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.

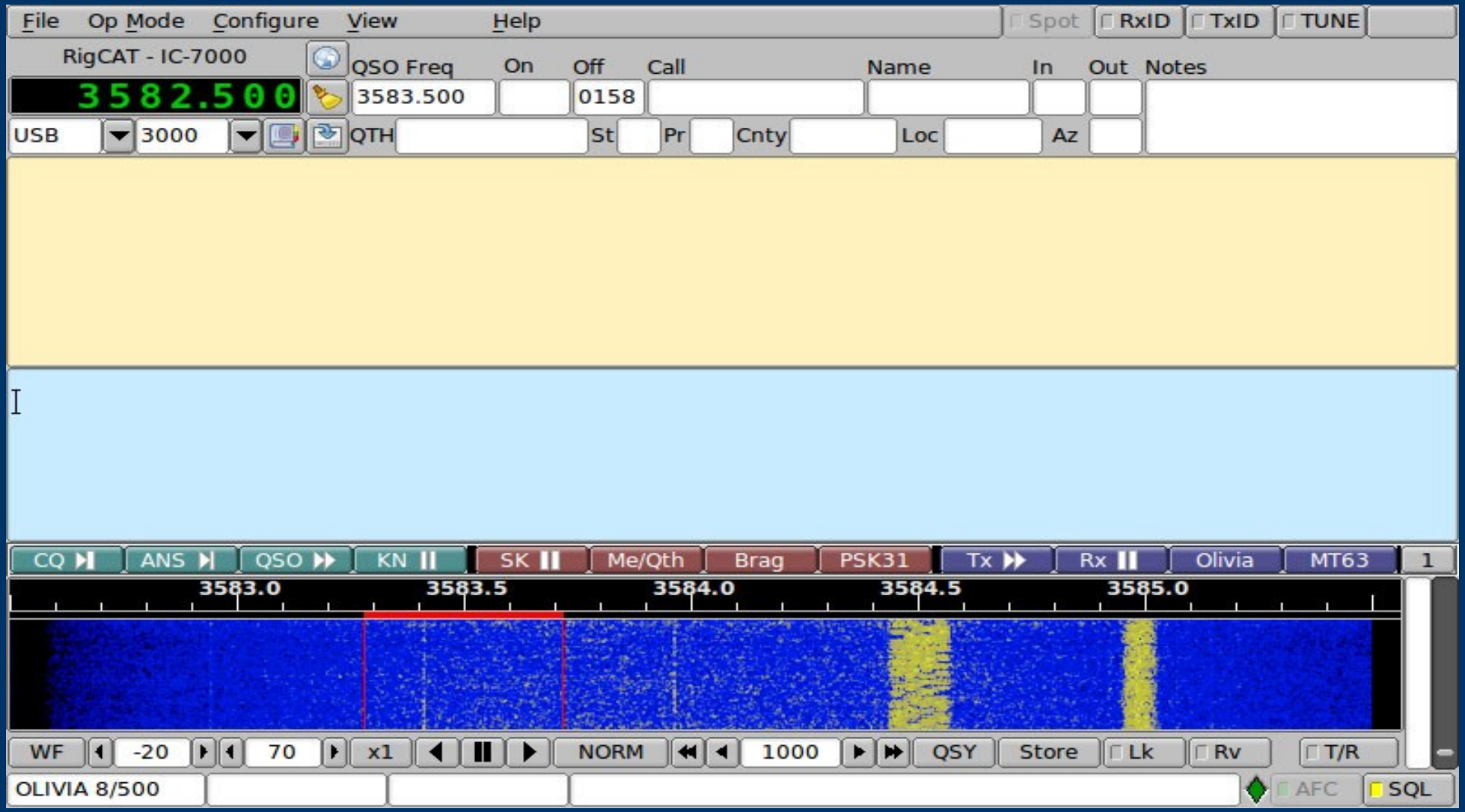
What is NBEMS?

- 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 forms 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



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 Terminal Node Controller (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.

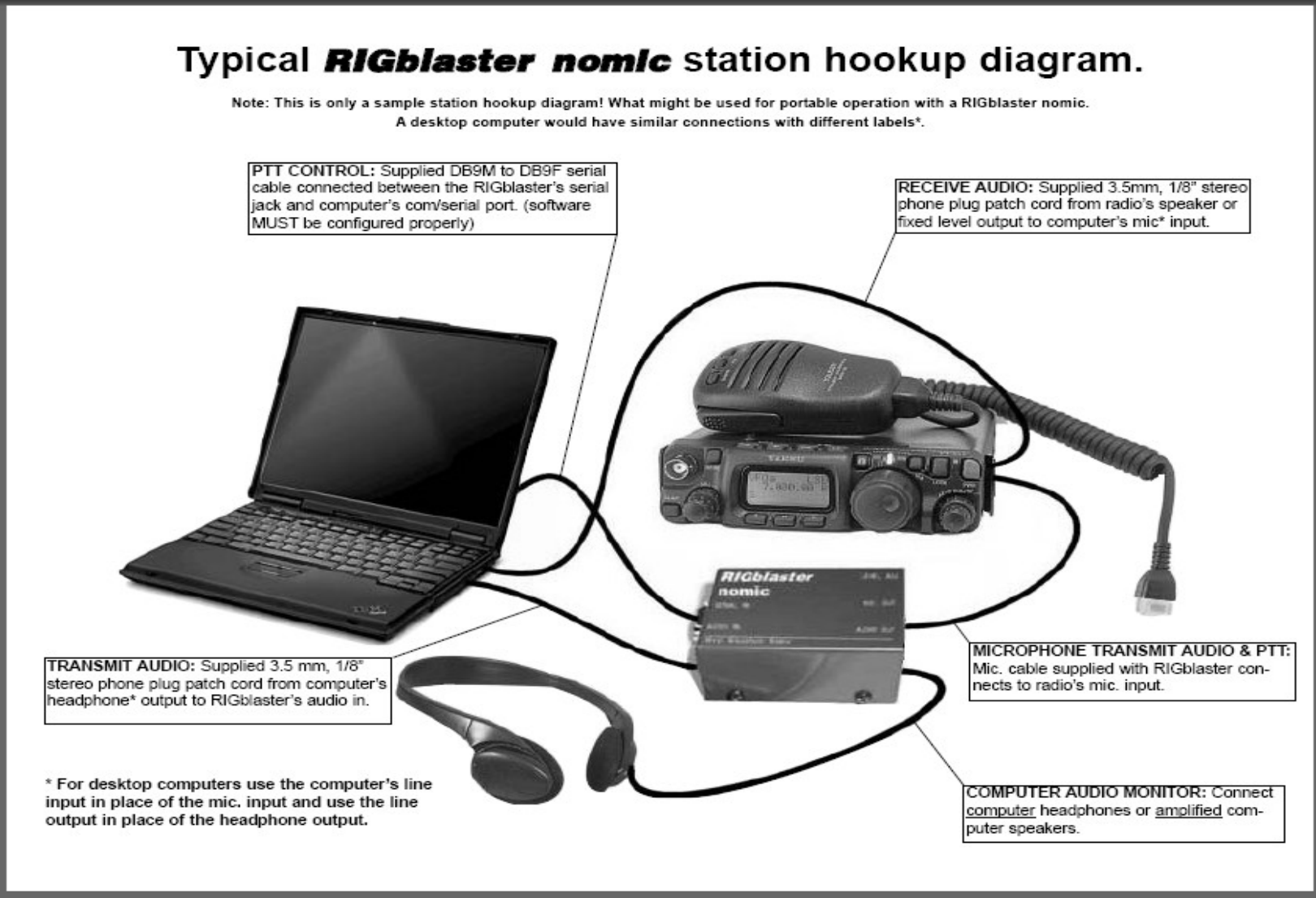
Interfacing with computer

- 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 or field site.

Typical Rigblaster nomic setup

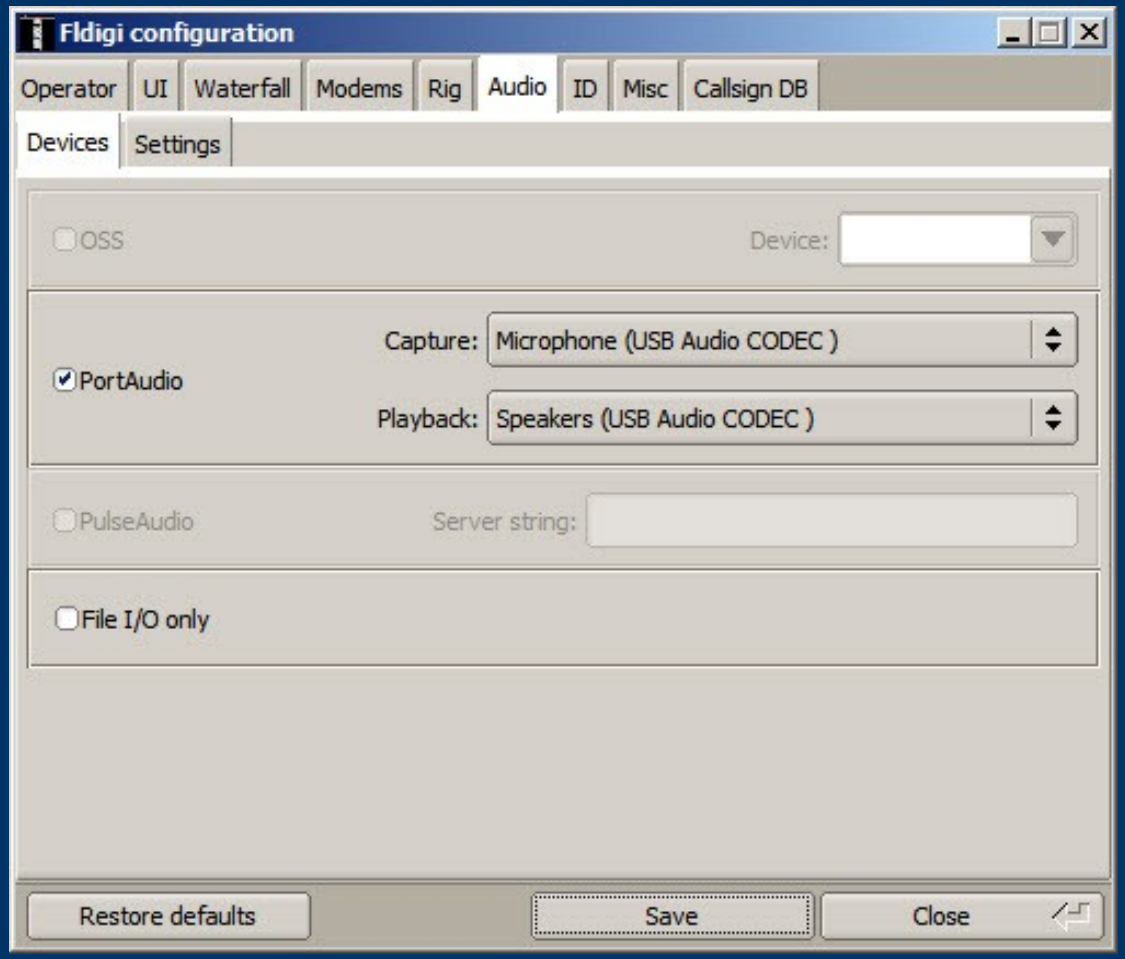


Signalink USB

SignaLink Configuration

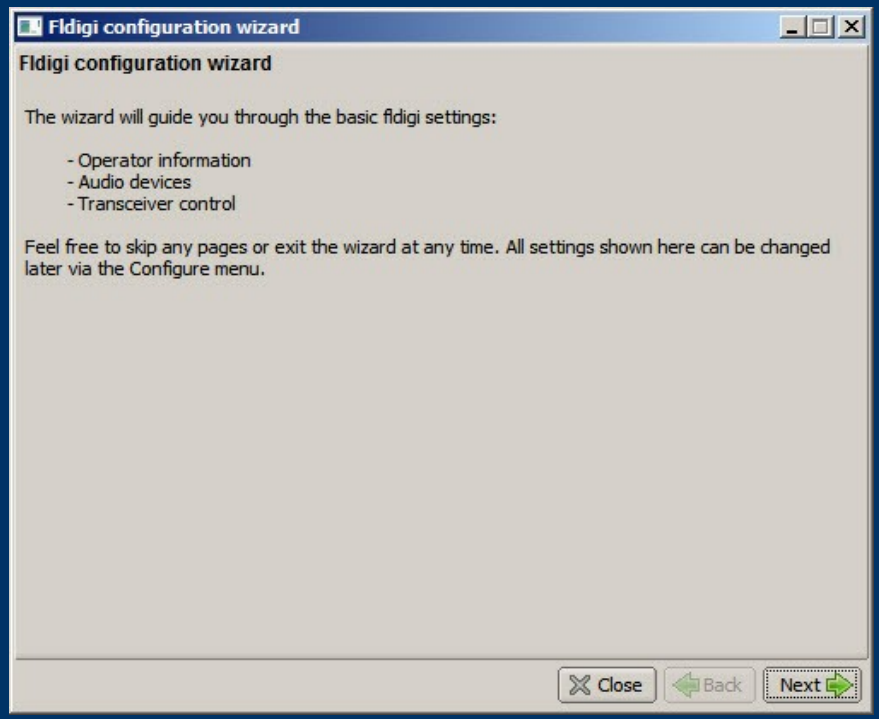
- SignaLink is very easy to configure.
- Just connect to computer via USB.
- Configure Fldigi to use SignaLink USB sound card.
- Generate just enough audio from computer to trigger SignaLink vox.
- Use volume controls on SignaLink and don't touch computer audio settings

SignaLink Configuration



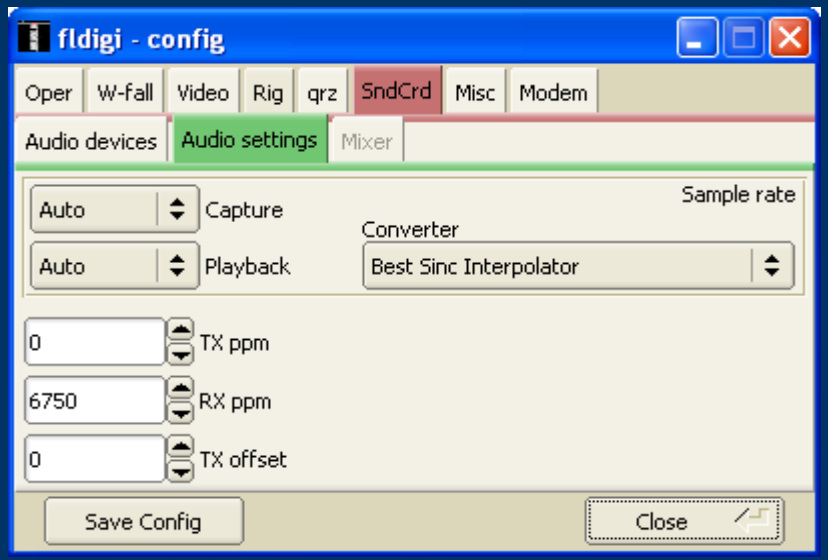
Configuring Fldigi

- 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.



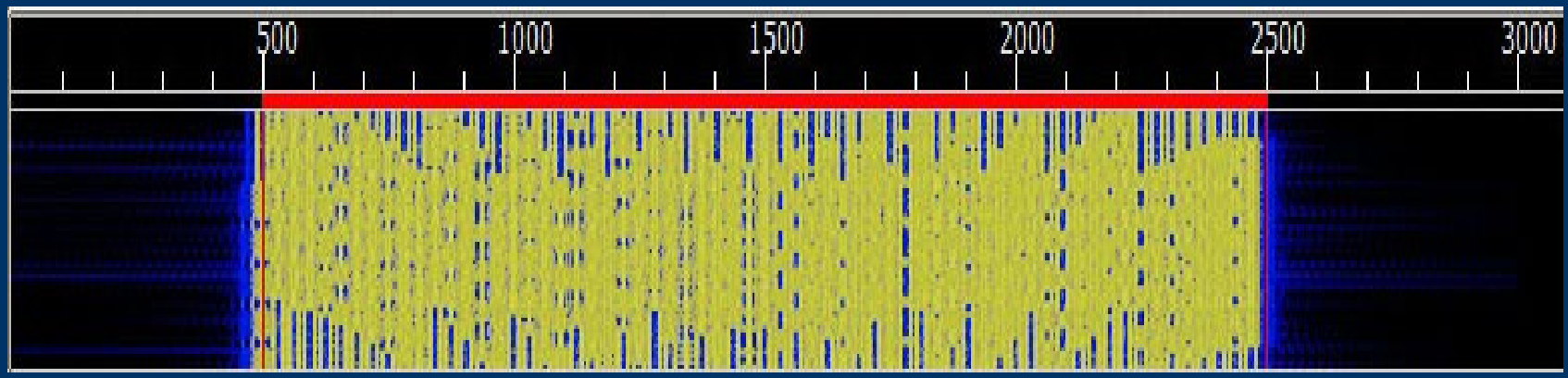
Modes

- 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

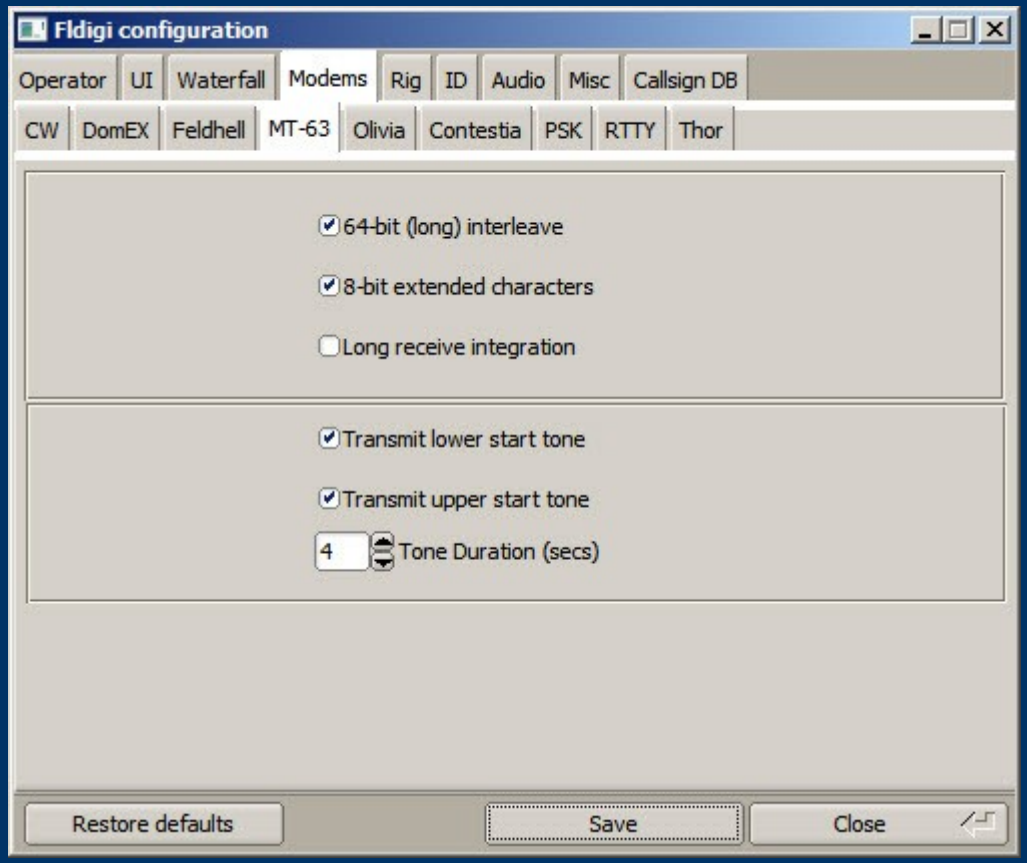
- MT63-2000 great choice for FM EmComm.
- Fast – less than 2 min to send 2kb text file.
- Data redundancy in time and in frequency.
- Used by MARS.
- Very resistant to noise – can lose up to 25% of signal and still copy.
- Works well with holding mike up to speaker
- Used in Allegheny County SET and Red Cross drills
- See instructional video at http://www.youtube.com/watch?v=SWZ2vKWSilE

MT63-2000 Waterfall



- 64 tones sent at same time
- Signal width is 2000 Hz
- Offset frequency is always fixed at 1500 Hz
- Fixed low frequency eliminates tuning errors
- Sounds like a giant buzzsaw

Important MT63 configuration



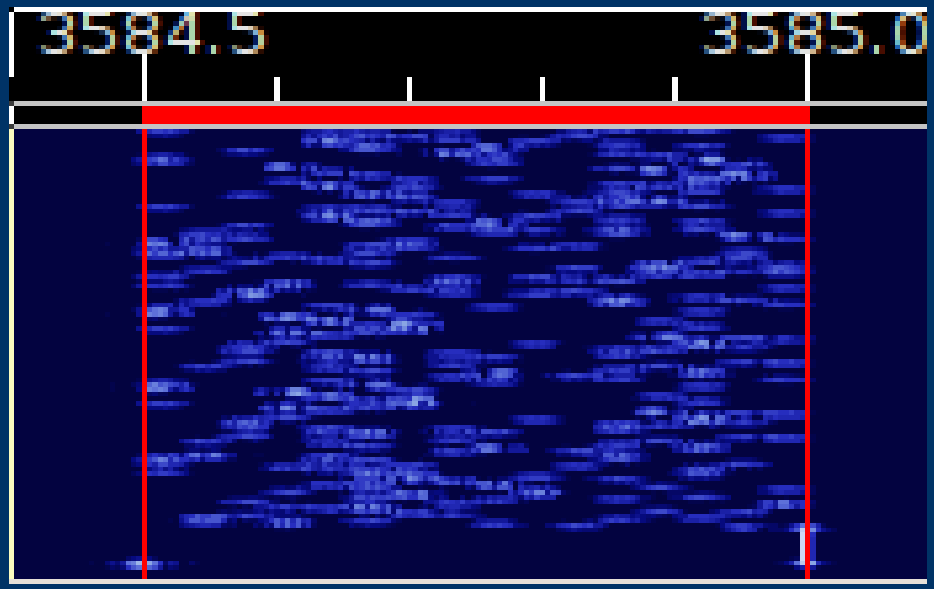
- Be sure to set 64 bit interleave and 8-bit char.
- Provides extra data redundancy.
- Both stations must have same interleave setting.

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.

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

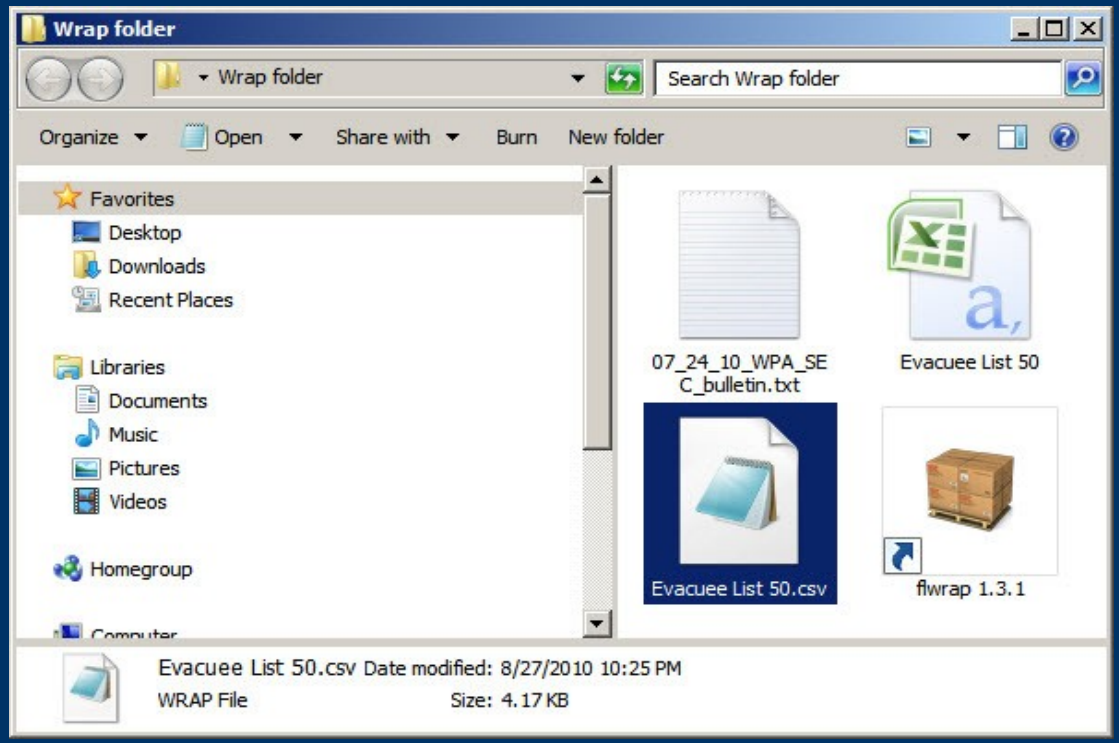
This is an example of a “wrapped” file:

```
[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.

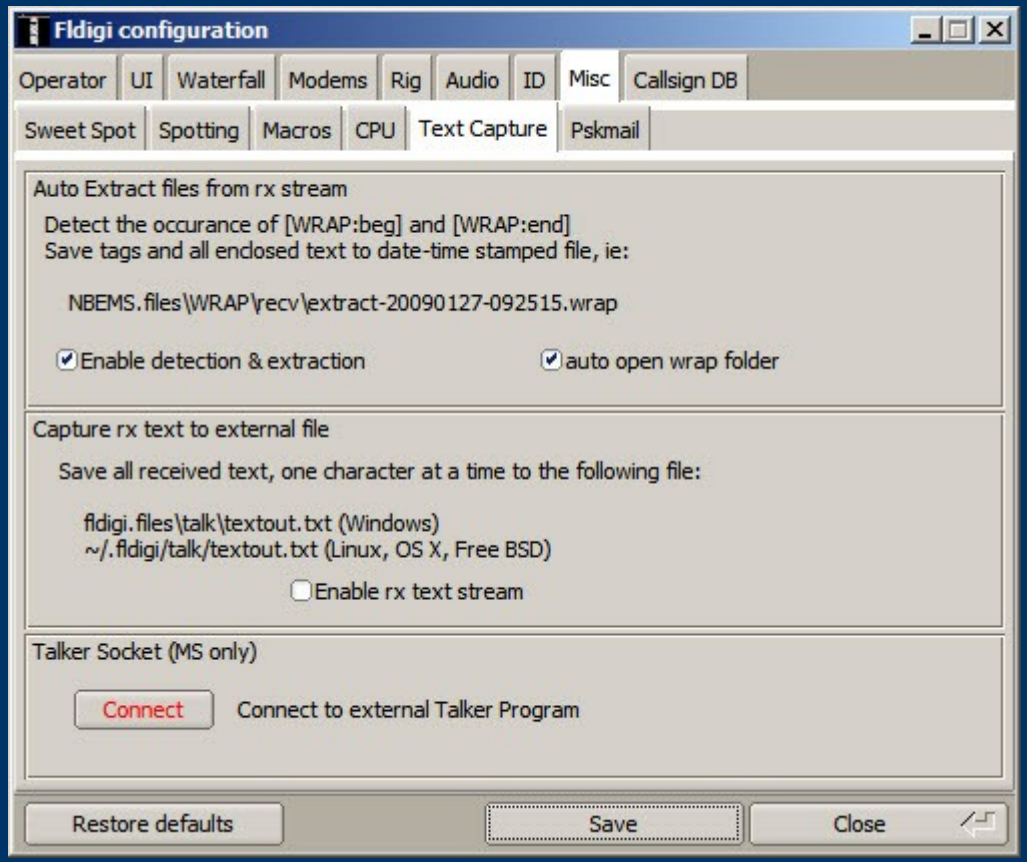
Wrapping data

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



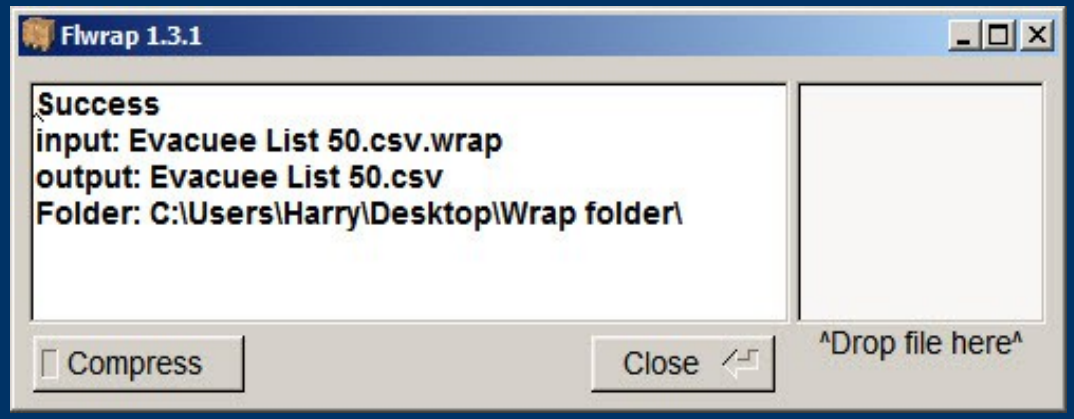
Configure fldigi to extract data

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



Verify extracted Wrapped files

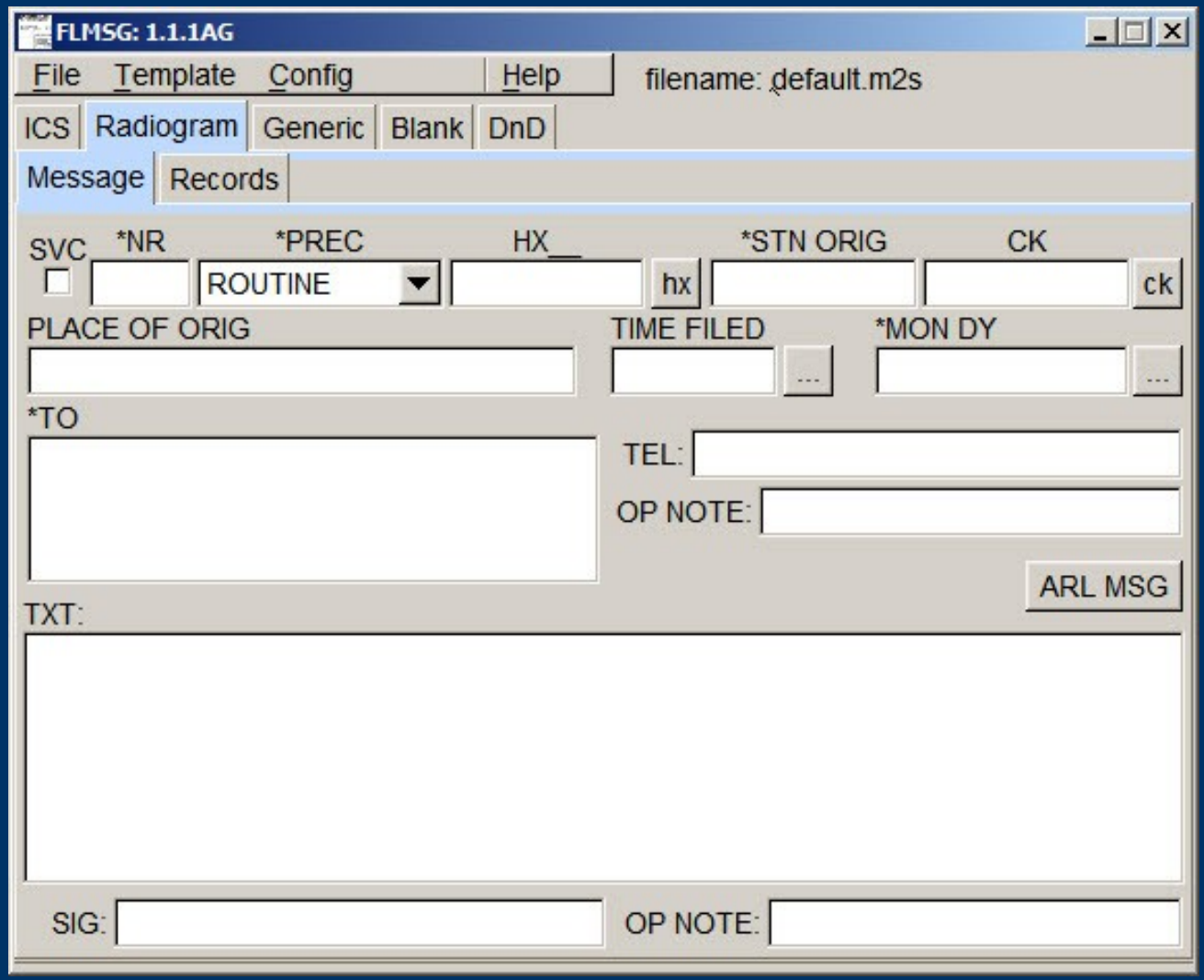
- Go to File-->Folders->NBEMS Files menu and enter Wrap/recv folder.
- Drag resulting files over Flrap icon to verify and extract data



Flmsg – send forms

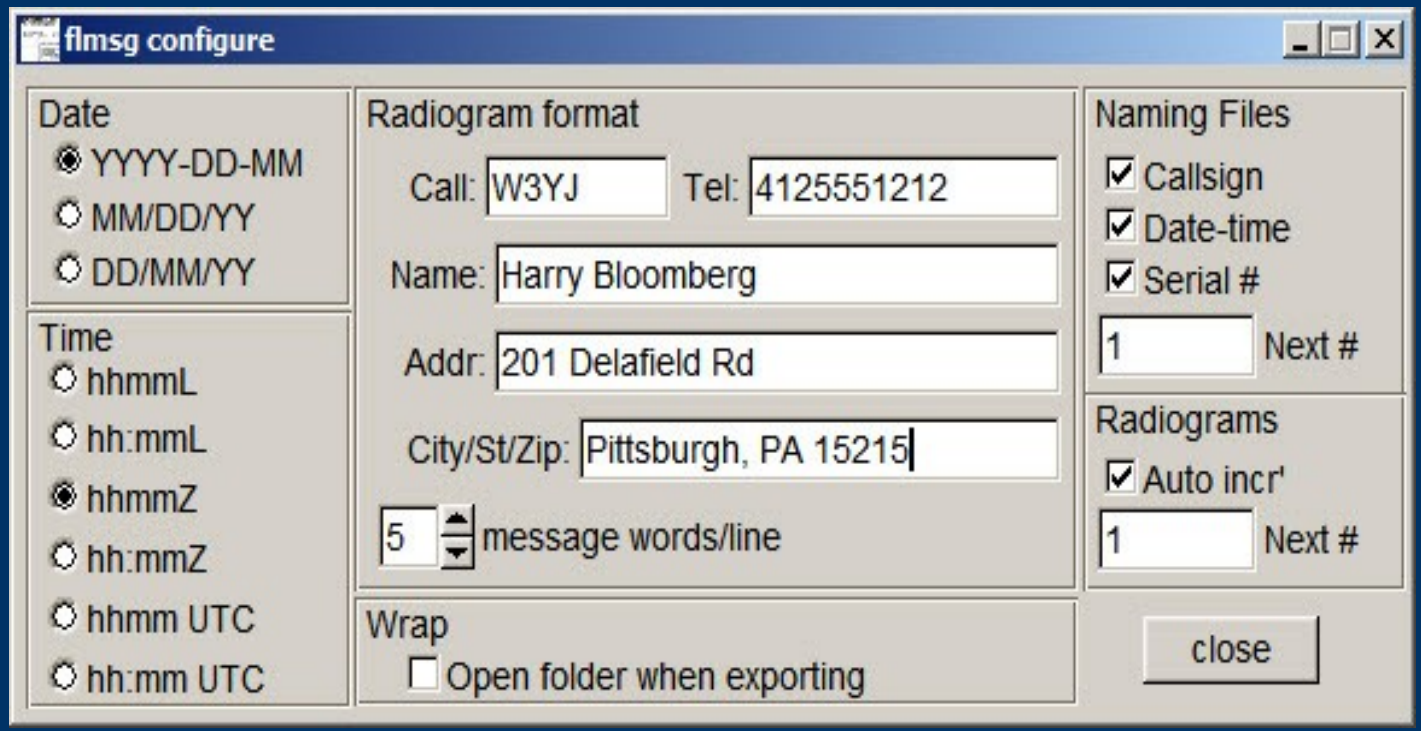
- Flmsg used to send formatted messages:
  - ICS forms like ICS-213
  - ARRL Radiograms
  - Blank text
- Blank text form can easily speed workflow for plain text messages.
- No need for use of text editor like Notepad.
- Automates use of Flwrap.
- Starts transmission automatically.
- Eases importing and checksum verification of incoming message.

Flmsg screenshot



Flmsg - configuration

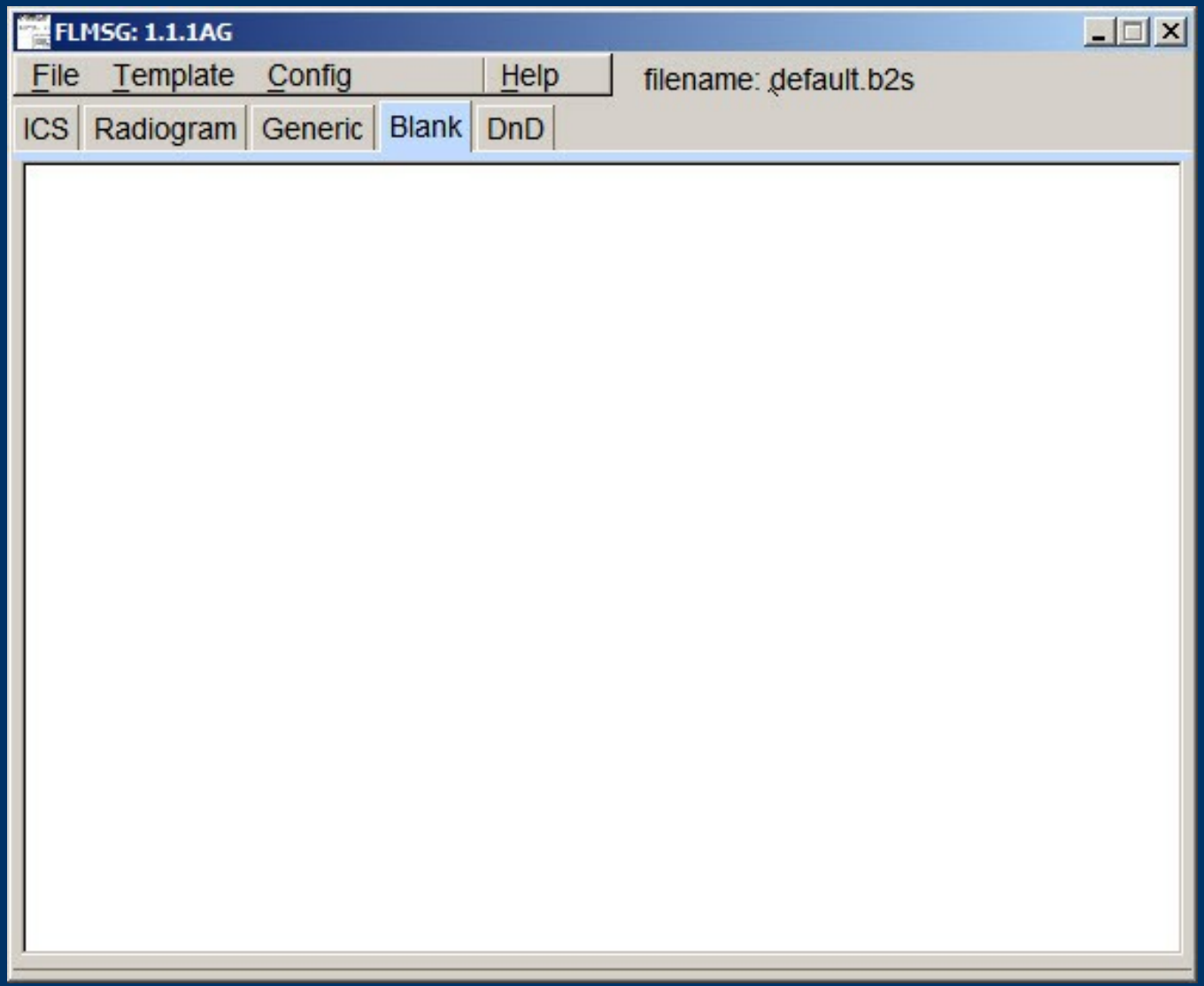
- Click on Config menu.
- Enter your preferences and info.



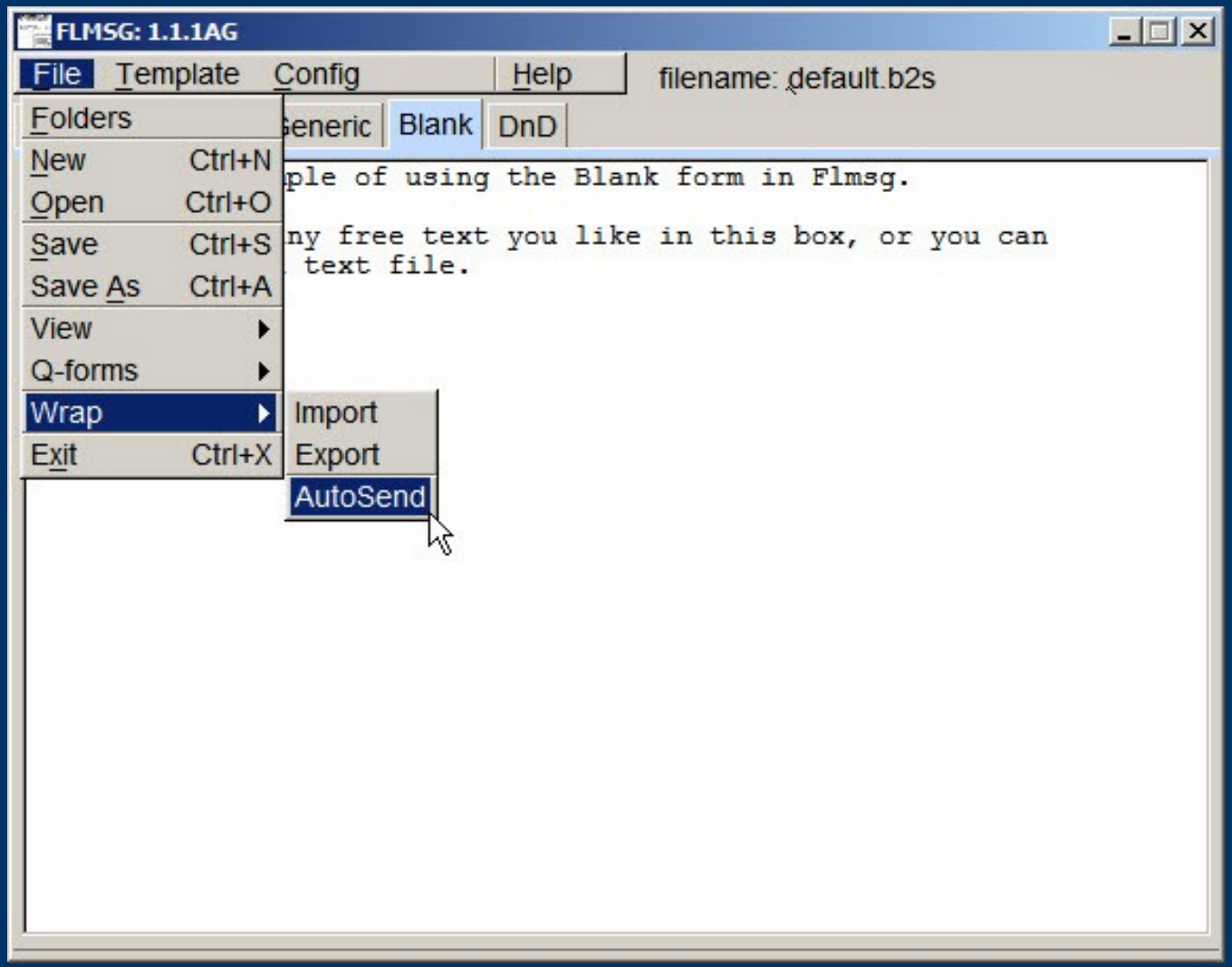
Flmsg – Autosend workflow

- Click on Blank tab.
- Enter text directly into large empty box.
- Can also drag-and-drop text file into box.
- File->Wrap->Autosend
- Will be prompted to save file with automatically assigned unique filename.
- Flmsg will cause Fldigi to automatically send message.
- That's it! Much simpler workflow!
- Easier to teach to beginners.

Flmsg – use Blank tab for text



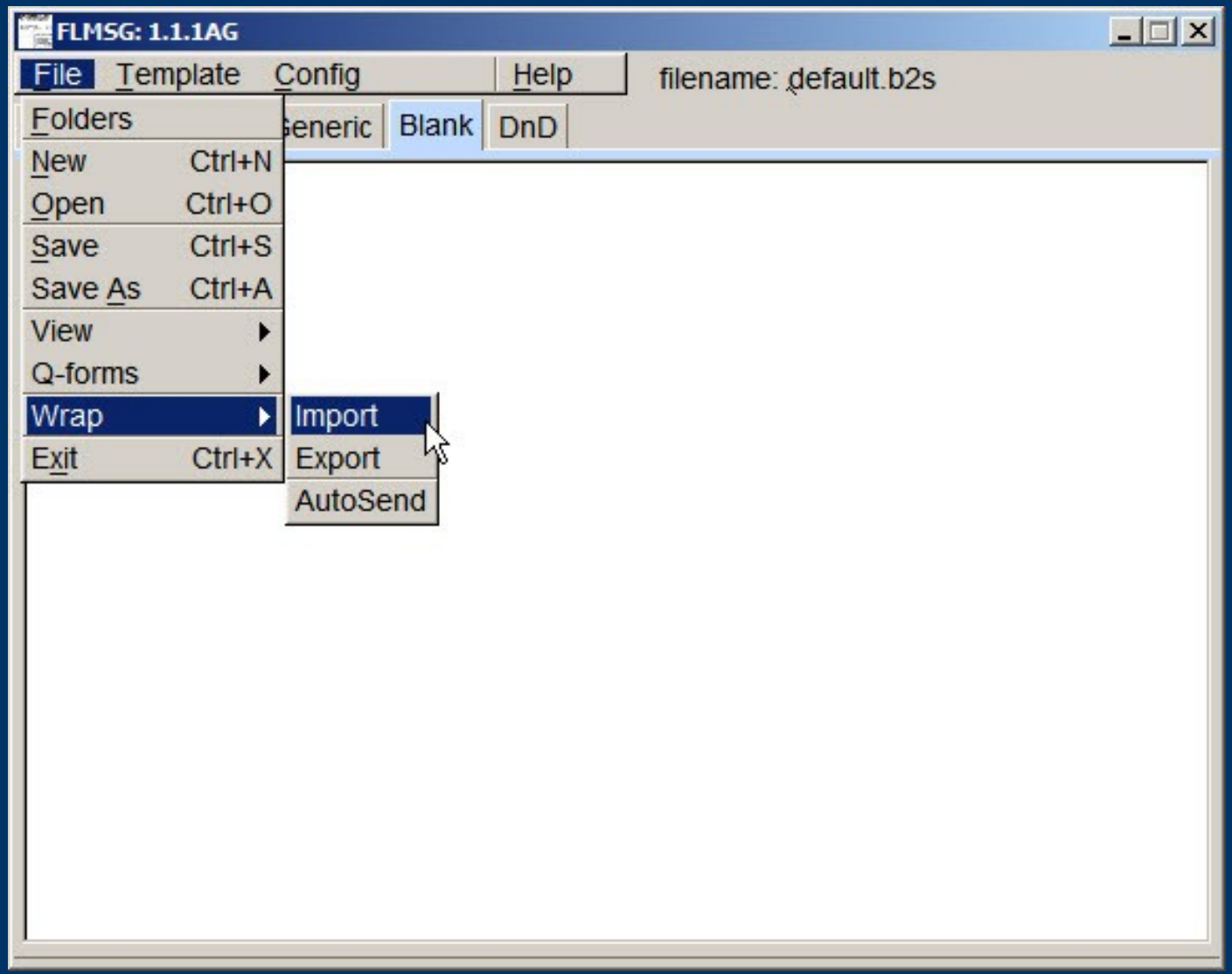
Flmsg - Autosend



Flmsg – importing file

- Flmsg simplifies importing file.
- File->Wrap->Import
- Select desired extract file from Wrap folder.
- Usually want extract file on bottom – newest file.
- File will be loaded into Flmsg.
- Can do this only if file was sent using Flmsg.
- If not sent with Flmsg, must use manual workflow.
- If checksum error, Flmsg will ask if you want to try to import anyway.

Flmsg – importing file



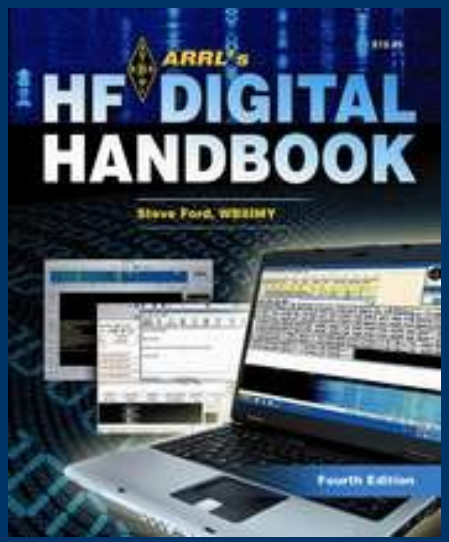
Next steps

- 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

- paNBEMS group
- Organized by Dave Kleber KB3FXI and Ed Brenneiser WA3WSJ
  http://paNBEMS.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
- June 2010 QST

Advanced NBEMS

- Data compression with Flwrap
- ICS forms and ARRL Radiogram with Flmsg
- Use of Flarq
- Transmitting large data files
- Throughput benchmarking
- RSID
- New high-speed PSK “R” modes with FEC