Turbo535

**A computer program to support
Short-Wave Listening with your NRD-535
and to give your SWL-ing a 'Turboboost'**

6th version: T535V6
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1. Introduction

1.1 The Receiver

It has no doubt that NRD-535 short-wave receiver from JRC is one of the best receiver for SWL-ing. Especially its high sensitivity combined with a high dynamic range is very much appreciated by the many enthusiastic users.

If you want to know more about JRC and its SW receivers go to http:/www.jrc.co.jp/index-e.html or find a more independent source at http://www.rnw.nl/realradio/nrd535.html
As far as I know there is no file version of the NRD-535 manual nor about the remote control protocol. For both you need a paper copy of the 'Instruction manual for Model NRD-535 "
You can find a lot more web addresses with information about this receiver by just entering 'NRD-535' in one of the well-known Internet search engines.

I bought my NRD-535D beginning of the 90-ties and I am still very happy with it, also because it gives me again and again the possibility to combine two of my hobbies, SWL-ing and computer programming.

1.2 The Program

It is already some years ago that I started the development of short-wave receiver control programs to support the SWL activities. I gained a lot of experience programming for the NRD-535(D) already some years ago, see details below.
In the recent years I have focussed on developing a program for the AR7030. The latter is called 'ParaDise' and Internet filenames are P7030V3A.ZIP and P7030V3B.ZIP.

In autumn 2000 I started a complete overhaul of my program for the NRD-535, with the aim to bring it at least at the same level of functionality as the program for the AR7030.
That renewed program for the NRD-535 is still called TURBO535 and the latest version (v6, Internet filenames T535V6A.ZIP and T535V6B.ZIP) can again be found on a number of sites on the Internet, certainly on those mentioned in chapter 1.3 below.

History of the program.
My first steps to program for the NRD-535 were made in 92/93 using GFA Basic. Several releases were issued in the public domain under the name NRD535M#. In 94 I started to program in Visual Basic for Windows and after some pre-releases, named WIN535V#, I released the first TURBO535 packet in March '95.
The second release, issued Dec. '95 (Internet filename TURBO536.ZIP), focussed on improving the user interface. The most important changes in that release were :
- Redesigned memory management with additional functionality (see chapter 5)
- Redesigned spectrum scan to make it much more flexible (see chapter 6.1)
- Redesigned timer programming to make it much less cryptic (see chapter 9.3)
- Added sub records for start-end time and language in the Own-files (see chapter 3)
  NB: The record structure of the OWN-files have been changed to include Language and Start-End time. In chapter 3.1 is described how existing files can be adapted.
- Removed some bugs, like hanging on fetching empty NRD memory cell and fault in UTC at half hour differences, etc.

In the third release, issued May 96 (Internet filename TURBO537.ZIP), the possibilities were further extended mainly by :
- Adding the possibility to use the public domain files from the ADDX with data on English broadcast (see chapter 3.2). With thanks to Andreas Volk from Germany who monthly issues this file.
- Adding facilities to the Signal Analysis menu to print a spectrum scan or propagation impression (see chapter 6.4).
- Continuous update of frequency display in Full Control and SWL Workshop window during up/down frequency tuning (see chapter 2 and 7)
- A number of small improvements, like no loss of graphical data in spectrum- and propagation graph after a screensaver has been active and more flexible and accurate frequency setting after spectrum scan.

In the fourth release, issued May 97 (Internet filename TURBO538.ZIP), new functions were added and a number of smaller improvements introduced:
- Tracking mode to show to which station the receiver is tuned (see chapter 4.2)
- Fast and easy logging by introducing a 'Get current setting' of the receiver and the date and time in the Log record
- Improved and extended frequency data file-conversion possibilities
- Much easier access to edit and printing facilities for the frequency data and memory files
- Furthermore the documentation has partly been restructured and made easily accessible, Without leaving the program, with the menu item Direct/See Docs

Because the difference between v4 and this new one is so huge, v5 was skipped.

In this sixth release a large number of additions and improvements were again brought in.
The most important are:
1. Incorporating a conversion facility for the ILGRadio LW/MW (>9000 records) and SW (>12000 records) database to make these data suited as tracking files and improving the tracking facility, to optimise for using the ILG data (see chapter 5.2 and 5.3)
2. The same converted ILGRadio database can also be searched on the following (combined) criteria : frequency, language, station name, transmitter location, time of broadcast, and target area, to find very fast the type of broadcast you want to listen to and the related frequencies can directly be sent to the NRD-535 with one mouse double-click (see chapter 4.3)
   This type of 'forward' control combined with the 'backward' control from the tracking facility gives the highest speed and accuracy in finding the station(s) you are looking for.
3. Totally renewed and improved memory management
4. Much easier, faster and more user-friendly approach to use the BDXC and OWN files
5. In the Set-up you can select how many records (1000-30000) each BDX, OWN, LOG and ILG file (as maximum) can contain (see chapter 2.4, 4 and 5)
6. Added in the Set-up the "NO RX" program option to prevent that the program immediately crashes as no NRD-535 is connected to de serial port of the PC (see chapter 2.4)
7. Include the 'minimise' option in the receiver control main window.
8. The co-operation between and the stability during combined use of the BDXC, OWN, ILGRadio, LOG and TRACKING windows has been considerably improved. (chapter 4.4)
9. Also the combined use of SPECTRUM scanning with TRACKING is now possible. (see chapter 6.4)
10. Intelligent S-meter (see chapter 6.1)

- **NB:** Because new set-up possibilities are added, the file T535V6.INI is not compatible with the INI-file of previous versions.

The program has the aim to give your SWL-activities with the NRD-535 a 'turboboost', therefore it is called 'TURBO535' and the release filenames will (from now) be T535***.ZIP, with *** being the version type and number.
As programming tool Visual Basic version 6 professional is now used. Only a 32-bit version will be distributed, so you need Windows 95, 98, 2000 or NT to run it.
Minimum system requirements are 486 50 MHz with at least 8 MB Ram and VGA 640 x 480.
For easy operations (especially with the dial-tracking facility and the new filtering function) a 300 MHz Pentium, at least 16 MB of Ram and 800 x 600 or better SVGA (if more windows are open at the same time :1024x768) is the system of choice.

The 6th release package is split in 2 parts, named T535V6A.ZIP and T535V6B.ZIP and these are uploaded by me to
- An ftp-server in the Internet in Europe   : ftp://ftp.funet.fi/pub/ham/rigctrl/
- An ftp-server in the Internet in the USA   : ftp://ftp.qrz.com/files/controls/

Information about the latest developments on my RigControl programs can be found on my home page at the URL: http://home.wxs.nl/~jarkest/home.html

1.3 Giving Feedback

As everybody working with a computer knows, a program always can be improved. So if you find bugs or insufficient / lacking functionality just let me know and I will try to improve it (NO guarantee, it is just a hobby).

You can give me feedback in several ways :
1. Internet E-mail   : jan.arkesteijn@wxs.nl (preferred)
2. Phone call   : Contact me by phone (+31) (0) 348 419651, between 20-21 L(S/W)T in NL
3. Letter to   : Jan Arkesteijn, Fagellaan 7,NL-3445 EZ Woerden, The Netherlands

2. Installation of program and set-up

In this chapter is described how the receiver should be connected to the computer, which files you need and in what directory structure these files have to be placed and an easy way to install the program and select the right set-up

2.1 Connection between Receiver and Computer

Before the program can be used, the receiver should be connected to a serial port of a computer. You need for that an standard RS232 cable with 25 pin connectors, a so-called null-modem and if your PC has a 9 pin serial port connector you need also a adapter between a 9 pin and 25 pin connectors
As can be found in the NRD-535 Operating Manual the pins should be connected as given below :

```
        NRD-535          PC25-D       or      PC9-D
        pin 1            pin 1                pin
        pin 2            pin 3                pin
        pin 3            pin 2                pin
        pin 4            pin 5                pin
        pin 7            pin 7                pin
        pin 20           pin 6                pin
```

2.2 Directory structure and files

For a proper working of the program it is necessary that a (large) number of files are available and that they are placed in the prescribed directory structure. The files needed can be classified in two groups :
1. The application file T535V6.EXE and the frequency data files I gathered or produced
For these files C:\T535V6 is proposed as main directory. In case another main directory is preferred then this should be changed during the installation and also the INI file should be adapted, see chapter 2.4 Set-up.
In the main directory the following subdirectories should be available : BDXC, OWN, RX2DB, LOG, MEM, PAN and SAN. To understand how these files are organised and what type of data they contain the following survey is given :

```
C:\T535V6
        T535V6.EXE          : the main executable file
        T535V6.INI          : the configuration file
        ILGfilter.ini       : ini file with database filtering preferences (to be customised)
        T535V6.DOC          : the user manual in English
        T535NL6.DOC         : the user manual in Dutch
C:\T535V6\BDXC
        BDX_DTOE.TXT        : BDCX file with data on Dutch broadcast TO Europe
        BDX_ETOE.TXT        : BDCX file with data on English broadcast TO Europe
        BDX_FTOE.TXT        : BDCX file with data on French broadcast TO Europe
        BDX_GTOE.TXT        : BDCX file with data on German broadcast TO Europe
        ADX_ETOW.TXT        : ADDX file with data on English broadcast TO the World
        ADX_FTOW.TXT        : ADDX file with data on French broadcast TO the World
        ADX_GTOW.TXT        : ADDX file with data on German broadcast TO the World
        ADX_RTOW.TXT        : ADDX file with data on Russian broadcast TO the World
        ADX_STOW.TXT        : ADDX file with data on Spanish broadcast TO the World
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```
        ADX_TTOW.TXT        : ADDX file with data on Turkish broadcast TO the World
C:\T535V6\OWN
        OWN_BCAF.TXT        : user collected data on broadcasts from Africa
        OWN_BCAM.TXT        : the same but now from the America's
        OWN_BCAS.TXT        : the same but now from Asia
        OWN_BCEU.TXT        : the same but now for Europe
        OWN_BCME.TXT        : the same but now for the Middle East
        OWN_BCPA.TXT        : the same but now from the Pacific
        OWN_BCWW.TXT        : a combination (World Wide) of your favourites
        OWN_HAMS.TXT        : user collected data on radio amateur transmissions
        OWN_UTAE.TXT        : user collected data on aeronautical voice services
        OWN_UTFX.TXT        : user collected data on fax transmissions
        OWN_UTMA.TXT        : user collected data on maritime voice services
        OWN_UTRY.TXT        : user collected data on telex over radio services
C:\T535V6\RX2DB
        ILGADATA.FTL        : converted ILG MW database, used for tracking mode
        ILGSDATA.FTL        : converted ILG SW database, used for tracking mode
C:\T535V6\LOG
        LOG_BCWW.TXT        : file to log the received broadcast transmissions
        LOG_HAMS.TXT        : file to log received radio amateur transmissions
        LOG_UTIL.TXT        : file to log all type of received utility stations
C:\T535V6\MEM
        MEM_BCWW.TXT        : example file with stored NRD-535 memory contents
C:\T535V6\PAN
        PAN_VoG1.TXT        : example file with propagation impression (V o Greece)
C:\T535V6\SAN
        SAN_49m1.TXT        : example file with spectrum scan data (49 m band)
```

2. The many Visual Basic v6 system files (*.dll, *.ocx) required to run my application:
msxbse.dll, vb5db.dll, msrepl35.dll, msrd2x.dll, expsrv.dll, vbajet32.dll,msjint35.dll, msjter35.dll,
msjet35.dll, dao35.dll, mfc40.dll, mscomctl.ocx, mscomm32.ocx, dblist32.ocx, grid32.ocx,
spin32.ocx, threed32.ocx. These files will be placed automatically somewhere in the windows or
windows\system directory by the set-up wizard.

2.3 Installation

After downloading and unzipping the program in a temporary directory select run 'set-up' from the
W95+ Start menu and follow the guidance given by the set-up program. As main application
directory for this version C:\T535V6 is proposed, but you can of course choose another one during
the set-up. (Do not forget to change the INI file if you select another directory.)
If everything goes as planned you will find a directory structure with files as described in 2.2 at the
end of the installation procedure.

2.4 Set-up and GO

After successful installation and connecting the computer serial port to the radio, run the program. A welcome screen will appear with several buttons. See picture 1below.

Picture 1 Welcome window

At least the first time you should select the left-lower button 'Set-up' to get the Set-up window. This is shown in picture 2 on the next page :

First set the CommPort to be used. Then, if you are not living in the Central European Time area (where summertime =UTC +2, wintertime = UTC +1), you have to change the LT-UTC textbox to your Local Time minus UTC difference. Values between -13 and +13 will be accepted. Also half hour differences can be entered.
In case you selected another main directory to install the program in, you have to change the Dir(ectory) Path option.
In the program options frame you can select to power-on the receiver at the start of the program and to switch-off the receiver at closing the program.
The "NO RX' option gives the possibility to get a 'look and feel' of the program without an NRD-535 connected to the serial port of the computer. If functions are used that send data to or expect to receive data from the serial port / receiver the program still can crash. If the 'NO RX' option is changed you have to 'Save' this and restart the program.
By selecting the 'Enable editor' checkbox you get fast and easy access to edit and printing facilities for the frequency data, memory data, log and tracking files in every 'File Load/Open' window.
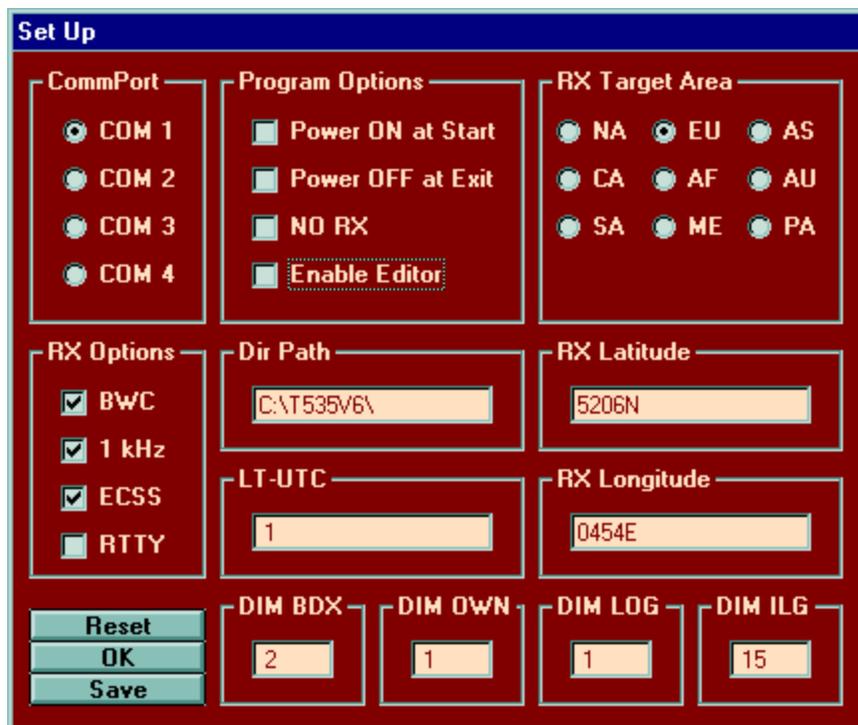
Picture 2 Set-up window

In RX Target Area you informs the program in which area your receiver is located. This is used to give additional information during 'Tracking', see chapter 5.2
(NA= North America, CA= Central America, SA= South America, EU= Europe, AF= Africa, ME= Middle East, AS= Asia, AU= Australasia, PA = Pacific)
In RX Latitude and RX Longitude the precise location of the receiver should be entered. This is also used during 'Tracking', to calculate the distance between transmitter and receiver.
The format for latitude has to be in degrees and minutes N(orth) or S(outh) and a total of 5 characters, for example: '5206N' or '0530S'. The format for longitude is also in degrees and minutes E(ast) or W(est) and 5 or 6 characters, for example '0454E' or '14520W'.

With the 'RX options' you can adapt the program to the options available in your receiver configuration :
    + BWC : BandWidth Control option (unit CFL-243(W) is needed)
    + 1 Khz : Narrow filter option (unit CFL-233 or eq.is needed)
    + ECSS: Synchronous AM reception (unit CMF-78 is needed)
    + RTTY: RTTY decoding option (unit CMF-530 is needed)
If you possess a NRD-535D you can certainly check the first three.
NB: It is not necessary to check the RTTY option if you use external programs like Code 3 to decode 'digital' traffic. It is only relevant in relation to the use of the CMF-530 unit.

In the DIM frames the dimension or the maximum number of records (x 1000) that can be loaded in the program from the various frequency data files can be set. The selectable range is 1 (=1000) to 30 (=30000). The default is 2 (=2000) for the BDXC/ADDX type files, 1 (=1000) for the Own type files, 1 (=1000) for Log type files and 15 (=15000) for ILG based tracking files.
This option makes it possible to optimise between available RAM in the PC and the file sizes. For each 1000 records, about 100 KB additional RAM should be available. In case al 4 file types are set to 30 (=30000) a total of 12 MB of RAM should be available for these files only.

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In case the number of records in a file is higher then the limit set for this file type, the program will crash.

The set-up can be saved in the T535V6.ini file by clicking in the 'Save' button.

Below an explanation of the contents of this ini-file (for the authors situation) is given :

C:\T535V6\   Main application directory path
5206N   Receiver latitude (5 char)
0454E   Receiver longitude (5 or 6 char)
1   Com Port (1= COM 1, 4=COM 4)
2   Difference between Local (S/W) Time and UTC(Range -13 to 13 h)
0   Power On at Start (1=yes)
0   Power Off at Exit (1=yes)
0   To use the program without receiver this should be 1
1   Enable Editor (1=yes)
3   Target area / Area where receiver is located (3= Europe, etc)
2   Maximum number of records (x 1000) in BDXC/ADDX files, up to 30 (x 1000)
1   Maximum number of records (x 1000) in OWN files, up to 30 (x 1000)
1   maximum number of records (x 1000) in LOG files, up to 30 (x 1000)
15   Maximum number of records (x 1000) in ILG files, up to 30 (x 1000)
1   BWC   )
1   1KHz   ) 1 is Yes, this option is fitted in the RX
1   ECSS) 0 is No, this option is not fitted
1   RTTY)

If the set-up is done, click in 'GO' to get the receiver control window.

IMPORTANT NOTICE 1 :
If in the program set-up not the right Comm port is selected or if the computer is not correctly connected to the radio or the power is not switch on, the program will crash.

IMPORTANT NOTICE 2 :
To make the program independent of the selected decimal operator (. or ,) in the Windows Set up (See Country settings / Number tab) the decimal operator shown in the program is, will and should always be a . (dot). To prevent any problems also do not use any thousand separator sign. More over frequency data in any database file used with this program, with the exception of the memory files, is given in KHz and has/must have a dot as decimal separator.

IMPORTANT NOTICE 3 :
The set-up of windows and text boxes in the program is based on the use of the standard font size in your Windows setting. If you use enlarged or double size fonts, possibly part of the data will become invisible or result in a distorted window.

3. Receiver control main window

The receiver control main window is the part of the program that always should be active. It contains a very flexible and direct access to all accessible receiver settings and it gives also access to the main menu items to use for instance databases etc. See picture 3 below :
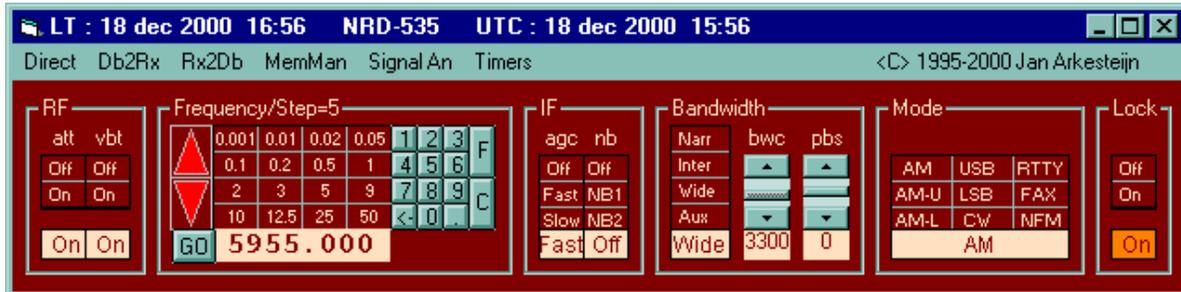
Picture 3 Receiver main control window

In this chapter is described how the receiver can be controlled. A description of the use of the main menu items can be found in the next chapters.

The basic approach in the program is that the receiver controls are not locked.
But there are several situations that can better be done while the receiver is under full control of the program only. Examples are: use of BWC and PBS from the program, memory scan, analysis of received signal strength and tracking with the dial option.

At the start up of the program the most important current receiver setting as described below, will be read into the program automatically. After you have changed the receiver setting by using the dials and / or buttons on the receiver itself, you can update the program by double clicking in the receiver control window outside any frame, or by pressing the F5 key, or by clicking in the menu item ' Direct/Update'.

The receiver control window is divided more or less according to the block schematic diagram of the receiver. The blocks are :

3.1. Radio Frequency (RF)
In this block the setting of the input attenuator (att) can be selected. Click in 'On' to attenuate the input signal with 20 db and in 'Off' to pass the attenuator. The selected state will be shown at the bottom in the cell with the light background.
Special feature of the NRD-535 is its front-end Variable Bandpass Tuning (VBT) filter. This filter is necessary to give the receiver its high dynamic range. Small disadvantage is that it adds some extra attenuation. In some rare cases it can helpful to bypass the VBT. To do so, click in 'Off'. Normally this filter should be 'On'.

3.2. Frequency setting
The upper part of this frame, is showing a grid with cells with a dark red background and light figures with all possible frequency step values in kHz between .001 kHz (= 1 Hz) and 50 kHz. All frequency channel spacings used in the spectrum covered by the NRD-535 can be directly selected for easy channel-wise stepping through those parts of the frequency band.

Examples are 9 (Europe) or 10 kHz (USA, Japan) in the long wave and medium wave broadcast bands, 3 kHz in the Aero bands. The default frequency step value is 5 kHz, as used for the channel spacing in the HF broadcast bands.

After the frequency step value is selected, the frequency can be changed by clicking in the up/down spin button at the left hand side of this grid. If you want a continuous change of the frequency using the selected step size click in the 'GO' button. To stop this, click in the same 'NO' button.

The lower part of this frame shows the frequency setting of receiver (light background).

The value can also be directly changed. After double clicking in the textbox with the frequency, the current value disappears and you can type the new value. Press enter to activate it.

In the right hand side of this frame a keypad is available for direct entry -with your mouse- of both frequency and memory channel. The frequency should be in KHz with the dot as the decimal separator. With ← you can remove the last added figure.

To activate the frequency click in 'F' to activate the memory channel, click in 'C'

3.3. Intermediate Frequency (IF) and Bandwidth selection

A lot of signal processing takes place in the IF part of the receiver. Therefore also many settings can be controlled in this part. This is divided over two boxes (IF and BW)

For certain reception modes some of the settings described above are not relevant. In those case the program disables the possibility to change its value.

In the IF box you can change speed of the automatic gain control (AGC) and activate two different noise blankers (NB) to suppress spikes.

In the bandwidth box you can select the IF filter bandwidth and if the receiver is locked you can also the setting of the BWC and PBS unit.

3.4 Reception Mode (Mode)

The NRD-535 is equipped with seven reception modes, these being RTTY, CW, USB, LSB, AM, FM, FAX, AM-U (=ECSS-USB) and AM-L (=ECSS-LSB). These can be easily selected with one mouse click in the relevant grid cell in the 'Mode' block. Also in this case, settings not relevant for a certain mode will be blocked.

3.5 Lock

To get the receiver under continuous computer control click in 'On'. This is visible on the receiver because 'REMOTE' is shown on its display. While the receiver is under computer control you can not use the dials and buttons on the receiver, with the exception of AF gain, RF gain, power and Notch, because they are disabled. Click in 'Off' to release the receiver.

4. Database to Receiver files (Db2Rx)

Structuring of the program in relation to database use is based on two main types :
1. Files with frequency data (Own/BDXC/ADDX/ILGRadio) that can be *sent to* the NRD-535 (Db2Rx)
2. Files that store (Log) or translate (Tracking) data *coming from* the NRD-535 (Rx2Db)
This chapter gives information on the first type and the next chapter describes the use of the second.

4.1 BDXC en ADDX broadcast data files

A number of Public Domain files exist with data on short-wave transmissions. Some of these files are updated on a regular basis. Special attention should be given to the work that is done, as part of the activities of the BENELUX DX-CLUB (BDXC), by Jan Nieuwenhuis and Cees van Oudheusden and as part of the activities of the 'Assozation Deutschsprachiger DX-er' (ADDX) by Andreas Volk

4.1.1 BDXC Files
Each month files are issued with data on Dutch, English and French broadcast transmissions on short wave. These files can be downloaded from the Internet at http://www.425dxn.org/swls/bdxc/
This data is also distributed in printed form in the ' BDXC Bulletin'.
Jan Nieuwenhuis keeps the English to Europe file updated. He can be reached on 'jan-en-annette@hetnet.nl'. Cees van Oudheusden keeps the Dutch to Europe and French to Europe files up to date. He can be reached at 'c.vanoudheusden@net.hcc.nl.

After downloading the above mentioned html files, load the files with broadcasts in Dutch and in French in an ASCII text editor and delete all except the information sorted on time and save the part that is left to the files BDX_*TOE.TXT in the directory C:\T535V6\BDXC.
This will result in 2 files :
BDX_DTOE.TXT for Dutch broadcasts TO Europe
BDX_FTOE.TXT for French broadcasts TO Europe

The record structure of these files is/should be :
Character positions   1 up to and including 16 : Country name
Character positions 18 up to and including 34 : Broadcast organisation
Character positions 36 up to and including 43 : hhmm-hhmm, UTC start-end time
Character positions 49 up to and including 77 : frequencies in use (max. 7)

As an example a few lines are shown from a BDX_ETOE.TXT file :

```
AUSTRALIA       R.Australia      0600-0830    9580,13605,15415,17750,21725
CROATIA         Croatian Radio   0605-0610(g)  5920,7165,9830,13830
SWITZERLAND     Swiss Radio Int. 0615-0630     6165,9535
```

Don't change the record structure of these files otherwise the computer will get interpretation problems. The default for the maximum number of records is set to 2000 and the maximum record length is 100. The maximum number of records can easily be changed in the set-up between 1000 en 30000 by setting appropriate figure in DIM BDX.

The file with broadcasts in English from Jan Nieuwenhuis has a different record structure. So this file has to be converted before it can be used in PD7030. This facility is not yet build-in.

4.1.2 ADDX File
On a regular basis files are issued with data on English, French, German, Russian, Spanish and Turkeys broadcasts to all parts of the world. The filenames are hfp*.htm, with *= the first letter of the language and can be found on the Internet, URL http://www.addx.de/hfpdat/plaene.htm
This data is also published in printed form in the 'KURIER'. Andreas Volk keeps the data up to date. He can be reached on 'hfp@addx.de'

The record structure of these files is different from that in the BDXC-files. So, to make it usable in T535V6, the record structure has to be changed to make it equal to the record structure of the BDXC-files. This has already be done with the files include in this packet.
After the conversion the ADX_*TOW.TXT file have the same record structure as any of the BDX_*TOE.TXT files so all what is said in the next paragraphs is also valid for these files.

4.1.3 Using the BDXC files and converted ADDX files
Click in the main menu item 'Db2Rx Files' on the receiver control panel and select 'BDXC'
Then the BDXC window will be loaded. See picture 4 below :

BDX_ETOE.TXT   UTC : 1 dec 2000 11:58

Load BDX/ADX File	NRD-535Freq (kHz) : 15195.00			RX Control	Exit

UNITED	BBC World	0600-1500	12095				
UNITED	BBC World	0600-1700	15565				
UNITED	BBC World	0600-1800	12095				
UNITED	BBC World	0600-2000	9410	12095			
UNITED	BBC World	0600-2100	9410				
UNITED	BBC World	0700-1500	17640				
UNITED	BBC World	0700-1700	15565				
UNITED	BBC World	0700-1800	12095	15485	17640		
UNITED	Sunrise Radio	0700-1859	5850				
ITALY	IRRS-Shortwave	0730-1300	7120				
CROATIA	Croatian Radio	0800-1630	6165	7185	9830		
UNITED	BBC World	0900-1515	17705				
ECUADOR	HCJB	0900-1600	21455				
USA	WHRI	1000-1600	6040				
JORDAN	R.Jordan	1100-1730	11690				
NETHERLANDS	R.Netherlands	1130-1325	6045	9855			
KAZAKHSTAN	R.Almaty Int.	1200-1220	9620	11840			
BULGARIA	R.Bulgaria	1200-1300	15700	17500			
FRANCE	R.France Int.	1200-1300	9805	15155	15195		
UNITED	Merlin Network 1	1200-1400	9915	13645	17630		
USA	WWCR-4	1200-1400	7435				
USA	WEWN	1200-2000	15745				
USA	WWCR-1	1200-2100	15685				

Picture 4 BDXC window

After the BDXC window is loaded click in ' Load BDXC/ADDX File" to get a survey of files to select from. Select one file by double clicking in the file name. This file will now be loaded in the grid in the BDXC window. If you now DOUBLE click on a grid cell with frequency data (or give a cell the focus using your cursor keys and then pressing 'Enter'), the receiver is directly tuned to that frequency, using standard AM broadcast receiver setting for HF attenuator (0 dB), IF filter bandwidth (5 kHz), mode (AM) and AGC (fast). To Change this click in the button

'RX control' to get the receiver control window and make the necessary change. After clicking in the BDXC window the receiver control window will move to the background again.

4.2 OWN frequency data files

The basic idea behind this menu item is that a user has the possibility to send self-collected frequency data in a fast and direct way to the NRD-535 to support his/her listening activities. For an easy start I have set-up already a number of these files with data I have collected recently from several sources. In collecting the data for the files on broadcasts from the various regions of the world the focus has been on frequencies used for English broadcasts to Europe. It needs of course continuous attention to keep all these files updated.
For updating the utility data a lot of information can be found on the web page from the World Utility News club (WUN), see http://www.wunclub.com / with also many links to other relevant sites.

4.2.1 Open Own window and Own files
Click in the main menu item 'Db2Rx Files' on the receiver control panel and select 'OWN'
The Own window will then be loaded. See picture 5 below

OWN_UTAE.TXT   UTC : 1 dec 2000 11:59

| Load Own File | NRD-535 Freq (kHz) 15195.00 | | | | RX Control | Exit |

WW calling/distress	E	0000-2400	3023	5680					
VOLMET Africa			2860	3404	5499	6538	8852	10057	13261
VOLMET Caribbean			2950	5580	11315				
VOLMET Europa			2998	3413	5505	6580	8957	11378	13264
VOLMET Middle East			2956	5589	8945	11393			
VOLMET N. Atlantic			2905	3485	5592	6604	8870	10051	
Volmet N. Atlantic			13270	13276					
VOLMET N. + C. Asia			3461	4663	5676	10090	13279		
VOLMET Pacific			2863	6679	8828	13282			
VOLMET S. America			2881	5601	10087	13279			
VOLMET S. E. Asia			2965	3458	5673	6676	8849	11387	13285
VOLMET RAF			5450	11253					
MWARA Africa 1			2851	2878	3419	3425	3467	4657	5493
MWARA Africa 2			5652	5658	6559	6574	6673	8894	8903
MWARA Africa 3			11300	11330	13273	13288	13294	17961	
MWARA Caribbean 1			2887	3455	5520	5550	6577	6586	8846
MWARA Caribbean 2			8918	11387	11396	13297	17907		
MWARA C/E Pacific 1			2869	3413	4657	5547	5574	6673	8843
MWARA C/E Pacific 2			10057	11282	13300	17904			
MWARA C/W Pacific 1			2998	3455	4666	5652	5661	6532	6562
MWARA C/W Pacific 2			8903	10081	11384	13300	17904		
MWARA East Asia 1			3016	3485	3491	5655	5670	6571	8897

Picture 5 OWN window

After the OWN window is loaded click in ' Load OWN File" to get a survey of files to select from. Select one file by double clicking in the file name. This file will now be loaded in the grid in the OWN window. If you now DOUBLE click on a grid cell with frequency data (or give a cell the focus using your cursor keys and then pressing 'Enter'), the receiver is directly tuned to that frequency,

using standard receiver setting for HF attenuator , IF filter bandwidth, mode and AGC, depending on which type of transmission is tuned to.
To change the receiver setting click in the button ' RX control" to get the receiver control window and make the necessary change. After clicking in the OWN window the receiver control window will move to the background again.

The default for the maximum number of records in a file is set to 1000. This can easily be changed in the set-up between 1000 and 30000, by changing DIM OWN. All records in these files have the same structure i.e. each line in the file is build-up as given:
- Character positions   1 up to and including 19 : Organisation name
- Character positions 21 up to and including 23 : ITU country code
- Character positions 25 up to and including 27 : Language of transmission
- Character positions 29 up to and including 37 : hhmm-hhmm (UTC start-end time)
- Character positions 39 up to and including 42 : abdg (basic NRD-535 setting)
- Character positions 44 up to and including 49 : 'empty'
- Character positions 51 up to and including 92 : frequencies in use (in KHz, max. 7)

For the proper working of the program it is absolutely necessary that the described record structure be maintained. Also use only the . (dot) as decimal separator in the frequencies.

The meaning of figures used to store the basic settings can be found in the NRD-535 manual and is also given here :
- a is the RF attenuator setting:
  0= 0dB, 1= 20 db
- b is the IF filter bandwidth setting
  0= Wide, (6 kHz) 1=Inter (2 kHz) , 2=Narrow (1 kHz), 3= Aux (12 kHz)
-d is the reception mode
  0= RTTY, 1= CW, 2= USB, 3= LSB, 4= AM, 5= FM, 6= AM-U, 7= AM-L
- g is the AGC speed setting
  0= Slow, 1= Medium, 2= Off

4.3 ILG Radio broadcast data files

Given the easy availability (see also 5.3) and the accuracy of the ILGRadio database and the limitations of the ADDX/BDXC files, also a ILGRadio database search facility is now build in.
For this search / filter function the same files are used as for the tracking function (see 5.3)

4.3.1 Open ILGRadio search window and search file
After selecting the menu-item Db2Rx/ILG Radio the search window will be opened. Clicking in the button 'Load file' will give access to the ILG Radio broadcast files. Select 'ILGADATA.FTL' (LW/MW) or 'ILGSDATA.FTL' (SW) and load it in RAM. The total file is then available in the list box. In the picture on the next page the ILGRadio window with certain search results is shown. Information about the file structure and related items can be found in 5.2.1
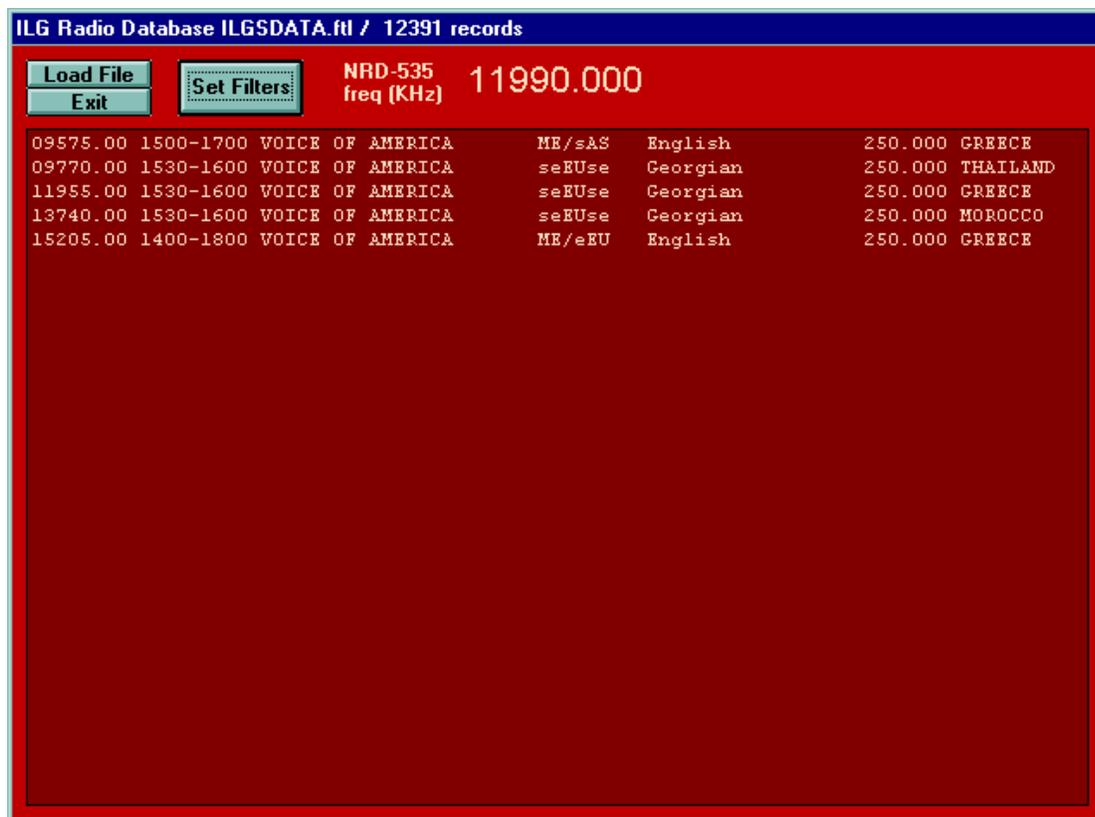
Picture 6 ILGRadio window

4.3.2 Searching the ILGRadio broadcast database
To set the search criteria click in 'Set Filter'. Then a new window appears with all the search criteria. See picture 7 below :

Picture 7 Filter window

To use a search criterion, check its check box and type the value/text to search for. Instead of typing you can also select an option from each of the list boxes. These list boxes can be customised, see 4.3.3. After you have selected all the search criteria click in 'Search ILG Radio db' to start the actual search. The progress of the search is shown the right hand upper side of the window. After a 'few' second the result will appear.
If you now double-click on a line, the NRD-535 will be set to the frequency shown in this line.

In case for certain frequencies more then 28 records are available, automatically a scroll bar will be introduced to let you view the other records.

4.3.3 Customising the search criteria window
The search criteria as available in the list boxes in the ILG filter window are read from the ilgfilter.ini file. To change or supplement these, load the ilgfilter.ini file from the main TURBO535 directory in an ASCII type text editor.
The start of the content of a list box is shown with "**** + item name"" and end of file is with "####"
Do NOT change these lines. All the other lines can be changed or lines can be added.
Check what you change or add carefully with the exact typing used in the different sub-records in the ILGADATA.FTL and ILGSDATE.FTL files, otherwise it will not work properly.

4.4   Combined use of BDXC and/or Own and/or ILGRadio and/or Log files with Tracking

In case your video screen is large enough you can easily combine the use of the 'forward' control facilities in the BDXC and/ or Own and/or ILG Radio and/or Log windows with the 'backward' control form the Tracking window.
Open for example the ILGRadio window and load the ILGSDATA.FTL file and open the Filter window and set the criteria for your search and start the search. After some time the result of the search is shown in the ILGRadio search window.
Also open the Tracking window and load also the ILGSDATA.FTL. If not already done automatically, **select the mouse option** for frequency changes**.
If you now click on one of the lines in the ILGRadio search window, the NRD-535 is tuned to the frequency shown on that line and the tracking window shows the same data and in addition what else could be possibly found on this frequency.

5. Receiver to database files (Rx2Db)

As explained in the introduction to chapter 4, two main types of database uses are distinguished. In this chapter the use of files that store (see 5.1 Logging) or translate (see 5.2 Tracking) data *coming from* the NRD-535 are described.

5.1 Logbook facilities

With the menu item logging a range of logbook facilities come available. Above the features you find in the BDXC and OWN menu, it gives the possibility to add and to change log records, to change the screen format and to sort the records. The result can of course be saved to a log file for future use.

5.1.1 Open Log window and Log file
After selecting the menu-item Rx2Db/Logging the log window will be opened. See picture 8 below:

Logging							

| | Load Log File | NRD-535 Freq (kHz)   21605.00 | | RX Control | Exit |

000	20000924	1814	11990	44434	E	R. Kuwait	px abt moslim faith
001	20000924	1818	12070	34333	vie	Voice of Vietnam	music
002	20000924	1821	12085	33333	D	Radio Damascus	nachrichten, commentaar
003	20000924	1825	15190	33333	?	Radio Pilipinas	talk px
004	20000924	1833	15420	33433	E	BBC	tlks abt china
005	20000924	1839	09460	44444	Tur	Voice of Turkey	nice turkeys mx
006	20000924	1848	09480	44434	E	Voice of Russia	religious px
007	20000930	1918	21500	33333	S	Voz Cristiana	tlks
008	20000930	1921	21455	33233	G	WYFR Okeechobee	mailbox px, music
009	20000930	0441	05025	23332	S	Radio Rebelde, Bauta	olympiade
010	20000930	0450	04890	33333	F	R. France Int.	tlks
011	20000930	0453	04885	33232	P	R. Clube do Para	mx
012	20000930	0457	04819	43333	S	La Voz Evangelica	id at 0500 La Voz Evang
013	20000930	0504	05070	44444	E	WWCR, Nashville	abt pro-life group agai
014	20000930	0510	04949	11111	S	R. Amazonas ?	very weak no id
015	20000930	0517	04919	23332	S	Radio Quito	id:"radio quito" la mx
016	20000930	0525	04905	33333	P	Radio Anhanguera	mx at 0530 id
017	20000930	0532	03300	23333	S	Radio Cultural	nice mx and latin tlks
018	20001002	1731	04965	22332	E	Christian Voice	17.30 id gospel mx
019	20001010	2043	09680	44444	E	R. Thailand	nx abt tourism to Pukat

| Add Record | Change Record | Delete Record | Format | Sort | Save | SaveAs | Close |

Picture 8 Logging window

Clicking in the button 'Load Log File' will give access to a number of log files. Select a file and load it in RAM.
The default for the maximum number of records in a log file is set to 1000. This can easily be changed in the set-up between 1000 and 30.000, by changing DIM LOG. Each record has the same structure. The maximum length of a record is 160 characters and is build-up as follows:

- Character positions   1 up to and including   3 : Record number (###)
- Character positions   5 up to and including   12 : Date (yyyymmdd)
- Character positions   14 up to and including   17 : Start time (hhmm)
- Character positions   19 up to and including   22 : End time (hhmm)
- Character positions   24 up to and including   32 : Frequency (in kHz, #####.###)
- Character positions   34 up to and including   38 : SINPO
- Character positions   40 up to and including   42 : Language
- Character positions   44 up to and including   63 : Broadcast organisation
- Character positions   65 up to and including   84 : Transmitter location
- Character positions   86 up to and including   91 : // Frequency 1 (in kHz, #####)
- Character positions   92 up to and including   96 : // Frequency 2 (in kHz, #####)
- Character positions   98 up to and including 102 : // Frequency 3 (in kHz, #####)
- Character positions 104 up to and including 108 : // Frequency 4 (in kHz, #####)
- Character positions 110 up to and including 149 : Remarks
- Character positions 151 up to and including 154 : Rx setting (abdg)
- Character positions 156 up to and including 159 : 'empty'

After a selected file is loaded, you can double click on a frequency or a // frequency in the grid (or give a cell the focus using your cursor keys and then pressing 'Enter') to tune your NRD-535 to that frequency. If an Rx setting was saved then the main receiver parameters will be set accordingly.

5.1.2 File data manipulation
At the bottom of the Log Window you find a kind of toolbar to Add, Change or Delete records to/from the file, to change the Format of the data shown on your screen, to Sort the file and to Save or to save and Close the file. This toolbar will only be enabled after a log file is loaded.
The Add, Change and Delete commands are available to keep your logging up to date.
For large updates it is however easier to use an ASCII text editor, for example 'Notepad', to edit the file directly. The program 'Notepad' can also be used to print the files. See 'Set-up / Program options' in chapter 1 for easy access to this program.

A short description of all command buttons is given below:
- Add Record gives the possibility to add a new record. After clicking there, a new window appears to edit the record. See picture 9 on the next page.
By clicking in 'Get current setting', the current time and receiver setting will be automatically inserted in the right textboxes. You can also type the necessary data in the other boxes. Part of it can be find by simultaneous use of the tracking option. To add it to the list click in OK
- Change Record gives the possibility to change an existing record. First click once in a grid cell to select the row, then click on the 'Change Record' button to get the edit window with the old record, see picture 9 on the next page for the lay-out. Change it as wanted and click in 'OK' to bring the changes back in the list. In case you want to add data, first delete some spaces at the end of the item that has to be changed, because all sub-records are brought at the same max. length by adding spaces.
- Delete Record gives the possibility to delete a record from the list. First click in a grid cell of the record that has to be deleted, then click the Delete Record button and click in Yes to confirm it.

Input Record 047

Date (yyyymmdd)	20010202	15395.000	Frequency (kHz)
Start UTC (hhmm)	1313	34433	SINPO (#####)
End UTC (hhmm)		Ara	Language (%%%)
Organisation	R. Dubai		
TX Location	UAE		
// Frequency 1	13675		// Frequency 3
// Frequency 2	21605		// Frequency 4
Remarks			
Settings abmg	0041		Settings pqrs

Get Current Setting

OK   Cancel

Picture 9 Logging Add/Change record window

- Format gives the possibility to change the parts of the records that are shown on the screen, especially to keep the parts shown within about a total of 70 characters, the maximum that can be visible in the log grid. After clicking in format a window appears with a survey of all sub-records available in each record. See picture 10 on the next page
By checking the sub-records you want to be shown and at the same time keeping an eye on the total record length given at the bottom of the same window you can compose your best view of the record.
- Sort gives the possibility to change the order of the records in the list, depending on the purpose of it.
- Save gives the possibility to save all records to the existing file any time you want, without closing the file.
- Save As gives the possibility to save all records in a new file by selecting another filename in the Save file combo box. This filename should fulfil the following criteria, the name should start with 'log_' and end with '.txt' In between you can use 1 to 12 characters. Examples are 'log_myfavourites.txt' or LOG_abcdefghij.TXT
-Close give the possibility to save and close the file.
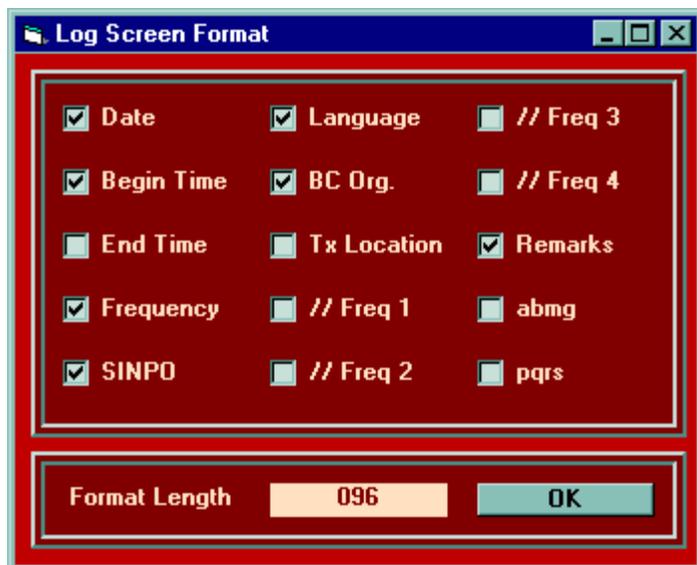
Picture 10 Log screen format

5.2 Tracking facilities

In Tracking mode you can tune the receiver by turning the frequency dial on the receiver or by mouse clicks in a spin control in the tracking window of the program, while the program continuously gets the receiver tuned frequency and tries to find a frequency or frequency and time or frequency, time and target area match in a open database, to show to which station you are (possibly) tuned. See picture 11 on the next page.
From version 6 this is based on tracking files converted from the extended (and free) ILGRadio Medium Wave and Short Wave databases from Bernd Friedewald, see chapter 5.3 .

5.2.1 Open Tracking window and Tracking file
After selecting the menu-item Rx2Db/Tracking the tracking window will be opened. Then clicking in the button 'Load file' will give access to the ILG based tracking files. Select 'ILGADATA.FTL' (LW/MW) or 'ILGSDATA.FTL' (SW) and load it in RAM.
The default of the maximum number of records in a tracking file is set to 15000. This can easily be changed in the set-up between 1000 and 30000. Each record has the same structure. The length of each record is max. 120 characters and is/should be build-up as given :
Character positions   1 up to and including   8 : Frequency (mmkkk.uu)
Character positions   10 up to and including   13 : Start time UTC (hhmm)
Character positions   15 up to and including   18 : End time UTC (hhmm)
Character positions   20 up to and including   41 : Broadcast organisation
Character positions   43 up to and including   50 : Target Area
Character positions   52 up to and including   68 : Language
Character positions   70 up to and including   76 : Transmitter power in kW (####.###)
Character positions   78 up to and including   82 : Transmitter Latitude
Character positions   84 up to and including   89 : Transmitter Longitude
Character positions   91 up to and including   99 : Coded data about target area(s)
Character positions 101 up to and including 112 : Country where transmitter is located

```
Tracking mode active with ILGSDATA.ftl / 12925 records     UTC : 1 dec 2000 12:48

Load File   Catch Range (kHz) : 2  NRD-535   13611.61    ● Mouse  ● Hits   ● Lat/Lon   ●
  Exit                              Freq (kHz) 1 2 3 4 5 6 7   ● Dial   ● All    ● Dis/Dir   Ctry

13610.00 0130-1735 CNR Beijing 1        (CHNe  ) Mandarin       50.00 2510N 10250E
13610.00 2300-2345 DEUTSCHE WELLE       seASn    English       250.00 0844N  8110E
13610.00 0300-0400 R.FRANCE INTERN.     eAF/cAF  French        500.00 4657N  0159E
13610.00 0700-0800 VOICE OF AMERICA     cAS      Mandarin      500.00 1458N 14538E
13610.00 0800-1000 VOICE OF AMERICA     cAS/sAS  English       500.00 1458N 14538E
13610.00 1000-1100 VOICE OF AMERICA     cAS      Mandarin      500.00 1458N 14538E
13610.00 0700-1355 R.PORTUGAL INTERN.   EU       Portuguese    100.00 3845N  0840W
13610.00 0445-1600 R.DAMASCUS           nAF      Arabic        500.00 3327N  3630E
13610.00 0545-1600 R.DAMASCUS           nAF      Arabic        500.00 3327N  3630E
13610.00 1600-1700 R.DAMASCUS           nwME     Turkish       500.00 3327N  3630E
13610.00 1700-1800 R.DAMASCUS           eEU      Russian       500.00 3327N  3630E
13610.00 1805-1905 R.DAMASCUS           EU/NA    German        500.00 3327N  3630E
13610.00 1905-2005 R.DAMASCUS           EU/NA    French        500.00 3327N  3630E
13610.00 2005-2105 R.DAMASCUS           EU/NA    English       500.00 3327N  3630E
13610.00 2110-2210 R.DAMASCUS           NA/EU    English       500.00 3327N  3630E
13610.00 2215-2315 R.DAMASCUS           SA/wAF   Arabic        500.00 3327N  3630E
13610.00 2315-2345 R.DAMASCUS           SA/wAF   Portuguese    500.00 3327N  3630E
13610.00 2345-0030 R.DAMASCUS           SA/wAF   Spanish       500.00 3327N  3630E
```

Picture 11 Tracking window

5.2.2 Methods of changing the receiver frequency
After a file is loaded the tracking mode is automatically activated. By clicking in the option box upper right in the tracking window at the right-hand side of the receiver frequency, you can choose between two methods of changing the receiver frequency.
- Mouse : change frequency by clicking in the up/down spin button left of this option box
  In the textbox 'Freq. Step' you can change the frequency step size for using the spin button. The default value after loading of the MW tracking file is 9 kHz, being the frequency channel spacing in the LW and MW broadcast bands. The default with the SW tracking file is 5 kHz.
- Dial : change frequency by dialling around the frequency dial on the receiver

Large frequency changes are also easily possible in both modes. Double clicking in the frequency textbox will let disappear the current frequency setting. Then type the new frequency and activate it by pressing the <Enter> key.

5.2.3 Explanation of presentation and presentation options
- Background Colours
In case there is only a frequency match, the background becomes (medium) red. If there is also a match in time then the background will become magenta and in case a frequency, time and target area match occurs, it becomes lime green. This will only work correctly if you have set in the Set-up window the right RX Target Area option.

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- Select page to be presented
In case for certain frequencies more then 27 records are available, it is possible to show them page by page by clicking in the page number just below the receiver frequency. Up to 7 pages / ~180 records can be shown. Page number selection buttons are only enabled if that page really contains data.
-Showing all records for one frequency or only frequency plus time /target area hits.
In the option selection box at the right-hand top you can select between a presentation of all the records in relation to the tuned frequency (all) or only those with a match on frequency and time or frequency and time and target area (hits)
-Showing transmitter Latitude/Longitude or Distance and Direction from Rx to Tx or Country where the transmitter is located
In the option box Lat/Lon or Dis/Dir or Ctry you can select whether (1) the Latitude and Longitude of a transmitter is shown or (2) the distance between your receiver and the transmitter and the (great circle) direction from your receiver to that transmitter or (3) the country where the transmitter is located. This will only work correctly if you have filled-in in the Set-up window the accurate location (RX Latitude and RX Longitude) and Target Area of your receiver.
- Catch range
In the Text Box called 'Catch range' you can change the deviation (in kHz) between NRD-535 frequency and frequency data in the database at which a match will be indicated. The default catch range is +/- 2 kHz.

5.3 ILGRadio database conversion

5.3.1 The ILGRadio LW/MW and SW databases
ILGRadio is the amateur version of the ILG (International Listening Guide) professional databases, set-up and kept up to date by Bernd Friedewald from Germany. All info about these databases can be found on his web pages, starting at "http://www.ilgradio.com/". A lot of specific info about ILGRadio, including access to download facilities, can be found at http://www.iilgradio.com/ilgradio.htm. To download these files you need a user name and password. This can also be asked for on the download page. The info you give is only used for statistics, the databases itself are free of charge.
It was agreed with Bernd Friedewald that no converted ILGRadio files will be distributed with the TURB535 program. So if you want to use the converted ILGRadio files with the program you have to download the LW/MW (ILGADATA.DBF) and SW (ILGSDATA.DBF) database files -in dbase /*.dbf format- from the ILG website mentioned above and convert them as described in 5.3.2.
The advantages of this approach are two-fold, Bernd can keep track of the usage of his databases an you can update the tracking files yourself as soon as they come available on the ILG website.

5.3.2 Conversion of ILGRadio-dbf files to 'Filtering'- and 'Tracking' files
After you have downloaded and unzipped the ilgadata.dbf and ilgsdata.dbf files in your ILGRadio directory , start the TURBO535 program and select the menu "Rx2Db\Convert ILGRadio". Then the conversion window will be loaded. See picture 12 on the next page.
Click first in 'Locate ILGRadio *.dbf files'. Then you get a window with a drive list box, a directory list box and a file list box. Select the drive where your ILGRadio files are located and then the directory. If you select the right directory the filenames (only ilgadata.dbf and/or ilgsdata.dbf will be sought for, so do not change the names) will appear in the file list box and the OK command button will become enabled. Click in 'OK'
Now connect to the database you want to convert, by clicking in the option button 'Connect to ILG MW db' or 'Connect to ILG SW db. After that click in 'Convert' to start the conversion.
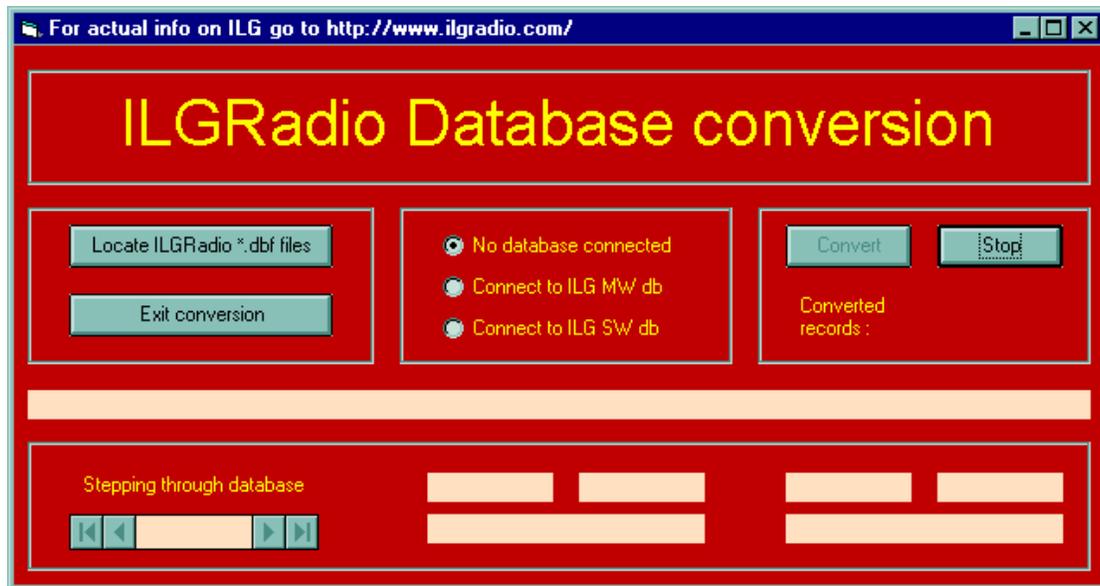
Picture 12 ILGRadio database conversion window

During the conversion each hundredth record will be shown at the bottom of the conversion window.
After a few minutes a message appears that the conversion is finalised. The converted file is automatically saved in the 'Rx2Db' sub-directory of the TURB535 program
If now the ILGRadio filtering window (see 4.3) or the tracking window (see 5.2) is loaded the converted ILGRadio file can be used.

6. Analysis of received signal strength

All options under the menu-item 'SignalAn' (=Signal Analysis) are based on reading and processing the received signal strength (S-meter) of the NRD-535. You can analyse in two dimensions :
- Time, resulting in a propagation impression over time for one frequency and the path
  between the selected transmitter and your antenna-receiver combination. See 6.1 and 6.3
- Frequency, resulting in a survey of signals that can be received at that moment in the
  selected part of the HF spectrum. See 6.2

Because all three option described in the next paragraphs are base on the same S-meter readings, you can use only one at a time, therefore you will find the other options inaccessible after selecting one of the options.

6.1 S-meter

After clicking in the menu-item 'SignalAn/S-meter' a small separate S-meter window will be opened. See the picture below :
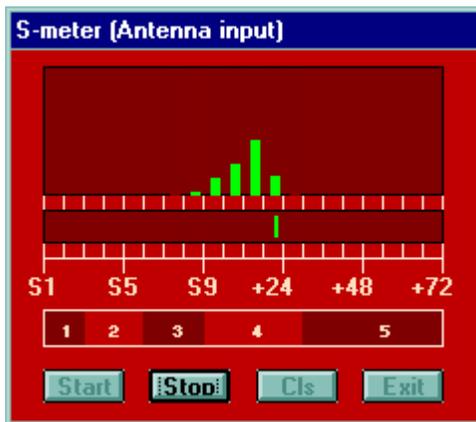
Picture 13 S-meter window

Click in 'Start' to start the measuring process. In the middle the real time S-meter value, updated each second, is shown. In the upper part a histogram is shown, giving a statistical overview of the occurrence of certain S-values the most recent 60 seconds.
To prevent interference with data communications between other windows and the receiver a number of these windows, including the receiver main control window, are disabled during the S-meter measurements. If you want to use those other windows, then click first in 'Stop' to stop the S-meter measurements. Then the other windows are active again.
The S-meter values shown are the signal strength at the antenna input of the receiver. This means that a correction is brought in, to compensate for the input attenuator setting.
In the lower part of the S-meter window a translation is given of the S-meter values to the signal strength part (1-5) of the SINPO rating.

6.2 Spectrum

Click on the main menu item ' SignaAn' and select the sub-menu item ' Spectrum'
The Spectrum window will now be loaded and shown on your screen. See below.
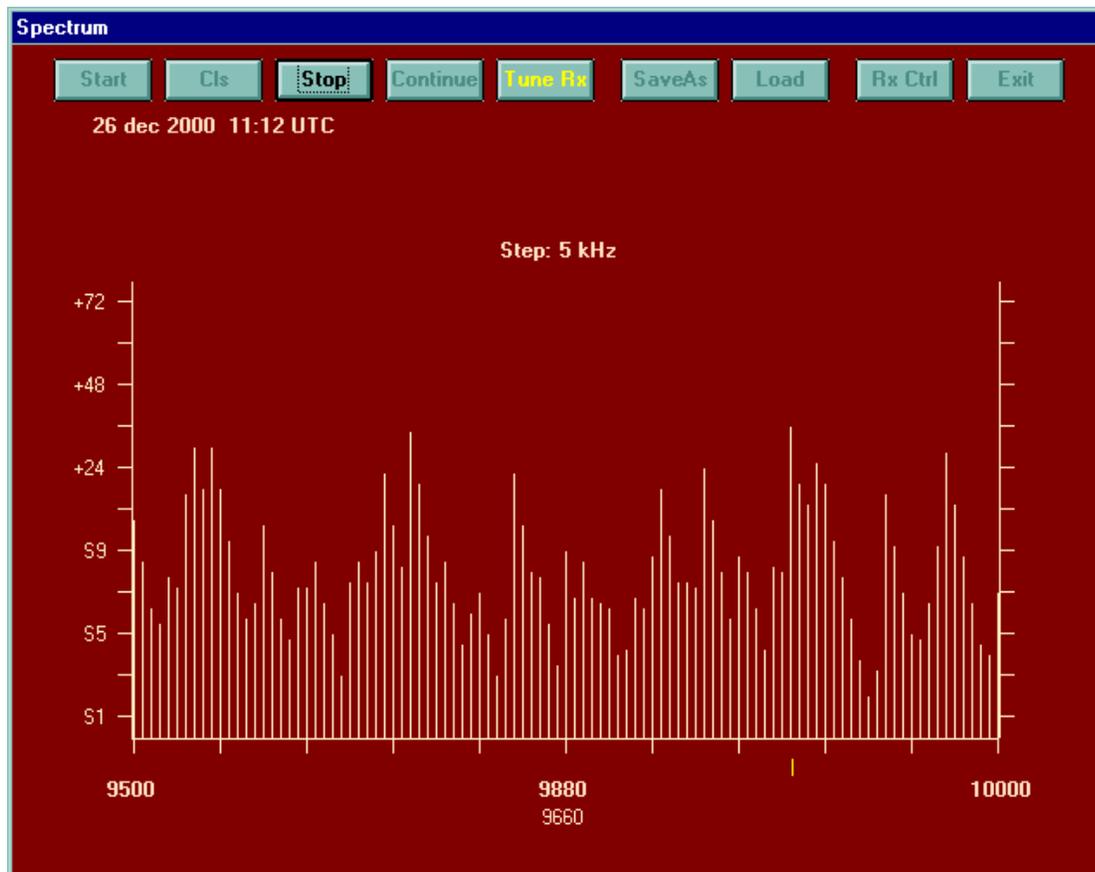
Picture 14 Spectrum scan window

After clicking in 'Start' a small window appears that gives the possibility to enter the lower and upper limit (in kHz) of the frequency band to be shown. Use the Tab-key to jump to the next textbox.
The maximum part of the spectrum that can be shown is 500 x the step size. The step size (in kHz) should of course be related to the use of the band. Some examples are :

LW Broadcast :lower limit   151 kHz, upper limit   238 kHz, channel spacing 9 kHz
MW Broadcast :lower limit   531 kHz, upper limit 1602 kHz, channel spacing 9 kHz
49 m band   :lower limit   5900 kHz, upper limit   6200 kHz, channel spacing 5 kHz
25 m band   :lower limit 11600 kHz, upper limit 12100 kHz, channel spacing 5 kHz
Aeronautical   :lower limit   5481 kHz, upper limit   5730 kHz, channel spacing 3 kHz
Aeronautical   :lower limit   8816 kHz, upper limit   9040 kHz, channel spacing 3 kHz
etc. etc.

The next item that can be selected is the Scan Delay time, being the time that one frequency is being monitored. Values between 0.5 and 5 sec can be selected. The default is 1 sec.

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If you do not want only a single run of the spectrum scan you have to check the box 'Continuous loop' In the continuous loop situation you can also check to keep the highest measured S-value for each frequency

After filling in all 4 textboxes (and possibly the checkboxes) click in 'OK' or just pressing enter.
A validity check is done on the values typed in the textboxes. If everything is correct then the spectrum scan will start.
Depending on the place where you are, the type of antenna you use, the part of the band you want to investigate, the hour of the day and may be many other things the number of signals and the signal strength can be very different. Therefore it is sometimes necessary to adapt your receiver setting before you start a spectrum scan.
I propose you always set AGC to fast, and in a crowded band with strong signals (f.e. the 49 m band in Europe in the evening hours) use your smallest filter and the hf input attenuator.
On the screen always the signal strength on the antenna input is shown. This is done by compensating in the program for the setting of the input attenuator.

After the spectrum scan is finalized or after clicking in 'Stop' you can set the NRD-535 easily to any interesting-looking channel in the investigated part of the spectrum, by first clicking in 'Tune Rx' and then clicking the left mouse button after bringing the mouse pointer to the right place in the spectrum graph. The selected frequency is shown at the mid-bottom of the screen and the small yellow line helps to find the signal level at this frequency during the spectrum scan.
In case the received signal sounds blurred you can try to improve it by changing the receiver setting for filter bandwidth and/or mode. To get access to the receiver control panel click first in 'Stop' and then in 'RX Ctrl'. Go back to the spectrum graph by just clicking in that window.

To compare spectrum scans (f.e. for antenna comparison or propagation investigations) it is possible to save and load scan results. If you want to save a spectrum scan for later comparison, let the program finalise a started spectrum scan or click in 'Stop' during a running scan. Then click in 'Save As' to get a survey of earlier saved scans and select a filename for the scan to be saved. As default 'san_xyzxyzxyzxyz.txt' is proposed. It is necessary always to use the san_*.txt layout, with * is 1 to 12 characters, otherwise the save option will not work correctly. Click in 'OK' to save the file. To load a previous saved scan, click in 'Load' and then double click in the filename you want to load. For easy comparison, successive loaded files will show their results in up to four different colours.
Remark : To compare different spectrum scans it is advised that is checked if they cover the same frequency range. The program has no protection to prevent loading successively spectrum scans for different frequency ranges.

The file structure for spectrum scans is given below
First record   : date and time (UTC) of measurement
Second record   : lowest frequency
Third record   : highest frequency
Fourth record   : frequency step size
Fifth record   : number of scan samples
Successive records   : S-value x 10 (Value of 090 = S9, value of 210 = S9+72 dB, etc)

In case a high frequency signal generator is available also the characteristics of the mid-frequency filters of the NRD-535 can be made visible with this option. Connect the HF generator to the antenna input, set the frequency to, for example, f = 5 MHz and tune the receiver to this frequency. Set the S-meter value to the maximum by fine-tuning the NRD-535 and set this value to S9+50 dB by changing the output of the HF signal generator.
Select the filter to be measured and then select the spectrum option and enter as lower limit f-10 kHz, as upper limit f+10kHz and as step size 0,1 or 0,05 kHz and click in 'OK' . . .

6.3 Propagation

6.3.1 Time Analysis
Set the receiver to the frequency you want to monitor. Click on the main menu item 'SignalAn' and select the sub-menu item 'Propagation/Time Analysis' A propagation impression window will now be loaded and shown on your screen. See the picture below.
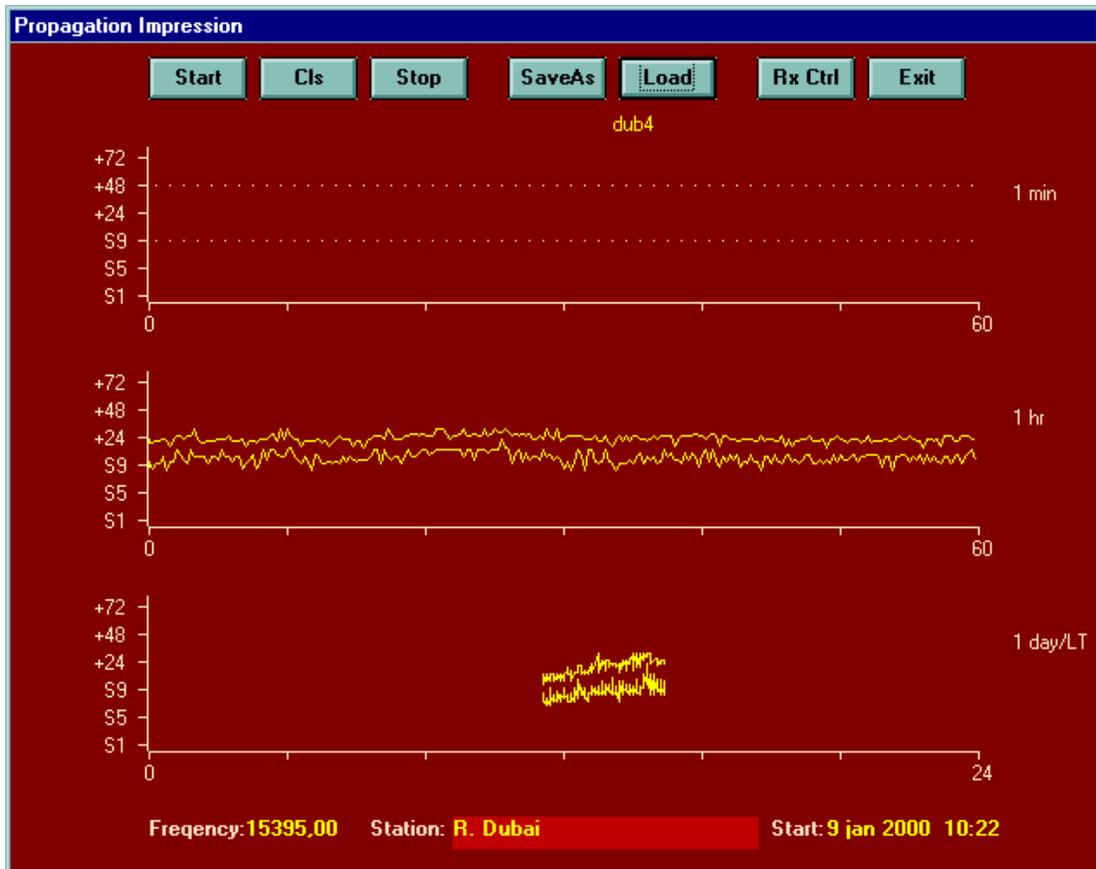
Picture15 Propagation impression window (Time analysis)

Click in 'Start' to start the measurement process. The basis of the analysis is that roughly each second the S-meter value is read. This is processed directly and presented on the screen in the '1 min' graph. Every 15 seconds a line is plotted in the '1 hr' graph connecting the highest and lowest measured S-value in that 15 second period. In the '1 day' graph the same happens on a 6 minute basis.
Before you start, check if the AGC is set to fast. You can always get access to the receiver control panel after clicking in 'Stop' and 'RX Ctrl'. Click in the Propagation window and then in 'Start' again to continue.
If you want to save propagation data for later use, you should stop any running measurement, then first type in the textbox at the bottom of the window to which station you are tuned and then click in 'SaveAs'. Select a filename and click in "OK" in the file save window. Use always the pan_*.txt layout , with * is 1 to 12 charcters (for example pan_abcdefghij.txt) for the filename, otherwise the save option will not work properly. After the file save window is closed, click immediate in the 'Start'

command button to start the measurements and the saving to file of the calculated data. Just below the 'SaveAs' button is shown in which file the data is stored. If you click in 'Stop', the measurements will end and the file will be closed automatically. To load a previous saved file with propagation data, click in 'Load' and then double click in the file name to be loaded. For easy comparison of results only the highest and lowest values are shown and for each successive file in up to four different colors

The structure of the file with propagation data is as follows:
First record   : Date and start time (UTC) of measurement
Second record: Frequency
Third record   : Station name
Successive records   : Time(LT) + 4 x (lowest + highest measured S-value (x10) per 15 sec)

Remark : To prevent the incompatibility with the differences in used decimal separators in the different countries (. or ,) the S values are multiplied by 10 before saving and off course again divided by 10 after loading.

6.3.2 Time + Histogram
If you select the submenu SignalAn / Propagation / Time +Histogram, another Propagation impression window will be loaded and shown on your screen. See picture below.
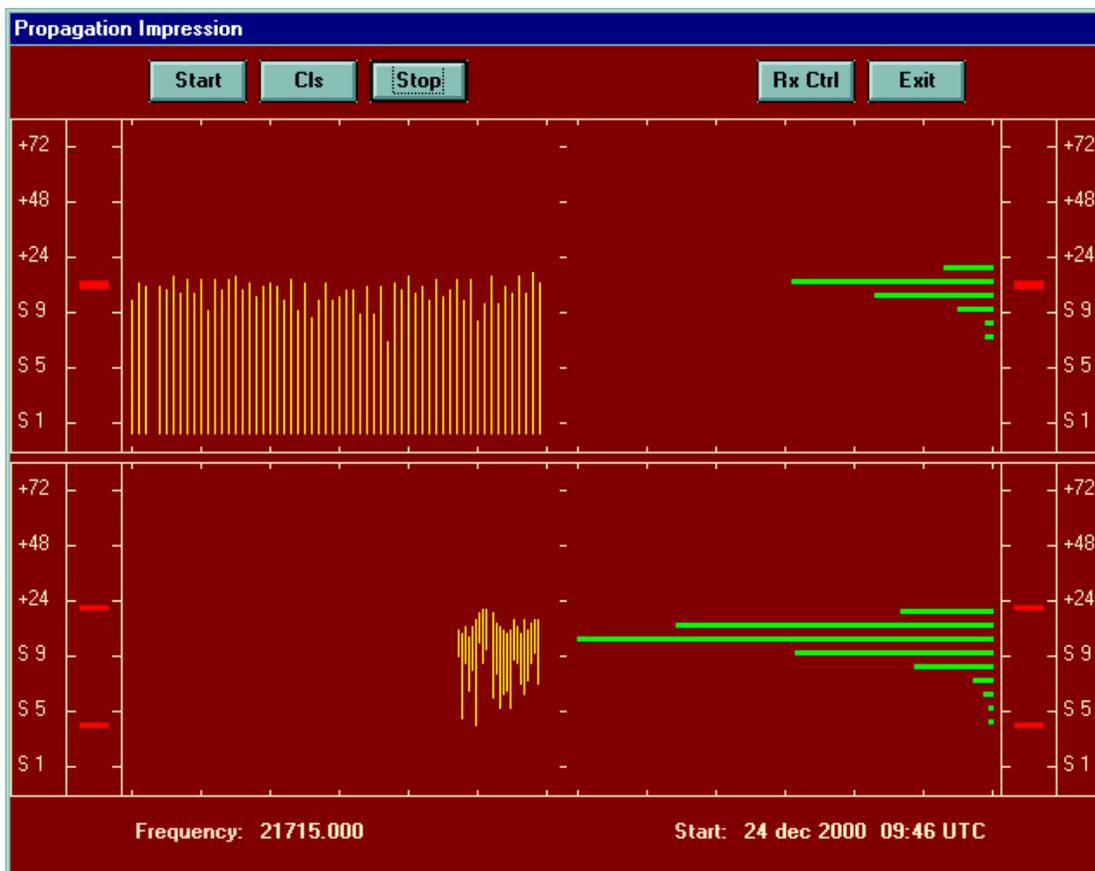
Picture 16 Propagation impression window (Time analysis and histograms)

The left-hand part is equal to the 1 min and 1 hr graph of the Propagation impression window described in 6.3.1.

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In the right hand part some statistical info on signal strength is added in the form of histograms. The upper right hand part shows the distribution of the signal strength over the most recent 60 sec. The lower right hand part shows the distribution of the signal strength over the total measuring period and is updated each minute.

The short horizontal red lines left and right in the upper part show the latest measured S- value. The short horizontal red lines left and right in the lower part show the highest and lowest measured S-value during the measurement period. The distance between these two lines is the fading range of the received signal. This fading range can be over 50 db

This window has no saving options.

6.4 Combined use of Spectrum scan and Tracking

To get a quick and still rather detailed overview of what is 'on the air' in a certain broadcast band, you can do a band scan of that (part of the) band as described in chapter 6.2 in combination with the tracking facility described in chapter 5.2, to get direct information for each scanned frequency whether and, if yes, which broadcast is (most probably) received.

First open the tracking window and load the ILGRadio file that contains the data about the part of the broadcast band you want to investigate. **Be sure that the mouse option is selected** for frequency changes, otherwise it will not work properly

Now load the spectrum scan window and start the scan as described in chapter 6.2, using a delay time between successive scan steps of at least 1 sec.

The TuneRx option or SaveAs options as described in chapter 6.2 are still available in this combined use situation.

Remark : If you load the Tracking window while you are using the TuneRx function, you will 'loose contact' with the receiver. Click in 'Stop' and then in 'TuneRx' again to get back 'full control'.

7. Receiver Memory Management

The NRD-535 has a total of 200 memory cells (000 - 199). Each cell can contain the setting of the frequency, attenuator, bandwidth, mode and agc. In the Memory Management window all these memory cells can be easily selected and manipulated. It is also possible to sort the contents of the memory cells on frequency.

Using memory management, you should keep in mind that there are 3 locations were data in relation to the receiver memories can be found. These are (1) The NRD memory, (2) the memory files on the hard disk and (3) the data available in the Memory Management window. When data is changed, at first only the data in the Memory Management windows is changed. Separate action is necessary to update the NRD memory (for example with 'Fill RM') or the file on hard disk (by using 'SaveAs').

After the content of the memory cells is copied to the PC, or a memory file is loaded in the PC, the content of each cell is made visible in a grid. Double clicking in a line in that grid will switch the receiver to the setting stored in the selected memory cell in the receiver. The Memory Management window is shown in the picture below :

Picture 17 Memory Management window

The Memory Management window contains the following command buttons:

7.1 Load/Save
Load gives the possibility to replace the contents of the grid in the Memory Management window with data from a file. After selecting this item, a list box with all available memory files is shown. Double clicking on one of these filenames or clicking once plus clicking in 'OK' will load this file in the memory management window.
The record structure in the file to be loaded should be equal to the one described in chapter 5.5.3, item 'L' of the NRD manual (example "L123040216050001") plus additional a character string (alpha tag) of max 50 characters for additional information.

Save gives the possibility to store the contents in the grid in the Memory Management window in a file. After selecting this item a list box with already existing memory files will appear. You can either enter a new filename in the top of the box or, by clicking once on one of the filenames in the list, you can select to overwrite an existing file. The filename should always have the following layout : MEM_*.TXT, with * is 1 to 12 characters (for example mem_myfavourites.txt.), otherwise the save action will not work properly. The save-action starts by clicking in OK .
Remark : Before the current contents of the NRD-535 memory is removed you better check whether the saved file is faultless.

7.2 Print
With the 'Print' command you can sent the contents of the memory cells including the added 'alpha tags' to a printer. The range of cells to print can be set by typing the start value in the 'From' field and the end value in the 'To' field right below the scan start/stop button. If the 'From' number is higher then the 'To' number then the printed range becomes: From-nr to 199 + 0 to To-nr

7.3 Clr / Exit
Clicking in 'Clr' will clear the grid in the memory management window and remove all related data. Click in the 'Exit' command button to leave the Memory Management option.

7.4 RX Ctrl
If you have not enough room on you screen to show several windows at the same time, click in the button 'RX Ctrl' to get the receiver control window on top and make any necessary change. After clicking in the Memory management window the receiver control window will move to the background again.

7.5 Fetch RM
Clicking in 'Fetch RM' (RM= Receiver Memory) gives the possibility to copy the contents of all memory cells from the NRD-535 in the computer RAM for fast and easy processing. This fetch result is also shown in the grid in the Memory Management window.

7.6 Sort Freq
Clicking in 'Sort Freq' will sort the contents in the Memory Management window on frequency. Empty cells are put at the end of the row. To make it active in the receiver memory also the 'Fill RM' action should be done.

7.7 Fill RM
Clicking in 'Fill RM' will fill /replace the Receiver Memory with the current contents of the grid in the Memory Management window. The range of cells to be filled can be set by typing the start value in the 'From' field and the end value in the 'To' field right below the scan start/stop button.

7.8 Set R2M
Clicking in 'Set R2M' will change the receiver parameters to those present in the selected receiver memory cell.

7.9 Scan
The scan function can be used to automatically step through a selected range of the NRD memory channels. Type the first cell to scan in the 'From' box and the last cell to scan in the 'To' box. If the 'From' number is higher then the 'To' number then the scanned range becomes: From-nr to 199 + 0 to To-nr.
In the 'Delay' box you can give the time in sec. that the program will wait until stepping to the next channel. Delay between .1 and 10 sec will be accepted.

7.10 Change
With this command the individual memory cell window opens with the current the Memory management window content of that cell. See picture below. Bring in the necessary changes. The result can be stored in the Memory Management window for further processing (click in 'To MMW') or stored in the selected memory cell of the NRD-535 (click in 'To RxM') .

Picture 18 Change/Copy/Dump memory cell window

7.11 Dump
With this command the individual memory cell window opens with current the receiver parameters visible in the different boxes. This can be stored in the Memory Management window for further processing (click in 'To MMW') or stored in the selected memory cell of the NRD-535 (click in 'To RxM') .
It can be very interesting to combine this functionality with the SignalAn/Spectrum/TuneRX possibility. Open both the spectrum analysis- and the memory management window. Do a spectrum scan in the part of the band you are interested in (see 6.2) After the spectrum scan click in the TuneRx button and click in the graph at interesting looking frequencies to tune the receiver to it. Then click in 'Dump' in the memory management window to store these receiver settings in the selected memory cells for later use.

7.12 Copy
With this command the individual memory cell window opens with the contents of the selected memory cell visible in the different boxes. After changing the cell number to the new number this can be stored in the Memory Management window on the new place for further processing (click in 'To MMW') or stored in the newly selected memory cell of the NRD-535 (click in 'To RxM') .

7.13 Delete
With this command the individual memory cell window opens. Then you can select to empty the cell in the Memory Management Window (Click To MMW) or tin the receiver memory (Clik RxM)

8. Timer programming

8.1 PC system clock setting

After choosing this menu-item the current PC system time and date is shown in the well-known W95+ window for that purpose. If it is necessary to change this, enter new time and / or new date in the relevant boxes. PC system time and date is supposed to be Local (summer/winter) Time and Date. All timing in the program is derived from the PC system clock.

8.2 Receiver clock settings

After choosing this menu-item a window appears showing three NRD clock setting possibilities. The first one, the actual time, can be read and set. The clock in the receiver can be set to LT or UTC by clicking in 'Set Rx Clock to LT' or 'Set Rx clock to UTC'
The last two, timer-on and timer-off settings, can not be read but only set. The time setting of the NRD will become visible after clicking in the 'See Tmr On' or 'See Tmr Off' button. You can set a new actual time by typing it in the relevant text box and clicking in 'Set Tmr On' and/or 'Set Tmr Off' at the right time.
To leave this option click in 'Exit'. Then also automatically the current frequency where the receiver is tuned to, will again be shown on the receiver display.

Remark : The clock/timer settings in the receiver are not relevant to the program because none of the NRD timers is used in any program functionality.

8.3 Timer programming

To support the unattended reception of selected transmissions, including the storing of the received program on a cassette recorder, a programmable timer is built in. The cassette recorder should be a type that can be remote controlled, so it can be started and stopped with the NRD-535 timer relay that is controlled by the program. The right connection points on the rear panel of the NRD-535 are shown in fig 5-7 in the NRD-535 manual.
It is of course also possible to use the hard disk in your PC to store the audio in .wav or mp3 files, using the line input on the soundcard of the PC in combination with recording software.
The long-term timer-programming window is shown in the picture on the next page.
In the upper part of window you can set the start time/date (UTC!) and duration of the program to be recorded and also the NRD-535 settings by clicking in the spin buttons. You can select the actual time and date (in UTC) by clicking in the command button 'UTC' and the actual NRD-535 setting by clicking in the command button 'RX'
After you have selected the time/date/duration and NRD-535 setting for the event you want to program, click in the command button 'Fix1'. Then select the next event you want to program with the spin buttons and fix it by clicking in 'Fix2', etc. You can always clear the settings fixed the latest by clicking in the relevant 'Clr#' button.
Keep in mind that the first event to be programmed should be at least 1 minute ahead of current time and also the time between successive events should be at least 1 minute, otherwise the program will not accept it.

	DD MM YY	Start UTC	Dur.	Att	Bw	Pbs	Bwc	Mode	Agc	MHz	kHz	Hz	
Select values													Select values
UTC	14 Jan 01	17 : 00	10	Off	Inter	0.0	1.7	USB	Slow	0 5 ,	5 0 5 .	0 0 0	RX

Fix 1	14 Jan 01	15 51	10	Off	Wide	+0.0	5.5	AM	Fast	0 7	2 6 5	0 0 0	Clr 1
Fix 2	14 Jan 01	17 00	10	Off	Inter	+0.0	1.7	USB	Slow	0 5	5 0 5	0 0 0	Clr 2
Fix 3													Clr 3
Fix 4													Clr 4
Fix 5													Clr 5

Timer On	Timer Off	LT: 15:54:26	UTC: 14:54:26	Clear All	Exit
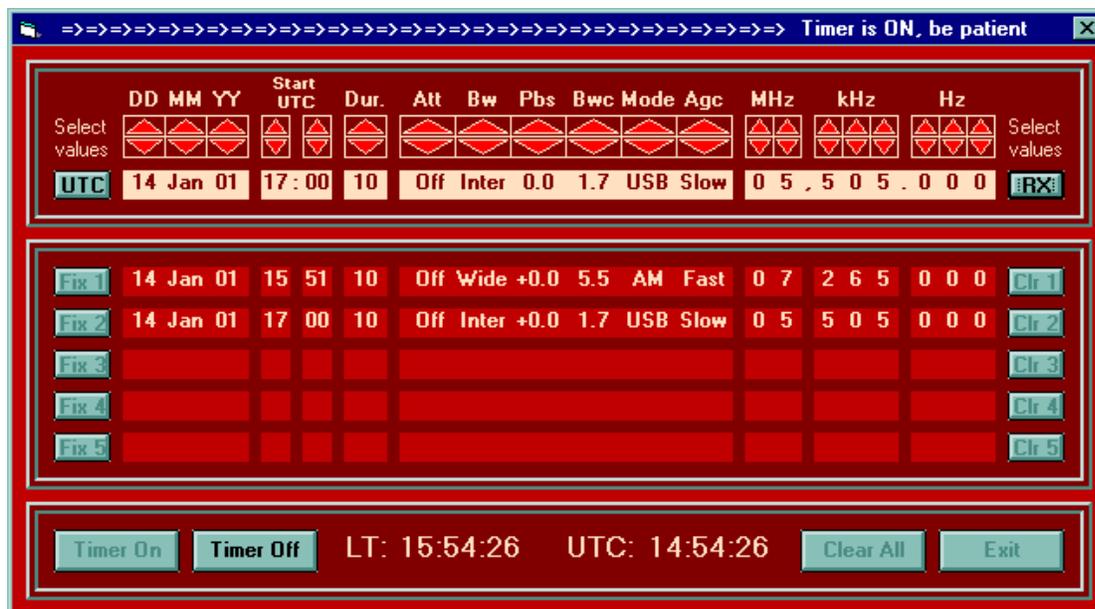
Picture 19 Long term timer programming window

After all necessary settings are fixed, the programmed timer can be activated by clicking in 'Timer On'. At the moment the timer programming is activated the NRD-535 power will be switched off. Also between events the power will be switched off again. Just 1 min before each event the receiver is switched on to prepare the receiver for the next programmed event.