RDSDX ver. 4.02a   (C) A.Vainio 2004-2006

About the RDSDX

RDSDX decodes and displays extended RDS information, which is normally not displayed by the receivers. This information can be used to identify stations and their locations. It is also possible to create a database of radio stations and the tuned station can be searched very quickly according to the frequency and received PI-code. You may also run this programme without a RDS tuner to use database alone.

Remote controlling of Sony ST-SE520, ST-SE700, ST-SA3ES, ST-SA5ES and Kenwood KT-6040 - type of receivers is also possible, if an external hardware based on PIC16F877-20/P –microcontroller was installed to the tuner.

This programme is completely FREEWARE for non-commercial use. You may make as many copies as you wish for your personal use, but selling or making any kind of profit by means of RDSDX or its accessories is strictly prohibited by the author. Public distribution using any kind of medias (CDs, WWW etc.) except http://home.scarlet.be/~wijnherm/ is also prohibited.

RDSDX software is provided "as-is". No warranty of any kind is expressed or implied.

Requirements

*Pentium-PC, 600 MHz or faster. Might operate on slower machines as well, but not tested.

    Due to comprehensive station lists, 600 MHz processor might not be fast enough.

    - Windows 98 or later

    - Display resolution at least 1024 x 768 pixels

    - Few Mb of free hard disk space (depending on the size of database)

    - COM-port for RDS implementation.

* RDS capable FM-tuner (for RDS implementation)

Installation

* Software

If you are updating from RDSDX versions 3.03 or lower to 4.00 or higher you must delete the registry entry of RDSDX under HKEY_CURRENT_USER -> Software -> AVA Production before launching the programme. Write down all selections from Options-Properties before deletion as the registry information will be lost. Run COM Selection -programme, if you are using COM2 as the RDS-port. Also copy the supplied programme LogConverter to the same directory where your loggings are located and launch the converter. Notice that number of countries in ListFiles has been increased from 170 to 242. Copy all missing files to the ListFiles -directory. After this you may launch the RDSDX 4.00.

If you are a new user then follow the instructions below:

Copy distributed file "RDSDX.exe" into any folder and "ListFiles" -folder containing database examples and Coordinates.txt into the same directory where "RDSDX.exe" locates. The directory tree should look like as an example below. Folders are bolded.

C:\

|

Programme Files

    +**RDSDX**

        + RDSDX.exe

        + **Maps**

            + World.bmp

        + **ListFiles**

            + ALB.lst

            + ALG.lst

            + AND.lst

            + Coordinates.txt

               …

        + **AddressURL**

+ ALB.adr

+ ALG.adr

+ AND.adr

…

Some other folders and files are generated by the programme during run-time.

Please notice that the programme writes to registers of the PC. You may find the writing by using "RegEdit" supplied with the OS. XP writes under
"HKEY_CURRENT_USER" - "Software" - "AVA Production" - "RDSDX".
Delete the register folder "AVA Production" as well as RDSDX folder on the hard disk to uninstall the programme.

* Hardware (RDS implementation)

No special hardware is needed for the RDS-interface. Parts needed are as follows:

- 2 x small signal NPN transistors (BC547 or equivalent)

- 2 x resistor 10k

- 2 x resistor 100k

You should do some minor modifications to your receiver to get RDS data out for the PC. These modifications are easy to do, but remember that modifying the receiver void its warranty.
Open the receiver's cover and locate RDS decoder IC.
The known RDS decoder ICs and pin connections are listed in an appendix.
Find out the +5V rail of the receiver (any point having constant voltage approx. +5V) or use +12V rail with a regulator to get +5V. Known connection points are listed in an appendix.

Follow the circuit diagram drawn below in "Hardware". Notice that both RDS-data and RDS-clock signals provided by the receiver are needed. Do not try to use "series -capacitors" -interface described in some publications as the interface!

The receiver might have other RDS decoder IC than SAA6579. RDS-clock pin has the voltage approx. 2.7V and the constant frequency of 1187.5 Hz. RDS-data pin has also the voltage approx. 2.7 V, but the frequency is variable due to its waveform.

Connect your radio and the PC together using shielded two-wire cable as described below.
The cable can be at least as long as 6 meters. However, shorter the cable - less interference from PC to the tuner. Author is using approx. 2 meter long cable between the receiver and PC. No interference whatsoever was noticed.

See chapter "Usage of the programme" for more information about configuration of the software.
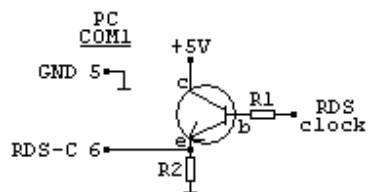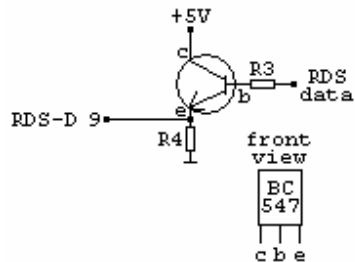
part list

R1, R3   10k

R2, R4   100k

Transistors BC547 or equiv.

The interface can also be replaced by two+two Hex Inverting Schmitt Triggers of MM74HC14 as described below in Hardware (remote control).

Follow Appendix A for RDS clock and RDS data connections to decoder IC.

* Hardware (remote control)

Millions of thanks to Arto Harjula (OH2BGN) for the idea to use a PIC 16F877 -microcontroller to sniff at the PLL-line of the receiver. The remote controller works in Sony ST-SE520, ST-SE700, ST-SA3ES, ST-SA5ES and Kenwood KT-6040 -type of receivers. It <u>might</u> work in other type of Sony receivers as well, but not tested. Currently only remote controlling from receiver side to PC is supported.
No interference from the board to receiver audio was noticed in Sony -environment, when the board was installed inside the receiver.
Unfortunately there were noticeable interferences in KT-6040, most probably due to inadequate shielding of the front end of the KT-6040, when board was tried to install inside the receiver.
However, it's verified by several users that installation to KT-6040 without any interferences is possible when board is installed outside the receiver into external enclosure.
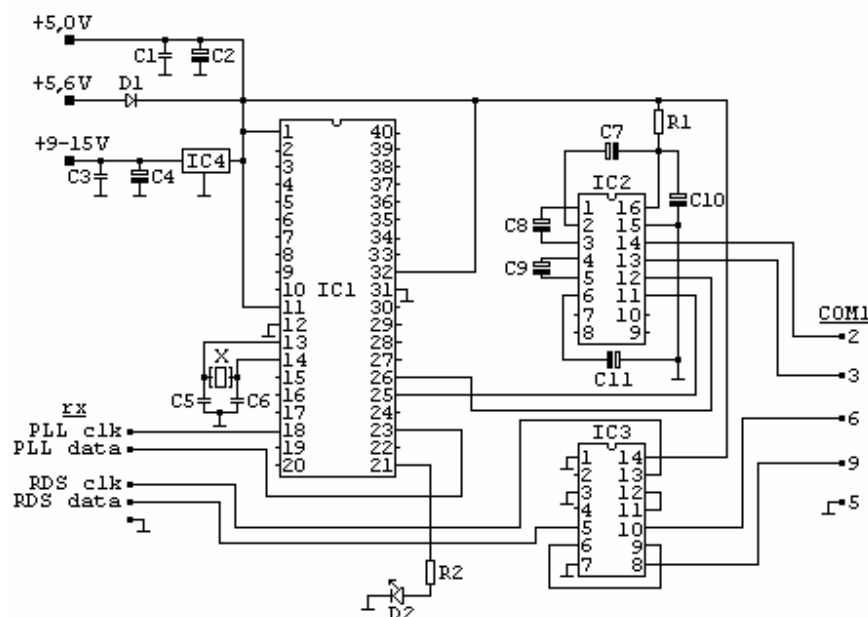
How-to instructions:

Program the PIC16F877-20/P –controller with the supplied hex -code "PicRDSDX.hex".
Notice that the controller must be "20 MHz " –type of controller.
Use 'HS' –option of the oscillator setting in the programmer, no Watchdog.
Build the hardware according the circuit diagram drawn below.

part list

IC1	PIC16F877-20/P	R1	22 ohm	C1, C3	100 nF
IC2	MAX232	R2	1 kohm	C2, C4	100 uF / 16V
IC3	74HC14	D1	1N4148	C5, C6	33 pF
IC4	78L05	D2	led, green or red	C7-C11	22uF / 16V

 X1 Crystal, 20 MHz

Connect the hardware inside the receiver or use external enclosure. It's almost a must to use power supply of the receiver to feed the board. The PLL circuitry of the receiver (in KT-6040) is blocked, if the board is connected to receiver, but the board has no voltage. This means that the tuner cannot be tuned, if the board has no voltage.

RDS interface IC3 can also be replaced by two transistor switches as described in Hardware (RDS implementation) above.

Try to maintain the supply voltage of IC1, IC2 and IC3 as close as +5,0 volts as possible.
There are three different voltage inputs in the circuit. Select the best for your needs.
It's recommended to use +5,6 volts -line in Sony, which can be found for example at IC801 pin5.
It's recommended to use +13 volts -line in KT-6040, which can be found at jumper W44 in Main Board. There is also another jumper W44 in Display Board, which should not be used as it's not carrying enough voltage.

Notice that the line of +5 volts in KT-6040 is alive even if the receiver has been switched off.

See Appendix C for PLL connections.

Pin 21 in microcontroller operates as "Heartbeat" changing its state from 5 volts to 0 volts and vice versa once in a second. You may omit components R2 and D2, if visible heartbeat is not needed.

Ready-made circuit boards for KT-6040 and Sony tuners mentioned above are available from the author Arno.Vainio@Luukku.com at reasonable prices.

* COM port selection

You may select the COM port before running RDSDX. Run the accessory program "COM Selection" and select the COM port you are going to use as RDS -interface. There is no need to run this program, if the default port of COM1 will be selected.

The value is saved to Windows registry. This means that you have to run this accessory program only once.

Files used or generated by the RDSDX

* Database files (*.lst)

Database files are located in a subfolder "ListFiles". There are currently 242 countries supported by the programme. The files have three letter identification mostly based on ITU abbreviations.
Edit the files for your needs as described. Below is a couple of lines from author's database file "FIN.lst".

```
              1           2           3           4           5

 1234567890123456789012345678901234567890123456789 0123

-----------------------------------------------------

  87.70 H 6201  30.000 KP01UG /    YLE1, Eurajoki

        H 6201   2.000 KP33OM      YLE1, Iisalmi
```

Exact column positions for each and every item are important to use! Do not use tabulator while writing a list. You may comment lines out by placing the character '!' to the column 1. Lines commented out are not loaded or handled by the programme.

Columns

1-6   Frequency of the station. Use ascending order of the frequencies in a list. Duplicate frequencies are not needed to write to keep the list more readable. The first column should be a space, if the frequency is less than 100.00 MHz.

7   Space

8   Polarization of the station. This might be any character.

9   Space

10-13   PI-code of the station, if known. Leave empty if the code is unknown.

14   Space

15-21   The power of the station in kWs

22   Space

23-28   This is the Maidenhead locator of the station. This field is calculated by the programme while selecting "Create Location List" based on the coordinates given in the "Coordinates" -file.

29   Space

30   The status of the station. This might be any character.
           The author is using following characters   / heard   x reported   O verified.

31-32   Reserved for future use.

33   Space

34   The name and location of the station separated by the comma and a space. This field length can be variable length. You might use several commas in the station name, but the location is taken from the last comma. Thus the following station name is valid having the location of "Köping".

```
89.00 H    0.250      JO89AM    Rix FM 106,1 Västerås, Köping
```

Use "Enter" at the end of the each line.
Remember to save your changes in TEXTMODE.
Do not try to use "Word 6.0" or other special formats!

* Coordinates file (Coordinates.txt)

This file is initially created by the programme while selecting the option "Create Location List".
Below are a couple of lines from the author's Coordinates -file:

```
         1         2         3         4         5         6

1234567890123456789012345678901234567890123456789012345678901

-------------------------------------------------------------

FIN Jyväskylä                       62 14N  25 50E  KP22WF

FIN Jyväskylän mlk                                  KP22

FIN Jämsä                           61 53N  25 10E  KP21OV
```

Columns 1 to 39 are created by the programme according to database files.

Columns 40 to 53 should be filled by the user. The coordinates are given in degrees and minutes, decimals are not allowed. Coordinates can be found for example in the book of maps.

Columns 54- are filled by the programme at the next time you select the option "Create Location List" according to the coordinates given. The locators are also written into the Database Files (FIN.lst etc.).

You may insert the locator by yourself, if you cannot find coordinates from any books. This area should be at least four (4) characters long. See an example "Jyväskylän mlk" above, which has no coordinates.

* Error file (Errors)

Four kinds of errors or warnings are listed while creating a Coordinates -file:

- "Missing station data" is given, if length of a line in any ".lst" -files is too short.

- "Missing comma" is given, if no comma is detected in a field of stations. This means that location can not be written into "Coordinates" -file.

- "Two commas detected" is given, if the line has at least two commas. This might not be an error as the line indeed might have two or more commas. However, the location is taken from the last comma.

- "Location too long" is given, if the location has more than 27 characters. Shorten the location in *.lst - file and run "Create Location Files" again.

Usage of the programme

* RDS data fields displayed by the programme

- PI	Programme Identification code
- ECC	Extended Country Code. Together with PI-code the exact country of origin can be identified.
- **PTY**	Programme Type code: displayed as 16 character string. The data is displayed either according to RDS- or U.S. RBDS-specification depending on Options - Properties - RDS - RDS type setting.
- PIN	Programme Item Number code
- PS	Programme Service code
	Historical Programme Services (though are against the RDS specification) can be checked on "View - PS & RT history".
- **CT**	Clock Time and Date code
- **TP**	Traffic Programme identification

- **TA**	Traffic Announcement identification
- MS	Music Speech switch
- **DI**	Decoder Identification and dynamic PTY indicator
- **Language**	Spoken language transmitted by the broadcaster
- AF	Alternative Frequencies list
- EON	Enhanced Other Networks information
- RT	Radio Text

There are many good sites in Internet explaining the meaning of the fields above.

* Other fields

- Country	Received country/countries based on either PI, CT or ECC.
- Based On	See country description above
- **FM mode**	Shows whether station is broadcasting in Stereo or Mono. In reality this value is not always correct, but the value taken from the PLL -data in Sony. The field is only displayed, if tuner type is "Sony" and "Show FM mode" has been checked.
- Ant	Shows which is the currently used antenna. The field is only displayed, if tuner type is "Sony ST-SE700", "Sony ST-SA3ES" or "Sony ST-SA5ES".
- **IF-filter**	Shows currently used IF-filter in "Sony ST-SE700", "Sony ST-SA3ES" or "Sony ST-SA5ES". The value is either "Wide" or "Narrow"
- **Attn**	Shows whether Attenuator has been set on in "Sony ST-SE700", "Sony ST-SA3ES" or "Sony ST-SA5ES".

- **Bearing and Distance:** Shows the bearing and distance to the selected station.

* Input fields

- Frequency	Received frequency given by the user. Either comma or dot can be used as decimal separator. Frequency can also be given without decimal separator. Thus the inputted frequency strings "102.3", "102,3" and "1023" all are considered as the frequency of 102.3 MHz. There is no need to click the 'Freq' -button as the new frequency can also be given directly from keyboard whenever the 'Freq' -button could be pressed. The first character must be either '8', '9' or '1'.

* Buttons

- Freq	Opens the window for inputting tuned frequency

- Find Stn	Searches the database through for matching PIs in the set frequency. Only active countries (See "Lists in Use", Options - Properties - Finder below) are searched, if the "Find Stn - Search all lists" is unchecked in Options - Finder. Otherwise whole database is searched through. The regional nibble of PI is removed (F202 can be considered as F402 etc).
- Find AFs	Searches the database through for matching PIs in all frequencies in AF-window. Only active countries (See "Lists in Use", Options - Properties - Finder below) are searched, if the "Find AFs - Search all lists" is unchecked in Options - Finder. Otherwise whole database is searched through. The regional nibble of PI is removed (F202 can be considered as F402 etc).
- Clear RDS	All RDS fields will be cleared
- AreaSize	Defines the size of the area search in Maidenhead locators when "Area" -header is pressed in Stations listbox. Selected station is in the middle of the area. The selection 'Map' can only be selected, if areas have been selected on Map display. See below the definition of Maidenhead Coordinates.
- FIN, SWE...	60 buttons can be defined in Options to get quick access to the favourite lists.
- Notes	Note -files for each country can be created, edited and viewed by this option. The file to be displayed is the one, which is the currently highlighted country in Stations Window. You may write information for example for local transmission times etc. into the file. A reminder (***** -characters next to the Notes -button) can optionally be set on or off from Options-Properties-Alarms-Notes reminder.
- Space	Frequency in the Freq -box is set to the next frequency of the currently displayed list. Space with Left Shift will tune to the previous frequency of the list. This works only, if tuner type has been set as "None".
- Enter	Frequency in the Freq -box is set to the frequency, where Enter -key was pressed. The option is in use only, if tuner type has been set as "None".

* List Boxes

- AF	The list of the same programme in the same or adjacent reception area. The list is sorted by the frequency.
- EON	The list of programme services other than the one received. This list is very useful, when deciding what station is the tuned one, if there is more than one station broadcasting same programme on the frequency. Received head frequency of the list is displayed on the left side of the box. There might be more than one list of frequencies. These lists can be scrolled by pressing the Freq -header button in the list box. PTY code is displayed as an eight character string. Depending on the screen resolution and OS you may have to set column sizes at the first time you are using the programme.

- RT   Radio Text, which is currently transmitted

                  - Line feed (0x0A) is shown as '¬'

                  - Carriage return (0x0D) is shown as '«'

                  Historical Radio Texts can be checked on "View - PS & RT history".

- Stations   The pre-defined list (initially FIN.lst) will be loaded to the box.

                  There are several options to sort stations from database to the box. You may
                  use following options by pressing the list header:

                  - Freq: All lists are searched to display stations in the selected frequency.

                  - PI: All lists are searched to display stations having the received PI-code

                  - ID: The defined list (country) will be displayed

                  - Station: All stations having the same prefix until first comma will be
                  displayed

                  - Power: Filters the list inside the preset PwrFilter -setting. This is only in use,
                  if Ctrl -key is pressed at the same time as the Power -header was selected. See
                  the Ctrl -key usage below.

                  - Area: All stations on the selected area (or surrounding areas defined by
                  AreaSize) are displayed.

                  - St (Status): All stations having a character in status column will be displayed.
                  You may use this selection to display all heard/reported stations. There are also
                  columns "dB" and "N" in the list box. These will be implemented in the future.
                  Depending on the screen resolution and OS you may have to set column sizes at
                  the first time you are using the programme.

Ctrl usage: Selections above are done from all active countries. However, you may reselect
                  stations from the currently displayed list by pressing and holding Ctrl-key at the
                  same time as headers are selected from the Stations Window. The selection is
                  then done from the displayed list. A couple of examples:

                  - Display all heard stations from Spain: Select ESP -list. Press and hold Ctrl-key
                  and select 'Status' -field from Stations Window.

                  - Display all 'YLEX' -stations from Finland having power equal or more than 10
                  kw: Select FIN -list. Move selection bar on top of any YLEX -station. Press and
                  hold Ctrl-key and select 'Station'. Press right button of the mouse and select
                  'Power Filter' and select the radio button 10.000- kW and select OK. Press and
                  hold Ctrl-key and select 'Pwr/kw'.

* Station Edit

The selected station data can be edited by clicking right button of the mouse on top of Stations listbox and selecting option 'Edit'. You may select this option also from the menu 'Edit' - 'Station Edit' or using Hotkey Ctrl-E. At the moment the main editing of database is meant to be done by other tools, for example by using Notepad. However, you may change the station's status or add PI-codes of heard stations easily by selecting this option. Changing PI-code in the editing window allow you to select, if the PI-code is set only to changed item or all stations having same prefix. Using this option is highly recommended when you are filling PI-codes first time to the database.

The great circle distance as well as theoretical antenna direction to the selected station are also displayed on the editing window. Added Web- and street addresses for each station are written into folder "AddressURL". The station should be considered as the string in front of the last comma in the station's name.

Local time of the station is also shown. The time can only be displayed, if the country has only one time zone. Russian, Canadian and the States times are also shown based on the regions, provinces and states respectively.

* Maps

The selected station can be displayed on a map by clicking right button of the mouse on top of Stations list box and selecting option 'Show on map'. The station's location is shown with a small red dot on the map. Currently only European and North African maps are drawn.

You may also select areas of interest (max. of 121 areas) to be displayed, when"Area" -header was pressed in Stations list box.

11 lists of areas of interest with appropriate names for different kind of radio conditions can be created, saved and loaded. Selected areas will also be saved to Windows registry.

Do not edit the map used by the program, the file is protected. Please, contact the author if you are willing to do modifications to the map -file for the RDSDX -project.

* Menus

- File

+ Open Station List

Country based lists can be opened by selecting this option. Selecting a country outside the active list will set the list as "All Files".

Use Alt-S from main window to get fast access to the selection box.

+ **Open Log**

Displays date-based logs logged by "Logging"-"Log Station". Select any number of daily based logs for viewing. You may delete unnecessary log entries and edit data of the loggings by selecting log entries and clicking right button of the mouse. Column can be sorted and the sorted data can be printed to date-based file into the folder "PrintFiles".

Selected stations can be displayed on maps, if the locator is known (distance is shown in logging -window). Locations on the map are colour coded by the number of loggings.

+ **Print to file**

Station's displayed in the "Station's Window" can be printed as a text file to the folder "PrintFiles".

+ **Create Location List**

Locations from the database are collected to the file "Coordinates". You may then insert the coordinates of locations as described in Coordinates File. Then run this option again and Coordinates are converted to Maidenhead locators into all database files. Running this option might take few minutes depending on file sizes and the speed of your PC.

+ **Exit**

Exits RDSDX and returns to Windows.

- **Edit**

+ **Station Edit**

See Station Edit above.

- **View**

+ **Notes**

See Notes above

+ **Partial Find**

A part of the station name can be used as the searching key. Notice that the search is initially case sensitive. You may also ignore any spaces set in database files by selecting Remove spaces. Number of found items is displayed, if Options - Properties - Finder - Show number of matches is set on.

Check the "PI search" box on, if you wish to search a particular PI-code. The search is not case sensitive. You may also use the characters '*' in the PI-

code to be searched. However, at least one defined character must be given. All four characters must be given, e.g. *0** will display all stations, which PI-code's 2nd character is zero.

"Power Filtering" is set off while using this option.

+ Country Info

This list box shows all countries supported by the RDSDX.
The country abbreviations, PI and ECC -codes of the countries are displayed. The countries can be sorted by clicking the header tabs in the list box.

It is also possible to display the selected country file by double-clicking one of the rows on the list.

Depending on the screen resolution and OS you may have to set column sizes at the first time you are using the programme.

+ Show on map

See Maps above

+ Recent loggings

Loggings made on the current date can be displayed by this option.

+ PS & RT history

Last 30 received Programme Services and Radio Texts together with the UTC time taken from the PC can be checked.

+ Heard locators

The list of all locators, which have a marking in Station Window's 'Status' – field. Locators can be displayed in maps by pressing "Map" -button. Heard locators on the map are colour coded by the number of heard stations in each locator.

+ Screen Dump archive

The list of all saved Screen Dumps. The list is taken from the folder "ScreenDump" as well as from any sub-folders under "ScreenDump". The first four characters of a ScreenDump -file should be the PI-code of the station and the rest should be station's name, for example "E201 SR P1, Stockholm". The path of the saved Screen Dump is also shown, if the dump is saved under the "ScreenDump" -folder. It's a good idea to create subfolders for each country. The date and time of saving are also displayed.

The selected Screen Dump can be displayed by double-clicking on top of the list line or pressing the right button of the mouse and selecting option "Show". Screen Dumps can also be renamed by selecting option "Rename" or deleted

from hard disk by selecting station(s) and pressing the right button of the mouse and selecting option "Delete". Use "Refresh" to update the list, if you have modified Screen Dump archive outside the program, for example if the file has been moved to another folder. The frequency of the Screen Dump can be fixed by the selection "Fix frequency". This option is useful, if you have accidentally dumped the station without checking that the RDSDX -frequency matches the received station.

The order of Screen Dumps can be sorted by clicking the header tabs in the list box.

+ Number of displayed stations

The number of stations currently displayed in Stations Window.

- Logging

+ Log Station

You may log the station at any time to date-based log file. The frequency is taken from the selected station on the Stations Window. However, if remote option is used (tuner is set on in Options-Properties-Remote-Tuner) then you may set the options "Frequency cross-checking" and "PI cross-checking" on to be sure that you actually are logging on the correct frequency. This option is void, if there was no tuner set on.

You may also manually log stations, which are on Log Station's "PI barring" - list. Doing a manual logging gives you a possibility to add a note to the logged station. The frequency of the logged station is also set as the RDSDX's frequency on 'Freq' -field, if there was no receiver selected on Options-Properties-Remote-Tuner type.

It's possible to create several folders under the folder "Loggings" for example for each month of the year and cut and paste the data to the archive folder.

+ Screen Dump

All received RDS-data and frequency set at "Freq" -box will be saved to disk, initially to folder "ScreenDumps". Since version 3.00 also tuner data as well as RDS quality are saved. The dumps can be reviewed by the option "View"-"Screen Dump archive". You may also manually do a Screen Dump for stations, which are on Screen Dump's "PI barring" -list.

Screen Dumps are saved as Text Files to disk. Initially the files are saved to disk as "PI + Date + Time", for example "F202 040519 162026". Screen Dumps are always saved to folder "ScreenDumps". You may create several folders under the folder ScreenDumps as archives for different countries.

The filenames can also be changed to be more intuitive, like "F202 FCulture". Notice that the first four characters should be the PI-code of the station and the rest should be the station's name.

Do not edit ScreenDump -files as the file information may easily be corrupted!

- Option + Properties

RDS:

RDS type: Set the box checked, if you wish received PTY data to be displayed according to U.S. RBDS Standard.

ON Validity: Defines how many correct blocks in sequence are needed to display data into the screen. The value can be set between 0 to 60. Set the value as 0, if no RDS -interface is connected to the system. Very good compromise between the speed and confidence is the value of 3 for ON Validity.

OFF Validity: Defines how many seconds the data is kept on screen before screen clearance, if correct PI-code for the station is not received. The timer is reset each time the correct PI-code is received. Set the value to 60 (seconds) or longer to keep received RDS data on screen "forever". Setting so only a new PI-code will clear received RDS data.

Remote controlling: RDS data is cleared as soon as a new frequency has been entered. You may set the off validity as 60 (forever) in normal tuning conditions. Setting the value to 3 seconds might be good compromise to catch meteor scatter data in one frequency.

Programme Service (PS): Set the checkbox "Full PS required" on, if you don't want partially received PS -codes to be displayed. Spaces received in PS code will be replaced by "_" -character, if the checkbox "Space replaced by "_" is set on.

Radio Text (RT): Set checkboxes off, if you don't want LFs or CRs associated to the RadioTexts to be displayed.

Enhanced Other Networks (EON): Spaces received in EONs PS code will be replaced by "_" -character, if the checkbox "Space replaced by "_" is set on.

"RDS Country" -string: Set possible list of countries to be displayed in "Country" -window, when a PI-, CT- or ECC-code is received.

Quality Meter: Set the update interval for RDS Quality Meter. The interval must be between 100 and 9999 ms. Initially the value is set as 1000 ms.
RDS Quality is calculated from the last 2 seconds of RDS data.
Set "Average measurement" on, if you wish to monitor the average RDS quality for the tuned station measured from the beginning of the received RDS data.

DST On: Daytime Savings Time will be used to define received countries, if CT was received.

Finder:

Initial List: Defines which ".lst" -file will be loaded as initial file after the programme was started.

Lists in use: You may setup seven separate configurations for different kind of radio conditions. Initially there are configurations "List1" to "List9" set. The names can be changed to be more intuitive, for example "Balkan". Countries used for searching can be set at "Setup list". Leaving out unnecessary lists significantly speeds up searching. Use configuration "All countries", if you wish to display stations on every country based lists set in "Setup all countries". However, the number of stations even in one frequency might be quite huge! You may also define countries for quick access buttons on the right side of the display. This can be done for each of these configurations separately. The first button, however, cannot be changed. It is always the initial list defined above. There is also a selection to clear the button for clarity ([ ] Empty selection). This can also be done by pressing LCtrl while selecting the button.

Active country list can be switched at any time to the next one by pressing Ctrl-U (Lists in **U**se).

Partial Find: Set "Show number of matches" on, if you like to get the number of found items after Partial Find.

Bearing and Distance: Set "Show on main screen" on, if you like to see the bearing and distance on the main screen. Unchecking the selection will hide the fields.

Find AFs: Set "Search all lists", if the search will be done from all ListFiles. Uncheck this and the search is done from active lists only.

Find Stn: Set "Search all lists", if the search will be done from all ListFiles. Uncheck this and the search is done from active lists only.

Power Filter: Set the filtering range. You may leave some countries unfiltered by selecting the countries from 'Set countries'. Select 'Display stations having no listed power' to display stations without a power in 'Power' field in Stations Window while displaying filtered list (notice that most of Italian stations have no listed power).

Remote:

Tuner type: Select the tuner type in use, if the remote control board has been installed to the tuner. Leave as "None", if no board was installed.

On Freq –timer: Set a proper value for the timer. This timer is in use when the 'Freq' –tab has been pressed from the Stations Window to show stations from one frequency only. The new list is generated as soon as no new frequencies entered by the receiver and the set value of the timer has been expired. The value can be any time between 100 ms to 9999 ms. Displaying all stations on the frequency while using remote option requires pretty powerful computer.

You may very easily get tuner's frequency out of phase of RDSDX's frequency.If so happens, try to increase the value of the On Freq -timer.

Keep RDS: Checking the box will activate the "Keep RDS" -feature. The received data is kept on screen while tuning to adjacent channel as long as the difference of last received RDS data and tuned frequency is less or equal than the preset value in Combo Box (either 25, 50, 75 or 100 kHz). This feature is only on, if there is a selected tuner in Tuner type, the "RDS OFF Validity" is set to 60 seconds (forever) and "Log Station" and "ScreenDump" are set as "Manual" (because the program cannot decide correct frequency for received RDS data 100% sure). You then should do both loggings manually, if needed.

Protocol test: You may test PLL–protocol used by the tuner by this option.

Important notice: I have no other tuners than a couple of Sonys and Kenwood KT-6040s and I have no access to any circuit diagrams of other tuners. Please, do not send any inquires about the compatibility to other tuners as I have no information whatsoever.

Alarms:

Audible Alarm: You may set the audible alarm on (given by the PC's speaker in format of Morse Code) to inform you, if a new PI-code is received.

This feature can be used to monitor radio conditions without receiver's audio. Set the speed of the code and the side tone frequency. Initial speed is set as 60 characters / minute with the side tone frequency of 500 Hz. There is also a Test -button in the window, if you wish to test PC's speaker with the given frequency and speed. The test message code is " - . .   - . . -   - . .   - . . - " (DX DX).

The alarm itself is given in format of "DX Z", where Z is the first character of the PI-code.

The morse codes for possible PIs are as follows:

0: - - - - -	5:	A: . -
1: . - - - -	6: -	B: - . . .
2: . . - - -	7: - - . . .	C: - . - .
3: . . . - -	8: - - - . .	D: - . .
4: . . . . -	9: - - - - .	E: .
		F: . . - .

The played code for the station, which has the PI "F202" is then

" - . .   - . . -   . . - . " (DX F)

Set "PI barring" -list for PI codes, which will not give an audible alarm. Separate codes in the list with a space -characters and Returns. You may set as much as 100 barred PIs.

Notes reminder: Set the checkbox on, if a reminder next to the Notes -button is needed to inform that there is a note for currently selected country.

Logging:

Log Station: Set the checkbox on, if you wish stations to be added to the logbook automatically. Set "PI barring" -list for PI codes, which will not be saved automatically to disk as logged stations. Separate codes in the list with a space -characters and Returns. You may set as much as 100 barred PIs.

ScreenDump: Set the checkbox on, if you wish that a screen dump will be done automatically. Set "PI barring" -list for PI codes, which will not saved automatically to disk as Screen Dumps. Separate codes in the list with a space -characters and Returns. You may set as much as 100 barred PIs.

You may use these options for example while hunting meteor scatter stations.

Autologging implies only, if the RDS data is lost due to timer or another station's PI code replaces the existing one. However, if remote controlling has been set on from Options-Properties-Remote, the new data is logged also if the frequency is changed.

You may create an archive of received PI-codes into an archive either to folder "ScreenDump" or under it to several sub-folders. The file names should be started with the PI-code (4 characters) and the rest should be the station's name, for example "E201 SR P1, Stockholm". Existing PI-codes are read at the beginning of the programme and the list is updated each time a new PI-code is received. Check "Notification", if you wish to have a notification when a new code is received. The notification is given only once for each new PI-code during the session.

Own locator

Several coordinates and descriptions for observation locations can be added. Press "Calculate" -button after you have filled the coordinates. Maidenhead locators are then automatically calculated. Select the active location for your observation location.

- Help

+ HotKeys

All possible HotKey -selections are displayed.

There is no run-time help available at the moment.

Maidenhead Coordinates

This coordinate system is commonly used by amateur radio operators. Each and every coordinate can be represented in unique six characters like KP01RD. This area has the size of 0° 2'30" x 0° 5'00".

The area size is small enough for distance and direction calculations even in tropospheric conditions.

There are 24 x 24 squares inside each and every square below (from AA at bottom left corner to XX at top right corner).

Countries supported by RDSDX

Supported countries and abbreviations can be found on separate attachment "Supported Countries". Only the supported countries (and abbreviations) can be used in RDSDX.

I would like to express my greatest gratitude to UKWTV for giving us permission to use the station's data collected by the group.

Appendix A   RDS decoder ICs

	RDS-clock	RDS-data
SAA6579	pin 16	pin 2
TDA7330B	pin 12	pin 13
uPC 1346CS	pin 11	pin 12 thanks to Kurt Zscherp for information !

Appendix B   Known voltage connection points

Receiver	+5V	+12V
Sony ST-SE700	IC801 pin 5	IC301 pin 22
Onkyo T-4970	uPC 1346CS pin 1	
Kenwood KT-6040		jumper W44 (+13V) in Main Board

Appendix C   Known PLL connection points

Receiver	PLL clock	PLL data	
Sony ST-SE700	CN701 pin 4	CN701 pin 3	CN701 = connector at Display Board
Kenwood KT-6040	See the document "Remote-6040.jpg"		

CN701 description in Sony ST-SE700

pin 1: PLL CE	pin 6: Power
pin 2: PLL Data In	**pin 7: GND**
pin 3: **PLL Data Out**	**pin 8: +5V (+5,6V)**
pin 4: **PLL Clock**	pin 9: -30V
pin 5: **RDS Clock**	

CN702 description in Sony ST-SE700

pin 1: F	pin5: EON
pin 2: F	pin6: Mute
pin 3: Signal	pin 7: Tuned
pin 4: RDS Data	pin 8: Stereo

Similar connector was found also in ST-SE520. These pins can be used as RDS- and Remote connections points.

Appendix D   Version changes

Ver 1.00   * Initial version (never published)

Ver 1.10   * Improvements... (never published)

Ver 1.20   * Programme rewritten due to complexity. Much better now in Windows 95

Ver 2.00b   * Remote controlling of the tuner (Sony ST-SE700) left out due to XP -
                            problems. Screen Dump under construction.

Ver 2.01b   * Screen Dump finished. Log Station and RT-history added. Bug fix in Create
                            Location List.

Ver 2.02b   * Automatic logging / Screen Dump added. Initial version of Audible Alarm.
                            Shutdown process of the programme changed.

Ver 2.03b   * Bug fix in EON handling. RT history and PS history added. RDS-data can
                            now be kept on screen "forever". Some Near East countries added to supported
                            countries. "PI search" -definition added to Partial Find (BBC2 can be both a PI-
                            code and station's name).

Ver 2.04b   * EON TNs increased to 10

Ver 2.05b   * Bug fix in PS & RT history. Default RDS ON Validity set as 2.
          HotKey -info text fix.

Ver 2.06b   * Floats changed to doubles in Maidenhead handling, AutoLog value read
                            from registers. "Updated"- and "Lines" -fields inserted into CountryInfo.
                            Unsupported countries filtered out. (never published)

Ver 2.10b   * Displayed list handling changed radically. "Partial Find" -minimum string
                            length set as two characters. Number of found items added for "Partial Find".

Ver 2.11   * No longer Beta -status !!!! U.S. RBDS PTY -codes added.
                            Displayed list handling improved significantly. "Find Stn" -button added. "List
                            In Use" -HotKey (Ctrl-U) added. On/Off Validity, AutoLog, AutoDump and
                            Lists In Use -information displayed in the Status Bar.

Ver 2.12   * RDS Monitor and Audible Alarm -information added to the Status
                            BarAutoDump value read from registers. PI barring for Audible Alarm,
                            Automatic Logging and ScreenDump added. "Edit frequency" and "Delete
                            Logging(s)" added into Station Log. Some of the HotKeys re-ordered. Number
                            in displayed items increased in AF. EONTNs increased to 15 for security
                            reasons. Missing initializations added to "View ScreenDump".

Ver 2.13	* Screen Dump filenames now editable. Number of pre-defined selectable list configurations increased to 7. COM port handling moved to MainFrame.
Ver 2.14	* Number of PI barring increased to 100. COM port can now be selected by using "COM Selection" -accessory program.. RDS Quality -meter added. Bug fix in Logging date. AF-lists sorted by frequency. Unnecessary RDS window "PTYN" removed.
Ver 2.15	* All ITU-countries supported by RDS-specification added. Abbreviation "YUG" changed as "SCG".
Ver 2.16	* Distance field in "Edit Station" lengthened to display distances over 9999 kms. Local time of the station shown on "Edit Station". "Find AFs" -button added. ListFile comment lines added. The list of "Country Info" can be sorted. Further improvements in Station List -handling and RDS Qual -meter. "All countries" -selection added to Ctrl-U.
Ver 2.17	* European and Northern African maps added. Progress dialog added to 'Partial Find'. List handling speeded up. Maximum AreaSize increased to 121 squares.
Ver 2.171	* A couple of bugs fixed in Map handling. The size of station's red dot increased. Maidenhead syntax checking while initial list loading added.
Ver 2.18	* Map zooming added. Bug fix in 'Station Edit'. Progress dialog extended to cover all list loadings as well as 'Station Edit'. The option can be switched off.
Ver 3.00	* The frequency of RDSDX can be controlled by ST-SE520, ST-SE700, ST-SA3ES, ST-SA5ES and KT-6040 receivers. The list of "Heard squares" added. Power filtering added. Improvements in Stations Window and Logging. "Notes" added. "Keep RDS" -feature, "Screen Dump notification" and "Average RDS Quality" added. "File - Open ScreenDump" replaced as "View - Screen Dump archive".
Ver 3.01	* "Print to file" and URLs and addresses for stations added. Freq column added to Screen Dump Archive. Small bug fixes in Options-Remote and Screen Dump Archive. Location List back in operation.
Ver 3.02	* Handling of RDS group 15B added. Added loggings sorting by columns and printing to file. "Dist/km" -column added to Stations Log
Ver 3.03	* Heard locators and logged stations can be displayed on map.
Ver 4.00	* Display area increased to 1024 x 768 pixels. Number of QuickKeys increased to 56. RT- and PS-history increased to 200 items. RDS Country String handling improved. Sorting order of ScreenDump Archive saved. Frequency -input improved. Tons of other minor changes.

Ver 4.01   * Fix frequency added to Screen Dumps. Multiple Own Locations, Recent
                               Loggings and Partial PI-code added. Pwr/kW field correction. PLL fix in 6040
                               handling. "MAK" added to supported countries. Number of QuickKeys
                               increased to 60. European and North African maps replaced by the World Map.
                               Number of presets on map increased to 11. Notes -reminder added. Stations
                               Logging changed.

Ver 4.02   * Ctrl+A (select all) added to Loggings. Bug fix in Edit Loggings. Several
                               minor changes.

Ver 4.02a   * Bug fix in Own Locator

Appendix E   Contact address of the author (Arno Vainio, AVA, OH1MLB)

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