

# *Digital EmComm with NBEMS*



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# *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 four programs:
  - Fldigi – Fast Light Digital modem application
  - Flarq – Fast Light Automatic Repeat Request
  - Flwrap – embed a checksum in a file
  - Flmsg – easily send ICS-213 and Radiogram
- Can download from <http://www.w1hkj.com/>
- Runs on Windows, 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

The screenshot shows the Fldigi software interface. At the top, there is a menu bar with 'File', 'Op Mode', 'Configure', 'View', and 'Help'. To the right of the menu bar are several checkboxes: 'Spot', 'RxID', 'TxID', and 'TUNE'. Below the menu bar, the text 'RigCAT - IC-7000' is displayed. The main display area is divided into several sections:

- Frequency Display:** A large green digital display shows '3582.500'.
- QSO Log Table:** A table with columns: 'QSO Freq', 'On', 'Off', 'Call', 'Name', 'In', 'Out', and 'Notes'. The first row contains the values: '3583.500', an empty box, '0158', an empty box, an empty box, an empty box, and an empty box.
- QTH Fields:** Below the log table are fields for 'QTH', 'St', 'Pr', 'Cnty', 'Loc', and 'Az', each with an empty input box.
- Waterfall Display:** A spectral display showing frequency from 3583.0 to 3585.0. The display is mostly blue with some yellow and red highlights, indicating signal activity.
- Control Panel:** At the bottom, there are various control buttons and indicators, including 'CQ', 'ANS', 'QSO', 'KN', 'SK', 'Me/Qth', 'Brag', 'PSK31', 'Tx', 'Rx', 'Olivia', 'MT63', '1', 'WF', '-20', '70', 'x1', 'NORM', '1000', 'QSY', 'Store', 'Lk', 'Rv', 'T/R', 'OLIVIA 8/500', 'AFC', and '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.
- Disable all DSP “enhancement” programs on mic.

# *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

## Typical **RIGblaster nomic** station hookup diagram.

Note: This is only a sample station hookup diagram! What might be used for portable operation with a RIGblaster nomic.  
A desktop computer would have similar connections with different labels\*.

**PTT CONTROL:** Supplied DB9M to DB9F serial cable connected between the RIGblaster's serial jack and computer's com/serial port. (software MUST be configured properly)

**RECEIVE AUDIO:** Supplied 3.5mm, 1/8" stereo phone plug patch cord from radio's speaker or fixed level output to computer's mic\* input.

**TRANSMIT AUDIO:** Supplied 3.5 mm, 1/8" stereo phone plug patch cord from computer's headphone\* output to RIGblaster's audio in.

**MICROPHONE TRANSMIT AUDIO & PTT:** Mic. cable supplied with RIGblaster connects to radio's mic. input.

\* For desktop computers use the computer's line input in place of the mic. input and use the line output in place of the headphone output.

**COMPUTER AUDIO MONITOR:** Connect computer headphones or amplified computer speakers.



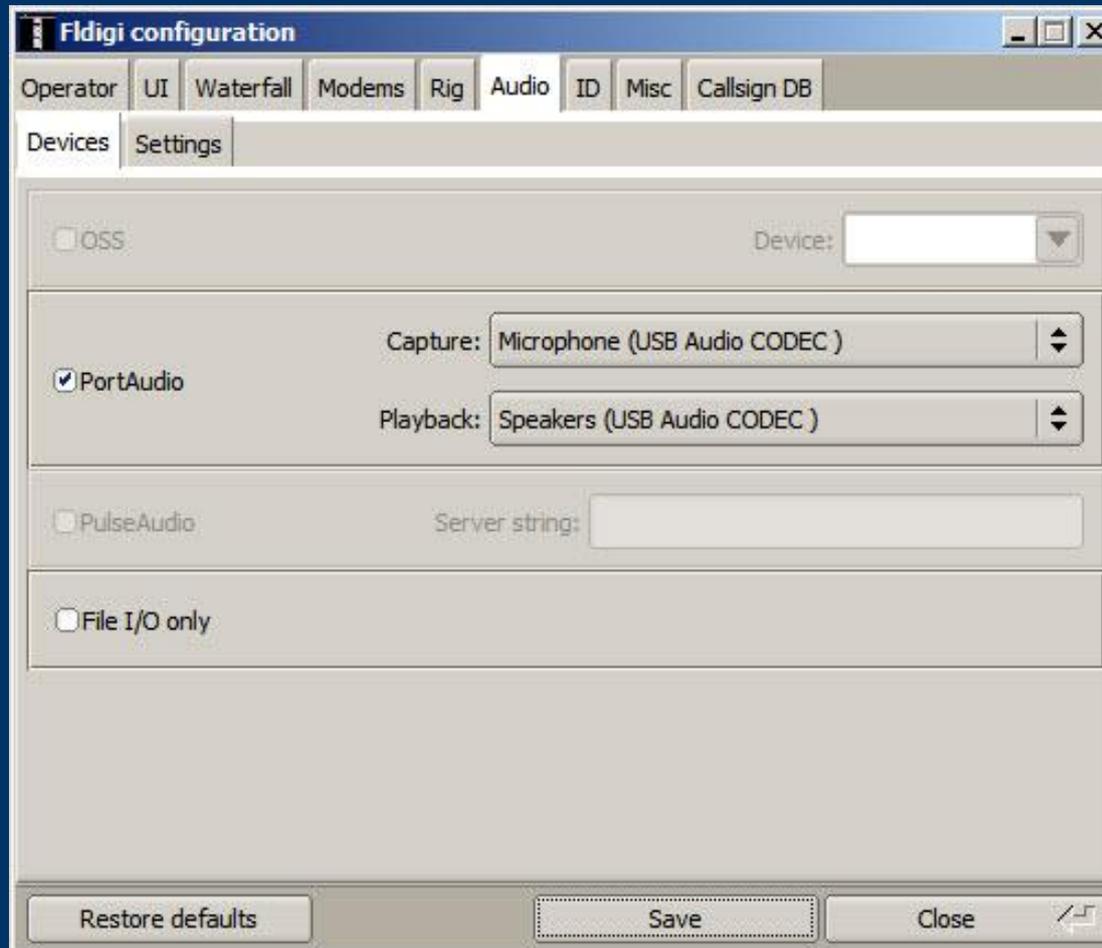
# Signalink USB



# *Signalink Configuration*

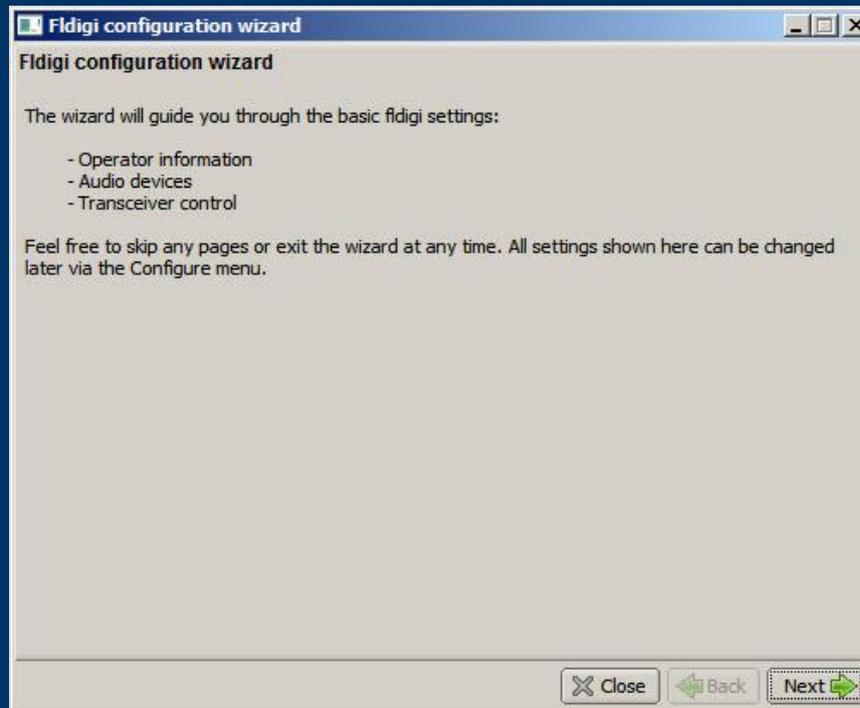
- Signalink is very easy to configure.
- Just connect to computer via USB.
- Configure Fldigi to use Signalink USB sound card.
- Generate just enough audio from computer to trigger Signalink vox.
- Use volume controls on Signalink and don't touch computer audio settings

# Signalink Configuration



# Configuring Fldigi

- First time through, wizard is run.
- 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.



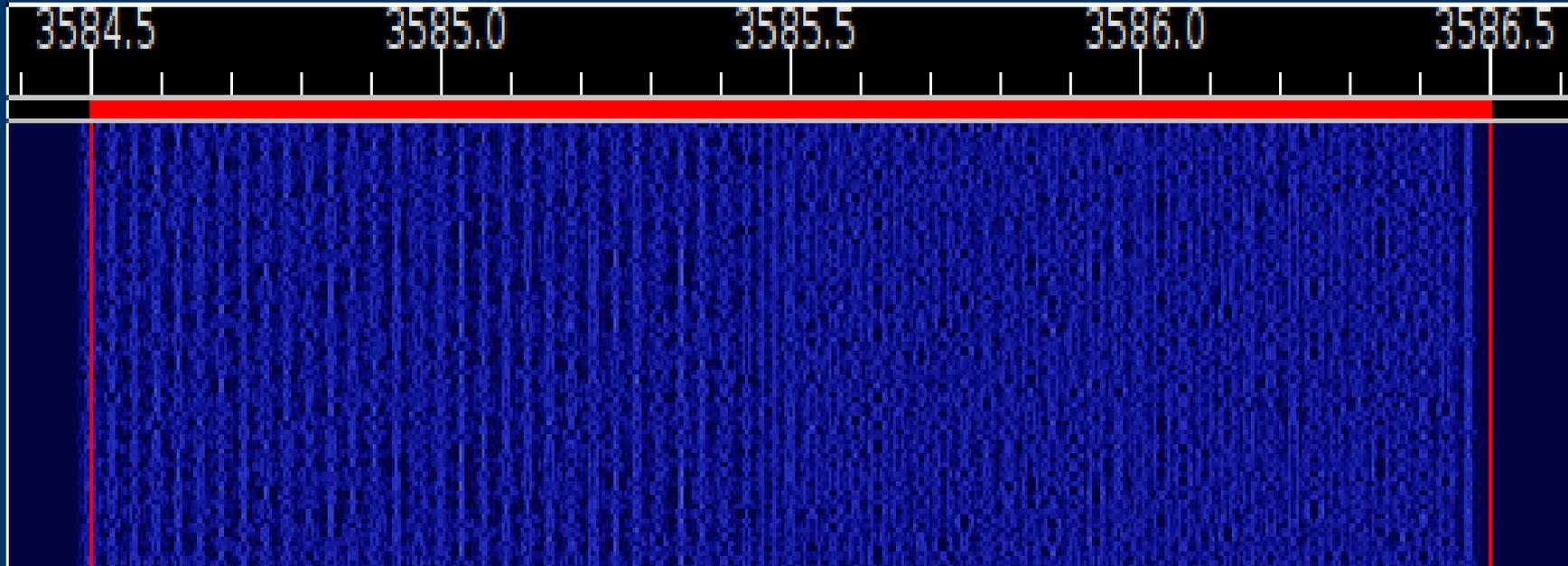
# Modes

- Lots of modes, most popular ones are...
- MT63 (500, 1000, 2000)
- Olivia
- “R” PSK modes...fast with FEC
- Popular PSK31 OK for making non-emcomm contacts, but has no error correction.

# *MT63 – King of EmComm modes*

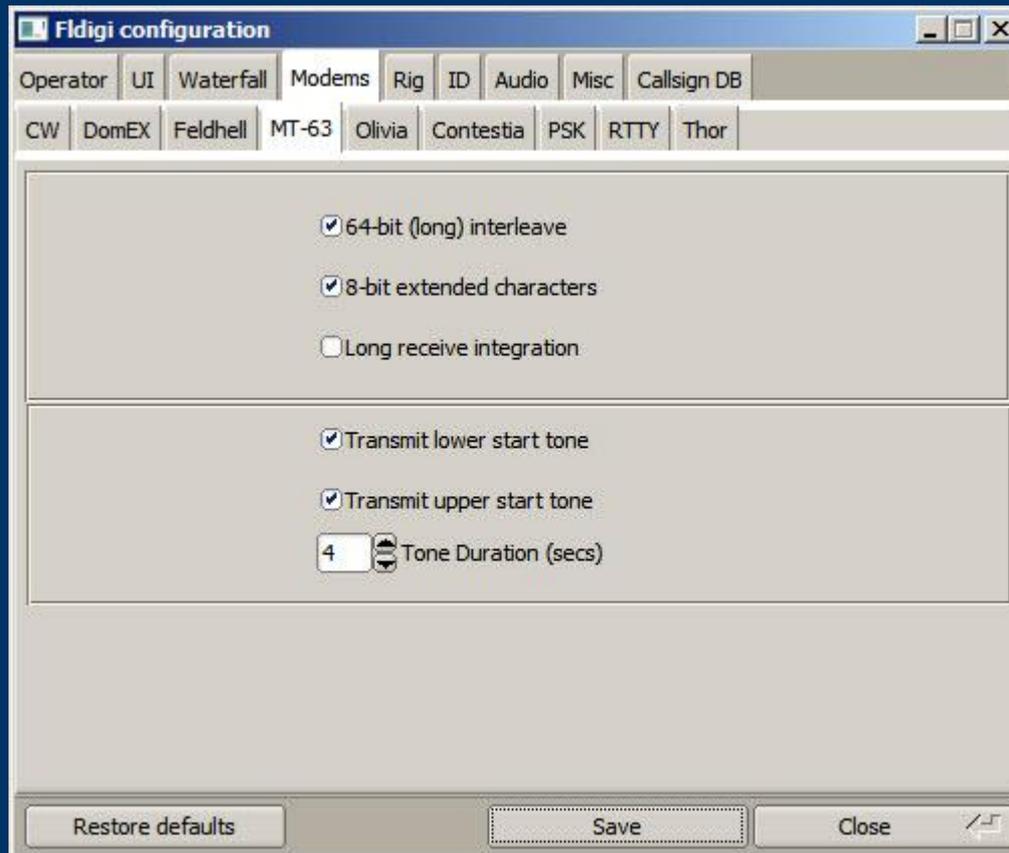
- MT63-2000 great choice for FM EmComm.
- Fast – less than 2 min to send 2kb text file.
- Data redundancy in time and in frequency.
- Used by MARS.
- Very resistant to noise – can lose up to 25% of signal and still copy.
- Works well with holding mike up to speaker, even in noisy environments.
- Used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

# 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



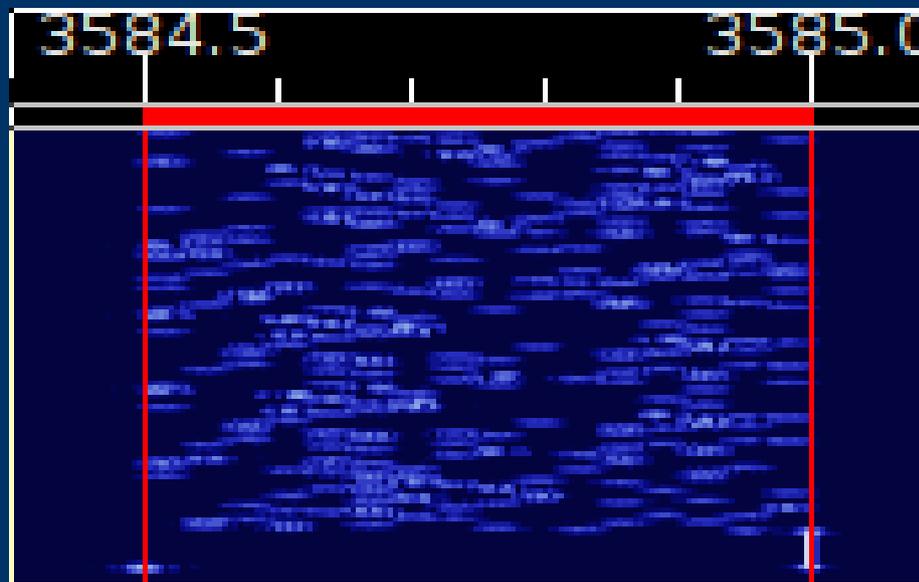
- Be sure to set 64 bit interleave and 8-bit char.
- Provides extra data redundancy.
- Both stations must have same interleave setting.

# 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!
- Does not require precise tuning.
- 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!

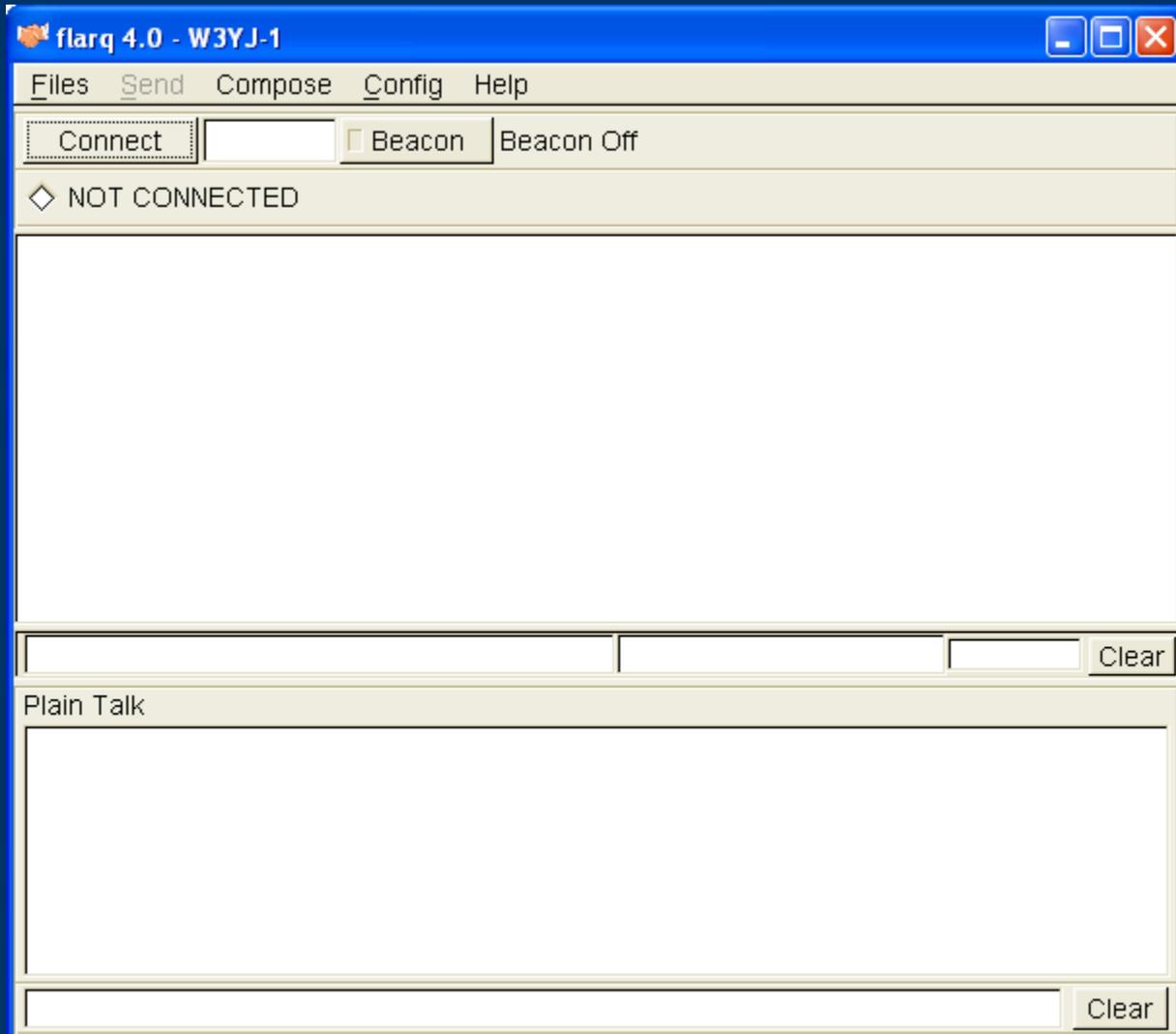
# HF Tips

- 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!
- RF kills touchpads...use an external mouse!
- Don't need high power for digital modes anyway.

# *Flarq*

- Fast Lightning Automatic Request.
- 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 with small blocking.
- Potential for lots of resends over poor path.
- Must use hard-wired interface, acoustical coupling will not work.
- May be appropriate for large files.
- Works well with new high-speed PSK modes.

# *Data verification with Flwrap*

- Flwrap 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.

# *Flwrap - example*

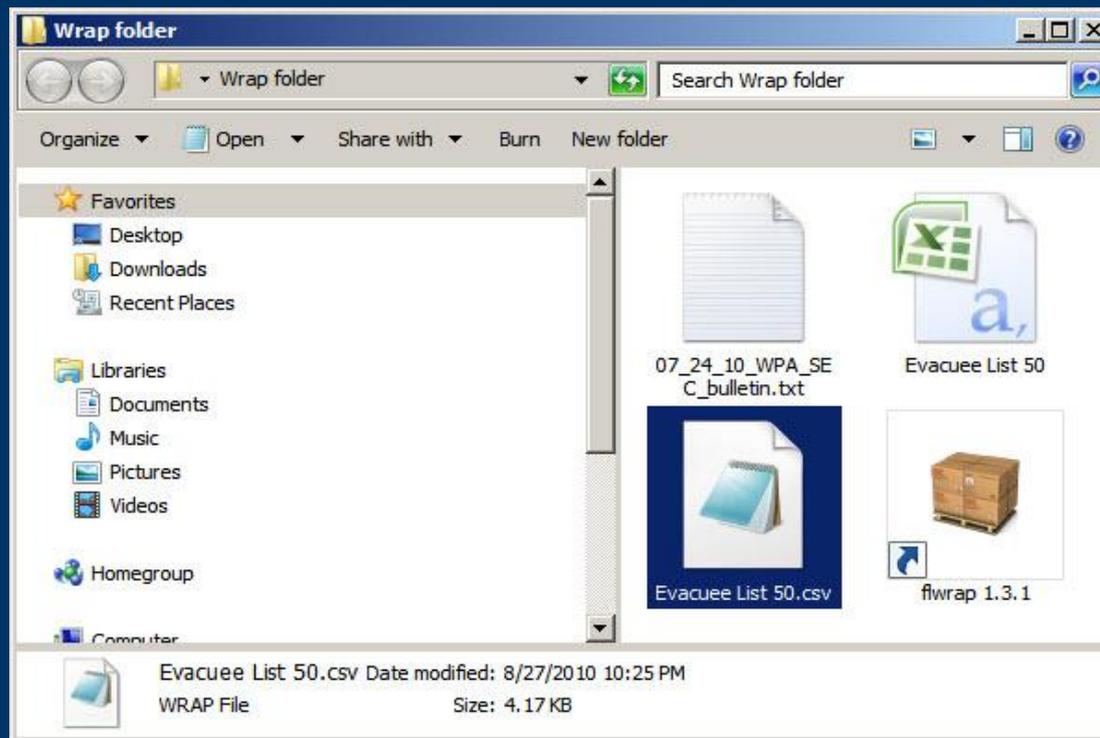
This is an example of a “wrapped” file:

```
[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.

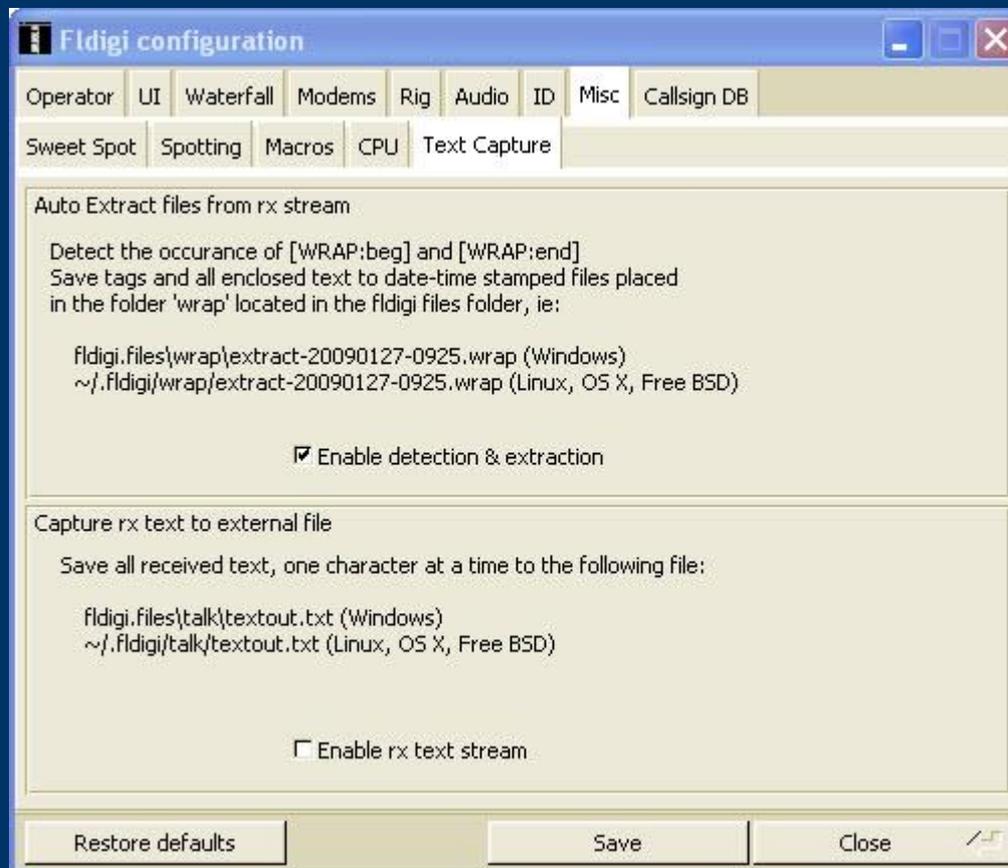
# Wrapping data

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



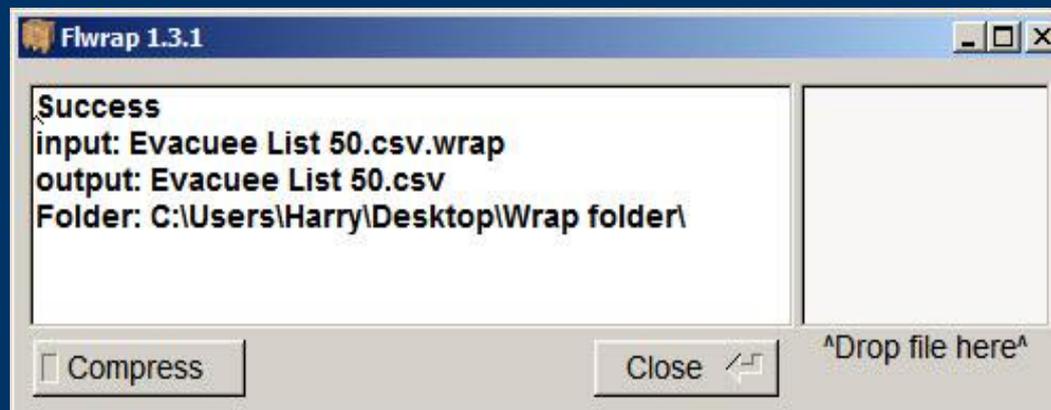
# Configure fldigi to extract data

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



# Verify extracted Wrapped files

- Go to File-->Folders->NBEMS Files menu and enter Wrap/recv folder.
- Drag resulting files over Flrap icon to verify and extract data

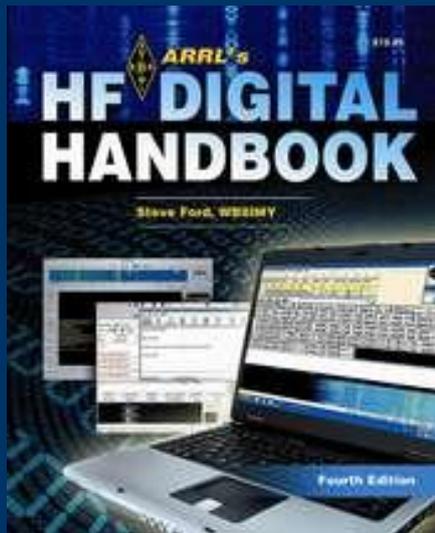


# *Next steps*

- 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 Dave Kleber  
KB3FXI  
<http://wpaNBEMS.org>
- ARRL's HF Digital Handbook



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# Resources

- W1HJK (author of fldgi)  
<http://www.w1hkj.com/>
- MT63 page  
<http://www.qsl.net/z11bpu/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
- June 2010 QST

# *Advanced NBEMS*

- Data compression with Flwrap
- ICS-213 and ARRL Radiogram with Flmsg
- Use of Flarq
- Transmitting large data files
- Throughput benchmarking
- RSID
- New high-speed PSK “R” modes with FEC
- Download 3.2x from <http://www.w1hkj.com>