



# Digital Modes 101

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# Used for a variety of purposes

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- Chatting
- DX'ing
- Contesting



# So many to choose from...

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- RTTY
- PSK31
- PSK63
- Olivia
- MFSK
- Pactor
- Amtor
- JT65
- JT9
- FSK441
- ...and more



# The focus of today are the following popular digital modes

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- Radioteletype (RTTY)
- Phase Shift Keying - 31 baud (PSK31)



# Digital Basics

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- Digital modes are used to send text from one station to another...keyboard to screen
- In RTTY and PSK31, the text is sent in real time...as you type, the text is sent



# Digital Basics

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- Characters are represented by a series of 1's and 0's.
- In a computer, the standard is ASCII (American Standard Code of Information Exchange).
- The ASCII letter capital A is represented by
  - Decimal 65
  - Hexidecimal 41
  - Bit mapping 01000001



# In Ham Radio Digital Modes...

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- Letters are still represented by 1's and 0's....but not using the ASCII definition
- Each mode has it's own interpretation of what a letter is
- Each mode has a different way of determining what a 1 and a 0 is.
- The 1's and 0's are transmitted using audio tones.



# Basics...

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- Since it's audio tones, the set up is simple
- Receive: connect audio out from your rig to the PC's Line or Mic in.
- Transmit: connect audio out from the PC to the rig's mic or data input (we'll talk about a RTTY variation in a minute).





# Basics...

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- It's common to have an interface box between the rig and computer
  - Eliminates possible ground loops that could cause hum, which might distort the signal.
  - Adds functions, like switching the rig audio input from the PC to the mic.
  - Popular: West Mountain Radio, Signalink

# Let's start with the most basic

## - CW

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- A 1 is tone on
- A 0 is tone off
- Variable number of bits:
  - E is dit
  - F is dit-dit-dah-dit
- Case ambiguous – you decide if it's upper case or lower case
- Includes numbers and some punctuation



# Looking at RTTY now

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- A 1 is called a Mark
- A 0 is called a Space
- The standard mark and space tones are 2125 hz and 2295 hz respectively, sent using Lower Sideband (LSB)...audio remember?



# Looking at RTTY now

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- Uses 5 bit Baudot code sent at 45 baud
  - Every letter is the same 5 bits long
  - Example: Baudot code for letter A is 11000
- Upper Case only
- Includes numbers and punctuation

# RTTY...

- Used to be sent via a teletype machine



- Now sent using a software program
- 2 types of sending, depending on your rig



# RTTY...

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- AFSK – Audio Frequency Shift Keying – the PC sends the audio tones to the rig’s mic or data input. Rig is in LSB mode.
- FSK - Frequency Shift Keying – the PC sends a signal (1 or 0) to the rig to have it send the appropriate tone (mark or space)



# RTTY...

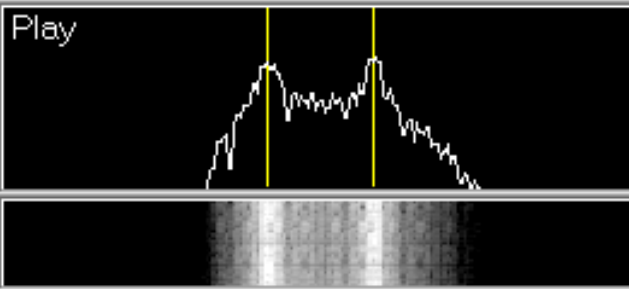

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- Popular free software: MMTTY by JE3HHT
- Some newer rigs have a built-in decoder – no PC needed.
- Some newer rigs have the interface built-in – no external device needed

# MMTTY Screenshot

KFOUR (KFOUR.MDT) - MMTTY Ver1.68A

File(F) Edit(E) View(V) Option(O) Profiles(S) Program(P) Help(H)

Control	Demodulator (IIR)						Macro				Play 
FIG	Mark	2125	Hz	Type	Rev.	HAM	2x	QANS	SK	RY	
UOS	Shift	170	Hz	SQ	Not.	BPF	3x	M6	EE	M14	
<b>TX</b>	BW	60	Hz				4x	M7	M11	CQ2	
TXOFF	AV.	70	Hz	ATC	NET	AFC	UR599	M8	M12	CQ1	

QSO Data Init Call  Find Name  My  His 599  14

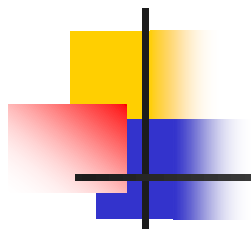
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h5
Ø4Ø

2MEKMHLOK

VB
GDTBFHOE
SEEQVPPCXAAASF
KDWDKKU
NPBDKFXVXULMBZAOWAZKUDMNVNLHWJYDVWNPYAMIMTTGGJ
WVTPIYJ/
7;
Ø?1..45 8h25""")".398&:
11/;$1/.93&,/?:(."h(22-7$"ØØ5--AEC1DBO DE K1IED OK JUAN COPY FINE AND THANKS FOR THIS QSO
I HOPE TO WORK YOU AGAIN _
```

Clear 1X1 DEAR ANS BTU  Edit Both wait





# RTTY Demo



# PSK31

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- A 1 or 0 is noted by the phase of the audio. Determined by a soundcard.
- 31.25 baud
- Variable number of bits. More common letters are shorter (= faster).
- Case sensitive – both upper case and lower case
- Can backspace!



# PSK31...

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- Soundcard can hear and determine a 1/0 when a human can't.
- Great for weak propagation or QRP or poor antenna.
- Most users turn down the power.



# PSK31...

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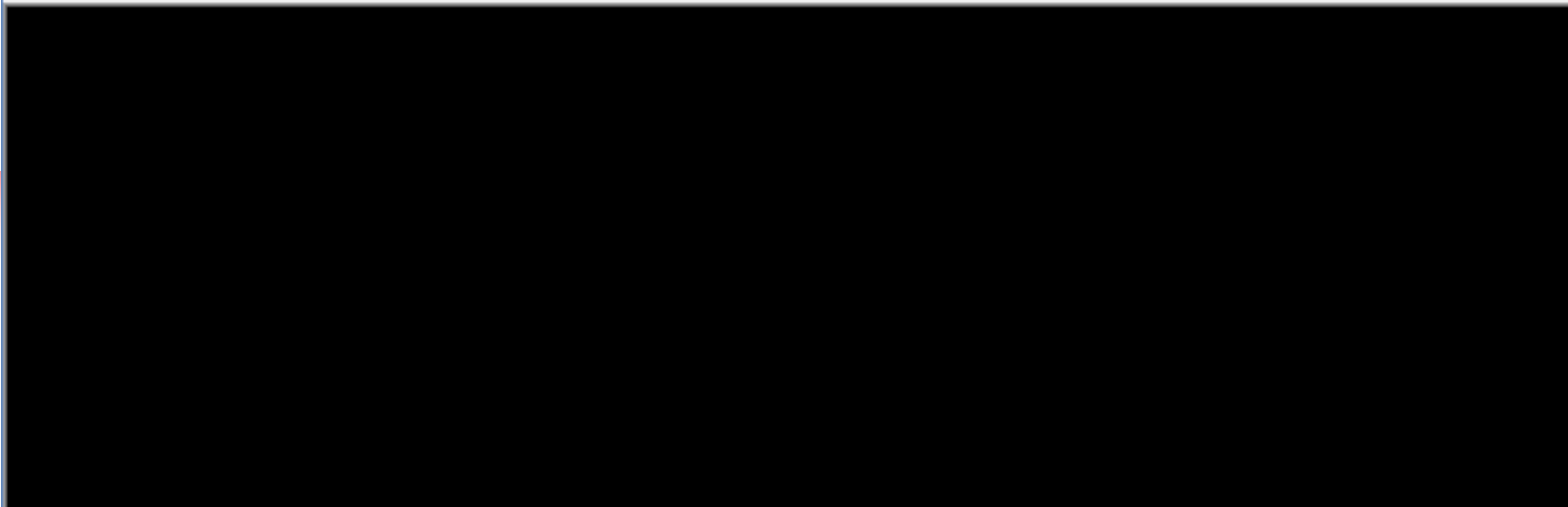
- Lots of programs – all use the same free decoder from Peter Martinez G3PLX.
- What's different is the GUI wrapper and functions the developer decided to put it.



# PSK31...

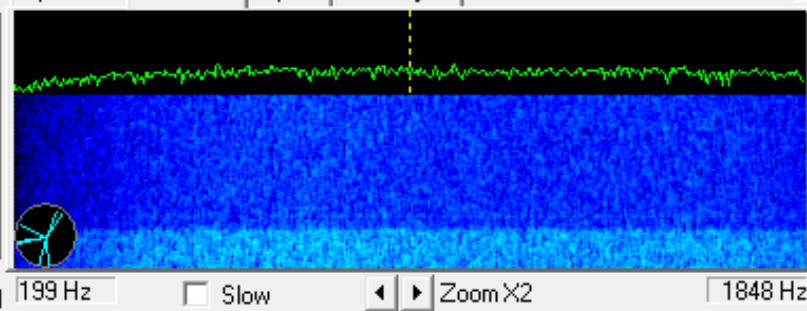
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- Popular free software: Lots!
- I've used WinPSK for many years.



RX Freq SQ Spectrum Waterfall Input Data Sync Auto Text Select

RX Freq  
1020  
 AFC  
Tx Freq  
1000  
 Net  
 PSK63  
 BPSK  
 QPSK (usb)



199 Hz  Slow   Zoom X2 1848 Hz

Their Call  
  
Their Name  
  
Text Grab  
Clear QSO Info

(Rt-Click on Macros to Edit)  
F1=QSO Start F6=Undefined  
F2=QSO BTU F7=Undefined  
F3=QSO Final F8=Undefined  
F4=CQ F9=Undefined  
F5=Brag File F10=Undefined  
<<< Home F11 >>>  
Macro Set = 1



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# PSK31 Demo



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Thanks for your time!

C U on the air

73, Shel KFOUR



# KFØUR



Colorado Springs, Colorado, USA

Elevation  
6850 Feet