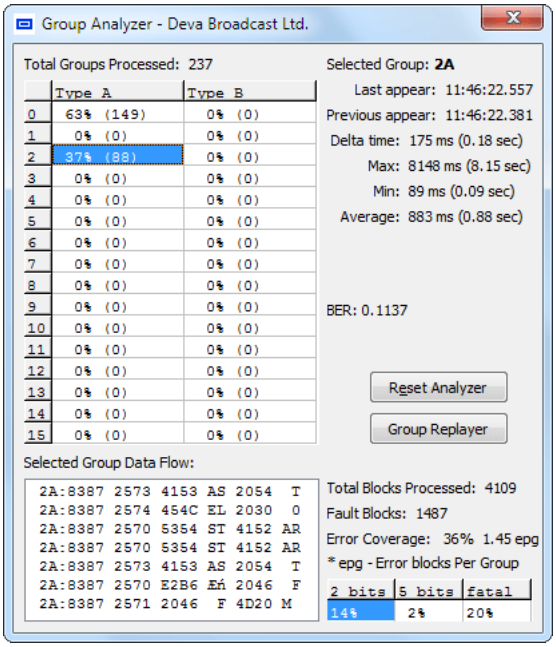
GROUP ANALYZER



This window gives the user statistical analysis of the incoming RDS/RBDS data stream. Detailed report for the groups' quantity and ratio is included. Each group timing presence is reported in a separate table. The number of the valid or non-valid blocks processed is contained in this screen.

The refreshing of the statistical data depends on the selected group. The time of the last showing of the group, and time differences between any groups appearing is calculated. The average time of group appearing is also displayed.

The "**Reset Analyzer**" button resets all of the buffered data and starts all over. Changing tuned frequency also resets Group Analyzer.

The "**Group Replayer**" button will open tool for more sophisticated group analysis. (see "Group Replayer" on page 51)

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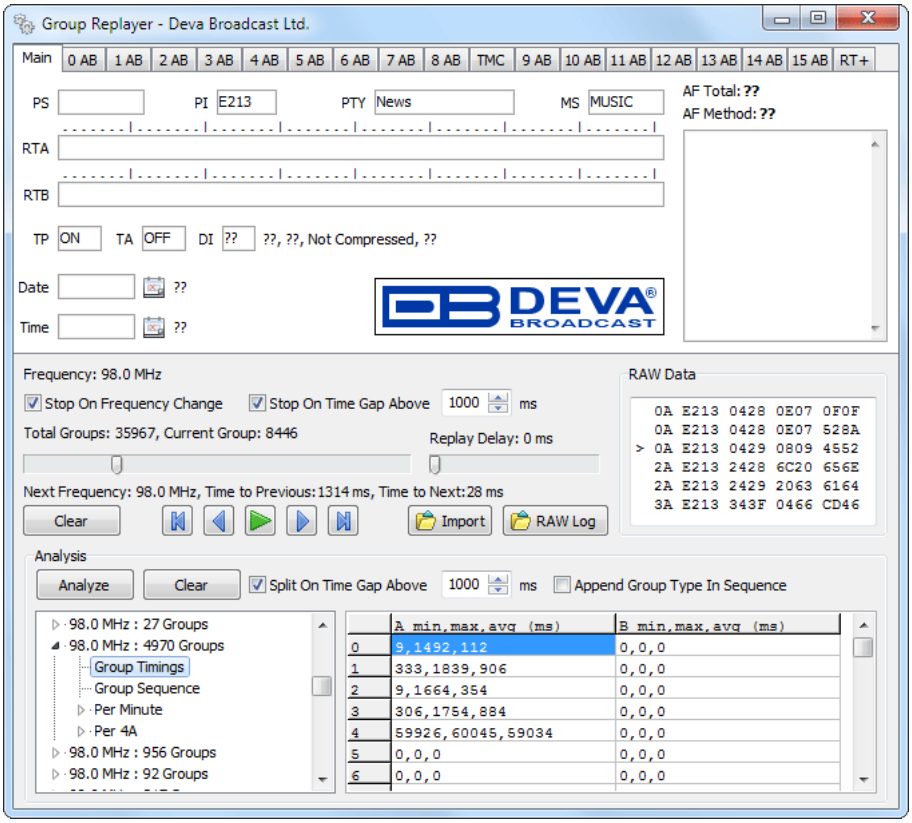
GROUP REPLAYER



Group Replayer tool utilizes RAW RDS data and Replays it. Existing data can be used from RAW Log as well from previously exported GRP files.

Top half of the Replayer is identical to Main Program View and acts in same manner, i.e. RDS data is interpreted in the same way.

First import data using '**Import**' or '**RAW Log**' buttons.

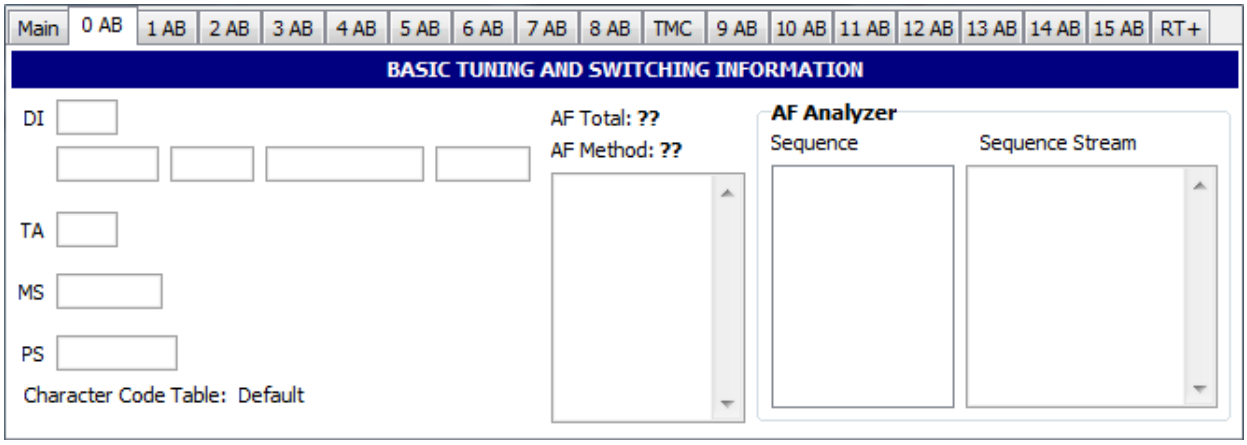
Use Replay buttons to step/run through RDS stream. Playing back and forth have immediate result in upper section. Discontinuance in RDS stream could be sensed in two ways - by frequency switch or by too big time delay.

More sophisticated analysis could be performed by pressing '**Analyze**' button in Analysis section. There entire RDS stream will be divided into several sections according to frequency switch and defined time gap. Each section has its own statistical information represented into right side.

Short description of all groups analyzed

TYPE 0A & 0B GROUPS: BASIC TUNING AND SWITCHING INFORMATION

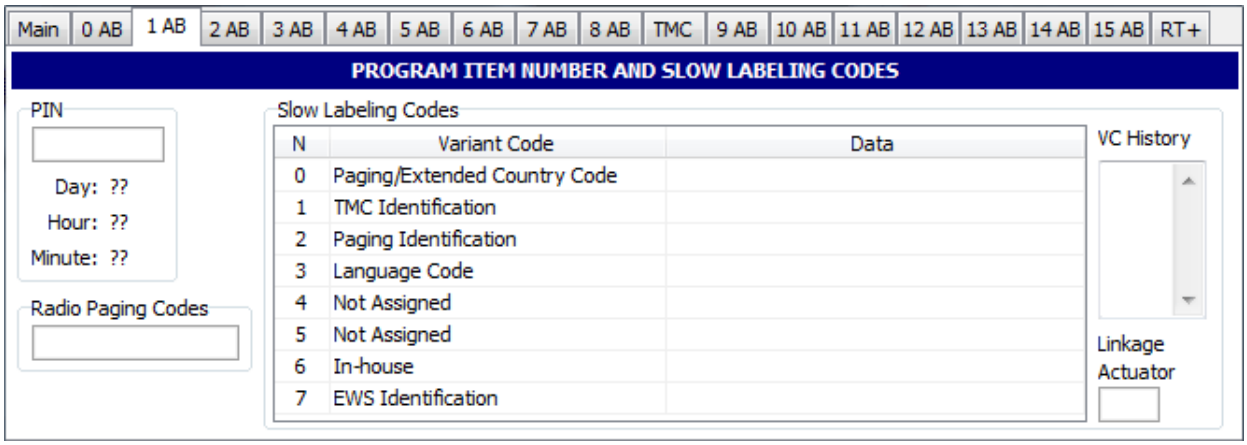
Type 0A groups are usually transmitted whenever alternative frequencies exist. Type 0B groups without any type 0A groups may be transmitted only when no alternative frequencies exist. There are two methods (A and B) for transmission of alternative frequencies. The PS function is also part from this group. The Program Service name comprises eight characters. It is the primary aid to listeners in program service identification and selection.



The Program Service name is to be used only to identify the station or station program. The PS may be changed as required by the station. Nowadays this feature is used for transmitting artist names, song titles, promos or some kind of advertisement texts.

TYPE 1A & 1B GROUPS: PROGRAM ITEM NUMBER AND SLOW LABELING CODES

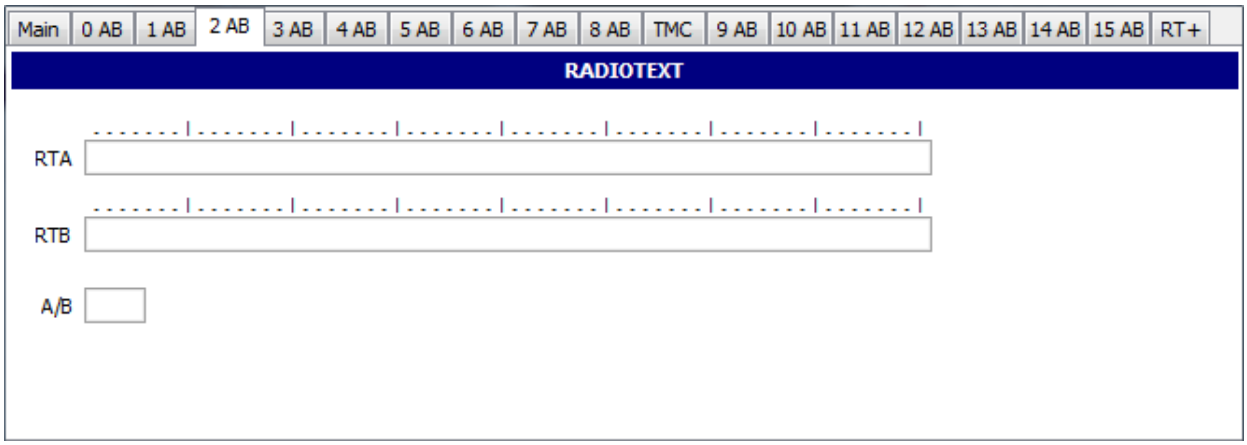
Program Item Number, Type 1B group - The Program Item Number is the scheduled broadcast start time and day of month as published by the broadcaster. The day of month is transmitted as a five-bit binary number in the range 1-31. Hours are transmitted as a five-bit binary number in the range 0-23. The spare codes are not used. Minutes are transmitted as a six-bit binary number in the range 0-59. The spare codes are not used.



The most significant five bits in block 4 which convey the day of the month, if set to zero, indicate that no valid Program Item Number is being transmitted. In this case, if no Radio Paging is implemented, the remaining bits in block 4 are undefined. However, in the case of type 1A groups only, if Enhanced Radio Paging is implemented, the remaining bits carry Service Information.

TYPE 2A & 2B GROUPS: RADIOTEXT

The 4-bit text segment address defines in the current text the position of the text segments contained in the third (version A only) and fourth blocks. Since each text segment in version 2A groups comprises four characters, messages of up to 64 characters in length can be sent using this version. In version 2B groups, each text segment comprises only two characters and therefore when using this version the maximum message length is 32 characters.



If a display which has fewer than 64 characters is used to display the radiotext message then memory should be provided in the receiver/decoder so that elements of the message can be displayed sequentially. This may, for example, be done by displaying elements of text one at a time in sequence, or, alternatively by scrolling the displayed characters of the message from right to left.

- An important feature of type 2 groups is the Text A/B flag contained in the second block. Two cases occur:

If the receiver detects a change in the flag (from binary “0” to binary “1” or vice-versa), then the whole radiotext display should be cleared and the newly received radiotext message segments should be written into the display.

- If the receiver detects no change in the flag, then the received text segments or characters should be written into the existing displayed message and those segments or characters for which no update is received should be left unchanged.

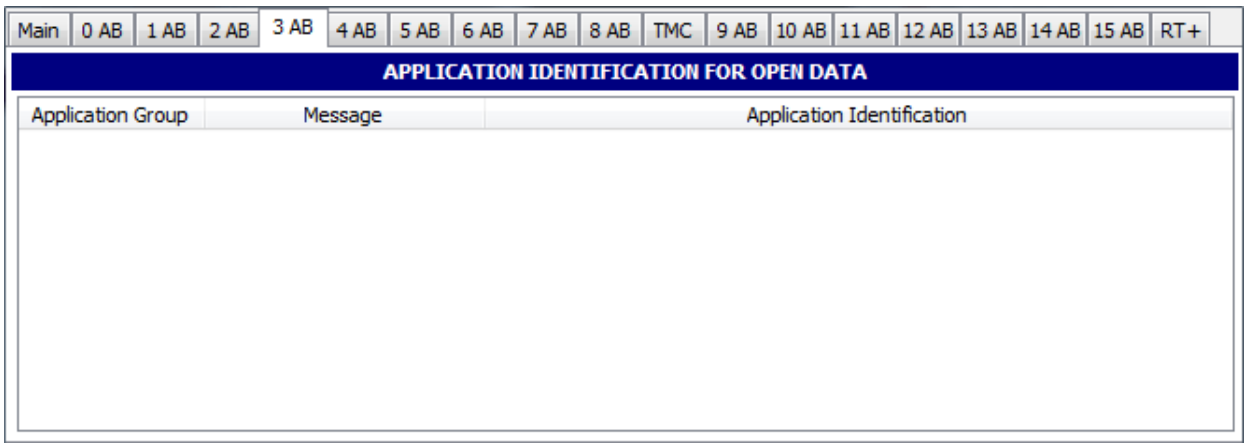
When this application is used to transmit a 32-character message, at least three type 2A groups or at least six type 2B groups should be transmitted in every two seconds.

TYPE 3A & 3B GROUPS: APPLICATION IDENTIFICATION FOR OPEN DATA

The type 3A group conveys, to a receiver, information about which Open Data Applications are carried on a particular transmission and in which groups they will be found. The type 3A group comprises three elements:

- Application Group type code used by that application, 16 message bits for the actual ODA and the Applications

- Identification (AID) code. Applications which actively utilize both, type A and B groups, are signaled using two type 3A groups. The Application Group type code indicates the group type used, in the particular transmission, to carry the specified ODA. Two special conditions may be indicated: 00000 - Not carried in associated group; 11111 - Temporary data fault (Encoder status) which means that incoming data to the encoder cannot be transmitted. The AID determines which software handler a receiver needs to use. This supplements information carried in the type 1A group and permits groups specified in this standard for EWS, IH, RP and TMC to be re-allocated when these features are not used. This method of allocating and defining Open Data Applications in an RDS transmission allows the addition and subtraction of ODAs, without constraint or the need to await the publication of new standards. For each group type addressed by the Application Group Type codes of a particular transmission, only one application may be identified as the current user of the channel.



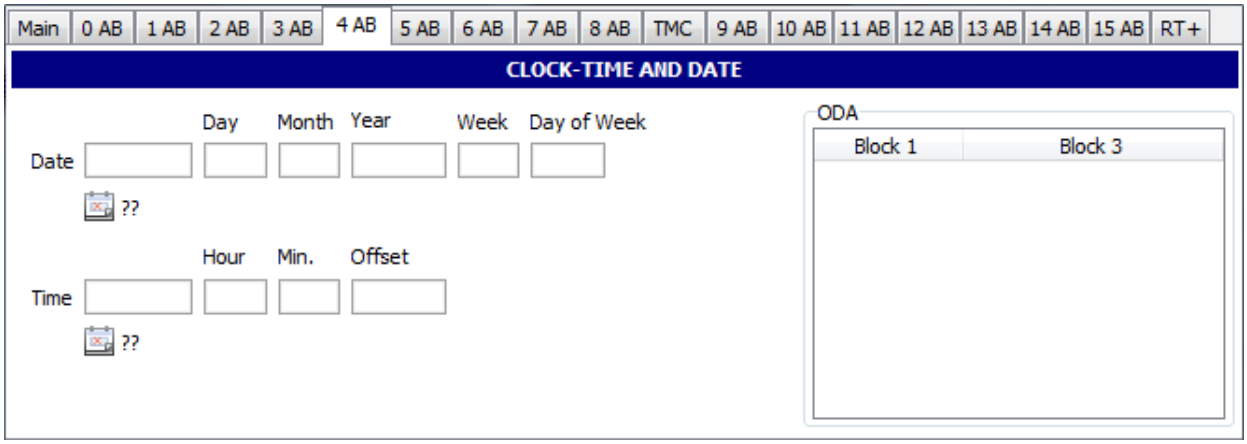
- The AID code 0000 (Hex) may be used to indicate that the respective group type is being used for the normal feature specified in this standard. Application Identification codes 0001 to FFFF (Hex) indicate applications as specified in the ODA Directory. The ODA Directory specification associated with a particular AID code defines the use of type A and type B groups as follows:

-type A groups used alone (mode 1.1)
-type B groups used alone (mode 1.2)
-type A groups and type B groups used as alternatives (mode 2)
-type A groups and type B groups used together (mode 3)

It is important to note that the ODA Directory specification must not specify the actual type A and type B groups to be used, since these are assigned in each transmission by the type 3A group. The AID feature indicates that a particular ODA is being carried in a transmission. Each application will have unique requirements for transmission of its respective AID, in terms of repetition rate and timing. These requirements must be detailed in the respective ODA specification. The specification must also detail the AID signaling requirements for such times when an application assumes or loses the use of a group type channel.

TYPE 4A & 4B GROUPS: CLOCK-TIME AND DATE, OPEN DATA APPLICATION

The transmitted clock-time and date shall be accurately set to UTC plus local offset time. Otherwise the transmitted CT codes shall all be set to zero. When this application is used, one type 4A group will be transmitted every minute. The local time is composed of Coordinated Universal Time (UTC) plus local time offset. The local time offset is expressed in multiples of half hours within the range -12h to +12h and is coded as a six-bit binary number. “0” = positive offset (East of zero degree longitude), and “1” = negative offset (West of zero degrees longitude). The information relates to the epoch immediately following the start of the next group. The Clock time group is inserted so that the minute edge will occur within ± 0.1 seconds of the end of the Clock time group.

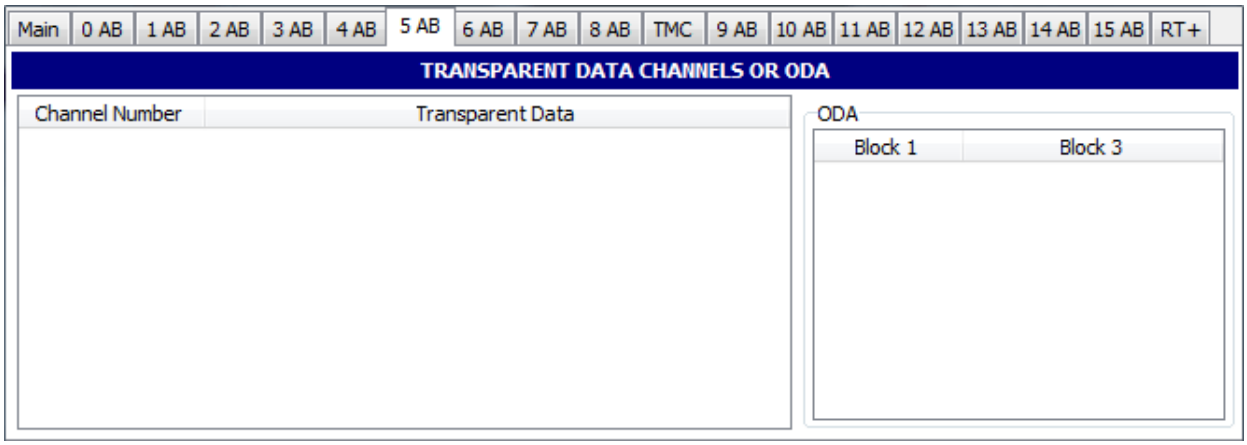


Minutes are coded as a six-bit binary number in the range 0-59. The spare codes are not used. Hours are coded as five-bit binary number in the range 0-23. The spare codes are not used. The date is expressed in terms of Modified Julian Day and coded as a 17-bit binary number in the range 0-99999. Note that the Modified Julian Day date changes at UTC midnight, not at local midnight. Accurate CT based on UTC plus local time offset must be implemented on the transmission where TMC and/or Radio paging is implemented.

4B groups are usable for Open data (see “Type 3A & 3B groups” on page 55)

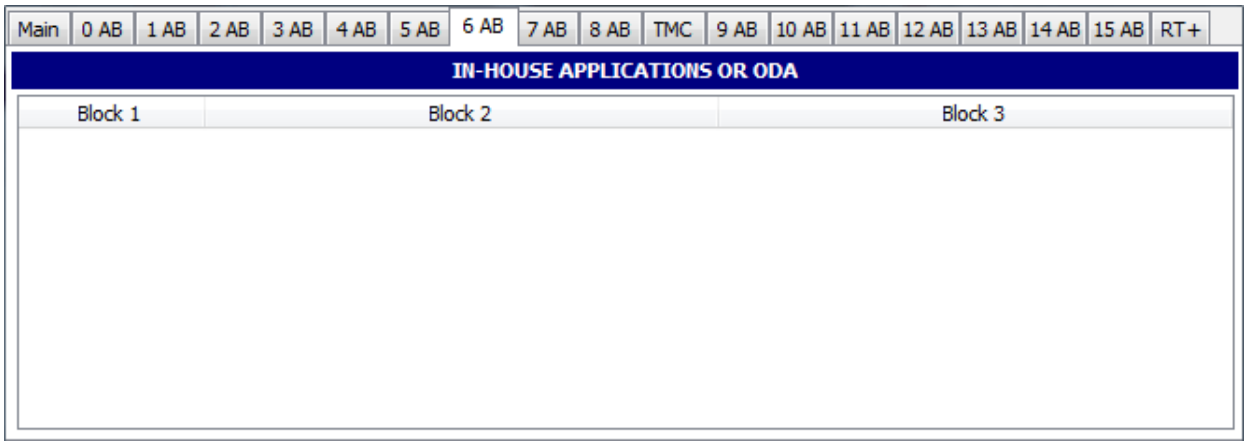
TYPE 5A & 5B GROUPS: TRANSPARENT DATA CHANNELS OR ODA

These channels may be used to send alphanumeric characters, or other text (including mosaic graphics), or for transmission of computer programs and similar data not for display. Details of implementation of these last options are to be specified later. The repetition rate of these group types may be chosen to suit the application and the available channel capacity at the time.



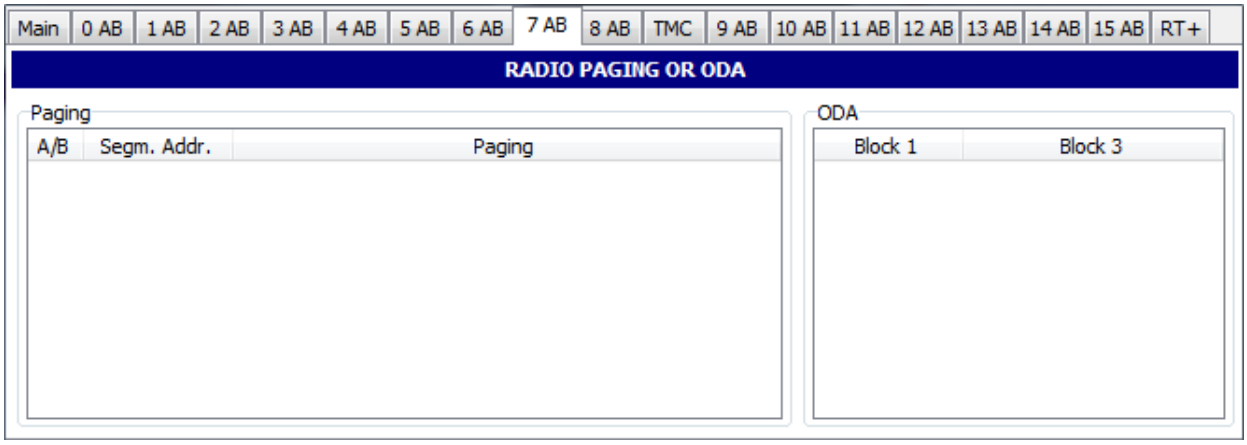
TYPE 6A & 6B GROUPS: IN-HOUSE APPLICATIONS OR ODA

Type 6A groups are used for ODA and IH. In case this group is used for ODA applications see "Type 3A & 3B groups" description. There are some unreserved bits in these groups. The contents of the unreserved bits in these groups may be defined unilaterally by the operator. Consumer receivers should ignore the in-house information coded in these groups. The repetition rate of these group types may be chosen to suit the application and the available channel capacity at the time.



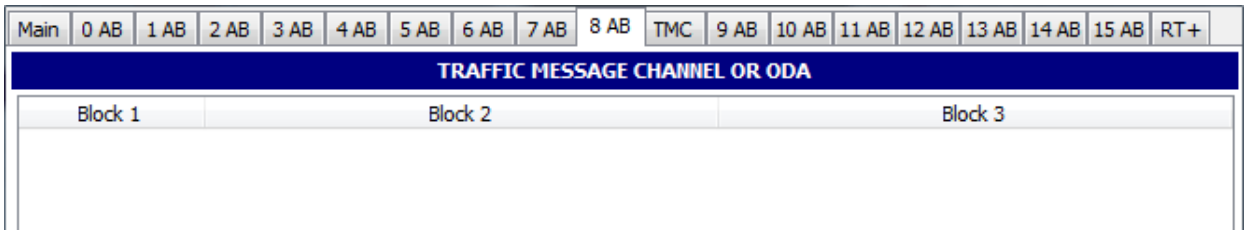
TYPE 7A & 7B GROUPS: RADIO PAGING OR ODA

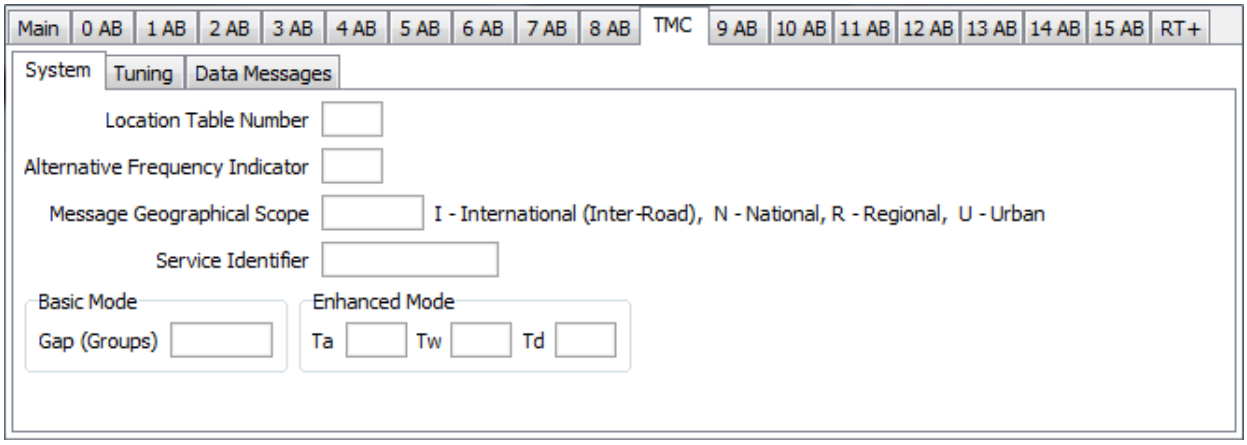
Type 7A groups are used for Radio Paging or ODA (see “Type 3A & 3B groups” on page 55)

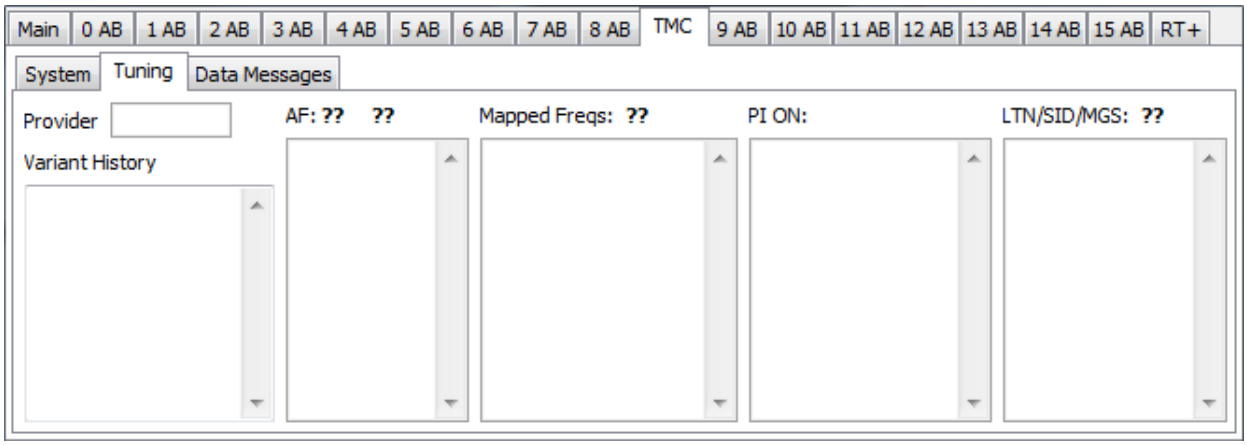


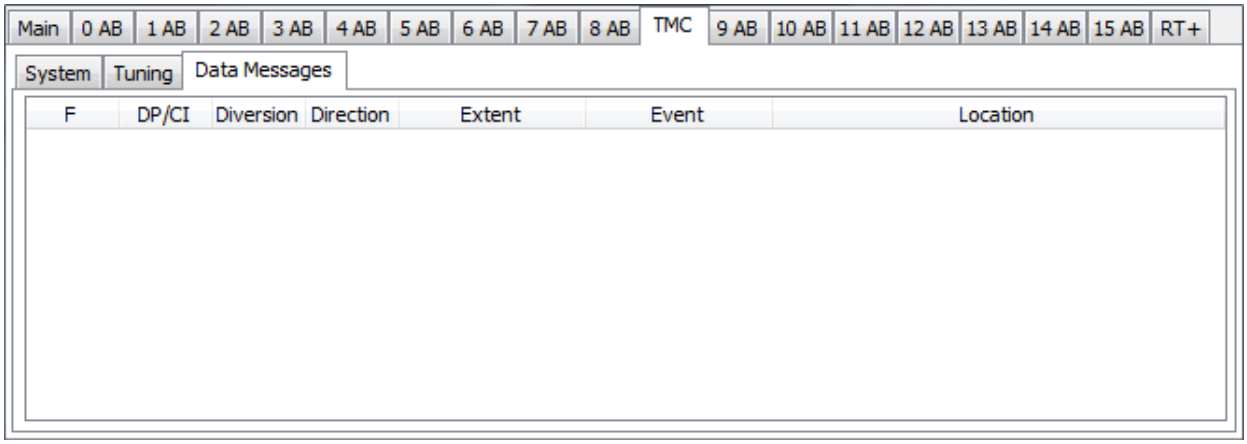
TYPE 8A & 8B GROUPS: TRAFFIC MESSAGE CHANNEL OR ODA

Type 8A groups are used for Traffic Message Channel (TMC); if used for ODA see "Type 3A & 3B groups" description. This group carries the TMC messages. The specification for TMC, using the so called ALERT C protocol also makes use of type 1A and/or type 3A groups together with 4A groups



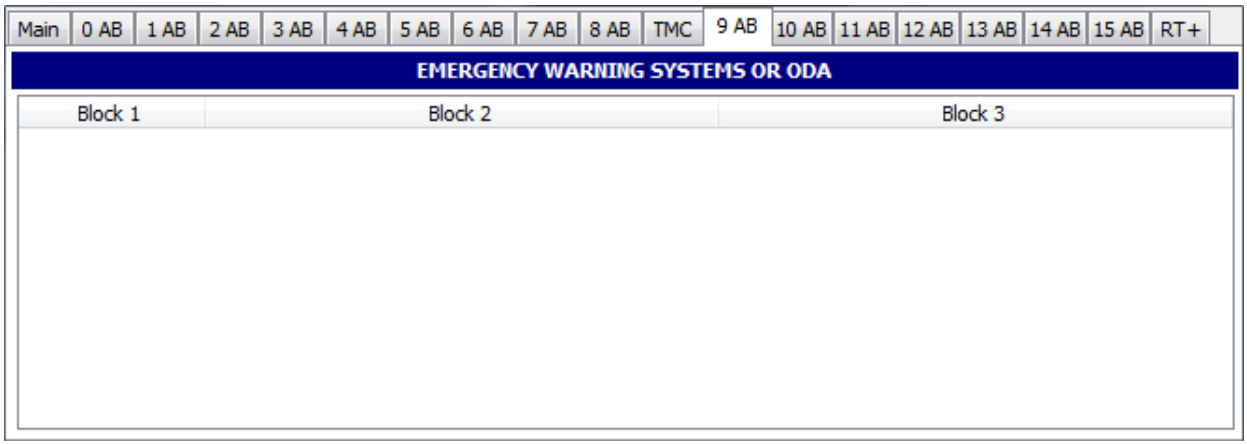






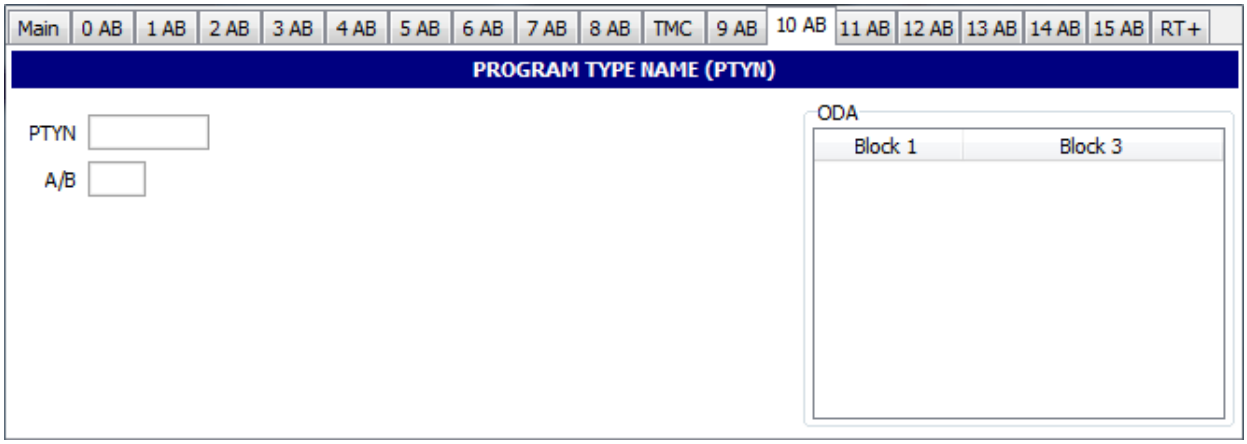
TYPE 9A & 9B GROUPS: EMERGENCY WARNING SYSTEMS OR ODA

These groups are transmitted very infrequently, unless an emergency occurs or test transmissions are required. Type 9A group is used for EWS; if used for ODA, see "Type 3A & 3B groups" description. The ODA may be used only in type B of these groups. Format and application of the bits allocated for EWS messages may be assigned unilaterally by each country. However the ECC feature must be transmitted in type 1A groups when EWS is implemented.



TYPE 10A & 10B GROUPS: PROGRAM TYPE NAME (10A) AND OPEN DATA (10B)

The type 10A group allows further description of the current Program Type, for example, when using the PTY code 4: SPORT, a PTYN of "Football" may be indicated to give more detail about that program. PTYN must only be used to enhance Program Type information and it must not be used for sequential information. The A/B flag is toggled when a change is made in the PTYN being broadcast. Program Type Name (PTYN) (for display) is transmitted as 8-bit characters as defined in the 8-bit code tables in annex E. Eight characters (including spaces) are allowed for each PTYN and are transmitted as four character segments in each type 10A group. ODA - Type 10B group see "Type 3A & 3B groups" description.



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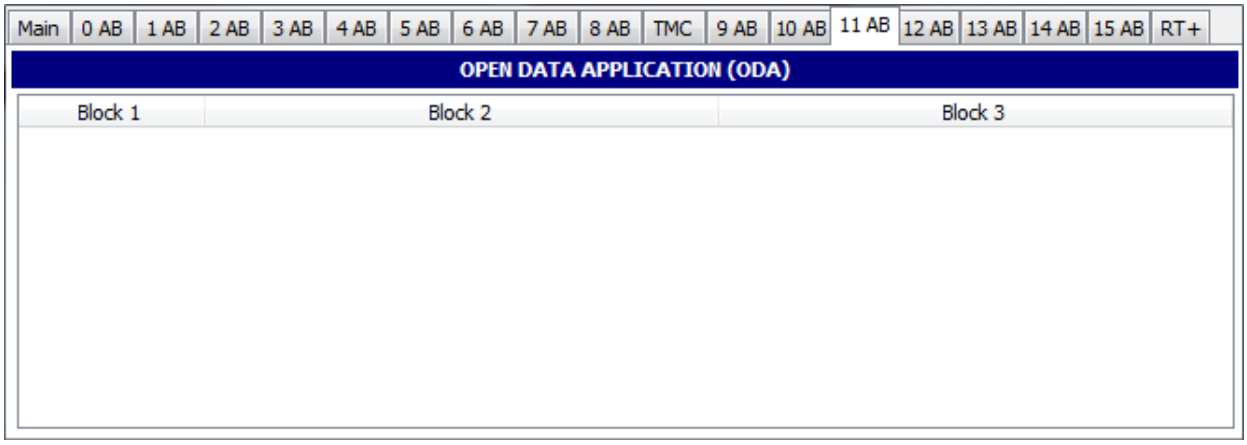
TYPE 11A & 11B GROUPS: OPEN DATA APPLICATION

Open data - Type 11A and 11B groups (see “Type 3A & 3B groups” on page 55)



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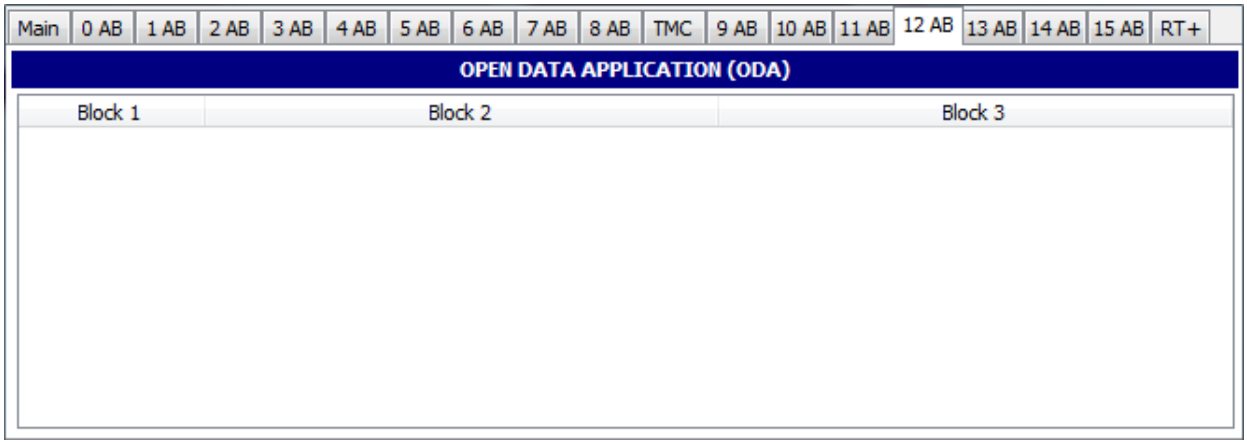
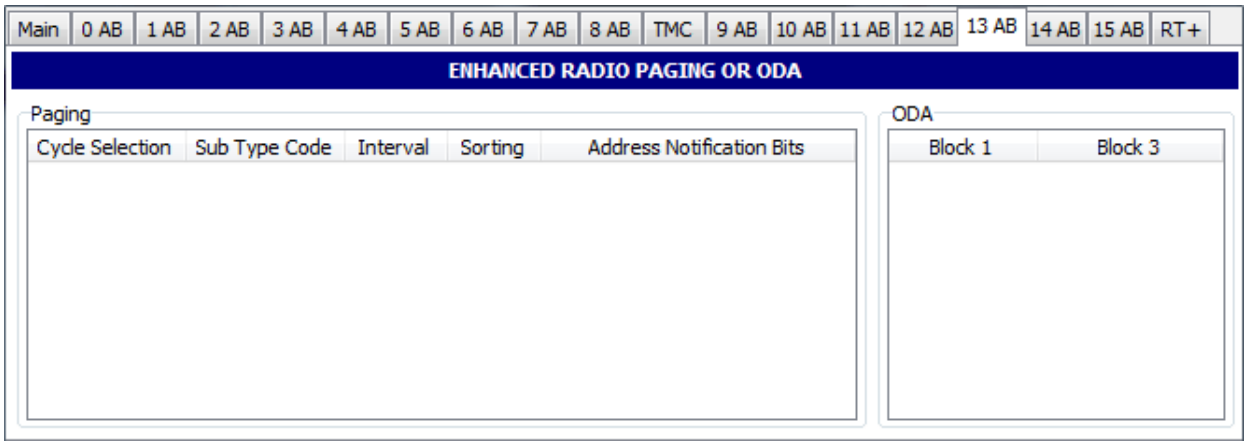
TYPE 12A & 12B GROUPS: OPEN DATA APPLICATION

Open data - Type 12A and 12B groups (see “Type 3A & 3B groups” on page 55)



TYPE 13A & 13B GROUPS: ENHANCED RADIO PAGING OR ODA

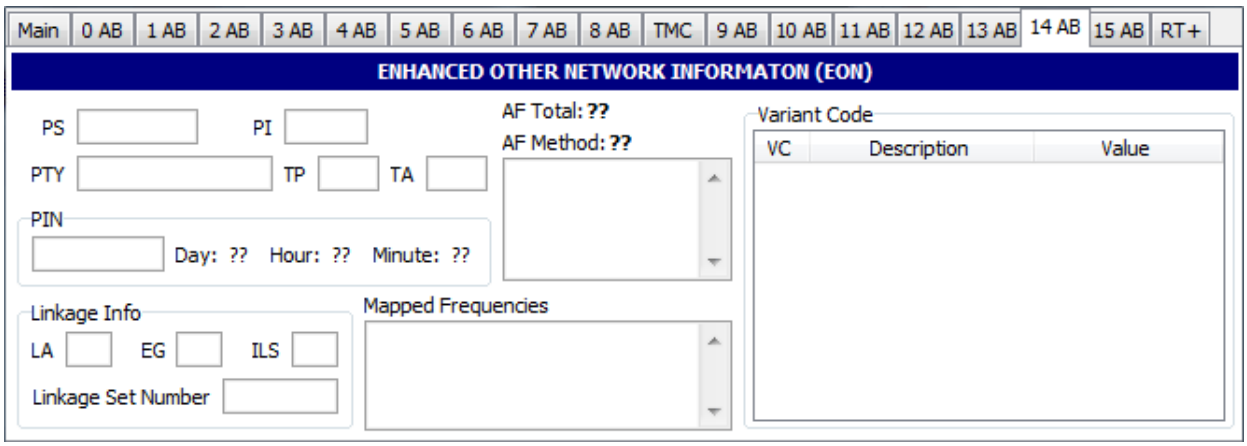
The type 13A group is used to transmit the information relative to the network and the paging traffic. Its primary purpose is to provide an efficient tool for increasing the battery life time of the pager. These groups are transmitted once or twice at the beginning of every interval (after the type 4A group at the beginning of each minute or after the first type 1A group at the beginning of each interval).



13B groups are usable for Open Data (see “Type 3A & 3B groups” on page 55)

TYPE 14A & 14B GROUPS: ENHANCED OTHER NETWORKS INFORMATION (EON)

These groups are transmitted if Enhanced Other Networks information (EON) is implemented. AF codes in type 14A groups are used to refer to frequencies of other networks. There are two AF methods for transmitting this information. Variant 4 utilizes AF method A coding to transmit up to 25 frequencies; the coding method is as described above for type 0A groups. The PI code of the other network to which the AF list applies is given in block 4 of the group. Variant 5 is used for the transmission of "Mapped frequency pairs". This is used to specifically reference a frequency in the tuned network to a corresponding frequency in another network. This is particularly used by a broadcaster that transmits several different services from the same transmitter tower with the same coverage areas. The first AF code in block 3 refers to the frequency of the tuned network, the second code is the corresponding frequency of the other network identified by the PI code in block 4. Where it is necessary to map one tuning frequency to more than one VHF/FM frequency for the cross-referenced program service (due to multiple use of the tuning frequency or because the cross-referenced program is receivable at more than one frequency within the service area associated with the tuning frequency), then variants 6, 7 and 8 are used to indicate second, third and fourth mapped frequencies, respectively. LF/MF mapped frequencies are implicitly signaled by using variant 9. AF Code 250 is not used with the mapped AF method.



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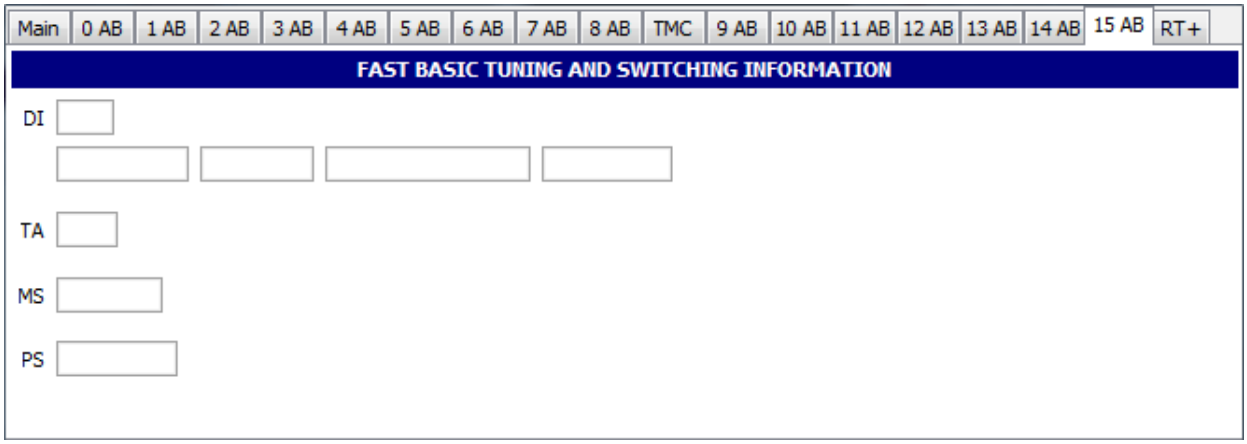
TYPE 15A & 15B GROUPS: FAST BASIC TUNING AND SWITCHING INFORMATION

Encoder manufactures usually eliminate this group type on new equipment. The RDS standard currently has no definition for this group. It is intended that type 15A groups should be inserted where it is desired to speed up acquisition time of the PS name. No alternative frequency information is included in 15A groups, and this group will be used to supplement type 0B groups. If alternate frequencies exist, type 0A will still be required. It is intended that type 15B groups should be inserted where it is desired to increase the repetition rate of the switching information contained in block 2 of type 0 groups without increasing the repetition rate of the other information contained in these groups. No alternative-frequency information or program-service name is included in 15B groups, and this group will be used to supplement rather than to replace type 0A or 0B groups.

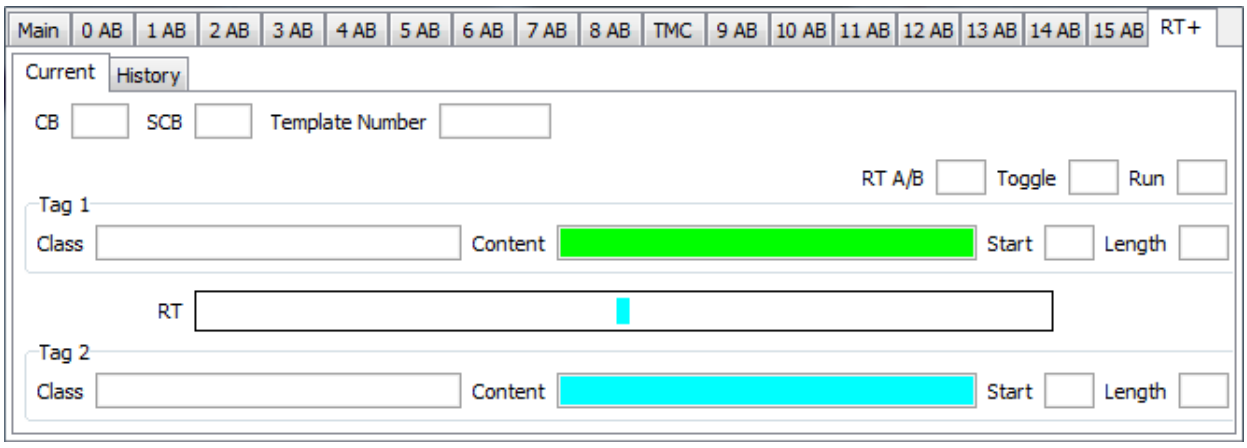


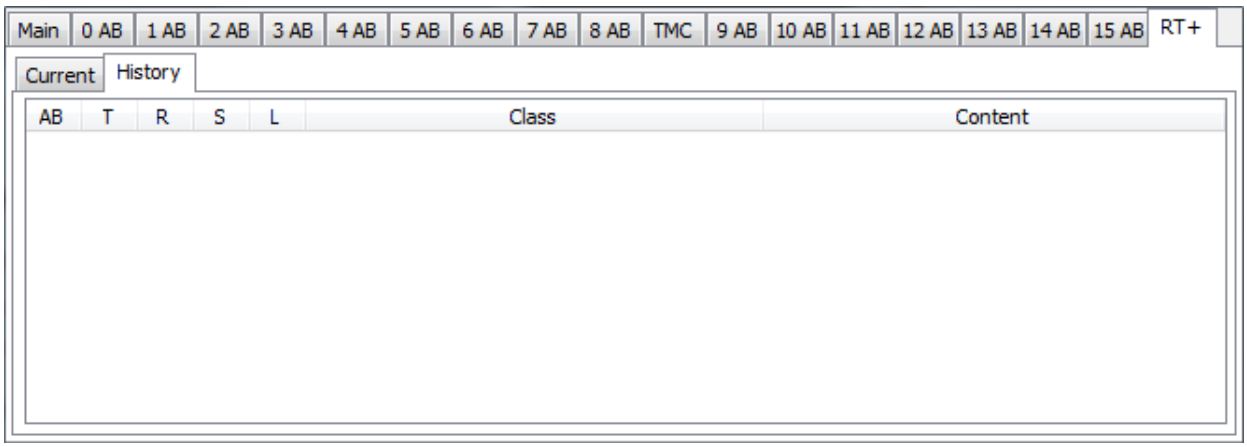
When groups of this type are transmitted, the repetition rate may be chosen to suit the application and the available channel capacity at the time.

RADIOTEXT PLUS (RT+)

RadioText Plus or RT+ is “semantic analogue radio”. It allows the RDS feature RadioText (RT) to be understood by FM RDS receiving terminals. RT+ is based on RDS RT messages and is completely backwards compatible with RT. RT+ has been designed to let the listener (or user) derive additional benefits from the RDS RadioText service. It enables FM RDS receivers to “understand” the RadioText – to recognize designated objects, to make those objects manageable by the user and thus offer the user direct access to specific elements of RadioText messages. Such an element can, for example, be programme-associated metadata such as the Title and the Artist of the currently playing song, or it can be news headlines. This provides the listener with an “mp3-player feeling” while listening to analogue FM radio. The elements can also carry additional service messages or information about the Radio Station such as the telephone number or the web address of the Radio Station’s hotline. These objects, or more accurately RT+ information elements carried in the RDS RadioText (RT) messages, are identified by their location within the RT messages and by the class code of their content type. Once an information element is received and understood, a receiver is able to, for example, store the different RT+ information elements and the listener may then select and request a specific content type from the radio’s memory at an instant in time that suits the listener’s needs. Thus the listener is no longer forced to watch the RT information passing (scrolling) by. Moreover, RT+ offers selected RT message elements to car drivers on a static display, without risk of distracting the attention of the driver. Furthermore, RT+ is well suited for mobile phones with built-in FM receivers: telephone numbers can be directly used to initiate calls, and web addresses can be used to start browsing the web content offered by the radio programme provider.

All additional information necessary for implementing the RT+ service is carried in the RDS group 3A and in an appropriate RDS ODA group.





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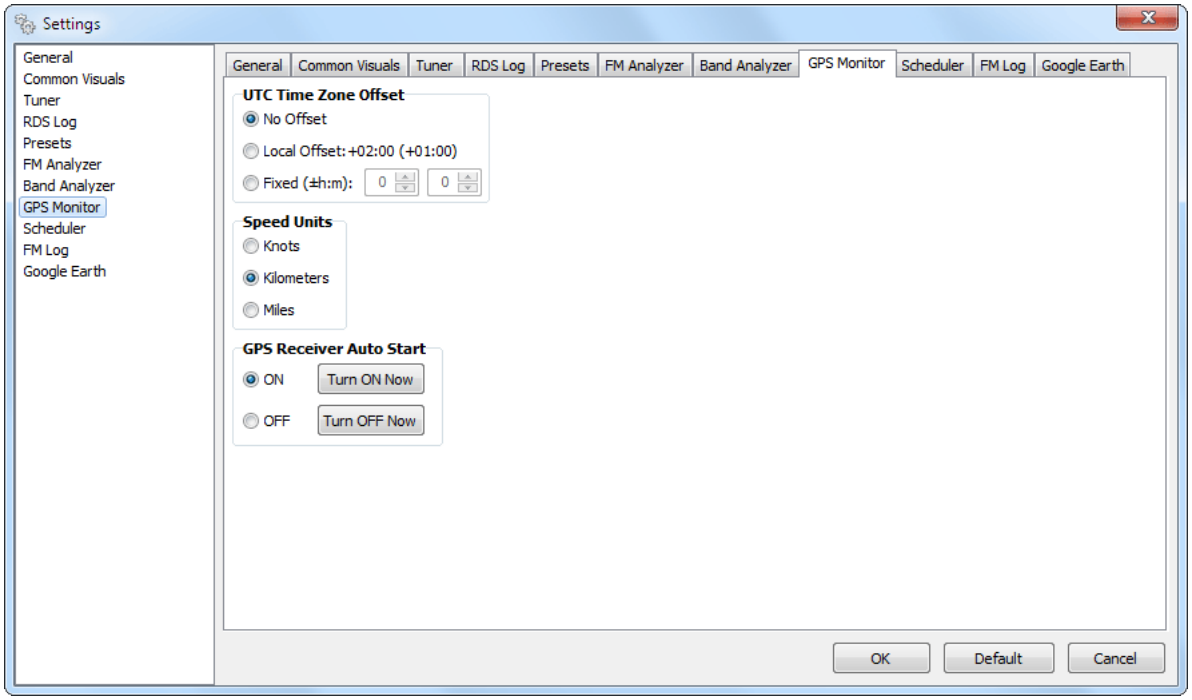
GPS Monitor

GPS MONITOR SETTINGS



UTC Time Zone Offset - Coordinated Universal Time is International Atomic Time. Greenwich Mean Time (GMT) is the same as UTC. To adjust representation of UTC according to your local time (or anything that suits you) select the proper offset.

No Offset - UTC remains as it is.

Local Offset - Local offset is added, according to Windows Time Zone Settings. Value in brackets is daylight savings if applicable.

Fixed - Custom offset is added regardless of local Time Zone Settings.

Speed Units - Visual conversion of the speed units.

GPS Receiver Auto Start -

ON - GPS Receiver is Turned ON. GPS Receiver keeps existing Fix.

OFF - GPS Receiver is Turned OFF. GPS Receiver loses existing Fix.

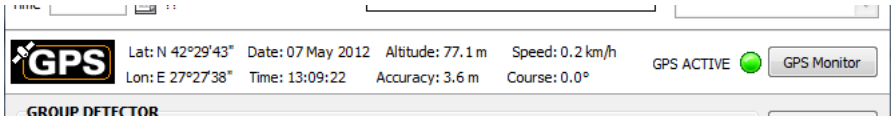
Turn ON button - Immediately Turns ON GPS Receiver.

Turn OFF button - Immediately Turns OFF GPS Receiver. Current Fix is lost.

NOTE: GPS Receiver loses Fix when device is disconnected from the PC or explicitly Turned OFF. Closing the software keeps the GPS Receiver state intact i.e. GPS Receiver continues to operate independently and keeps track on satellite information (if turned ON).

GPS MONITOR

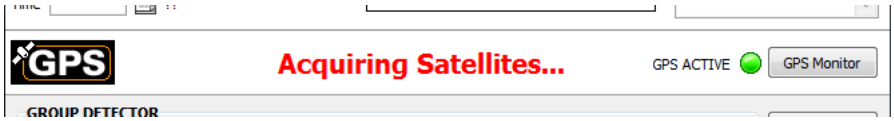
Essential part of Band Scanner GPS is GPS Monitor.
Brief View of GPS Monitor is situated on Main screen:



Here are visualized all mandatory GPS parameters - Latitude, Longitude, Date, Time, Altitude, Accuracy, Speed and Course.

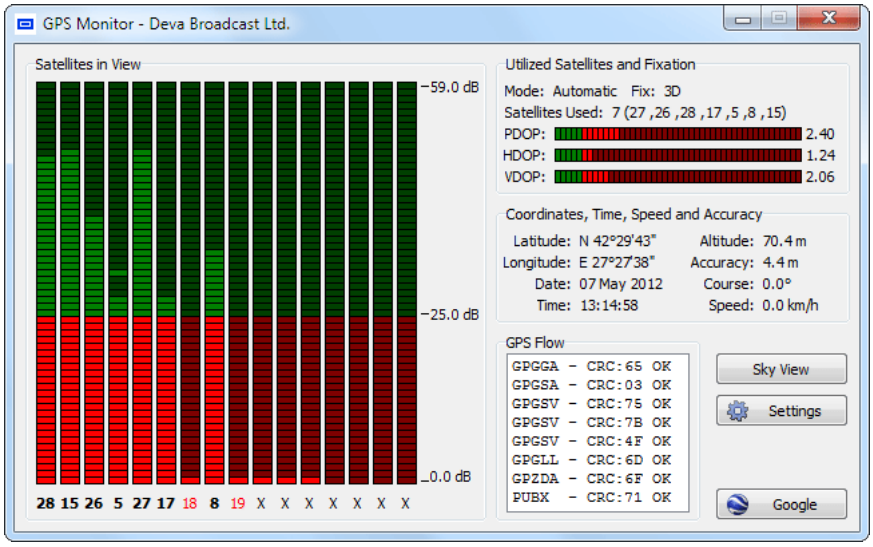
When GPS Receiver is active, the green indicator will blink constantly. The GPS Receiver is turned ON by default, but if necessary could be turned OFF from "GPS Monitor Settings".

After initial power-up of the device, Brief View will be empty, indicating only that GPS Receiver is under Satellite Acquisition.



Usually this process takes no more than 5 minutes. For example - bad weather or/and improper GPS antenna position may extend Acquiring time.

Detailed View is under GPS Monitor button:



1. Satellites in View

This section consist information about the satellites, which Band Scanner GPS has detected. LED indicators shows reception quality for each satellite. Number beneath every LED is Satellite ID. (see also "Sky View")

2. Utilized Satellites and Fixation

2.1. Fix Mode: Manual (forced to operate in 2D or 3D) or Automatic (2D or 3D). Fix Mode is direct result from satellites in view, as well as their position in the sky.

2.2. Satellites Used: Satellites included in Fix and DOP (Dilution of Precision) calculation.

2.3. PDOP (Position Dilution of Precision), **HDOP** (Horizontal Dilution of Precision), **VDOP** (Vertical Dilution of Precision) - A Root Mean Square (RMS) measure of the effects that any given position solution geometry has on position errors. Geometry effects may be assessed in the local horizontal (HDOP), local vertical (VDOP) or three-dimensional position (PDOP) for example.

3. Coordinates, Time, Speed and Accuracy

Here are shown position attributes - Latitude, Longitude, Date, Time, Altitude, Accuracy, Speed and Course. Each reading is Fix Mode dependent i.e. better Fixation provides more accurate values.

4. GPS Flow

Tiny information passing through GPS messages.

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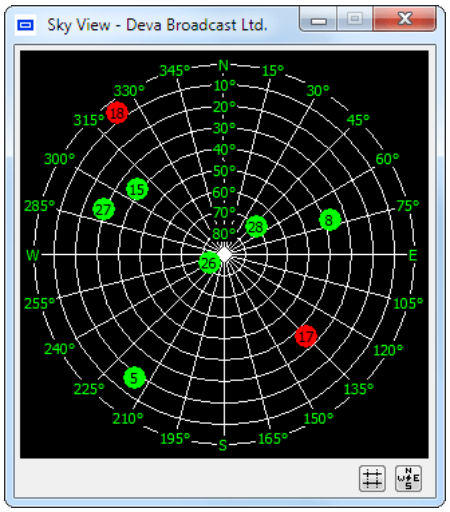
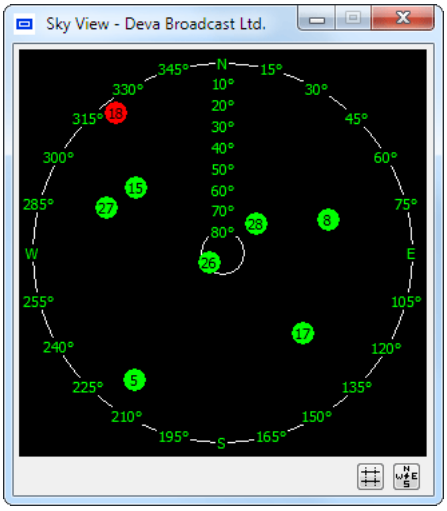
SKY VIEW

Sky View - the visual representation of the satellites in view. This is an alternative representation of **Satellites in View**. Every satellite is represented as a 2D point in space, according to Elevation, Azimuth and signal quality of the satellite. **Sky View** gives a general idea of how satellites are scattered through the visible sky. The bigger the distance better the Dilution of Precision. Satellites with insufficient signal quality are colored in red.

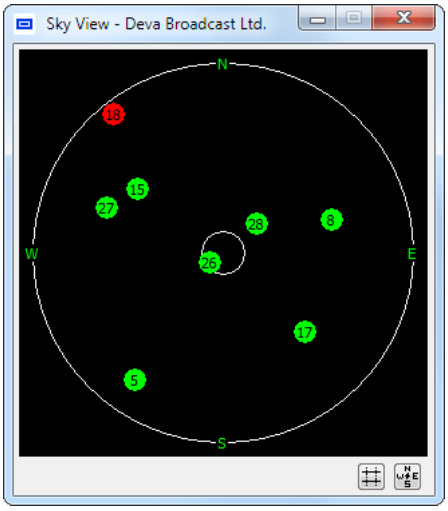


Two interactive buttons that will change the appearance of Sky View are also available.

The first one hides/shows the inner grid.



The second hides/shows azimuth and elevation labelling.

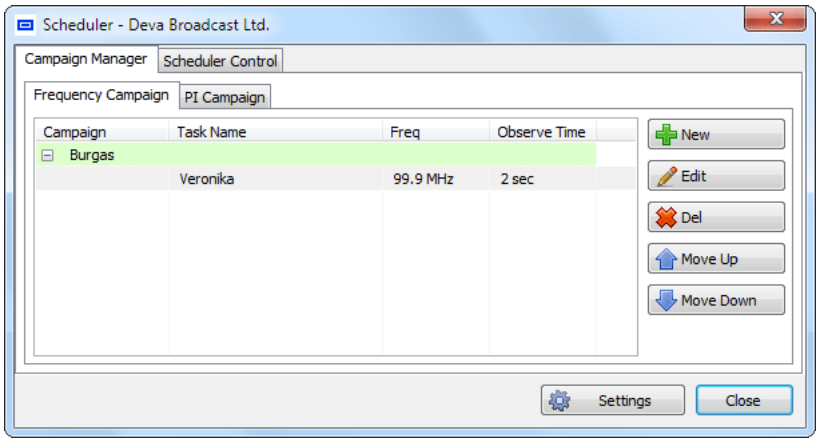


Scheduler

CAMPAIGN MANAGER

Campaign Manager is essential part of the Scheduler. Here all predefined Campaigns and their Tasks are set.

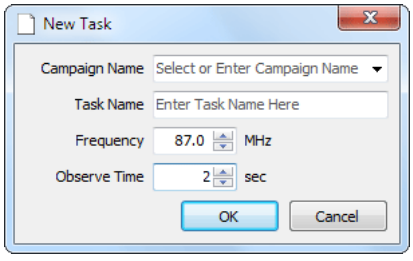
Frequency Campaign



The campaign set-up process is quire simplified and explained in details below:

1. Press [+ New] to create a new Campaign Task. A New Task window will appear;
2. Specify or select **Campaign Name** – this will be used to distinguish the campaigns from each other. If a campaign with the same name does not exist, it will be automatically created.
3. Specify **Task Name** – name of the radio for example;
4. **Frequency** – specify the frequency to be monitored;
5. **Observe Time** – set the desired observation time;
6. Press [OK] to save the changes.

IMPORTANT: The same procedure should be completed for each of the frequencies that are to be monitored in this campaign mode.



To edit Task/Campaign, select Task/Campaign from the list and press **Edit** button, or double-click on selection.

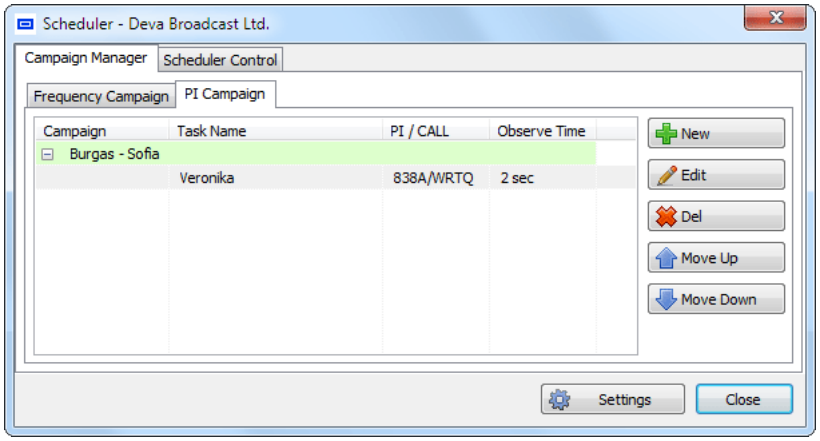
To remove Task/Campaign from the list, select Task/Campaign and press **Del** button.

WARNING: Campaign and its Tasks will be lost permanently and can not be undone.

To rearrange Task/Campaign position use **Move Up** and **Move Down** buttons respectively.

NOTE: Tasks sequence is strictly followed by the scheduler .

PI Campaign

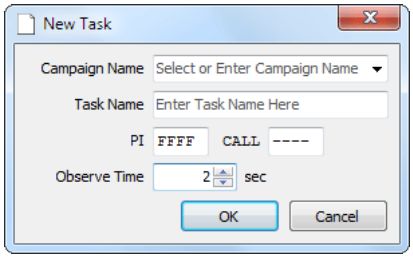


The campaign set-up process is quire simplified and explained in details below:

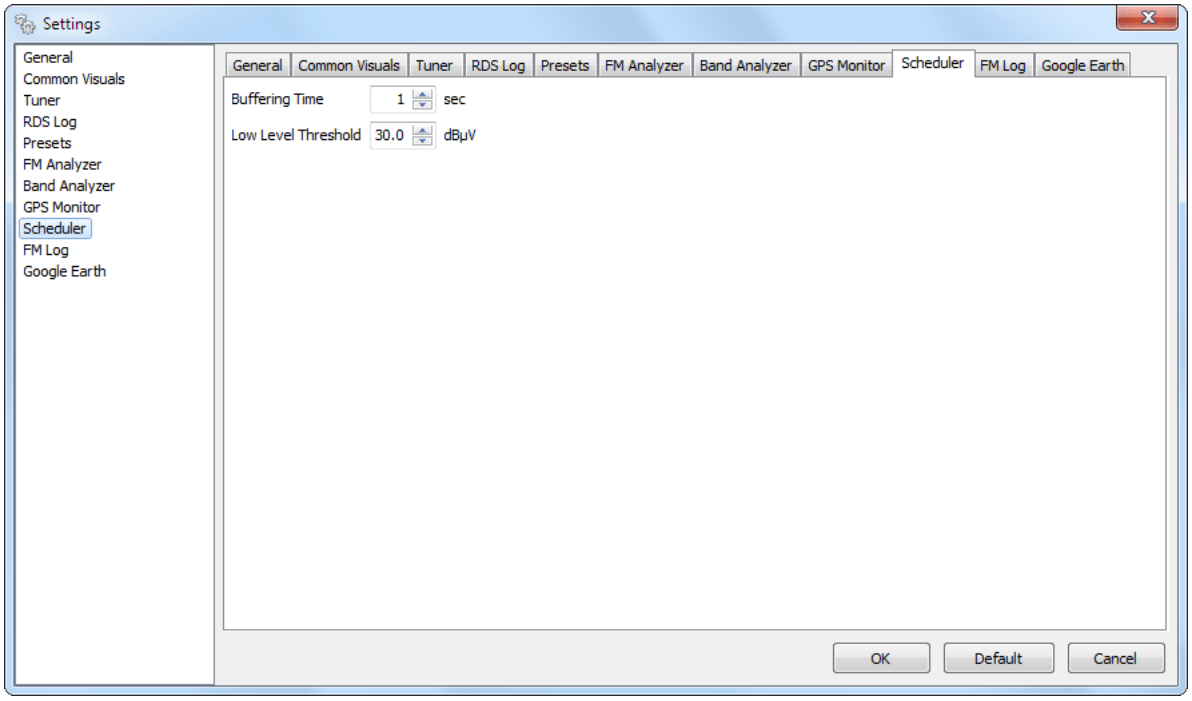
1. Press [+ New] to create a new Campaign Task. A New Task window will appear;
2. Specify or select **Campaign Name** – this will be used to distinguish the campaigns from each other. If a campaign with the same name does not exist, it will be automatically created.
3. Specify **Task Name** – name of the radio for example;
4. Specify **PI** or **CALL** sign of the channel to be monitored;
5. **Observe Time** – set the desired observation time;
6. Press [OK] to save the changes.

IMPORTANT: The same procedure should be completed for each of the frequencies that are to be monitored in this campaign mode.

NOTE: If you need to move a task from one campaign to another, select the task and press [Edit]. Then select the name of the campaign where you want to move it. **HAVE IN MIND** that it not allowed several tasks with one frequency or PI/CALL in a campaign to be added.



SCHEDULER SETTINGS



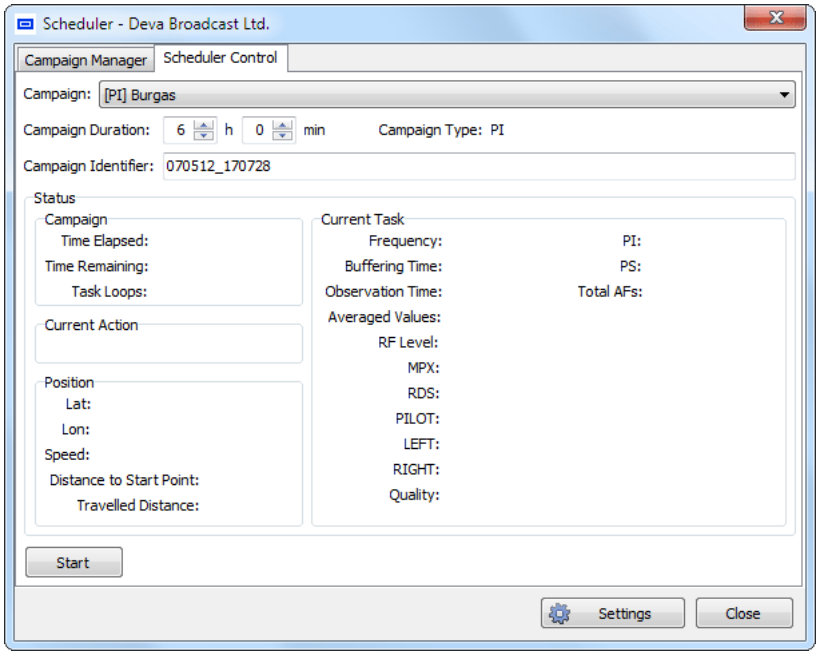
Allows you to apply the general settings related to the **Scheduler** option.

From here the **Buffering Time** and **Low Level Threshold** can be changed with user defined settings.

- **Buffering Time** – the time slot to elapse before switching to the next frequency.
- **Low Level Threshold** – The RF level below which the measurements during campaign are considered inaccurate.

SCHEDULER CONTROL

Scheduling is process where list of predefined Tasks is processed according user-defined rules.



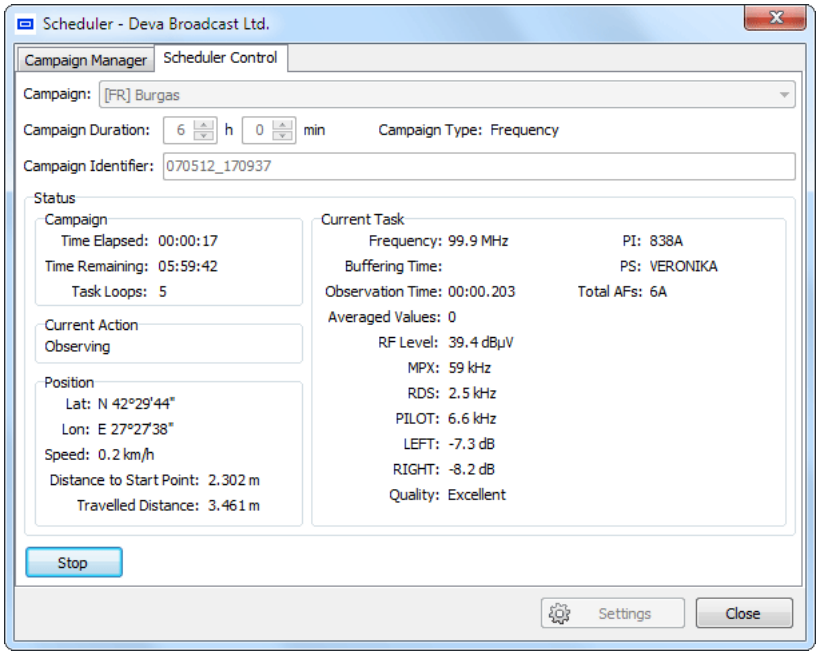
Select campaign from **Campaign** drop-down. The menu contains list of all predefined campaigns from Campaign Manager.

Campaign Duration defines duration of Scheduling Process up to 24 hours.

Campaign Identifier gives unique label/description for each scheduled campaign, which allows to distinguish identical campaigns. Software automatically assigns Identifier which includes current date and time.

To start Scheduling Process press **Start** button, which changes to **Stop** and allows to stop Scheduling Process at any time.

NOTE: Frequency Campaigns are marked with **[FR]** before their names, as well PI Campaigns wit **[PI]**.



While the Scheduler is in progress, the **Status** section is updated simultaneously. All status readings are self explanatory.

You will find below detailed explanation of the process:

Scheduling is repetitive task performed in accordance with the predefined Task List (Campaign). Tasks are picked one by one from the list and observed for defined time. Once the last task is reached and completed, the scheduler will revert back to the first Task and will continue the same loop until the Campaign Duration elapses.

Task observation is the inner process of scheduling and basically is defined by Frequency/PI and observation time. While observing, all FM, RDS and GPS parameters are monitored. When GPS position is changed or the observing ends, all parameters are recorded.

Right before the current task is completed and the new one is about to be started, the “switching” is activated (applicable for Frequency Campaigns only). Switching defines what actions should be taken when the RF Level is below the specified threshold, PI change or loss due to bad RDS reception. (see “Scheduler Settings” on page 75) There are several possible actions:

PI Search - When PI is lost (frequnecy is not known), Scheduler will perform fast Band Scan and will search the band for matching PI. This is rather slow process, but rarely executed (mandatory at the Scheduling Start)

AF Switch - if during observation Alternative Frequencies are received, they will be observed one by one. If some AF matches the current PI and has better RF Level, it will replace the current frequency in the task list. If there is more than one PI match, the one with strongest RF Level will be chosen.

NOTE: Do not burden PI Campaigns with long task lists. This may lead to significant increase in repetition time! (See Side Effects below)

IMPORTANT: It is possible to start Schedule with lack of Fixation but no data will be recorded until Fixation is reached.

To stop Scheduling Process press the [**Stop**] button or [**Close**] the scheduler.

SIDE EFFECTS

Following a succession of Tune-Check Position-Collect Data, Scheduling Process is quite simple, but combination of circumstances may lead to side effects:

- Lack of Fixation or Turned OFF GPS Receiver may produce empty Campaigns;

- Accuracy is bound up with DOP coefficients. High DOP usually lowers the Accuracy. While staying motionless, DOP may remain constant for very long period, but Scheduling is intended to be mobile. Spikes in resulting paths are consequence of low Accuracy, but inaccurate is only the GPS position;

- Scheduling Process strictly follows the Task Sequence defined in Campaign Manager. The design of Band Scanner GPS is intended for single-tune i.e. only one station at a time can be observed. Appending Tasks increase the total observation time, which defines the repetition time of every Task. AF observation during PI Campaings also have influence here, but it is variable. On the other hand, motion is assumed along with the observation. In conclusion - number of Tasks together with high speed brings proportional point-to-point gaps i.e. jagged path.

- '**Distance to Start Point**' is straight line between starting and current location in contrast to '**Travelled Distance**' which is sum of joined segments. While 'Travelled Distance' is always increased, 'Distance to Start Point' may increase and decrease. Don't confuse both of them, because their meanings are not equal.

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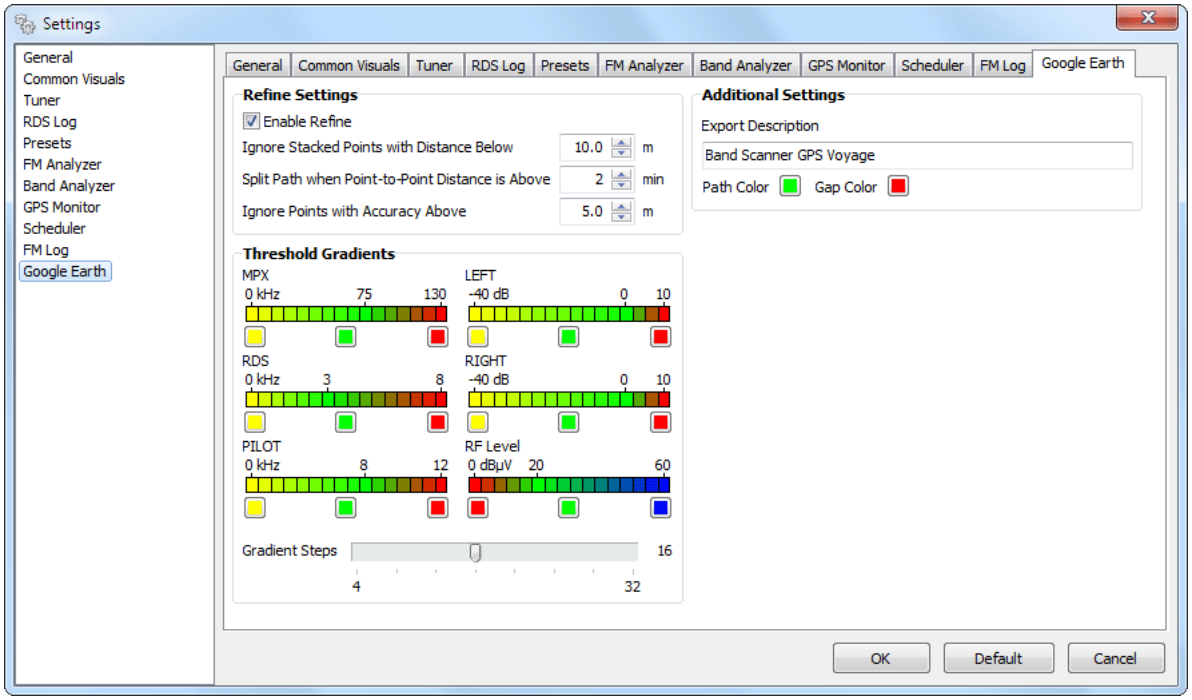
Visualisation in Google Earth

GOOGLE EARTH SETTINGS



Refine Settings:

Enable Refine - Enables refine settings to be applied with Visualisation in Google Earth.

Ignore Stacked Points with Distance Below - If the distance between two points is less than the one that is set, these two points will be converted into one.

Split Path when Point-to-Point Distance is Above - If the time between two points is greater than the one that is set, the covered distance between these two points is considered as unknown. The first point is regarded as the end of the present path and the second as a starting point of the next one.

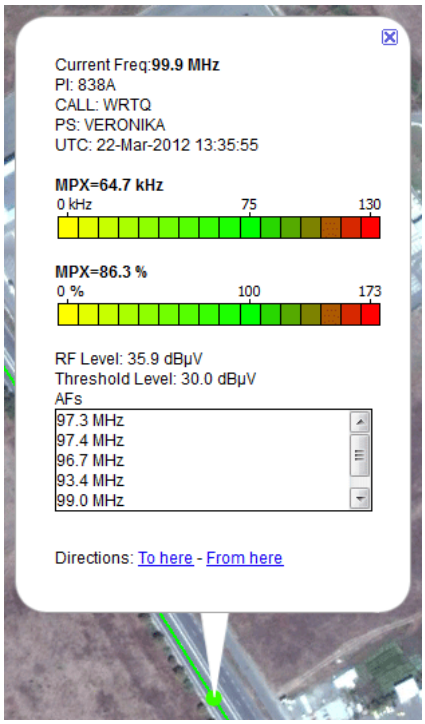
Ignore Points with Accuracy Above - Every recorded point has a corresponding accuracy value (See DOP). The Accuracy used here (as term) is not coefficient, it is deviation in length units. To eliminate inaccurate points, specify value closer to zero. Entering zero value will ignore Accuracy despite Enable Refine option.

Description - General description of the exported data, visible when Google Earth is opened.

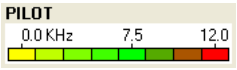
Path & Gap Color - Coloring of Paths and Gaps applicable to Google Earth and Quick Preview.

Threshold Gradients - Each measured value will be represented with colored point according to this gradients. Thresholds are constant according to broadcasting authorities and can't be changed. Every gradient is defined from three colors - left, transitional and right. Each color corresponds to thresholds above i.e. transitional color is not always in the center.

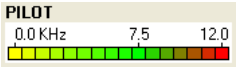
NOTE: Units for MPX, RDS and PILOT depend on Tuner Mode (RDS - KHz, RBDS - %) but while in Google Earth double-gradient will be exported:



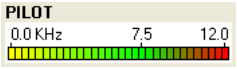
Gradients Steps - Value between 4 and 32, which defines granularity of the gradient:



- 8 steps



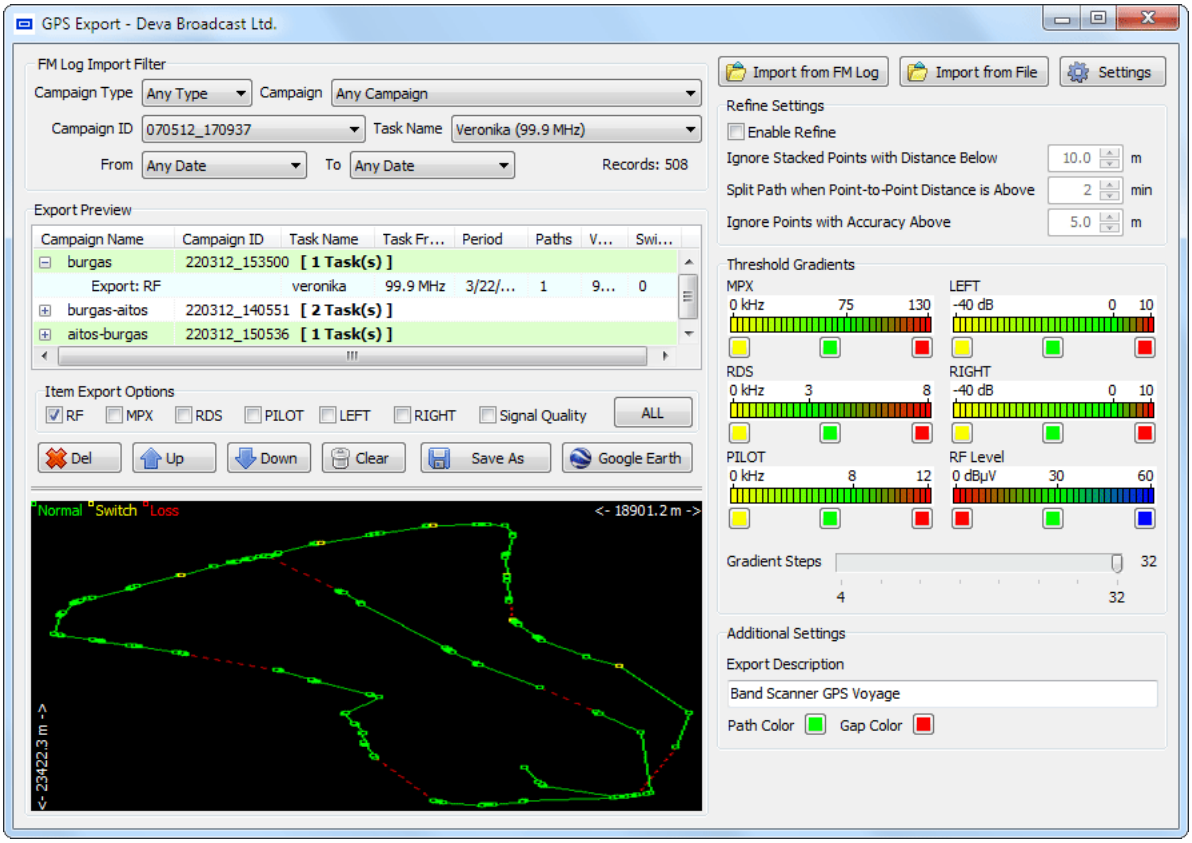
- 16 steps



- 32 steps

MEASUREMENTS VISUALISATION IN GOOGLE EARTH

This is intermediate point between Band Scanner GPS and Google Earth.



Refine Settings & Threshold Gradients refer to "Google Earth Settings".

FM Log Import Filter acts like FM Log View.

Import from FM Log - imports all available data accroding to *FM Log Import Filter*.

Import from File - imports data from previously exported Campaigns.

Export Preview is List of Tasks and Campaigns for visualisation in Google Earth as well as in Quick Preview. List gathers essential information as Task Name, Task Frequency/PI, Period of Observation, Paths, Valid Points (regarding Refine Settings) and Switching Points. Selecting Item from List shows brief representation in Quick Preview which is close enough to Google Earth.

To **Remove Item** from List - select desired Item and press **Del** button.

To **Clear** entire List press **Clear** button.

Rearrange Campaigns/Tasks using **Up** and **Down** buttons respectively.

Quick Preview auto calculates distance between outermost points along the horizontal and vertical axis. Each point is represented with small square. Paths are drawn as solid lines. Gaps are drawn as dashed lines. Paths and Gaps are colored according"Google Earth Settings".

To Save all items available in Export Preview press **Save As** button. Type in desired name or leave default one, which is formed from current date and time. Pressing **Save** button Google Earth file is saved and will be available for future use. Saved files are intended for use exclusively with Google Earth refer to "Look and Feel Google Earth" for detailed explanation of their purpose.

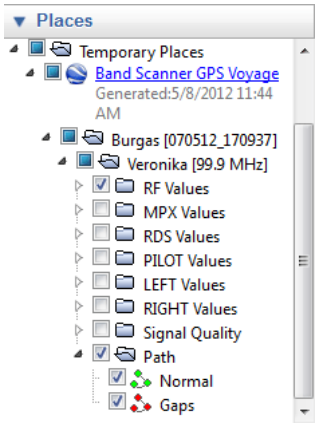
Pressing the **Google Earth** button will start Google Earth Software (if installed) preloaded with auto-generated file of current Export Preview.

LOOK AND FEEL GOOGLE EARTH

NOTE: This chapter is not intended to explain how Google Earth Software works, but to guide your experience with it.

Supposing you have Google Earth installed and pre-genareted .KMZ file is opened (see "Measurements Visualisation in Google Earth" on page 81).

On Sidebar under *Places Panel* you'll find folder named exactly as defined in Description within our "Google Earth Settings". Beneath the name is Date of Generation.

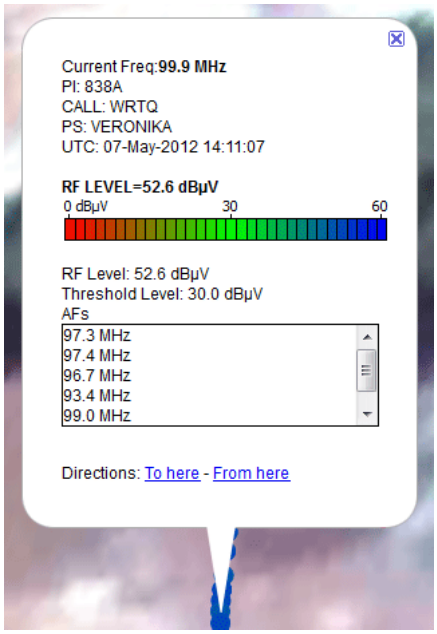


Subfolders are named in accordance with the information they contain, and allow to selectively arrange visibility of the data available. Each Task folder is denoted with Observed Frequency/PI and contains selected FM parameters as well as traversed path. When multiple Tasks are available, only the first one is selected so that visual overlapping could be prevented. This is not a restriction but for convenience. Path and first of the exported parameters are also auto-selected. Keep in mind that visual overlapping follows the folder order e.g. Path is always beneath others.

Regardless of path visibility, Values alone forms the path itself.

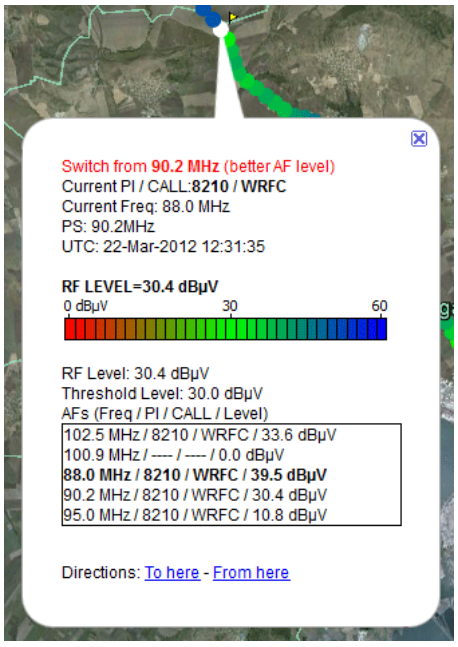
While examining points, Data Coloring takes its place. As individual every Point is Color-Coded according to Value measured and gives fast perception about parameter's condition. As group of Points Color-Coding represents per-area affect of the parameter.

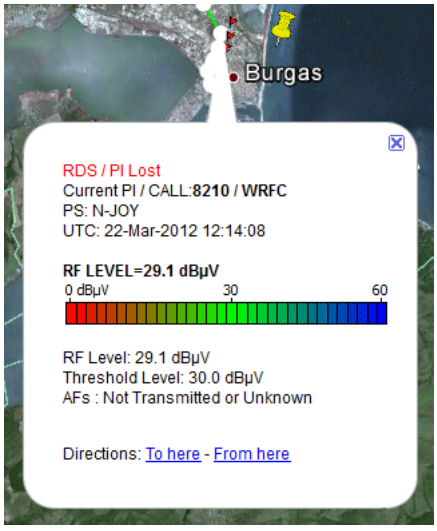
Each point can be examined upon clicking on it:



Information related to observation conditions is contained into pop-up balloon. Frequency, Date/Time of observation and actual value together with Color-Coding legend are shown.

There are two additional points which do not follow color-coding and are related to switch conditions. When during campaign there is a frequency switch white point with yellow flag will be displayed. When PI/RDS switch occurs, white point with red flag is displayed:





Additionally, each switch point represents switch information and conditions.

Detailed manipulations with Points, Paths, Time Slices and Google Earth Software as a whole different software product will not be discussed further. To obtain help and copy of Google Earth visiti Google Earth Website.

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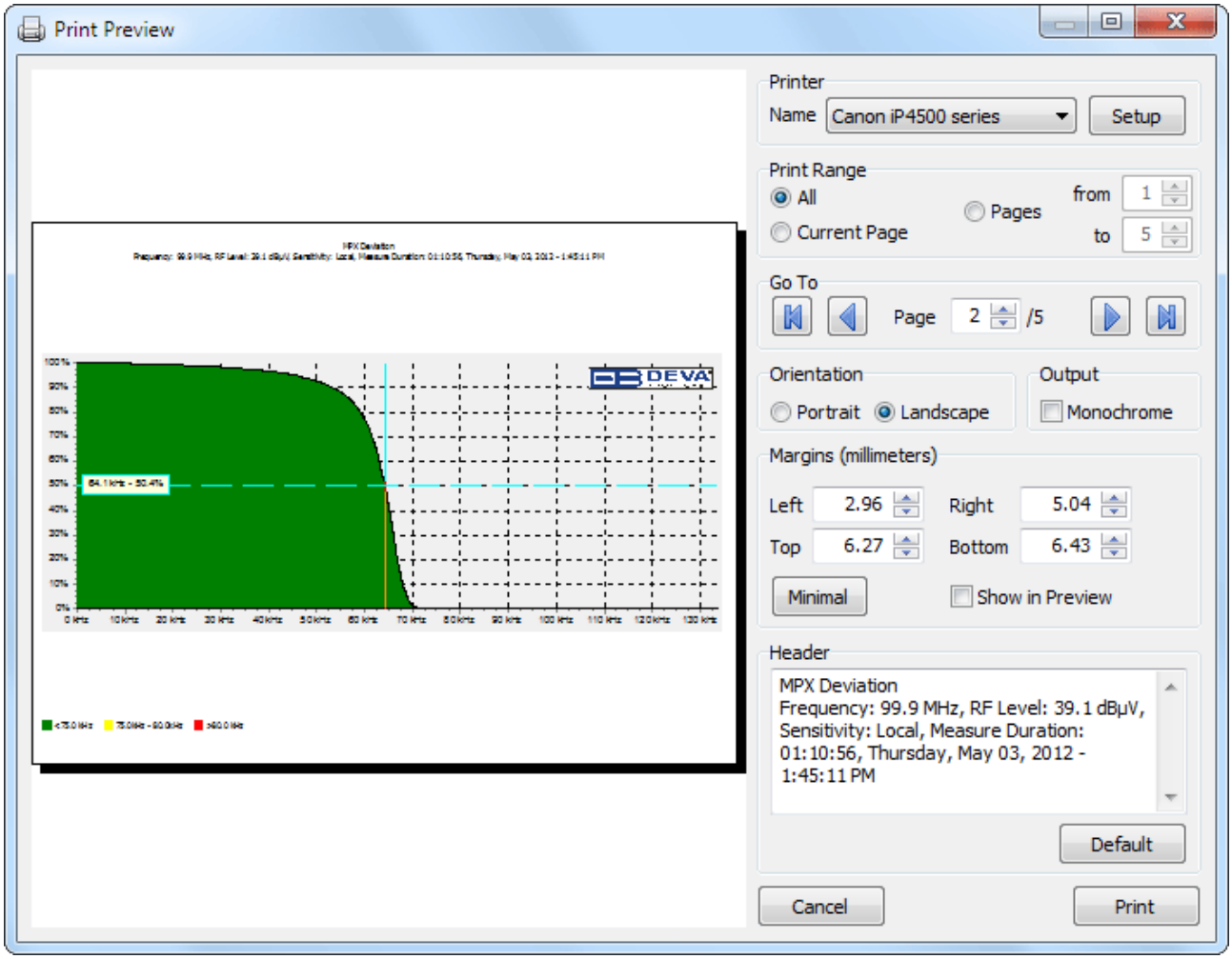
Print Capabilities



Dialog content differs from tool to tool but functionality remains the same.

Select the printer from the **Printer** drop-down. From the Setup button you can modify your Printer settings if necessary (paper size, orientation, etc.).

Print Range provides easy way to select only desired pages to be printed.

From **Go To** section can be changed currently previewed page.

Output can be set to **Monochrome** independently of printer capabilities and will automatically convert the graphic(s) from color to monochrome.

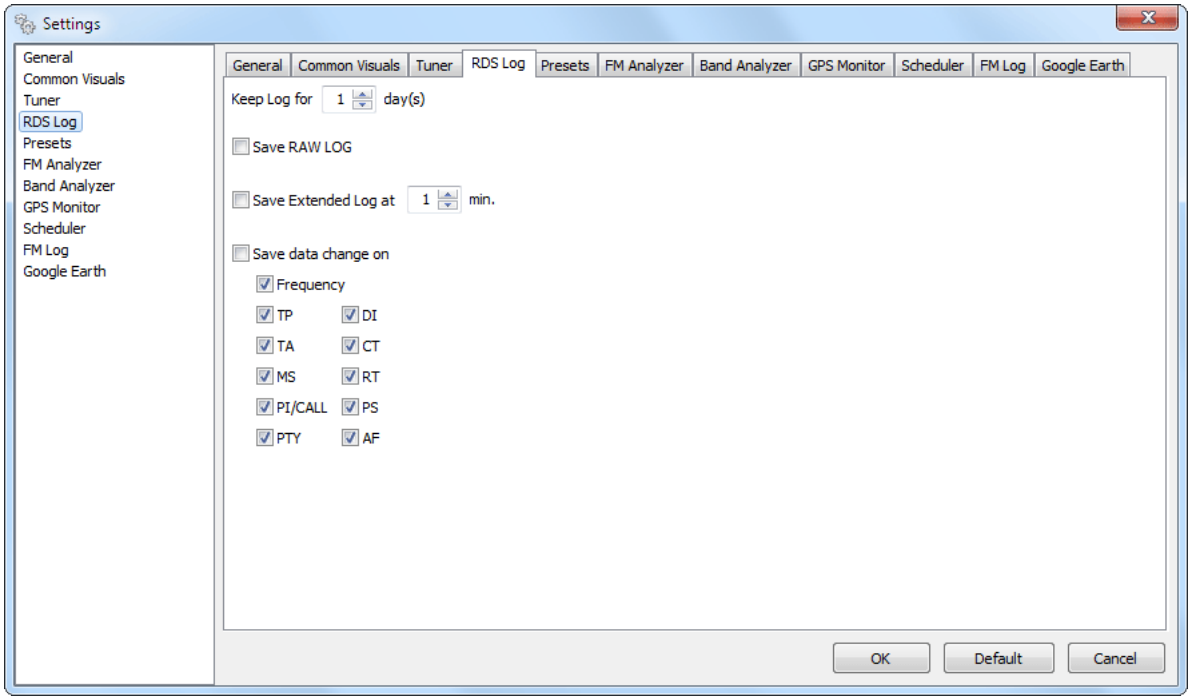
Margins allow to predefine reserved white space around graphic(s). Clicking on **Minimal** button will set margins to minimum allowed values for the printer selected. **Show in Preview** checkbox shows/hides margins in preview as dotted lines, but not include them in output.

Header can be altered into different fashions and restored to default by Default button.

After adjusting all of the properties you are able to print the graphic just by pressing the "**Print**" button.

Log Capabilities

RDS LOG SETTINGS



Keep Log – In this field you must select the length of the log in days. Maximum value: 30 days. Data older than the maximum assigned will be erased from the Log automatically (see "Automatic Log Maintenance" on page 94).

Save RAW Log – By selecting this option the saving of the RAW data stream will be enabled.
ATTENTION: "Save RAW Log" feature should be used only if is really necessary, because the RAW RDS data stream generates high capacity of stored data files. This may cause creating of big files and slowing down your PC functionality. This problem may occur when Minimal System Requirements are not covered or near minimum.

Save Extended Log – This option allows saving of the main RDS parameters and the tuner condition. The saving period may be changed up to 30 minutes.

Save data change on – Enabling this feature allows saving all of the changes, detected in listed parameters.

NOTE: In case of changing the working frequency or the input signal source, the "Change On" log conditions are reset and the incoming data will be treated as new.

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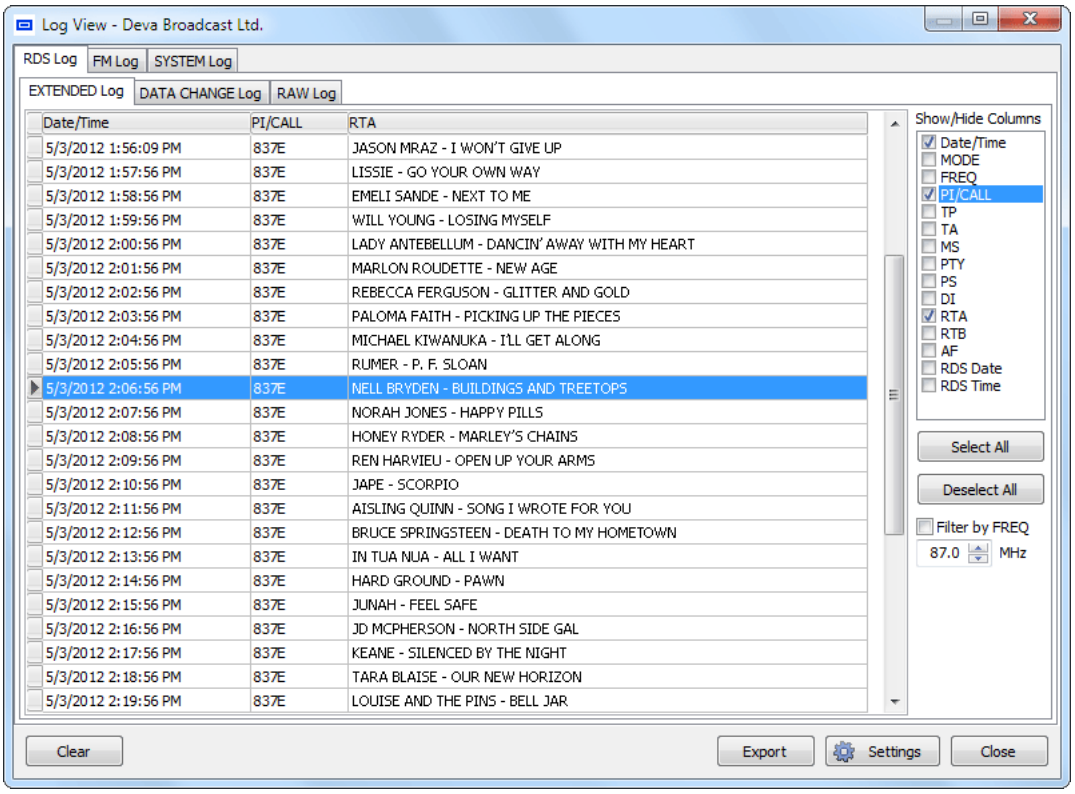
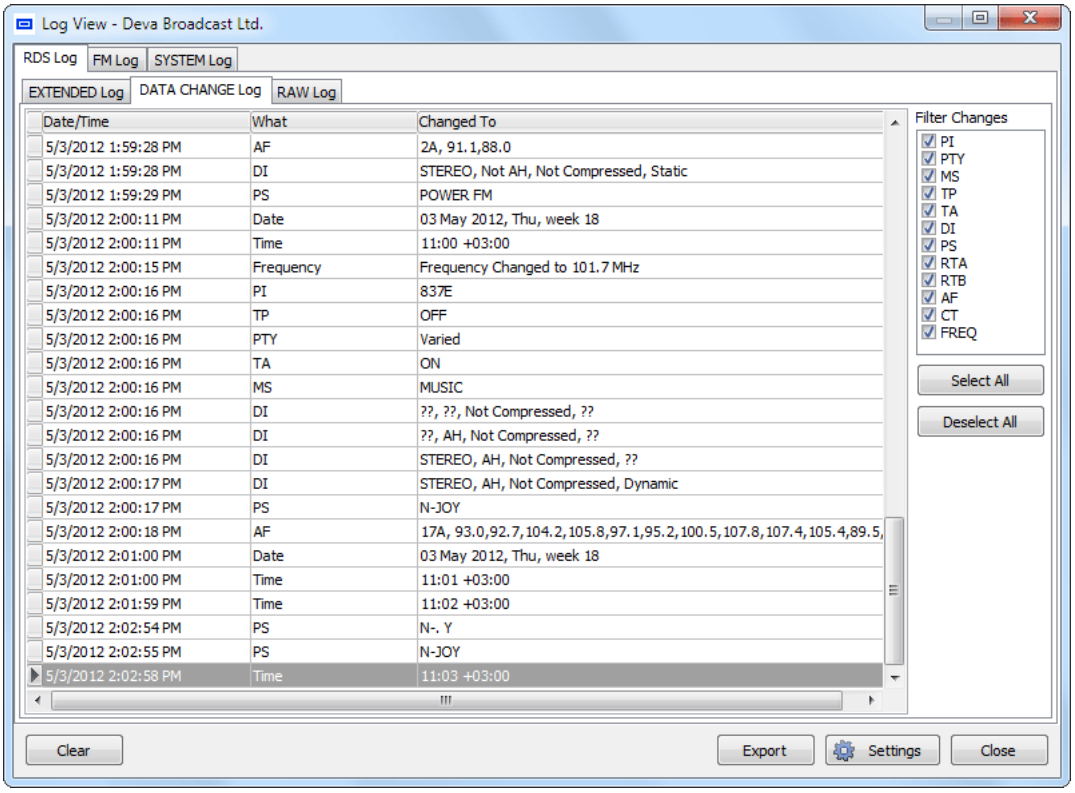
TRACKING THE HISTORY SAVED IN THE RDS LOG

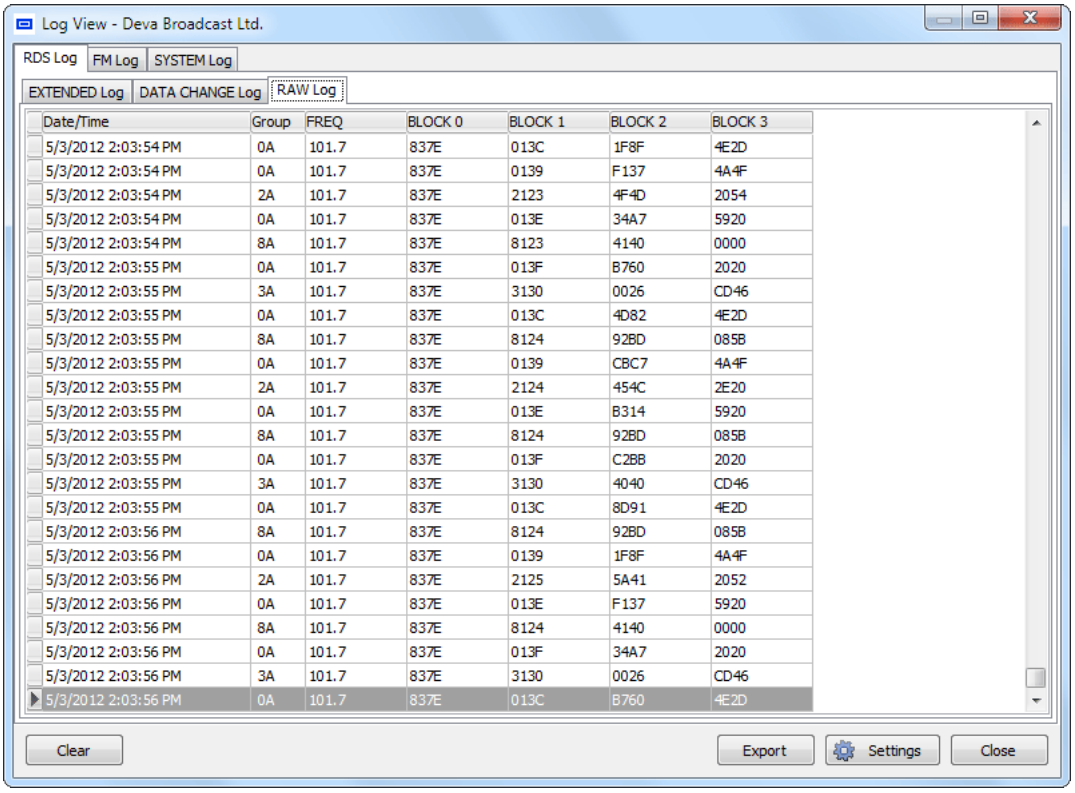
Using the LOG VIEW function allows the user to track and analyze all of the RDS data, saved in the history. Each one LOG provides access to all the actions and records accumulated by previously assigned schedule.



In the Extended Log sub window are listed main RDS parameters and tuner condition, saved at predefined period. In the right side are situated filtering options, allowing to choose preferred columns and frequency.



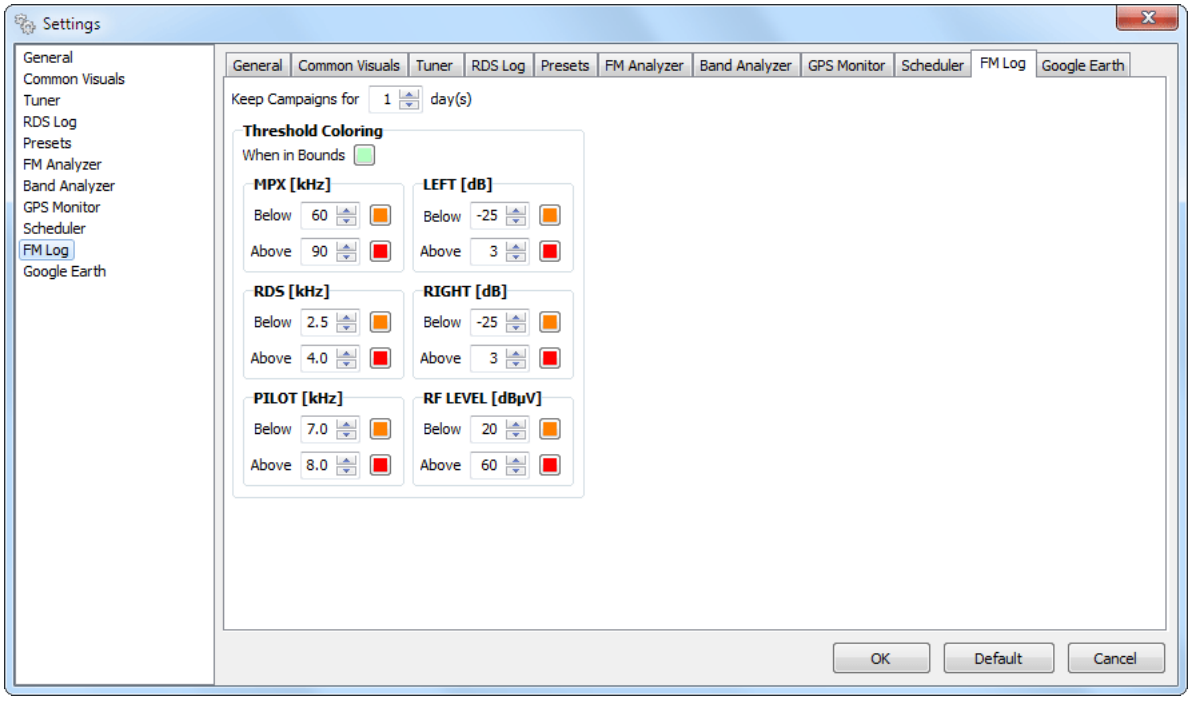
In the Data Change Log sub window are listed all occurred changes. In the right side are situated filtering options, allowing to choose which changes to be listed.



Date/Time	Group	FREQ	BLOCK 0	BLOCK 1	BLOCK 2	BLOCK 3
5/3/2012 2:03:54 PM	0A	101.7	837E	013C	1F8F	4E2D
5/3/2012 2:03:54 PM	0A	101.7	837E	0139	F137	4A4F
5/3/2012 2:03:54 PM	2A	101.7	837E	2123	4F4D	2054
5/3/2012 2:03:54 PM	0A	101.7	837E	013E	34A7	5920
5/3/2012 2:03:54 PM	8A	101.7	837E	8123	4140	0000
5/3/2012 2:03:55 PM	0A	101.7	837E	013F	B760	2020
5/3/2012 2:03:55 PM	3A	101.7	837E	3130	0026	CD46
5/3/2012 2:03:55 PM	0A	101.7	837E	013C	4D82	4E2D
5/3/2012 2:03:55 PM	8A	101.7	837E	8124	92BD	085B
5/3/2012 2:03:55 PM	0A	101.7	837E	0139	CBC7	4A4F
5/3/2012 2:03:55 PM	2A	101.7	837E	2124	454C	2E20
5/3/2012 2:03:55 PM	0A	101.7	837E	013E	B314	5920
5/3/2012 2:03:55 PM	8A	101.7	837E	8124	92BD	085B
5/3/2012 2:03:55 PM	0A	101.7	837E	013F	C2BB	2020
5/3/2012 2:03:55 PM	3A	101.7	837E	3130	4040	CD46
5/3/2012 2:03:55 PM	0A	101.7	837E	013C	8D91	4E2D
5/3/2012 2:03:56 PM	8A	101.7	837E	8124	92BD	085B
5/3/2012 2:03:56 PM	0A	101.7	837E	0139	1F8F	4A4F
5/3/2012 2:03:56 PM	2A	101.7	837E	2125	5A41	2052
5/3/2012 2:03:56 PM	0A	101.7	837E	013E	F137	5920
5/3/2012 2:03:56 PM	8A	101.7	837E	8124	4140	0000
5/3/2012 2:03:56 PM	0A	101.7	837E	013F	34A7	2020
5/3/2012 2:03:56 PM	3A	101.7	837E	3130	0026	CD46
5/3/2012 2:03:56 PM	0A	101.7	837E	013C	B760	4E2D

In the RAW Change Log sub window contains information on all the RAW data passed through. (see “Log Export” on page 93) (see also “Group Replayer”)

FM LOG SETTINGS

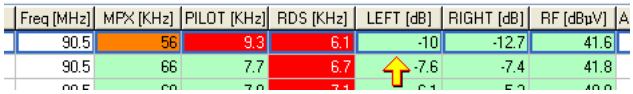


Keep Campaigns for – This field defines the time period (in days) for which the Campaigns in Log should be stored. Maximum value is 30 days. Data older than the maximum assigned period will be erased from the FM Log automatically (see “Automatic Log Maintenance” on page 94).

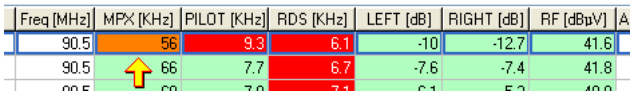
Thresholds - allows setting individual boundary for each measured parameter including color for border values.

NOTE: Thresholds are only for visual representation and don’t have influence elsewhere.

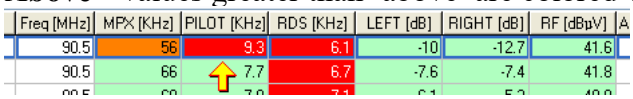
When in Bounds - Values greater than ‘below’ and lesser than ‘above’ are colored with selected color.



Below - Values lesser than ‘below’ are colored with selected color.

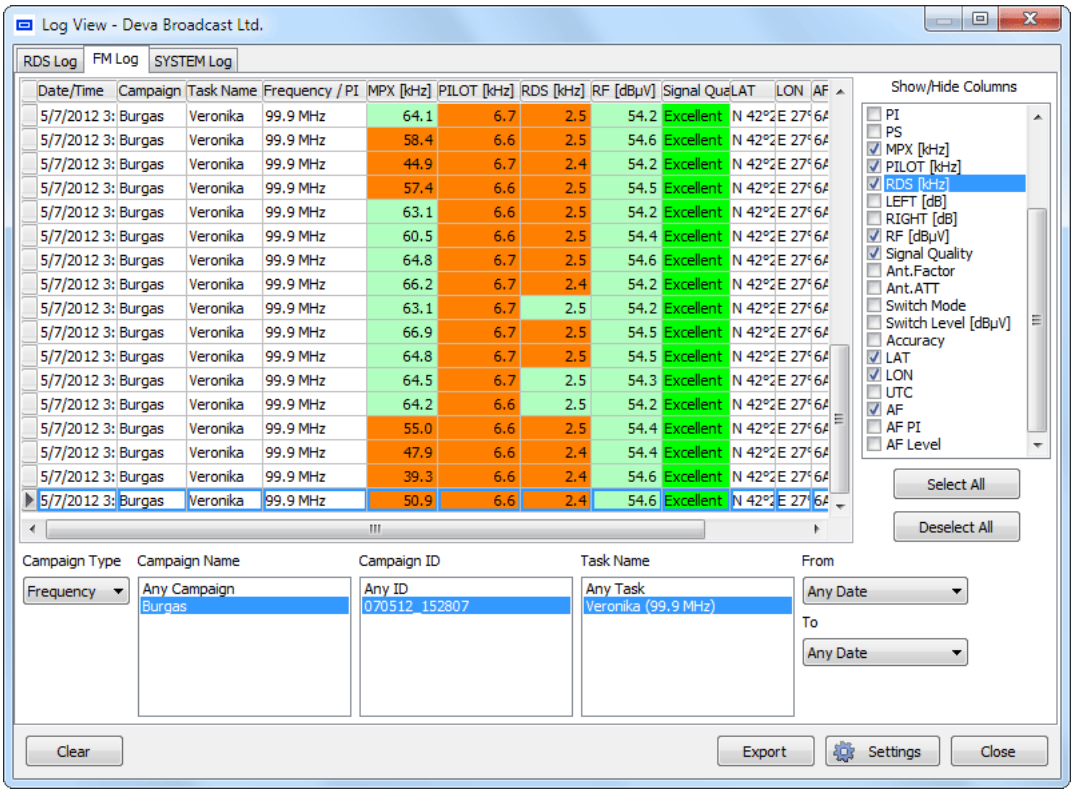


Above - Values greater than ‘above’ are colored with selected color.



NOTE: Units for MPX, RDS and PILOT depend on Tuner Mode (RDS - KHz, RBDS - %).

TRACKING THE HISTORY SAVED IN THE FM LOG



FM Log contains all data collected through Scheduling Process. At the bottom are situated refining controls which gives the possibility to extract necessary data.

Campaing Type - Exclude all Campaign Types from view except selected one. Selecting 'Any Type' shows all Types available.

Campaign Name - Exclude all Campaigns from view except selected one. Selecting 'Any Campaign' shows all Campaigns available.

Campaign ID - Exclude all IDs from view except selected one. Selecting 'Any ID' shows all IDs available within selection.

Task Name - Exclude all Tasks from view except selected one. Selecting 'Any Task' shows all Tasks available within selection (See notes below).

From - Exclude all records prior to selected date.

To - Exclude all records past selected date.

In the right side are situated filtering options, allowing to choose preferred columns.

Select/Deselect All buttons select/deselect all columns at once.

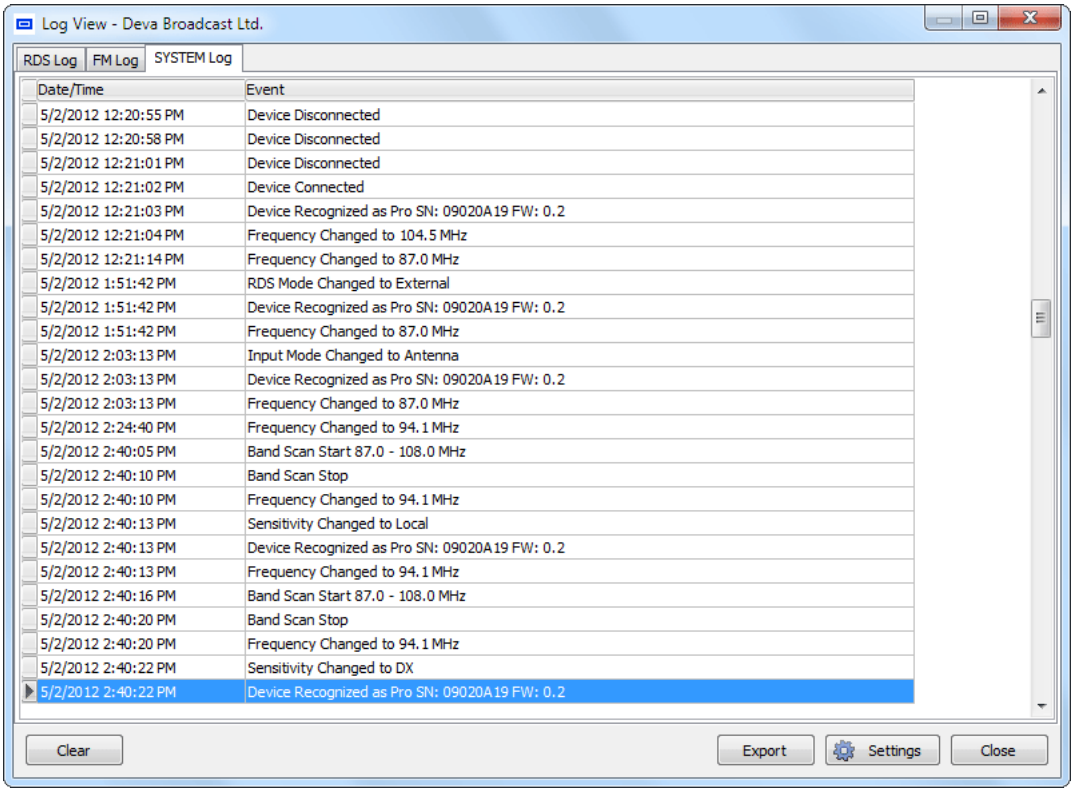
Export - Exports refined data for future use. (see "Log Export" on page 93)(see "Measurements Visualisation in Google Earth" on page 81).

Data Coloring. By coloring individual data cells it is possible to make fast conclusion which parameter is out of range (see "FM Log Settings" on page 90). Also, when exporting data to Google Earth, data coloring is applied too, but bounds are constant regarding broadcasting authorities.

Notes about Refining Back and Forth:

When refining data some strange behaviour may be experienced. This is because of indefinite property of refining controls and their close relation. Refining, especially when controls are set to 'Any' state, is obvious. Confusion comes when mixing indefinite with constant selections. Keep in mind that refining controls alter each other i.e. when changed they try to exclude redundant data from other controls. For example: selected Task for 'CMP 1' is 'Fr 99.9'. When selecting 'CMP 2', Task turns to 'Any'. Because 'CMP 2' don't include Task 'Fr 99.9', only choice remains 'Any', while trying to keep refining as close as possible. Sometimes given criteria may lead to non-existing result, nevertheless the software tries to grant only existing choices. To avoid confusion restore controls to 'Any' state and try not to mix mutually exclusive criteria.

TRACKING THE HISTORY SAVED IN THE SYSTEM LOG

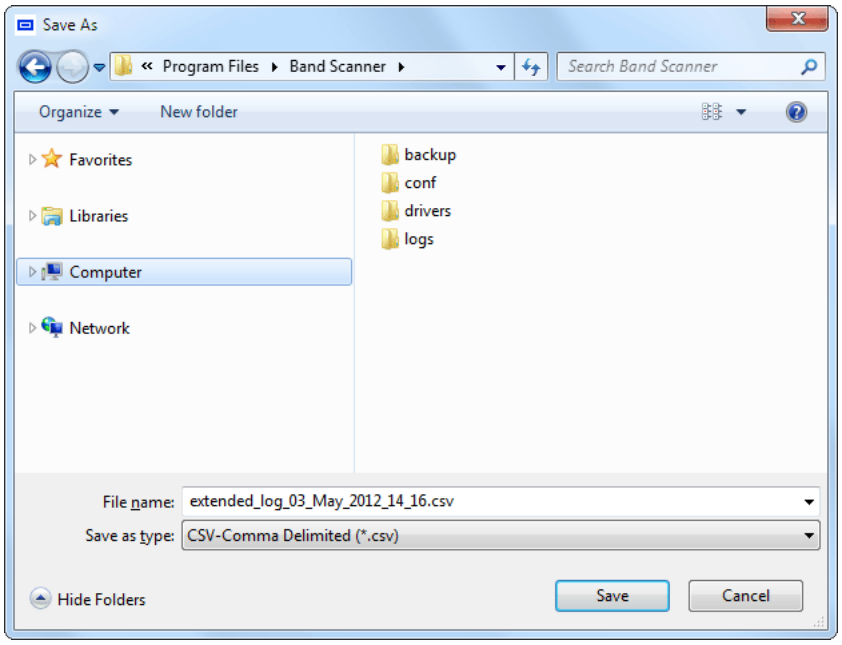


All the System messages carry information about the system's changes and have no direct influence on the RDS parameters reading.

LOG EXPORT

Regardless of type, all Logs could be exported to CSV (Comma Delimited) format (see "General Settings" on page 22) and can be opened and used with Microsoft Excel or any CSV-compatible software.

Clicking on [Export] will open 'Save As' dialog:



Exporting process automatically pre-generates suitable name, including type of log and current date.

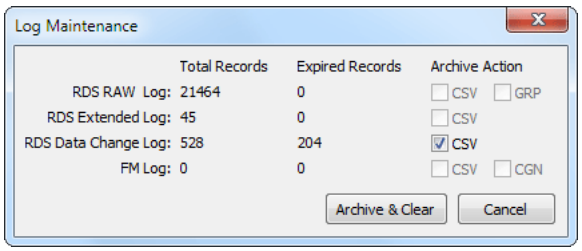
Additionally RAW Log can be saved as proprietary GRP format applicable into "Group Replayer" Tool. FM Log can be saved as proprietary CGN format for use in Measurements Visualisation in Google Earth.

NOTE: Erasing or modifying of the exported files do not cause any influence to the normal program execution.

AUTOMATIC LOG MAINTENANCE

Upon startup the Band Scanner Software performs automatic check of log retention depending on Log Settings. This helps to “fight” the log pile-up and at the same time offers possibility to backup the expired records in safe manner.

When expired records are found the following window will appear:



To Archive/Backup (and Clear afterwards) expired records, just select the suitable format for archive action and click on “Archive & Clear” button. If not sure or need to delay the maintenance process, simple click the “Cancel” button.

Backup files could be found under the “backup” folder, which resides inside the software installation (typically: C:\Program Files\Band Scanner\backup).

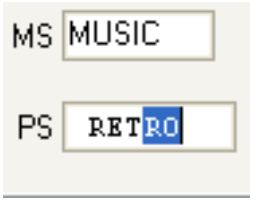
Specialities

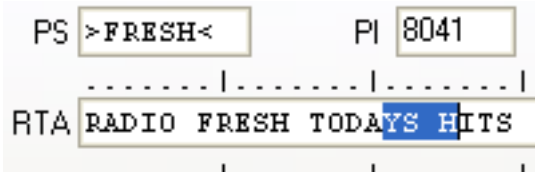
MAIN-PS OR 0AB-PS

Band Scanner program vizualizes PS in 2 different places - “Main” tab and “0AB” tab. At first glance, there is nothing in particular, but the difference is significant and may cause some misleadings!

In “Main” tab PS is visualized by “Whole PS” rule. “Whole PS” means that between 1-st and 8-th symbol there are no breakings. Even 1 missed symbol causes the rule to be wrong. This rule is used also when detecting “Change On”.

In “0AB” tab “Whole PS” rule has no use - every arrived PS symbol is visualized, no matter of the previous one or its place. Clicking inside the PS field you will notice that selection moves across the field, indicating where the current symbols were inserted. Same “selection crawl” can be found on “Main” tab along with both RT fields.





NOTE: In case the RDS stream is coming with errors, the “Whole PS” rule will be wrong at most of the cases, even PS may not be shown at all.

WHERE MY ALTERNATIVE FREQUENCIES GONE?

Sometimes the AF List on “Main” tab is constantly empty. To find them, open the “0AB” tab and find the AF Analyzer Tool. There may be a lot of reasons why this happens, but the most common ones are:

A) The tuned station doesn’t transmit AF and/or there are no “Declared AF”.

B) The program can’t “catch” all AF repetitions (errors in the stream). But AF Analyzer reports some readings. First the number of AFs must be transmitted (declared) followed by the AFs as described in the RDS/RBDS Standard. In this case the announced number of AFs doesn’t cover the received AFs, thus the program can’t specify the full AF List and indicates nothing.

APPENDIX A

RDS: EUROPE VS AMERICA

The European Broadcasting Union (EBU) and its member countries originated the concept of "Radio Data" transmission. The European RDS specification, CENELEC Standard EN50067, was first published in 1984. 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 radio data subcarrier.

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

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

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

The European concept of a service area equates to the US broadcaster's market. The subtle difference between these designations further characterizes broadcasting practices and ethics. RDS benefits the European broadcaster through almost an altruistic endeavor to be of service to his listeners. The US broadcaster is marketing his programming and is primarily interested in how he can create additional revenue from RDS.

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, yet it is quite robust because of data redundancy and effective error correction.

It is not within the scope of this Manual to cover the details of RDS subcarrier coding and modulation. For this, the reader is directed to the Specification appropriate to his location either the CENELEC EN50067 Specification for Europe or the United States NRSC Specification. Since the Manual will deal with specific implication of RDS implemented with the Band Scanner GPS, it is assumed that the user is familiar with the RDS concept.

APPENDIX B

RDS APPLICATIONS SUPPORTED

Following is an alphabetical list of the RDS applications supported by Band Scanner GPS. The standardized RDS application abbreviation is followed by an expansion of the application name and a short explanation of the function.

AF

List of Alternative Frequencies: In order holes in the coverage area to be filled, list of all frequencies where identical program could be heard simultaneously can be included by the network broadcaster or one with low-power rebroadcast transmitters (translators). The RDS receiver (particularlythe upscale car radio) constantly searches for the best signal that carries the same program. The radio will re-tune without noticeable interruption, when a better signal is found. The principal utility of this RDS function is with European radio networks and US stations with 'translators.'

CT

Clock Time and date: Time and date codes should use Coordinated Universal Time (UTC) and Modified Julian Day (MJD). If MJD = 0, the receiver should not be updated. The listener, however, will not use this information directly and the conversion to local time and date will be made in the receiver's circuitry. CT is used as time stamp by various RDS applications and thus it must be accurate.

DI

Decoder Information: This is one of several 'flags' that convey yes/no or other very basic data. This flag helps the receiver to indicate whether the broadcast is monaural or is 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.

ECC

Extended Country Code: RDS uses its own country codes. The first most significant bits of the PI code carry the RDS country code. The four bit coding structure only permits the definition of 15 different codes, 1 to F (hex). Since there are much more countries to be identified, some countries have to share the same code which does not permit unique identification. Hence there is the need to use the Extended Country Code which is transmitted in Variant 0 of Block 3 in type 1A groups and together with the country identification in bits b15 to b12 of the PI code render a unique combination. The ECC consists of eight bits.

EON

Enhanced Other Networks information: This feature can be used to update the information stored in a receiver about program services other than the one received. The alternative frequencies-PS name, Traffic Program and Traffic Announcement identification as well as Program Type and Program Item Number information can be transmitted for each other service. The relation to the corresponding program is established by means of the relevant Program Identification. Linkage information, consisting of four data elements, provides the means by which several program services may be treated by the receiver as a single service during times a common program is carried. Linkage information also provides a mechanism to signal an extended set of related services.

EWS

Emergency Warning System: The EWS is intended to provide coding for warning messages. These messages will be broadcasted only in case of emergency and will be evaluated by special receivers.

IH

In House application: This refers to data to be decoded only by the operator. Some examples noted are identification of transmission origin, remote switching of networks and paging of staff. The applications of coding may be decided by each operator itself.

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.

ODA

Open Data Applications: The Open Data Applications feature allows data applications, not previously specified in EN 50067, to be conveyed in a number of allocated groups in an RDS transmission. The allocated groups are indicated by using type 3A group which is used to identify to a receiver the data application in use in accordance with the registration details in the EBU/RDS Forum - Open Data Applications Directory and the NRSC Open Data Applications Directory.

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 authorities in most countries, but in the US it 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: The code enables the designed to use this feature receivers and recorders to respond to the preselected by the user program item(s).This feature is used via scheduled program time, to which in order to avoid ambiguity is added the day of the month.

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 the automobile receivers. Because of driving safety considerations broadcasters are generally discouraged from scrolling messages in this field.As a matter of fact, it is a violation of both the CENELEC and the NRSC standards to scroll the PS display, although the practice has become universally 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. A listing of the PTY categories is given in "PTY Code Description Used in RBDS Mode – North America" on page 101 and "PTY Code Description Used in RDS Mode – Europe, Asia" on page 102.

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

PTYN

Program TYpe Name: The PTYN feature allows the predefined by the RDS/RBDS Standard PTY to be further described using user-defined text (e.g. PTY=4: Sport and PTY=8: Football). The PTYN is not intended to change the default eight characters of PTY which will be used during search or wait modes. Its purpose is to show in details the program type once tuned to a program. If the broadcaster is satisfied with the default PTY name, it is not necessary to use additional data capacity for PTYN. The Program Type Name is not intended to be used for automatic PTY selection and must not be used for giving sequential information.

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 by pressing an INFO button on the receiver. This function is not available on many automobile radios for safety reasons, which has precipitated the frowned-upon practice of scrolling the PS field instead.

Most radios have limited alphanumeric display capability, so the 64 characters of RadioText march across the front panel, much akin those annoying LED advertising signs found in airport buses or fast food emporia. Like the scrolling-PS implementation, RadioText can announce song titles and performers, run special promotions or contests, or broadcast sponsors' messages.

RT+

RadioText Plus is “semantic analogue radio”. It allows the RDS feature RadioText (RT) to be read by the FM RDS receiving terminals. Based on the RDS RT messages, RT+ is completely backwards compatible with RT. The usage of RT+ allows the listener/user to derive additional benefits from the RDS Radio Text service. It enables FM RDS receivers to “read” Radio Text (to recognize designated objects and make them manageable) by user’s direct access to specific elements of the Radio Text messages. For example, that element could be programme associated metadata like Title and Artist of the currently playing song or a news headlines. This provides the listener with an “mp3-player feeling” while listening to analogue FM radio. The elements can also carry additional service messages or information about the Radio Station such as the telephone number or the web address of the Radio Station’s hotline. These objects, or more accurately RT+ information elements carried in the RDS RadioText (RT) messages, are identified by their location within the RT messages and by the class code of their content type. Once an information element is received and understood, a receiver is able to, for example, store the different RT+ information elements and the listener may then select and request a specific content type from the radio’s memory at an instant in time that suits the listener’s needs. Thus the listener is no longer forced to watch the RT information passing (scrolling) by. Moreover, RT+ offers selected RT message elements to car drivers on a static display, without risk of distracting the attention of the driver. Furthermore, RT+ is well suited for mobile phones with built-in FM receivers: telephone numbers can be directly used to initiate calls, and web addresses can be used to start browsing the web content offered by the radio programme provider. Last but not least, RT+ is also used for satellite radio broadcasting via DVB-S. It may be adopted by DRM and DAB in the future, too.

TA

Traffic Announcement: This is a temporary flag added to the RDS data stream only as a traffic bulletin is being aired. Some RDS car radios can be set to search for traffic bulletins among various TP stations (see TP below) while 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 temporarily switches-over to receive it. When the bulletin is finished, the receiver switches back to the original program, tape or CD.

TDC

Transparent Data Channels: The transparent data channels consist of 32 channels, which may be used to send any type of data.

TMC

Traffic Message Channel: This feature is intended to be used for the coded transmission of traffic information.

TP

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

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APPENDIX C.1

PTY Code Description Used in RBDS Mode – North America

PTY	Short Name	Description
1	News	News reports, either local or network in origin.
2	Information	Programming that is intended to impart advice.
3	Sports	Sports reporting, commentary, and/or live event coverage, either local or network in origin.
4	Talk	Call-in and/or interview talk shows either local or national in origin.
5	Rock	Album cuts.
6	Classic Rock	Rock oriented oldies, often mixed with hit oldies, from a decade or more ago.
7	Adult Hits	An up-tempo contemporary hits format with no hard rock and no rap.
8	Soft Rock	Album cuts with a generally soft tempo.
9	Top 40	Current hits, often encompassing a variety of rock styles.
10	Country	Country music, including contemporary and traditional styles.
11	Oldies	Popular music, usually rock, with 80% or greater non-current music.
12	Soft	A cross between adult hits and classical, primarily non-current softrock originals.
13	Nostalgia	Big-band music.
14	Jazz	Mostly instrumental, includes both traditional jazz and more modern “smooth jazz.”
15	Classical	Mostly instrumentals, usually orchestral or symphonic music.
16	Rhythm and Blues	A wide range of musical styles, often called “urban contemporary.”
17	Soft R and B	Rhythm and blues with a generally soft tempo.
18	Foreign Language	Any programming format in a language other than English.
19	Religious Music	Music programming with religious lyrics.
20	Religious Talk	Call-in shows, interview programs, etc. with a religious theme.
21	Personality	A radio show where the on-air personality is the main attraction.
22	Public	Programming that is supported by listeners and/or corporate sponsors instead of advertising.
23	College	Programming produced by a college or university radio station.
24	Spanish Talk	Call-in shows, interview programs, etc. in the Spanish language
25	Spanish Music	Music programming in the Spanish language
26	Hip-Hop	Popular music incorporating elements of rap, rhythm-and-blues, funk, and soul
27-28	Unassigned	
29	Weather	Weather forecasts or bulletins that are non-emergency in nature.
30	Emergency Test	Broadcast when testing emergency broadcast equipment or receivers. Not intended for searching or dynamic switching for consumer receivers. Receivers may, if desired, display “TEST” or “Emergency Test”.
31	Emergency	Emergency announcement made under exceptional circumstances to give warning of events causing danger of a general nature. Not to be used for searching - only used in a receiver for dynamic switching.

NOTE: These definitions can differ slightly between various language versions.

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APPENDIX C.2

PTY Code Description Used in RDS Mode – Europe, Asia

PTY	Short Name	Description
1	News	Short accounts of facts, events and publicly expressed views, reportage and actuality.
2	Current affairs	Topical program expanding or enlarging upon the news, generally in different presentation style or concept, including debate, or analysis.
3	Information	Program the purpose of which is to impart advice in the widest sense.
4	Sport	Program concerned with any aspect of sport.
5	Education	Program intended primarily to educate, of which the formal element is fundamental.
6	Drama	All radio plays and serials.
7	Culture	Programs concerned with any aspect of national or regional culture.
8	Science	Programs about the natural sciences and technology.
9	Varied	Used for mainly speech-based programs usually of light-entertainment nature, not covered by other categories. Examples include: quizzes, games, personality interviews.
10	Pop	Commercial music, which would generally be considered to be of current popular appeal, often featuring in current or recent record sales charts.
11	Rock	Contemporary modern music, usually written and performed by young musicians.
12	Easy Listening	Current contemporary music considered to be “easy-listening”, as opposed to Pop, Rock or Classical, or one of the specialized music styles, Jazz, Folk or Country. Music in this category is often but not always, vocal, and usually of short duration.
13	Light classics	Classical Musical for general, rather than specialist appreciation. Examples of music in this category are instrumental music, and vocal or choral works.
14	Serious classics	Performances of major orchestral works, symphonies, chamber music etc., and including Grand Opera.
15	Other music	Musical styles not fitting into any of the other categories. Particularly used for specialist music of which Rhythm & Blues and Reggae are examples.
16	Weather	Weather reports and forecasts and Meteorological information.
17	Finance	Stock Market reports, commerce, trading etc.
18	Children’s programs	For programs targeted at a young audience, primarily for entertainment and interest, rather than where the objective is to educate.
19	Social Affairs	Programs about people and things that influence them individually or in groups. Includes: sociology, history, geography, psychology and society.
20	Religion	Any aspect of beliefs and faiths, involving a God or Gods, the nature of existence and ethics.
21	Phone In	Involving members of the public expressing their views either by phone or at a public forum.
22	Travel	Features and programs concerned with travel to near and far destinations, package tours and travel ideas and opportunities. Not for use for Announcements about problems, delays, or roadworks affecting immediate travel where TP/TA should be used.
23	Leisure	Programs concerned with recreational activities in which the listener might participate. Examples include, Gardening, Fishing, Antique collecting, Cooking, Food & Wine etc.
24	Jazz Music	Polyphonic, syncopated music characterized by improvisation.
25	Country Music	Songs which originate from, or continue the musical tradition of the American Southern States. Characterized by a straightforward melody and narrative story line.
26	National Music	Current Popular Music of the Nation or Region in that country’s language, as opposed to International ‘Pop’ which is usually US or UK inspired and in English.
27	Oldies Music	Music from the so-called “golden age” of popular music.
28	Folk Music	Music which has its roots in the musical culture of a particular nation, usually played on acoustic instruments. The narrative or story may be based on historical events or people.
29	Documentary	Program concerned with factual matters, presented in an investigative style.
30	Alarm Test	Broadcast when testing emergency broadcast equipment or receivers. Not intended for searching or dynamic switching for consumer receivers.. Receivers may, if desired, display “TEST” or “Alarm Test”.
31	Alarm	Emergency announcement made under exceptional circumstances to give warning of events causing danger of a general nature. Not to be used for searching - only used in a receiver for dynamic switching.

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E-mail: office@devabroadcast.com ,Web: www.devabroadcast.com

WARRANTY TERMS AND CONDITIONS

I. TERMS OF SALE: DEVA Broadcast Ltd. 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 DEVA Broadcast Ltd.

A. The Warranty Registration Card supplied with this product must be completed and returned to DEVA Broadcast Ltd. 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 DEVA Broadcast Ltd.

C. This Warranty does not apply to damage caused by improper mains settings and/or power supply.

D. 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: DEVA Broadcast Ltd. products are warranted to be free from defects in materials and workmanship.

A. Any discrepancies noted within TWO YEARS of the date of delivery will be repaired free of charge, or the equipment will be replaced with a new or remanufactured product at DEVA Broadcast Ltd. option.

B. Parts and labor for factory repair required after the two-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 Material Authorization (RMA) number issued by DEVA Broadcast Ltd. prior to its return. An RMA 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 DEVA Broadcast Ltd. Shipping charges will be reimbursed for valid Warranty claims. Damage sustained as a result of improper packing for return to the factory is not covered under terms of the Warranty and may occasion additional charges.

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PRODUCT REGISTRATION CARD

• All fields are required, or warranty registration is invalid and void

Your Company Name_____

Contact_____

Address Line 1_____

Address Line 2_____

City_____

State/Province_____ ZIP/Postal Code_____

Country_____

E-mail_____ Phone_____ Fax_____

Which DEVA Broadcast Ltd. product did you purchase?_____

_____

_____

Product Serial #_____

Purchase date_____/_____/_____ Installation date_____/_____/_____

_____
Your signature*

*Signing this warranty registration form you are stating that all the information provided to DEVA Broadcast Ltd. are truth and correct. DEVA Broadcast Ltd. declines any responsibility for the provided information that could result in an immediate loss of warranty for the above specified product(s).

Privacy statement: DEVA Broadcast Ltd. will not share the personal information you provide on this card with any other parties.