AF · CT · DI · EON · IH · MJD · MS · ON · PI · PS · PTY · RP · RT · TA · TDC · TMC · TP · AF · CT · DI · EON


RADIO DATA SYSTEM

*The greatest advance in sound broadcasting since the implementation of FM-Stereo*

---

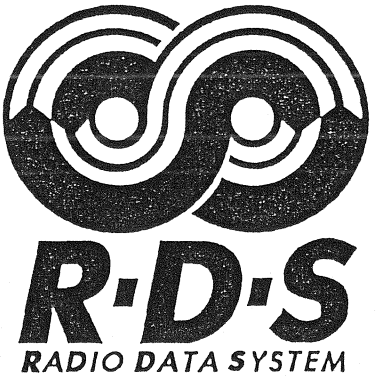
*RDS SOFTWARE DECODER for IBM-AT by*

# FRANKEN RDS-TEAM

*Displays everything what´s on the air with RDS!*



AF · CT · DI · EON · IH · MJD · MS · ON · PI · PS · PTY · RP · RT · TA · TDC · TMC · TP · AF · CT · DI · EON




# Software Decoder for IBM AT

## INSTRUCTION MANUAL



Program by Jörg Bauer

Concept, Design and Manual by
Dieter Nohse

Distribution by:

Ing.-Büro Dieter Nohse
Weichselleite 18

D-8501 Obermichelbach
Germany

# THE RDS SOFTWARE DECODER for IBM-AT

## 1. INTRODUCTION

The RDS software decoder for the IBM-AT was designed and written from insiders of the RDS scenery and includes many new, powerful and unique features. It was implemented according to the European CENELEC standard EN 50067 "Specifications of the radio data system (RDS)".

Operation of the program is as easy as possible. However, some knowledge of the RDS system is presupposed. The program is useful for the RDS-professional, to check the RDS data in a new and comfortable way.

All what you see on the screens is realtime, because RDS block and group synchronisation is also done by the AT (no blackbox). This is the one and only way for realtime decoding! Since every RDS receiver (HIFI or carradio) is suitable for this software, there is no need to buy a special one. Simply connect the buffered digital signals RDS DATA and RDS CLOCK to the parallel interface of your AT, that's all...!

With the exception of the RDS block and group synchronisation, all other software is written in Turbo-Pascal. This allows an easy update for future RDS implementations. Even special customized software is possible by your request.

The optional, as we know world's first RDS logic analyzer enables you to check the timing of RDS encoders very accurate. Various combinations of triggers and delays together with the sampler function of the decoder permits an easy RDS data analysis.

### 1.1 Remark

This manual was done carefully for an easy introduction of the program and its operation. However, you are welcome to write us your critique and/or suggestions for the improvement of this manual and of course of the program!

### 1.2 Delivery

The RDS software decoder comprise an english manual and a floppy disk with the program and some data files:

| | |
|---|---|
| RDS.EXE | The RDS software decoder. |
| RDS.PAR | Parameters for individual setup. |
| RDS.MSK | Screen masks. |
| RDS.HLP | Eight predefined help screens. |
| RDS.SMP | Default loadable sampler file. |
| READ.ME | Additional info not covered in this manual (if necessary). |
| | |
| BACKUP | Directory with a safety copy of all files. |
| SAMPLER | Directory with some original sampler files. |

### 1.3 System requirements

IBM AT-compatible PC, 8 MHz min., 512 KB RAM, DOS 3.0 or later. Monitor: Hercules, EGA, VGA or CGA (restricted, see 3.1).




## 2. INSTALLATION

### 2.1 Installation of the RDS software decoder on floppy disk

Simply make a copy of the original disk (e.g. "DISKCOPY A: B:"). The original disk is not copy protected, but please note that the program is your personal installation with your crypted name and address in the program code. You may check the ordinary owner by selecting screen 2 and holding down both shift-keys together with "U" (SHIFT SHIFT U). Then the name and address will appear in the field of RT.

### 2.2 Installation of the RDS software decoder on hard disk

First of all make a safety copy (backup) of your original disk. Install a directory "RDS" on your hard disk (e.g. "MD C:\RDS") and copy all files from the disk to that directory (e.g. "XCOPY A:*.* C:\RDS /S").

## 3. RUNNING THE PROGRAM

Enter that directory or drive where you have installed the RDS software decoder (e.g. "C:"; "CD \RDS" or "A:"). Then enter "RDS" to start the program. The program then will load the files "RDS.PAR", "RDS.MSK", "RDS.HLP" and by default "RDS.SMP" automatically. After that, the RDS data screen 2 will appear with the display of the most important RDS data.

### 3.1 Running the program on a PC/XT

Use of a IBM PC/XT (8 bit databus) with this software is also possible in theory, but may give some timing problems with the keyboard interrupt of DOS, if the computer is too slow. However, we cannot guarantee proper operation because this depends hardly on the 8 bit machine and bus speed so that we recommend an AT compatible machine with at least 8 MHz clock. Another problem could be "snow" on an old colour graphics adapter (CGA) which were supplied with old XT-machines. There is no way to avoid this snow!

### 3.2 The internal mode

Before connecting any hardware, we suggest to run the program in the internal mode, to get familiar with the most functions and features (see chapter 14. for a quick training). Selection of the internal mode is done by pressing the keys ALT and F1 (ALT-F1) simultaneously. Please note, that the word "INTERN" in the menu line on the bottom left change to "EXTERN". ALT-F1 toggles between internal (INTERN) and external (EXTERN) mode. Different RDS-sampler files may then be loaded from the subdirectory SAMPLER on the original disk with the function ALT-F7 (load sampler file). External mode means RDS realtime decoding with an external connected RDS receiver via parallel interface.

## 4. EXIT THE PROGRAM

The program will terminate by pushing the F10 key twice.

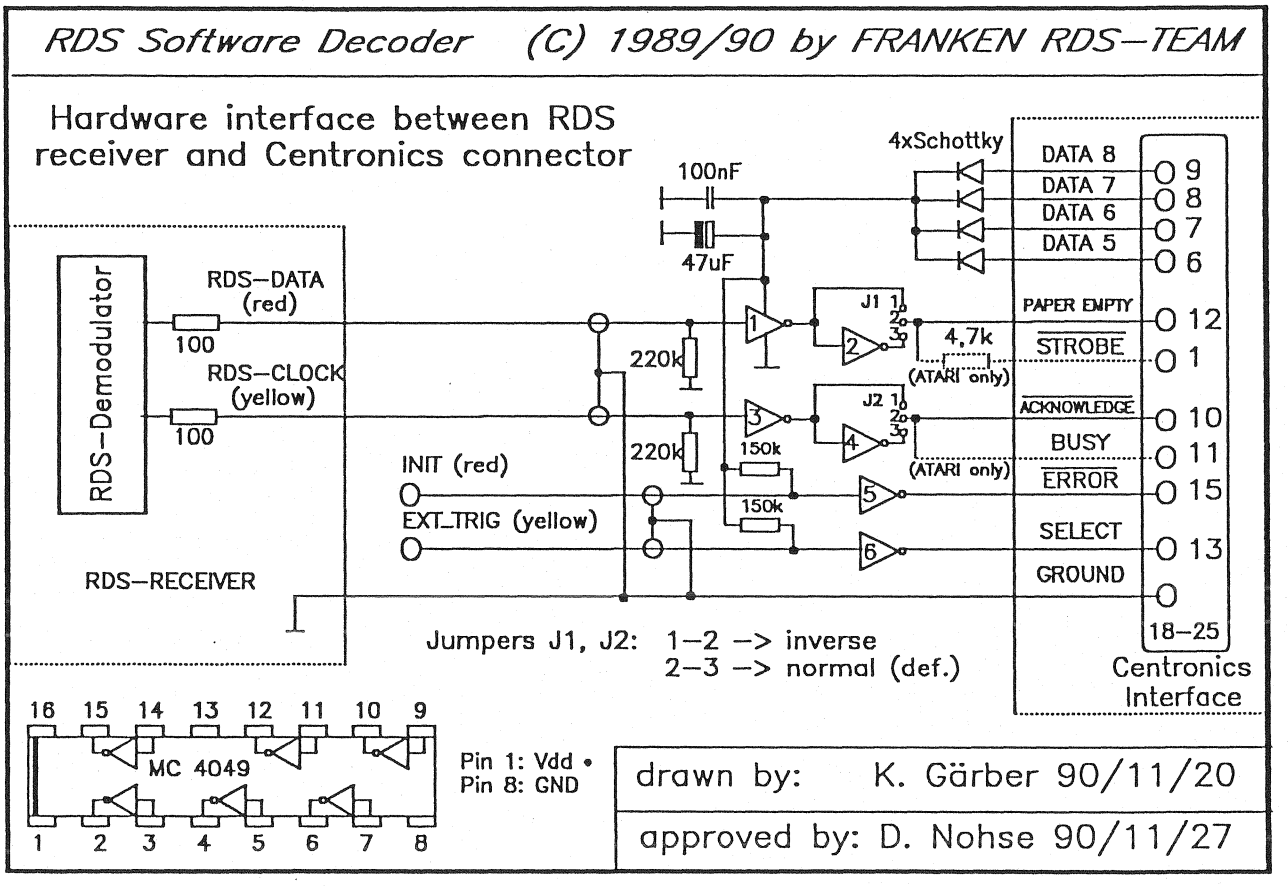
## 5. EXPLANATION OF SOME TERMS

| | |
|---|---|
| (data) screen: | Abbreviation for logical screen or screen display. |
| help screen: | On screen help with F1. |
| field: | Framed or shaded (inverse) part of a data screen. |
| window: | Input field for user inputs (e.g. filename). |
| CR: | Pressing the key ENTER (<┘ ,RETURN). |
| ESC: | Pressing the key ESC. |
| Fn: | Pressing the key Fn (n = 1..10). |
| ALT-Fn: | Pressing the key ALT together with Fn (n = 1..10) simultaneously. |
| Cursors: | Pressing one of the arrow keys UP, DOWN, LEFT, RIGHT. |

## 6. HARDWARE INTERFACE

No external "blackbox" is required. The interface is as easy as possible. Only a buffer is needed for decoupling as shown in the figure. The circuit will fit in the casing of the 25 pole connector for the parallel printer interface. Note, that an external supply voltage is not necessary!

Just connect the digital signals RDS DATA and RDS CLOCK from the RDS demodulator of your RDS receiver to the parallel interface (Centronics) of your AT. This is easy done by wireing the two signals to an additional connector (e.g. 3.5mm stereo-phone-jack) at the front or rear of the receiver and should be no problem for a technician.




(!) The cable between the RDS receiver and the AT should be shielded.

(!) The used buffer (e.g. 4049) should be CMOS.

(!) All diodes must be Schottky diodes.

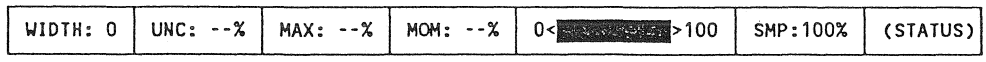
(!) If there are any problems with the external RDS decoding, one should try to invert the RDS-CLOCK and/or RDS-DATA via jumper (depends on the RDS demodulator).

(!) If the external trigger and RDS block synchronisation is disabled in setup, the buffers 5 and 6 may be omitted.

(!) The cable for the additional external trigger and remote RDS block synchronisation may be removed at the 25 pole connector if not used.

## 7. THE STATUS LINE

The status line is the top line of every screen:




The meaning of the particular fields:

WIDTH: Maximum allowed burst width for error correction. 0/1/2/3/4/5 bit burst error correction is selectable with the numerical keys 0..5. WIDTH=0 means error correction is off.

UNC: Percentage of uncorrectable block errors, according to the error correction. An update occurs every 100 blocks (≈ 2s).

MAX: Percentage of maximal occured block error after the last RDS block synchronisation. This value is independent of the error correction. An update occurs every 100 blocks (≈ 2s).

MOM: Percentage of momentary errors. This value is independent of the error correction. An update occurs every 100 blocks (≈ 2s). The values for UNC and MOM are the same, if error correction is off (WIDTH=0).

<> Analogue bargraph of the quality of the RDS signal with a resolution of 5%. The quality is defined as 100% minus momentary errors. An update occurs every 20 blocks (≈ 400ms).

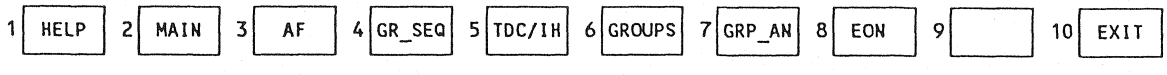
SMP: Percentage of the occupied sampler memory when the sampler is not active or sampler status (ARMED, SAMPLING, T-DELAY).

(STATUS): SYNC means, that RDS block synchronisation has occured and RDS signal will be decoded. NSYNC means not synchron because the RDS signal is <u>not</u> detectable or the RDS clock has failed. STOP means that the display is "frozen" due to a user request.

## 8. THE MENU LINES

The menu line is the bottom line of every screen. Please note, that the menu line will change when the ALT key is pressed.

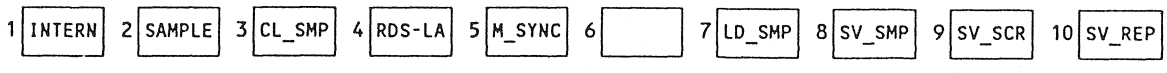
### 8.1 The menu line without ALT key




The function keys F1..F8 select the the HELP screen and the different RDS data screens.

### 8.2 The menu line with ALT key

The menu line will change when the ALT key is held down. These special functions are available when pressing ALT together with the appropriate function key (ALT-F1..ALT-F10).




The details of the special functions are explained later.

## 9. <F1> THE HELP SCREEN(S)

Selection of the help screen done by pushing the function key F1.

Function of the cursor keys:

Cursors: Sequential selection of the different help pages.

HOME (POS1): Selection of first page.

END (ENDE): Selection of last page.

### 9.1 Example of page 1-1 of the help screen

```
1-1
 R D S  SOFTWARE DECODER FOR IBM-AT          (C) '89-'91 by FRANKEN RDS-TEAM

  Program written by:      Jörg Bauer  |  Developed with  TURBO-PASCAL (R)
  Concept and Design by: Dieter Nohse  |     and  TURBO-ASSEMBLER (R)

                FUNCTION KEYS                          SPECIAL FUNCTIONS

F1: HELP ON/OFF          ALT-F1: INTERN/EXTERN    SPACE:  RUN/STOP
F2: MAIN INFORMATION     ALT-F2: SAMPLER ON/OFF   Cursor: depends on screen#
F3: AF LIST              ALT-F3: CLEAR SAMPLER
F4: GROUP SEQUENCE       ALT-F4: LOGIC ANALYZER   0..5:   ERROR CORRECTION
F5: TDC/IH ANALYSIS      ALT-F5: MAN./AUTO SYNC   DEL:    BLOCK SYNCHR.
F6: GROUP ANALYSIS       ALT-F6:                  +:      FOLLOW AF/PI(ON)
F7: ADV. GROUP ANALYSIS  ALT-F7: LOAD SAMPLER     -:      DON'T FOLLOW AF/PI
F8: EON                  ALT-F8: SAVE SAMPLER
F9:                      ALT-F9: SAVE SCREENS
F10: EXIT (enter twice)  ALT-F10: SAVE REPORT     ESC:    ABORT

SETUP: Enter "RDS /S"      Distribution by:        Weichselleite  18
                           FRANKEN RDS-TEAM      D-8501 Obermichelbach
                          Ing.-Büro D. Nohse            GERMANY
```

The help screen is always available with function key F1. Pressing F1 or ESC again goes back to the previous data screen. Up to 15 pages with useful information may be defined. 8 pages are predefined in the file "RDS.HLP". Please note, that HELP screen 1-2 is for the optional available RDS LOGIC ANALYZER!

It is very easy to add your own help page(s) with an ASCII text editor (e.g. Norton Editor NE or EDLIN). This is a very unique feature! To create an own personal page of help information, you have just to add 23 lines (rows) to the contents of the file "RDS.HLP" (please make a safety copy of that file before). However, it is not allowed to change the copyright messages in the help screens!

(!) Use blanks instead of tabs when editing the help file. Users of a text processor like WORD or WORDSTAR must store the text **without any formating information.** Otherwise the help screen will not look as expected!

## 9.2 Example of page 1-4 of the help screen

1-4

| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BLOCK 2 TYPE 0X BASIC INFO | 0 | 0 | 0 | 0 | X | TP | P | T | Y | | | | TA | M/S | DI | PS-ADDR |
| TYPE 1A PIN, RP | 0 | 0 | 0 | 1 | 0 | TP | P | T | Y | | | | GROUP-DES. | | | INTERV. |
| TYPE 1B PIN | 0 | 0 | 0 | 1 | 1 | TP | P | T | Y | | | | spare bits | | | |
| TYPE 2X RT | 0 | 0 | 1 | 0 | X | TP | P | T | Y | | | | A/B | SEGMENT ADDR. | | |
| TYPE 4A MJD, CT | 0 | 1 | 0 | 0 | X | TP | P | T | Y | | | | spare bits | | | MSB MJD |
| TYPE 5X TDC | 0 | 1 | 0 | 1 | X | TP | P | T | Y | | | | ADDRESS | | | |
| TYPE 6X IH | 0 | 1 | 1 | 0 | X | TP | P | T | Y | | | | IN HOUSE MSB | | | |

## 9.3 Example of page 1-7 of the help screen

1-7

STRUCTURE OF VARIANT 12 OF BLOCK 3 OF TYPE 14A GROUPS (LINKING INFORMATION)

| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ILS=0 | LA | EG | X | 0 | LINKAGE SET NUMBER (LSN) | | | | | | | | | | | |
| ILS=1 | LA | EG | X | 1 | COUNTRY ID (CI) | | | | LINKAGE IDENTIFIER (LI) | | | | | | | |

ILS INTERNATIONAL LINKAGE SET
0 = NATIONAL LINK
1 = INTERNATIONAL LINK

EG EXTENDED GENERIC INDICATOR
0 = NO MEMBER OF AN EXTENDED GENERIC SET
1 = MEMBER OF AN EXTENDED GENERIC SET

LA LINKAGE ACTUATOR
0 = POTENTIAL FUTURE LINK IF LSN <> 0
1 = LINKED TO SERVICES WITH THE SAME LSN

## 10. <F2>..<F8> THE RDS DATA SCREENS

Selection of one of the seven RDS data screens is done with the function keys F2..F8. The current screen number is displayed on every screen on top left. The function key in pointed brackets (e.g. <F2>) specifies the key for recalling the screen.

### 10.1 Context sensitive functions

Some keys will have special functions depending of the selected screen (context sensitive). These functions are explained directly after the head line of each paragraph for <Fn>.

### 10.2 <F2> Screen 2: Basic RDS information

Cursors: Selection of an AF-head in the field "DETECTED AF-HEADS". The AF-list belonging to that AF-head will be displayed in the field "AF LIST OF" below.

\+ (plus): Follow to current AF-head (list) enable (default).

\- (minus): Follow to current AF-head (list) disable.

```
2=PI=======PS======TP=TA=MS=======PTY=======DI=======DATE=======TIME=======PIN=====
| D323 | BAYERN 3 | 1 | 0 | 1 | 00 not used | 01 | SU 10.04.91 | 12:33 | ∞∞∞∞∞∞∞∞∞∞∞∞∞ |

                    RADIO-TEXT  (RT, GROUP 2)
  A/B = 0 | RDS:  ARD-Radiotext-Versuchssendung     D323     Dillberg     DS5
  A/B = 1 | Versuchssendung mit RDS Radiotext vom bayerischen Rundfunk

COUNTRY: GERMANY              COVERAGE: SUPRA-REGIONAL     DI: STEREO

GROUP-TYPES | 0A      2A              6A

------ #20 OF 29 ------------ DETECTED AF-HEADS  (GROUP 0) ---------- METHOD B ------
 3_ 90.4   5_ 93.4   5_ 97.1   3_ 99.7   7_ 96.1  25_ 98.5   3_ 98.5   7_ 97.6
 5_ 96.7  11_ 99.8   5_ 96.9  11_ 94.4  11_ 99.3   7_ 99.2  19_ 97.9   5_ 97.7
 9_ 97.6   9_ 95.8   5_ 91.0   7_ 95.9  11_ 99.6   9_ 94.7  11_ 99.5   3_ 95.9
11_ 96.3   3_ 95.3   3_ 94.0   3_ 97.3   9_ 99.4

                          AF LIST OF:    98.5
  91.0   94.4   95.3   95.8   95.9   97.1   97.3   97.6   97.9   99.2   99.5
  99.6   99.7
```

The RDS data screen 2 will show all basic RDS data at one glance. The upper fields with PI, PS, TP etc. will be copied on all other RDS data screens.

#### 10.2.1 PI, PS, TP, TA, M/S, PTY, DI, CT and PIN

```
2=PI=======PS======TP=TA=MS=======PTY=======DI=======DATE=======TIME=======PIN=====
| D323 | BAYERN 3 | 1 | 0 | 1 | 00 not used | 01 | SU 14.04.91 | 12:33 | ∞∞∞∞∞∞∞∞∞∞∞∞∞ |
≈                                                                               ≈
```

The string "∞∞∞∞∞∞" means, that no data has been decoded until yet for a particular field. Please note, that the data for CT (date and time) are usually transmitted only once per minute.

PI Programme identifikation:
This hexadecimal code is assigned to each individual radio programme to enable it to be distinguished from all other programmes.

PS Programme service name:
This is a text of not more than eight alphanumeric characters which could be displayed on a RDS receiver to inform the listener to which station the receiver is tuned to.

TP Traffic programme:
This is an on/off (1/0) switching signal to indicate that this is a programme on which traffic announcements are usually made (1=yes).

TA Traffic announcement:
This is an on/off (1/0) switching signal to indicate whether an traffic announcement is on the air (1=yes). **The flags TA and TP will flash if both are one!** The combination TP=0 TA=1 indicates, that the station will provide travel information via 14B groups ("travel-EON").

M/S Music/speech:
This signal provides information on whether music (1) or speech (0) is being broadcast. This flag must be 1 if not used.

PTY Programme type:
This is an identification number for each programme item, which is intended to specify the programme type within 32 (0..31) possibilities. The shortform interpretation (8 character max.) for the number may be redefined or edited by setup.

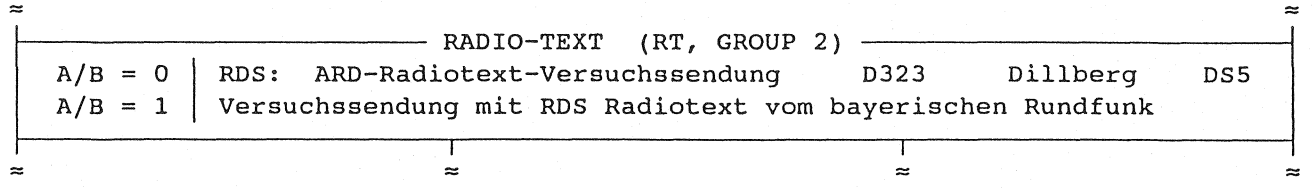
DI Decoder information:
This is a switching signal indicating which of 16 (0..15) possible operating modes is appropriate for use with the broadcast signals.

DATE The display is of the form "day dd.mm.yy" (e.g. "SU 14.04.90") in 24 hour format.

TIME The display is of the form "hh:mm" (e.g. 15:33) in 24 hour format.

PIN Programme item number
Switching signal similar to VPS to enable receivers to respond to particular programme items. The display is of the form "dd.hh:mm" (e.g. 8.15:30) in 24 hour format.

10.2.2 RT (radio text)




Two rows with 64 characters each will be displayed according to the logical state of the text A/B flag.

10.2.3 COUNTRY, COVERAGE and DI

```
≈                                                                    ≈
┌──────────────────────┬──────────────────────────┬──────────────────┐
│ COUNTRY: GERMANY     │ COVERAGE: SUPRA-REGIONAL │ DI: STEREO       │
└──────────────────────┴──────────────────────────┴──────────────────┘
≈                                                                    ≈
```

Interpretation of the codes for COUNTRY (1st element of PI), COVERAGE (2nd element of PI) and DI. These strings may be changed in setup, to allow translation into your language or redefinition.

10.2.4 Detected group types

```
≈                    ≈                    ≈                    ≈
┌──────────────┬─────┬────┬─────────────────┐
│ GROUP-TYPES  │ 0A  │ 2A │ 6A              │
└──────────────┴─────┴────┴─────────────────┘
≈                                          ≈
```

This row clearly shows all RDS group types which are decoded from the observed broadcasting station. With helpscreen 1-3 you will find out very quick what kind of RDS features are implemented on that station.

10.2.5 The AF-heads

```
≈                                                                    ≈
┌──── #20 OF 29 ──── DETECTED AF-HEADS (GROUP 0) ──── METHOD B ────┐
│ 3_ 90.4  5_ 93.4  5_ 97.1  3_ 99.7  7_ 96.1 25_ 98.5  3_ 98.5  7_ 97.6 │
│ 5_ 96.7 11_ 99.8  5_ 96.9 11_ 94.4 11_ 99.3  7_ 99.2 19_ 97.9  5_ 97.7 │
≈                                                                    ≈
```

Alternative frequencies are sent in one (method A) or more (method B) AF (sub)lists with up to 25 AFs each. An AF (sub)list begins with a so called AF-head which includes the number of AFs and that frequency where the following AFs are valid (method B only).

Up to 48 AF heads will be collected in this field. The AF method and number of AF lists are displayed additional. The selection of a particular AF list is done easy with the cursor keys.

10.2.6 The AF list

```
≈                                                                    ≈
┌──────────────────────────── AF-LIST OF:  98.5 ────────────────────────┐
│ 91.0  94.4  95.3  95.8  95.9  97.1  97.3  97.6  97.9  99.2  99.5     │
│ 99.6                                                                 │
≈                                                                    ≈
```

In this field, the AF-list of the marked AF-head above is shown. LFMF codes (AM frequencies) or AFs of pairs in descending order (method B only) are marked (e.g. displayed inverse). In the example above, the AF sublist for the main frequency 98.5 is shown. Because of method B, the number of AFs is calculated (n-1)/2, where n is part of the AF-head.

(!) When more than one AF-list with the same AF-head exist, the AFs will be collected together in this field, i.e. the number of AFs is larger than displayed in this case.

## 10.3 <F3> Screen 3: List(s) of alternative frequencies

+ (plus): Start from begin, if the same AF-head is decoded again (default).

- (minus): Don't start from begin, if the same AF-head is decoded again.

| 3 PI | PS | TP | TA | MS | PTY | DI | DATE | TIME | PIN |
|---|---|---|---|---|---|---|---|---|---|
| D323 | RADIO XY | 1 | 0 | 1 | 00 not used | 01 | ∞∞∞∞∞∞∞∞∞∞∞∞∞∞∞∞ | ∞∞∞∞∞∞∞∞ | ∞∞∞∞∞∞∞∞∞∞∞∞∞∞ |

ALTERNATIVE FREQUENCY LIST (AF, GROUP 0)

| | | | | |
|---|---|---|---|---|
| 3AF _ 90.4 | 90.4_ 94.4 | FILL _FILL | 5AF _ 93.4 | 93.4_ 96.3 | 93.4_ 97.6 |
| FILL _FILL | 5AF _ 97.1 | 95.9_ 97.1 | 97.1_ 98.5 | FILL _FILL | 3AF _ 99.7 |
| 98.5_ 99.7 | FILL _FILL | 7AF _ 96.1 | 95.9_ 96.1 | 96.1_ 96.7 | 96.1_ 96.9 |
| FILL _FILL | 25AF _ 98.5 | 91.0_ 98.5 | 94.4_ 98.5 | 95.3_ 98.5 | 95.8_ 98.5 |
| 95.9_ 98.5 | 97.1_ 98.5 | 97.3_ 98.5 | 97.6_ 98.5 | 97.9_ 98.5 | 98.5_ 99.2 |
| 98.5_ 99.5 | 98.5_ 99.6 | FILL _FILL | 3AF _ 98.5 | 98.5_ 99.7 | FILL _FILL |
| 7AF _ 97.6 | 93.4_ 97.6 | 96.3_ 97.6 | 97.6_ 99.3 | FILL _FILL | 5AF _ 96.7 |
| 96.1_ 96.7 | 96.7_ 96.9 | FILL _FILL | 11AF _ 99.8 | 96.3_ 99.8 | 97.9_ 99.8 |
| 99.2_ 99.8 | 97.9_ 99.8 | 99.4_ 99.8 | FILL _FILL | 5AF _ 96.9 | 96.1_ 96.9 |
| 96.7_ 96.9 | FILL _FILL | 11AF _ 94.4 | 90.4_ 94.4 | 94.4_ 94.7 | 94.4_ 97.9 |
| 94.4_ 98.5 | 94.4_ 99.6 | FILL _FILL | 11AF _ 99.3 | 96.3_ 99.3 | 97.6_ 99.3 |
| 97.9_ 99.3 | 99.3_ 99.5 | 99.3_ 99.8 | FILL _FILL | 7AF _ 99.2 | 96.3_ 99.2 |
| 99.2_ 99.4 | 99.2_ 99.8 | FILL _FILL | 19AF _ 97.9 | 94.4_ 97.9 | 94.7_ 97.9 |
| 97.6_ 97.9 | 97.9_ 98.5 | 97.9_ 99.3 | 97.9_ 99.4 | 97.9_ 99.5 | 97.9_ 99.6 |
| 97.9_ 99.8 | FILL _FILL | ▪ 5AF _ 97.7 | 91.0_ 97.7 | 97.7_ 99.2 | FILL _FILL |
| 9AF _ 97.6 | 97.6_ 97.9 | 97.6_ 98.5 | 97.6_ 99.5 | 97.6 99.6 | FILL _FILL |
| 9AF _ 95.8 | 94.0_ 95.8 | 95.8_ 98.5 | 95.8_ 99.2 | LFMF_1107 | FILL _FILL |
| 5AF _ 91.0 | 91.0_ 97.7 | 91.0_ 98.5 | FILL _FILL | | |

Display of up to 108 AF pairs as they come "from the air". LFMF codes and AF pairs in descending order (method B only) are marked (e.g. inverse, not shown in the figure). All possible codes of group 0A block 3 are displayed including FILLER, LFMF and offsets. When the code is undefined, then the hexadecimal code is shown.

The list always begins with an AF-head. The first decoded AF-head will be stored as reference. The list starts from begin, when the first AF head (reference) is decoded again. This feature may be switched off with the "-"-key. When the number of AF pairs does not exceed 108, the display then is pseudo static after a full AF sequence, where the current AF data is marked with a "▪". However, this implies nearly 100% quality (no errors) of the received RDS signal.

(!) Some broadcasting stations will send more than one AF list with identical AF-heads. If this head is stored as reference, it is not possible to get a static display even with 100% quality. If this happens, one should do a new RDS block synchronisation with the DEL key, to raise another AF head for reference.

An AF-head begins with the string "nAF". "xxH" means, that the code is undefined and therefore is displayed hexadecimal, FM offset are decoded ("+25", "+50", "+75") for historical reason, but please note, that these codes are undefined now!

(!) In case of receiving errors, the interpretation of this list must be done carefully, because some AF pair(s) up to the next AF head may not belong to the preceding AF head. This happens if an AF-head was not recognized due to errors.

## 10.4 <F4> Screen 4: RDS group type statistics

| 4 PI | PS | TP | TA | MS | PTY | DI | DATE | TIME | PIN |
|---|---|---|---|---|---|---|---|---|---|
| DAAA | ARD-TEST | 1 | 0 | 1 | ∞∞ ∞∞∞∞∞∞∞∞∞∞∞∞ | 01 | WE 02.05.84 | 13:40 | 14 05:30 |

DISTRIBUTION OF GROUP TYPES

| ?? | G0 | G1 | G2 | G3 | G4 | G5 | G6 | G7 | G8 | G9 | G10 | G11 | G12 | G13 | G14 | G15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05% | 33% | 08% | 16% | 09% | 09% | 09% | 08% | --% | --% | --% | --% | --% | --% | --% | --% | 08% |

MIXTURE OF GROUP TYPES

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2A | 0A | 6A | -- | 0A | 1B | 2A | 0A | 3A | 4A | 0A | 5A | 2A | 0A | 6A | -- | 0A | 1B | 2A |
| 0A | 3A | 4A | 0A | 5A | 2A | 0A | 6A | -- | 0A | 1B | 2A | 0A | 3A | 4A | 0A | 5A | 2A | 0A |
| 6A | -- | 0A | 1B | 2A | 0A | 3A | 4A | 0A | 5A | 2A | 0A | 6A | -- | 0A | 1B | 2A | 0A | 3A |
| 4A | 0A | 5A | 2A | 0A | 6A | -- | 0A | 1B | 2A | 0A | 3A | 4A | 0A | 5A | 2A | 0A | 6A | -- |
| 0A | 1B | 2A | 0A | 3A | 4A | 0A | 5A | 2A | 0A | 6A | -- | 0A | 1B | 2A | 0A | 3A | 4A | 0A |
| 5A | 2A | 0A | 2A | 0A | 6A | -- | 0A | 1B | 2A | 0A | 3A | 4A | 0A | 5A | 2A | 0A | 6A | -- |
| 0A | 1B | 2A | 0A | 3A | 4A | 0A | 5A | 2A | 0A | 6A | -- | 0A | 1B | 2A | 0A | 3A | 4A | 0A |
| 5A | 2A | 0A | 6A | -- | 0A | 1B | 2A | 0A | 3A | 4A | 0A | 5A | 2A | 0A | 6A | -- | 0A | 1B |
| 2A | 0A | 3A | 4A | 0A | 5A | 2A | 0A | 6A | -- | 0A | 1B | 2A | 0A | 3A | 4A | 0A | 5A | 2A |
| 0A | 6A | -- | 0A | 1B | 2A | 0A | 3A | 4A | 0A | 5A | 2A | 0A | 6A | -- | 0A | 1B | 2A | 0A |
| 3A | 4A | 0A | 5A | 2A | 0A | 6A | -- | 0A | 1B | 2A | 0A | 3A | 4A | 0A | 5A | 2A | 0A | 6A |
| -- | 0A | 1B | 2A | 0A | 3A | 4A | 0A | 5A | 2A | 0A | 6A | -- | 0A | 1B | 2A | 0A | 3A | 4A |
| 15B | 15B | 15B | 15B | 15B | 15B | 15B | 15B | 2A | 0A | 3A | 4A | 0A | 5A | 2A | 0A | 6A | -- | 0A |
| 1B | 2A | 0A | 3A | 4A | 0A | 5A | 2A | 0A | 6A | -- | 0A | 1B | 2A | 0A | 3A | 4A | 0A | 5A |

### 10.4.1 Distribution of group types

≈

DISTRIBUTION OF GROUP TYPES

| ?? | G0 | G1 | G2 | G3 | G4 | G5 | G6 | G7 | G8 | G9 | G10 | G11 | G12 | G13 | G14 | G15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 05% | 33% | 08% | 16% | 09% | 09% | 09% | 08% | --% | --% | --% | --% | --% | --% | --% | --% | 08% |

≈

Percentage of all detected group types (block 2, offset B). Only errorfree or corrected groups are evaluated. Assuming normal distribution of errors, this means, that even with bad reception quality, the calculated percentage is always correct. An update occurs every 100 good type 2 blocks. The number on the left side (??) shows errors of block 2 within the last 100 groups. If block 2 is destroyed, then it is not possible to evaluate the following blocks 3 and 4. Please note, that 100% could only be displayed as 99%.

### 10.4.2 Mixture of group types

≈

MIXTURE OF GROUP TYPES

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2A | 0A | 6A | -- | 0A | 1B | 2A | 0A | 3A | 4A | 0A | 5A | 2A | 0A | 6A | -- | 0A | 1B | 2A |
| 0A | 3A | 4A | 0A | 5A | 2A | 0A | 6A | -- | 0A | 1B | 2A | 0A | 3A | 4A | 0A | 5A | 2A | 0A |

≈

Realtime display of the group type sequence of the last 266 groups (≈ 23s). Faulty blocks 2 are indicated with "--". This display is very useful to check for example group type 15B at the begin and the end of a traffic announcement.

## 10.5 <F5> Screen 5: Analysis of TDC and IH

| 5 PI | PS | TP | TA | MS | PTY | DI | DATE | TIME | PIN |
|---|---|---|---|---|---|---|---|---|---|
| D02A | GONG | 1 | 0 | 1 | 00 not used | 01 | SU 08.04.90 | 13:35 | ∞∞∞∞∞∞∞∞∞∞∞∞ |

TRANSPARENT DATA CHANNELS (TDC, GROUP 5)

| | | | |
|---|---|---|---|
| 00: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 08: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 16: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 24: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ |
| 01: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 09: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 17: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 25: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ |
| 02: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 10: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 18: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 26: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ |
| 03: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 11: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 19: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 27: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ |
| 04: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 12: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 20: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 28: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ |
| 05: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 13: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 21: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 29: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ |
| 06: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 14: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 22: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 30: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ |
| 07: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 15: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 23: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 31: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ |

IN HOUSE APPLICATION (IH, GROUP 6)

| | | | |
|---|---|---|---|
| 00: ∞∞∞∞∞∞∞∞∞∞∞∞:∞∞∞∞∞∞ | 08: 01234567:.#Eg | 16: 01234567:.#Eg | 24: 01234567:.#Eg |
| 01: 89ABCDEF:ë½=∩ | 09: 89ABCDEF:ë½=∩ | 17: 89ABCDEF:ë½=∩ | 25: 89ABCDEF:ë½=∩ |
| 02: 01234567:.#Eg | 10: 01234567:.#Eg | 18: 01234567:.#Eg | 26: 01234567:.#Eg |
| 03: 89ABCDEF:ë½=∩ | 11: 89ABCDEF:ë½=∩ | 19: 89ABCDEF:ë½=∩ | 27: 89ABCDEF:ë½=∩ |
| 04: 01234567:.#Eg | 12: 01234567:.#Eg | 20: 01234567:.#Eg | 28: 01234567:.#Eg |
| 05: 89ABCDEF:ë½=∩ | 13: 89ABCDEF:ë½=∩ | 21: 89ABCDEF:ë½=∩ | 29: ▪89ABCDEF:ë½=∩ |
| 06: ----4567:.#Eg | 14: 01234567:.#Eg | 22: 01234567:.#Eg | 30: 01234567:.#Eg |
| 07: 89ABCDEF:ë½=∩ | 15: 89ABCDEF:ë½=∩ | 23: 89ABCDEF:ë½=∩ | 31: 89ABCDEF:ë½=∩ |

Realtime display of blocks 3 and 4 of the transparent data (TDC) and in house channels (IH) in hexadecimal and ASCII representation. The blocks are sorted according to their address information (0..31) in block 2. This unique feature allows clear analysis of TDC and IH.

The string "∞∞∞∞∞∞" indicates, that no data has been decoded for the corresponding channel until yet. The current data is marked with a "▪". Faulty data words are marked with the string "----" instead of the hexadecimal code.

(!) Most of the broadcasting stations now send dummy codes for these RDS data channels. The future will show, if the channels will be used for a more ingenious application.

## 10.6 <F6> Screen 6: Analysis of RDS group types

| 6=PI | PS | TP | TA | MS | PTY | DI | DATE | TIME | PIN |
|---|---|---|---|---|---|---|---|---|---|
| DAAA | ARD-TEST | 1 | 0 | 1 | ∞∞ ∞∞∞∞∞∞∞∞∞∞ | 01 | WE 02.05.84 | 13:40 | 14 05:30 |

HEXADECIMAL / ASCII REPRESENTATION OF DETECTED GROUPS

| TYPE | BL.1 | BL.2 | BL.3 | BL.4 | ASCII | TYPE | BL.1 | BL.2 | BL.3 | BL.4 | ASCII |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0A | DAAA | 064A | CD68 | 5445 | =hTE | 0B | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ |
| 1A | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | 1B | DAAA | 1E59 | DAAA | 715E | ┌¬qˆ |
| 2A | DAAA | 2641 | 696F | 2D44 | io-D | 2B | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ |
| 3A | DAAA | 3640 | E0CD | DDAB | α=▌½ | 3B | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ |
| 4A | DAAA | 4655 | 65FC | DA28 | eⁿ┌( | 4B | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ |
| 5A | ---- | 5655 | 4461 | 7465 | Date | 5B | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ |
| 6A | ▪DAAA | 6652 | ---- | CDEF | ë½=∩ | 6B | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ |
| 7A | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | 7B | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ |
| 8A | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | 8B | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ |
| 9A | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | 9B | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ |
| 10A | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | 10B | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ |
| 11A | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | 11B | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ |
| 12A | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | 12B | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ |
| 13A | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | 13B | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ |
| 14A | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | 14B | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ |
| 15A | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | 15B | DAAA | FE4A | DAAA | FE4F | ┌¬▪O |

Hexadecimal display of all (!) blocks of each group, separated by type A/B. The blocks 3 and 4 are displayed in ASCII too. Errors in the datastream of the RDS encoder are exposed very simple at one glance. Faulty blocks are marked with the string "----". The current group is marked with a "▪". The string "∞∞∞∞∞∞" indicates, that no data has been decoded for the corresponding group or block until yet.

Please note, that even block 1 is displayed. Don't think this is unnecessary because we know, that everything may happen in the world of RDS encoder software!




## 10.7 <F7> Screen 7: Enhanced RDS group type analysis

Cursors UP/DOWN: Selection of a group type.

Cursors LEFT/RIGHT: Selection of a mask.

| 7=PI | PS | TP | TA | MS | PTY | DI | DATE | TIME | PIN |
|---|---|---|---|---|---|---|---|---|---|
| D313 | SDR3 | 1 | 0 | 1 | 00 not used | 01 | ∞∞∞∞∞∞∞∞∞∞∞∞∞∞∞∞ | ∞∞∞∞∞∞∞ | ∞∞∞∞∞∞∞∞∞∞∞∞ |

SORTED GROUP 02 BY ADDRESSCODE IN BLOCK 2

| GR | MASK | ADDR | BL.2 | BL.3 | BL.4 | ASCII | ADDR | BL.2 | BL.3 | BL.4 | ASCII |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 00 | 03 | 00 | 2400 | 4152 | 442D | ARD- | 16 | 2410 | 5072 | 6F67 | Prog |
| 01 | 1F | 01 | 2401 | 5261 | 6469 | Radi | 17 | 2411 | 7261 | 6D6D | ramm |
| >02 | 1F | 02 | 2402 | 6F74 | 6578 | otex | 18 | 2412 | 3A20 | 5344 | : SD |
| 03 | 0F | 03 | 2403 | 742D | 5665 | t-Ve | 19 | 2413 | 5233 | 2020 | R3 |
| 04 | 00 | 04 | 2404 | 7273 | 7563 | rsuc | 20 | 2414 | 2020 | 2020 | |
| 05 | 1F | 05 | 2405 | 6873 | 7365 | hsse | 21 | 2415 | 2020 | 2020 | |
| 06 | 1F | 06 | 2406 | 6E64 | 756E | ndun | 22 | 2416 | 2020 | 2020 | |
| 07 | 1F | 07 | 2407 | 6720 | 2020 | g | 23 | 2417 | 2020 | 2020 | |
| 08 | 00 | 08 | 2408 | 2020 | 2020 | | 24 | 2418 | 2020 | 2020 | |
| 09 | 00 | 09 | 2409 | 2020 | 2020 | | 25 | 2419 | 2020 | 2020 | |
| 10 | 00 | 10 | 240A | ---- | 6567 | Deg | 26 | 241A | 2020 | 2020 | |
| 11 | 00 | 11 | ▪240B | 6572 | 6C6F | erlo | 27 | 241B | 2020 | 2020 | |
| 12 | 00 | 12 | 240C | 6368 | 2044 | ch D | 28 | 241C | 2020 | 2020 | |
| 13 | 00 | 13 | 240D | 5331 | 2020 | S1 | 29 | 241D | 2020 | 2020 | |
| 14 | 0F | 14 | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | 30 | 241E | 2020 | 2020 | |
| 15 | 03 | 15 | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | 31 | 241F | 2020 | 2020 | |

Hexadecimal display of blocks 2, 3 and 4 of a particular group type, sorted by addresscodes in block 2. Blocks 3 and 4 are displayed in ASCII too. This is the most powerful screen for enhanced group analysis. It allows you to analyze every group type (even those which are undefined until now) in an absolut new and unique way.

As you know, the address for the blocks 3 and/or 4 of a particular group is usually coded in the last 1 to 5 bits of block 2. For example, the last 4 bits of block 2 of group type 2 determines the position of the 4 character segment in the following blocks 3 and 4 within the 64 character radio text (RT).

Using this addresscode together with a filter (mask) for logical AND combination, allows to sort the blocks of a particular group. This group and mask selection (groups: 0..15, masks: 0,1,3,7,Fh,1Fh,--) is done easy with the cursor keys. With mask "--" the groups are displayed in sequence without sorting.

In the figure above, group 2 (RT) has been selected with mask 1Fh (binary 11111). So rows with address 0..15 displays the radiotext segments with text A/B=0 whereas rows 16..31 displays those segments with text A/B=1 (see help screen page 1-4). You want to analyze NWS? No problem, simply select group type 9 and voilà...!

Faulty blocks are marked with the string "----". The current data is marked with a "▪". The string "∞∞∞∞∞∞" indicates, that no data has been decoded for the corresponding address until yet.

## 10.8 <F8> Screen 8: Enhanced other network EON

Cursors: Selection of a crossreferenced network by PI-code. All the EON data belonging to that PI-code is shown below the field "CROSSREFERENCED NETWORKS".

+ (plus): Follow to current PI(ON) enable (default).

- (minus): Follow to current PI(ON) disable.

```
8═PI═══════PS═══════TP═TA═MS═══════PTY═══════DI═══════DATE═══════TIME═══════PIN═
 C201 |  BBC R1  | 0 | 1 | 1 | 00 not used | 01 | MO 01.10.90 | 09:02 | 00 00:00

──── #01 OF 20 ──── CROSSREFERENCED NETWORKS (EON, GROUP 14A) ──────────────────
 C202  C203  C204  C417  C711  CD11  C613  CB12  C513  C913  CF11  C713  CB11
 CF14  CA13  CC13  C813  C413  CA12  C205

 ──PS──────┬TP┬TA┬──PTY──────┬──PIN──┐ ┌LA┬EG┬IL┬LSN┐ ┌UC10┬UC11┬UC13┬UC15┐
 BBC R2    | 0 | 0 | 00 not used | 26 23:59 | | 1 | 0 | 0 | BCD | | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | 0000 | 0003 |

═══════════════════════ AF-LIST ═══════════════════════════════════════════════
  97.9: 88.3   99.1: 89.5   99.7: 90.1   98.2: 88.6   98.9: 89.3   98.2: 88.5
  99.5: 89.9   98.8: 89.1

═══════════════ TRAFFIC ANNOUNCEMENTS VIA 14B ═══════════════════════════════
  C413_11_07:30   C413_10_07:37   C413_11_08:56   C413_10_08:58
```

The RDS data screen 8 will show all important EON data of a selected crossreferenced network at one glance. The string "∞∞∞∞∞∞" means, that no data has been decoded until yet for a particular field.

### 10.8.1 PI-codes of crossreferenced networks

```
──── #01 OF 20 ──── CROSSREFERENCED NETWORKS (EON, GROUP 14A) ──────────────────
 C202  C203  C204  C417  C711  CD11  C613  CB12  C513  C913  CF11  C713  CB11
 CF14  CA13  CC13  C813  C413  CA12  C205
```

Up to 26 PI(ON)-codes of 14A groups will be collected in this field. The current PI(ON)-code is marked (e.g. inverse). The selection of a particular PI(ON)-code is done easy with the cursor keys.

### 10.8.2 Various information about a crossreferenced network

```
≈                                                                              ≈
 ──PS──────┬TP┬TA┬──PTY──────┬──PIN──┐ ┌LA┬EG┬IL┬LSN┐ ┌UC10┬UC11┬UC13┬UC15┐
 BBC R2    | 0 | 0 | 00 not used | 26 23:59 | | 1 | 0 | 0 | BCD | | ∞∞∞∞∞∞ | ∞∞∞∞∞∞ | 0000 | 0003 |
≈                                                                              ≈
```

This fields show all important EON data such PS(ON), TP(ON), TA(ON), PTY(ON) and PIN(ON) of the selected network by PI-code. In addition to this, the linkage information, as described in appendix 4a of an EBU proposal, is shown clearly with LA, EG, IL(S) and LSN (see help screen 1-7). The data of block 3 with usage codes (UC) 10, 11, 13 and 15 is shown in the last 4 fields in hexadecimal.

10.8.3 AF-list of a crossreferenced network

```
≈                                                                                ≈
┌──────────────────────────────── AF-LIST ─────────────────────────────────────┐
│  97.9: 88.3   99.1: 89.5   99.7: 90.1   98.2: 88.6   98.9: 89.3   98.2: 88.5 │
│  99.5: 89.9   98.8: 89.1                                                     │
≈                                                                                ≈
```

Up to 24 AF-pairs of the crossreferenced network will be collected in this field. A colon (:) between pairs means, that the frequencies are mapped (usage codes 5..9), whereas an underline marks an AF-pair of method A (usage code 4).

10.8.4 Travel announcements via 14B group

```
≈                                                                                ≈
╞═══════════════════════ TRAFFIC ANNOUNCEMENTS VIA 14B ═══════════════════════╡
│  C413_11_07:30   C413_10_07:37   C413_11_08:56   C413_10_08:58               │
≈                                                                                ≈
```

This field monitors the occurence of 14B groups ("Travel-EON", begin (TA=1) and end (TA=0) of a traffic announcement on another network). An entry is of the form "PPPP_FF_hh:mm" where PPPP is the PI-code in hexadecimal, FF is the TP- and TA-flag in binary and hh:mm is the current PC-time in 24 hour format (not CT!). The display will scroll if the last position in this field has been reached.

(!) The usual fast multiple repetition of 14B groups (e.g. 8 times) for a reliable recognition cannot be seen in this field, because entries with the same information are suppressed. You may use screen 7 or the RDS-LA to check the number of repetitions.

In the example above, traffic announcements were made at 7:30h until 7:37h and at 8:56h until 8:58h on the service station "Radio WM" with the PI-code C413.




# 11. CONTROL FUNCTIONS

## 11.1 Function of <F10>

The program will be terminated by pushing F10 twice. Any other key will abandon that function, but the STOP mode will be entered.

## 11.2 Function of <ESC>

This key aborts menus for file selection. Because menus may have submenus, repeated execution of ESC may be necessary.

## 11.3 Function of <SPACE>

RDS decoding may be stopped with the SPACE-key. The message STOP in the status line will then flash. The screens will be "frozen" until release of the stop mode by pressing SPACE again. This function is helpful to capture a certain event for further analysis.

## 11.4 Function of <DEL> (ENTF)

With this key, a RDS block synchronisation may be forced manually. All collected RDS data will be lost and the screens will be cleared. This function is useful to check the timing of RDS data.

(!) A new RDS block synchronisation will be done automatically, if 100 subsequent blocks are wrong. When tuning to another RDS-transmitter on the receiver, RDS block synchronisation may sometimes not occur, because "valid" pseudo blocks will be detected periodically. A high RDS error rate (>90%) with good reception quality is characteristic for this situation. In that case, a new RDS block synchronisation should be done manually with the DEL-key.

(!) The screens will be cleared, if the RDS clock has failed for about 3 seconds. When the clock is present again, then a RDS block synchronisation is done automatically.

## 11.5 Function of the numerical keys 0..5

The numerical keys 0..5 determines the maximum burst width of an error, where error correction should occur. The choosen burst width will be shown in the status line (WIDTH:). Selection of "0" means no error correction. Error correction applies to data and check bits or both. Please note, that the burst width determines the distance of the outer faulty bits. For example, the error pattern "10001" is a 5 bit burst error! Error correction is applied to all blocks if enabled! However, it should be noted, that the correction of block 2 is very dangerous!

(!) The error correction may correct errors which are in fact uncorrectable. As a result you may receive data, which are not really sent from the broadcaster. This means, that with error correction on, the RDS data interpretation should be done with care! More than 2 bit burst error correction is not reliable in practice, because "correction" of de facto uncorrectable errors will increase with "higher" correction drastically!

## 11.6 Function of <+>,<-> (numerical keyboard)

See 10.2, 10.3 and 10.8!




## 12. SPECIAL FUNCTIONS ALT-FN

The menu line will change when pressing the ALT key. These special functions will be recalled with ALT-F1..ALT-F10, e.g. pressing ALT and Fn simultaneously.

### 12.1 <ALT-F1>: EXTERN / INTERN

Toggle function to switch between internal and external mode. Internal mode means "playback" of the sampler memory. External mode means realtime decoding with an external connected RDS receiver via parallel interface. The string in the field for ALT-F1 also toggles between "EXTERN" and "INTERN".

### 12.2 <ALT-F2>: RDS SAMPLER ON / OFF

Toggle function for sampler on/off. With sampler on, the incoming RDS data and checkbits (including errors) will be recorded up to 3 minutes into a separate memory (sampler memory) of your AT. When the sampler is running, the string "SAMPLING!" or "T-DELAY" will flash in the status line.

Because the structure of the sampler memory is a ring buffer, recording is possible even with a full sampler memory (status line: 100%). The sampler memory will always contain RDS data of the last 3 minutes of recording.

If you want to record different RDS data and save these records as sampler files (*.SMP), it is recommendable to clear the sampler memory with ALT-F3 before each new record.

(!) Of course, operation of the sampler is only possible in external mode!

### 12.3 <ALT-F3>: CLEAR SAMPLER MEMORY

The percentage of the occupied sampler memory is displayed in the status line (e.g. SMP: 25%). ALT-F3 clears the sampler memory (SMP: 0%) and prepares for a new "record".

### 12.4 <ALT-F4>: RDS LOGIC ANALYZER (optional)

*Start of the optional RDS logic analyzer.*

### 12.5 <ALT-F5>: MANUAL SYNC / AUTO SYNC

Toggle function between manual and automatic RDS block synchronisation. Normally, automatic RDS block synchronisation occurs, if 100 RDS blocks in sequence are wrong. All RDS data in memory will be lost and the screens will be cleared. This is the default mode after start of the program (AUTO-SYNC). However, this may not be suitable when the receiving conditions are bad (e.g. mobile reception with a low fieldstrength). With MANUAL SYNC on, the automatic RDS block synchronisation is disabled.

(!) With MANUAL SYNC on, the RDS block synchronisation should be done manually with the DEL-key, when the RDS receiver is tuned to another station. Otherwise the RDS data screens will display a mixture of RDS data of the previous and the new station.

### 12.6 <ALT-F6>:

Reserved for future implementations.




## 12.7 <ALT-F7>: LOAD SAMPLER FILE

Sampler files (*.SMP) may be loaded from harddisk or floppy with ALT-F7. A window will open with the default path and extender. This path and the extender can be edited. With CR another window opens, where all files with the same extender are displayed in the choosen directory. The selection of the file is done easy with the cursor keys or by input of the first character of the file. Repeated input of a character leads to the next file beginning with that character. With F2 the previous window may be recalled again for manual correction of the current path and extender.

The choosen file is loaded into the sampler memory when pressing CR again. ESC aborts the file selection. When a sampler file is loaded, then a switching to the INTERN-mode occurs automatically.

(!) A sampler file named "RDS.SMP" in the current directory of the RDS software decoder will be loaded automatically at the start of the program.

## 12.8 <ALT-F8>: SAVE SAMPLER MEMORY

The contents of the sampler memory will be stored on floppy or harddisk with ALT-F8. The default filename is the current RDS PS-name with the extender "*.SMP" (e.g. "BAYERN_3.SMP"). This name may be edited if required. The sampler data will be stored with CR. ESC aborts that function.

## 12.9 <ALT-F9>: SAVE SCREENS

The contents of all RDS data screens will be stored on floppy or harddisk in the current directory with ALT-F9. The default filename is the current RDS PS-name with an extender "*.SCR" (e.g. "BAYERN_3.SCR"). This name may be edited if required. The data will be stored with CR. ESC aborts that function. The file may be printed later for documentation or edited with an ASCII text editor.

## 12.10 <ALT-F10>: SAVE REPORT

A "ready to print" report of the most important RDS data will be stored on floppy or harddisk with ALT-F10. The default filename is the current RDS PS-name with an extender "*.REP" (e.g. "__SDR3__.REP"). This name may be edited if required. The data will be stored with CR. ESC aborts that function. The file may be printed later for documentation or edited with an ASCII text editor.

(!) **After file storage with ALT-F8, ALT-F9 or ALT-F10 the STOP-mode is selected automatically, to allow storage of more data. Due to the timing of the disk I/O of DOS, it is not possible to maintain synchronisation on the RDS data stream. This means, that RDS block synchronisation is inevitable, if the STOP-mode is abolished with the SPACE-key. As long as the STOP-mode is active, all RDS data will be kept to allow further storage.**

12.10.1 Example of a RDS report without EON

```
R D S Software Decoder for IBM AT              (C) 1989-1991 FRANKEN RDS-TEAM

       RDS Report of   SDR3          (FR 01.02.91, 18:41)           Page   1


    PI: D313       (GERMANY , SUPRA-REGIONAL)
    PS: '  SDR3  '
    TP: 1
    TA: 0
    MS: 1
   PTY: (00) not used
    DI: (01) STEREO
   PIN: ∞∞∞∞∞∞∞∞∞∞∞∞
  TIME: ∞∞∞∞∞∞∞∞
  DATE: ∞∞∞∞∞∞∞∞∞∞∞∞∞∞∞∞

  RT A: ARD-Radiotext-Versuchssendung            Degerloch DS1  ∞∞∞∞∞∞∞∞∞∞∞∞
  RT B: Programm: SDR3

  Number of detected AF lists: 11      AF-METHOD: B

       3AF _ 98.9:    97.4_ head

       7AF _ 95.5:    92.2_ head   head_ 97.4   head_ 98.1

       9AF _ 99.9:    head» 92.2   head» 96.5   head» 97.0   99.5_ head

       7AF _ 97.0:    92.2_ head   96.5_ head   99.9» head

      13AF _ 92.2:    head_ 95.5   head_ 96.5   head_ 97.0   head_ 97.4
                      head_ 98.1   99.9» head

       7AF _ 97.4:    92.2_ head   95.5_ head   head_ 98.1

      11AF _ 96.5:    92.2_ head   head_ 97.0   head_ 98.1   head_ 99.7
                      99.9» head

       3AF _ 99.5:    head_ 99.9

       7AF _ 94.6:    head_ 96.5   head_ 99.7   99.9» head


       9AF _ 98.1:    92.2_ head   95.5_ head   96.5_ head   97.4_ head

       7AF _ 99.7:    94.6_ head   96.5_ head   99.9» head
```

This is a typical RDS report of "SDR3". Most important RDS data are shown on top of the report. It can be seen that PIN, TIME and DATE (CT) are not implemented on "SDR3". AF data is coded according to method B. There are 11 AF sublists. AF pairs in descending order are present. The string "head" in the AF pairs indicates the frequency of the AF head on the left side. If the character "»" separates the 2 AFs of a pair instead of an underline ("_"), then this AF pair is in descending order (AF of a related programme, method B only).

The string "∞∞∞∞∞∞" is a filler code and indicates, that no data has been decoded for the corresponding entry.

The formating of the file is as shown above and may be printed on a standard printer with the DOS command PRINT, COPY or TYPE.

12.10.2 Example of a RDS report with EON

```
R D S Software Decoder for IBM AT              (C) 1989-1991 FRANKEN RDS-TEAM

       RDS REPORT OF: ' BBC R1 '     (SA 06.04.91, 15:50)              PAGE   1

         PI: C201       (UNITED KINGDOM , NATIONAL)
         PS: ' BBC R1 '
         TP: 0
         TA: 1
         MS: 1
        PTY: (00) not used
         DI: (01) STEREO
        PIN: 00 00.00
       TIME: 15:50
       DATE: SA 06.04.91

       RT A: ooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooooo
       RT B:           BBC Radio One                    Number One for Music

       ------------------------------------------------------------------------
       NUMBER OF DETECTED AF LISTS: 1     AF-METHOD: A

       11AF _ 97.9:     99.1_ 99.7   98.2_ 98.9   99.5_ 98.8   98.3_ 99.6
                        97.7_ 97.8

       ------------------------------------------------------------------------
       NUMBER OF CROSSREFERENCED NETWORKS VIA EON: 20

       #  1 ---------------------------------------------------------------------
       PI: C204          PS: ' BBC R4 '     PIN: 00 00.00
       TP: 0             TA: 0              PTY: (00) not used

       Usage codes:      10        11        12        13        14        15
                        ooooooo   ooooooo   ooooooo   0000      0000      0007

       AF-List ( f1:f2 = mapped AF ; f1_f2 = method A ):
       (5)  97.9: 92.7   (5)  99.1: 93.9   (5)  99.7: 94.5   (5)  98.2: 93.0
       (5)  98.9: 93.7   (5)  98.2: 92.9   (5)  99.5: 94.3   (5)  98.8: 93.5

       #  2 ---------------------------------------------------------------------
       PI: C417          PS: ' Cymru  '     PIN: 00 00.00
       TP: 0             TA: 0              PTY: (00) not used

       Usage codes:      10        11        12        13        14        15
                        ooooooo   ooooooo   ooooooo   0000      0000      000B

       AF-List ( f1:f2 = mapped AF ; f1_f2 = method A ):
       (4)  6AF _ 93.3   (4)  94.0_ 94.2   (4)  93.5_ 94.5   (4)  96.8_FILL

       #  3 ---------------------------------------------------------------------
```

In the above example of "BBC R1", the EON crossreferences are shown for 2 other networks. This is only an extract of the report, because the BBC sends 20 (!) EON-lists. The crossreferences are made for PS, TA, TP, AF, PIN, and PTY. It can be seen that usage code (UC) 15 is used for internal use.

All the AFs of "BBC R4" are mapped (UC 5), whereas "Cymru" has a method A AF-list (UC 4). The number in brackets in front of an AF-pair [e.g. "(5) 98.9: 93.7"] displays the usage code of that pair.




## 13. THE SETUP MENU

Start of the program with the option "/s" (i.e. "RDS /S CR") leads to a status display with some useful information. When "s" is entered again, a special setup menu occurs on the screen. ESC aborts the program (back to DOS) and any other key starts the RDS software decoder.

Your special setup is stored in a parameter file "RDS.PAR" if the question "SAVING PARAMETERS" is answered with "y". As explained before, the file "RDS.PAR" will be loaded at program start.

(!) Simply copy "RDS.PAR" from the original disk if your special setup is corrupted or not useful anymore.

The following submenus are available in setup. Selection of a submenu is done by pressing the appropriate numerical key in pointed brackets (e.g. <1>).

### 13.1 SETUP <1>: selection of the parallel interface

As a default LPT1 and IRQ7 will be choosen. If more than one parallel interface is available in your system, you may enter the number of the printer port (LPT1/2/3).

(!) If the hardware is correct and there is no response on the RDS data screens in EXTERNAL mode, then an attempt should be done by setting IRQ to IRQ5. This setting depends on the interface card in your AT.

### 13.2 SETUP <2>: selection of colours

In this menu, the colours of the various figures in the different screens may be setup by your taste. This menu is available in black & white mode (e.g. Hercules) too, but changes of the original preset makes not so much sense.

However, if you are a proud owner of a colour monitor, then the colour arrangement of the different screens may be setup very comfortable. Simply select a line in the window with the cursor keys. With CR another window will open with the available colour palette. Again the selection of the colour is done with the cursor keys. CR will adopt the new colour whilst ESC will cancel it and restore the old one.

#### 13.2.1 Hints when using a laptop with monochrome display

Some laptops will have a monochrome LC-display with a colour grafics adapter (VGA or EGA) and colour emulation with gray scales (e.g. Toshiba T1600). We suggest to choose the monochrome modus in the setup of the computer (Toshiba: SETUP1). However, if you want to use the emulation, the best preset is to choose for "screen masks", "RDS data" and "quality bargraph" dark characters on bright ground and for the other bright characters on dark ground.

### 13.3 SETUP <3>: terms for DI

Decoder information (DI) indicates one of 16 operating modes for the RDS receiver. The translation of the 16 codes (0..15) to impressive terms is done with this table. The terms may be edited for translation or redefinition. Simply select a line (term) with the cursor keys and enter the new term. CR will adopt the new term whilst ESC will cancel it and restore the old one.

### 13.4 SETUP <4>: terms for PTY

Programme type (PTY) is an identification number (code) for each programme item within 32 possibilities. The translation of the 32 codes (0..31) to impressive terms is done with this table. The terms may be edited for translation or redefinition. Simply select a line (term) with the cursor keys and enter the new term. CR will adopt the new term whilst ESC will cancel it and restore the old one.

### 13.5 SETUP <5>: terms for COUNTRY

The first element of the PI-code is used for the identification of the nationality of a RDS transmitter (country codes). Because only 15 codes are possible (code 0 is undefined), the same code is given to more than one country which frontiers are separated over a long distance. The terms for the country may be edited for translation or redefinition. Simply select a line (term) with the cursor keys and enter the new term. CR will adopt the new term whilst ESC will cancel it and restore the old one.

### 13.6 SETUP <6>: terms for COVERAGE

The second element of the PI-code is used for the definition of coverage of a RDS programme. The translation of the 16 codes (0..15) to impressive terms is done with this table. The terms for the coverage may be edited for translation or redefinition. Simply select a line (term) with the cursor keys and enter the new term. CR will adopt the new term whilst ESC will cancel it and restore the old one.

### 13.7 SETUP <7>: character table for displayable characters

This setup provides a full code conversion table for the displayable characters. Changes to the character table is done by selecting the character in the left part of the window by cursor function and entering the specific new character. The hexadecimal code of the character is shown in the right part of the window. This part is for confirmation only and cannot be edited!

If the character cannot be input by keyboard directly, you may enter this character with a ALT-sequence (see manual of your computer). For instance the sequence ALT 165 leads to the character: "Ñ".

### 13.8 SETUP <8>: External trigger and RDS block synchronisation

The function is useful only for the optional available RDS logic analyzer. When using the first interface cable which was delivered with the RDS software decoder versions 1.04 and 1.05, this option should always be disabled because the inputs will float when enabled! It requires a special interface cable when enabled.

## 14. THE RDS SAMPER FILES

The provided RDS sampler files are useful for demo purpose and for a quick training for the user without the necessity of any hardware. Some typical RDS data has been sampled and are stored on the original disk in the directory SAMPLER. Loading of a sampler file is done with function key ALT-F7 (load sampler). The internal mode will be selected automatically. This can be seen that after loading, the string in the field for ALT-F1 will change to "EXTERN".

Selection of the data sets described below is done by loading the file with that appropriate name. Please note, that the PI-code will be marked, when a sampler file is played back.

(!) Please allow some time after loading of a sampler file for RDS data collection. The speed of building up the data is similar to RDS real time decoding (i.e. ≈ 1200 bit/s).

### 14.1 Sampler file "ARD-TEST"

A data set for test purpose from the IRT in Germany with group types 0/1/2/3/4/5/6 and 15. The AF list is coded according to method A. Please have a look to the AF list on screen 3 (F3): AF codes (pairs) are used in many possible combinations (FILLER, OFFSET, LFMF).

Exercise: Press F7 to select screen 7 and then the cursor keys UP/DOWN for selection of group 0 in the left vertical field "GR". Now change the mask for the address calculation with the cursor keys LEFT/RIGHT and watch the effect on screen. Try all possible masks (0/1/3/7/F/1F/--). If the mask is "--", then the data of group 0 will be displayed continuously without sorting.

Repeat this exercise with other group types (e.g. 2/4/5/6)!

### 14.2 Sampler file "BAYERN_3"

This is an older data set of BAYERN 3 with 29 (!) AF lists according to method B. A look on screen 3 (F3) shows, that a double filler code is sent between each AF list due to a software error of the RDS encoder. This error has unnecessary extended the repetition time of the complete AF list. Today, this error has been fixed.

### 14.3 Sampler file "A_BAYERN"

This is an older data set of ANTENNE BAYERN. Only group 0A was sent with one AF list according to method A. Please notice the fast access to the RDS data (e.g. the AF list) compared to the other data sets when doing a new RDS block synchronisation with the DEL key.

### 14.4 Sampler file "SDR3"

This is an older data set of SDR3. Please have a look to the AF list on screen 2 (F2). The marked AFs indicate, that they belong to AF pairs in descending order. Such AFs may not be valid during the whole transmission time because the network will split a certain time of the day.

Screen 3 shows, that an RDS encoder with the same software error was used as explained before ("BAYERN 3"), because each AF list is separated with an unnecessary double filler. Today, this error has been fixed. Again, the marked AF pairs on screen 3 indicates pairs in descending order, i.e. the first frequency is higher than the second.

Exercise: Select screen 2 with F2 and have a look on the different AF lists in the field "AF LIST OF" with the help of the cursor keys (UP/DOWN/LEFT/RIGHT). Notice, that the following to the current AF head will be disabled when pushing one of the cursor keys. To enable the following again you have to press the "+" key.

### 14.5 Sampler file "BAYERN_2"

As an example for a poor RDS quality, the RDS data of BAYERN 2 was sampled under a bad reception condition due to a low fieldstrength.

With this sampler data, the incoming RDS data may be observed under a disturbed condition. The effect of error correction can be studied in a wide range. Please note the analogue quality bargraph in the status line, which was alway 100% with the other RDS data sets. The waving of the bargraph is caused by the modulation of the transmitter.

Exercise: Select different burst widths for error correction with the numerical keys 0..5 and watch the effect on PS and RT. You will find out, that a correction of large burst errors (3/4/5) will lead to more wrong characters because some errors are in fact uncorrectable. This example shows, that the application of the error correction should be done cautious and requires some more techniques such as adaptive correction in practice!




## 15. THE OPTIONAL RDS LOGIC ANALYZER

# THE RDS LOGIC ANALYZER for IBM-AT

*(!) For economic reasons, we have written only one (this) manual including the description of the RDS-LA. This means that customers, who did not purchased the optional RDS-LA may skip this chapter.*

On demand of the German ARD, Franken RDS-TEAM has implemented an additional program option for timing tests of RDS encoders. We are proud to present the world's first RDS logic analyzer (RDS-LA). With that option the user can sample RDS data with various external and internal triggers (RDS groups or PI-change) together with time delays and analyze (view) the sampler memory very simple.

For instance, it is possible to trigger to the event of RDS group 15B (begin/end of a traffic announcement) with the trigger position in the middle of the sampler memory. After the sampler has been started, it will sampling continuously (ring buffer) until the trigger event occurs. Then a delay counter will start according to the selected delay (begin, middle, end). After timeout of that delay counter, the sampler will stop automatically and the user can analyze, view or store the contents of the sampler memory. If the trigger event was set to the middle, then the sampler memory contains all RDS data approx. 1½ minutes before and after the trigger event.

(!) **Operation of the sampler is only possible when the RDS software decoder is on screen. The trigger modes are defined in the LA part, but to start the sampler, you must always go back to the decoder with ALT F4.**

(!) The LA is a separate but optional program which is integrated in the RDS software decoder. It is not possible to maintain RDS block synchronisation while the LA software is active. Therfore, RDS decoding is stopped when going back to the decoder. If there is anything to store, one should do it before the STOP-mode is released by the SPACE key, because an new RDS block sychronisation will then occur.

### 15.1 Features of the LA

With the optional RDS logic analyzer, the user may view the contents of the sampler memory. All groups are shown in sequence as they are recorded. The LA is entered by pushing ALT-F4.

With the cursor functions, each group in the memory can be selected. Time measuring can be done between a marked group and the group at the current cursor position. A FILTER-function enables to skip only between a specific RDS group.

5 different modes of trigger possibilities are included. The sampler can run in single, continuous and external/internal trigger mode. The sampler can record 2100 RDS groups (≈3 minutes) of RDS data including checkbits.

## 15.2 The RDS-LA status line

The LA status line shows all selected options (modes) for the LA:

| GROUPS: 2099 | TIME: 183,825S | MODE: INT_TRIG: 15B | DLY: [_T_] | FILTER: 14A |
|---|---|---|---|---|

The meaning of the particular fields:

GROUPS: Number of groups between marker and cursor.

TIME: Elapsed time between marker and cursor.

MODE: Trigger mode (SINGLE, INT_TRIG: XX, PI-CHANGE, EXT_TRIGGER, CONTINUOUS).

DLY: Delay for INT_TRIG and EXT_TRIGGER only.

FILTER: Selected RDS group filter (XX, XA, XB, 0X/0A/0B...15X/15A/15B) for the display. The selected groups are highlighted.

## 15.3 The RDS-LA menu line without ALT-key

The menu line is the bottom line on the screen:

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| HELP | MODE | TRIG | TR_DLY | FILTER | | G_MARK | G_TRIG | | EXIT |

These functions are available directly by pressing the appropriate function key.

## 15.4 The RDS-LA menu line with ALT key

When the ALT-key is pressed and held down, the menu line will change:

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| | | | DECODE | | | LD_SMP | SV_SMP | SV_SCR | |

These functions are available when pressing the ALT key together with the appropriate function key.

## 15.5 Display of the sampler memory

RDS LOGIC ANALYZER

| Nr. | TYPE | 1 | 2 | 3 | 4 | ASCII | Nr. | TYPE | 1 | 2 | 3 | 4 | ASCII |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1278 | 2A | D41C | 2402 | 6E64 | 6F72 | ndor | 1294 | 0A | D41C | 040A | 96A2 | 4F20 | ôCO |
| 1279 | -- | D41C | ---- | A2AF | 4449 | C DI | 1295 | 2A | D41C | 2407 | 2044 | ---- | D4Q |
| 1280 | 6A | D41C | 6403 | 89AB | CDEF | ù$Z | 1296 | 2A | D41C | 2408 | ---- | ---- | Bª |
| 1281 | 6A | D41C | 6404 | ---- | 4567 | #Eg | 1297 | 0A | D41C | 040F | A2AF | 3720 | C 7 |
| 1282 | 0A | D41C | 040A | 8FAF | ---- | O | 1298 | 6A | D41C | 6409 | ---- | ---- | ù$Z |
| M1283 | 2A | ---- | 2403 | 7420 | ---- | t qa | 1299 | 6A | ---- | 640A | ---- | 4567 | #Eg |
| 1284 | -- | D41C | ---- | ---- | 6E2C | Sen, | 1300 | -- | D41C | ---- | E78F | 5241 | φ RA |
| 1285 | 0A | D41C | 040F | 96AF | 3720 | ô 7 | 1301 | 2A | D41C | 2400 | 436F | 6465 | Code |
| 1286 | 6A | D41C | 6405 | 89AB | CDEF | ù$Z | 1302 | 2A | D41C | 2401 | 7273 | 7461 | rsta |
| 1287 | 6A | D41C | 6406 | 0123 | 4567 | #Eg | 1303 | 0A | D41C | 0409 | 8FA2 | 4449 | CDI |
| 1288 | 0A | D41C | 0408 | E7A2 | 5241 | φCRA | 1304 | 6A | D41C | 640B | 89AB | ---- | ù$So |
| 1289 | 2A | D41C | 2405 | 2050 | 492D | PI- | 1305 | 6A | D41C | 640C | 0123 | 4567 | #Eg |
| 1290 | 2A | ---- | 2406 | 436F | ---- | Codd | 1306 | 0A | ---- | 040A | ---- | 4F20 | VO |
| 1291 | 0A | D41C | 0409 | 8FA2 | 4449 | CDI | T1307 | 2A | D41C | 2402 | 6E64 | 6F72 | ndor |
| 1292 | 6A | ---- | 6407 | 89AB | CDEF | ù$Z | 1308 | 2A | ---- | 2403 | 7420 | ---- | t Aa |
| 1293 | 6A | ---- | 6408 | 0123 | 4567 | #Eg | 1309 | -- | D41C | ---- | 8FAF | 3720 | 7 |

| BLOCK 1 | BLOCK 2 | BLOCK 3 | BLOCK 4 |
|---|---|---|---|
| 00110100 00011100 | 00100100 00000011 | 01110100 00100000 | 01110001 01100001 |

The figure above gives an example of the representation of the LA screen. Up to 32 RDS groups out of 2100 are displayed. Each group is numbered according to it's position in the sampler memory. All blocks are displayed in hexadecimal and blocks 3 and 4 are additional displayed in ASCII. The block at the current cursor position is displayed in binary on bottom of the screen. "M" indicates a marked block whilst "T" marks that group, where the trigger has occured.

When block 2 is errorfree, then the group type is displayed in a separate column (TYPE). Faulty blocks are indicated with "----".

(!) An indication of faulty blocks of sampler files, which were recorded with the RDS software decoder versions 1.04 or 1.05 is not possible!

## 15.6 Function of the cursor keys

### 15.6.1 UP, DOWN, LEFT, RIGHT

The keys LEFT/RIGHT can only move horizontally.

The key UP will select the previous RDS group. The display will scroll towards lower entries, when the cursor is in the upper left position.

The key DOWN will select the next RDS group. The display will scroll towards higher entries, when the cursor is in the lower right position.

### 15.6.2 PAGE UP, PAGE DOWN

When the cursor is not in the upper left position, PAGE UP sets the cursor to that position of the current screen. Otherwise, it will select a new "page" of previous RDS groups.

When the cursor is not in the lower right position, PAGE DOWN sets the cursor to that position of the current screen. Otherwise, it will select a new "page" of succeeding RDS groups.




15.6.3 HOME, END

When the cursor is not in the upper left position, HOME sets the cursor to that position of the current screen. Otherwise, it will select the first "page" of RDS groups.

When the cursor is not in the lower right position, END sets the cursor to that position of the current screen. Otherwise, it will select the last "page" of RDS groups.

## 15.7 The RDS-LA trigger modes

15.7.1 Single shot without trigger (SINGLE)

In this mode, sampling starts immediate and will stop after 2100 RDS groups (≈3 minutes). The sampler memory always holds the last received 2100 RDS groups of recording. This is the default mode after program start. In this mode it is not possible to enter a trigger word and/or a trigger delay.

15.7.2 Single shot with internal trigger (INT_TRIG: XX)

In this mode, sampling is done continuously until the trigger event (RDS group, e.g. 15B) occurs. Sampling will then stop after timeout of the selected trigger delay. The selection of the delay is done with F4 whilst the RDS group for trigger is selected with F3.

15.7.3 Single shot when PI code changes (PI-CHANGE)

In this mode, sampling is done continuously until the trigger event (change of PI code) occurs. Sampling will then stop after timeout of the selected trigger delay. The selection of the delay is done with F4.

15.7.4 Single shot with external trigger (EXT_TRIGGER)

In this mode, sampling is done continuously until the external trigger event (level change of EXT_TRIG) occurs. Sampling will then stop after timeout of the selected trigger delay. The selection of the delay is done with F4. Please note, that this mode is normally disabled in the original setup. It you want to use the external trigger, you must enable it in setup <8>.

15.7.5 Continuous sampling (CONTINUOUS)

The logical model of the sampler memory is a powerful ring buffer. In the CONTINUOUS mode, sampling is endless until the sampler is stopped manually. When stopped, the sampler memory contains RDS data of the past 3 minutes. In this mode it is not possible to enter a trigger word and/or a trigger delay.

## 15.8 The trigger group

Selection of the trigger group can be done with F3 in the internal trigger mode (INT_TRIG) only. When pushing F3 a window will open, where the RDS group can be choosen with the cursor keys. CR will accept the new trigger group whilst ESC will abandon the group selection.




### 15.9 The trigger delay

With trigger modes INT_TRIG, PI-CHANGE or EXT_TRIGGER, the sampler is sampling continuously, until the trigger event occurs. After that, a delay counter will be active and will stop sampling, when the timeout occurs.

[T__] When the trigger event occurs, the delay counter will be set in such a way, that sampling will stop after 2000 further RDS groups (≈175s). When more than 100 RDS groups has been sampled before the trigger event has occured, then the trigger group will be at position 100 in the sampler memory (marked with "T").

[_T_] When the trigger event occurs, the delay counter will be set in such a way, that sampling will stop after 1050 further RDS groups (≈92s). When more than 1050 RDS groups has been sampled before the trigger event has occured, then the trigger group will be at position 1050 in the sampler memory (marked with "T").

[__T] When the trigger event occurs, the delay counter will be set in such a way, that sampling will stop after 100 further RDS groups (≈9s). When more than 2000 RDS groups has been sampled before the trigger event has occured, then the trigger group will be at position 2000 in the sampler memory (marked with "T").

(!) The word "ARMED!" will flash in the status field of the decoder, when the sampler is active but the trigger did not occur until yet. After the trigger, the word "T-DELAY" will flash.

### 15.10 The external trigger

In the mode EXT_TRIGGER, the trigger occurs when the electrical level will change at the external input EXT_TRIG. The level may change from low to high or high to low and should be stable for at least 5ms and must be CMOS compatible.

### 15.11 Remote controlled RDS block synchronisation

RDS block synchronisation is done, when the electrical level will change at the external input INIT. The level may change from low to high or high to low and should be stable for at least 5ms. The function does the same as pressing the DEL-key.

## 15.12 <F1>..<F10> The RDS LA functions

### 15.12.1 <F1>: HELP

F1 has the same function as in the software decoder (see 9.). The HELP screen 1-2:

1-2

```
R D S  LOGIC ANALYZER FOR IBM-AT              (C) '89-'91 by FRANKEN RDS-TEAM

     The RDS LOGIC ANALYZER (LA) is an optional program for the expansion
          of the SAMPLER functions of the RDS SOFTWARE DECODER.

                FUNCTION KEYS                          SPECIAL FUNCTIONS

F1: HELP ON/OFF            ALT-F1:                 SPACE:  MARK RDS GROUP
F2: TRIGGER MODES          ALT-F2:                 Cursor: SELECT RDS GROUP
F3: RDS GROUP f. TRIGGER   ALT-F3:                 +:      NEXT  GROUP (FILT.)
F4: TRIGGER DELAY          ALT-F4:  RDS DECODER    -:      PREV. GROUP (FILT.)
F5: RDS GROUP f. FILTER    ALT-F5:
F6:                        ALT-F6:
F7: GOTO MARKER            ALT-F7:  LOAD SAMPLER
F8: GOTO TRIGGER           ALT-F8:  SAVE SAMPLER
F9:                        ALT-F9:  SAVE SCREEN
F10: EXIT (enter twice)    ALT-F10:                ESC:    ABORT

          MADE IN GERMANY                  Note: Cursor means all functional keys
                                                 for cursor control including
                                                 HOME, END, PAGE UP, PAGE DOWN
```

### 15.12.2 <F2>: LA TRIGGER MODES

The trigger mode can be selected with F2. The mode is displayed in the RDS-LA status line (e.g. "MODE: CONTINUOUS").

### 15.12.3 <F3>: TRIGGER GROUP

The RDS group for the internal trigger can be selected with F3. The RDS group for trigger is displayed in the RDS-LA status line (e.g. "MODE: INT_TRIG: 15B")

(!) This function is only effective in the trigger mode INT_TRIG!

### 15.12.4 <F4>: TRIGGER DELAY

The trigger delay for the internal or external trigger mode can be selected with F4. The choosen delay is displayed in the RDS-LA status line (e.g. "DLY: [_T_]").

(!) This function is only effective in the trigger modes INT_TRIG, PI-CHANGE or EXT_TRIGGER!

### 15.12.5 <F5>: FILTER GROUP

A certain RDS group can be filtered on the display with F5. Each occurence of the choosen group is then highlighted. With the keys +/-, one can skip to the next/previous group of the same type. The default filter is XX, i.e. all groups are selected. The selected filter is shown in the status line (e.g. "FILTER: 14A").

### 15.12.6 <F6>:

Reserved for future implementations.

15.12.7 <F7>: GOTO MARKER

A single RDS group can be marked with the SPACE-key. When pushing F7, the cursor will go immediately to that marked position.

15.12.8 <F8>: GOTO TRIGGER

When pushing F8, the cursor will go immediately to that RDS group, where the trigger event has occured. This function is only effective if a sampler record was done before with the trigger modes INT_TRIG, PI-CHANGE or EXT_TRIGGER!

15.12.9 <F9>:

Reserved for future implementations.

15.12.10 <F10>: EXIT

The program will terminate by pushing this key twice (back to DOS).

## 15.13 Special RDS LA functions

15.13.1 <ALT-F1>:

Reserved for future implementations.

15.13.2 <ALT-F2>:

Reserved for future implementations.

15.13.3 <ALT-F3>:

Reserved for future implementations.

15.13.4 <ALT F4>: RDS SOFTWARE DECODER

Exit to the RDS software decoder is done with ALT-F4.

15.13.5 <ALT-F5>:

Reserved for future implementations.

15.13.6 <ALT-F6>:

Reserved for future implementations.

15.13.7 <ALT F7>: LOAD SAMPLER FILE

Same function as in the software decoder (see 12.7).

15.13.8 <ALT F8>: SAVE SAMPLER MEMORY

Same function as in the software decoder (see 12.8).




15.13.9 <ALT F9>: SAVE LA SCREEN

Same function as in the software decoder (see 12.9), with the exception, that only the current LA-screen will be stored with the default extension *.LA (e.g. "BAYERN_3.LA").

15.13.10 <ALT-F10>:

Reserved for future implementations.

15.13.11 Function of <SPACE>

A single RDS group can be marked with the SPACE-key. The time and number of groups between a marked RDS group and the group at the current cursor position is shown in the status line (e.g. "GROUPS: 100"; "TIME: 8.758s").

15.13.12 Function of <+> / <->

When the filter is active (F5), one can skip to the next/previous group of the same (filtered) type with the keys +/-.

# 16. APPENDIX

## 16.1 An example of advanced error analysis for RDS experts.

The RDS data of "Ra M-hus" in Sweden was sampled on wednesday, the 7.11.90 at 15:39h. The sampler file is provided in the directory SAMPLER on the original disk. The sampling was done from one of our customers at Telecom Denmark in Taastrup. This example was reality, in the mean time the errors has been fixed!

Apart from the funny radiotext ("- - - "), two curiosities can be seen when the file "RA_M_HUS.SMP" is loaded into the sampler memory:

- The TP-flag is toggling periodically from 1 to 0 (all screens). This is a very serious error of the RDS encoder!

- The AF-list seems to be corrupted periodically. This can be seen on screen 3! It shows, that the monotonic sequence of the AF list (group 0A) is disturbed. Again, this is a very serious error of the RDS encoder!

### 16.1.1 Fixing the first error

The first error is fixed very easy with screen 6 (analysis of RDS group types):

R D S Software Decoder for IBM AT (C) '89-'91 by FRANKEN RDS-TEAM

| 6=PI | PS | TP | TA | MS | PTY | DI | DATE | TIME | PIN |
|---|---|---|---|---|---|---|---|---|---|
| E324 | Ra M-hus | 1 | 0 | 1 | 00 not used | 01 | WE 07.11.90 | 15:39 | 01.23:59 |

HEXADECIMAL / ASCII REPRESENTATION OF DETECTED GROUPS

| TYPE | BL.1 | BL.2 | BL.3 | BL.4 | ASCII | TYPE | BL.1 | BL.2 | BL.3 | BL.4 | ASCII |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0A | ▪E324 | 0409 | E514 | 204D | Y M | 0B | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo |
| 1A | E324 | 1405 | 0000 | 0DFB | c | 1B | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo |
| 2A | E324 | 2401 | 2D20 | 2020 | - | 2B | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo |
| 3A | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo | 3B | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo |
| 4A | E324 | 4401 | 7894 | E9C2 | xî É | 4B | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo |
| 5A | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo | 5B | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo |
| 6A | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo | 6B | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo |
| 7A | E324 | 7003 | 0A12 | 7160 | q | 7B | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo |
| 8A | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo | 8B | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo |
| 9A | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo | 9B | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo |
| 10A | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo | 10B | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo |
| 11A | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo | 11B | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo |
| 12A | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo | 12B | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo |
| 13A | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo | 13B | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo |
| 14A | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo | 14B | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo |
| 15A | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo | 15B | ooooooo | ooooooo | ooooooo | ooooooo | ooooooo |

Observing block 2 of group 7A (RP), it can be seen, that the second nibble is always zero whereas this nibble is 4 in all other groups. This means, that the TP-flag is not 1 when RP-information (group 7) is inserted in the RDS data stream.

16.1.2 Fixing the second error

The next error is not so easy to find out. It can be seen on screen 3, that the corruption of the AF-list always occurs, when the TP-flag is toggling. To verify that, one should do a new RDS block synchronisation with the DEL-key several times. It becomes suspicious, that the error occurs whenever group 7A is inserted!

We will now have a look on screen 7 (advanced analysis of RDS group types), selecting group 0A and choosing the mask "--" (continuous without sorting). Because the corruption of the AF-list is at the same time when the TP-flag toggles, we will stop the decoder with the SPACE-key quite after such event (try it several times).

The screen 7 will then look similar as in the next figure:

R D S Software Decoder for IBM AT (C) '89-'91 by FRANKEN RDS-TEAM

| 7 PI | PS | TP | TA | MS | PTY | DI | DATE | TIME | PIN |
|---|---|---|---|---|---|---|---|---|---|
| E324 | Ra M-hus | 1 | 0 | 1 | 00 not used | 01 | ∞∞∞∞∞∞∞∞∞∞∞∞∞∞∞∞ | ∞∞∞∞∞∞∞∞ | 01.23:59 |

SORTED GROUP 00 BY ADDRESSCODE IN BLOCK 2

| GR | MASK | ADDR | BL.2 | BL.3 | BL.4 | ASCII | ADDR | BL.2 | BL.3 | BL.4 | ASCII |
|---|---|---|---|---|---|---|---|---|---|---|---|
| >00 | -- | 00 | ▪040F | E514 | 7573 | Y us | 16 | 040F | A29B | 7573 | Cçus |
| 01 | 1F | 01 | 0408 | 919D | 5261 | äqRa | 17 | 0408 | E514 | 5261 | Y Ra |
| 02 | 1F | 02 | 0409 | A29B | 204D | Cç M | 18 | 0409 | 919D | 204D | äq M |
| 03 | 0F | 03 | 040A | E514 | 2D68 | Y -h | 19 | 040A | A29B | 2D68 | Cç-h |
| 04 | 00 | 04 | 040F | 919D | 7573 | äqus | 20 | 040F | E514 | 7573 | Y us |
| 05 | 1F | 05 | 0408 | A29B | 5261 | CçRa | 21 | 0408 | 919D | 5261 | äqRa |
| 06 | 1F | 06 | 0409 | **E514** | 204D | Y M | 22 | 0409 | A29B | 204D | Cç M |
| 07 | 1F | 07 | 040A | **919D** | 2D68 | äq-h | 23 | 040A | E514 | 2D68 | Y -h |
| 08 | 00 | 08 | 0409 | **919D** | 204D | äq M | 24 | 040F | 919D | 7573 | äqus |
| 09 | 00 | 09 | 040F | **E514** | 7573 | Y us | 25 | 0408 | A29B | 5261 | CçRa |
| 10 | 00 | 10 | 0408 | **A29B** | 5261 | CçRa | 26 | 0409 | E514 | 204D | Y M |
| 11 | 00 | 11 | 040F | **A29B** | 7573 | Cçus | 27 | 040A | 919D | 2D68 | äq-h |
| 12 | 00 | 12 | 0408 | **919D** | 5261 | äqRa | 28 | 040F | A29B | 7573 | Cçus |
| 13 | 00 | 13 | 040F | **919D** | 7573 | äqus | 29 | 0408 | E514 | 5261 | Y Ra |
| 14 | 0F | 14 | 0409 | E514 | 204D | Y M | 30 | 0409 | 919D | 204D | äq M |
| 15 | 03 | 15 | 040A | 919D | 2D68 | äq-h | 31 | 040A | A29B | 2D68 | Cç-h |

The hexadecimal sequence "E514 919D A29B" is the correct sequence for the AF-list: "5AF_89.5 102.0_103.2 103.7_103.0". This sequence is ok until ADDR 5 (see block 3 in the figure above).

The AF pairs that follow the AF head at ADDR 6 then are both "919D" (ADDR 7..8)! However, this is not the end of the "drama": The AF pairs that follow the AF head at ADDR 9 then are sent twice "A29B A29B 919D 919D" (ADDR 10..13)!

(!) The encoder error is periodically always with the insertion of RP groups 7A! Because the insertion of RP information is asynchronous to the static RDS data stream, the faulty result (sequence) for the AF-list is always different (random).

*(!) There is no doubt about the faulty behaviour of the RDS encoder, because the RDS data was sampled without any reception error!*

16.1.3 Use of the RDS logic analyzer for final proof

Now we will use the RDS logic analyzer to confirm the error of the Swedish RDS encoder. With the filter function (F5), we will skip to the first occurence of 7A groups. After that we will use the cursor keys until the screen will look as in the figure below (group 25 in the upper left):

R D S Software Decoder for IBM AT (C) '89-'91 by FRANKEN RDS-TEAM

RDS LOGIC ANALYZER

| Nr. | TYPE | 1 | 2 | 3 | 4 | ASCII | Nr. | TYPE | 1 | 2 | 3 | 4 | ASCII |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 0A | E324 | 040A | E514 | 2D68 | Y -h | 41 | 7A | E324 | 7002 | 2431 | 5508 | 1U |
| 26 | 0A | E324 | 040F | 919D | 7573 | äqus | 42 | 0A | E324 | 0409 | A29B | 204D | Cç M |
| 27 | 2A | E324 | 2401 | 2D20 | 2020 | - | 43 | 7A | E324 | 7003 | A759 | 6814 | öYh |
| 28 | 0A | E324 | 0408 | A29B | 5261 | CçRa | 44 | 7A | E324 | 7012 | 2361 | 0508 | #a |
| 29 | 0A | E324 | 0409 | E514 | 204D | Y M | 45 | 7A | E324 | 7013 | A749 | 0028 | öI ( |
| 30 | 0A | E324 | 040A | 919D | 2D68 | äq-h | 46 | 1A | E324 | 1406 | 0000 | 0DFB | c |
| 31 | 2A | E324 | 2400 | 2D20 | 2D20 | - - | 47 | 7A | E324 | 7002 | 2384 | 6504 | #íe |
| 32 | 0A | E324 | 040F | A29B | 7573 | Cçus | 48 | 7A | E324 | 7003 | 55A2 | 2702 | UC' |
| 33 | 0A | E324 | 0408 | E514 | 5261 | Y Ra | 49 | 7A | E324 | 7012 | 2429 | 05A0 | ) ª |
| 34 | 2A | E324 | 2401 | 2D20 | 2020 | - | 50 | 0A | E324 | 040A | 919D | 2D68 | äq-h |
| 35 | 1A | E324 | 1406 | 0000 | 0DFB | c | 51 | 7A | E324 | 7013 | 8A26 | 9691 | Ñ&öä |
| 36 | 7A | E324 | 7002 | 1340 | 9501 | @ï | 52 | 7A | E324 | 7002 | 2512 | 7504 | % u |
| 37 | 7A | E324 | 7003 | 1A23 | 7220 | #r | 53 | 7A | E324 | 7003 | 54A0 | 1111 | Tª |
| 38 | 7A | E324 | 7012 | 1839 | 8508 | 9ì | 54 | 0A | E324 | 0409 | 919D | 204D | äq M |
| 39 | 0A | E324 | 040F | E514 | 7573 | Y us | 55 | 7A | E324 | 7012 | 2692 | 3506 | &ê5 |
| 40 | 7A | E324 | 7013 | A702 | 0180 | ö á | 56 | 7A | E324 | 7013 | 0A17 | 0812 | |

| BLOCK 1 | BLOCK 2 | BLOCK 3 | BLOCK 4 |
|---|---|---|---|
| 11100011 00100100 | 01110000 00000011 | 10100111 01011001 | 01101000 00010100 |

The blocks 3 of groups 0A at locations 29, 30 and 32 (see figure above) shows the last correct sequence of the AF-list: "E514 919D A29B".

Analysis of the following groups:

| | | | |
|---|---|---|---|
| Nr. 33, (block 3): | E514 | -> | The AF-head 5AF_89.5 |
| Nr. 35..38: | Begin of RP information with groups 1A and 7A. | | |
| Nr. 39 (block 3): | E514 | -> | Error, the AF-head again! |
| Nr. 42 (block 3): | A29B | -> | Error, where is the preceeding AF-pair 919D? |
| Nr. 50 (block 3): | 919D | -> | here it comes, but surprise... |
| Nr. 54 (block 3): | 919D | -> | ...the same AF-pair again! |

The encoder error is periodically always with the insertion of RP groups 7A! Because the insertion of RP information is asynchronous to the static RDS data stream, the faulty result (sequence) for the AF-list is always different (random). This can be seen easy, if the next insertion(s) of 7A groups are observed (beginning at nr. 104, 172, 240 etc.). It seems, that the software of the RDS encoder has a problem with pointers!

*(!) Again, there is no doubt about the faulty behaviour of the RDS encoder, because the RDS data was sampled without any reception error!*

# 17. YOUR RIGHT AND OURS

This documentation and the accompanying software programs are subject to change without notice. Use of the software and documentation is governed by the terms of the following license agreement.

## 17.1 Copy protection

The software is provided on an unprotected disk because the authors believe that the buyer should be able to make backup copies for his or her use ONLY. Because it is unprotected, we expect you to respect the copyright and NOT give, sell or even lend copies of this program to anyone else. The buyer should know, that his/her program is a personal installation with the crypted name and full address in the program code.

## 17.2 Licence agreement

The computer software and printed documentation supplied under this agreement (the "product") is the property of FRANKEN RDS-TEAM (the "developer"). The developer grants you the right to use the product subject to the following terms:

You may:
- Install and use the product on a single computer system.
- Make backup copies of the product for your own use, and only in support of your use of the product on the computer on which the product is installed. You must reproduce the copyright notice on any copies.
- Transfer this license to another party, so long as the party agrees to be bound by the terms of this agreement, and you transfer or destroy all copies of the product in your possession.

You may not:
- Install, use, or allow the use of the product on more than a single computer system.
- Modify, transfer to another form, merge with any other product, disassemble or decompile the product.
- Transfer the product through or within a computer network.

## 17.3 Disclaimer of warranty

THIS PRODUCT IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THIS PRODUCT IS WITH YOU. SHOULD THE PRODUCT PROVE DEFECTIVE, YOU ASSUME THE ENTIRE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

## 17.4 Limitation of remedies

THE DEVELOPER SHALL NOT BE LIABLE FOR DAMAGES OF ANY KIND, INCLUDING, BUT NOT LIMITED TO, ANY LOST PROFITS, LOST SAVINGS OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THIS PRODUCT EVEN IF THE DEVELOPER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR FOR ANY CLAIM BY ANY OTHER PARTY.

## 17.5 Use of product



## 17.6 Trademarks

The trademark notices below apply to product names mentioned in this manual and in the RDS SOFTWARE DECODER program.

IBM PC, XT, AT, PS/2, and PC-DOS are registered trademarks of International Business Machines Corp..
MS-DOS and WORD are registered trademarks of Microsoft Corporation.
TURBO PASCAL and TURBO ASSEMBLER are registered trademarks of Borland International, Inc..
WORDSTAR is a registered trademark of MicroPro International Corp..
NORTON EDITOR is a registered trademark of Peter Norton Computing Inc..

# RDS GLOSSARY

| | |
|---|---|
| AF | ALTERNATIVE FREQUENCY |
| CT | CLOCK TIME |
| DI | DECODER INFORMATION |
| EON | ENHANCED OTHER NETWORK |
| IH | IN HOUSE APPLICATION |
| MJD | MODIFIED JULIAN DAY |
| MS | MUSIC / SPEECH |
| NWS | NATIONAL WARNING SYSTEM |
| ON | OTHER NETWORK |
| PI | PROGRAMME IDENTIFICATION |
| PIN | PROGRAMME ITEM NUMBER |
| PS | PROGRAMME SERVICE NAME |
| PTY | PROGRAMME TYPE |
| RP | RADIO PAGING |
| RT | RADIO TEXT |
| TA | TRAFFIC ANNOUNCEMENT |
| TDC | TRANSPARENT DATA CHANNELS |
| TMC | TRAFFIC MESSAGE CHANNEL |
| TP | TRAFFIC PROGRAMME |

RDS SOFTWARE DECODER
for IBM AT
designed by:

FRANKEN RDS-TEAM

Distribution by:
Ing.-Büro Dieter Nohse
Weichselleite 18
D-8501 Obermichelbach
GERMANY