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# DIGITAL COMMS

Part One: Overview and Demonstrations

K7AVR Lee Lukehart

Bonner County ARES/RACES

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# WHAT IS DIGITAL COMMS?

- TX & RX computer-generated sounds via radio
- Ways to MOdulate and DEModulate signals
- Software apps to create & translate signals
- Signals are encoded (not encrypted) in *modes*

# WHY USE DIGITAL MODES?

- Fast & accurate data transfers for EMCOMM
- Low Power – never need to run more than 25 W
- Many modes – select for conditions
- Reliable comms – succeed when even CW fails  
(some error corrections work below -20 dB s/n!)

# FLdigi Application Suite

“FL” in name indicates GUI built with Fast Light Toolkit

- FLdigi** – digital modem \*
  - FLarq** – Automated Repeat reQuest \*
  - FLmsg** – message forms management \*
  - FLamp** – Amateur Multicast Protocol \*
  - FLrig** – transceiver control \*
  - FLwrap** – file encapsulation \*
- + other W1HKJ apps not part of NBEMS

\* collectively referred to as NBEMS  
(Narrow Band Emergency Messaging Software)

Many thanks to creator W1HKJ Dave Freese

# FOR OPERATING SYSTEMS

- Linux / Unix
- Windows – Win7 / Win8 / Win10
- OSX – i386 or x86
- Desktop / Notebook / Netbook / Tablet
- “AndFlmsg” for Android

# FLDIGI DEMONSTRATIONS!

Three computers set up,  
with speakers and microphones only (no radios):

➤ Windows

➤ Linux (on Raspberry Pi 4)

➤ Mac

# 14070.000

Frq 14071.380 On Off 0053 In Out  
 Call Op Az  
 USB Qth St Pr Loc

- 14072.91 o&ilte e
- 14072.17 ta aet e oe enn e
- 14072.02 in eeEo setn ioe
- 14071.69 DX BGod Bless an
- 14071.62 t
- 14071.38 n r C let o-t-ei
- 14071.21 o1In,
- 14070.87 %PeeO e Tgw n

How  
 Your my 6,861 PSK31 QSO

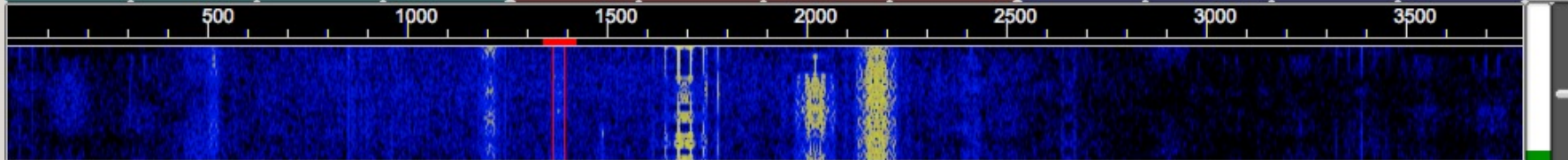
Report : 599 599  
 Name : Rich Rich  
 QTH : Ft Lupton, CO Ft Lupton, CO  
 Grid : DN70oc DN70oc  
 County : WELD WELD - 35 miles NE of Denver, Colorado

WX currently its 13 °F - cloudy skies with flurrries -Low abt 0 tonight Winds ENE at 10 to 15 mph Humidity 70%

How copy? BTU Bob, KD8QZE de KB0QC pse kn oenleh  
 rxQC d  
 KD8Q  
 ipe te mee

CQ  
 3.0  Clear

CQ	ANSWER	QSO	KN	SK	Me/Qth LV	Brag LV	Me/QTH SV	Brag SV	Olivia 16/500	DominoEX 8	DominoEX 4	1
CQ DX	CQ DX 2X	CQ 2X	CPS Test	Call	Log QSO	CW-CQ	WEFAX	BPSK 31	BPSK 63	BPSK 63F	BPSK 125	2



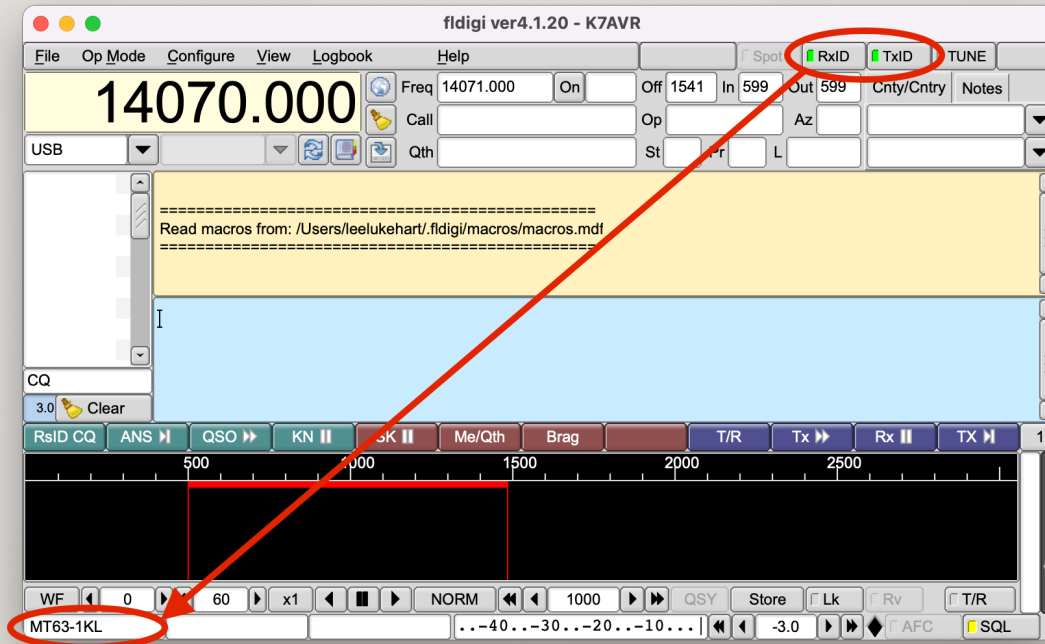
WF -12 70 x1 FAST 1380 QSY Store Lk Rv T/R  
 BPSK31 s/n 16 dB imd -29 dB -3.0 AFC SQL KPSQL

# MOST COMMON DIGITAL MODES

- RTTY – legacy digital mode; not for QRP; poor s/n performance
- PSK-31 – ideal for keyboard to keyboard casual comms
- MT63 – immune to interference – moderate speed
- Thor-16 – forward error correcting multi-tone; very easy to tune; excellent s/n performance; FAX image transfers
- Olivia – 8/500 & 16/500 – very slow for keyboard communications, excellent s/n performance
- Contestia – 8/500 – like Olivia, upper case only; great casual comms at marginal s/n
- FT8 – QSOs only (-20 s/n!); not for comms



# MODE IDENTIFIERS (RXID, TXID)



- Preamble Sequence of 15/30 tones before message to identify mode
- Reed Soloman encoding can be detected at -18 dB s/n
- Both TX and RX behavior configurable

# CONFIGURE OPERATOR

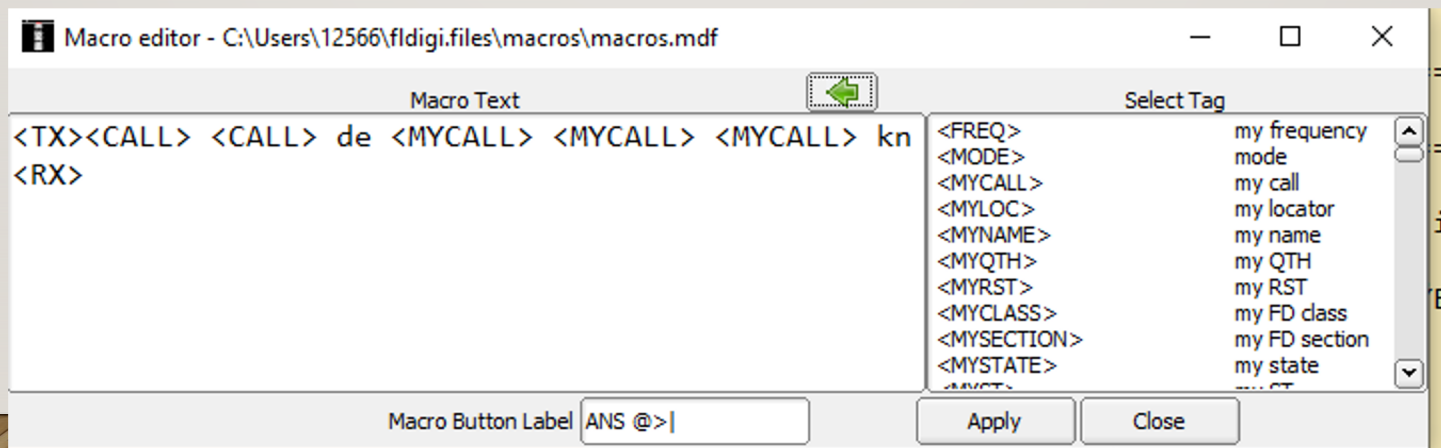
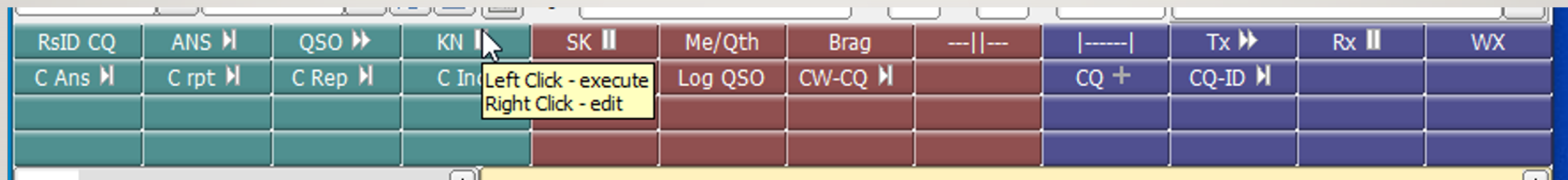
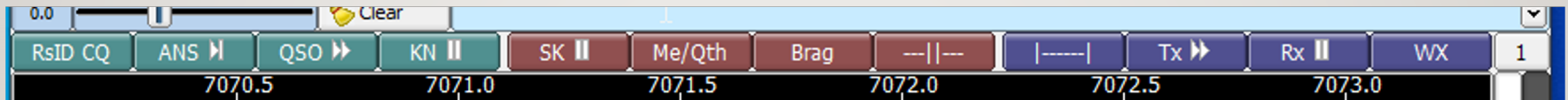
The screenshot shows a window titled "Fldigi configuration" with a sidebar on the left and a main configuration area on the right. The sidebar contains a tree view with the following items: Configure, Colors-Fonts, Contests, IDs, Logging, Modem, Misc, Operator-Station (highlighted), Rig Control, Soundcard, UI, Waterfall, and Web. The main area is titled "Operator-Station" and contains the following fields:

- Station Callsign:
- Operator Callsign:
- Operator Name:
- Antenna:
- Station QTH:
- Station Locator:
- State / Provinces:
- Counties / Regions:

At the bottom of the window, there are four buttons: "Collapse Tree", "Restore defaults", "Save", and "Close".

# MACROS

Automate routine operation; add program control



# WHAT EQUIPMENT DO YOU NEED?

- Radio

- Computer (Mac / Win / Linux)

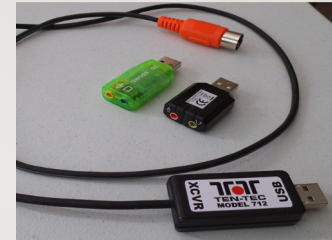
- Software

Also useful:

- Sound card interface (e.g. Signalink, RIGblaster)

# SOUND CARD INTERFACE

- Connects computer sound card to the radio
- RF isolation
- Ground loop isolation (transformer coupling)
- Can automate the PTT when you transmit

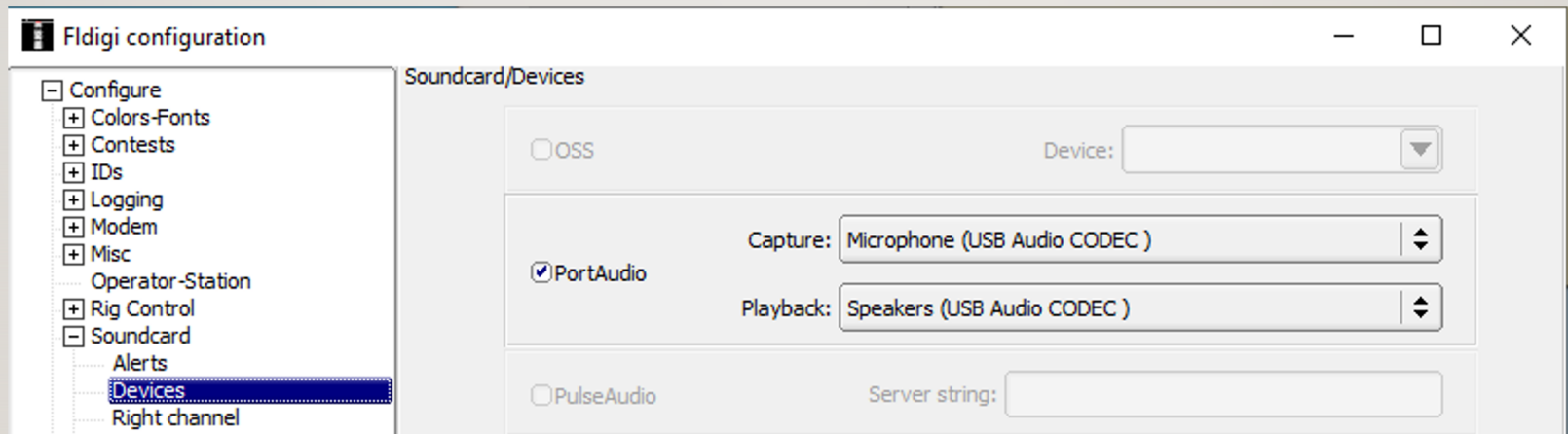


- Some radios have sound interface built-in



# FLDIGI SETUP - AUDIO

- Install audio device drivers specific to OS, as needed (most PnP)
- On Windows & Apple – select PortAudio listed device
- On Linux – use PulseAudio or added library (e.g. PAVC)



# TRANSCEIVER CONTROL OPTIONS

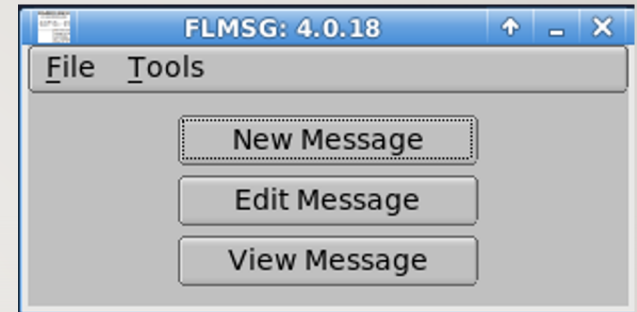
- flrig – separate application
- rigcat – fldigi user-definable (XML)
- hamlib – public domain library
- other 3<sup>rd</sup> party control access using remote procedure calls (xmlrpc)

# FLMSG

## Message manager

- Generate
- Store
- Send
- Receive
- Fixed format
- Custom HTML-5

## Simple Interface





# FLMSG – EXPERT INTERFACE

The screenshot displays the FLMSG 4.0.18 software interface. The title bar reads "FLMSG: 4.0.18". The menu bar includes "File", "Form", "Template", "Config", "AutoSend", "Utilities", and "Help". The main window title is "ARRL radiogram" and the file name is "file: new.m2s". There are two tabs: "Message" (selected) and "Records".

The "Message" tab contains the following fields and controls:

- SVC**:  2
- \*NR**: ROUTINE
- \*PREC**: [dropdown arrow]
- HX\_**: [text field] hx
- \*STN ORIG**: [text field]
- CK**: [text field] ck
- PLACE OF ORIG**: [text field]
- TIME FILED**: [text field] ...
- \*MON DY**: [text field] ...
- \*TO**: [text field]
- TEL:** [text field]
- OP NOTE:** [text field]
- Standard Format
- ARL MSG
- TXT:** [large text area]
- SIG:** [text field]
- OP NOTE:** [text field]
- Comp 8PSK1200F [dropdown arrow] \*
- ARQ Send [text field] NOT CONNECTED [text field]

# FLMSG BUILT-IN FORMS

The screenshot displays the FLMSG 4.0.17.01 application interface. A menu is open, listing various built-in forms: Blank, CAP, CSV, Custom, Ham Forms, HICS, IARU, ICS, MARS, Plaintext, Radiogram, Red Cross, Transfer, and Weather. The main window shows a message being composed, with fields for 'Message', 'SVC \*NR', 'PLACE OF', and 'TO'. A 'CSV spreadsheet' window is open, displaying a list of medications with columns for Type, NDC Product Code, Medication Name, Units Required, and Location. A 'CSV Viewer' window is also open, showing a table of the same data.

**CSV Viewer Data:**

Type	NDC Product Code	Medication Name	Units Required	Location
1	54092-371	Adderall	10	ER
2	0024-5401	Ambien	10	ER
3	0254-2101	Amitriptyline	15	ER
4	0093-4160	Amoxicillian	20	OR
5	0781-1078	Atenolol	5	OR
6	64455-063	Ativan	5	OR
7	63304-958	Cephalexin	10	MEDSURG
8	0597-0006	Clonidine	10	OR
9	0002-3235	Cymbalta	10	OR
10	50580-280	Dizepam Flexeril	20	OR





# FLMSG CUSTOM FORMS

127.0.0.1:8080 Search

Most Visited fldigi SF-files

## Select the Damage Level

From the Damage Level Pictures 1 through 4 shown below, choose the damage level that more closely resembles the damage in the address you are reporting.

 <p><b>1</b></p> <p>FLOOD LEVEL 5</p> <p>FLOOD LEVEL 6</p> <p>NO/MINOR DAMAGE HABITABLE</p>	 <p><b>2</b></p> <p>MAJOR DAMAGE HABITABLE</p>	 <p><b>3</b></p> <p>MAJOR DAMAGE UNINHABITABLE</p>	 <p><b>4</b></p> <p>DESTROYED</p>
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Select damage level: 2. Major, habitable

Submit Form

# Useful Links

Main fldigi website:

<http://w1hkj.com>

Source Forge files download

<http://sourceforge.net/projects/fldigi/files/>

Fldigi on-line mode identification – sights and sounds

<http://w1hkj.com/modes/>

NBEMS EMCOMM user group:

<https://groups.io/g/nbems>

Windows fldigi user group:

<https://groups.io/g/winfldigi>

Linux / Mac fldigi user group:

<https://groups.io/g/linuxham>

Raspberry Pi 4:

<https://www.raspberrypi.com/products/raspberry-pi-4-model-b/>