Patrick Lindecker (F6CTE) the 05th of January 2006 (mail: <u>f6cte@free.fr</u>) 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.

<u>Status of Multipsk</u>: 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.

<u>Status of Clock</u>: 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 "<u>Playing and recording sound files (.WAV)</u>" 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.

🐹 * * MULTIPSK - THE MULTIMODE DIGITA	L TRANSCEIVER	R** Version 3.12 Co	nfiguration	×
Lang(u)age Help and licence PC Options for s	serial ports – Ser	ial port – Serial port for GPS	Sound Ca	rd Mixer
Sequence (long macro) Fonts Your Logbook /	Actions Exit to	RX/TX screen		
Deutshe Hilfe	Open "Conf	iguration" screen after start u	ip De	fault Parameters
Decoding: from the sound input or a sound file	Open RX/	TX screen after start up	Save	Para. Load Para.
EXAMPLE_BPSK31	Recording or	n a .WAV sound file	P	ecording duration
Load a new playing sound file	RECORDIN	G		minutes
Sound input Play Stop O Sound file	Load a	a new recording sound f	ile	240 -
Repeat the recording Pause (s): 1 3 10	No reco	ording C Reco	ording	240
Beacon mode fall modes Odd message Even message		0	3/01/06 1	3:08:31 UTC
No Séquence Sequence	Pause 🔺	Duration 🔟 🗍 🗍	art time for re	ecording or beacon
O Yes 1 🔽 1 🔽	10 s 🖵	15 min 🗾 🔍 No	O Yes	00:00
XIT (for PSK31/63(F)/10, PSKFEC31, PSKAM, T	(HROB(X), MFSK	K, CW and CCW) and initial P	RX/TX freq.	(200 to 4300 Hz)
• XIT as an offset (Hz) XIT: 0	÷ ÷ F	RX Fr.: 1000 ≑	+÷ D	K Fr.: 1000 📗
XIT as a coefficient (0.0001 * Hz/Hz)	x1 x10	×1	x10	
Short cuts ("RX/TX screer	n" for the ma	ain screen):	Full-	duplex sound card
RX/TX screen PSK PANG	DRAMIC	Initial RX/TX modes		Mixer control
Checking serial port Persona	il data	Log book		Reading a QSO
Patrick LINDECKER (F6CTE) 4, a	avenue du Sq	uare BURES-SUR-YVE	TTE 9144	0 FRANCE
VERSION 3.12 of (du) 03/01/2006:				
* mode CHIP (64/128) added (RX/TX) (ajout du mode CHIP (64/128)) (RX/TX)),				
* new PAX2 mode, twice rapid than the PAX mode (nouveau mode PAX2, deux fois plus rapide que le mode PAX), * mode Pactor 1 FEC added (BX/TX) (ajout du mode Pactor 1 FEC (BX/TX))				
* RTTY 50 bauds in RX/TX instead of RX only (RTTY 50 bauds en RX/TX au lieu de RX seulement),				

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.

<u>Note</u> : 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.

X * * MULTIPSK - THE MULTIMODE DIGITAL TRANSCEIVER * * Version 3.12 RX/TX screen	_ 8 ×
Help Transceiver Country/Locator World QSO Config Tune Program Beacon Panoramic Exit BPSK31 BPS	K63 PSKFEC31 PSKAM 10 31 50
About Clocks Sampling freq. PC (>=) MHz Mixer adjustments Level Over QPSK31 QPS	K63 PSK10 MT63
Licence Personal 16 bits Video ID © 450 0 166 0 66 Input Output 30 %	SKI PACKET+APRS+DIGISSTV
1 Call Name Freq Mhz Mode Ur RST My RST R S Wkg QTH NOTES ? Clear Logbook Record Pactor1 FEC	RTTY 45/50+SYNOP 75 100 ASCII
TX/BX modes Economical Video ID and and 21 hand Mode	DR ARQ AMTOR FEC
TX: BPSK31 MODE BX: BPSK31 Auto mode BFSK37 C Master PAX/PAX2+AP	PRS OLIVIA HE FAX SSTV
TX frequency RX frequency Fr. difference: Squelch IMD= Quality=5/5	PSK HI FM HI HELL 80
993.2 Hz 993.2 Hz 0.0 Hz 2 Reset n="8" 0 S/N>+15 dB FILTERS BINA	
	2500 Spectrum Waterfall High
	Mar1 Mar2 Go M1 Go M2
	Band KHz (P450=+)
	↓ 10 AGC Grey ↓ →
BPSK31	
File MACROS Clear Repeat UTC/GMT SEQ. 9 SEQ. 10 CW end/fin CW answer	
	A
	-1
	-
	<u> </u>
Snapshot Print Fonts Clear Ø Double Auto TX Height + 50 TX STOP RX 03/01/06 13:20:20 UTC	

Transceiver window (chapter "<u>Transceiver control through the Commander</u> <u>software</u>" 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

🔉 Transceiver control through the Com	imander software		
Multipsk is connecte	d with Commander	03/01/06 13:37:43 UTC	DDCK24 DDCK63 D
Help	+1 +10 +100 +1 KHz +10 KHz +10		OPEK21 OPEKE2
Mouse wheel step: 100 Hz	-1 -10 -100 -1 KHz -10 KHz -10	0 KHz -1 MHz -10 MHz - Band	DEKE2E DICISETV
Export of the frequency to the log	· F KU- · 12 F KU- · 25 KU- 174		PSK63F DIGISSTVI F
From/to the transceiver			CW CCWI-FSKI
0.000 KHz PTTY-P	-3 KHZ -12.3 KHZ -23 KHZ CHT	as ("M1" and "M2"	Pactor1 FEC RITY 4
	Management of the two available memore		TOR A AMTOR ARC
14075 KHz Forward	M2: Store 10.149.000 KHz		THROB THROBX MI
14075 Kiz 10Maid	MZ. 3000 10140,000 KHZ		PAX/PAX2+APRS OI
TX frequency RX frequency Fr. difference	Squelch IMD	= Quality=1/5	FELD HELL PSK H
999.9 Hz 999.9 Hz 0.0 Hz	On 2 Reset	n="8" 0 S/N<-30 dB	FILTERS BINAURAL
200 500	, 10 <u>00 , , , , , , , , , , , , , , , , , ,</u>	1500	2000

Country/Locator and **World** windows (chapter "<u>Countries, world map, Locator,</u> <u>automatic reception and location</u>" 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 "<u>Reading a QSO in progress or a previous QSO</u>" 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).

🔉 Reading of the QSO in progress or a previous QSO	<u>(</u>
<rx> BPSK31 CQ CQ CQ CQ DE F6CTE F6CTE F6CTE CQ CQ CQ CQ DE F6CTE F6CTE F6CTE C</rx>	BPSK31 BPSK63 P QPSK31 QPSK63 PSK63F DIGISSTV F CW CCW(-FSK) F Pactor1 FEC RTTY 4 TOR A AMTOR ARC THROB THROBX MI PAX/PAX2+APRS OI FELD HELL PSK H FILTERS BINAURAL 2000
In RTTY and AMTOR, the short bell is noted "*".	
CQ CQ CQ DE F6CTE F6CTE F6CTE F6CTE CQ CQ CQ CQ DE F6CTE F6CTE F6CTE CQ CQ CQ CQ DE F6CTE F6CTE F6CTE CQ CQ CQ CQ DE F6CTE F6CTE F6	

Tune window (chapter "<u>Tune function and opening of a repeater</u>" 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).

🔀 * * MULTIPSK - THE MULTIMODE DIGITAL TRANSCEIVER * * Version 3.12 RX/TX screen					
Help Transceiver Country/Locator Work	d QSO Config Tune Program Beacon Pa	noramic Exit	BPSK31 BPSK63 P		
About Clocks Sampling freq. PCI Licence Personal 16 bits Video ID • 4	Tune	Over	PSK63F DIGISSTV		
1 Call Name Freq Mhz Mode Ur RST t BPSK31 599	TX frequency of: 1000 Hz	jbook Record eper DXK fields	Pactor1 FEC RTTY 4		
TX/RX modes Frequencies Video ID r	duration: 6 sec		THROB THROBX M		
TX frequency RX frequency Fr. difference Square 1999	P moy BPSK31-63(F)-220F-PSKAM31/P moy Tune = 79 % P moy CHIP (64/128) / P moy Tune = 79 %	ality=5/5	FELD HELL PSK H		
200 500	P moy QPSK31 - QPSK63 / P moy Tune = 38 % P moy PSKAMI0 - 50 / P moy Tune = 86 %	N<-30 dB	2000		
	P moy PSK10 - PSK1EC317 / Pmoy Tune = 86 % P moy CW-CCW / P moy Tune = 50 % P moy CCW-FSK - PACTOR 1 FEC / P moy Tune = 100 % P moy RTTY - ASCI1 - PACKET / P moy Tune = 100 % P moy AMTOR-FEC - HELL 80 / P moy Tune = 100 % P moy HF-Fax - SSTV - FM HELL / P moy Tune = 100 % P moy MFSK16 - MFSK8 - DOMINO / P moy Tune = 100 % P moy FELD-HELL / P moy Tune = 25 %				
CQ ABCDEFGH 12345678 File MACROS Clear Repeat U	P moy PSK HELL / P moy Tune = 62 % P moy THROB 4bauds / P moy Tune = 19 % P moy THROB(X) 1-2 bauds / P moy Tune = 35 % P moy MT63 / P moy Tune = 10 % P moy OLIVIA · PAX · PAX2 / P moy Tune = 76 %	SEQ. 8 CW answer			
	Hepeteur: [Hz] 67.0 88.5 1750 End of tune Help				

Program window (chapter "<u>Multipsk programming</u>" 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.

MULTIPSK - THE MULTIMUDE DIGITAL TRANSLETTER * * Tersion 3.12 RX/TX screen	
Help Transceiver Country/Locator World QSO Config Tune Program Beacon Panoramic I	Exit BPSK31 BPSK63 P
🕅 Multipsk programming for the reception management	Over QPSK31 QPSK63
R-200	PSK63F DIGISSTV F
	Cord CW CCW(-FSK)
	Field Pactor1 FEC RITY 4
	TOR A AMIOR ARG
	PAX/PAX2+APRSI OI
	FELD HELL PSK H
	2000
// "//" for comments	
// this simple program sweeps the spectrum in CW mode	
SOUND 1000 30 // a SOUND of 30 ms at 1000 Hz at each call (one by second)	
// initialization	
// block IFEQUALENDIF run if IFEQUAL is true	
IFEQUAL N -1 // N=-1 only true at the first call	8
CLEARWINDOW // clear the user window	er
ROUAL H 14078000 // the variable H is set to 14078000 (Hz)	
Line Line Print Print user window	
Save	
Program example Load a program file Save as End	
Control Execution Automatic running Pause Help	

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.

🔉 * * MULTIP5K - THE MULTIMODE DIGITAL TRANSCEIVER * * Version 3.12 RX/TX screen	
Help Transceiver Country/Locator World QSO Config Tune Program Beacon Panoramic Exit	BPSK31 BPSK63 P
About Clocks Sampling freq. PC (>=) MHz Mixer adjustments Level Over	QPSK31 QPSK63
Licence Personal 16 bits Video ID @ 4500 166 0 66 Input Uutput U 2 J	CW CCW(-FSK)
Call Name Freq Mhz Mode Ur KST My KST K S Wkg UTH NUTES ? Llear Record	Pactor1 FEC RTTY 4
TX/RX modes Frequencies Video ID prefix Sound card	TOR A AMTOR ARC
TX: BPSK31 RX: BPSK31 Auto mode	PAX/PAX2+APRS OI
TX frequency RX frequency Fr. difference Squelch [IMD= Quality=3/5]	FELD HELL PSK H
1000.0 Hz 1000.0 Hz 0.0 Hz 0.0 Hz 0.0 Hz 0.0 Hz 1000 1000 1000 1000	FILTERS BINAURAL
	2000

BEACON: BPSK31 TRANSMISSION

Beeps on your call: F6CTE Stop

CQ CQ CQ CQ CQ DE F6CTE F6CTE F6CTE +K®

Panoramic window (chapter "<u>Panoramic reception for PSK modes (BPSK31, BPSK63</u> <u>and PSKFEC31)</u>" 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.

Panoramic for PSK reception (BPSK31, PSK63 and PSKFEC31)	
p	
1500 -	
1000 - event and the call of the root in t	
500 -	
Ea	
Click on the USD in progress to traduce it in the RX/TX window U3/U1/U6 15:U4:U8 UTC	
BPSK31BPSK53 Squarer 2 Recording control Output volume 30 %	
Return to translator without selection STOP BX Clear all Help Country World >=450Mbz >=166Mbz PC ob	
Reeps on recention of a general call "CO-CO-" or on the "Call" or on the text of "NOTE y" as specified in "Personal data"	
Beeps on: "CQ CQ " Call (Indicatif) Note 1 Note 2 Note 3 Note 4 Stop beeps	
Personal data Return to BX/IX on alarm	

Clocks window

Local and UTC dates and times are displayed.

🔀 Local and UTC times 🛛 🗶	DE DIGITAL TRANSCEIVER * * Version 3	.12 RX/TX screen	
16:09:26 15:09:26	cator World QSO Config Tune	Program Beacon Panoramic Exit	BPSK31 BPSK63 P
03/01/06 03/01/06	freq PC (>=) MHz Mixer adjustm	ientsCevelCver	QPSK31 QPSK63
. 12	eo ID • 450 • 166 • 66 Input	Output 0%	PSK63F DIGISSTV
	de UrRSTMyRSTR SWkg QTH	NOTES ? Clear Logbook Record	CW CCW(-FSK)
	1 599 599	Log DXKeeper Cha DXK	Pactor1 FEC RITY 4
Local UTC	Help on right click		TURA AMIORARC
Only Local Only UTC	BX: BPSK31 Auto mode	Slave	PAY/PAY2+APPS OI
TX frequency BX frequency Er d	ifference - Squelch	TMD= Quality=1/5	FELD HELL PSK H
1000.0 Hz 1000.0 Hz 0	OHz On 2	Beset n="8" of c /w / 20 Jp	FILTERS BINALIRAL
200 500	1000	1500	2000

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.

	My personal data					
Ē	<my call=""></my>	<my na<="" td=""><td>ME></td><td><my qth=""></my></td><td><my locator=""></my></td><td>BPSK31 BPSK63 P QPSK31 QPSK63</td></my>	ME>	<my qth=""></my>	<my locator=""></my>	BPSK31 BPSK63 P QPSK31 QPSK63
ļ	F6CTE	Patrick	Bur	es-sur-Yvette	JN18CQ	PSK63F DIGISSTV CW CCW(-FSK)
ŕ	<web adress<="" td=""><td>3> <₩E</td><td>B SITE></td><td><!--</td--><td>RIG></td><td>Pactor1 FEC RTTY 4</td></td></web>	3> <₩E	B SITE>	</td <td>RIG></td> <td>Pactor1 FEC RTTY 4</td>	RIG>	Pactor1 FEC RTTY 4
Ê	f6cte@free.fr	http://i	f6cte.free.	TS440S, 30 watts	output	THROB THROBX M
F	<antenna> <com< td=""><td>MPUTER></td><td><software></software></td><td>PAX/PAX2+APRS OI FELD HELL PSK H</td></com<></antenna>		MPUTER>	<software></software>	PAX/PAX2+APRS OI FELD HELL PSK H	
2	Broad-Band ante:	nna H	Pentium 220	0 MHz	Multipsk	FILTERS BINAURAL
I	<note1></note1>	<nc< td=""><td>)TE 2></td><td><note 3=""></note></td><td><note 4=""></note></td><td></td></nc<>)TE 2>	<note 3=""></note>	<note 4=""></note>	
I						
	Can	cel		Save	Help	

Sampling freq. window (chapter "<u>Determination of the sound card RX/TX sampling</u> <u>frequencies</u>" 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.

🔀 * * MULTIPSK - THE MULTIMODE DIGITAL TRANSCEIVER * * Version 3.12 RX/TX screen	
Help Transceiver Country/Locator World QSO Config Tune Program Beacon Panoramic Exit	BPSK31 BPSK63 P
About Clocks Sampling freq. PC (>=) MHz Mixer adjustments Level Over	QPSK31 QPSK63
Determination of the RX and TX sound card sampling frequencies	CW CCW(-ESK)
Return (in PSK10 mode) Help	Pactor1 FEC RTTY 4
First step: détermination of the RX sound card sampling frequency (standard=11025)	TOR A AMTOR ARC
Determination of the standard RX sampling frequency (test on 5 minutes)	THROB THROBY MI
11097 samples/second Ouality=4/5	FELDHELL PSK H
Second step (optional): precise determination (see help)	FILTERS BINAURAL
Third step (optional): offset between RX and TX sampling frequencies (see help)	2000
Determination of the TX/RX offset (for "full-duplex" sound card)initially: 0 samples/s	
PSE: confirm the result	
Fourth step: determination of the RX/TX sampling frequency for MT63 (standard=8000)	
Determination of the MT63 RX/TX sampling frequency (test on 3 minutes)	
8098 samples/second	

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.

🔀 * * MULTIPSK - THE MULTIMODE DIGITAL TRANSCEIVER * * Version 3.12 RX/TX screen	
Help Transceiver Country/Locator World QSO Config Tune Program Beacon Panoramic Exit	BPSK31 BPSK63 P
About Clocks Sampling freq. PC (>=) MHz Mixer adjustments Level Over	QPSK31 QPSK63
Licence Personal 16 bits Video ID 450 166 66 Input Output 1	CW CCW(-ESK)
🐹 Management of the mode label sent in CMT Hell before the transmission, and visible on the "wate 💶 🗖 🗙	Pactor1 FEC RTTY 4
Font Information to be sent	TOR A AMTOR ARC
Hell 80 double (standard) Mode User call Locator	THROB THROBX M
C FELD Hell double, normalMULTIPSK''User nameQTH (20 char, max)	PAX/PAX2+APRS OI
C Hell 80 double, bold " <u>"HTTP://F6CTE.FREE.FR"</u>	FELD HELL PSK H
Help Quit Standard parameters Personal	FILTERS BINAURAL
	2000

Logbook window (chapter "<u>Use of the Multipsk logbook and logging of an external</u> <u>logbook (DXKeeper...)</u>" 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.

X * * MULTIPSK - THE MULTIMODE DIGITAL TRANSCEIVER * * Version 3.12 RX/TX screen	
Help Transceiver Country/Locator World QSO Config Tune Program Beacon Panoramic Exit	BPSK31 BPSK63 P
About Clocks Sampling freg. PC (>=) MHz Mixer adjustments Level Over	QPSK31 QPSK63
Licence Personal 16 bits Video ID 450 166 66 Input Output 0%	PSK63F DIGISSTV
2 Call Name Freq Mhz Mode Ur RST My RST R S Wkg QTH NOTES ? Clear Logbook Record	Pactor1 EEC PTTV 4
DN3AD Pat 3.590 PAX 539 539 Y Y Leopoldsb test PAX Log DXKeeper Cha. DXK	TOR A AMTOR ARC

<u> Log</u> Book										X
Exit Help Day / Month / Year 01 01 01 >= = =	From all data Filter editor Call filter Mode filter	QSO by QSO Page by page	Alphabetical order Reverse alpha order Log start Log end	Display all Delete all QSO modificat Delete QSO Log DXKeep	tion					
UTC/GMT	CALL	NAME	FREQ (MHz)	MODE	UR RST	MY RST	R S WKD	CONDITIONS	(OM) /	STATION
03/01/06 15:37:1	18 ON 3 AD	Pat	3.590	PAX	539	539	Y Y			
1 rov	cord of OSO	Number	of the last display	nd 090-1						<u> </u>
Export file name Export 03-01-2006 Export in text forr Options relative to the s Automatic search	TXT Export to mat Archi earch of a call among the h QSO fields	DXKeeper (V. 4.2.2 or r ving Compress last QSO's (button "?" in RX/TX overwriting Search in a	nore) Export 03:01 sion Export 03:01 screen) ADII	in ADIF format						

Sequence window (chapter "<u>Setting up of sequences (long macros) 1 to 24</u>" 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.

Sequence text editor (5000 characters maximum) File: F1.SER Sequence 1	
Macros: <my call=""> <my name=""> <my oth=""> <my locator=""> <mes and="" locator<="" th=""> <mes <="" and="" locator<="" th=""><th>PSK31 BPSK63 P PSK31 QPSK63 PSK63F DIGISSTV F</th></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></mes></my></my></my></my>	PSK31 BPSK63 P PSK31 QPSK63 PSK63F DIGISSTV F
Contacted OM Contacted OM Addition and addition and addition and addition and addition and additional a	CW CCW(-FSK)
Diverses	Pactor FEC RITY 4
modes <u>KPSK63</u> <u>KPSKFEC31</u> <u>KPSK10</u> <u>KPSK63F</u> <u>KCW</u> <u>KCW</u> <u>KBSK31</u> <u>KD</u> <u>KS75</u>	UPOP TUPOPY
THROBS THROBS MESK16S MESK8S ASCID KETTYS AMTORS PSK220F2	HROB THROBA MI
<u><preced></preced></u>	PAXIPAXZ+APRS U
CQ CQ CQ CQ CQ DE F6CTE F6CTE F6CTE +K <rxclr></rxclr>	
	2000
	2000
Lext control according to the selected mode	
CANTOR CARTONICAL AND A CARLAR THE CARTONICAL AND CARTONICAL AND CARTONICAL AND CARLAR CARTONICAL AND CARTONICA	
C DAMIUNO C MIDS/OLIVIA C FELD/PS/RELL/PMELL/RELL/BU C KITY C THRUB C THRUBA C ASUL/ DIS	
Heip Edit Save Gose Save and close	
Sequence name	
Edit sequence name CO Save sequence name	

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.

% * * MULTIPSK - THE MULTIMODE DIGITAL TRANSCEIVER * * Version 3.12 RX/TX screen	
Help Transceiver Country/Locator World QSO Config Tune Program Beacon Panoramic Exit	BPSK31 BPSK63 P
About Clocks Sampling freq. PC (>=) MHz Mixer adjustments Level Over	QPSK31 QPSK63
MACROLIBRARY	CW CCW(-FSK)
	Pactor1 FEC RTTY 4
My information (ANTENNA> (COMPUTER> (SOFTWARE> (NOTE 1> (NOTE 2>	TOR A AMTOR ARC
	THROB THROBA MI
His information <call> <name> <oth> <my rst=""> Help Cancel</my></oth></name></call>	FELD HELL PSK H
Diverses	FILTERS BINAURAL
Ζυυ οφυ τυρυ τορυ τορυ	2000

Mode window (chapter "<u>RX/TX modes selection and their descriptions</u>" 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.

📡 TX AND RX DIGITAL MODES SELECTION	×	
TX mode = RX mode Reception mode (RX)		BPSK31 BPSK63 P
Shift for 50, 75, and 100 bauds RTTY transmissions	Description of the modes	QPSK31 _QPSK63 _ PSK63F DIGISSTV _F
85 Hz (50 b) 425 Hz (standard) 450 Hz (50 b.) 850 Hz	Frequencies used	CW CCW(-FSK)
<u>1/0 Hz (/5 b.)</u> <u>183 Hz (/5 bauds)</u> <u>200 Hz (/5 b.)</u>	CW/CCW <> ANSI	Pactor1 FEC RTTY 4
CW (Morse) parameters Keying done through the serial port DTR or RQS pin (for P166 or +)	CCW-OOK + CCW-FSK Keying CCW speed	TOR A AMTOR ARC THROB THROBX MI
Yes (not advised for W. XP) No (keying by the sound-card)	12 words/mn	FELD HELL PSK H
Keying CW speed Translation CW speed	 "ררש " prefix	FILTERS BINAURAL
20 words/mn Standard AUTO	Yes No Standard	2000
Return		

SYNOP+CHIP window in RTTY 50 bauds (chapter "<u>Description of the SYNOP/SHIP</u> <u>commands (in RTTY 50 bauds)</u>" 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).

🔀 SYNOP and SHIP transmissions (WX) decoding	
Correct message	03/01/06 19:13:37 UTC
Maps New map definition Clear the map Auto. User units Display	Ring File Filter <mark>Off Ship Help Exit Print</mark>
03/01/06 19:13:36 UTC	Snapsh.
AAXX 03184 71816 32574 12410 11146 21187 30119 40183 56007 81500 333 11144 21221 7999	9
Stations in chronological order Display all 03/01/06 19:13:36 UTC Manned VITC time AIRPORT Canada (alt:49 m) 1 Stations in alphabetical order 12 4 1 Display hour Display hour X=189 Y=17 Lat=57^40.50' N Long=005^45.00' E S. X=2409 km	<pre>land station 71816 CYYR GOOSE BAY 8:00 UTC the 3rd Lat=53^19 N Long=060 from anemometer Base:600 to 1000 =-14.6 C Dew=-18.7 C Loc pres=1011.9 Sea Decreasing, then steady resultant 2528 km Distance=1027 km / Az.=12deg</pre>
06030 06070 0612061206120 0612061206120 06252 06260 06408 07005 07005 07007 07005 0705 070	Call 71816 Time/date 18:00 UTC the 3rd Latitude 53°19N Longitude 060°25W Source: CYYR GOOSE BAY AIRPORT Canada (alt:49 m) Direction (deg.) 240 Speed (km/h) 18.5 Temperature (C) -14.6 Humidity (%) -18.7 Sea pres. (mBar) 1018.3 Loc pres(mBar) 1011.9 Pressure evolution 3h (mBar) -0.7 Cloud cover 1/8th Visibility 24 km Cloud base 600 to 1000 m Sky state 1/8 Rain (mm) 9999 (in 24h) Ship
08045 08045 08545 08545 08221 08557 08221 08557 08221 08557 08221 08557 08221 08557 08221 08557 08221 08557 08221 08557 08221 08557 08221 08557 08545 08221 08557 08545 08545 08221 08557 08545 08545 08545 08221 08557 08545 08557 08221 08557 08575 08221 08557 08575 08575 08221 08557 08575 08221 08557 08575 08221 08557 08575 08221 08557 08575 08221 08557 08575 08221 08557 08575 08575 08221 08557 08575 08221 08557 08575 085555 085555 085555 08555 085555 085555 085555 085555 08	Min temp. (C) .22.1 Max temp. (C) .14.4 Other information Low clouds: stratocumulus Middle clouds: no middle clouds High clouds: no high clouds Distance=4271 km / Rz.=301deg

DIGISSTV window (chapter "<u>Description of the DIGISSTV ("Run" protocol) commands</u> 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.

🔀 RX/TX of "	'Run'' digital SST¥	pictures		_ 🗆 🗙	TX screen	
RX	Historic RX	ΤX	Picture		leacon Panoramic Exit	BPSK31 BPSK63 P
Forma	t: 80x70 color, 10	6:29:10 UTC	, d=47s		Level	OPSK31 OPSK63
	End of picture	reception			27 %	PSK63F DIGISSTV F
	Auto. recording	Clear Sele	ective clear Init	Help	? Clear Logbook Record	Pactor1 EEC RTTY 4
	uto. complement	Complement			Log DXKeeper Cha. DXK	TOR A AMTOR ARC
	100 % Line: 70	Compleme	nt and record			THROB THROBX MI
	<				onder OFF - beacon OFF	PAX/PAX2+APRS OI
PI A C	-				lo	FELD HELL PSK H
	Z				Options Resp. / Dead Mail	2000
1 1 - 3 A	Ç.					
					Martin Providence	
					SEQ. 7 SEQ. 8	
					W end/fin CW answer	
<u> </u>						

APRS window (chapter "<u>Description of the APRS commands (in non-connected Packet</u> <u>or PAX/PAX2)</u>" 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.

🔀 Packet APRS frames decoding/coding	
Correct APRS frame	03/01/06 16:36:10 UTC SKFE
Maps New map definition Clear the map Auto. Units Display Ring He	p GPS Off Transmission Beacon Off Exit Print PSK
03/01/06 16:36:05 UTC APZMU3 de F6CTE	Snapsh PSK2
/031640z4841.97N/00209.35E-APRS test transmission	PACK
Stations in chronological order Display all 03/01/06 16:36:05 UTCI Source:	FECTRIARZMUS de FECTRILE: 40 UTC the 3rdi
UIC time Lat=48^41.97'N Long=002^09.3	5'E Precis=0.005' House QTH (VHF)
Distance=0 km / Az.=Odeg Com	ment:APRS test transmission
Stations in alphabetical order Frame: /031640z4841.97N/00209.	35E-APRS test transmission
Display hour	
X= Y= Lat= Long= E. X= E. Y=	=2528 km 25
	de F6CTE Time/date 16:40 UTC the 3rd
	Lat. 48^41.97'N Long. 002^09.35'E Prec. 0.005'
	"Icone" House QTH (VHF)
and the second	
	Direction (deg.)
the lost the se	Speed (km/h) W
The product of the second	Cust (Im/b)
The way through	Gase (Might)
FECTE A AND A	Temperature (C) Pressure(mBar)
and the start and	Rainfall during last hour (mm)
C S Contract ()	Rainfall during last 24 hours (mm)
A JAY & MA L	Rainfall since midnight (mm)
he and the to	Sportfall during last 24 hours (cm)
he may the here of	Humidity (%) Luminosity (Watt/m2)
7 / 1 / 10-52	APRS test transmission
A TATA	Other information
15 (.º V 6'\$3''	Distance=V Km / Az.=Vdeg
A low	
Mar and the	T F

Resp./Beac window (chapter "<u>Description of the specific PACKET (PAX/PAX2)</u> 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").

🐹 Beacon and AX25 responder + rad	io mail (for licensed copies only), to s	tart in Unproto mo	de 💶 🛛	
Welcome to my automatic responder. Type "L" to read the titles of the 8 message Type "Rx" to read the message number x (x Your message will be stored. The TX power is 5 watts and my Locator is v Bienvenue sur mon répondeur automatique. Tapez "L" pour lire les titres des 8 message: Tapez "Rx" pour lire les titres des 8 message Tapez "Rx" pour lire le message numéro x (s Votre message sera enregistré. La puissance TX est de 5 watts et mon Loc	s. from 1 to 8). IN18CQ. s. « entre 1 et 8). ator est JN18CQ.			BPSK31 QPSK31 PSK63F CW C Pactor1 TOR A IHROB PAX/PA FELD H FILTER
Title Connexion				2000
Record the message	466 characters	Ra	dio mail	
Packet beacon		Pause	Duration	
Beacon enabled	Message transmitted by the bear	con 20 s 👻	15 min 👻	
Click on a "message buttor	" to modify the corresponding messa	ige.		
Ī	Message 1	Arc	hive message 1 📗	
	Message 2	Arc	hive message 2	
	Message 3	Arc	hive message 3	
	Message 4	Arc	hive message 4	
	Message 5	Arc	hive message 5	
	Message 6	Arc	hive message 6	
	Message 7	Arc	hive message 7	
	Message 8	Arc	hive message 8	
	Connection	Arch	ive "connection"	
Befurn to BX/TX window	Responder enab	led 📃	Help	

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

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

Radio mail (messages re	ceived by the Packet or by	the PAX/PAX2 responder),	for licensed copies only		< -
Exit Help Day / Month / Year	From all data One by or Filter editor	ne Page by page	Display all Delete all		3
01 01 01 →= = =<	Call filter	File	e start Message display e end Delete message		S
DESTINATION F6CTE	MODE U1 PACKET 1K2 03/01/0	C/GMT CALL 06 16:59:52 F2XYZ	MESSAGE This is my message: "	Test of the Multipsk radio mail".¬	- o
	· · · · · ·	· · · · ·	<u> </u>	·	
					F
					45 C
-					
Arabicing file mana	1 message	Number of the last (disnlaved message: 1		-
Archive 03-01-2006 .TXT	l		Export message		F
Manual archiving	Automatic archivin	g Compression	Print message	Message:	╞
The 03-01-06 16h59m	n52 from F2XYZ	to F6CTE	in PACKET	1K2	
This is my message:	"Test of the Multip	osk radio mail".			<u> </u>

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 "onboard" 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.

GPS RECEIVED TRANSMISSION (UTC	TIME) DISPLAY AND CONTROL	×
Help		
Castisuaus ball to a	ton manuallu	
Alarm time	top manually	GFS CONTROL WINDOW
14-00-00		
14:26:33		Success opening the serial port linked to the GPS
LUCAL AND UNIVERSAL ST	STEM TIME DISFLAT	
Local system tim	e display	
Local system date (D/M/Y)	Local system time	
03/01/06	18:36:42	
Universal système tim	e (UTC) display	
Universal system date (D/M/Y)	Universal system time	
03/01/06	17.36.42	Warning sound on synchronization Yes
00/01/00	17.00.42	RETURN TO THE MENU

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 radioamateurs.

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 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.



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).

200	500	1000	1500
			Q
Feld Hell			
PSKHell			
200	500	1000	1500
			Ø

200	500		1000			1500			
									0
								1	-9
			MAL PROF						
1									

FM Hell

200	. 500 .		1500
것			The second se
		The second	
1 2 속 2 4 4 4			The second strength with the
			The second second second second
방송(주요)			
			Print

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

+	+
sound card	O Line in connector (stereo 3.5 mm jack) O Mic in connector (mono 3.5 mm jack) O Line out connector O Speaker out connector (stereo 3.5 mm jack)
	Game/MIDI connector (not used

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 Al=2700 or more, for example):

+----+ Sound card (input)+------¦Ferrite|-----Transceiver (AFSK OUT or DATA)



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).

<u>IMPORTANT</u>: 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.