RDS ENCODER

User manual   Rev 2.3   1-2014

Firmware   **2.1.0.0**

Declaration of conformity
according to directive 99/5

Itel Elettronica e Telecomunicazioni SNC – Via S.Penna, 82 06132 S.Andrea delle Fratte Perugia (PG)
hereby declares that the product:

RDS CODER

and its optional accessories :
OPT1: MPX CODER
OPT2: LAN INTERFACE
OPT3: AUDIO CHANGEOVER

intended for RDS and MPX signal generation, manufactured by Itel Elettronica e Telecomunicazioni SNC, complies with essential requirements of article 3 and other relevant provisions of Directive 1999/5/EC, when used for its intended purpose.
Health and safety requirements pursuant to Article 3.1.a
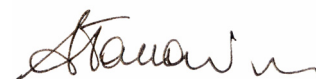   Standards applied: EN60125: 1989/A1:1992/A2:1994

Protection requirements concerning electromagnetic compatibility pursuant to article 3.1.b
        Standards applied: EN301489-1 V 1.8.1 ; EN301489-11 V 1.3.1.

Perugia 10/02/2012

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WARNING

 Before attempting any operation, please follow the safety instructions contained in the following paragraph.

ITEL SNC declines any liability for damage to people or things due to non-compliance, even if partial, of the following indications

• Ensure that the supply voltage corresponds to what is indicated on the apparatus.

• Ensure that the electrical system is equipped with a ground connection.

• Use only power sockets and cables with ground connection

• Disconnect power before attempting any operation inside the device.

• The power cutting device is the power cord, so this should be easily accessible and the socket must be positioned close to the apparatus.

• Any operation involving the access to internal parts must be performed only by trained service personnel.

Front panel:
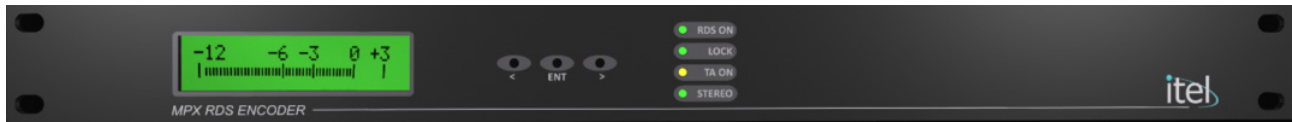
Leds on front panel:

- RDS ON: is on when the RDS encoder is active
- LOCK: is on when the encoder is synchronized to an external 19KHz signal
- TA ON: is on when the Traffic Announce flag is being transmitted
- STEREO: is on when the internal stereo coder is active

Rear panel:

Connector and settings on the rear panel

- RIGHT IN   (XLR-F) right channel input for the stereo coder [1]
- LEFT IN   (XLR-F) left channel input for the stereo coder   [1]
- MPX OUT   (BNC-F) MPX mixer output (MPX IN + RDS)
- RDS INJ LEVEL RDS injection level on MPX OUT output
- MPX IN   (BNC-F) MPX mixer input
- RDS LEV   Output level of RDS OUT output
- RDS OUT   (BNC-F) RDS signal output
- RS232   (DB9-F) RS232 communication port
- EXT PORT   (DB9-M) optoisolated control port for TA and MS flags
- 19KHz SYNC   (BNC-F) Synchronization input for 19KHz pilot reference
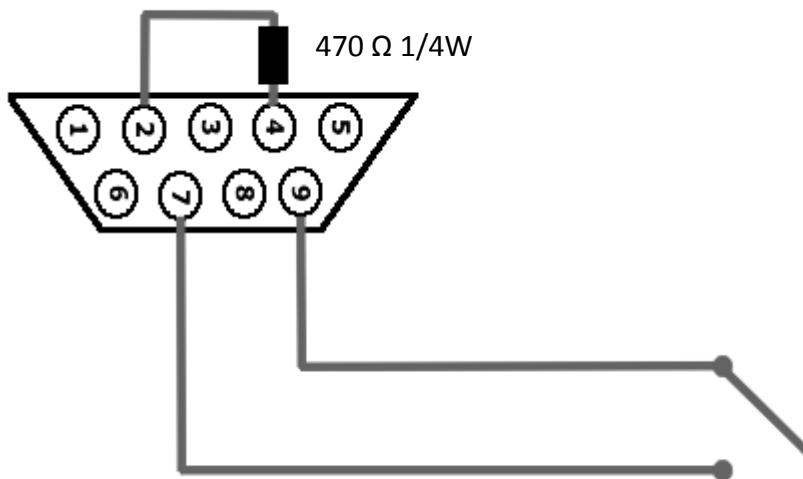- AC LINE   (VDE-M) AC line input 100-230V AC 50/60Hz

[1] stereo coder board is optional

External control port and input equivalent circuit:
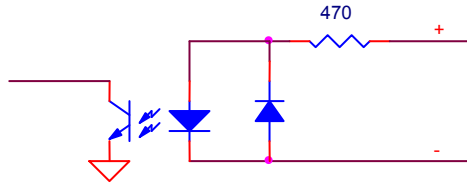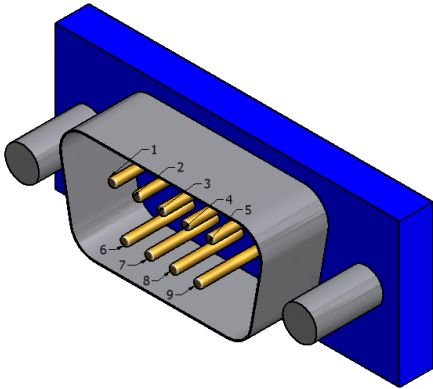
PIN	Description	Notes
1	M/S +	
2	TA +	
3	SPARE +	
4	+12V	Max 50 mA
5	+12V	Max 50mA
6	M/S -	
7	TA -	
8	SPARE -	
9	GND	Frame ground

Connection example for remote switching of TA flag

470 Ω 1/4W

i

Note: The external connector must be enabled via the specific menu on the display or using the configuration program (RdsProg).
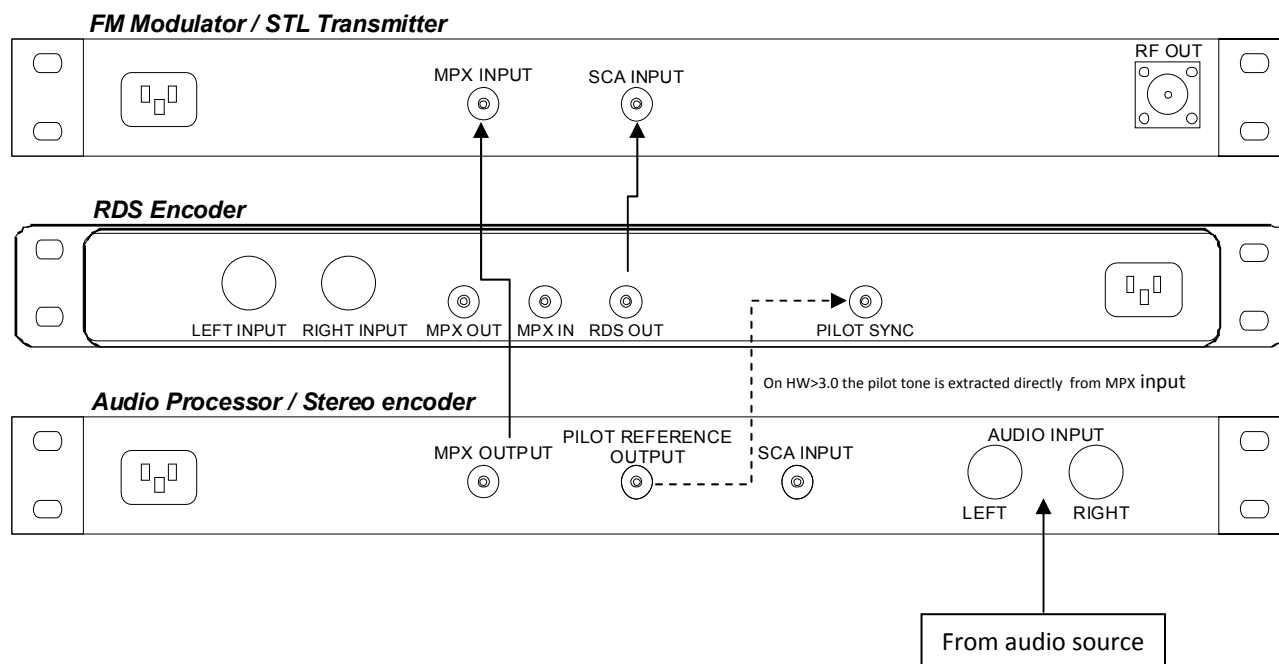
On Hw>3.0 the pilot reference, as a default setting, is extracted from the incoming MPX signal.
If a separated clock sync is needed, the internal jumper J1 has to be set to "BNC" position and a 19KHz clock signal has to be injected into "PILOT SYNC" connector.
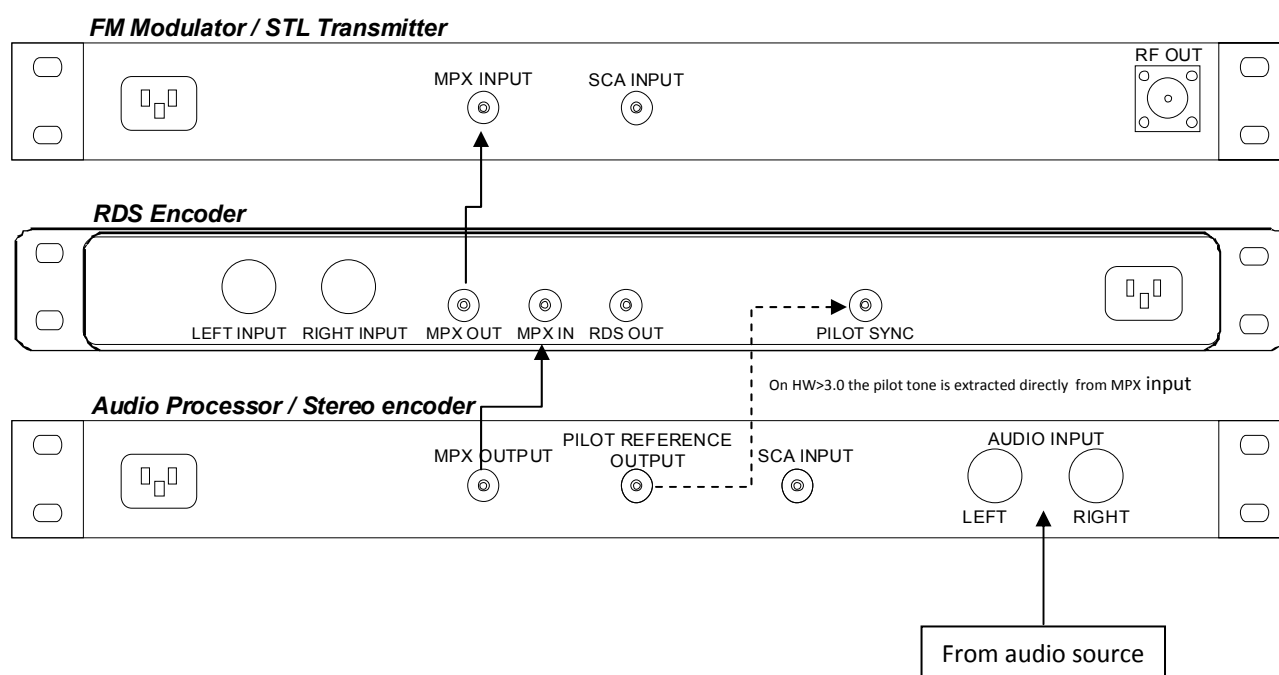
Connection examples:

Stereophonic modulation, using external audio processor / stereo encoder and FM modulator, or STL transmitter, as a RDS signal mixer.
Pilot reference for the RDS encoder has to be set to external.

FM Modulator / STL Transmitter

MPX INPUT   SCA INPUT   RF OUT

RDS Encoder

LEFT INPUT   RIGHT INPUT   MPX OUT   MPX IN   RDS OUT   PILOT SYNC

On HW>3.0 the pilot tone is extracted directly from MPX input

Audio Processor / Stereo encoder

MPX OUTPUT   PILOT REFERENCE OUTPUT   SCA INPUT   AUDIO INPUT
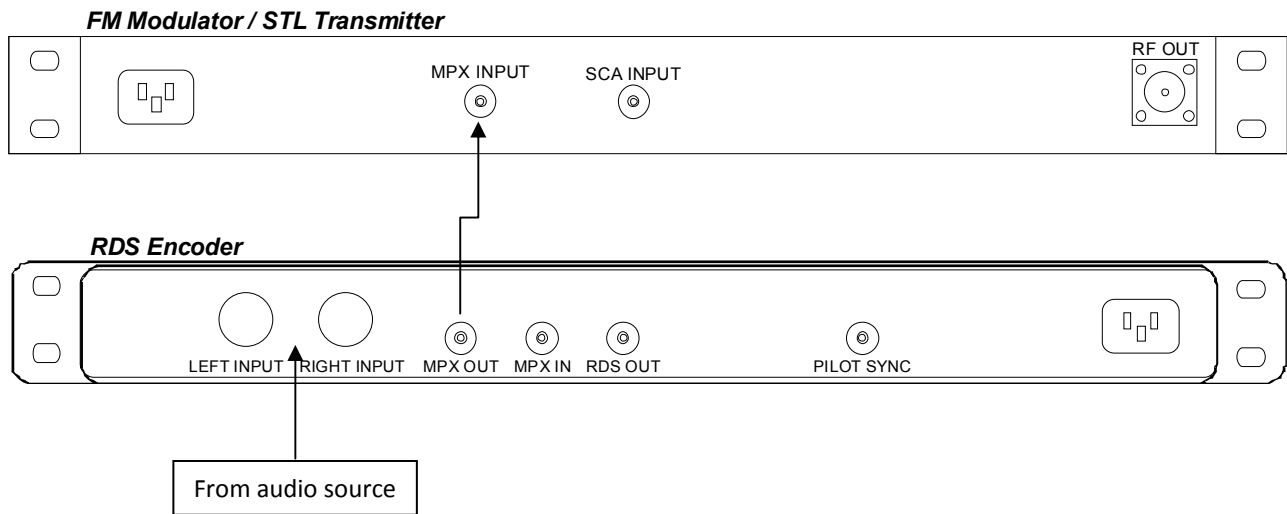
LEFT   RIGHT

From audio source

Stereophonic modulation, using external audio processor / stereo encoder and internal RDS mixer.
Pilot reference for the RDS encoder has to be set to external.

FM Modulator / STL Transmitter

MPX INPUT   SCA INPUT   RF OUT

RDS Encoder

LEFT INPUT   RIGHT INPUT   MPX OUT   MPX IN   RDS OUT   PILOT SYNC

On HW>3.0 the pilot tone is extracted directly from MPX input

Audio Processor / Stereo encoder

MPX OUTPUT   PILOT REFERENCE OUTPUT   SCA INPUT   AUDIO INPUT

LEFT   RIGHT

From audio source

Stereophonic / Monophonic modulation, using internal audio stereo encoder.
Pilot reference for the RDS encoder has to be set to internal.

FM Modulator / STL Transmitter

MPX INPUT   SCA INPUT   RF OUT

RDS Encoder

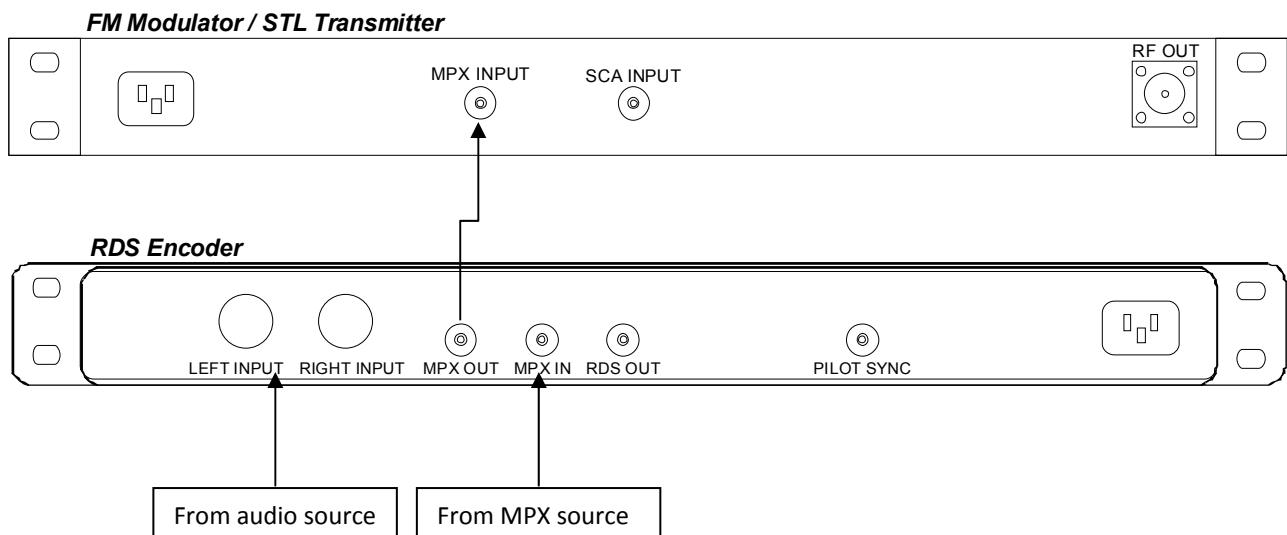LEFT INPUT   RIGHT INPUT   MPX OUT   MPX IN   RDS OUT   PILOT SYNC

From audio source

Audio changeover connection example:

If the coder is equipped with MPX Coder (OPT1) or monophonic audio changeover (OPT3), it is possible to connect two audio sources, one to MPX input and another to XLR connectors, using the coder as an emergency audio switcher in case of failure of the main audio signal.
Any of the two sources, on XLR input or MPX input, can be assigned as the main audio source; the other will be the backup channel.

Note: it is assumed that the incoming MPX signal has already its RDS subcarrier summed, so the coder will be automatically disabled when the external MPX input is put on air.

FM Modulator / STL Transmitter

MPX INPUT   SCA INPUT   RF OUT

RDS Encoder

LEFT INPUT   RIGHT INPUT   MPX OUT   MPX IN   RDS OUT   PILOT SYNC

From audio source   From MPX source

Navigation / Editing:

The windows can be scrolled through using the "left/increment" and "right/decrement" keys on the front panel.

To modify editable parameters, once entered into the desired window, press the button "Edit/Enter".

```
RDS  Enabled: ON
TA:OFF  MS:MUS
```

Pressing the "edit/enter" key, an asterisk "*" will appear near the first editable item

```
RDS  Enabled: ON*
TA:OFF  MS:MUS
```

Pressing the "left/increment" or "right/decrement" keys the "*" cursor can be positioned on the other editable items on the selected window.

```
RDS  Enabled: ON
TA:OFF* MS:MUS
```

Wishing now to modify the value of TA flag, press again the "Edit/Enter" key: a "<" symbol will appear near then parameter indicating that it is in editing state.

```
RDS  Enabled: ON
TA:OFF< MS:MUS
```

Pressing now "Right/Increment" and "Left/Decrement" keys, the value of selected parameter can be changed.

```
RDS  Enabled: ON
TA:ON < MS:MUS
```

Once the desired value is set, press again the "Edit/Enter" key. The symbol will return to "*", to indicate that you are back in navigation state.
If needed, you can then go and change other parameters into the same window.

```
RDS  Enabled: ON
TA:ON * MS:MUS
```

However, if editing is completed, press the "Edit/Enter" key again: the "*" symbol will disappear and it will be possible, using "Left/Increment" and "Right/Decrement" keys, to navigate the other menus.

Menus on firmware rev. 2.0.0.0

Firmware version window:

```
Itel RDS Encoder Hw 2.0.0.0
Sw: 2.0.0.0
```
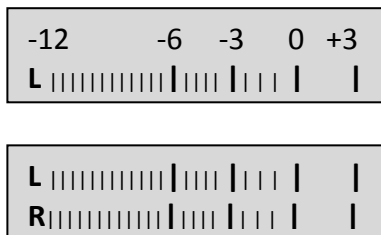
The product name is shown and its firmware version. No parameter can be modified here.

Station ID window:

```
Station ID:
STATION NAME
```

In this window, a user definable label is shown to identify the coder and the site to which the coder is assigned.
The text shown is a label only and will not be transmitted in any RDS block.

Audio levels window :

```
-12        -6   -3   0  +3
L ||||||||||||||||| |||| |
```

```
L ||||||||||||||||| |||| |
R||||||||||||||||| |||| |
```

The input audio level is shown and no parameter can be modified.
Note: this window is present only if the mono or stereo audio card is installed.

Composite level monitor window:

```
Mpx KHz  75.0
||||||||||||||||||||||||||      |
```

In this window, is shown the output level.
The leftmost marker corresponds to a deviation of 60KHz, the center marker corresponds to 75KHz, the rightmost to 90KHz.

 Note: the level shown is not influenced by the setting of the output level trimmer on the rear panel.
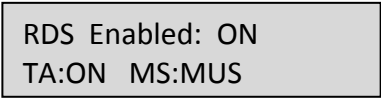*The "MPX OUTPUT" is factory trimmed to 0dBm (2.2Vpp), corresponding to a 75KHz deviation.*

Preemphasis and clipper window:

```
Clip: ON P_Emph: ON
```

The clipper and preemphasis status are shown. Both parameters are editable.

RDS flags window:

```
RDS  Enabled:  ON
TA:ON   MS:MUS
```

The encoder, TA (Traffic Announce) and M/S (Music/Speech) flags status are shown.
All parameter are editable and, furthermore, the ON/OFF status of the encoder and the TA status are also indicated by the front panel leds.
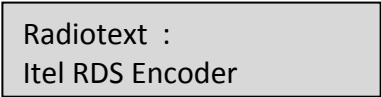
PS, PI and PTY window:

```
PS:MY RADIO PI:55FF
PTY:09:Varied
```

The program station name (PS), its PI code and PTY are shown on this window.
No parameter can be modified.

Radiotext window:

```
Radiotext  :
Itel RDS Encoder
```

It is shown if the encoder is enabled and allowed to send the Radiotext block and, if enabled and active, the current radiotext being transmitted.
If the current radiotext is transmitted as a radiotext-plus string, the first row label will turn into "Radiotext+:".

Note: as the radiotext string is longer than the display size, it will be visualized 20 chars at a time.
The resulting scrolling animation will not be present on the radiotext string being transmitted.

External control port status and enabling:

```
Ext port enab.: OFF
TA: OFF  MS:OFF  SP:MUS
```

In the upper row, the external control port status is shown.
To remotely control the TA and M/S flags with external devices (eg. your radio automation system), it is necessary to enable the external port.

Note: when the external control port is enabled, it will not be possible to control these flags through the Rd-Link software.

The lower row shows the input status in real time and it is useful, during the installation process, to verify the correct connection of the external devices.

Encoder synchronization window:

```
VCXO [|||||||||||||        ]
19K Ref: INT
```

On the encoders provided with external synchronization input, the synchronization window is available and it allows the selection of internal or external reference and the operating status.

During normal operation, both with internal or external reference, the bar should be about half scale.
If the bar reach extreme values, it means that the synchronization signal has a tolerance greater than +/- 2Hz.

Note: If the encoder is used with monophonic signals, the reference must be set on INTERNAL.
With a stereo signal, you must enable the external reference.
*On Hw>3.0 the pilot reference, as a default setting, is extracted from the incoming MPX signal.*
If a separated clock sync is needed, the internal jumper J1 has to be set to "BNC" position and a 19KHz clock signal has to be injected into "PILOT SYNC" connector.

Configuration software:

The configuration software is supplied for setting up all coder features.
The connection is through a serial port 9600 baud 8 databits, no parity, 1 stop bit.

Main window:
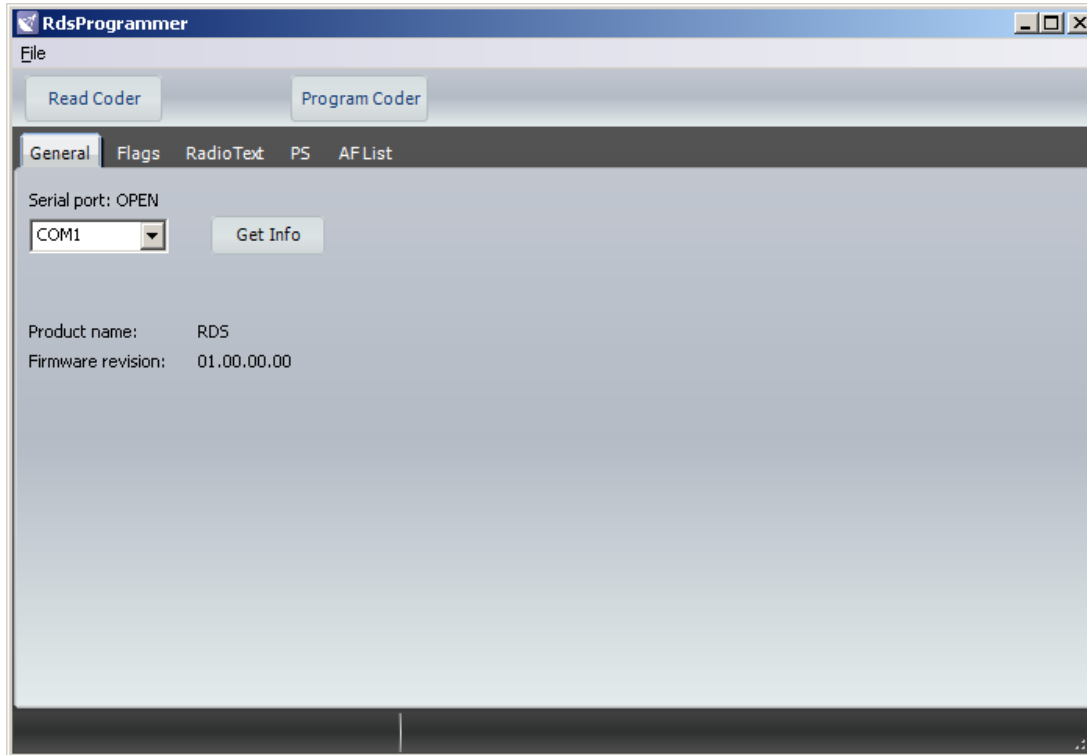
In the main window you can select the COM port used for communication with the RDS encoder
To verify communication, once you the serial port is selected, connect the encoder to the PC and press the button "Get Info".
If the communication is correct, the product type and its firmware version will be shown.
You can then, by pressing the "Read Coder" button, read all the informations stored into the coder.
Anyway, any block (flags, Radiotext, PS or Af List) can be read individually, using the "Read" button into the related tab.
To speed up programming is in fact possible to edit and transfer all blocks or read and write only what you need to change, eg. the alternate frequencies or PSNs, leaving all others unchanged.
The programmed setup can be saved and reloaded from disk using the pull down menu "File".

Encoder Flags:
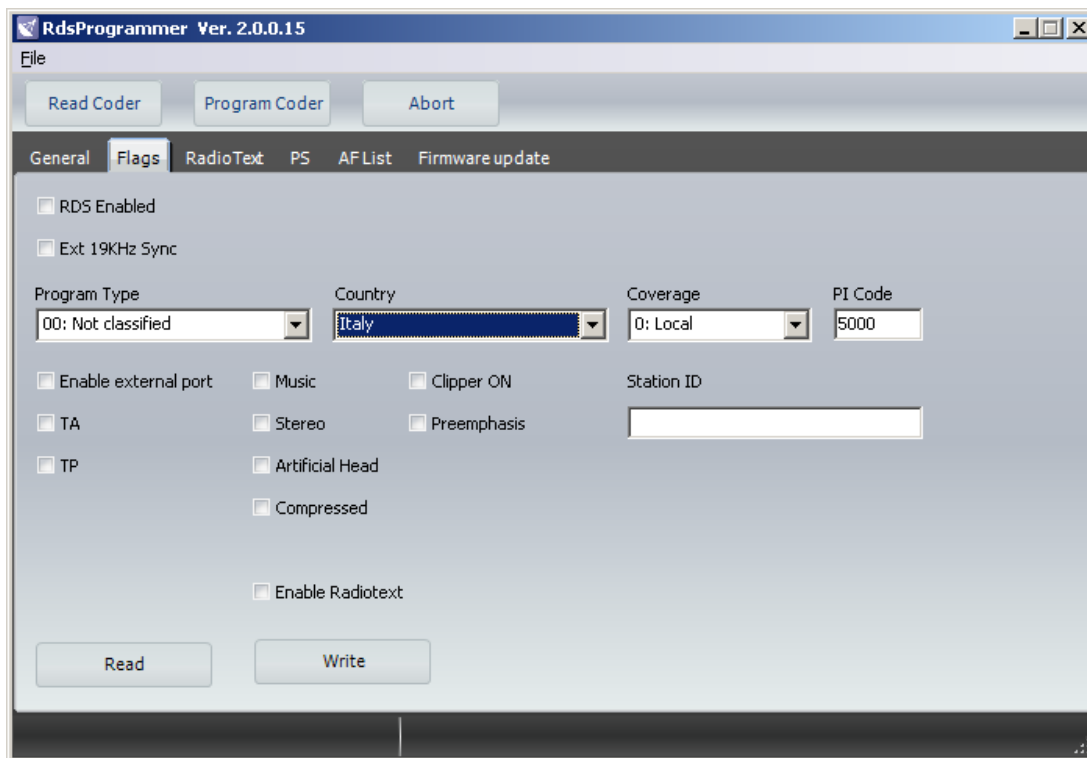
This window contains the configuration parameters of the encoder.

These parameters can be read by pressing the "Read" button, or by pressing the "Read Coder", which will read its entire programming.

If, after changing any parameter, you wish to save the flags only, press the button "Write".

RDS ENABLED:
Enable the RDS coder.

EXT SYNC 19KHz:
enable synchronization with external stereo coder

EXTERNAL PORT ENABLE: Enable external control port for controlling external TA and Music / Speech flags.

Note: When this flag is enabled, you cannot set the flags TA and Music / Speech by the configuration program or the Rd-Link program.

PTY: Program Type
Set the program type.
Many receivers are equipped to select the received stations based on the format preferred by the listener.

PI:Program Identification
Identification code of the station.
The code consists of 4 digits, the first digit indicates the country of origin, the second represents the area of coverage and the last two identify the station into its coverage area.

First digit, the country of origin of the program. You may write it directly into the "PI Code" editbox or select it using the "Country" dropdown list.
A list of some country codes is reported in appendix A.

For the second, according to the coverage area, choose one of the following codes:

0	Local coverage, **the station has only one frequency**
1	International
2	National
3	Supra-regional
4..F	Regional

Note: the coverage code "0" is intended for stations having just one frequency.
If used erroneously, it might lead some receivers to ignore the AF lists.

The two last digits uniquely identify the station into its coverage area and shall be different amongst all other stations transmitting on the same area.

Some examples:

5001: Italian radio station (5)	local coverage	(0),	program code 01
5202: Italian radio station (5)	national coverage	(2),	program code 02
54AF: Italian radio station (5)	regional coverage	(4),	program code AF

Please note that it is particularly important that your PI code has to be unique into the coverage area, on the contrary it will be possible that the receiver will tune in the frequency of the other station having the same PI as yours.

TP: Traffic program
This flag indicates that your station, during normal programming, broadcasts traffic programs.

TA:Traffic Annonunce
Traffic Announce on air.
This flag should be set when traffic related news are being broadcasted.
For this reason, the TA flag can be switched by the external control port.

MUSIC:
This flag indicates if the station main format is music or speech.
Some receivers use this information to apply a different tone equalization or volume according to whether music or speech is being broadcasted.
It is possible to switch this flag externally, using the external control port.

STEREO:
This flag indicates that the program is stereophonic.

ARTIFICIAL HEAD:
This flag indicates that the program was recorded using an artificial head.
This device is a dummy human head with two microphones inserted into the auditory canals, used during the recording process of the performance or live event, to accurately reproduce the original spatiality.

COMPRESSED:
This flag indicates that the program was compressed.

ENABLE RADIOTEXT:
Flag to enable radiotext group (2A) transmission.
If disabled, only 0A groups will be trasmitted.

CLIPPER ON:
If the RDS coder has the audio input card, it will turn the clipping function on to cut out all peaks exceeding +/- 75KHz deviation.

PREEMPHASIS ON:
If the RDS coder has the audio input card, it will turn on the preemphasis.
Ensure that the audio input signal has not been already preemphasized.

STATION ID:
This 16-chars string can be assigned to the coder for its identification.
It could be its destination, the site to which the encoder is assigned, or the name of the radio which owns it.
It will not be shown anywhere else, neither transmitted into any RDS block; it is just a label to identify the coder.

Radiotext strings programming:
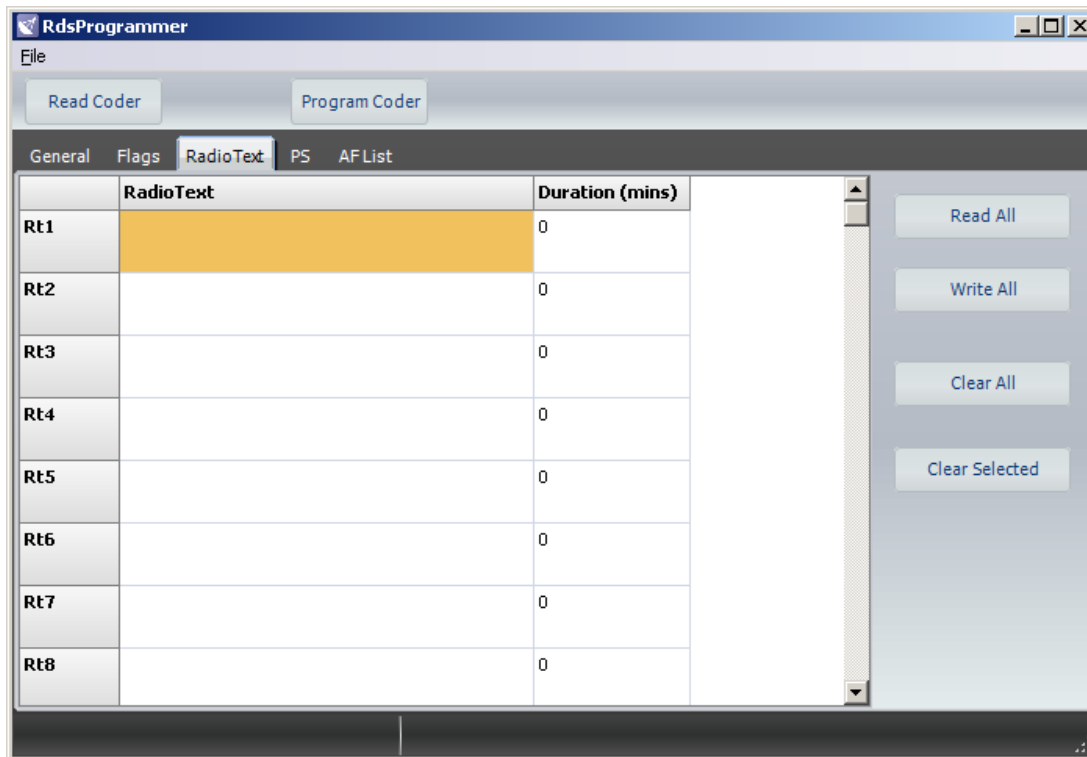
In this window, It is possible to enter the radiotext strings, each of which can be up to 64 characters long.
For each string you can set the display duration time in minutes.
A duration time of 0, disables the corresponding string.

READ ALL:
read all radiotext strings from the encoder.
Warning: all strings on the grid will be overwritten.

WRITE ALL:
transfer all strings on grid to the coder.
Warning: the strings on the coder will be overwritten.

WRITE MODIFIED:
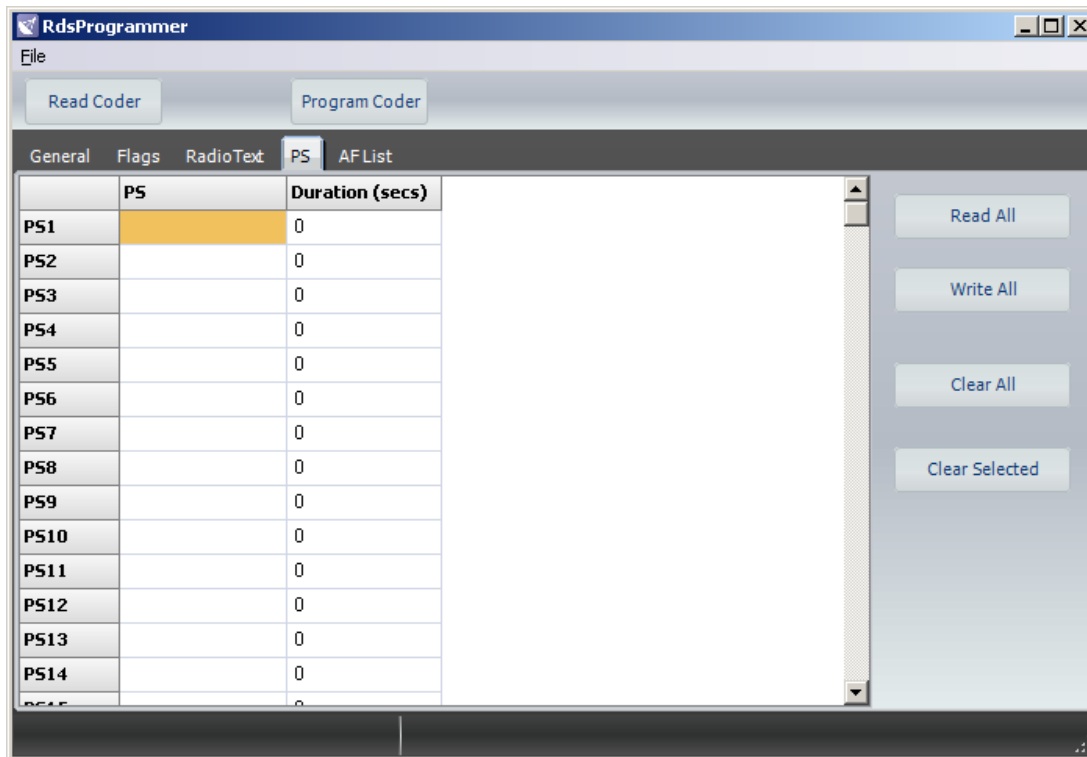transfer only modified Radiotext entries

CLEAR ALL:
clear all strings which are on the grid.

CLEAR SELECTED:
clear all selected strings on the grid.

PS programming

In this window, It is possible to enter the program station names, each of which can be up to 8 characters long.
For each string you can set the display duration time in seconds.
A duration time of 0, disables the corresponding string.

READ ALL:
read all PS strings from the encoder.
Warning: all strings on the grid will be overwritten.

WRITE ALL:
transfer all strings on grid to the coder.
Warning: the strings on the coder will be overwritten.

WRITE MODIFIED:
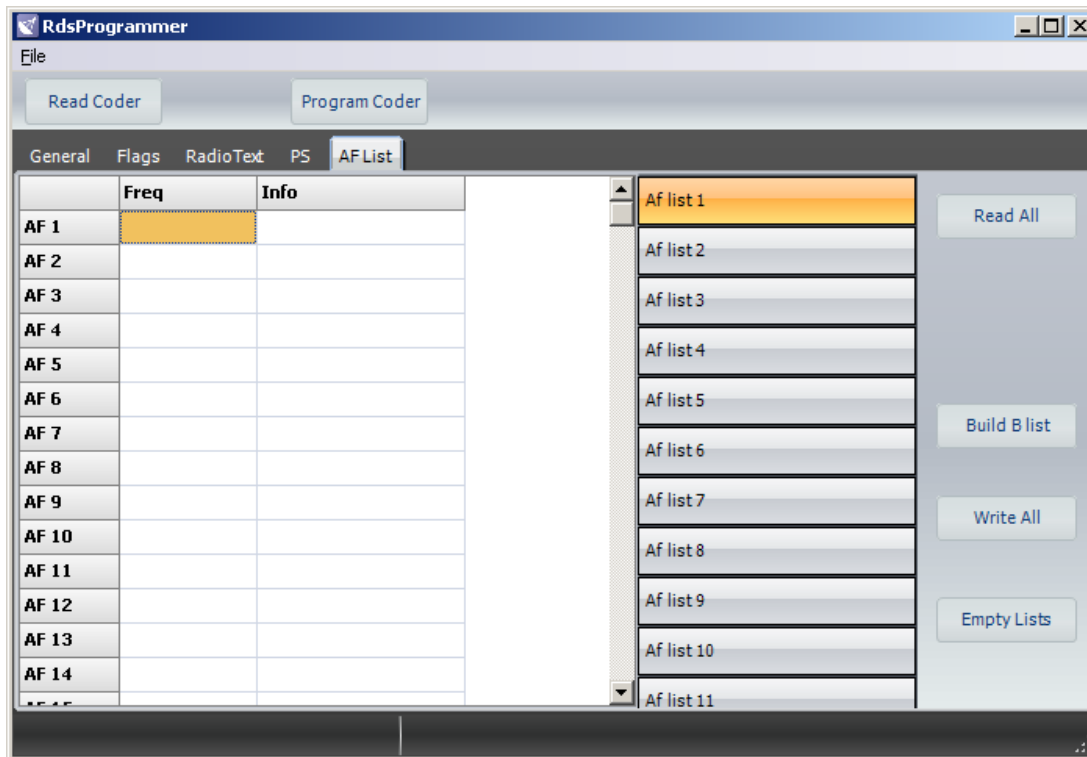transfer only modified entries

CLEAR ALL:
clear all strings which are on the grid.

CLEAR SELECTED:
clear all selected strings on the grid.

Alternative frequencies

The RDS encoder allows method "A" or "B" for transmitting alternative frequencies.
The choice between the two methods depends on the structure of the network and the number of alternative frequencies.
There is no flag that indicates to the receiver if the alternative frequencies are transmitted by method "A" or "B"; the difference between the two methods is just on how the lists are compiled.

Note:
It is not possible to compile different lists using the A and B simultaneously.

"A" method should be used only when the network has a maximum of 25 frequencies and does not differentiate regional programming.

"B" method is used when the alternative frequencies are more than 25 or when, within the same network, there is a program differentiation, such as local news or advertising, only on certain frequencies.

The lists must be compiled starting from the first and should be filled leaving no empty lists in between: lists after any empty list will not be transmitted.

Editing:
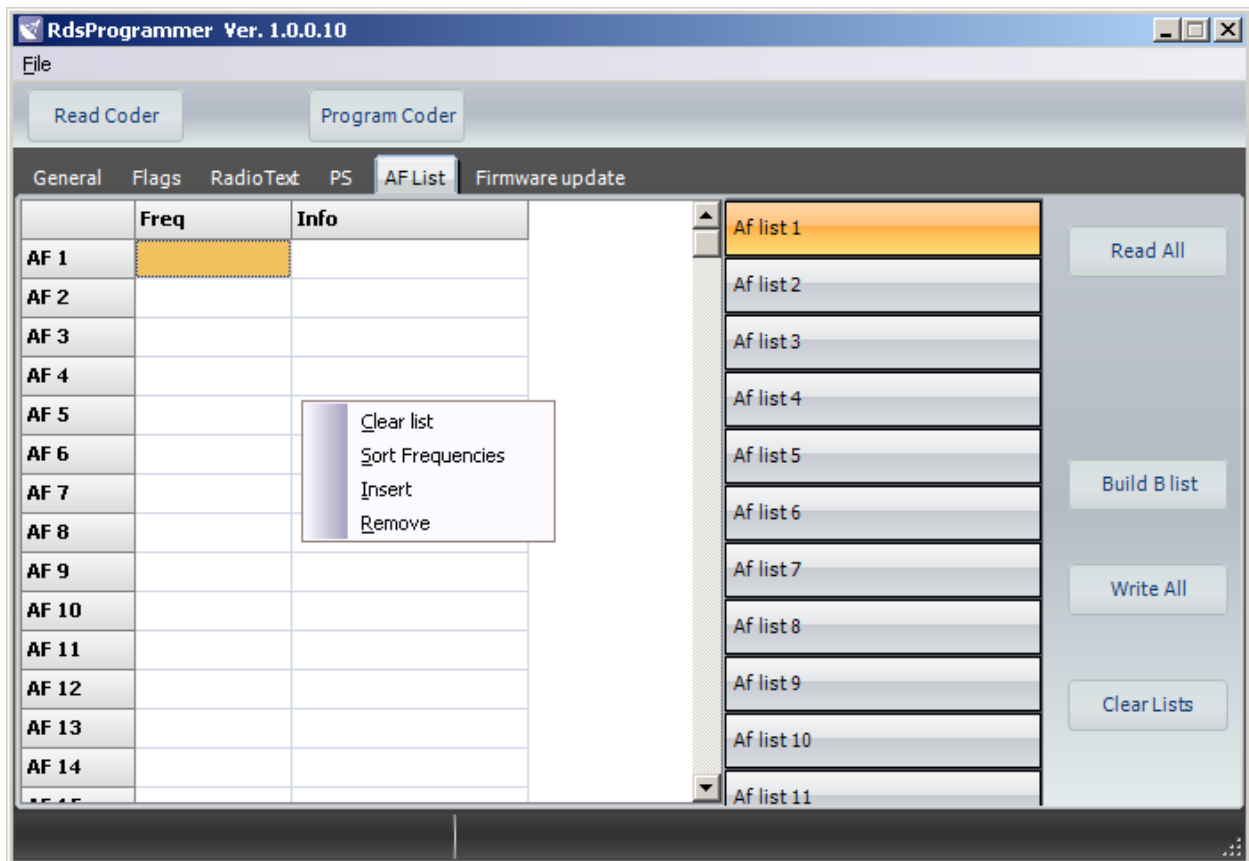
The frequencies must be inserted starting from the first list "Af list 1", cell AF1.

Right-clicking on the list, a popup menu will appear allowing to:

Clear list: the current list will be cleared
Sort frequencies: the frequencies inserted into the current list will be sorted in ascending order
Insert: insert a new frequency at the selected cell position
Remove: remove the frequency at the selected cell position

METHOD "A":

This is the simplest method and it is indicated for all those stations which have a maximum of 25 alternative frequencies and do not broadcast regional programming.

To implement this method, simply insert in *AF List 1* all frequencies of the station in ascending order.
No other lists have to be filled.

Example:
88.1
91.3
104.1
104.5

METHOD "B":

This method is used where the number of alternative frequencies used by a transmitter and its associated repeater stations exceed 25, or where it is required to indicate frequencies which belong to different regions which at times carry different programs.

Each transmitter and associated repeater stations broadcast the same set of different AF lists in sequence. The number of AF lists within a network is in general identical to the number of transmitters and repeater stations in the network so as to provide a unique list for each transmitting station. In this protocol the alternative frequencies for the VHF/FM transmitters are individually addressed by transmitting the tuning frequency paired with one alternative frequency within one block.

Each list starts with the tuning frequency for which the list is valid.

All remaining pairs (up to 12) give the tuning frequency together with a valid AF.

Usually, the tuning/AF pair has to be entered in ascending order if the AF is not a regional variant of the tuning frequency, on the contrary the order has to be reversed.

If the number of AFs of a station is larger than 12, the list must be split into two or more lists. These lists are transmitted directly one after the other, and the receiver must combine the lists again.

If a transmitter frequency is used more than once within a network the respective AF lists are transmitted separately. In order to indicate that these lists with the same tuning frequency belong to different stations, the lists must be separated by AF lists of other stations.

To simplify the programming of a B list, put into the first line AF1 the main tuning frequency, then enter on the other lines (AF2 to AF13) a maximum of 12 alternative frequencies, then press the button "Build B list."
If you, in future, wish to add some new frequencies to the list, simply enter them at the bottom and press the button "Build B list."
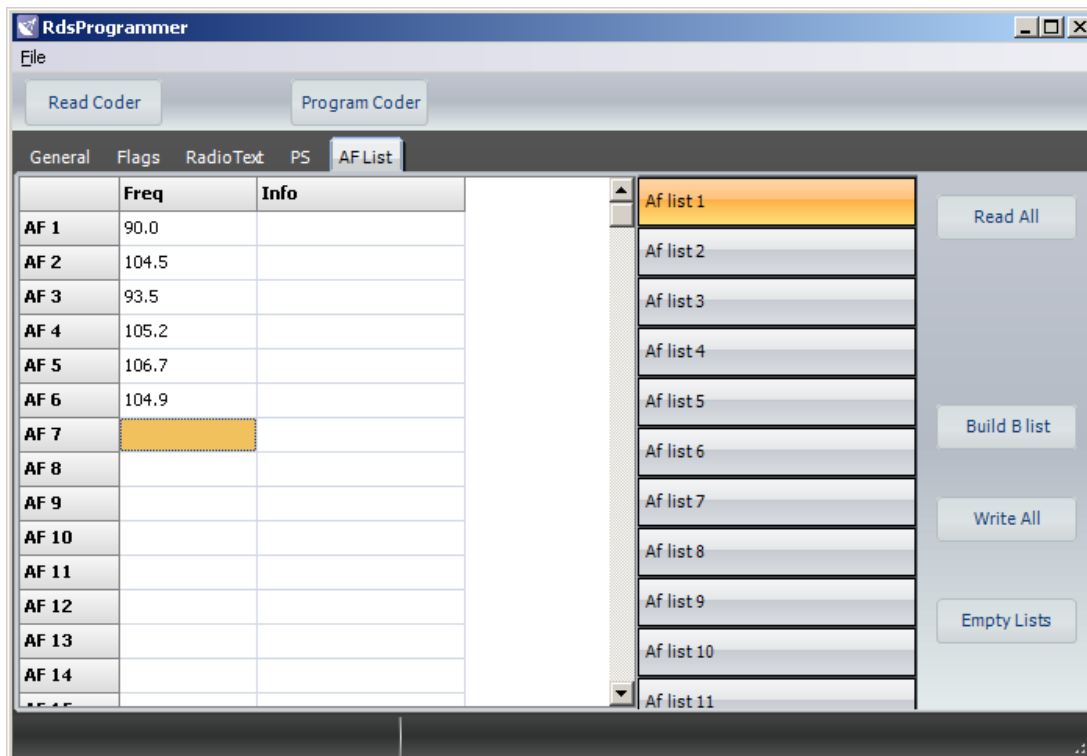
In the above example, all alternative frequencies of the main tuning frequency 90MHz are entered.
Pressing the "Build B list" button, you get the list compiled using method "B".
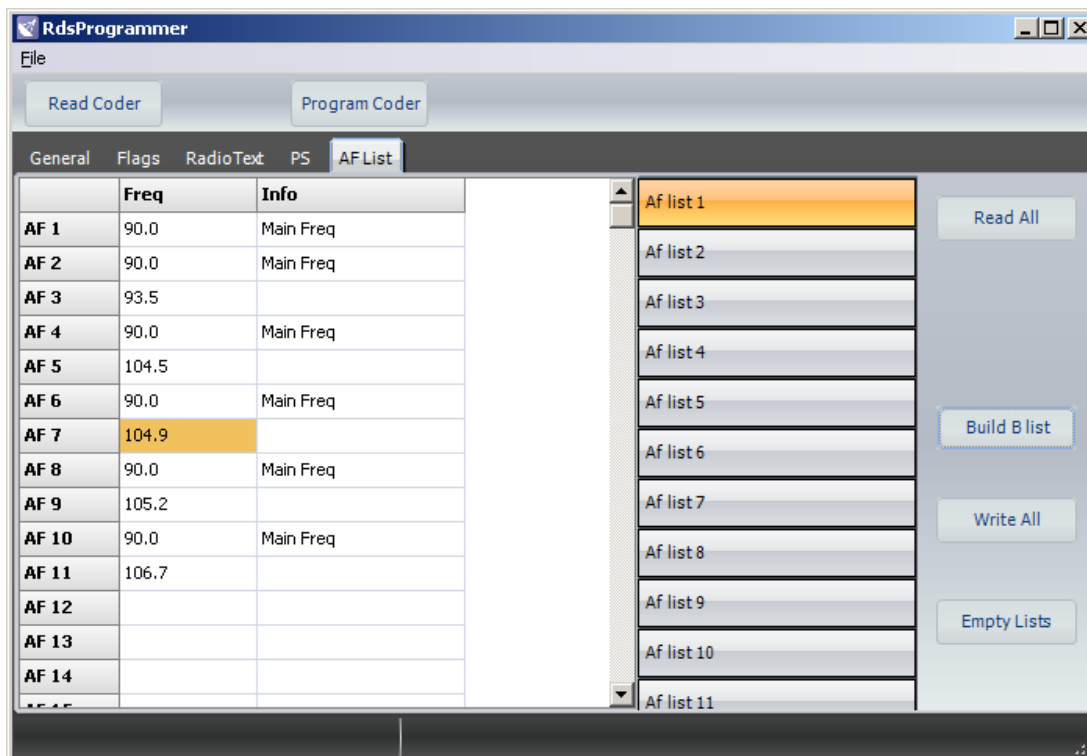
Note: the list is compiled assuming all AFs are not regional variants of the tuning frequency. If there are one or more regional variants in the list, once compiled, they have to be edited manually.

Appendix A

Country codes for the European Broadcasting Area
(CENELEC EN 50067 Annex D)

Country codes for the African Broadcasting Area
(CENELEC EN 50067-1998, Annex N)

COUNTRY/AREA	ISO CODE	SYMBOL FOR PI
Ascension Island		A
Cabinda		4
Angola	AO	6
Algeria	DZ	2
Burundi	BI	9
Benin	BJ	E
Burkina Faso	BF	B
Botswana	BW	B
Cameroon	CM	I
Canary Islands	ES	E
Central African Republic	CF	2
Chad	TD	9
Congo	CG	C
Comoros	KM	C
Cape Verde	CV	6
Cote d'Ivoire	CI	C
Democratic Republic of Congo	ZR	B
Djibouti	DJ	3
Egypt	E.G.	F
Ethiopia	ET	E
Gabon		8
Ghana	GH	3
Gambia	GM	8
Guinea-Bissau	GW	A
Equatorial Guinea	GQ	7
Republic of Guinea	GN	9
Kenya	KE	6
Liberia	LR	2
Libya	LY	D
Lesotho	LS	6
Maurituis	MU	A
Madagascar	MG	4
Mali	ML	5
Mozambique	MZ	3
Morocco	MA	I
Mauritania	MR	4
Malawi	MW	F
Niger	NE	8
Nigeria	NG	F
Namibia	NA	I
Rwanda	RW	5
Sao Tome & Principe	ST	5
Sechelles	SC	8
Senegal	SN	7
Sierra Leone	SL	I
Somalia	SO	7
South Africa	ZA	A
Sudan	SD	C
Swaziland	SZ	5
Togo	TG	D
Tunisia	TN	7
Tanzania	TZ	D
Uganda	UG	4
Western Sahara	EH	3
Zambia	ZM	E
Zanzibar		D
Zimbabwe	ZW	2