

## **Digital Modes**

March 10, 2014 Bob - WB4SON

# **Digital Modes**

- Popular Modes (RTTY, PSK, JT65)
- Required Equipment (Radio, PC, Interface)
- Popular Software (FLDIGI, DXLabs, HRD, WSJT)

# RTTY (Radio Teletype)

- Derived from landline Baudot Code in 1874
- Commercial radio use widespread in 1930's
- Amateur Radio use Post WWII
- 45.45 Baud, 60 WPM, 170Hz shift (250 Hz RX)
- Still used today for contests, DX, casual QSOs

#### BPSK31 & BPSK63

- Developed by G3PLX in 1998
- Binary Phase Shift Keying
  - Narrow bandwidth reduces noise
  - But doesn't work well for transpolar routes
- 31 baud, 50 WPM, 31 Hz shift, < 100 Hz RX
- Very popular conversation mode

#### JT65A & JT9

- Invented by K1JT in 2003: weak signal reception of EME (-250 dB)
- Encoding designed for high loss, phase shifts, fades, etc.
- MFSK 65 tones <180 Hz per signal.
- RX Bandwidth wide open allowing 12+ signals in 2.5 KHz
- Exchange is call signs, location, strength, 73. Not a "conversation"
- Great for QRP and poor antennas, making it very popular.
- JT9 was designed for HF < 16 Hz wide (120+ QSOs in 2.5 KHz RX)
- Both can decode signals that can't be heard above the noise

## **Required Equipment**

- Radio that can run SSB (5-25 watts typical)
- Soundcard Interface (external or built-in)
- Cables (radio to interface and rig control)
- PC with software (Windows 7 preferred)
- Accurate Time (+/- 1 sec) for JT65 & JT9

## Radios

- Almost any rig QRP is fine!
- Should be modern enough to have rig control





## Most Popular Interface

- SignaLink USB see: http://www.tigertronics.com/
  - Interface Box
  - Configuration Header
  - Audio/PTT cables
- Costs \$95-\$140 (with cables and header)
- Transformer Isolated Sound, PTT from audio
- NOTE: Does NOT provide Rig Control (Freq)

#### SignaLink USB



Note: SignaLink cables deal with Audio and PTT. They don't control Rig Frequencies/Modes/Bands/Filters/Etc.

# **Rig Control Cable**

- Allows you to control frequency, modes, bandwidth, power, etc via PC
- Avoid "Prolific" Chips
- Mfg Cables are EXPENSIVE
- "OEM" Cables are \$20-\$40
- Check out Amazon

![](_page_9_Picture_6.jpeg)

# **Digital Mode Software**

- Purpose is to decode the RX audio and encode the TX using a soundcard
- Typically has tuning aids like a "Waterfall"
- Generally radio stays on a fixed frequency and user clicks on desired signals to "tune"
- Often integrates logging

## What's a Waterfall?

![](_page_11_Figure_1.jpeg)

Upper: Shows Time vs Frequency -- Use it as a tuning aid, signal identification, strength, quality, or finding an open freq.

Lower: Signal Strength vs Frequency

# FLDIGI (Fast Light Digital)

- Free
- Many Digital Modes
- Part of NBEMS suite of software
- Find it at http://www.w1hkj.com/Fldigi.html

#### FLDIGI

![](_page_13_Picture_1.jpeg)

NOTE: Mode is Olivia 8/250, a 8 tone MFSK FEC Mode

### **DXLabs WinWarbler**

- Free
- Written by David Berstein, AA6YQ
- Updated Frequently
- Used by many Dxers and Contesters
- Find it at http://www.dxlabsuite.com/

#### **DXLabs WinWarbler**

![](_page_15_Figure_1.jpeg)

NOTE: Decoding a PSK31 Signal

## Ham Radio Deluxe DM780

- Originally Free, now commercial \$99
- Written by Simon Brown HB9DRV
- Considered the best at digital modes
- JT65 and JT9 being added by Joe Taylor
- Find it at: http://www.ham-radio-deluxe.com/

#### Ham Radio Deluxe DM780

![](_page_17_Figure_1.jpeg)

#### Ham Radio Deluxe DM780

![](_page_18_Picture_1.jpeg)

SuperSweeper decoding RTTY signals

#### WSJT-X

- Free
- Written by Joe Taylor, K1JT
- JT65 and JT9 only (for now)
- Find it at: http://www.physics.princeton.edu/pulsar/K1JT/wsjtx.html
- JTAlert: http://hamapps.com/

#### WSJT-X

![](_page_20_Picture_1.jpeg)

NOTE: Decoding 8 JT65 signals in ~1800 Hz