

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

The screenshot displays the Fldigi software interface. At the top, the menu bar includes File, Op Mode, Configure, View, and Help. Below the menu bar, the RigCAT section shows 'RigCAT - IC-7000'. The main display area features a large digital frequency display showing '3582.500' in green. To the right of the frequency display are fields for QSO Freq (3583.500), On, Off (0158), Call, Name, In, Out, and Notes. Below these are fields for QTH, St, Pr, Cnty, Loc, and Az. The interface is divided into a yellow upper section and a light blue lower section. At the bottom, there is a control panel with buttons for CQ, ANS, QSO, KN, SK, Me/Qth, Brag, PSK31, Tx, Rx, Olivia, and MT63. Below the buttons is a frequency scale from 3583.0 to 3585.0. A waterfall plot shows a blue background with a yellow vertical line at 3584.5. The bottom control panel includes buttons for 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 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

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.



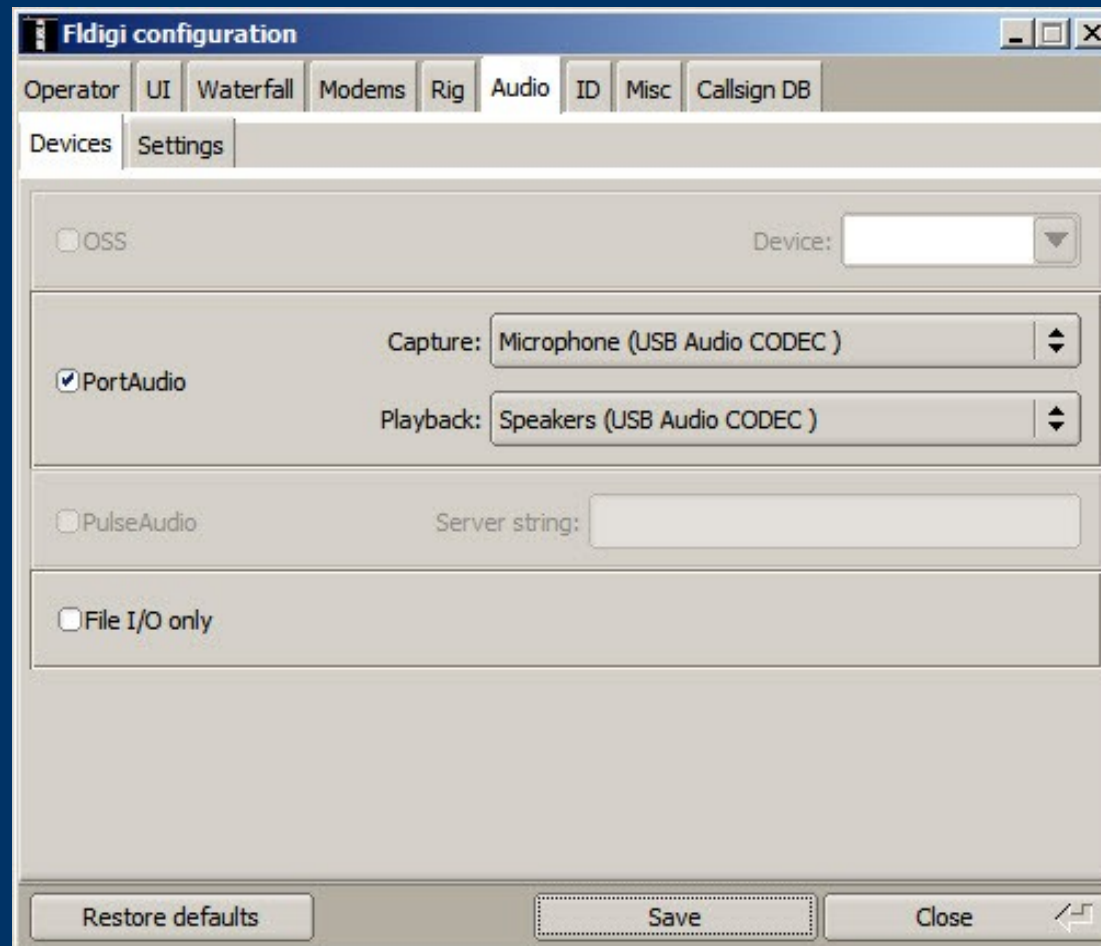
Signalink USB



Signalink Configuration

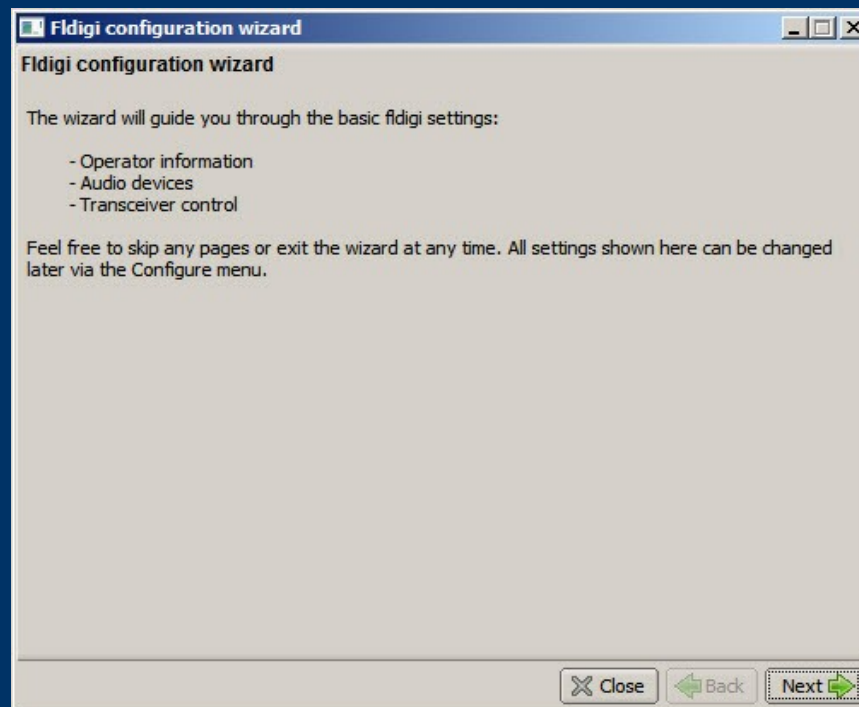
- Signalink is very easy to configure.
- Just connect to computer via USB.
- Configure Fldigi to use Signalink USB sound card.
- Generate just enough audio from computer to trigger Signalink vox.
- Use volume controls on Signalink and don't touch computer audio settings

Signalink Configuration



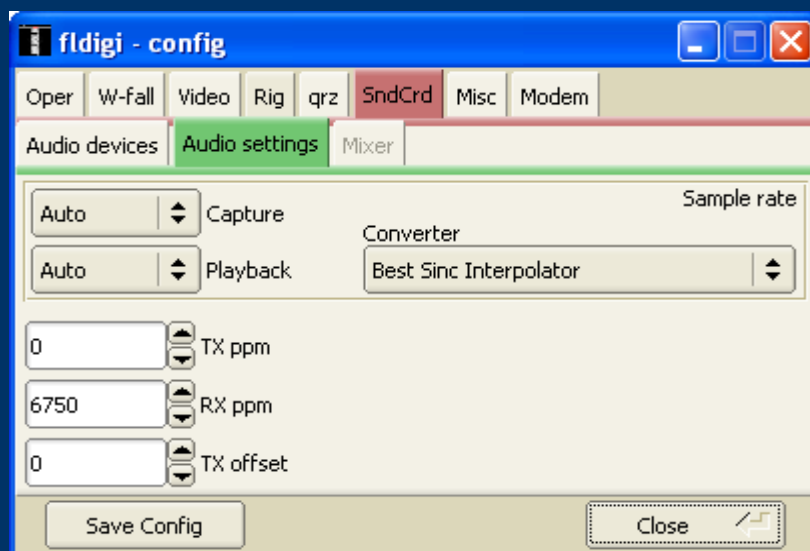
Configuring Fldigi

- 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.



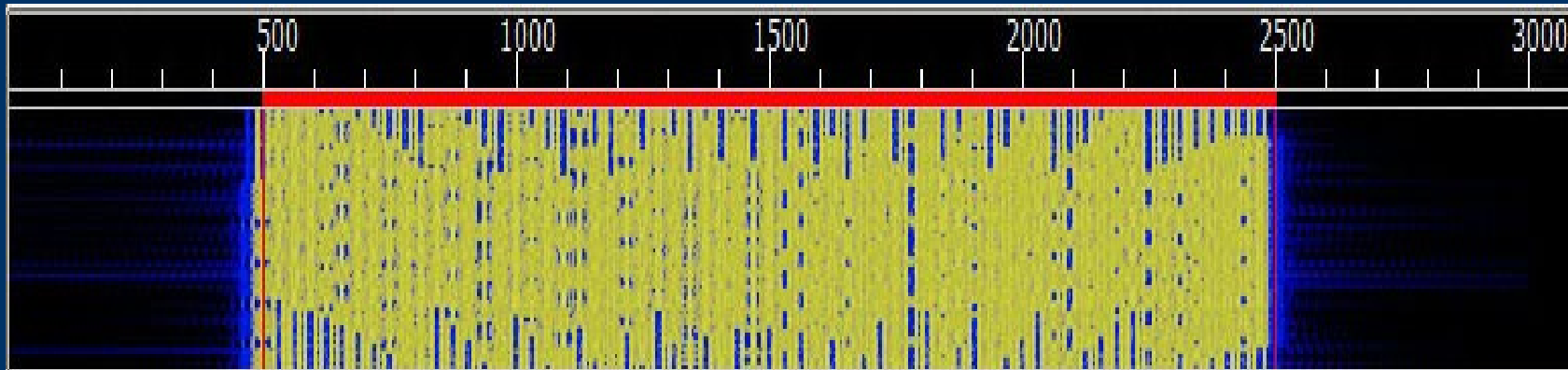
Modes

- 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

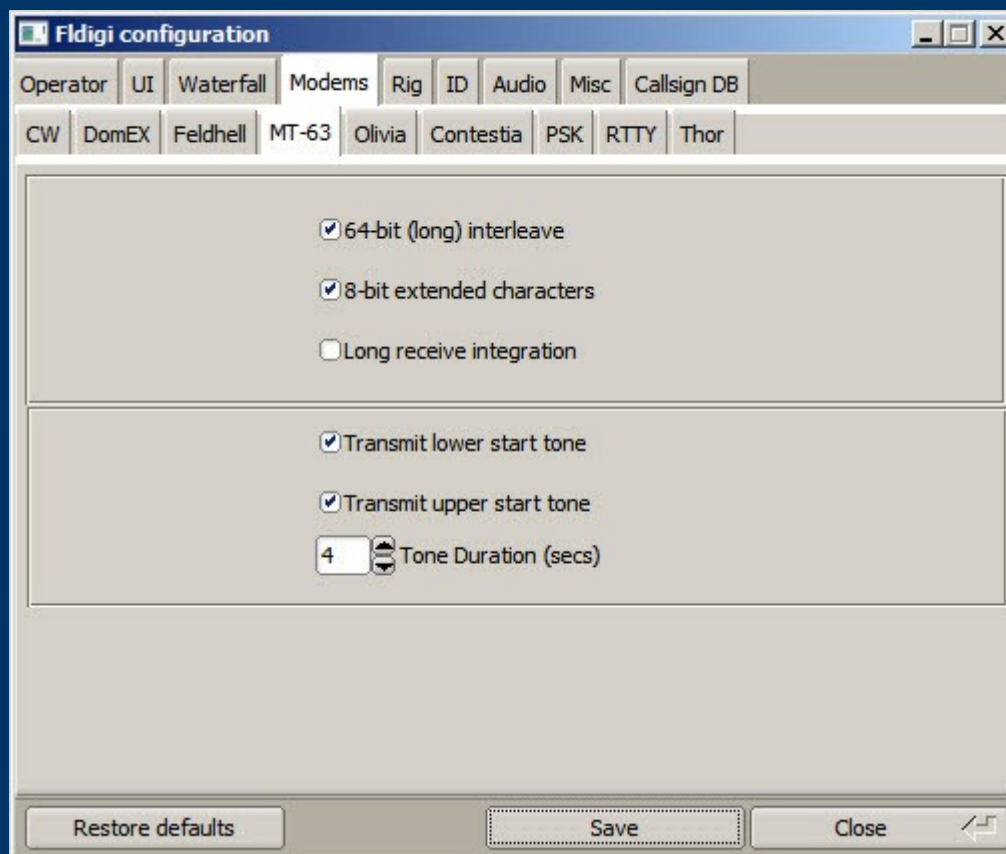
- MT63-2000 great choice for FM EmComm.
- Fast – less than 2 min to send 2kb text file.
- Data redundancy in time and in frequency.
- Used by MARS.
- Very resistant to noise – can lose up to 25% of signal and still copy.
- Works well with holding mike up to speaker
- Used in Allegheny County SET and Red Cross drills
- See instructional video at <http://www.youtube.com/watch?v=SWZ2vKWSi1E>

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



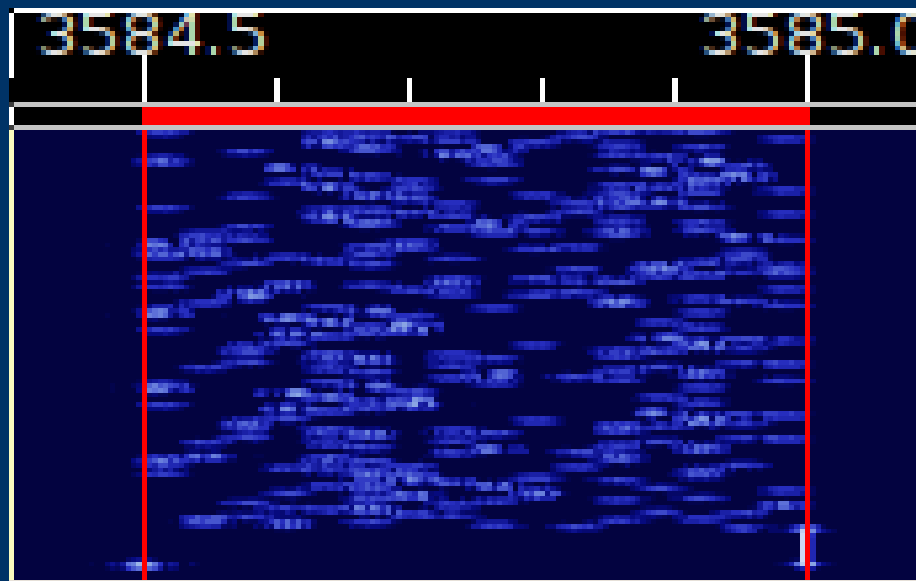
- Be sure to set 64 bit interleave and 8-bit char.
- Provides extra data redundancy.
- Both stations must have same interleave setting.

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

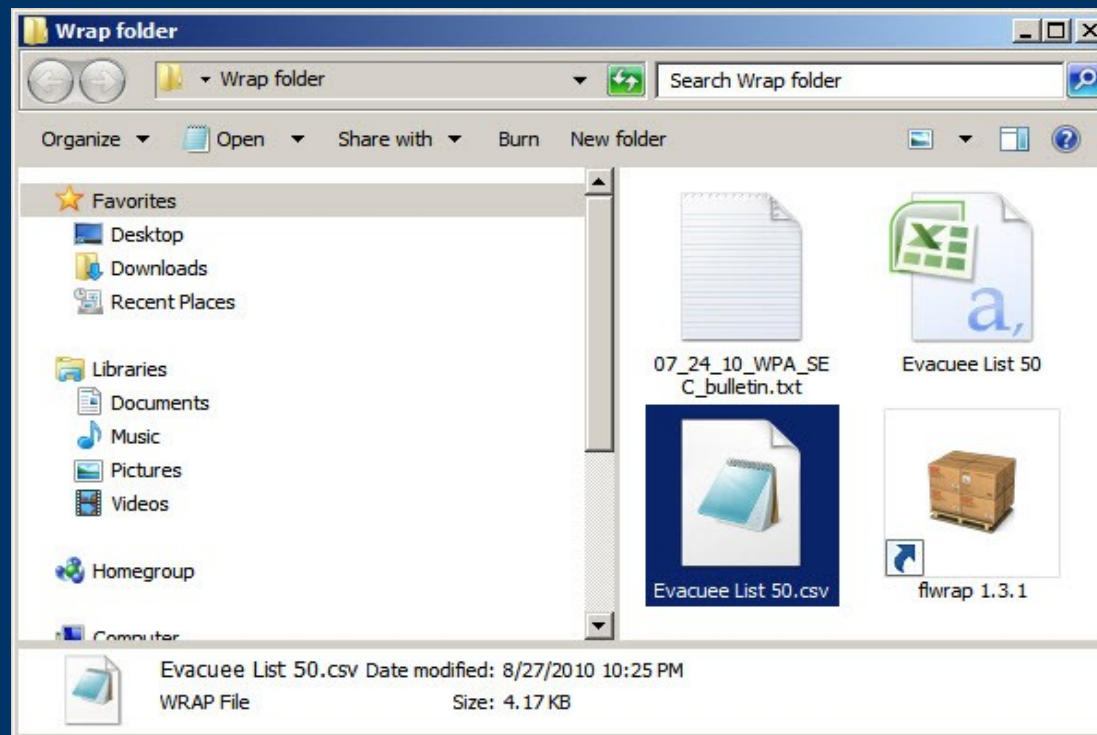
This is an example of a “wrapped” file:

```
[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.

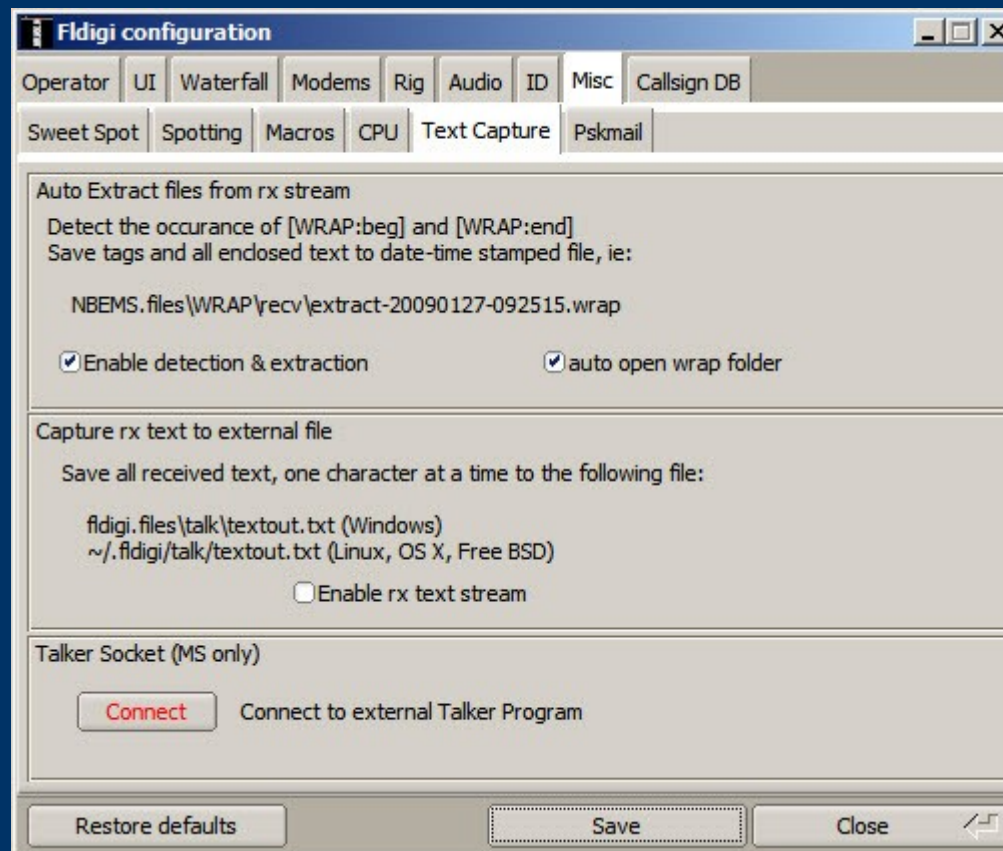
Wrapping data

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



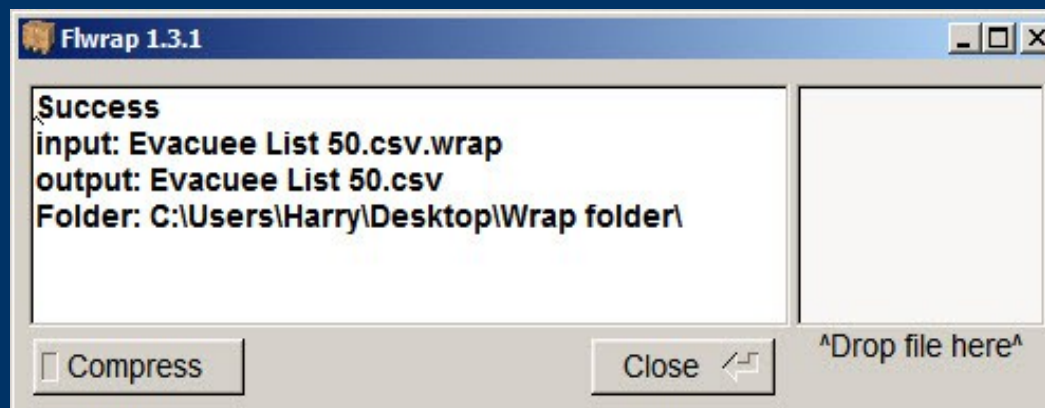
Configure fldigi to extract data

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

The screenshot shows the FLMSG: 1.1.1AG application window. The title bar reads "FLMSG: 1.1.1AG" and the filename is "default.m2s". The menu bar includes "File", "Template", "Config", and "Help". Below the menu bar are tabs for "ICS", "Radiogram", "Generic", "Blank", and "DnD". The "Message" tab is active, with a sub-tab for "Records".

The main form contains several input fields and buttons:

- SVC**: A checkbox.
- *NR**: A text input field.
- *PREC**: A dropdown menu currently set to "ROUTINE".
- HX**: A text input field.
- *STN ORIG**: A text input field.
- CK**: A text input field.
- PLACE OF ORIG**: A text input field.
- TIME FILED**: A text input field with a browse button (...).
- *MON DY**: A text input field with a browse button (...).
- *TO**: A large text input area.
- TEL:**: A text input field.
- OP NOTE:**: A text input field.
- ARL MSG**: A button.
- TXT:**: A large text input area.
- SIG:**: A text input field.
- OP NOTE:**: A text input field.

Flmsg - configuration

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

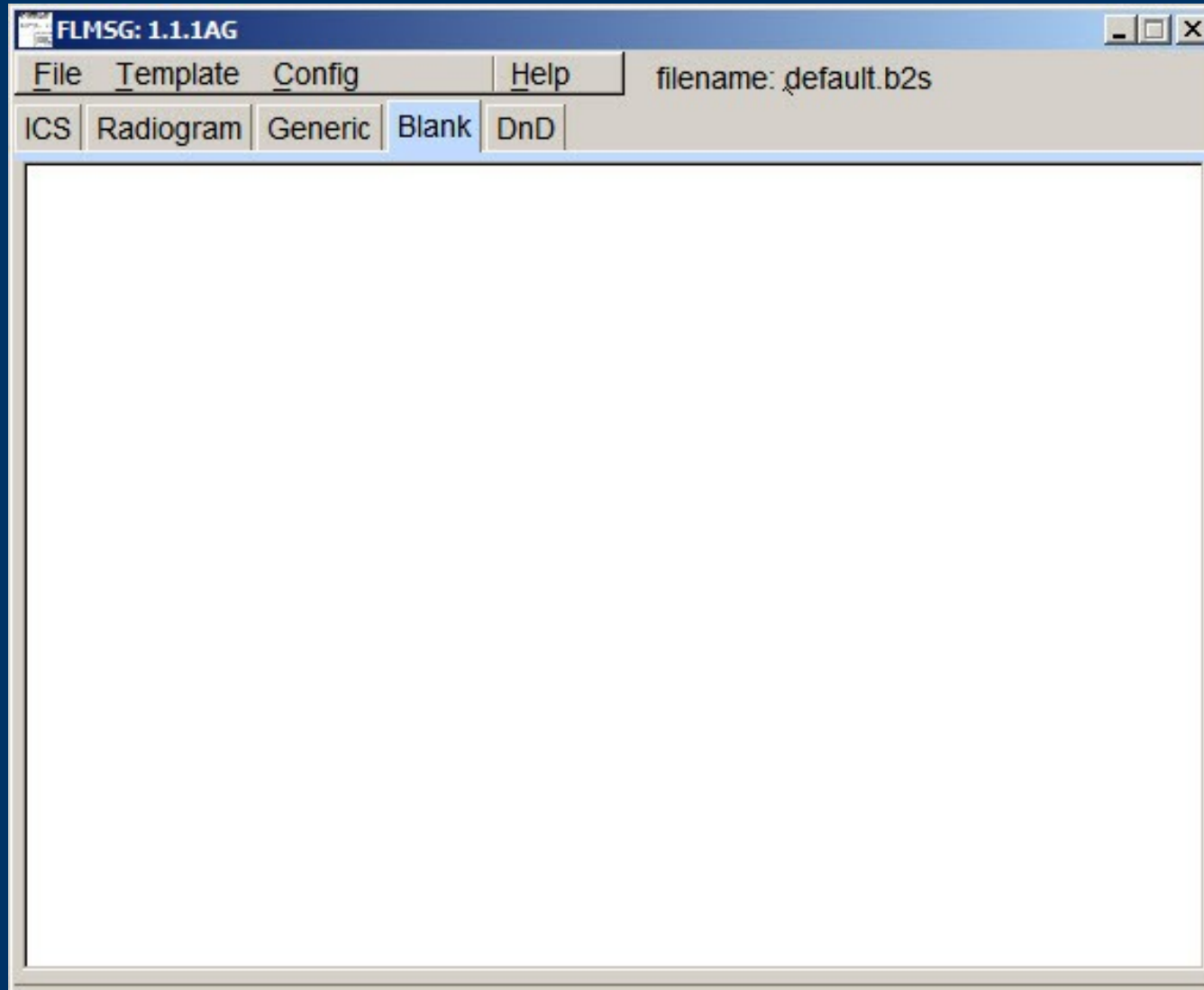
The screenshot shows a Windows-style dialog box titled "flmsg configure". It is divided into several sections for configuration:

- Date:** Three radio buttons for date formats: YYYY-DD-MM, MM/DD/YY, and DD/MM/YY.
- Time:** Six radio buttons for time formats: hhmmL, hh:mmL, hhmmZ, hh:mmZ, hhmm UTC, and hh:mm UTC.
- Radiogram format:** Fields for "Call:" (W3YJ), "Tel:" (4125551212), "Name:" (Harry Bloomberg), "Addr:" (201 Delafield Rd), and "City/St/Zip:" (Pittsburgh, PA 15215). A spinner box shows "5" with the label "message words/line".
- Wrap:** A checkbox labeled "Open folder when exporting" which is currently unchecked.
- Naming Files:** Three checked checkboxes: "Callsign", "Date-time", and "Serial #". Below them is a spinner box with "1" and the label "Next #".
- Radiograms:** One checked checkbox: "Auto incr'". Below it is a spinner box with "1" and the label "Next #".
- A "close" button is located at the bottom right of the dialog.

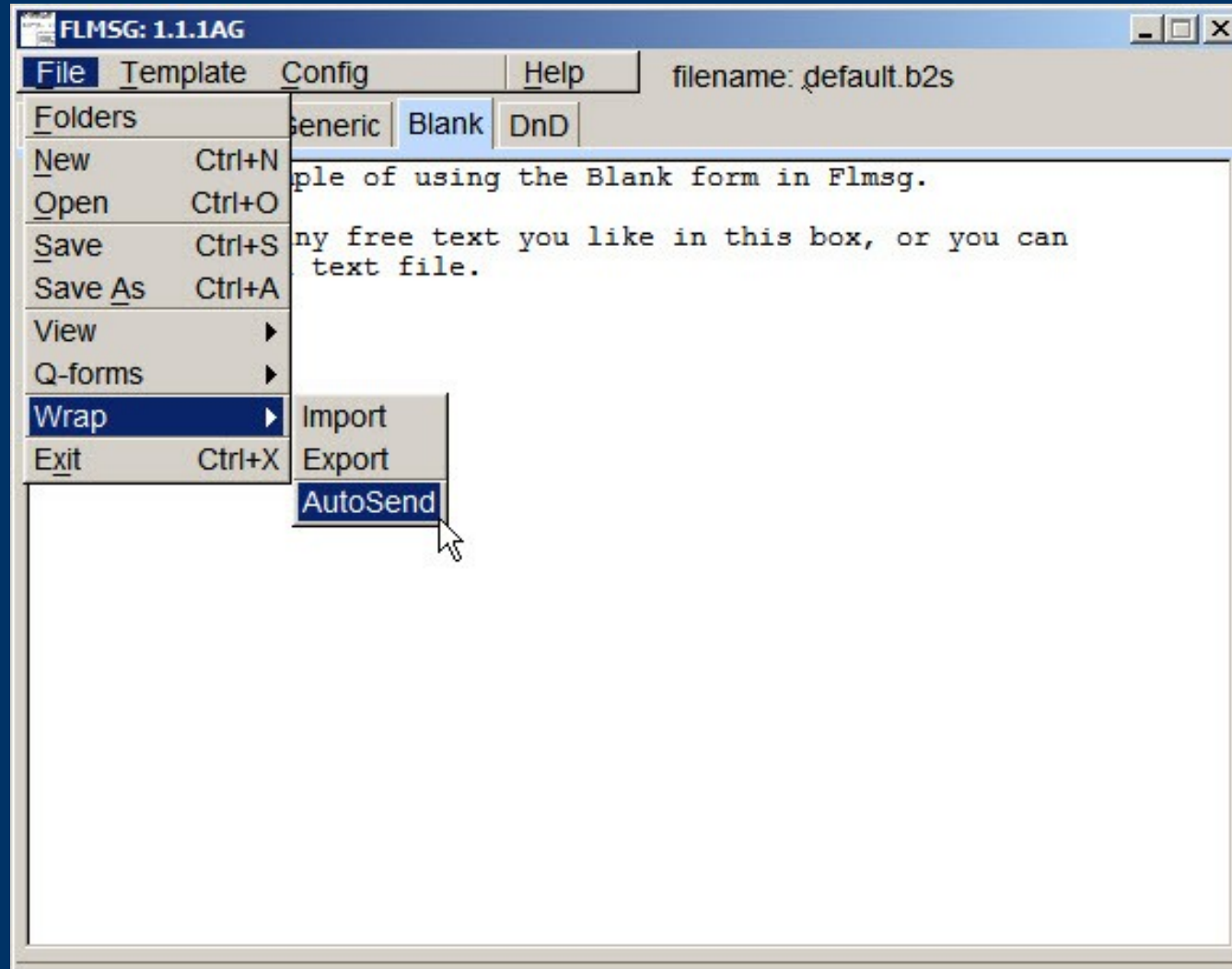
Flmsg – Autosend workflow

- 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



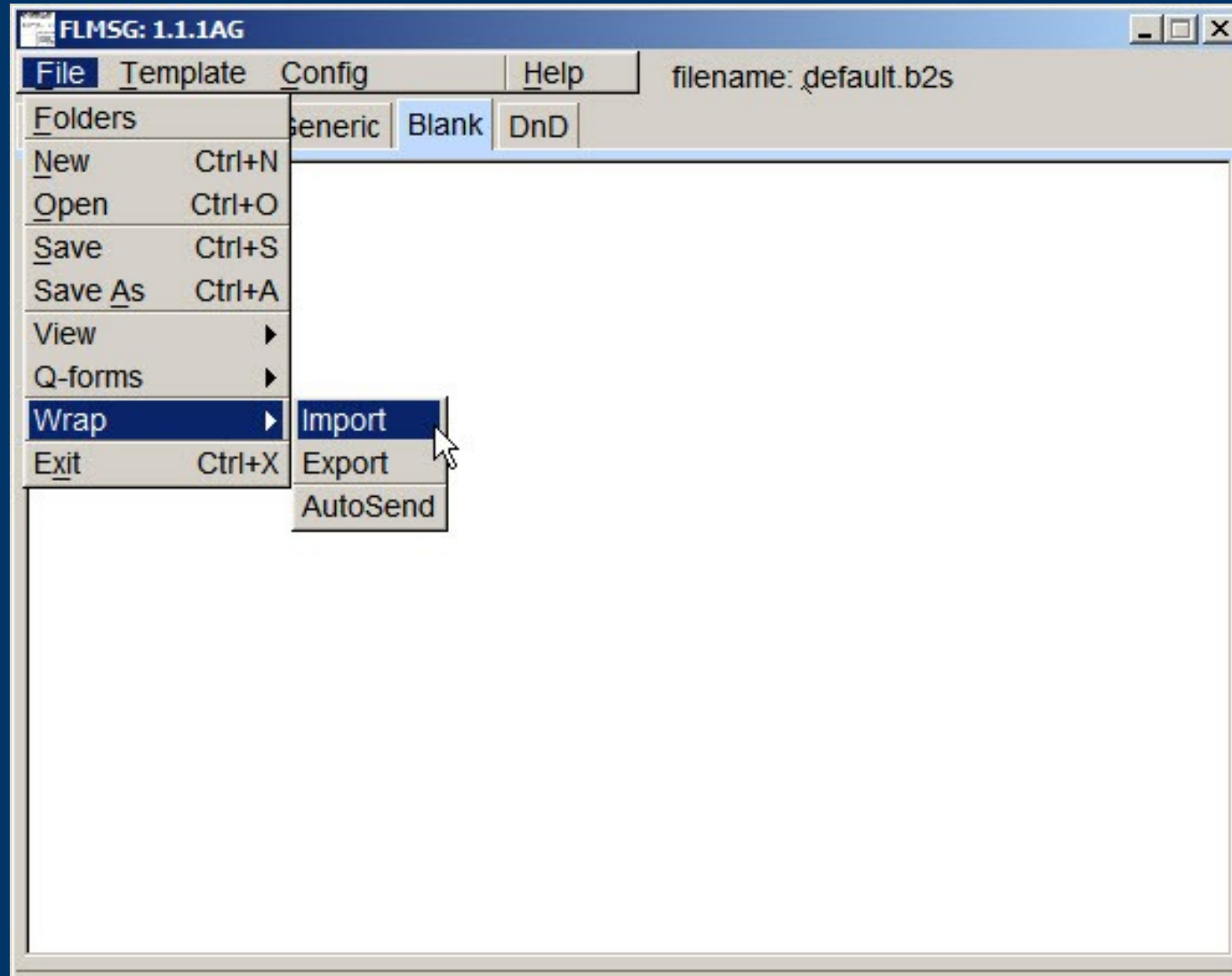
Flmsg - Autosend



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



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