Patrick Lindecker (F6CTE) the 05th of January 2006 (mail: f6cte@free.fr )
Version 0

**In this document, I will describe the digital modes coding/decoding program "Multipsk", intended to radio-amateurs and to radio-listeners . I will also speak of the program "Clock" intended to decode frames from transmitters sending date and time in a coded form.**
**Both programs can be downloaded from the following WEB site: http://f6cte.free.fr**

# Warning

Multipsk et Clock evolving permanently, the here after presented snapshots can be different from the ones of the last version.
This presentation leans on the 3.12 version of Multipsk and on the 1.5.2 version of Clock.

This is not the official user handbook.

Status of Multipsk: it is basically a freeware. However, a certain number of functions are submitted to a license...see the chapter " Limitations to the use of the freeware version - Purchase conditions of the non-limited version" in the handbook, for details.

Status of Clock: it is a freeware for the decoding part but the automatic synchronization of the PC and the alarm programmed actions are submitted to a license.

# Help in the programs et technical support

**Help in the programs**
The handbook is directly available from the programs.

Moreover, a contextual help is often proposed by clicking on the right button of the mouse.

Help or function definition hints are often proposed at the buttons level (by positioning the mouse cursor just over the button).

**Technical support**:
It exists a Yahoo group (in English language) for Multipsk and Clock users: Multipsk@yahoogroups.com. You can expose encountered problems or organize skeds...If necessary, contact the group arbitrator Terry at the address: info@hamsoft.co.uk

# Interfaces to realize to use both programs

Refer to the paper in Appendix C.

# Programs installation and start

**Installation**

The "MULTIPSK.ZIP" file must be unzipped in a provisional directory (for example: C:TEST).
Start the INSTAL. EXE file. After having given the name of the target directory, it will be proposed:

- either the program update (to pass from the x.y or x.y.z version to the x.y+1 or x.y.z+1 version),
- or the complete installation, in all the other cases.

Please, read the file _READ_ME.TXT for other details about installation.
**Attention**: do not start the installation from the Windows "desktop".

**Start**

To start Multipsk or Clock, click on the Windows button "Start", then on "Programs". Afterwards, click on "Multipsk & Clock" then choose either "Multipsk" or "Clock".
Multipsk and Clock works only under Windows (from W95 to XP). The PC must be equipped with a sound card. The majority of the functions are available with a PC 66 MHz, but the advised minimum configuration is a PC 166 MHz with a 800x600 graphic format. A PC at 1000 MHz or more with a 1024x768 graphic format is ideal to have all modes available and a comfortable interface.

# Introduction

The goal of this presentation is not a description of the coded and decoded digital modes in Multipsk (description available in the "RX/TX modes selection and their descriptions" handbook chapter) but to describe the main functions of the programs (without being an exhaustive list of all functions). The description of each function is, in general, accompagnied by a snapshot (done in graphic format 1024x768).

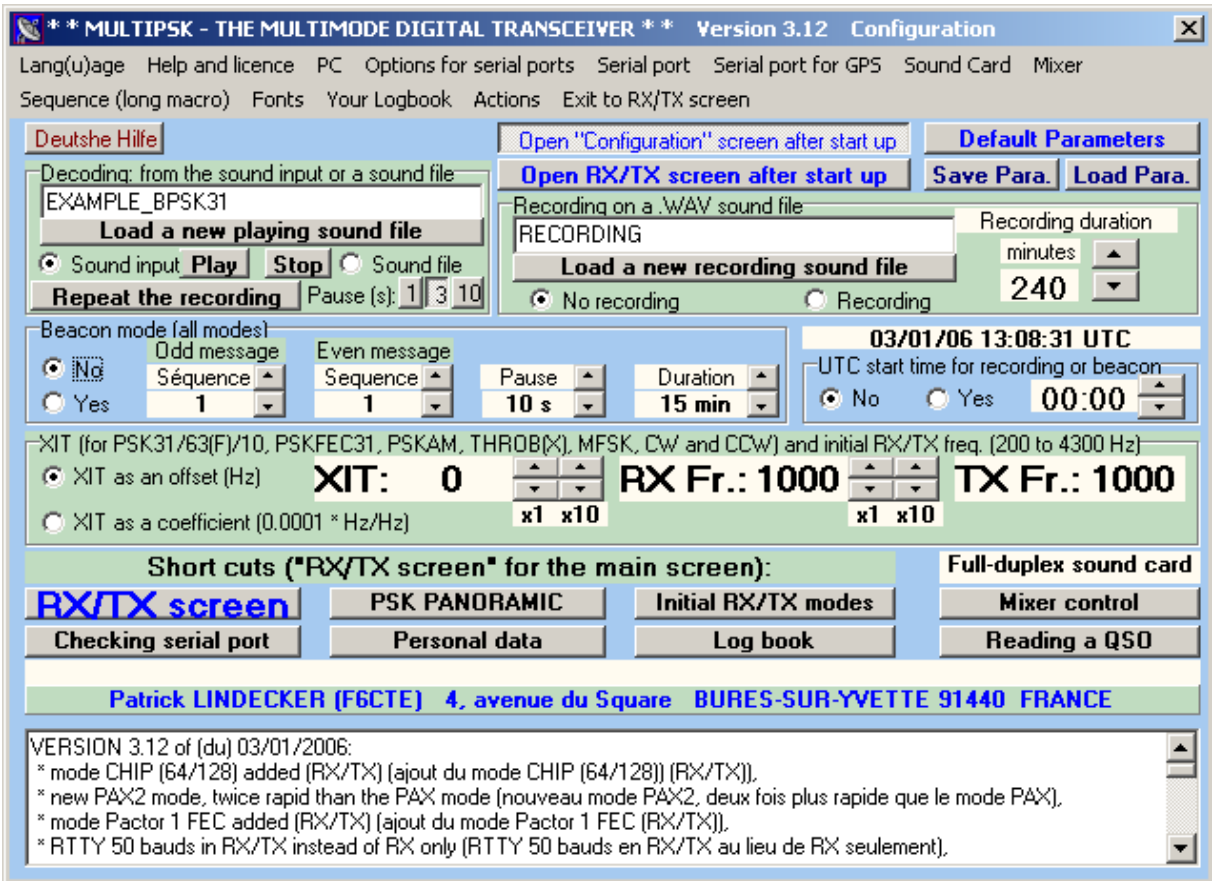
# Multipsk presentation

**Configuration screen** (chapter "Access to the configuration screen" of the handbook)

At the first start of Multipsk, the screen configuration opens.
This screen allows the user to precise the main user options (language, PC power, serial ports, sound card, mixer, characters fonts, personal data, log book...).
It can be defined different "sequences" (long "macros") and started up (by the "Actions" menu or by the buttons) different actions, the main being the coding/decoding ("RX/TX") screen start up.

In licensed copies, it can be stored the received sound in a WAV file, then decode it, listen to it or repeat it (see the chapter "Playing and recording sound files (.WAV)" of the handbook).

In this screen, it is set up the parameters for the beacon (duration, time interval, message(s)), the initial RX and TX frequencies and the possible offset between RX and TX frequencies.
It will be also found on this screen the modifications introduced by the new version.
This screen can be by-passed, one will pass directly to the RX/TX screen.



**RX/TX** screen (chapter "Introduction and description of the windows and commands - Use in reception - Use in transmission" of the handbook)

It is the main screen of the software. A big part of the commands are directly accessible by buttons, rather than by menus: it is the initial choice of the author who prefers to have a maximum of commands accessible in a minimum of "clicks", without investigation. This involves a big density of commands, which can seem curious or unsual at the first glance.

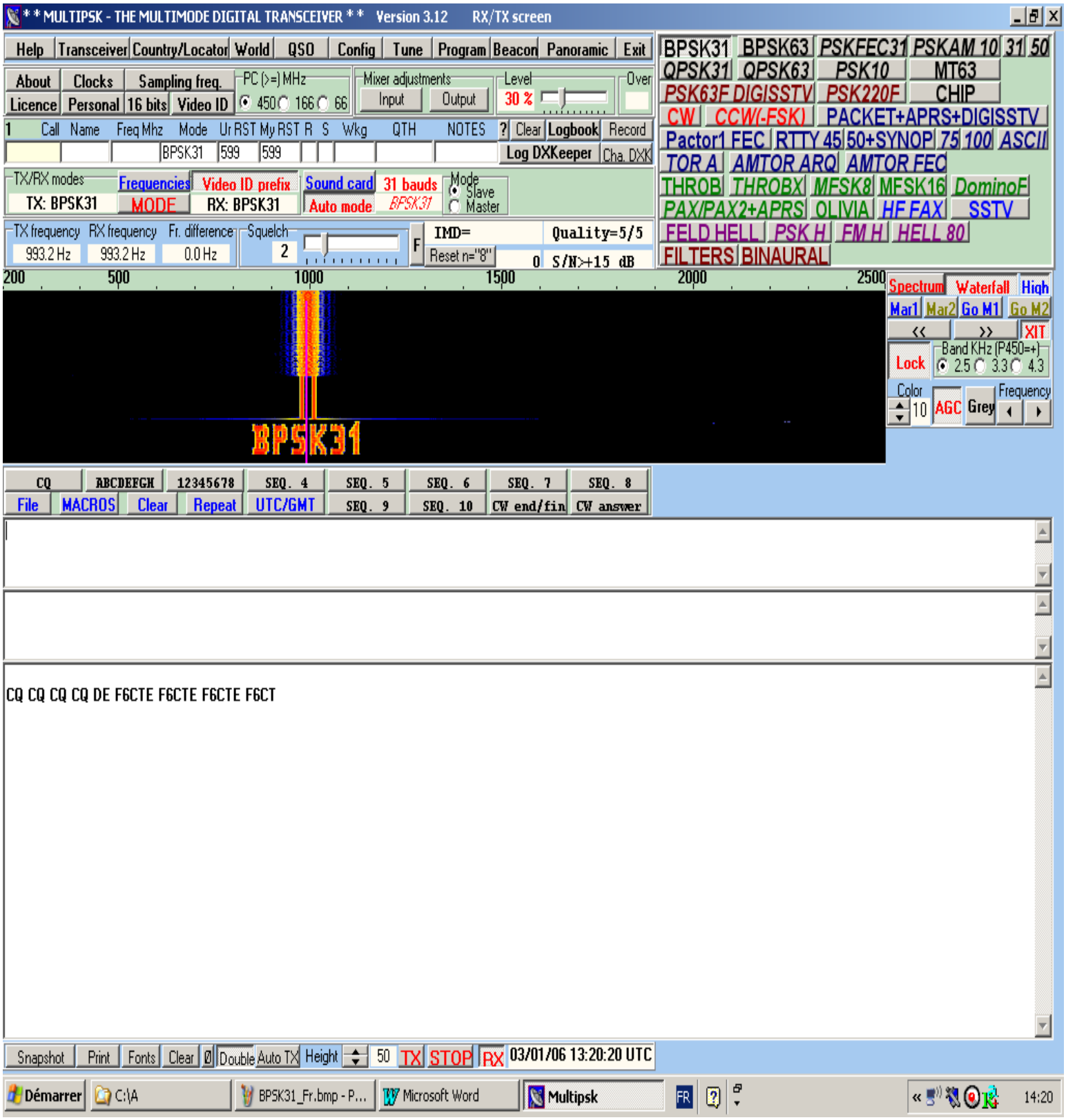
The main function is the decoding which, in general, is done on the following way:

- after having adjusted the input level, the signal appears on the "waterfall",
- the user selects the mode corresponding to the transmission (RTTY 45, BPSK31...),
- then he clicks on the signal. The text must appear almost at once.

Note : it is recommended to determine the sound card sampling frequencies (see « Sampling freq. window » here after) before to continue using this software.

It is also possible to transmit by clicking on the button "TX". The typed text will be coded in the selected mode, then it will be transmitted to the transceiver. The output level must be adjusted.

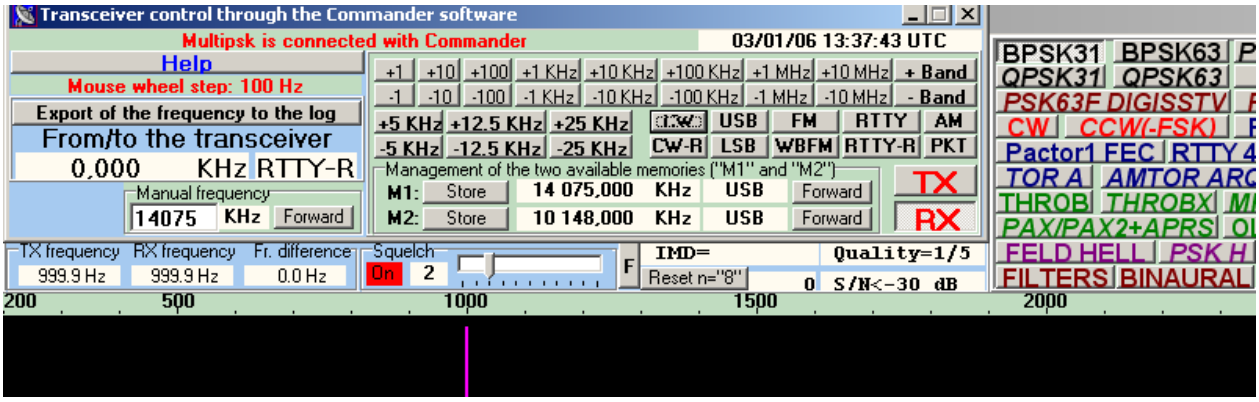
Here after it will be found a snapshot done in BPSK31.



**Transceiver** window (chapter "Transceiver control through the Commander software" of the handbook)

The operator has the possibility to control his transceiver from his PC using the Commander (DXKeeper) software as an interface between Multipsk and the transceiver.
The global control may be summarized according to the following diagram:

```
MULTIPSK (DDE TX)-->(DDE RX) COMMANDER-->COM-->"CAT SYSTEM"-->TRANSCEIVER
MULTIPSK (DDE RX)<--(DDE TX) COMMANDER<--COM<--"CAT SYSTEM"<--TRANSCEIVER
```

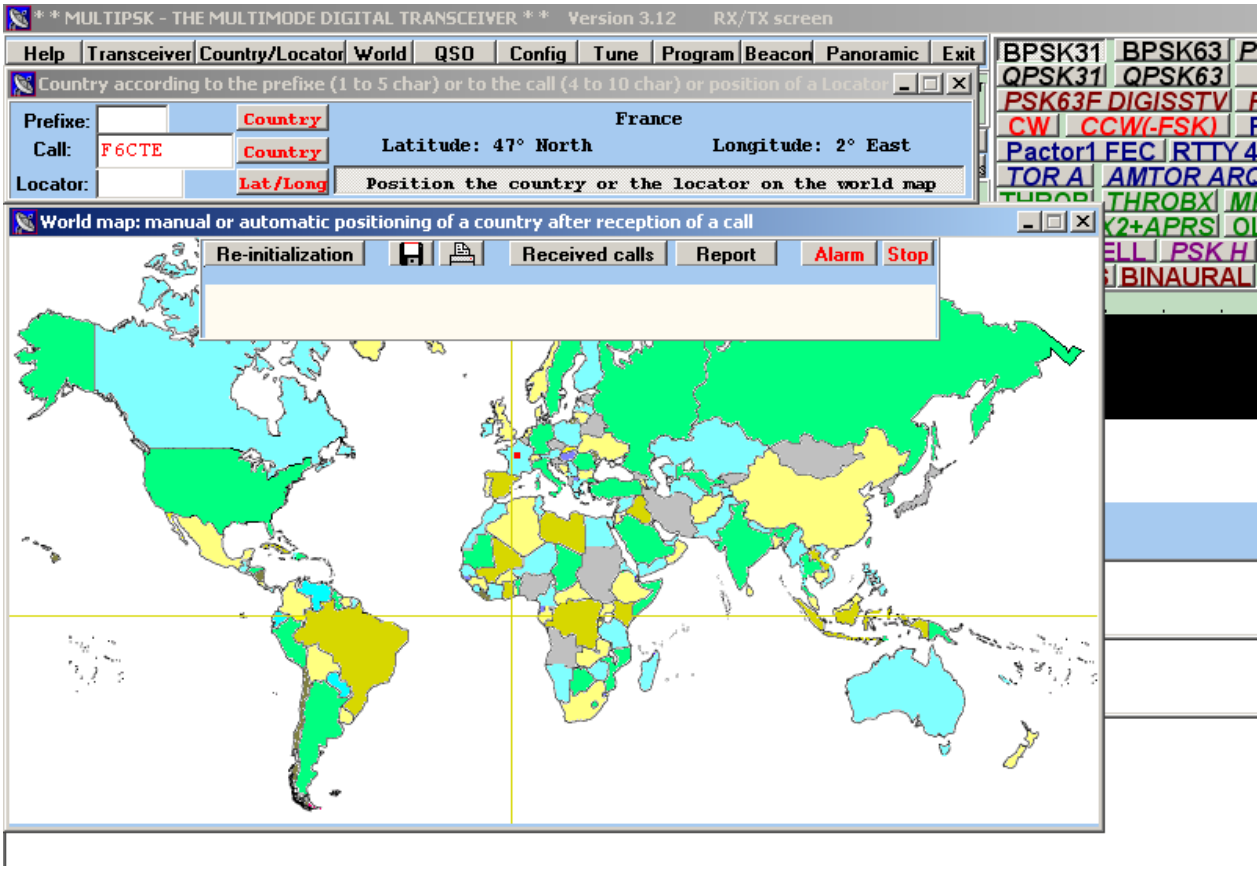


**Country/Locator** and **World** windows (chapter "Countries, world map, Locator, automatic reception and location" of the handbook)

It is possible to:

- search and position a country on the world map, through a prefix or a callsign,
- position a Ham by his Locator.

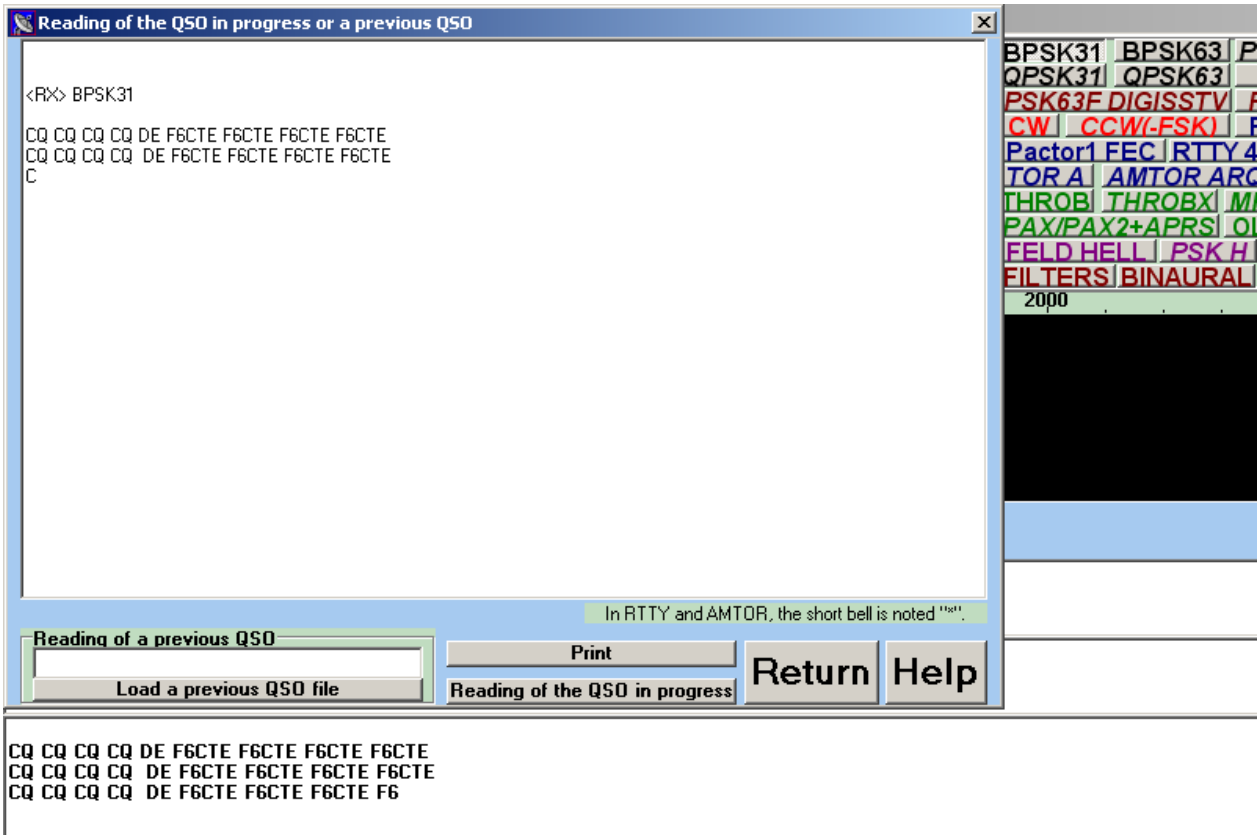
It is proposed to automatically receive and position received callsigns, from the RX/TX screen or from the panoramic screen.



**QSO** window (chapter "Reading a QSO in progress or a previous QSO" of the handbook)

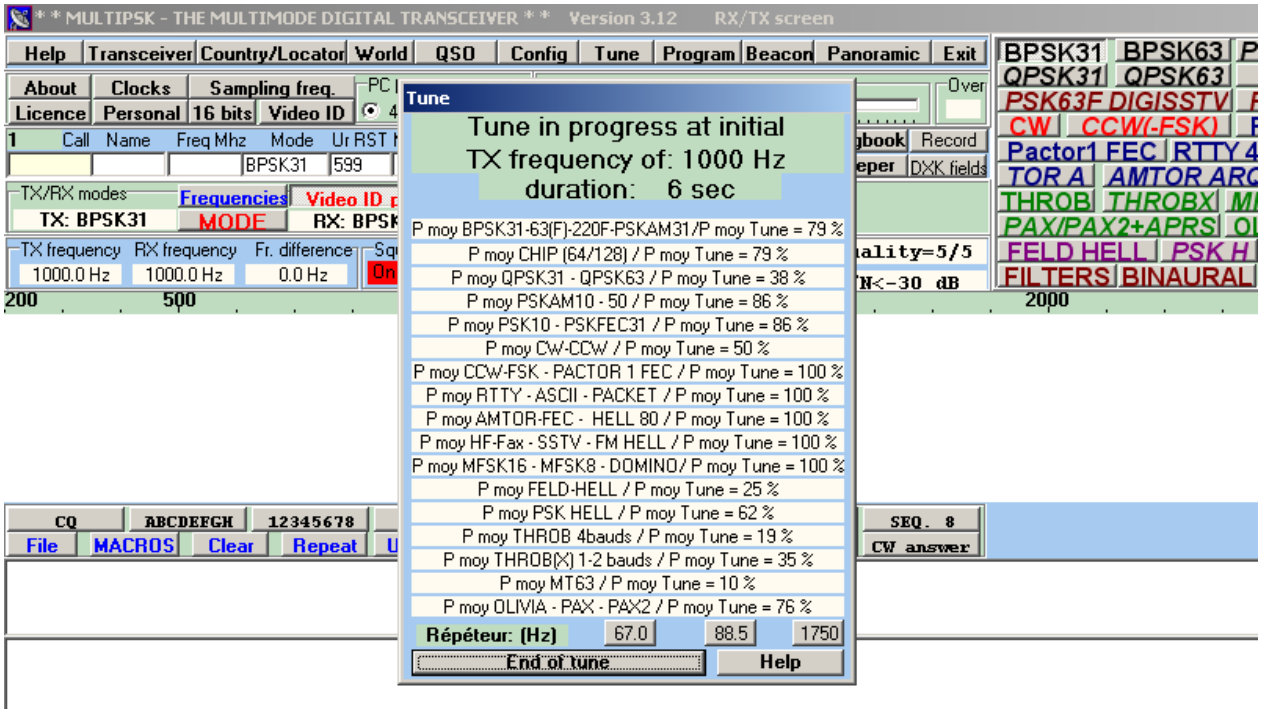
It is possible:

- to read a QSO in progress,
- or, thanks to the button "Load a previous QSO file", any previous QSO (from the file named QSO <Date> <Time>.TXT) with <Date>: year-month-day (so as to arrange the QSO files in a chronological order).



**Tune** window (chapter "Tune function and opening of a repeater" of the handbook)

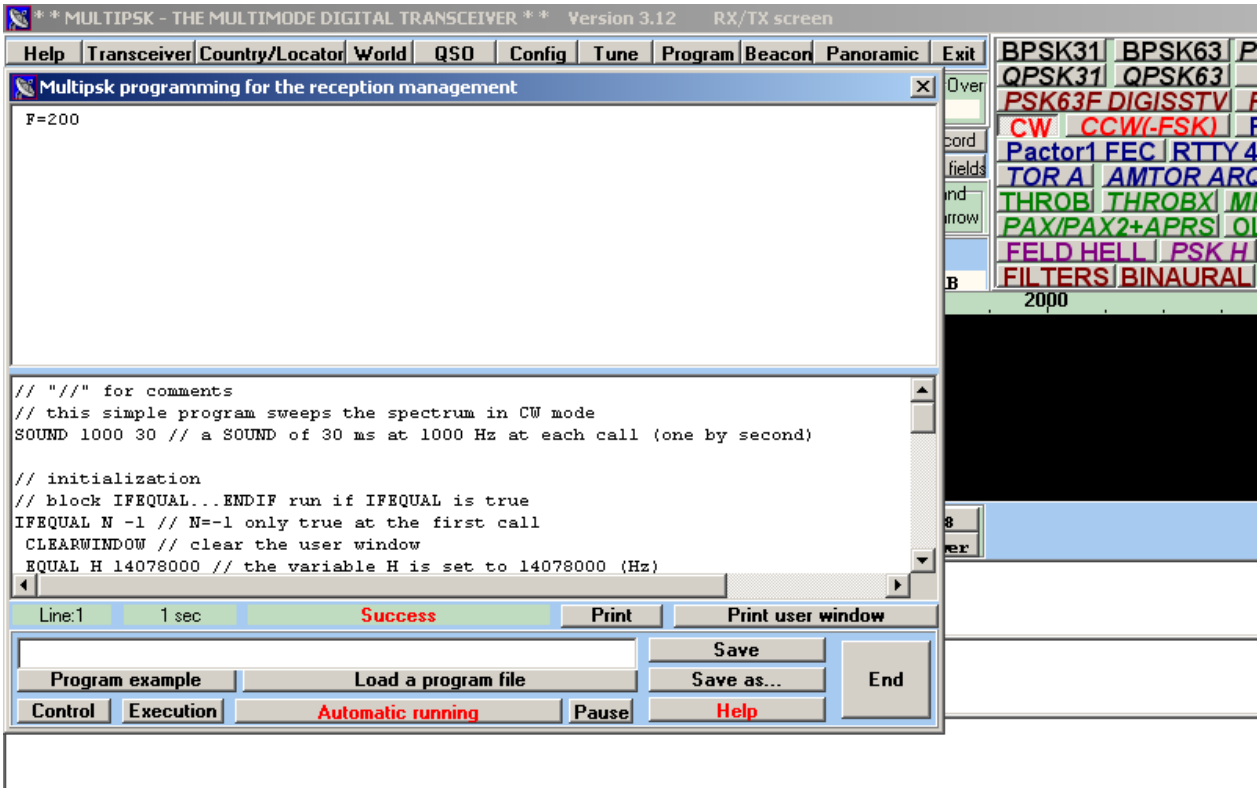
This function is available for adjusting the transmitter power. "Tune" sends a pure carrier (a sinusoidal wave). The frequency is the one which will be sent by the transmitter (= RX frequency + XIT).
The buttons "67", "88.5", "1750" allows the user to open repeaters by transmitting a tone at the frequency displayed on the button (during about 2 seconds).



**Program** window (chapter "Multipsk programming" of the handbook)

Multipsk allows the user to program text reception mode (not SSTV, FAX or HELL) with a little programmer, in a specific type language, without creating an internal loop. It is possible, for example, to view the entire AF band in a given mode, staying more time on powerful signals, then doing the same type of watching in an other mode.

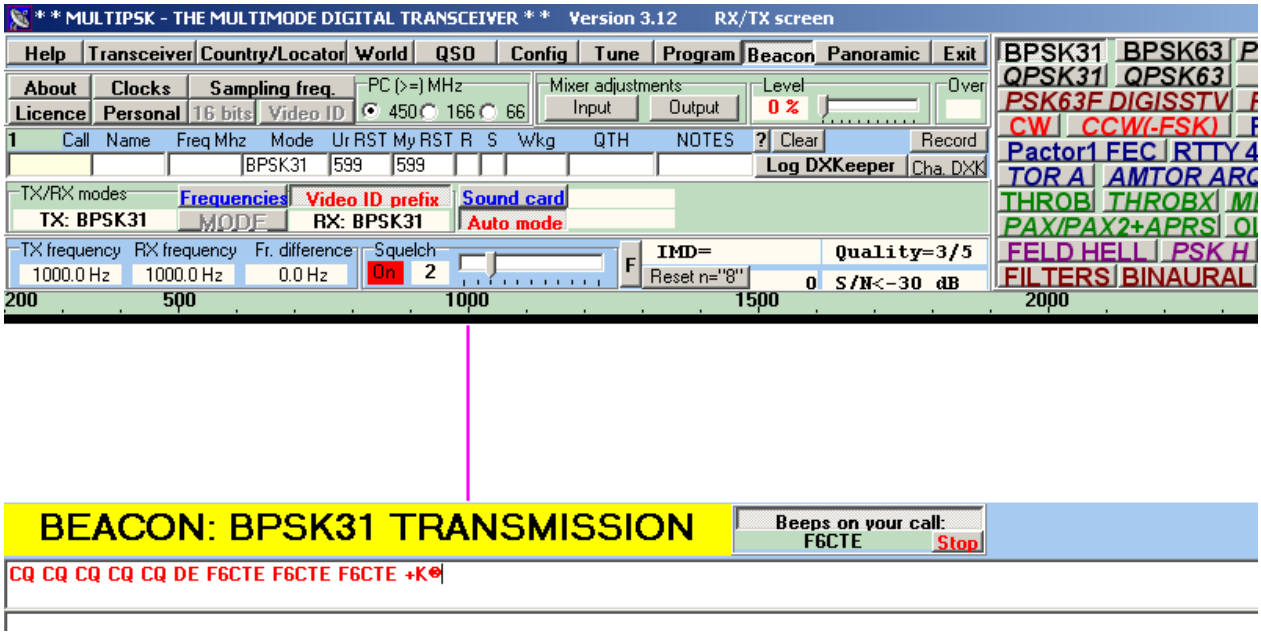
Once started in automatic in the RX/TX screen, the program will be run regularly (one time by second).
Programs can be saved and then loaded.



**Beacon** window (chapter "Description of the beacon commands" of the handbook)

Except PACKET, PAX/PAX2 and the graphical modes (fax and SSTV), the beacon function is related to all other RX/TX text modes.

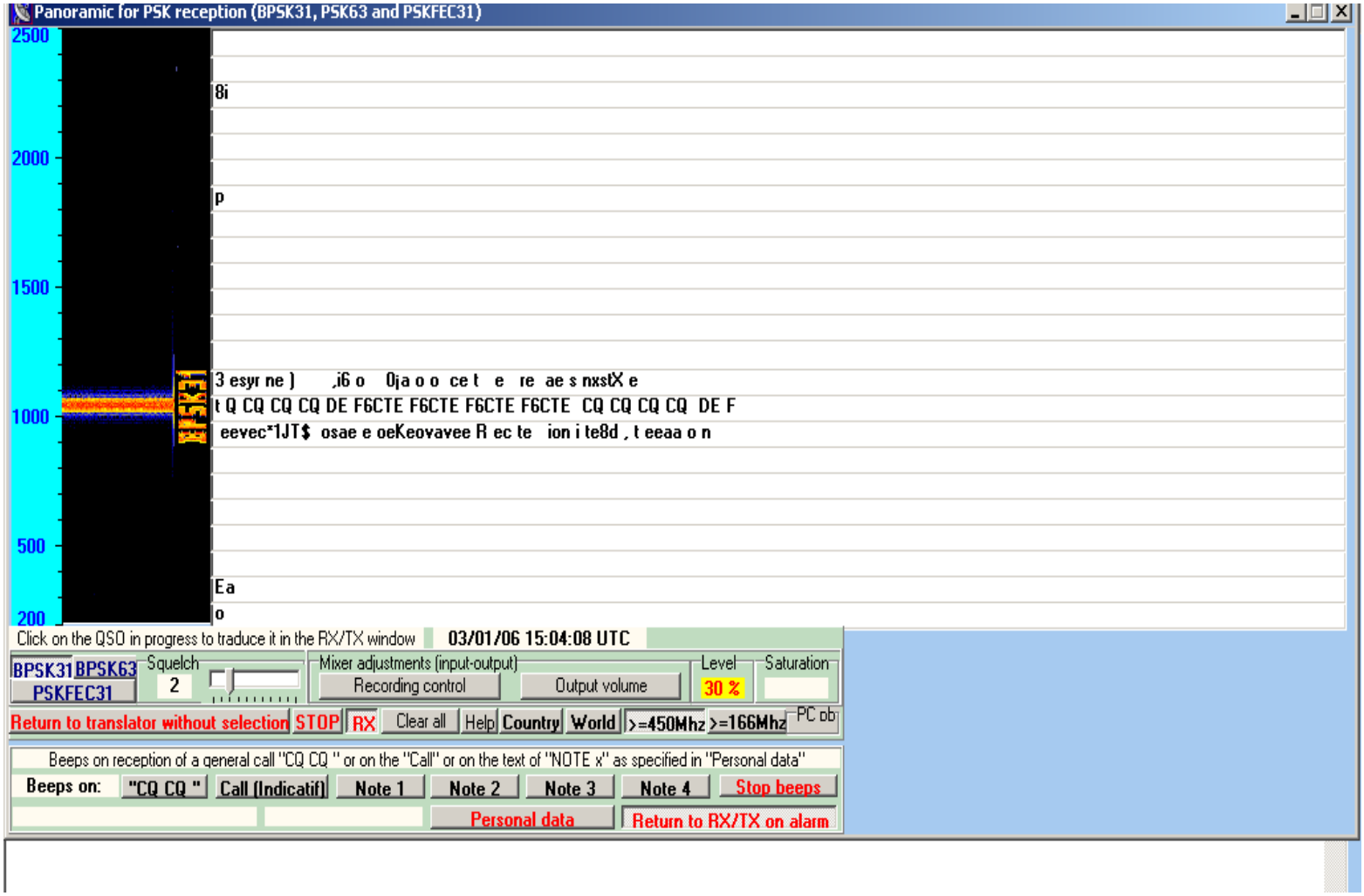
The beacon allows the automatic operation of reception and transmission, in alternatively (one after the other) in the chosen mode. The program works independently in a stand-alone way. Except for a particular need, the beacon must not work for more than one or two hours long. The transmitted message is prepared before hand. The reception duration is adjustable (see the Configuration screen). An alarm (beeps and blinks) can be started on reception of the operator call.



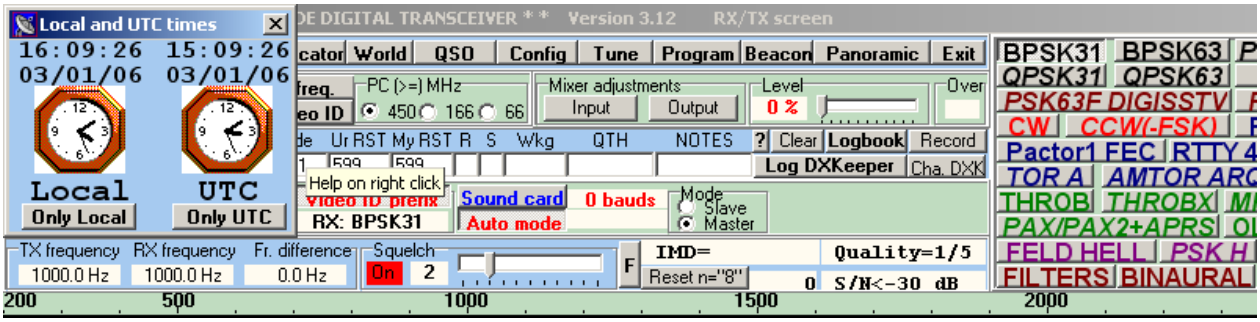
**Panoramic** window (chapter "Panoramic reception for PSK modes (BPSK31, BPSK63 and PSKFEC31)" of the handbook)

The user may with "panoramic" reception read BPSK31, BPSK 63 or PSKFEC31 QSO's in progress, on a 2.3 KHz band (from 200 to 2500 Hz). The maximum number of QSO's displayed is 23 (so one decoding channel every 100 Hz : 200 to 300 hz,..,2400 to 2500 Hz).
For example, by adjusting the receiver on 14070 KHz USB, the user will see all BPSK31 transmissions from 14070.2 to 14072.5 KHz.

Automatic reception and location can be done in panoramic mode.

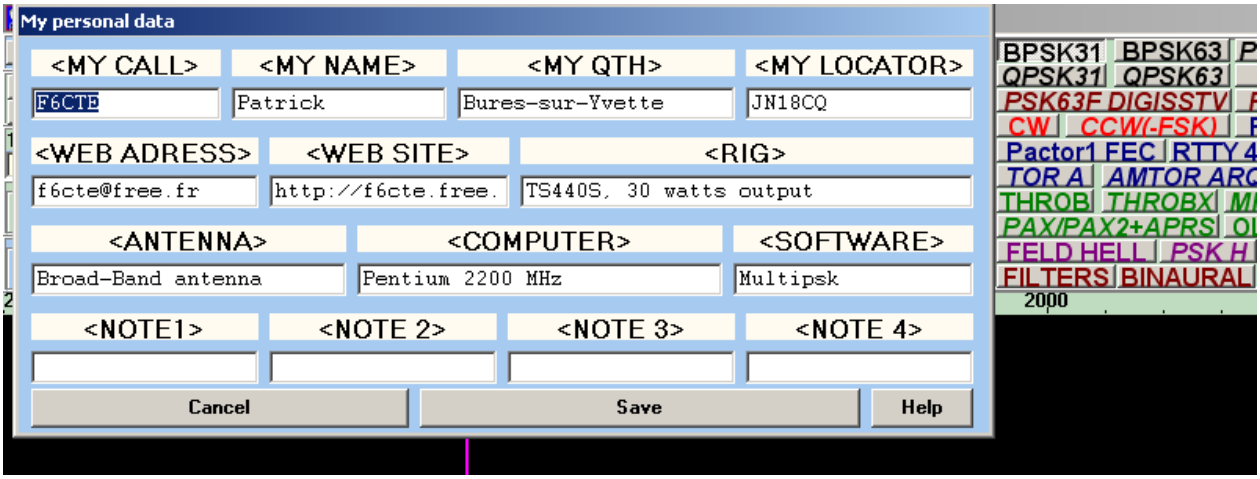


**Clocks** window
Local and UTC dates and times are displayed.



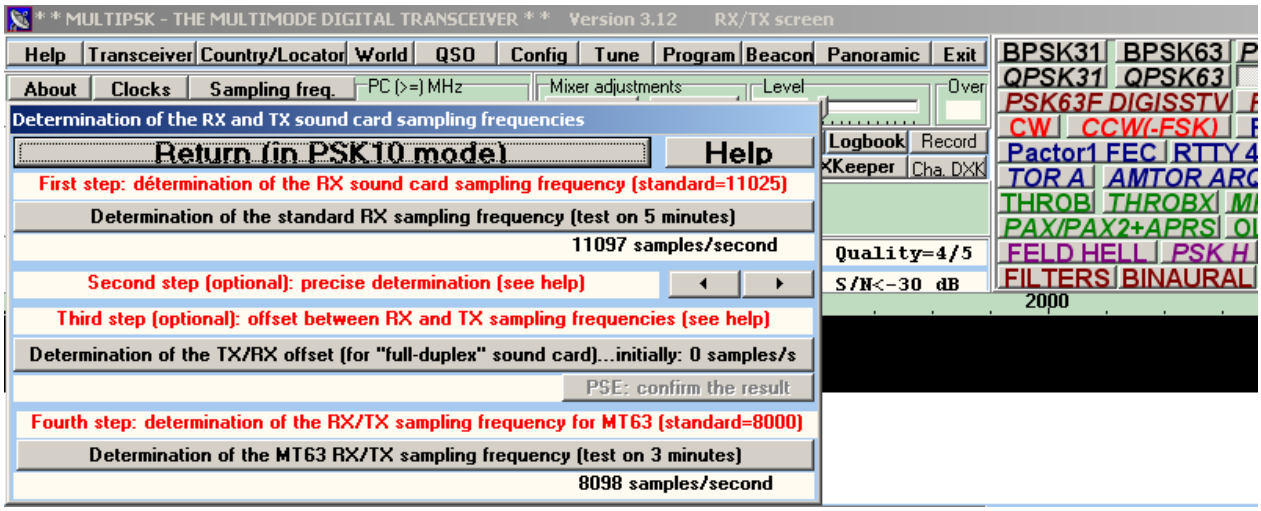

**Personal** window (chapter "Personal data and macros" of the handbook)

Here the fields have an obvious meaning. The operator has only to fill in the fields.
It can be noticed that <NOTE 1> to <NOTE 4> have no predefined meaning. The user fills them in at wish.
The fields have a maximum length of 255 characters.



**Sampling freq.** window (chapter "Determination of the sound card RX/TX sampling frequencies" of the handbook)

The standard sample frequency is 11025 samples/sec (except in MT63 where it is 8000 samples/sec). This frequency is only respected by quality sound cards (SB16, for example). On-board sound cards have not, in general, a good precision, the sample rate being able to go from 11025 -1% to 11025 +1% samples/sec.
So in this case, this operation is advised because the decoding will be improved.

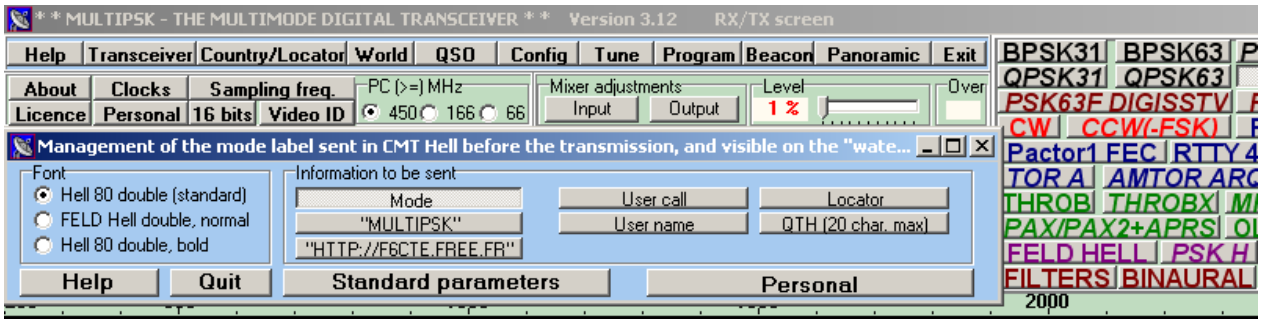



Button **16 bits**
This button allows, for powerful PC, to sample on 16 bits rather than 8 bits, which improves the sensitivity of the decoder.

**Video ID** window (chapter "Use of the video identifier of mode" of the handbook)

This window permits to manage all the options relative to the transmission in CMT Hell of the mode label (and/or other information) before the main transmission. This identifier will be visible in the "waterfall" of the other Ham.
For example, just before the general call ("CQ") in PSKFEC31, it will be sent automatically "PSKFEC31" on CMT Hell. The other Ham will see "PSKFEC31" displaying on his "waterfall" and will switch immediately to PSKFEC31.

This video ID is sent, only if the button "Video ID prefix" is pushed.

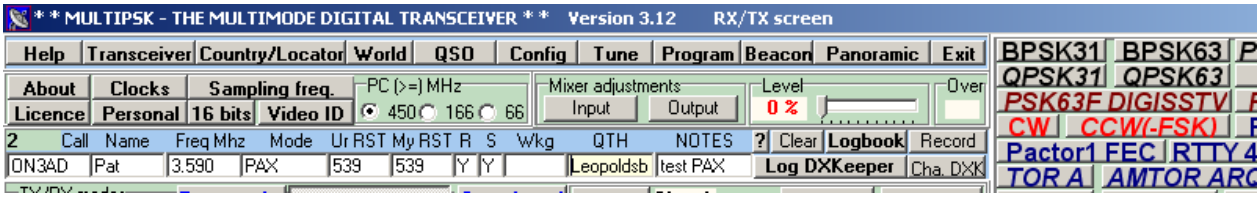


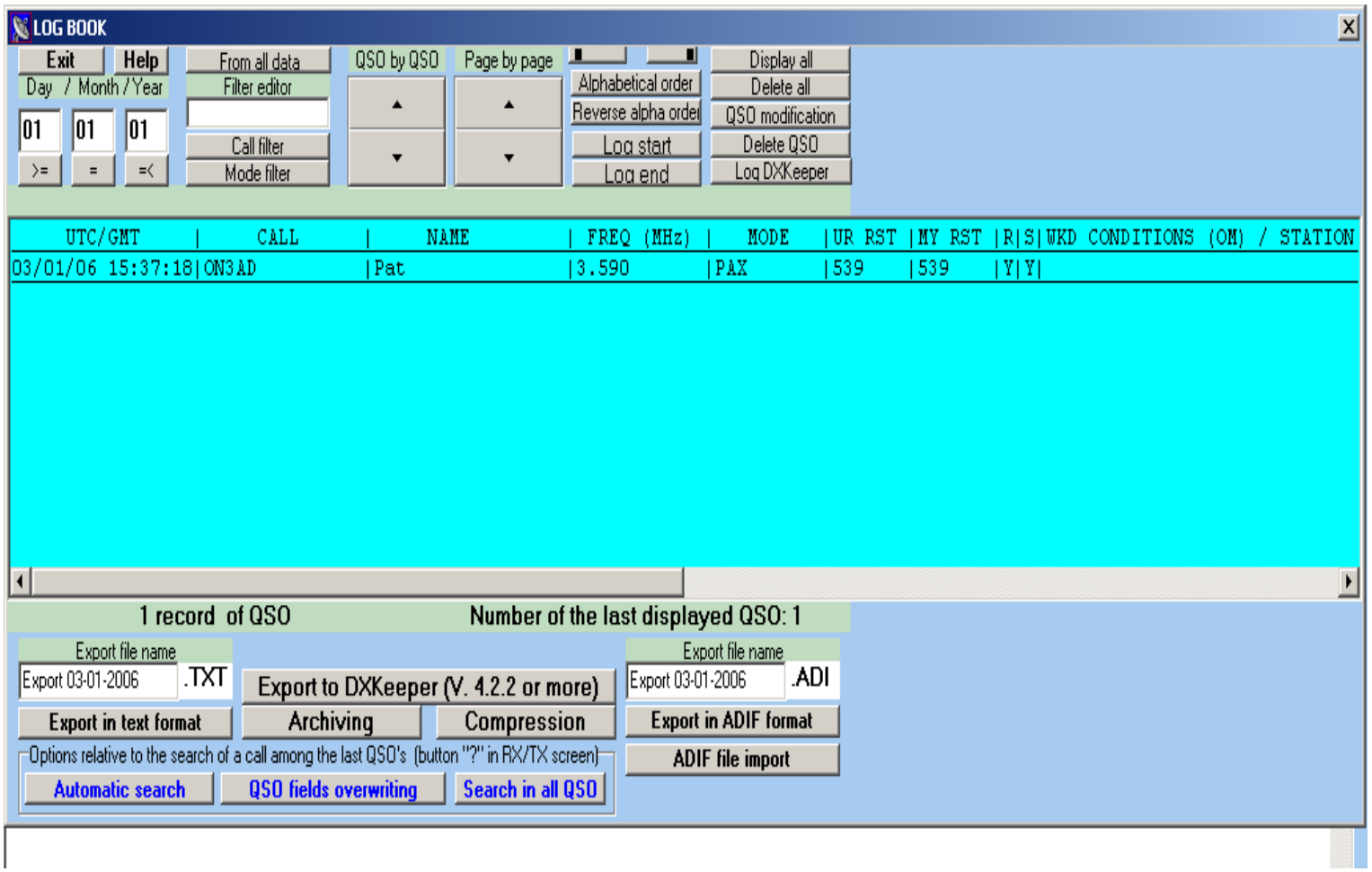
**Logbook** window (chapter "Use of the Multipsk logbook and logging of an external logbook (DXKeeper...)" of the handbook)

The QSOs will be recorded in the log book all along the use of the program without necessity to quit the decoder.
UTC / GMT date and time are given automatically by the software when the QSO is recorded.

The current focused log field is colored in light yellow. Clicking on a field make it become "current" which fills it in light yellow.

A lot of options exist...see the handbook for details.

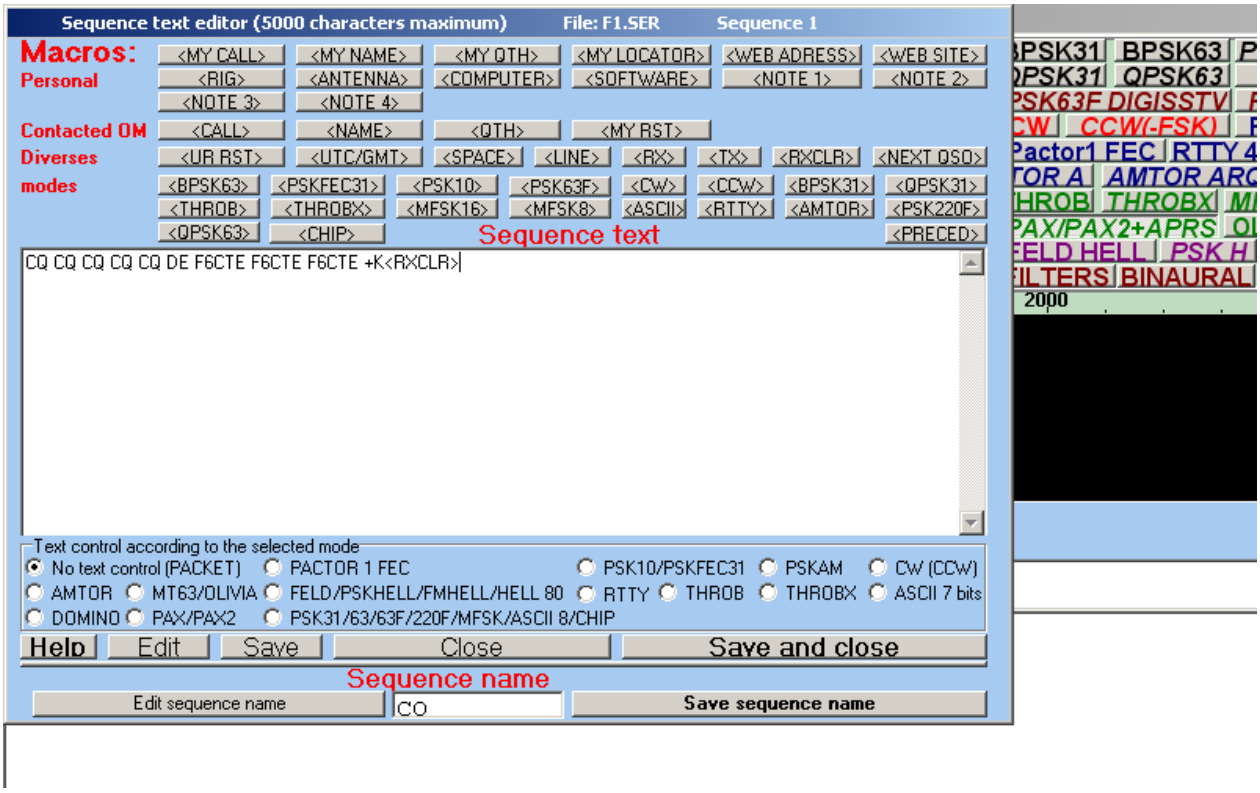


**Sequence** window (chapter "Setting up of sequences (long macros) 1 to 24" of the handbook)

The user can set up messages utilizing a special text editor. These messages could then be used in any text mode, from the RX/TX screen.

On pushing the key <Ctrl> ("CONTROL"), it is obtained a new set of 12 sequences with the buttons called "SEQ 13" to "SEQ.24", which carries the total to 24 possible sequences.

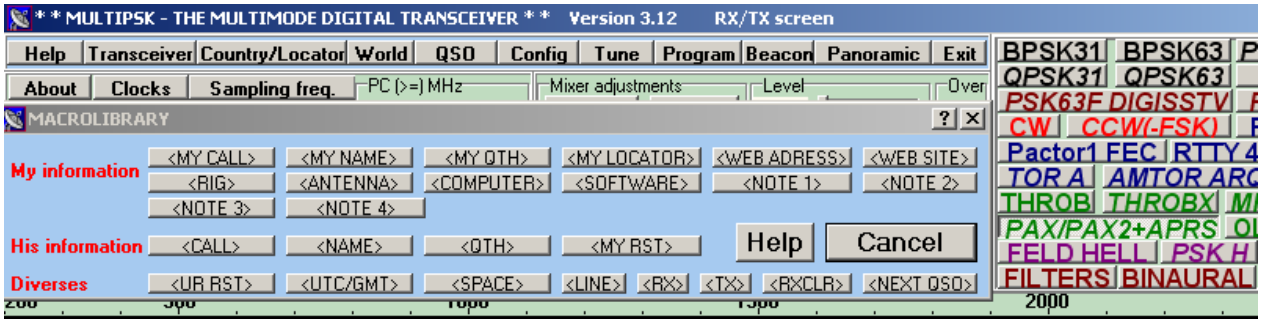


**Macros** window (chapter "Personal data and macros" of the handbook)

The macros are divided into 4 categories :

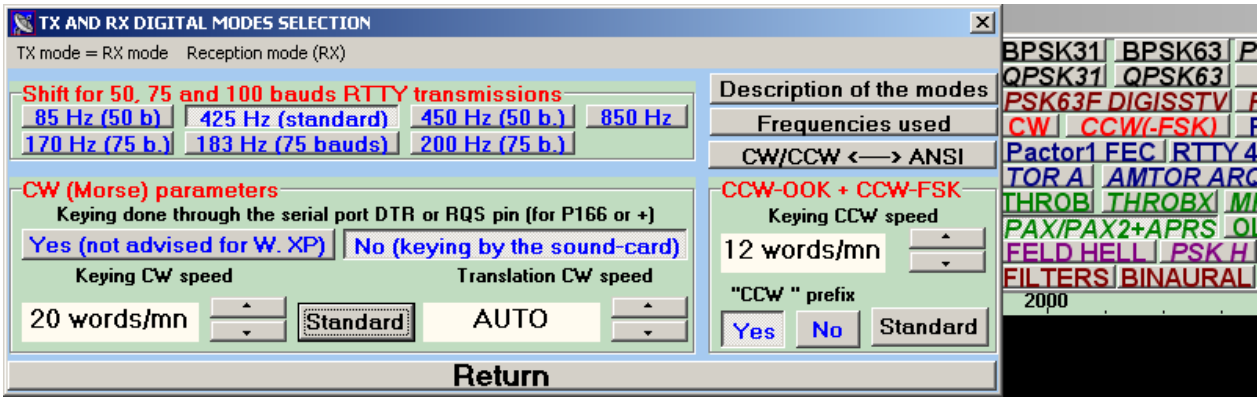
- those that are personal to the operator himself: his personal data,
- the ones concerning the other operator whose information has been received and recorded in the fields of the log book,
- diverse macros,
- macros relative to modes.

Clicking on a macro, the text of the macro will be put on the text editor ready for transmission.



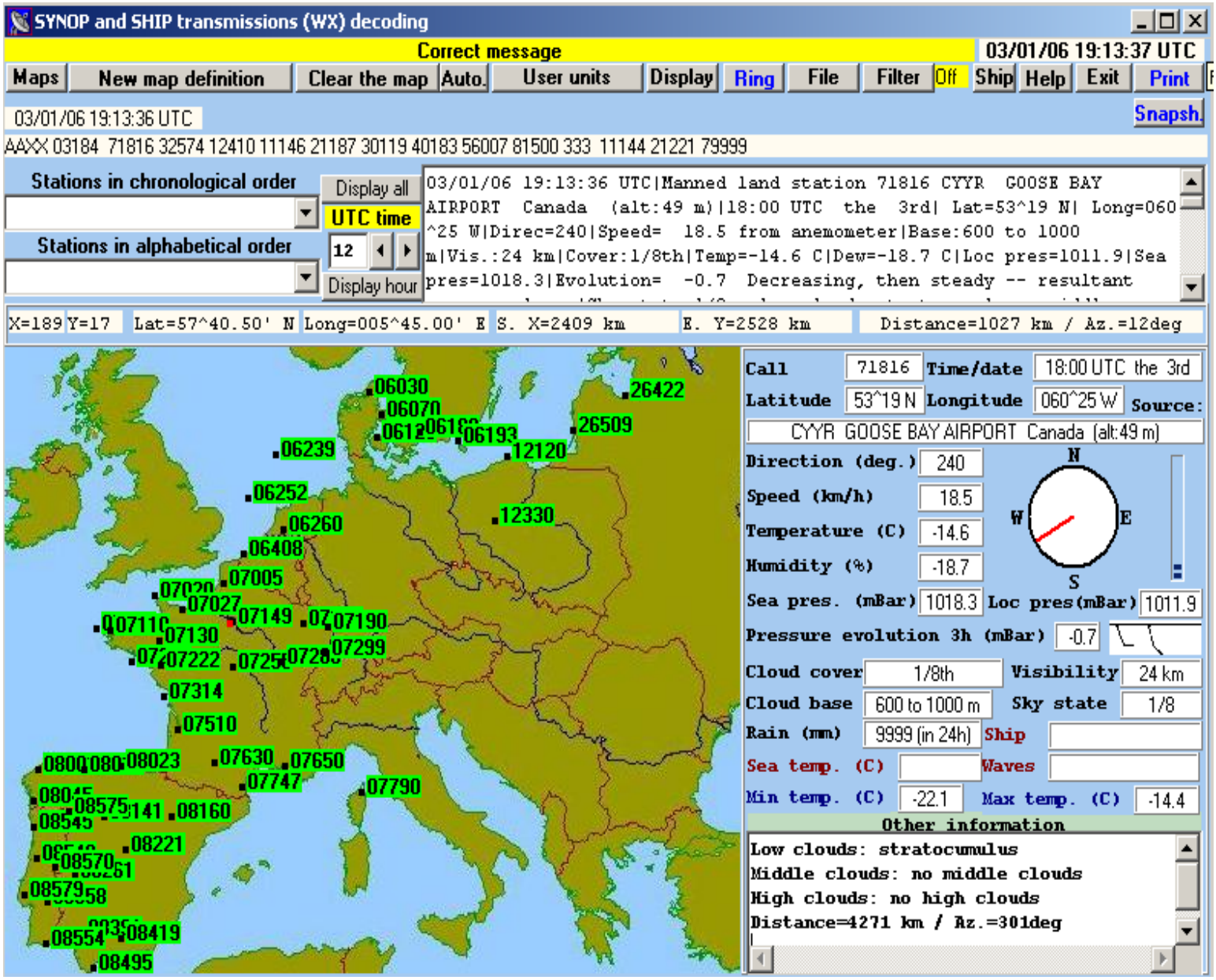
**Mode** window (chapter "RX/TX modes selection and their descriptions" of the handbook)

Except for several modes as HF Fax, SSTV, Filters, binaural reception, Hellschreiber modes..., it is possible to choose a  transmission (TX) mode different from the one chosen for reception (RX).
With a graphical resolution of 800x600 or more, the mode can be chosen directly from the mode table on the upper right hand side of the screen.



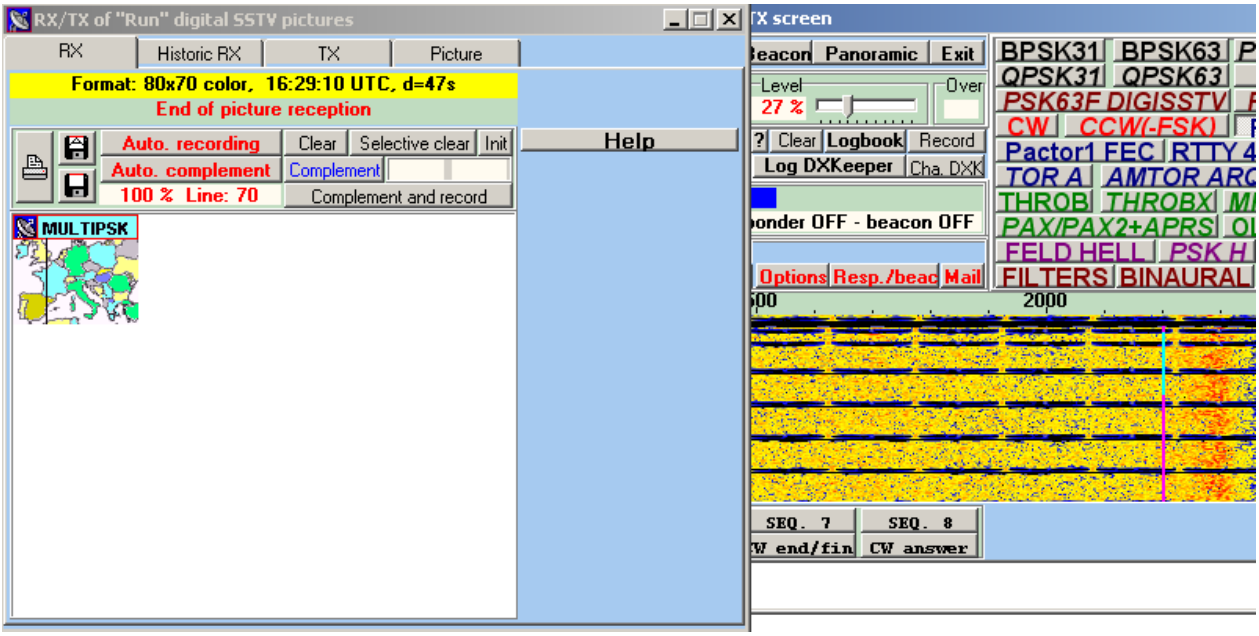
**SYNOP+CHIP** window in RTTY 50 bauds (chapter "Description of the SYNOP/SHIP commands (in RTTY 50 bauds)" of the handbook)

The SYNOP message is a report of surface observation generated from a land station, manned or automatic.
The SHIP message is equivalent to the SYNOP message but generated from a sea station (ship).
All these pieces of information are exchanged between all meteorological services over the world. They are, afterwards, transmitted by HF stations in RTTY 50 bauds (for example, from DDK2 on 4583 KHz or DDH7 on 7646 KHz or DDK9 on 10100.8 KHz).



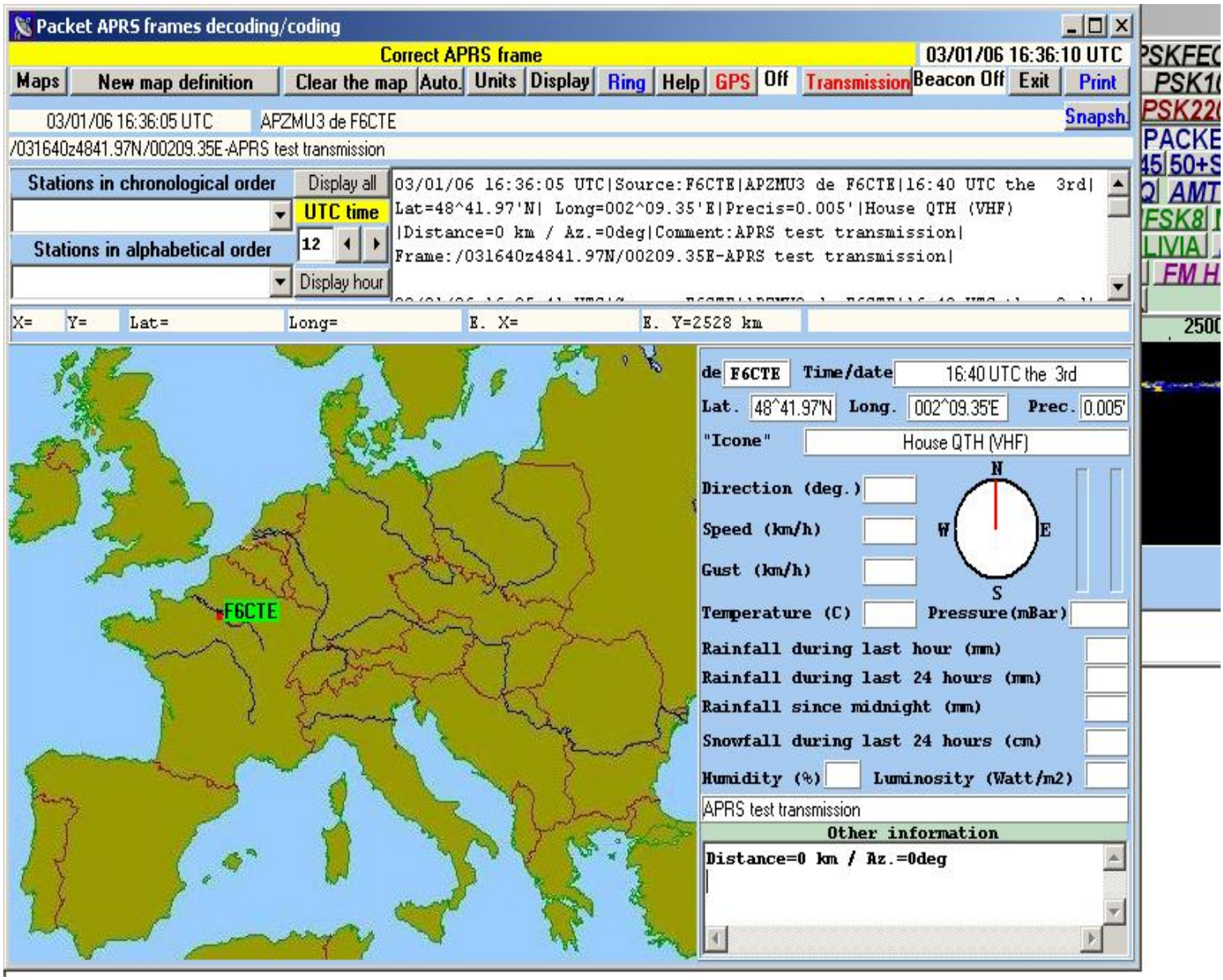
**DIGISSTV** window (chapter "Description of the DIGISSTV ("Run" protocol) commands in PSK63F/PSK220F/PACKET" of the handbook)

It is a digital SSTV protocol (DIGISSTV), allowing transmission pictures in colors, in gray scale or in black and white, where the picture may be transmitted among PSK63F, PSK220F or PACKET text.



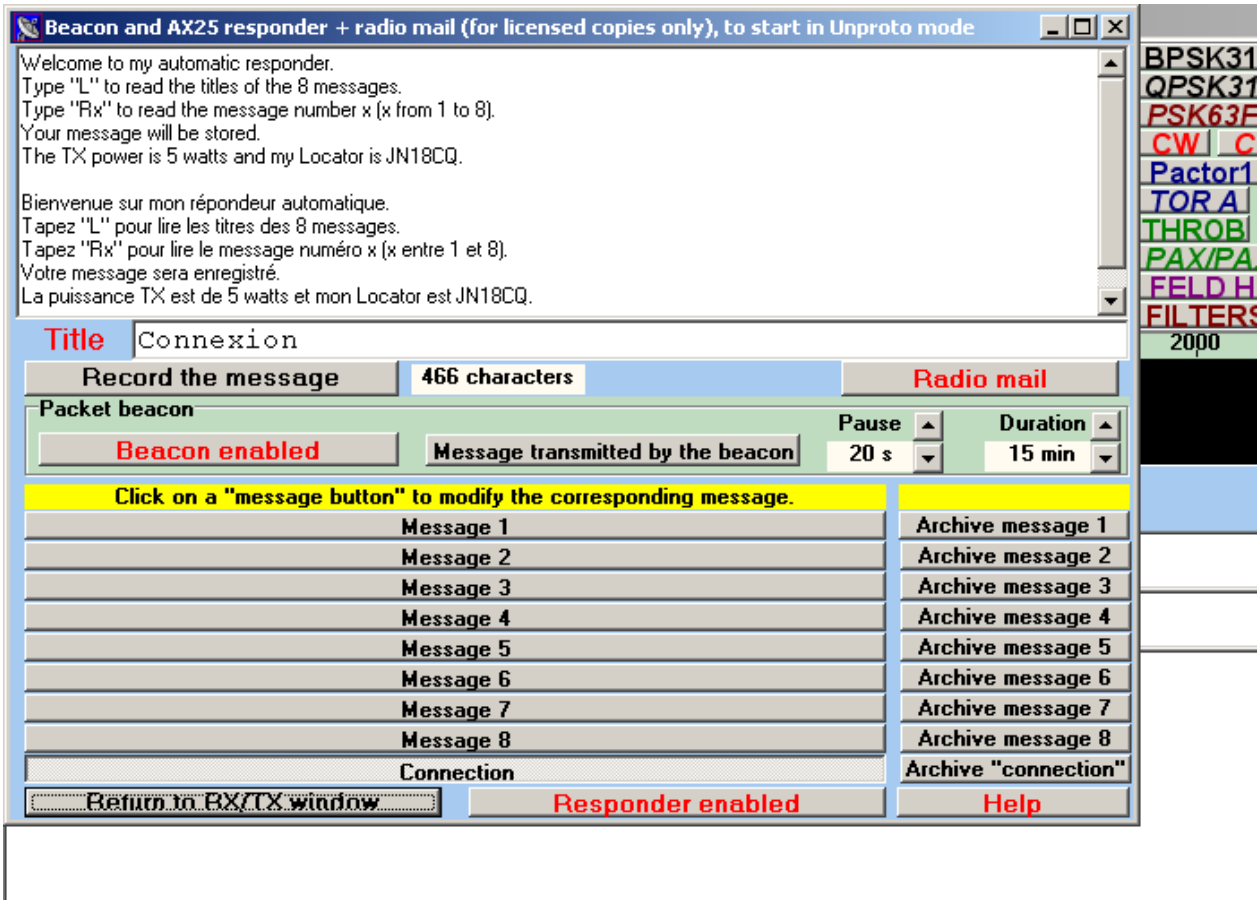
**APRS** window (chapter "Description of the APRS commands (in non-connected Packet or PAX/PAX2)" of the handbook)

APRS is a Packet communication protocol for disseminating live data to everyone on a network in real time. Its most visual feature is the combination of Packet radio with the Global Positioning System (GPS) satellite network, enabling radio amateurs to automatically display the positions of radio stations and other objects on maps on a PC.



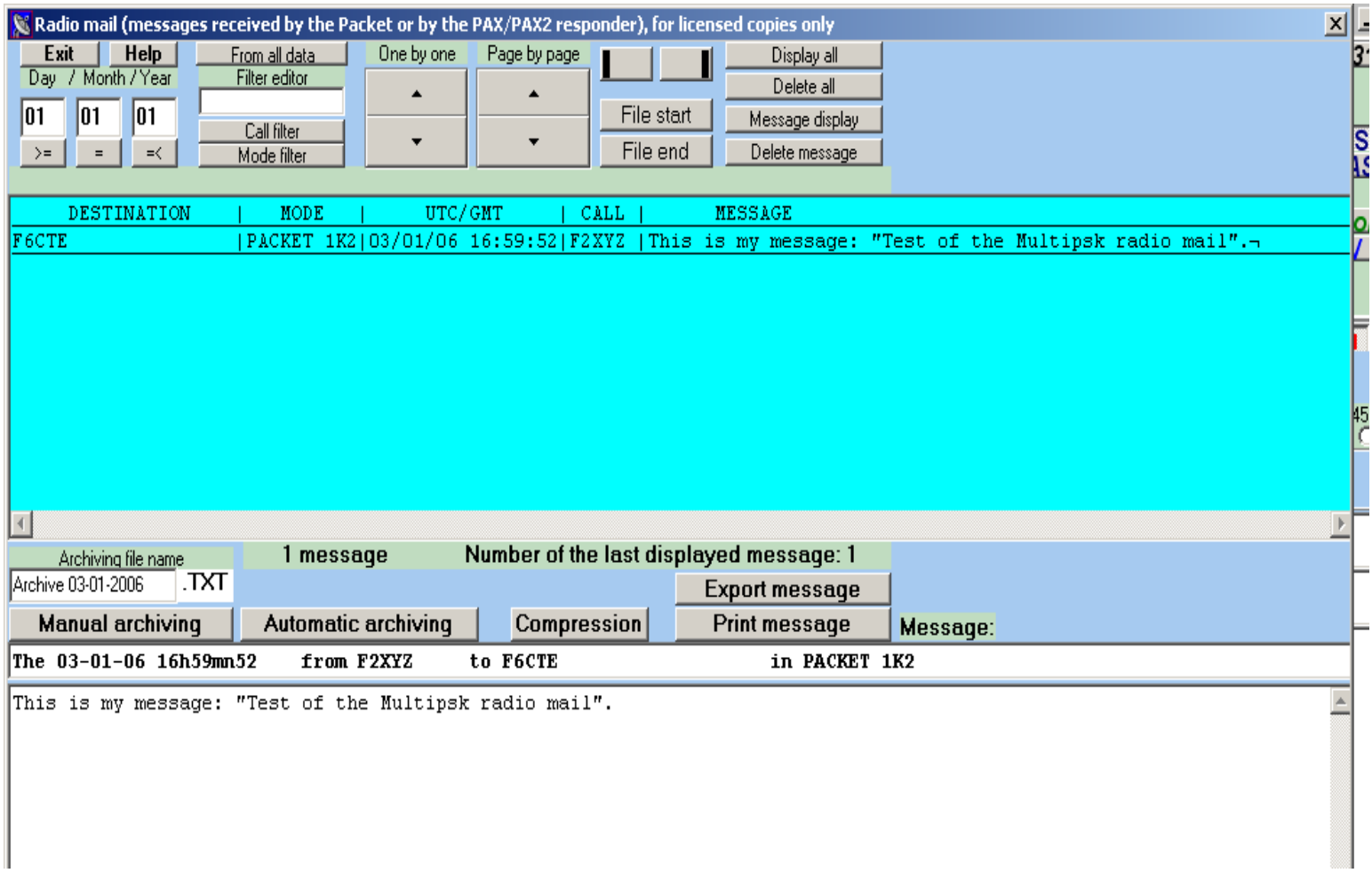
**Resp./Beac** window (chapter "Description of the specific PACKET (PAX/PAX2) commands (+beacon/responder/radio mail)" of the handbook)

The Packet/PAX/PAX2 beacon allows the automatic operation of reception and transmission, alternatively.
When the responder is enabled, the working is completely automatic. On connection of another ham, the responder immediately sends a reception message (programmed by the operator). Then, the connected Ham will be able, either to read the 8 messages titles ("L" command) or to read one of the messages 1 to 8 by the Rx command ("R1" to "R8").



**Mail** window (chapter "Description of the specific PACKET (PAX/PAX2) commands (+beacon/responder/radio mail)" of the handbook)

This radio mail permits to manage the mails received by the Packet or PAX/PAX2 responder.



# Clock presentation

This software allows:

- to decode the time frame transmitted by FRANCE-INTER, DCF 77, HBG, RUGBY, WWV-WWVH or WWVB, received under acoustic form from a long wave SSB (LSB or USB) receiver (AM receiver for WWV-WWVH), in date and time,

- to decode the $GPZDA GPS frame, giving the UTC date/time data,

- for licensed versions, to synchronize the local (current) time and universal (UTC) time of the computer with the received time. After synchronization, the computer (system) clock will have an accuracy of about 1 second with the real time (for PC at 166 MHz or more),

- for licensed versions, to begin an action (start up of a software, toggle of serial port pins or bell) at a determined time, as a digital alarm-clock.

See Appendix B for a presentation of the radio-clock transmitters and the way to synchronize.

**NOTE**: this program needs a precise sound-card (sampling frequency close to 11025 samples/second). Thus it must prefered an external sound-card rather than an “on-board” sound-card.

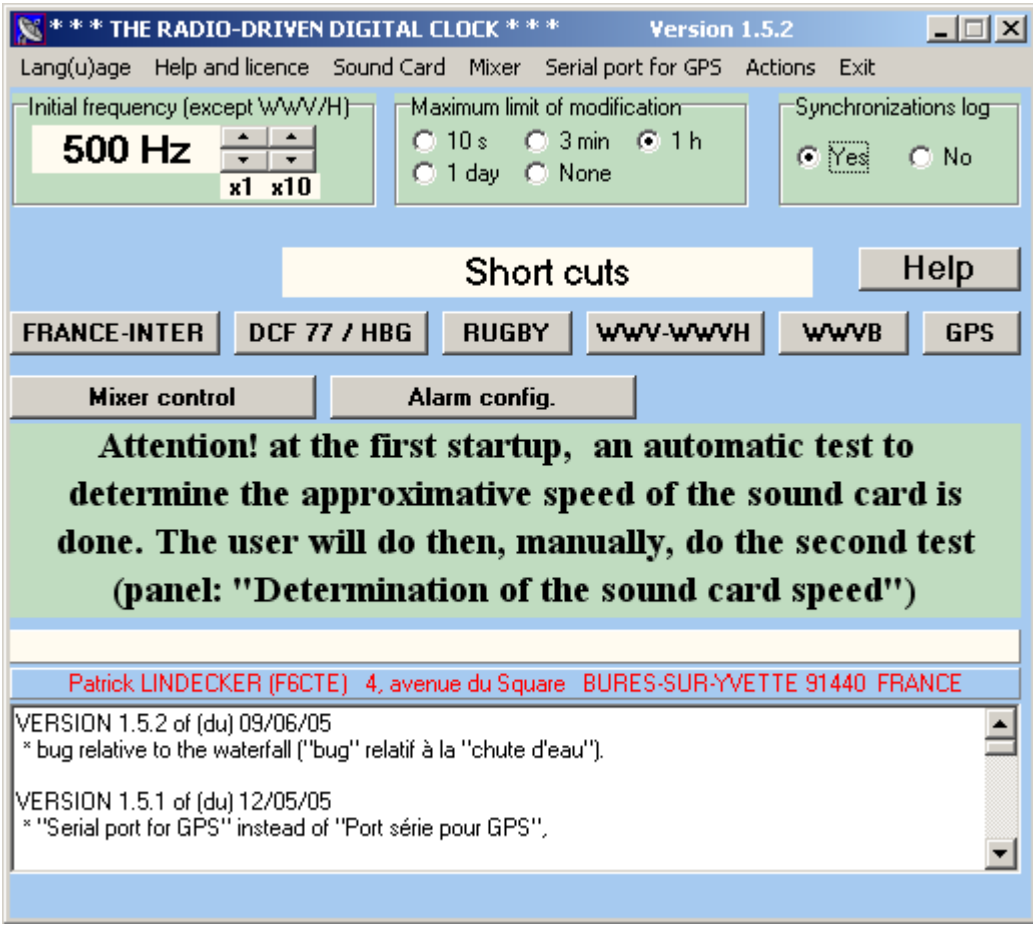
**Main menu** (chapter "Access to the main menu" of the handbook)

At the first start of Clock, the main menu opens.

This screen allows the user to precise the main user options (language, serial ports, sound card, mixer).
It can be defined a maximum limit of modification (compared to the PC time) and if the user wants a synchronization log.
It is defined the initial reception frequency (500 Hz by default).

It will be also found on this screen the modifications introduced by the last version.

In radio reception (not in GPS reception), at the first startup, it is indicated that an automatic test to determine the approximate sound card speed will be done. After the test done, it is displayed the speed as determined by the first test (standard: 11025 data per second).

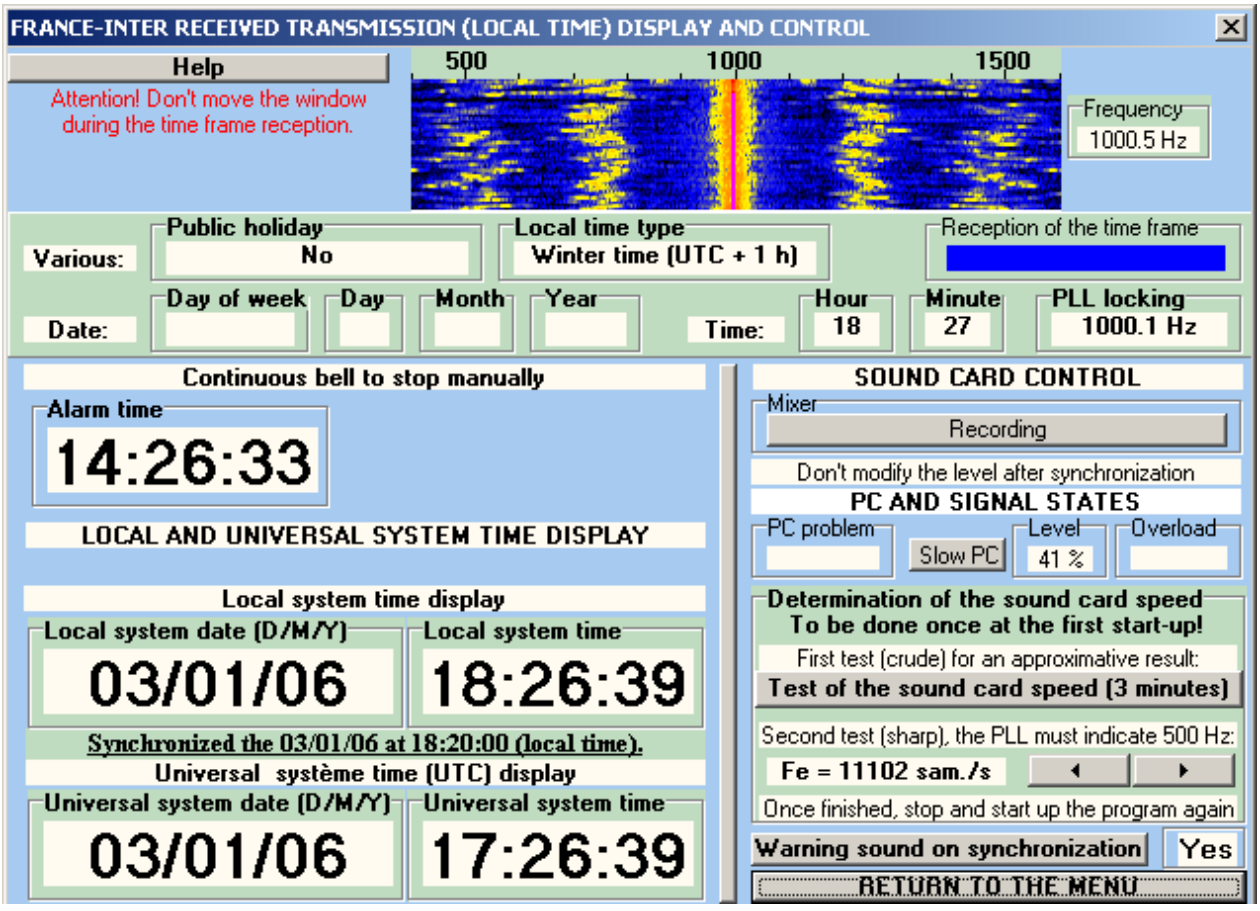


**Radio decoding** screens (chapter "Following and control of the radio-driven digital clock on FRANCE-INTER, DCF 77, HBG, RUGBY, WWVB or WWV-WWVH - Preliminaries and description of the windows and controls" of the handbook)

As soon as the option "PC synchronization on FRANCE-INTER, DCF 77, HBG, RUGBY, WWVB or WWV-WWVH" is started, a window opens which contains:

- the "waterfall" where it is possible to precisely tune the reception frequency,
- the radio transmission translation window containing the synchronization controls (at the top),
    * the display window for universal and local system date and time (at the left bottom),
    * the window containing the sound card controls and the signal and PC states (at the right bottom).

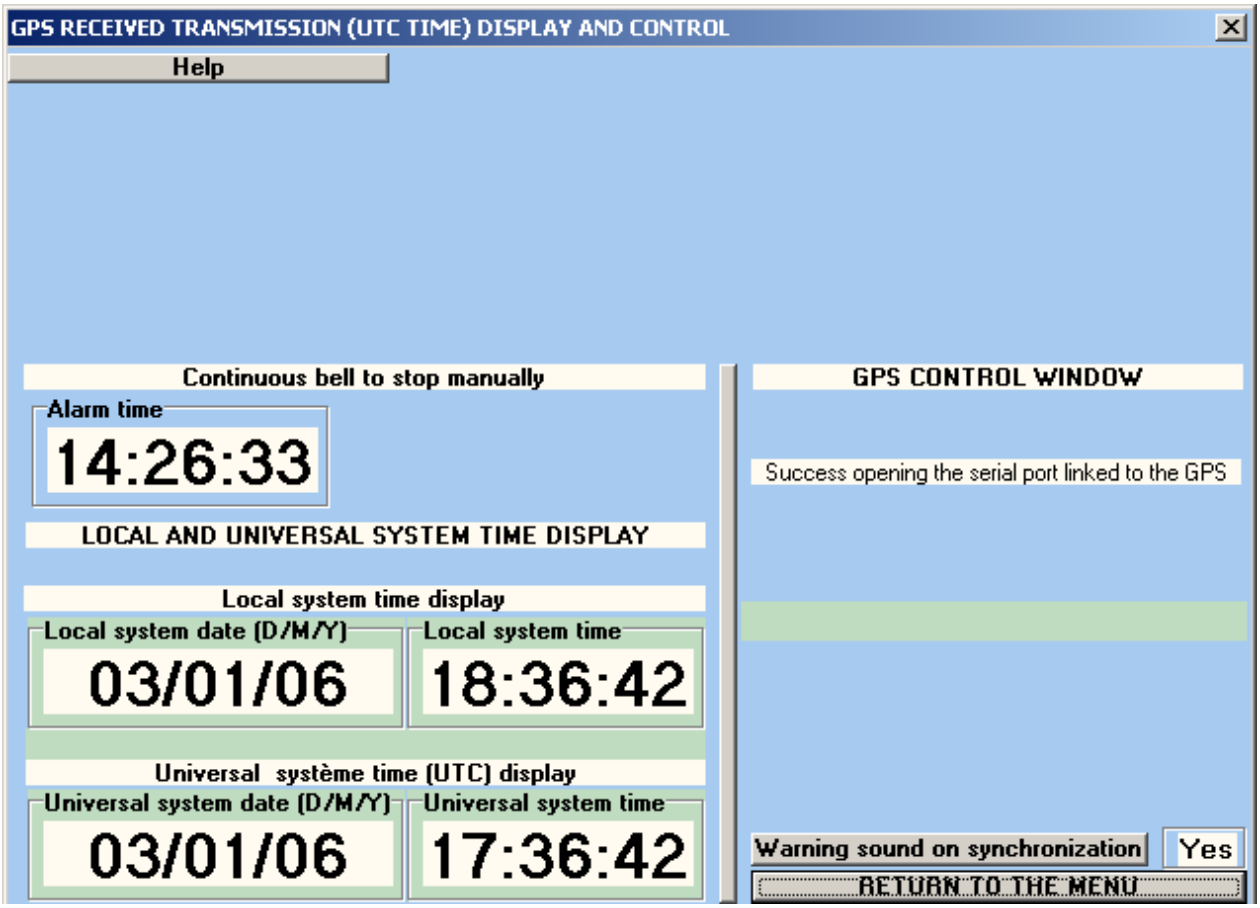
Decoding and displaying of the time frame are done in real time.
At the end of the reception of date and time and after coherence checking between successive results, an automatic synchronization allows the PC clock to up to date local and universal dates and times. A sharp warning sound signal is emitted.



**GPS decoding** screen (chapter "Following and control of the GPS-driven digital clock" of the handbook)

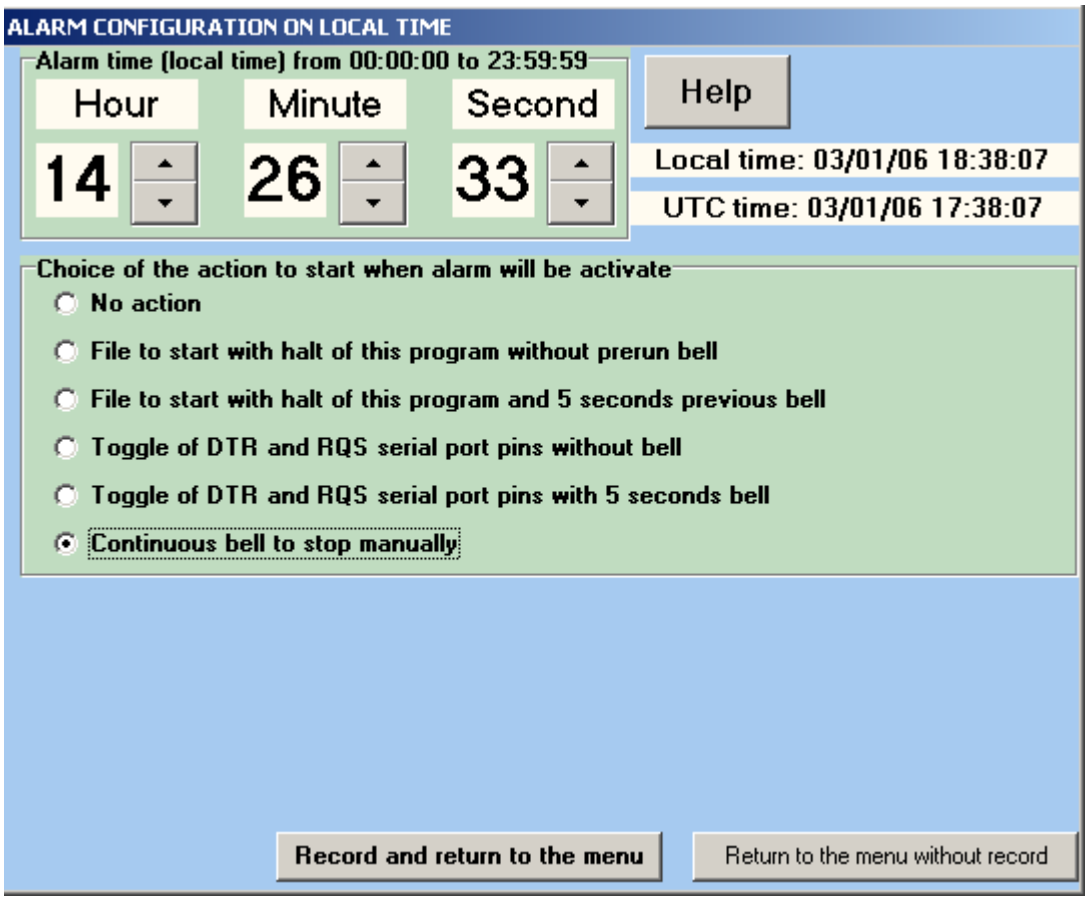
The GPS receiver is connected to the serial port of the PC and the GPS is put on (after having been configured to transmit the "sentence" (frame) "$GPZDA").

The synchronization's done will appear.



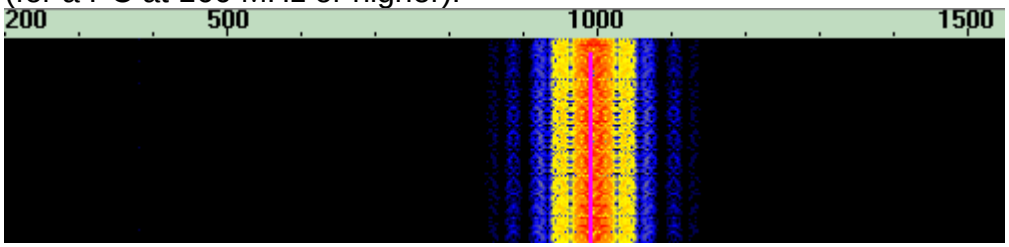
**Alarm** window (chapter "Alarm configuration" of the handbook)

Making benefice of the precision of the system time, the user can choose to realize an action at a precise time (local time).

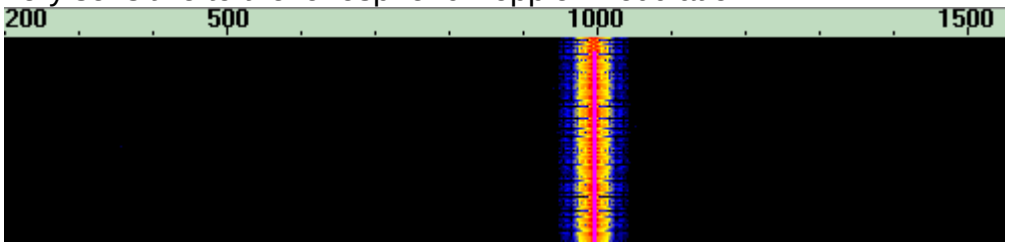


# APPENDIX A
# Multipsk modes (version 3.12)

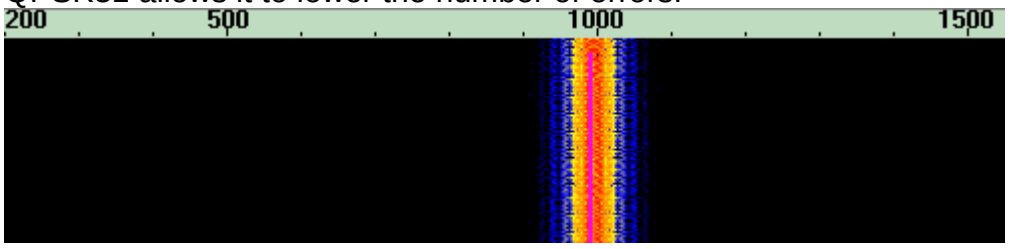
An experimental new mode called **PSKFEC31** is introduced. This mode is derived from PSK10 mode for the set of characters and from PSK31 for the speed (31.25 bauds). Each bit (and not each character as in PSKAM) is transmitted twice with an interval of 13 bits between the two transmissions of the bit. The speed is about 28 wpm. This mode permits to lower appreciably the number of errors due to HF propagation conditions. The bandwidth is about 110 Hz. The lowest S/N is -14.5 dB (for a PC at 166 MHz or higher).




**PSK10** mode is designed to assure communications with weak ratio Signal-to-Noise ratios down to -17.5 dB with less than 2% errors. The speed is 18 wpm. This mode is very sensitive to the ionospheric Doppler modulation.

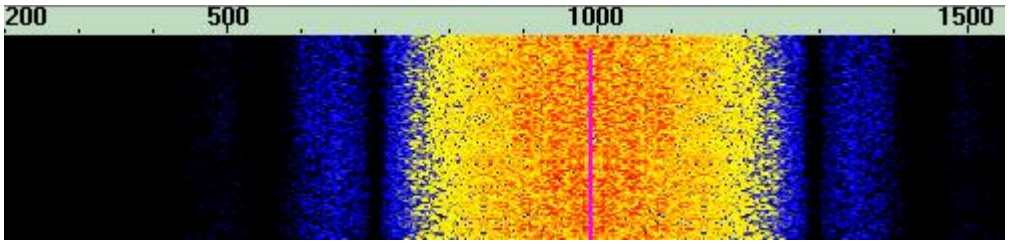



The **BPSK31** and **QPSK31** modes are designed to assure communications with Signal-to-Noise ratio down to 0.1 (-11.5 dB, for a PC at 166 MHz or more). The speed is 37 wpm in capital letters and 51 wpm in small letters. When we say PSK31, it refers to a general term for BPSK31 and QPSK31. The convolutional encoding of QPSK31 allows it to lower the number of errors.



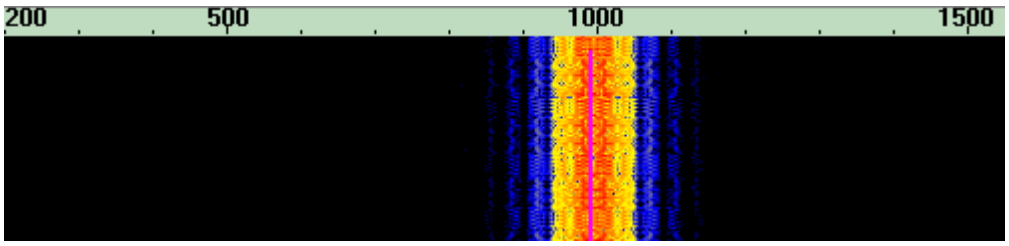

BPSK31

The new **CHIP** (64/128) mode is a new PSK mode which uses the "Spread Spectrum" modulation technique and, particularly, the Direct Sequence Spread Sequence (DSSS), this through an original algorithm. This technique permits to achieve a very robust mode. The minimum ratio Signal-to-Noise ratio is -8 dB.



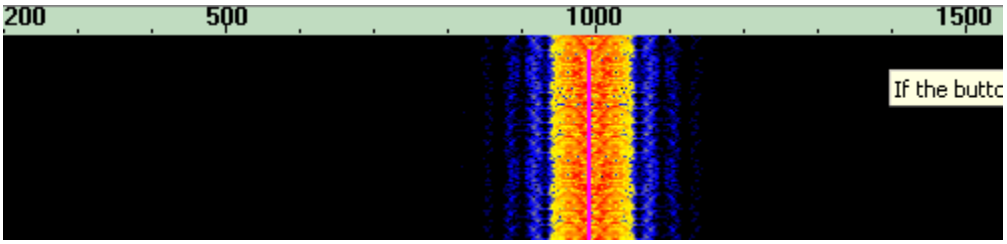

CHIP 64

The new **BPSK63** and **QPSK63** modes derives from BPSK31/QPSK31 but they are twice faster. The minimum ratio Signal-to-Noise ratio is about - 7 / -8 dB.

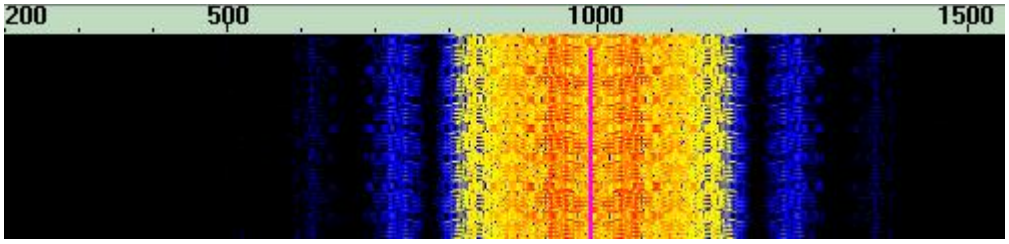



BPSK63

The **PSK63F** mode has a same speed (62.5 bauds) as PSK63 but with a convolutional encoding. It is a powerful mode with the presence of noise. The minimum ratio Signal-to-Noise ratio is about - 12 dB.



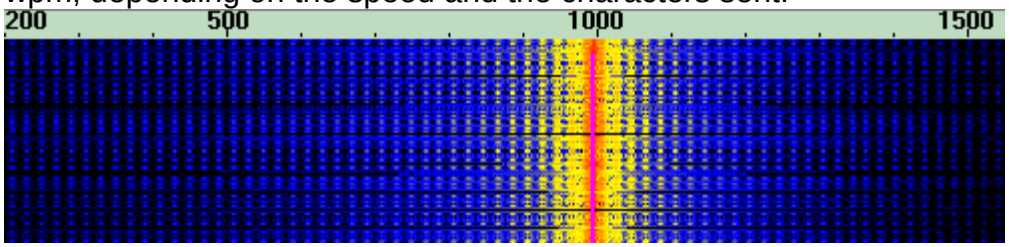

The **PSK220F** mode is a PSK63F mode carried to a 220 bauds speed. It allows a very rapid transmission speed. The minimum ratio Signal-to-Noise ratio is about - 7 dB.




**DIGISSTV "Run"** in PSK63F or in PSK220F: it is possible to send and to receive small pictures in digital SSTV ("Run" protocol), during QSOs in these modes.

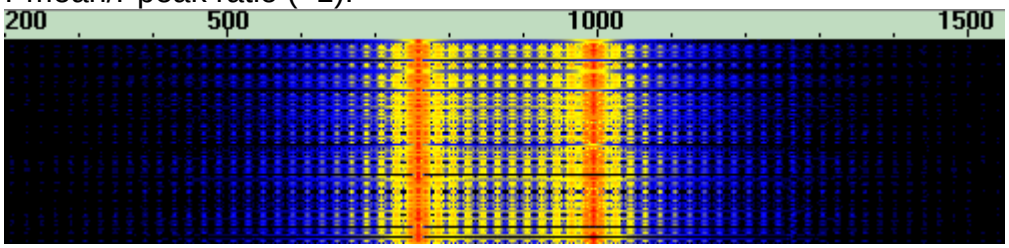
**CCW** (Coherent CW) has been created, for amateur radio, by Ramond Petit (W6GHM) in 1975. The CCW presented here derives from the "traditional" CCW with

some modifications (F6CTE/DK5KE). For example, the standard speed is 12 wpm . Here the user can choose between 12, 24 and 48 wpm.
The minimum S/N ratio can be very low, down to -12 dB for the standard speed of 12 wpm, depending on the speed and the characters sent.




CCW OOK 24

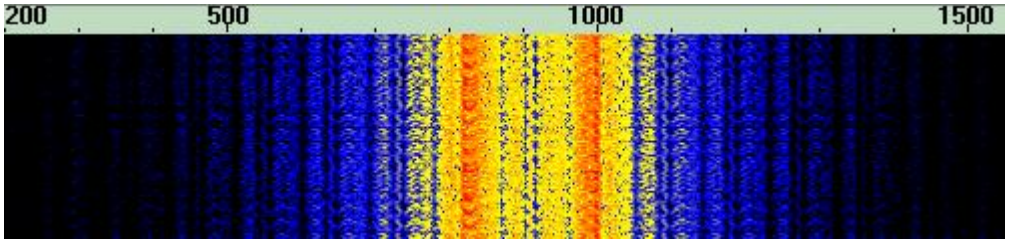
The **CCW-FSK** variant permits a more efficient decoding (+3 dB) and a better Pmean/Ppeak ratio (=1).



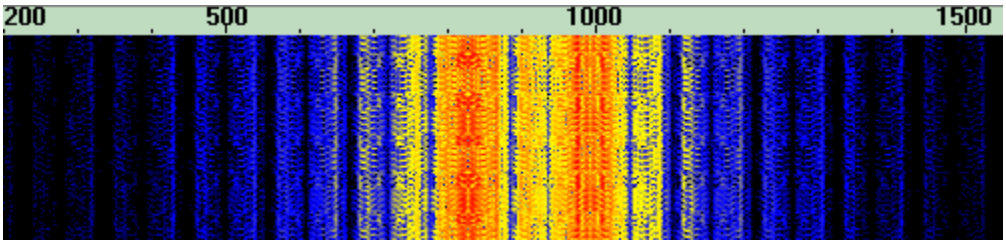

CCW FSK 24

**CW**, **RTTY**, **ASCII** and **AMTOR** are what we call as traditional modes used by radio-amateurs.

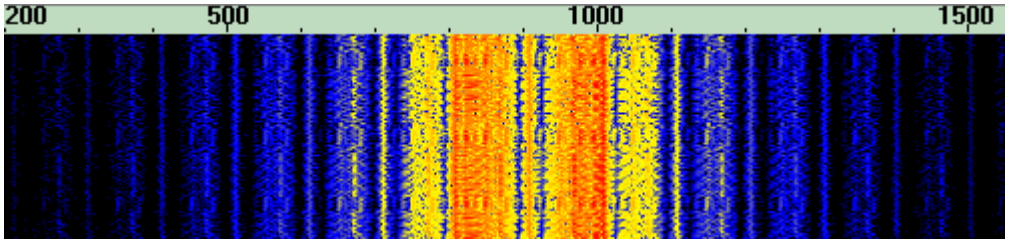
RTTY, ASCII and AMTOR use two frequencies which are filtered, each one corresponding to a binary digit (1 or 0). These two frequencies, separated by a shift, modulate the RF when transmitted and the modulation is called Audio Frequency-Shift Keying (AFSK), otherwise the modulation can be done directly on the RF carrier and it is called Frequency-Shift Keying (FSK). In HF amateur radio, only AFSK is used.



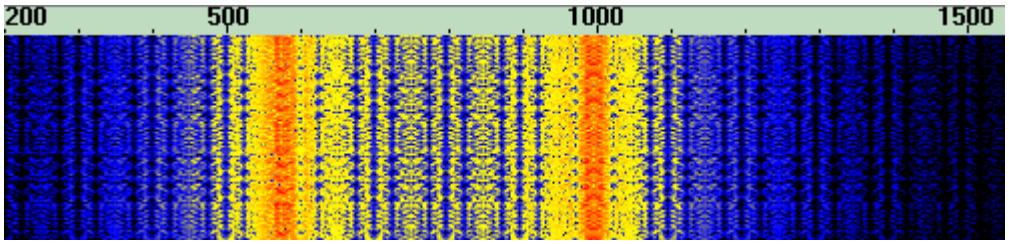

RTTY 45




ASCII 7 bits



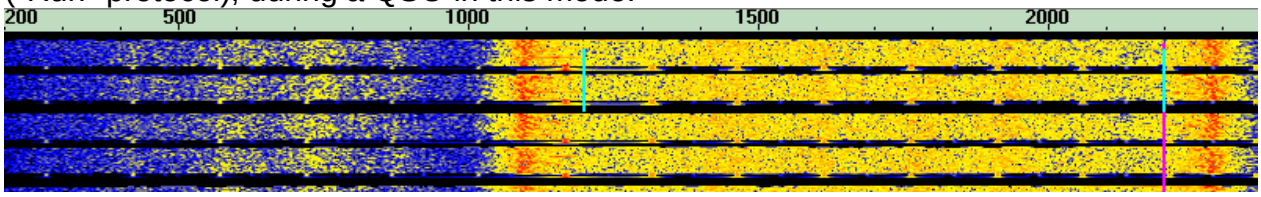

AMTOR FEC




RTTY 50 (Shift: 425 Hz)

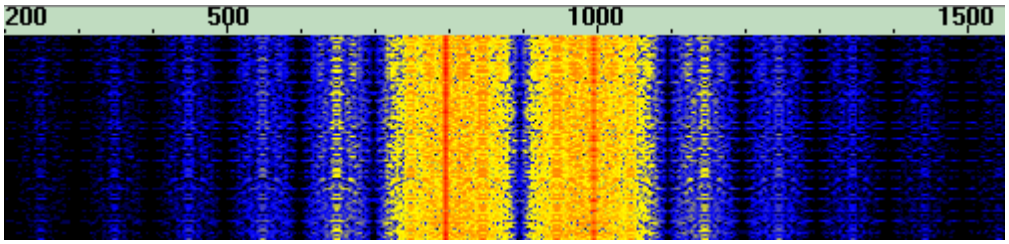
In RTTY 50 bauds with a shift of 450 Hz (and secondarily in 100 bauds), it is possible to decode the **SYNOP/SHIP** HF transmissions (WX information).

**PACKET** is an AFSK mode as AMTOR (see above). In 1200 bauds, it allows to acceed in VHF to BBS (Packet servers). It is a mode which allows the transport of APRS (Automatic Position Reporting System) frames.
**DIGISSTV "Run"**: it is possible to send and to receive small pictures in digital SSTV ("Run" protocol), during a QSO in this mode.



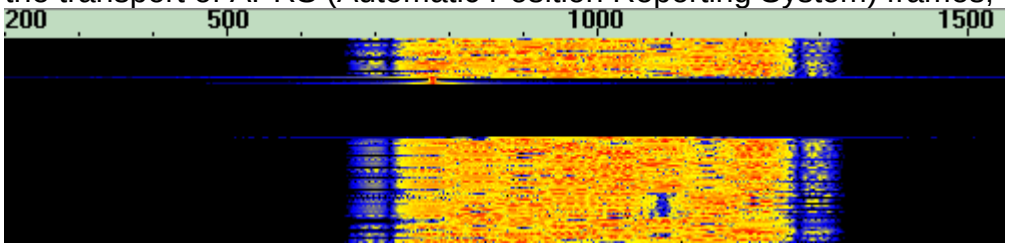

Packet 1200 Unproto

**PACTOR 1** is an AFSK mode using an ARQ protocol (as AMTOR ARQ). It allows QSO error free in HF. It can be also used as a FEC mode: this is the way Multipsk transmits it.



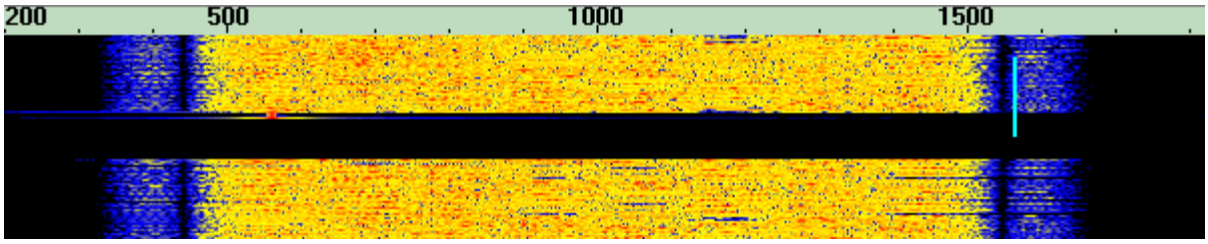

Pactor1 FEC

**PAX** is a robust MFSK mode which derives from Olivia. The minimum Signal-to-Noise ratio is about - 10 dB. It is also a protocol closed to AX25 (the one used for the Packet). Hence, it permits frame exchanges in non-connected mode (Unproto) and the transport of APRS (Automatic Position Reporting System) frames,




PAX Unproto

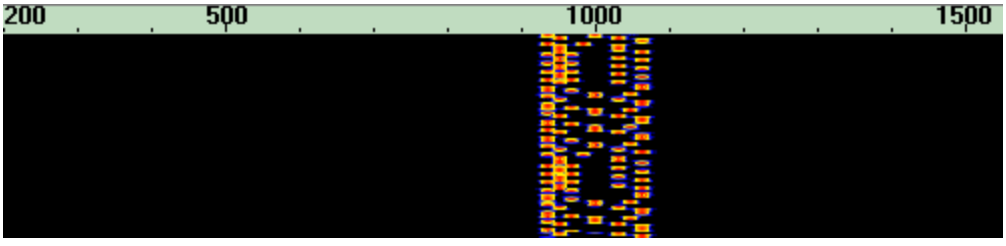
The **PAX2** is the PAX mode but modulated twice rapidly. The minimum Signal-to-Noise ratio is about - 7 dB. It allows a quick communication. The protocol is the same as PAX's one.

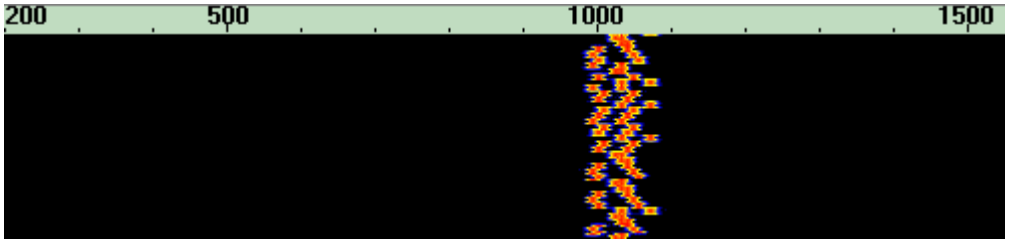



PAX2 Unproto

**THROB** and **THROBX** are experimental multi-tone frequency shift keyed (MFSK) modes, good for low power transmission without being sensible to Doppler as are PSK transmissions. The use of raised cosine shaped tones pulses applied to each character gives a characteristic "throbbing" sound, hence the name of the modes. THROBX is an improved THROB mode but only for speeds of 1 and 2 bauds. The minimum Signal-to-Noise ratio is about - 18.5 dB for THROBX at 1 baud.

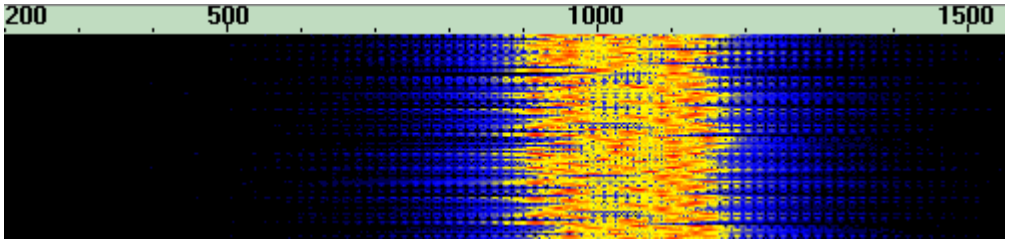
Throb 4 bauds



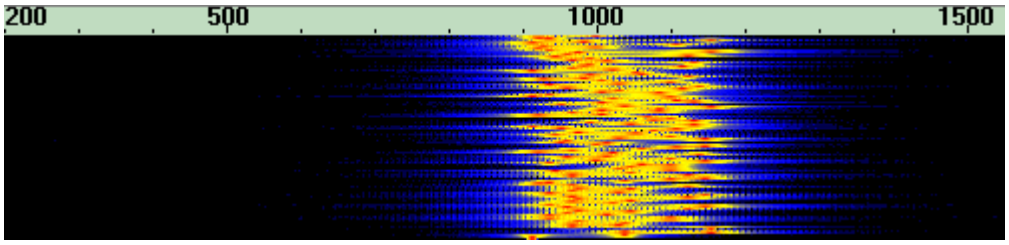



ThrobX 2 bauds

**MFSK16** and **MFSK8** are powerful modes MFSK (Multi Frequency Shift Keying) modes designed specifically for DX. They use a convolutional FEC (Forward Error Correction) coding and an interleaver, which disperse the symbols over a long period of time, in a way that counters the effects of noise and multi-path that affect reception. Bits are sent on a carrier chosen among 16 (MFSK16) or 32 (MFSK8). The minimum ratio Signal-to-Noise ratio is about - 13.5 dB for MFSK16 and -15.5 dB for MFSK8.



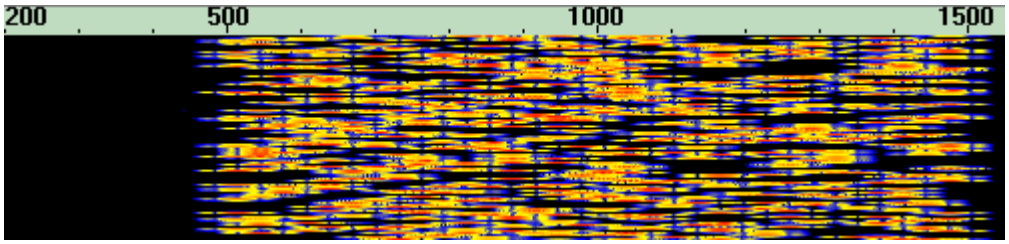

MFSK16




MFSK8

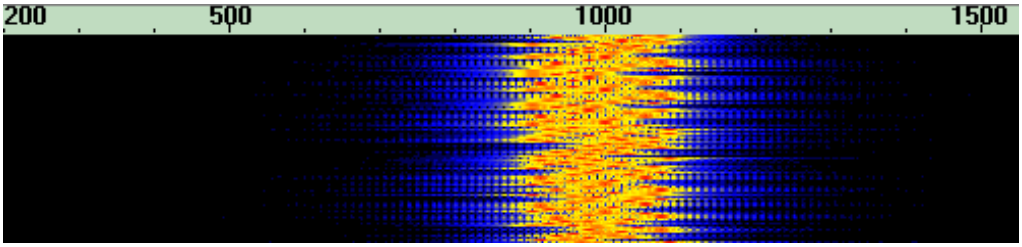
**SSTV in MFSK16**: it is possible to send and to receive small pictures during a QSO in MFSK16.

**OLIVIA** is a MFSK mode designed for QRP and QRM (due to a large bandwidth, up to 1000 Hz) transmissions. It uses Walsh-Hadamard functions, an interleaver and a scrambler which makes it robust. The minimum ratio Signal-to-Noise ratio is about -12 dB (in the standard mode).



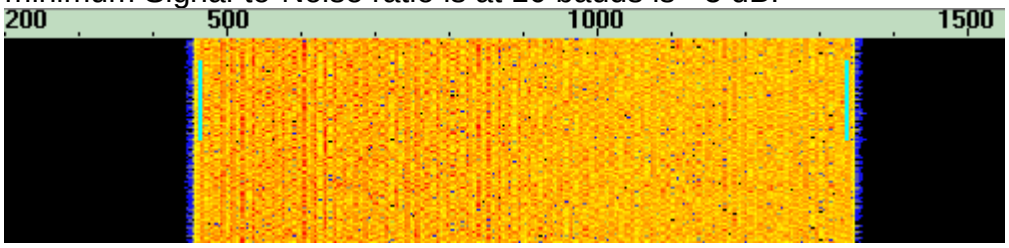
Olivia 32 1K

**DOMINO** DF (DominoF 11) is a sensitive mode which, due to its incremental frequency keying and thanks to its interleaved multiple tones sets, is easy to tune and is few sensitive to interference and ionospheric effects. The minimum ratio Signal-to-Noise ratio is about - 12 dB.



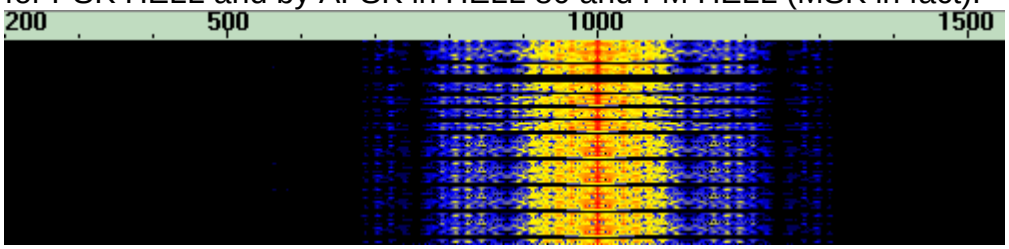
DominoF 11

**MT63**: 64 carrier frequencies are phase modulated. This mode is not sensitive to fading and, due to its interleaving, is considered as a very robust mode. The minimum Signal-to-Noise ratio is at 10 bauds is - 5 dB.

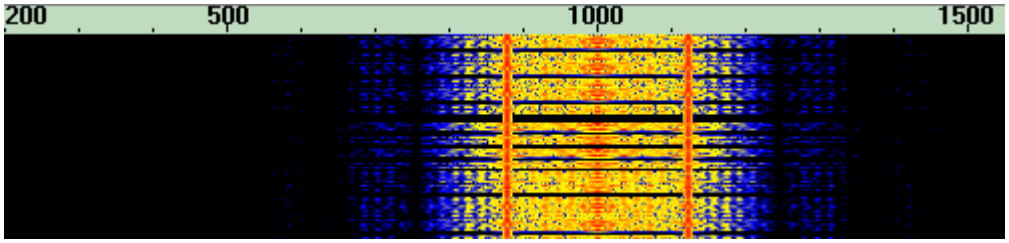


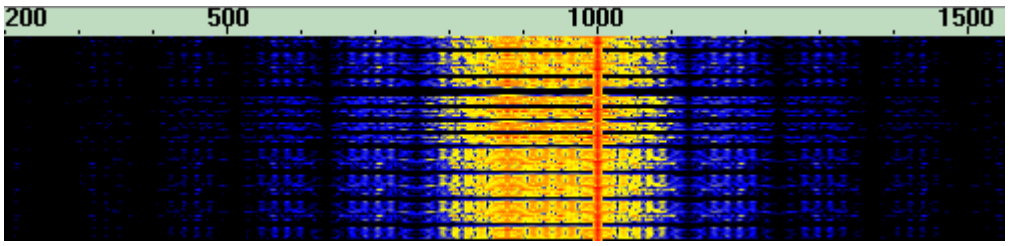
MT63 1K Lg

Hellschreiber **FELD HELL**, **PSK HELL**, **FM HELL** and **HELL 80** modes are graphical modes where characters are drawn and the interpretation done by the user. For FELD HELL, the transmission is done by On-Off keying (OOK) as in CW, by BPSK for PSK HELL and by AFSK in HELL 80 and FM HELL (MSK in fact).

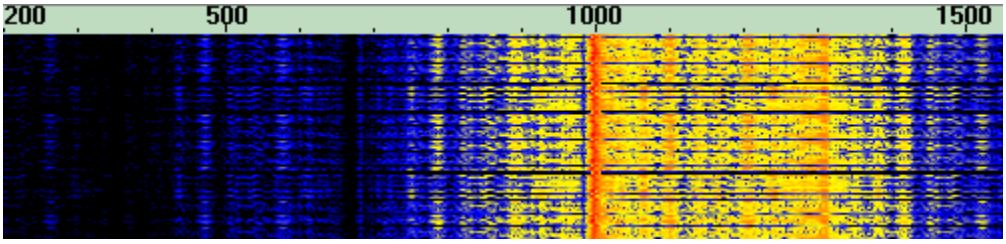


Feld Hell
PSKHell



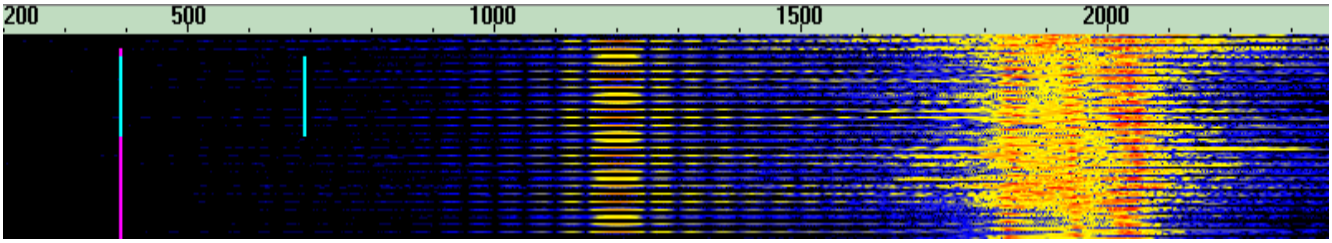



FM Hell



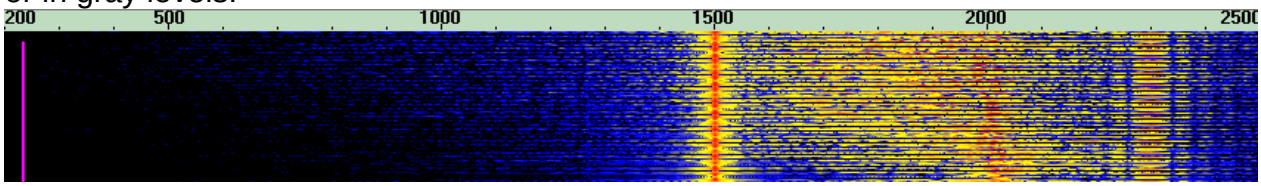

Hell 80

**SSTV** ("Slow Scan Television") allows the user to send fixed pictures (in general in colors), with a bandwidth similar to the one of HF Fax (« shift » of 800 Hz, white at 2300 Hz and black at 1500 Hz). Different SSTV modes are proposed,




SSTV PD 90

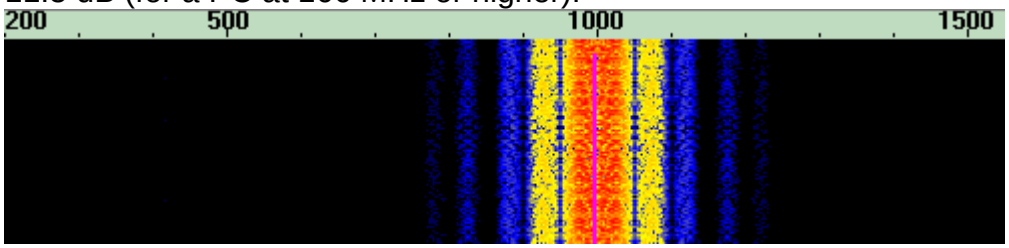
**HF Fax** is similar to the RTTY mode with a shift of 800 Hz, the white at 2300 Hz and the black at 1500 Hz, except it concerns RX/TX of pictures either in black and white or in gray levels.



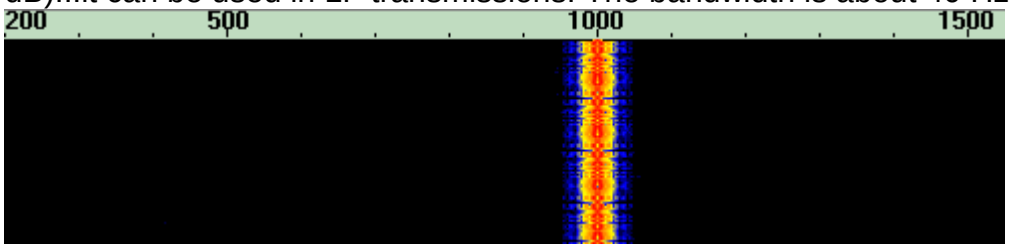

HF Fax

The interleaved **PSKAM50** mode derives from PSK10 mode for the modulation and for AMTOR FEC for the repetition of the characters (time diversity). The speed is 50 bauds but each character is transmitted twice at an interval of five characters (example: A X B Y C A D B…). The speed is about 31 wpm. This mode permits to lower appreciably the number of errors due to HF radio conditions (without

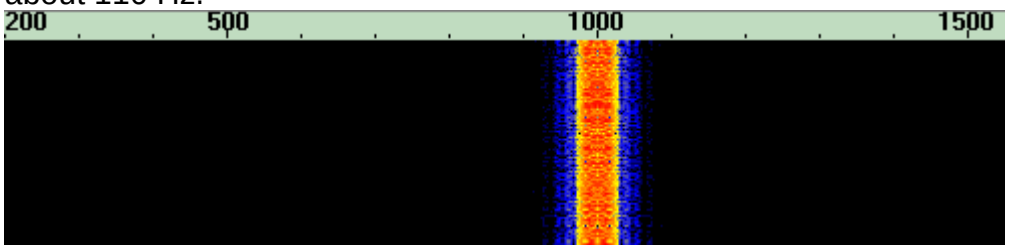
transmitting random characters). The bandwidth is about 180 Hz. The lowest S/N is -11.5 dB (for a PC at 166 MHz or higher).




The **PSKAM10** mode is PSKAM transmitted at 10 bauds. The speed is about 6 wpm. This mode permits only to chat at slowly speed but down to very weak S/N (-19.5 dB)...it can be used in LF transmissions. The bandwidth is about 40 Hz.




The **PSKAM31** mode is PSKAM transmitted at 31.25 bauds. The speed is about 20 wpm. This mode permits to chat down to a weak S/N (-14 dB). The bandwidth is about 110 Hz.




This program proposes an audio filter (as lowpass, bandpass or band rejection) for audio signals received from the receiver. It can also lower the background noise (pseudo-mode **FILTERS**).

This program also proposes a binaural CW reception, i.e. by the two ears, the signals going to the headphones being in quadrature. This reception improves the signal-to-noise ratio as physiologically felt by the user (pseudo-mode **BINAURAL**).

# APPENDIX B
# Radio-clock transmitters (Clock version 1.5.2)
# Presentation and synchronization examples

## Presentation of the transmitters

**FRANCE-INTER** disposes of two 1000 KW transmitters on 162 KHz located in Allouis (Cher), 200 km south-west of Paris.

**DCF 77** disposes of a 50 KW transmitter on 77,5 KHz, located in Mainflingen near Francfort, 500 km north-east of Paris.

**HBG** disposes of a 20 KW transmitter on 75 KHz, located in Prangins near Nyon (Switzerland), 400 km south-east of Paris.

**RUGBY (MSF)** disposes of a 15 KW transmitter on 60 KHz located in Rugby near Coventry, 500 km north-west of Paris.

**WWV**, located at Fort Collins in the Colorado (USA), disposes of two 2500 W transmitters on 2,5 and 20 MHz and of three 10 KW transmitters on 5, 10 and 15 MHz.

**WWVH**, located in the Island of Kauai at Hawaii (USA), disposes of one 5000 W transmitter on 2,5 MHz and of three 10 KW transmitters on 5, 10 and 15 MHz.

**WWVB**, located at Fort Collins in the Colorado (USA), disposes of three transmitters on 60 Khz and of two (north and south) antennas. The effective radiated power of WWVB is 50 KW.

## Examples of synchronization

The SSB receiver is turned on (AM for WWV-WWVH). It is supposed a reception frequency of 500 Hz (adjustable between 500 to 1600 Hz). For WWV-WWVH, the reception frequency is useless (AM reception)

If **FRANCE_INTER** is chosen (preferably because this transmitter is very powerful, but depending on distance to the transmitter), on the SSB receiver, the user adjusts the frequency to 162.5 KHz in LSB or 161.5 KHz in USB, the received sound being a 500 Hz continuous carrier superposed to the speaking broadcast.

If **DCF 77** is chosen, on the SSB receiver, the user adjusts the frequency to 78 KHz in LSB or 77 KHz in USB, the received sound being a 500 Hz variable carrier.

If **HBG** is chosen, on the SSB receiver, the user adjusts the frequency to 75,5 KHz in LSB or 74,5 KHz in USB, the received sound being a 500 Hz variable carrier.

If **RUGBY or WWVB** is chosen, on the SSB receiver, the user adjusts the frequency to 60.5 KHz in LSB or 59.5 KHz in USB, the received sound being a 500 Hz variable carrier.

If **WWV (WWVH)** is chosen, on the AM receiver, the user adjusts, for example, the frequency to 15000 KHz in AM. It must be heard clearly tops, audio frequencies (500 and 600 Hz) and a voice announcing, regularly, the UTC time. It must be noted that the 100 Hz is not audible.
IMPORTANT: if the voice is not properly heard (due to the presence of interferences or parasitics) the time/date reception will be impossible.

# APPENDIX B
# HOW TO DO DIGITAL TRANSMISSIONS

**Further on, it will be found the description of the necessary connections between the transceiver and the computer. This concerns the audio frequency (AF) input and output and the switching transmission/reception on the transceiver.**

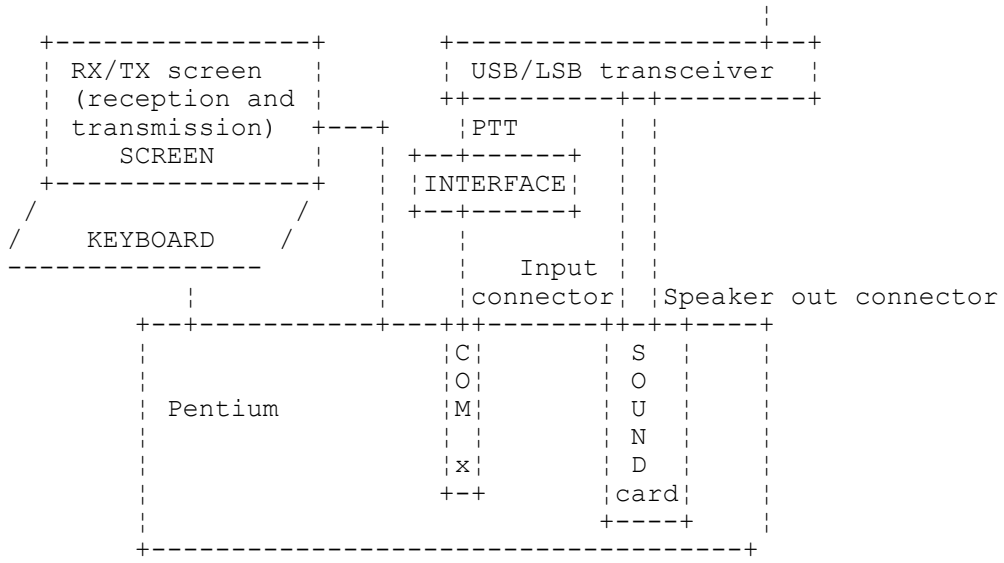
## General principles

The two operations (transmission/reception) are done through a sound card embedded in a free slot of your computer, card that is connected:

* for reception (in input), to the speaker of the transceiver or to the auxiliary AF output (AFSK OUT) or to the AF output on the DATA plug (IC706),
* for transmission (in output), to the RTTY input (AFSK IN) of the transceiver or to another pin of the DATA plug (IC706).

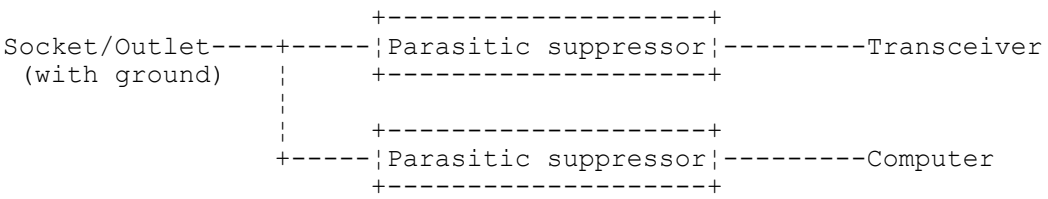
To switch the transceiver in transmission/reception, either the user will use the VOX function of the transceiver or he will use the " Push To Talk " pin which must be connected with an adequate electronic set to the RQS or to the DTR pin of the selected serial port on the program (COM1 or COM2, in general).

## Schematic of the connections (Using the PTT)



## Mains supply

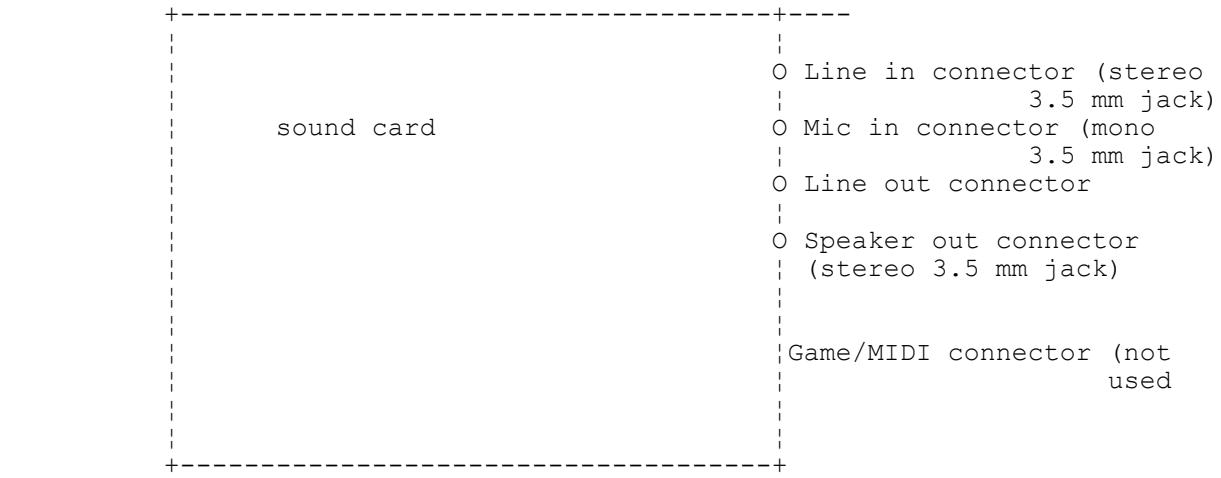
The mains supply (with electrical ground) of the transceiver and the computer may be passed by an individual parasitic suppressor filter dimensioned for this use.




The grounds of the transceiver and of the computer must be connected together with the shortest connection possible. Both grounds will be connected to the general electrical ground.

## Connections between the transceiver and the sound card

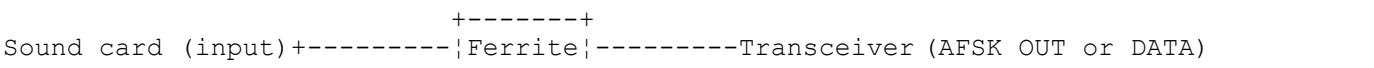
**OUTSIDE CONNECTIONS OF THE SOUND CARD**




Either the Line in or the Mic in connector is used as well as the Speaker out connector (or the Line out connector).
On some sound cards, the Line in input and the Mic input are geographically inverted and on some others there is only one output (Line out).

The direct branch (without ferrites or other feature) of the sound card to the transceiver is not advisable because RF returns will not be avoided when the Ham will be in transmission and parasitics when he will be in reception.

The connections will be done with a thin shielded cable.
On each of the connections to the sound card, it will be wired between 1 to 2 meters of cable around a big ferrite (model with exterior diameter of 3.6 cm and interior of 2.3 cm) of high permeability (coefficient AI=2700 or more, for example):



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                              +-------+
Sound card(output)+-----------¦Ferrite¦---------Transceiver (AFSK IN or DATA)
                              +-------+
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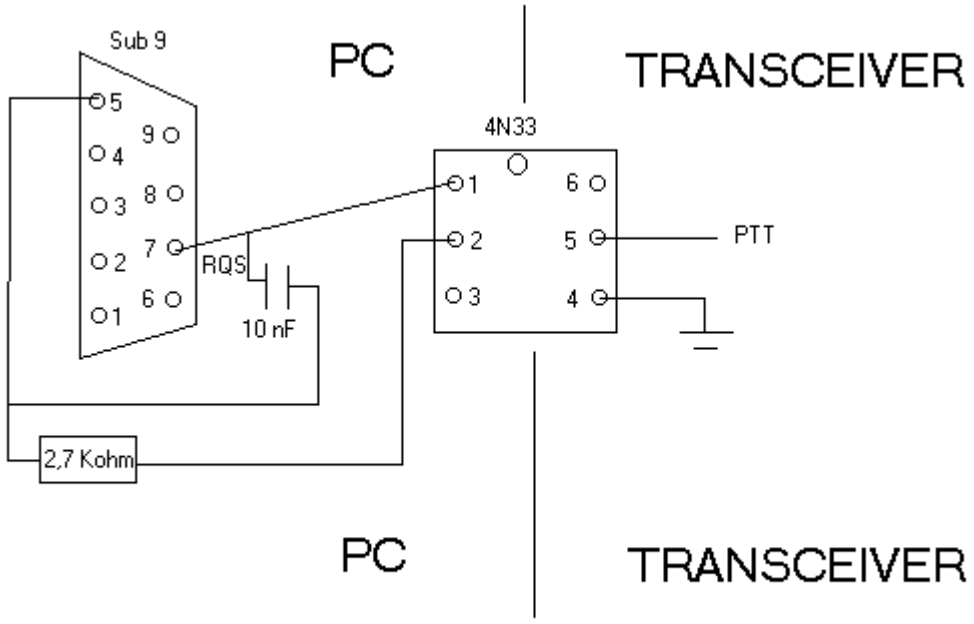
## Switching of the transceiver (connection between the transceiver and the RS232 serial plug on the computer)

It is reminded that if the user does not dispose of the VOX function (or does not want to use it), it is possible to control the PTT terminals of the transceiver by one of the DTR/RQS pin of a serial port (COM 1 to 8).
For this, a menu gives the ability to choose the port between COM 1 and COM 8 and to check the selected one.

Two types of interface are described. The first type is used if the PTT withstands a weak but not nil potential barrier (due to the photo-coupler transistor): this is the case for KENWOOD TS-440S. The second type is used if PTT requires a “dry” contact sec: for example the IC 706.

FIRST TYPE OF INTERFACE
If the user disposes of a TS-440S Kenwood type transceiver, he may use the following interface (adapted from an interface described by F1ULT).



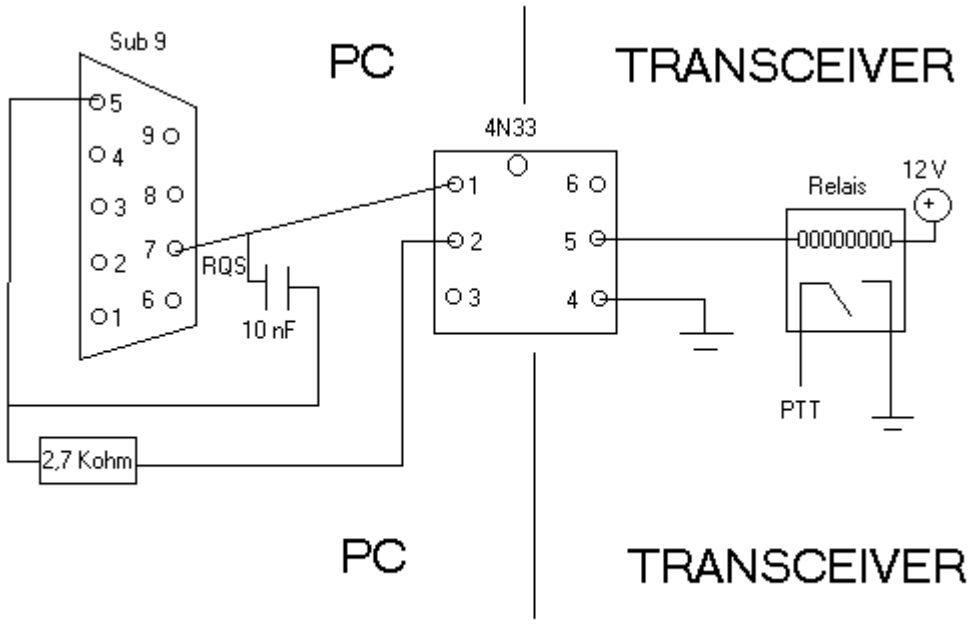

The Sub9 female connector is seen from the pins to weld. The pin number 5 is the logical ground. The RQS pin passes about -10 V in reception to 10 V in transmission.

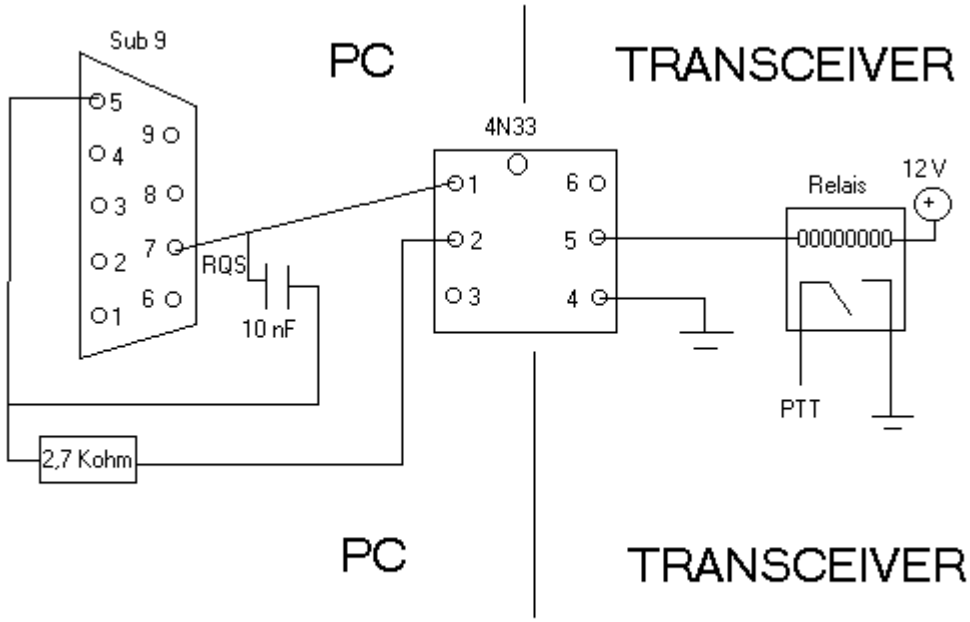
The 4N33 is a Darlington photo-coupler.

On Kenwood TS-440S, the PTT pin (for PTT foot switch) is situated on the REMOTE connector on the rear panel of the transceiver.

SECOND TYPE OF INTERFACE

For transceiver IC706 type, the contact must be or open or closed but without any potential barrier. It may be used the following interface. Of course, this interface may be also used for Kenwood TS440S.






I put the biggest relay I had (a SGR 662 ELESTA model).
The 13.8 V issued from the IC706 must not be used. An independent 12 V source must be used (a little 12 V supply block).

The 3 grounds (from PTT and from lines coming from the sound card) go to pin 2 of the DATA connector. The PTT goes to the pin 3, the line from the sound card receiving the AF signal goes to the pin 5 and the last line from sound card (active in transmission) goes to the pin 1.

## Diverse considerations

To connect the transceiver to the antenna, better is to dispose of a coaxial feeder, if not there is a risk to get parasitics coming from the computer.

To adjust the transmitter, the user produces a “tune” on a resistive charge (with the Multipsk program, for example) and adjusts the output level of his sound card to have the requested power with the minimum AF voltage, so as to keep linear.

The mean power must not exceed the half of the maximal power of the transceiver (in general 50 watts for 100 watts maximum). For example in CW or in PSK31, the power must be reduced to 60 watts (or a little bit more in CW). In RTTY 45 bauds, the power must be reduced to 50 watts because in RTTY the level envelope is constant, as for a tune.

I know that some Hams have particular solutions. For example, Bernard F5OHV uses with success, 2x600 ohm transformers taken on old telephone, for connections between the sound card and the transceiver. It can be found diagrams on Internet and yet on Internet, it exits interesting “ chat ” groups about digital transmissions (Digital, Digipals, PSK31, Multipsk...on Yahoos’s groups, for example).

**IMPORTANT: for those who don’t want to go in an interface project, it exits a big choice of interfaces ready to be employed or nearly ready. In fact, it is enough, in general, to plug straps corresponding to the transceiver and that’s all.**