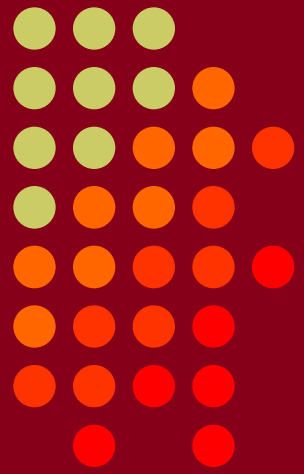
CTU 2016 Presents

Advanced RTTY Contesting

Ed Muns, W0YK



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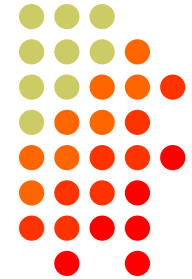
Advanced RTTY Contesting

- 1st CTU session: *"Getting Started in RTTY Contesting"*
- Radio Configuration
- Messages
- Keyboard Optimization
- Super Check Partial & Pre-Fill
- Callsign Stacking
- Multiple Decoders
- SO2V, SO2R-SOnR
- Logging Software
- Ergonomics

Radio Configuration

AGC

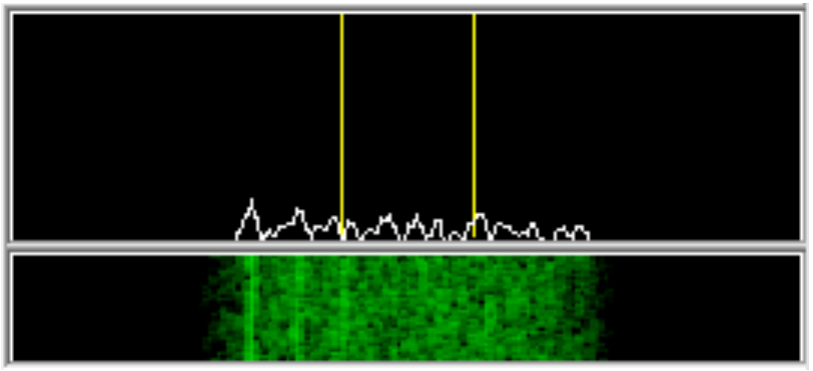


- Turn off AGC
  - or, at least minimize
- AGC increases error rate in modern software decoders
- Use minimum discernible headphone volume
  - Ear protection from loud signals

Radio Configuration

decoder level

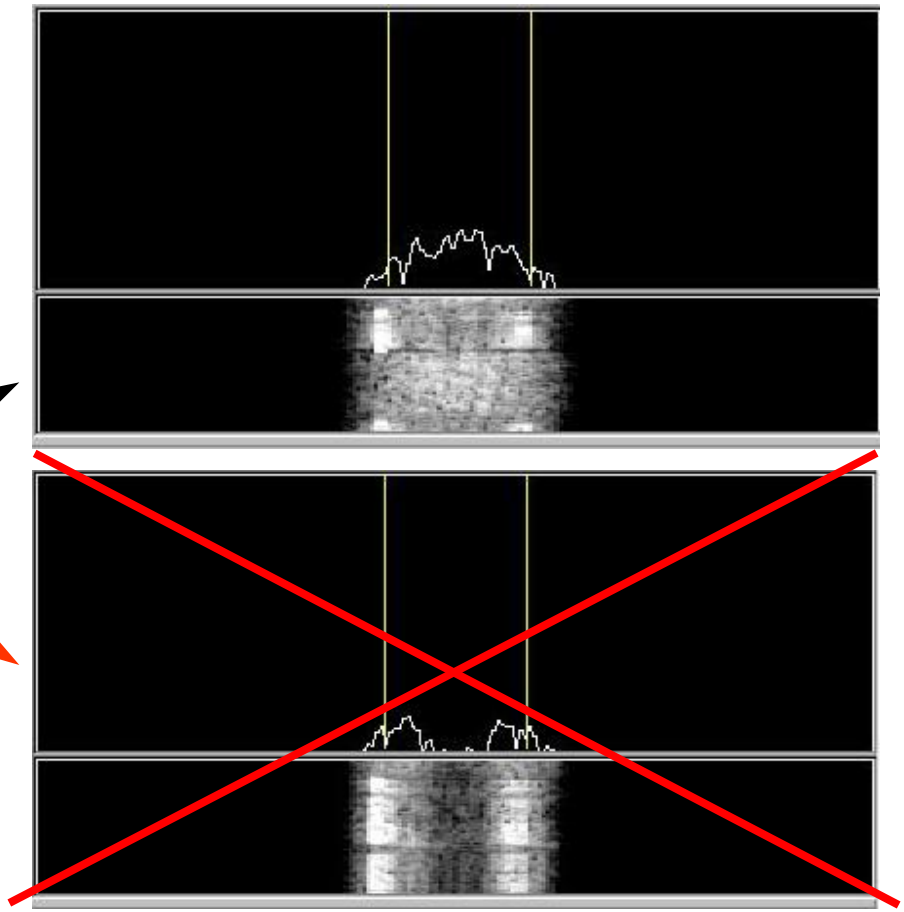
- Decoder audio level
  - Band noise 5% of full-scale
- Note 500 Hz IF filtering



Radio Configuration

IF filtering

- PC Audio isolation
  - Transformer
  - Commercial interface
  - Some radios (K3)
- Narrow IF filters (Roofing & DSP)
  - 500 Hz - normal
  - 250 Hz - strong QRM only
  - Tone filters – don't use!
    - Icom Twin Peak Filter
    - K3 Dual-Tone Filter
- Audio filtering
  - JPS NIR-10/12
  - Timewave DSP-599zx
  - Modern DSP rigs



Radio Configuration

soundcard levels

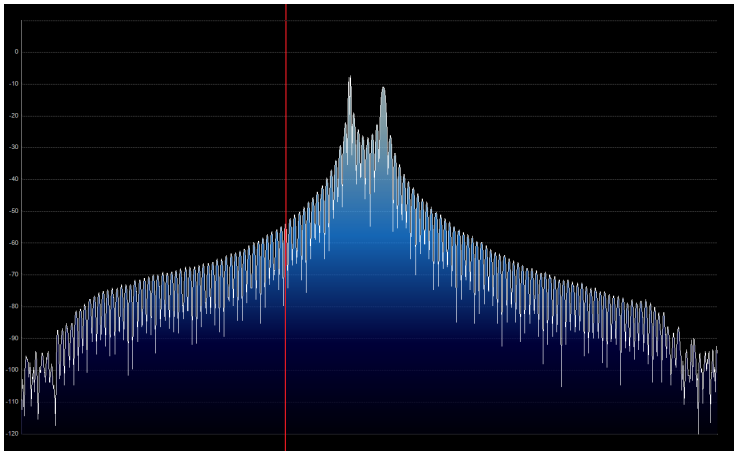
- Adjust levels in Windows Volume Control
  *(or, in MMTTY **Options/Soundcard** …)*
  - Use isolation transformer, if needed
  - Mute other inputs and outputs
- RX audio goes to LINE IN (or, MIC w/pad)
  - ***Options/Soundcard input level***
- TX AFSK audio (mic) comes from LINE OUT
  - ***Options/Soundcard output level***
  - Turn off radio compression (speech proc.)
  - Avoid over-drive

Radio Configuration

FSK bandwidth

Old K3 FSK bandwidth

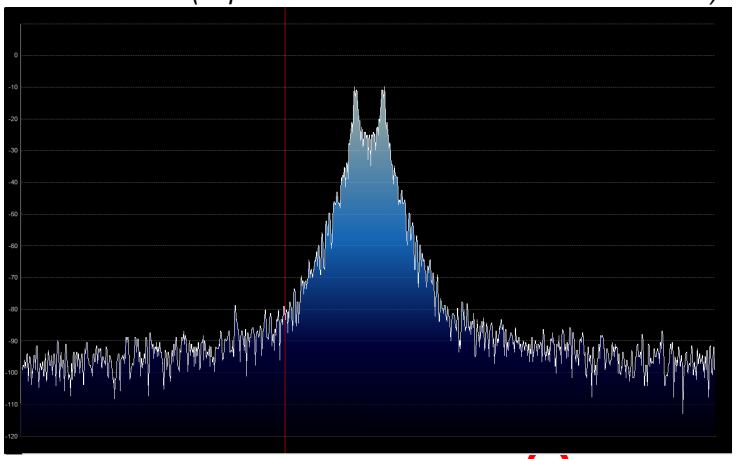
- No waveshaping
- < DSP281 firmware
- Typical of all radios
- 50 watts



Thanks K0SM (http://www.frontiernet.net/~aflowers/k3beta/)

New K3 FSK bandwidth

- Optimal DSP filter
- DSP281+ firmware, March 2013
- Lobby other mfrs

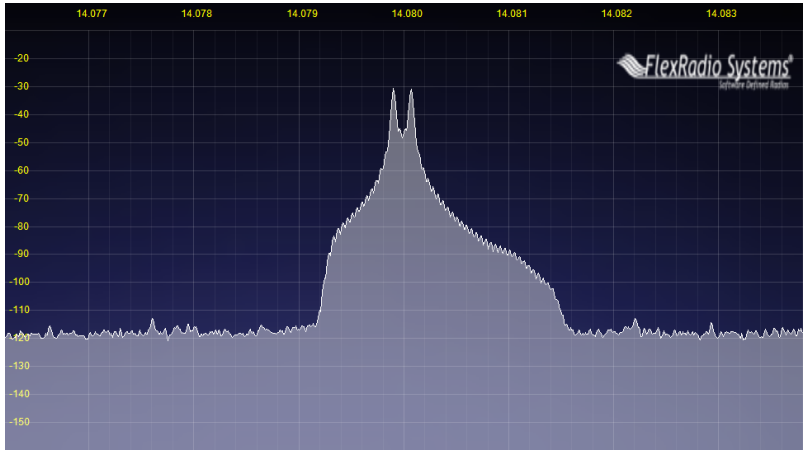


Radio Configuration

AFSK bandwidth

MMTTY - AFSK

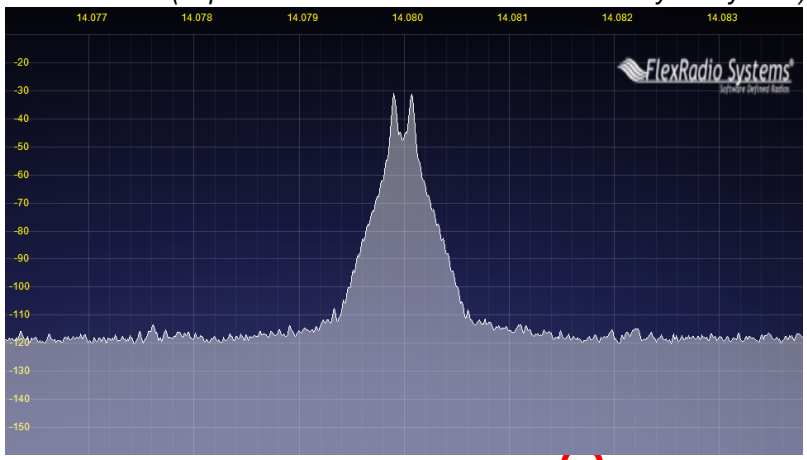
- No filtering
- K3 @ 1 mW



Thanks K0SM (http://www.frontiernet.net/~aflowers/k3rtty/k3rtty.html)

MMTTY - AFSK

- Default 48-tap TX BPF
- K3 @ 1 mW



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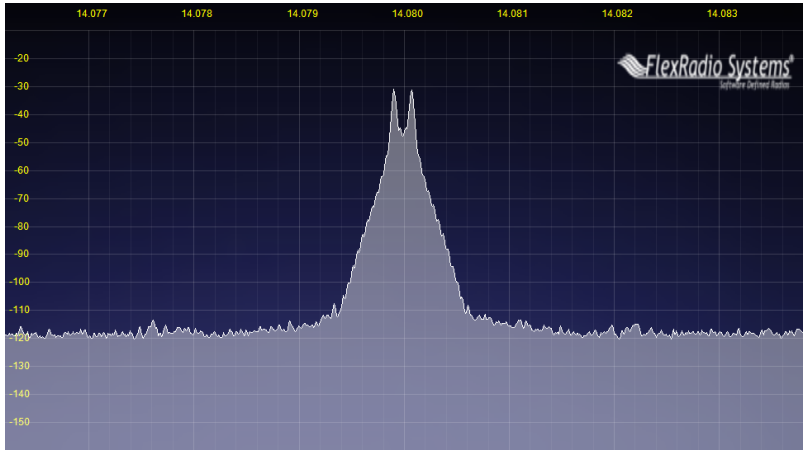

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MMTTY - AFSK

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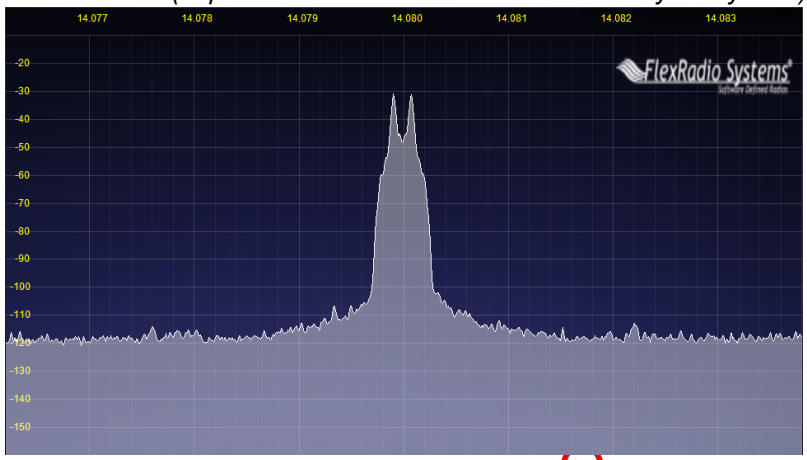

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Radio Configuration

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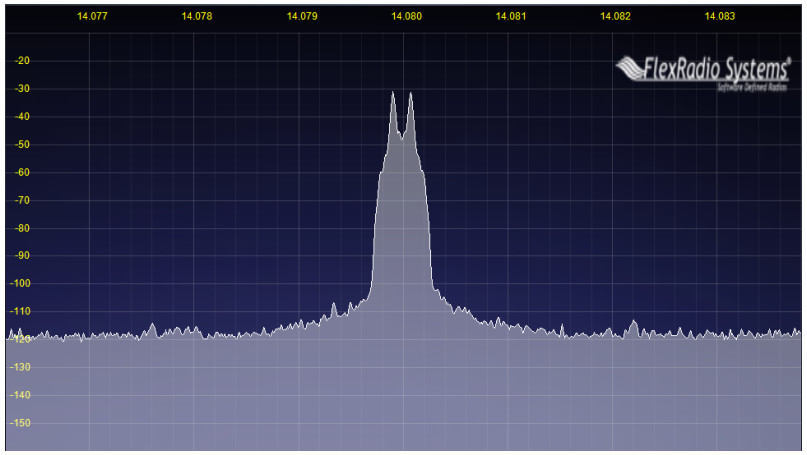
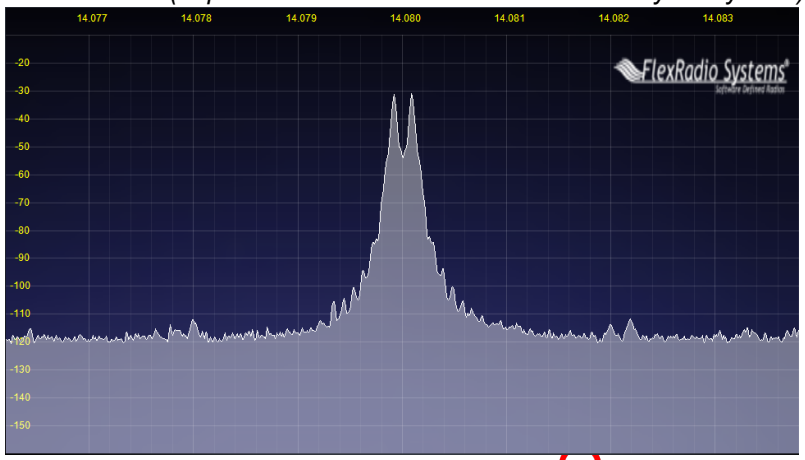


Thanks K0SM (http://www.frontiernet.net/~aflowers/k3rtty/k3rtty.html)

2Tone - AFSK

- Default “AM” setting
- K3 @ 1 mW



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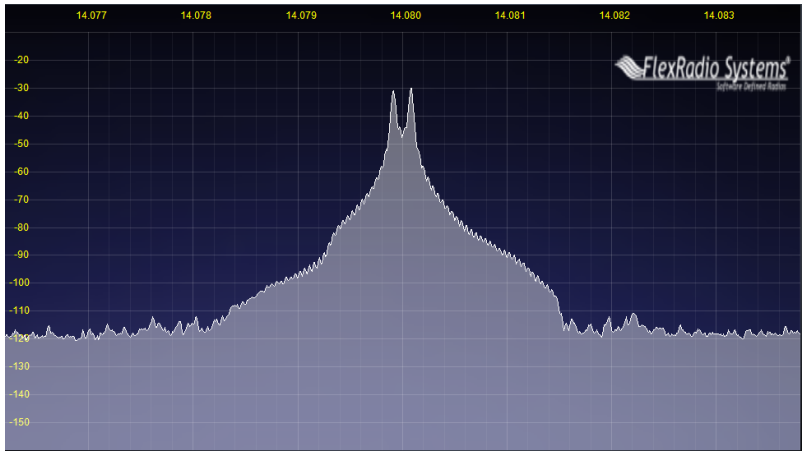
Radio Configuration

PA IMD impact on AFSK bandwidth

MMTTY - AFSK

- No filtering
- K3 @ 100 watts



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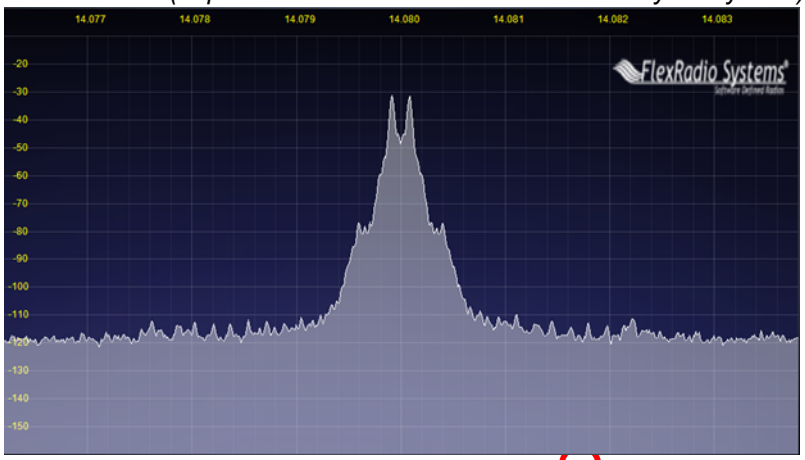
MMTTY - AFSK

- 512-tap TX BPF
- K3 @ 100 watts



Radio Configuration

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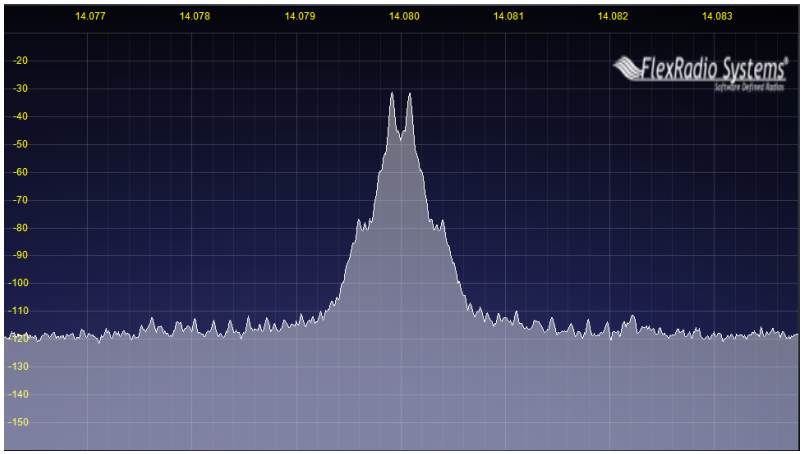
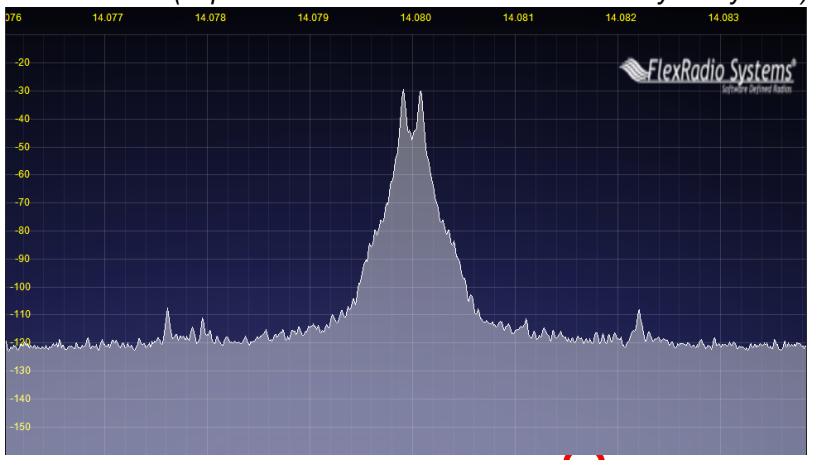


Thanks K0SM (http://www.frontiernet.net/~aflowers/k3rtty/k3rtty.html)

MMTTY - AFSK

- No MMTTY filter
- K3 AFSK filter
- K3 @ 100 watts



Radio Configuration

FSK & AFSK bandwidth

FSK

- Use radio FSK filter
  - DSP TX filter (K3)
  - Crystal TX filter (K3)
  - Lobby other mfrs
- Otherwise, use AFSK
  - With TX filtering
  - Properly adjusted

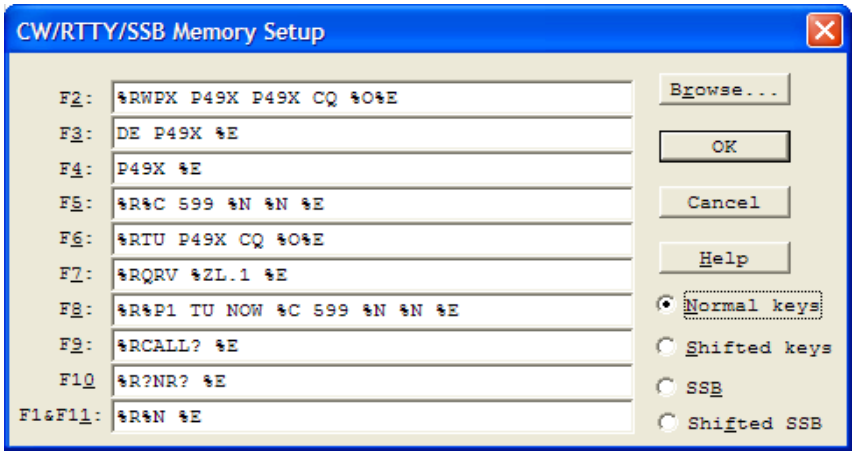
AFSK

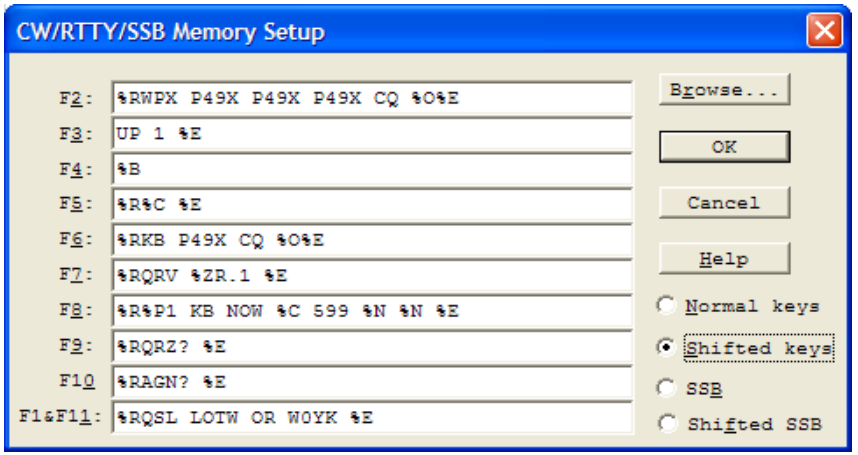
- Use radio AFSK filter
  - DSP TX filter (K3)
  - Crystal TX filter (K3)
  - Lobby other mfrs
- Use MODEM TX filter
  - MMTTY 512-tap
  - 2Tone default

Messages

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

www.rttycontesting.com/tutorials/messages

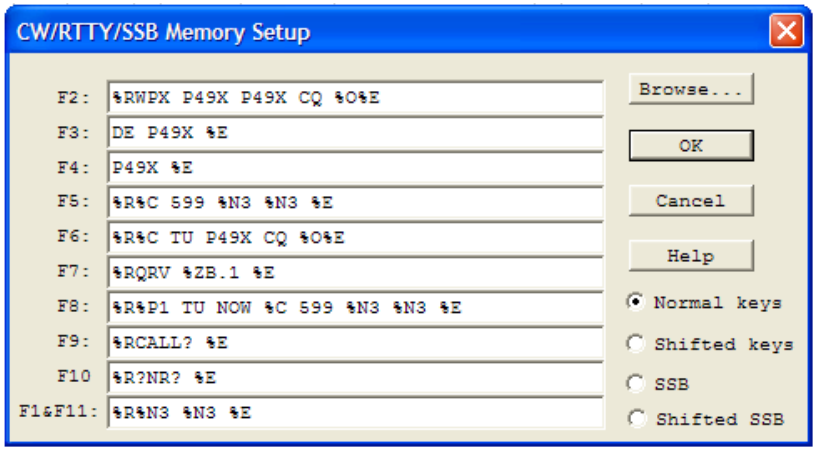


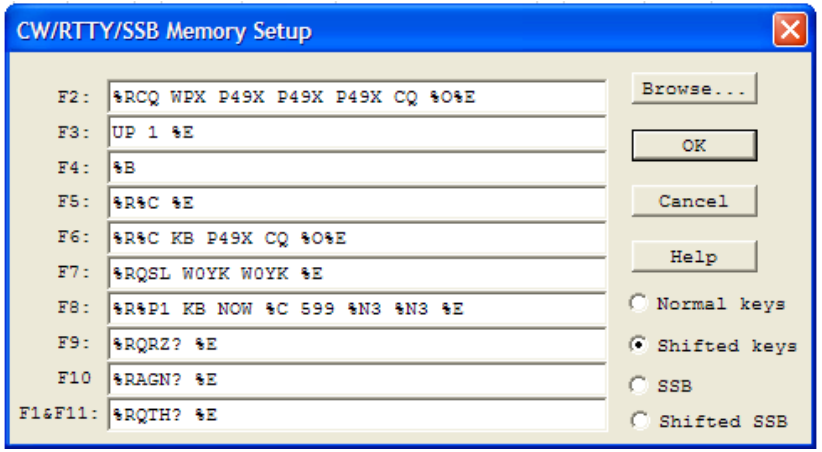


Messages

optimize

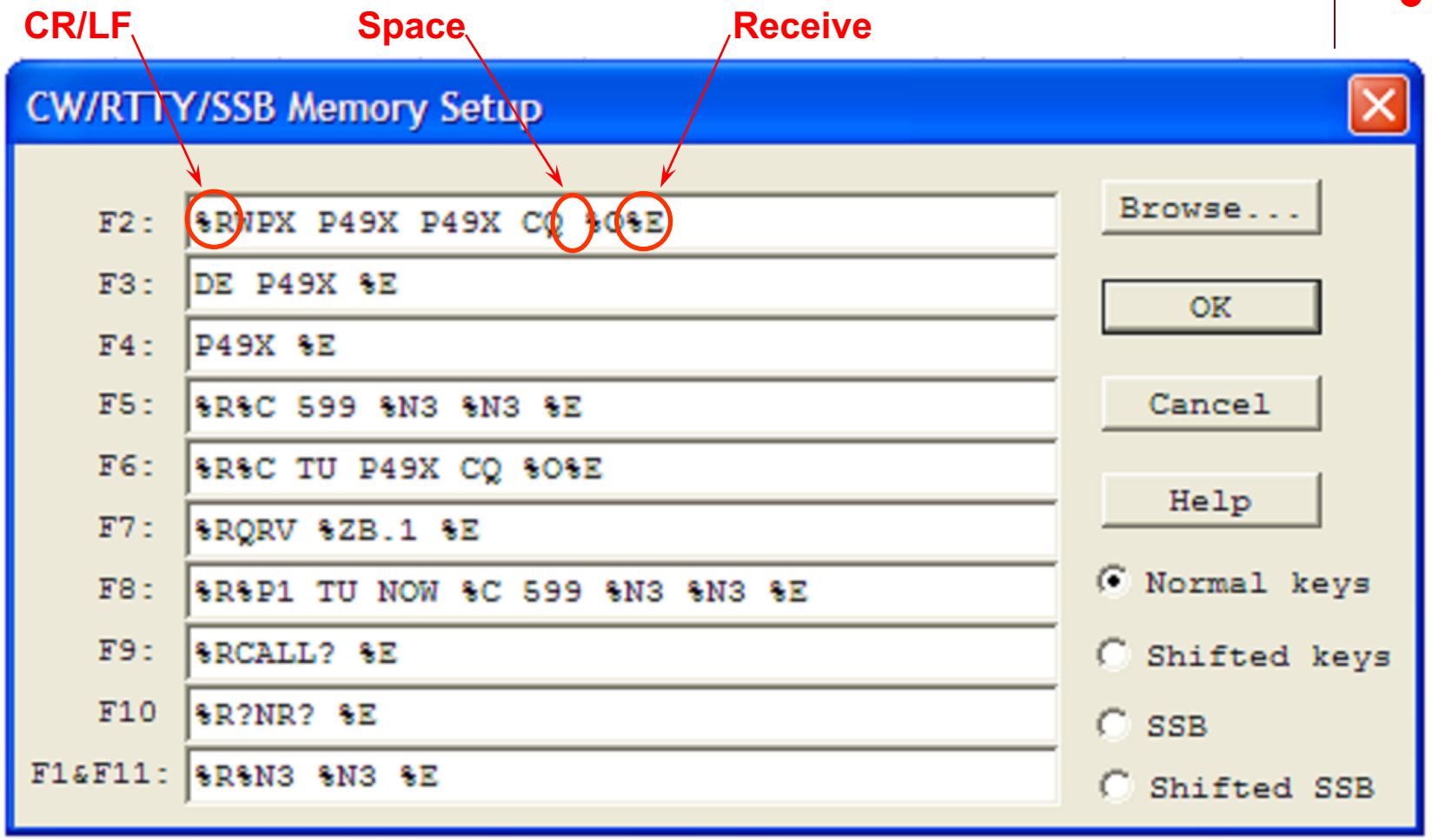
- Modular
  - Chaining
- Group logically
- Supports a cadence





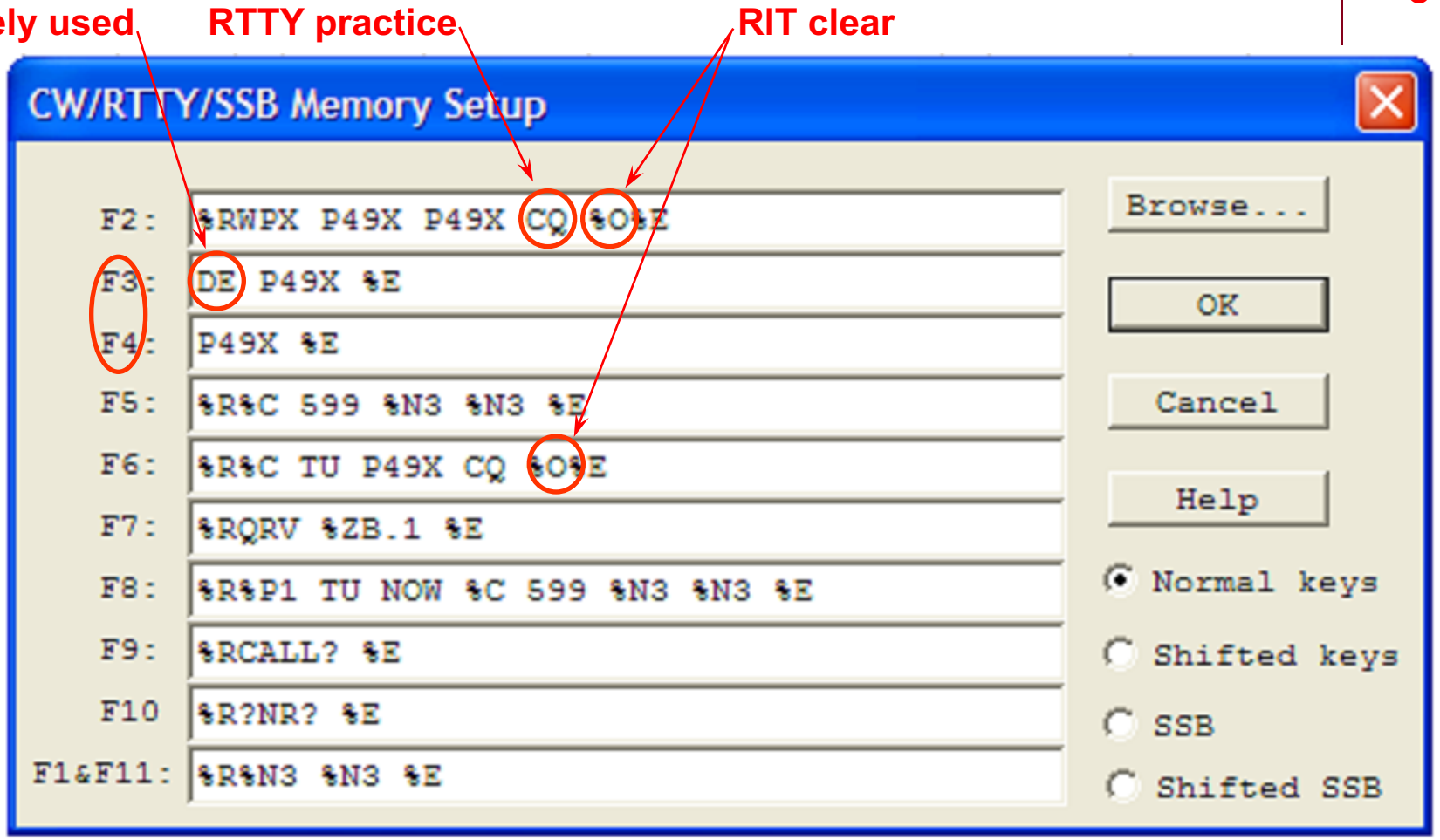
Messages

formatting



Messages

efficiency

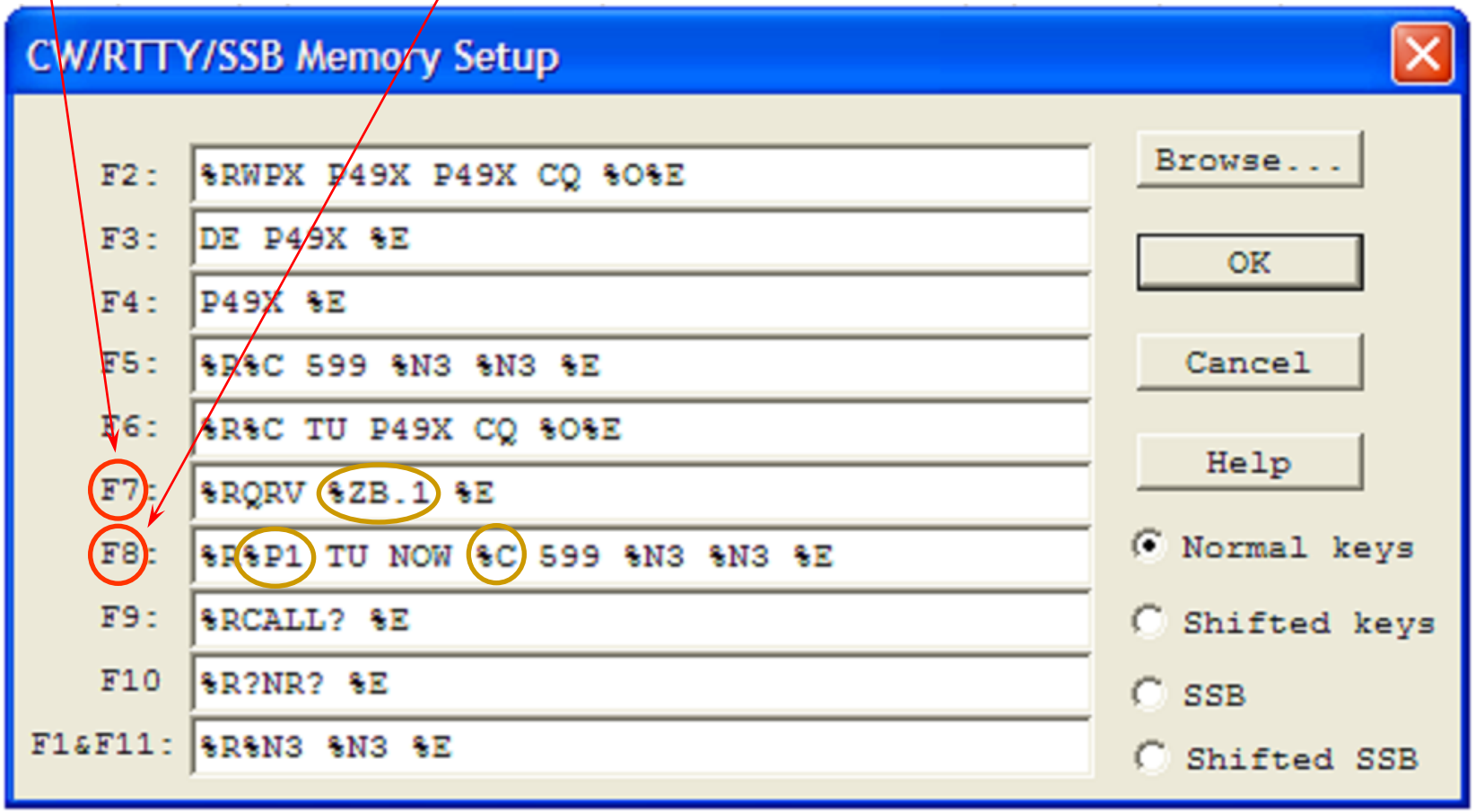


Messages

special

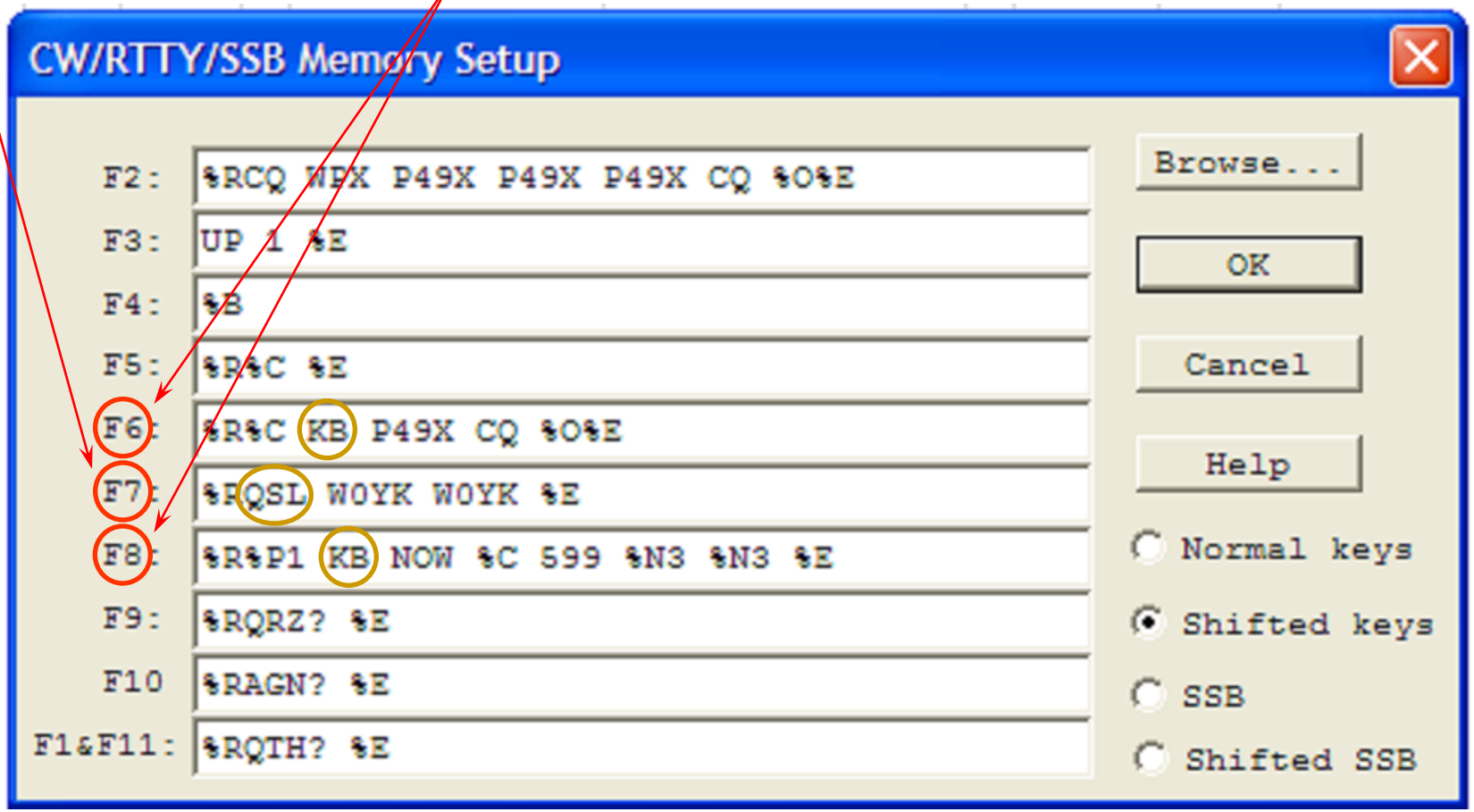
other radio freq.

Stacked Call Sign exchange



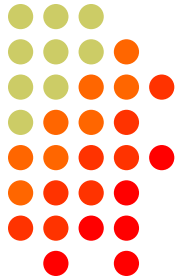
Messages

personal



Messages

CQ WW RTTY

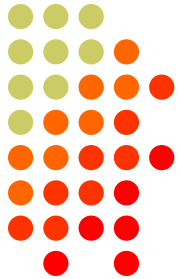


- WW W1UE W1UE CQ
- <his call> 599 05
  (TU) 599 05
- TU W1UE CQ

- W1UE
- ZN
- AGN
- ?

Messages

CQ WPX RTTY

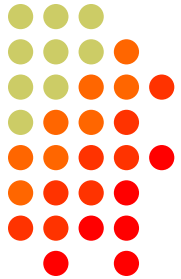


- WPX AK1W AK1W CQ
- <his call> 599 1867 1867
  (TU) 599 1867 1867
- TU AK1W CQ

- AK1W
- NR
- AGN
- ?

Messages

NA RTTY Sprint



- NA N0NI N0NI CQ
- <his call> N0NI 154 154 TONI TONI IA IA
  <his call> 154 154 TONI TONI IA IA N0NI
- TU

- N0NI
- NR
- NAME
- QTH
- AGN
- ?

Messages: Space Delimiter

*UnShift On Space**

**UOS or USOS*

TX RX	599 123 123	599 CA CA
UOS on	f599 f123 f123	f599 CA CA
UOS on	f599 f123 f123	f599 CA CA
UOS on	f599 f123 f123	f599 CA CA
UOS off	f599 f123 f123	f599 :- :-
UOS off	f599 123 123	f599 lCA CA
UOS on	f599 QWE QWE	f599 lCA CA
UOS off	f599 123 123	f599 lCA CA
UOS off	f599 123 123	f599 lCA CA

f: FIGS character

l: LTRS character

Garbled copy

- Protocol that provides some noise immunity for shift characters by:
  - forcing the Letters set after a received Space
  - sending a FIGS character after a Space when the next character is in the Figures set
- MMTTY:
  - RX UOS and TX UOS can be independently enabled or disabled

Messages: Space Delimiter

UOS and a noise hit

	TX RX	599 123 123	599 123 123	599 CA CA	599 CA CA
best case	UOS on	f599 f123 f123	f599 f123 f123	f599 CA CA	f599 CA CA
	UOS on	xTOO f123 f123	f599 xQWE f123	xTOO CA CA	f599x:- CA
	UOS on	f599 f123 f123	f599 f123 f123	f599 CA CA	f599 CA CA
	UOS off	xTOO f123 f123	f599 xQWE f123	xTOO CA CA	f599x:- :-
	UOS off	f599 123 123	f599 123 123	f599 lCA CA	f599 lCA CA
	UOS on	xTOO QWE QWE	f599xQWE QWE	xTOO lCA CA	f599 x:- CA
worst case	UOS off	f599 123 123	f599 123 123	f599 lCA CA	f599 lCA CA
	UOS off	xTOO QWE QWE	f599xQWE QWE	xTOO lCA CA	f599 x:- :-

f: FIGS character

l: LTRS character

Garbled copy

Turning on UOS for both RX and TX is the best hedge:

- Most other stations will be that way
  - MMTTY default; 78% of survey respondents use MMTTY
- With only one noise hit, at least one of the important exchange elements is received properly

Messages: Hyphen Delimiter?

UOS is defeated: so all four cases have identical noise results

TX RX	599-123-123	599-123-123	599-CA-CA	599-CA-CA
UOS on	f599-123-123	f599-123-123	f599-lCAf-lCA	f599-lCAf-lCA
UOS on	xTOOAQWEAQWE	f599x123-123	xTOOAlCAf-lCA	f599-x:-f-lCA
UOS on	f599-123-123	f599-123-123	f599-lCAf-lCA	f599-lCAf-lCA
UOS off	xTOOAQWEAQWE	f599x123-123	xTOOAlCAf-lCA	f599-x:-f-lCA
UOS off	f599-123-123	f599-123-123	f599-lCAf-lCA	f599-lCAf-lCA
UOS on	xTOOAQWEAQWE	f599x123-123	xTOOAlCAf-lCA	f599-x:-f-lCA
UOS off	f599-123-123	f599-123-123	f599-lCAf-lCA	f599-lCAf-lCA
UOS off	xTOOAQWEAQWE	f599x123-123	xTOOAlCAf-lCA	f599-x:-f-lCA

f: FIGS character

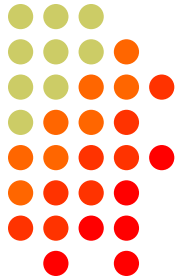
l: LTRS character

Garbled copy

- Sending Hyphen instead Space “defeats” UOS and speeds up the message slightly by eliminating the FIGS character
  - However, if the first FIGS character is hit by noise, then the entire exchange is garbled
- Space with USO enabled is a slightly better hedge
  - Majority of stations use MMTTY with UOS enabled so at least one of the important exchange elements is received

Messages: "Double Shift"

LTRS/FIGS noise immunity



- MMTTY Double Shift may be enabled to send two LTRS or FIGS characters instead of one
- Eliminates single noise hits on LTRS and FIGS characters
- Moderate speed penalty for all transmissions

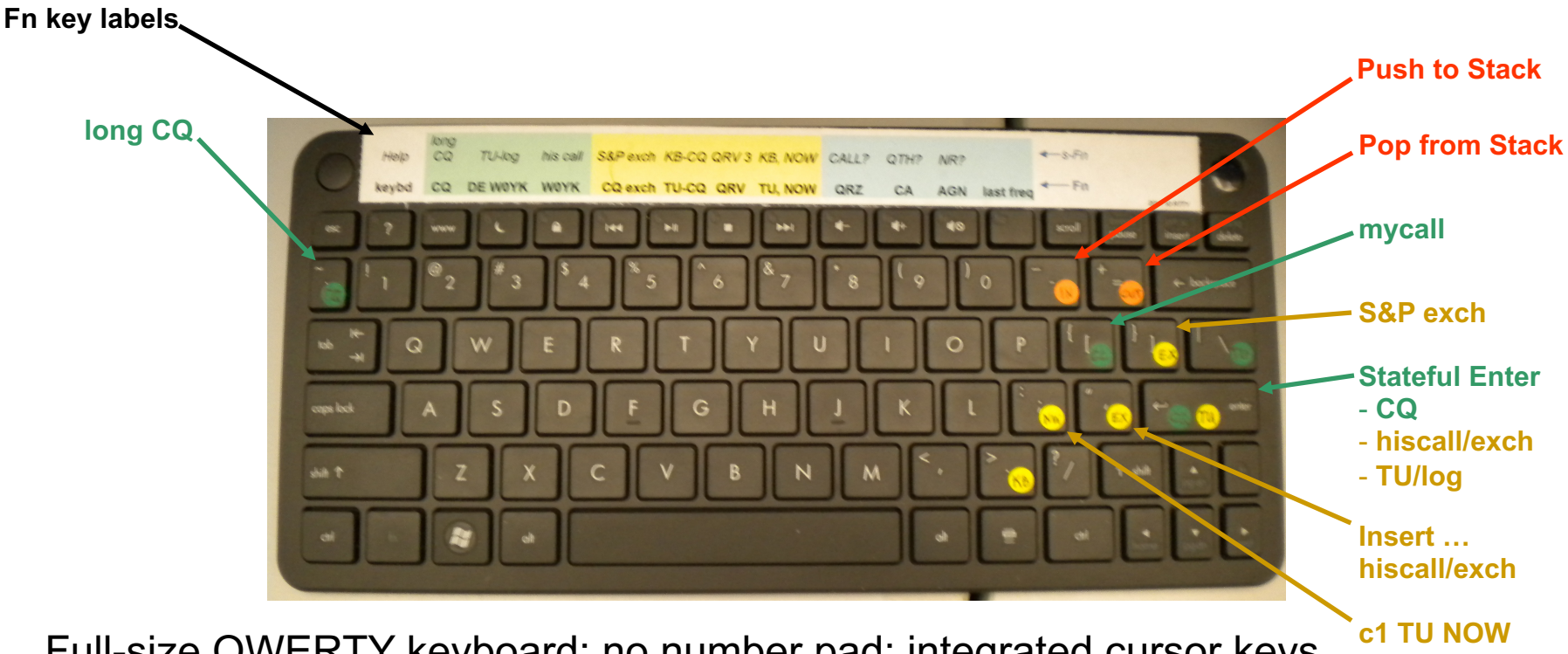
Probably not a good trade-off

Keyboard Optimization

- Accelerator keys
  - Insert: grab call sign & send exchange
  - +: log QSO & send TU/CQ message
- ESM (Enter Sends Message)
  - Enter sends CQ, exchange or TU/CQ message
- Key remapping
  - Most-used messages
  - Group around Enter key

Keyboard Optimization

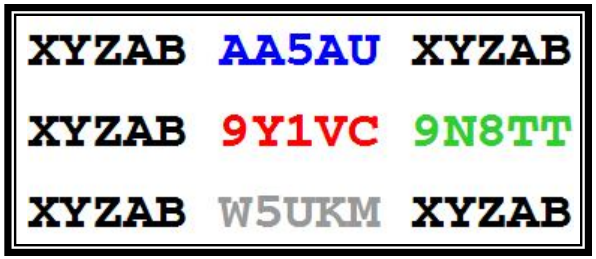
key re-mapping



Full-size QWERTY keyboard; no number pad; integrated cursor keys

Super Check Partial

- SCP (Super Check Partial) enables computer to pick out call signs in receive window
  - Call signs
  - New mults and double mults
  - Dupes



N1MM Logger

- Use main SCP from CW/SSB/RTTY contests
  - RTTY SCP is a subset

Super Check Partial

logger differences

XYZAB	AA5AU	XYZAB
XYZAB	9Y1VC	9N8TT
XYZAB	W5UKM	XYZAB

N1MM Logger

XYZAB	AA5AU	XYZAB
XYZAB	9Y1VC	9N8TT
XYZAB	W5UKM	XYZAB

WriteLog

XYZAB	AA5AU	XYZAB
XYZAB	9Y1VC	9N8TT
XYZAB	W5UKM	XYZAB

Win-Test

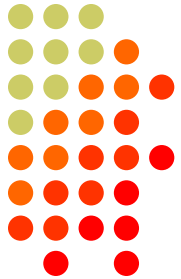
Pre-Fill

"Danger, Will Robinson!"

- Pre-fill is a ***typing aid*** using prior log data
- Each logger is unique:
  - N1MM: Call History Lookup File (text file)
    - User-created with Excel from prior logs
  - WriteLog: Pre-fill File (ADIF file)
    - User-created with text editor from prior ADIF logs
  - Win-Test: Database File
    - Provided for specific contests by the Win-Test team
- **Log what is communicated to you!**

Callsign Stacking

"Slow Down to Win"



- Sailboat racing analogy:
  - Pinwheel effect at mark-rounding
- Let pile-up continue 1-3 seconds after getting first call sign
  - Increase chance for another call sign or two
  - Increase chance for QSO-phase-skip
- Apply same tactic for tail-enders … pause before sending TU/CQ message

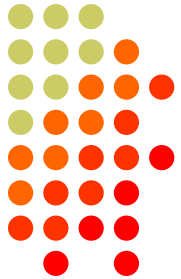
The 4 Phases of a QSO

- Normal Run mode flow:
  1. Enter or F1 (CQ)
     - repeat
     - AGN?
  2. pile-up
  3. Insert or ‘ (grab call sign, send exchange)
     - Send fill(s)
  4. receive exchange
  - ➢ check pre-fill, click their exchange
     - AGN? or NR? or QTH? or NAME?
  1. Enter or + (log contact, send TU/CQ)
     - optionally send F7 (QRV message)

- Normal S&P mode flow:
  1. CQ
  2. Enter or F4 (mycall)
     - repeat
  3. receive exchange
  - ➢ check pre-fill, click their exchange
     - AGN? or NR? or QTH? or NAME?
  4. Enter or F5 (send exchange)
     - send fill(s)
  1. find next CQ

Callsign Stacking

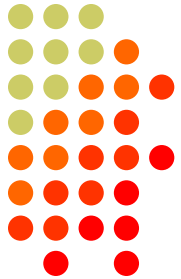
skip 2 phases



Normal	***Shortened***
1. *WPX P49X P49X CQ, or TU P49X CQ*	1. (skip CQ)
2. *K3LR K3LR K5ZD K5ZD*	2. (skip pile-up)
3. *K3LR 599 2419 2419*	3. *K3LR TU NW K5ZD 599 2420 2420*
4. *TU 599 842 842*	4. *TU 599 1134 1134*

Callsign Stacking

tail-ender



Normal	***Shortened***
1. *WPX P49X P49X CQ, or TU P49X CQ*	1. (skip CQ)
2. *K3LR K3LR*	2. (skip pile-up)
3. *K3LR 599 2419 2419 K5ZD*	3. *K3LR TU NW K5ZD 599 2420 2420*
4. *TU 599 842 842*	4. *TU 599 1134 1134*

Callsign Stacking

- Efficiently work:
  - multiple callers in a pile-up, and
  - tail-enders to a completing QSO
- Calls pushed onto the stack as they arrive
- Message parameter pops call off of the stack into the Entry window
- Eliminates 2 of 4 QSO phases, which doubles rate

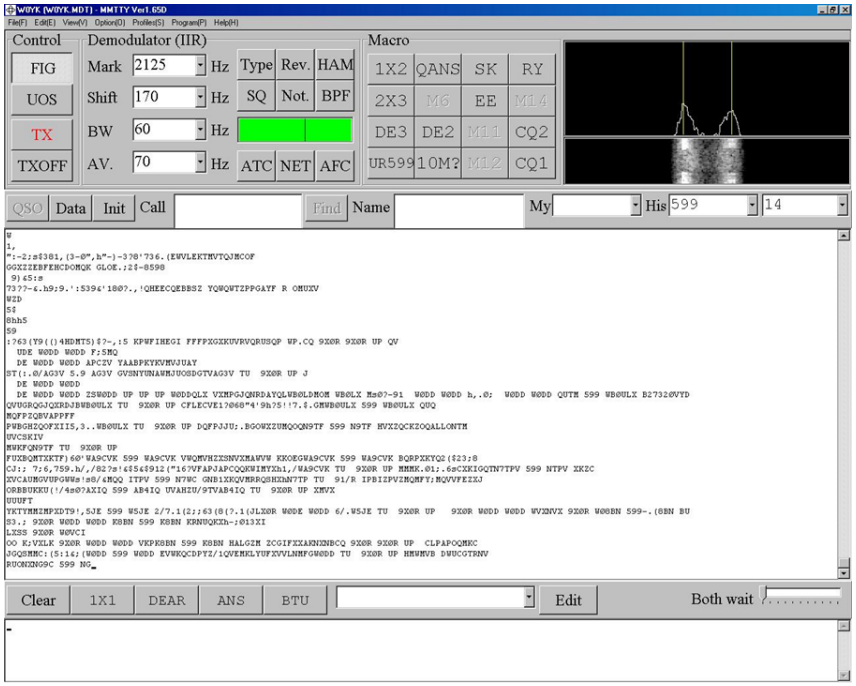
Multiple Decoders

choice of Tones

- Low tones are less fatiguing
- Low/High tones can be mixed to put two audio streams in one ear:
  - SO2R plus SO2V per radio
  - SOnR

Multiple Decoders

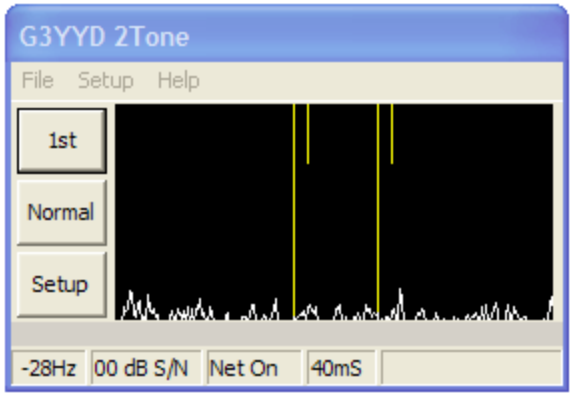
MMTTY

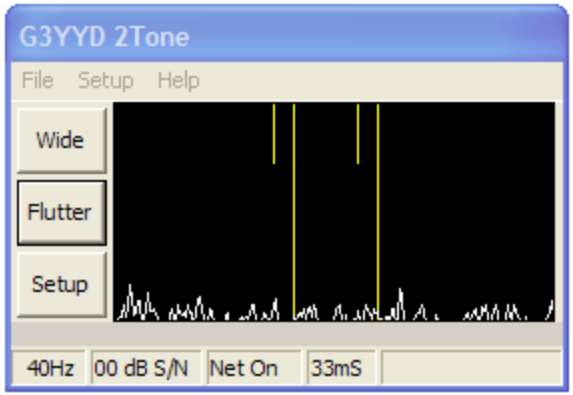


- Dominant SC MODEM
- Standalone, or …
- Contest loggers:
  - N1MM Logger+
  - WriteLog
  - Win-Test
- Introduced June 2000
- Mako Mori, JE3HHT

Multiple Decoders

2Tone

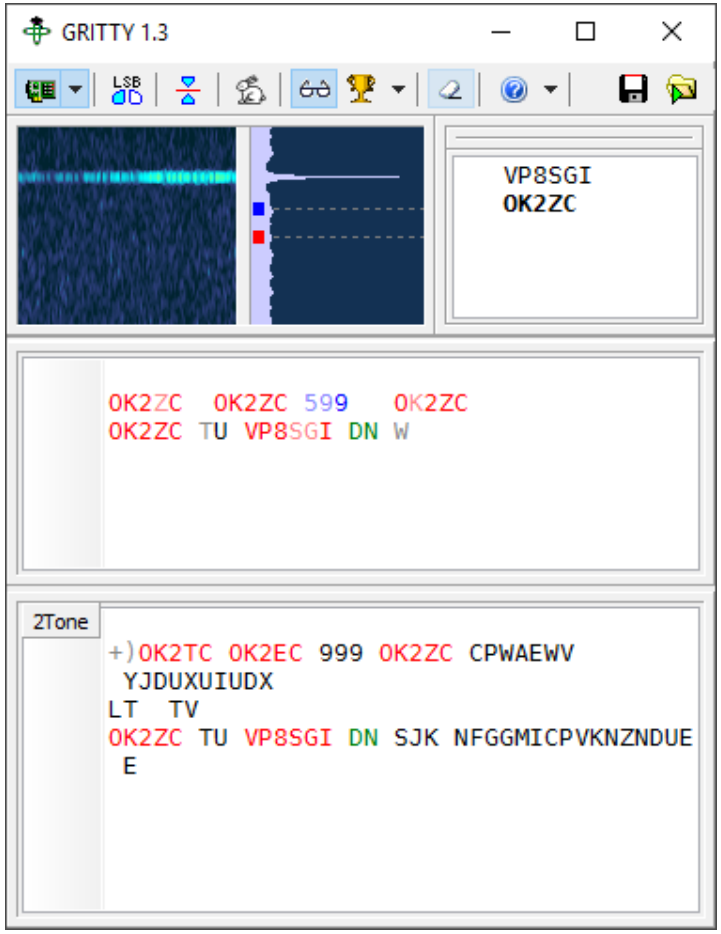




- Outperforms MMTTY ?
- Uses less CPU cycles
- Contest loggers:
  - N1MM Logger+
  - WriteLog
  - Win-Test
- Introduced late 2012
- David Wicks, G3YYD

Multiple Decoders

GRITTY



- Best accuracy ?
- Bayesian statistics
- Standalone, or …
- Contest loggers:
  - N1MM Logger+ only
- Introduced late 2015
- Alex Shovkoplyas, VE3NEA

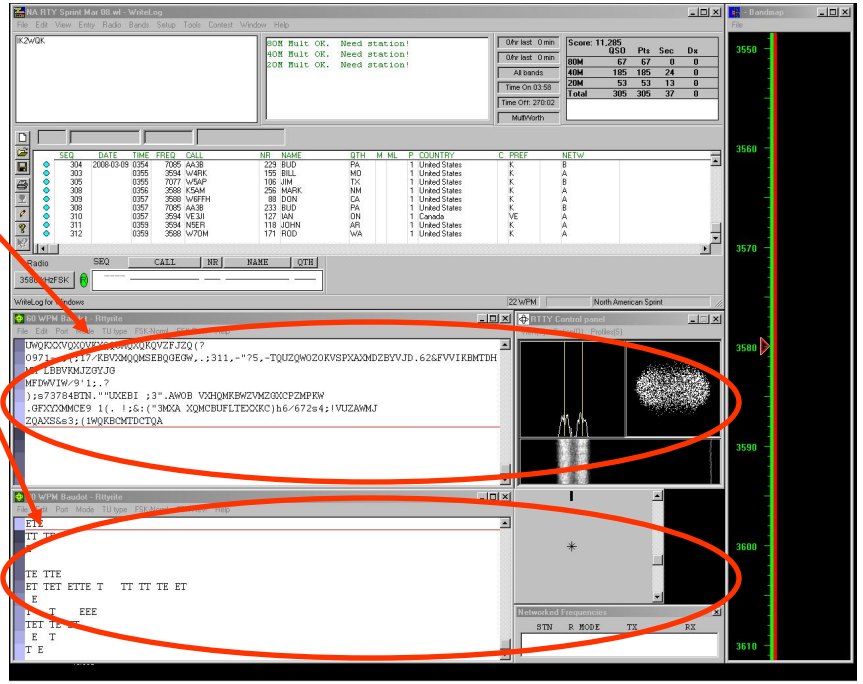
Multiple Decoders

hardware MODEM

Multiple Decoders

MMTTY & DXP38 - WriteLog

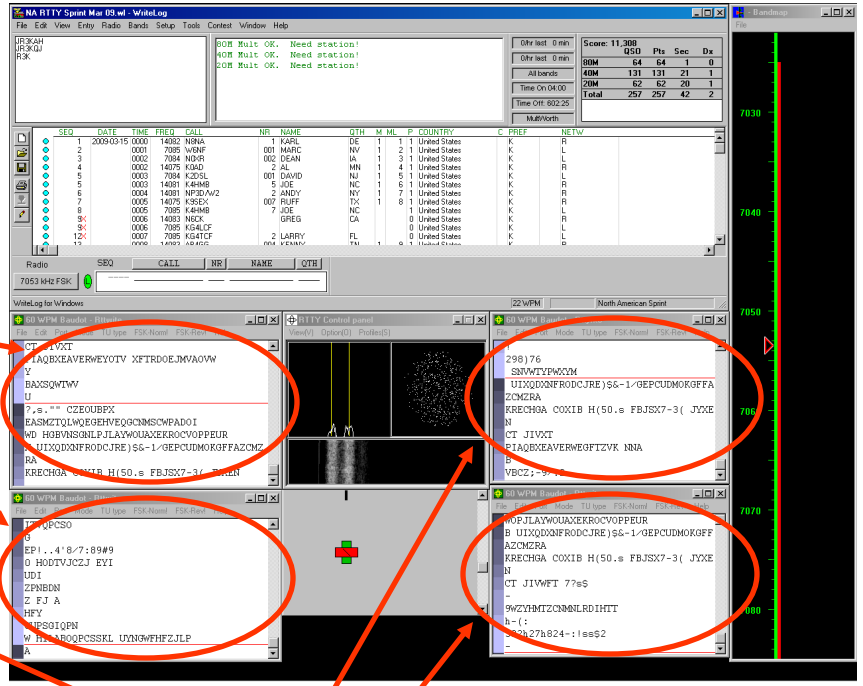
- Parallel decoding
  - Software, e.g., MMTTY
  - Hardware, e.g., DXP38
- Diverse conditions
  - Flutter
  - Multi-path
  - QRM, QRN
  - Weak signals
  - Off-frequency stations



Multiple RTTY Decoders

multiple MMTTY profile windows

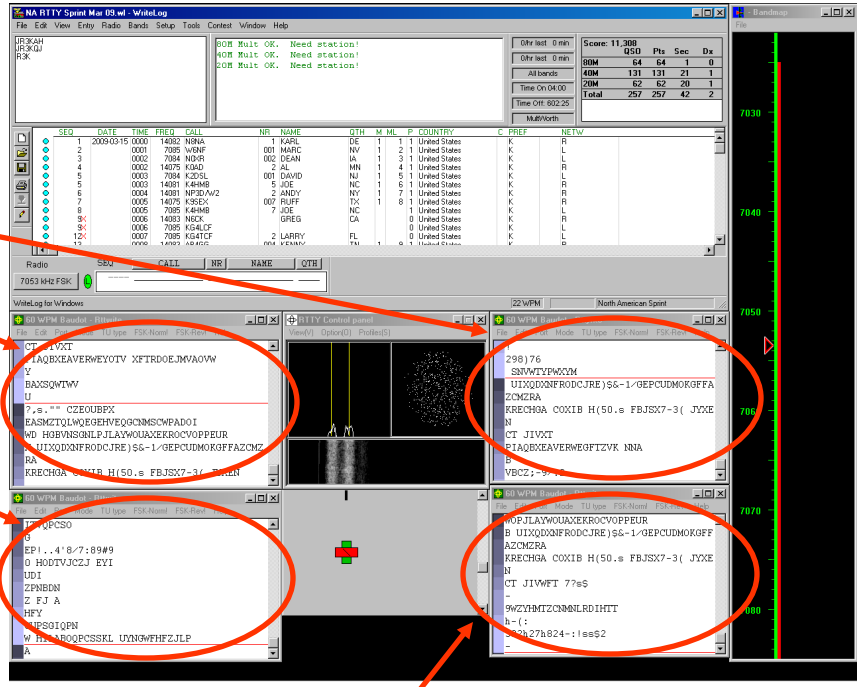
- Parallel decoding
  - same audio stream
  - switching takes too long
- Multiple profile windows
  - Standard
  - Fluttered signals
  - Fluttered signals (FIR)
  - Multi-path
  - hyper sensitive
  - EU1SA
  - AA6YQ-FIR-512
    - weak signals in QRN



Multiple Decoders

two IF bandwidths

- Narrow IF filtering (main RX)
  - Hardware modem, i.e. DXP38
  - MMTTY profiles
    - Standard
    - Fluttered signals
    - Fluttered signals (FIR)
    - Multi-path
    - hyper sensitive
    - EU1SA
- Wide IF filtering (sub RX)
  - MMTTY profiles
    - AA6YQ-FIR-512
      - Dual Peak Filter
      - “Matched filter”

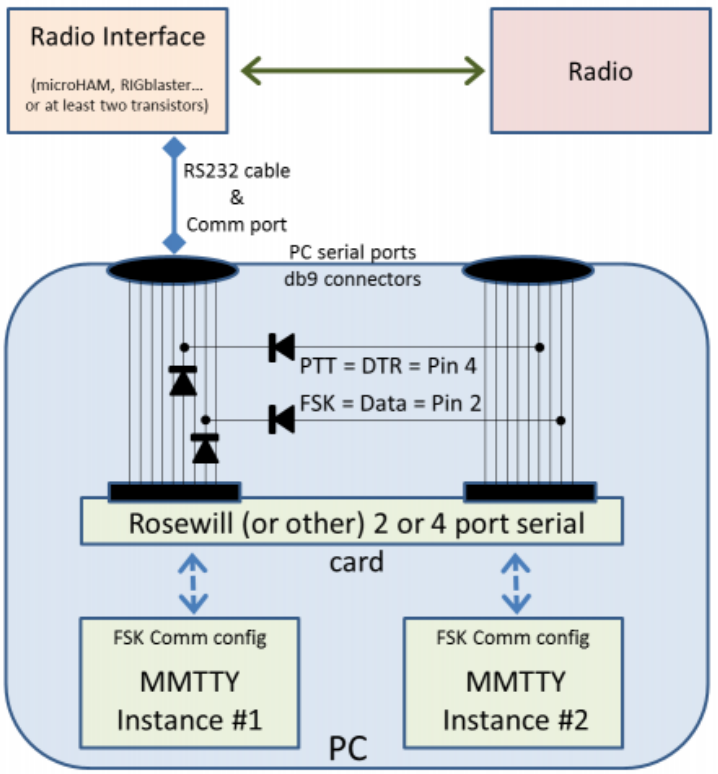


SO2V

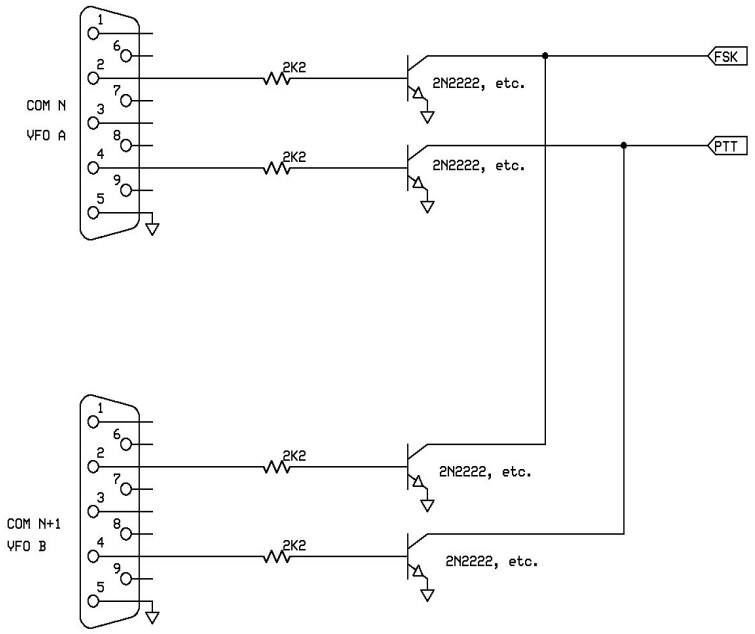
1. If Assisted and running on VFO-A, then
   - A<>B
   - Click spot, tune, ID station, work station
   - A<>B, resume running
2. Or, set up decoder windows on VFO-A and VFO-B
   - Radio must have two true receivers
   - Monitor both frequencies simultaneously with right/left channels of sound card
     - Left-click call from 2nd RTTY window into VFO-B Entry Window
   - Two ways to transmit on VFO-B:
     I. A<>B, work the mult, A<>B
     II. SPLIT, work the mult, SPLIT, resume running
        - Requires “wire-OR’d” FSK or AFSK and two transmit RTTY windows
        - K3/WriteLog invokes SPLIT when call is right-clicked

SO2V

Wire-OR FSK/PTT



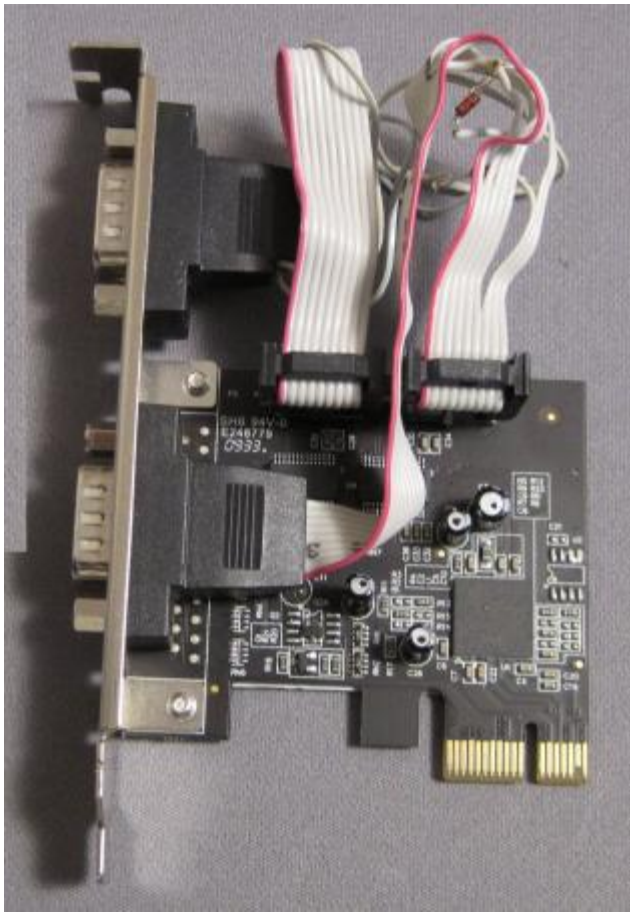
Serial Signals (K8UT)



FSK/PTT Signals (W0YK)

SO2V

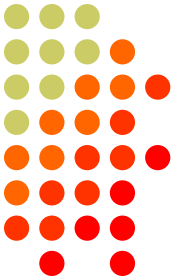
Wire-OR FSK/PTT



Serial Signals (K8UT)

FSK/PTT Signals (W0YK)

SO2R



- Eliminates SO1R RTTY boredom
- Think beyond run and S&P:
  - Dueling CQs; run on two bands simultaneously
  - S&P on two bands simultaneously, esp. w/Packet
  - SO2V on one or both radios (SO4V!)
- Two networked computers:
  - Eliminates PC focus swapping
  - RTTY doesn't require much typing
    - Mini-keyboards ideal for RTTY
  - 2 x SO2V=SO4V for picking up mults on both run bands
  - Easily extendible to SO4R

No time to watch TV or read spy novels!

SO2R

M2 configuration

SO2R in the NA Sprint

- Set VFOs at least 10 kHz apart on both radios
- Find a clear spot on one radio and CQ while you tune the other radio for a station to work
- If you don't find a station to work quickly (within a minute), find a clear frequency and duel CQ
- After a QSO swap VFOs on that radio, search for up to a minute, then resume dueling CQ
- Don't waste time trying to work the "couplet" … CQing is OK in Sprint!

SOnR

> 2 radios

- Simplify antenna/filter band-decoding:
  - Dedicate a band/antenna to the 3rd (or 4th) radio
- Networked PC/radio simplifies configuration
- RTTY (vs. CW or SSB) easier for operator
  - PC decodes for operator
  - Low tones & high tones allows two radios per ear
    - Classic audio headphone mixer provides radio 1, radio 2 or both

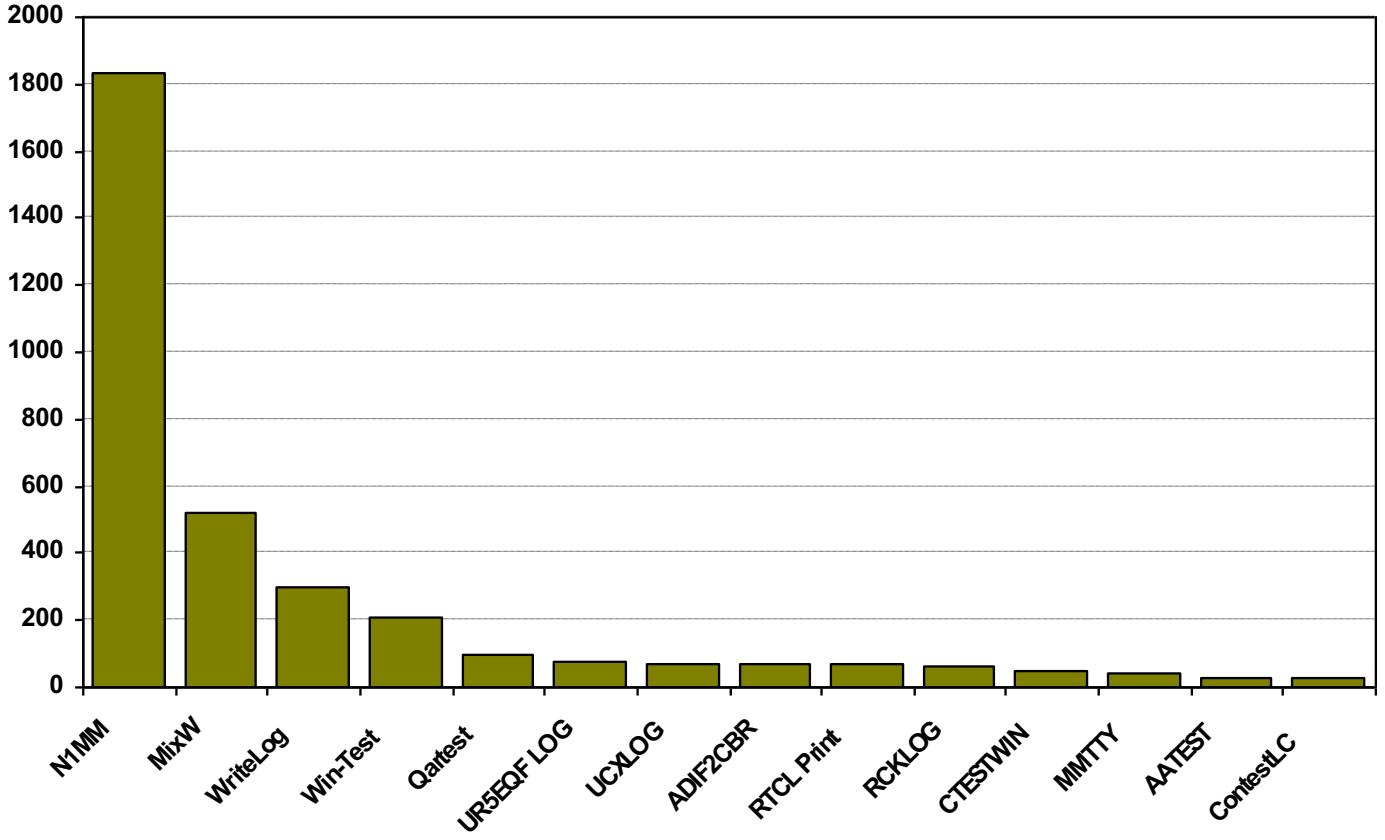
SOnR

Multi-Multi configuration

dedicated to 10 meters

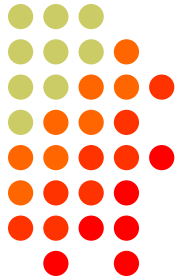
Logging Software

2012 CQ WPX RTTY



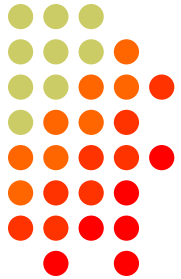
Logging Software

The Big Three



- WriteLog *(1994)*
  - created for RTTY *(CW & SSB came later)*
  - *www.rttycontesting.com/tutorials*
- N1MM Logger+ *(2000; free)*
  - dedicated RTTY software designer
  - *www.rttycontesting.com/tutorials*
- Win-Test *(2003)*
  - RTTY is low priority.

Logging Software



	WriteLog	N1MM	Win-Test
MMTTY	☻	☻	☻
2Tone	☻	☻	☻
other decoders	☻	☻	none
Call sign acquisition	☻	☻	☻
Contests supported	☻	☻	fewer
Advanced RTTY	☻	☻	none

- *All three are entirely adequate for basic RTTY contesting*
- *Use the logger you are already familiar with for CW & SSB*

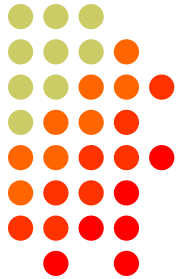
Logging Software

N1MM Logger, WriteLog, Win-Test

- 13 features compared
  - Simplifying assumption: features equally weighted
  - Rated 0 to 5
- All three score ‘5’ on:
  - MMTTY integration
  - Stateful Enter key (ESM: Enter Sends Message)
  - Accelerator keys
  - QRV message parameter
- Another 9 advanced RTTY features distinguish these loggers

RTTY Contest Loggers

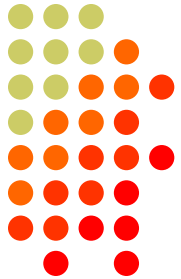
relative ratings



WL	*N1*	*WT*	***Logger***
5	5	5	• RTTY window readability
5	4	0	• Multiple decoders
4	5	0	• MMTTY, 2Tone, GRITTY
0	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
39	***40***	***23***	***Overall***

Logging Software

multiple decoders

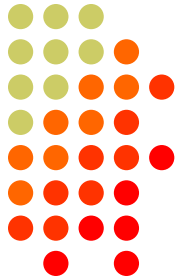


- N1MM Logger limited to 4 total, but has best DXP38 & GRITTY support
- WriteLog has 10 additional decoders per rcvr and the most hardware MODEMs
- Win-Test only supports one instance of MMTTY or 2Tone

- WriteLog & N1MM Logger only
- Multiple parallel decoders for marginal copy

Logging Software

ESM mouse control



- Left-click enters call sign or exchange
- Right-click (ESM) sends exchange or TU/CQ
- QSOs can be worked entirely with mouse action, except for the rare instance where a call or exchange must be typed in
- Particularly suited to unique non-prefillable exchanges such as serial numbers

- N1MM Logger only
- Eliminates keyboard for efficiency

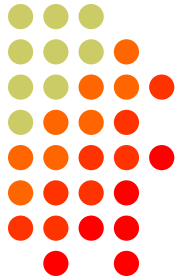
SO2V

- Basic capability with two VFOs
- Advanced capability with two receivers
  - Requires second receiver in radio
  - Independent RTTY window for second receiver
  - radio/logger SPLIT mode

- N1MM Logger & WriteLog
- Interleave S&P QSOs on Run band

SO2R

M2 configuration

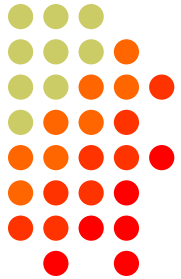


- PC & UI per radio; networked
- Single signal interlock
- Extendible to SOnR

- Only WriteLog
- Another user preference alternative; SOnR

Logging Software

key re-mapping



- Soft re-definition of keyboard keys
- Examples:
  - Insert → ‘
  - = → PopCallFromStack
- WriteLog provides a rich built-in function set for key shortcuts

- WriteLog & Win-Test remap keys and functions
- N1MM Logger uses HotKeys
- Relocates keys for efficiency

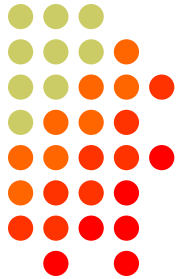
Logging Software

re-mapped keys

Full-size QWERTY keyboard; no number pad; integrated cursor keys

Logging Software

callsign stacking



- N1MM Logger can automatically fill stack
- WriteLog has convenient stack management
- Win-Test script can use partner stack

- All three loggers
- Doubles rate by skipping CQ & pile-up

Logging Software

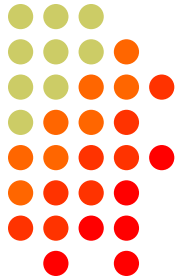
callsign stacking

- N1MM Logger automatically pushes calls into the Grab window.
  - It can also explicitly push calls onto the Call Stack (like WriteLog and Win-Test)
  - There is a rich list of stack functions and ESM integration
- WriteLog explicitly right-clicks calls onto the call stack
- Win-Test requires a LUA script to push calls onto the Partner Stack

Automatic vs. explicit pushing is personal pref.

Logging Software

AFSK & FSK flexibility

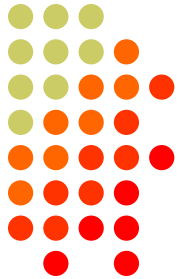


- WriteLog has built-in AFSK & FSK
- N1MM relies on MODEM for AFSK or FSK

- WriteLog
- Independence from MODEM for transmit

RTTY Contest Loggers

relative ratings



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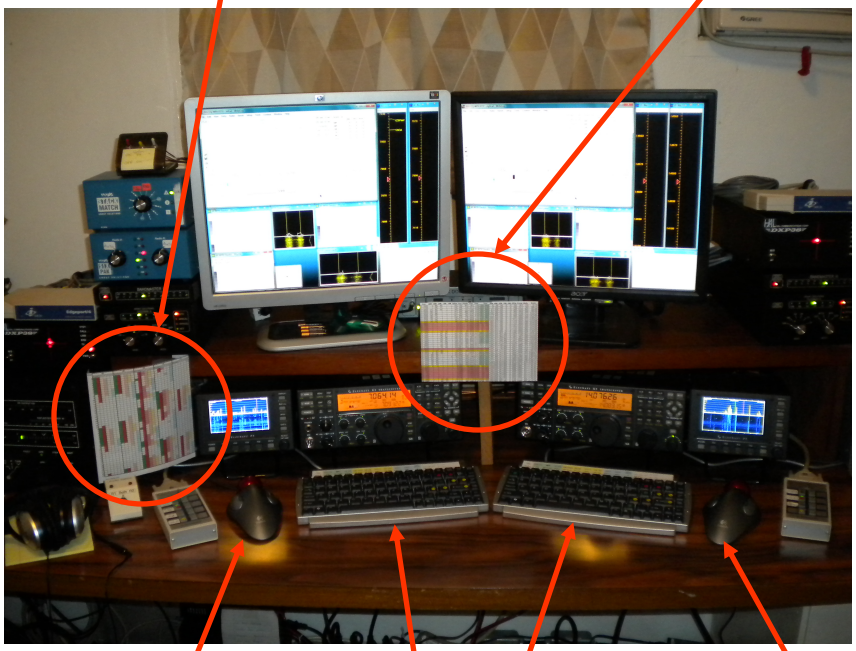
Ergonomics

user interface



- Comfortable heights, reaches, layout
- Right-sized keyboard
  - Fn keys template
  - Label re-mapped keys
- Right & left trackballs
- Bose QC2 phones
  - Minimal volume
  - Stereo

Ergonomics

keyboard or mouse?

- Keyboard – minimal typing in RTTY
  - Either:
    - F1, Insert and + … or,
    - Enter, Insert and Enter (ESM – Enter Sends Message)
    - Plus Fn keys or re-mapped Fn keys
  - Mouse click received exchange, if not pre-filled
- Mouse/trackball
  - 100% (N1MM Logger)
  - 80% (WriteLog and Win-Test)

Resources

- www.rttycontesting.com
  - Tutorials and resources (beginner to expert)
  - WriteLog, N1MM Logger+ and MMTTY
- rtty@contesting.com
  - Email reflector
  - RTTY contester networking
  - Q&A
- Software web sites
  - mmhamsoft.amateur-radio.ca/ (MMTTY)
  - n1mm.hamdocs.com/tiki-index.php (N1MM Logger+)
  - www.writelog.com (WriteLog)
  - www.wintest.com (Win-Test)
- Software Reflectors
  - mmtty@yahoogroups.com (MMTTY)
  - N1MMLoggerplus@yahoogroups.com (N1MM Logger+)
  - N1MMLogger-Digital@yahoogroups.com (N1MM Logger+ RTTY & PSK)
  - writelog@contesting.com (WriteLog)
  - support@win-test.com (Win-Test)