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		§4.3	RF Configuration Menu v3.1	
		§4.4	Modifications in the Figure 5 : Organization of the menu	Modifications of the central frequencies of the channels
		§4.4.1.4	Pseudo-random sequence	
		§4.4.4	Modifications of the central frequencies values	Modifications of the RF Configuration Menu
		§5	Modifications in the Figure 6 : Configuration of the menu	

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1. PRODUCT MODIFICATIONS

- Initial version described in the *STS Train Radio – User Manual– FCC Test Configuration DIT/NYL/26.0125.02/SA/SA – 644088* document.
- Version 3.1 :
  - The central frequencies of the channels have been modified :

    From : 2408, 2416, 2424, 2432, 2440, 2448, 2456, 2464, 2472 MHz.

    To : 2408, 2416, 2424, 2432, 2441, 2450, 2458, 2466, 2474 MHz.

  - The power levels have been modifed :

    From : P0=27.5 dBm ; P1=17.5 dBm ; P2=7.5 dBm

    To : P0=27.5 dBm ; P1=23.5 dBm ; P2=13.5 dBm

2. CONFIGURATION

The test configuration is :

- one WRE, not redundant (unlike NYCT config). The CIDO board (FO Wayside Radio Network) is not enclosed.
- one CRE, not redundant (as NYCT config). The CIDRE board (Train Radio Network) is not enclosed.

2.1. WRE – Wayside Radio Equipment

2.1.1. WRE characteristics

The WRE is a cardfile which complies with the IEC 60297-3 standard and has the following characteristics :

- Height : 266.7 mm = 10.5"
- Width : 238.8mm = 9.4"
- Depth : 236mm=9.3"
- Weight : <15Kg/30Lbs

2.1.2. Power supply of the WRE

- Nominal : 24 VDC
- Range : 16 VDC to 36 VDC
- Maximum Power : 80 W

2.1.3. RF outputs of the WRE

- Two outputs respectively identified as RFA1 and RFA2 for the WRU-A (WRU-B is not used).
- 50 Ohm coaxial cable terminated by a N male type plug.

2.1.4. View of the WRE – Test configuration

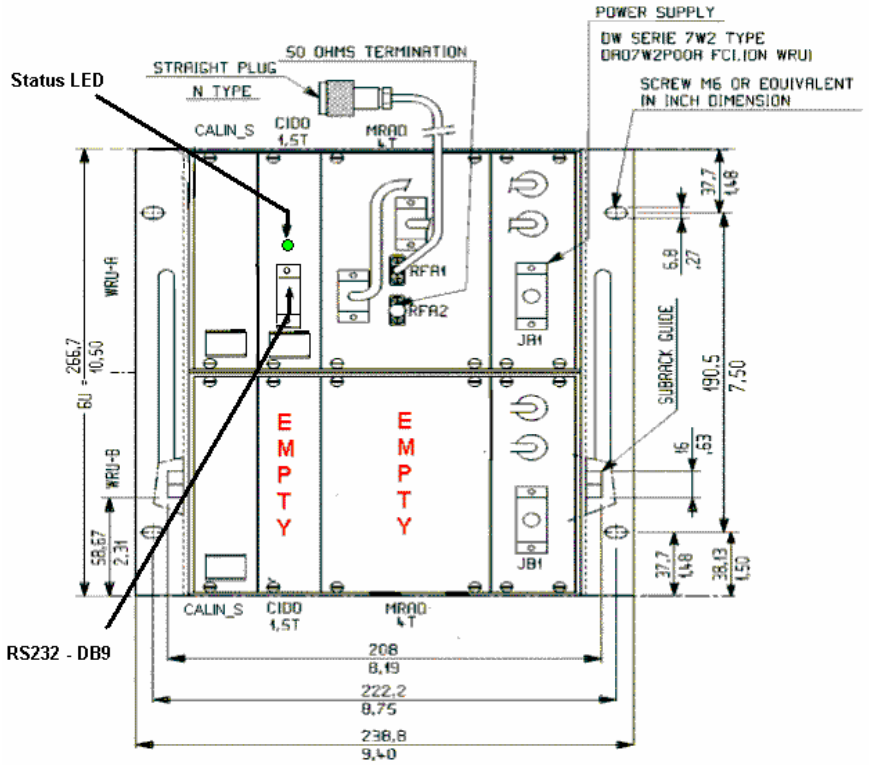

Figure 1 : The WRE

2.2. CRE – Carborne Radio Equipment

2.2.1. CRE characteristics

The CRE is a cardfile which complies with the IEC 60297-3 standard and has the following characteristics:

- Height : 133.35mm = 5.25"
- Width : 482.6mm=19"
- Depth : 268mm=10.55"
- Weight : <10Kg/20Lbs

2.2.2. Power supply of the CRE

- Nominal : 37.5 VDC
- Range : 24 VDC to 44 VDC
- Maximum Power : 80 W

2.2.3. RF outputs of the CRE

- Two outputs respectively identified as RFA1 and RFA2 for the CRU-A (CRU-B is not used).
- 50 Ohm coaxial cable terminated by a N male type plug.

2.2.4. View of the CRE

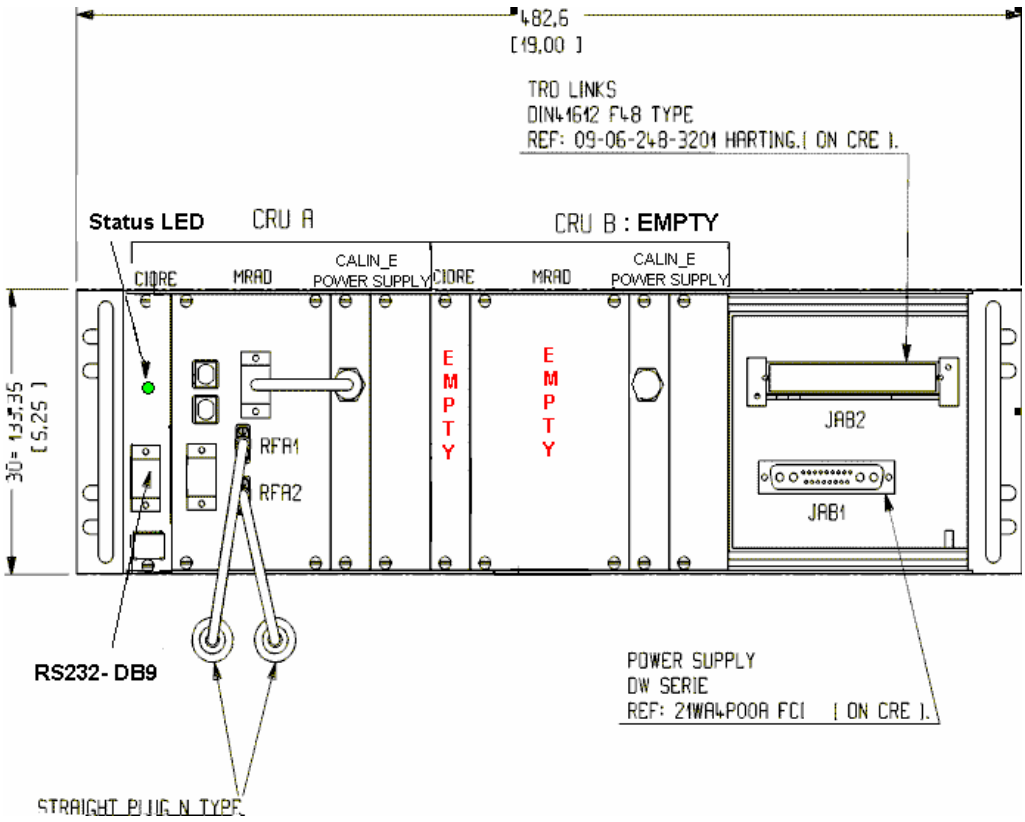

Figure 2 : The CRE

3. INSTRUCTIONS FOR THE MRAD

3.1. SMA connectors on the RF outputs

The SMA connectors should not be removed from the MRAD.

3.2. Before Power On

Before Power On, make sure each RF output is connected to an antenna (via the 50 Ohm coaxial cable terminated by a N male type plug) or to a 50 Ω termination.

3.3. Power on

LED status after less than 15 s at power on	*Meaning*	*Action*
Medium intensity	Tx permanent mode (4.125ms/4.125ms)	None
Flashing, high intensity, 5s on / 5s off	Tx permanent mode (5s/5s)	None
Other	Possibly RF parameters undefined	Configure with the terminal menu – If no change, power off, and power on again.

3.4. Disconnecting coaxial cables or antennas

Before disconnecting any 50 Ω termination, coaxial cable or antenna, the MRAD should be powered off.

4. INSTRUCTIONS FOR USE

4.1. Setting the communication parameters

The communication is established with a RS232 link between the computer and the equipment via a terminal. The RS232 is accessed via the DB9 socket [Figure 1; Figure 2] on the front panel.

When the terminal is opened on the computer, its parameters have to be defined in the menu Parameters/communications as following :

- Ports = COM1 or COM 2 (depends on which one was put the RS connection)
- Transmission speed = 9600
- Bits of stop = 1
- Stream control = none
- Data bits = 8
- Parity = none

4.1.1. Manual setting

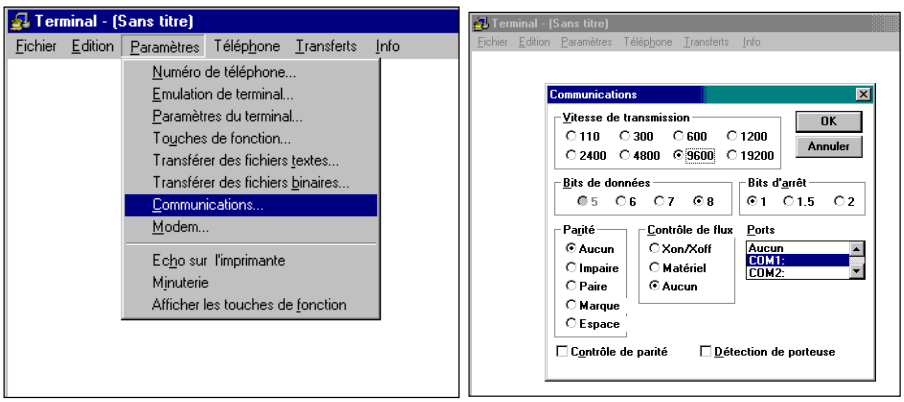

Figure 3 : Setting the communication parameters

4.2. Automatic setting

The parameters can be automatically defined by opening the file *config.trm* (provided on a floppy on the example below).

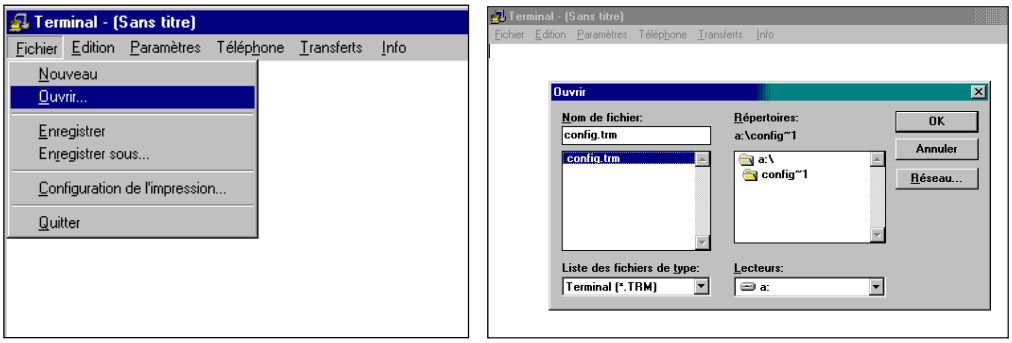

Figure 4 : Setting the communication parameters with a *.trm file

4.3. Listing the menu

Type the touch “enter” to list the menu. It looks as following :

```
*****************************************
*****************************************
*          RF Configuration Menu v3.1      *
*****************************************
*****************************************

 0 : Load FPGA code
 1 : Download new FPGA code
 2 : Program the Tx mode
 3 : Check Mode / Parameters

 please choose:
```

4.4. Available functions in the menu

The menu is organized as following :

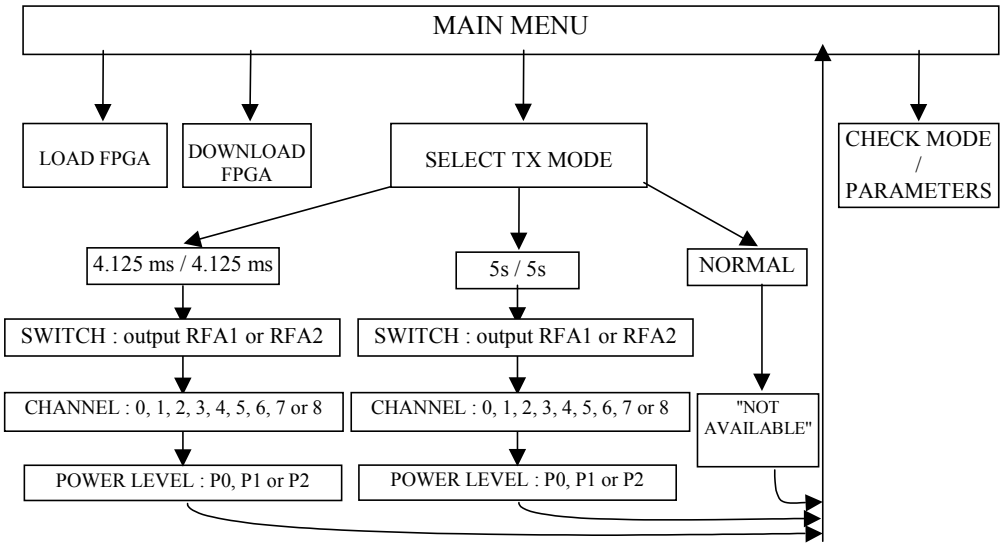

Figure 5 : Organization of the menu

4.4.1. Tx Mode

The available Tx modes are :

- 4.125ms Tx / 4.125ms Rx,
- 5s Tx /5s Rx
- or normal operation

4.4.1.1. Permanent Mode 4.125ms/4.125ms

The MRAD emits during 4.125 ms and stops emitting during the following 4.125ms and so on… Actually, its emission is active during : $4.219ms - 700\mu s + 80\mu s =$ ***3.599 ms*** and inactive during : $3.904ms + 700\mu s - 80\mu s =$ ***4.524 ms***.

The status LED [Figure 1; Figure 2] is always on with medium intensity : in fact, it flashes quickly (on during 4.125ms Tx / off during 4.125ms Rx).

4.4.1.2. Permanent Mode 5s/5s

The MRAD emits during 5 s and stops emitting during the following 5 s and so on…

The status LED [Figure 1 ; Figure 2] is on with high intensity during 5s Tx and off during 5s Rx…

4.4.1.3. Mode normal

In normal operation, the MRAD follows a normal radio cycle, its behavior being either a wayside or carborne equipment. However, this mode is not available for the tests.

4.4.1.4. Configuration of the messages – permanent Tx mode

The messages which are emitted are a pseudo-random sequence.

4.4.1.5. Configuration of the spread sequence

There are four spread sequences :

- Sequence 0 (boot frame sequence) :

1100-1110-0111-1011-0011-1011-0110-0100-1100-0101-1111-1011-1010-0011-0101-0000-0100-0001-0101-0110-1100-1101-0100-0000-0100-1100-1000-1110-0001-1110-0011-111

- Sequence 1 :

1100-0111-0110-1011-1110-1100-0110-1101-1111-1000-1110-0100-0111-0000-1000-0100-1011-1101-1001-1010-0011-0100-1011-0110-1010-1010-0000-1110-0100-0011-0100-010

- Sequence 2 :

1101-1000-0010-1100-0111-1010-1110-0010-1001-1010-0101-1101-0011-1110-1100-0001-1100-1011-0111-0100-1001-0000-1101-0001-0000-0100-0111-1101-1011-1001-0011-110

- Sequence 3 :

1001-0001-0001-1100-0100-1110-1111-0111-0100-1010-1111-1111-0100-1000-1100-1010-0000-1110-1111-0001-0010-1001-0110-1001-0010-0111-1100-1000-1000-0111-1110-001

The sequence used in permanent Tx mode (both 4.125ms/4.125ms and 5s/5s) is the sequence 0 (boot frame sequence).

4.4.2. RF Switch

The MRAD has two RF outputs RFA1 and RFA2 that may be selected thanks to this RF switch.

4.4.3. Power levels

The available power levels are :

- P0 : 27.5 dBm,
- P1: 23.5 dBm,
- or P2 : 13.5 dBm

4.4.4. Frequencies

The available frequencies channels are : 2408 MHz, 2416 MHz, 2424 MHz, 2432 MHz, 2441 MHz, 2450 MHz, 2458 MHz, 2466 MHz, 2474 MHz.

5. CONFIGURATION OF THE MENU (VERSION 3.1)

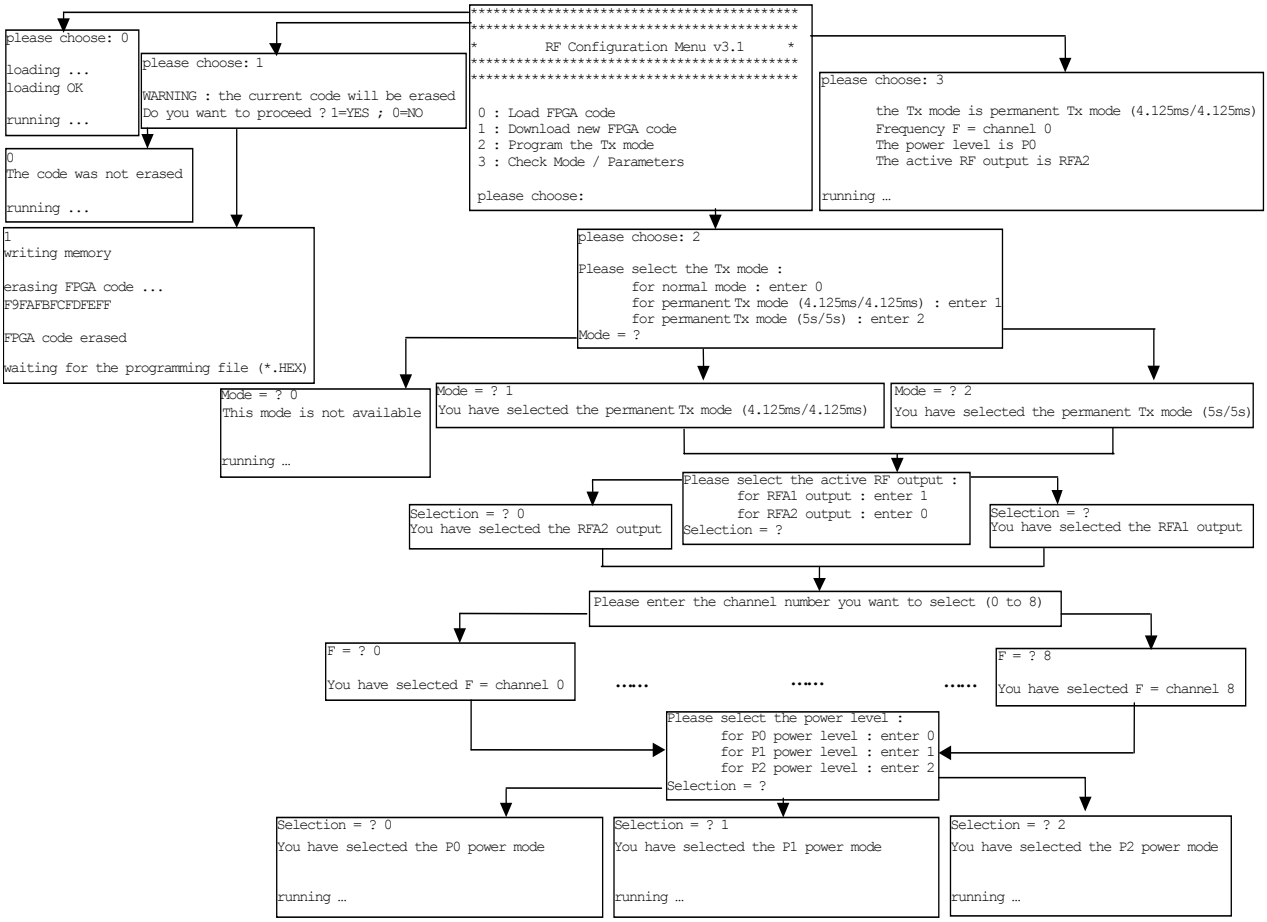

Figure 6 : Configuration of the menu

Notes :

- When powered on, the MRAD begins to emit with the previous parameters. If no parameter was ever entered, there is a warning : “the Tx mode is unknown” and all parameters (Tx mode, RF output, frequency, power level) must be defined.
- During the RF configuration, the MRAD continues to emit.
- Each new parameter is applied immediately after input.

6. DOWNLOADING A NEW FPGA CODE

To download a new FPGA code, the menu 1 (“Download a new FPGA code”) has to be chosen and confirmed. Then, the FPGA code is erased and the menu waits for a programming file *.hex.

```
1
writing memory

erasing FPGA code ...
F9FAFBFCFDFEFF

FPGA code erased

waiting for the programming file (*.HEX)
```

The programming file is in : A:*Programming_FPGA\ckmr_fcc.hex*. It has to be sent as following:

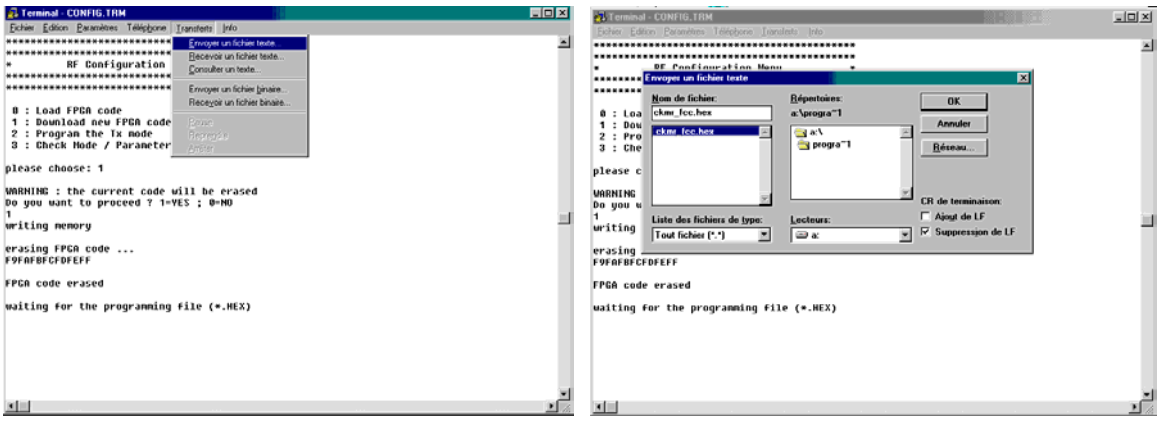

Figure 7 : Downloading a new FPGA code

Note : The programming lasts about 5 minutes.

7. GLOSSARY

BRAD	Radio frequency unit
CALIN_E	Carborne power supply
CALIN_S	Wayside power supply
CIDO	WRD controller
CIDRE	Carborne Radio Distribution Unit
CKMR	Radio controller board
CRE	Carborne Radio Equipment
CRU	Carborne Radio Unit
MRAD	Radio module
RF	Radio Frequency
Rx	Reception
Tx	Transmission
WRE	Wayside radio equipment
WRU	Wayside Radio Unit

END OF DOCUMENT