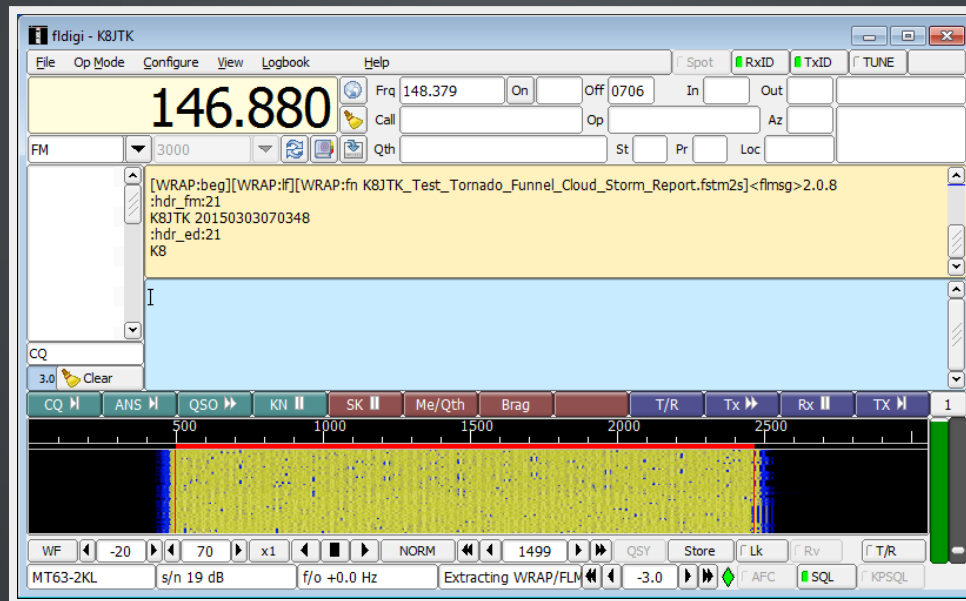


# VHF/UHF NBEMS

## AN INTRODUCTION USING FLDIGI AND FLMSG



Jeffrey Kopcak - K8JTK  
ARRL Ohio Section Technical Coordinator

# TECHNICAL COORDINATOR

The ARRL Technical Coordinator (TC) is a section-level official appointed by the Section Manager to coordinate all technical activities within the section.

- Supervise and coordinate the work of the section's Technical Specialists (TS).
- Refer amateurs in the section who need technical advice to local TS.
- Encourage amateurs in the section to share their technical achievements with others through the pages of QST, at club meetings, hamfests, and conventions.

# TECHNICAL COORDINATOR

- Be available to assist local technical program committees in arranging suitable programs for local club meetings, ARRL hamfests, and conventions.
- Promote technical advances and experimentation at VHF/UHF and with specialized modes, and work closely with enthusiasts in these fields within the section.

# TECHNICAL SPECIALIST

For a section team to be effective in one of the most important arenas in Amateur Radio, technology, there must be a cadre of qualified, competent Technical Specialists (TS).

"Advancement of the radio art" is a profound obligation we incur under the rules of the FCC.

TSes help meet this obligation.

# TECHNICAL SPECIALIST

TS supports the TC in two main areas of responsibility:  
**Radio Frequency Interference and Technical Information.**

Technical Specialist can specialize in certain specific technical areas, or can be generalists.

<http://www.arrl.org/technical-specialist>

# OUTLINE

- Digital communications
- Emcomm
- NBEMS
- Interfacing digital modes
- Fldigi & MT63-2KL
- Flmsg
- Setup Fldigi and Flmsg
- Workflow
- Hands on & demonstrations

# DIGITAL COMMUNICATIONS

Digital is a binary representation of some data (1's and 0's).  
Encoded in a structure before transmission.

Digital is a very broad term and takes many forms:

- **Morse Code (CW).**
- **Voice:** P25, D-STAR, DMR, FreeDV, System Fusion.
- **Text and data:** D-STAR, MT63, MFSK, JT65, Olivia, Packet/APRS, PSK31, RTTY, System Fusion.

img: [KhalilAensland](#)

# WHY DIGITAL?

Wide spread ownership of personal computing devices allows amateurs to develop and use these modes for communication purposes. This includes smartphones and tablets.

When compared to voice communications, digital can be:

- **Faster:** Transmit more words per minute.
- **Reliable:** Greater distances. Poorer conditions. Forward error correction (redundant encoding to reconstruct lost data without retransmission).

Each mode has applications, uses, advantages, and disadvantages.



# EMCOMM

Short messages suited for voice:

*Patient transport - romeo 5 - has arrived at Lakewood Hospital.*

*Patient 176008 status is now green.*

Not suited for voice:

- Lists of patients.
- Descriptions of prescription medications.
- Lists of supplies.
- Directions to a location.
- Contacts and phone numbers.

# CASE FOR DIGITAL EMCOMM

Voice example:

*St. John's, prepare to copy.  
Tag 176003, female, 20 - 30, transport helo,  
red.*

Now imagine having to transmit and verify that 20, 30, **50** times or more. How long would that take?

Not including phonetics, repeats, fills, breaks, and confirmation... **17 minutes.**

Using a digital mode, we can transmit that data in a fraction of the time... and verify it! **2 minutes 28 seconds.**

# ENTER NBEMS

NBEMS stands for Narrow Band Emergency Messaging System (or Software).

Established standards for passing email and text-based traffic over Amateur Radio.



David H Freese, Jr.  
W1HKJ



Howard (Skip) Teller  
KH6TY

# NBEMS PHILOSOPHY

- Utilize radios, software, and hardware that are used in every day ham radio (familiarity).
- Inexpensive. All can participate. Older computers can be used.
- Simple. No steep learning curve in an emergency situation but flexible.
- Independent of infrastructure.



img: [RCARC](#)

# INTERFACES

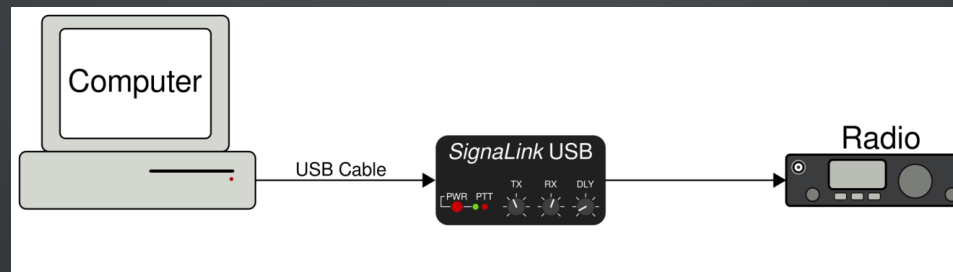
Need a radio, computer, interface between the two, and software.

- **Signalink USB (preferred).**
- Rigblaster.
- Built in USB on newer HF radios.
- Build your own connection.
- **Acoustic interface.**

All audio/DSP enhancements must be disabled!

# SIGNALINK USB

- \$120 for the **Signalink USB** and connecting cable at ham retailer.
- Connecting cable depends on radio.
- Simple wiring instructions for radio and cable. Jumper modules available \$10/ea, good using multiple radios.
- W: 3.2 in., H: 1.6 in., D: 3.6 in. 0.40 lbs.
- VOX. Computer audio triggers PTT.



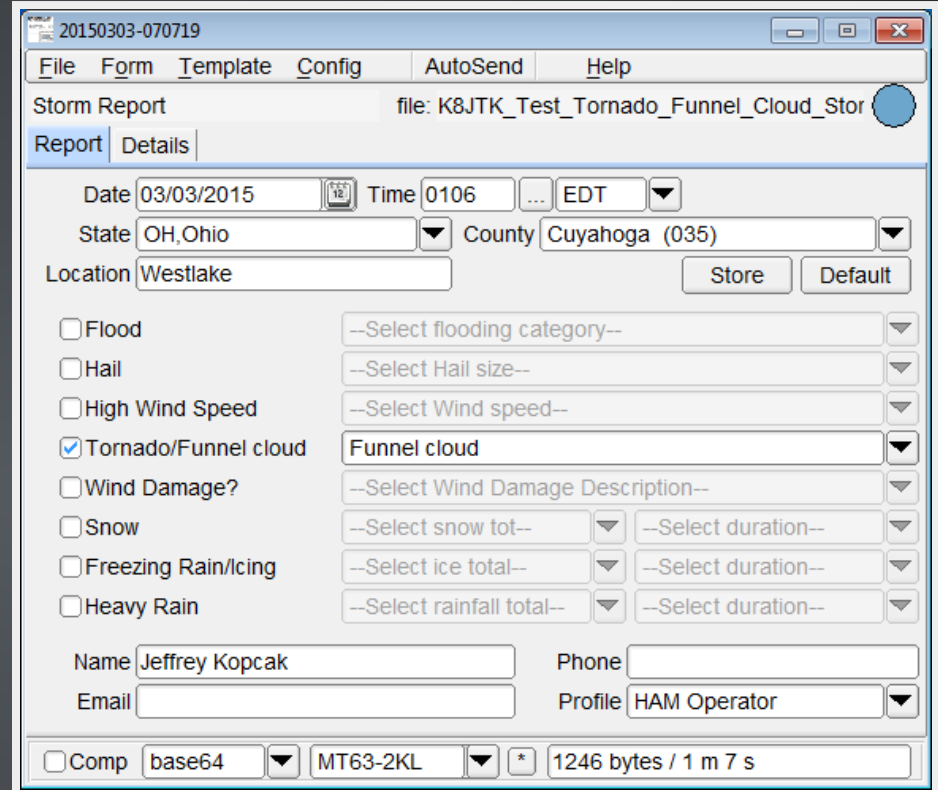
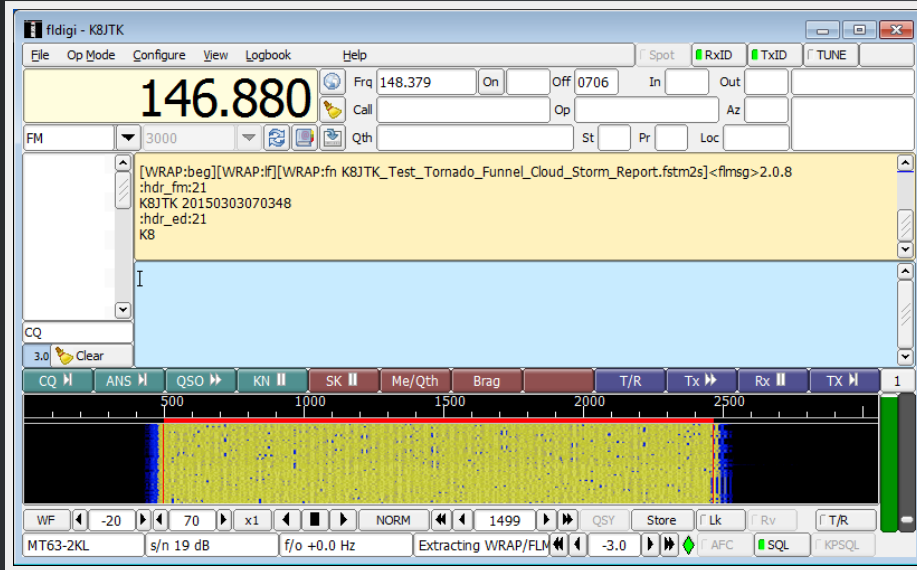
# ACOUSTIC INTERFACE

- Doesn't require additional hardware.
- A game saver in a pinch.
- Participate even without an interface.
- **Receive data:** hold radio to computer microphone.
- **Transmit data:** hold radio to computer speakers.
- **PTT:** manually.
- MT63 very robust to deal with background noise.
- Not an optimal setup.
- Works poorly or not at all for some digital modes, requires more attention, and disruptive at a busy field site.



img: [FLEMA](#)

# FLDIGI & FLMSG

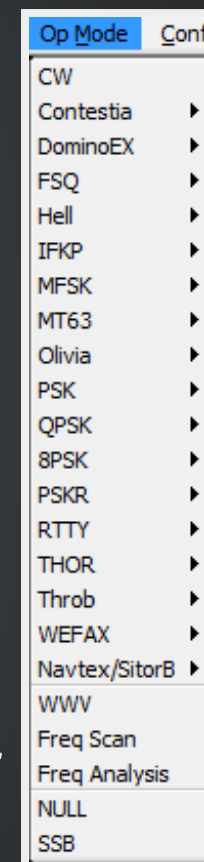


Downloadable from [www.w1hkj.com](http://www.w1hkj.com).  
Open source, public license, FREE software.  
Run on Windows, Linux, and Mac.

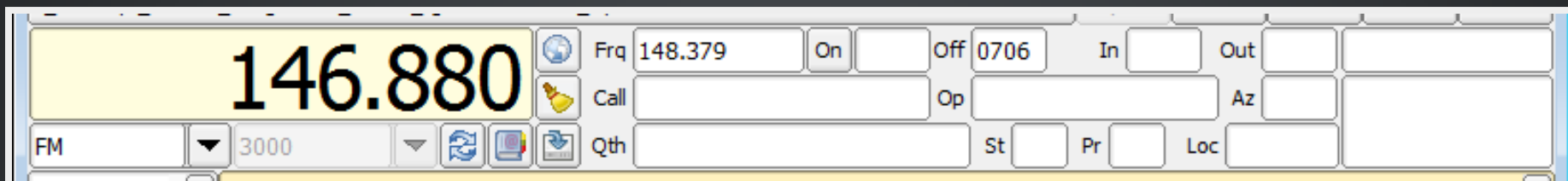


# FLDIGI

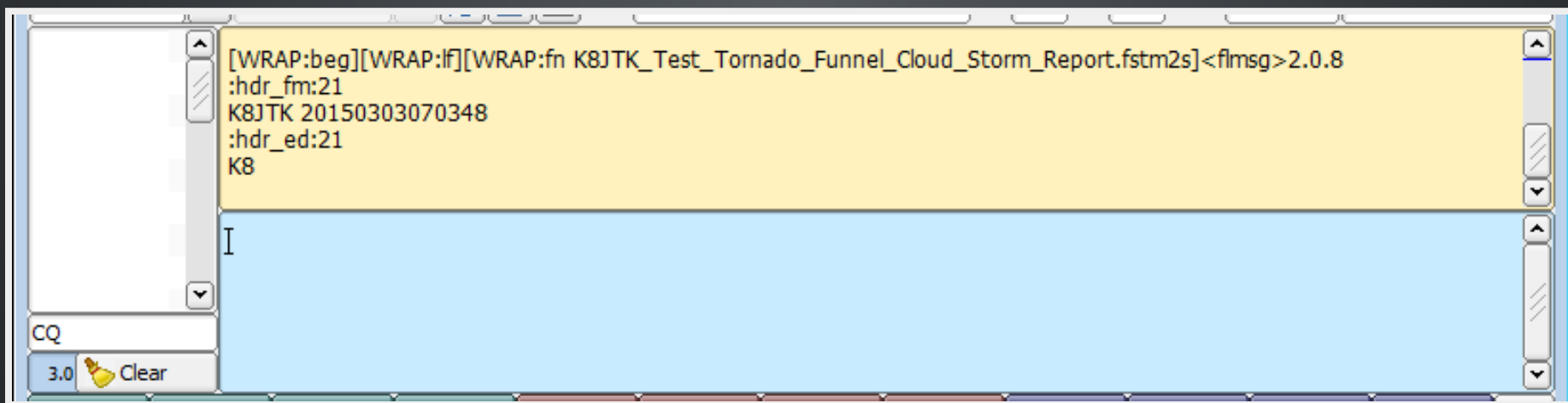
- Fast Light Digital modem application.
- Created by David Freese, Jr., W1HKJ and associates.
- One of several programs called the "Fldigi suite."
- Generates or decodes the digital signal using the computer's sound card.
- Lots of modes supported including: Contestia, DOMINO, FSQ, HELL, MFSK, MT63 (NBEMS), Olivia (NBEMS HF), RTTY, PSK...
- PSK31 popular on HF. Not used for NBEMS, no error correction.



# FLDIGI INTERFACE

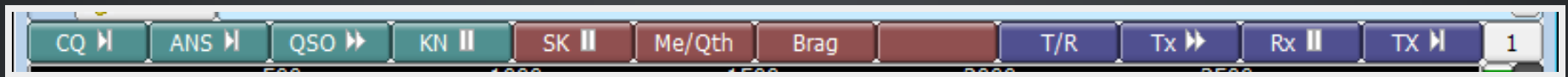


Frequency control and logging.

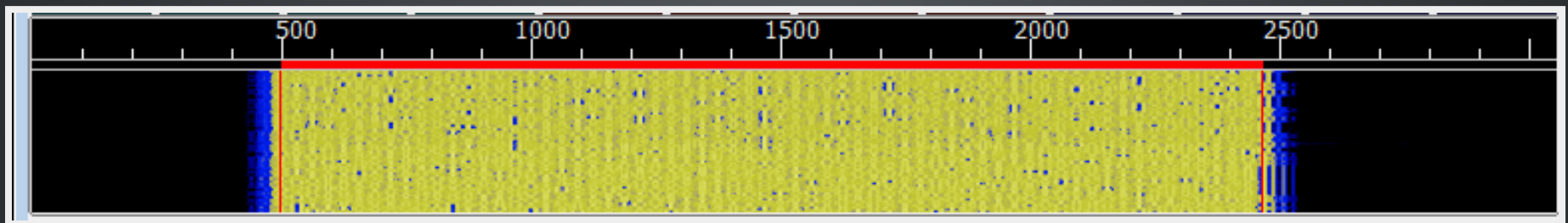


White: channels (PSK), tan: receive pane, blue: transmit pane.

# FLDIGI INTERFACE



Macros... QSOs, contesting.

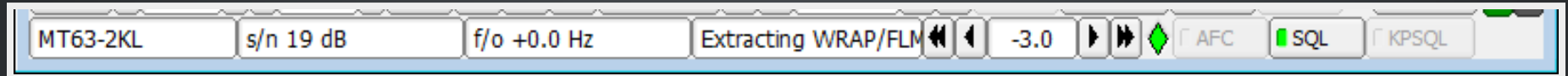


Waterfall. Graphical representation of signals.



Program controls: waterfall, frequency, transmit/receive.

# FLDIGI INTERFACE



Program status: mode, s/n, f/o, attenuator, auto frequency control, squelch.



Squelch level and control.

# MT63

- MT63-2KL is VHF/UHF NBEMS standard.
- Created by Pawel Jalocho, SP9VRC.
- Forward error correction. 25% of the characters sent are obliterated, it will give perfect copy.
- Characters spread over time and frequency for robustness.
- "L" versions have long interleave providing even better error correction (MT63-500L, MT63-1KL, MT63-2KL).
- Works well holding mic up to speaker.
- Text speed: 100 wpm.
- Data transfer speed: 1kb over 1 minute.
- MT63-2000L = MT63-2KL.
- Bandwidth is suffix: 2000 = 2KHz wide.

# FLMSG

- Part of the "Fldigi suite."
- Forms manager.
- Send and receive: forms, text files (TXT, CSV).
- Create templates and forms.
- Generate and verify checksums automatically.

The screenshot displays the FLMSG software interface for creating a storm report. The window title is "20150303-070719". The menu bar includes "File", "Form", "Template", "Config", "AutoSend", and "Help". The main area is titled "Storm Report" and shows the file path "file: K8JTK\_Test\_Tornado\_Funnel\_Cloud\_Stor". The "Report" tab is active, with a "Details" sub-tab. The form contains the following fields and options:

- Date: 03/03/2015, Time: 0106, EDT
- State: OH, Ohio, County: Cuyahoga (035)
- Location: Westlake
- Event type:  Tornado/Funnel cloud (selected as "Funnel cloud")
- Other event types:  Flood,  Hail,  High Wind Speed,  Wind Damage?,  Snow,  Freezing Rain/Icing,  Heavy Rain
- Name: Jeffrey Kopcak, Phone: [empty], Email: [empty], Profile: HAM Operator
- Encoding:  Comp, base64, MT63-2KL, 1246 bytes / 1 m 7 s

The screenshot displays a list of form templates in the FLMSG software. The "Form" tab is active, and the list includes:

- Drag-n-Drop
- Blank
- CAP
- CSV
- Custom
- HICS
- IARU
- ICS
- MARS
- Plaintext
- Radiogram
- Red Cross
- Transfer
- Weather

# FLMSG CHECKSUM

**Checksum:** detecting errors which may have been introduced during transmission or storage.

```
[WRAP:begin][WRAP:lf][WRAP:fn K8JTK test  
message.txt]This is a test message from  
K8JTK.[WRAP:checksum EB84][WRAP:end]
```

- Verifies message transmission.
- The checksum on this file is "EB84".
- Included in the "WRAP" tags.
- Flmsg automatically generates for transmitted messages...
- calculates and compares on received messages.

source: [Wikipedia](#).

# NBEMS DATA GUIDELINES

- File size limited to under 3K (3,000 bytes @ 1K/min) to avoid repeater timeouts.
- Limited to text. No binary files: images, video, Word documents, Excel spreadsheets, programs, etc.
- Export Excel to CSV file, Word to TXT file.
- Served agencies MUST understand these bandwidth constraints to set a realistic level of expectation.
- There is very limited bandwidth --Narrow Band EMS.
- Limited to 10 minutes on simplex for ID requirements.

When hi-resolution images or large data transfers are requirements, some other method or system must be utilized.



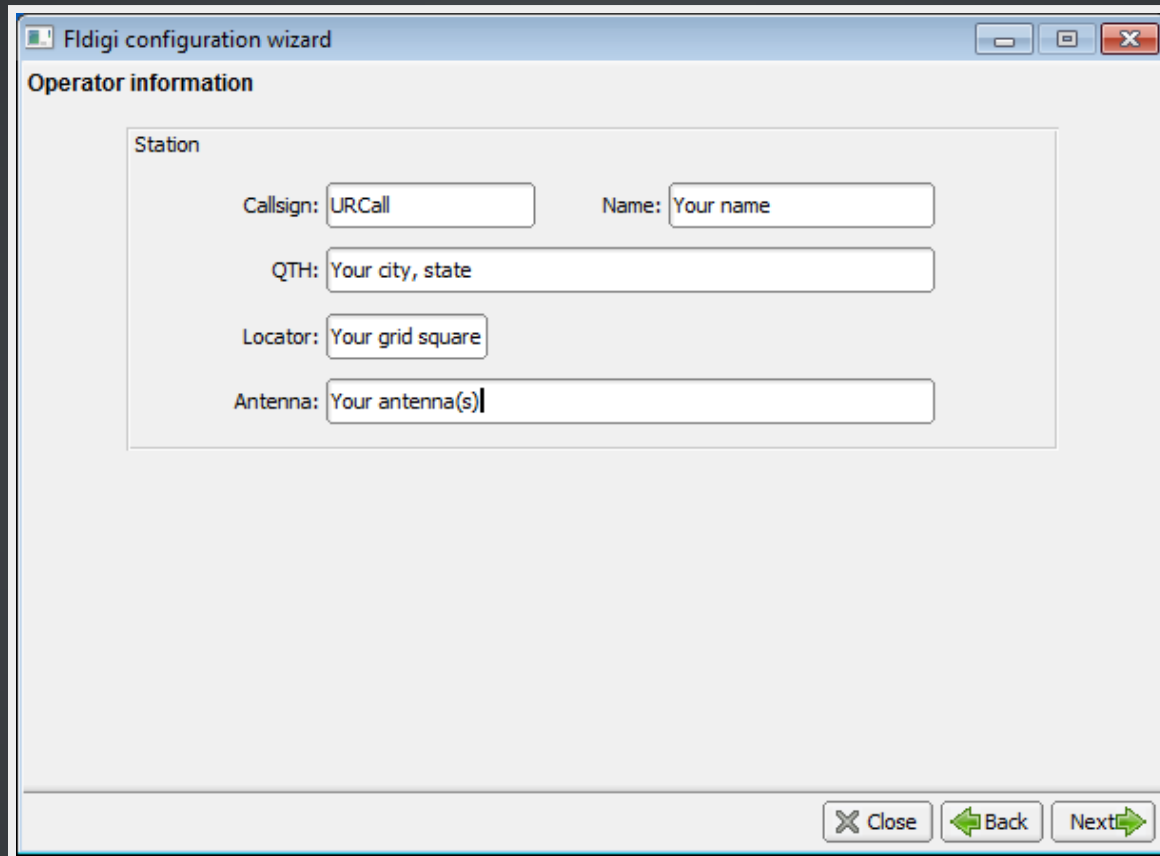
# FLDIGI CONFIGURATION HIGHLIGHTS

Setup tutorials:

[Sound Card](#)

[Fldigi and Flmsg](#)

# FLDIGI CONFIGURATION



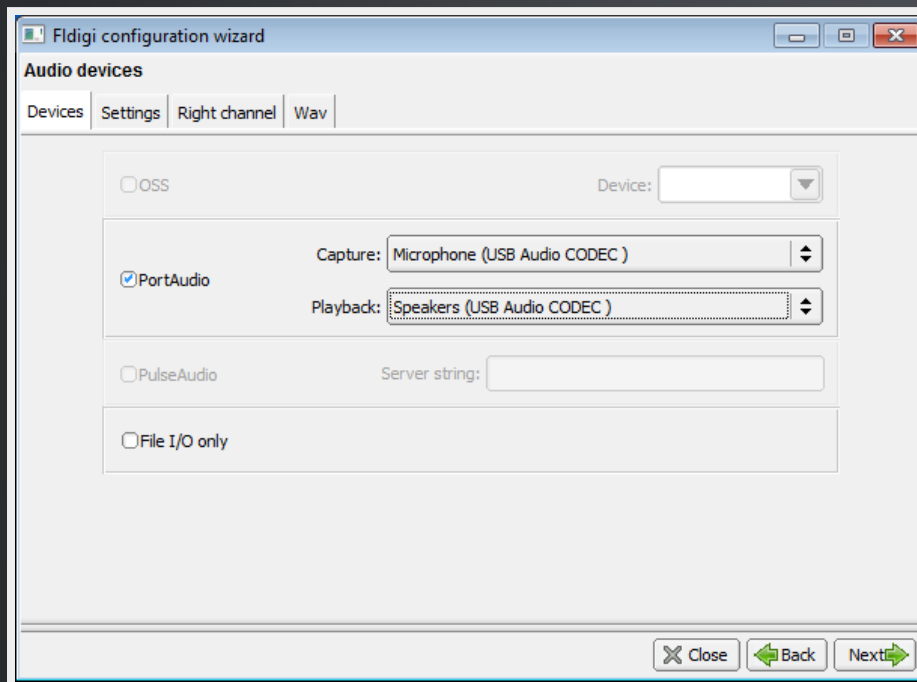
The screenshot shows a window titled "Fldigi configuration wizard" with a standard Windows-style title bar. The main content area is titled "Operator information" and contains a "Station" section with the following fields:

- Call sign:
- Name:
- QTH:
- Locator:
- Antenna:

At the bottom right of the window, there are three buttons: "Close" (with a red X icon), "Back" (with a green left arrow icon), and "Next" (with a green right arrow icon).

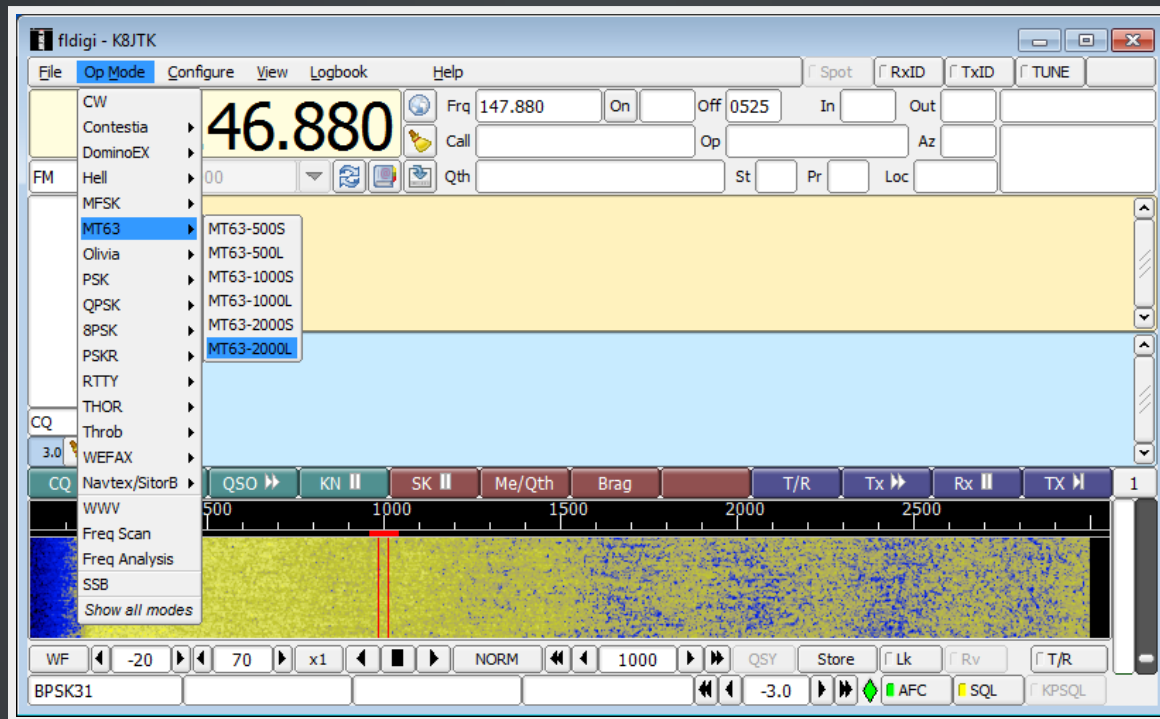
Enter your station information. All fields are not required.  
QTH: 'Portable' for a go-box.

# FLDIGI CONFIGURATION



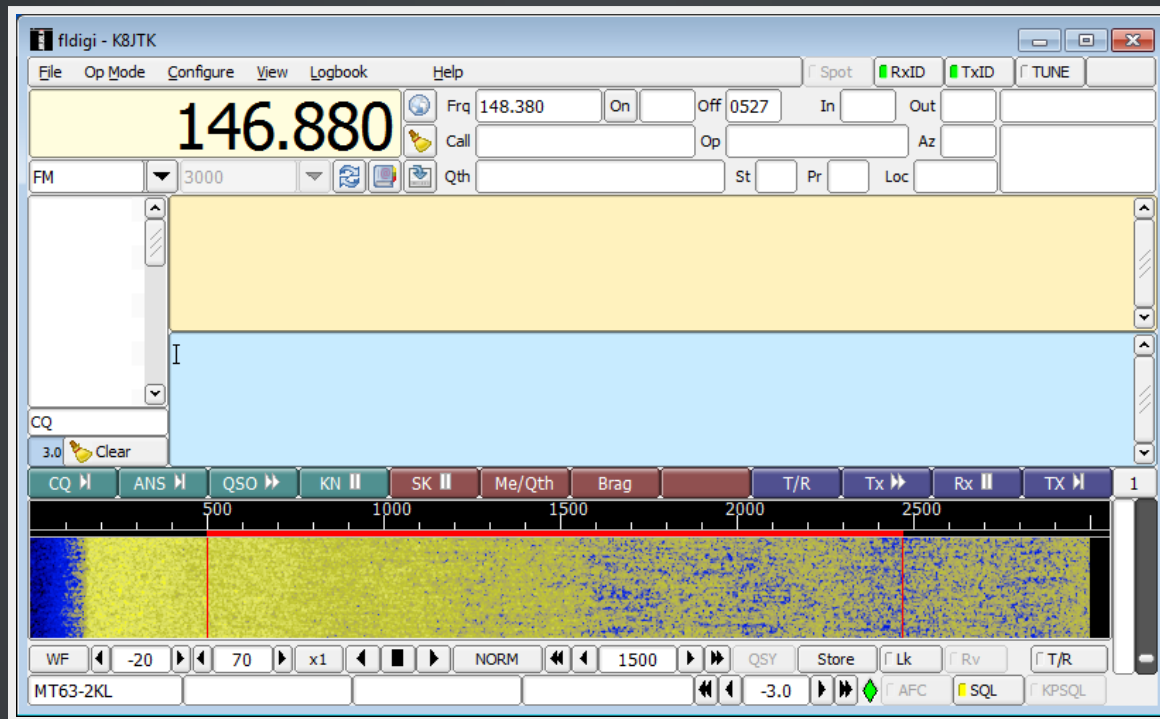
- Check **PortAudio**.
- Click **Capture**.
- Click the **receive audio interface device**.  
Signalink USB: **USB Audio Codec**.  
Acoustic interface: **soundcard manufacturer**.
- Click **Playback**.
- Click the **transmit audio interface device**.  
Signalink USB: **USB Audio Codec**.  
Acoustic interface: **soundcard manufacturer**.

# FLDIGI CONFIGURATION



Click Op Mode.  
Select MT63.  
Click MT63-2000L.

# FLDIGI CONFIGURATION

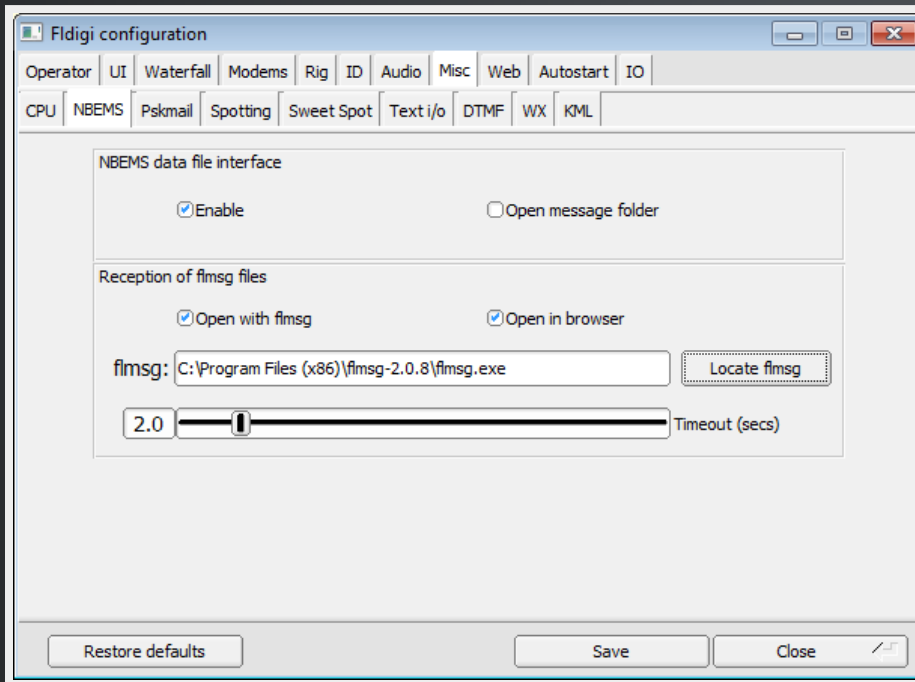


Click **1500** on the waterfall.

Fine tune with the **Adjust Cursor Frequency** adjustment.

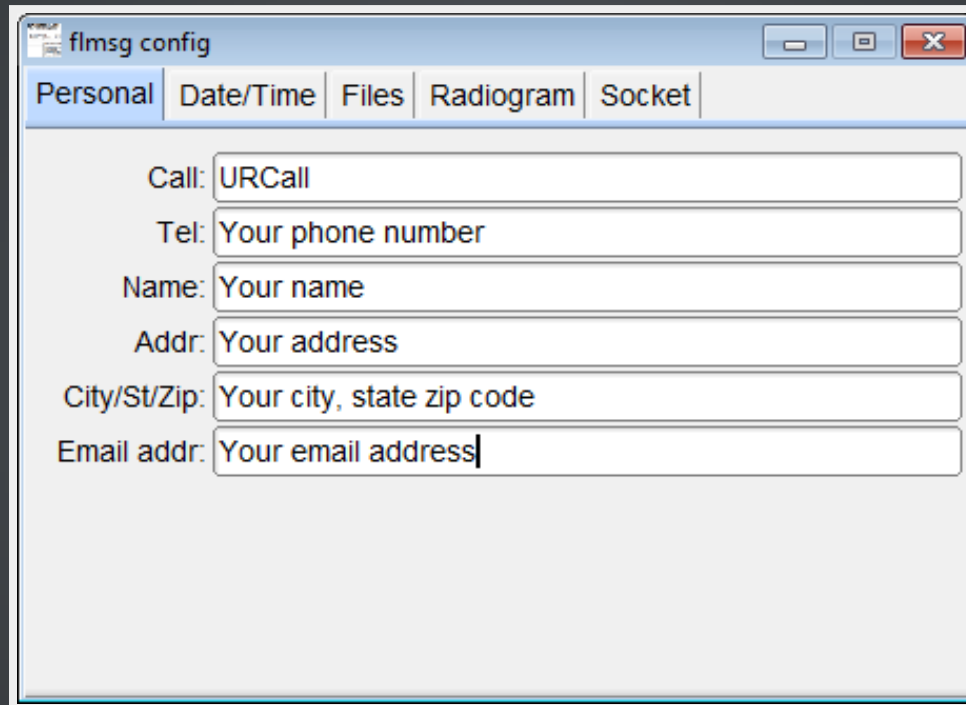
Click **RxID** and **TxID** (top).

# FLDIGI CONFIGURATION



- Click **Configure**.
- Click **Misc**.
- On the second row of tabs, click **NBEMS**.
- Under "NBEMS data file interface", **Enable** should be checked.
- Under "NBEMS data file interface", **Open with flmsg** and **Open in browser** should be checked.
- Click **Locate flmsg**.
- Locate the **flmsg-x.x.x** folder in "Program Files/(x86)".
- Double-click **flmsg.exe**
- Click **Save**, then click **Close**.

# FLMSG CONFIGURATION



The image shows a screenshot of a software configuration window titled "flmsg config". The window has a standard Windows-style title bar with minimize, maximize, and close buttons. Below the title bar is a tabbed interface with five tabs: "Personal", "Date/Time", "Files", "Radiogram", and "Socket". The "Personal" tab is currently selected and active. Inside this tab, there are six text input fields, each with a label to its left and a placeholder text inside the field:

- Call: URCall
- Tel: Your phone number
- Name: Your name
- Addr: Your address
- City/St/Zip: Your city, state zip code
- Email addr: Your email address

Enter your station information. All fields are not required.

# FLMSG CONFIGURATION

FLMSG: 2.0.8

File Form Template Config AutoSend Help

ARRL radiogram file: new.m2s

Message Records

SVC \*NR \*PREC HX \*STN ORIG CK

1 ROUTINE hx [ ] [ ] ck

PLACE OF ORIG TIME FILED \*MON DY

[ ] [ ] [ ]

\*TO

[ ] TEL: [ ]

OP NOTE: [ ]

Standard Format ARL MSG

TXT:

[ ]

SIG: [ ] OP NOTE: [ ]

Comp base64 8PSK125 \* [ ]

- MT63-1KL
- MT63-1KS
- MT63-2KL
- MT63-2KS
- Olivia-4-250
- Olivia-4-500
- Olivia-8-250
- Olivia-8-500

Click the Op Mode box.  
Select MT63-2KL.



# WORKFLOWS



img: [KB9RZ](#).

# SENDING A FORM

- In Flmsg, click **Form**.
- Select form or message type.
- Fill out form.
- Fldigi **must** be open before checking the mode!
- Check mode is MT63-2KL (Flmsg & Fldigi), transmit time less than 3 minutes, Fldigi centered on 1500 Hz.
- Click **AutoSend**.
- You will be prompted to **Save form**. Name you can easily and quickly recognize are good for retransmission.
- Click **SAVE**.
- Form will be transmitted!

# TRANSMIT EXCEL SPREADSHEET (EXCEL)

- In Excel, click **File** tab or menu option.
- Click **Save As**.
- Select location and enter **File name**.
- Save as type: **CSV (Comma delimited) \*.csv**.
- Click **Save**.
- Click **OK** on 'file type does not support multiple sheets.'
- Click **Yes** on 'may contain features that are not compatible with CSV.'
- Continue to Flmsg...

# TRANSMIT EXCEL SPREADSHEET (FLMSG)

- ...In Flmsg, click **Form**.
- Click **CSV**.
- Click **Import CSV**.
- Select file created earlier.
- Click **Open**.
- Check mode, transmit time, & center frequency.
- Click **AutoSend** (no saving needed).

# TRANSMIT WORD DOCUMENT

- In Word, click **File** tab or menu option.
- Click **Save As**.
- Select location and enter **File name**.
- Save as type: **Plain Text \*.txt**.
- Click **Save**.
- Click **OK** on 'file conversion.'
- In Flmsg, click **Form**.
- Click **Blank**.
- **Drag & drop** TXT file created earlier to white text area.
- Check mode, transmit time, & center frequency.
- Click **AutoSend**.
- **Save form**.

# RECEIVE EXCEL SPREADSHEET

- After receiving CSV file, it will open in Flmsg and browser if checksum matches.
- In Flmsg, click **Export CSV**.
- Select location and enter **File name**.
- Click **Close** on 'data written' message.
- Open file in Excel or copy to USB drive.

# RECEIVE WORD DOCUMENT

- After receiving TXT file, it will open in Flmsg and browser if checksum matches.
- **Copy & paste** text from Flmsg or browser to Word.
- Save to computer or USB drive.

OR

- In Flmsg, click **File**.
- Select **View**.
- Click **Plain Text** to open in text editor.
- Save to computer or USB drive.

# OPEN/PRINT A SAVED OR RECEIVED FORM

- In Flmsg, click **Form**.
- Click form or message type.
- Click **File**.
- Click **Open**.
- Select the filename of the saved form.
- Click **Open**.

Print:

- In Flmsg, click **File**.
- Select **View**.
- Click **Html delivery**.
- In web browser, click **File** (or menu).
- Click **Print**.



# RETRANSMIT FORM

- In Flmsg, click **Form**.
- Select form or message type.
- Click **File**.
- Click **Open**.
- Select the filename of the saved form.
- Click **Open**.
- Check mode, transmit time, & center frequency.
- Click **AutoSend** (no saving needed).

# TIPS, TRICKS, AND HINTS

- Experiment **BEFORE** you actually use Fldigi in a real event.
- Do **NOT** have your Signalink or other radio interface as the system default audio device! (*except Acoustic Interfacing.*)
- Received messages are saved to the Hard Drive by default and don't need to be retransmitted.
- When upgrading, **verify** Fldigi/Fmsg settings.
- Fmsg path always changes when upgraded (Fldigi -> NBEMS tab).
- Radio Time-Out-Timer: **10 minutes.**
- Always follow net protocol, ask before transmitting.

# FINDING OUT MORE

Official Fldigi/Flmsg documentation:

[Wiki, Programs & Documentation](#)

(in program directory, download "help" or "manual" files).

[NBEMS presentation - ARRL & W3YJ.](#)

[Radio Interface Setup.](#)

[Getting Started with Fldigi.](#)

[OHDEN](#) (HF). Tuesdays 8:00pm. 3.585 USB.

OLIVIA 8/500. PSK31 (alt). No voice.

# THANK YOU FOR ATTENDING!

Jeffrey Kopcak - K8JTK

[K8JTK@arrl.net](mailto:K8JTK@arrl.net)

ARRL Ohio Section Technical Coordinator.

[Other involvement.](#)

This presentation is available on my website: [K8JTK.org](http://K8JTK.org)

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