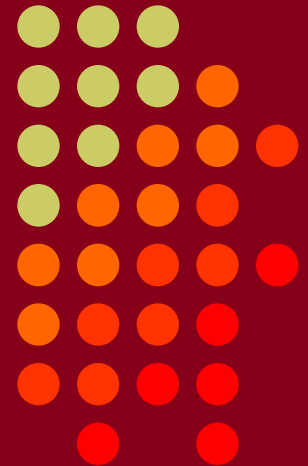


CTU 2014 Presents

The Essentials of RTTY Contesting

Ed Muns, W0YK



• CTU •
CONTEST
UNIVERSITY

ICOM®

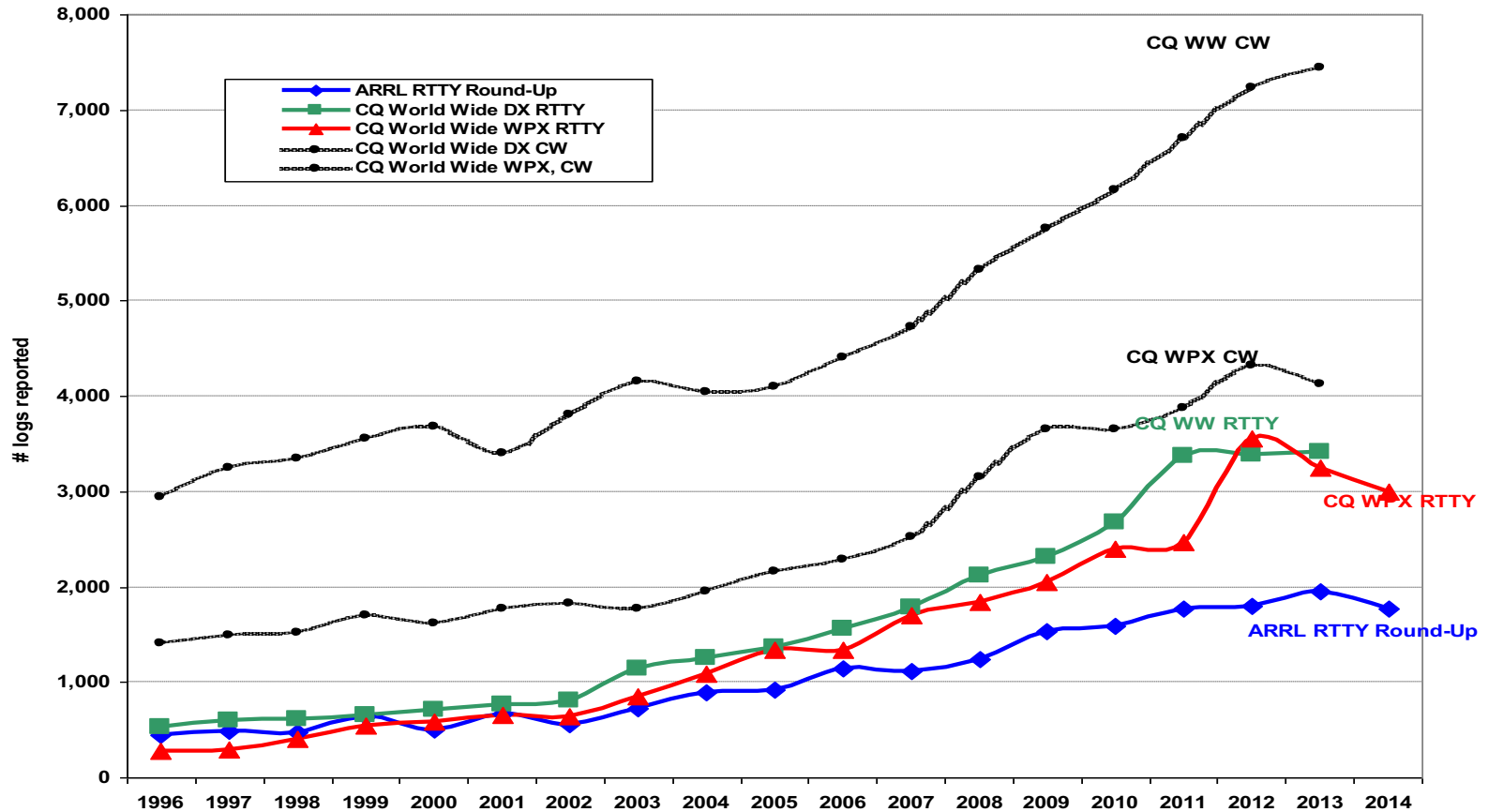
RTTY Contesting



- Introduction
- Part 1: Setting Up
 - RTTY Decoder/Encoder
 - PC-radio interface
- Part 2: Operating
- 2nd CTU RTTY session:
“Advanced RTTY Contesting”

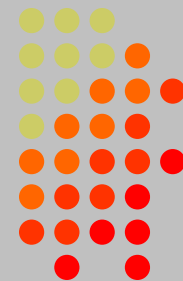
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Three Largest RTTY Contests



Lots of RTTY Contests

> two/month



- **Biggies (7)**

- CQ WW RTTY (last weekend in September)
- CQ WPX RTTY (2nd weekend in February)
- ARRL RTTY Roundup (1st weekend in January)
- BARTG (3rd weekend Jan, 3rd weekend March)
 - 75 Baud (April & September)
- WAE RTTY (2nd weekend in November)

- **NCJ contests (4)**

- NAQP RTTY (3rd Sat. in February, 2nd Sat. in July)
- Sprint RTTY (2nd Sat. in March & October)

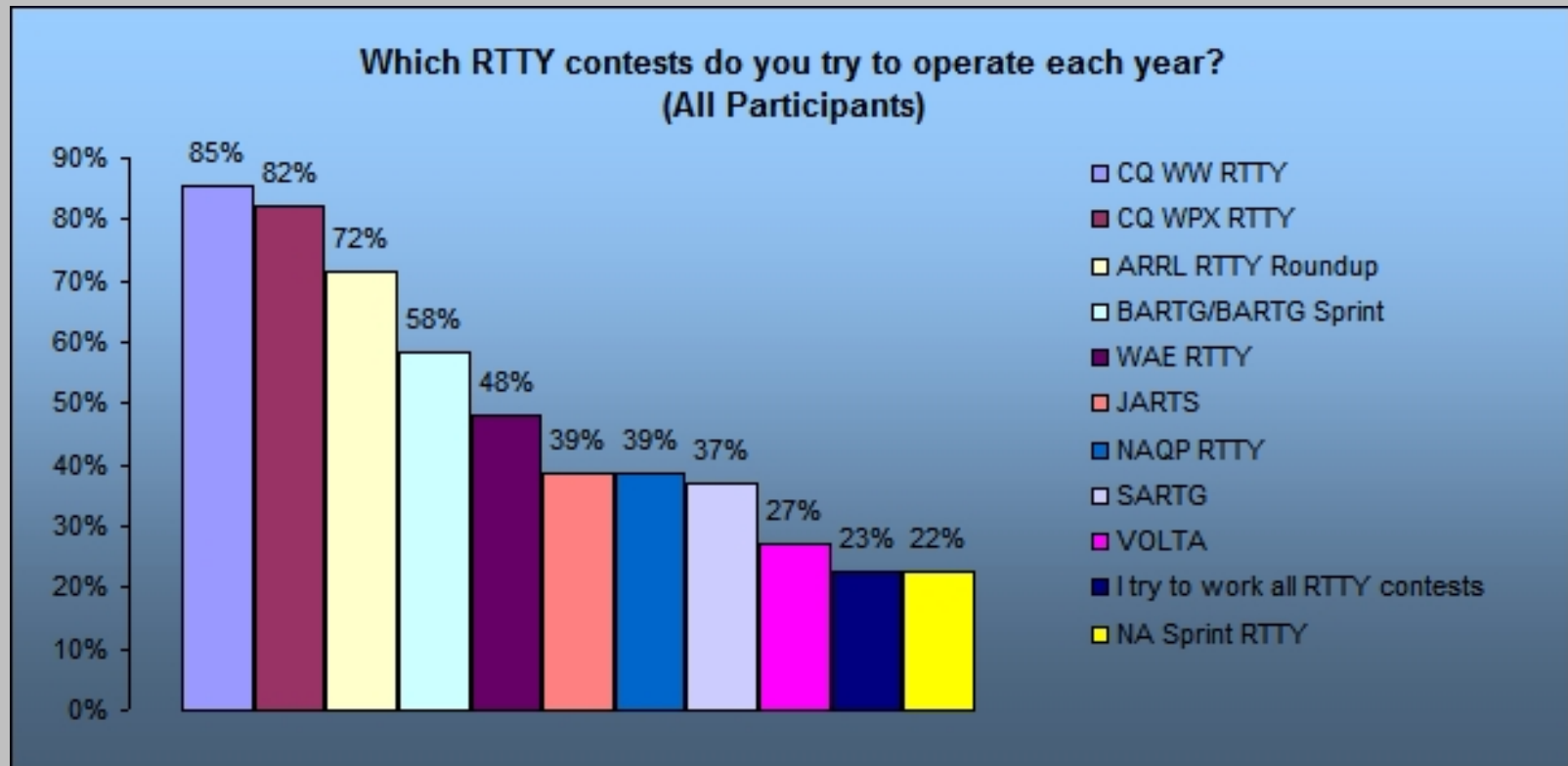
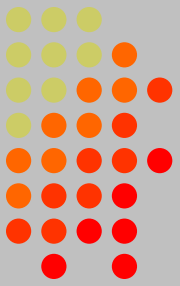
- **Other popular RTTY contests (20)**

- Ten-Meter RTTY (1st Sat. in December)
- JARTS, Makrothen, SARTG (2)
- 15 others

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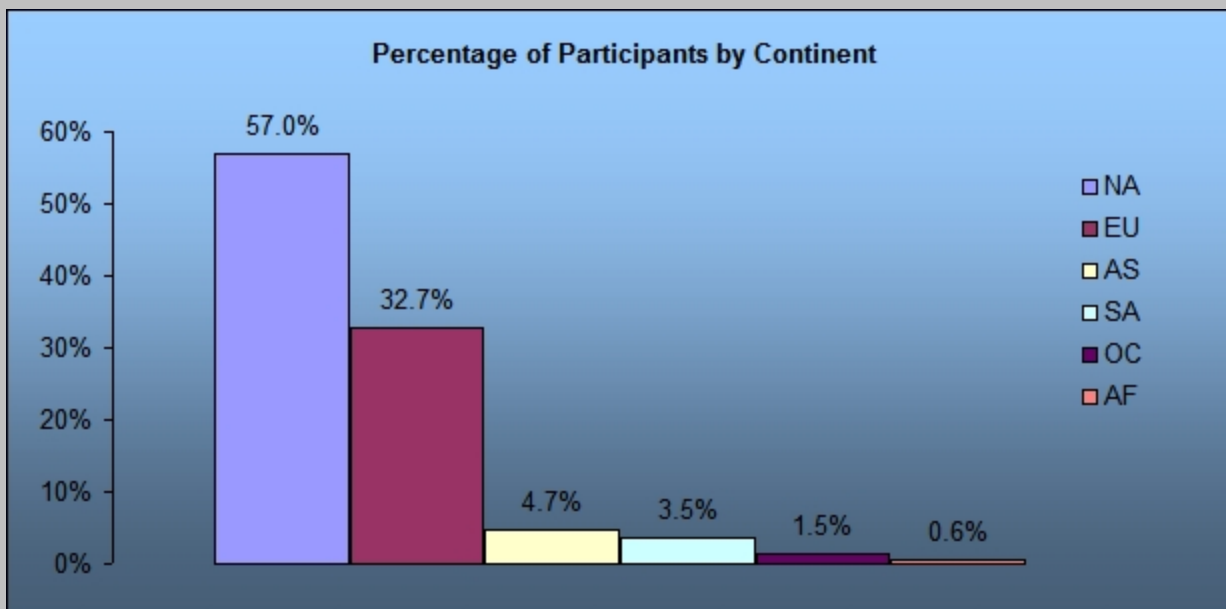
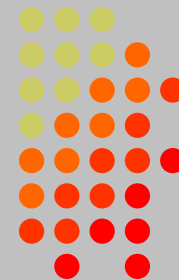
Contest Popularity

2010 survey



RTTY Contesters

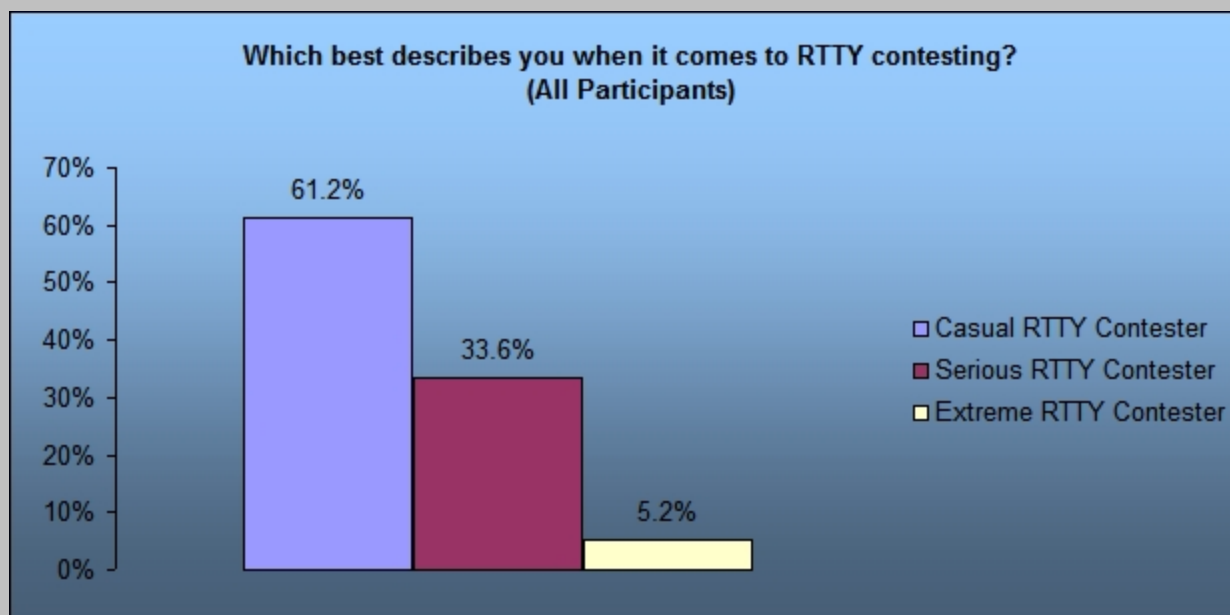
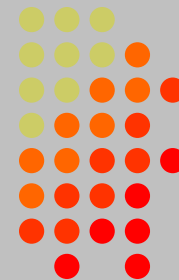
2010 survey



- 825 participants; 13 questions
- conducted in February 2010

RTTY Contesters

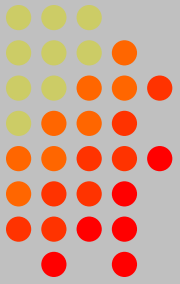
2010 survey



- The percentage of Casuals is much higher than shown, because few took the survey

RTTY Contesters

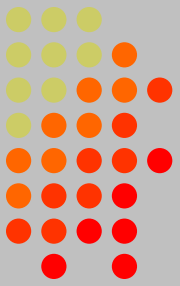
contester styles



- Casual
 - New
 - Making QSOs
 - Chasing awards
 - ➔ majority of participants ... sometimes slower operators
- Serious
 - High rates; snappy QSOs; no chit-chat
 - ➔ minority of participants ... faster operators (and easily annoyed by slower operators!)

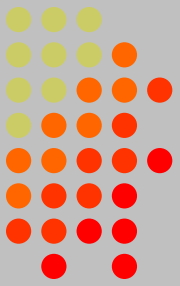
RTTY Contesters

contester types



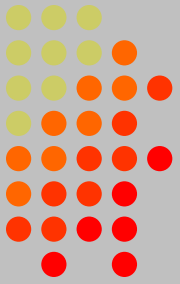
- “Gentleman RTTYers”
 - RTTY is the gentleman’s *mode*
(similar to 160 being the gentleman’s *band*)
- RTTY contest junkies
 - Years of experience; many different contests
- New testers
 - Many with extensive PC skill
- Multi-Mode testers
 - Strong growth

What Makes a Great RTTY Contester?



- Contester who happily logs casual callers
- Uses CW & SSB techniques where useful
- Strives to exploit RTTY uniqueness
 - Auto-decode frees operator time ... use it to do things difficult with CW & SSB, e.g., SO3R!
 - Speed is ~2x CW
- Applies learning back to CW & SSB

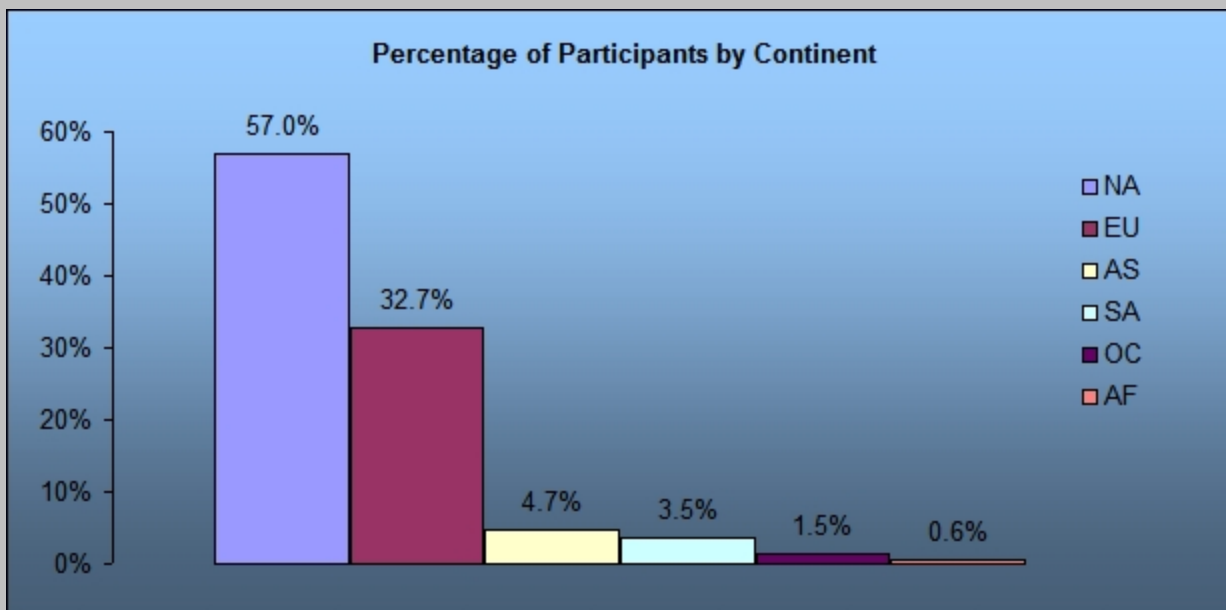
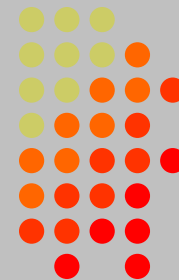
Giving Back



- Open logs
 - Allows others to learn
 - Raises level of competition
- Sharing
 - Improves operating quality and skill
 - Raises level of competition
- Growing the sport
 - “Lighthouse”: AA5AU & www.rttycontesting.com

RTTY Contesters

2010 survey



- 825 participants; 13 questions
- conducted in February 2010

What is RTTY?

compared to CW



CW

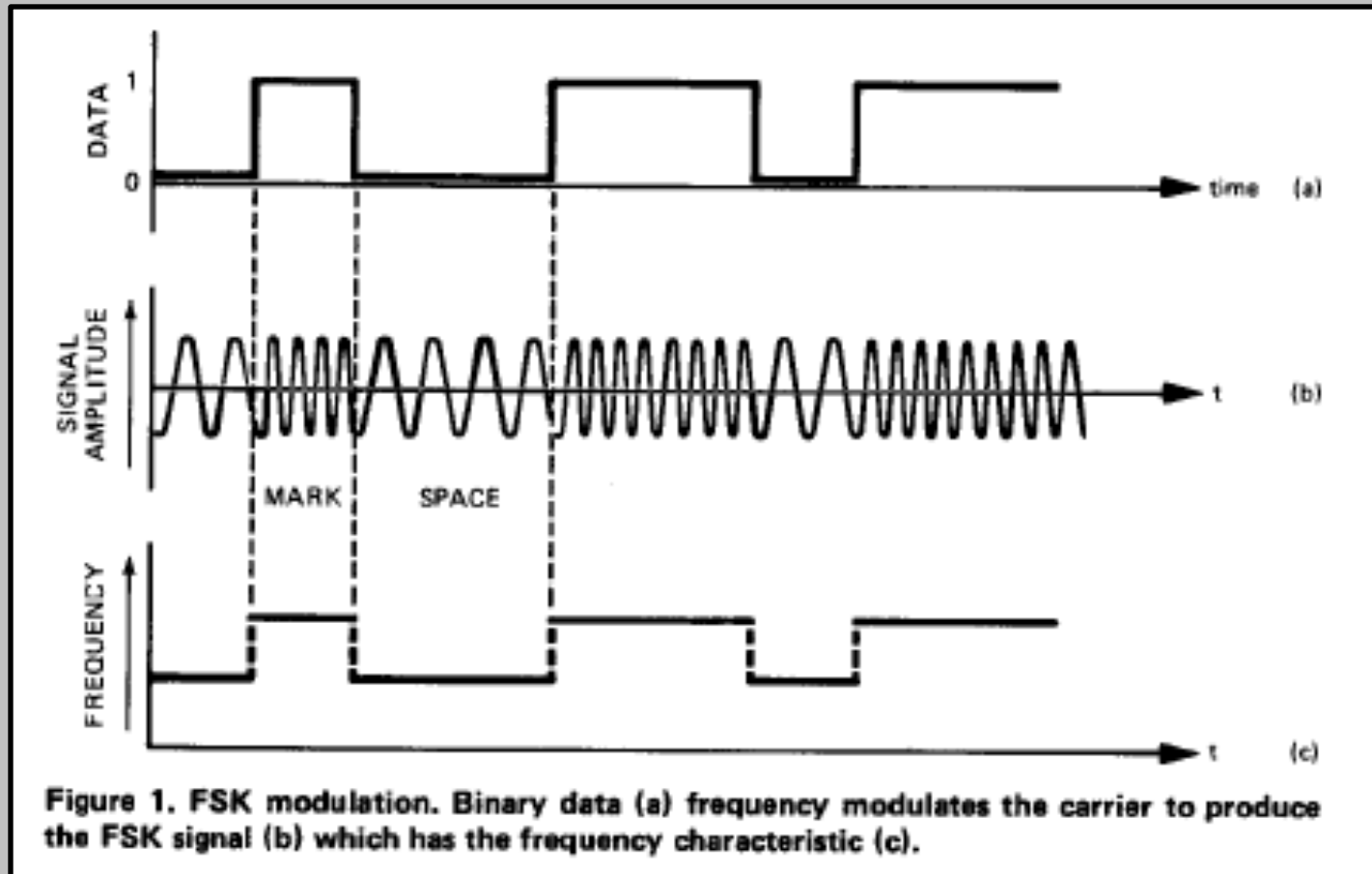
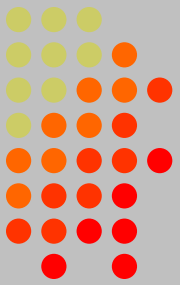
- **One** RF carrier
- Local audio **pitch**
- On **or** off
 - key up is data 0
 - key down is data 1
- **Morse** code
 - typically 25-40 wpm

RTTY

- **Two** RF carriers 170 Hz apart (*Space & Mark; Shift*)
- Local audio **tones**
- One on **and** other off
 - Space is data 0
 - Mark is data 1
- **Baudot** code
 - constant 60 wpm (*or 45.45 Baud*)

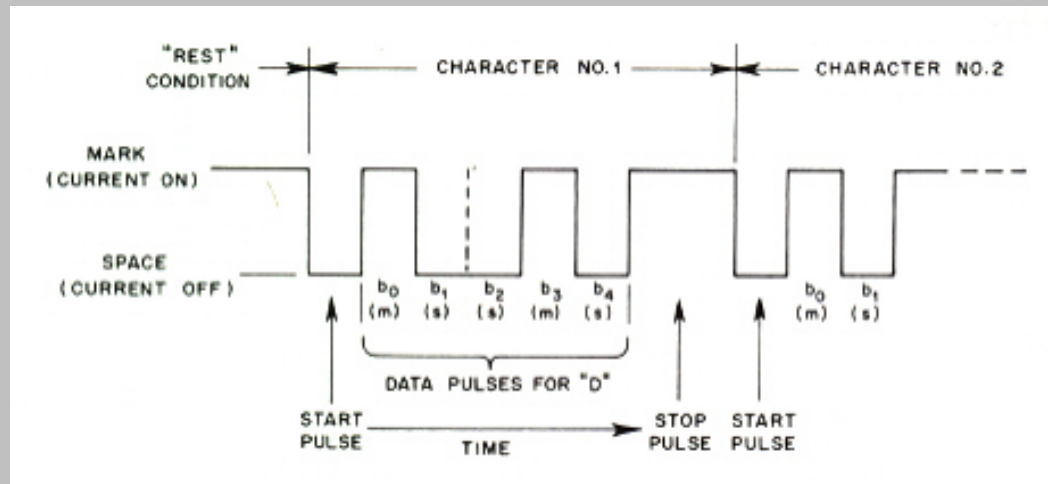
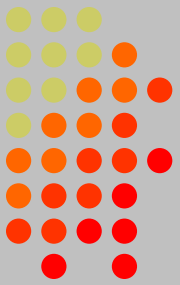
What is RTTY?

Space & Mark



What is RTTY?

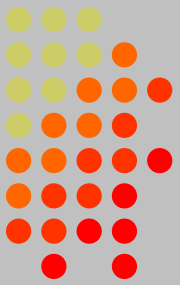
45.45 Baud = 60 WPM



- Asynchronous character stream
 - 1 bit Start pulse (Space)
 - 5 bits of data (character code)
 - 1, 1.5 or 2 bits Stop pulse (Mark)

What is RTTY?

code history



- Baudot code (1870)
 - Manual bit entry
 - 5-bit ITA1 code
 - Two 32-bit character sets
 - letters
 - figures
- Murray code (1901)
 - Teletype character entry
 - Western Union variation
- **5-bit ITA2 code (1930)**
 - **USTTY variation**
- ASCII (1967)
 - 7-bit ITA5 code

Code	Control Characters		
11111	LTRS		
11011	FIGS		
00000	Null		
00100	Space		
01000	LF		
00010	CR		
	Letters	Figures	
		ITA2	USTTY
00011	A	-	
11001	B	?	
01110	C	:	
01001	D	ENQ	\$
00001	E	3	
01101	F		!
11010	G		&
10100	H		#
00110	I	8	
01011	J	BELL	'
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	"	

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What is RTTY?

Figures Shift

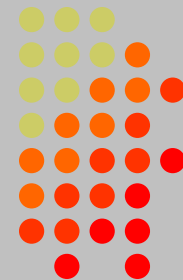


- 5-bit code → 32 chars.
- 2 sets:
 - Letters set & Figures set
 - 6 common control chars.
 - LTRS (unshifted)
 - FIGS (shifted)
 - Null, Space, LF, CR
- LTRS or FIGS toggle set

Code	Control Characters		
11111	LTRS		
11011	FIGS		
00000	Null		
00100	Space		
01000	LF		
00010	CR		
	Letters	Figures	
		ITA2	USTTY
00011	A	-	
11001	B	?	
01110	C	:	
01001	D	ENQ	\$
00001	E	3	
01101	F		!
11010	G		&
10100	H		#
00110	I	8	
01011	J	BELL	'
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	"	

What is RTTY?

Figures Shift



- The *LTRS* and *FIGS* characters do not print
 - The code for the characters “Q” and “1” is the same; which one prints depends on if you are in Letters or Figures set
 - Note that the *LTRS*, *FIGS* and *space* characters appear in both sets
- Example: “**KI7GUO DE K4GMH**” gets sent as:
 - *LTRS K I FIGS 7 LTRS G U O Space D E Space K FIGS 4 LTRS G M H*
- Why do we care to understand this?
 - If a burst of static garbles the *LTRS* or *FIGS* character, then what prints after that is from the wrong set until the next *LTRS* or *FIGS* character appears

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What is RTTY?

UnShift on Space



- UnShift On Space (USOS or UOS)
 - Increases noise immunity for alpha text
 - Space character forces a shift to the Letters set
- Contest exchanges are alpha and numeric
 - Should UOS be on or off?
 - Should Space or Hyphen delimit exchange elements?
 - 599 JOHN NY or 599-JOHN-NY
- *Recommendation:*
 - *Turn on both RX & TX UOS and use Space delimiters*
 - *(more detail in Advanced RTTY Contesting)*

What is RTTY?

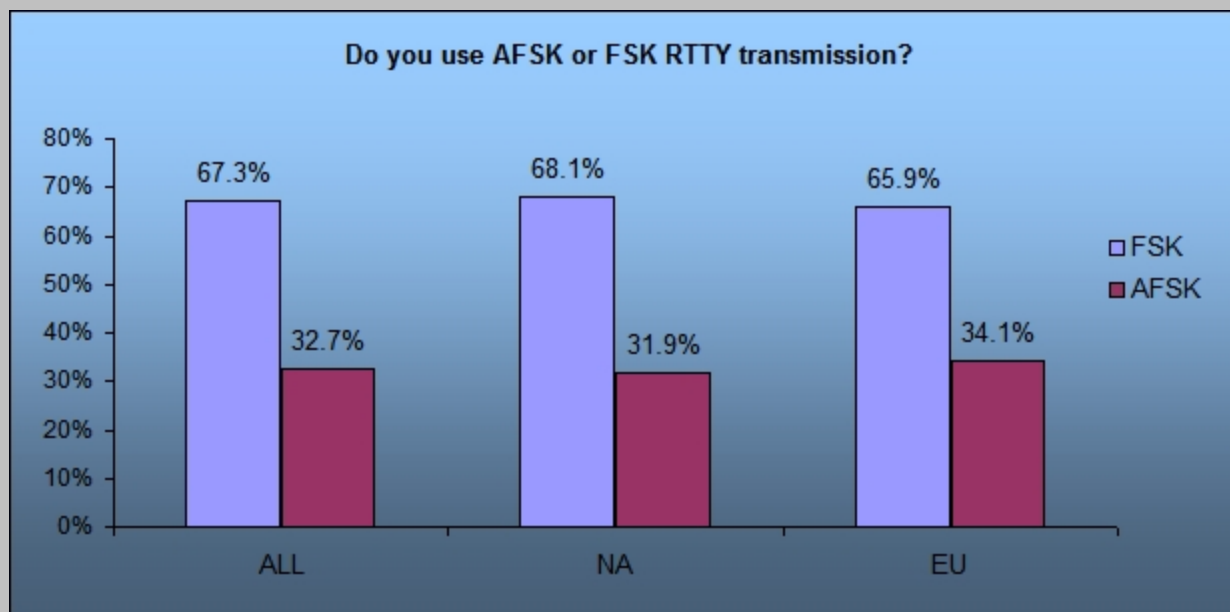
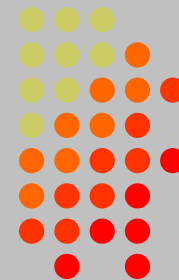
audio tones



- Space and Mark audio tones
 - Default: 2295 and 2125 Hz (“high tones”)
 - Less fatiguing: 1085 and 915 Hz (“low tones”)
- Analogous to CW pitch
 - Operator choice
 - Each operator can use different tone pairs
 - Transmission is always two carriers 170Hz apart
- Must be same in radio and decoder/encoder

AFSK vs. FSK

2010 survey



- AFSK has been overtaken by FSK since it first appeared in radios, circa 1990

What is RTTY?

AFSK vs. FSK



Two methods of transmission:

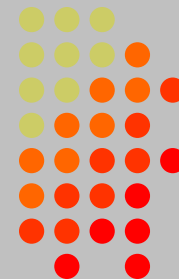
- AFSK (Audio Frequency Shift Keying)
 - keyed audio tones into SSB transmitter via:
 - Mic input, or
 - Auxiliary audio input. e.g., Line In
- FSK (Frequency Shift Keying)
 - keys the transmitter just like CW

Note: Receiving is the same in either case.

What is RTTY?

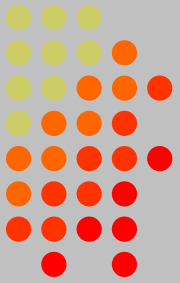
dial frequency

spots are often wrong



- RTTY RF is independent of local audio tones and whether LSB or USB is used:
 - The higher RF frequency is the Mark (*14090.000 kHz*)
 - The lower RF frequency is the Space (*14089.830 kHz*)
 - The difference between the two is the shift (*170 Hz*)
- FSK displays Mark (*14090.000 kHz*)
- AFSK displays suppressed carrier which varies with local audio tones and sideband used!
 - For Mark tone of 2125 Hz (Space tone of 2295 Hz):
 - LSB (*14092.125 kHz*)
 - USB – Mark & Space tones reversed (*14087.005 kHz*)

What is RTTY?



AFSK vs. FSK

AFSK

- Indirect (*tones → Mic input*)
- Any SSB radio (*esp. legacy*)
- SSB (wide) filtering
- Dial = sup. car. frequency
- VOX
- Audio cable (*same as PSK31*)
- Must use high tones
- *NET* (*automatic TX tone control*)
- *Less bandwidth* (*depends on radio*)
- *Easier hook-up; NET*

FSK

- Direct (*like CW keying*)
- “Modern” radios
- RTTY (narrow) filtering
- Dial = Mark frequency
- PTT
- COM FSK keying cable
- Can use low tones
- *No audio level adjust*
- *No disabling speech proc.*
- *No erroneous sound keying*
- *Less pitfalls*

What is RTTY?

summary



- Uses 5-bit Baudot ... er ... USTTY code with two sets of 32 characters: Letters and Figures
- Space & Mark frequencies separated by 170 Hz “Shift”
- Local Space & Mark tones analogous to pitch in CW
- Constant 45.45 Baud (60 wpm) asynchronous character stream with 5 data bits and 2-3 sync bits
- Figures Shift & Letters UnShift
 - Use optional UnShift-On-Space (UOS), plus space delimiter
- AFSK vs. FSK transmission (receiving is the same)
 - Radio dial frequency differences
 - 100% duty cycle!

The Cynics Say ...



- “RTTY is a pain to set up and get working.”
... stay tuned, it's really not that difficult!
- “The RTTY decoder/encoder does everything.”
however, this attribute ...
 - frees the operator to improve other skills
 - enables more contest participants
 - provides mode diversity for contest junkies

How Do I Set it Up?

overview

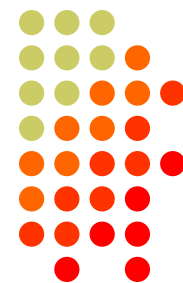


- **Acquire** hardware and/or software to convert between the RTTY signal and text:
 - RTTY *receive* decoder
 - RTTY *transmit* encoder
 - PC-radio interface
- **Configure** decoder/encoder
- **Integrate** decoder/encoder with logger

The rest of the station setup is the same as for CW and SSB

How Do I Set it Up?

RTTY decoder/encoder



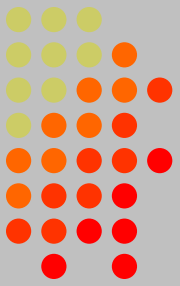
- RTTY *receive* decoder converts printed characters from the two RTTY frequencies
 - CW and SSB receive audio is converted to typed characters by our ears/brain/hands
- RTTY *transmit* encoder converts typed characters (or messages) into the two RTTY frequencies
 - Transmitted CW is converted from text by our brain/hand with the aid of a key and/or keyer
 - Transmitted SSB is converted from text by our brain/mouth via a microphone

(CW decoders are also available, similar to RTTY decoders, but seldom used)

(CW software keyers and SSB DVKs are also used, similar to RTTY encoders)

How Do I Set it Up?

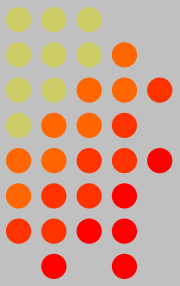
decoder/encoder terminology



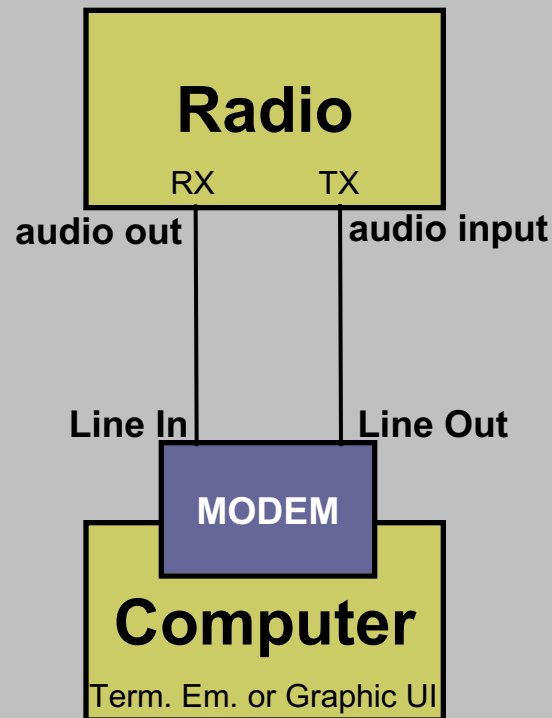
- The RTTY *transmit encoder* and *receive decoder* is sometimes referred to as a MODEM or a TNC:
 - MODEM = MOdulator DEModulator
 - TNC = Terminal Node Controller
- MODEMs can be:
 - a hardware box, or
 - a software application driving a PC soundcard

How Do I Set It Up?

hardware *MODEM*

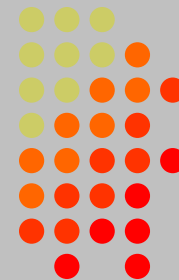


AFSK

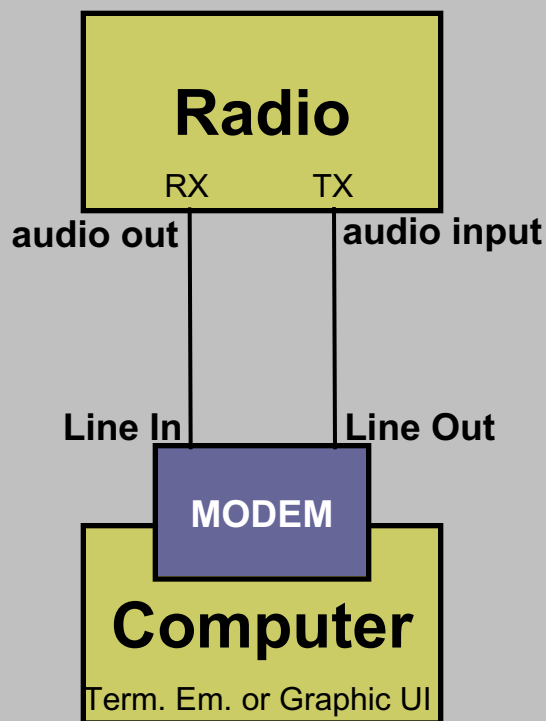


How Do I Set It Up?

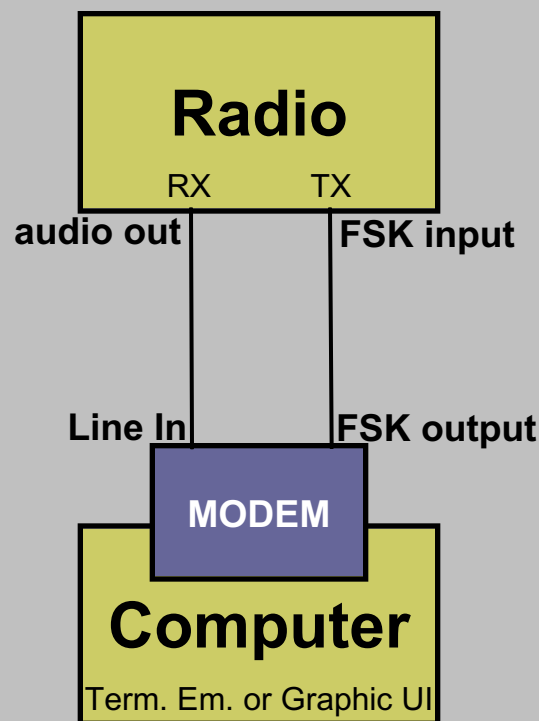
hardware *MODEM*



AFSK



FSK



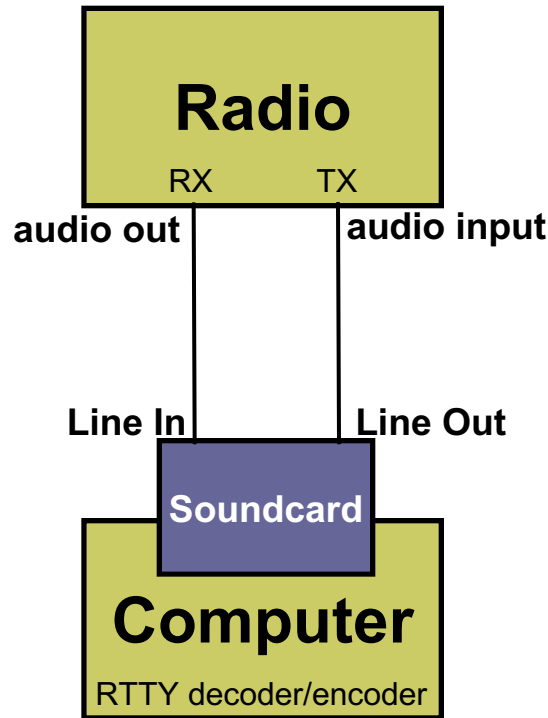


How Do I Set It Up?

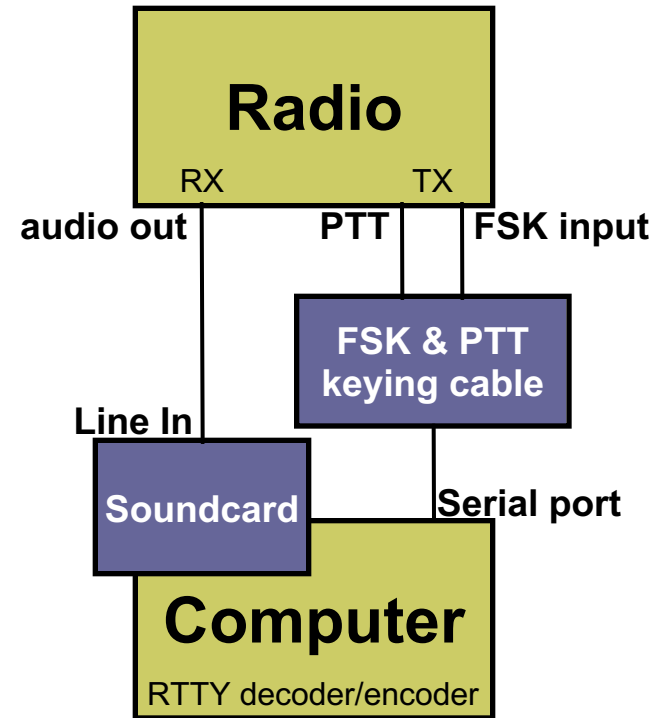
software application & *soundcard*



AFSK

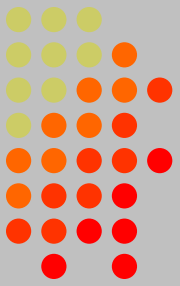


FSK



How Do I Set It Up?

ground loops

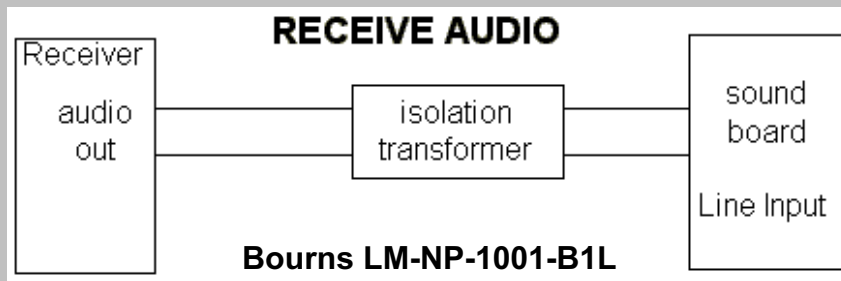
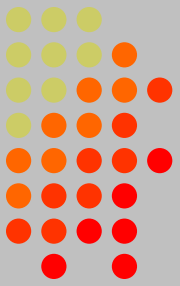


- Eliminate ground loops between radio and PC
- Otherwise insert 1:1 audio isolation transformer on:
 - RX output
 - TX Mic input (*AFSK only*)
- Alternatives:
 - Bourns LM-NP-1001-B1L transformer → homebrew cable
 - Ground loop isolators
 - W2IHY iBox
 - Commercial RTTY interfaces
 - K3 (uses Bourns LM-NP-1001-B1L on LINE IN & OUT)

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How Do I Set It Up?

homebrew audio isolation



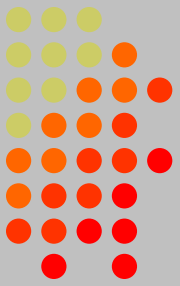
\$1.78

-90 dBc 3rd order IMD



How Do I Set It Up?

ground loop isolators



Radio Shack \$19.49 or eBay \$6.99
-64 dBc 3rd order IMD



eBay \$3.35



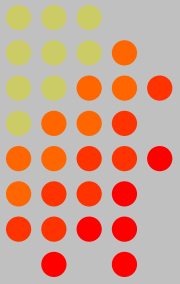
eBay \$5.50



eBay \$7.45

How Do I Set It Up?

W2IHY iBox audio isolation



How Do I Set It Up?

commercial interface audio isolation



Rascal



RIGblasters



How Do I Set It Up?

radio audio isolation



K3 audio isolation IN – LINE – OUT

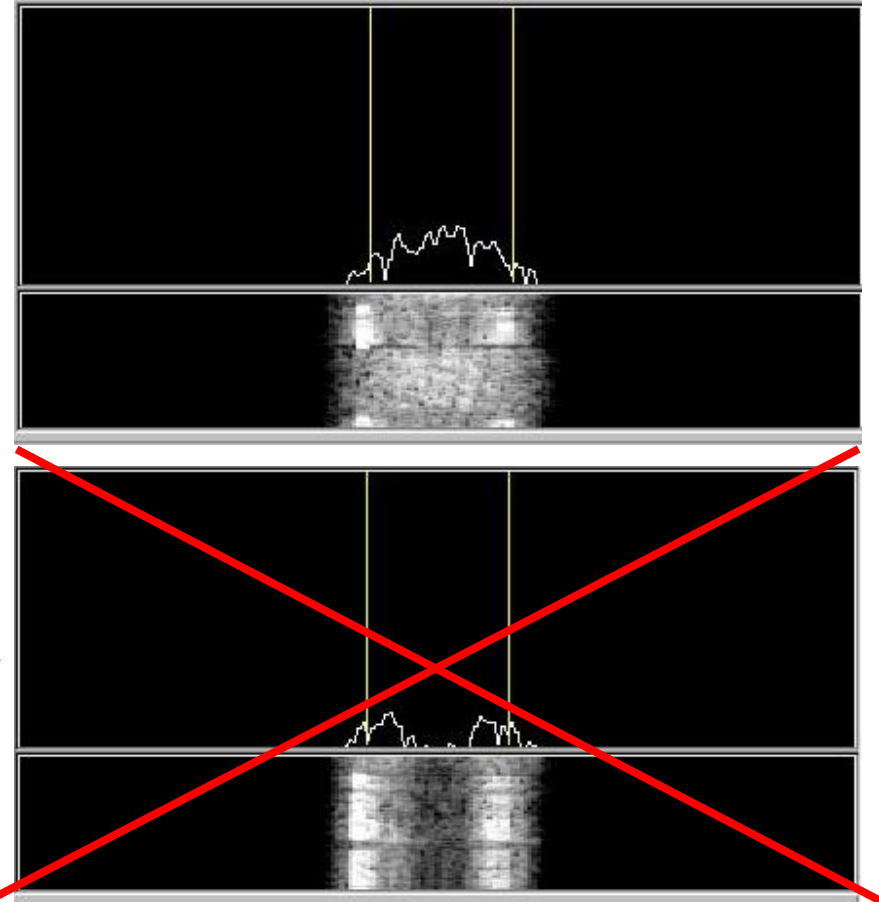


How Do I Set It Up?

radio IF filtering



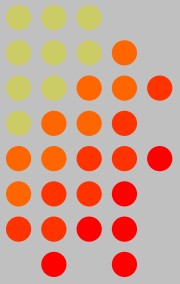
- PC Audio isolation
 - Transformer
 - Commercial interface
 - Some radios (K3)
- **Narrow IF filters (Roofing & DSP)**
 - 500 Hz - normal
 - 250 Hz - strong QRM only
 - **Tone filters – don't use!**
 - Icom Twin Peak Filter
 - K3 Dual-Tone Filter
- Audio filtering
 - JPS NIR-10/12
 - Timewave DSP-599zx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



o GTU o

How Do I Set It Up

AF filtering



- PC Audio isolation
 - Transformer
 - Commercial interface
 - Some radios (K3)
- Narrow IF filters (Roofing & DSP)
 - 400 Hz - normal
 - 250-300 Hz - strong QRM
 - Tone filters??
 - Icom Twin Peak Filter
 - K3 Dual-Tone Filter
- Audio filtering
 - JPS NIR-10/12
 - Timewave DSP-599zx
 - Modern DSP rigs

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How Do I Set It Up?

soundcard levels



- Adjust levels in Windows Volume Control
(or, in MMTTY *Options/Soundcard ...*)
 - Use isolation transformer
 - Avoid over-drive
 - 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.)

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How Do I Set It Up?

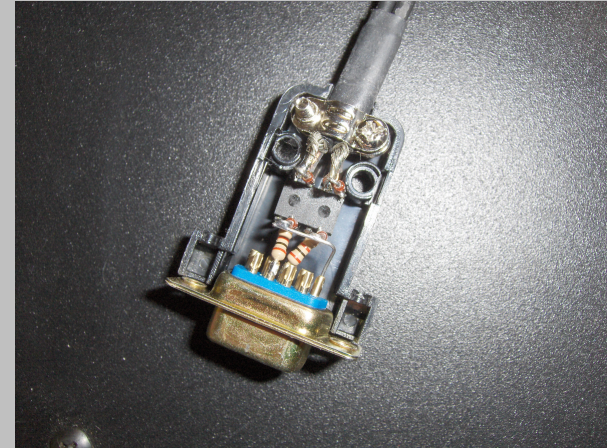
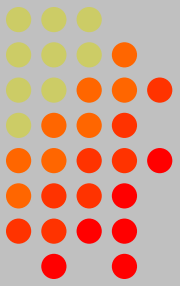
PTT vs. VOX



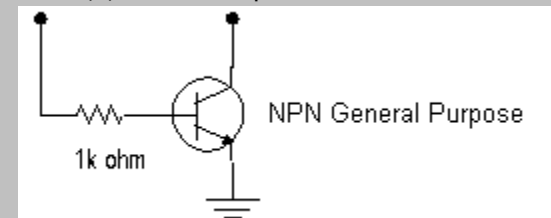
- AFSK uses VOX (or PTT); FSK uses PTT
- PTT by:
 - Computer control via Serial COM port
 - Footswitch *(not recommended)*
- FSK to use semi-break-in in the future?

How Do I Set It Up?

homebrew *FSK & PTT* keying cable



FSK: TXD (3) FSK input } on radio
PTT: RTS (7) PTT input }

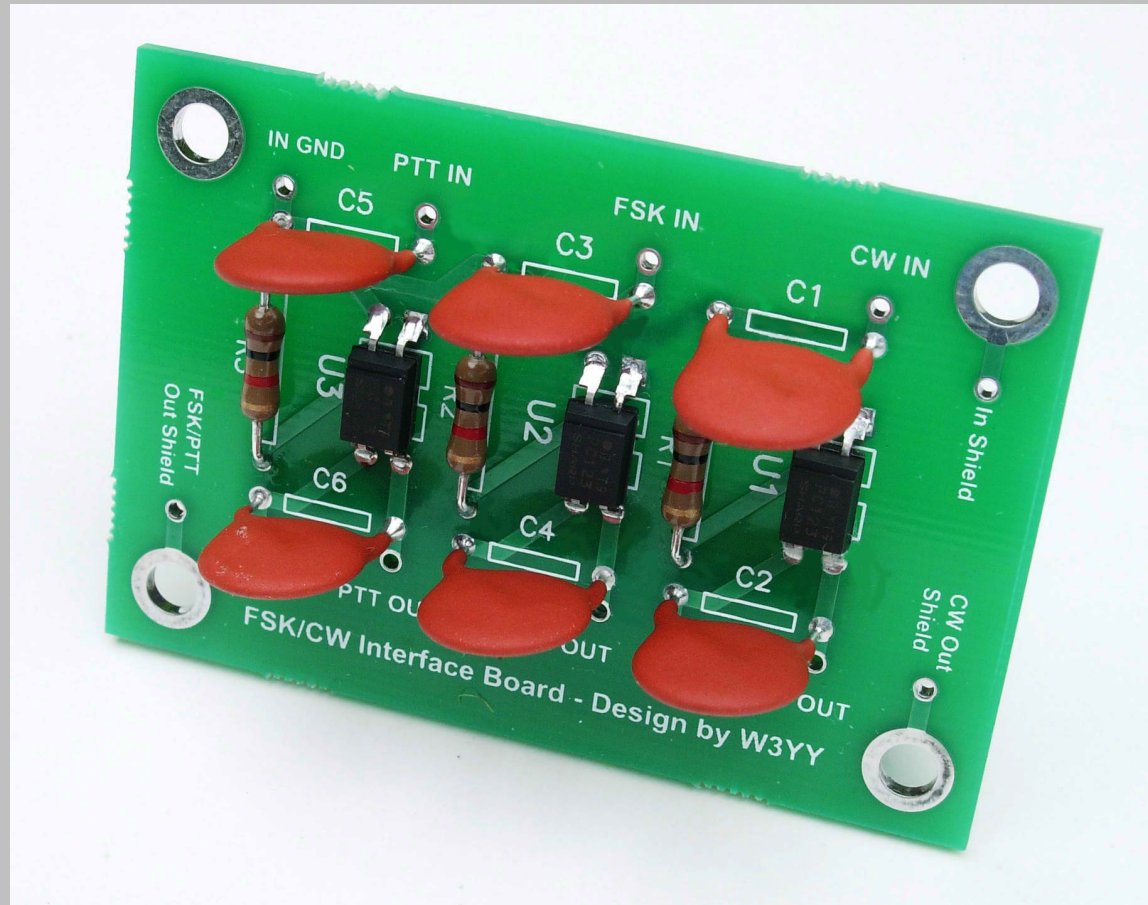
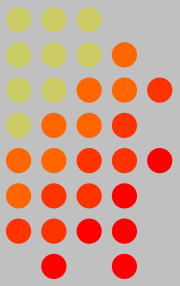


(DB9 pin #)

Gnd (5)

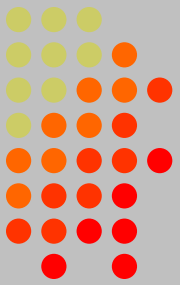
How Do I Set It Up?

W3YY FSK & PTT keying cable



How Do I Set It Up?

commercial interfaces



RASCAL

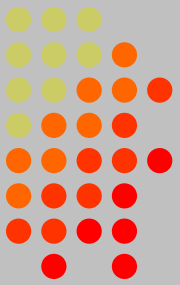


◦ CTU ◦

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How Do I Set It Up?

commercial interfaces

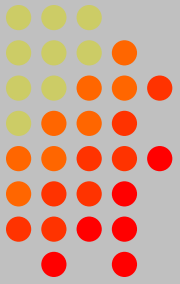


Vendor	Model	Price	PC In'fc	PTT	Soundcard	Level ctrl	FSK	CW	WinKey	Voice	Radio in'fc
generic (with K3)	(2) 3.5mm M-M audio cables	\$ 10	-			√					
Buxcomm	Rascal-IIB or -IIIA	\$ 69	-								
Buxcomm	Rascal GLX	\$ 79	Serial	√							
Tigertronics	SL-1+	\$ 80	-	auto							
Tigertronics	USB	\$ 110	USB	auto	√	√					
MFJ	1273B	\$ 60	Serial	√							
MFJ	1275	\$ 110	Serial	√							
MFJ	1279	\$ 140	Serial	√	√						
Mountain Radio	RIGblaster Nomic	\$ 60	Serial/USB	√							
Mountain Radio	RIGblaster Plug & Play	\$ 120	USB	√				√			some
Mountain Radio	RIGblaster Plus II	\$ 160	USB	√			√ or CW	√ or FSK			some
Mountain Radio	RIGblaster Advantage	\$ 200	USB	√	√	√	√ or CW	√ or FSK			√
Mountain Radio	RIGblaster Pro	\$ 300	Serial/USB	√			√	√			√
Navigator	Navigator	\$ 417	USB	√	√	√	√	√	√		√

See May-June 2012 NCJ, "RTTY Contesting" column

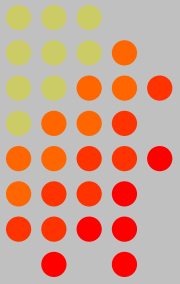
How Do I Set It Up?

RigExpert Interfaces



How Do I Set It Up?

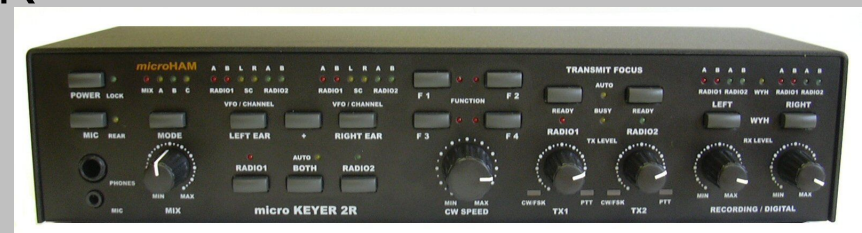
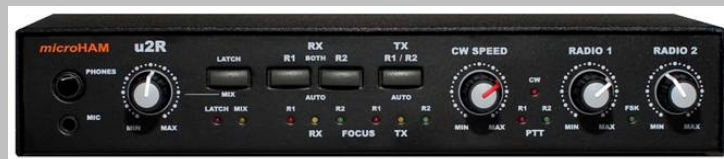
microHAM interfaces



One Radio

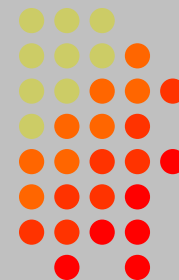


SO2R



How Do I Set It Up?

RigExpert & microHAM interfaces



Vendor	Model	Price	PC In'fc	PTT	Soundcard	Level ctrl	FSK	CW	WinKey	Voice	Radio in'fc	SO2R
RigExpert	Tiny	\$ 120	USB	✓	✓			✓		✓	✓	
RigExpert	Standard	\$ 265	USB	✓	✓	✓	✓	✓	✓	✓	✓	
RigExpert	TI-5	\$ 365	USB	✓	✓	✓	✓	✓	✓	✓	✓	
microHAM	USB Interface II	\$ 179	USB	✓				✓			✓	
microHAM	USB Interface III	\$ 225	USB	✓	✓	✓		✓			✓	
microHAM	Digi KEYER II	\$ 369	USB	✓	✓	✓	✓	✓	✓		✓	
microHAM	microKEYER II	\$ 479	USB	✓	✓	✓	✓	✓	✓	✓	✓	
microHAM	micro2R	\$ 369	USB	✓		✓	✓	✓	✓	✓	✓	✓
microHAM	MK2R	\$ 899	USB	✓		✓	✓	✓	✓	✓	✓	✓
microHAM	MK2R+	\$ 999	USB	✓	✓	✓	✓	✓	✓	✓	✓	✓

See May-June 2012 NCJ, "RTTY Contesting" column

How Do I Set It Up?

summary - receive



1. Use appropriate receiver IF and AF filtering.
2. Receiver Audio Out (via isolation) to ...
 - MODEM Audio In, or
 - MMTTY via Soundcard Line In (or Mic In with pad):
 - Enable soundcard Line In (or Mic) input, disable/mute other inputs
3. Set level so band noise is 10% of full-scale

How Do I Set It Up?

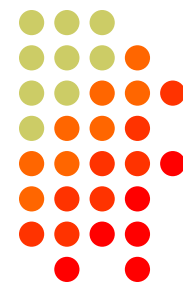
summary - AFSK



1. Turn off speech processor in radio; enable VOX
2. Connect radio's Line In (Mic In with pad) via isolation to:
 - MODEM Audio Out
 - Set radio Mic level to just reach peak power output
 - OR
 - Soundcard Line Out
 - Enable soundcard WAV output, disable/mute other outputs
 - Increase WAV level and/or radio Mic level to just reach peak power output

How Do I Set It Up?

summary - FSK



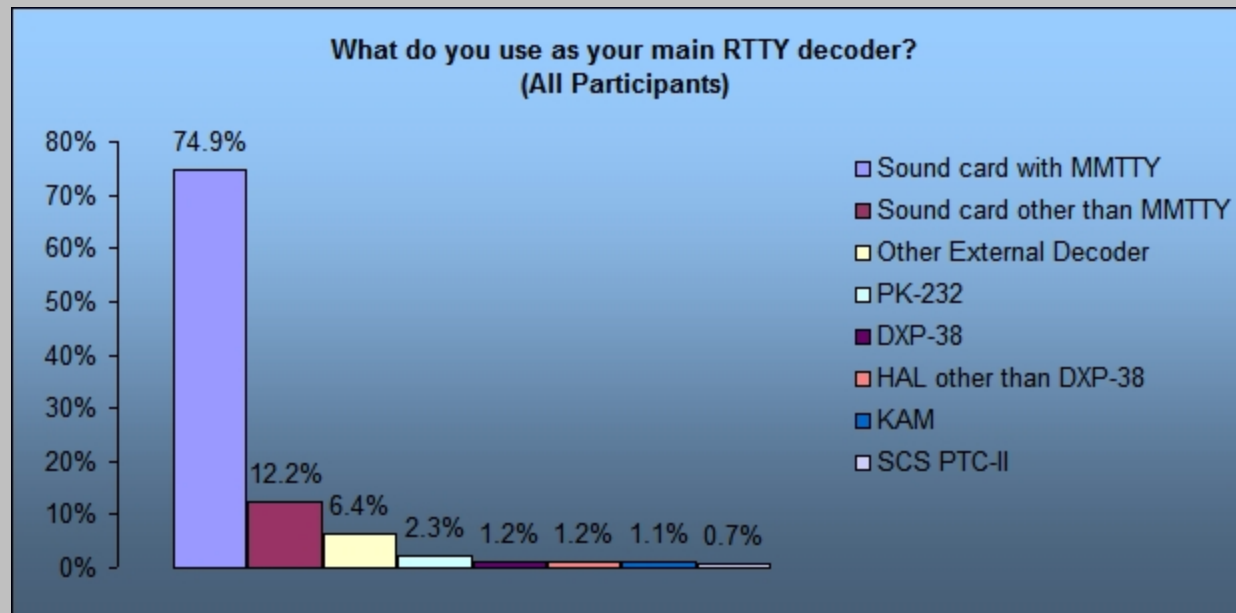
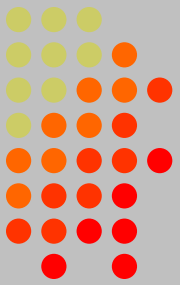
1. Connect the radio FSK and PTT inputs to:
 - the MODEM FSK and PTT outputs and connect the MODEM Serial port to the PC

OR, if MMTTY

 - the RTTY interface FSK and PTT outputs and connect the interface Serial or USB port to the PC
2. If no PC Serial port, then use a USB-Serial adapter.
 - Beware that some won't key FSK properly. Edgeport USB-Serial adapters are known good.

Decoders

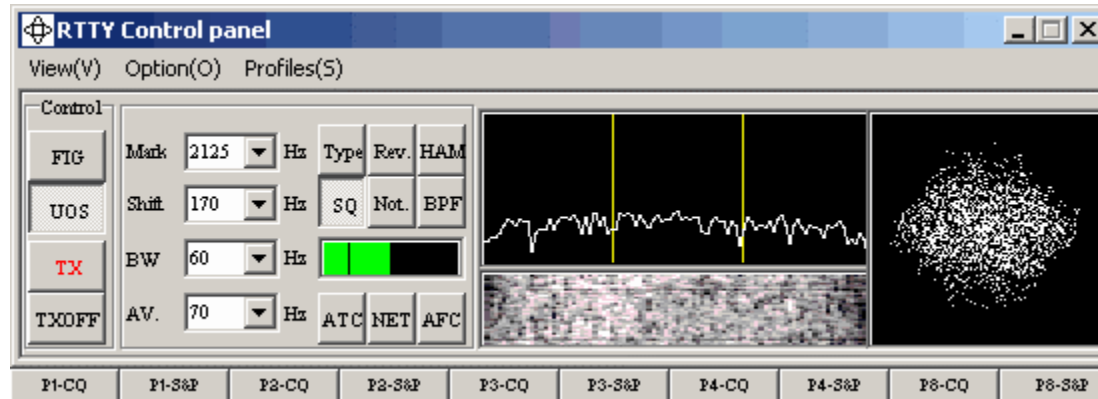
2010 survey



- 87% use soundcard decoding/encoding
- 86% of soundcard users run MMTTY
- 2Tone introduced late 2012

Decoders

MMTTY



- Dominant soundcard MODEM in use today
- Exceeds performance of most other MODEMs
- Freeware since introduction in 2000
- Written by Mako, JE3HHT

How Do I Set It Up?

MMTTY standalone



Squelch

Messages

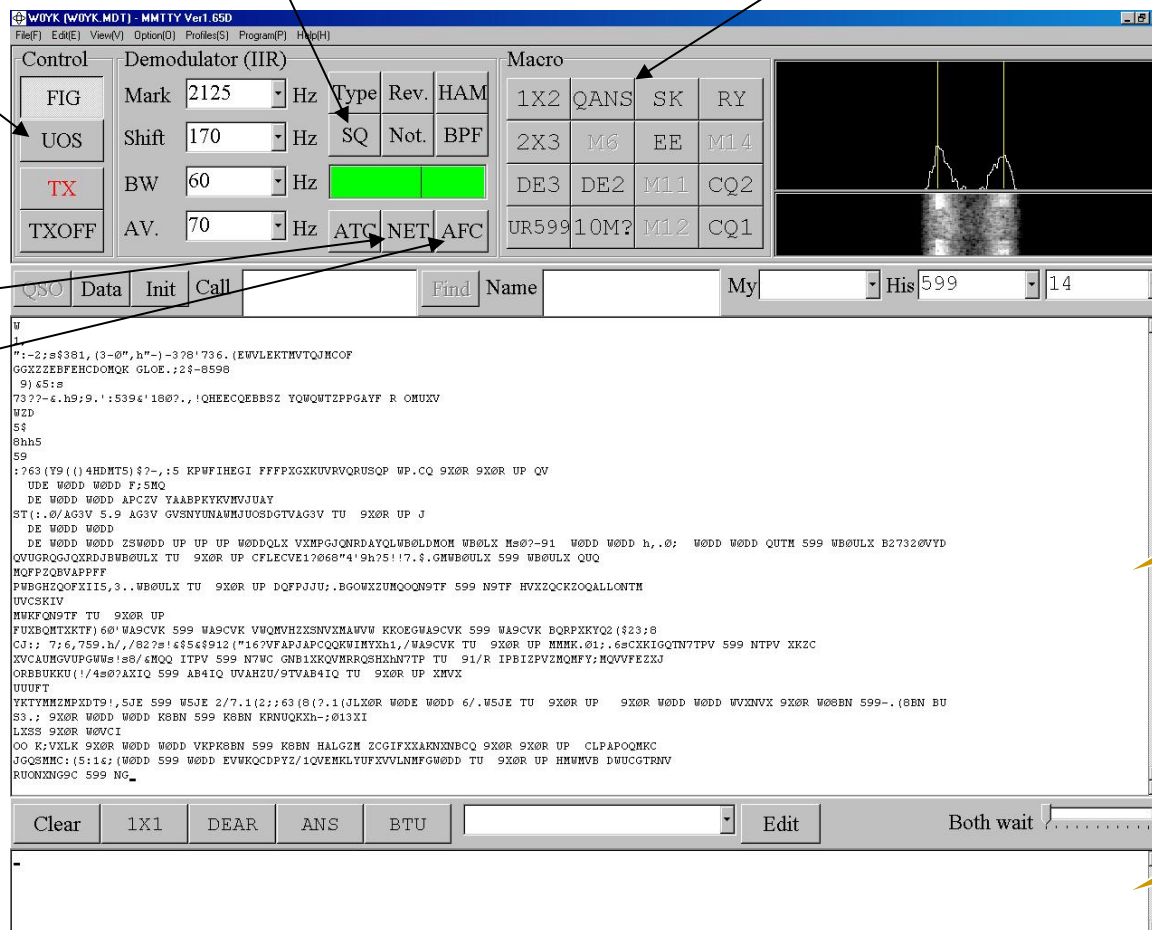
Leave UOS on

Turn off: NET
AFC

Don't click
inside display

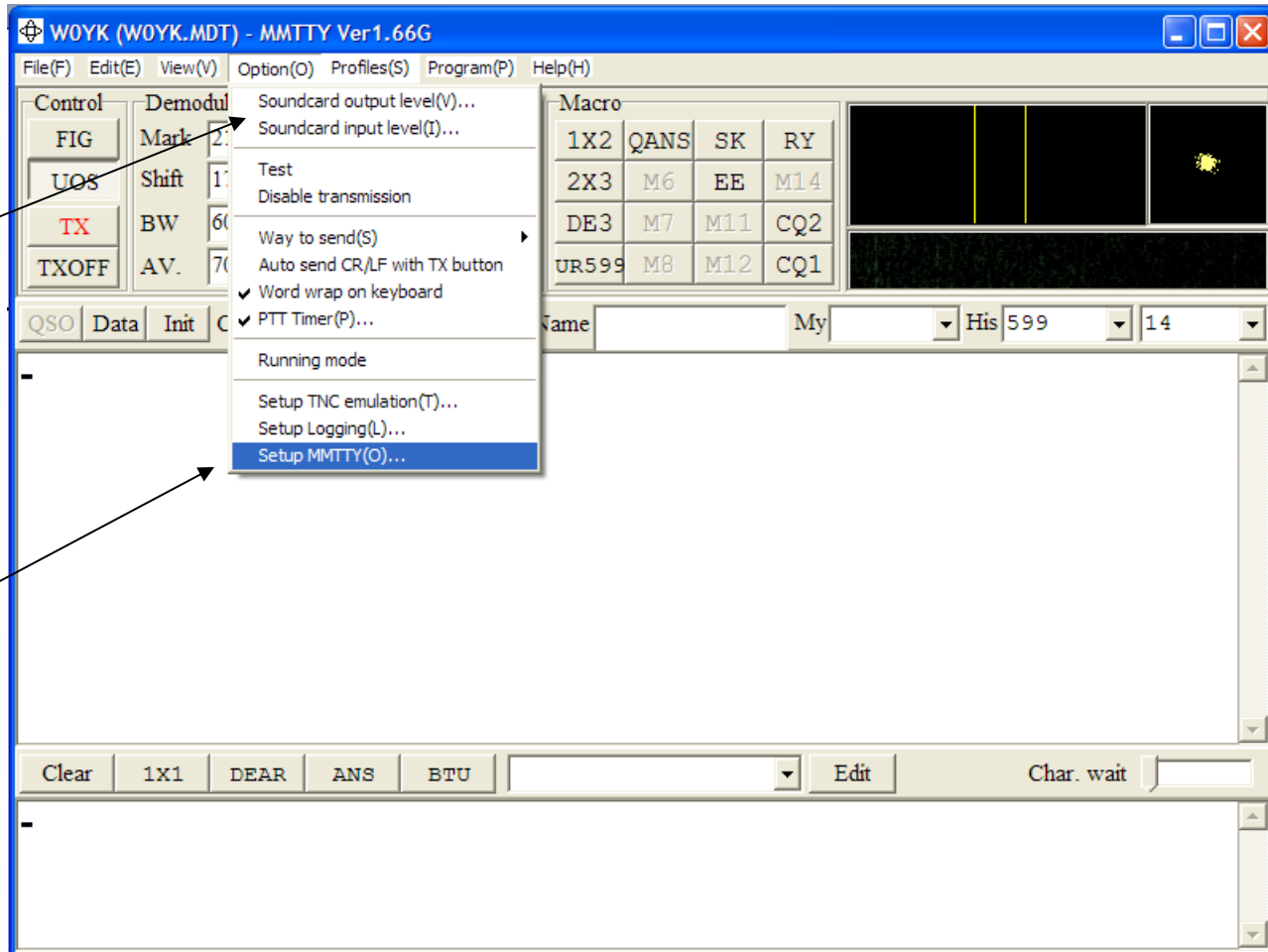
received
text

transmitted
text



How Do I Set It Up?

MMTTY Option menu

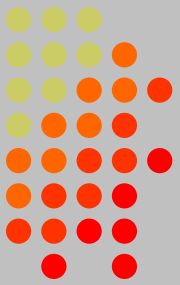


Soundcard
levels

MMTTY
setup

How Do I Set It Up?

MMTTY Option/Setup/Demodulator



Set tones

Setup MMTTY Ver1.66G

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

Discriminator
Type
☒ IIR resonator
☐ FIR BPF
☐ PLL

Limit Amp.
☒ AGC
☐ Over Sampling
Gain 200

Pre-Filter
Show

BPF LMS/Notch
☐ ON
Tap 56
FW 100
☒ AFC Connection

Mark 2125 Hz
Shift 170 Hz
BW 60 Hz
Show

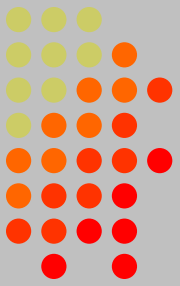
Smooth LPF
☒ FIR av. ☐ IIR
Freq 70 Hz
f

☐ Reverse
HAM Default 2125 170

HAM Set Default(Demodulator) ? OK Cancel

How Do I Set It Up?

MMTTY Option/Setup/TX



TX UOS on

Select LTR

512 Tap

Setup MMTTY Ver1.66G

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

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

FSK/PTT port

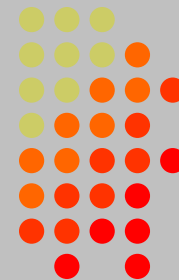
Soundcard
Line Out level

◦ CTU ◦

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How Do I Set It Up?

MMTTY Option/Setup/Misc



Soundcard

AFSK

FSK

Setup MMTTY Ver1.66G

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 0 TX 0

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)

System Font

Window Times New Roman Set 0

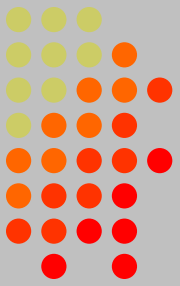
Fixed pitch Courier New Set 0

Japanese English

HAM Set Default(Demodulator) ? OK Cancel

How Do I Set It Up?

MMTTY Option/Setup/SoundCard



Setup MMTTY Ver1.66G

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

Reception

- ☒ Line in/Mic in
- ☐ Modem #0 Line Record
- ☐ Realtek HD Digital input
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐

Transmission

- ☒ Realtek HD Audio rear output
- ☐ Modem #0 Line Playback
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐

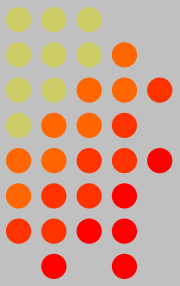
HAM Set Default(Demodulator) ? OK Cancel

Select receive Soundcard

Select transmit
Soundcard
(AFSK only)

How Do I Set It Up?

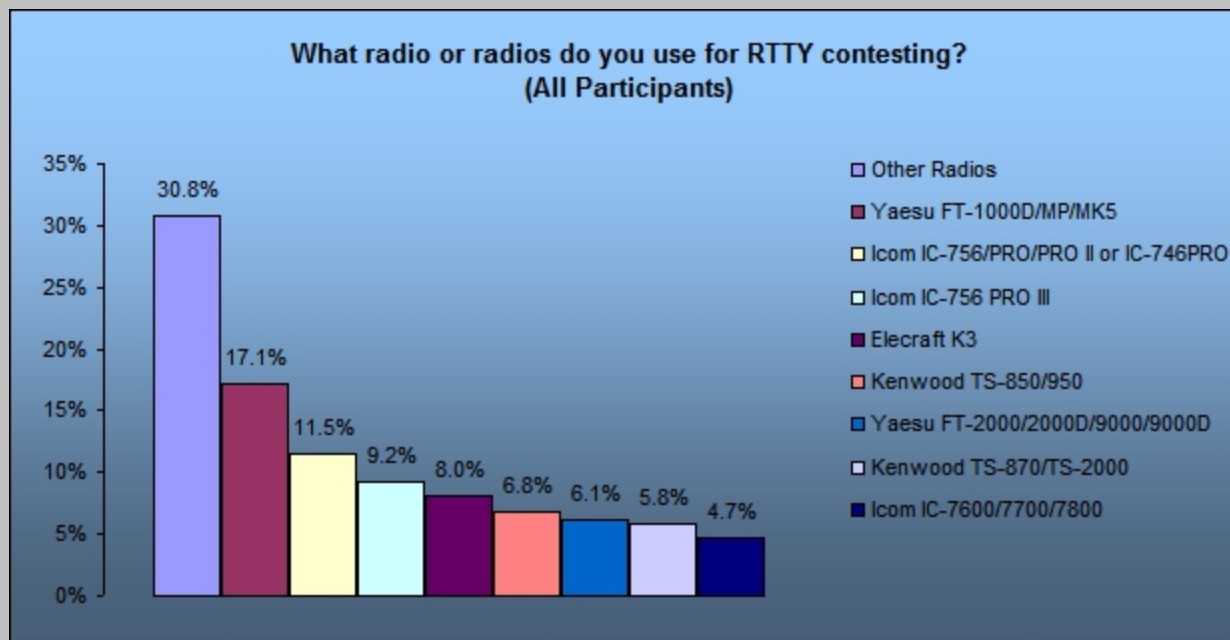
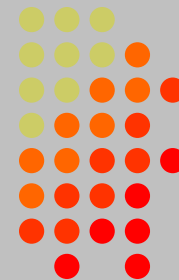
MMTTY userpara.ini



- *userpara.ini* file (in MMTTY program directory) stores parameter defaults
- There is a section for each profile, e.g.,
 - [Define0]
 - Name=Standard RTTY
- In each section (profile) make sure:
 - NET and AFC are off [NET=0, AFC=0]
 - UOS and TXUOS are on [UOS=1, TXUOS=1]
 - Other parameters are set so that they do not have to be changed every time you load MMTTY or that profile

RTTY Radios

2010 survey



- Icom 756Pro series most popular
- Elecraft K3 growing rapidly

RTTY Radios

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

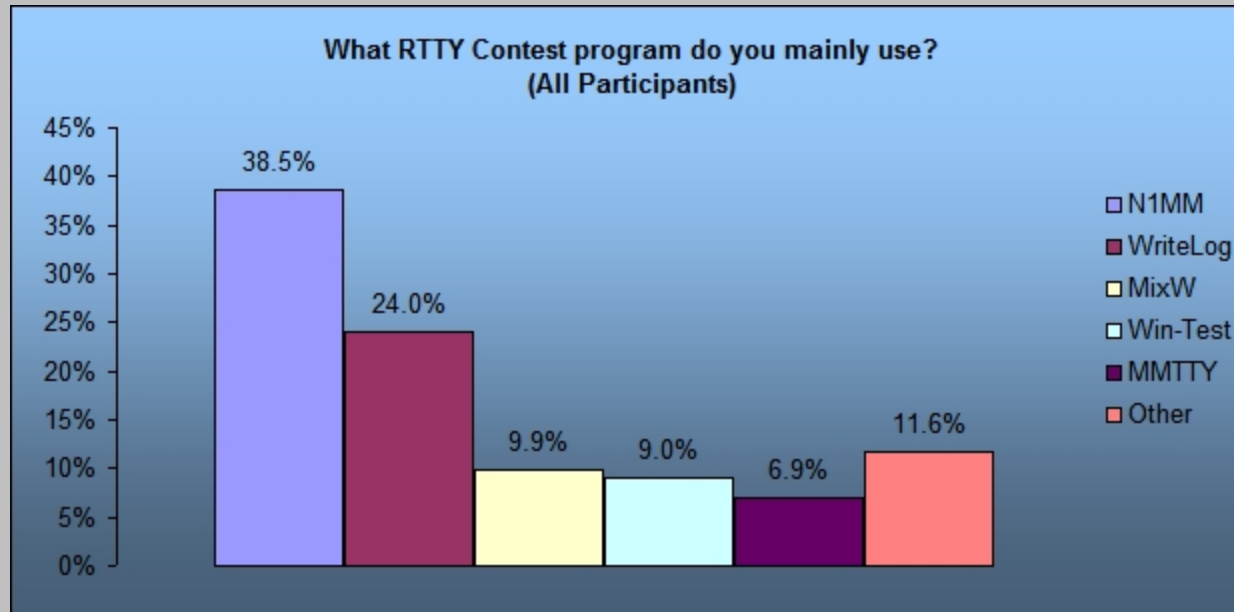
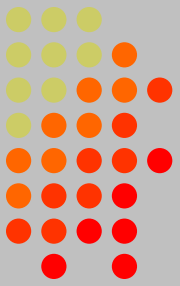


AFSK

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

RTTY Contest Loggers

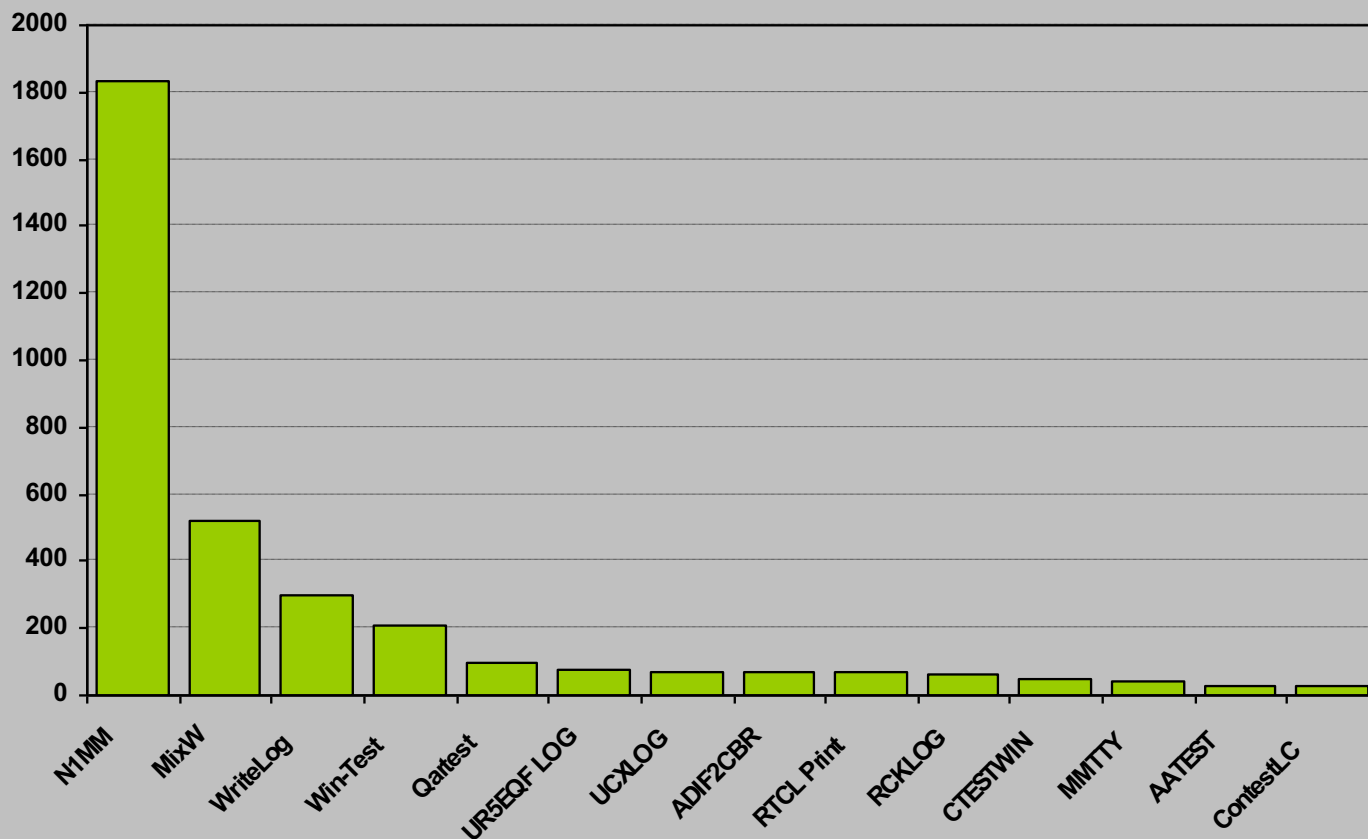
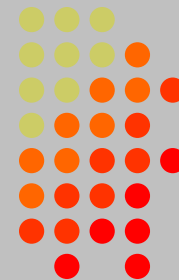
2010 survey



- MixW ahead of Win-Test
- MMTTY used stand-alone

2012 CQ WPX RTTY

3550 submitted logs



RTTY Contest Loggers



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

All three integrate MMTTY and have similar functionality for basic RTTY contesting.

A Blizzard of Details!

this is fun??



Start Simple, then Enhance

- MMTTY (*free*)
 - get RX working (*std audio cable from radio to PC*)
 - get TX working; use either:
 - AFSK (*2nd std audio cable from radio to PC*)
 - FSK (*keying cable or commercial interface*)
- Integrate MMTTY with logging software
- Enhance later
 - Audio isolation (*highly recommended*)
 - Commercial interface
 - Advanced setup: SO2V, SO2R, multiple decoders, ...

The Cynics Say ...



- “RTTY is a pain to set up and get working.”
... stay tuned, it's really not that difficult!
- “The RTTY decoder/encoder does everything.”
however, this attribute ...
 - frees the operator to improve other skills
 - enables more contest participants
 - provides mode diversity for contest junkies

RTTY Considerations

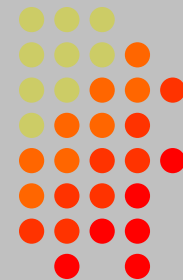


Much like CW and SSB, except:

- Non-human decoding implications
 - *e.g., serial number repeat, universal “fist” or “voice”*
- RTTY established practice
 - *e.g., ‘CQ’ at end of CQ message*
- Whisper-level headphone volume; low tones
 - *just to detect presence & timing*
- Avoid distraction
 - *tempting to read, do email, watch TV, etc.*
- Key-down transmission ... 100% duty cycle

◦ GTU ◦

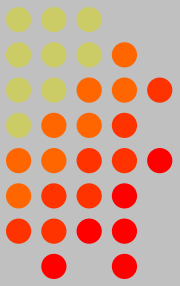
RTTY Sub-Bands



- 10 meters: 28080-28100, during contests 28060-28150
- 15 meters: 21080-21100, during contests 21060-21150
- 20 meters: 14080-14100, during contests 14060-14150
 - JA: 14070-14112
- 40 meters: 7025-7050 and 7080-7100, during contests 7025-7100
 - JA: 7025-7045
 - EU: below 7050
- 80 meters: 3580-3600, during contests 3560-3600
 - JA: 3520-3530 and 3599-3612
- 160 meters: No RTTY contesting

RTTY Sub-Bands

don't QRM!



- Avoid PSK-31 operations near:
 - 28120, 21070, 14070, 7070 and 3580
- Avoid the NCDXF beacons:
 - 21150 and 14100

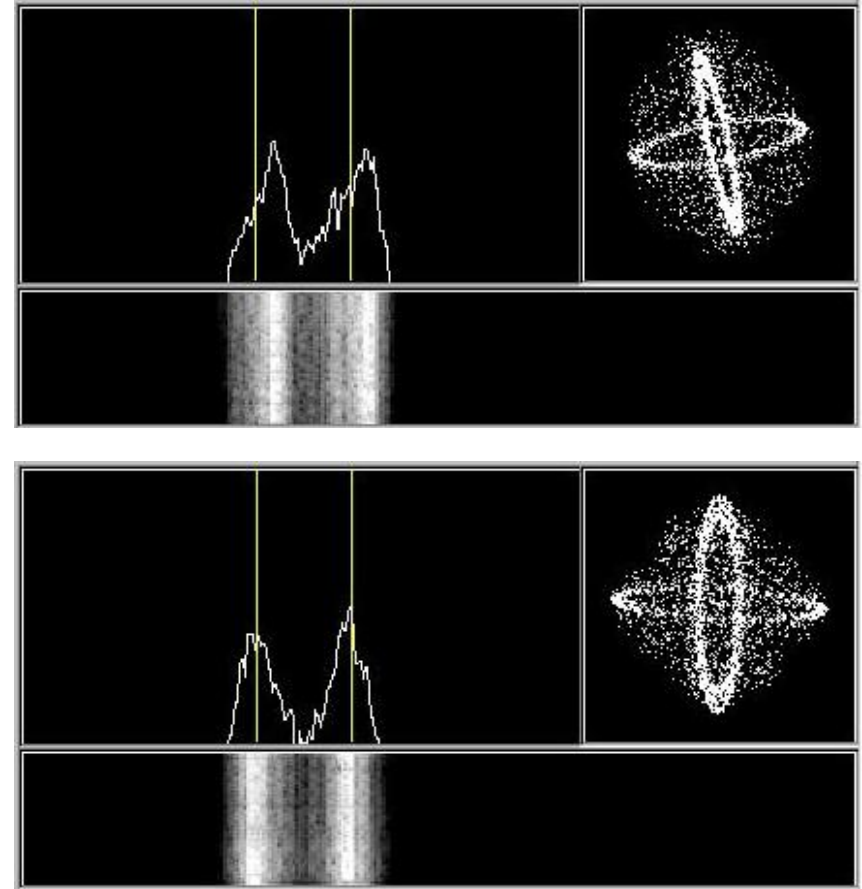
- More details:

www.aa5au.com/gettingstarted/rtty_subbands.htm

Receiving

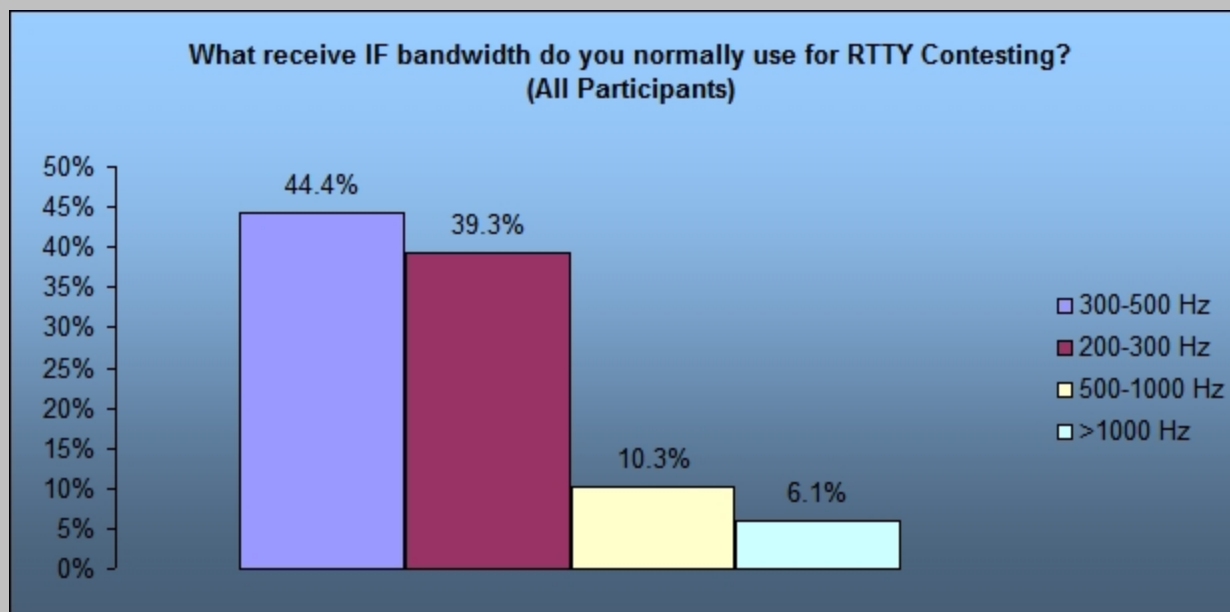
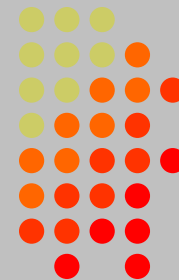


- Set RX audio level
 - noise 10% of full-scale
- Use narrow filtering
 - CW filters ~ 500 Hz
- Learn to tune by ear
 - practice with eyes closed
 - get within 10-20 Hz
- Use “low tones” (if FSK)
 - less fatigue



IF Bandwidth

2010 survey



- Like FSK, narrow IF filtering for RTTY appeared in radios in the early 1990s

Tips

“All I receive is gibberish!”



- “Upside-down”
 - Reverse Mark & Space in software
 - LSB vs. USB
- Figures vs. letters
 - TOO=599, WPIR=2084
 - Shift-click to convert, or
 - Look at top two rows
- Mic/Line In, level, muting, tones, flutter



Tips

“They never answer me!”



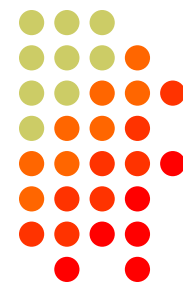
- “Upside-down”
 - FSK polarity switch in radio
 - AFSK mode, LSB vs. USB
- MMTTY AFC & NET
 - AFC & NET are on by default!
(and every time you choose a profile!)
 - Change defaults in USERPARA.INI
- Radio mode, tones, FSK interface,
AFSK: Mic & SC level & speech processor

More Tips



- Transmit when others stand-by
- Add his call at end of exchange in pile-ups
- Recommend RIT, but if you use AFC/NET ...
 - AFC only for running, not S&P
 - Use AFC/NET for S&P (only avail. with AFSK)
- Mode-independent skills, e.g.,
 - Bandmap usage
 - QSO ~~B4~~
 - Roving mult: “Squat & Shoot” (*Cajun-speak!*)

and ... More Tips



- 100% duty cycle ... *caution!*
- Practice
 - During RTTY contests (~ two per month)
 - NCCC Thursday night practices (weekly)
- Multi-Ops
- SO2V & SO2R
- LoTW

Basic RTTY Contest QSO



- **WPX K5AM K5AM CQ**
- **ZC4LI ZC4LI**
- **ZC4LI 599 1349 1349**
- **[K5AM] TU 599 985 985**
- **[ZC4LI] TU K5AM CQ**

K5AM: running station

ZC4LI: S&P station

Disciplined QSO Flow



- Standard keystroke (or mouse) sequences for:
 - Normal contact in Run mode
 - Normal contact in S&P mode
 - Repeats/Fills (in either mode)
 - QSO phase skip & tail-enders (in Run mode)
- Each sequence is executed the same way hundreds (thousands) of times during the contest
- Avoid deviations and special sequences

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

○ GTU ○

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RTTY Messages

CQ WW RTTY



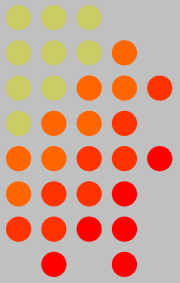
- WW W1UE W1UE CQ
- <his call> 599 5 5 (TU) 599 5 5
- TU W1UE CQ
- W1UE

S&P exchange

- CALL
- ZN 5 *your Zone*
- AGN
- ?

RTTY Messages

CQ WPX RTTY

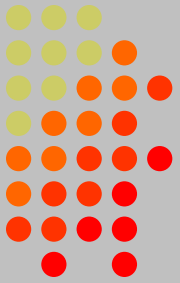


- WPX AK1W AK1W CQ
- <his call> 599 1867 1867 (TU) 599 1867 1867 *S&P exchange*
- TU AK1W CQ
- AK1W

- CALL
- NR %N *your Serial Number*
- AGN
- ?

RTTY 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 *S&P exchange*
 - TU
 - N0NI

 - CALL
 - NR %N
 - NAME TONI
 - QTH IA
 - AGN
 - ?
- } *your Exchange elements*

RTTY 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/rttymessages.htm

CW/RTTY/SSB Memory Setup

F2:	%RWPX P49X P49X CQ %O%E
F3:	DE P49X %E
F4:	P49X %E
F5:	%R%C 599 %N %N %E
F6:	%RTU P49X CQ %O%E
F7:	%RQRV %ZL.1 %E
F8:	%R%P1 TU NOW %C 599 %N %N %E
F9:	%RCALL? %E
F10:	%R?NR? %E
F16/F11:	%R%N %E

Browse... OK Cancel Help

☒ Normal keys
☐ Shifted keys
☐ SSB
☐ Shifted SSB

CW/RTTY/SSB Memory Setup

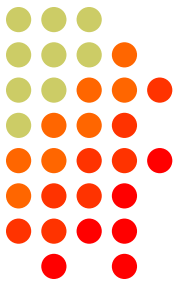
F2:	%RWPX P49X P49X P49X CQ %O%E
F3:	UP 1 %E
F4:	%B
F5:	%R%C %E
F6:	%RKB P49X CQ %O%E
F7:	%RQRV %ZR.1 %E
F8:	%R%P1 KB NOW %C 599 %N %N %E
F9:	%RQRZ? %E
F10:	%RAGN? %E
F16/F11:	%RQSL LOTW OR W0YK %E

Browse... OK Cancel Help

☐ Normal keys
☒ Shifted keys
☐ SSB
☐ Shifted SSB

RTTY Messages

optimize



- Modular
 - Chaining
- Group logically
- Supports a cadence

CW/RTTY/SSB Memory Setup

F2: %RWPK P49X P49X CQ %0%E

F3: DE P49X %E

F4: P49X %E

F5: %R%C 599 %N3 %N3 %E

F6: %R%C TU P49X CQ %0%E

F7: %RQRV %ZB.1 %E

F8: %R%P1 TU NOW %C 599 %N3 %N3 %E

F9: %RCALL? %E

F10: %R?NR? %E

F1&F11: %R%N3 %N3 %E

Browse...

OK

Cancel

Help

☒ Normal keys

☐ Shifted keys

☐ SSB

☐ Shifted SSB

CW/RTTY/SSB Memory Setup

F2: %RCQ WPK P49X P49X P49X CQ %0%E

F3: UP 1 %E

F4: %B

F5: %R%C %E

F6: %R%C KB P49X CQ %0%E

F7: %RQSL WOYK WOYK %E

F8: %R%P1 KB NOW %C 599 %N3 %N3 %E

F9: %RQRZ? %E

F10: %RAGN? %E

F1&F11: %RQTH? %E

Browse...

OK

Cancel

Help

☐ Normal keys

☒ Shifted keys

☐ SSB

☐ Shifted SSB

RTTY Messages

formatting



CW/RTTY/SSB Memory Setup

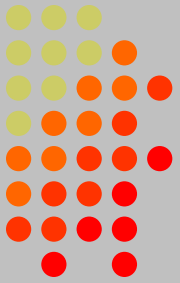
F2:	%RNPX P49X P49X CQ %O%E	Browse...
F3:	DE P49X %E	OK
F4:	P49X %E	Cancel
F5:	%R%C 599 %N3 %N3 %E	Help
F6:	%R%C TU P49X CQ %O%E	<input checked="" type="radio"/> Normal keys
F7:	%RQRV %ZB.1 %E	<input type="radio"/> Shifted keys
F8:	%R%P1 TU NOW %C 599 %N3 %N3 %E	<input type="radio"/> SSB
F9:	%RCALL? %E	<input type="radio"/> Shifted SSB
F10:	%R?NR? %E	
F1&F11:	%R%N3 %N3 %E	

o GTU o

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RTTY Messages

efficiency



CW/RTTY/SSB Memory Setup

Clear RIT

F2:	%RWPX P49X P49X CQ %OE	Browse...
F3:	DE P49X %E	OK
F4:	P49X %E	Cancel
F5:	%R%C 599 %N3 %N3 %E	Help
F6:	%R%C TU P49X CQ %OE	<input checked="" type="radio"/> Normal keys
F7:	%RQRV %ZB.1 %E	<input type="radio"/> Shifted keys
F8:	%R%P1 TU NOW %C 599 %N3 %N3 %E	<input type="radio"/> SSB
F9:	%RCALL? %E	<input type="radio"/> Shifted SSB
F10:	%R?NR? %E	
F1&F11:	%R%N3 %N3 %E	

o G1U o

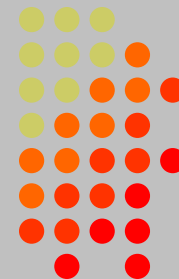
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RTTY Messages

special



CW/RTTY/SSB Memory Setup

F2:	%RWPX P49X P49X CQ %O%E	Browse...
F3:	DE P49X %E	OK
F4:	P49X %E	Cancel
F5:	%R%C 599 %N3 %N3 %E	Help
F6:	%R%C TU P49X CQ %O%E	<input checked="" type="radio"/> Normal keys
QSY F7:	%RQRV %ZB.1 %E	<input type="radio"/> Shifted keys
Tailend F8:	%R%P1 TU NOW %C 599 %N3 %N3 %E	<input type="radio"/> SSB
F9:	%RCALL? %E	<input type="radio"/> Shifted SSB
F10:	%R?NR? %E	
F1&F11:	%R%N3 %N3 %E	

o G1U o

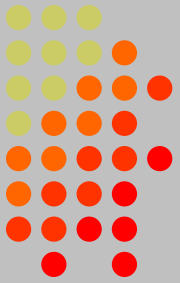
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RTTY Messages

personal



CW/RTTY/SSB Memory Setup

F2:	%RCQ WPX P49X P49X P49X CQ %O%E	Browse...
F3:	UP 1 %E	OK
F4:	%B	Cancel
F5:	%R%C %E	Help
F6:	%R%C (KB) P49X CQ %O%E	<input type="radio"/> Normal keys
F7:	%RQSL WOYK WOYK %E	<input checked="" type="radio"/> Shifted keys
F8:	%R&P1 (KB) NOW %C 599 %N3 %N3 %E	<input type="radio"/> SSB
F9:	%RQRZ? %E	<input type="radio"/> Shifted SSB
F10:	%RAGN? %E	
F1&F11:	%RQTH? %E	

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Interim Summary



- Predominantly casual RTTY contest participants
- RTTY sub-bands; 10-80 only; avoid PSK & beacons
- Narrow (CW) receive filtering
- Common problems
 - “Upside-down” or reversed Space/Mark (and, LSB vs. USB)
 - Figures vs. Letters
 - Audio:
 - RX audio output level and TX (AFSK only) audio input level
 - Unmuted soundcard inputs and outputs
 - Space and Mark tone consistency between decoder and radio
 - Off-frequency tuning (e.g., MMTTY AFC & NET); propagation flutter
- Messages (“macros”)
 - Short, 5NN, exchange twice, Space delimiter

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

XYZAB	AA5AU	XYZAB
XYZAB	9Y1VC	9N8TT
XYZAB	W5UKM	XYZAB

N1MM Logger

Super Check Partial

logger differences



XYZAB	AA5AU	XYZAB
XYZAB	9Y1VC	9N8TT
XYZAB	W5UKM	XYZAB

N1MM Logger

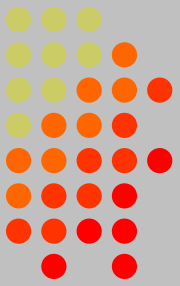
XYZAB	AA5AU	XYZAB
XYZAB	9Y1VC	9N8TT
XYZAB	W5UKM	XYZAB

WriteLog

XYZAB	AA5AU	XYZAB
XYZAB	9Y1VC	9N8TT
XYZAB	W5UKM	XYZAB

Win-Test

Resources



- www.rttycontesting.com
 - Tutorials and resources (beginner to expert)
 - WriteLog/MMTTY/2Tone (N1MM Logger coming)
- 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)
 - N1MMLogger@yahoogroups.com (N1MM Logger general)
 - N1MMLogger-Digital@yahoogroups.com (N1MM Logger RTTY & PSK)
 - writelog@contesting.com (WriteLog)
 - support@win-test.com (Win-Test)

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