# Digital EmComm with NBEMS


ARRL Western Pennsylvania Section

Dave Kleber KB3FXI
O'Hara Twp EMA
kb3fxi@arrl.net

Harry Bloomberg W3YJ
Assistant SEC WPA ARRL Section
hpb@pitt.edu

# *Why Digital EmComm?*

- Think back to your last public service event, drill, or deployment.
- You probably passed a lot of traffic best suited for voice communications but...
- What if you had been asked to pass
  - Roster of evacuees
  - Required prescription medications
  - Directions to a disaster scene

# *Why Digital EmComm?*

- The needs of our Served Agencies have changed.
- They still need voice communications but...
- There's an increasing need for data communications.
- We need to be able to provide more than just voice communications from a ham with an HT.

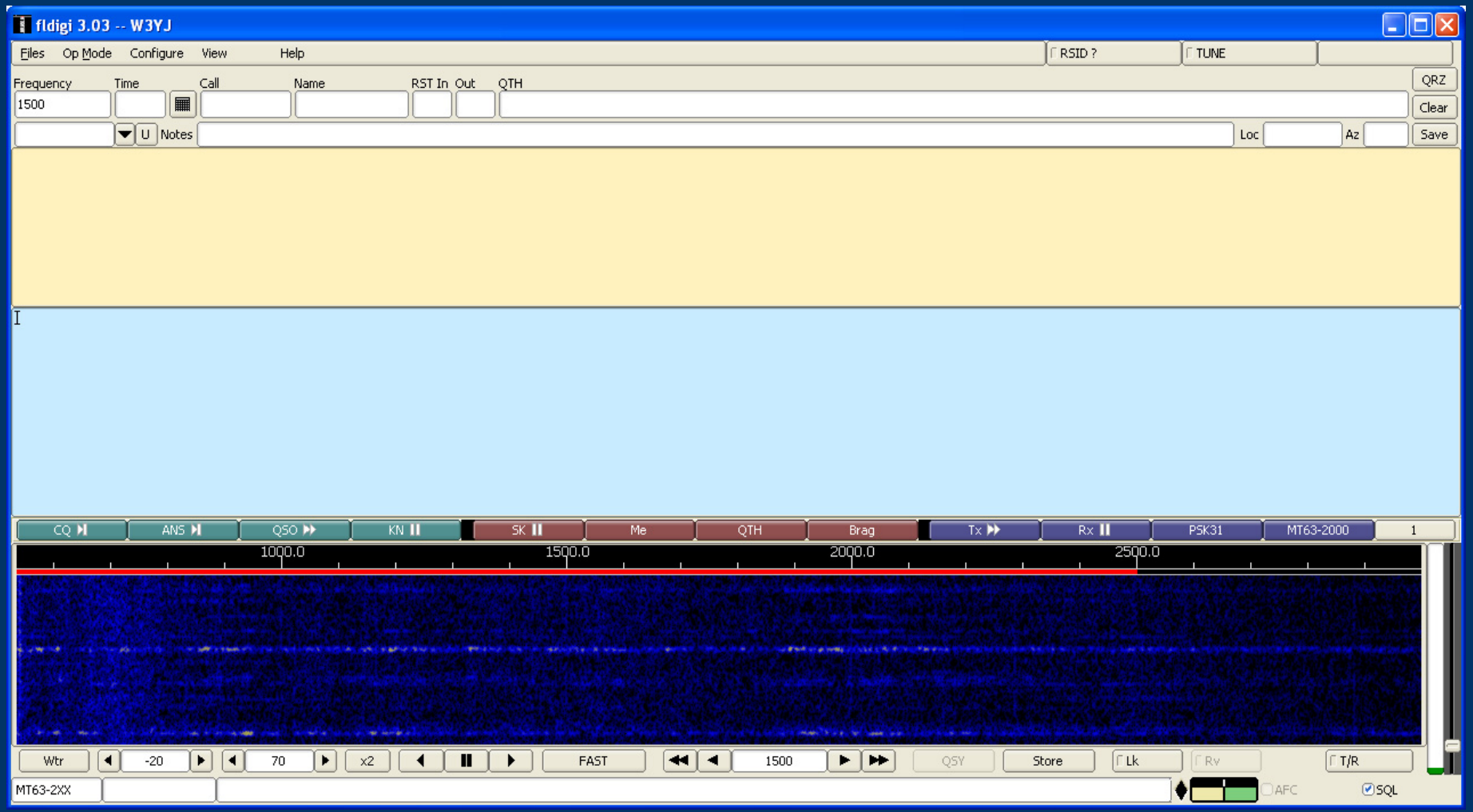
# What is NBEMS?

- Narrow Band Emergency Messaging System
- Consists of three programs:
- fldigi – Fast Light Digital modem application
- flarq – Fast Light Automatic Repeat Request
- wrap – embed a checksum in a file
- Can download from http://www.w1hkj.com/
- Runs on Windows (XP and Vista), Linux, and Mac.
- Released under GNU Public License, so is completely FREE.

# NBEMS philosophy

- Keep it cheap.
- Keep it simple.
- Use Open Source software.
- Don't depend upon infrastructure.
- Make it fun to use between drills and disasters.
- Any computer, any radio.

# Fldigi


fldigi 3.03 -- W3YJ
Files
Op Mode
Configure
View
Help
RSID ?
TUNE
Frequency
Time
Call
Name
RST In
Out
QTH
1500
QRZ
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Save
Notes
Loc
Az
CQ
ANS
QSO
KN
SK
Me
QTH
Brag
Tx
Rx
PSK31
MT63-2000
1
1000.0
1500.0
2000.0
2500.0
Wtr
-20
70
x2
FAST
1500
QSY
Store
Lk
Rv
T/R
MT63-2XX
AFC
SQL

# How it works

- fldigi uses your computer's sound card to generate and decode digital signals.
- All work is done by your computer, don't need an external TNC.
- Audio from your computer speakers go into your radio's mike input for transmission.
- Audio from your radio goes into your computer's mike or line-in for decoding.
- Don't need an extremely powerful new computer, older machines work just fine.

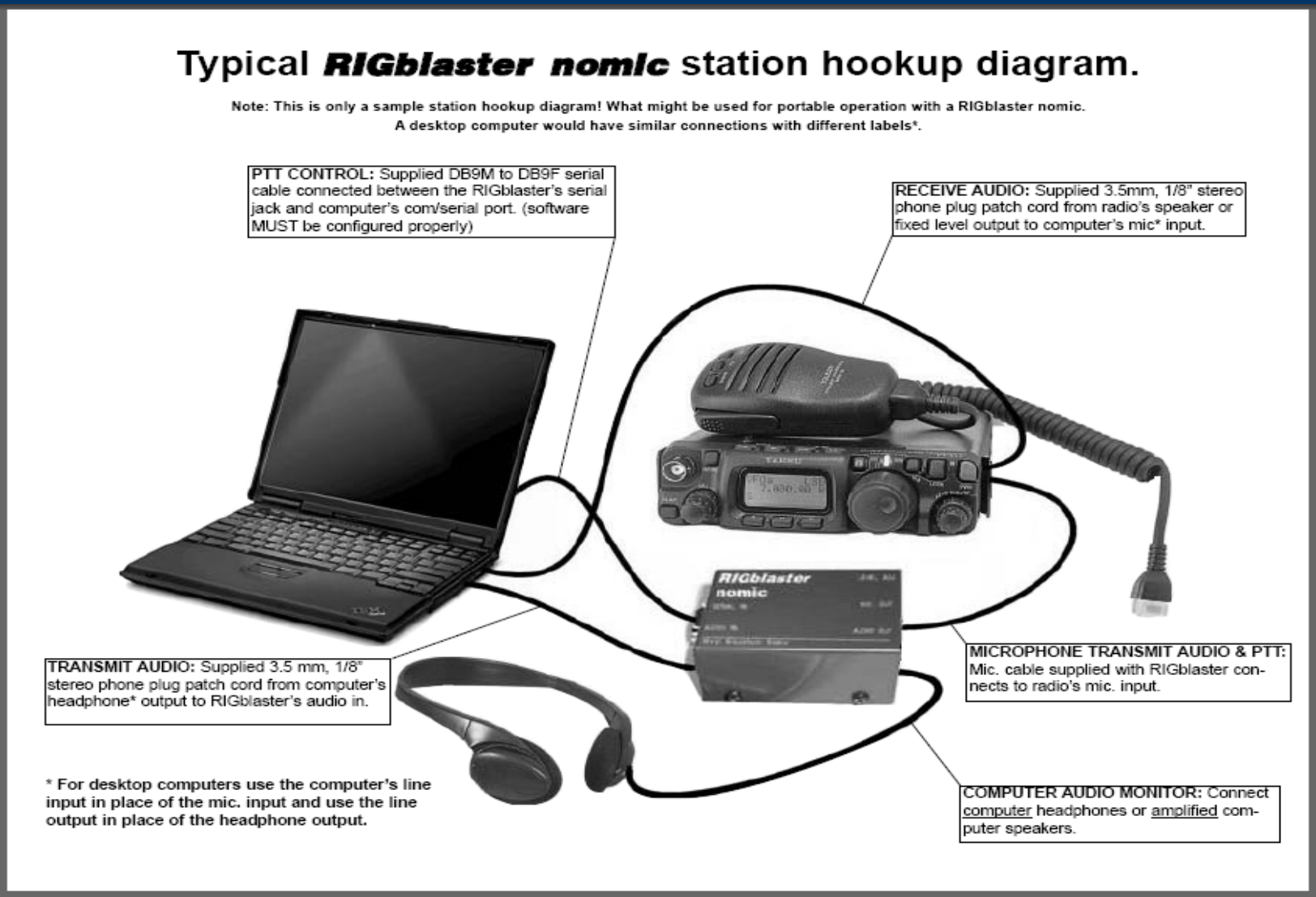
# *Interfacing with computer*

- Many ways to interface with computer.
- Rigblaster
- SignaLink
- But, if necessary, hold radio mike up to computer speaker and...
- Hold radio speaker up to computer mike!
- In an emergency, don't really need hardwired interface.

# Acoustic Interface

- Easiest way to interface radio to computer is to...
- Hold radio mike up to computer speakers.
- Hold radio speaker up to computer mike.
- You do PTT manually.
- Works especially well with VHF/UHF FM.
- Real gamesaver during emergencies.
- Allows you to easily send data using any radio.
- Hams can participate who do not have a soundcard interface.
- MT63 is sufficiently robust to deal with background noise, even in a noisy EOC.

# Typical Rigblaster nomic setup



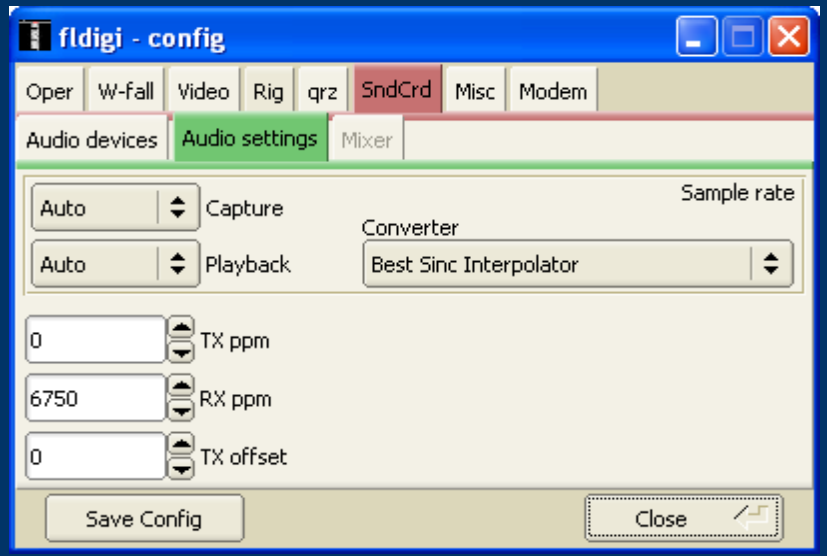
# Signalink USB


# Configuring fldigi

- Go to Configure -> Defaults menu
- Enter your personal info.
- Also configure soundcard, radio interface, and modems.

# Soundcard Calibration

- If possible, calibrate your soundcard.
- Especially necessary for narrowband HF modes.
- Can use fldigi WWV mode or CheckSR.exe.



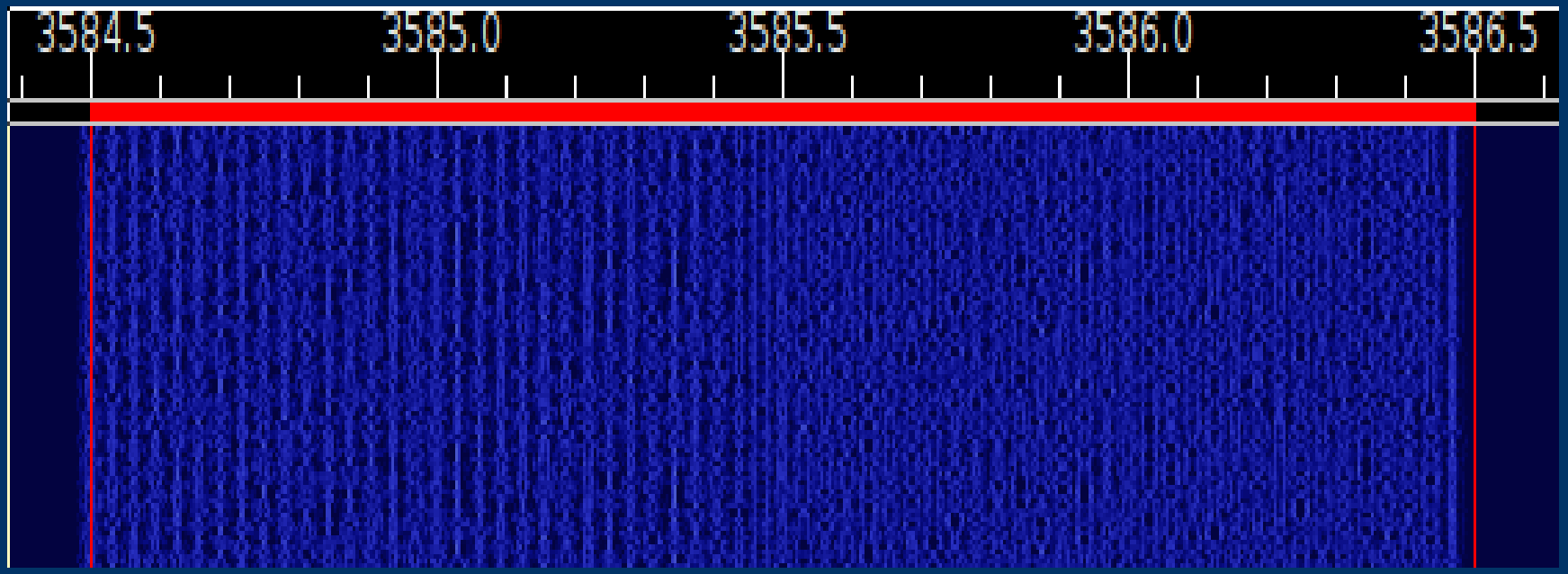
# Modes

- Lots of modes, most popular ones are...
- MT63 (500, 1000, 2000)
- MFSK
- DominoEX
- Olivia
- PSK 125
- Popular PSK31 OK for making non-emcomm contacts, but has no error correction.

# MT63 – King of EmComm modes

- MT63-2000 great choice for FM EmComm.
- Fast – less than 2 min to send 2kb text file.
- Data redundancy in time and in frequency.
- Used by MARS.
- Very resistant to noise – can lose up to 25% of signal and still copy.
- Works well with holding mike up to speaker, even in noisy environments.
- Used in most recent Allegheny County SET over repeater.

# MT63-2000 Waterfall




- 64 tones sent at same time
- Signal width is 2000 Hz
- Center frequency is 1500 Hz
- Sounds like a giant buzzsaw

# *Important MT63 configuration*

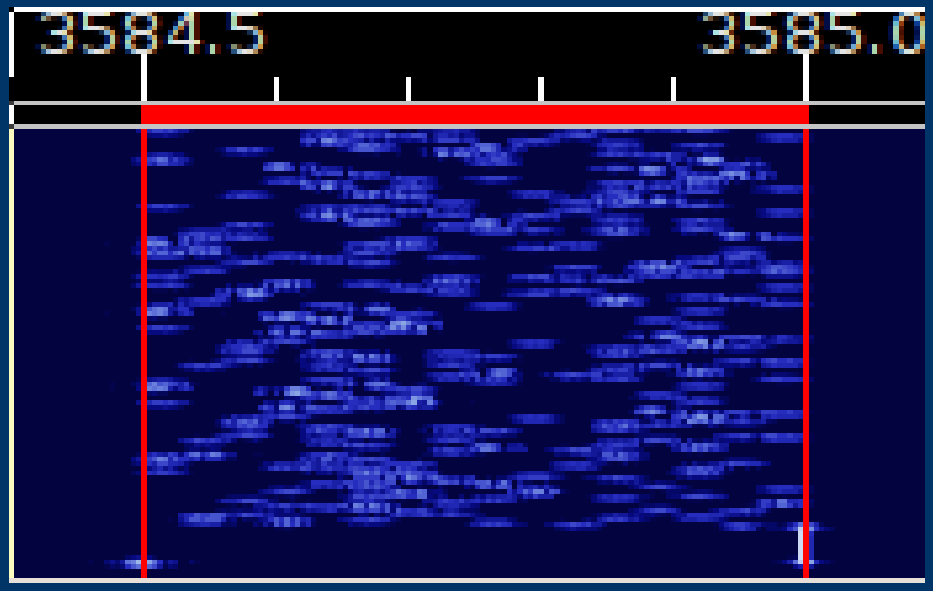
- Be sure to set 64 bit interleave.
- Provides extra data redundancy.
- Both stations must have same interleave setting.

# HF modes

- Preferred HF mode is Olivia.
- Olivia is great for poor HF conditions.
- Will get through when no other mode will.
- Can make contacts below noise floor!
- We use 8/500 when possible – 8 tones in a 500 Hz bandwidth.
- When conditions are poor, we go to 16/500 – 16 tones in a 500 Hz bandwidth.
- 16/500 is slower, but will get through.
- Fine article in Dec 2008 QST by WB8ROL.

# *Olivia waterfall*

- Screenshot of Olivia 16/500 signal in waterfall




- Unmistakable sound...like a flute!

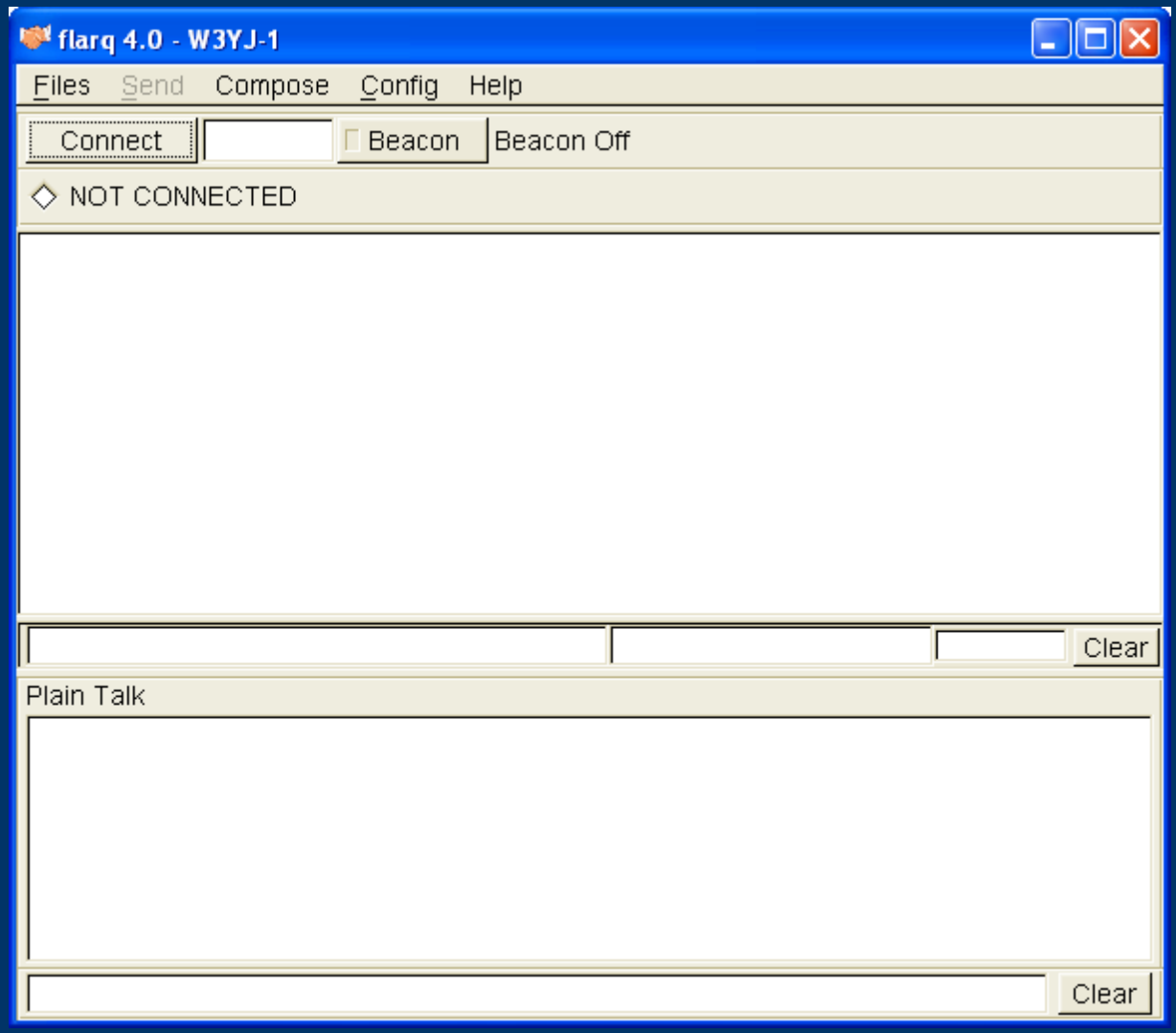
# HF Tips

- A few things to remember for HF operation.
- Always use upper sideband (USB), even on 40M and 80M.
- Don't overdrive your audio.
- Disable speech compressor, noise blanker, and all other audio processing.
- Adjust mike gain so that ALC just moves a little.
- Digital modes are 100% duty cycle like CW or RTTY so...
- 50 watts is plenty!
- Don't need high power for digital modes anyway.

# flarq

- Fast Lightning Automatic Reqeust.
- Provides handshaking on top of fldigi.
- Able to send binary files.
- Can provide 100% assurance that message got through.

# Flarq screenshot



# flarq tradeoffs

- If we can provide 100% guarantee, why not use flarq all the time?
- Adds considerable overhead.
- Potential for lots of resends over poor path.
- MT63 has shown itself to be sufficiently robust.
- Rarely need to send binary file, use text instead.

# Data verification with Wrap

- Wrap allows you to be 100% sure your message was received accurately.
- Checksum is inserted into a file.
- Receiving station computes the checksum on the incoming file and...
- If the two checksums are identical, the file was received without error.
- Allows multiple stations to receive and confirm data 100%.
- Great for bulletins like situation updates, weather reports, road closures, lists of contact info.

# Wrap - example

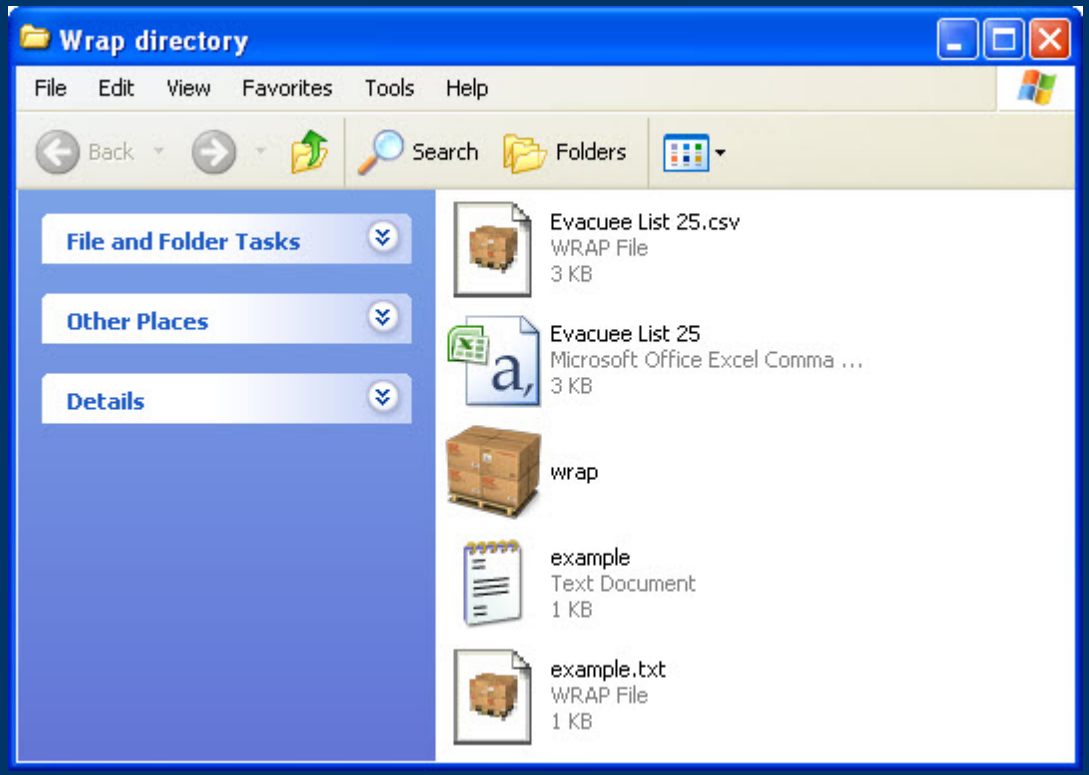
This is an example of a “wrapped” file:

```
[WRAP:beg][WRAP:crlf][WRAP:fn example.txt]This is an example of a wrapped file.
    Here's what happens when we wrap something.[WRAP:chksum B71E][WRAP:end]
```

- Note the WRAP beg and end delimiters
- Also note the checksum, it's B71E.
- Easy to import wrapped file...just drag into Fldigi transmit window.

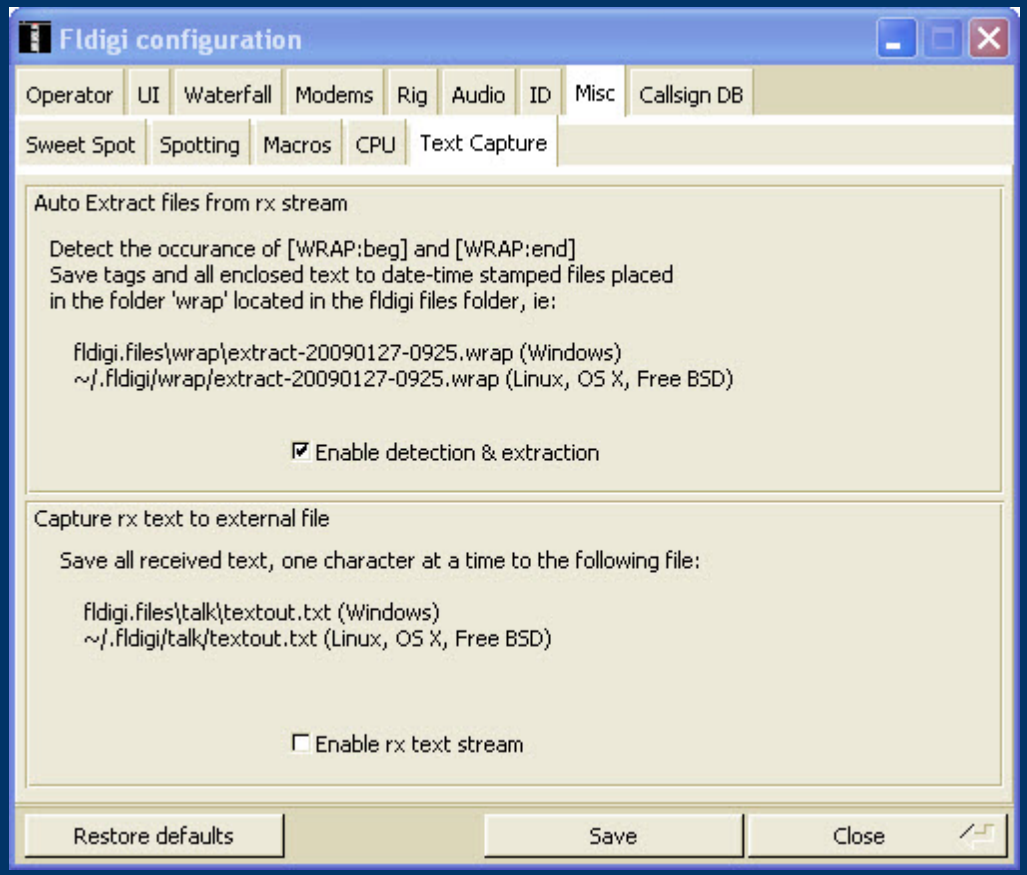
# Wrapping data

- To “Wrap” data, just drag and drop a file onto the Wrap program's icon



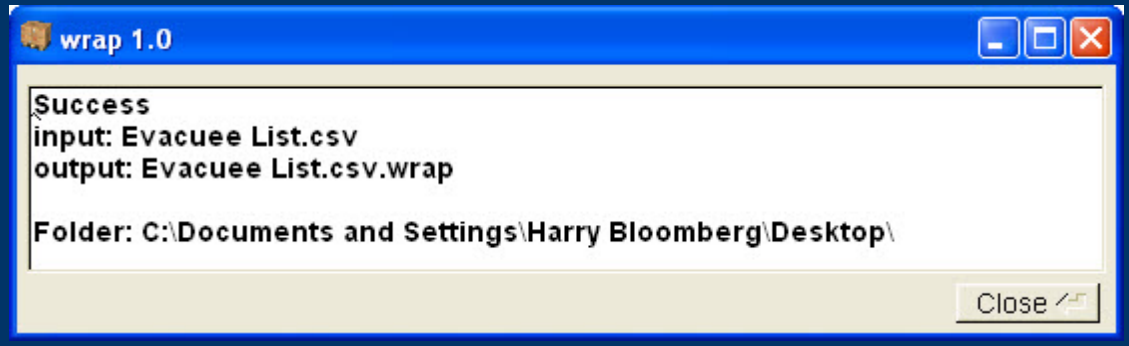
# Configure fldigi to extract data

Set the Fldigi configuration setting and Wrapped data will be automatically extracted!



# Verify extracted Wrapped files

- Can cut-and paste data from received window or...
- Go to File->Show Config menu and enter wrap folder.
- Can either drag resulting files over Wrap icon to verify and extract data (preferred) or...
- File associate Wrap with .wrap file extension and just double click!

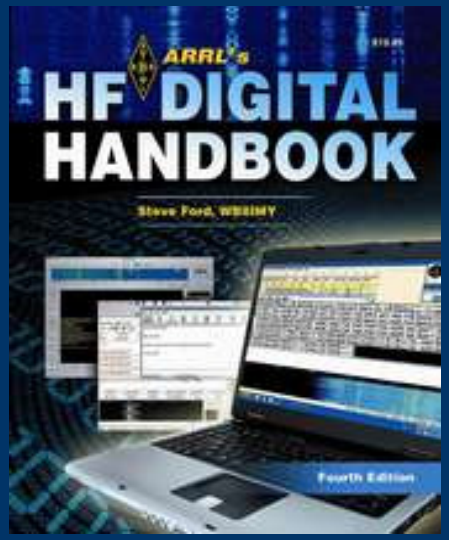


# Next steps

- Our strength is the ability to turn fun amateur activities into powerful emcomm tools.
- So, download NBEMS, and make lots of contacts!
- If you're ready for your daily hamming, you're more prepared for emergency than you think.
- Be active, and on the day you're needed, you'll feel right at home.

# Resources

- wpaNBEMS group organized by KB3FXI
  http://wpaNBEMS.org
- ARRL's HF Digital Handbook



# Resources

- W1HJK (author of fldgi)
  http://www.w1hkj.com/
- MT63 page
  http://www.qsl.net/zl1bpu/MT63/MT63.htm
- MT63 Wikipedia page
  http://en.wikipedia.org/wiki/MT63
- WPA Section Digital Emcomm Standards
http://www.wpaares.org/ecom.html
- August 2009 QST – pages 73-74
Public Service Column