(RTTY) Contesting on GNU/Linux with QARTest

Serge Stroobandt, ON4AA

QARTest, even though written in Italian, is interesting because it supports many European RTTY contests and the software is kept maintained. Running QARTest with PlayOnLinux on GNU/Linux looks promising. However, I have not yet managed to run it fully stable as I did with Win-Test. Hence, the information contained on this page should be considered as experimental. I will update this page as I make progress. Drop me a line when you managed to get QARTest running in a stable fashion on GNU/Linux.

Introduction

RTTY is a great mode for contesting. There is no need to type a lot, nor do you need to shout your voice hoarse. What is more, you even do not need to listen to RTTY stations in order to work them. These characteristics render late-night RTTY contesting especially gentle towards family members and nearby neighbours. The required signal-to-noise ratio lies between a moderately low -5 to -9 dB @ 2500 Hz; in any case, much lower than the +10 dB for SSB!

However, getting set for RTTY contesting under GNU/Linux is kind of challenging.

Previously, I have been using Win-Test on Xubuntu LTS.

QARTest TODO

I prefer the use of PlayOnLinux — a front-end for Wine — over using bare metal Wine. PlayOnLinux offers the benefit of installing unrelated Windows™ programs on separate virtual drives, also called «bottles» in CrossOver, a commercial offering similar to the free (as in beer) PlayOnLinux. The use of virtual PlayOnLinux drives keeps things uncluttered and limits the damage when any Windows™ program goes awry.

microHAM Digi Keyer

If you own a modern transceiver with a USB port which presents audio as a sound device, you may skip this part.

Many transceiver interfaces work with GNU/Linux. However, as with all hardware under GNU/Linux, always check for Linux support on the web before acquiring a new interface! Because they are quite popular and I had one lying around, this article will focus on the excellent microHAM interface products.

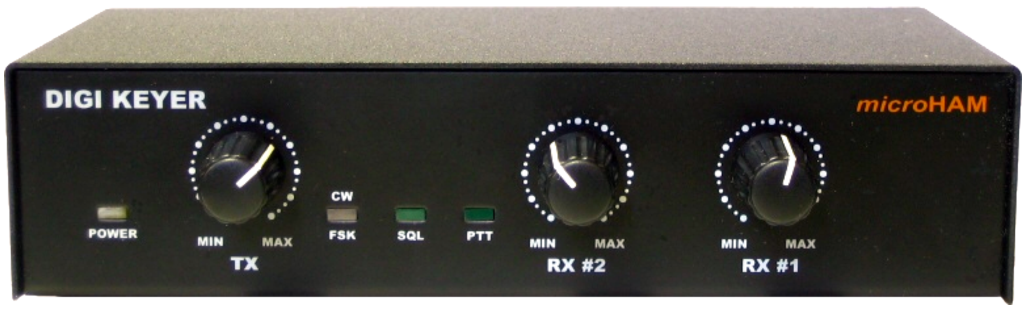


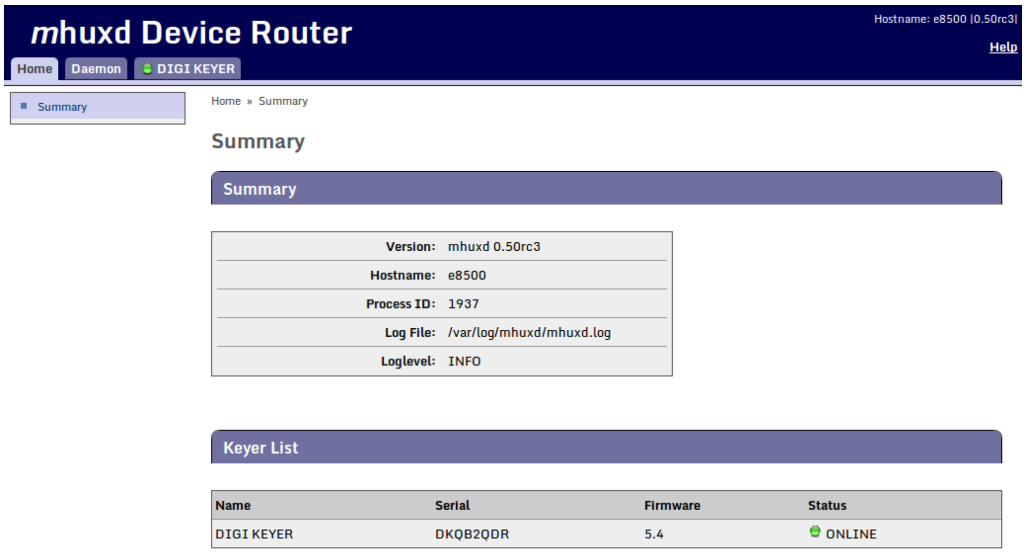
Figure 1: Front panel of the microHAM Digi Keyer

The good news is Matthias (Max) Moeller, DJ5QV, was so kind to code and share the `mhuxd` microHAM Unix daemon. In doing so, he could count with the help of Joe Subich, W4TV of microHAM for providing protocol specifications. The daemon should support all microHAM interface products.

On Ubuntu-derived systems, it is best to install `mhuxd` by adding its PPA repository. This will ensure updates are installed automatically when they become available. Type the following commands (without the `$` prompt) in a terminal window:

```
$ sudo add-apt-repository ppa:dj5qv/mhuxd-0.5
$ sudo apt-get update
$ sudo apt-get install mhuxd
```

The `mhuxd` daemon should immediately start running in the background. You can check that and perform the initial configuration by opening the following URL in your browser: `http://localhost:5052` Bookmark this URL as you may need it again occasionally. Note that microHAM interfaces are powered by the transceiver; not the computer.



Summary

Summary

Version:	mhuxd 0.50rc3
Hostname:	e8500
Process ID:	1937
Log File:	/var/log/mhuxd/mhuxd.log
Loglevel:	INFO

Keyer List

Name	Serial	Firmware	Status
DIGI KEYER	DKQB2QDR	5.4	● ONLINE

Figure 2: Summary screen of the `mhuxd` daemon available at `http://localhost:5052`, showing the keyer's firmware version.

Caveat: Upgrade to the latest firmware!

Once `mhuxd` is installed, first, **make absolutely sure your microHAM keyer is running the latest firmware!** Failing to do so, guarantees problems with MMTTY PTT keying over the FSK port —as I experienced first-hand.

The firmware for the micro/Digi/CW keyers (MK/CK/DK) goes under the name of `mmk`. Hidden deep within its change file `mmk_change_log.txt`, the November 22, 2007 entry reads:

«Some changes in keyer protocol and settings format was introduced to be compatible with router v5.1.0. Hence firmware MUST be upgraded and power-up settings MUST be again stored to EEPROM of keyer.»

Installing new keyer firmware is the one and only instance where you are probably quicker off borrowing a Windows™ computer. In less than 10 minutes, you get the job done. Just install the Windows™ microHAM USB Device Router and let this program upgrade your keyer to the latest version of the appropriate firmware. Keep your transceiver and cabling at hand too, because —remember— the keyer gets its power from the transceiver.

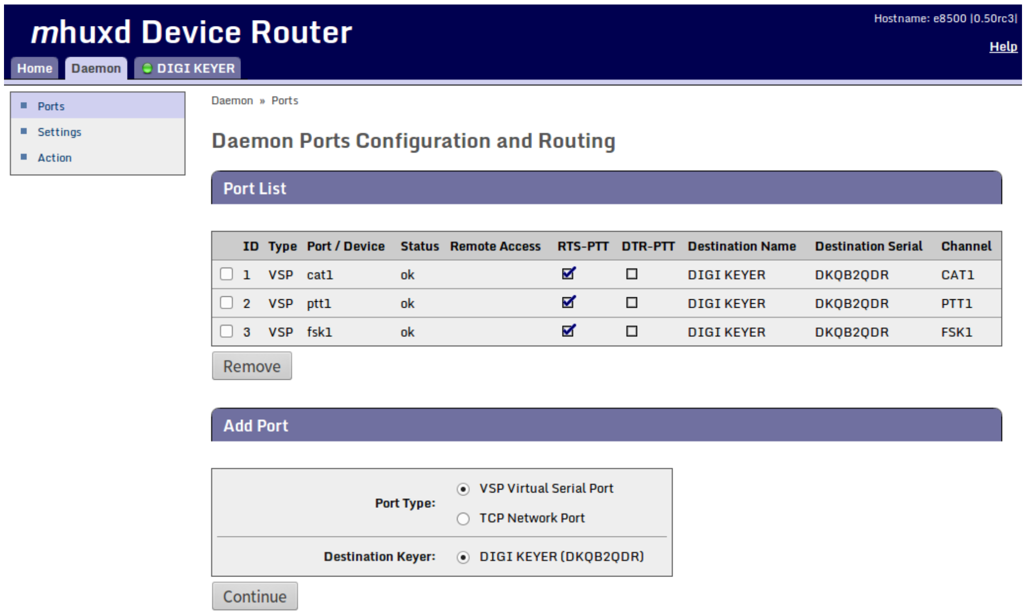
microHAM port routing

In this step, the CAT, PTT and FSK channels of the microHAM keyer will be assigned to a Linux device virtual serial port. Also make sure to tick off RTS-PTT for each of these virtual serial ports.

Here is why: MMTTY is only able to employ a single COM port for both PTT T/R and FSK tone keying. Instead of using the dedicated PTT1 port, MMTTY will need to key PTT with a RTS (ready to send) signal on the FSK1 port. (See below.) It is a good idea to also configure RTS-PTT for the other virtual serial ports for use with other programs.

Table 1: Digi Keyer port routing

channel	RTS-PTT	virtual serial port
CAT1	☑	`/dev/mhuxd/cat1`
PTT1	☑	`/dev/mhuxd/ptt1`
FSK1	☑	`/dev/mhuxd/fsk1`



Daemon Ports Configuration and Routing

Port List

	ID	Type	Port / Device	Status	Remote Access	RTS-PTT	DTR-PTT	Destination Name	Destination Serial	Channel
☐	1	VSP	cat1	ok		☑	☐	DIGI KEYER	DKQB2QDR	CAT1
☐	2	VSP	ptt1	ok		☑	☐	DIGI KEYER	DKQB2QDR	PTT1
☐	3	VSP	fsk1	ok		☑	☐	DIGI KEYER	DKQB2QDR	FSK1

Add Port

Port Type: [✓ VSP Virtual Serial Port] TCP Network Port

Destination Keyer: [✓ DIGI KEYER (DKQB2QDR)]

Figure 3: Configuration and routing of the `mhuxd` deamon virtual serial ports for the microHAM Digi Keyer

To make the `mhuxd` device ports accessible from your account, add your username to the `mhuxd` group. Log out for this change to take effect.

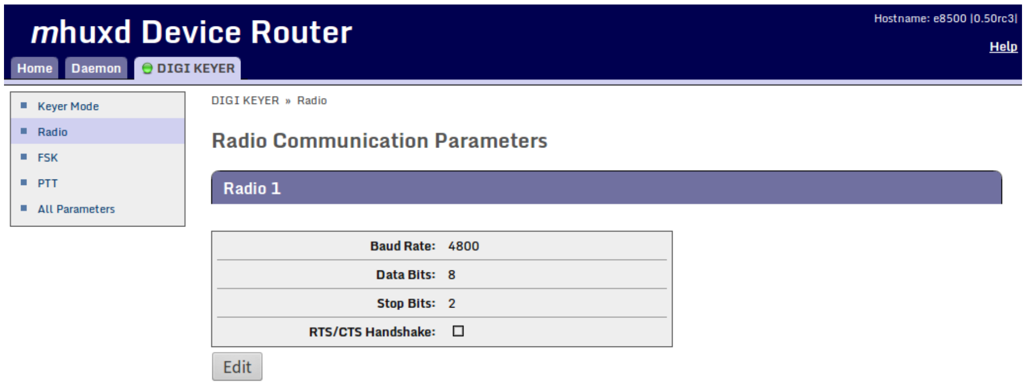
```
$ sudo adduser $USER mhuxd
```

In the rare event of a `mhuxd` daemon crash, there is no need to restart your computer. Typing the following command in a terminal window should do as long as your system is not using `systemd`.

```
$ sudo service mhuxd restart
```

Specifying the CAT protocol

The CAT1 port on the microHAM interface needs to be informed about the serial protocol parameters which are specific to your transceiver brand and model. Consult your transceiver manual for the proper settings. This CAT port will be used by QARTest —not MMTTY— to read and control your transceiver.

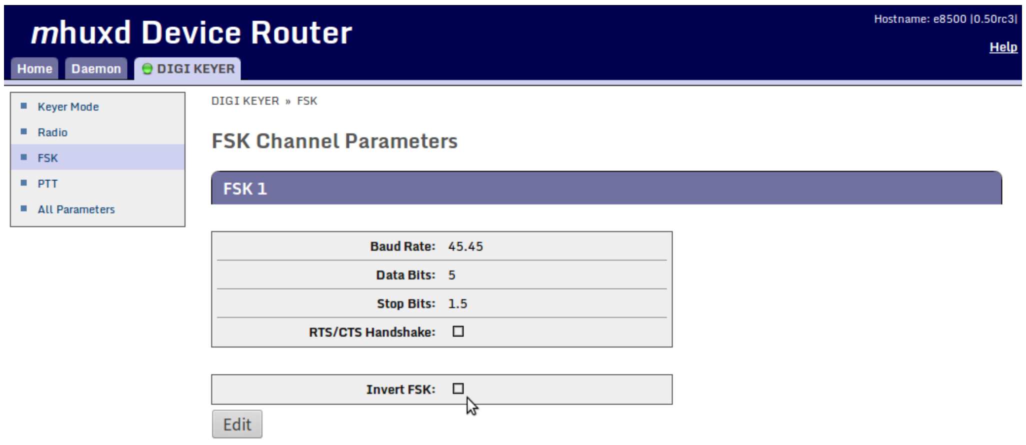


Baud Rate:	4800
Data Bits:	8
Stop Bits:	2
RTS/CTS Handshake:	☐

Figure 4: Computer-aided transceiver protocol parameters for interfacing with the Yaesu FT-990. Consult your transceiver manual for the proper settings.

FSK parameters

Standard FSK parameters for amateur radio TTY service are shown below. Other services (press, diplomatic, military) may require different parameters.

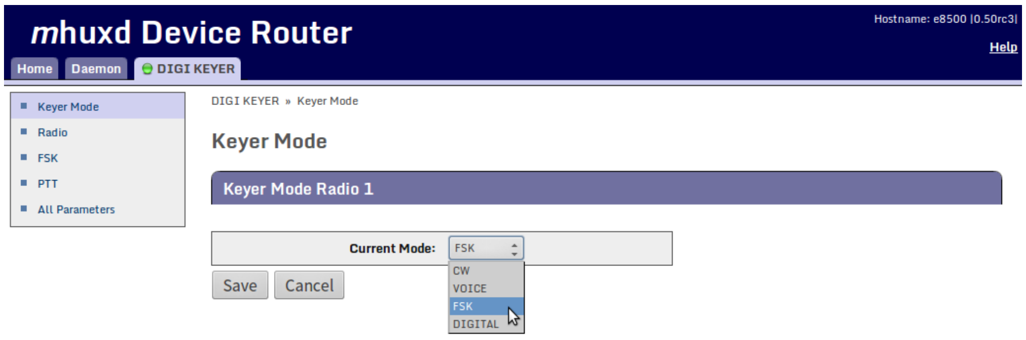


Baud Rate:	45.45
Data Bits:	5
Stop Bits:	1.5
RTS/CTS Handshake:	☐
Invert FSK:	☐

Figure 5: FSK parameter settings for RTTY, with an option to inverse the FSK stream on transmit.

Setting the keyer mode

Keyer mode is the only setting which requires changing each time one switches between operating modes (e.g. when switching from real `FSK` for MMTTY to `DIGITAL` AFSK for use with Fldigi). On newer microHAM interfaces (DK2, MK2 and MK2R+), it is more practical to opt for the `Keyer Mode Follows RIG` automation. This will eliminate once and for all the need to revisit this `mhuxd` configuration page.



Current Mode: FSK

Figure 6: Setting the keyer mode for real `FSK` keying with MMTTY.

Transceiver settings

- Whenever possible, always use truly keyed FSK on transmit. Because of confusing FT-990 CAT messaging, I am required to always operate my Yaesu FT-990 in `RTTY-USB` mode.
- To protect the transceiver PA from overheating, reduce the `RF PWR` to 50%.
- If one of the tones falls outside the (250 Hz) bandpass filter, use the transceiver's `SHIFT` knob to correct this.
- For fine tuning, employ `RX CLAR` and `TX CLAR` simultaneously on the FT-990.
- I prefer to listen to lower pitched "European" RTTY tones instead of the US default. On the FT-990, this is set using DIP switches.

Table 2: Mark and shift settings

style	MARK	shift	SPACE
US default	2125 Hz	170 Hz	2295 Hz
EU easy listening	1275 Hz	170 Hz	1445 Hz

Caveat: Reversed FSK on RX implies inversing FSK on TX!

My Yaesu FT-990 insists on designating `RTTY-LSB` as reversed or `RTTYR` in its CAT communication with my computer. This is cumbersome for logging QSOs on LoTW which does not know how to handle `RTTYR` as a mode. Hence, I operate this transceiver always in its `RTTY-USB` mode. This means Rev. on reception is always `on` in MMTTY **and** either my keyer or my transceiver is set to inverse the FSK transmission stream. I chose to do the latter by flipping a DIP switch on the FT-990. Remember: If nobody answers your calls, chances are you are sending in reverse!

PlayOnLinux

As mentioned earlier, PlayOnLinux is a neat front-end for Wine, offering the possibility to install unrelated Windows™ programs on segregated virtual drives. Being included with the Xubuntu LTS repositories, installing PlayOnLinux is straightforward:

```
$ sudo apt-get install playonlinux
```

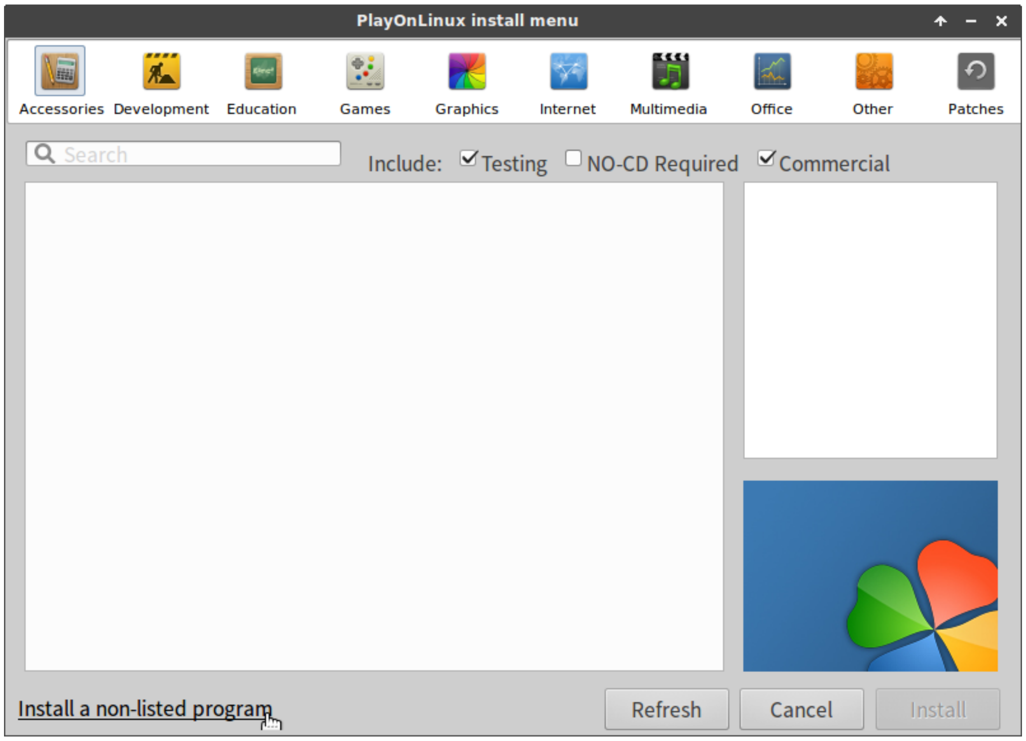


Figure 7: After clicking the + Install button, click on «Install a non-listed program» at the bottom of the window.

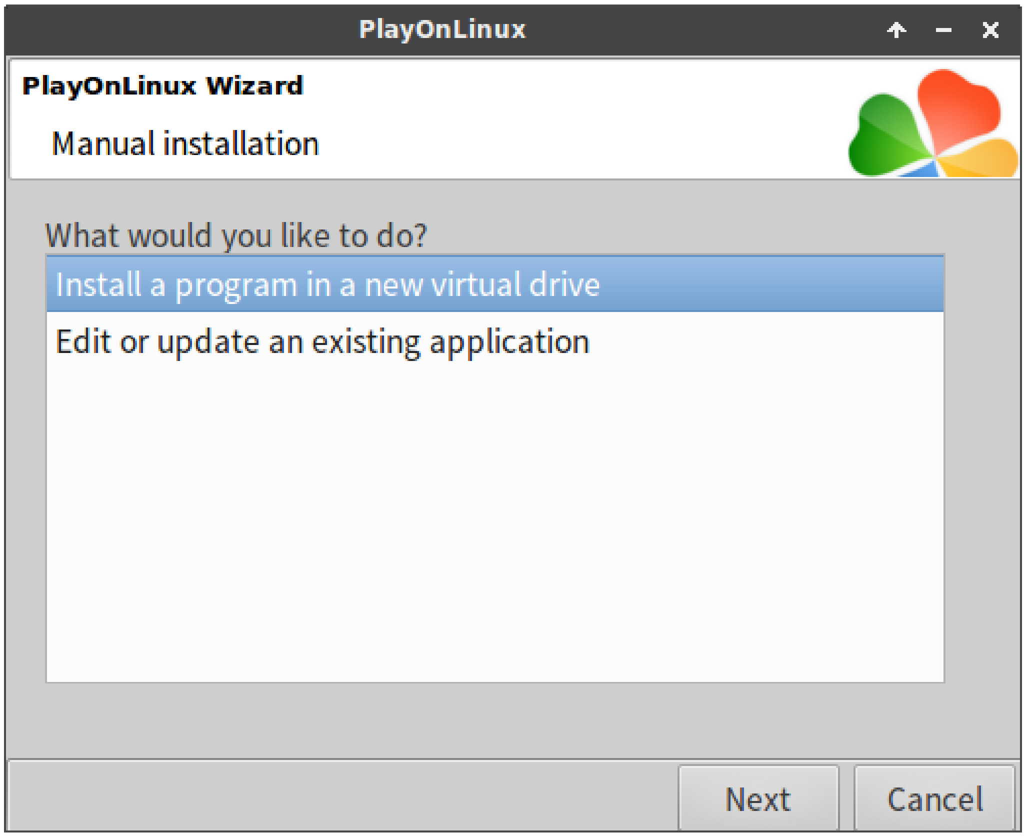
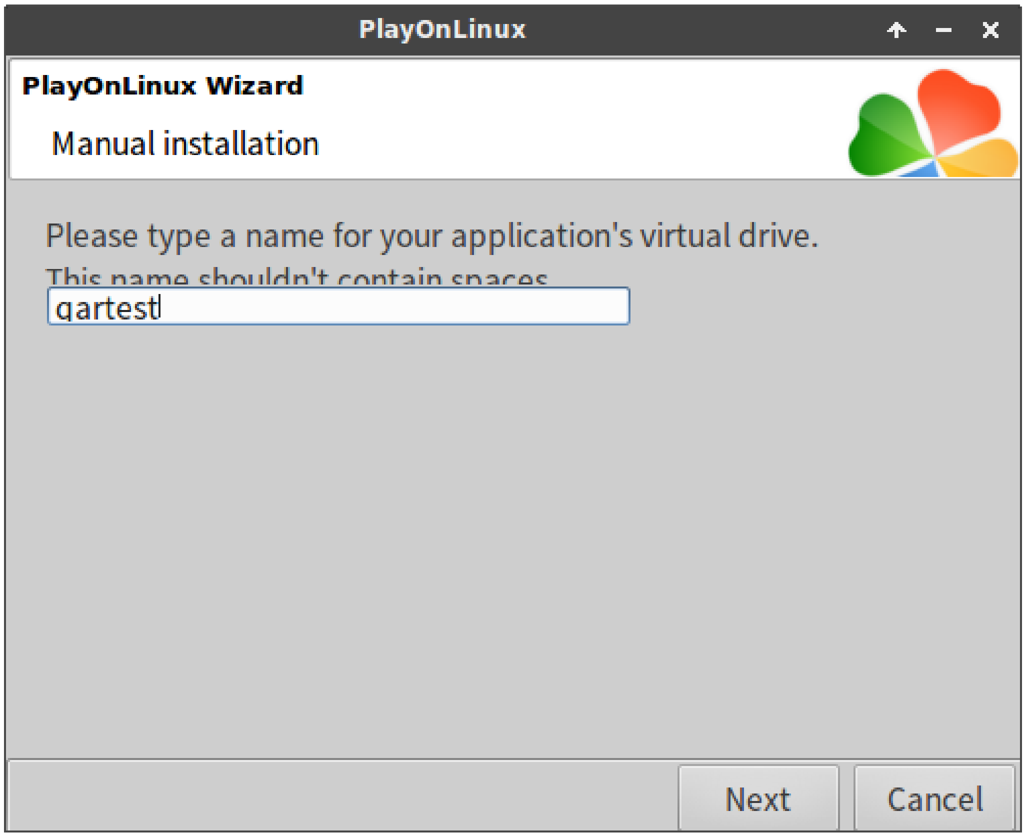

PlayOnLinux
PlayOnLinux Wizard
Manual installation
What would you like to do?
Install a program in a new virtual drive
Edit or update an existing application
Next
Cancel

Figure 8: Choose «Install a program in a new virtual drive» and click on Next.


PlayOnLinux

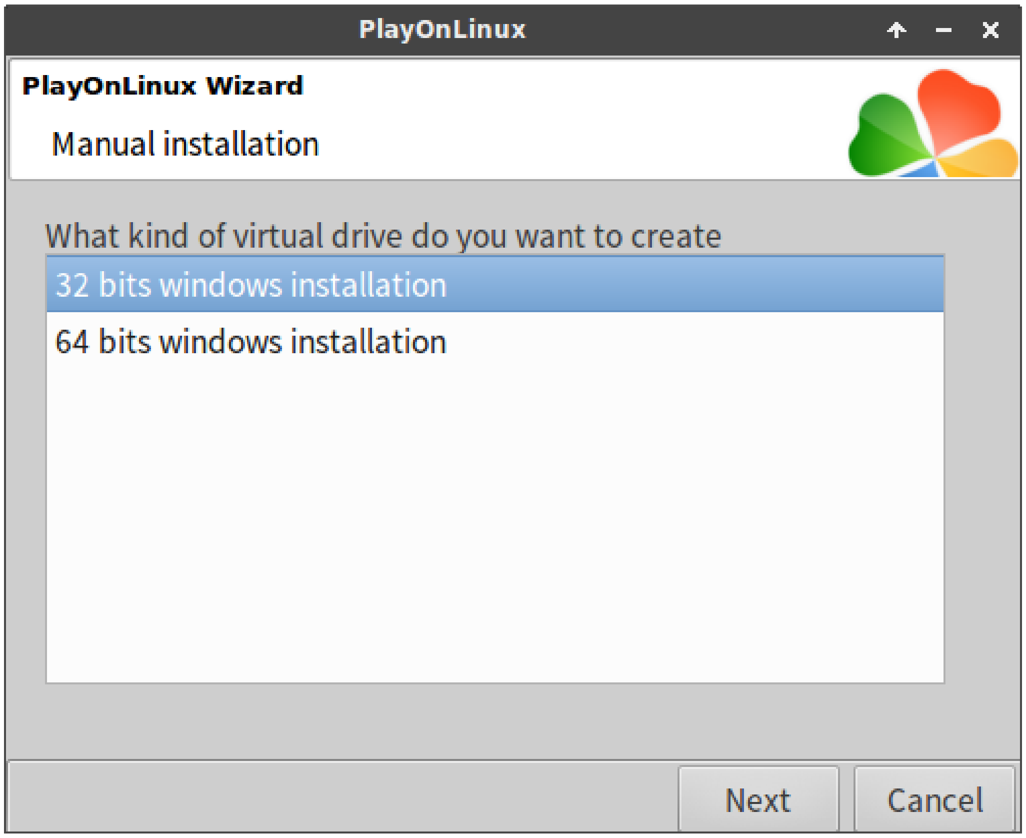
PlayOnLinux Wizard

Manual installation

Please type a name for your application's virtual drive.
This name shouldn't contain spaces

qartest

Figure 9: Type `qartest` and click on Next.


PlayOnLinux

PlayOnLinux Wizard

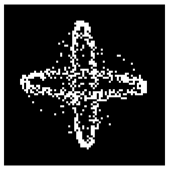
Manual installation

What kind of virtual drive do you want to create

32 bits windows installation
64 bits windows installation

Figure 10: Choose «32 bits windows installation» and click on Next.

MMTTY installation


MMTTY is installed first, on a PlayOnLinux virtual drive called `qartest`. MMTTY and QARTest will share this virtual drive because both programs are related and need to be aware of oneanother. MMTTY allows for hard FSK keying, which in a contest environment is less prone to errors than modulating audio AFSK.

Caveat: Do not install EXTFSK!

On the web, you may find conflicting advice about installing the EXTFSK MMTTY extension. Here is the definitive answer by Joe Subich, W4TV, of microHAM:

«*NEVER* use EXTFSK with microHAM microKEYER, DigiKeyer, microKEYER II, DigiKeyer II, MK2R+ or micro2R. All of those interfaces provide a UART compatible, virtual port for FSK that handles 45, 50, 75 and 100 baud RTTY (baudot) directly. EXTFSK is not compatible with the FSK output of the microHAM "keyer" devices.»

Wine COM port mapping

Both MMTTY and Win-Test carry along their own drivers to communicate with the CAT interface of most common transceivers. These drivers function perfectly with PlayOnLinux, provided the Linux `mhuxd` device ports appear as `COM` ports to the Windows™ programs on the `win-test` virtual drive.

I reiterate that as a GNU/Linux user, one needs to make oneself member of the `mhuxd` group in order to use these virtual ports.

Old `wine` versions, prior to version 2.8

Up to `wine` version 2.8, symbolic links from the Linux device ports to the typical Windows™ `COM` ports can be created directly in the directory `~/.PlayOnLinux/wineprefix/qartest/dosdevices` on the `qartest` virtual drive:

```
$ cd ~/.PlayOnLinux/wineprefix/qartest/dosdevices
$ ln -s /dev/mhuxd/cat1 com1
$ ln -s /dev/mhuxd/ptt1 com2
$ ln -s /dev/mhuxd/fsk1 com3
```

New wine versions, since version 2.8

Since the advent of `wine` version 2.8, above solution no longer works because `wine` overwrites any symbolic link. However, the CAT1, PTT1 and FSK1 ports can be mapped to respectively `COM1`, `COM2` and `COM3` by adding new string entries to the `HKEY_LOCAL_MACHINE\Software\Wine\Ports` key of the `wine` registry on the `qartest` virtual drive.

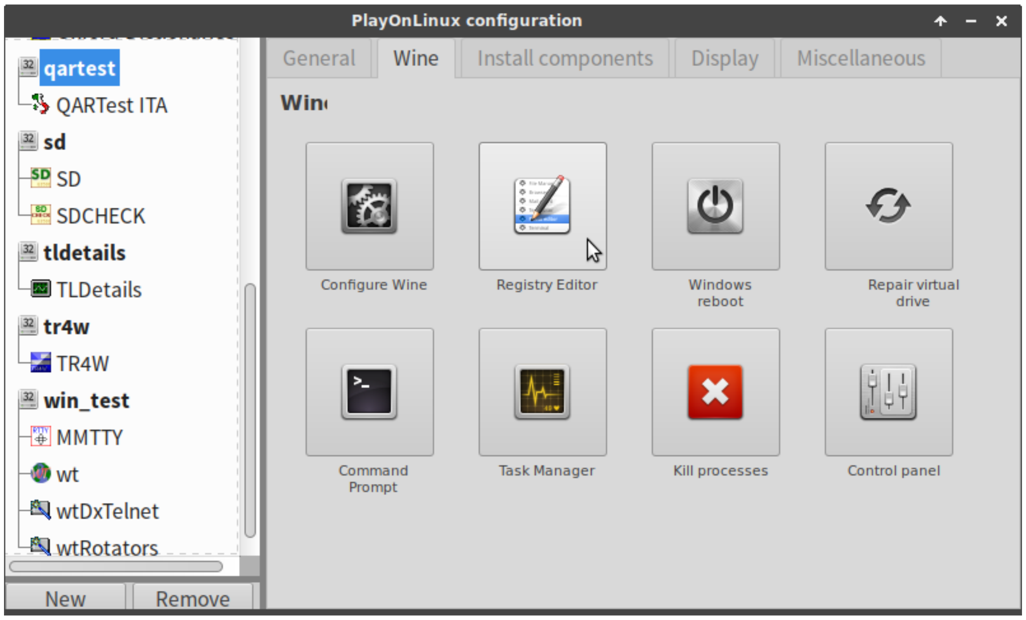
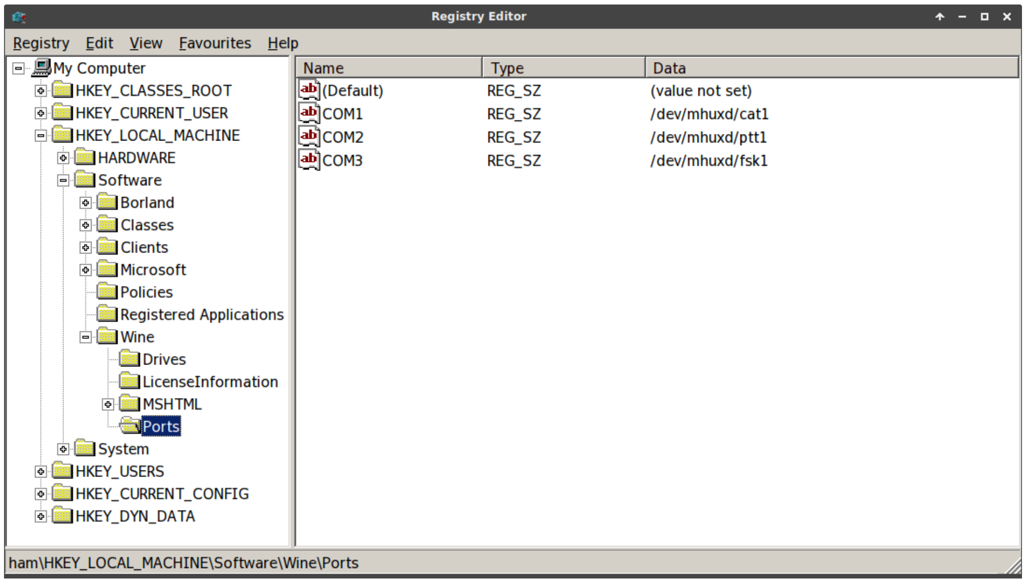


Figure 11: The registry editor can be opened through: `PlayOnLinux` → `Configure` → `qartest` virtual drive → `Wine` tab → `Registry Editor`.

Table 3: String values to be added

name	type	data
COM1	REG_SZ	/dev/mhuxd/cat1
COM2	REG_SZ	/dev/mhuxd/ptt1
COM3	REG_SZ	/dev/mhuxd/fsk1



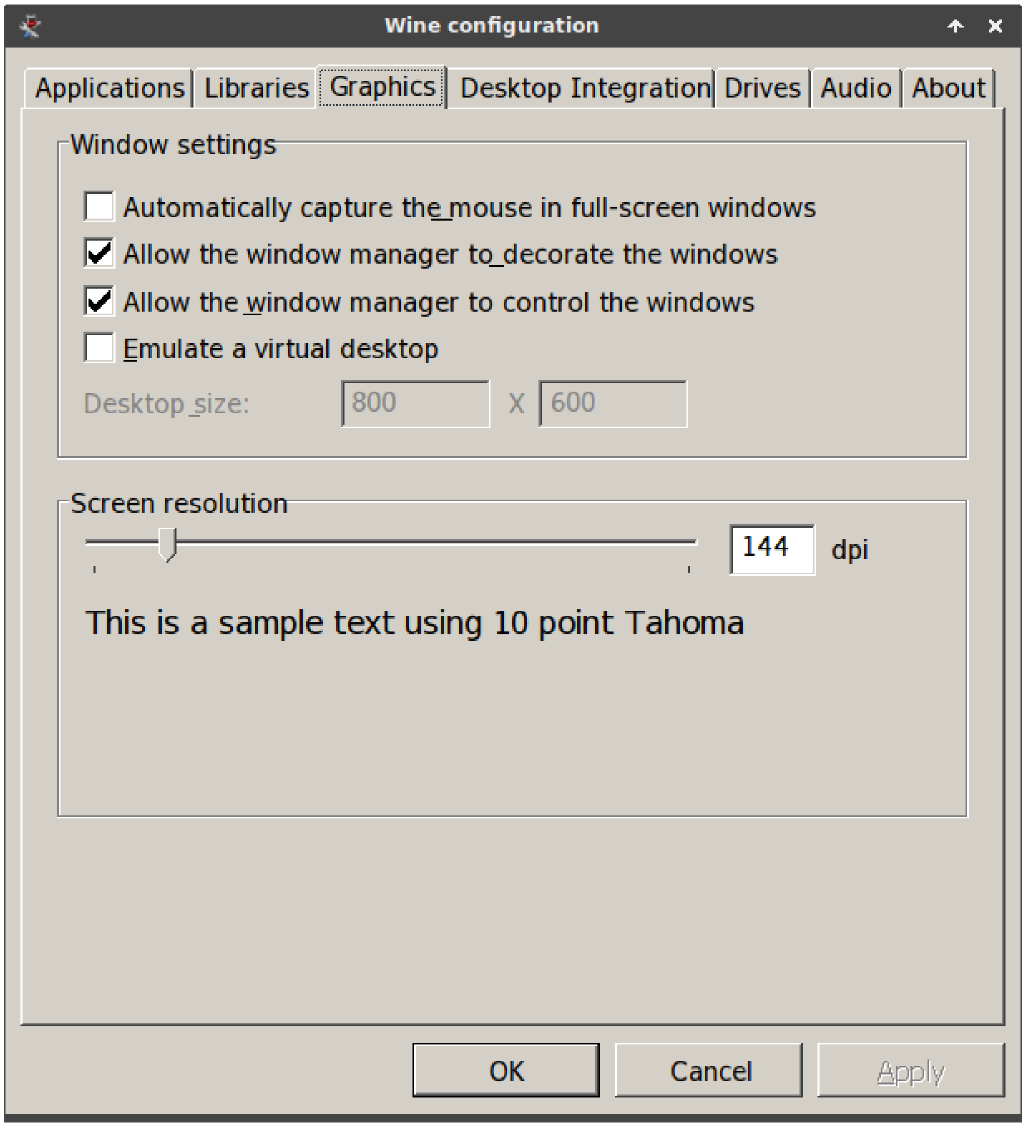
Name	Type	Data
(Default)	REG_SZ	(value not set)
COM1	REG_SZ	/dev/mhuxd/cat1
COM2	REG_SZ	/dev/mhuxd/ptt1
COM3	REG_SZ	/dev/mhuxd/fsk1

ham\HKEY_LOCAL_MACHINE\Software\Wine\Ports

Figure 12: The `HKEY_LOCAL_MACHINE\Software\Wine\Ports` key with three new string values added to remap `COM1`, `COM2` and `COM3` to the `mhuxd` device ports.

Wine DPI setting

When you are used to GNU/Linux or for people with poor eyesight, the fonts on the Windows™ screens may appear particularly small. Luckily, the dots per inch (DPI) screen resolution can easily be set for each `wine` virtual drive individually.



Window settings

- [ ] Automatically capture the mouse in full-screen windows
- [x] Allow the window manager to decorate the windows
- [x] Allow the window manager to control the windows
- [ ] Emulate a virtual desktop

Desktop size: 800 X 600

Screen resolution

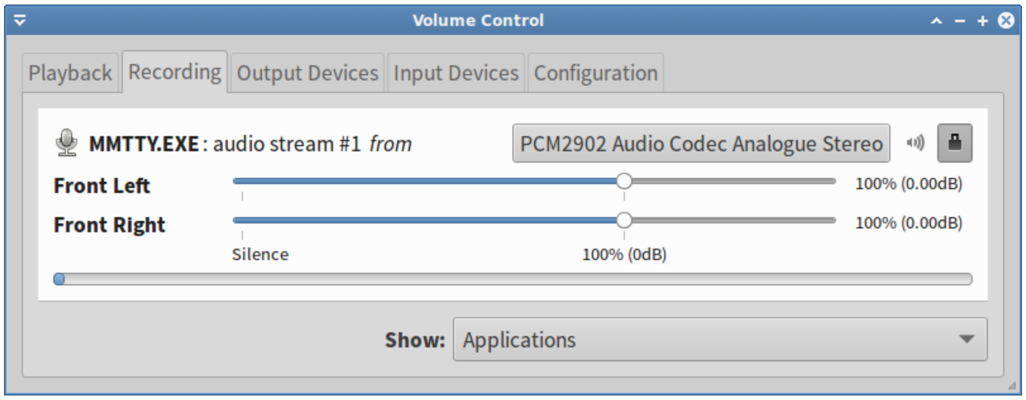
144 dpi

This is a sample text using 10 point Tahoma

Figure 13: The dots per inch (DPI) screen resolution can easily be increased through: `PlayOnLinux` → `Configure` → `qartest` virtual drive → `Wine` tab → `Configure Wine` → `Graphics`.

Pulseaudio settings

The microHAM Digi Keyer contains its very own low-noise PCM2902 stereo USB1.1 codec chip. To use it, open `pulseaudio` volume control while MMTTY is running and select the PCM2902 chip as recording source for MMTTY. Newer microHAM interfaces use a differently named chip, as do modern transceivers with a built-in sound device and USB port.



MMTTY.EXE: audio stream #1 *from* PCM2902 Audio Codec Analogue Stereo

Front Left 100% (0.00dB)

Front Right 100% (0.00dB)

Show: Applications

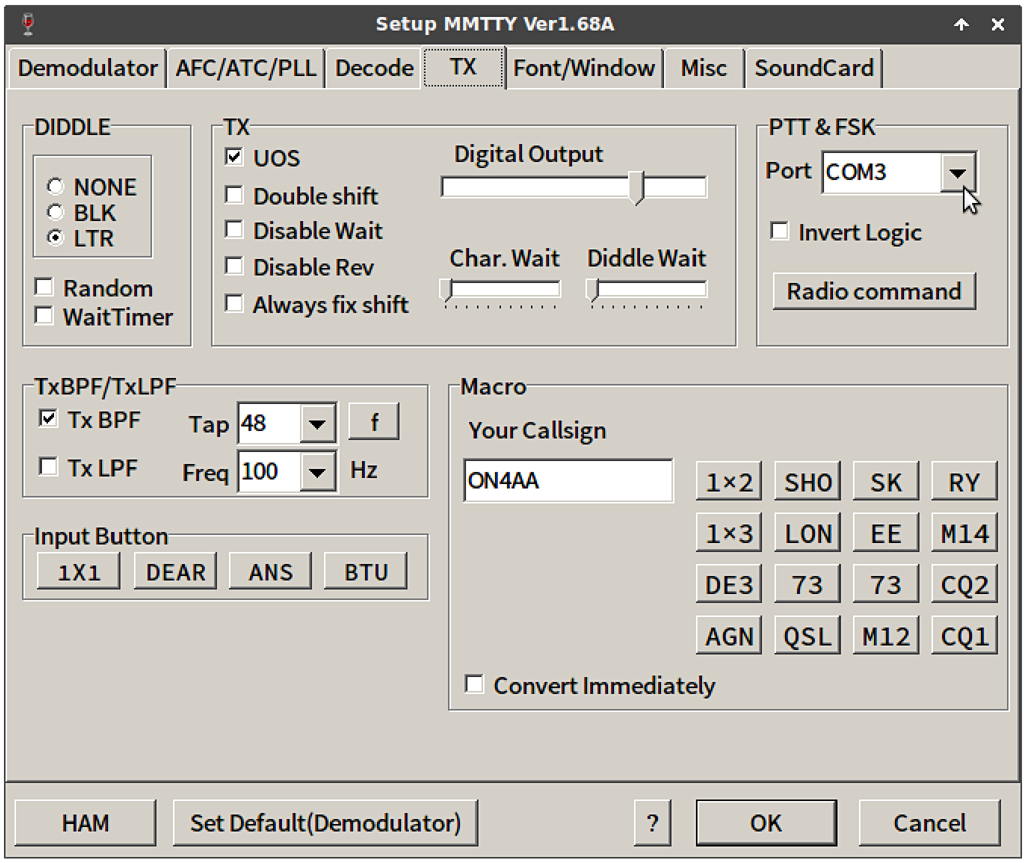
Figure 14: Binding MMTTY recording to the PCM2902 codec using `pulseaudio` volume control in Xubuntu LTS

MMTTY configuration

MMTTY is best configured and tested running standalone, i.e. independently of QARTest. All MMTTY configuration settings will remain in place under QARTest, except for the CAT settings and casual QSO message macros which apply only to MMTTY running standalone.

COM port for keying

I am a fervent advocate of hard FSK keying, which in a contest environment is less prone to errors than modulating audio AFSK. To do so, select `COM3` in MMTTY's `TX` menu for FSK (and PTT) keying.


Setup MMTTY Ver1.68A

Demodulator | AFC/ATC/PLL | Decode | TX | Font/Window | Misc | SoundCard

DIDDLE
( ) NONE
( ) BLK
(●) LTR
☐ Random
☐ WaitTimer

TX
☑ UOS
☐ Double shift
☐ Disable Wait
☐ Disable Rev
☐ Always fix shift
Digital Output
Char. Wait
Diddle Wait

PTT & FSK
Port COM3
☐ Invert Logic
Radio command

TxBPF/TxLPF
☑ Tx BPF Tap 48 f
☐ Tx LPF Freq 100 Hz

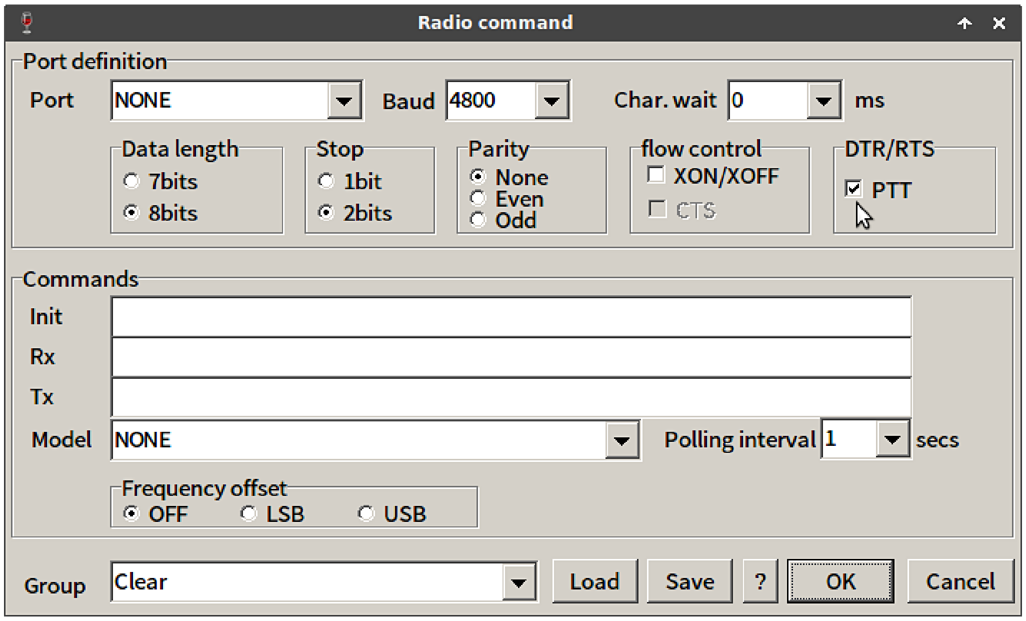
Input Button
1X1 DEAR ANS BTU

Macro
Your Callsign
ON4AA
1×2 SHO SK RY
1×3 LON EE M14
DE3 73 73 CQ2
AGN QSL M12 CQ1
☐ Convert Immediately

HAM | Set Default(Demodulator) | ? | OK | Cancel

Figure 15: Select `COM3` for FSK (and PTT) keying in the MMTTY `TX` menu

MMTTY is only able to use a single COM port for both FSK and PTT keying. Hence, PTT keying will be performed with a RTS (ready to send) signal on the very same `COM3` port. For this to happen, place the appropriate check mark in MMTTY's `Radio command` menu, underneath the `TX` menu. This setup will only work when RTS-PTT was previously selected on the microHAM port routing screen.


Radio command

Port definition

Port NONE Baud 4800 Char. wait 0 ms

Data length: 7bits [✓ 8bits]
Stop: 1bit [✓ 2bits]
Parity: [✓ None] Even Odd
flow control: XON/XOFF, CTS
DTR/RTS: [✓ PTT]

Commands

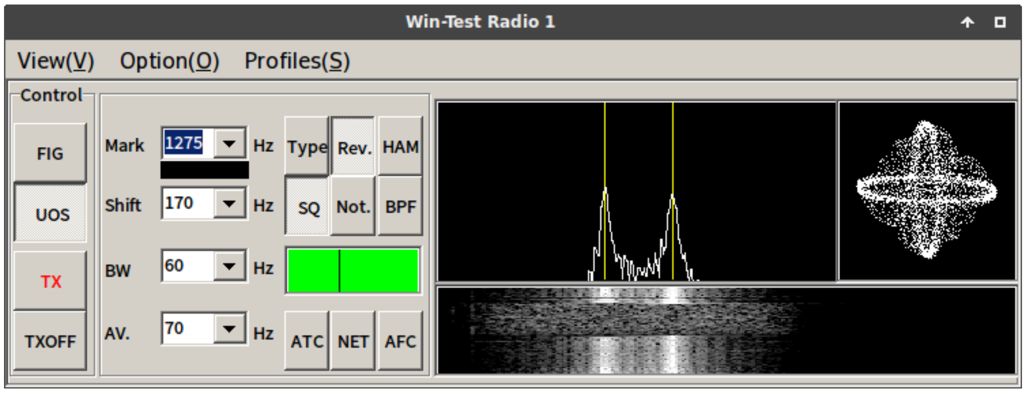
Init
Rx
Tx
Model NONE Polling interval 1 secs

Frequency offset: [✓ OFF] LSB USB

Group Clear Load Save ? OK Cancel

Figure 16: Select `RTS` for PTT keying in the MMTTY `Radio command` menu

MMTTY's all important main settings are next up for discussion.


Win-Test Radio 1

View(V) Option(O) Profiles(S)

Control

Mark 1275 Hz
Shift 170 Hz
BW 60 Hz
AV. 70 Hz

Figure 17: MMTTY on Linux!

Rev.

Because of confusing FT-990 CAT messaging, I need to operate my Yaesu FT-990 in RTTY-USB mode. Consequently, MMTTY's *Reverse* Rev. needs to be always `on` in my case. Test this setting by entering in an RTTY QSO before the contest! Very occasionally, when restarting under QARTest, MMTTY might be a little confused showing Rev. as `on` whilst not decoding in reverse. Should this happen, simply click Rev. twice, and all should be again in good order.

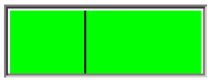
I have noticed that, **upon starting MMTTY V1.68A,** one needs to click the Rev. button **twice** in order to put MMTTY effectively in reverse decoding!

UOS `on`

It is recommended to *Unshift On Space* UOS, on both transmit and receive, whilst employing space delimiters (instead of using `599-001-001` hyphens). Doing so, increases the noise immunity for letters (which are more common), by always forcing the `LTRS` code page (i.e. unshifting) after a space.[1] By using unshifting spaces as delimiters between number sequences, the `FIGS` shift will also be repeated more often.

ATC

Automatic Threshold Control ATC adjusts the input level to the comparator in accordance with the strength of the input signal. If propagation conditions are good, it is better left `off`. It is only useful when there is an echo on the received signal.[2]



MMTTY's decoding threshold can also be set manually by moving the slider along the green bar. Set this according to your local noise level and propagation conditions.

NET

Activating NET makes your transmit frequency follow your receive frequency when using AFSK. This feature should never be used during a contest. It is of no effect when employing truly keyed FSK.

AFC

Automatic Frequency Control AFC lets MMTTY track the frequency of the received signal within the receive passband. Leave AFC `off` when operating in `S&P` mode; In `RUN` mode, having AFC switched `on` may be useful for working «lid operators». However, remember to reset your `MARK` tone using the HAM button, when switching it back `off`! Otherwise, you yourself become the «lid operator»!!!

Table 4: AFC

operating mode	AFC
search & pounce	always `off`
running	allowed `on` reset `MARK` tone using HAM after use!

HAM

HAM resets your `MARK` tone and `SHIFT` to your preset defaults.

There is an excellent MMTTY help which you should have read at least once. Additional MMTTY setup documentation is made available by Donald A. Hill, AA5AU.

Casual QSO messages for MMTTY

Contest messages are always sent by Win-Test; not MMTTY. Independently of these, you can define casual QSO messages for standalone MMTTY use. Here are some examples. Adding line feeds at the beginning and end, makes your messages stand out more at the reception end.

```
__

%c DE %m %m %m K

_\
```

```
__

%f %n
UR %r %r
OP SERGE SERGE
QTH HASSELT HASSELT
%c DE ON4AA K

_\
__

%f %n
UR %r %r
OP SERGE SERGE
QTH HASSELT HASSELT
LOC JO 20 QW  JO 20 QW
P 50 W 50 W
CENTER LOADED OCFD ANT AT 15 M
MMTTY ON XUBUNTU LTS GNU LINUX
WWW.HAMWAVES.COM
%c DE ON4AA K

_\
```

```
__

%c DE %m
TNX %n FOR QSO
LOTW BURO EQSL
73 PEACE AND GD HEALTH
%c DE %m SK

_\
```

```
__

AGN? AGN?

_\
```

```
__

QSL QSL DE %m K

_\
```

Caveat: Avoid frequent shifts to `FIGS`!

When defining RTTY messages, try to avoid frequent changes between letter and figure characters. Missing a `LTRS/FIGS` shift means that all subsequent characters will be printed wrong up until the next `LTRS/FIGS` shift. This situation can be improved upon by **setting *Unshift On Space* UOS, on both transmit and receive, whilst employing space delimiters (instead of using `599-001-001` hyphens).** Doing so, increases the noise immunity for letters (which are more common), by always forcing the `LTRS` code page (i.e. unshifting) after a space.[1] By using unshifting spaces as delimiters between number sequences, the `FIGS` shift will also be repeated more often.

Binary code 00000 is the null character, used for idling.

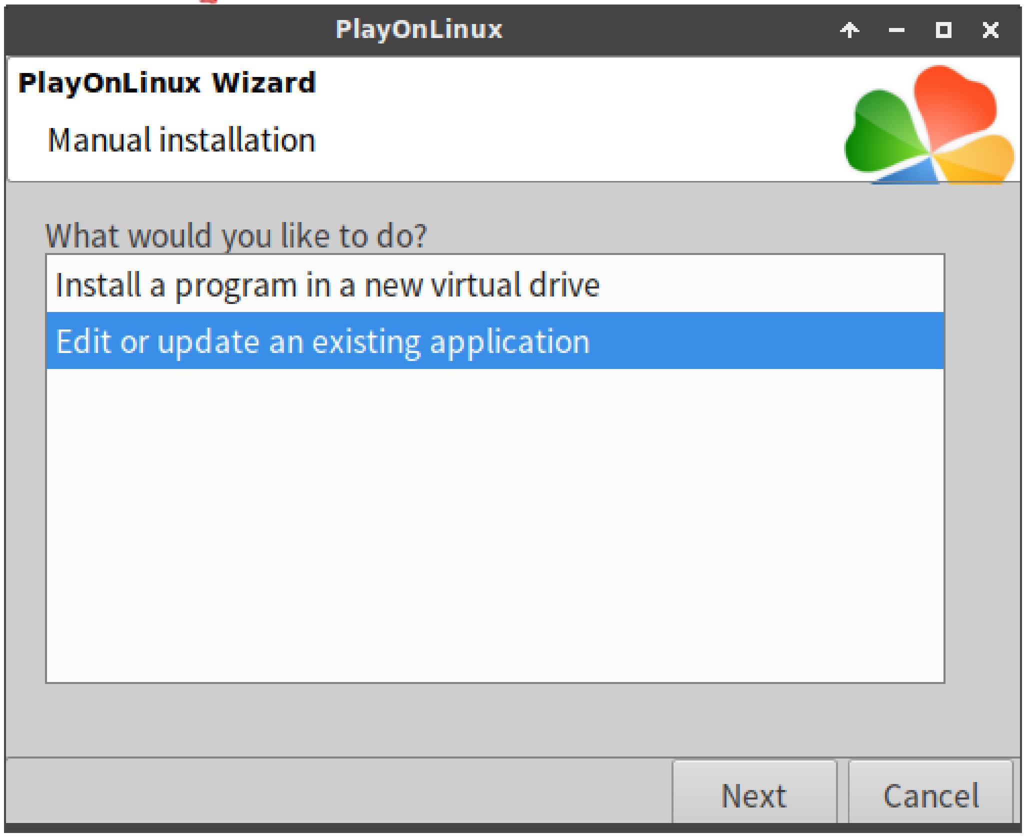
Table 5: 5-bit ITA2 USTTY code pages

binary	hex	LTRS	FIGS
00011	03	A	-
11001	19	B	?
01110	0E	C	:
01001	09	D	$
00001	01	E	3
01101	0D	F	!
11010	1A	G	&
10100	14	H	#
00110	06	I	8
01011	0B	J	BELL
01111	0F	K	(
10010	12	L	)
11100	1C	M	.
01100	0C	N	,
11000	18	O	9
10110	16	P	0
10111	17	Q	1
01010	0A	R	4
00101	05	S	′
10000	10	T	5
00111	07	U	7
11110	1E	V	;
10011	13	W	2
11101	1D	X	/
10101	15	Y	6
10001	11	Z	"
01000	08	CR	CR
00010	02	LF	LF
00100	04	SP	SP
11111	1F	LTRS	LTRS
11011	1B	FIGS	FIGS

QARTest installation

QARTest TODO

Install Win-Test on the same `qartest` virtual drive where MMTTY was installed previously.



PlayOnLinux

PlayOnLinux Wizard

Manual installation

What would you like to do?

Install a program in a new virtual drive

Edit or update an existing application

Figure 18: Choose «Edit or update an existing application» and click on Next.

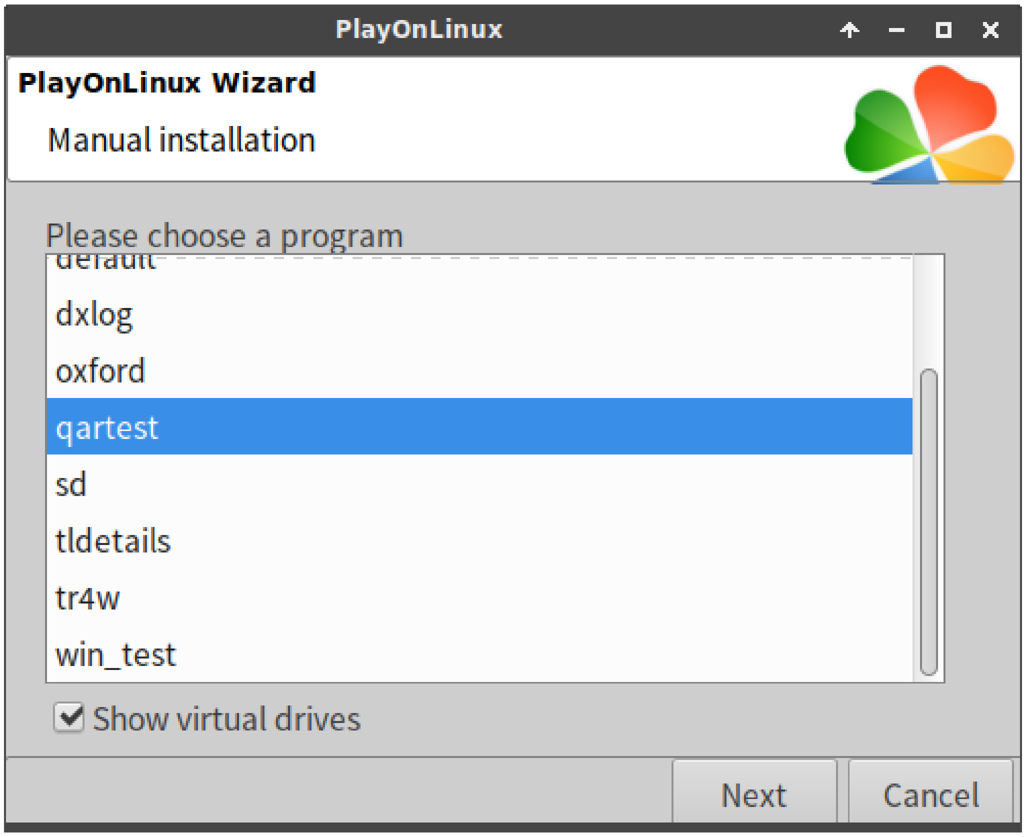
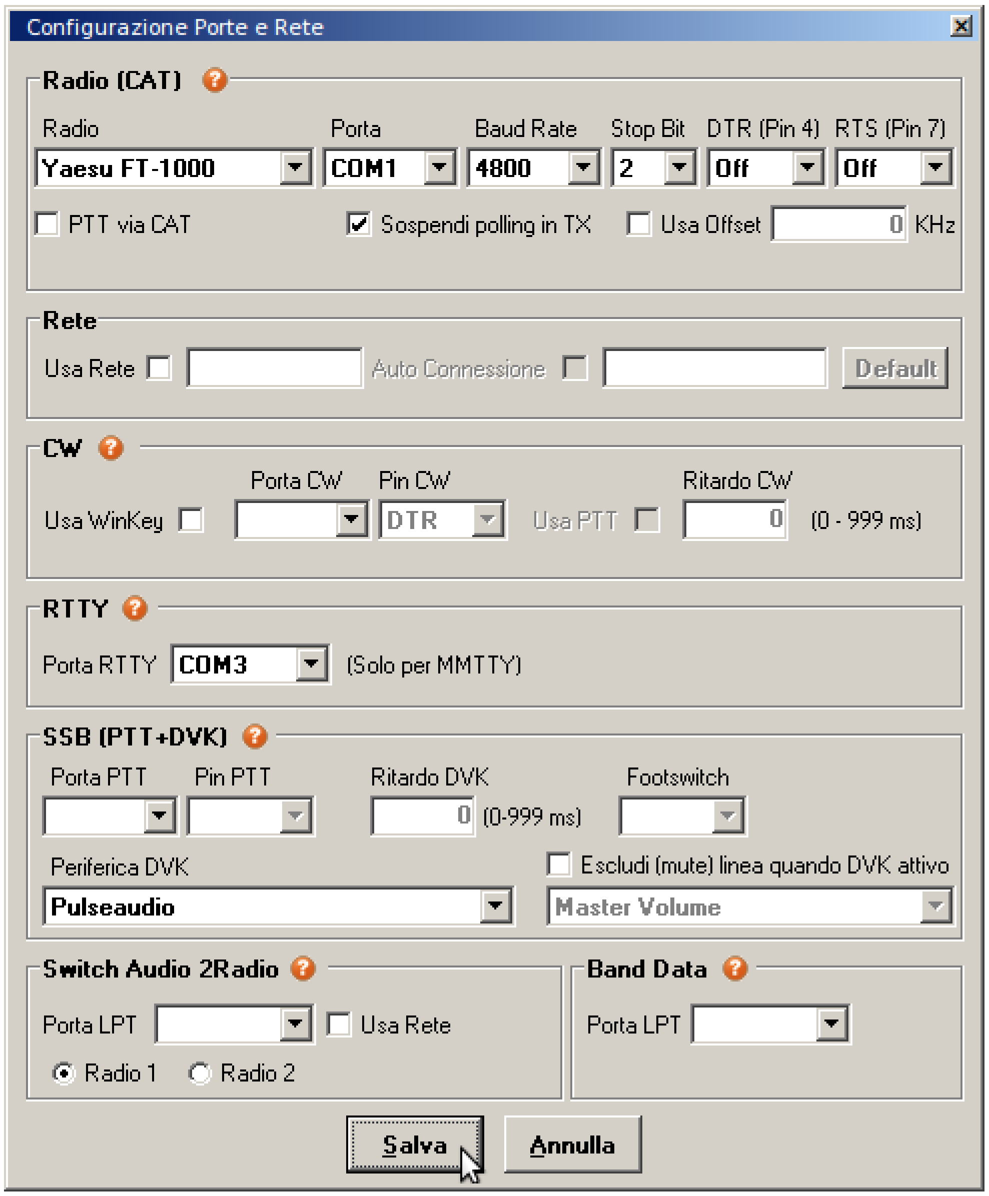


Figure 19: Select «Show virtual drives» and choose the `qartest` virtual drive. Continue by clicking on Next.

QARTest port configuration


Configurazione Porte e Rete

Radio (CAT)

Radio	Porta	Baud Rate	Stop Bit	DTR (Pin 4)	RTS (Pin 7)
Yaesu FT-1000	COM1	4800	2	Off	Off

☐ PTT via CAT ☑ Sospendi polling in TX ☐ Usa Offset 0 KHz

Rete

Usa Rete ☐ Auto Connessione ☐ Default

CW

Usa WinKey ☐ Porta CW: Pin CW: DTR Usa PTT ☐ Ritardo CW: 0 (0 - 999 ms)

RTTY

Porta RTTY: COM3 (Solo per MMTTY)

SSB (PTT+DVK)

Porta PTT: Pin PTT: Ritardo DVK: 0 (0-999 ms) Footswitch:

Periferica DVK: Pulseaudio ☐ Escludi (mute) linea quando DVK attivo: Master Volume

Switch Audio 2Radio

Porta LPT: ☐ Usa Rete

● Radio 1 ○ Radio 2

Band Data

Porta LPT:

Salva Annulla

Figure 20: QARTest port configuration: The transceiver make and model are selected for CAT on `COM1`. Note that `DTR` and `RTS` are switched `Off` to avoid unwanted PTT switching. `COM3` will be used by MMTTY for both FSK and PTT keying. `Salva` means `Save`.

RTTY contest messages

QARTest's default RTTY contest messages can be improved upon. Donald A. Hill, AA5AU, of RTTY contesting fame offers a great breakdown of optimal RTTY contest messages. Some of this great information has been condensed in the following set of rules[3] and the tables below. On his fabulous website, Don also offers a number of contest-specific examples.

3. Start all primary messages with a carriage return (CR/LF).
2. End *all* messages with a single space character.
3. Do not use outdated characters or character strings such as ~~DE, K, BK, SK or UR~~ in any of your messages.
4. Send RST always as `599` and send it only once if required. If not required, do not send RST at all.
5. Always employ space delimiters (instead of `599-001-001` hyphens).[1]
6. Always end your CQ message with `CQ`.
7. Always end your run confirmation message with either `CQ` or `QRZ`.

If you are completely new to RTTY, you will certainly find the RTTY DXing presentation[1] of Ed Muns, WØYK/P49X, very helpful in getting you started.

RTTY messages are defined under the `Log → Messaggi` menu.

During a contest, you can work stations in two ways:

- either *running*: i.e. calling CQ TEST,
- or *search & pounce*: i.e. working stations that are calling CQ.

QARTest does not feature any specific means to switch contest mode.

Table 6: QARTest macros

key	use	message
F1	run	`{CR}TEST {MY} {MY} CQ{SP}`
F2	run	`{CR}{HIS} 599 {#} {#} 14{SP}`
F3	run	`{CR}{HIS}{LOGQSO} TU {MY} CQ{SP}`
F4	repeat	`{CR}AGN? AGN?{SP}`
F5	S&P	`{CR}{MY} {MY} {MY}{SP}`
F6	S&P	`{CR}599 {#} {#} 14 {MY}{SP}`
F7	S&P	`{CR}QSL {MY}{SP}`
F8	repeat	`{CR}{#} {#} {#} {#}{SP}`
+	pile-up	`{CR}{HIS}{LOGQSO} TU NOW {POP}{F2}`

References

1. Ed Muns, WØYK/P49X. RTTY DXing. Published online 2012. https://www.ncdxc.org/presentations/2012/W0YK-RTTY-DXing-06212012.pdf

2. Jan Ditzian, KX2A. MMTTY help. Published 2003. https://hamwaves.com/linux.rtty/doc/MMTTY_Help.v166G.pdf

3. Donald A. Hill, AA5AU. RTTY contest messages.
   https://www.rttycontesting.com/lagniappe/rtty-messages/