

MM-DD HH:MM	Call	Freq	Name	Sect	M1	M2
07-16 05:29	NA7RH					
07-16 05:32	NN4K	7101.56	BOB	AZ		
07-16 05:33	KC3HPS	3584.64	MAC	GA		
07-16 05:33	KM4ALP	3584.64	ANDREW	MD		
07-16 05:35	WV2ZOW	7101.56	BRIAN	FL		
07-16 05:39	K5CM	7101.56	MIKE	NJ		
07-16 05:40	K4HPS	7101.56	CON	OK		
07-16 05:40	K4HPS	7106.16	MIKE	OK		

Band	QSOs	Pts	Sec	Mt2	Pt/Q
3.5	83	83	27	0	1.0
7	243	243	43	2	1.0
14	232	232	50	4	1.0
21	37	37	17	1	1.0
28	5	5	5	0	1.0
Total	600	600	142	7	1.0
Score:	89,400				
1 Mult = 4.0 Q's					

# Getting Started with RTTY Contesting

RTTY Engine 1

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

FIG

Mar

2121

Hz

Type

R

HA

UOS

Shift

170

Hz

SQ

Not

BPF

TX

BW

60

Hz

TXOFF

AV

70

Hz

ATC

NET

AFC

14090.00 RTTY K3 - VFO A

File Edit View Tools Config Window Help

Name

State

RTTY

160

80

40

20

15

10

Run

S&P

F1 CQ

F2 Exch

F3 RPT E

F4 K9WX

F5 Hs Call

F6 Rpt Exc

F7 K9WX-4

F8 AGN

F9 NAME?

F10 QTH?

F11 AGN

Esc: Stop

Wipe

Log It

Edit

Mark

Store

Spot It

QRZ

Heading appears here when enabled.

Call history UserText appears here when enabled.

0 spots loaded after filtering.

600/142/7

89,400

14097.88 RTTY Mode - Split

C KBWKKWX

GWFOW ZGJAYXX

CQ NA K9WX K9WX CQ

UM;h1: )031529\$SYU

/)

A

PDW

VLWUUEH

FEZCHZS;:,-81/s

?:'/:;.5"2.71hXVIAGHNKZKVVK

CQ NA K9WX K9WX



# ***My RTTY History***

- First license: Tech+ September 1993
- Upgraded to General January 14, 1994
- First CW QSO January 28, 1994

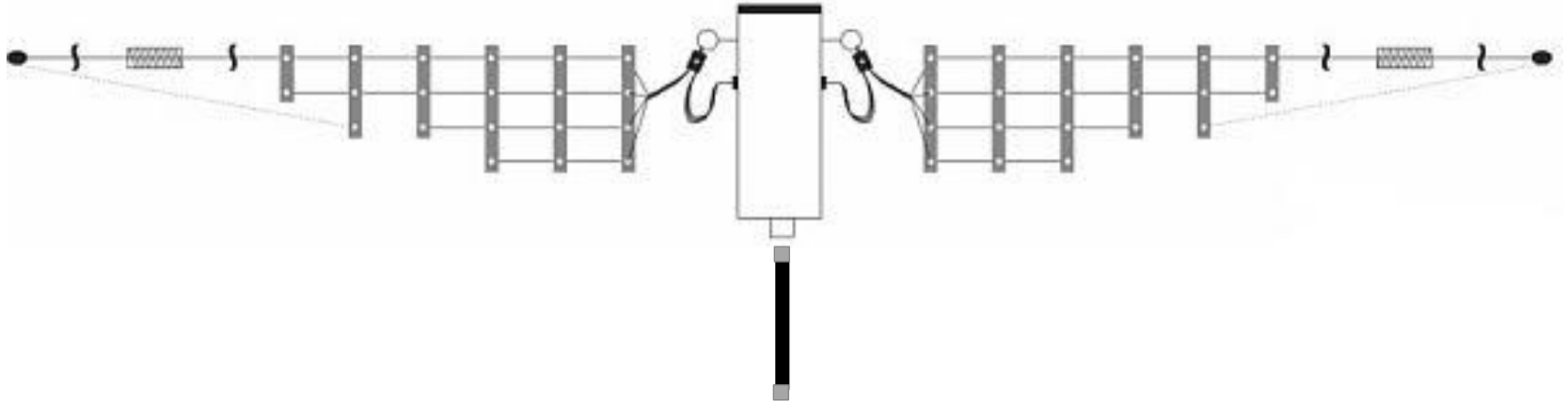


# *My RTTY History*

First RTTY QSO 4 Years  
Later: March, 1998!

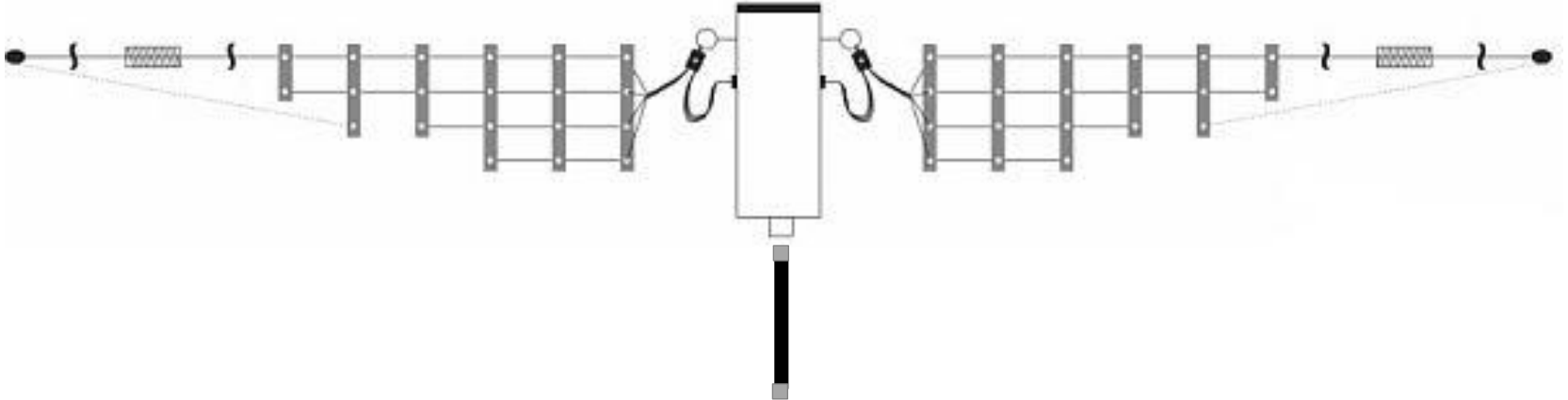


# ***What You Need: Phone***



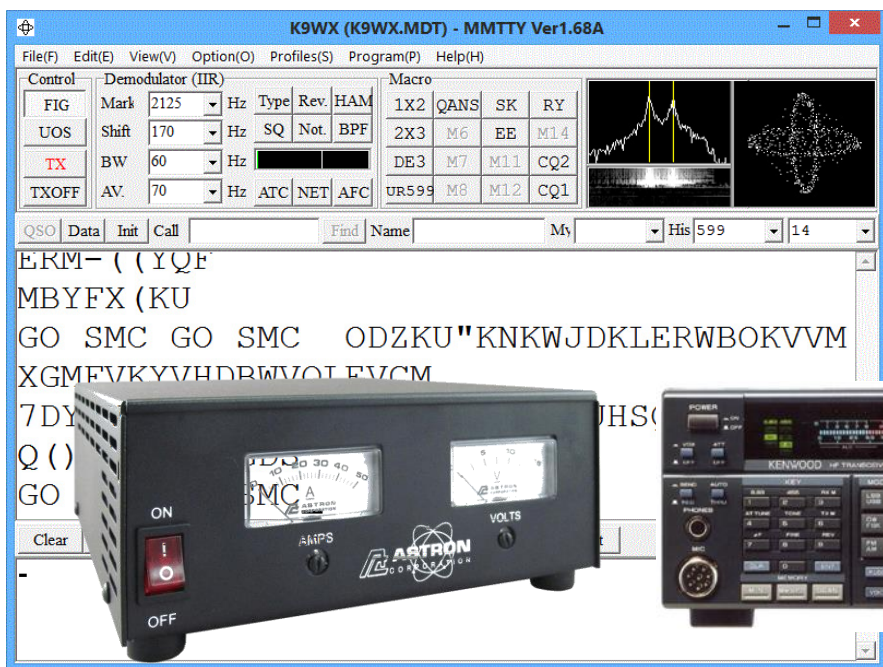
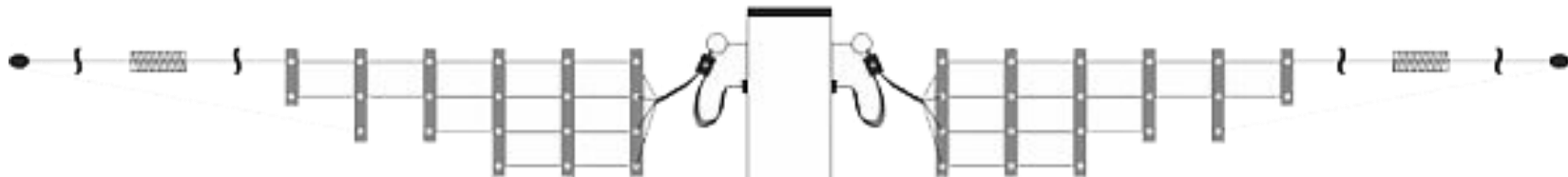
Getting Started With RTTY Contesting

# *What You Need: CW*



Getting Started With RTTY Contesting

# What You Need: RTTY



Getting Started With RTTY Contesting



# ***What You Need: Patience***



Getting Started With RTTY Contesting

# ***Why Do I Like RTTY?***

Ability to copy  
is THE skill that  
separates  
average  
contesters  
from great on  
phone and CW.





# ***Why Do I Like RTTY?***

Ability to copy  
is simply not a  
factor in RTTY  
contesting: the  
decoder does  
all the work.



# ***Why Do I Like RTTY?***

The RTTY  
operator can  
draw other skills,  
techniques and  
strategies not  
applicable to  
CW/Phone  
contesting



# ***Why Do I Like RTTY?***

High-  
performance  
contesting is  
enabled for more  
participants



# ***Why Do I Like RTTY?***

- On a good day, I am an average CW contester
- On an average day, I am a good RTTY contester
- It doesn't matter what day it is, I am a lousy Phone contester



# ***Why Do I Like RTTY?***

CW contesting is a lean-forward experience:

- Tense
- White-knuckled
- Straining to hear every dot and dash through the static



# ***Why Do I Like RTTY?***

RTTY contesting is a lean-back experience

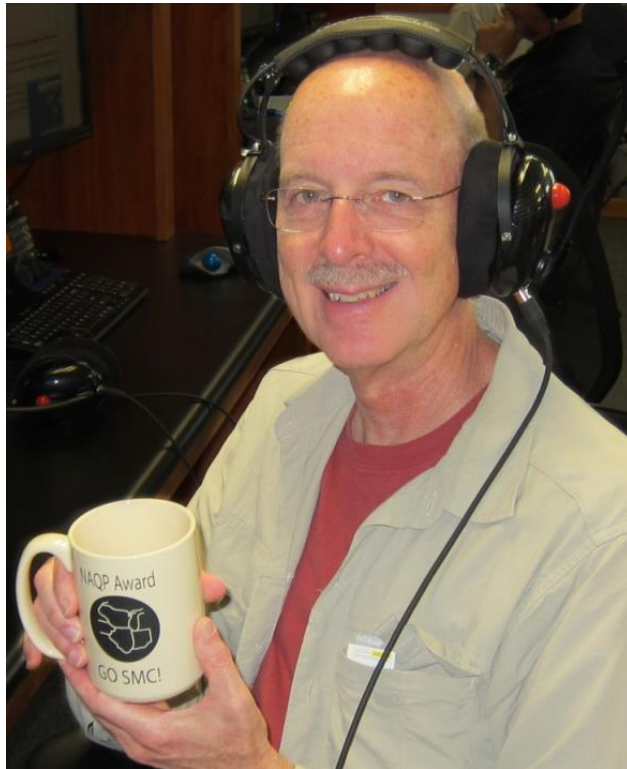
- Relaxed
- Calm
- I let the computer do the hard work





# ***Why Do I Like RTTY?***

## **After RTTY Contest**



## **After CW Contest**



# ***Presentation Overview***

- Anatomy of a RTTY signal
- Three basic decisions to make as you get started
- Operating demonstration
- Operating essentials
- A look at the future and FT8



# ***Presentation Overview***

Will ignore

- Paddle-generated RTTY
- Using radio memories
- Hardware modems: Hal, Kantronics



# ***Presentation Overview***

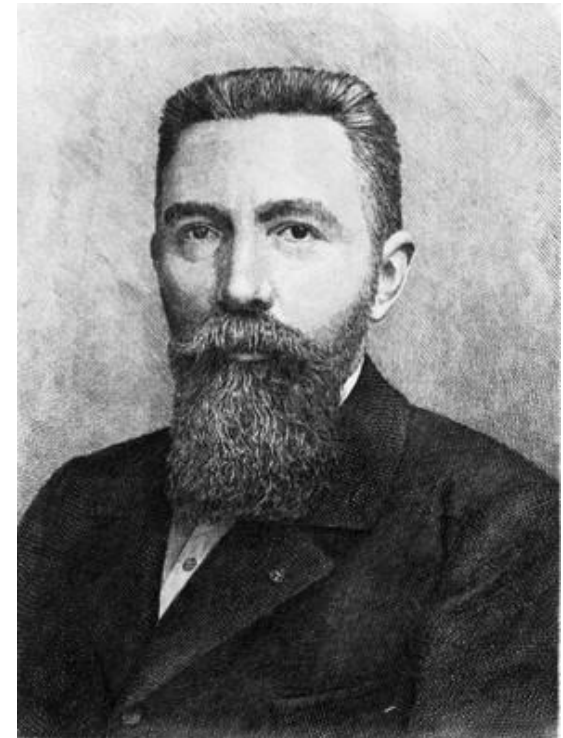
RTTY, It's:

- Like CW in some ways
- Different from CW in other ways



# ***Anatomy of a RTTY Signal***

- Based on work of Emile Baudot, 1870
- Telegrapher
- His goal: create a new communication system with more automation than telegraph and Morse code



# ***Anatomy of a RTTY Signal***

1. All RTTY characters are the same length
  - CW characters can be from 1 to 6 bits
  - CW bits (1's and 0's, dit's and dah's) are different lengths
2. Prior agreement on speed
  - CW: the sender picks the speed and recipient must adapt





# *Anatomy of a RTTY Signal*

- 5-bit code:  
C = 01110  
Q = 10111
- 5-bit binary code only  
has 32 combos:  $2^5 = 32$



# ***Anatomy of a RTTY Signal***

- Allow each 5-bit code to represent 2 different characters:
  - Letters in “letters” character set, 26 characters
  - Numbers and punctuation in “figures” character set, 26 characters



# Anatomy of a RTTY Signal

## The USTTY or “S-Bell” character set

- Typically the default set used by your software
- A LTRS or FIGS character is transmitted to define whether subsequent characters are interpreted as Letters or Figures

Code	Control Characters	
00000	Null	
00100	Space	
01000	CR	
00010	LF	
11011	FIGS	
11111	LTRS	
	Letters	Figures
00011	A	—
11001	B	?
01110	C	:
01001	D	\$
00001	E	3
01101	F	!
11010	G	&
10100	H	#
00110	I	8
01011	J	'
01111	K	(
10010	L	)
11100	M	.
01100	N	,
11000	O	9
10110	P	0
10111	Q	1
01010	R	4
00101	S	BELL
10000	T	5
00111	U	7
11110	V	;
10011	W	2
11101	X	/
10101	Y	6
10001	Z	"



# ***Anatomy of a RTTY Signal***

The USTTY or “S-Bell” character set

- Typically the default set used by your software
- A LTRS or FIGS character is transmitted to define whether subsequent characters are interpreted as Letters or Figures



# *Anatomy of a RTTY Signal*

Send “CQ W9OX”

- CW: 6 Characters  
plus a pause for the  
space
- RTTY: 10 Characters

	LTRS	11111
	C	01110
	Q	10111
	Space	00100
	W	01111
→	FIGS	11011
	9	11000 ←
→	LTRS	11111
	O	11000 ←
	X	11101



# ***Anatomy of a RTTY Signal***

What does it sound like? CW:

- RX is a single audio tone
  - Duration of tone (dot/dash) indicates Data 1 or 0
  - RX stations pick their preferred audio frequency by selecting their CW offset, commonly from 400 Hz to 800 Hz
  - There is a pause between tones or bits
  - A longer pause between characters
  - A still longer pause between words





# *Anatomy of a RTTY Signal*

What does it sound like? RTTY:

- Two audio tones, low & high, identical in length
- The audio frequency of the tone indicates Data 1 or 0
  - 2125 Hz = Data 1 = “Mark” = low tone
  - 2295 Hz = Data 0 = “Space” = high tone
  - “Shift” = 170 Hz
  - One tone or the other is always “on”: 100% duty



# ***Anatomy of a RTTY Signal***

Prior agreement on speed

- Many different rate protocols
- Ham radio contesting uses a bit or tone duration of 22 milliseconds almost exclusively
- This equates to a 45.45 baud or symbol rate (~60 wpm)



# *Anatomy of a RTTY Signal*

## Start and stop bits

- Timing and synchronization
- No info included
- No error correction!

Questions?

LTRS	0111111 <sub>1</sub>
C	0011101 <sub>1</sub>
Q	0101111 <sub>1</sub>
Space	0001001 <sub>1</sub>
W	0011111 <sub>1</sub>
FIGS	0110111 <sub>1</sub>
9	0110001 <sub>1</sub>
LTRS	0111111 <sub>1</sub>
O	0110001 <sub>1</sub>
X	0111011 <sub>1</sub>



# *Three Important Decisions*

- TX: AFSK or FSK?
- Radio to PC interface
- Software



# *Then . . .*

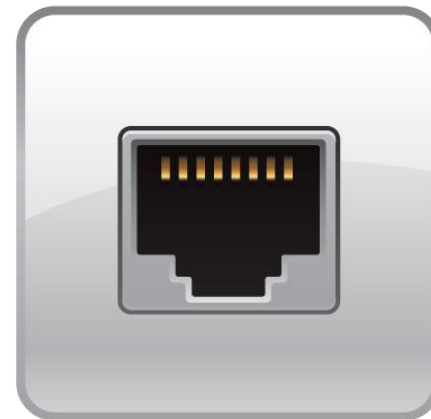


# *. . . Versus Now*



Getting Started With RTTY Contesting

# *Then versus Now*



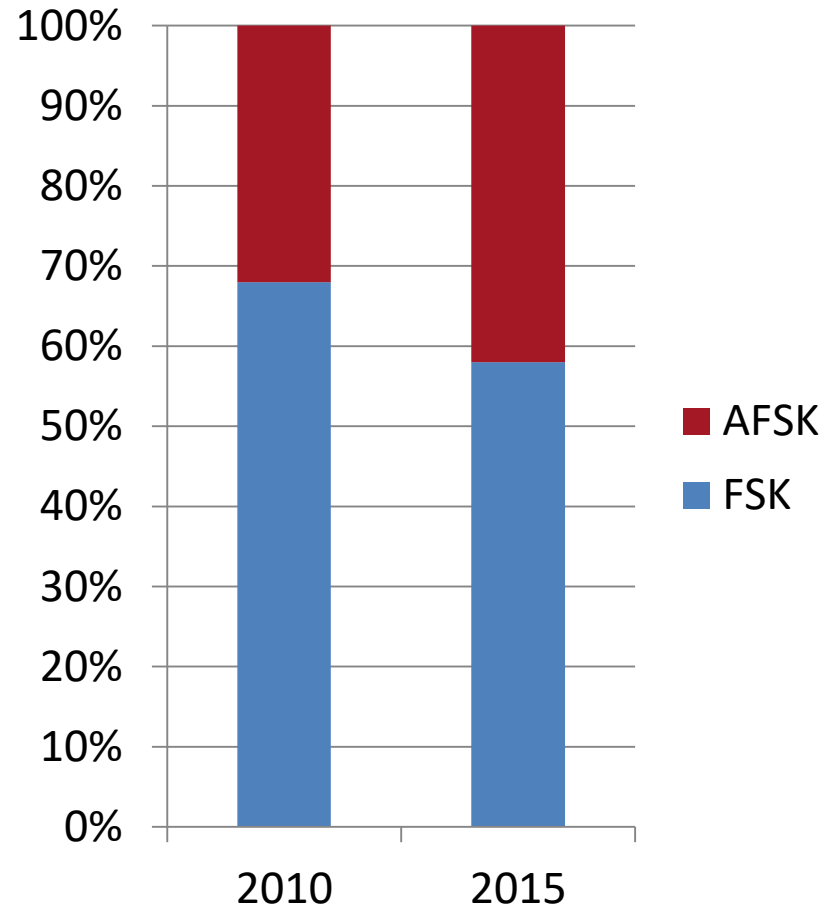
Getting Started With RTTY Contesting



# ***AFSK or FSK?***

- The ham community is evenly split

Source: [rttycontesting.com](http://rttycontesting.com)



# ***AFSK or FSK?***

FSK: Frequency Shift Keying

- Directly keys transmitter like CW
- A radio-specific feature
- Two control lines from PC serial port to radio aux connector
  - Line 1: Continuously grounds PTT input
  - Line 2: Toggles FSK/Data/RTTY input



# ***AFSK or FSK?***

## Audio Frequency Shift Keying

- Tones generated in sound card, fed into mic or aux audio input on the radio
- Radio TX is via LSB



# ***AFSK or FSK?***

## **AFSK**

- Indirect keying-mic/audio input
- Any LSB radio
- May be limited by SSB filters
- Dial = suppressed carrier freq.
- VOX
- Sound card
- Manage audio levels, compression, Windows sounds

## **FSK**

- Direct keying
- Radio specific
- RTTY RX filters
- Dial = Mark freq.
- PTT
- Com port
- No audio level worries



# ***AFSK or FSK?***

FSK or AFSK, which should you use?  
The answer is:

*It won't make any difference to your  
QSO partners.*



See the July/August 2018 *NCJ* for an unbiased overview of the FSK vs. AFSK choice, and the use of USB-Serial converters, by WOYK.



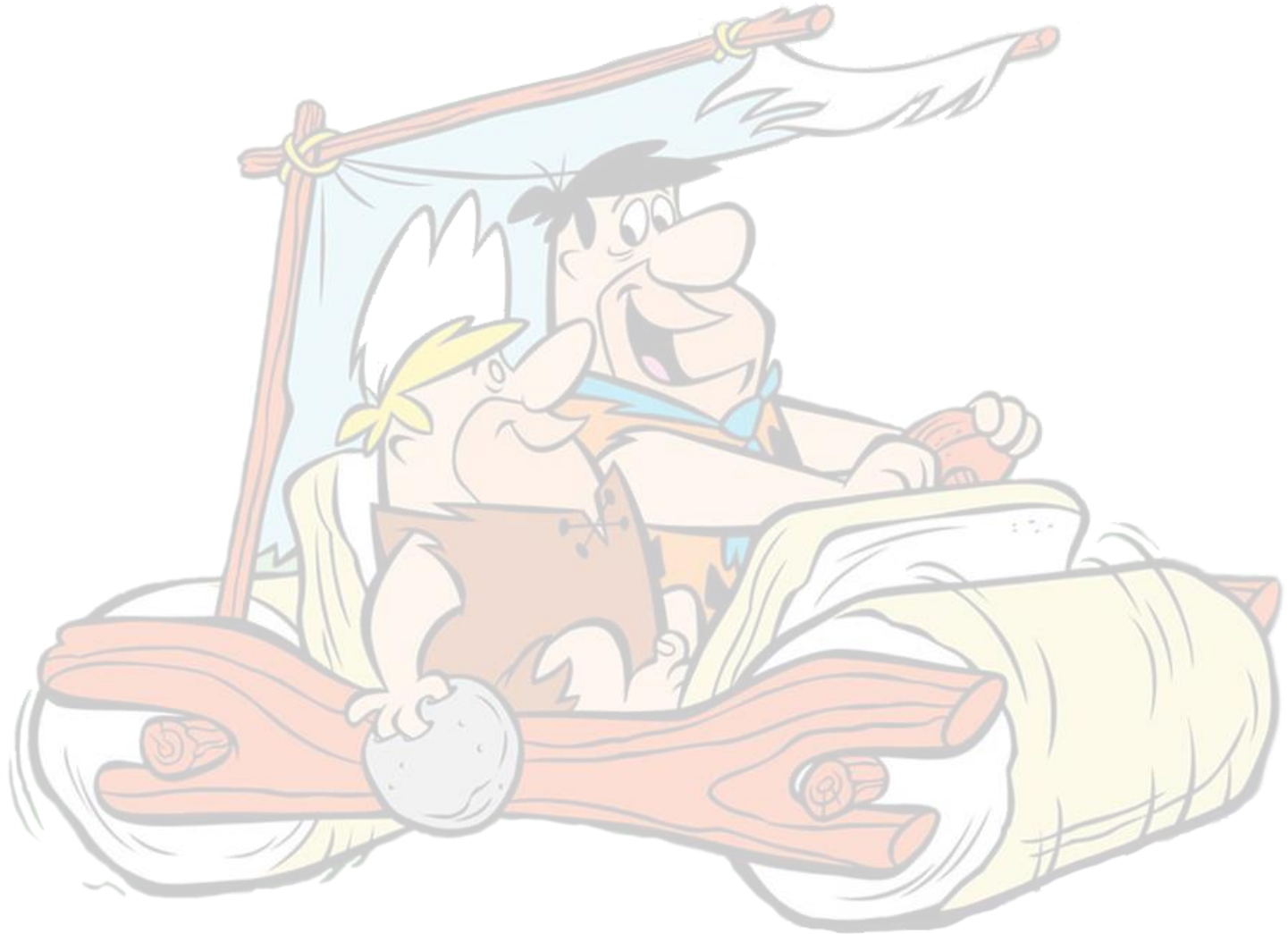
# *Radio to PC Interface*



Getting Started With RTTY Contesting



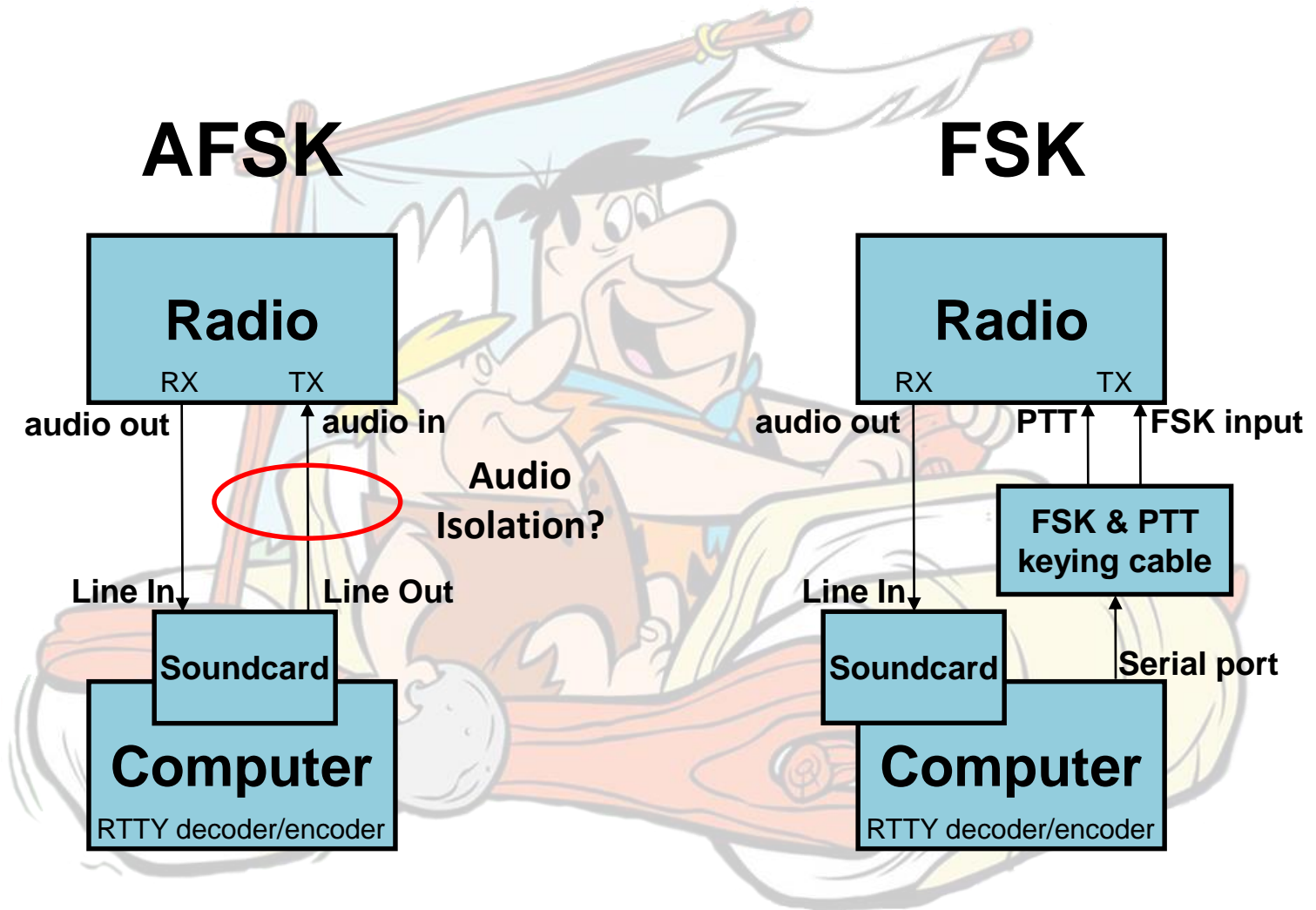
# ***Radio to PC Interface***



Getting Started With RTTY Contesting



# Radio to PC Interface



# ***Radio to PC Interface***



Getting Started With RTTY Contesting

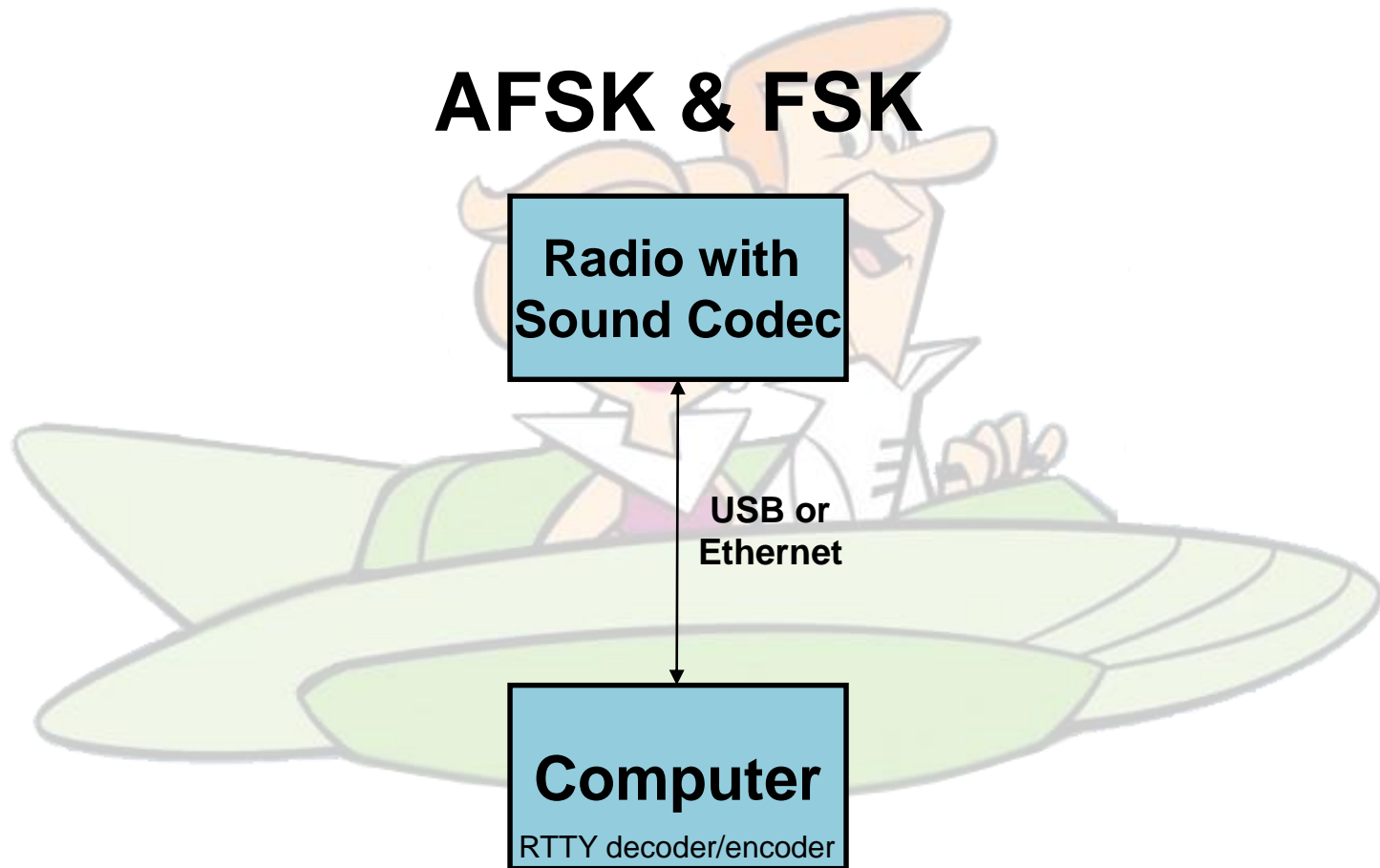
# ***Radio to PC Interface***



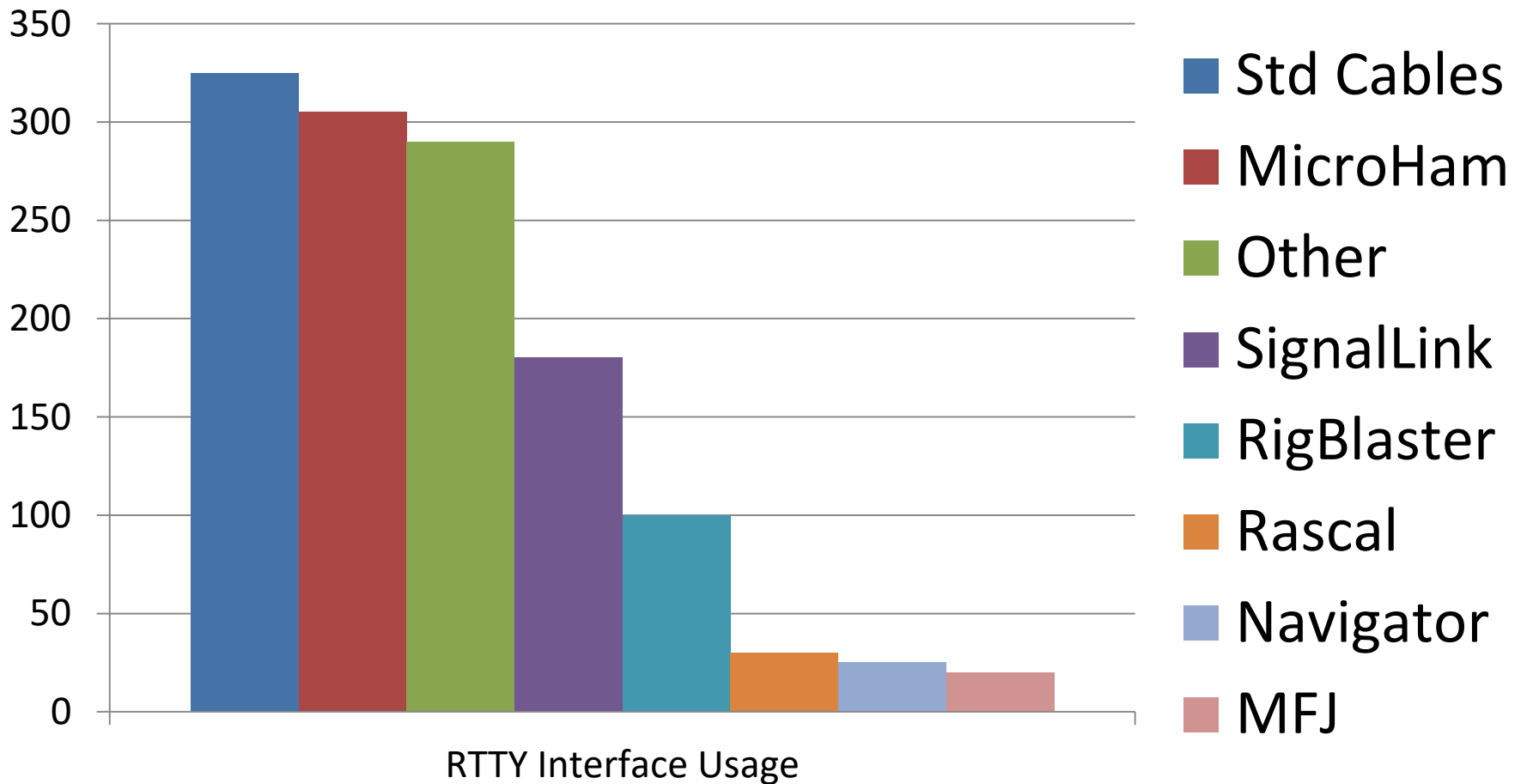
Getting Started With RTTY Contesting

# *Radio to PC Interface*

## AFSK & FSK



# *Radio to PC Interface*



Source: [rttycontesting.com](http://rttycontesting.com)

Getting Started With RTTY Contesting



# ***Radio to PC Interface***

Commercial interfaces: Typical RTTY Features

- Support for AFSK
- Audio isolation
- Mic/computer audio switching



# ***Radio to PC Interface***

## Additional RTTY Features

- Integrated sound card
- Support for FSK
  - Direct FSK via legacy serial port
  - USB FSK, may require additional software driver



# ***Radio to PC Interface***

Many interfaces include non-RTTY features

- Rig control
- CW interface, possibly a WinKey

Subjective parameters

- Construction features i.e. metal enclosure vs. plastic
- Reviewer comments
- Documentation, support





# Radio to PC Interface

Single Radio AFSK-Capable Interfaces with Audio Isolation					
	FSK	PC Connect for FSK	Sound Card	List Price	eHam Reviews
Microham Microkeyer II	VCP	USB	Integrated	\$429	85
Microham Digikeyer II	VCP	USB	Integrated	\$329	32
WMR RIGblaster Pro	VCP	USB to Serial Cable	PC	\$299	33
	Legacy	RS232			
WMR RIGblaster Adv.	VCP <sup>1</sup>	USB	Integrated	\$200	16
WMR RIGblaster Blue	No	N/A	Integrated	\$200	4
Microham USB III	VCP	USB	Integrated	\$199	26
Microham USB II	VCP	USB	PC	\$159	25
WMR RIGblaster P&P	No	N/A	PC	\$120	42
Signalink USB	No	N/A	Integrated	\$120	241
Signalink SL-1	No	N/A	PC	\$90	97
WMR RIGblaster Nomic	No	N/A	PC	\$60	40
1. Output shared with CW					

Based on August 2015 survey



Getting Started With RTTY Contesting

# *Radio to PC Interface*

# Cables available at an additional cost



## Getting Started With RTTY Contesting

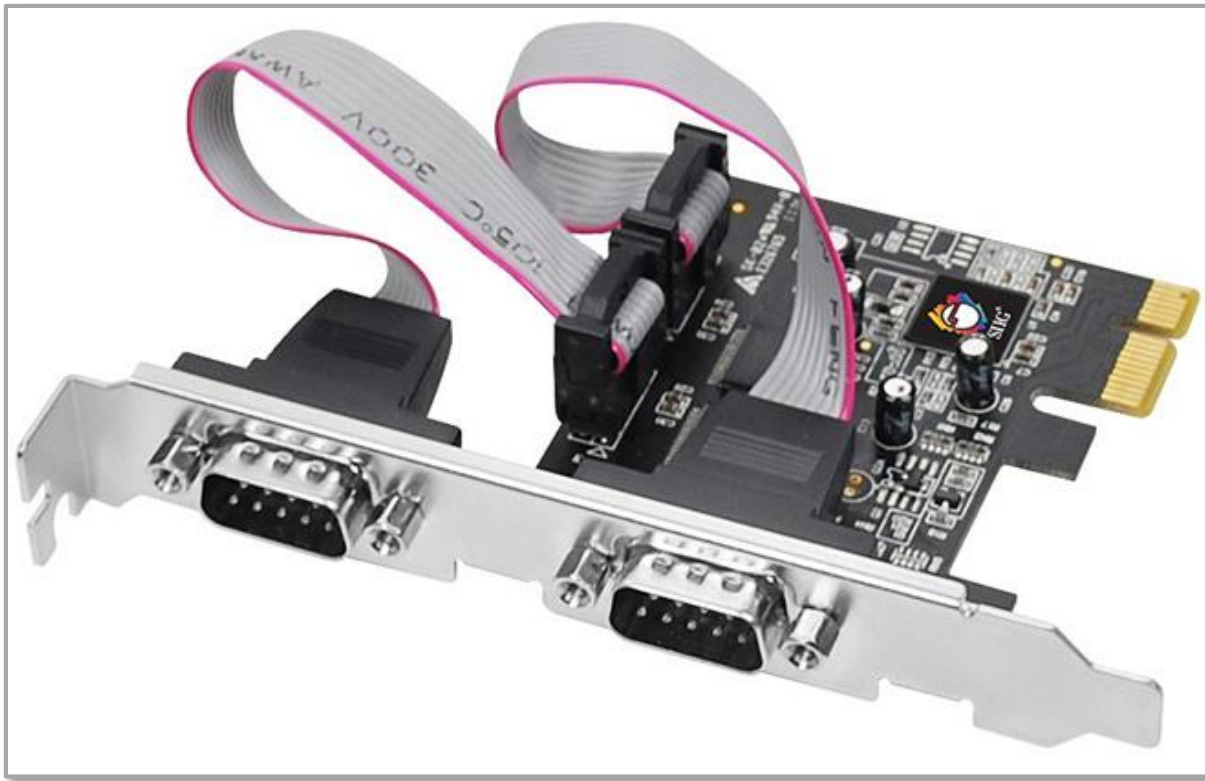
# *Radio to PC Interface*

Should you build your own FSK  
keying interface?



# ***Radio to PC Interface***

Does your PC have a serial port?



Getting Started With RTTY Contesting

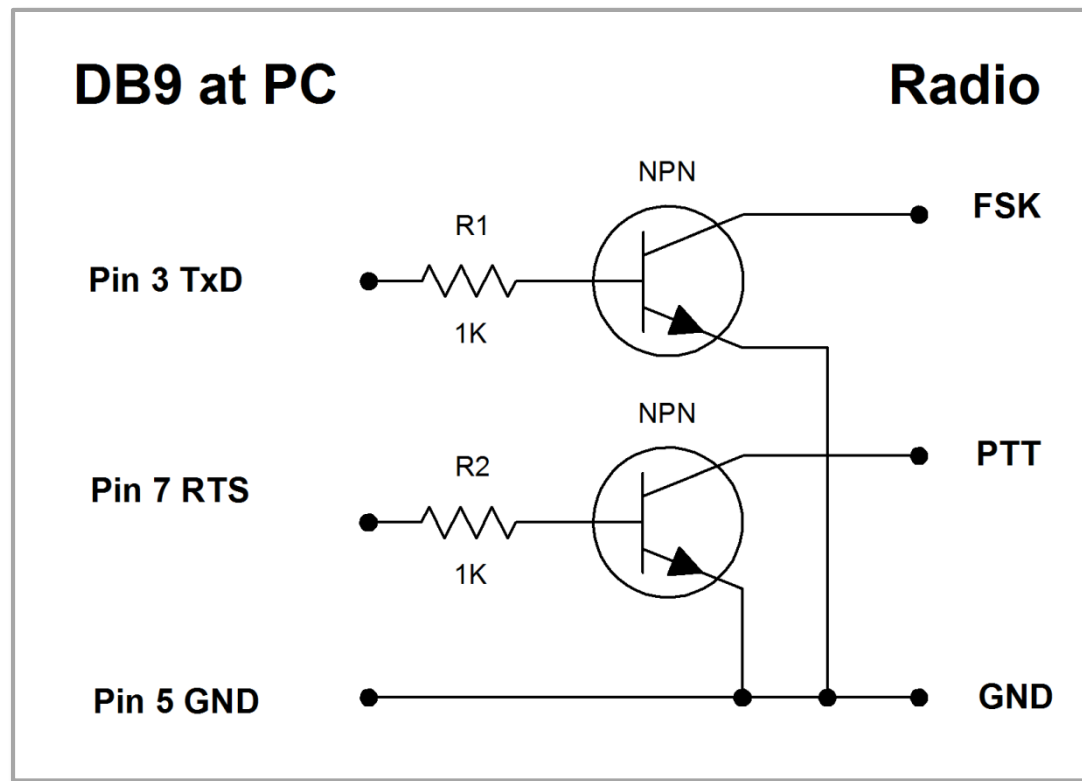
# ***Radio to PC Interface***

Look for the FTDI chipset



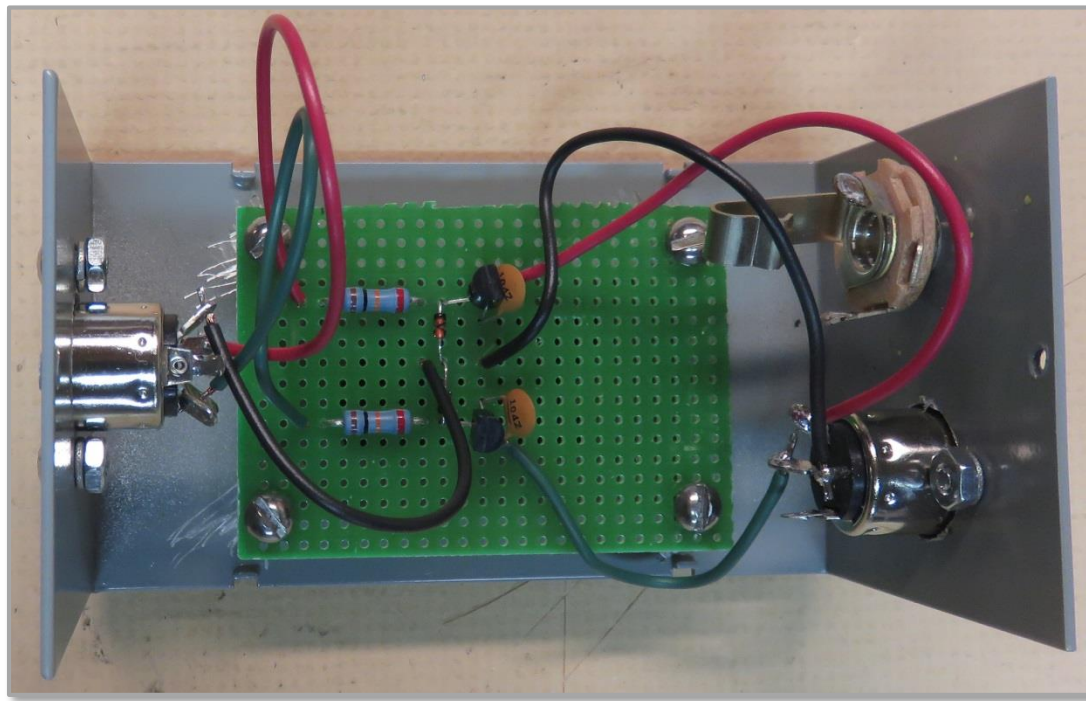
# ***Radio to PC Interface***

Must convert RS232 signals to TTL



# *Radio to PC Interface*


Must convert RS232 signals to TTL



# Radio to PC Interface

Radio connections  
for FSK are  
radio specific

Icom 756ProIII

ACC (1)	PIN No.	NAME	DESCRIPTION
 Rear panel view	1	RTTY	Controls RTTY keying
	2	GND	Connects to ground.
	3	SEND	Input/output pin. Goes to ground when transmitting. When grounded, transmits.
	4	MOD	Modulator input. Connects to a modulator.
	5	AF	AF detector output. Fixed, regardless of <b>[AF]</b> position in default settings. (see notes below)





# ***Radio to PC Interface***

**Warning:** The Com port used for FSK control and the Com port used for rig control **MUST** be different ports!



# ***RTTY Software***

RTTY Software should:

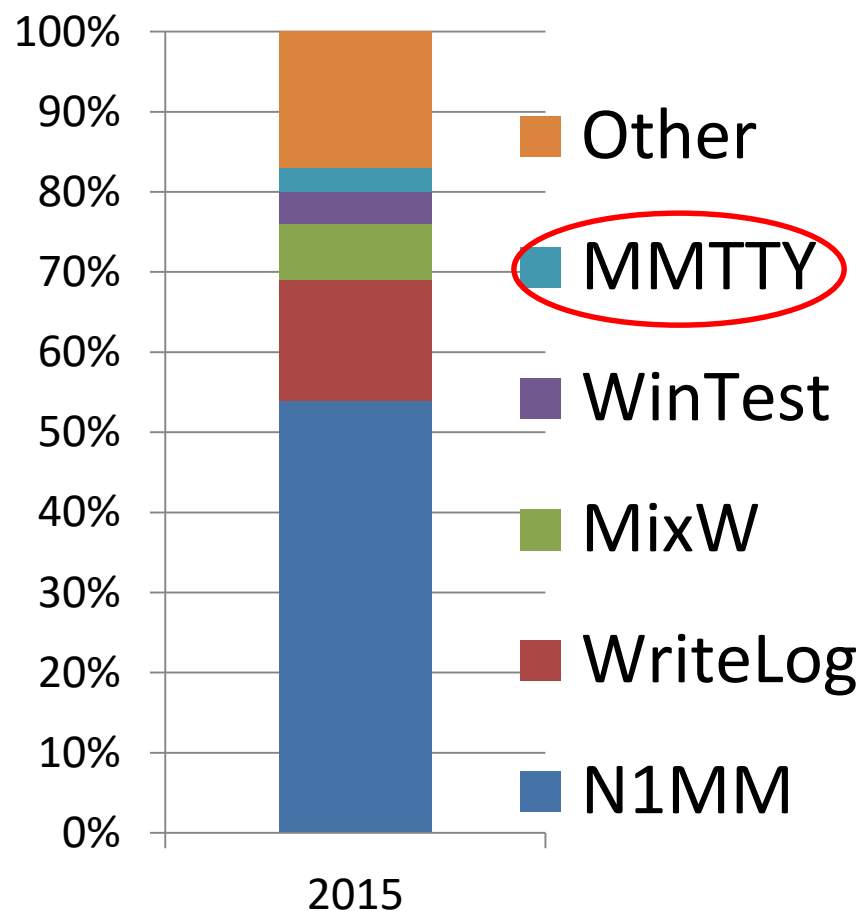
- Encode your transmissions
- Decode your receive
- Log your QSO's
- Provide contest-enhancing functionality:  
packet, rates, multipliers



# ***RTTY Software***

## RTTY Software

- N1MM and WriteLog account for nearly 70% of all users
- N1MM share is growing while all other shares are shrinking



Source: [rttycontesting.com](http://rttycontesting.com)



# ***RTTY Software***

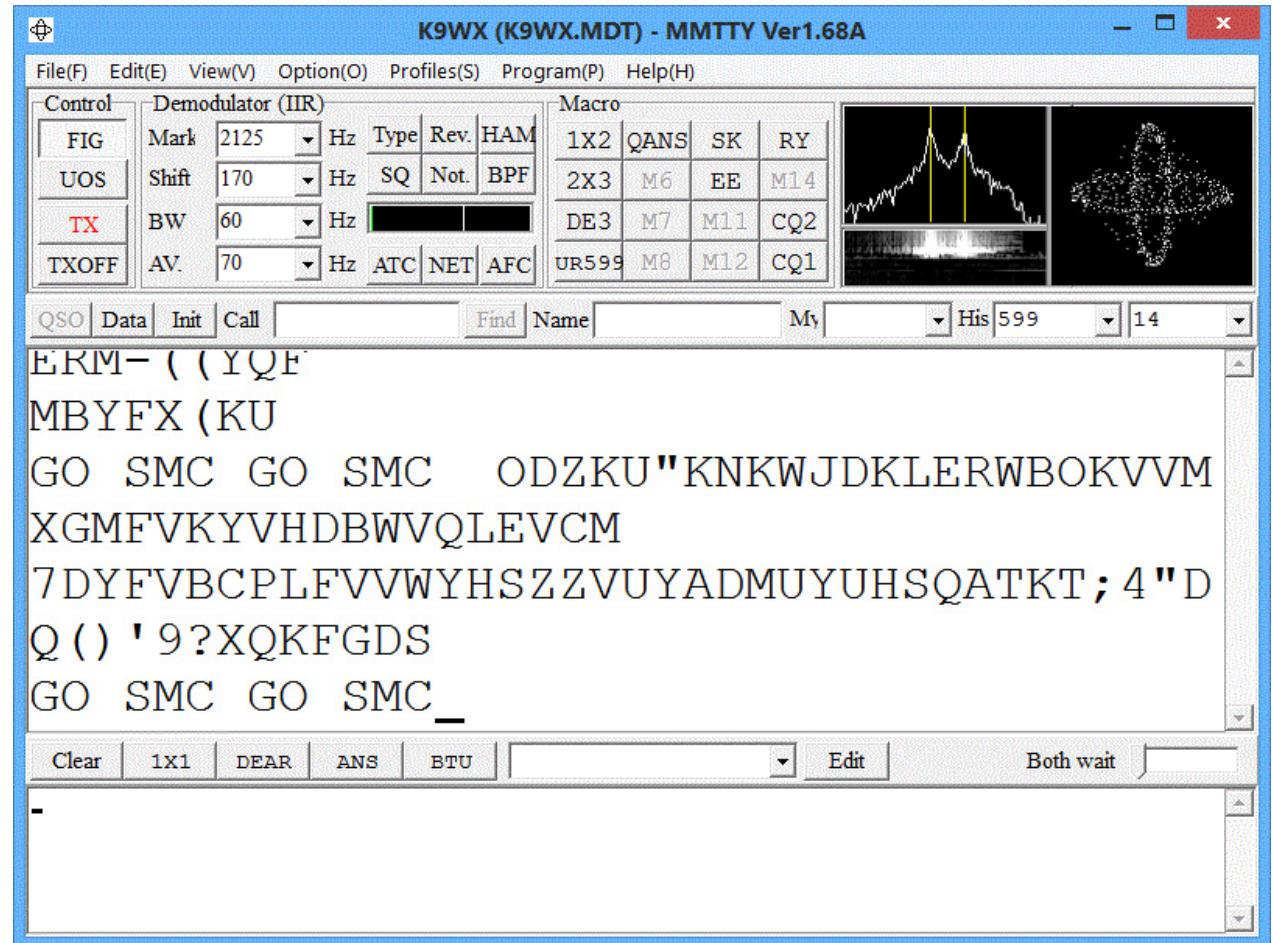
## MMTTY

- Has a contest interface but probably not your first choice for contest software
- Has an excellent decoder
- Extensively used as a decoder/encoder with N1MM and WriteLog
- Get MMTTY working on a stand alone basis as your first step



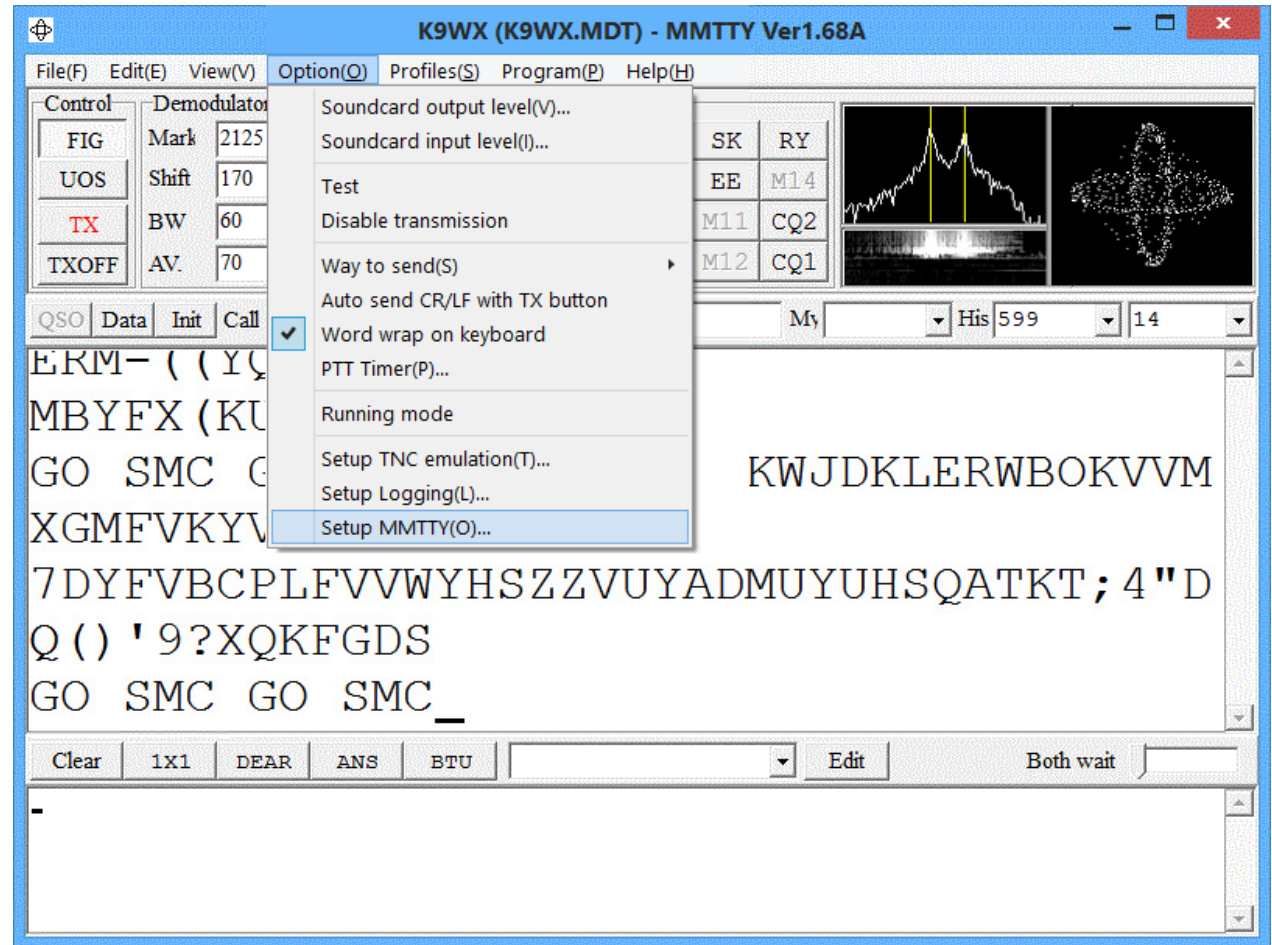
# RTTY Software

## MMTTY Set up



# RTTY Software

## MMTTY Set up



# RTTY Software

MMTTY  
Set up for  
AFSK with  
VOX

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 **NONE**

☐ 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

K9WX    1X2    QANS    SK    RY  
2X3    M6    EE    M14  
DE3    M7    M11    CQ2  
UR599    M8    M12    CQ1

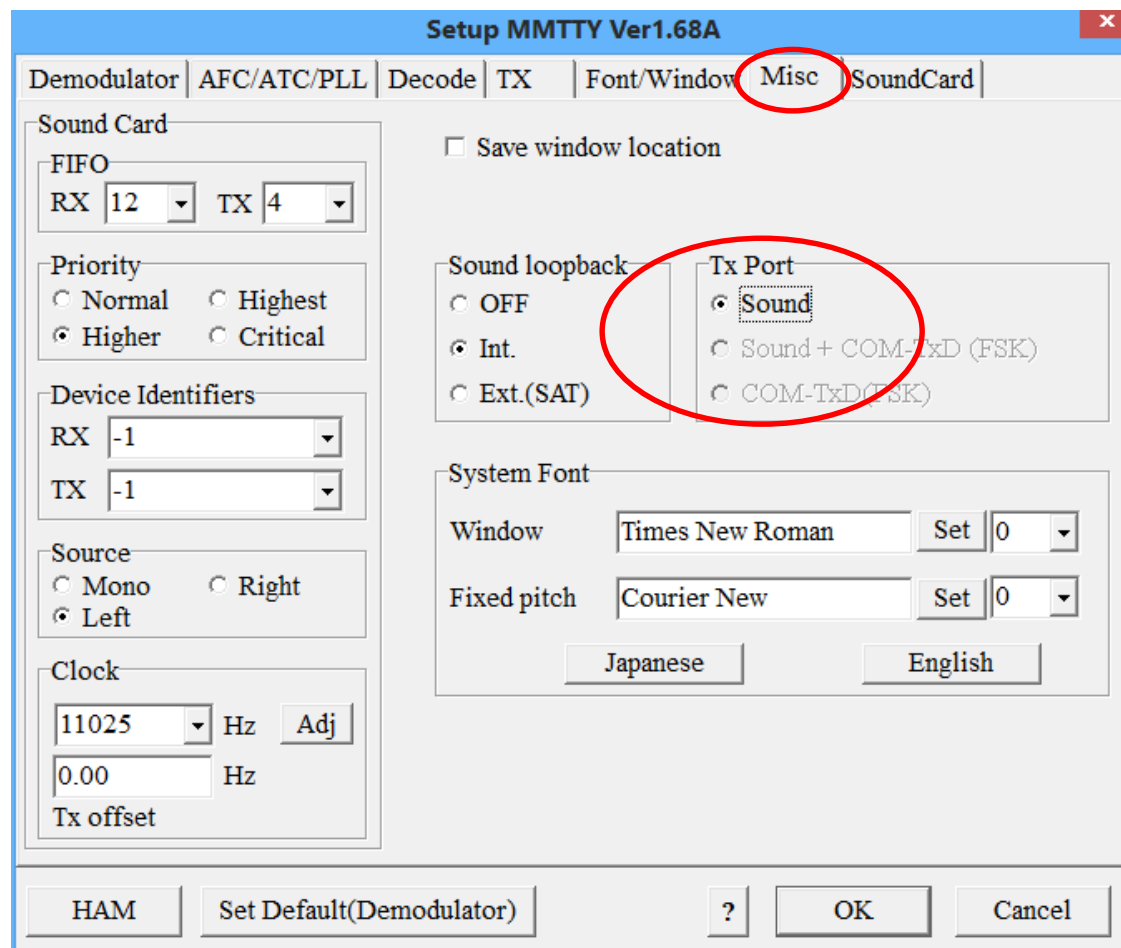
☐ Convert Immediately

HAM    Set Default(Demodulator)    ?    OK    Cancel



# RTTY Software

MMTTY  
Set up for  
AFSK with  
VOX



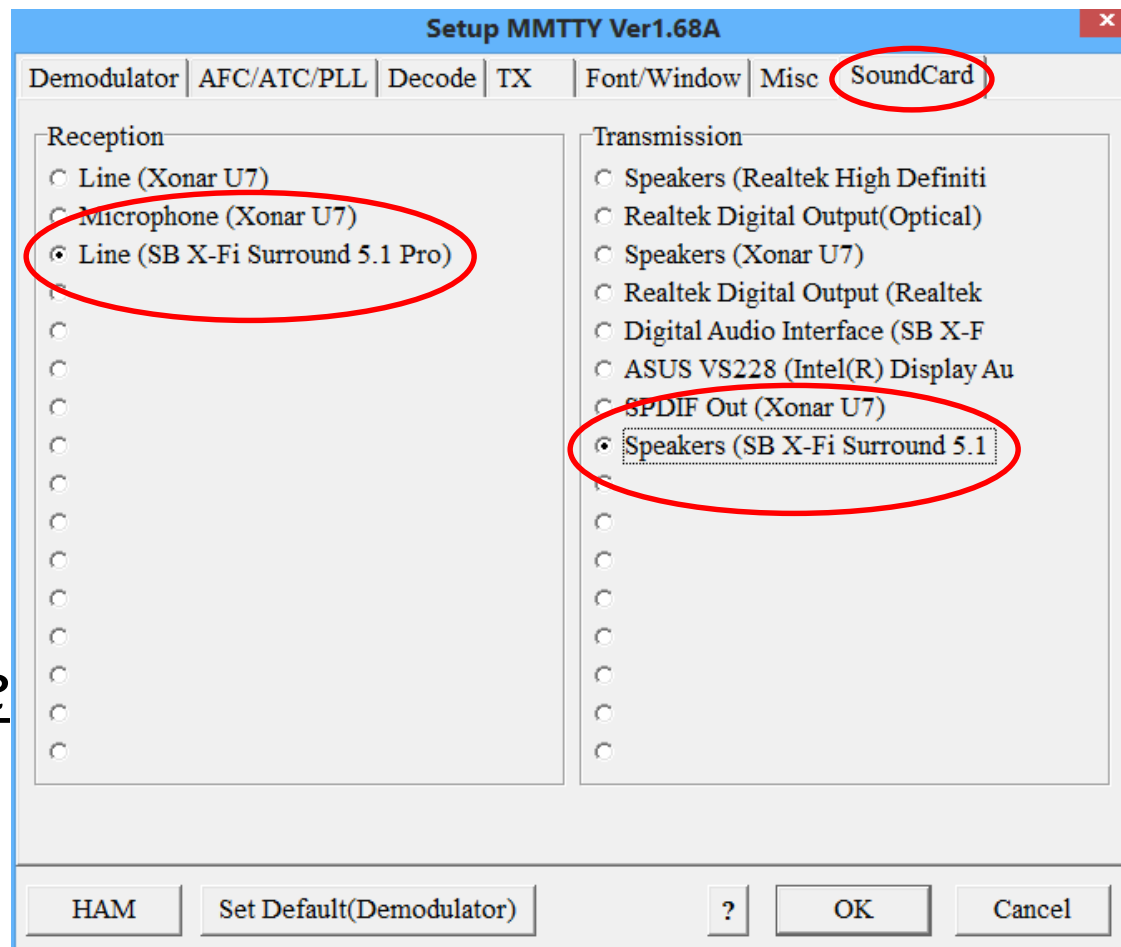
Getting Started With RTTY Contesting



# RTTY Software

MMTTY  
Set up for  
AFSK with  
VOX

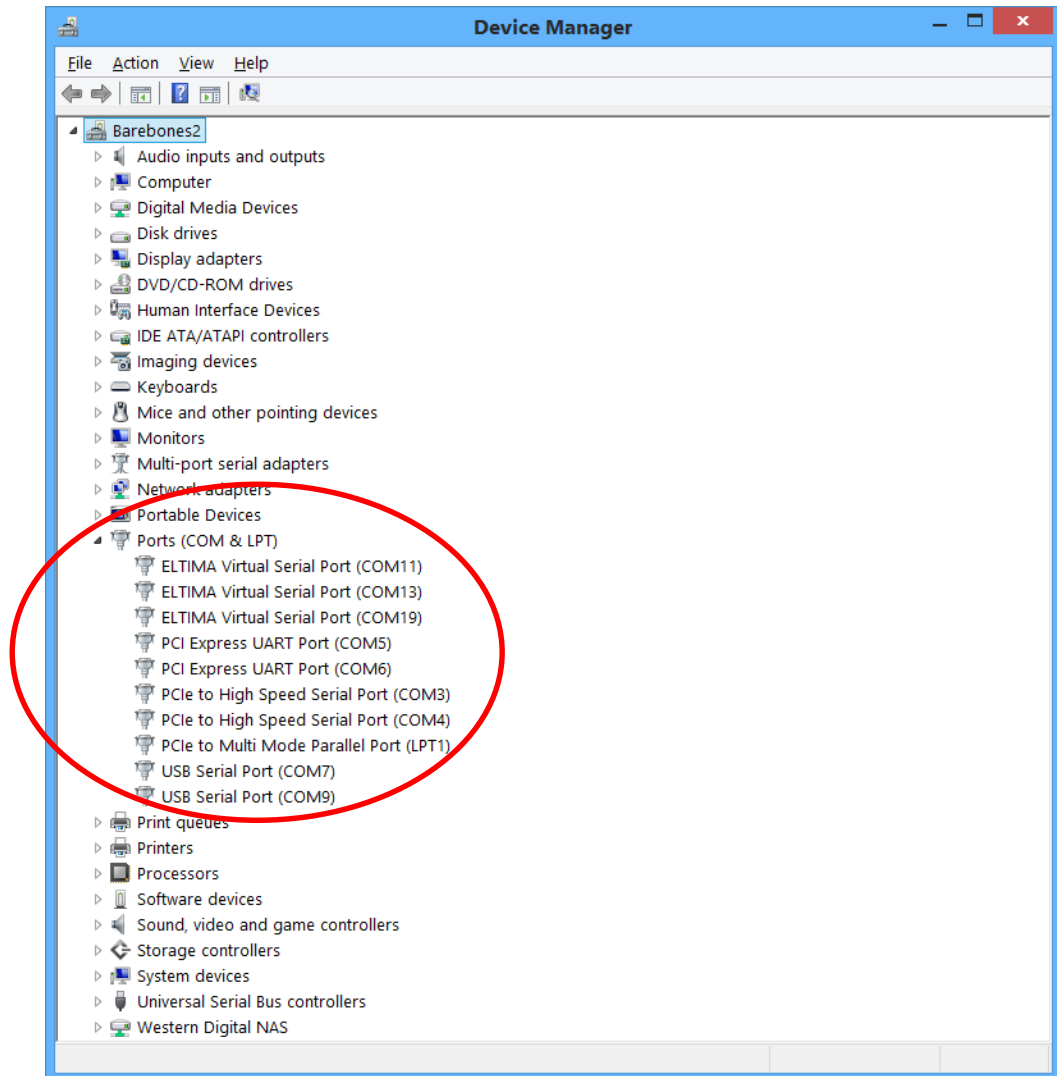
Make sure all  
audio cables are  
connected  
before setting  
up MMTTY!



# *RTTY Software*

## MMTTY Set up for FSK

- Determine your Com port number

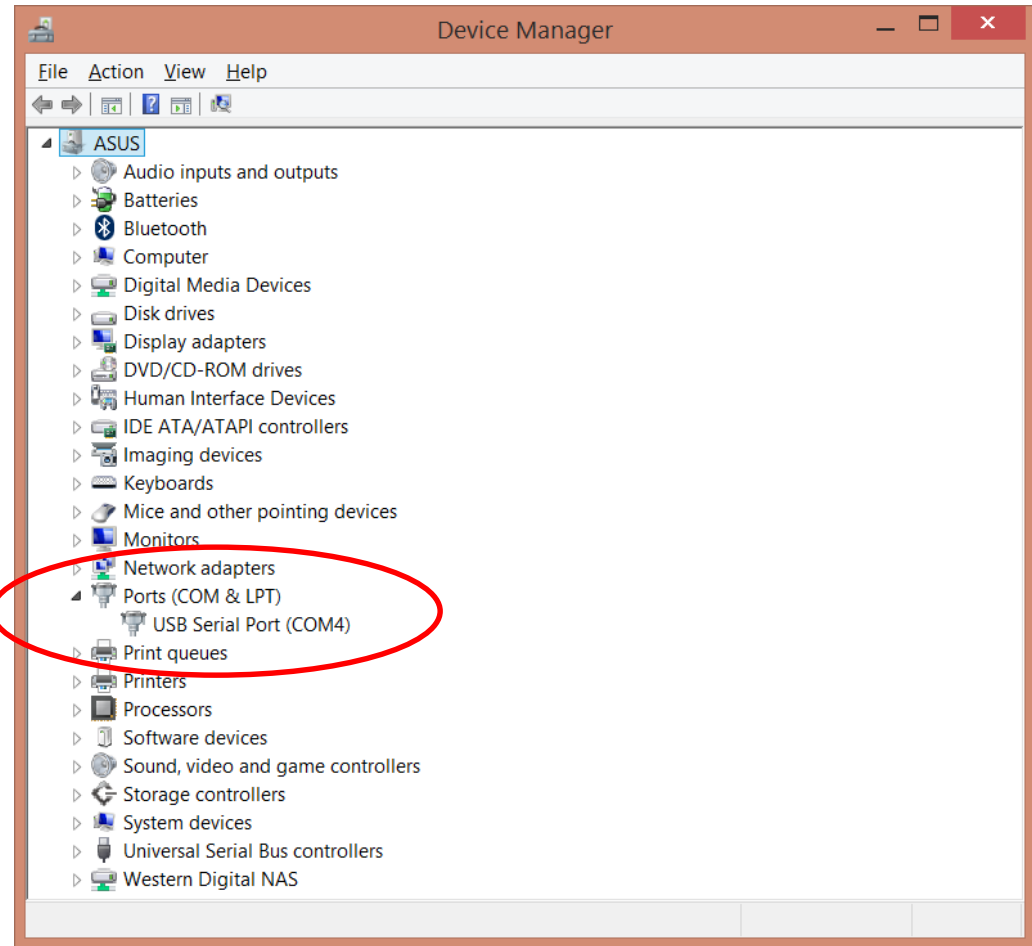


nidxa

# *RTTY Software*

## MMTTY Set up for FSK

- Determine your Com port number



# Getting Started with RTTY

MMTTY  
Set up for  
FSK

The screenshot shows the 'Setup MMTTY Ver1.68A' window. The 'TX' tab is selected and highlighted with a red circle. Within the TX section, the 'PTT & FSK' sub-section is also highlighted with a red circle, showing the 'Port' set to 'COM5'. Other visible settings include 'DIDDLE' set to 'LTR', 'UOS' checked, and 'Tap' set to 48.

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: **COM5**

☐ 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

K9WX    1X2    QANS    SK    RY  
2X3    M6    EE    M14  
DE3    M7    M11    CQ2  
UR599    M8    M12    CQ1

☐ Convert Immediately

HAM    Set Default(Demodulator)    ?    OK    Cancel



# Getting Started with RTTY

MMTTY  
Set up for  
FSK

Setup MMTTY Ver1.68A

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

Sound Card

FIFO  
RX 12 TX 4

Priority  
☐ Normal ☐ Highest  
☒ Higher ☐ Critical

Device Identifiers  
RX -1 TX -1

Source  
☐ Mono ☐ Right  
☒ Left

Clock  
11025 Hz Adj  
0.00 Hz  
Tx offset

☐ Save window location

Sound loopback  
☐ OFF  
☒ Int.  
☐ Ext.(SAT)

Tx Port  
☐ Sound  
☐ Sound + COM-TxD (FSK)  
☒ COM-TxD(FSK) USB Port

System Font  
Window Times New Roman Set 0  
Fixed pitch Courier New Set 0  
Japanese English

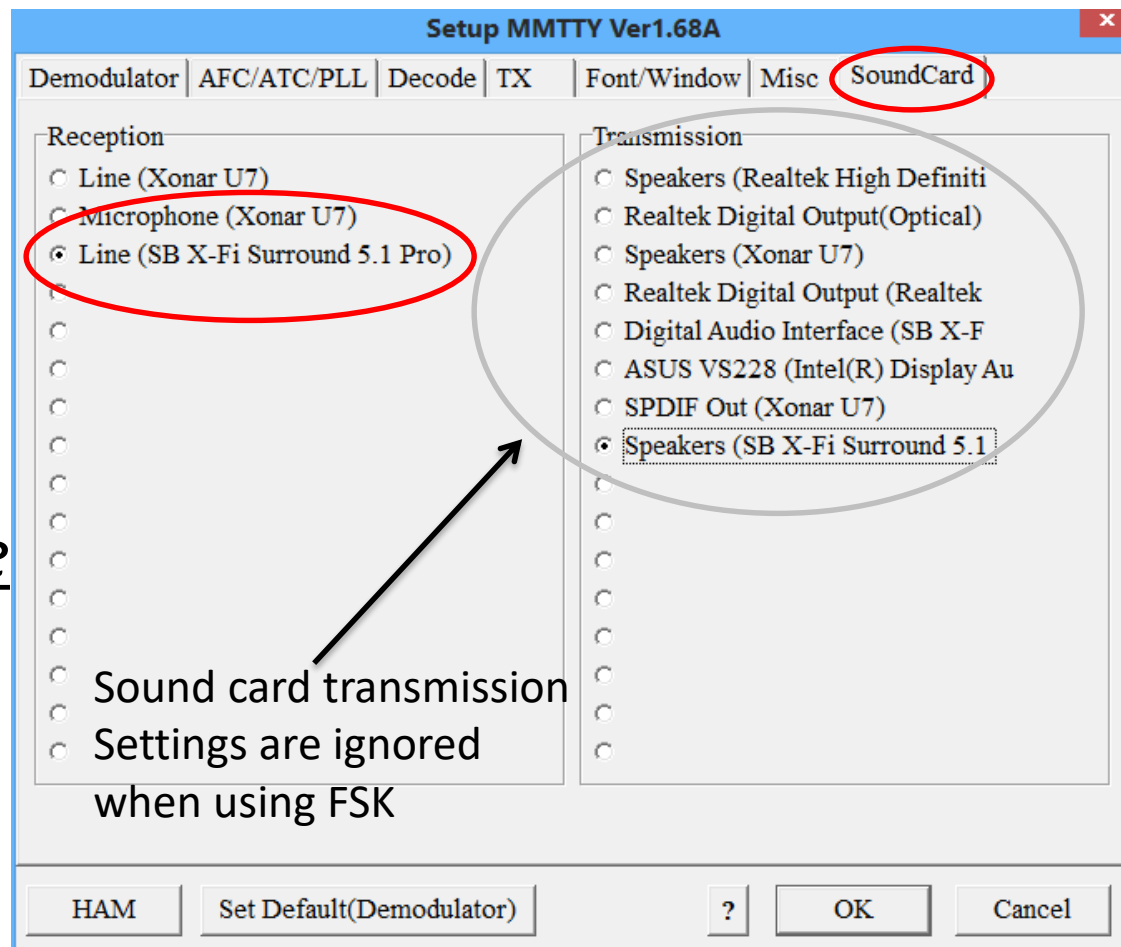
HAM Set Default(Demodulator) ? OK Cancel



# Getting Started with RTTY

## MMTTY Set up for FSK

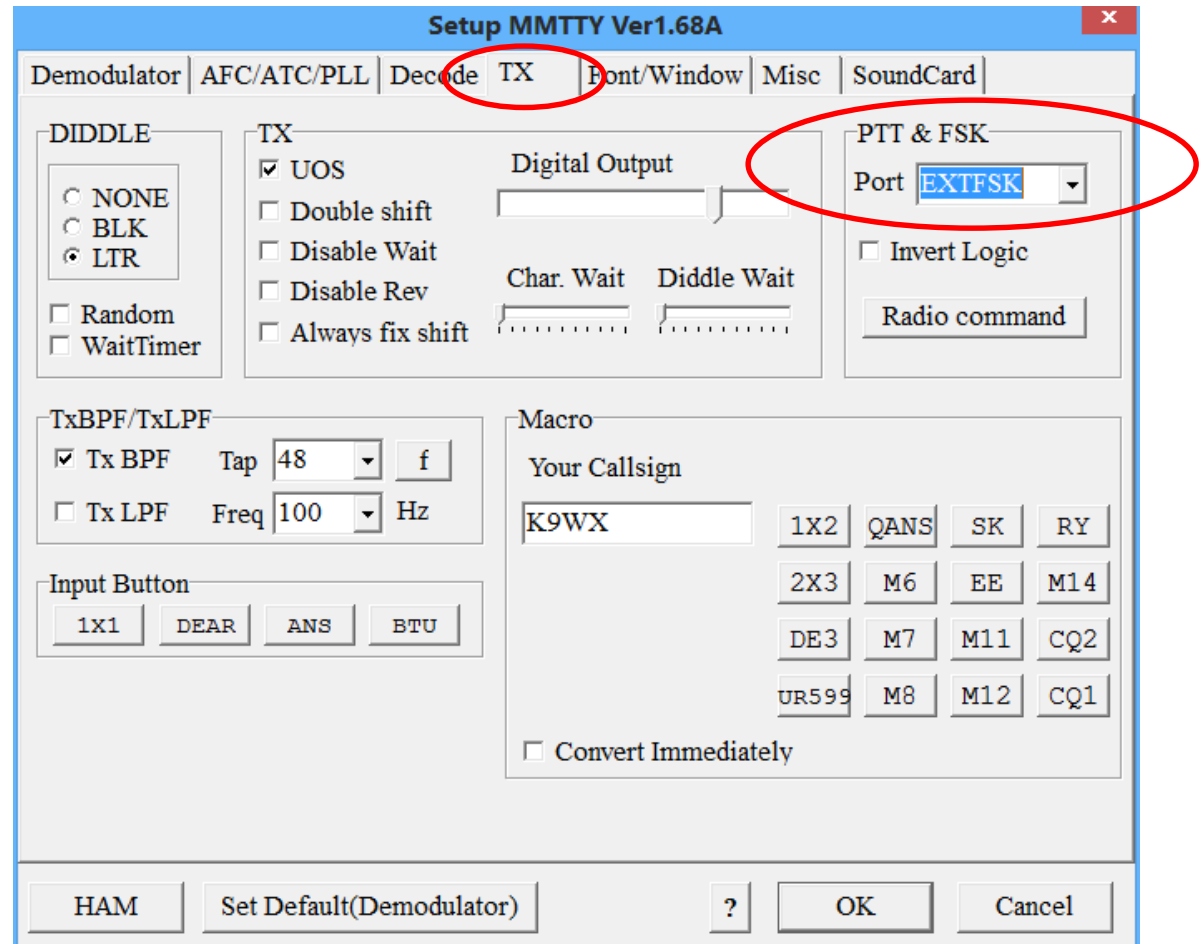
Make sure all  
audio cables are  
connected  
before setting  
up MMTTY!



# RTTY Software

## MMTTY Set up for USB FSK

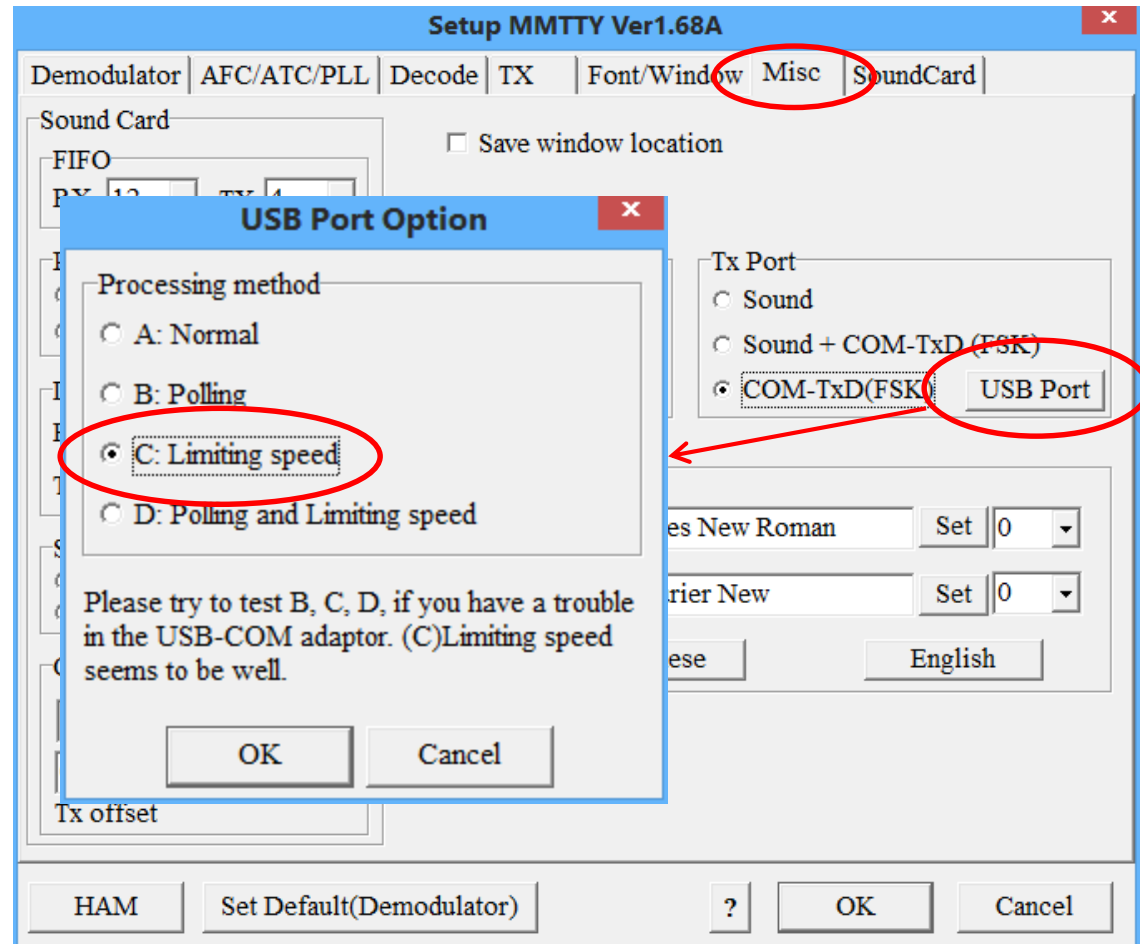
Place a copy of  
extfsk.dll in the  
MMTTY.exe  
directory!



# RTTY Software

MMTTY  
Set up for  
USB FSK

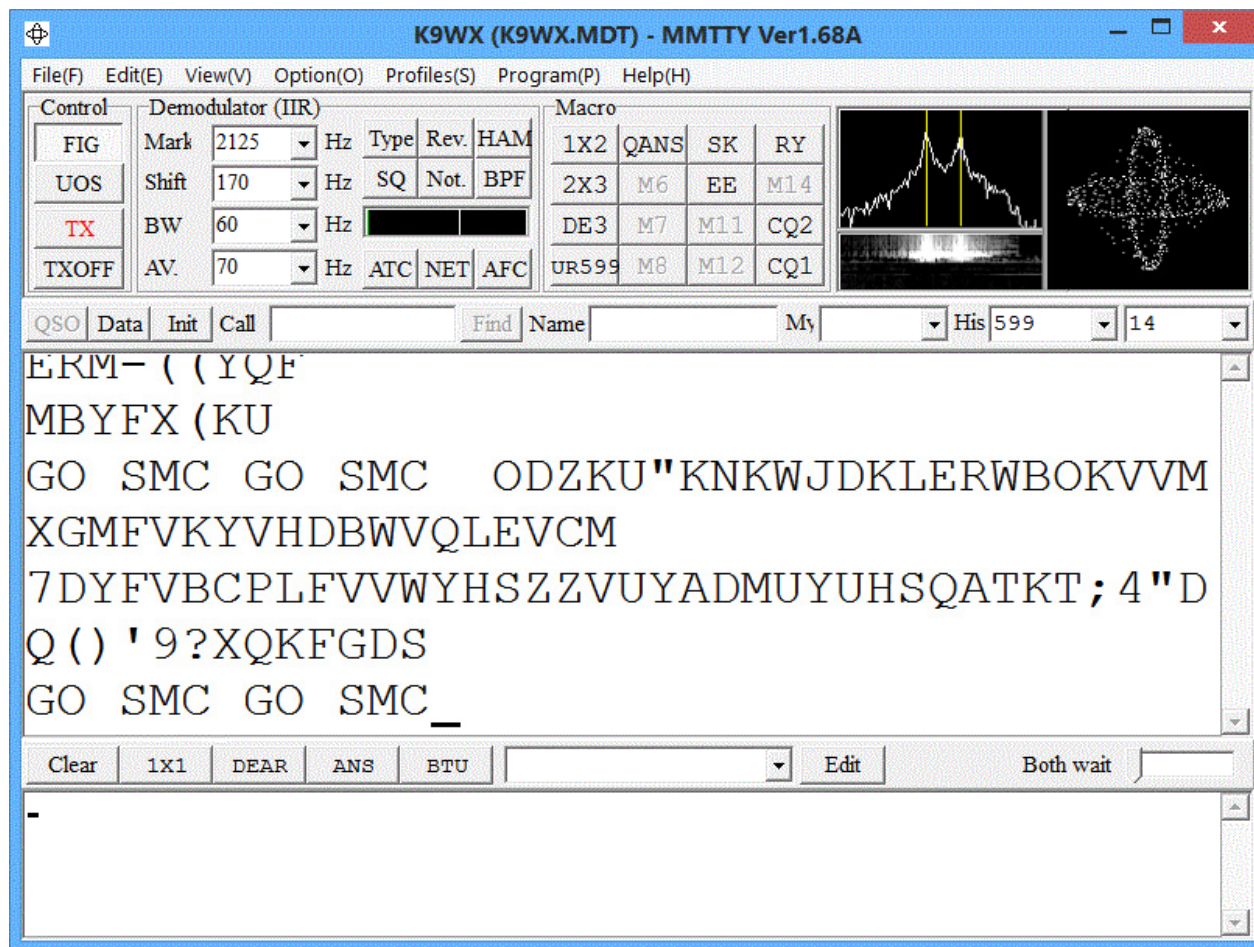
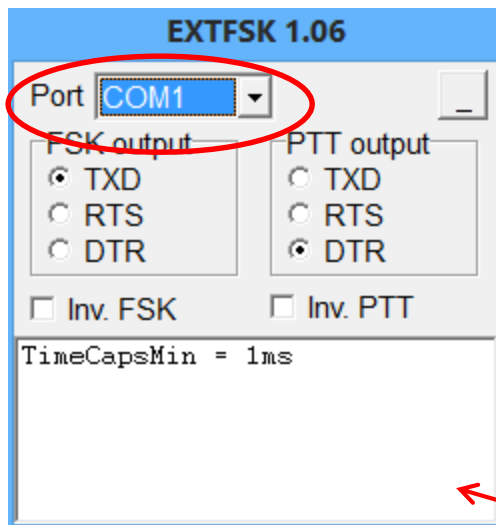
Place a copy of  
extfsk.dll in the  
MMTTY.exe  
directory!





# RTTY Software

MMTTY  
Set up for  
USB FSK



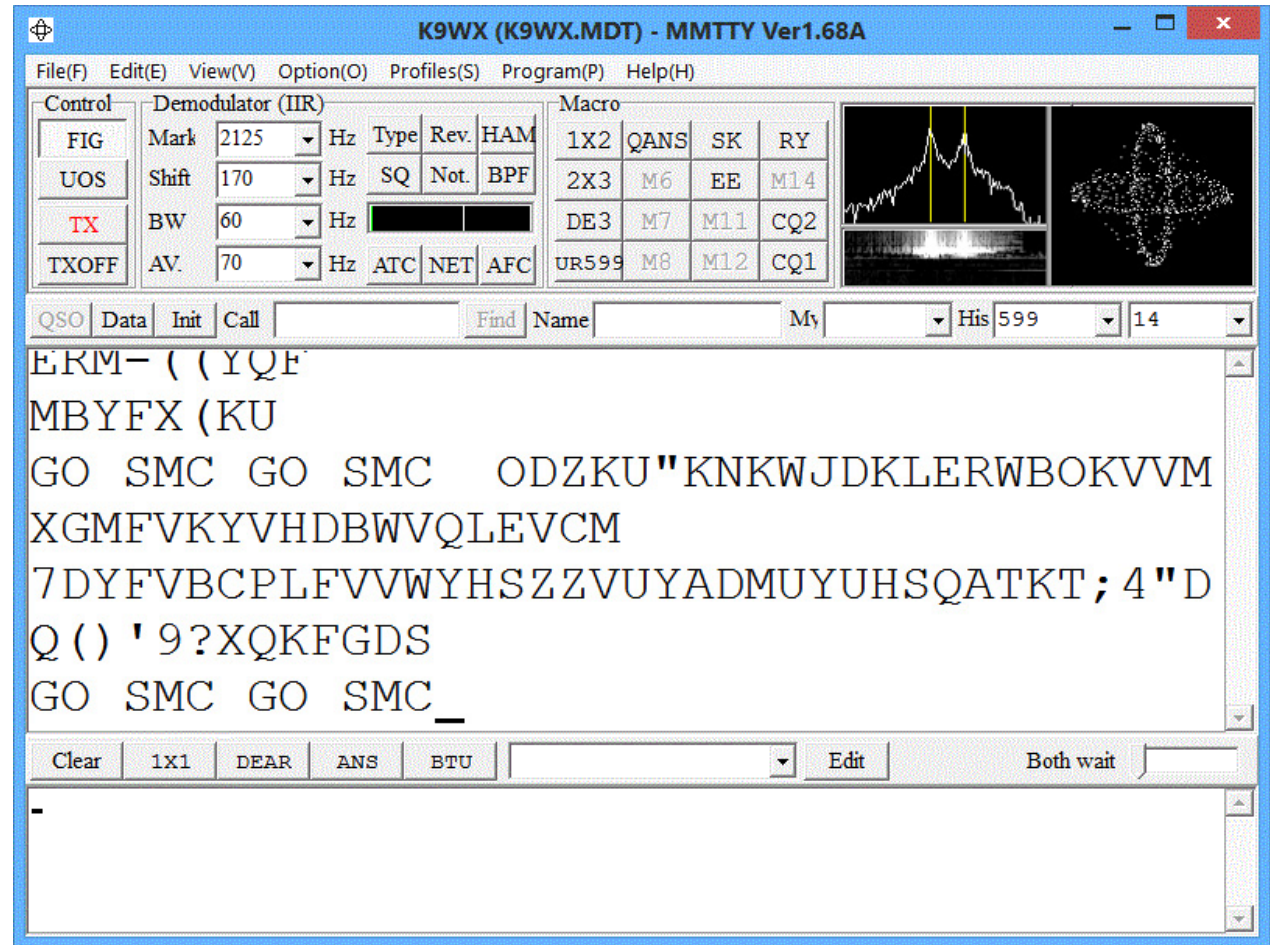
This window only appears after all  
set up windows have been closed



# RTTY Software

## MMTTY Set up

- Commercial interfaces may have their own software and drivers



# ***RTTY Software***

Getting your hardware and software to work together can be challenging.

*Don't be afraid to look for an Elmer*



Questions?



# *Operating Essentials*

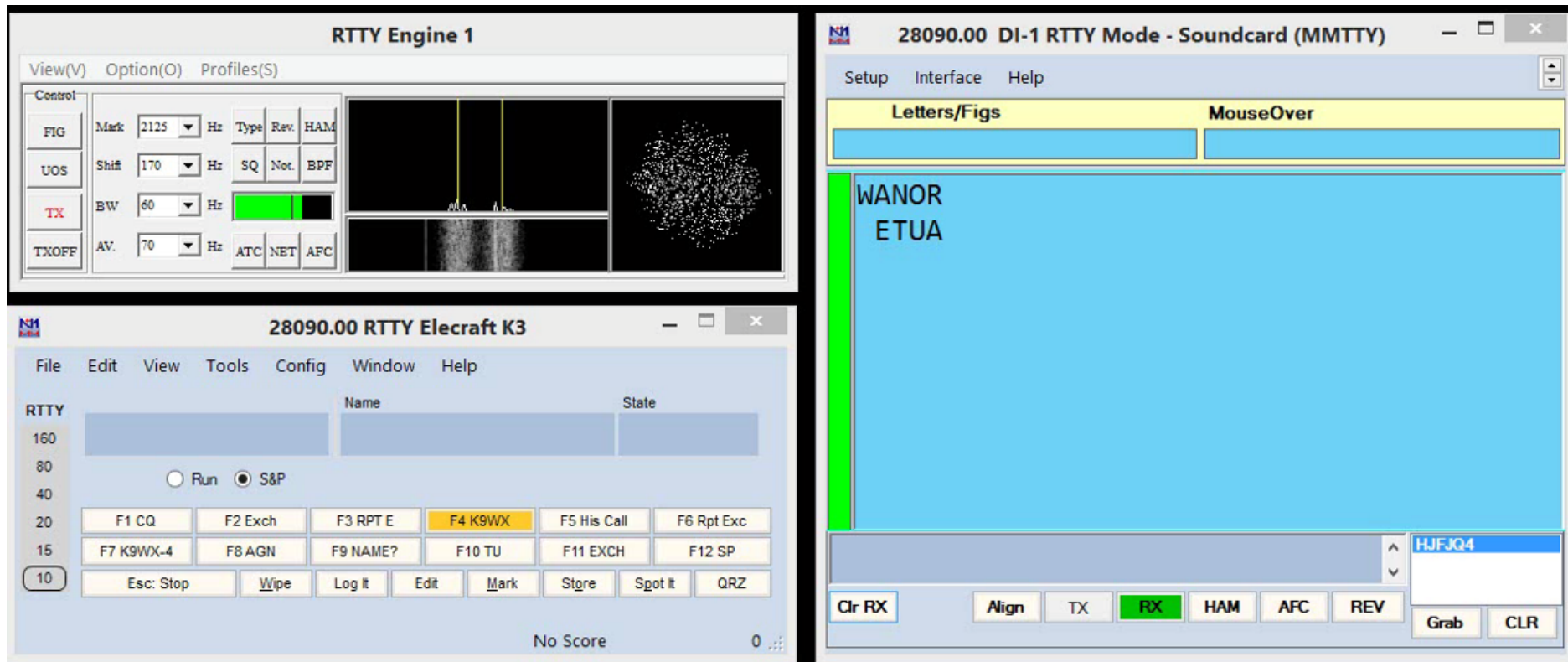
## Operating Essentials

- Think mouse, not keyboard
- You can operate virtually 100% of a RTTY contest with the mouse, never touching the keyboard





# Operating Essentials



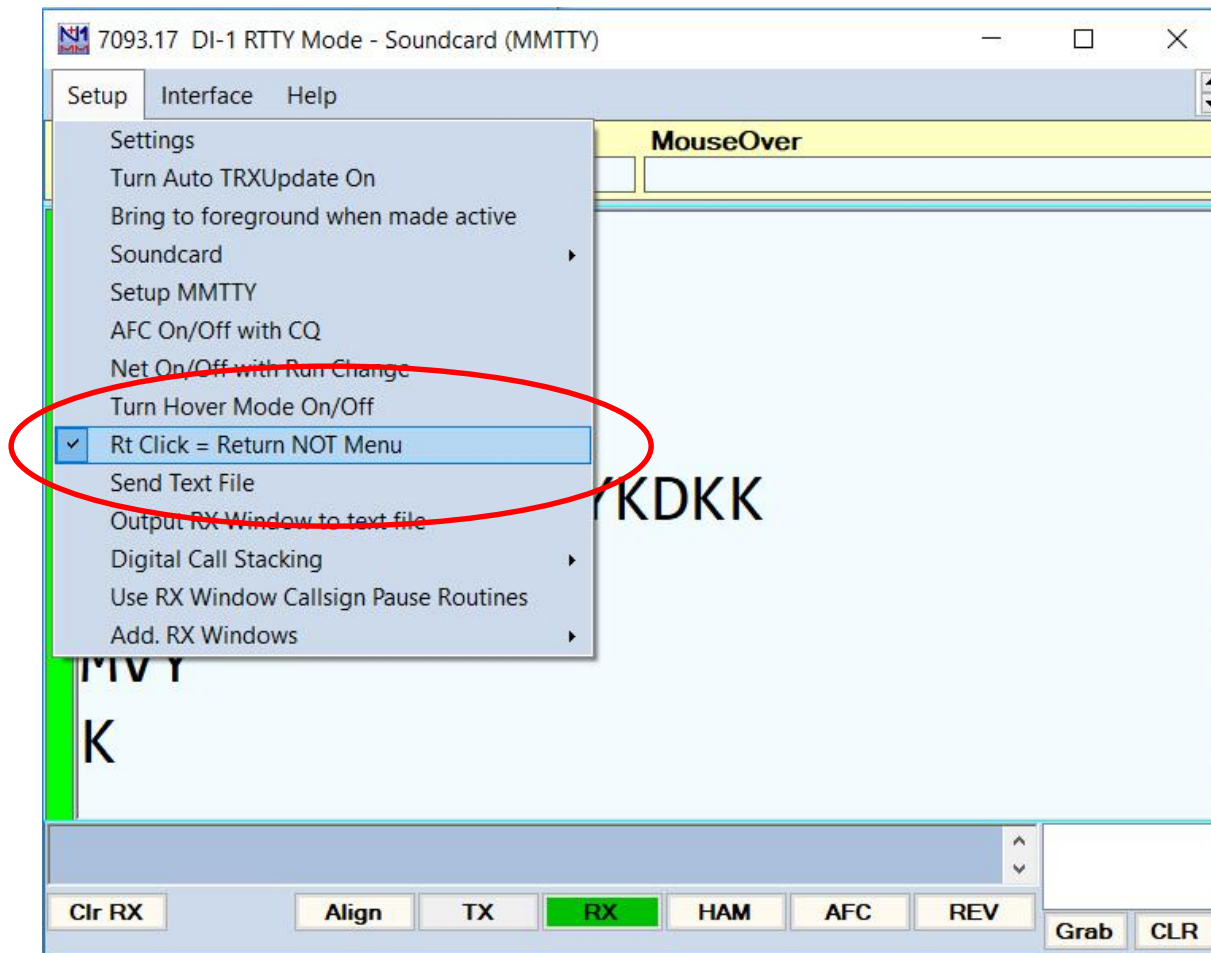
The image displays three windows from the N1MM Logger software suite, used for RTTY (Radio Teletype) operation.

- RTTY Engine 1:** This window shows the core RTTY engine settings. It includes a 'Control' panel with buttons for FIG, UOS, TX, and TXOFF. The 'Mark' is set to 2125 Hz, 'Shift' to 170 Hz, and 'BW' to 60 Hz. A green progress bar indicates the current status. The main display area shows a waterfall plot with a signal visible around 2125 Hz.
- 28090.00 RTTY Elecraft K3:** This window shows the interface for the Elecraft K3 radio. It includes a menu bar (File, Edit, View, Tools, Config, Window, Help) and a 'Name' field. The 'RTTY' section shows a frequency of 28090.00 and a mode of 'S&P'. A grid of function keys (F1 to F12) is visible, with F4 set to 'K9WXX'. The 'No Score' indicator is shown at the bottom.
- 28090.00 DI-1 RTTY Mode - Soundcard (MMTTY):** This window shows the interface for the MMTTY soundcard interface. It includes a 'Letters/Figs' section and a 'MouseOver' section. The main display area shows the received text 'WANOR ETUA'. A 'HJFJQ4' call sign is visible in the bottom right corner.



Getting Started With RTTY Contesting

# Operating Essentials



# *Operating Essentials*

There is no industry standard among radio manufacturers for the FSK shift, up or down

- You might be “upside down” – Mark and Space tones reversed
- Look for a menu setting in your radio to reverse tones



# *Operating Essentials*

## Are you in LSB or USB?

- Regardless of what it says on your radio, AFSK RTTY is done in LSB on TX
- Regardless of what it says on your radio, RTTY RX is always LSB





# *Operating Essentials*

## Unshift On Space

- On by default in MMTTY for TX. *LEAVE IT ON!*
- On/Off button on the MMTTY control panel for RX. *LEAVE IT ON!*
- See <http://www.dxlabsuite.com/dxlabwiki/RTTYFiguresLettersUSOS> or <http://www.w7ay.net/site/Applications/cocoaModem/UsersManual/RTTYPage/index.html> for more information



# *Operating Essentials*



Getting Started With RTTY Contesting

# *Operating Essentials*



Getting Started With RTTY Contesting

# ***Operating Essentials***

***“Radiosport is unique in that competitors must cooperate to score points.”***

**- Ed W0YK**





# ***Operating Essentials***

The Challenge:  
Find the balance  
between

- Short (speed)
- Longer with redundancy  
(fewer fills)



# *Operating Essentials*

## Messages Matter

- Manage redundancy: How and when to repeat exchange elements
  - Signal reports: send once, don't repeat
  - Serial numbers: send twice
  - Name & QTH: send once or twice



# *Operating Essentials*

## Messages Matter

- Run the default messages for your software for your first few contests
- Then work on optimizing your messages
- Many expert RTTY contesters now recommend the use of CW-like messages
- Adjust redundancy, on the fly if necessary, to match band conditions



# *Operating Essentials*

Try these:

- Reduce fatigue by lowering headphone volume to a bare minimum
- Eliminate headphones entirely
- Learn your software and try out new features
- Automate yourself – develop muscle memory
- Embrace the Zen of QSO flow





# ***The Future of RTTY***

- FT8 will replace RTTY as the digital mode of choice for DXpeditions
- RTTY will remain a popular HF contest mode into the foreseeable future, but
- FT8 HF contests may emerge



MM-DD HH:MM	Call	Freq	Name	Sect	M1	M2
07-16 05:29	NA7RH					
07-16 05:32	NN4K	7101.56	BOB	AZ		
07-16 05:33	KC3HPS	3584.64	MAC	GA		
07-16 05:33	KM4ALP	3584.64	ANDREW	MD		
07-16 05:35	WV2ZOW	7101.56	BRIAN	FL		
07-16 05:39	K5CM	7101.56	MIKE	NJ		
07-16 05:40	K4HPS	7106.16	MIKE	OK		

Band	QSOs	Pts	Sec	Mt2	Pt/Q
3.5	83	83	27	0	1.0
7	243	243	43	2	1.0
14	232	232	50	4	1.0
21	37	37	17	1	1.0
28	5	5	5	0	1.0
Total	600	600	142	7	1.0
Score:	89,400				
1 Mult = 4.0 Q's					

# Getting Started with RTTY Contesting

RTTY Engine 1

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

FIG

Mar

2121

Hz

Type

R

HA

UOS

Shift

170

Hz

SQ

Not

BPF

TX

BW

60

Hz

TXOFF

AV

70

Hz

ATC

NET

AFC

14090.00 RTTY K3 - VFO A

File Edit View Tools Config Window Help

RTTY

160

80

40

20

15

10

Run

S&P

F1 CQ

F2 Exch

F3 RPT E

F4 K9WX

F5 Hs Call

F6 Rpt Exc

F7 K9WX-4

F8 AGN

F9 NAME?

F10 QTH?

F11 AGN

Esc: Stop

Wipe

Log It

Edit

Mark

Store

Spot It

QRZ

Heading appears here when enabled.

Call history UserText appears here when enabled.

0 spots loaded after filtering.

600/142/7

89,400

14097.88 RTTY Mode - Spectra

C KBWKKWX

GWFOW ZGJAYXX

CQ NA K9WX K9WX CQ

UM;h1: )031529\$SYU

/)

A

PDW

VLWUUEH

FEZCHZS;:,-81/s

?:'/:;.5"2.71hXVIAGHNKZKVVK

CQ NA K9WX K9WX

