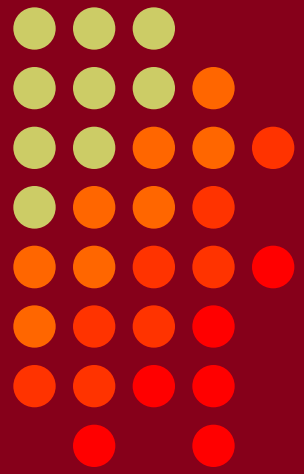
Inside W0YK & P49X RTTY Contesting

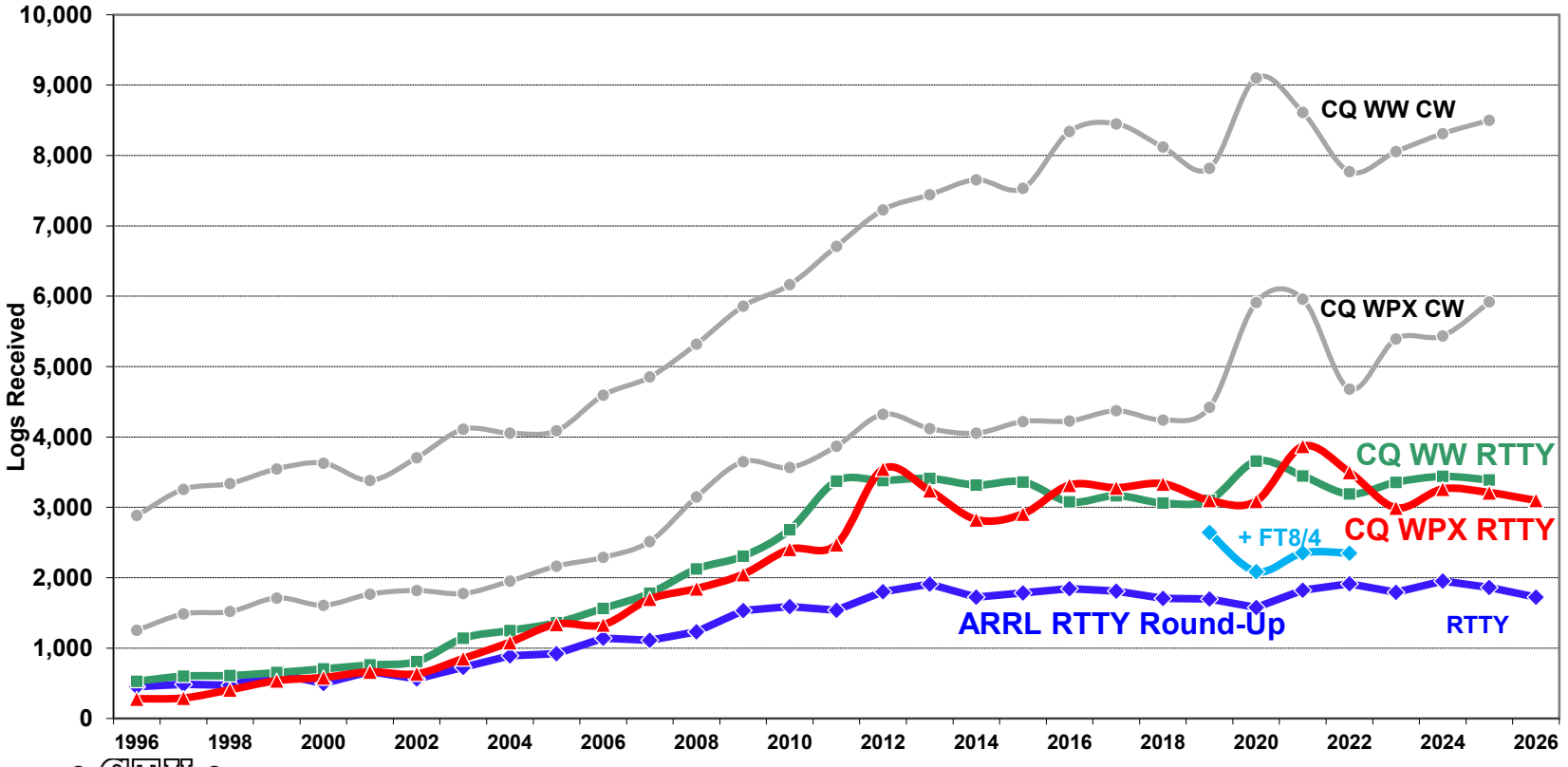
Ed Muns, W0YK / P49X



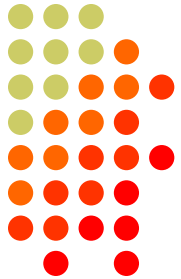
• CTU •
CONTEST UNIVERSITY

ICOM

Three Largest RTTY Contests



Inside W0YK & P49X RTTY Contesting



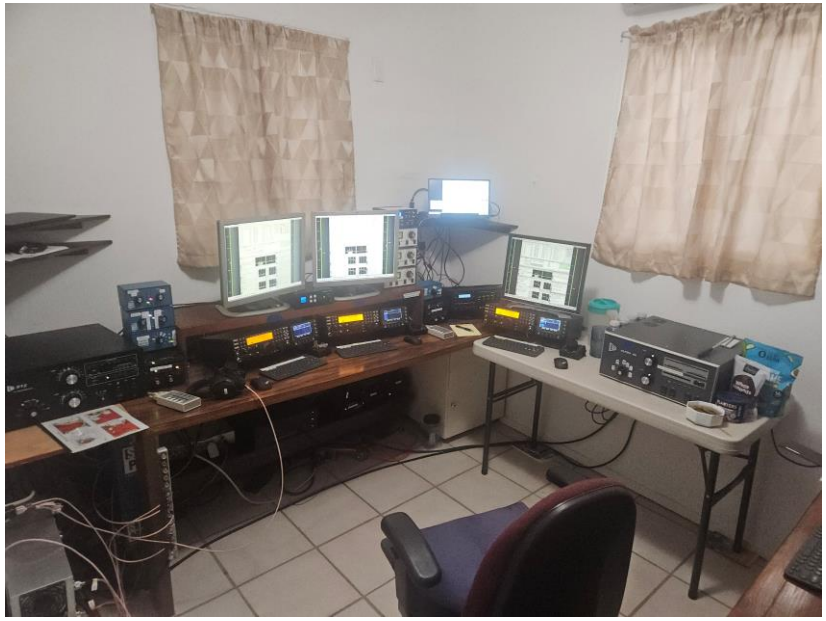
- Station components
- Checklist
- WriteLog
- Decoders
  - Receiving
- Encoder
  - Transmitting
  - BW
- UOS
- Messages
  - Keyboard
- Miscellaneous Choices
- Call Sign Queueing
- SO2V (2 streams)
- Multiple Streams
  - SO2R + SO2V = 4 streams
  - SO3R + SO2V = 6 streams

W0YK & P49X Station Components

Radios, etc.

W0YK

P49X



W0YK & P49X Station Components

Radios, etc.

	W0YK	*P49X*
Radios	• 2x Elecraft K4D • 2x Elecraft K3S/P3	• 3x Elecraft K3S/P3 • Elecraft K4D
BP Filters	• 2x W3NQN LP	• 2x FilterMax LP; 4O3A HP
Amplifiers	• 2x KPA1500 • KPA500 / KAT500	• 2x Alpha 86 • Alpha 91B • Elecraft KPA1500
Misc.	• RigSlelect PRO • Bose NC Phones w/ Boom Mic	• RigSelect PRO • Bose NC Phones w/ Boom Mic
Computers	• 2x Win11 NUCs	• 3x Lenovo X1 Carbon Win11
Logger	• WriteLog Latest Beta	• WriteLog Latest Beta
Decoders	• 2x MMTTY per radio • 4x 2Tone per radio	• 2x MMTTY per radio • 4x 2Tone per radio
Encoder	• TinyFSK per radio	• TinyFSK per radio

W0YK & P49X Station Components

Antennas

W0YK

P49X

W0YK & P49X Station Components

Antennas

	W0YK	P49X
Ant. Control	• SixPak • StackMatch • Green Heron/Prop Pitch	• 2x SixPak • 2x StackMatch • 3x Green Heron/T2x&Yaesu

Antennas	• 80’ R45:
	  • 87’ 2-el 40M Moxon
	  • 85’ 80M Shorty Dipole
	  • 82’ 5-el 20M Yagi
	  • 75’ 160M Inverted-V
	  • 70’ 30M Shorty Dipole
	  • 48’ 5-el 15M Yagi, fixed NE
	  • 40’ 5-el 10M Yagi, fixed NE
	  • 30’ 3-el 10M Yagi, fixed SE
		• 80’ R45:
		  • 82’ 5-el 20M Yagi // 2-el Shorty Forty
		  • 78’ 160M Double-L // 80M Inverted-V
		  • 35’ 2-el SteppIR, fixed N-S
		• 55’ R25:
		  • 5-el 15M Yagi // 6-el 10M Yagi
		• 45’ R25:
		  • JK Mid-Tri
		• 45’ SpiderPole (remote)
		  • 40M/80M Fan Dipole
		• 4x Bevs, 800’; K9AY Switch

Checklist

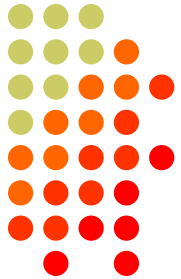
history repeats!

- After years of re-solving the same problem
- And sometimes knowing I previously solved it
- But not remembering how
- And forgetting to check or do certain things
- I started maintaining a dynamic, living …

Checklist

RTTY Contest Loggers

relative ratings



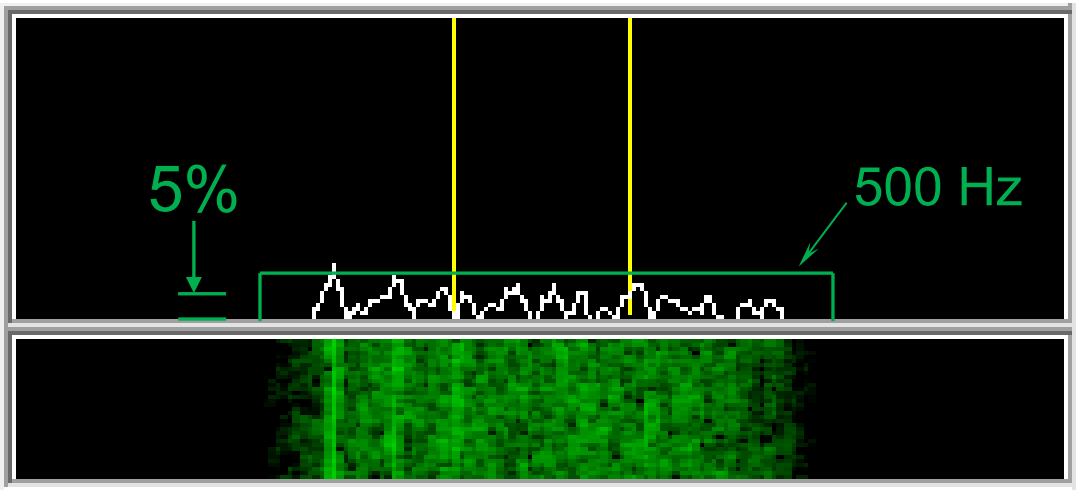
WL	N1	WT	Logger
5	4	5	RTTY window readability
5	4	0	Multiple decoders
4	5	0	MMTTY, 2Tone, GRITTY
3	5	3	ESM mouse ctrl & Sprint mode
5	5	0	SO2V
5	3	3	M2 SO2R configuration
5	4	5	Re-mapped keys
5	5	3	Call sign stacking
5	4	4	AFSK/FSK flexibility
42	**39**	**23**	**Overall**

WriteLog

- Created for the first *Windows* RTTY logger
- User Interface and “Look & Feel”
- Multiple decoder personality
- Call sign stacking personality
- SO2R extendibility with interlock
- Beta participation

Receiving

decoder *level & IF width*



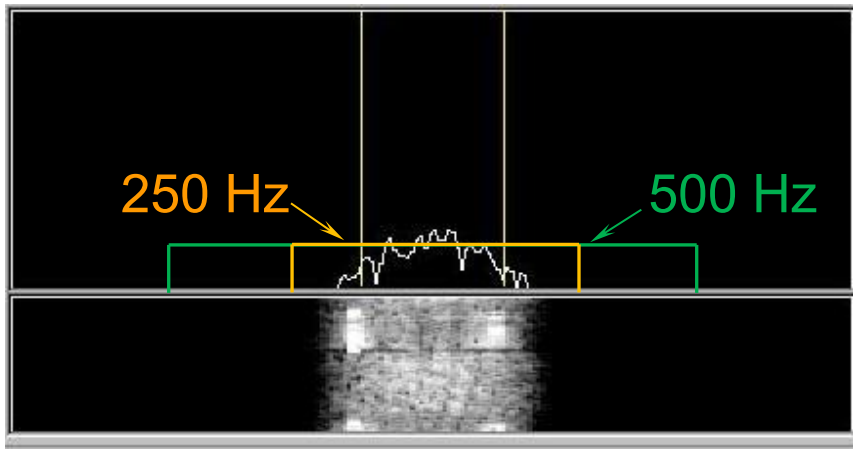
- Decoder level at 5% of full-scale (band noise)
  - Receiver audio out level control, and/or
  - *Windows* Recording Volume Control applet
- 500 Hz. radio IF filter

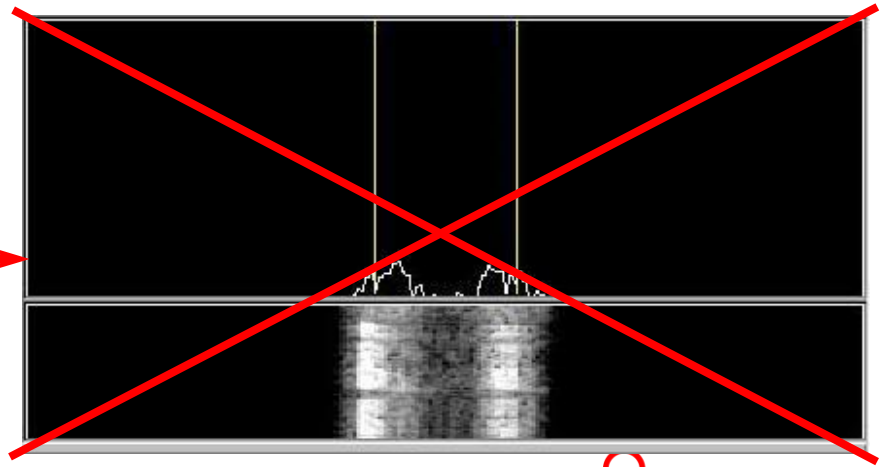
Receiving

radio IF filtering

Narrow IF filters

- **500 Hz** – normal
  - 500Hz xtal filter = 500 Hz
  - cascaded with 500 Hz DSP results in ~480 Hz
- ~~**250 Hz** - extreme QRM~~
  - 250 Hz xtal filter = 370 Hz
  - cascaded with 250 Hz DSP results in ~250 Hz
- Tone filters – I don't use!
  - Icom Twin Peak Filter
  - K3/K4 Dual-Tone Filter

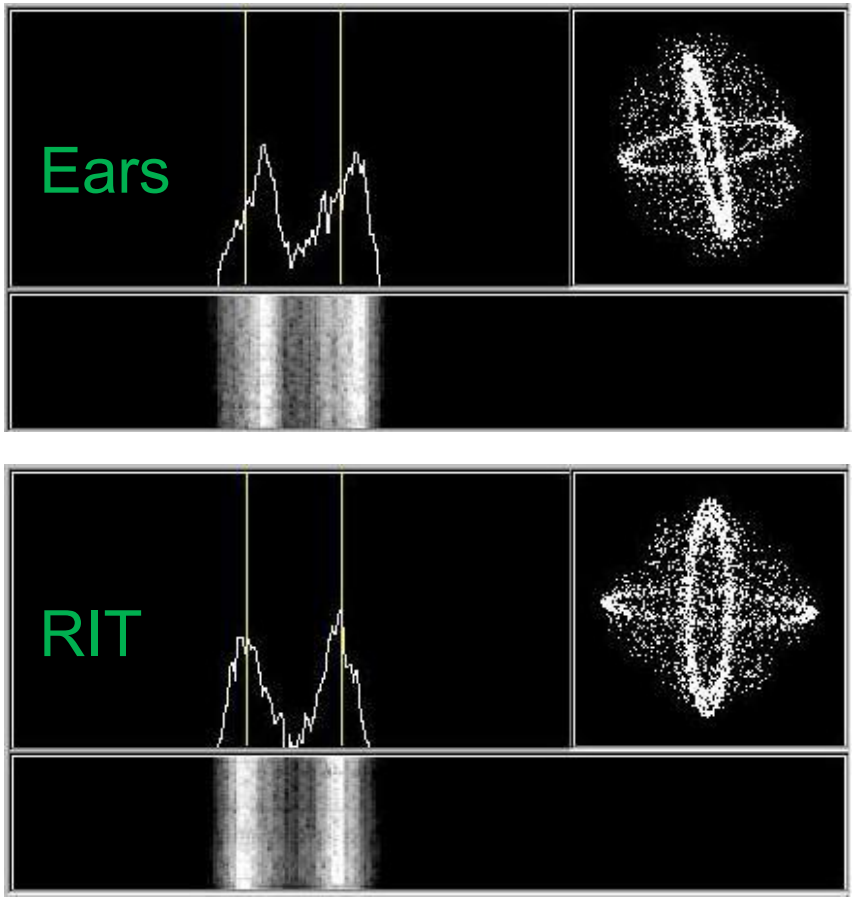




Receiving

tuning a RTTY signal

- Tune by ear
  - get within 10-20 Hz
  - 15 minutes practice
    - Close eyes to train ears
- Fine-Tune with RIT
  - if needed

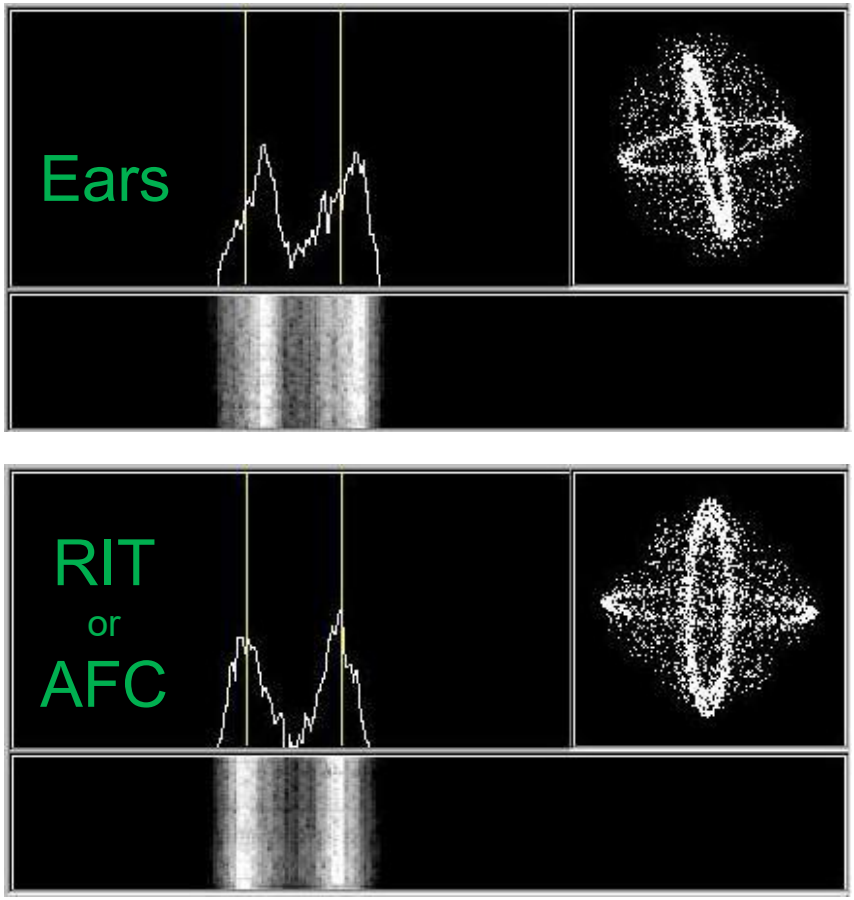


Receiving

AFC Off

For FSK:

- **Run: AFC off**
  - Can use AFC
- **S&P: AFC off**
  - **Otherwise, TX freq ≠ RX freq.**

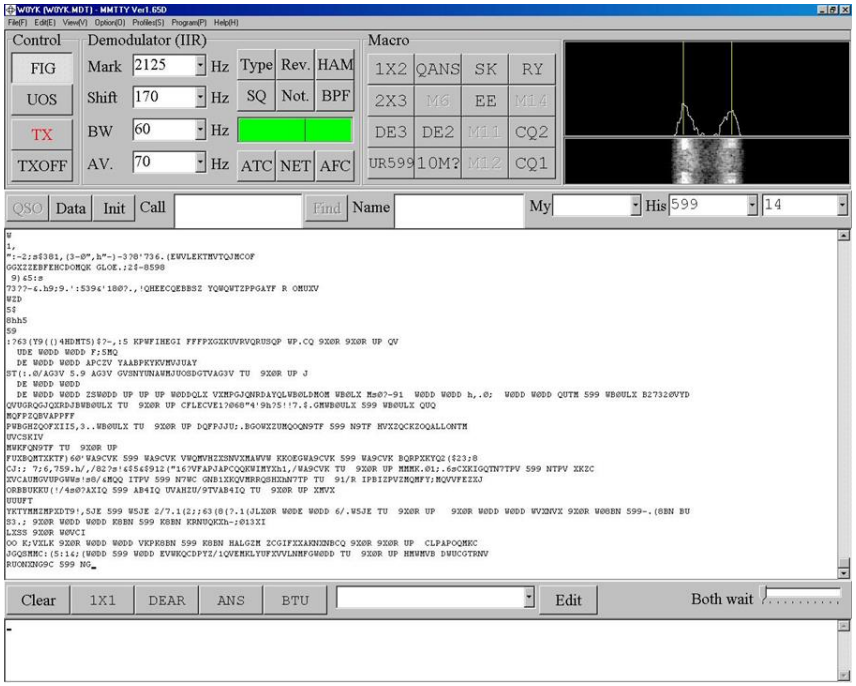


For AFSK, if AFC On:

- Run: NET Off
  - Locks TX freq.
- S&P: NET On
  - Moves TX freq. = RX freq.

Decoders

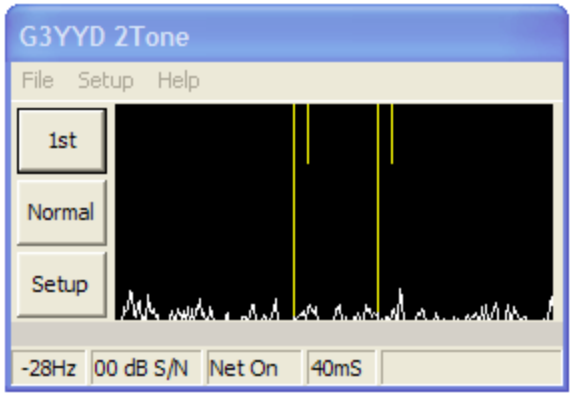
MMTTY

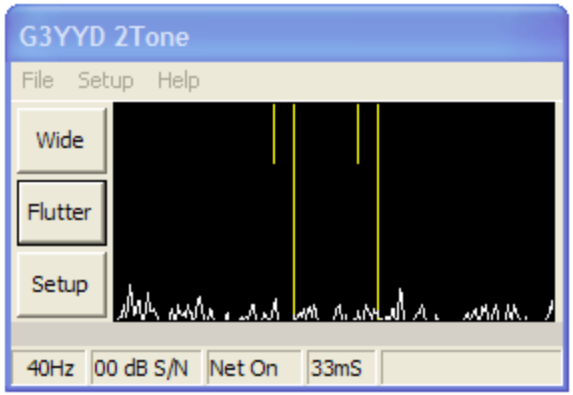


- Dominant SC MODEM
- Standalone, or …
- Contest loggers:
  - N1MM Logger+
  - WriteLog
  - Win-Test/DXLog
- Introduced June 2000
- Mako Mori, JE3HHT

Decoders

2Tone

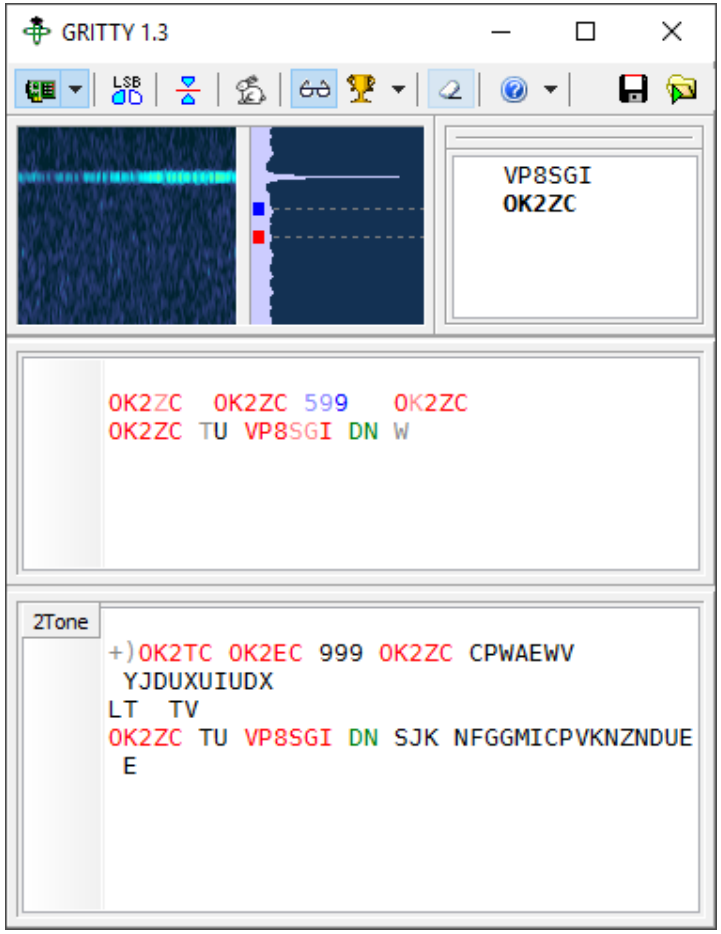




- Outperforms MMTTY (?)
- Uses less CPU cycles
- No standalone operation
- Contest loggers:
  - N1MM Logger+
  - WriteLog
  - Win-Test/DXLog
- Introduced late 2012
- David Wicks, G3YYD

Decoders

GRITTY

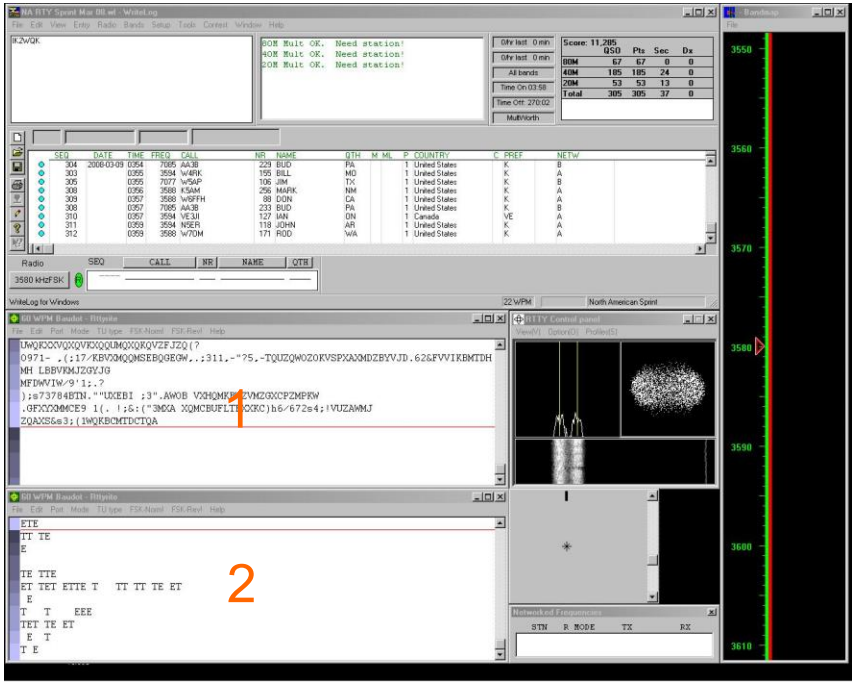


- Best accuracy (?)
- Bayesian statistics
- Standalone, or …
- Contest loggers:
  - N1MM Logger+ only
  - WriteLog
  - Win-Test/DXLog
- Introduced late 2015
- Alex Shovkoplyas, VE3NEA

Multiple Decoders

MMTTY & DXP38

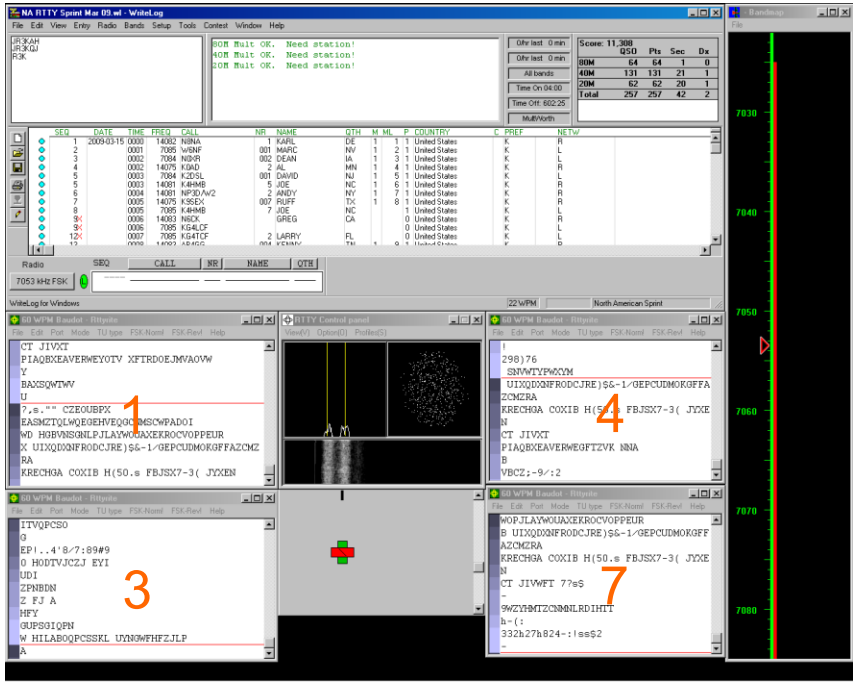
- Parallel decoding
  1. Software, e.g., MMTTY
  2. Hardware, e.g., DXP38
- Diverse conditions
  - Flutter
  - Multi-path
  - QRM, QRN
  - Weak signals
  - Off-frequency stations



Multiple Decoders

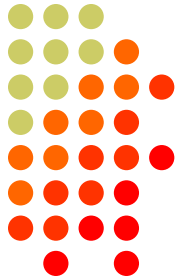
multiple MMTTY profiles

- Parallel decoding
  - same audio stream
  - switching takes too long
- Multiple profile windows
  1. Standard
  2. Fluttered signals
  3. Fluttered signals (FIR)
  4. Multi-path
  5. hypersensitive
  6. EU1SA
  7. AA6YQ-FIR-512
     - weak signals in QRN



Multiple Decoders

Tone choices for monitoring

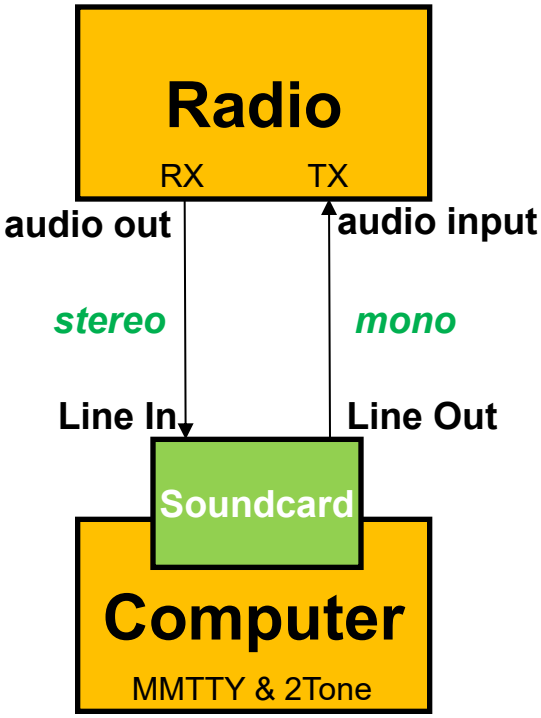


- Low tones (915/1085 Hz) are less fatiguing
  - Use higher tones for secondary audio stream
- Low & High tones can be mixed to put two audio streams in one ear:
  - SO2R plus SO2V (4 streams)
  - SO3R plus SO2V (6 streams)
  - Audio mixer, e.g. RigSelect PRO

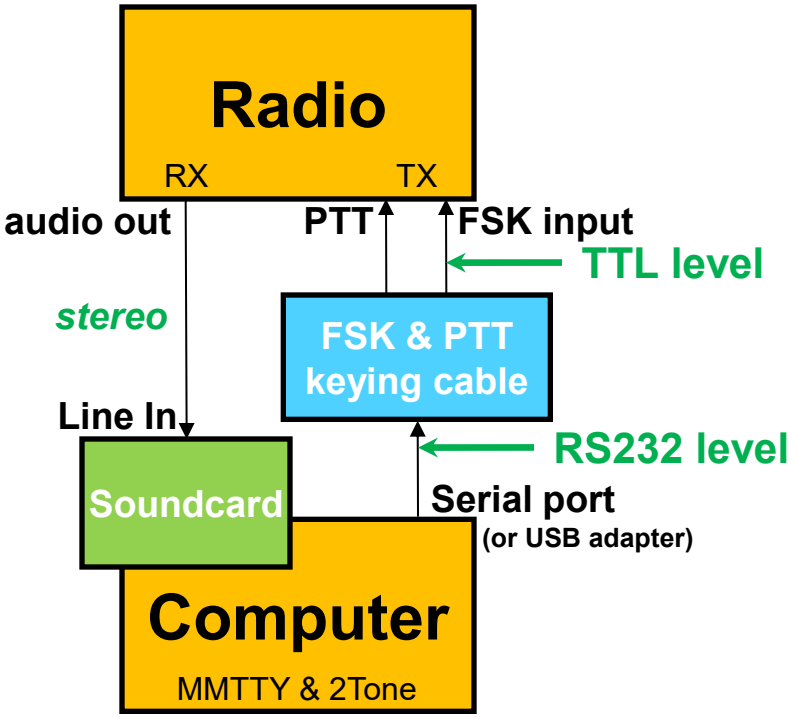
Transmitting

AFSK vs. FSK

AFSK



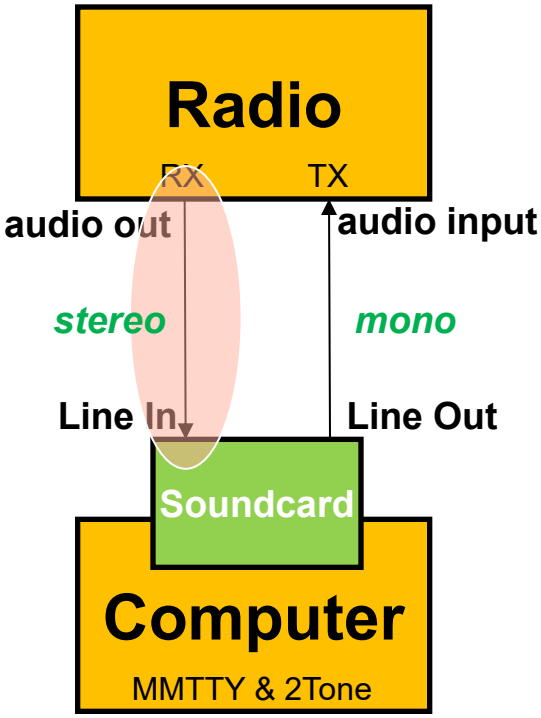
FSK



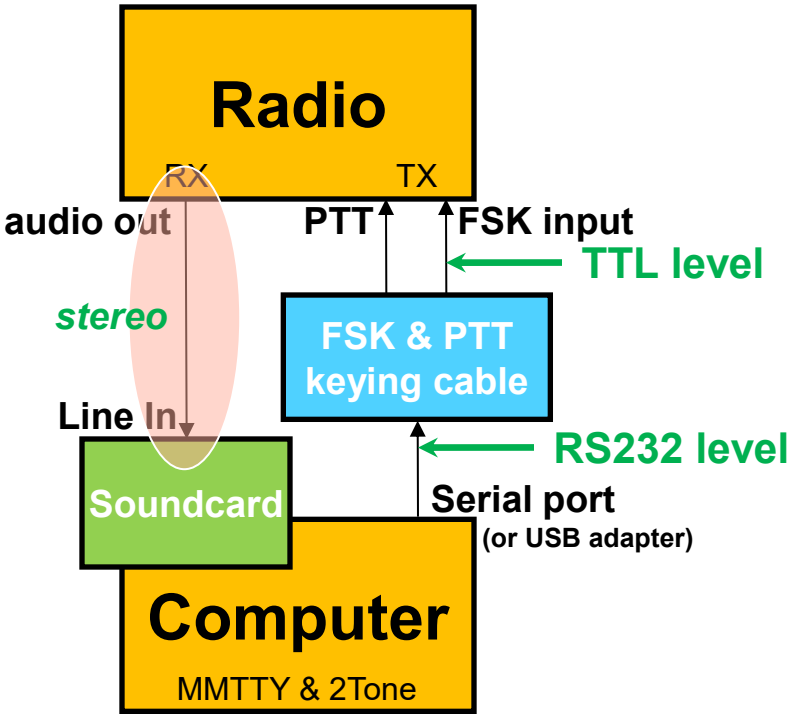
Transmitting

identical receive method

AFSK



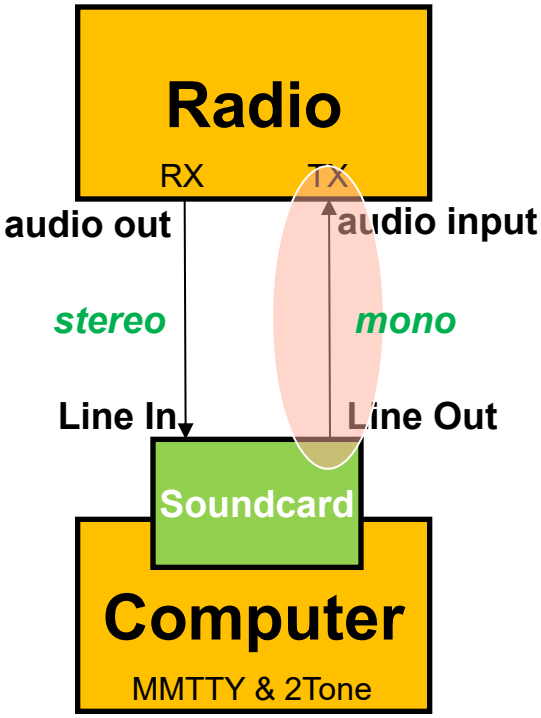
FSK



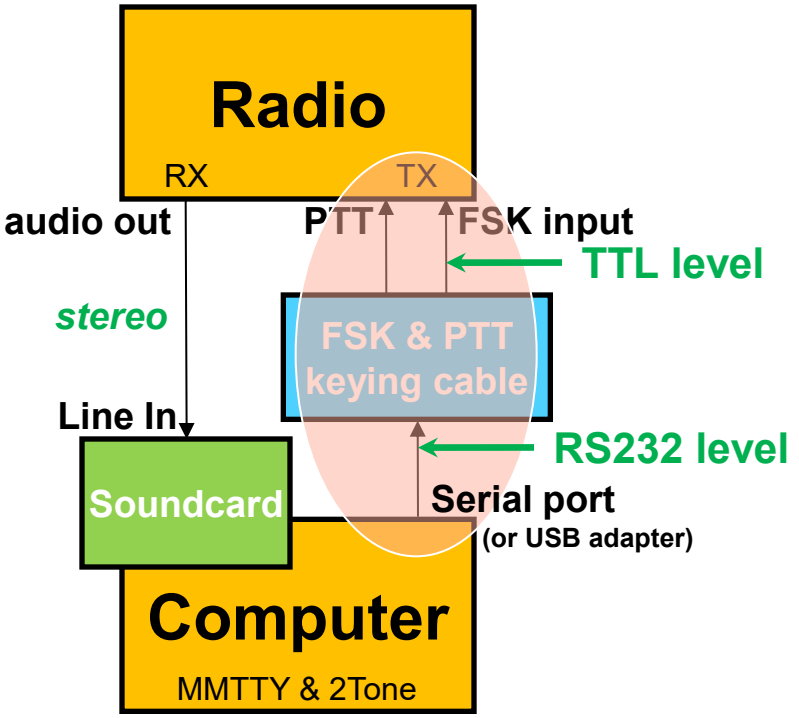
Transmitting

different transmission method

AFSK



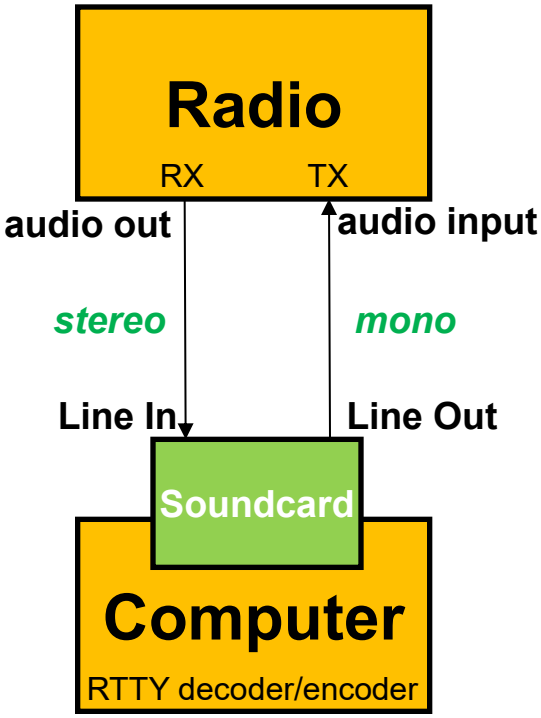
FSK



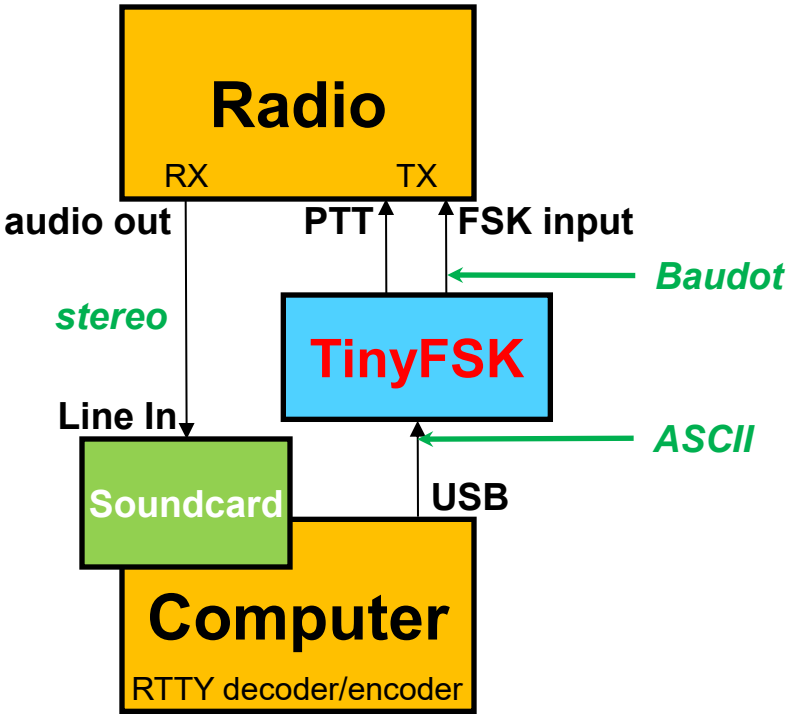
Transmitting

different transmission method

AFSK



FSK



Transmitting

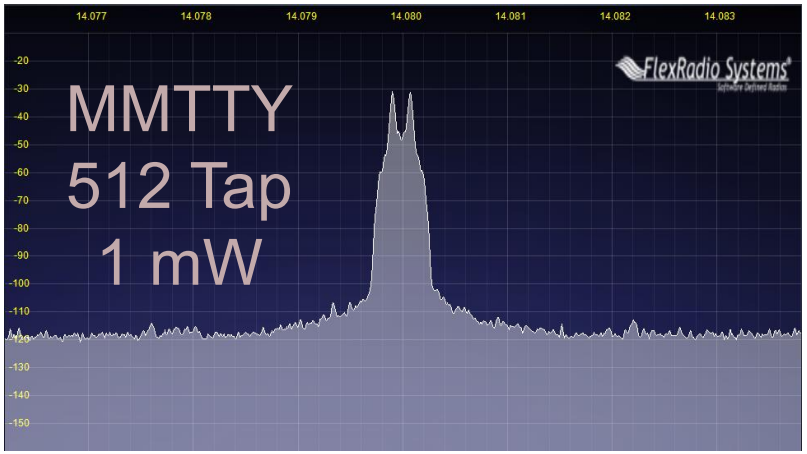
bandwidth

- Wasted power outside receiving decoder BW
  - Suitably narrow TX BW effectively amplifies signal
- Unnecessary QRM
  - Wide 1.5 KW RTTY can QRM several QSOs
  - Similar to CW key click problem

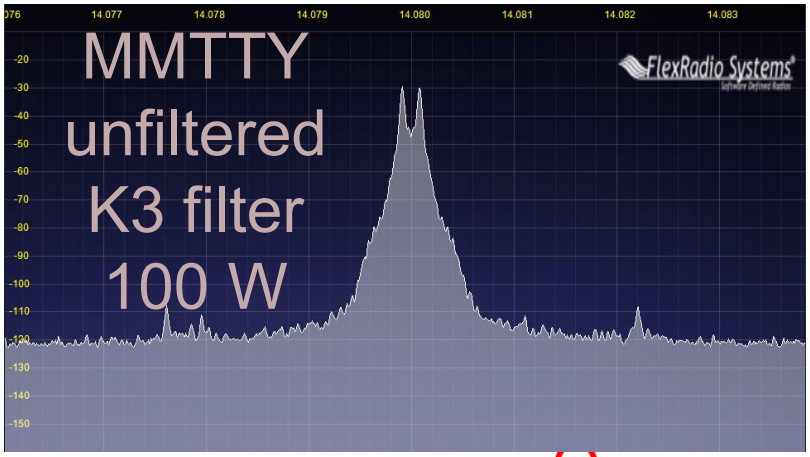
Maximizes my power & is good sportsmanship

Transmitting

PA IMD effect



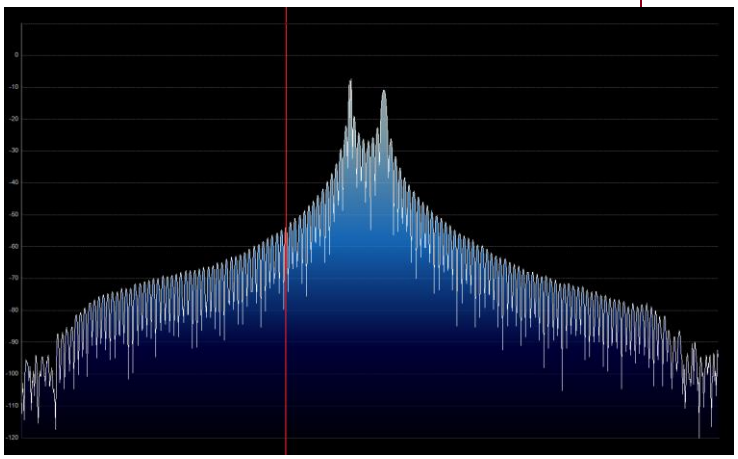
And a 1.5 kW amplifier has an even larger effect



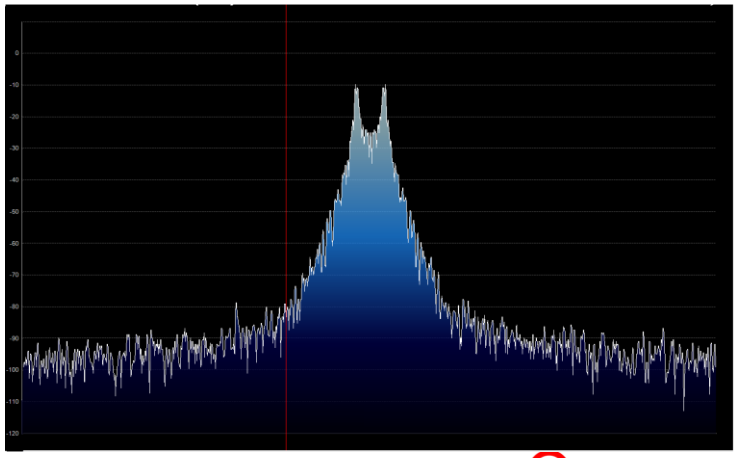
Transmitting

FSK bandwidth

- Old K3 FSK bandwidth
  - No wave shaping
  - < DSP281 firmware
  - Typical circa 2012 radios
  - 50 watts



- New K3 FSK bandwidth
  - Optimal DSP filter
  - DSP281 firmware, March 2013
  - Other radios??



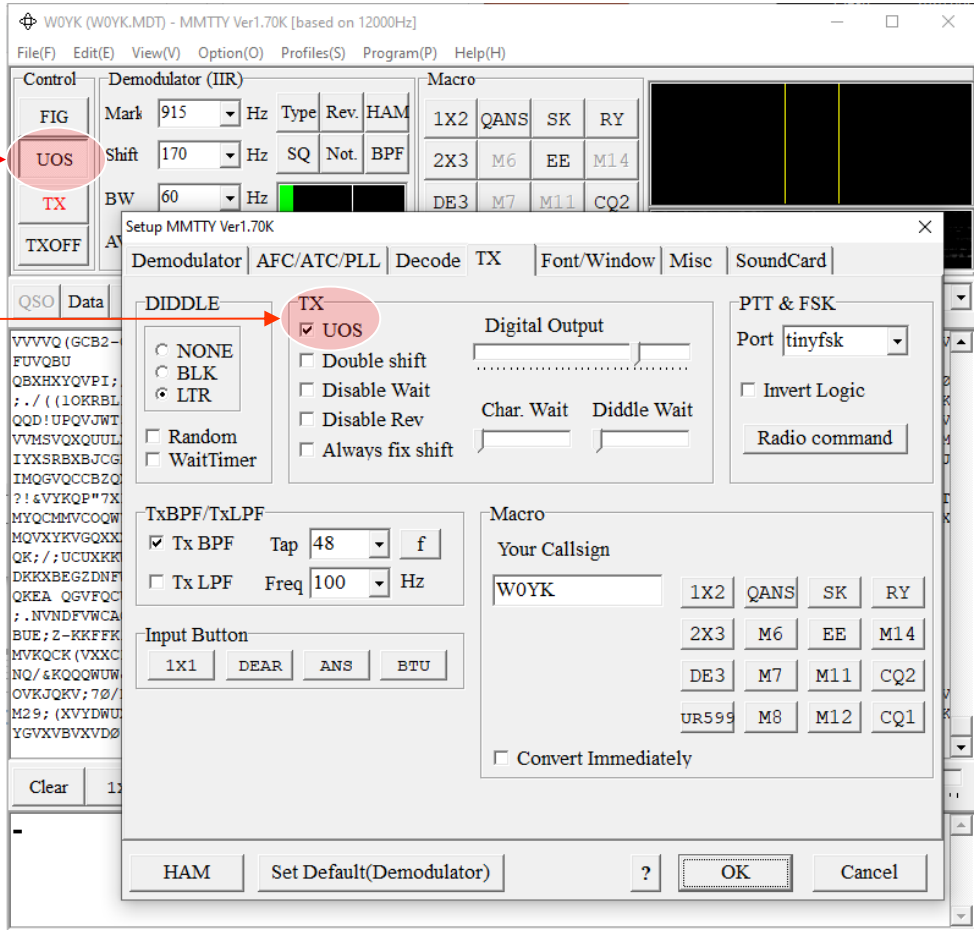
UOS

(Unshift-On-Space)

- Receive UOS:
  - Increases noise immunity for alpha text
  - Space character forces a shift to the Letters set
- Transmit UOS:
  - Sends Figures character after Space, before numeric “word”
- ***Both RX & TX UOS are on***
- ***Word delimiter is Space (not hyphen)***

UOS

MMTTY


RX
TX
W0YK (W0YK.MDT) - MMTTY Ver1.70K [based on 12000Hz]
File(F) Edit(E) View(V) Option(O) Profiles(S) Program(P) Help(H)
Control
FIG
UOS
TX
TXOFF
Demodulator (IIR)
Mark 915 Hz
Shift 170 Hz
BW 60 Hz
Type Rev. HAM
SQ Not. BPF
Macro
1X2 QANS SK RY
2X3 M6 EE M14
DE3 M7 M11 CQ2
QSO Data
Clear
Setup MMTTY Ver1.70K
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 tinyfsk
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
W0YK
1X2 QANS SK RY
2X3 M6 EE M14
DE3 M7 M11 CQ2
UR599 M8 M12 CQ1
Convert Immediately
HAM
Set Default(Demodulator)
?
OK
Cancel

Messages

basic sequence

- ***RU AA5AU AA5AU CQ***
- ***P49X P49X***
- ***P49X 599 LA LA***
- ***[AA5AU] TU 599 891 891***
- ***P49X TU AA5AU CQ***

AA5AU: running station

P49X: S&P station

[AA5AU] optional

Messages

ARRL RTTY RoundUp

- ***Modular***
- Short, as with CW/SSB
- No extraneous info
- 599, not 5NN (or, ENN)
- Serial number twice
- Space (not hyphen)
- Omit ‘DE’
- RTTY chars (%R, %E)

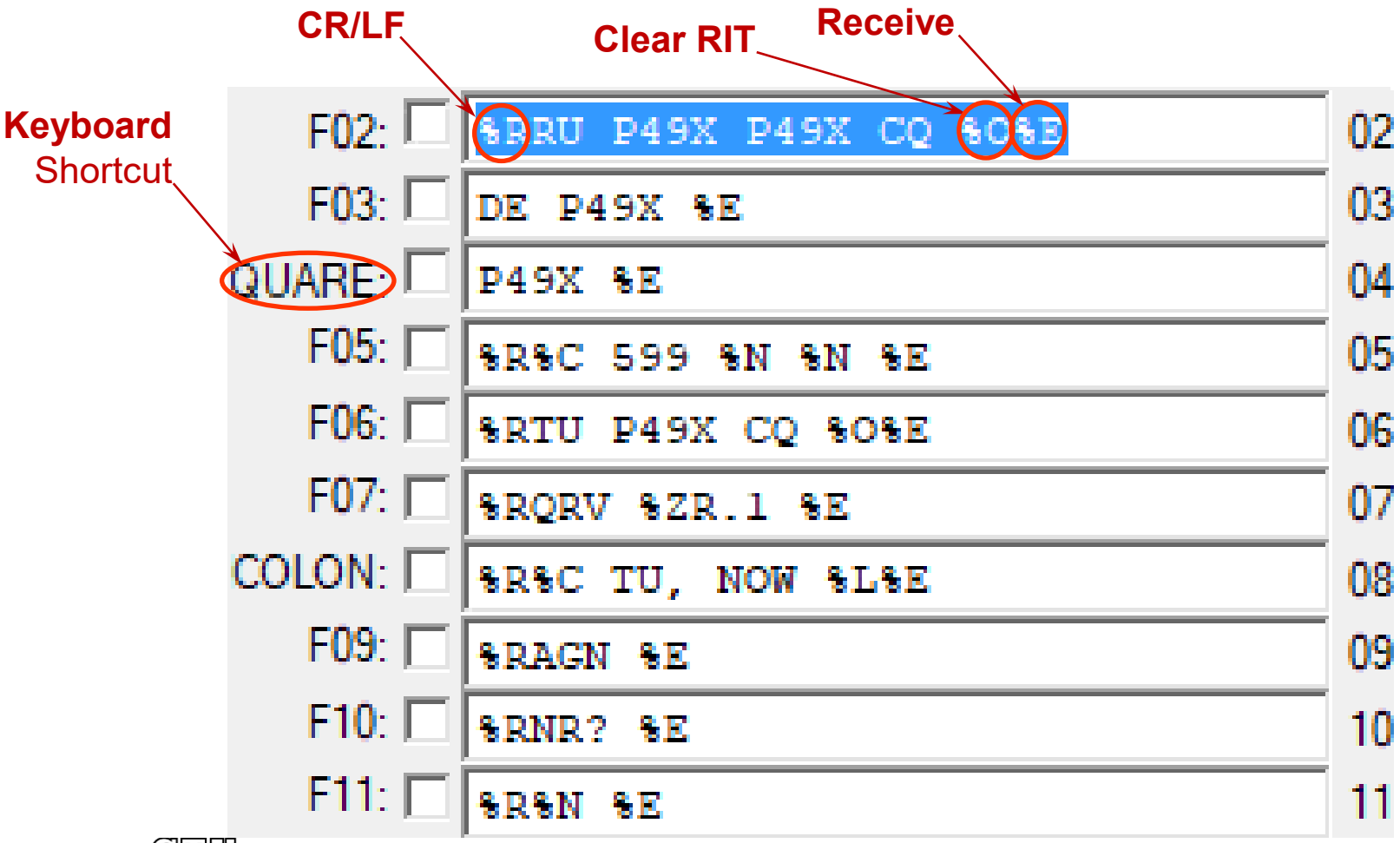
www.rttycontesting.com/tutorials/messages

F02:	%RRU P49X P49X CQ %O%E	02
F03:	DE P49X %E	03
QUARE:	P49X %E	04
F05:	%R%C 599 %N %N %E	05
F06:	%RTU P49X CQ %O%E	06
F07:	%RQRV %ZR.1 %E	07
COLON:	%R%C TU, NOW %L%E	08
F09:	%RAGN %E	09
F10:	%RNR? %E	10
F11:	%R%N %E	11

GRAVE:	%RCQ RU P49X P49X P49X CQ %O%E	02
F03:	QSL LOTW OR W0YK %E	03
F04:	%R%C %E	04
QUARE:	%RTU 599 %N %N %L%E	05
(SLASH:	%RKB P49X CQ %L%O%E	06
F07:	%RQRV %ZS.1 %E	07
F08:	%R%C KB, NOW%L	08
F09:	%RQRZ %E	09
F10:	%RQTH? %E	10
F11:	%RCALL? %E	11

Messages

formatting



Keyboard

key mapping

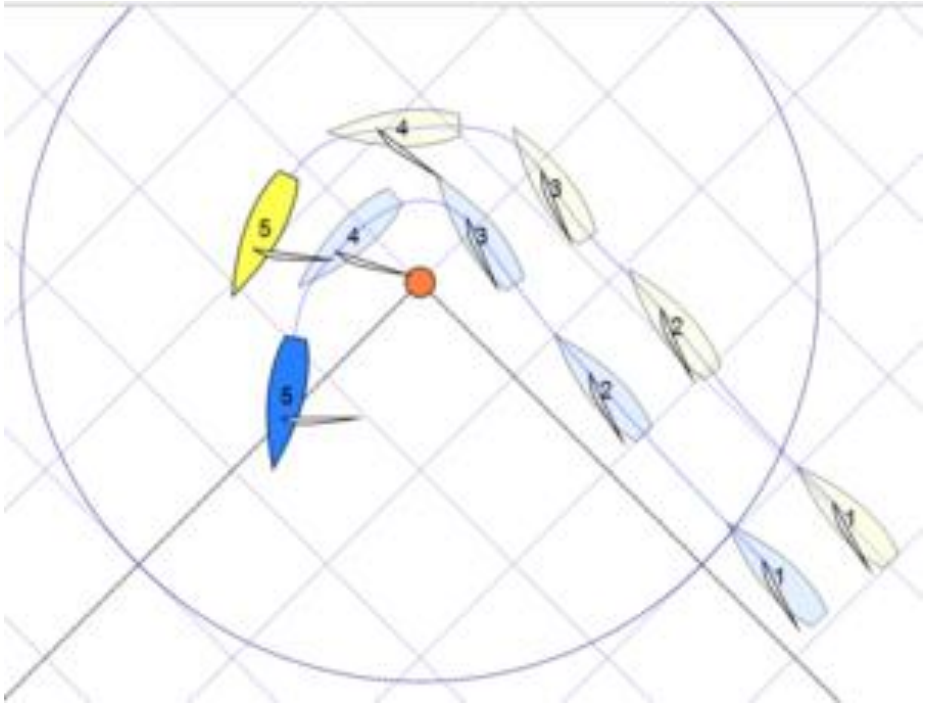
Miscellaneous Choices

- Super Check Partial (SCP) highlights calls
- Prefill as a typing aid
  - *"Danger, Will Robinson!"*
- Work calls in order they print
  - except mults take priority
- Sometimes use names
  - Controversial (shortest possible messages)
- LOW (Last One Wins) interlock

Call Sign Queuing

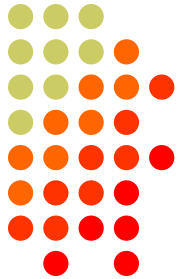
sailboat racing

Yellow falls behind by keeping up with Blue



Call Sign Queuing

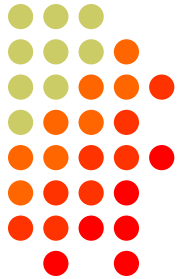
"Slow Down to Win"



- Sailboat racing analogy:
  - Pinwheel effect at mark-rounding
- Let pile-up continue a "beat" after getting the first call sign. Increase chance for:
  - another call sign or two
  - QSO-phase-skip
- Same tactic for tail-enders
  - Pause ½-second before sending TU/CQ message

Call Sign Queuing

The 4 Phases of a QSO



Normal Run mode flow:

1. CQ msg
   a) Repeat or AGN?
2. pile-up
3. Exchange msg
   a) Send fill(s)
4. receive his Exchange
   a) AGN? or NR? or QTH? or NAME?

1. TU/CQ msg (logs QSO)

Normal S&P mode flow:

1. CQ
2. <mycall> msg
   a) repeat
3. receive his Exchange
   a) AGN? or NR? or QTH? or NAME?
4. Exchange msg (logs QSO)
   a) send fill(s)

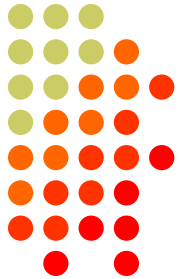
1. find next CQ

transmit

receive

Call Sign Queuing

Pileup



Normal	Shortened
1. *RU P49X P49X CQ, or TU P49X CQ*	1. (skip CQ)
2. *K3LR K3LR K5ZD K5ZD*	2. (skip pileup)
3. *K3LR 599 2419 2419*	3. *K3LR TU, NW K5ZD 599 2420 2420*
4. *TU 599 PA PA*	4. *TU 599 OH OH*

If another call in the queue

transmit
receive

Call Sign Queuing

Tail-end

Normal	Shortened
1. *WPX P49X P49X CQ, or TU P49X CQ*	1. (skip CQ)
2. *K3LR K3LR*	2. (skip pileup)
3. *K3LR 599 2419 2419 K5ZD (tail-end)*	3. *K3LR TU NW K5ZD 599 2420 2420*
4. *TU 599 PA PA*	4. *TU 599 OH OH*

If another call in the queue

transmit
receive

Call Sign Queuing

summary

- Efficiently work:
  - multiple callers in a pile-up, and
  - tail-enders to a completing QSO
- Calls Pushed onto the queue
  - mouse right-click
  - not automatic → choose order to work
- TU, NOW message Pops call off the queue into the Entry window
- 2 of 4 QSO phases → 2x short-term rate

SO2V

two IF bandwidths

- Narrow IF filtering (**VFO-A**)
  1. Hardware modem, i.e. DXP38
  2. MMTTY profiles:
     a. Standard
     b. Fluttered signals
     c. Fluttered signals (FIR)
     d. Multi-path
     e. hypersensitive
     f. EU1SA
- Wide IF filtering (**VFO-B**)
  3. MMTTY profile:
     a. AA6YQ-FIR-512
        - Dual Peak Filter
        - “Matched filter”

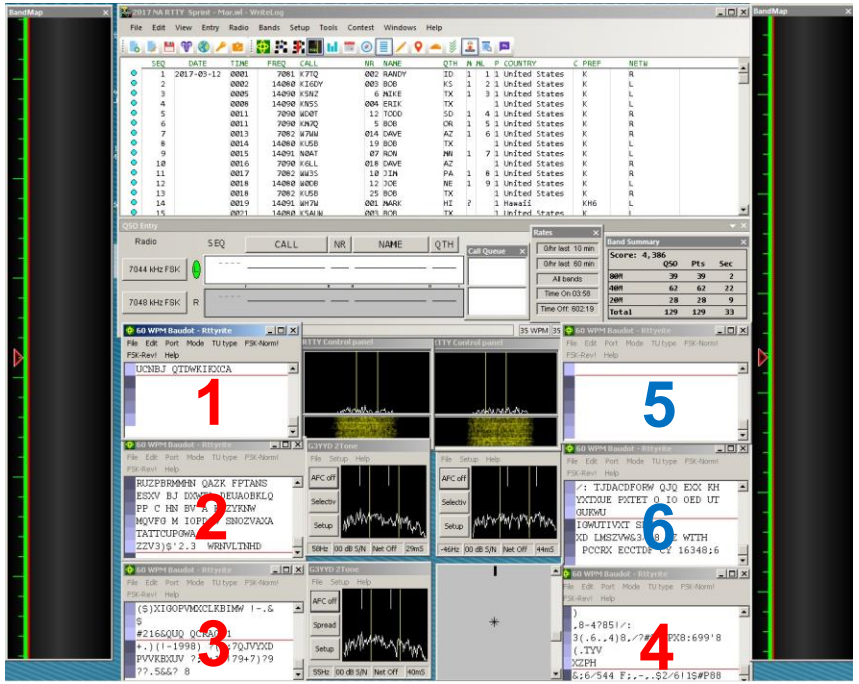
SO2V (2VSIQ)

multiple decoders

- **VFO-A** (main RX)
  1. MMTTY Standard profile
  2. 2Tone Flutter profile
  3. 2Tone Selective profile
  4. 2Tone Spread

- **VFO-B** (sub-RX)
  5. MMTTY Standard profile
  6. 2Tone Flutter profile

- 6 decoders
  - Per radio
  - **1** and **5** are required
  - **2-4** and **6** are clones



SO2V (2VSIQ)

1. [1 Rcvr] If Assisted and running on **VFO-A**, then
   - A<>B, click spot, tune, ID station, work station
   - A<>B, resume running

   Toggle as needed
2. [2 Rcvrs] Set up decoder windows on **VFO-A** and **VFO-B**
   - K3S & K4D have two independent receivers
   - One TinyFSK shared by both VFOs (WriteLog Shared COM Port feature)
   - Monitor both VFOs simultaneously with left & right channels of sound card
   - Radio Split TX invoked when WriteLog focus is on **VFO-B**

   a. While VFO-A is receiving, left-click call in **VFO-B** Rttyrite window → **VFO-B** Entry window
      - Move cursor back to **VFO-A**, if necessary

   b. When timing right, mover cursor to **VFO-B** and send W0YK
      - Move cursor back to **VFO-A**, if necessary

   c. When timing right, mover cursor to **VFO-B** and send Exch
      - Move cursor back to **VFO-A**, if necessary

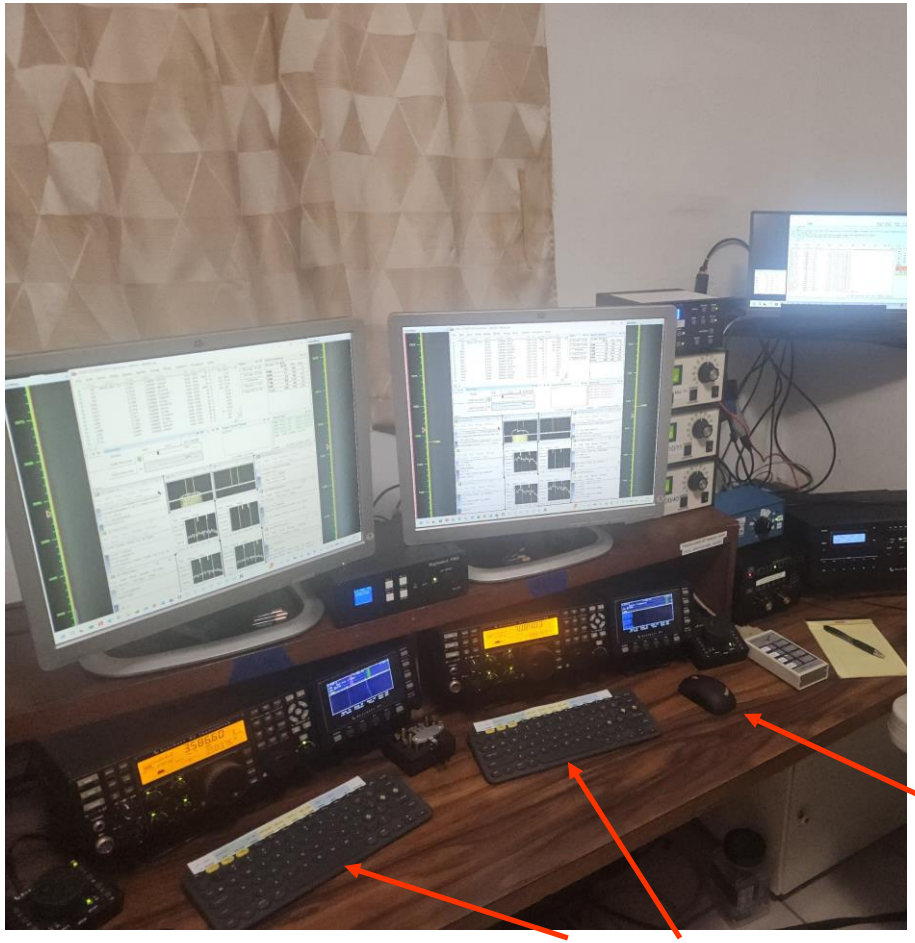
SO2R (2B2VSIQ)

- Eliminates SO1R RTTY boredom
- Beyond SO2V (only run and S&P):
  - Dueling CQs→running on two bands simultaneously
  - S&Ping on two bands simultaneously, esp. w/Packet
  - SO2V on one or both radios (SO4V!)
- Two networked computers:
  - Focus is physical, not a key or mouse action
  - More display room for multiple decoder windows per radio
  - Minimal typing with RTTY→mini-keyboards
  - 2 x SO2V=SO4V for picking up mults on both run bands
  - Easily extendible to SO3R

No boredom for watching TV or reading email!

SO2R (2B2VSIQ)

"M2" configuration



Right-Hand Mouse

(Left-Hand Mouse)

"Right-Sized" Keyboards

SO3R (3B2VSIQ)

3 radios

- Simplified antenna/filter band-decoding:
  - Left radio for 10M & 80M
  - Middle radio for 15M & 40M
  - Right radio dedicated to 20M
- Networked PC/radio simplifies configuration
- RTTY easier than CW or SSB
  - PC decoding instead of my brain
- ***RigSelect*** selects any 2 radios (3rd mixed in)
- Assisted category simplifies VFO-B searching

SO3R (3B2VSIQ)

Multi-Multi configuration

Final Comments

- When does RTTY need to be different?
  - Non-human decoding
    - Repeat unique info
    - Reduced headphone level
  - Conventions
    - Messages ending with ‘CQ’
- ***Practice*** builds expertise: ***Outliers*** by Malcolm Gladstone
- ***Learn*** from others
  - Multi-ops
  - Meetings, events, mail lists, etc.
  - Give presentations and help others *“Learn from Teaching”*

Resources

- www.rttycontesting.com premier website
  - Tutorials and resources (beginner to expert)
  - WriteLog, N1MM Logger+ and MMTTY
- rtty@groups.io and rttydigital@groups.io Email reflectors
  - RTTY contester networking
  - Q&A
- Software web sites
  - hamsoft.ca/ (MMTTY)
  - n1mm.hamdocs.com/tiki-index.php (N1MM Logger+)
  - www.writelog.com (WriteLog)
  - www.win-test.com (Win-Test)
  - www.dxlog.net (DXLog)
- Software Email reflectors
  - mmtty@yahoogroups.com (MMTTY)
  - N1MMLoggerplus@groups.io (N1MM Logger+)
  - Writelog@contesting.com (WriteLog)
  - support@win-test.com (Win-Test)
  - DXLog@groups.io (DXLog)