



DIGITAL COMMS

Part Two: Hands-on Configuration

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Bonner County ARES/RACES

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REVIEW:WHAT IS DIGITAL COMMS?

- TX & RX computer-generated sounds via radio
- Ways to MOdulate and DEModulate signals
- Signals are encoded (not encrypted)
- Various softwares to send and capture signals
- Reliable comms for EMCOMM

WHAT DO YOU NEED?

- Computer (Mac / Win / Linux)
- Software (FLdigi suite)
- Radio (any)

Also useful:

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

FLdigi Application Suite

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

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

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

OPERATING SYSTEMS

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

14070.000

Frq 14071.380 On Off 0053 In Out
 Call Op Az
 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

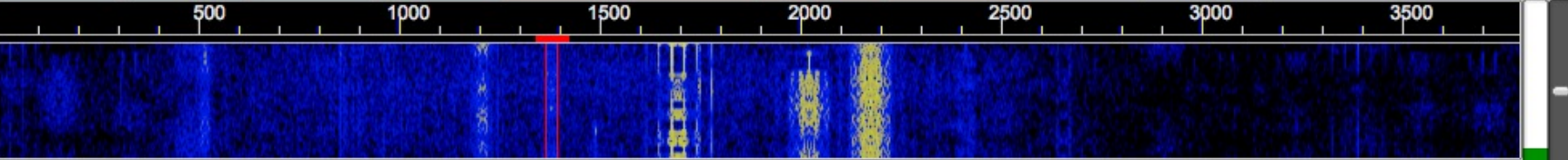
WX currently its 13 °F - cloudy skies with flurries -Low abt 0 tonight Winds ENE at 10 to 15 mph Humidity 70%

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

I

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 M	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

CONFIGURE OPERATOR

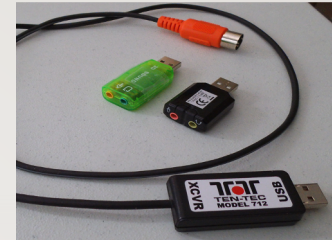
The screenshot shows a window titled "Fldigi configuration" with a sidebar on the left and a main configuration area on the right. The sidebar contains a tree view with the following items: Configure, Colors-Fonts, Contests, IDs, Logging, Modem, Misc, Operator-Station (highlighted), Rig Control, Soundcard,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

- Station Callsign: K7AVR
- Operator Callsign: K7AVR
- Operator Name: Lee Lukehart
- Antenna: Buckmaster OCF dipole
- Station QTH: Sandpoint, ID, USA
- Station Locator: DN18ri
- State / Provinces: Idaho (dropdown) ID
- Counties / Regions: Bonner (dropdown) BNR

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

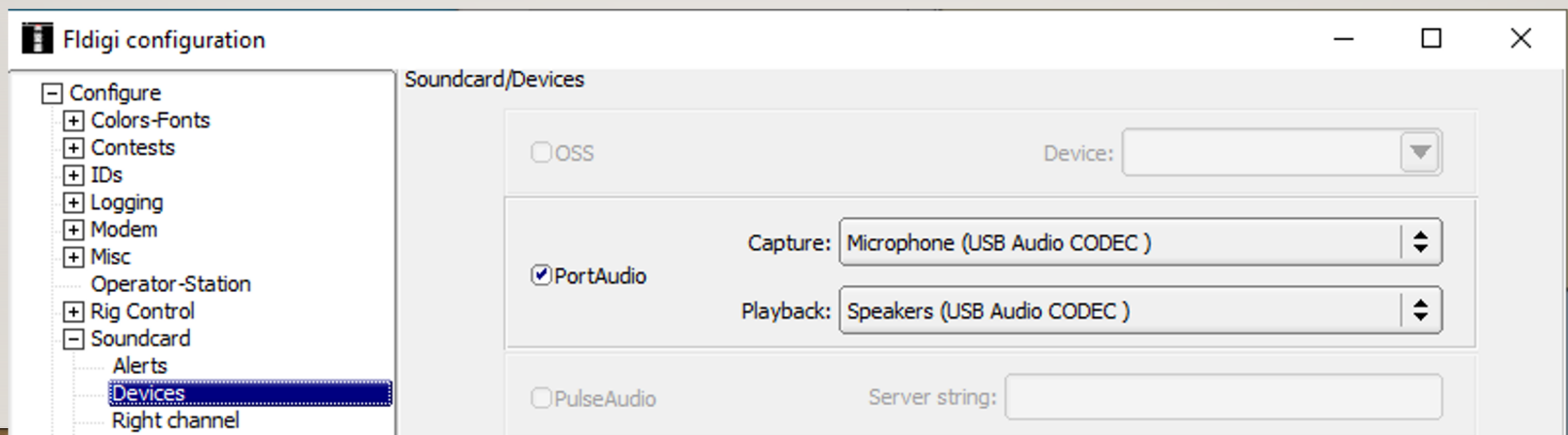
SOUND CARD I/O

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

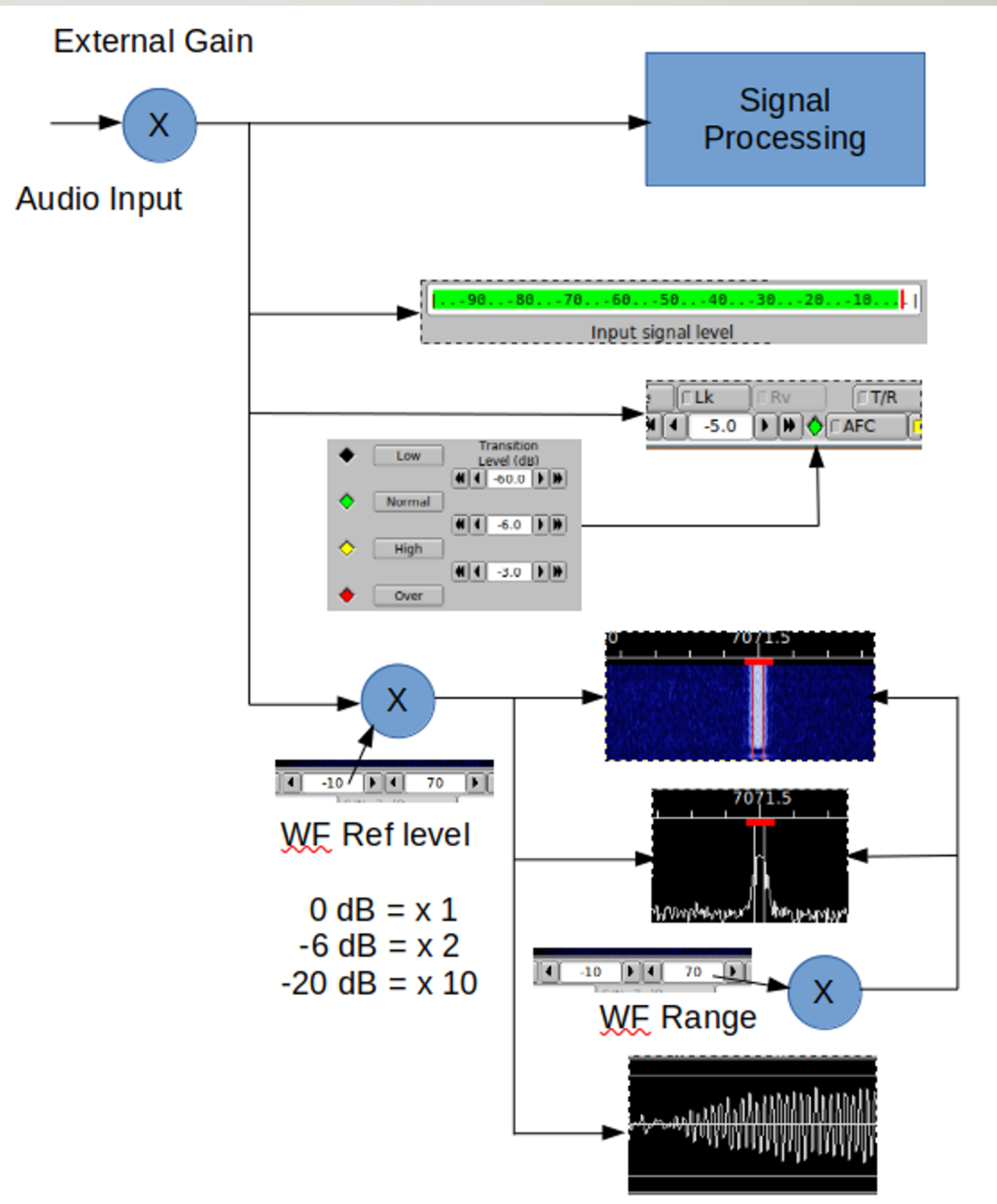


FLDIGI SETUP - AUDIO

- 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. PAVU)



RECEIVED AUDIO PATHS



INPUT SIGNAL LEVEL

Fldigi configuration

- [-] Configure
 - [+] Colors-Fonts
 - [+] Contests
 - [+] IDs
 - [+] Logging
 - [+] Modem
 - [+] Misc
 - Operator-Station
 - [+] Rig Control
 - [-] Soundcard
 - Alerts
 - Devices
 - Right channel
 - Settings
 - Signal Level**
 - Wav file recording
 - [+] UI
 - [+] Waterfall
 - [+] Web

Signal Level

Signal Levels

- ◆ Low Transition Level (dB) -60.0
- ◆ Normal Transition Level (dB) -6.0
- ◆ High Transition Level (dB) -3.0
- ◆ Over

Default

0..-60..-50..-40..-30 | ..-20..-10... |

Input signal level

x1 ◀ ■ ▶ NORM ◀◀ ◀ ▶▶ 1644 QSY Store

90..-80..-70..-60..-50..-40..-30 | ..-20..

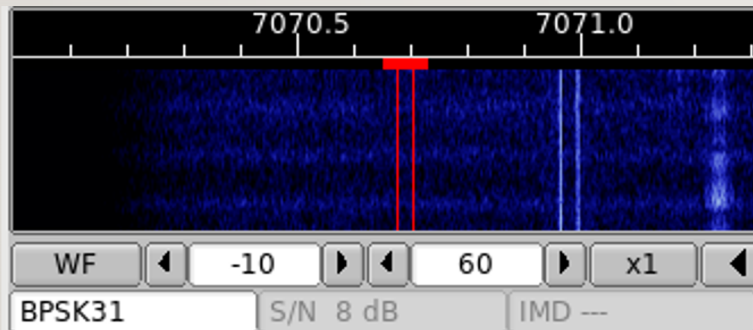
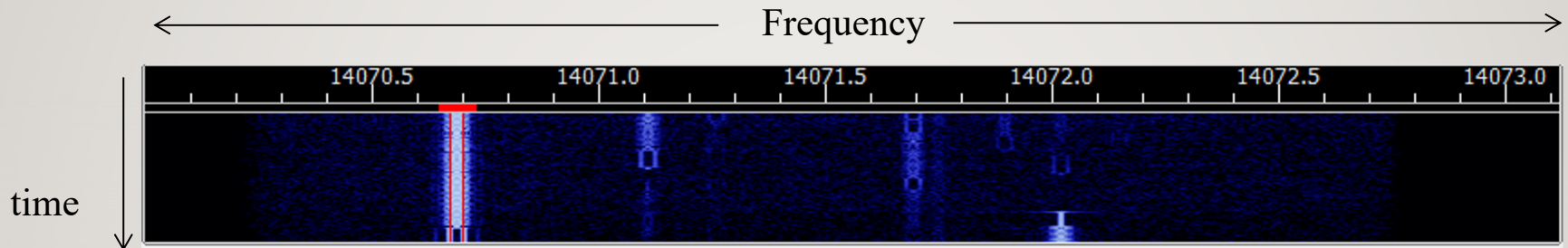
7070.5 7071.0

WF ◀ -10 ▶◀ 60 ▶▶ x1 ◀

BPSK31 S/N 8 dB IMD ---

Check Input Audio on Waterfall

A rolling representation of Time, Frequency, Amplitude



Color == Amplitude

- Blue = low amplitude
- White = medium amplitude
- Red = high amplitude

TRANSCEIVER CONTROL

- flrig – separate application
- rigcat – fldigi user definable interface
- hamlib – public domain library
- 3rd party control access using remote procedure calls, xmlrpc

FLRIG SETUP

The image displays the FLRIG software interface. On the left is a tree view with categories like 'Configure', 'Rig Control', and 'flrig'. The main window is titled 'Rig Control/flrig' and contains the following elements:

- A note: "flrig is the preferred method of transceiver control"
- Two checkboxes: "Enable flrig xcvr control with fldigi as client" and "Shutdown flrig with fldigi"
- Text: "flrig xmlrpc server parameters these controls are mirrored on the IO configuration tab"
- An input field for "Addr" containing "127.0.0.1"
- Text: "*Disable PTT keys modem if multiple modems are connected to a serial port"
- Checkbox: "Frig PTT keys"

Overlaid on the right is a control panel window titled "flrig IC-7100". It features a menu bar (File, Config, Memory, Keyer, Help) and a digital display showing "7070.000" and "14070.000". Below the display are various controls:

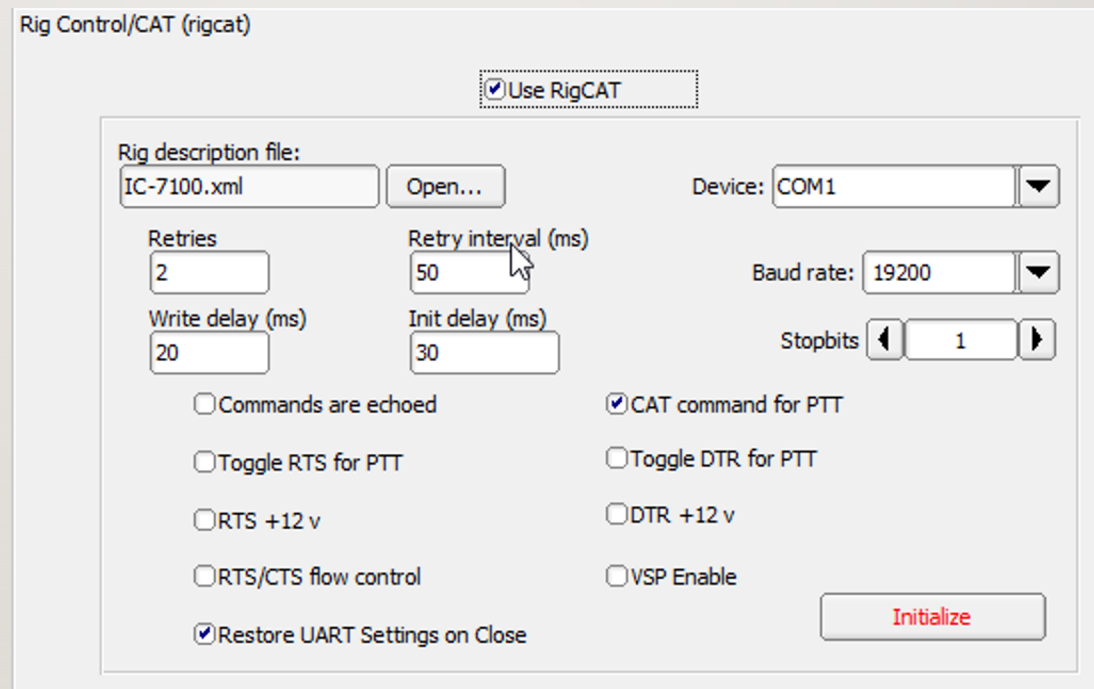
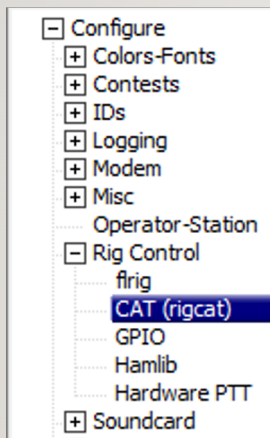
- Frequency scale: S3, S6, S9, +20, +40, +60
- Buttons: vfoA, vfoB, A<->B, Split
- Mode: 2, 3000, USB-D
- Sliders: Vol (0), RF (100), SQL (0), NR (0), Lock (0), ClrPBT (0), IFsh (0), Nch (-1040), Mic (19), Pwr (100)
- Buttons: ATT, Pre, NB, AN, Tune, PTT

Support for 85 transceivers

Transceiver control for 3rd party apps such as WSJTX concurrent with fldigi

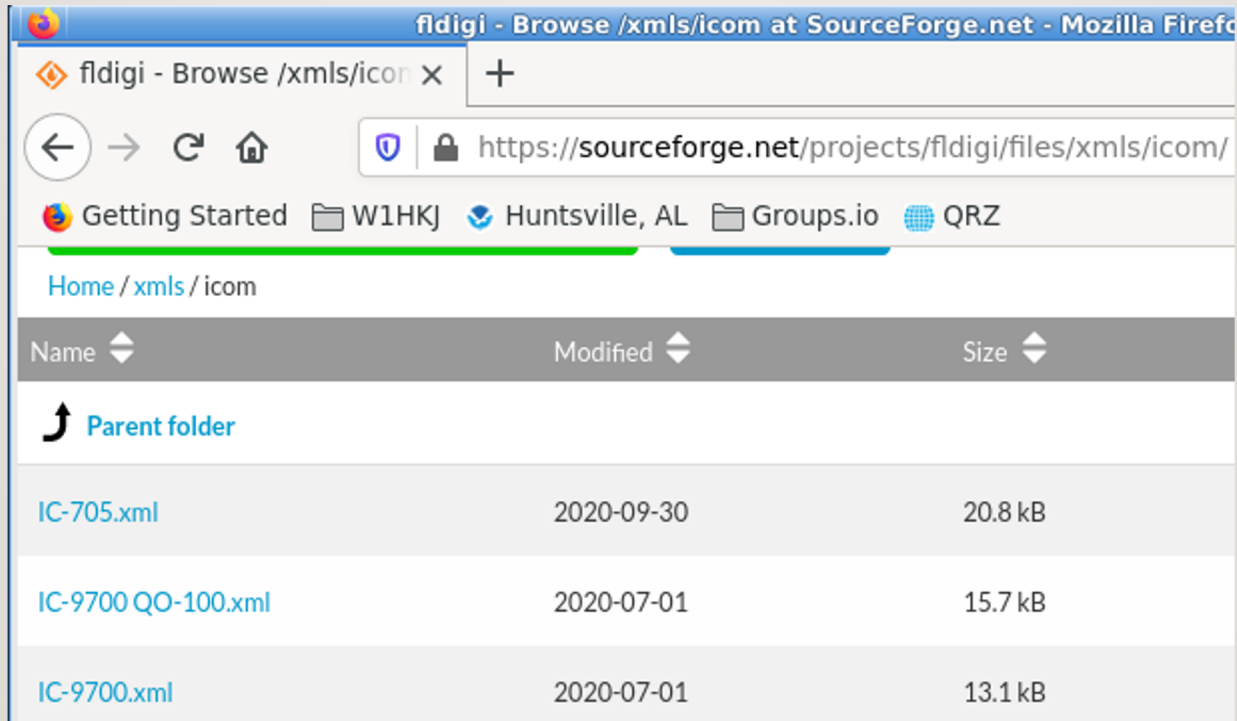
RIGCAT SETUP

- Configure RigCAT tab



RIGCAT XCVR DEFINITION FILES

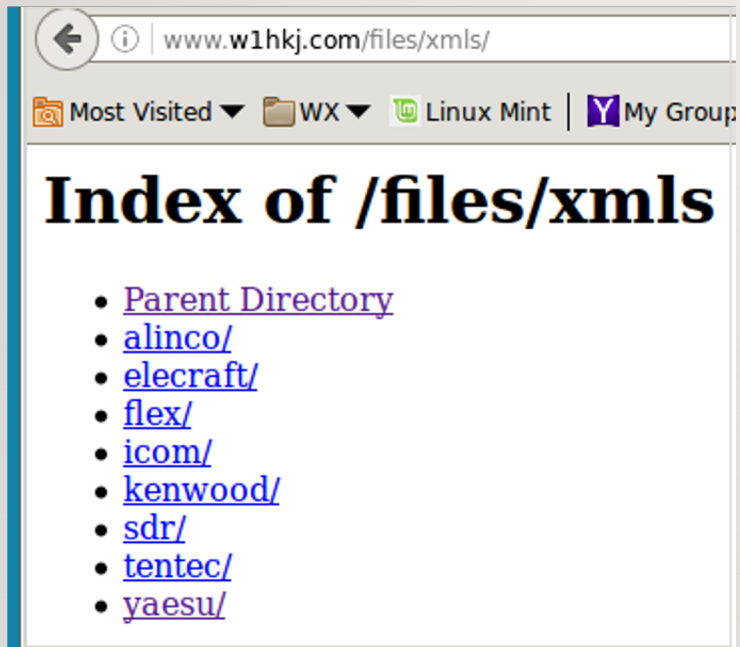
Download the xml CAT file from Source Forge



Copy file to the `fldigi.files\rigs\` folder in your home folder

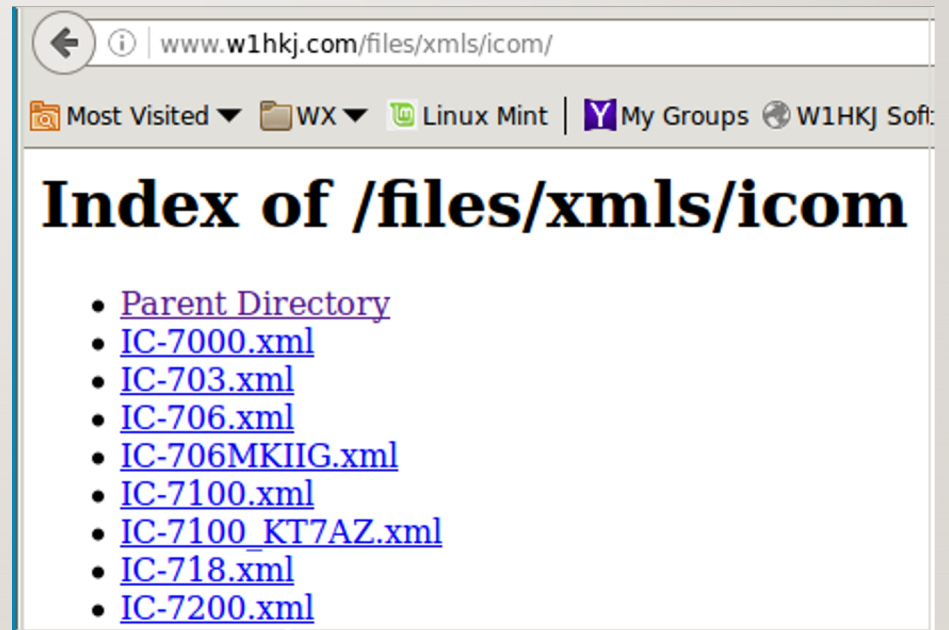
RIGCAT XCVR CONTROL FILES

- Or from <http://www.w1hkj.com/files/xmls/>



A screenshot of a web browser window. The address bar shows the URL www.w1hkj.com/files/xmls/. Below the address bar, there are navigation icons for 'Most Visited', 'WX', 'Linux Mint', and 'My Group'. The main content area displays the title 'Index of /files/xmls' in bold black text. Below the title is a list of links:

- [Parent Directory](#)
- [alinco/](#)
- [elecraft/](#)
- [flex/](#)
- [icom/](#)
- [kenwood/](#)
- [sdr/](#)
- [tentec/](#)
- [yaesu/](#)

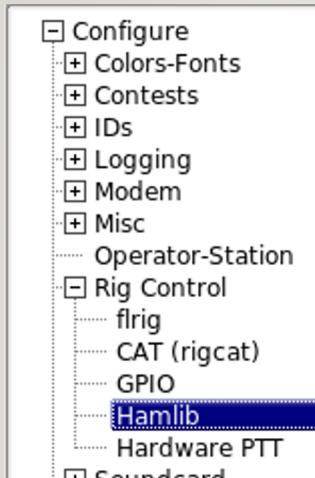


A screenshot of a web browser window. The address bar shows the URL www.w1hkj.com/files/xmls/icom/. Below the address bar, there are navigation icons for 'Most Visited', 'WX', 'Linux Mint', 'My Groups', and 'W1HKJ Soft'. The main content area displays the title 'Index of /files/xmls/icom' in bold black text. Below the title is a list of links:

- [Parent Directory](#)
- [IC-7000.xml](#)
- [IC-703.xml](#)
- [IC-706.xml](#)
- [IC-706MKIIG.xml](#)
- [IC-7100.xml](#)
- [IC-7100_KT7AZ.xml](#)
- [IC-718.xml](#)
- [IC-7200.xml](#)

Copy file to the `fldigi.files\rigs\` folder in your home folder

HAMLIB SETUP



Rig Control/Hamlib Use Hamlib Defaults

Rig: Icom IC-7100 (Untested) Device: Controller_00C970EB-if00-port0

Retries: 3 Timeout (msec): 1000 Baud rate: 19200

Write delay (msec): 0 Post write delay (msec): 0 Stopbits: 1

Polling Interval (msec): 250

PTT via Hamlib command Mode delay (msec): 200

Audio on Auxiliary Port Sideband: Rig mode

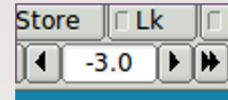
DTR +12 RTS +12 CW is LSB mode

RTS/CTS flow control XON/XOFF flow control RTTY is USB mode

Advanced configuration:
 Initialize

TRANSMIT LEVEL CONTROL

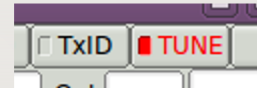
- Set TX attenuator to -3 dB



- Set xcvr power

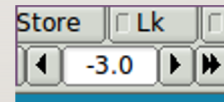
- Open OS mixer control for xcvr device

- Press the fldigi “tune” button



- Adjust the mixer control for desired pwr out
25 W or less

- Fine tune with fldigi TX attenuator

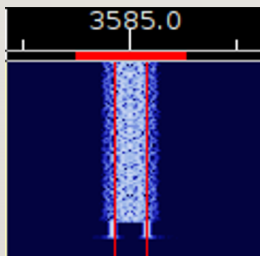
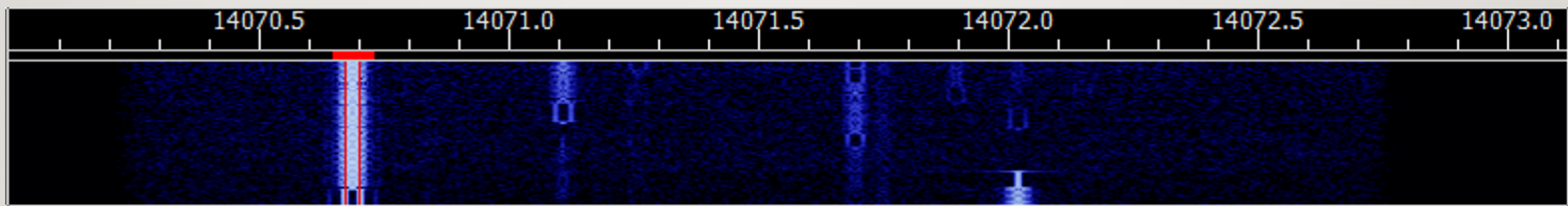


- Adjust for zero ALC => clean signal

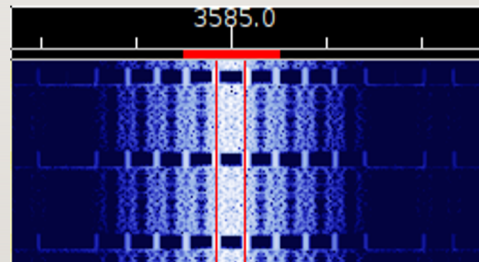
- Repeat with on-air tests

PSK EXAMPLE: “GOOD NEIGHBOR”

You are sharing the spectrum;
do not splatter!



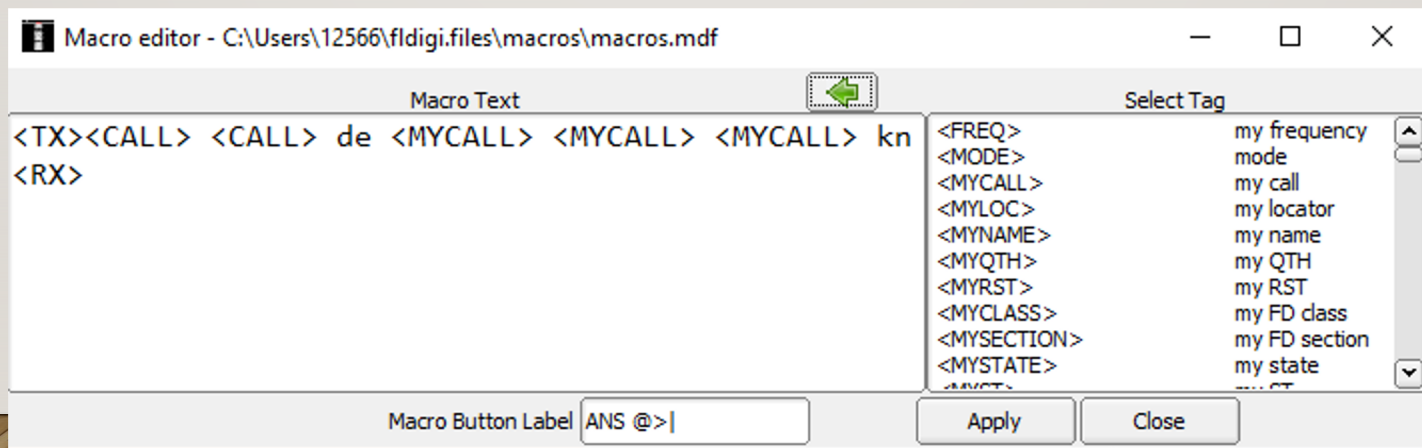
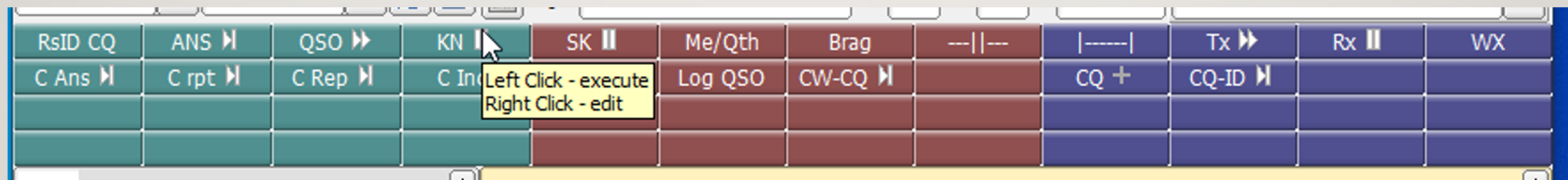
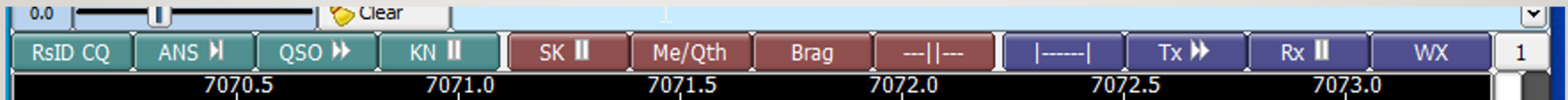
Ideal



Overdriven ALC

MACROS

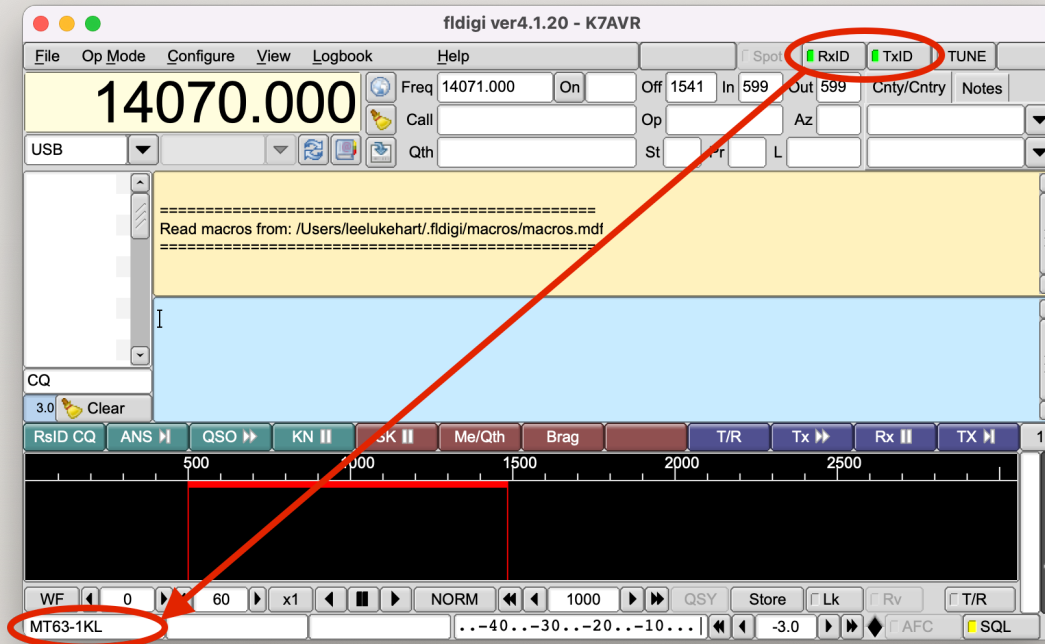
Automate routine operation – add program control



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)



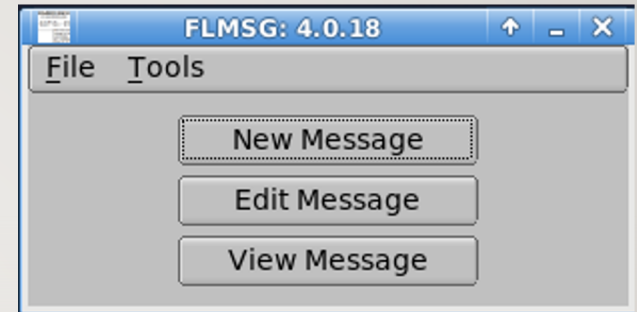
- Preamble Sequence of 15/30 tones before message to identify mode
- Reed Soloman encoding can be detected at -18 dB s/n
- Both TX and RX behavior configurable

FLMSG

Message manager

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

Tyro Web Interface



FLMSG – EXPERT INTERFACE

The screenshot shows 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 form fields are organized as follows:

- SVC**: 2
- *NR**: ROUTINE
- *PREC**: (dropdown menu)
- HX_**: hx
- *STN ORIG**: (text field)
- CK**: ck
- PLACE OF ORIG**: (text field)
- TIME FILED**: (text field) ...
- *MON DY**: (text field) ...
- *TO**: (large text area)
- TEL:** (text field)
- OP NOTE:** (text field)
- Standard Format
- ARRL MSG** (button)
- TXT:** (large text area)
- SIG:** (text field)
- OP NOTE:** (text field)
- Comp 8PSK1200F (dropdown menu) *
- ARQ** (button) Send (button) (text field) NOT CONNECTED (text field)

FLMSG BUILT-IN FORMS

The screenshot displays the FLMSG 4.0.17.01 application window with several overlapping windows and a menu open.

Main Window (FLMSG: 4.0.17.01): Shows a menu with options like File, Form, Template, Config, AutoSend, Utilities, and Help. The 'Form' menu is open, listing various form types such as Blank, CAP, CSV, Custom, Ham Forms, HICS, IARU, ICS, MARS, Plaintext, Radiogram, Red Cross, Transfer, and Weather.

ARRL radiogram window (file: W1HKJ-1.m2s): Shows a message form with fields for SVC (*NR), PLACE OF (NYC), *TO (DAVID FR), and SIG: HEL.

CSV spreadsheet window (file: druglist.c2s): Contains buttons for Import CSV, Export CSV, View CSV, and Edit CSV. Below the buttons is a text area with the following 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
```

CSV Viewer window: Displays the data from the CSV spreadsheet in a table format:

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

The CSV Viewer window has a 'Close' button at the bottom right.





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>1</p> <p>FLOOD LEVEL 5</p> <p>FLOOD LEVEL 6</p> <p>NO/MINOR DAMAGE HABITABLE</p>	 <p>2</p> <p>MAJOR DAMAGE HABITABLE</p>	 <p>3</p> <p>MAJOR DAMAGE UNINHABITABLE</p>	 <p>4</p> <p>DESTROYED</p>
--	---	--	--

Select damage level: 2. Major, habitable

Submit Form

CONFIGURE FLDIGI / FLMSG

The screenshot displays the configuration window for FLDIGI, specifically the 'NBEMS interface' section. On the left, a tree view shows the configuration hierarchy, with 'NBEMS interface' selected. The main panel is titled 'NBEMS interface' and contains the following settings:

- NBEMS data file interface:**
 - Enable
 - Open message folder
- Reception of flmsg files:**
 - Selection of transfer direct takes precedence over all other flmsg reception settings
 - Transfer direct to executing flmsg
 - Open with flmsg
 - Open in browser
- flmsg:**
- Timeout (secs):**

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>