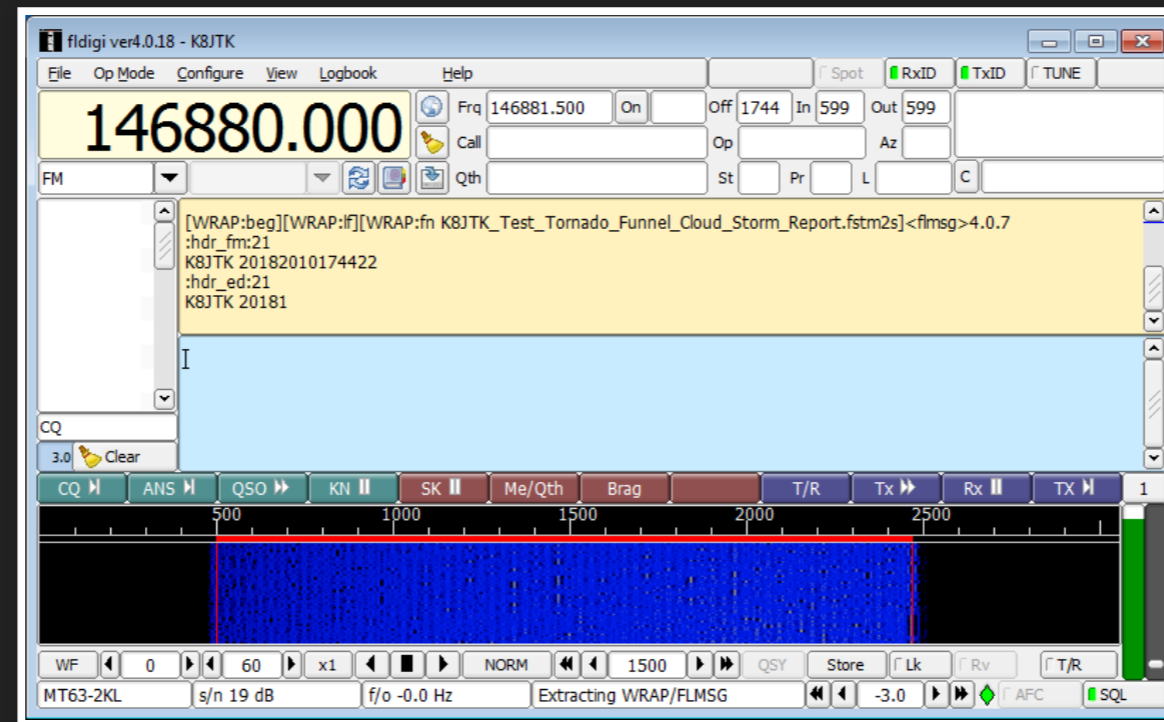


NBEMS

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 & Olivia
- 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.

source: [Wikipedia](#)

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.

CASE FOR DIGITAL EMCOMM

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

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Not including phonetics, repeats, fills, breaks, and confirmation...

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

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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!

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INTERFACES

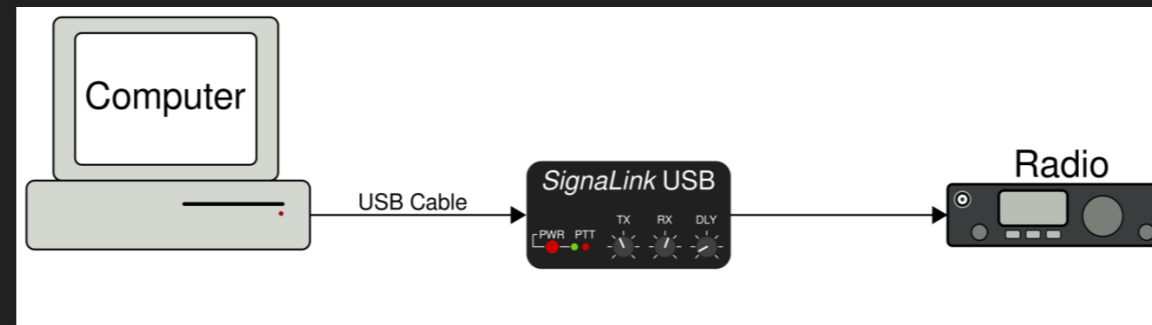
Need a radio, computer, interface between the two, and software.

- **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

- \$130 for the [Signalink USB](#) and connecting cable
- 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.



img: [F8DZY](#), [W3YJ](#)

ACOUSTIC INTERFACE

- MT63-2KL only
- 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
- Very robust to deal with background noise



img: [FLEMA](#)

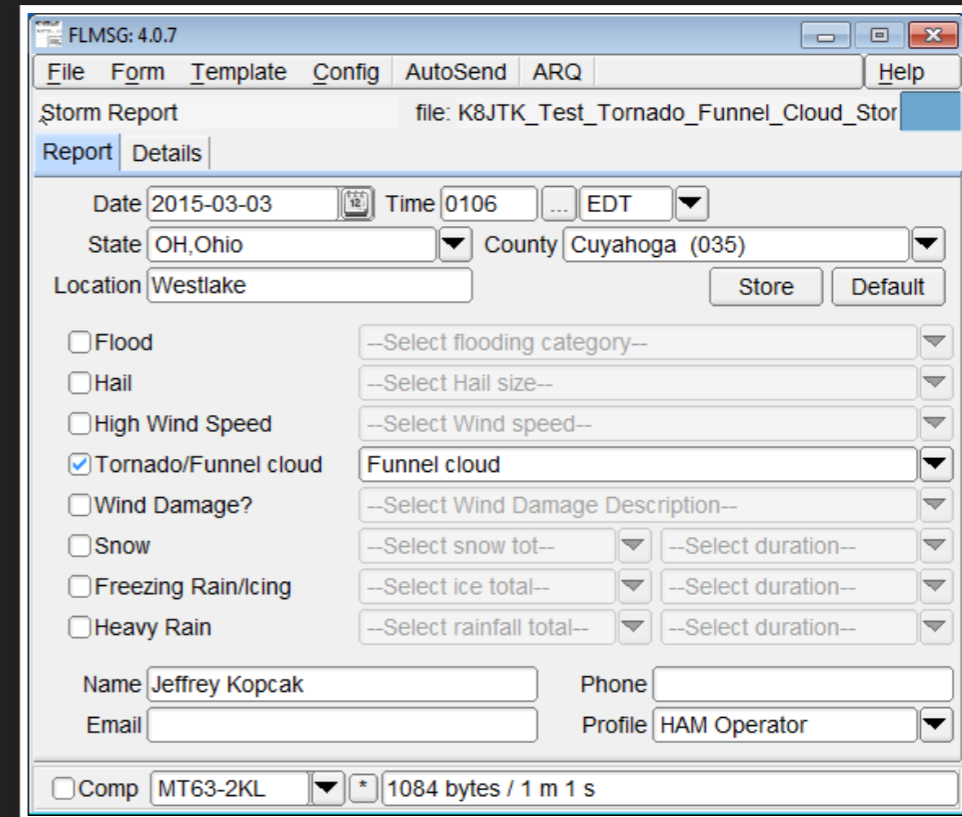
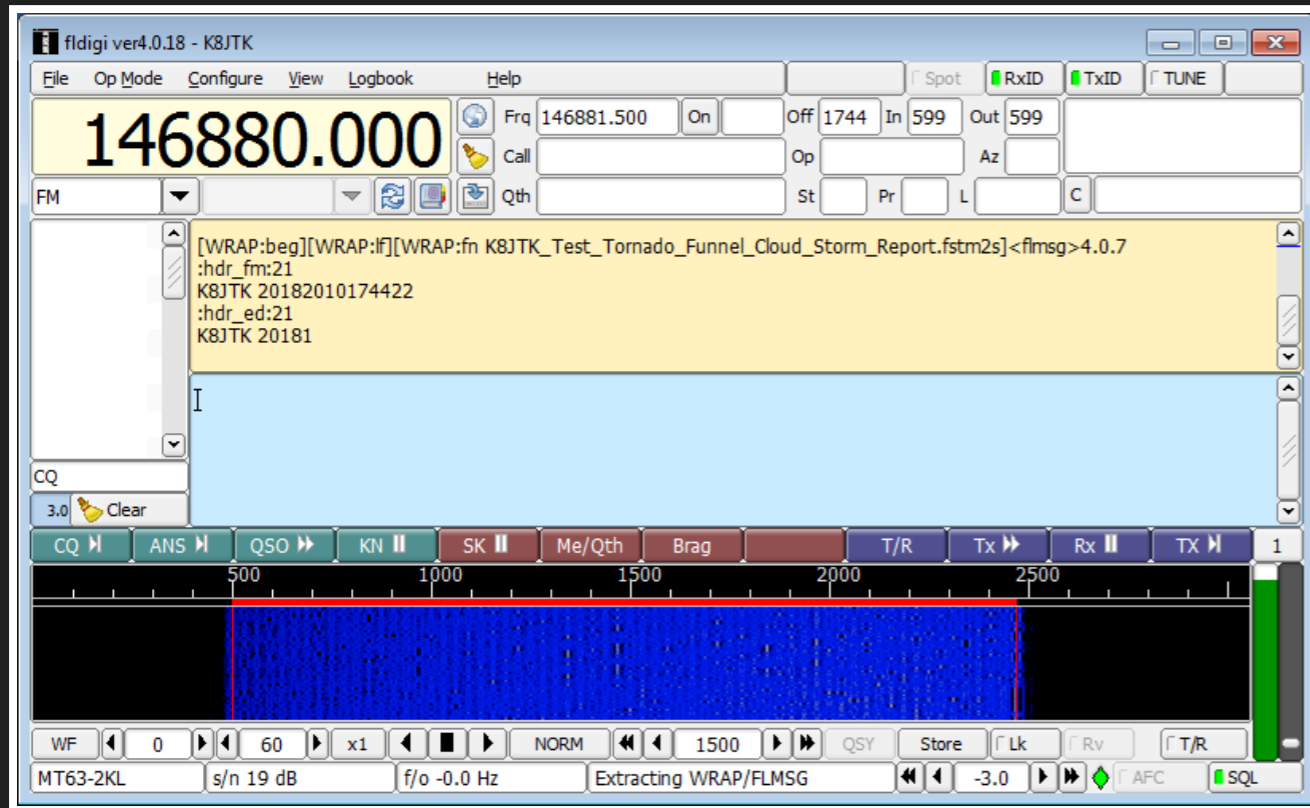
ACOUSTIC INTERFACE

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- Participate even without an interface
- **Receive data:** hold radio to computer microphone
- **Transmit data:** hold radio to computer speakers
- **PTT:** manually
- 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.

Open source, public license, FREE software.

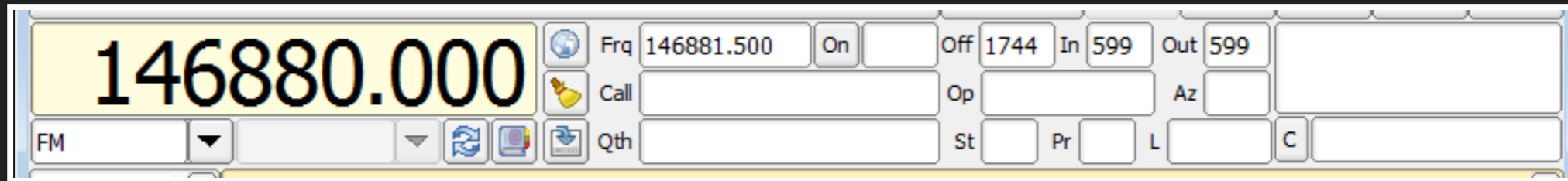
Run on Windows, Linux, Mac, and Android.

FLDIGI

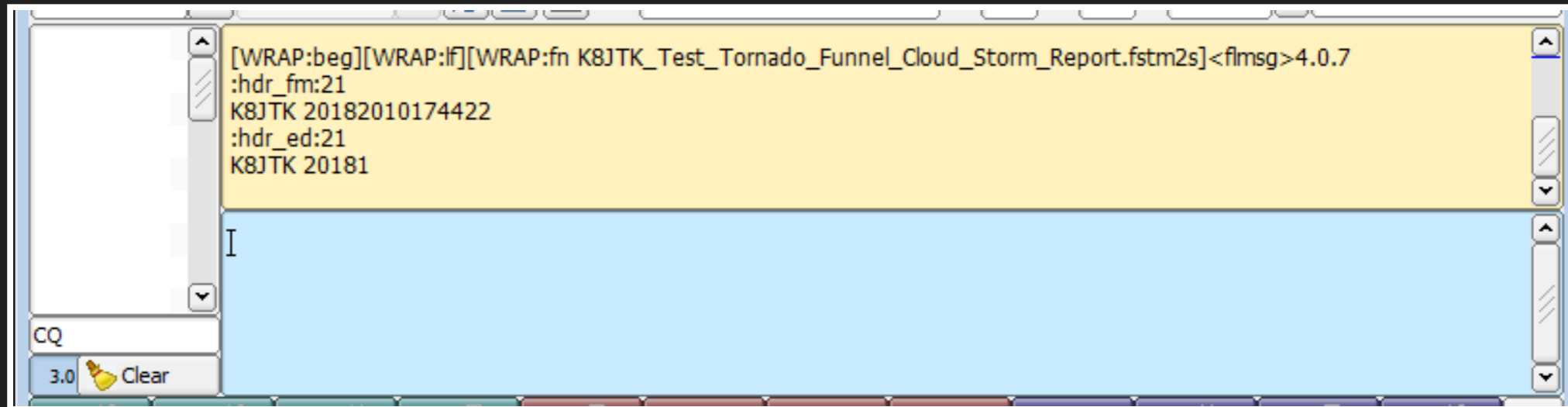
- Fast Light Digital modem application
- Created by David Freese, Jr., W1HKJ and associates
- One of several programs called the "Fldigi suite"
- Generates or decodes the digital signal using the computer's sound card
- Lots of modes supported including: Contestia, DOMINO, FSQ, HELL, MFSK, MT63 (NBEMS),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



FLDIGI INTERFACE

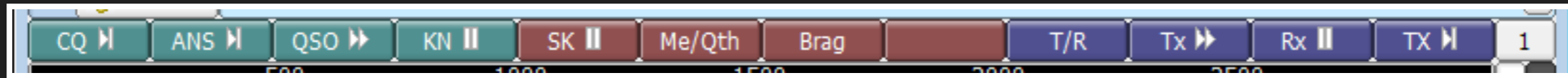


Frequency control and logging.

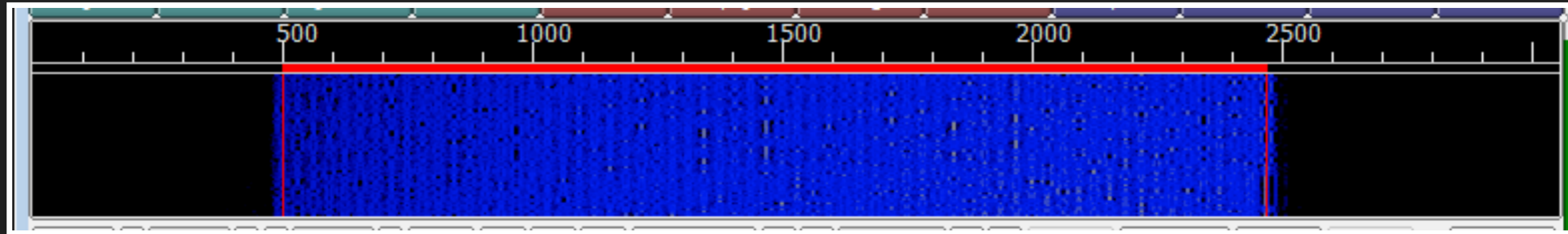


White: channels (PSK), tan: receive pane, blue: transmit pane.

FLDIGI INTERFACE



Macros... QSOs, contesting.

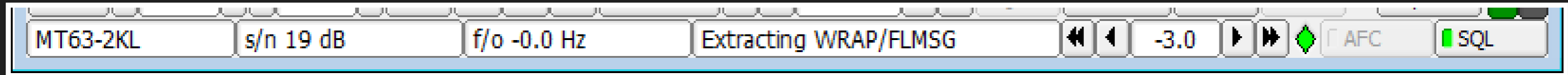


Waterfall. Graphical representation of signals.

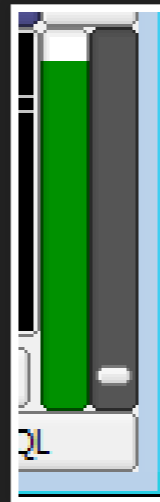


Program controls: waterfall, frequency, transmit/receive.

FLDIGI INTERFACE



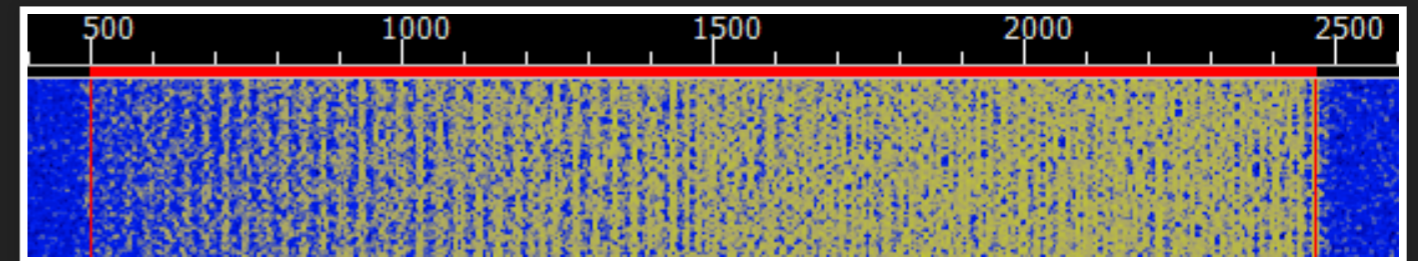
Program status: mode, s/n, f/o, attenuator, auto frequency control, squelch.



Squelch level and control.

MT63

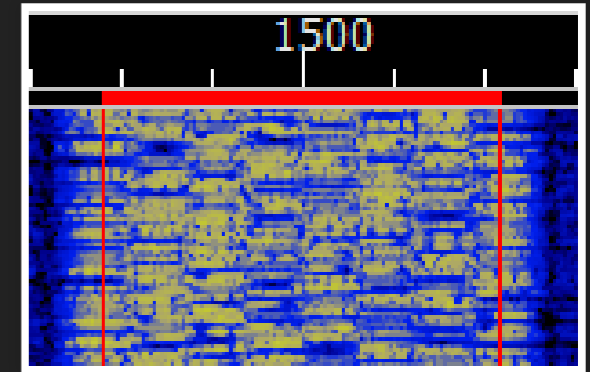
- MT63-2KL is VHF/UHF NBEMS standard
- Created by Pawel Jalocho, SP9VRC
- Forward error correction. 25% characters sent obliterated, perfect copy.
- Characters spread over time and frequency for robustness
- "L" versions have long interleave providing even better error correction (MT63-500L, MT63-1KL, 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



source: WM2U (defunct)

OLIVIA

- Olivia 8/500 is HF NBEMS standard
- Created by Pawel Jalocho, SP9VRC
- Signals decoded below noise
- QRP nearly as effective as high power
- Channelized approach - signals seen but not heard
- Slow but accurate under poor HF conditions
- Text speed: 25 wpm
- Data transfer speed: 170 bytes over 1 minute
- Olivia 8/500 = 8 tones, 500 Hz
- Secondary HF modes: Olivia 16/500, MT63-1KL, PSK-125R, PSK-250R



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 shows the FLMSG 4.0.7 application window. The title bar reads "FLMSG: 4.0.7". The menu bar includes "File", "Form", "Template", "Config", "AutoSend", "ARQ", and "Help". The main window displays a "Storm Report" form for a file named "K8JTK_Test_Tornado_Funnel_Cloud_Stor". The form has two tabs: "Report" (selected) and "Details".

The "Report" tab contains the following fields and options:

- Date: 2015-03-03 (with a calendar icon)
- Time: 0106
- Timezone: EDT (with a dropdown arrow)
- State: OH, Ohio (with a dropdown arrow)
- County: Cuyahoga (035) (with a dropdown arrow)
- Location: Westlake
- Buttons: Store, Default
- Event type selection (checkboxes and dropdowns):
 - Flood: --Select flooding category--
 - Hail: --Select Hail size--
 - High Wind Speed: --Select Wind speed--
 - Tornado/Funnel cloud: Funnel cloud
 - Wind Damage?: --Select Wind Damage Description--
 - Snow: --Select snow tot-- (dropdown), --Select duration-- (dropdown)
 - Freezing Rain/Icing: --Select ice total-- (dropdown), --Select duration-- (dropdown)
 - Heavy Rain: --Select rainfall total-- (dropdown), --Select duration-- (dropdown)
- Name: Jeffrey Kopcak
- Phone: (empty field)
- Email: (empty field)
- Profile: HAM Operator (with a dropdown arrow)

At the bottom of the form, there is a "Comp" section with a dropdown menu set to "MT63-2KL" and a status indicator showing "* 1084 bytes / 1 m 1 s".

The screenshot shows the "Form" menu in the FLMSG application. The menu is open, displaying a list of form templates. The "Form" menu item is highlighted in blue. The list of forms includes:

- Drag-n-Drop
- Blank
- CAP
- CSV
- Custom
- Ham Forms
- 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:beg][WRAP:lf][WRAP:fn K8JTK test message.txt]This  
is a test message from K8JTK.[WRAP:chksum 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

NBEMS GUIDELINES: PARTICIPANTS

- VHF/UHF: file size limited to under 3K (3,000 bytes @ 1K/min), avoid repeater timeouts
- HF: file size limited to about 1.7K (1,700 bytes @ 170 bytes/min), avoid ID requirements
- Limited to text. No binary files: images, video, Word documents, Excel spreadsheets, programs, etc.
- Export Excel to CSV file, Word to TXT file
- There is very limited bandwidth --Narrow Band EMS
- Limited to 10 minutes on simplex for ID requirements
- Practice, practice, and practice more

NBEMS GUIDELINES: LEADERSHIP

- Establish and understand served agency requirements
- Served agencies MUST understand NBEMS bandwidth constraints to set a realistic level of expectation
- When hi-resolution images or large data transfers are requirements, some other method or system must be utilized - mesh or faster transfer modes

- Standardize on versions of Fldigi & Flmsg.
- Tools. Need to find how to best utilize the tool, how it can be used efficiently, and have people who know how to use these tools.
- Group of digital operators
- Train, train, and train more

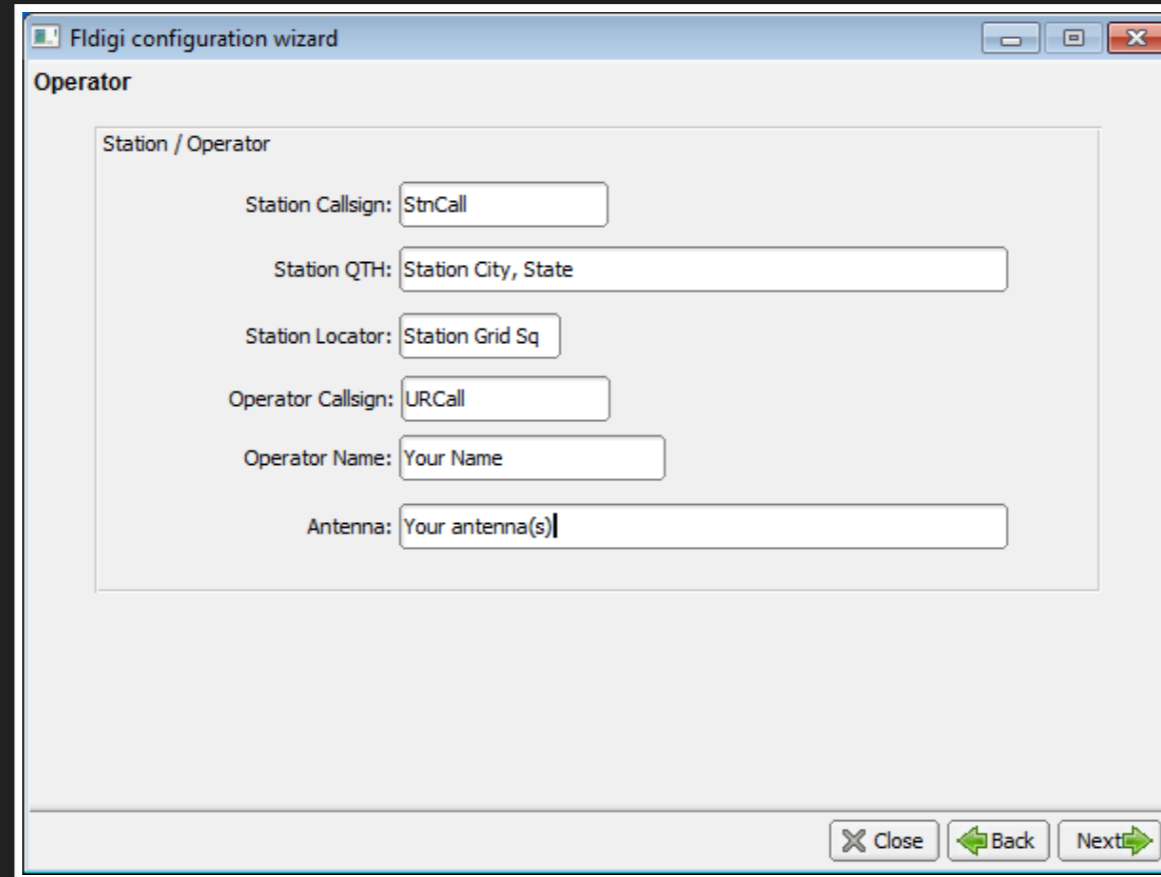
FLDIGI CONFIGURATION HIGHLIGHTS

Setup tutorials:

[Sound Card](#)

[Fldigi and Flmsg](#)

FLDIGI CONFIGURATION



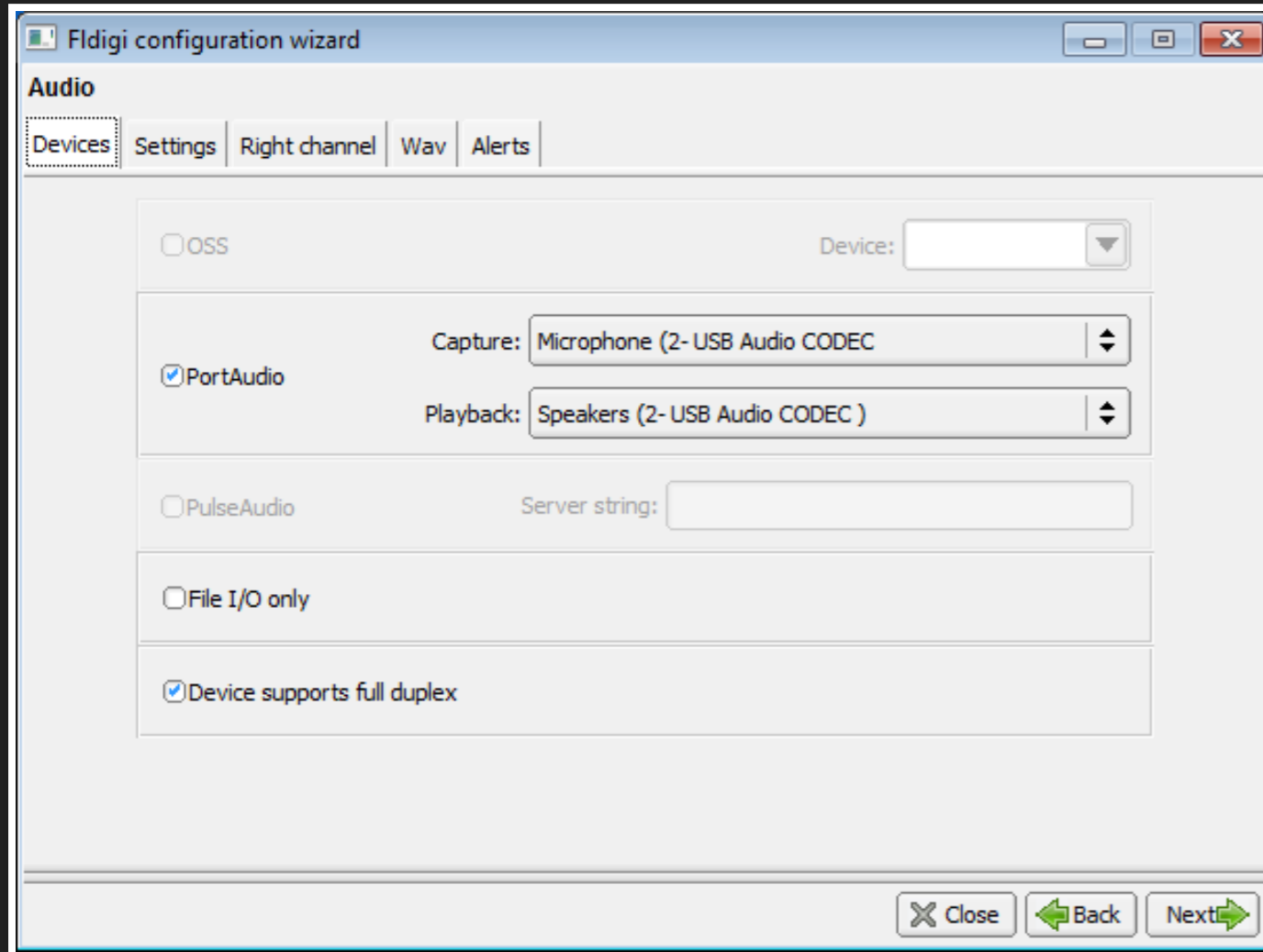
The screenshot shows a window titled "Fldigi configuration wizard" with a sub-header "Operator". Inside the window, there is a section titled "Station / Operator" containing several input fields:

- Station Callsign: StnCall
- Station QTH: Station City, State
- Station Locator: Station Grid Sq
- Operator Callsign: URCall
- Operator Name: Your Name
- Antenna: Your antenna(s)

At the bottom right of the window, there are three buttons: "Close", "Back", and "Next".

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

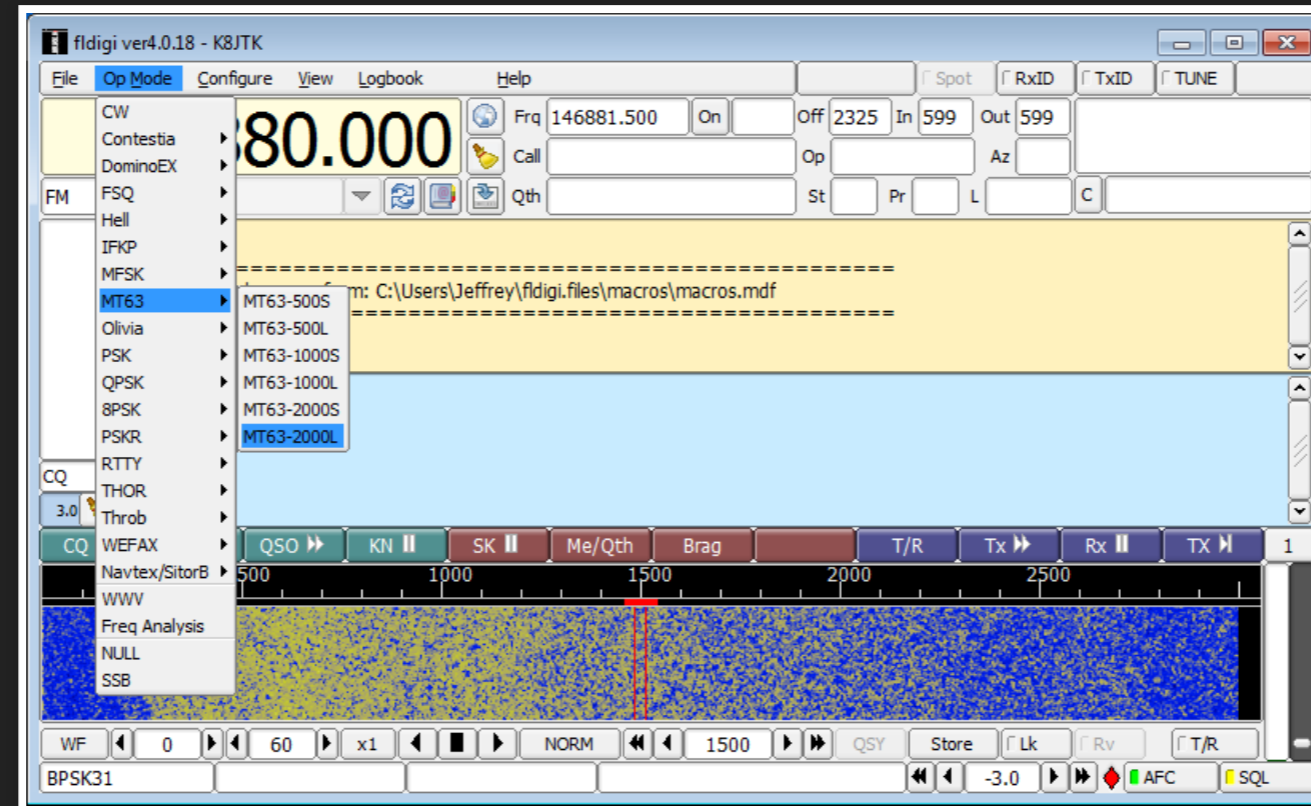
FLDIGI CONFIGURATION



The screenshot shows the 'Audio' configuration window of the Fldigi software. The window has a title bar 'Fldigi configuration wizard' and a tabbed interface with 'Devices' selected. The 'Audio' section contains several options: 'OSS' (unchecked), 'PortAudio' (checked), 'PulseAudio' (unchecked), and 'File I/O only' (unchecked). The 'PortAudio' section is expanded, showing 'Capture' set to 'Microphone (2- USB Audio CODEC)' and 'Playback' set to 'Speakers (2- USB Audio CODEC)'. There is also a 'Device:' dropdown menu and a 'Server string:' text field. At the bottom, there are 'Close', 'Back', and 'Next' buttons.

- 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

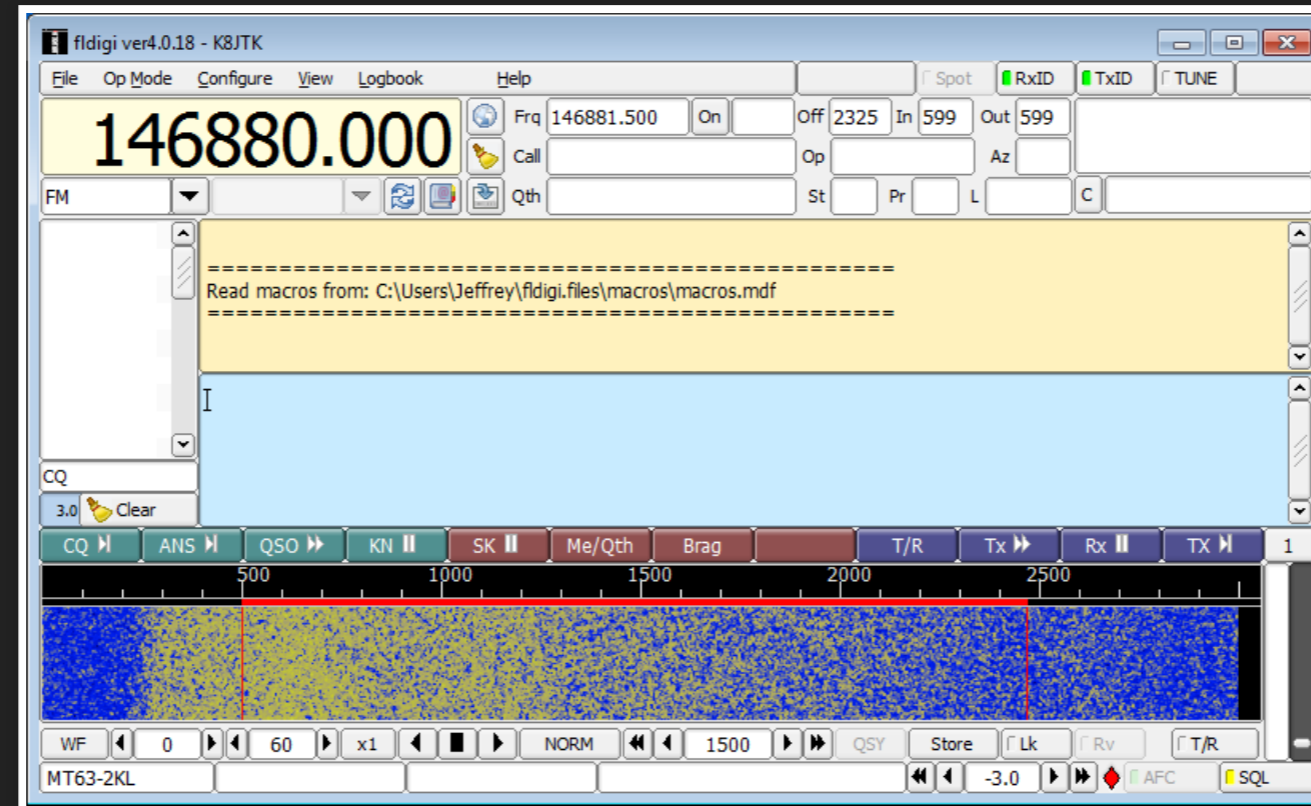


Click Op Mode.

Select MT63.

Click MT63-2000L.

FLDIGI CONFIGURATION

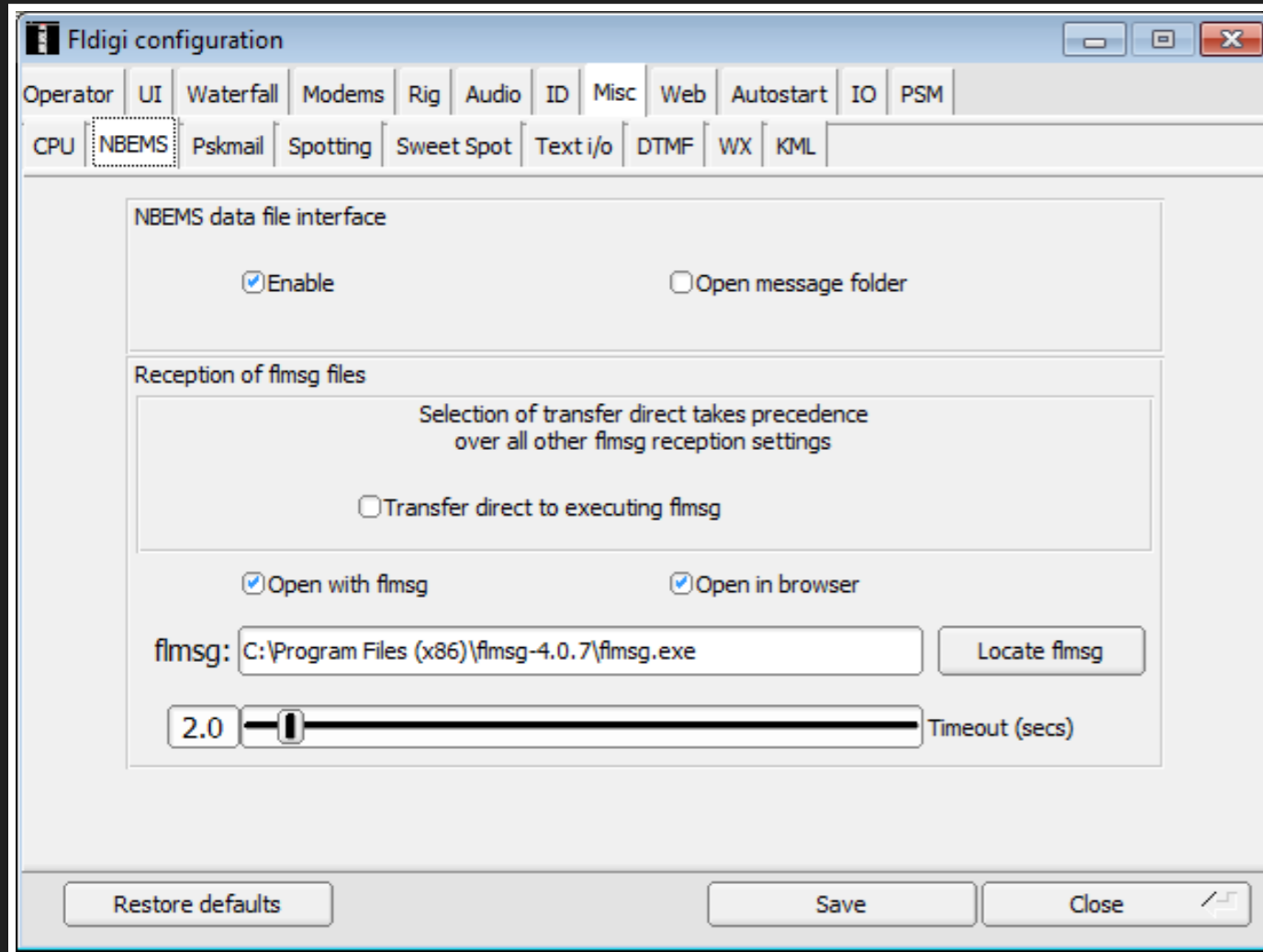


Click **1500** on the waterfall.

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

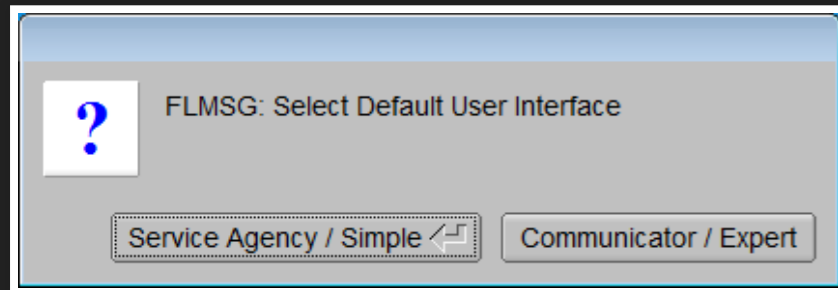
Click **RxID** and **TxID** (top).

FLDIGI CONFIGURATION

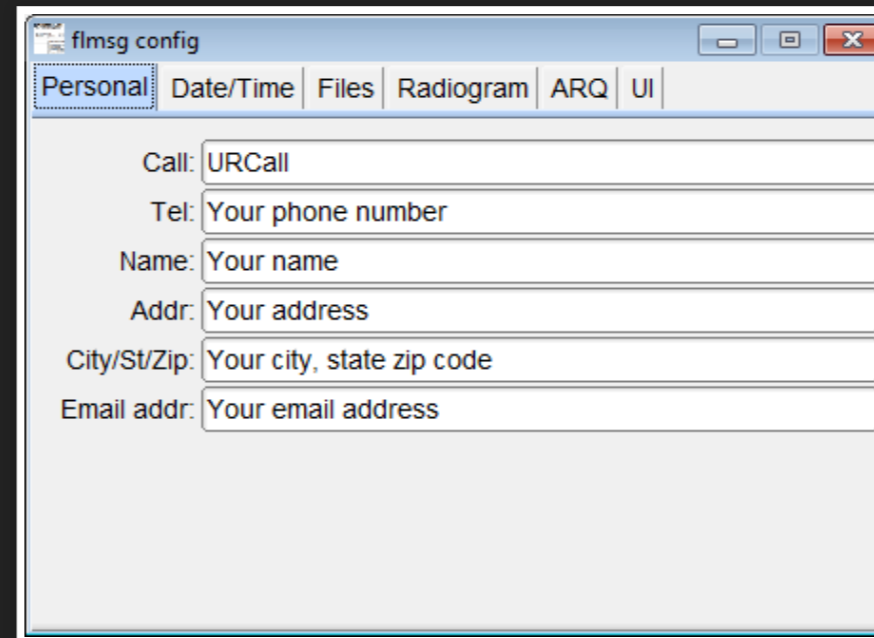


- Click **Configure**
- Click **Miscellaneous**
- Click **NBEMS**
- Under "NBEMS data file interface", **Enable** should be checked
- Under "Reception of flmsg files", uncheck **Transfer direct to executing flmsg**
- **Open with flmsg** and **Open in browser** should be checked
- Click **Locate flmsg**.
- Locate the **fldigi-x.x.x** folder in "Program Files/(x86)".
- Double-click **fldigi.exe**
- Click **Save**, then click **Close**.

FLMSG CONFIGURATION



Click **Communicator /
Expert**

A screenshot of a window titled "flmsg config". It has a tabbed interface with tabs for "Personal", "Date/Time", "Files", "Radiogram", "ARQ", and "UI". The "Personal" tab is active and contains several text input fields:

- 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: 4.0.7

File Form Template Config AutoSend ARQ 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 8PSK125 []

- MFSK128L
- MT63-500L
- MT63-500S
- MT63-1KL
- MT63-1KS
- MT63-2KL
- MT63-2KS
- Olivia-4-250

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
- Check mode is MT63-2KL
- Transmit time less than 3 minutes
- Fldigi: centered on 1500 Hz
- Click **AutoSend**
- You will be prompted to **Save form**. Name file 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 **Yes** on 'features in workbook might be lost'
- 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 (WORD)

- 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 **Allow character substitution**, then **OK** on 'file conversion'
- Click **Yes** on 'some text maybe lost on conversion'
- Continue to Flmsg...

TRANSMIT WORD DOCUMENT (FLMSG)

- 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 **Plan Text** to open in text editor
- Save to computer or USB drive

OPEN/PRINT A SAVED OR RECEIVED FORM

Open:

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

Print:

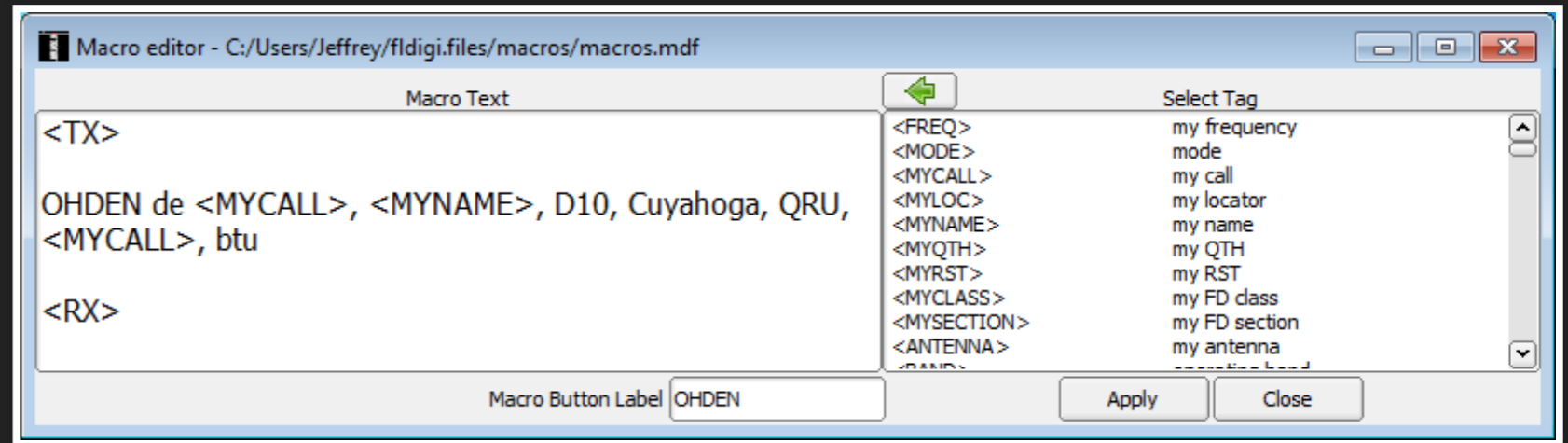
- In Flmsg, click **File**
- Select **View**
- Click **Html delivery**
- In web browser, click **File** (or menu)
- Click **Print**

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)

MACROS

- Commonly used actions: calling CQ, brag tape
- Allow state control: change TX <-> RX, frequency, mode, logging
- Not used in NBEMS
- Nets use to streamline check-ins
- OHDEN net [check-in macro](#)



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/Flmsg settings
- Flmsg path always changes when upgraded (Fldigi -> NBEMS tab)
- Radio Time-Out-Timer: **10 minutes**
- On HF: 5-30 watts, 50 max. USB.
- Always follow net protocol, ask before transmitting

FINDING OUT MORE

Official Fldigi/Flmsg documentation:

[Programs & Documentation](#)

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

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

[Radio Interface Setup.](#)

[Getting Started with Fldigi.](#)

[OHDEN \(HF\).](#) Tuesdays 7:45pm.

3584.500 USB @ 1500 Hz on waterfall using Olivia 8/500. No voice.

THANK YOU FOR ATTENDING!

Jeffrey Kopcak - K8JTK

K8JTK@arrl.net

ARRL Ohio Section Technical Coordinator.

[Other involvement.](#)

This presentation is available on my website: K8JTK.org

[Ohio Section](#) Management:

Section Manager: [Scott Yonally - N8SY](#)

Section Emergency Coordinator: [Stan Broadway - N8BHL](#)