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  – QRZ
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Chapter 3

Installing fldigi on a thumb drive

Installing fldigi (and any of the other NBEMS flxxxx applications) on a thumb drive is very simple. Create a folder on the thumb drive named FL_APPS. Then copy the fldigi executable to that folder. Note that folder FL_APPS may reside on any hard drive, or removable drive (including a rewritable CD/DVD) on your system. Copy the executable for flarq, flrig, flmsg, flamp, etc to that same folder if you want to have a complete NBEMS installation on that device:

- fldigi.exe
- flarq.exe
- flmsg.exe
- flamp.exe
- flrig.exe

The key to using the applications thus installed is to execute the program from that folder. This is best accomplished by opening the FL_APPS folder using the system files explorer. Then start the application by double clicking on it's icon.

You will be guided through the new install wizard the first time you do this and fldigi will place all of it's configuration folders in the same folder from which it was started. For example, if the thumb drive were on an XP system and the drive was system device "H:"

- H:\FL_APPS\fldigi.exe
- H:\FL_APPS\fldigi.files
- H:\FL_APPS\fldigi.files\fldigi_def.xml
- etc ...
3.1 Moving thumb drive between computers

If this removable drive installation is to be used on several computers or you expect that the hardware configuration might change then you should follow these steps each and every time that you exit the program. This will insure that fldigi will restart correctly.

- select sound card as "File I/O only"
- deselect all transceiver control (be sure to Initialize any changes)
- note: you do not have to disable xmlrpc rig control
- save the configuration

You will follow a similar procedure when you shut down flrig. The purpose is to remove all configuration items which are hardware specific. Reconfiguring the sound card and transceiver control only takes a few steps the next time fldigi is executed.

3.2 Extended Character Set Install

This installation technique works equally well on the C:\ drive, and it should be used when the operating system uses an extended character set for folder names and user login names such as Bjöørn. fldigi will try to convert that user name to a UTF-8 character sequence which the OS (typically Microsoft) will not be able to use to create the fldigi.files folder, etc.

Create the folder c:\FL_APPS
Copy fldigi, flaq, flrig, flmsg, etc executables to the newly created folder and then either

- delete the original desktop icon for the flxxx application, and create a new one for the copied file(s), or
- modify the properties dialog of the original desktop icon so that the "Target:" entry points to the newly copied file(s)

The fldigi.files, NBEMS.files, flrig.files, etc. folders will be created as sub-folders in the c:\FL_APPS folder the first time that the respective application is executed.
Configure each application. If you already have logs, macro files, etc. copy these to the respective places in the c:\FL_APPS tree.
When you upgrade fldigi you will only need to copy the new executable to that c:\FL_APPS folder, perhaps renaming the existing file as fldigi.exe.bak so that it can be recovered if necessary.
Initial Configuration

The first time you execute fldigi you should resize the main window to suit your screen dimensions. Then adjust the divider line between the Rx and Tx text widgets.

Fldigi contains many configurable items, to specify operator data, user interface, and modem characteristics. The application also saves many state variables between executions. It will start up in the state that it was last used.

4.1 User Interface configuration

The tree menu is used to access configuration categories as "leaves" of the tree.

You should initially configure the following:
14 Initial Configuration

- Configure Operator
- Sound Card Configuration
- Xcvr Control Configuration
- RX/TX Audio Levels
- New Installation
- Configure ARQ/KISS I/O
- Configure Power Signal Monitor (PSM)

4.2 Windows Specific Install / Config

- Installing Fldigi on Windows
- New Install Wizard

4.3 Other Configuration options

When the program receives and transmits digital signals and your rig control is satisfactory then you can continue configuring other aspects of the program:

- Callsign DB Configuration
- Colors and Fonts
- Audio Alerts
- Rx Audio Monitor
- Autostart Configuration
- RSID / Video / ID Configuration
- PSKmail Configuration
- Configure Touch Screen
- User Interface Configuration - Browser
- User Interface Configuration - General
- User Interface Configuration - Logging
- User Interface Configuration - Macros
- User Interface Configuration - WF Controls
- Waterfall Configuration
- WEFAX
- Working Logs
4.4 Command Line Switches

Additional configurational items are available from the command line.

See Command Line Switches for details.

4.5 Modem Configuration Options

You can configure each modem type to suit your particular operating needs, but the defaults should be satisfactory for most users.

- Contestia Configuration
- CW Configuration
  - nanoIO Interface
  - Navigator Interface
  - WinKeyer Interface
  - CW Keyline Configuration
  - CW CAT Keying Configuration
- DominoEX Configuration
- Feld Hell Configuration
- FSQ Configuration
- IFKP Configuration
- RSID / Video / ID Configuration
- Miscellaneous Configuration
- MT63 Configuration
- Olivia Configuration
- PSK Configuration
- RTTY / FSK Configuration
- Thor Configuration
- Frequency Analysis & Measurement
  - Frequency Analyzer
  - Frequency Measurement Test Modem
  - WWV codec PPM measurement
  - WWV transmit mode

When you have completed the configuration go to the Configure menu and select Save config or press the "Save Config" button on the configure dialog box. The program will write the file ~/.fldigi/fldigi_def.xml.
4.6 Configure Operator

Enter your personal information on the Operator tab of the configuration dialog. This information is used by some of the macro expanders.

NOTE:

Thor and DominoEX secondary text field are initially set to the operator callsign. On subsequent changes to the callsign, these fields are not updated. See Thor Configuration and DominoEX Configuration for the location of the secondary text entry fields.

The antenna information is required if you elect to report to the spotting web site, PSK reporter.

Your locator data is also used for automatically computing Azimuth to a remote locator when that is available from an on-line database Call query.

4.7 Sound Card Configuration

A few words about sound I/O on the PC. "You are in a maze of twisty little passages, all alike".

PortAudio, PulseAudio and OSS are different ways in which fldigi can access your sound card through the various sound systems.
OSS was the first audio backend in fldigi. It works with the Linux sound system of the same name, which has now been replaced by ALSA but is still supported via an emulation layer. Its only advantage, as an audio backend, is that it's simple and doesn't require any external libraries.

The PortAudio backend was written subsequently to support OSS on Linux and FreeBSD, ALSA and JACK on Linux, CoreAudio on OS X, and also the various sound APIs on Windows – all through the same PortAudio library.

PulseAudio is more than an audio hardware access layer; refer to its website for a summary of what it does. Fldigi supports it mainly because many Linux distributions are now integrating it with their desktops, but also because it has a few interesting features:

- it can take care of the resampling and volume control for us,
- it can stream audio over the network, and
- it makes it easier to run multiple fldigi instances (all accessing the same sound card).
- it provides mixer controls for input and output audio streams
- it remembers which hardware is used for each application it serves, and it remembers the mixer levels associated with that application

In the future it might be possible to replace all of these with a single backend, without any loss of functionality, performance, sound system or platform support. That'll be the day! Until then:

![Soundcard/Devices](image)

**Figure 4.3 Audio Devices**

**On Linux:**

- Use PulseAudio if your Linux distro ships it, and you already have the pulseaudio daemon running (this is the case with Fedora 8/9 and Ubuntu 8.04, probably also with openSUSE 11.0). Or if you want networked audio, etc. etc.
• Otherwise, use PortAudio and select a device from the list(s). PortAudio is also the best way to access JACK, through which you can use other programs as audio sources/sinks – particularly useful with SDR software. As with PulseAudio, you can select different capture and playback audio devices.

• The OSS backend should be used only as a last resort. Note that it has not been updated to support user-configurable sample rates.

• Most audio devices will support full duplex operation. The device will be opened for both read and write. If your audio device does not support full duplex (some blue tooth devices are in this category), then uncheck the "Device supports full duplex" control.

On Windows:

Use the PortAudio and select the device from the list(s).

Select the SndCrd\'tab on the configuration dialog.

On Linux Fldigi can interface to the sound card using either the OSS, the Portaudio, or the PulseAudio. Each of the appropriate libraries must be present on the computer to use that particular sound i/o.

On Windows Fldigi uses the Portaudio sound driver only.

It is also possible to configure Fldigi with File I/O only, which is useful for testing the application without an interface to the sound card. In the File I/O only configuration you can record and playback audio files in a number of different formats including the "wav" format associated with the Windows operating system.

The program will find all active sound cards and the associated drivers for both. Select the sound card and driver type that will be used with the program. I recommend using the Pulseaudio device driver if that is available on your Linux distribution.

![Soundcard/Settings](Image)

**Figure 4.4 Config Audio Settings**

If Pulse or Port audio is selected then you can either allow the program to use the auto detect to determine the best sound card sampling rate, or you can pick from the drop down list. If you know your RX and TX sound card oscillator correction factors you can enter them now. If not you can determine the RX rate correction using a special WWV modem built into Fldigi. The decoder and encoder logic for each of the various modems require a specific sound card sample rate which may not be the the actual sound card sample rate. The conversion between the
modem sample rate and the sound card sample rate is accomplished by one of a set of sample rate converters.

Sound card oscillators may have a slight error in frequency that causes their sampling rate to not be the value specified. This error is usually small enough to be measured in a parts per million. Fldigi uses a technique called rate conversion to correct the sampled waveform for this error. The error can be measured and the correction factor determined by using the WWV calibration modem. The supporting library used for the converter provides several different levels of conversion, Best, Medium, Fastest and Linear Interpolator. The default, Medium interpolator, will be satisfactory for most sound cards. If you are running fldigi on a computer with limited cpu power you might find it necessary to select one of the more cpu efficient converters, either Fastest or Linear. Each gives progressively poorer performance but use fewer cpu cycles to perform the frequency conversion. You should also be sure that the cpu type is set to Slow cpu on the miscellaneous configuration tab.

![Figure 4.5 Audio Mixer](image)

Mixer controls are only active on Linux using OSS, ALSA backends and if the distribution provides application layer mixer support. Select whether you will be using Line-In or Mic-In for the audio connection from the receiver output. Fldigi ALWAYS expects to use the Line-Out for driving the transmitter audio. Set the PCM level for your sound card. If you check “Manage mixer” then the Tx and Rx “volume” controls on the main fldigi dialog will be active.
4.7.1 Right Channel Audio Output

You may elect to make the right and left channels both contain the modem signal. Or, you may reverse the right and left channel audio signals. These two controls only change the function of the audio output.

1. Sleeve: usually ground
2. Ring: Right-hand channel for stereo signals, negative polarity for balanced mono signals. Fidigi uses this channel for special controls signals.
3. Tip: Left-hand channel for stereo signals, positive polarity for balanced mono signals. Fidigi uses this channel for Rx and Tx audio.
The PTT, CW QSK and Pseudo-FSK items are found on their respective configuration tabs. They are replicated here for your convenience and these controls may be changed on this or the other tabs.

### 4.7.2 WAV File Sample Rate

![Figure 4.8 Sample Rate of Saved WAV Files](Image)

fldigi can record received and transmitted audio. The recordings use "wav" file format and can be in any sample rate selectable on the Audio/Wav configuration tab. The audio in/out is normally on the left channel and that is the only channel recorded. The recording is made in two channels with the right channel silent. fldigi's right channel can be used for PTT, Pseudo FSK, and CW QSK signal tones. It helps to be able to view both channels using an audio analysis program such as Audacity. Enable the "Record both channels" check box to record both left and right channel signals.

### 4.7.3 Multiple sound cards

This section applies to Linux and OS X operating systems.

In systems with multiple sound cards they will not always be in the correct sort order on boot. This may cause problems not only with fldigi, but other apps that depend on a certain sound card. The work around is not that difficult and will reliably place the preferred sound card in the correct slot. Sound cards are numbered from 0 on to however many cards you have in your computer. Usually its only 2.

The 1st step is to determine the correct id of the cards in your system. Open a terminal and issue the following ::

```bash
aplay -l
```

Here is an example of what you may see.

```
**** List of PLAYBACK Hardware Devices ****
card 0: ICH6 [Intel ICH6], device 0: Intel ICH [Intel ICH6]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 0: ICH6 [Intel ICH6], device 4: Intel ICH - IEC958 [Intel ICH6 - IEC958]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 1: AudioPCI [Ensoniq AudioPCI], device 0: ES1371/1 [ES1371 DAC2/ADC]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 1: AudioPCI [Ensoniq AudioPCI], device 1: ES1371/2 [ES1371 DAC1]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
```
If it does not already exist you will need to create the following file:

/etc/modprobe.d/alsa-options

You will have to root privileges to create the file, so a system such as Ubuntu that depends on sudo you would enter

$ sudo touch /etc/modprobe.d/alsa-options

Using the above example, you edit that file so that it's contents contain

# Set preferred order of the sound cards

options snd-ICH6 index=0
options snd-AudioPCI index=1

The simplest terminal editor that is on just about every distribution is "nano" so to edit the file you just created you can again use sudo

$ sudo nano /etc/modprobe.d/alsa-options

If you want to test this new file, reboot and open a terminal and again issue the command :: aplay -l

You will normally find that your internet browser and/or Flash want to use card 0, so you then may want to consider using card 1 for fldigi

Here is another example with 3 sound systems; mother board ALC1200, a thumb-drive audio codec, and a Signa Link USB:

**** List of PLAYBACK Hardware Devices ****
card 0: NVidia [HDA NVidia], device 0: ALC1200 Analog [ALC1200 Analog]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 1: Set [USB Headphone Set], device 0: USB Audio [USB Audio]
  Subdevices: 1/1
  Subdevice #0: subdevice #0
card 2: default [USB Audio CODEC ], device 0: USB Audio [USB Audio]
  Subdevices: 1/1
  Subdevice #0: subdevice #0

The /etc/modprobe.d/alsa-options contains these lines

options snd-NVidia index=0
options snd-Set index=1
options snd-CODEC index=2

Notice that each line is uniquely related to the aplay -l report
4.8 Xcvr Control Configuration

4.8.1 flrig as xcvr controller

flrig is a separate program that provides nearly 100% control over more than 60 different transceivers. Using flrig with fldigi can enhance your digital mode operating experience. It is the recommended method of control when your transceiver supports CAT operations and has been coded for flrig.

fldigi and flrig communicate changes in transceiver state using the xmlrpc protocol over a local socket. Transceiver control changes may be made at the transceiver, flrig, or fldigi and the change will be annunciated at the other two. These changes are communicated ten times each second. The update limit is usually imposed by the transceiver and the baud rate selected for the transceiver-computer interface. Older transceivers will impose the greatest restriction especially when it's firmware is busy with internal processes.

Select the "Enable flrig xcvr control with fldigi as client" for this method of control. fldigi will attempt to connect to the flrig server and will do so periodically until the connection is established. flrig may reside on the same computer or on another that can be reached on the local area network. The computer address and port must match the location and configuration of flrig. The defaults are local host, 127.0.0.1, and port 12345.
4.8.2 RigCAT xcvr control

RigCAT is a rig control that was developed specifically for fldigi. It uses command / response definitions that are found in various rig.xml files. You can use a rig.xml file specific for your transceiver or write and test one yourself. The easiest way is to adapt an existing rig.xml file for a rig that is similar to your own. ICOM uses almost identical command/response strings for all of its transceiver line. Yaesu rigs have nearly all used unique command/response structures until just recently. The FT-450, FT-950 and others share a similar set of commands and responses.

RigCAT commands and responses are defined in a rig specific xml file which contains all of the required queries and responses in extended markup language format. Please read the specification document rigxml to learn more about this new way of building generic rig interface definitions and how they are used with fldigi. fldigi will look for a file in the $HOME/.fldigi/rigs directory for all files with extension ".xml". These contain definitions for the transceiver indicated by the file name, ie: FT-450.xml, IC-756PRO.xml, etc. You can download the appropriate xml files from the resource directory tree http://www.w1hkj.com/xmls or from the archives web page. Place the file in your rigs directory and fldigi will find it.

You will need to specify how your PTT will be triggered. This can be using a CAT command, the RTS or DTR pins or none. None would be appropriate if you are using the rig's VOX or an outboard sound card interface such as the SignalLink SL-1+ which produces its own VOX type of PTT. In that case simply leave all of the PTT options unselected.

If you are using a transceiver or a rig interface such as CI-V that echos all serial data you check off the "Commands are echoed" box. That will suppress fldigi trying to respond to a command it just sent to the transceiver.

You may need to try various values of retries, retry interval, and command interval to achieve consistent rigcat control.

Press the Initialize button after setting all of the parameters. If the settings are all correct fldigi should start receiving frequency information from the rig and annunciating them on the rig control frequency display.
4.8.3 Hamlib xcvr control

Hamlib is a set of standard libraries for interfacing to a large number of transceivers. The hamlib library system consists of a front end which acts on behalf of all rigs and backends which are specific to each rig. The hamlib library is not developed or maintained by the fldigi developers.

![Hamlib CAT Control](image)

Select your transceiver from the list of supported units. Then select the serial port and baud rate. If you are familiar with the hamlib library you can send various startup sequences to the rig using the advanced configuration. PTT control can be achieved using CAT commands or via DTR / RTS on the same port as the control comms. You might also need to specify whether RTS/CTS flow control is used (Kenwood rigs use this quite often) or if Xon/Xoff flow control is used.

You may need to try various values of retries, retry interval, and command interval to achieve consistent hamlib control.

Press the Initialize button after setting all of the parameters. If the settings are all correct fldigi should start receiving frequency information from the rig and annunciating them on the rig control frequency display.

4.8.4 External program XmlRpc control

Xml-Rpc allows third party software to control various aspects of fldigi operation including but not limited to rig control. fldigi's xmlrpc server is always executing. External programs can concurrently provide rig control using the fldigi recognized xmlrpc commands. This control can be concurrent with other control methods, i.e flrig, fldigi and an xmlrpc client can simultaneously control the transceiver. Only one can be used to send and receive transceiver commands via it's serial i/o stream.
4.8.5 Use hardware PTT only

![Hardware PTT control](image)

**Figure 4.12 Hardware PTT control**

Serial Port using DTR or RTS

The simplest rig control is just being able to control the push to talk via an external transistor switch. You set this type of control on the hardware configuration tab for rig control.

You select this operation by checking the "Use serial port PTT". Select the serial port from the list (fldigi will have searched for available ports). Enable the "Port is second SCU-17 device" control if you are using an SCU-17 or a similar device which has a dual USB virtual serial port. The SCU-17 Windows driver requires the stop bits to be set to ZERO or the driver fails to correctly initialize.

Then specify whether the h/w uses RTS or DTR and whether a + or - voltage is required to toggle PTT on. The program allows you to use RTS, DTR or BOTH for the PTT signal. Press the Initialize button to restart the serial port with the selected settings.

Parallel Port (Linux and Free BSD only)

Fldigi sets and clears the parallel port pin, PARPORT_CONTROL_INIT, pin 16 on the 25 pin parallel port connector. Keydown sets Pin 16 to +5 volts and keyup sets the voltage to zero.

µH Router (MacOS X)

Similar functionality can be achieved on the Macintosh operating system using 'µH Router' by Kok Chen, W7AY. See µH Router Website for specific details and requirements. A selectable (check box) option will be available on the Rig->Hardware PTT Configuration panel.
4.8 Xcvr Control Configuration

PTT delays

You can accommodate delays in transceiver switching between receive and transmit by adjusting the PTT delays. The control values are in milliseconds. These controls have no effect on external PTT circuits such as those implemented in the SignaLink interfaces. They rely on detecting the audio data stream. You can use a combination of macro tags in a macro key definition to achieve a resolution. For example try a macro definition similar to this to insure that the RSID is sent via a slow FM xcvr (or via a VHF repeater)

<TX><MODEM:NULL><IDLE:2.5>
<MODEM:MT63-500>
<TXRSID:on>

Change the idle time value (in fractional seconds) to suit your needs.

4.8.6 PTT using audio tone

Fldigi can generate a 1000 Hz tone for the duration of the PTT keydown period. When selected this tone is on the right channel of the stereo connector. A simple tone detector/filter and transistor switch can be used to generate a PTT signal from this sound card output. Jim, W5ZIT, has provided details on building a right channel PTT interface for this type of hardware control.

4.8.7 Use Pi GPIO PTT

The Pi series of miniature computers offer a large array of possibilities for controlling devices. It has a array of General Purpose Input Output, gpio, lines of a 40 pin in-line header. 17 of these gpio lines can be used for things like push-to-talk. There are several add on boards for the Pi3 and Pi4, such as the NW Digital Radio UDRC-II, that has a full interface for digital operations, including PTT and audio codecs.
Access to hardware ports is always limited to the user who either is root or has root privileges. setuid and setgid (short for set user ID upon execution, and set group ID upon execution, respectively) are Linux access rights flags that allow users to run an executable with the permissions of the executable's owner or group respectively and to change behaviour in directories. They are often used to allow users on a computer system to run programs with temporarily elevated privileges in order to perform a specific task. While the assumed user id or group id privileges provided are not always elevated, at a minimum they are specific.

It is possible to give full gpio access and control privileges by elevating fldigi with setuid root. But this is not advisable as fldigi is also granted access to both serial and network services. There is a way to provide the access via a second program that does have the elevated privilege.

This is a copy of material at

https://projects.drogon.net/raspberry-pi/wiringpi/download-and-install/

for installing WiringPi which includes a really nice utility called gpio.

To obtain WiringPi using GIT:

$ git clone git://git.drogon.net/wiringPi

If you have already used the clone operation for the first time, then

$ cd wiringPi
$ git pull origin

Will fetch an updated version then you can re-run the build script below.

To build/install there is a simplified script:

$ cd wiringPi
$ ./build

The build script will compile and install it all for you. It does use the sudo command at one point, so you may wish to inspect the script before running it.

Test wiringPi's installation

run the gpio command to check the installation:

$ gpio -v
$ gpio readall

That should give you some confidence that it's working OK.

WiringPi is released under the GNU Lesser Public License version 3.

fldigi uses the gpio program for initializing the gpio port, which also happens to the change the privilege of the temporary sys file for setting the port state.

Read the man document for gpio
GPIO is a Swiss army knife of a command line tool to allow the user easy access to the GPIO pins on the Raspberry Pi and the SPI A/D and D/A converters on the Gertboard. It’s designed for simple testing and diagnostic purposes, but can be used in shell scripts for general if somewhat slow control of the GPIO pins.

It can also control the IO’s on the PiFace IO board and load the SPI and I2C kernel modules if required.

Additionally, it can be used to set the exports in the /sys/class/gpio system directory to allow subsequent programs to use the /sys/class/gpio interface without needing to be run as root.

After installing gpio on your Pi you can set the gpio port on fldigi’s GPIO configuration tab. The UDRC-II for example uses pin 16, BCM # 23, for push to talk. It has an LED indicator on the board to show when PTT has been enabled. For this board you select "BCM 23" and select the corresponding "= 1 (on)" check box.

During start up fldigi uses the gpio program to set up the gpio pins with the command

```
$ gpio export NN out
```

This is the command to export a GPIO pin in the /sys/class/gpio directory. Note that the pin number is the BCM GPIO number. ‘out’ sets the pin to be an output control, and ‘in’ an input control.

Once a GPIO pin has been exported, the gpio program changes the ownership of the

```
/sys/class/gpio/gpioX/value
```

and if present in later kernels, the

```
/sys/class/gpio/gpioX/edge
```

pseudo files to that of the user running the gpio program. This means that you can have a small script of gpio exports to setup the gpio pins as your program requires without the need to run anything as root, or with the sudo command.

During shutdown fldigi uses the gpio program to disable access to the gpio pins used with PTT by invoking the command

```
gpio unexport NN.
```

You can check that this is working correctly from a terminal window using the command

```
$ gpio readall
```
4.8.8 C-Media GPIO PTT

Sound card interface units such as the Masters Communications DRA series use C-Media audio codec chips.

These devices will be enumerated on the sound card devices configuration panel. The C-Media device must be selected for both input and output audio or the GPIO PTT output will not be enabled.

The C-Media GPIO PTT is enabled on a separate rig control configuration panel:
4.9 RX/TX Audio Levels

4.9.1 Receive audio

Setting the correct hardware, operating system, and fldigi received audio levels is not difficult, but it is the one setup procedure most often done incorrectly. The most commonly used sound card devices contain either a 16 or 24 bit analog to digital (a/d) converter. A 16 bit a/d can provide approximately 90 db of signal conversion. For the 16 bit converter, if the peak audio signal that the a/d can handle is +/- 1 volt then the minimum discernable signal (1 bit) will be +/- 30.5 microvolts. If more than a +/- 1 volt signal is applied to the a/d input then either one of two things may occur, (1) the audio is clipped, or (2) the audio is wrapped, large positive signals wrap to large negative signals and vice versa.

Signal decoding and signal display are two separate software processing paths:

If multiple C-Media devices are discovered they will enumerate as C-Media-A, C-Media-B, etc. You must test the selected interface as it is not possible to know which is the correct one for the DRA interface. Pressing the TEST button will cause the PTT line to rapidly toggle for a period of 2 seconds. This will cause the RED PTT led to flash and the transceiver PTT to toggle on and off.

Return to Top of Page
Return to Main Page
The objective in adjusting the Rx audio is to use the full dynamic range of the a/d without either incurring over or under drive. fldigi provides a number of display controls to assist in setting up the Rx audio. fldigi does not attempt to control the system input mixer controls. Those must be adjusted by the operator. Mixer control access is different for each of the supported operating systems. The input signal level effects the decoder performance and the visual presentation of the signal.

fldigi displays the raw input signal in a VU style meter. This meter is accessed from one of two signal level configuration panels:
4.9 RX/TX Audio Levels

and on the Main Dialog, location shared with center status bar control. Left click on the status bar / vumeter to toggle between the two.

There are two controls that adjust the visual appearance of the waterfall. These controls are below and to the left of the waterfall, "Upper signal level (dB)" and "Signal range (dB)". The "Upper signal level" control is a gain control. 0 dB == x₁, -6 dB = x₂. These values are dB relative to input signal level. This control will effect the Waterfall (WF), Fourier Transform (FFT), and Signal (SIG) views. The "Signal range" control will only effect the WF and FFT views.

Set the level to -20 and the range to 70. Change the waterfall display to the "Scope" view. Do this by pressing the "WF" button twice if it is currently displaying the waterfall. You can also right click once on that button. That button acts as a rotary and is left/right click sensitive. The display should show what looks like an oscilloscope view of the received audio. This is the entire audio signal and not just the signal that is currently decoded.

If your sound card a/d (also referred to as codec) is functioning correctly there should be no signal offset and the signal will be centered vertically about the x-axis. Set your transceiver to a portion of the band with no signals; 14.065 MHz might suffice. Adjust the audio path gain; transceiver audio, external audio codec gain, and operating system gain for a noise level that is about -50 dB on the VU meter. Then set the transceiver to an active portion of the digital band; 14.070 MHz for PSK or 14.074 MHz for JT type digital signals. Make sure that the input gain controls are not set too hot. The peak signals do should not exceed the upper/lower gray lines on the display. The diamond indicator to the left of the fldigi AFC button will be colored as follows:

- BLACK - no signal present
- GREEN - signals are in the correct range
- YELLOW - signals level high, but still OK
- RED - signals too high, danger of decode errors
The transition levels can be adjusted on the "Signal Level" configuration panel. The default settings will be good for most users. The colors can be set to suit the users' color vision.

You can then proceed to adjust the waterfall/fft appearance when you have the audio Rx level adjusted correctly. Remember that changing the WF/FFT/SIG level and range controls DOES NOT effect the decoder signal path.

The three signal views should be similar to this with the level/range controls set to -20 and 70 respectively. The waterfall palette used is "default.pal", and the received signal is about 20 dB above the noise floor.

![Figure 4.17 Waterfall](image)

![Figure 4.18 FFT](image)

![Figure 4.19 Scope](image)

### 4.9.2 Windows Audio Properties

A combination of the Windows operating system and certain audio codecs needs to be accommodated. The codecs used by devices like the SignaLink-USB, the TS590S, and recent Icom transceivers are identified by the Windows operating system as "microphone" devices. The Windows mixer controls for that device are then set to insert about 30 dB of gain in the signal path. To compensate most users simply lower the transceiver audio output. The result is very poor decoding. The correct procedure is to force the Windows mixer controls to remove that 30 dB of gain. This procedure is for Windows 10, but is similar on Windows 7, and Windows 8.

Right click on the task bar speaker icon and select the "Recording devices" menu item. This will open the Sound devices dialog:
This is the dialog on my Windows 10 test computer with a SignaLink-USB connected to a USB hub. The SignaLink-USB shows up as a **Microphone** USB Audio CODEC. Right click on the device entry and select Properties. This opens up the Microphone Properties dialog:
Select the "Levels" tab and set the level to as close to 0 dB as is available:

![Figure 4.22 Microphone Level](image)

Then select the "Advanced" tab and change the type of converter.

![Figure 4.23 Microphone Advanced Tab](image)

Apply and save the changes. The last step is usually needed to insure that the settings are not lost when the operating system is closed and restarted.

### 4.9.3 Transmit audio

Too often you see an overdriven signals on the digital sub-bands; multiple audio sidebands on PSK, splatter from overdriven MFSK and RTTY. There is absolutely no reason for a transceiver driven by fldigi to exhibit this type of performance. You can set up your computer / transceiver for good solid performance without excessive drive.

The "TUNE" button generates a continuous single frequency audio signal at the exact frequency to which the waterfall cursor has been set. The peak amplitude of this signal is the peak amplitude of every modern signal generated by fldigi. None will exceed this value, even the simultaneous multi-tone modes like Throb. Every modern SSB transmitter uses some automatic level control ALC for preventing overdrive for SSB voice. A little overdrive on
a voice channel can be tolerated to a degree. In fact, that is what an analog RF compressor does, overdrive and then subsequent filtering. But you absolutely cannot tolerate that with the digital modes. Here is the way to set up your transceiver for a clean signal. I recommend starting out with a dummy load, but an "off hour" for a band might work just as well if you do not have a dummy load. If available, set the transceiver power level control for maximum power output. On my Icom 7100 and Yaesu FT991A that is 100 watts.

- Make sure your transceiver’s speech compression control is OFF
- Set the operating system audio output mixer control to about 10% of full scale output.
- Set the fldigi transmit attenuator to -3 dB (control to the left of the AFC button)
- Set the waterfall cursor to 1000 Hz
- Enable the "Tune" mode in fldigi ... you do have CAT or PTT set up ...right?
- Slowly bring up the Mixer audio output level until your rig’s ALC just starts to function (a light blinking or a meter showing this condition). That will probably be at about 30 watts output if the transceiver is rated at 100 watts.
- Reduce the Mixer audio output until the ALC is disabled.
- You are now transmitting at maximum output power without distortion.
- You can use the fldigi transmit attenuator to make small adjustments in the output power to compensate for variations in the SSB transmit filter.

You can use any level below this and be assured that your output signal will be clean. All digital signals that fldigi generates will be limited to this peak-to-peak voltage. You should always use the minimum power necessary to maintain good comms, remember that even if you are clean at 100 W you signal will be so strong among the QRP signals that it will overpower the AGC on many receivers that are working another digital station within the same SSB bandwidth that you are on. You will appreciate this the first time that you are working a weak PSK DX station and someone blasts through and captures your AGC.

You should try the above adjustments at different audio frequencies. Transceivers that achieve the SSB filtering with crystal or mechanical filters will have a considerable amount of variation across the passband of the filter. This will show up as a varying amount of ALC that is dependent on the audio frequency. Once you are comfortable with the process you can very quickly repeat the "Tune" and set the power for the frequency to which the waterfall is set. The fldigi transmit attenuator control should have sufficient range to compensate for transmit SSB filter variation. You do not want to transmit (or receive) near the cutoff frequencies of the SSB filter. The transceiver filter will introduce both phase and amplitude distortion over the signal bandwidth.

4.10 New Installation

fldigi’s opening screen looks like the following when starting fldigi for the first time or when setting up a second or subsequent instance using the –config-dir command line switch. The Wizard was not used to initialize operator, transceiver, or sound card.
Fldigi will create a working files folder, multiple sub folders and also populate them with a set of default files. The working files folder is different on the different OS.

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Folder/Directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Win XP</td>
<td>C:\Documents and Settings&lt;username&gt;\fldigi.files</td>
</tr>
<tr>
<td>Win Vista/7/8/10</td>
<td>C:\Users&lt;username&gt;\fldigi.files</td>
</tr>
<tr>
<td>Linux</td>
<td>/home/username/.fldigi</td>
</tr>
<tr>
<td>Macintosh</td>
<td>/Users/User_Login_Name/.fldigi</td>
</tr>
</tbody>
</table>

After closing the application the working folder will contain the following folders and files:
4.10 New Installation

The help, images, logs, scripts and temp folders will be empty. They will contain program created files as you use the program or you may post files in those folders for use by fldigi. Images to be sent with the MFSK pic mode should be placed in images. Your logbook database will appear in logs. If you are running on Linux then you can use various scripts to enhance the macro language that fldigi supports. The temp directory holds files that are transitory and you can safely delete those files between sessions. The 3 files that appear initially are:

<table>
<thead>
<tr>
<th>File</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>fldigi.prefs</td>
<td>contains variables that describe the status of fldigi when last used. This is an ASCII text file that you can safely read. You should not edit or change this file.</td>
</tr>
<tr>
<td>fldigi_def.xml</td>
<td>contains variables that relate to all of fldigi's configurable items. This is an ASCII text file that conforms with the XML specification. You can safely read this file but should not edit or change it.</td>
</tr>
<tr>
<td>frequencies2.txt</td>
<td>an ASCII text file that contains the default (and / or modified) entries for fldigi's rig control process</td>
</tr>
</tbody>
</table>

The macros folder contains a single file: macros.mdf. This is an ASCII text file that contains the default macro definitions. After running fldigi for a while and creating your own sets of macro definitions there will be additional *.mdf files located here.

The palettes folder contains the following files:

Each of these is a palette definition file that is used to modify the appearance of the waterfall. Fldigi has a palette editor that enables you to modify these default files or to create your own. The file format of these files is identical to the palette files used by DigiPan. The final color rendition might be a little different as a result of using different painting functions. The file digipan.pal contains:

```
0; 0; 0
0; 0; 62
0; 0;126
0; 0;214
145;142; 96
181;184; 48
223;226;105
254;254; 4
```
Don't bother trying to modify these using an editor. The palette editor is much easier to use and will keep you from wrecking havoc with the program.

The easiest way to find the working files folder is to start fldigi and then select the menu item File/Show config.

4.11 Configure ARQ/KISS I/O

![Figure 4.27 ARQ/KISS IO Configuration Panel](image)
4.11 Configure ARQ/KISS I/O

4.11.1 I/O Configuration

I/O configuration panel as seen above allows the user to select one of the IO interfaces. Each of the two interface options are used for different purpose(s). ARQ is selected when the user requires the use of the FLDIGI suite of programs (FLARQ, FLMSG, FLAMP, etc). The KISS interface is used to transfer 8 bit binary data over wireless pathways using HDLC encoded frames. With this interconnectivity multiple host programs are available to leverage this option. See KISS Host Program(s) and FLDIGI

Note:

Any changes to the IP Address and/or port numbers requires FLDIGI restart.

4.11.1.1 ARQ I/O

![ARQ IO Panel Options](image)

Figure 4.29 ARQ IO Panel Options
To select ARQ I/O, mouse click on the [ ] Enable ARQ check box. If the checkbox is grayed out, this indicated the panel is locked. Deselect the [ ] Lock checkbox to gain access.

The ARQ section of the configuration panel allow the user to set the IP address and port number. Pressing the [Default] button set the fields to their startup values. In order for communications to occur both FLDIGI and the FLDIGI suite of program must be assign the same IP address and port number if the programs are used on the same computer. If the program are running on different machines then the IP Address must be set accordingly while maintaining the same port number. The IP Address entered is the destination Address for the recipient program/host computer.

### 4.11.1.2 KISS I/O

![KISS IO Panel Options](image)

To select KISS I/O, mouse click on the [ ] Enable KISS check box.

Setting and configuring IP address and ports numbers are described in the ARQ section.

### 4.11.1.3 Ax25 Decoding

If the data received is using Ax25 protocol enabling this option translates the protocol into human readable form. Only available when KISS I/O selected.

**NOTE:**

When actived, only valid ax25 data will be displayed to the receive panel. No un-squelched random characters will be seen.

### 4.11.1.4 KISS over IP

FLDIGI supports KISS data tranfers over two types of IP communications. UDP (connectionless) and TCP (connection). Each method have is avantages and disavantages. If you wish to know more about the differences performing a search on the internet using key words:

“TCP/IP UDP/IP”

If you are a programmer a good source and free documentation on the subject can be found by performing a search on these keywords:

“Beej’s Guide to Network Programming”
4.11 Configure ARQ/KISS I/O

4.11.1.4.1 Connectionless UDP/IP [UDP]  Selecting UDP/IP envoks a connectionless communications path. Host software must support UDP/IP data transfers in order to use this option.

4.11.1.4.2 Dual Port [DP]  Used with UDP/IP communications and does not functions with TCP/IP connections.

Since the data exchange protocol is based on UDP/IP (connectionless) a loopback issue can arise if the two programs are hosted on the same machine. By allowing more then one port number the loopback condition can be avoided. Host programs must support dual port for proper communications.

4.11.1.4.3 Connection TCP/IP [TCP]  TCP connections are far more reliable then UDP since the protocol confirms data transfers between programs. UDP communications on the same machine is generally a non issue though. It's normally an issues when distance and congestion comes into play as packet might timeout in the transfer process. TCP/IP can resend the data where UDP doesn't.

Select TCP/IP if the host program supports it.

4.11.1.4.4 Listen/Bind  When selected (checked) with TCP/IP the interface will wait/listen for TCP/IP connections from the host program. If unchecked the user will press the start button and FLDIGI will attempt to connect to the host program multiple time over a ten second period.

If the connection fails the user should ensure the FLDIGI/host program is running and configured correctly.

The Binding is a operating system process for a given IP address and port number. The binding of an address/port number can only occur once on the same machine no matter how many programs use the same address and port number. If you are getting errors as a results of binding it's possible another program on the same machine has bound the address/port number already. Unchecking this option may help in this circumstance. Listen/Bind is required if you want FLDIGI to wait for connections.

To start the Listening state pressing the start button is required. In the event the host programs disconnects FLDIGI will return to Listen state unless the user selects the Stop button. The Start and Stop button is the same button that is renamed depending the connection state.

4.11.1.4.5 Auto Connect [AC]  Auto connect is used to connect to the host program on start up. Configure KISS interface as needed then enable (check) the [x] AC option. Press the [Save] button at the bottom of the configuration panel in order for it to take effect on the next restart. This is a useful option in the event of power failures.

4.11.1.4.6 Inhibit 7bit Modem  Selecting this option will disable the warning message reported by FLDIGI in the event there is a change to a modem type that is not KISS IO compatible. The invalid modem will be ignored and FLDIGI will remain in the current valid modem. Deselecting this option allows the operator to approve the modem change.

This is an option that should be disabled when FLDIGI is used in an automated state as FLDIGI will wait indefinitely for a response from the operator.
4.11.1.5 XMLRPC I/O

Setting and configuring IP address and ports numbers are described in the ARQ section.

4.12 Configure Power Signal Monitor (PSM)
4.12 Configure Power Signal Monitor (PSM)

4.12.1 PSM Configuration

The Power Signal Monitor (PSM) configuration panel consists of four different sections. Each with specific functions to enhance the detection of signals with the intent of minimizing collisions.

NOTE:
In the event of a transmit with PSM enabled, the T/R button light will indicate yellow when a pending transmission is in play. Deselecting a second time (while yellow or red) will terminate the transmission.

4.12.1.1 Busy Channel

To enable Busy channel select "[x] Enable Busy Channel" checkbox option provided on the left hand side of the configuration panel.

There are a number of control parameters for adjusting to the current conditions.

Allow TX After Signal Detection (Seconds)

Places a TX inhibit any time there is a signal present on the waterfall. When a signal is detected the inhibit timer is reset to the selected value and will remain inhibited for the specified duration (minimum, in seconds). This can be useful during signal fades allowing for a period of time elapse to ensure the signal has completed. Generally it’s a good idea to turn this option on when there is fair amount of QSB. This also can be used to prevent FLDIGI from transmitting in between the gaps of RSID and the data stream.

TX Buffer Flush Timer (Minutes, 0=Disable)

If there is an extended period of time when FLDIGI has not been allowed to transmit. The transmit buffer is cleared to prevent an excessively long transmit period once the frequency clears. This is generally not an issue with keyboard ops, but with programs using one of the three IO ports (ARQ/KISS/XMLRPC). It’s possible large sums of data might be present in the transmit buffer.

Setting this value to 0 (zero) disables the TX buffer flushing.
Modem Bandwidth Margins

The method used to detect a signal is the difference between high and low values within in bandwidth of the modem in addition to the bandwidth margins. If a modem is selected (like MT63) there is very little difference in the high/low values within the bandwidth of this modem. By extending the sampling to just outside of the modem bandwidth high/low values are typically present. However, the draw back to extending the bandwidth margins is nearby signals will effectively keep FLDIGI from transmitting until both the margin and modem bandwidths are clear.

Valid Signal Sample Period (Milliseconds)

As a general rule, the shorter the sampling period the better. The actual sample rate has as much to do the the Waterfall display rate. PSM is event driven by the waterfall update routines. Ensure the Waterfall display rate is set to "FAST" for best results.

4.12.1.2 Carrier Sense Multiple Access (CSMA)

Carrier Sense Multiple Access CSMA adds a little randomness to the transmit process. By varying the transmitting actions of FLDIDI by random amounts synchronized transit collision can be reduced.

![Figure 4.34 CSMA](image)

To enable CSMA select "[x] Enable CSMA" checkbox option provided on the left hand side of the configuration panel.

Persistance

Persistance is the random part of the process. A random number is generated and compared to the persistance value. If the persistance value is lower then the generated number tranmission is allowed. The second field in the Persistance row (config panel) indicates the percent chance of transmitting each time a random number is generated and compared. The accumulative delay in the transmit period is governed by the slot time.

Slot Time

Slot time is the minimum amount of time between data transmissions of open air time. No transmissions are allowed during this break. This variable effects the delay period as governed by the persistance parameter. The persistence value prevents the transmission and is delayed by the slot time value before the persistance value can be evaluated again during the random number generator and compare process.

Transmit Data Delay

If the modem being used has the option to idle transmit. This is the duration in milliseconds the transmissions send idle data. Useful for repeaters or other conditions that have a delay before decoding can occur.
4.12 Configure Power Signal Monitor (PSM)

4.12.1.3 Histogram

This option is experimental. The basic idea is to keep the PSM threshold a few points just above the noise level. If the noise level changes so does the histogram reference. It's intended to be used with FM modulations. This option is not suitable with Busy channel.

4.12.1.4 PSM Attenuation (Sensitivity Adjustment)

Generally you would want to keep the value around 2 to 4 for over the air use. If you are testing using a direct connect (soundcard to soundcard) you will need to increase the attenuations up considerably. The representation of the value is simply a 1 over N fraction. If the attenuation value is set to 2 then the attenuation is 1/2 of the full signal level.

4.12.1.5 Enable PSM Use on Front Panel.

Selecting this checkbox enables the PSM button on FLDIGI's main window.
4.12.1.6 Resetting PSM to Defaults.

Pretty simple, just press the [ Defaults Settings ] button.

4.13 Installing Fldigi on Windows

The port of fldigi to the Windows operating system is built using cross-compilers on Linux. The cross-compilation environment is created using mingw32.

Installing fldigi on windows is very simple. Simply execute the installer program and both fldigi and flarq will be installed in the default programs directory structure for the specific Microsoft version that is being targeted. Desktop icons and desktop menu items will be created. An uninstaller link will be created on the desktop menu.

Click on the desktop icon to start the application. If this is a new installation you will be guided through the initial configuration with a new install wizard.

Resize the main dialog to suit your screen. Adjust the Rx/Tx divider to your liking. Then set up the operator and sound card configuration items; configuring fldigi. When you have fldigi receiving and decoding signals you can exit the application which will allow you to save your configuration settings.

Now open up the following folder using your windows file explorer if you do not have a login name and password:

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Folder Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>On XP</td>
<td>C:&quot;Documents and Settings&lt;urlogin&gt;\fldigi.files&quot;</td>
</tr>
<tr>
<td>On W2K</td>
<td>C:&quot;Documents and Settings&lt;urlogin&gt;\fldigi.files&quot;</td>
</tr>
<tr>
<td>On Vista/Win7</td>
<td>C:\User&lt;urlogin&gt;\fldigi.files</td>
</tr>
</tbody>
</table>

where <urlogin> is the name with which you log onto the computer.

All of these files were generated by fldigi when it first started. The files with the extension pal are palette definition files. The file "macros.mdf" contains the macro definitions which you can change using the macro editor. fldigi_prefs and fldigi_def.xml are used for storing the application state and configuration items respectively. With the exception of the location of this folder the operation of fldigi on windows is identical to linux. In all instances where the help files make reference to $HOME/.fldigi you should be substitute the appropriate directory for XP or Vista/Win7.

Please take the time to read and reread the on-line help file. Better yet download the Adobe Reader file so that you can view the help locally without needing access to the internet. Fldigi is a large complex program with many ways for the user to customize its operation to his or her hardware environment.
4.13.1 Special Note for Vista/Win7 from user!

I am trying to install the latest and greatest version of FLDIGI and FLARQ on a new Toshiba laptop computer that runs Vista/Win7 / Win7. The main screen of FLDIGI comes up ok and it says that no call sign has been set and down in the bottom center right there is an error message about there not being the sound card that it thinks it should see. I understand the messages as the program needs to be configured. The problem is that when I click on 'Configuration' the main screen grays out and it seems to go off into never never land and not comeback or put up the configuration window. At that point the only thing that works on the main screen is the close button. What am I missing?

I solved the mystery! Cockpit error, kind of! I tried installing MULTIPSK and got the "no sound card error" also. Went into the Control Panel to see what was going on. When I looked at sound input it said there was NO microphone plugged in. Then the light came on and I remembered that you MUST have a microphone plugged in when using the Vista OS or it doesn't think there is a sound card in the computer!!! Well this is my first encounter with Vista and how am I suppose to know or remember that little quark on an OS I've never used before??

Once I plugged a mic into the sound card input both programs worked just fine.

Vista/Win7 requires either a microphone or a line-in device actually plugged into the 8 mm audio jack before the sound driver reports that there is an audio capture device.

4.14 New Install Wizard

New Install Wizard

The new installation wizard borrows from the normal configuration dialogs. You will find information on setting each of the wizard dialog pages on the associated configuration link.

Figure 4.38 Wizard Configuration
Figure 4.39 Operator Configuration

See Operator Configuration

Figure 4.40 Sound Card Configuration
See Sound Card Configuration

![Figure 4.41 Flrig Configuration](image1)

![Figure 4.42 RigCat Configuration](image2)
4.15 Callsign DB Configuration

4.15.1 QRZ
Fidigi will open a web browser to either QRZ.com or Hamcall.net with the contents of the QSO Call field used as a query string to the online service. You may find that your default browser needs to be triggered twice on the first such query. That behavior seems to be associated with IE7 but not IE6 for example.

If you have a CD with the QRZ database installed you can use that CD or its stored contents on a hard drive. Simply specify where the CALLBK directory can be found and enable the QRZ radio button.

If you are a paid subscriber to either QRZ or Hamcall xml database service then you can specify that fidigi use that service for all Callsign data base queries.

OK2CQR provides a very nice callsign lookup service on his hamqth.com web site. There is no subscriber fee to use this service. Simply register and then use your registered user name and password for access. You might want to provide monetary support to Petr if this service meets your needs.

### 4.15.2 EQSL
Configure the eQSL log entry upload with your user ID, password, and QTH nickname. See Macros for additional information.

### 4.15.3 FLdigi Logging

If you check the "send when logged" button then the logged record will be sent to eQSL when either the log it button is pressed, or when the macro tag `<LOG>` or `<LNW>` is executed.

You may elect to use the default of date-time ON or date-time OFF for the eQSL submission.

You may send a message with the log record. If you fill in the default message text then it will be used for that purpose. You might want to use something like:

Tks for (MODE) qso (NAME). 73, pse eQSL

**Verify**

Download an adif formatted record file from eQSL and save it to a convenient location on your computer. Then press the "Verify" button and fldigi will try to match your records with the eQSL download record; updating each matched record's eQSL date received data element.
4.15 Callsign DB Configuration

4.15.4 Logbook of the world

fldigi does not have a direct connection for uploading and downloading LoTW records. Instead, it uses the tqsl program that each LoTW user will have on his or her computer. The tqsl program is usually used with its graphics user interface, especially on Windows and OS X computers. But it also can be opened in a 'command line' mode in which the user dialog is never visible. fldigi passes the logbook records as a batch adif file via tqsl using this command line mode.

Open the LoTW configuration dialog from the Logbook menu:

![LoTW configuration dialog]

Use the "Locate" button to open an OS file finder dialog to locate the tqsl binary. Click on it when found. The above image shows this on a Linux computer. On OS X you need to open the Applications folder, and then drag and drop the tqsl icon on to the 'tqsl:' control. You will see /Applications/tqsl.app in that control after the drag and drop.

As a LoTW user you will have created at least one and possibly two passwords for system access. The first is your web access password and the second is the tqsl application password. The tqsl application password is optional. If you use a tqsl application password then you need to enter that in the Password control and also enable the "Use password..." check button. LoTW also provides for managing the LoTW data for specific locations. My LoTW logbook has data for the past two QTH locations. Enter the location for which the LoTW records will be relevant. Case is significant in both the password and the location entries.

Leave the "Quiet mode" unchecked until you are comfortable with fldigi's LoTW interface. If unchecked the tqsl dialog will open each time the "Send" button is selected. Checked and the tqsl dialog will not open.

If you never tweak the logbook entries, then enable the "Send QSO data..." check box. If checked each saved logbook entry will be sent individually to LoTW via the tqsl interface. Leave it unchecked if you want to review and possibly modify the records before the LoTW upload. When unchecked, fldigi will accumulate the adif records in an adif upload file. This file is not on disk. It is only a memory image of the file and is therefore volatile. Exit fldigi before submitting the LoTW records for upload and the memory image is lost. BUT the data is still available for LoTW upload.
The text box is an actual editor. You can modify or delete a record line, or just clear the entire image file contents. If you modify the file then you must save it before taking any subsequent action to upload the file to LoTW. Be sure you fully understand how to change the ADIF record before attempting to make changes. tqsl will reject mangled records.

You can create a new update file image, or append new (or corrected) records using the Export button. This will open the Export dialog:

Press the LoTW button to present the field selection. Then select the desired records either individually, all, or within a date block. The above image shows a date selection of all records between July 1 and October 31 of this year. When OK is pressed the upload image file will either be newly created or appended with the selected records.

View the upload image file again to insure you have not duplicated any records. tqsl will reject any that are duplicates if you forget this step.
When all looks OK you can upload the records using the Send button on the LoTW config dialog.

**Verifying local against LoTW download**

Download a set of adif records from LoTW using the LoTW web interface. Save the download file to a convenient location. Then press the "Match" button and fldigi will try to match your records with each LoTW download record; updating each matched record's LoTW date received data element. If the LoTW download was make using an extended format than fldigi will also update these adif fields if present in the LoTW record:

- LOTWRDATE - LoTW received date
- DXCC - dxcc entity number
- CNTY - county name
- COUNTRY - country name
- CQZ - CQ zone number
- GRIDSQUARE - Maidenhead grid square reported by QSL's station

A brief report will be given in a message dialog at the conclusion of the matching effort.

4.16 Colors and Fonts

"System colors" are set by command line switches. The default is black on a white background.

From the Menu Configure/Defaults select the menu item **Colors and Fonts** and then select one of the following tabs.

4.16.1 TextCtrls

![Figure 4.47 Colors Fonts RX / TX](image-url)
The initial color, font and font-size for the Rx and Tx panel are the default values. You can always return to these by pressing the Defaults button. The background color, font and font-size are independently selectable. The Rx panel displays text in one of 5 colors:

- normal received text - "Rx font" button
- transmitted text - XMIT button
- control characters - CTRL button
- skipped characters (Tx ON/OFF in Tx pane) - SKIP button
- quick view characters - ALTR button
- select text highlight - SEL button

The text widget used for Rx, Tx and Event log displays has been improved to give better performance with proportional fonts. Fixed width fonts still give better performance and are not as demanding on the cpu. There are several very good fixed width fonts that include a slashed zero which are available for both Windows and Linux. If you are using a proportional font and find that the Rx text display gets unresponsive with large amounts of text then you should change to a fixed width font. Do a search on the internet for "Andale Mono" or "Consolas". Both are excellent fonts for this use.

4.16.2 Character Set Selection

![UTF-8](image)

Figure 4.48 Character set

This setting affects how fldigi encodes the text that it transmits and how it interprets what it receives. This mainly matters if you intend to transmit and/or receive text containing characters that are not in the English alphabet (for example letters with diacritics, Cyrillic letters, Japanese script and similar). Successful transmission and reception of such symbols is only possible if both your and the correspondent's program are set to use the same encoding. Seeing "strange" characters instead of what you would expect for example "č" always turning up as "è" indicates that there is probably a mismatch between your encoding and the correspondent's.

Leaving this control set to UTF-8 (the default) is strongly recommended as this is a cover-all encoding that enables communication in almost any language and script imaginable. However, there are three cases in which you might want to switch encodings (at least temporarily):

- You never expect to transmit or view any character except for the lower 128 characters (ASCII) of the ANSI data set. This might be true for English to English communications in which you do not want to have decoded noise appear as UTF-8 character renditions.

- You want to communicate using non-English characters, but the correspondent's program does not support UTF-8. In such a case, you should find out what encoding the correspondent is using and change your setting accordingly.
• You expect to exchange a lot of traffic that mostly consists of non-English characters (communication in Cyrillic script being a notable example). UTF-8 encodes each non-English character into a symbol two to four bytes long. Such characters require more time to transmit and thus reduce the effective transmission speed. Choosing another encoding that requires less bytes to be sent might be beneficial if the transmission speed is crucial. For example, a pair of operators wanting to communicate in Cyrillic script might want to choose CP1251 to retain the maximum transmission speed.

Warning: transmission of non-English characters, regardless of the encoding used, requires that the digital mode used be capable of handling 8-bit traffic. The following modes suit this requirement:

• DominoEX
• MFSK
• MT63 (8 bit extended characters must be enabled)
• Olivia (8 bit extended characters must be enabled)
• PSK (all variants)
• THOR

4.16.3 Frequency Display

The rig control panel uses a special button for each digit the represents the transceiver frequency. The buttons are responsive to mouse clicks on the upper and lower half with corresponding changes it that unit's value. Unit value is also controlled by the mouse wheel when the cursor is over a particular digit. Select the background and foreground colors to please your overall color scheme and for best visual acuity. The System colors are the same ones that are used by all input and output text controls.
4.16.4 Logging controls

You can select the background color, the font, the font color and the font size for both the logging controls on the main dialog and the separate logbook dialog.

4.16.5 Func keys

You can color code the macro (function key) buttons in groups of 4, F1-F4, F5-F8, and F9-F12. The background color for each group is adjusted by clicking the respective Bkgnd button. The text color for the button labels is adjusted by clicking on the Label Txt button. The colors will change on these buttons and also on the main dialog as you make these adjustments. The Defaults button restores the colors as shown in this view.

4.16.6 Tab Colors

Adjust the color of all tabs to suit your personal taste.
4.16.7 Light Buttons Colors

- Adjust the "on" color of Spot, RxID, TxID, Tune, Lk, Rev, T/R and AFC button
- Adjust the "enabled" and "on" colors of the Sql button

4.16.8 Signal Level

You can select the low/normal/high/over-drive colors for the diamond signal level in the lower right hand corner of the main dialog.

Figure 4.53 Colors Fonts Buttons

Figure 4.54 Colors Fonts Signal Level

Figure 4.55 Level Indicator
Your audio Rx level should be set to allow the loudest signals to drive the indicator into the yellow and never into the red zone.

4.17 Audio Alerts

4.17.1 Alerts

There are occasions when your attention is not given fully to the computer screen, but you would like to know when a digital event takes place. You might for instance like to know when the signal decodes the character sequence "CQ CQ" or when your call sign is decoded. You might be waiting for the start of a net that is preluded by an RsID signal. In all of these instances, and more, you can set up fldigi to provide an audio signal alert to the default audio device.

4.17.2 Audio Alerts

![Figure 4.56 Generic Audio Alerts](image)

The PSK / RTTY / CW signal browser can be set up to search for incoming text strings. As the text string is detected in a browser line the color of the line text will change to indicate the text presence. The detection text can be a general regular expression, but most commonly is a simple text string such as "CQ CQ".
The regex detection defaults to red text. The detection of `<MYCALL>` is an integral part of the browser code. A `<MYCALL>` detection causes the text to turn green.

Both of these events can trigger an audio alert.

The regex audio alert is shown using an external wav file "barbershop-mail.wav", and the MYCALL audio alert is shown using an internal wav file "beeboo", a sound similar to a European emergency vehicle siren. If you use a wav file that you have either created yourself or downloaded from the internet try to keep its size less than 300 Kb and its duration to less than 5 seconds. The idea is to provide an audio alert, not play music. Hi fidelity is not important, so most 8000 sample/sec monophonic wav files will suffice. Look at this web site for a large selection of audio clips:

http://www.wavsource.com/

You can also enable an alert for these conditions:

- receipt of an flmsg text
- time out of a flmsg reception
- detection of an RsID signal

You can test the efficacy of the audio alert using the "Test" button associated with each of the alerts. Normal signal processing and user interaction with the program will not be effected by the audio alert. The alert playback is handled in a separate thread and occurs as a background process.

Select an internal audio alert signal using the "Sound" selector.
4.17.2.1 WARNING

DO NOT enable audio alerts if you are using the default audio device for fldigi transmit audio. You will be a very unwelcome neighbor if your start transmitting steam engine or diesel train whistles over the air!

4.17.3 Macro Audio Alerts

Two new macro tags provide support for function key initiated audio alert playback

< ALERT:internal-wav > where internal-wav may be one of

- bark - barking dog
- checkout - George Carlin - check out what's new
- diesel - diesel train horn
- steam train - steam train whistle
- doesnot - computer voice, "that does not compute"
- beeboo - occulting two-tone sound similar to euro police car
- phone - ringing telephone
- dinner bell - similar to cruise ship dinner bell

or < ALERT:path-name-to-wav-file > Audio playback using the macro tag is immediate upon pressing the associated function key.
4.17.4 Notifier Audio Alerts

You can create special audio alerts using the Notifications dialog.

![Notifications Dialog]

The notifier event is set up using these instructions with the addition of the audio macro event added to the text appended to the TX text. This text is never actually sent, but triggers the audio event playback using the macro facility.

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4.18 Rx Audio Monitor

4.18.1 Rx Monitor Control Dialog

fldigi allows the user to monitor the receive audio stream. The monitor includes a band pass filter implemented using a FIR digital filter. Open the monitor dialog using the menu item on the "View" menu.

![Rx Audio Monitor Dialog]
The rx monitor shares the audio output device with the "audio alert" system. The rx monitor volume can be independently controlled. Enable "Monitor ON" to listen to the rx audio on the audio-alert sound device. Insert the DSP filter by enabling "Filtered audio".

The DSP center frequency, bandwidth, low cutoff, and high cutoff can be controlled. These four controls interact. You will probably find it most convenient to use the bandwidth, BW, and center frequency, Mid, controls. Change any one of the four controls and the other three will track. You can also elect to have the center frequency track the waterfall cursor.

- Bandwidth is adjustable from 50 to 4000 Hz in 10 Hz steps
- Center frequency is adjustable from 400 to 3500 in 10 Hz steps
- Low frequency is adjustable from 100 to 3500 in 10 Hz steps
- High frequency is adjustable from 500 to 4000 in 10 Hz steps

### 4.19 Autostart Configuration

#### 4.19.1 Configuration

You can configure fldigi to start up to seven external programs when it begins execution

- flrig - Transceiver controller
- flamp - Amateur Multicast Protocol
- flnet - Net Control Operator database and logger
- fllog - fldigi compatible log server for multiple clients
- Prog 1..3 - user selectable programs
4.19.2 Program Selection

The location of each autostart program must be identified and entered into the respective text control. Use the "Locate" button to open a file browser. Select the executable and the full pathname to that file will be entered for you. You can also enter or modify each entry manually. The entry will appear similar to:

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows XP</td>
<td>C:\Program Files\flrig-1.3.31\flrig.exe</td>
</tr>
<tr>
<td>Windows 7</td>
<td>C:\Program Files (x86)\flrig-1.3.31\flrig.exe</td>
</tr>
<tr>
<td>Windows 10</td>
<td>C:\Program Files\flrig-1.3.31\flrig.exe</td>
</tr>
<tr>
<td>Linux</td>
<td>/usr/local/bin/flrig</td>
</tr>
<tr>
<td>OS X</td>
<td>/Applications/flrig-1.3.31.app</td>
</tr>
</tbody>
</table>

On OS X you simply drag the application icon (in the Applications folder) to the respective text control. The OS X "app" paradigm embeds the actual "unix binary" within the structure of the app directory (folder), i.e.

- /Applications/flmsg.app
- /Applications/flmsg.app/flmsg-4.0.3/Contents/MacOS/flmsg

Either the 1st or 2nd can be entered into the autostart control. If the first then fldigi will search for the unix binary pathname within the construct of the app directory.
Prog 1, Prog2, and Prog3 will all start the correct application when pressing the respective Test button. Note that the unix binary for flcluster is tagged with the name "exec" in the Finder. Prog 1 uses the system "open" to start Athena, the logbook program associated with the lgbkdb extension.

If the /+.app/+.Contents/MacOS/ folder has more than one file and both are tagged as "exec" then fldigi may not reference the correct one. In that case it is necessary to use the second format.

Drag the "app" icon to the control and the 1st entry results. Drag the "exec" icon to the control and 2nd entry results.

You must become conversant with the Unix directory system if you are working from within the context of an OS X terminal window. Open a terminal window and enter

echo $PATH

at the command line prompt. The terminal shell program should respond with:

/usr/bin:/bin/usr/sbin/sbin/usr/local/bin:

which is the order in which directories will be searched to find a terminal reference binary. The OS X terminal shell program does NOT search the app folders for an executable. If you want to execute an app exec binary from the terminal window it is necessary to enter the full Unix pathname to that executable, i.e.

/Applications/fldigi-4.0.13/Contents/MacOS/fldigi

### 4.19.3 Testing-Enabling

You can test, or manually start each of the autostart programs using the respective "Test" button. If the desired application launches correctly you can check the Enable box for that application to have it launch when starting fldigi.

**Figure 4.60 RSID Config Panel**
Fldigi offers several ways to identify the operator or mode that is being used. This is particularly useful when using a hard to recognize mode such as Thor, Olivia or MT63.

### 4.20.1 Reed Solomon Identifier

**RSID. Reed Solomon IDentifier** is a special transmission designed by Patrick Lindecker, F6CTE, for the modem program MultiPsk. It has been adapted to other modem programs. Fldigi's implementation is compatible with the MultiPsk RSID, but provides a slight variation. You can transmit RSID at both the beginning and end of a transmission. The detection of RSID normally only occurs in the near vicinity of the current waterfall tracking point. This cuts down on extraneous RSID detections when the band is crowded and several RSID signals might be present. If you want fldigi to search the entire waterfall for RSID signals you can do so by enabling the “Detector searches entire passband”. You start the search for a signal based on RSID by using the main panel switch. The RSID detector is a separate decoder that operates in parallel with all other modem decoders. If you select the “Mark previous frequency and mode” a restore link will be inserted into the RX text upon detecting an RSID signal. Clicking on this link restores the previous frequency and mode of operation. You elect to disable the RSID upon first detection. You also have the option of just receiving notification when an RSID signal is detected. The notification occurs with a pop-up message box.

You can select which modes will include the transmitted RS identifier, and which modes will react to a received and decoded RS identifier.

The mode to identifier relationships are selected by pressing the associated “modes” button.

![Receive Modes](image.png)

*Figure 4.61 Receive Modes*
4.20.2 Video Text

Transmitted video text will appear as a sequence of characters on the waterfall. The text can be a brief mode identifier or some user specified text. You can use a small font that always appears as a 2 character wide sequence or a larger font that can be 1 to 4 characters wide. You should be aware that the video signal is a constant energy signal and the content will be spread across multiple characters. The highest s/n at the receiving end will be for 1 character wide video. Small font at 2 character width is next in s/n performance followed by 2 character large font etc. You can select which modes will include the video text preamble. You can limit the horizontal (frequency width) of the video signal in one of several inclusive ways.

- Number of characters per row of text
- Constrain to be less than or equal to 500 Hz
- Constrain to be within the bandwidth limits of the mode in use
Fldigi uses abbreviated acronyms for the mode and its characteristics when you are transmitting the mode ID using a video text. Here are two examples, one in small and the other in large font.

![Figure 4.63 Small Font](image)

Figure 4.63 Small Font

![Figure 4.64 Large Font](image)

Figure 4.64 Large Font

Notice that Olivia 16-500 is abbreviated to OL-16/500 and that the number of characters is limited to 8 per row. You might want to use the large characters by default if you routinely have QSO's with operators using older digital mode programs or one whose waterfall visual is not on a par with fldigi's.

![Figure 4.65 Video ID Config Panel](image)

Figure 4.65 Video ID Config Panel
4.20.3 CW Postamble

You can transmit your callsign in CW as a postamble to all modes except of CW (a bit redundant to do that). You can select which modes will include the CW postamble.
4.21 PSKmail Configuration

Fldigi can act as both a server and a client for PskMail, a separate application from Fldigi. The PSKmail specific configuration parameters are all located on the Misc/Pskmail tab of the configuration dialog.

Instructions on setting these parameters are a part of the pskmail installation.
4.22 Configure Touch Screen

Figure 4.70 Touch Screen Configuration Panel
4.22.1 Touch Screen

Provides a few UI configurable items that improve using fldigi on a touch screen device, such as a Windows tablet, or an Android running a remote desktop with fldigi as the application. These items are enhanced by the addition of a macro tag that allows the operator to change focus to the frequency input widget by pressing that macro key:

<FOCUS>

Which then enables keyboard entry into the frequency widget, but more important also allows the cursor keys, and Shift-cursor keys to modify the frequency entry.

Tablets usually put the on-screen keyboard at the bottom of the display which covers up the fldigi Tx panel. Typing in the blind is not very satisfactory, so the "Tx above Rx" allows the the Rx and Tx panels to be swapped. The functions keys are too small for most adult male fingers on a touch screen. The "one Macro Row above Rx/Tx" and the size adjustment provides relief for bumbling fingers and also moves the function key bar from beneath that immovable tablet on screen keyboard.

4.23 User Interface Configuration - Browser
Signals can be viewed in a multi-channel context for the following modes:

- CW
- PSK-31, PSK-63, PSK-63F, PSK-125, PSK-250, PSK-250, PSK-500
- PSK-125R, PSK-250R, PSK-500R
- QPSK-31, QPSK-63, QPSK-125, QPSK-250, QPSK-500
- RTTY

The multi-channel display is either a separate dialog or an embedded resizable panel.

1) select the number of 100 Hz channels you want visible
2) select the start frequency for the browser (your transceiver may not rx signals below this value)
3) select the inactivity timeout for the browser. After this number of seconds the channel will be cleared and prepared for the next detection cycle.
4) select what kind of label annotation you want on each line
5) select the font and font size to be used in the browser
6) You can enter any text you want to search for in the Seek Regular Expression widget. This text can be a simple text snippet such as "CQ" or any regular expression. When the regex is satisfied in a channel the text color for that channel is changed to red. With a regex you can specify a more generic pattern, which means that you can match more things and your search is somewhat noise tolerant. Here is an example for a CQ from a US station (should match most callsigns):
>cq.+[aknw][a-z]?[0-9][a-pr-z][a-z]{1,2}

This says "cq followed by at least one character, followed by one A, K, N, or W, followed by an optional letter, followed by a digit, followed by a letter that is not q, followed by one or two letters". The search is case-insensitive.

All plain text is a valid regular expression, unless you really had been looking for these metacharacters:

```
.\{()\*+?\}\s
```

These will have to be escaped with a backslash.

7) select whether you want a marquee type of continuous scrolling, or simply clear the line when it is filled.
8) select whether you want the lowest frequency at the bottom (checked) or the top of browser panel
9) select whether you want the audio stream history buffer to be played back when you select an active channel. The first-in first-out audio history represents the previous 2 minutes of received audio.
10) Both the background and slider highlight colors can be selected for the signal browser detection level control. The default colors are shown in these images.
11) You can set the 2 levels of text hi-lighting that is used in the browser lines

- HiLite 1 - Text color when the regular expression evaluator finds the target text
- HiLite 2 - Text color when your call sign appears in that receive channel

12) You can set the background colors for the odd/even lines and the line selection color
4.24 User Interface Configuration - General

![UI Tabs Diagram](image-url)
Fldigi offers tips on the use of nearly every aspect of its operation. These are particularly useful when you first use the program, but after you are familiar with its operation they tend to get in the way. You can turn them off by de-selecting "Show tooltips".

Some users prefer to not have icons on the menu system. You can turn them off also.

Fldigi offers three different look and feel based on the parent Fast Light Toolkit graphics interface: "base", "gtk+" and "plastic". These can be combined with command line specifiers for the default background and foreground colors to create a user unique look to fldigi. You will probably discover that the default colors and the gtk+ UI scheme are to be preferred.

Fldigi has internationalization files for French, Italian, Polish and Spanish. These control the contents of various menu items and labels. Linux users should build and install fldigi from source to gain access to these. Windows users should select the language of choice from the list, press the "Save" button and then close and restart fldigi. The "UI language" selector is only present on the Windows version of fldigi. The percentage indicates the completeness of the translation.

CW, RTTY (baudot), THROB, and CONTESTIA are modes that only transmit in upper case characters. They also have a very limited set of non-alpha characters. A screen full of UPPERCASE characters can be stressful. Select this option to print all of this text in lower case.

fldigi's deadman timer can be set from 0 to 60 minutes in 1 minute intervals. Zero disables the deadman timer. If enabled the deadman timer will be shown on the fldigi menu bar. The timer is restarted whenever one of these events occurs:

- machine state changes to Tx
4.24 User Interface Configuration - General

- machine state changes to Tune
- a macro character is transmitted
- an xmlrpc text character is transmitted
- an ARQ character is transmitted
- a TX panel character is transmitted
- at end of all image transmissions, deadman stopped at start of image

Select the configuration items to allow prompting when exiting the program. Note that the prompts are only active if the menu item File/Exit is used.

You can elect to have the program check for updates every time it is started. You can also manually check for updates from the "Help / Check for updates" menu item.

4.24.1 Visible Modes

![Visible Modes](image)

Figure 4.76 Visible Modes
You may not want to use all possible modes when operating fldigi. Press the "Visible modes" button and open the mode selector dialog.

The use of this dialog should be obvious after a few clicks here and there.

### 4.24.2 Limit Modes

By deselecting all but CW, PSK31, PSK63 and RTTY the Op_Mode menu is uncluttered of all the other modes. The WWV and Freq Analysis modes are always visible. When a subset of the entire mode bank is selected a new menu item is added to the Op_Mode menu, "Show all modes". This is a toggle to restore all modes to the menu. The inverse toggle is "Show fewer modes."

---

**Figure 4.77 Limit Modes**

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4.25 User Interface Configuration - Logging

Figure 4.78 UI Tabs
4.25 User Interface Configuration - Logging

4.25.1 Capturing Log data

Fldigi has a built in logbook. You can request to be prompted whenever there is an unsaved entry in the qso log area. You can also elect to whether to clear all of the qso fields when the log is saved or to leave them intact. Auto-fill Country and Azimuth uses the data found in the file "cty.dat" that you should download and place in the fldigi default folder. You can force the callsign field to be upper case independent of capture or keyboard entry. You enter your default Transmit Power which is used for the logbook record.

Fldigi has various ways to transfer data in the Rx panel to the qso logging fields. The default is to use a Shift-Left-Click paradigm. You can also elect to use a single left click method if you prefer. The word pointed to by the cursor is parsed to determine it's intended field use; call, RSQ, operator name, and QTH. The call will be overwritten, but the other log fields need to be blank for the data transfer to be accomplished. Each data item is considered to be a single word normally delimited by the space, tab or end-of-line character. You can add word delimiter characters in the designated text box. The default is to add *-,.; to the normal delimiters. This is a useful tool for extracting contest exchange data. The exchange might be RST, STATE and NAME. The station being worked might send this as 599-NJ-Bozo. Clicking on the 599 NJ and Bozo would treat each as a separate word. You may also right click on a word (or a phrase that has been highlighted by dragging the cursor over the text). That will open a pop-up menu with selections to transfer the data into a number of different log fields.

You can elect to have the RST in/out preset to 599 after you clear the QSO entry fields.

If you check the "callsign tooltips in received text" then the Rx text area will popup an information box whenever the mouse is held over a callsign for more than 2 seconds. The popup will look like one of the following:
4.25.2 Pop ups

Figure 4.80 Pop ups

Figure 4.81 Pop ups 2

4.25.3 Country Files

The data is derived by parsing the callsign and referral to both the logbook and the "cty.dat" file. If the station was previously worked the operator’s name and azimuth/distance will be computed from the logbook gridsquare entry (Loc). Otherwise the azimuth/distance is computed from the data in the cty.dat file.

This file is maintained by, and can be downloaded from the following web site:

http://www.country-files.com/

The default location for this file is in the fldigi default files folder. You have the option of changing that file location by either entering the new folder pathname in the edit control, or by using the "Browse" or "Default" button. If you change the contents of cty.dat while fldigi is running you should force fldigi to reload the data from the file. This data is normally only read when the program starts.

4.25.4 Internal Logbook

Fldigi has an internal logbook. That log should be used for single operator operations. There may be times that you need to share a log, either between programs on a single computer, or with other operators running fldigi on other computers on a LAN (or even WAN).

In lieu of the internal logbook you can elect to use a common logbook server. This logbook is maintained by a separate logbook program, fllog. fllog provides access to read, query and update records via an xmlrpc socket interface. fllog provides the server function and connecting applications are clients.

You need to specify both the socket address and socket port. The defaults are as shown and are for the instance when both fllog and fldigi are on a single computer. Unless configured otherwise, fllog will always use the port address 8421.
4.25.5 Logbook Network Address

![Network Address Image]

My home network has IP address assignments as shown. If fllog were running on the mini-mac (fl-mac) and fldigi running on the linux-dev machine. I would enter the server address 192.168.1.94 into the fldigi configuration for the Client/Server Logbook.

![Connect to Server Image]

The “Logbook/Connect to server” menu item allows you to connect to the remote logbook. If successful then the toggle remains checked and the menu items for accessing the internal logbook are disabled.
4.26 User Interface Configuration - Macros

Figure 4.84 UI Tabs
Access to a macro is gained by pressing the associated function key. There are actually 48 separate macros that can be created. With the default configuration you rotate between the sub-sets of 12 using the numbered button to the right of the macro bar, or by selecting a set with the Alt-1, Alt-2, Alt-3 or Alt-4 key combination. (on OS X use the Option-1 etc.)

The default user interface is a single macro bar of 12 buttons located just above the waterfall panel. There are times when you need ready access to more than 12 macro functions. When a 2 row configuration is selected the original row is forced to the Alt-1, or first sub-set of macros, and it's numeric rotate button is disabled. The second or SHIFITED macro button row can be rotate through Alt-2 ... Alt-4 using either it's numeric button or the Alt-#key combination. The fldigi macro bar positions will change immediately so you can see the selection.
You edit any macro definition by using a mouse right-click on it's button.

You can also select to use the mouse wheel to rotate through the macro sub-sets. When checked you simply hover the mouse over the macro bar and roll the mouse wheel.

All 48 macro buttons can be displayed in a matrix.

![Figure 4.88 Macro Buttons Matrix](image)

The matrix display is toggled on and off using the menu item "View | View/Hide 48 Macros". When the 48 macro matrix is visible all 48 macros are available for selection and for editing. The position of the 48 macro matrix can be set to either above or below the Rx/Tx text panels. The 1 / 2 macro bar display is hidden when the 48 macro button matrix is displayed. fldigi will remember the toggle selection between program executions.

Fldigi manages multiple files that contain macro definitions. You may want to have the last used macro file be the one available the next time you start fldigi. If so, simply enable the "load last used Macro file on startup" check box. You can also choose to display which macro file was loaded at startup or when a new macro file is loaded. A brief message indicating which file was loaded will be written to the Rx text area if this option is selected.
4.27 User Interface Configuration - WF Controls

Figure 4.89 UI Tabs
You can configure the appearance of fldigi in a variety of ways, including the suppression of unused waterfall controls.

Before adjusting these settings it is recommended that you enable this menu item. You can then see the effect of enabling and disabling the various selection boxes.
4.28 Waterfall Configuration

Figure 4.92 UI Tabs
The waterfall palette or color scheme can be altered to suit your personal tastes and visual needs. When fldigi is first started it creates a wide range of pre-built palettes in the $HOME/.fldigi folder. The "Load" button gives you access to those palettes. You may change any palette by clicking on the various color buttons beneath the palette sample. A color picker opens for you to select the color by various means including specifying the RGB values. If you create a palette that suits you better than any of the prebuilt ones you can "Save" the palette.

The waterfall cursor is a set of markers on the frequency scale that are spaced a signal bandwidth apart. You can add a pair of lines that drop down from those two markers for the full height of the waterfall by selecting Cursor BW. You can add a center line cursor to this pair of BW line by selecting Cursor Center line. You can also add a set of BW lines that straddle the received signal tracking point by selecting Bandwidth tracks. All three of these options are color selectable. Click on the colored button below the check box and a color selection dialog will open.

The frequency scale defaults to RF frequency. You can select to show audio frequencies.

You can monitor the transmitted audio waveform and also set the level of the monitored signal. This IS NOT your final transmitted signal!

Fldigi can set a notch from the waterfall when used with firig and a transceiver that supports CAT control of a manual notch filter. When the notch is engaged a dotted vertical line is placed on the waterfall at the notch location. You can configure the color of the dotted notch indicator.
4.28.1 FFT Waterfall

You can extinguish the display of received signals below a particular audio frequency.

Fldigi's waterfall FFT has a bin size of 1 Hz. With an FFT of 8192 and a sampling rate of 8000 it takes almost a second to accumulate enough data to perform the full FFT. A waterfall that dropped at one scan line per second would be hard on the viewer, so fldigi uses a first-in-first-out (FIFO) 8192 byte buffer for the FFT data. 512 byte audio blocks move through the buffer with each successive read of the sound card. The full buffer of 8192 samples is used to compute the FFT. That means that data in the FFT can have a latency of 8 scans. This provides excellent frequency resolution but poor time resolution (the vertical waterfall appearance). The latency control allows you to select the number of 512 byte blocks that are used for the FFT. The default latency is set to 4. You should be able to achieve a reasonable compromise between the time and frequency domain resolutions.

FFT averaging can be used to smooth the waterfall display in the frequency domain.

The FFT Prefilter or window function is used to reduce aliasing in the FFT computation.

The default prefilter for the Fast Fourier Transform associated with the waterfall is Blackman. You can try the other windowing filter. Under some conditions you might prefer one of those. The Blackman window has proven best for my setup.
4.28  Waterfall Configuration

4.28.2  Waterfall Mouse Behavior

![Waterfall Mouse Behavior](image)

The mouse behavior in the waterfall panel can be controlled to suit your particular operating style. You might want to replay the saved audio history every time you either left click to select or right click to preview a particular signal. You can move the transceiver frequency in increments of 100 Hz by dragging the waterfall scale. You can also choose to insert a line of text into the Rx panel each time you left click a waterfall signal. The text can include expandable macro tags.

4.28.2.1  Waterfall Mouse Behavior Tailoring

The mouse wheel behavior can also be tailored to your liking:

- None - no mouse wheel activity in waterfall panel
- AFC range or BW - adjust the AFC range/BW up/down
- Squelch level - adjust the squelch level up/down
- Signal search - search up / down for next signal in current mode
- Modem carrier - adjust the audio tracking point +/- Hz increments
- Modem - select modem type from a full rotary of available modems
- Scroll - move the waterfall left/right in 100 Hz increments (for 2x, 4x expanded waterfall view)
4.29 WEFAK

This modem is able to receive and transmit HF-Fax images, traditionally used for weather reports.

More technical information is available on the wikipedia article Radiofax.

Two modes are implemented IOC=576 or 288. The focus is made on black-and-white images, color mode is still experimental.

Many frequencies are available at http://www.hffax.com/ for example.

4.29.1 Configuration.

As for any modem, weather fax has its own tab in the configuration window.

![Figure 4.96 WEFAK Configuration](image)

4.29.1.1 Logging messages to ADIF file

Each time an image is saved, it is possible to log this event, with the frequency and reception time, to the Adif file. This option is disabled by default.

4.29.1.2 Frequency shift adjustment

The default frequency is 800 Hz. However, it is possible to adjust for example to 850 Hz for Deutsche Wetter Dienst.
4.29.1.3 Center Frequency

Wefax transmissions are USB, with the center of the frequency modulated audio signal center at 1900 Hertz. This is the default value.

4.29.1.4 Maximum rows number

It non-continuous (Non non-stop) reception mode, an image is automatically saved when it has more than this number of lines (Default 2500 lines). Once this number of rows is reached, the image is saved and a new image is read with the same parameters. This feature has two applications:

- In automatic mode (APT control), if an image end is not detected, we can guarantee that the result will take no more than, for example, the size of two faxes. Typical faxes have about 1300 lines, so the max lines parameters can be tuned to, for example, 200 lines.
- In manual mode, where images are read continuously, this cuts the received images into chunks of equal size.

4.29.1.5 Auto-align

The Wefax signal has start, stop, and phasing components to the transmission. The decoder searches for the start signal, the stop signal and the phasing signal. The phasing signal is used for auto alignment of the image. You can specify the start, stop, and interval for the alignment.

Wefax images have a strong line to line correlation. This correlation is used to detect a signal loss to prevent printing noise. The image display is stopped when the correlation falls below the threshold as detected over the specified number of lines.

4.29.1.6 FIR filter

Select an input FIR (Finite Impulse Response) filter:

- narrow
- medium
- wide

There is rarely any QRM on a government WEFAX broadcast, but the filter selection might improve the decoded signal to noise ratio. Start with the medium filter setting.
4.29.1.7 Destination directory for saved images

Received images are saved in the default folder

`$HOME/.fldigi/images` (Linux) or `<defaultpath>/fldigi.files/images` (Windows).

Additionally, they can be saved manually, at any time, using the button 'Save'.
4.29.2 Receiving an image

A blank image is initially displayed. Several controls are available:

- Save: This allows to save the current image as a PNG file at any moment.
- Clear: Clear the image
- Cont*: At any moment, the image reception can be paused and resumed (State is displayed in the reception window label).
- Mag: Change the displayed magnification of the wefax image.
- Row: The number of the row (line) currently received.
- Tilt: This is used to adjust the slant of the image due to a part per million difference between the pc clock and the transmitting station clock. This value is saved in the configuration file, so it is not needed to reenter it each time.
- Align: Used to manually adjust the horizontal center of the image, if it could not be detected in the phasing step. The alignment value will be displayed if auto detected.
- Auto: When this button is set, the image will be automatically centered. This process occurs during the phasing interval of the wefax signal.
• Noise: Enable noise filtering. This option eliminates short-lived noise, individual pixels with a different value from their horizontal neighbors. They are modified using median values. This is based on the fact that no line should be narrower than two pixels, otherwise such an image would not be broadcast, because not correctly readable. It is therefore impossible to have one single pixel, simultaneously very different from its left and right neighbors.

• Bin: convert to binary image using the associated level. A weather fax can be stored as binary or grey level images. The cutoff level between black and white (Default 128) can be adjusted. No information is lost until the image is saved, therefore this level can be freely modified until image end. The purpose of this option is to save disk space.

4.29.2.1 Displaying received files

Each time the end of an image is detected, an image file is created and stored in the default Wefax image folder. Open the folder with the system file finder using the menu item "File / Folder / WEFAX images...". The images are saved as a Portable Network Graphics file, with the extension ".png". Use the system image viewer to view the images.

4.29.3 Transmitting an Image

To open the transmit window, select the menu item "View/Weather Fax Image TX"

Load an image file using the button "Load".

![Figure 4.98 Transmitting](image)

Click "Tx B/W" to start the transmission. During transmission, image reception is paused. The window will display each image line as it is sent. Please be patient, this may take a while. You might note that FiDigi status line displays the estimation transmit time, and the current stage (Start, phasing etc...).
4.30 Working Logs

4.30.0.1 Working Logs

Fldigi maintains a number of working log files that are found in its default folder. The default folder is easy to find, simply select the menu item "File/Show config" and your OS default files explorer will be opened to that location.

4.30.0.1.1 Rx/Tx Capture File

Everytime you start or stop fldigi that event is recorded in a daily log file. The daily log is named as:

fldigYYYYMMDD.log

where YYYYMMDD is the current GMT date. This log will also contain your entire session of Rx and Tx data annotated as to activity and time stamped. Here is a small example of the daily log:

--- Logging started at Tue Dec 30 11:37:21 2008 UTC ---
RX (2008-12-30 11:37Z): our property. No pwr even for a day is rough.
TX (2008-12-30 11:39Z):
TX (2008-12-30 11:39Z): CQ CQ CQ de W1HKJ W1HKJ W1HKJ pse k
RX (2008-12-30 11:40Z): mG sk
--- Logging stopped at Tue Dec 30 11:48:11 2008 UTC ---

This log is appended to with each start and stop. That means that no data is ever overwritten.
4.30.0.1.2 Status log  A log of errors, warnings and status reports is written for each session. This file is overwritten each time the program is opened and subsequently closed. Its format is also ASCII text and will contain data such as:

```
Q: main: fldigi 3.04BV log started on Tue Dec 30 05:47:10 2008
W: dxcc_open: Could not read contest country file "/home/dave/.fldigi/cty.dat"
```

This data is identical to that which can be viewed with the event log dialog which is opened using the menu item "Help/Event log"

![Figure 4.100 Event Log](image)

![Figure 4.101 Event Log Menu](image)

There are six levels of event logging with increasing depth of reports:

(a) Quiet  
(b) Error  
(c) Warning  
(d) Info  
(e) Verbose  
(f) Debug

![Figure 4.102 Event Logging Levels](image)
The default level for logging events is "warning."

The event log shown above was captured during a period of psk-reporting. Fldigi was set up to monitor and report all detected signals that satisfied the requirements of the psk reporter web site. The "spotted" signals were then automatically sent to the web site. A complete report of the recorded events was obtained by a right click in the text pane. Select-all and Save as was chosen.

At the Debug level you will probably see more events than you need. You can select which events to suppress using the "Log sources" menu button. It defaults to all enabled.

4.31 Contestia Configuration

![Contestia Configuration](image)

Configuration of Contestia is similar to Olivia as Contestia is a derivative of Olivia.

See Contestia for additional information.
4.32 CW Configuration

Fldigi can send and receive morse code from 5 wpm to 200 wpm. The operating controls for CW are found on
the Config/CW tab. You can open that tab by selecting the "Configure/Modems" menu item and the clicking on the
Modems/CW tab. You can also open up the CW tab by first selecting CW as the operating mode and then clicking
on the left-most item "CW" on the status bar at the bottom of the fldigi main window. During operation the Rx and
Tx WPM settings are annunciated on the status bar in the two boxes next to the mode indicator.

The CW signals are converted to a baseband signal. It is the digital equivalent of tuning an analog USB transceiver
so that the carrier is exactly at the CW carrier frequency. The CW decoder uses a Fast Fourier Transform (FFT)
filter implemented with a \( \sin(x)/x \) impulse response. This is a very steep sided low pass filter. The FFT filter is
optimum when receiving CW in a white noise environment. Select "Matched" filter to optimize the filter width for
the current transmit WPM setting. A lot of impulse noise (static) can cause the filter to ring. Increasing the filter
bandwidth might improve detection in that QRN environment.

Fldigi can track the incoming signal. Enable Rx WPM tracking by enabling the check box "Enable Tx Trkg". The
tracking range (+/- Hz around the TxWPM setting) can be set using the "Rx Trkg Rng" control. When tracking is
enabled the tracking filter is reset every time the transmit WPM is adjusted.

CW detection is basically an amplitude demodulator with an automatic threshold adjustment.
You can control the attack and decay squelch parameters of the detector, slow - medium - fast, for both attack and decay.

The RxWPM control is an indicator and is not used for setting the operation of the CW decoder.

"SOM decoding" provides a fuzzy logic implementation to match the RX stream detected on-off sequence to a "best fit" character. It can increase the probability of correctly identifying the text character under very noisy conditions.

The TxWPM sliding controller is used to set the transmit WPM. To make the setting easier two additional controls are provided. "Lower" sets the lower limit of the slider and "Upper" sets the upper limit of the slider. The resolution of the TxWPM slider is 1 WPM. The Lower/Upper controls are in in 5 WPM increments.

The transmit encoder settings for WPM can also be adjusted with three hot keys:

- Numeric keypad "+" increases the TxWPM by 1
- Numeric keypad "." decreases the TxWPM by 1
- Numeric keypad "*" toggles between the selected TxWPM and a default WPM

The "Default" control on the CW tab sets that default value. As shown above the TxWPM is 30 and the default is 18. If during a QSO you needed to slow down to give the other op a better chance to copy what you are sending, just hit the "*" on the numeric keypad and the CW code will immediately switch to sending CW at the set default value (18 wpm in this example). Press the "*" again to return to back to the CW speed that you were previously using.

### 4.32.1 Timing

![Figure 4.105 Timing](image-url)
Fldigi generates CW by inserting a keyed tone at the current waterfall audio frequency. The transceiver should be operated in either USB (preferred) or LSB mode. The CW signal is completely generated in the software so it is possible to control many aspects of the CW signal. The actual transmitted signal will be at the USB carrier + the audio frequency, or the LSB carrier - the audio frequency. If fldigi is tracking and receiving a CW signal on the waterfall your transmitted signal will be exactly on the frequency of the other operator. The CW generated this way has a nearly ideal attack and decay time, controlled by the software modem. But ... a caveat ... your transmitter must never be overdriven and it should have excellent opposite sideband suppression. Overdriving the transmitter can cause multiple audio signals within the SSB passband, and cause unwanted interference to other ops. The same is true for a poorly designed or adjusted transmitter with bad sideband suppression. I recommend having a trusted and knowledgable operator assist you when first trying A2 CW. Have them carefully look for evidence of your signal above and below your primary signal (by at least +/- 3 Khz). If there is no evidence of extra signals then your are set to go. If there is you might want to have the transceiver adjusted for sideband suppression, or check to be sure you are not over driving the audio.

- Wt % control sets the weight of the CW. Normal CW is at 50% weight, ie: a dot is equal to the interval between dots or between code elements. It has a range of 20 to 80 percent.

- Dash/Dot controls the relative weight between a dash and a dot. The standard for CW is 3 to 1. The dash is 3 times the length of a dot. Some operators prefer the sound of either a heavier or lighter sounding CW. This control can be adjusted from 2.5 to 4.0 in 0.1 increments.

- Edge shape provides two leading/trailing edge shapes (1) Hanning, or raised cosine, and (2) Blackman a modified raised cosine with a steeper attack and decay. Both of these edge shapes give a more narrow bandwidth CW signal than the traditional exponential waveform. They are very easy to listen to even at speeds exceeding 100 wpm.

- The Edge control sets the rise and fall times of the CW waveform. It can be set anywhere from 0.0 to 15.0 milliseconds in 0.1 millisecond increments. DO NOT operate A2 CW with the control set below 4 msec. This is the control that sets the effective bandwidth and sound of your CW. If the edge is too steep you will have a clicky signal and be the bane of the CW bands. The purpose of being able to set the edge to 0.0 or a very quick rise/fall time is explained below. A good setting for nice sounding CW at 40 WPM and below is 4 to 6 milliseconds.

- Edge decreases pulse width, when checked will give a slightly narrower dot length as the edge timing is increased. This is useful when operating QSK and listening between the character elements.

- The transmitted signal can be further wave shaped using a "Windowed-sinc” bandpass filter. It is enabled by checking the "BPF transmit audio” check box. The bandwidth of the filter can be adjusted from 10 to 1000 Hertz with the BPF bw control. The filter will always be centered on the AFCW injection frequency (waterfall TX cursor position). You should both visually observe and listen to the resulting CW signal. The easiest way to do this is to enable the "Send continuously”, select a test character and then press the TX button on the main dialog. The weight, dash/dot, edge shape selection, edge timing, BPF and bandwidth can be changed with immediate effect.

This is what the A2 signal should look like with various settings of weight, Dash/Dot and Edge. The audio frequency is 400 Hz and the TxWPM is 100 WPM.
Figure 4.106 Dash/Dot = 3.0, Edge = 0.0

Figure 4.107 Dash/Dot = 4.0, Edge = 0.0

Figure 4.108 Dash/Dot = 3.0, Edge = 3 msec
Changing the weight, dash/dot or edge of the waveform does not change the WPM at which the code is generated. When a conflict occurs between the various settings WPM takes first priority, and Edge second. In the above examples, the Edge setting could not exceed 12 msec even if the control were set higher than 12.0. The figures were generated by capturing the output data being sent to the sound card and then formatting it using Gnumeric. An oscilloscope photo of the signal is virtually identical.

The setting for inter-character and inter-word spacings are fixed at 3 and 7 respectively. The 3 is achieved by sending a silent period of 1 dot (element) length at the beginning of each character and 2 at the end of each character (shown in the figures). This silent period is sufficient for most transceivers to respond to the PTT signal which occurs at the beginning of the transmission so that the first dit or dash is not lost in transmission. QRQ (high speed CW operation)

You may wonder why fldigi can go as high as 200 WPM. It's hard to believe but there are CW operators who can decode 100+ WPM in their head. These operators also usually operate QSK (full breakin). A2 CW and PTT operation and QRQ/QSK are not a natural mix. But fldigi can be used for this type of operation if an external keyer is used. For that purpose the A2 Tx output from fldigi is full wave rectified and detected to create a keyline control. The outboard conversion from A2 to keyline requires a nearly square wave pulse output of audio at the CW keying rate. Setting the Edge control to 0.0 and then the audio frequency to about 1000 Hz provides the needed signal to
effect this type of keyline control.

If you are operating QSK with a separate receiver / transmitter you can very quickly stop your transmit signal with the TAB key. In the CW mode only the TAB key causes the program to skip over the remaining text in the transmit text buffer. The text that is skipped will be color coded blue. The program remains in the transmit mode (PTT enabled), but since the buffer is now empty no A2 CW signal is generated. Code transmission will then restart with the very next keyboard closure of a valid CW character. The Escape and Pause/Break keys still can be used to respectively abort and pause transmission.

4.32.2 QSK

Many QSK operators use high speed diode antenna switching between receiver and antenna. fldigi generates a signal that can be used for that purpose. The left audio channel is always theAFCW signal. When selected the right audio channel can be configured to generate a square wave signal that begins earlier and ends later than each of the CW elements. The square wave signal can be rectified and filtered to provide the diode switching signal for the Rx/Tx antenna switching.

The right audio channel QSK signal is selected by checking the box and then adjusting the pre and post timing in millisecond increments. Additional information and a schematic diagram of a QSK keying circuit is described in CW Keying. Setting up a QSK device can be quite difficult. Fldigi helps to ease the adjustment by generating a continuous series of characters. This allows a dual trace scope to be properly synched while making the adjustments to both the software and the associated QSK hardware. You enable continuous characters by selecting the checkbox, and then enabling the T/R button for transmit. The repeated character can be change on the fly with the pick control. It can be one of either E, I, S, T, M, O or V.

4.32.3 PROSIGNS

Use these for WinKeyer and nanoCW
* RR
$ SX
' WG
( KN
) KK
+ AR
< AR
> SK
= BT
- DU
@ AC

Figure 4.111 CW Prosigns
You can assign keyboard characters to be used for Morse prosigns. The available characters are: \sim, \%, \&, +, \{, \}, <, >, [, ].

The default assignments are shown above. You can also elect to send and receive the KN prosign as an open parenthesis '('.

See Operating CW for additional information.
See nanoIO Interface for additional information on nanoIO interface.
See WinKeyer Interface for additional information on WinKeyer interface.
See CW Keyline Configuration for additional information on DTR/RTS keying.
See CW CAT Keying Configuration for additional information on CAT keying.

4.33 nanoIO Interface

4.33.1 Specifications

nanoIO is an Arduino sketch (program) designed to work within the constraints of an "Arduino nano" circuit board. It converts serial ASCII characters to either CW or FSK keyline output. It also performs the functions of a simple Straight key, Iambic-A, or Iambic-B interface. The keyer does not provide any memory or parameter controls via button or paddle input. It is primarily a computer to keyline interface and all control parameters are executed via a simple serial command set.

nanoIO sketch is expanded version of these two GPL programs

- tinyFSK by Andy Flowers, K0SM
- Iambic Keyer, by Steven T. Elliott
FSK Specifications:

- 5 bit Baudot
- baud rates 45.45, 50, 75 and 100

CW Specifications:

- 5 to 100 WPM
- dash/dot ratio adjustable 2.5 to 3.5
- in-line increment decrement WPM using ^ and | characters
- incremental size user adjustable
- left/right paddle inputs

PTT signal generated by Arduino

Both: an internal buffer of 300 characters is available for buffered transmit.

Hardware requirements:

- nanoIO is compatible with kit interface MORTTY, by N8AR and K8UT. MORTTY is a Do-It-Yourself construction project that provides a miniature enclosure and a computing platform that can run either
  - nanoIO
  - K0SM's TinyFSK RTTY Keyer or
  - K3NG's CW Keyer sketch software.

MORTTY is an inexpensive minimalist solution that depends upon the configuration and control features incorporated in the computer program. It has only two inputs, a USB serial port interface to the computer, and a CW paddle.

Version 3 of MORTTY has two outputs, a PTT signal line, and a shared CW/FSK signalling line. The CW/FSK signal needs to be manually switched between the transceivers CW and FSK input ports. Version 3 also includes a speed potentiometer. The fldigi interface can set and read the speed range of the potentiometer.

- homebrew nanoIO circuit: Circuit Diagram
  - Arduino nano or compatible circuit board
  - LTV-847 quad opto-isolator
  - 4 - 620 ohm ¼ watt resistors
  - suitable connectors to interface to transceiver and paddles

The power on default configuration is:

- Mode: FSK
- FSK: Baud: 45.45, Mark LOW
- CW: WPM: 18/18, dash/dot 3.00, incr 2, IambicA keyer
Control and configuration commands to nanoIO are issued by the computer program via the built-in Arduino nano USB port.

**USB serial command strings all begin with the tilde, ~, character**

```
Cmd ~......
C,c  CW mode
F,f  FSK mode
T,t  CW Tune
Snnns computer wpm 10...100
Unnnu key [user] wpm 10...100
Dnnnd dash/dot 250...350 (2.5...3.5)
In  CW incr [1..9]
A,a  IambicA
B,b  IambicB
K,k  Straight key
0   FSK mark = HIGH
1   FSK mark = LOW
4   45.45 baud
5   50 baud
7   75 baud
9   100 baud
?   Show config
W   Write EEPROM
    Show cmds
```

In line special characters are used to control both CW and FSK signalling:

**Both:**

- `[ PTT on`
- `] PTT off`
- `\ escape; clear internal buffer and set PTT off`

**CW:**

- `^ increase computer wpm by increment value (default is 2)`
- `| decrease computer wpm by increment value`

- `% SK`
- `& AS`
- `+ KN`
- `- BT`
- `< AS`
- `= BT`
- `> AR`
- `{ left brace HM`
- `}` right brace VE

- the `| wpm modifiers do not effect the paddle CW, just the computer CW.

For example, a CW string might contain:

```
~C-S24s[tu ^^5nn|| k]
```
1. Mode is changed to CW
2. Computer WPM is set to 24
3. PTT is set ON
4. the string "tu " is sent
5. Computer WPM is increased by 2 increment factors
6. the string "5nn" is sent
7. Computer WPM is decreased by 2 increment factors
8. the string " k" is sent
9. PTT is set OFF

PTT would enable before starting the CW transmission. PTT would disable after the last CW character (k) was completed.

### 4.33.2 nano CW configure

Configure fldigi and the nanoIO interface for CW operation using the configuration tab Modems / CW / nanoCW

Select the USB serial port to which the Arduino is attached and press the "Connect" button.

The WPM rate is separately controlled for the computer and paddle characters. Dash/Dot ratio is adjustable from 2.5 to 3.5. This control effects both the computer and paddle generated CW. Set the two WPM settings, the paddle type to Straight, Iambic-A, or Iambic B. Set the incremental WPM adjuster (see ^ and | characters above).

CW is generated from USB serial input strings and/or the paddle inputs. Paddle input overrides the serial string, but does not clear the serial buffer.

The text control will show the current state after a successful connect:
4.33.3 FSK configure

Configure fldigi and the nanoIO interface for FSK operation using the configuration tab Modems / TTY / nanoFSK.

Set the state (high/low) of the FSK keyline for the transceiver to generate the MARK signal. Select the baud rate (45.45 is the one most used). Press the connect button and in a few seconds the USB Serial I/O text display should show
4.34 Navigator Interface

4.34.1 Description

Precise, jitter-free timing of FSK signals requires the use of external hardware/firmware that is dedicated to the task of converting text to a serial Baudot radio teletype (TTY) data stream. The *TimeWave Navigator*, previously sold as *Navigator* and *US Navigator*, simply referred to as *Navigator*, is a transceiver interface that performs that service. The Navigator interface can provide

- CAT serial port support
- Winkeyer compatible CW port
- FSK port
- PTT CW Squelch port
- Configuration control port (no jumpers used)
- An additional RS232 port for general use

The Winkeyer interface is identical to using and configuring a stand alone *WinKeyer Interface*. The CAT serial port is accessed using either hamlib, rigcat or an external control program such as flrig. This page is only concerned with the FSK interface provided by the Navigator.

Using the fldigi/Navigator interface requires that

- the transceiver be in RTTY
- fldigi be in the RTTY mode
- the Navigator be properly configured
- fldigi's serial access to the Navigator's FSK port(s) be activated
4.34.2 Accessing the interface

The Navigator has two serial ports dedicated to FSK signal line generation. One for the actual character stream conversion from text to FSK, and the other for configuring the Navigator firmware. You must know which ports are used for the FSK signal line and the configuration and configuration access. On Linux-based systems, you can show the available serial ports by opening a terminal window and issuing the command:

```
ls -la /dev/serial/by-id/
```

In the first line, `ttyUSB0` is matched to the FIRST device in the list, AKA.. the CAT port. `ttyUSB1` is associated to the second PTT line, etc.

### 4.34.2.1 Configuring

Refer to the Navigator documentation for details on the various configuration parameters. Select the correct port and press the Config button. The button will illuminate when the serial port is activated. The parameters will be read from the Navigator and each configuration control will display the current state of the hardware. The following text will be displayed in the Rx text panel:

```
Connected to Navigator configuration port
```

You can then set the various parameters using the respective fldigi control:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel 1 Attenuator</td>
<td>Normal, 15 dB</td>
</tr>
<tr>
<td>Channel 2 Attenuator</td>
<td>Normal, 15 dB</td>
</tr>
<tr>
<td>RF attenuator</td>
<td>Normal, 20 dB</td>
</tr>
<tr>
<td>WinKey PTT</td>
<td>On, Off</td>
</tr>
<tr>
<td>LED brightness</td>
<td>Dim, Normal</td>
</tr>
<tr>
<td>CAT LED state</td>
<td>Steady, Polling</td>
</tr>
<tr>
<td>Baud rate</td>
<td>45.45, 75, 100</td>
</tr>
<tr>
<td>Stop bits</td>
<td>1, 1.5, 2</td>
</tr>
<tr>
<td>Mark Polarity</td>
<td>Normal, Reverse</td>
</tr>
<tr>
<td>Side tone</td>
<td>On, Off</td>
</tr>
<tr>
<td>FSK PTT</td>
<td>On, Off</td>
</tr>
</tbody>
</table>
You can disconnect from the Navigator control port when you are satisfied that it is configured for the desired operating condition. You do not need to be connected to the configuration port for FSK signalling.

### 4.34.2.2 FSK Signal Generation

Select the FSK serial port and press the Connect button. The button will illuminate when connected and the text similar to the following will be displayed in the Rx text panel:

```
Connected to Navigator FSK port
Navigator Ver 1.00
```

fldigi will then use the navigator for generating the FSK signal. The fldigi internal audio frequency transmit modem will be disabled.

The Navigator's "FSK PTT" option must be enabled for proper operation. Any desired changes in the RTTY signal's BAUD, Stop bits, and Polarity, must be done via the Navigator hardware configuration menu. Any changes made to the RTTY parameters in the Fldigi RTTY modem screen will not alter the Navigator's operation.

---

### 4.35 WinKeyer Interface

If you own a WinKeyer, WinKeyer USB, or compatible keying interface then you may use that device with fldigi to key your transceiver.

The transceiver must be in either CW or CW-reverse mode for the WinKeyer to correctly key the transceiver. If you are using rig control, then the waterfall will correctly show the received CW in relation to the suppressed carrier insertion point. The waterfall scale will decrease from left to right if the transceiver operates CW as LSB and increase from left to right if the transceiver CW operates as USB (usually CW and CW-REV as on my IC-7200).

The transceiver will either have a fixed or adjustable CW received pitch. On the IC-7200 this is a menu item named CW-PITCH. I prefer listening to a 700 Hertz CW signal and set my transceiver accordingly. You must also set the fldigi CW sweetspot to the same value to insure that QSY, DXcluster spotting and other RF/AF functions to operate correctly in fldigi.

Open the configuration dialog and click on the CW/WinKeyer item in the tree menu.
Select the serial port to which the WinKeyer is attached. On a recent Linux distribution that will shown in both traditional device and named device.

Then press the "Connect" button. fldigi will attempt to connect and test the connection to the WinKeyer hardware. Upon success the "Connect" button will illuminate Yellow and the connection state will be annunciated to the Rx panel.

Pressing the "Connect" button when it is illuminated with cause fldigi to disconnect from the WinKeyer hardware and a successful disconnect will be annunciated to the Rx panel.
If the connection attempt fails the "Connect" button will fail to illuminate and a failure notice will be printed to the event log.

4.35 WinKeyer Interface

4.35.1 Configuration Items

The fldigi configuration interface for the WinKeyer is similar to the one available in the application flwkey. It will probably not exactly match any Windows application you may have received with the WinKeyer kit.

You may elect to use the speed potentiometer on the WinKeyer hardware. Check the "Use Pot" control and changes to the WinKeyer speed will be annunciated to both the configuration tab and the fldigi main dialog.

If you do not use the potentiometer, then fldigi will use it's internal controls which are described in the CW modem and CW modem configuration.

4.35.1.1 Keyer Mode

WinKey supports Iambic A, B, Ultimatic, and Bug keying modes. In iambic mode WinKey makes both dits and dahs automatically based on which paddle you press. In bug mode WinKey makes the dits and you make the dahs. You also can use bug mode to operate in straight key mode or if you want to key through WinKey with a different keyer, simply set bug mode and use the dah input to key WinKey. In either iambic mode, alternating dits and dahs are sent while both paddles are held closed. In mode B an extra alternate dit or dah is sent after both paddles are released. In Ultimatic mode when both paddles are pressed the keyer will send a continuous stream of whichever paddle was last pressed.
4.35.1.2 Sidetone

You can adjust the audible keying tone that the WinKeyer produces using the Sidetone selector. Turn the audio on and off using the "Tone ON" control.

4.35.1.3 Hang time

Hang Time works by holding PTT on between paddle presses. The holding time is called "hang time" and is measured in word space time.

- Wait 1.0 word space before ending paddle insertion
- Wait 1.33 word space before ending paddle insertion
- Wait 1.66 word space before ending paddle insertion
- Wait 2.0 word space before ending paddle insertion

4.35.1.4 Output Pins

The keyline can be connected and controlled from either "Key 1", "Key 2", or both simultaneously. Select the one that is appropriate for your installation.

4.35.1.5 Mode Register Controls

WinKeyer maps various internal controls to a "mode register" in which the state of the control is either on or off. These are mapped to the fldigi "ModeReg" controls:

- **Swap**
  This is a nice feature to have when right and left handed ops want to share the same keyer. Enable to reverse the sense of the left and right paddles.

- **Auto Space**
  Here is how autospace works: If you pause for more than one dit time between a dit or dah WinKey will interpret this as a letter-space and will not send the next dit or dah until full letter-space time has been met. The normal letter-space is 3 dits. WinKey has a paddle event memory so that you can enter dits or dahs during the inter-letter space and WinKey will send them as they were entered. With a little practice, autospace will help you to send near perfect Morse. This only applies CW sent using the paddles connected to the WinKeyer.

- **CT space**
  Winkey supports contest spacing which reduces the word space time by one dit. Instead of 7 dits per word space, Contest spacing selects six dits per word space.

- **Paddle Dog**
  Winkey has a paddle watchdog counter that will disable the key output after 128 consecutive dits or dahs. This is to guard against the paddles being accidentally keyed continuously. By default the paddle watchdog is on but it can be turned off by disabling this control.

- **Cut 0/9**
  Enable to force WinKeyer to send a T for 0 and N for 9. Often used in contests to shorten transmissions such as 599 to 5NN.
• Paddle echo
  When this control is set characters entered on the paddles will be echoed back to the host. From the host perspective paddle echo and serial echo are the same, in either case the letter sent in Morse by WinKey is echoed back to the host. The echo occurs after the letter has been completely sent. This feature is not currently used by the fldigi / WinKeyer implementation.

• Serial echo
  Always enabled.

• Tone Keyer
  Normally WinKeyer uses PTT output. Sacrificing PTT functionality, the WinKeyer can be configured to output a square wave sidetone instead by using enabling the "Tone Keyer".

• Tone ON
  Enable the audible keying tone emanated by the WinKeyer hardware.

• PTT ON
  Enable the PTT lines. Normally enabled, but you might want to disable if you are simply practicing CW and do not want to key the transmitter.

4.35.1.6 WPM Settings

These controls allow the user to set up various internal WinKeyer variables.

• Min WPM
  Sets the WPM for the minimum WinKeyer potentiometer position

• Rng WPM
  Sets the WPM range for the WinKeyer potentiometer

• Farnsworth
  Farnsworth spacing is useful for CW practice because it encourages you to learn characters by sound not individual dits and dahs. In WinKeyer, Farnsworth is implemented by sending letters at a fixed rate of nn WPM regardless what the WPM sending rate is. Spacing between characters is determined by the sending rate. When the WPM rate is set above the Farnsworth WPM, Farnsworth is automatically disabled.

• Cmd WPM
  Sets the WPM used for sending commands to the WinKeyer using the paddles.

4.35.1.7 Timing Settings

These control various aspects of the WinKeyer keyline output.

• Ratio
  Allows WinKey to deviate from the standard 1:3 ratio of dit/dah.

• Weight
  This control allows a proportional amount to be either added or subtracted from the length of all dits and dahs sent. Note that weighting does not affect sending speed because any increase in keyed time is subtracted from spacing time. Reduction in weighting results in a thinner sounding keying while increased weighting results in a heavier sound. Since weighting tracks speed, a given weighting will sound the same at all speeds.
- Comp
  Keying Compensation allows a fixed amount of time in milliseconds to be added to the length of all dits and
dahs.

QSK keying on modern transceivers can cause shortening of the dit and dah elements which is especially
noticeable at high speeds. WinKeyer allows the length of the dit and dah elements to be increased uniformly
to compensate for this. The adjustments are made in units of one-millisecond steps. The maximum adjust-
ment is 250 mSecs.

Key compensation is very similar to Weighting in that any adjustment added to the dits and dahs is subtracted
from the spacing so the speed is not changed. The difference between weighting and compensation is that
compensation is independent of speed, so if 10 msec of key compensation is selected 10 msec will be always
be added regardless of speed. So be careful at high speeds and large values of key compensation, you may
end up with no inter-element space.

- Lead-in, Tail
  WinKeyer provides a transmitter PTT output that can be used to switch a transmitter or linear amplifier over
to transmit mode in advance of actual CW keying. You have control over the time delay between when PTT
is asserted and when CW keying will start, this is lead-in. You also have control over how long the transmitter
will stay in transmit after keying has stopped; this is the tail delay.

- 1st Ext
  WinKey addresses a problem often encountered when keying older transceivers that have a slow break-in
response. Due to a slow receive to transmit changeover time, the first dit or dah of a letter sequence can be
chopped and reduced in length. Adding a fixed amount to the first element of a sequence can compensate
for this.

  For example, an R would be sent with the first dit elongated but the subsequent dah-dit sent normally. The
compensation amount is transceiver dependent and is generally independent of sending speed. Note though
that this is usually only a noticeable problem at higher CW speeds >25 WPM.

  A challenge in this scheme is to determine when sending has stopped long enough to cause the transceiver
to switch back to receive. If it has it'll require a new first element correction on the next sequence. WinKeyer
uses the PTT tail timer to determine this, set the tail timer to roughly match the transmit to receive changeover
time of the transceiver and things will work fine. It takes some trial and error to get it set up right so make
sure you preserve the value and load it as a defaults after reset.

- Sample
  Sets the number of samples per second that WinKeyer uses to read the WPM potentiometer and the paddle
states.

4.35.2 Dx Cluster QSY with Winkeyer

Set the fldigi configuration item for CW sweetspot to be the same as the transceiver's CW PITCH setting. On
older transceivers this might be the same as the beat frequency oscillator, BFO, setting. The following should work
correctly whether controlling the transceiver using hamlib, rigcat, or frig.

Select a dx station to track by clicking on the dx report line (see DX Cluster). If the dx station was reported as
operating at 7.0164 MHz but is actually at 7.0128 MHz; then the frig and fldigi controls will look like this if the
transceiver's CW is an LSB mode:
and the waterfall will appear as

Center the waterfall tracking point over the actual signal and then press the fldigi QSY button. The waterfall will change to

and fldigi and frig frequency controls move accordingly.
4.36 CW Keyline Configuration

fldigi supports CW keying using a serial port DTR or RTS signal line. The serial port may be on unique for keyline use or be a port shared with a PTT signal line. Shared ports include:

- RigCat serial port
- Separate PTT serial port

fldigi must be in the CW mode, and the transceiver set to CW mode for the keyline to be active. Configure the DTR/RTS keying on the "Modem/CW/DTR-RTS keying" tab:
Select shared port use by enabling either the RIGCAT, or Separate PTT box.

Select a unique serial port by selecting the port and enabling the Connect button.

For all port selections you need to specify the signal line, DTR or RTS, which is used for the keyline. If shared, it must not conflict with the PTT line.

The CW keyline timing may require compensation. This is highly dependent on both serial port hardware, pc architecture, and operating system. The combined effect of the three will be to lengthen the key down/up intervals. The calibrate button is used to measure the timing inaccuracy. The measurement is made by sending a sequence of ten “PARIS “ strings at the current CW WPM setting. The time to transmit is measured and compared to the ideal timing, 1200 msec / WPM. Be aware that this may transmit the characters. Use low power or a dummy load for the test. If needed, the computed compensation value will be entered in the Comp control. You may also manually enter or change this value.

4.37 CW CAT Keying Configuration

fldigi supports CW keying using CAT commands to transceivers which support that method. The CAT connection may be either using RigCAT or flrig.

fldigi must be in the CW mode, and the transceiver set to CW mode for the keyline to be active. If available, the transceiver should be configured for either semi or full break-in.

The CW CAT-keying may require compensation for timing. This is principally dependent on the pc architecture, and operating system, and the effect is to lengthen the time between characters. The calibrate button is used to measure the timing inaccuracy. The measurement is made by sending a sequence of “PARIS “ strings at the current CW WPM setting for 1 minute. The actual time to transmit is measured and compared to the ideal timing. Be aware that this may transmit the characters. Use low power or a dummy load for the test. If needed, the computed compensation value will be entered in the Comp control. You may also manually enter or change this value. After calibration you may test to see if the character spacing algorithm are providing the correct compensation.

Tested and known to work correctly with these transceivers:

Figure 4.114 CW CAT Keying configuration
4.38 DominoEX Configuration

Enter the secondary text. This text will be sent during periods when your keyboard is inactive (between letters for slow typists). The default for this text will be your callsign when you have entered that in the Operator configuration tab.

Set the BW factor for the decoding prefilter. 2.0 should be adequate unless you are experiencing nearby continuous wave interference (CWI). You can enable and disable the prefilter with the checkbox. Please note that the filter requires additional cpu cycles. Older and slower cpu models might give better decoding with the filter disabled.
Fldigi can send and receive FEC in accordance with the DomEX-FEC specification for MultiPsk. This type of FEC is achieved by some loss of non printing characters in the primary character set. It is therefore not usable as an FEC mode for ARQ (automatic repeat request) transmissions.

The DominoEX decoder can detect the presence of CWI within the passband set by the BW factor. Increasing the CWI threshold increases the sensitivity to such interference. When the interference is detected the associated data is culled using a technique called puncturing.

DominoEX operations are described in DominoEX.

4.39 Feld Hell Configuration

![Figure 4.116 Feld Hell Config Panel](image)

The Hellschreiber modes all use a video display that is basically a character-by-character facsimile. The shape of the characters is determined at the transmitting station. You can select from 15 different fonts, all of which have been designed for Feld Hell use. In normal use each dot of the character font is transmitted twice. You can increase the effective video s/n by transmitting the dots 2 or 3 times the normal. That is controlled by the Transmit width.

FeldHell is a pulse amplitude modulated signal. The shape of the pulse is a raised cosine. This helps to control the bandwidth of the transmitted signal. It is customary to use a 4 millisecond risetime for the raised cosine, especially on HF. You can change that to 2 milliseconds. The video edges will be sharper, but the bandwidth twice as large. You might find 2 msec a better choice for VHF and above.
Decoded FeldHell transmissions are displayed as a raw video raster. The video is displayed as black characters on a white background. Enable the “Reverse video” control for a white on black display.

The default display mode is for each line of text to be displayed in the lowest line, characters appended in a left to right fashion. The lines scroll up as each line is filled. You can select “Marquee text” mode if you prefer to have the characters scroll from right to left as on a movie marquee. Marquee text is suitable if you are only viewing a single line of text.

Both the width and height of the characters can be adjusted. The Feld Hell character is transmitted using a 7x14 or 8x14 array of dots. The character display height can be adjusted from 14 to 42 pixels, with 14, 28 and 42 being multiples of the transmitted rate. The height can be adjusted in units of 2 pixels. Remember that each vertical part of the character array is sent twice. The on screen display height for each row will than be twice the selected height, i.e. 28 to 84 pixels.

The width is adjustable as 1x, 2x, 3x and 4x the received array. I suggest you begin with the Rx Width Multiplier set to 2 and the Rx Height in pixels set to 28. Move the Rx/Tx panel divider up or down to see fewer or more raster lines.

The Rx AGC control sets the decay rate of the decoder average signal level. Lower numbers is slower and larger a faster decay rate.

As you change Hellschreiber modes the optimum filter bandwidth will be set. You can change that and might find a narrower filter effective if you are experiencing CWI interference. FeldHell is susceptible to CWI. If you narrow the filter to much the received video will become blurred.

4.40 FSQ Configuration

![FSQ Configuration Interface](image)
4.40 FSQ Configuration

4.40.1 Rx Parameters

The FSQ decoder is essential a set of single frequency filters spaced by the interval samplerate / symbol_length, 2.93 Hz. The filters are achieved using a Fast Fourier Transform. Each spectral line (or bin) of the FFT is then filtered using a time domain filter called a moving average (boxcar) filter. The moving average filter is the optimum filter for locating a signal transition in the time domain. The moving average filter can be adjusted to average 1 to 4 samples. A setting of 1 disables the filter. The default value for the moving average filter is 3.

The filtered spectral lines are then tested for maximum value. The Min Hits adjustment sets the number of consecutive times a spectral line is the maximum before being designated as a detected signal. Min Hits can be set over the range 3 to 6. The default value is 3.

Images are detected by first converting the signal to a base band. This is accomplished by mixing a 1500 Hz sine wave with the rx stream. This is equivalent to an analog receiver that using direct conversion. The down converted signal can be filtered to reduce the effect of noise. Your choice is NONE, 300, 400 or 500 Hz for the low pass filter 6 dB cutoff frequency. Use the narrower filters for noisy conditions, but remember that filtering will both reduce the image noise and also blur the image.

Callsigns that satisfy the parsing requirements will be added to the FSQ heard list. You can elect to have the heard list periodically managed so that older entries are removed or aged. The user can elect no aging, Never; or 1, 5, 10, 20, 30, 60, 90, and 120 minutes.

4.40.2 Tx Parameters

FSQ transmissions can occur at 2, 3, 4.5, or 6 baud. The default rate is 4.5. The baud rate can be selected on the fsq configuration tab, or by left clicking on the left most entry on the fldigi main dialog status bar.

FSQ “Sounding” is a periodic transmission of your call sign followed by a colon. The Sounding signal is a way of announcing your presence on the channel with the smallest possible data stream. Other FSQ stations will add you to their Heard list if they detect your Sounding signal. You set the Sounding interval to OFF, 1, 10 or 30 minutes.

Your QTC text can be sent using the “QTC” button on the main dialog. It can also be requested for auto reply by another FSQ station.

All FSQ transmissions are designed to be inhibited so long as the software detects a received signal (open squelch).

4.40.3 Logging

Any of the text in the Rx Panel or the Monitor Panel can be captured for copy, and saving to a file. Simply right click on the panel for a pop menu.

Fldigi’s FSQ also saves a continuous log of all Heard stations, and an Audit log that includes all received data. These logs are named fsq_heard_log.txt and fsq_audit_log.txt respectively. The logs are never cleared unless the operator does so using the operating system file handling facilities. Data is appended to each log as it occurs. These logs are located in the fldigi temp folder:

<table>
<thead>
<tr>
<th>OS</th>
<th>Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>XP</td>
<td>C:\Documents and Settings&lt;username&gt;\fldigi.files\temp</td>
</tr>
<tr>
<td>Vista</td>
<td>C:\Users&lt;username&gt;\fldigi.files\temp</td>
</tr>
<tr>
<td>Win7</td>
<td>C:\Users&lt;username&gt;\fldigi.files\temp</td>
</tr>
<tr>
<td>Win8</td>
<td>C:\Users&lt;username&gt;\fldigi.files\temp</td>
</tr>
<tr>
<td>Linux</td>
<td>/home/&lt;user&gt;/.fldigi/temp</td>
</tr>
<tr>
<td>OS X</td>
<td>/home/&lt;user&gt;/.fldigi/temp</td>
</tr>
</tbody>
</table>
You can elect to disable the logging functions. You may also rename the log to suit your particular operations.

4.41 IFKP Configuration

4.41.1 Tx Parameters

IFKP transmissions can occur at 0.5, 1, or 2 times the nominal baud rate. The baud rate can be selected on the IFKP configuration tab, or by left clicking on the left most entry on the fldigi main dialog status bar.

Lower case letters are transmitted within a single symbol length, while upper case letters require two symbols. You may configure IFKP to always transmit your own call sign, MYCALL, and the other call, CALLSIGN, using lower case letters.

The transmit center frequency can be locked to 1500 Hertz.

4.41.2 Logging

Any of the text in the Rx Panel for copy, and saving to a file. Simply right click on the panel for a pop menu.

Fldigi's IFKP can save a continuous record of all received data to an audit log. The heard list can also save a record of all stations added to the IFKP heard list. These logs are named IFKP_audit_log.txt and IFKP_heard_log.txt respectively. The logs are never cleared unless the operator does so using the operating system file handling facilities. Data is appended to each log as it occurs. These logs are located in the fldigi temp folder:
You can change the name of each log and elect to disable the logging functions.

4.42 Miscellaneous Configuration

4.42.1 Sweet spot

The sweet spot is the audio frequency at which your transceiver provides the best filtering for a particular signal type. You can specify the value of the sweet spot for CW, RTTY and all others. You can also elect to have the audio cursor placed at the sweet spot when changing modes. The sweet spot is used for the QSY function.

The K3 A1A lower sideband can be selected for any transceiver that only provides LSB in the CW mode.
4.42.2 Callsign spotting

Fldigi allows you to automatically participate in a spotting network maintained by Philip Gladstone. You can see what the web based reporter looks like by visiting this web site: http://pskreporter.info/pskmap?W1HKJ or by simply selecting the menu item "Help / Reception reports...".

Fldigi will continuously scan for spotted callsigns in the decoded text and send reports in the background if you check the "Automat..." option.

Reports will also (or only) be sent when you log the QSO into the logbook.

If you have rig control enabled the reported rig frequency will also be sent to the spotting network. Do not change the Host and Port numbers unless these are changed by Philip.

You need to press the Initialize to begin reporting spot information. You will receive a warning message if you did not enter your antenna information on the Operator tab.

If your CPU performance is marginal you can disable spotting when no signal browser is visible.
4.42 Miscellaneous Configuration

4.42.3 CPU performance

![Misc CPU](image)

Figure 4.119 Misc CPU

When fldigi is executed for the first time it does some tests to determine the performance factor for your central processor unit. If it determines that the cpu is below a critical speed it tries to compensate by modifying some of its timing and algorithms. If you are using a “slow” cpu the “Slow cpu” check box will be enabled. You can also manually check this box if you find that fldigi is not performing well on some of the more esoteric modes such as PSK250, MFSK32, etc.

4.42.4 Text i/o

![Misc Text I/O](image)

Figure 4.120 Misc Text I/O

Fldigi can perform automatic capture of the Rx text stream. The simplest is to simply capture all incoming text to a file. Select this from the lower of the two frames. The Rx file is named "textout.txt" and is written to the directory as shown above. The file can be used to review an execution session, or it can be accessed by an external program. For example it could be parsed to provide a text to speech conversion.

4.42.5 NBEMS (flmsg / flwrap) interface
The NBEMS suite of programs, fldigi, flarq, flwrap and flmsg provide the emergency operator with a set of tools to assist in the transfer of data files over HF and VHF radio. Additional information on flarq is available here:

- flarq help system.
- wrap help system.
- flmsg help system

The reception of a flwrap and flmsg files can be automated by selecting the “Enable detection” option. The wrap program can then be used to test for validity and data extraction at some later time. fldigi can recognize flmsg data files and automatically open the flmsg program with the newly received data stream. It can also transfer the data stream to flmsg and instruct flmsg to save the data file, unwrap and decode it, display the data in a fully formatted html page and then exit. Pressing “Locate flmsg” performs differently on the different OS that are supported.

The ability to transfer incoming flmsg data streams directly to an executing flmsg was introduced with flmsg 3.0. Check that option if you are using flmsg 3.0 or greater.

- Linux - a file finder is opened to the /usr/local/bin/ folder. Select the flmsg executable and the entry box is correctly populated.
- Windows - a file finder is opened to the "C:\Program Files\" folder. Drill down to the most current flmsg folder and then select the flmsg.exe file. The entry box will be correctly populated.
- OS X - a file browser is opened to the “Applications” folder. Locate the flmsg icon. Then drag and drop that icon on to the "flmsg:" entry control. You may also right click on the application icon, and select “Show Package Contents”. Double click "Contents". Double click on "MacOS". You will be viewing an icon labeled "exec". Drag and drop the icon on to the "flmsg:" entry box and the the value will be correctly entered. Either should correctly launch the flmsg application. See Autostart configuration.
4.42.6 DTMF decoding

Figure 4.122 Misc DTMF Decoding

Fldigi can encode and decode DTMF tone sequences. Enable this check box to display the decoded tone sequence in the Rx panel. DTMF encoding is accomplished by a MACRO tag.

4.42.7 WX rss-xml queries

Figure 4.123 Misc WX

Fldigi provides an automated query of a specified RSS-XML feed to obtain and format weather data. The report is added to the transmit text stream using the appropriate MACRO tag. The report for the above configuration is:

Huntsville, Madison County Executive Airport, AL, United States (KMDQ) 34-51-41N 086-33-26W  
Cond: overcast  
Wind: 210 at 12 mph 19 kph  
Temp: 62 F 17 C  
Baro: 30.04 in Hg 1017 mbar
The full report option creates this report:

Huntsville, Madison County Executive Airport, AL, United States (KMDQ) 34-51-41N 086-33-26W
Feb 29, 2012 - 07:15 AM EST / 2012.02.29 1215 UTC
Wind: from the SSW (210 degrees) at 12 MPH (10 KT) gusting to 17 MPH (15 KT)
Visibility: 10 mile(s)
Sky conditions: overcast
Temperature: 62 F (17 C)
Dew Point: 60 F (16 C)
Relative Humidity: 93%
Pressure (altimeter): 30.04 in. Hg (1017 hPa)

The "Search on web" button will open your browser to Greg Thompson's global listing of METAR station.

RSS feeds for world wide airports can be searched here http://www.airrouting.com/content/AirportLocatorForm.aspx.

4.43 MT63 Configuration

MT63 is an orthogonal frequency division multiplexed mode consisting of 64 parallel carriers each carrying a part of the transmitted signal. There are 3 bandwidths and baudrates that fldigi implements in MT-63:

- 500 Hz - 5 baud
- 1000 Hz - 10 baud
The lowest frequency transmitted is always 500 Hz. If you have a scheduled MT63 qso or are trying to copy what you think is MT63 you should tune the signal so that the lowest observable signal is at 500 Hz. Fldigi is capable of decoding signals that are mistuned by as much as +/- 100 Hz.

Selection of interleave (short/long) is made from the modem menu; MT63-500S, MT63-500L, MT63-1000S, MT63-1000L, MT63-2000S, MT63-2000L.

Interleave and 8-bit extended characters are usually agreed upon before a QSO exchange begins. The default is to use the long interleave. 8-bit extended characters allow the transmission of Latin-1 accented characters.

To assist the Rx operator you can transmit a short tone at the lowest (and highest) tone frequencies. You can set the tone duration.

You may also elect to use manual tuning (position on the waterfall) of the Tx / Rx signal. Be careful when doing this so that the signal does not extend beyond the limits of your transceiver SSB filters.

MT63 is used extensively in the Military Affiliate Radio System (MARS).

4.44 Olivia Configuration

![Modem/Olivia](image)
Olivia is a family of MFSK modes with a high redundancy Forward Error Correction system similar to MT63. The family is very large, with 40 or more different options, which can make it very difficult to work out which is which. The mode works well on poor HF paths and has good sensitivity. There are three popular modes, which have 8-FSK, 16-FSK and 32-FSK, thus having three, four or five bits per symbol. These three modes can be selected without additional configuration. The tone frequency spacing and integration period should always be left at 8 and 4 respectively unless you are experimenting with another station running an Olivia modem that can be changed. These must always be the same at both ends of the Olivia QSO. The modes have two serious shortcomings - excessive bandwidth combined with slow typing rate, and excessive latency which is the apparent typing delay caused by the integration period.

Each Olivia transmission can start and end with two distinctive tones. These tones are exactly at the lowest and uppermost tones for the selection of tones and bandwidth. They can assist the receiving station in tuning the Olivia signal on the waterfall.

The start/stop tones can be disabled.

See Operating Olivia for additional information.

---

4.45 PSK Configuration

You should set the acquisition search range for waterfall left click action. As you adjust this control you will see the red mode width change on the waterfall scale. You can also adjust this value by pointing the mouse to the waterfall. Hold down the Control key and rotate the mouse wheel. The search routine which finds the PSK signal operates on a s/n threshold detector as well as recognizing the PSK phase modulation. You can adjust the acquisition signal to ratio threshold for the search routine.
The PSK decoder estimates the signal to noise ratio, S/N, and the intermodulation distortion, IMD, of the received signal. This measurement is valid during periods when the other station is transmitting the idle signal. The estimates are displayed on the status bar. You can control how these values are displayed; clear or dim after NN seconds. Setting the seconds to 0 disables the clear/dim action.

Fdligi has a multi channel browser than can display simultaneous reception of up to 30 PSK signals. The browser is described here:

8psk (8 phase states) does not use AFC for signal acquisition or tracking. RsiD or operator adjustment of tracking point is necessary to align the decoder with the received signal. This mode includes the optional use of a pilot tone. The level of the pilot tone can be set relative to the total signal power.

This table shows the amount of transmit power used by the pilot tone:

<table>
<thead>
<tr>
<th>dB</th>
<th>-20</th>
<th>-26</th>
<th>-29</th>
<th>-32</th>
<th>-36</th>
<th>-40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pwr Lvl</td>
<td>10%</td>
<td>5%</td>
<td>3.5%</td>
<td>2.5%</td>
<td>1.6%</td>
<td>1.0%</td>
</tr>
</tbody>
</table>

Signal Browser

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**4.46 RTTY / FSK Configuration**
Fldigi operates RTTY using AFSK and the transceiver set to USB. The RTTY signal can be transmitted anywhere within the USB passband of the transceiver.

You can select from various Shifts, Bauds, Bits, Parity and Stop Bits for both AFSK and FSK keying of the transmitter. You can elect to have fldigi automatically insert a CFLF when it reaches character 72 on a line. You can also have it insert a CR-CR-LF sequence instead of the standard CR-LF sequence. This is very useful if you are communicating with someone using a hardware TTY printer. The extra carriage return will give the physical device time to move to the left margin before new characters arrive.

The RTTY decoder maintains an internal AFC system for tracking the desired signal. Depending on operating conditions you may need to adjust the action of the AFC loop. Select from the Slow, Normal or Fast AFC loop. You can also disable AFC with the AFC button on the main panel.
The received signal processing consists of a tuned Raised Cosine Filter followed by an optimized Automatic Threshold Correcting (ATC) detector. The resulting bit stream is then processed to extract the byte data.

![Figure 4.130 Classic RTTY XY Scope](image)

![Figure 4.131 Pseudo Signal XY Scope](image)

The Digiscope display can be defaulted to the X-scope or the Signal scope.

The classic XY-scope is similar to older hardware scopes that show the output of the separate Mark-Space filters, one applied to the horizontal and one to the vertical axis.

The Pseudo XY-scope is similar with the exception that the horizontal and vertical are phase related to the Mark-Space signals, but not the actual signal.

The Classic XY-scope will appear noisier than the Pseudo XY-scope.

PseudoFSK selection generates an additional audio signal on the right channel. This signal is a burst tone at the FSK keying rate. You can full wave rectify and filter the signal so that it can be used as the FSK keyline signal to a rig that supports FSK transmissions. See Pseudo FSK for additional information and a suitable keying circuit.

Your log can record either the center frequency between the Mark and Space or the Mark frequency. You can also select the color that should distinguish the Mark frequency.
See nanoIO Interface for additional information on nanoIO and MORTTY interface.

See Navigator Interface for additional information on using the Navigator interface.

See Synop and RTTY for additional information.

4.47 Thor Configuration
The decoder can detect and defeat a modest amount of CWI that is within the BW set by the BW factor. Increasing the CWI threshold increases the sensitivity for this correction. The offending tones are punctured thereby rendering them null to the Viterbi decoder.

Enter the secondary text. This text will be sent during periods when your keyboard is inactive (between letters for slow typists). The default for this text will be your callsign when you have entered that in the Operator configuration tab.

Set the BW factor for the decoding prefilter. 2.0 should be adequate unless you are experiencing nearby continuous wave interference (CWI). You can enable and disable the prefilter with the checkbox. Please note that the filter requires additional CPU cycles. Older and slower CPU models might give better decoding with the filter disabled.

The DominoEX decoder can detect the presence of CWI within the passband set by the BW factor. Increasing the CWI threshold increases the sensitivity to such interference. When the interference is detected the associated data is culled using a technique called puncturing.

Thor has been specifically designed to be used with ARQ text transmissions. It is also an easy to use keyboard chat mode. Thor operations are described in Operating Thor.

4.48 Frequency Analyzer

Fldigi can be used to accurately measure the frequency of a remote signal that is transmitting a steady carrier.

I have set the sound card up using the WWV modem and have it adjusted for the proper PPM offset on receive. I followed the frequency calibration procedure that ICOM recommends for the IC-746PRO, adjusting WWV at 10 MHz for a zero beat.

Then fldigi was used in the "Freq Analysis" mode to track the WWV carrier at 10 MHz. In this mode the decoder is merely a very narrow band AFC tracking filter. The filter bandwidth is set to 2 Hz and the tracking time constants
to about 5 seconds. Future releases will probably make both of these user adjustable. When the signal is being tracked the digiscope (right hand display) will be a horizontal line. If the signal is very noisy and tracking difficult the digiscope will jump and become wavy. You can see from the above image that I am tracking about 0.22 Hz high on WWV. I have repeated this measurement at various times during the day and on various days with nearly the same result. So I am comfortable with knowing that my local oscillator is just a little low (that is why the Frequency reads high).

ARRL frequently announces a frequency measurement test (FMT) which takes place on 160, 80 and 40 meters. This is a chance to test your skills in frequency measurement. You should be able to make a submission to the FMT using this technique. Make corrections to the FMT transmission based upon your WWV measurement. You may have to adjust for other local oscillator effects as well. If you have some good ways to measure and correct for these I would be glad to share them with the other fldigi users.

4.49 Frequency Measurement Test Modem

Fldigi can be used to accurately measure the frequency of a remote signal that is transmitting a steady carrier, such as WWV or an ARRL sponsored Frequency Measurement Test signal.
The program can track and record two signals simultaneously. One can be the unknown remote signal: "Unk:". The second can be a local signal generated from a precision signal generator: "Ref:". If the reference signal is much more stable than the receiver, then drift and thermal effects observed on both the unknown and reference signals should be identical. Post measurement processing will allow the user to remove those from the unknown frequency.

The unknown and reference tracking points are selected using

- waterfall cursor: SHIFT left mouse click for unknown track
- waterfall cursor: CONTROL left mouse click for reference track

The screen shot shows the unknown (blue), reference (yellow), and cursor tracks (3 lines) on the waterfall.

- Fine tuning both is accomplished using the respective tracking controls:
  - Outer buttons: +/- 10. Hertz
  - Middle buttons: +/- 1.0 Hertz
  - Inner buttons: +/- 0.1 Hertz
Each signal track is uniquely identified by color. The track color is displayed to the right of the frequency controls. The plot color and waterfall track bars are keyed to one another. The signal plots show error from the assigned tracking points.

Signal tracking for each can be turned on and off using the respective Unk / Ref button.

The averaged computed frequency is shown in the readout control. The averaged signal amplitude in dBvp is displayed to the right of the frequency.

Each track can be independently reset. Each track plot can be independently cleared.

The controls "Interval", "T-scale", "Scale", and the button "Record" are common to both tracked signals.

- **Interval**: select the time interval between records in the data character separated value file (format shown below).
- **T-scale**: select the number of minutes displayed in the plot panel. This control will not effect the data history, only it's visibility.
- **Scale**: select the vertical scale of the plot panel. This control does not effect the actual data, only it's display.
- **Record**: toggle the csv recording on / off. Each new ON starts a new file that is date-time stamped to the nearest minute. Filename aging is applied to the filename if more than a single on/off event occurs within the same minute. Either or both Unknown and Reference "Track" must be enabled for any recording to take place.

Recording will synchronize the data lines with UTC. Synchronization should occur within a second. The indicator to the left of the recording button will change from white to dark red when data recording has begun.

The recording files are saved in the folder `~/.fldigi/fmt; C:\User\<login>\fldigi.files\fmt`:

Example of recorded csv file opened using LibreCalc:
4.49 Frequency Measurement Test Modem

- Recorded file format as shown. Recording is not initiated by waterfall selections as occurs in the analysis modem.
- Reference Est. Freq. is computed as the sum of cells C, D, E and F on the same row.
- Unknown Est. Freq. is computed as the sum of cells C, D, J and K on the same row.
- Unknown Compensated is computed as the difference of cells L and F on the same row.
- The average entry is computed: average(O:O)
- The standard deviation entry is computed: stdev(O:O)

A plot of the elapsed time versus unknown frequency produced:

![Graph Image]

If a reference signal is not available, the user should just track the unknown. The resulting spreadsheet:

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
<th>O</th>
<th>P</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Clock</td>
<td>Elapsed Time</td>
<td>Freq.</td>
<td>Correction(A/Hz)</td>
<td>Frequency</td>
<td>Correction</td>
<td>Est. Freq.</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td></td>
<td>18:41:13.00</td>
<td>0</td>
<td>2955</td>
<td>0</td>
<td>10001755</td>
<td>-100</td>
<td>600</td>
<td>0.1213</td>
<td>1000000.1213</td>
<td>-43.27</td>
<td>1000000.1213</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18:41:14.00</td>
<td>1</td>
<td>2955</td>
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<td>10001755</td>
<td>-100</td>
<td>600</td>
<td>0.1250</td>
<td>1000000.1250</td>
<td>-43.43</td>
<td>1000000.1250</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18:41:15.00</td>
<td>2</td>
<td>2955</td>
<td>0</td>
<td>10001755</td>
<td>-100</td>
<td>600</td>
<td>0.1187</td>
<td>1000000.1187</td>
<td>-43.21</td>
<td>1000000.1187</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18:41:16.00</td>
<td>3</td>
<td>2955</td>
<td>0</td>
<td>10001755</td>
<td>-100</td>
<td>600</td>
<td>0.1062</td>
<td>1000000.1062</td>
<td>-41.29</td>
<td>1000000.1062</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18:41:17.00</td>
<td>4</td>
<td>2955</td>
<td>0</td>
<td>10001755</td>
<td>-100</td>
<td>600</td>
<td>0.1004</td>
<td>1000000.1004</td>
<td>-40.43</td>
<td>1000000.1004</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18:41:18.00</td>
<td>5</td>
<td>2955</td>
<td>0</td>
<td>10001755</td>
<td>-100</td>
<td>600</td>
<td>0.0947</td>
<td>1000000.0947</td>
<td>-40.13</td>
<td>1000000.0947</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18:41:19.00</td>
<td>6</td>
<td>2955</td>
<td>0</td>
<td>10001755</td>
<td>-100</td>
<td>600</td>
<td>0.0874</td>
<td>1000000.0874</td>
<td>-40.97</td>
<td>1000000.0874</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18:41:20.00</td>
<td>7</td>
<td>2955</td>
<td>0</td>
<td>10001755</td>
<td>-100</td>
<td>600</td>
<td>0.0862</td>
<td>1000000.0862</td>
<td>-41.42</td>
<td>1000000.0862</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18:41:21.00</td>
<td>8</td>
<td>2955</td>
<td>0</td>
<td>10001755</td>
<td>-100</td>
<td>600</td>
<td>0.0859</td>
<td>1000000.0859</td>
<td>-41.42</td>
<td>1000000.0859</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18:41:22.00</td>
<td>9</td>
<td>2955</td>
<td>0</td>
<td>10001755</td>
<td>-100</td>
<td>600</td>
<td>0.0856</td>
<td>1000000.0856</td>
<td>-41.42</td>
<td>1000000.0856</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18:41:23.00</td>
<td>10</td>
<td>2955</td>
<td>0</td>
<td>10001755</td>
<td>-100</td>
<td>600</td>
<td>0.0853</td>
<td>1000000.0853</td>
<td>-41.42</td>
<td>1000000.0853</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

will have the reference columns set to NIL values. The final Unknown Compensated, Average, and Standard Deviation computations will be correct for the singular tracked signal.

4.49.1 FMT configuration

Right click the left most control on the status line FMT to open the configuration dialog to the FMT settings panel:
Adjust the various colors to suit your visual acuity. The decoder converts the tracked signals to base band, much like a direct conversion receiver might do.

Enable "Thick plot lines" for a bolder plot grid and data lines.

Enable "Line/Axis" if you want the data plot to overlie the horizontal axis.

Audio Stream Processing

- **Rx Codec PPM** You may already have used the WWV time tick modem to compensate for the audio codec (sound card) master oscillator error. The Rx Codec PPM control mirrors the control on the sound card panel. Audio codec compensation insures that the frequency measurement will be correct over the received audio bandwidth. This is discussed further under audio code sample rate errors.

- **Sample rate** The decoder can be set to a number of sample rates. Suggest using 1/4 the native sample rate of the audio codec. For most transceiver built-in audio codecs the rate will be 44100, use 11025.

Transceiver frequency correction

- **Freq Correction** Your receiver may not be adjustable to less than 1 Hz. The Rx Offset adds a fine tuning adjustment to both tracked signals. Changes to this control will result in moving the track lines up or down. It does not physically change the transceiver tuning. This control can be adjusted in 1, 10 and 100 millihertz increments.

Waterfall

- **fldigi waterfall controls include a x1, x2 and x4 scale. When changing between scales the program will try to always center at the current signal tracking point. Select whether that will be at**
4.49 Frequency Measurement Test Modem

- the unknown signal track
- the reference signal track
- the median point between the two tracks, or the default of 1500 Hz (no selection)

Tab delimiters

- The recorded data file uses a text format known as character separated values, csv. The default separator character is a comma. CSV is often called comma separated values. Issues arise when the value fields also contain commas.
  
For some locale's (European), the comma is the decimal value rather than a period.

fdigi attempts to reduce confusion between the decimal and character separators by quoting all values, i.e. enclose every value in quotations, "". Unfortunately some spreadsheet programs still fail to properly load the data correctly into a spreadsheet. The solution is to use another separator character, the TAB.

Enable TAB separators if your locale uses the comma for decimal separation.

DFT Estimator

- **Data Filter** This is a post discriminator filter implemented as a sliding average filter. The average is computed over the last 'n' selected seconds.

- **DFT rate** Number of discriminator estimates made per second. The estimate is always over the last 1 second of audio stream data. The one per second rate is always an unbiased estimate. Faster rates are a sliding window over the past second, and each estimate computation is not independent of past estimates.

- **FIR band pass filter** Both unknown and reference signals can be passed through a band pass filter implemented as a Finite Impulse Response filter. The filter precedes the discriminator processing. The filter width can be set from 50 to 400 Hertz in 50 Hertz increments. Each filter can be independently enabled.

- **DFT controls**
  
  - Hard limiter - the Discrete Fourier Transform estimator computes the difference between the current and measured signal frequencies. That difference is then applied to the current estimate. If enabled the hard limiter constrains that difference to +/- the assigned limit value.
  
  - Cull - If enabled, difference values greater than the cull level are set to zero.

This is a live data recording showing the effectiveness of culling. The track later than minute 12 was without culling. The track from 0 to 12 was with cull on at level 0.050. During the brief interval with almost no noise the cull level was set to 0.005.

You can cull the estimator to oblivion.

![Graph of data recording showing effectiveness of culling](image)
Wave file recording

- Record Audio - turn on and off wav file recording. wav file is located in same fmt folder as data recordings. New file is opened with a date-time stamped file name each time this function is enabled. Current recording file name is displayed in the context control. When enabled the "Sync to record" is deactivated.

- Sync to record - wav file recording turns on/off in sync with the data record button. wav file and csv file will have identical date-time stamped filenames, one with a .csv and the other a .wav file name extension. When enabled the "Record Audio" is deactivated.

Audio Codec sample rate errors

A sample rate clock error measurable in parts per million, ppm, is a factor that needs to be considered for several modems, including FMT. The error is visible when receiving an MFSK, IFKP or THOR image. The error shows up as a slant in the received image. For images it is usually the differential ppm between the sending and receiving codec.

On FMT measurements, the ppm error effects the error across the receiver passband. Owners of a GPSDO can verify my measurement. The transceiver is fixed at a known frequency; for the test it was 5.003.000 Hz. The GPSDO is then slowly stepped from 5.003.400 to 5.005.800 Hz.

At each step the tracking error is measured. The absolute error is interesting but not relevant to this measurement. We are interested in the stability of the error across the passband. Here are my results for three ppm settings, 0, +10, a nd +20 for the FT991A / transceiver internal codec. The WWV time tick adjustment for ppm results in +10 ppm.

The WWV time tick ppm measurement and the passband error correlate almost exactly. This tells me that I can compensate for the audio tracking points for any calibrated ppm setting, preferably the one that results in a zero error slope across the pass band.
4.50 WWV codec PPM measurement

Some analog transmissions such as FAX, MFSK images, and Thor images will exhibit a slant in the received image if the sound card clock (sample rate) is not identical at both the transmitter and receiver. The best way to insure that they are identical is to calibrate both to an external frequency and time standard. Operators in the North American region can use the WWV and/or WWVH standard time transmissions for this purpose. European and Asian users should be able to use the German DCF-77 or Russian RMW time transmissions.

The WWV mode is used to measure the offset of the sound card oscillator. It does this by comparing the sound card sample rate with the clock tick signal that is transmitted by WWV and WWVH.

The sampling rate for the sound card should be set to "native". The sound card samples the signal and returns a block of samples in blocks of 512. This block sampling is what sets the basic timing mechanism for the thread that reads the sound card. Most modern soundcards will use 44100 or 48000 as the native sampling rate. The sampled signal is filtered and reduced to a sample rate of 1000 by a process called decimation in time. The resulting signal is then power detected and low pass filtered with a filter called a moving average filter. The moving average is very good at detecting the edge of a pulse such as the 1 second tick transmitted by WWV.

This decoded/filtered signal is then displayed in a manner very similar to a FAX signal. Each scan line represents the received signal over a 1 second interval. The bright white line is the time tick. You can see a very slight slope from left to right as the signal goes from top to bottom of the display.

Open the configure dialog box to the "SndCrd" tab. You are going to be adjusting the "Rx PPM" while you observe the effect of this control on the slope of the time tick line.

Tune in WWV or WWVH on 2.5, 5.0, 10.0 or 15.0 MHz in the AM mode. This seems to give the best signal view. Select the WWV modem. Open the scope dialog from the menu "View / Floating scope". Adjust the scope dialogs width and height to a 1:3 or greater ratio. Signal data will begin to accumulate in the digiscope display.

When you can clearly see the bright tick line, move the cursor to the bottom of the line and left click at that position. That will resync the digiscope display and put the ensuing tick marks at the center line red graticule. Then right click anywhere in the digiscope display. That changes the zoom level to show more signal detail and the slope of the time tick line will be more discernable. The zoom level increases by a factor of 5. Right clicking again restores the original zoom level. I recommend making the adjustments to the Rx PPM control in the x5 zoom level.

If the slope of the time tick line is positive you will need to apply a negative value to the Rx PPM. If it is negative then a positive correction is needed.

Start with a correction of 0 ppm and observe the slope. Try a value of 1000 ppm and observe the slope. Again, try a -1000 ppm correction and observe the slope. The following are some observations made on 10 MHz WWV, DCF-77 and RWM under less than ideal conditions.
You can see that my sound card requires a positive correction since the slope is negative with a 0 ppm entry. The required correction of +120 ppm was determined by guessing the needed correction to be close to 1/10 of the -1000 ppm slope and then adjusting for a steady track along the red graticule. The DCF-77 images were provided by Walter, DL8FCL. The RWM images were provided by Andy G3TDJ.

You can left click on the tick line anytime you want to recenter the signal. That will aid in making your visual observation.

When you are finished, the Rx PPM entry is the correct one for your sound card. Save the configuration for future fldigi use.

Andy also provided information on the RWM transmissions:

RWM details extracted from [http://www.irkutsk.com/radio/tis.htm](http://www.irkutsk.com/radio/tis.htm)
Station RWM - Main characteristics

Location: Russia, Moscow

55 degr. 44' North, 38 degr. 12' East

Standard frequencies: 4996, 9996 and 14996 kHz

Radiated power: 5kW on 4996 and 9996 kHz; 8kW on 14996 kHz

Period of operation: 24 hours per day, except 08.00-16.00 msk for maintenance as below:

- on 4996 kHz: 1st wednesday of the 1st month of quarter;
- on 9996 kHz: 2nd wednesday of the 1st month of the quarter;
- on 14996 kHz: 3rd wednesday of each odd month;

Coverage: 20 degr. - 120 degr. East

35 degr. - 75 degr. North

Time signals A1X are given every second of 100 ms duration with a frequency of 1 Hz. Minute pip is extended to 500 ms.

Hourly transmission schedule

m:s - m:s

00:00 - 07:55 – MON signals (no modulation)
08:00 - 09:00 – transmitter is signed off
09:00 - 10:00 – station's identification is sent by Morse Code
10:00 - 19:55 – A1X signals and identification of DUT1+dUT1
20:00 - 29:55 – DXXXW signals
30:00 - 37:55 – N0N signals (no modulation)
38:00 - 39:00 – transmitter is signed off
39:00 - 40:00 – station's identification is sent by Morse Code
40:00 - 49:55 – A1X signals and identification of DUT1+dUT1
50:00 - 59:55 – DXXXW signals

See Transmitting Simulated WWV Timing Tone
4.51 WWV transmit mode

The WWV mode is normally used to measure the offset of the sound card oscillator. See WWV ppm measurement.

It can also be used to transmit time tick signals similar to the format that is used by WWV. The WWV modem sends a time tick which is a 200 msec wide pulse at a once per second rate when the T/R button is enabled. This pulse is shaped with a 4 msec raised cosine shape on the leading and trailing edges to reduce key clicks. The accuracy of the transmitted time tick is solely dependent on the accuracy with which the WWV ppm measurement was performed.

The purpose of the WWV time tick transmission is to allow other stations to calibrate their sound cards against your calibrated system. This can be used to align all systems in a VHF/UHF net for example. It is only necessary for one of the net members to be able to calibrate his or her sound card against WWV. The other’s would then be calibrated by proxy use of the WWV time tick transmit mode. This can even be used in the case where no member has access to a HF transceiver. The master station would set the Rx and Tx ppm settings to zero. It would then transmit the time tick signal for the other stations to calibrate their sound cards against the master sound card. Having all of the stations calibrated in this way will insure that the modem decoders will give maximum performance. Here is an example of an advanced macro that will send a CW announcement, 2 minutes of time ticks and end with another CW announcement.

```<MODEM:CW>
<!GOFREQ:1000>
<!WPM:24>
QRZ QRZ de <MYCALL> <MYCALL>
2 minute time tick cal run follows
<!IDLE:2>
<!MODEM:WWV><!IDLE:120>
<!MODEM:CW><!IDLE:2>
end of time tick run
de <MYCALL> k
<TX><RX>
```

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Chapter 5

Developers

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- Google Maps
- Installing from Source
- FLDIGI KISS Hardware Commands
- Parse UALR
- Pseudo FSK
- Rig Xml How to
- ualr telnet
- Xmlrpc Control

5.1 Build Information

5.1.1 Build Info

The following is obtained by executing "fldigi --version"

Build information:
built:
Fri Dec 25 15:57:13 CST 2009 by dave@linux-dev on i686-pc-linux-gnu for
i686-pc-linux-gnu

configure flags: ‘--without-asciidoc’ ‘--enable-optimizations=native’

compiler : gcc version 4.3.3 (Ubuntu 4.3.3-5ubuntu4)

compiler flags : -I$<srcdir> -I$<srcdir>/include
                 -I$<srcdir>/irxml -I$<srcdir>/fileselector -pthread
                 -I/usr/local/include -I/usr/local/include/freetype2
                 -D_THREAD_SAFE -D_REENTRANT -D_REENTRANT -I/usr/local/include
                 -I/usr/include/libpng12 -I/usr/local/include -pipe -Wall -fexceptions
                 -O2 -ffast-math -finline-functions -fomit-frame-pointer -march=native
                 -mfpmath=sse -DNDEBUG

linker flags : -L/usr/local/lib -lportaudio -lm
               -lpthread -L/usr/local/lib -fltk_images -lpng -lz -ljpeg -fltk -lxft

Generated by Doxygen
-lpthread -ldl -lm -lXext -lX11 -lsndfile -lsamplerate
-lpulse-simple -lpulse -L/usr/local/lib -lhamlib -lm -lpng12
-L/usr/local/lib -lxmlrpc_server_abyss++ -lxmlrpc_server++
-lxmlrpc_server_abyss -lxmlrpc_server -lxmlrpc_abyss -lpthread
-lxmlrpc++ -lxmlrpc -lxmlrpc_util -lxmlrpc_xmlparse -lxmlrpc_xmltok
-lidl -lrt -lpthread

libraries: FLTK 1.3.2
libsampleRate 0.1.4
PortAudio 19
PulseAudio 0.9.14
Hamlib 1.2.10
XMLRPC-C 1.06.31

Runtime information:
system: Linux
linux-dev 2.6.28-17-generic #58-Ubuntu SMP Tue Dec 1 18:57:07 UTC 2009
i686

libraries: libsampleRate-0.1.4 (c) 2002-2008 Erik de Castro Lopo
libsndfile-1.0.17
PortAudio V19-devel (built May 25 2009 06:36:24) 1899
Pulseaudio 0.9.14
Hamlib version 1.2.10

5.2 Google Maps

snip ------------ copy the following to ~/.fldigi/scripts/map.pl

#!/usr/bin/perl

# Author: Stelios Bounanos, M0GLD
# Date: 20080625

use warnings;
use strict;
use Getopt::Std;

our $VERSION = "0.3141";
our %opts = ( "e" => 0, "m" => 1, "z" => 4);

cmdline();
open(STDOUT, "">", "/dev/null");

my $loc = exists($opts{'l'}) ? $opts{'l'} : $ENV{'FLDIGI_LOG_LOCATOR'};
die "Invalid locator\n" unless ((defined($loc) && length($loc) =~ /\[2-6\]/));

my $label = exists($opts{'t'}) ? $opts{'t'} : $ENV{'FLDIGI_LOG_CALL'};
$label = $loc if (!defined($label) || $label eq "");

($lon, $lat) = map { sprintf("%+.6f", $_) } mtoll($loc);
if ($opts{'m'}) {
    my $url = "http://maps.google.com/maps?q=$lat,$lon&\&saddr=$label\&\&z=$opts{\'z\'};"
    # $url =~ s/(/\1)/sprintf("%%%02X", ord($1))/ge; # encode some chars
    exec("xdg-open", $url);
    die "Could not exec xdg-open: $!
";
}
exit(0) unless ($opts{'e'});

my $kml = (exists($ENV{'TMPDIR'}) ? $ENV{'TMPDIR'} : "/tmp") .

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5.2 Google Maps

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"/" . $loc . ".kml";
open(KML, ’>’, $kml) or die "Could not write $kml: $!\n";
print KML <<EOF
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://earth.google.com/kml/2.2">
<Placemark>
<name>$label</name>
<description>
$label
$loc
</description>
<Point>
<coordinates>$lon,$lat,0</coordinates>
</Point>
</Placemark>
</kml>
EOF
;
close(KML);
########################################################################
sub cmdline
{
$Getopt::Std::STANDARD_HELP_VERSION = 1;
my $old_warn_handler = $SIG{__WARN__};
$SIG{__WARN__} = sub { die $_[0]; };
getopts(’t:l:mz:e’, \%opts);
$SIG{__WARN__} = $old_warn_handler;
}

# Convert a 2, 4, or 6-character Maidenhead locator string
# to decimal degrees. Return a (longitude, latitude) pair.
sub mtoll
{
my $len = length($_[0]);
$_[0] .= join("", ("A", "A", "0", "0", "A", "A")[$len .. 5]) if ($len < 6);
$_[0] = uc($_[0]);
die "Invalid locator\n" unless ($_[0] =~ /[A-R]{2}\d{2}[A-X]{2}/);
my @digits = split(//, $_[0]);
my ($lon, $lat) = (-180, -90);
$lon += (ord($digits[0])
(ord($digits[2])
(ord($digits[4])
$lat += (ord($digits[1])
(ord($digits[3])
(ord($digits[5])

-

ord(’A’)) * 20 +
ord(’0’)) * 2 +
ord(’A’) + 0.5) / 12;
ord(’A’)) * 10 +
ord(’0’)) +
ord(’A’) + 0.5) / 24;

return ($lon, $lat);
}
sub HELP_MESSAGE
{
print <<EOF
Usage: $0 [-OPTIONS [-MORE_OPTIONS]] [--] [PROGRAM_ARG1 ...]
The following single-character options are accepted:
-t LABEL

Use LABEL as the marker label
The default is \$FLDIGI_LOG_CALL

-l LOC

Place marker at IARU locator LOC
The default is \$FLDIGI_LOG_LOCATOR

-m
-z

Show in Google Maps (default)
Zoom level (Google Maps only)

-e

Write a Google Earth kml file in
\$TMPDIR/LOC.kml

Generated by Doxygen


5.3 Installing from Source

The developers recommend that you build either fldigi from source or install from the repository associated with your distribution. The repository may not be immediately available for the most current version number. In that case you can try installing the binary distribution. Keep in mind that the version numbers of the dependent shared libraries must match those on the machine used to create the binary.

The source code for fldigi is very large and has a number of dependencies that must be satisfied before a successful compile. If you are not familiar with compiling and linking source code you should probably practice on a simpler package before treading these waters. Please refer to the following web site for information on building for Linux, Windows and OS X.

Fldigi WIKI - build instructions

5.4 FLDIGI KISS Hardware Commands

Custom Frame Extensions

These commands are NON-STANDARD extension(s) to the KISS interface specifications and designed to control/configure aspects of FLDIGI not normally found in Hardware TNC's. Undefined kiss frame types 6 and 7 are used to identify these custom frames.

<table>
<thead>
<tr>
<th>Definition</th>
<th>Kiss frame ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>HARDWARE</td>
<td>6</td>
</tr>
<tr>
<td>RAW</td>
<td>7</td>
</tr>
</tbody>
</table>
External program which conform to the official KISS I/O specifications are expected to operate normally.

UDP/IP Connectionless communications are used to transfer information between FLDIGI and the host program. See Configure ARQ/KISS I/O and Command Line Switches for specific address and port number assignments.

### 5.4.1 Set Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCHN:&lt;ON/OFF&gt;</td>
<td>Busy Channel On/Off</td>
</tr>
<tr>
<td>BCHNS:&lt;0-999&gt;</td>
<td>Busy Channel Wait Duration (seconds)</td>
</tr>
<tr>
<td>CSMA:&lt;ON/OFF&gt;</td>
<td>Enable/Disable CSMA. Used on a shared frequency</td>
</tr>
<tr>
<td>IBCHN:&lt;N&gt;</td>
<td>Set Inhibit busy channel duration to N seconds</td>
</tr>
<tr>
<td>IBCHN:0</td>
<td>Resets temporary duration to default setting.</td>
</tr>
<tr>
<td>IBCHN:S</td>
<td>Inhibit busy channel temporarily. ‘S’ (character) (default 5 seconds)</td>
</tr>
<tr>
<td>KISSRAW:&lt;ON/OFF</td>
<td>ONLY&gt;</td>
</tr>
</tbody>
</table>

**Command**
- BCHN: Set busy channel on/off
- BCHNS: Set busy channel wait duration
- CSMA: Enable/Disable CSMA
- IBCHN: Set inhibit busy channel duration
- KISSRAW: Pass non HDLC encoded data

**Parameters**
- BCHN: ON = HDLC and Unaltered data, OFF = HDLC data only, ONLY = Unaltered data only.

**Command**
- KISSRCM: Set KISS frame checksum type
- KPSATT: Set fractional ratio gain value
- KPSQL: Set squelch level (percent)
- MODEM: Set modem type
- RSIDBCAST: Enable/disable RSID broadcast state change
- RSIDRX: Enable/disable RX RSID
- RSIDTX: Enable/disable TX RSID
- SQL: SQL On/Off
- SQLS: Set SQL level (percent)
- TRXSBCAST: Enable/disable TX/RX state change broadcast
- TXBEBCAST: Enable/disable TX buffer empty broadcast
- TXLOCK: Enable/disable TX waterfall position lock
- WFF: Move TXRX cursor to frequency on waterfall

**Parameters**
- KISSRCM: NONE = No CRC used, SMACK = Enable CRC use for Host <-> TNC ASYNC links, CCITT = Enable CCITT CRC, FCS = Enable FCS CRC, XOR = Enable BPQ’s XOR CRC

---

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BANDPASS = Search entire bandpass for RSID signals
MODEM = Search Modem bandpass (+/- 200HZ) for RSID signals
ACTIVE = When RSID received, move frequency transmit/receive cursor to location.
NOTIFY = Report RSID when detected (Notify only).

5.4.2 Query Commands

<table>
<thead>
<tr>
<th>Command / Return Status</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCHN: FLDIGI returns BCHN:&lt;ON</td>
<td>OFF&gt;</td>
</tr>
<tr>
<td>BCHNS: FLDIGI returns BCHNS:&lt;0-999&gt;</td>
<td>Busy Channel Wait Duration Query (seconds)</td>
</tr>
<tr>
<td>BUSY: FLDIGI returns BUSY:&lt;Y</td>
<td>N&gt;</td>
</tr>
<tr>
<td>CSMA: FLDIGI returns CSMA:&lt;ON</td>
<td>OFF&gt;</td>
</tr>
<tr>
<td>FLSTAT: FLDIGI returns FLSTAT:&lt;INIT</td>
<td>OK&gt;,&lt;HH&gt;:MM:SS&gt;</td>
</tr>
<tr>
<td>IBCHN: FLDIGI returns IBCHN:&lt;SECONDS&gt;</td>
<td>Inhibit busy channel durations in seconds.</td>
</tr>
<tr>
<td>KISSCRCM: FLDIGI returns CRCMODE:&lt;NONE</td>
<td>SMACK</td>
</tr>
<tr>
<td>KPSATT: FLDIGI returns KPSATT:&lt;value&gt;</td>
<td>Fractional value of KPSQL ratio gain figure (1/value)</td>
</tr>
<tr>
<td>KPSQL: FLDIGI returns KPSQL:&lt;ON</td>
<td>OFF&gt;</td>
</tr>
<tr>
<td>KPSQLP: FLDIGI returns KPSQLP:&lt;0-100&gt;</td>
<td>Current Power Level</td>
</tr>
<tr>
<td>KPSQLS: FLDIGI returns KPSQLS:&lt;0-100&gt;</td>
<td>Squelch set level Query (percent)</td>
</tr>
<tr>
<td>MODEM: FLDIGI returns MODEM:&lt;Modem ID String&gt;</td>
<td>Current Modem</td>
</tr>
<tr>
<td>MODEMBW: FLDIGI returns MODEMBW:&lt;Bandwidth in Hz&gt;</td>
<td>Current Modem Bandwidth</td>
</tr>
<tr>
<td>MODEML: FLDIGI returns MODEML:&lt;Modem1,Modem2,...&gt;</td>
<td>A List of comma delimited modem ID strings.</td>
</tr>
<tr>
<td>RSIDM: FLDIGI returns RSIDM:&lt;BANDPASS</td>
<td>MODEM&gt;,&lt;ACTIVE</td>
</tr>
<tr>
<td>RSIDRX: FLDIGI returns RSIDRX:&lt;ON</td>
<td>OFF&gt;</td>
</tr>
<tr>
<td>RSIDTX: FLDIGI returns RSIDTX:&lt;ON</td>
<td>OFF&gt;</td>
</tr>
<tr>
<td>SQL: FLDIGI returns SQL:&lt;ON</td>
<td>OFF&gt;</td>
</tr>
<tr>
<td>SQLP: FLDIGI returns SQLP:&lt;0-100&gt;</td>
<td>Current Symbol Quality Level (Currently Not returning valid data)</td>
</tr>
<tr>
<td>SQLS: FLDIGI returns SQLS:&lt;0-100&gt;</td>
<td>Set SQL Level Query (percent)</td>
</tr>
<tr>
<td>TNC: FLDIGI returns TNC:FLDIGI:&lt;Version Number&gt;</td>
<td>Returns the version number of FLDIGI</td>
</tr>
<tr>
<td>TRXS: FLDIGI returns TRXS:&lt;RX</td>
<td>TX&gt;</td>
</tr>
<tr>
<td>TXBUF: FLDIGI returns TXBUF:&lt;count&gt;</td>
<td>Return the number of byte in the transmit queue</td>
</tr>
<tr>
<td>TXLOCK: FLDIGI returns TXLOCK:&lt;ON</td>
<td>OFF&gt;</td>
</tr>
<tr>
<td>WFBW: FLDIGI returns WFBW:&lt;LOWER HZ</td>
<td>UPPER HZ&gt;</td>
</tr>
<tr>
<td>WFF: FLDIGI returns WFF:&lt;integer value&gt;</td>
<td>Current modem position on waterfall (center)</td>
</tr>
</tbody>
</table>

5.4.2.1 Query Commands (FLDIGI to HOST)

<table>
<thead>
<tr>
<th>Command</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOST:</td>
<td>Host returns HOST:&lt;program_name&gt; &lt;version&gt;</td>
</tr>
</tbody>
</table>
5.4 FLDIGI KISS Hardware Commands

Note:
Not required

5.4.3 Broadcast Status Messages (FLDIGI to HOST)

<table>
<thead>
<tr>
<th>Status &lt;parameters(s)&gt;</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSIDN:NEW_WF_OFFSET,NEW_MODEM,OLD_WF_OFFSET,OLD_MODEM,&lt;ACTIVE</td>
<td>NOTIFY</td>
</tr>
<tr>
<td>TRXS:&lt;RX</td>
<td>TX&gt;</td>
</tr>
<tr>
<td>TXBE:</td>
<td>Broadcast on emptied transmit buffer.</td>
</tr>
</tbody>
</table>

NEW_WF_OFFSET = 0-4000
NEW_MODEM = Modem ID string of newly switched modem.
OLD_WF_OFFSET = 0-4000
OLD_MODEM = Modem ID string of modem prior to switching.
ACTIVE = Indicating TXRX cursor changed.
NOTIFY = Notice only.
USER = Report User or commanded via KISS interface modem change.

5.4.4 Format of Hardware Commands

FLDIGI will only except KISS frames with a PORT ID of '0' (zero). The hardware frame is a kiss frame type 6.

MODEM:PSK125RC16
FEND,PORT(0)|HRDW(6),'M','O','D','E','M',':','P','S','K','1','2','5','R','C','1','6',FEND
KISS HARDWARE FRAME="MODEM:PSK63RC32"
KISS HARDWARE FRAME="RSIDTX:ON"
KISS HARDWARE FRAME="RSIDRX:OFF"

5.4.5 Format of RAW Data

To enable RAW use, issue hardware command KISSRAW:<ON|OFF|ONLY>. The encode of the raw data is the same as the encoding of normal kiss data. The host program is responsible for the proper protocol data syntax.

Format:

Dn=8 bit data (byte)

KISS RAW FRAME=D1,D2,D3,...
FEND,PORT(0)|RAW(7),D1,D2,D3,...,FEND

Notes:

1. The transmit buffer has a ten minute timer association. In the event data has been retained in the transmit buffer for more then 10 minutes without being transmitted in part or whole the buffer is cleared. This will prevent a build up of data and a subsequent transmit for an extended period once the frequency is clear. Consider all packets in the transmit queue lost. If enabled, TXBE will be issued when this occurs.

2. Both ARQ and KISS IO ports are active for the reception of data. However, only the selected port will pass data to the higher functions and the other port will not buffer the data for later use. Reason: see note 1.

3. By keeping a complete ARQ (RAW) packet in one KISS frame both HDLC and ARQ (RAW) data can coexist. This allows for sequential data transmission without interleaving data at the byte level.
5.5 Parse UALR

A simple parser to create a formatted console output for fldigi's `<EXEC>` macro:

```cpp
#include <ctime>
#include <cstdio>
#include <cstdlib>
#include <unistd.h>
#include <string>
#include <iostream>
#include <fstream>
using namespace std;
using std::cout;
using std::cin;

int main(int argc, char *argv[]) {
    size_t pos = 0, pos2 = 0, pos3 = 0, pos4 = 0, pos5 = 0;
    string commandline = "";
    string name = "";
    string qth = "";
    string answer = "";
    char c = cin.get();

    while (!cin.eof()) {
        commandline += c;
        c = cin.get();
    }

    if (commandline.find("No match found") != string::npos)
        goto noresponse;

    pos = commandline.find(", ");

    if (pos == string::npos)
        goto noresponse;

    pos += 2;
    pos2 = commandline.find("\n", pos);

    if (pos2 == string::npos)
        goto noresponse;

    name = commandline.substr(pos, pos2 - pos);
    pos3 = name.find(32);
    if (pos3 != string::npos)
        name = name.substr(0, pos3);

    for (size_t i = 1; i < name.length(); i++)
        name[i] = tolower(name[i]);

    answer = "$NAME";
    answer.append(name);

    pos4 = commandline.find("", ", pos2);
    pos4 = commandline.rfind("\n", pos4);
    pos4 += 1;
    pos5 = commandline.find("\n", pos4);

    qth = commandline.substr(pos4, pos5 - pos4);

    answer.append("$QTH"◉
    answer.append(qth);

    cout << answer.c_str();
    return 0;
}
```

noresponse:
```
5.6 Pseudo FSK

Using the FLdigi Pseudo FSK (Rt. Channel) function to key a transmitter

Select the PseudoFSK check boxes.

FLdigi is now ready to generate a 1000 hertz tone burst signal on the right channel of the stereo audio out of your sound card.

This tone burst is on when the RTTY bit is on and off when the RTTY bit is off. The left channel will be the normal AFSK signal.

The following circuit may be used to take the FLdigi PSEUDO-FSK signal from the right channel of your SOUND CARD to key your transmitter's FSK input line. You may find it necessary to invert the sense of the keying signal.
NOTE:
L1 - Radio Shack has two items that may be used for this isolation transformer.
Catalog # 270-054, and Catalog # 273-1374
Attach an audio cable from the Rt. Channel out of the your computer's SOUND CARD to the input of this FSK INTERFACE CIRCUIT (input of L1).

Attach another cable from the output of this circuit to your Rig's Keying FSK Jack.

Every PSEUDO-FSK tone that is generated by FLdigi is rectified by this FULL WAVE VOLTAGE DOUBLER circuit. The resultant voltage turns the Q1 transistor on and "grounds" the collector.

5.7 Rig Xml How to

This document describes the contents of the rig definition file "rig.xml".

A number of transceivers have rig definition files written and tested which you may use. These are found in the xmls directory on this site:  xml archives. You will find subdirectories by manufacturer which contain files named by rig type, ie: TS-850.xml. If you create, test and verify the proper operation for a transceiver not yet posted please share that with others by sending it as an attachment to feedback [at] w1hkj [dot] com and I will post it on the web site. You are encouraged to study the various rig definition files to learn more about how they are organized. Comments are contained within the tag pair:

<!--
...
--> and may appear anywhere in the rig definition file The entire rig definition must be contained within the tag pair

<RIGDEF>
...
</RIGDEF>

The text within the tag pair <RIG> </RIG> specifies the transceiver to which this file applies, as in:

<RIG>Icom 746 PRO</RIG>
5.7 Rig Xml How to

The text within the tag pair <PROGRAMMER>... </PROGRAMMER> is not used by the parser, but should as a minimum say who created and who tested the definition file, as in:

<PROGRAMMER>
  Dave Freese W1HKJ Tested by: W1HKJ, Dave
</PROGRAMMER>

The text within the tag pair

<STATUS> ... </STATUS>

is not used by the parser, but should as a minimum state whether the definition file has been "Verified", is "Alpha&", what the Version and Date of creation or update, as in:

<STATUS> Verified Version: 1.0 Date: 2007 Jan 5 </STATUS>

The title bar tag pair contains the text which will be displayed on the window decoration bar, as in:

<TITLE>Rig Control - IC-746 PRO</TITLE>

5.7.1 Serial Port Parameters

The serial port parameters may be preset in the xml file and also set or changed on the rigCAT configuration tab. These values are loaded from the xml file. If a value is changed on the configuration tab it is saved in the progdefaults.xml file if the configuration is saved. On a subsequent start of fldigi the saved parameters will override the ones in the rig definition file.

<table>
<thead>
<tr>
<th>xml tag</th>
<th>parameter</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;TIMEOUT&gt;TT&lt;/TIMEOUT&gt;</td>
<td>TT in milliseconds</td>
<td>serial port timeout</td>
</tr>
<tr>
<td>&lt;RETRIES&gt;NN&lt;/RETRIES&gt;</td>
<td>NN integer</td>
<td>number of times CAT string is resent</td>
</tr>
<tr>
<td>&lt;WRITE_DELAY&gt;TT&lt;/WRITE_DELAY&gt;</td>
<td>TT in milliseconds</td>
<td>wait time after sending normal command to xcvr</td>
</tr>
<tr>
<td>&lt;INIT_DELAY&gt;IT&lt;/INIT_DELAY&gt;</td>
<td>IT in milliseconds</td>
<td>wait time after sending init string to xcvr</td>
</tr>
<tr>
<td>&lt;BAUDRATE&gt;BAUD&lt;/BAUDRATE&gt;</td>
<td>BAUD integer</td>
<td>1200, 2400, 4800, 9600, 19200, 38400 ...</td>
</tr>
<tr>
<td>&lt;STOPBITS&gt;B&lt;/STOPBITS&gt;</td>
<td>B integer</td>
<td>1 or 2</td>
</tr>
<tr>
<td>&lt;RTSCTS&gt;BOOL&lt;/RTSCTS&gt;</td>
<td>BOOL true, false</td>
<td>h/w handshake used for data flow control</td>
</tr>
<tr>
<td>&lt;RTSPLUS&gt;BOOL&lt;/RTSPLUS&gt;</td>
<td>BOOL true, false</td>
<td>set RTS signal line to +12 V (default -12 V)</td>
</tr>
<tr>
<td>&lt;RTSTPTT&gt;BOOL&lt;/RTSTPTT&gt;</td>
<td>BOOL true, false</td>
<td>toggle RTS signal line for PTT</td>
</tr>
<tr>
<td>&lt;DTRPLUS&gt;BOOL&lt;/DTRPLUS&gt;</td>
<td>BOOL true, false</td>
<td>set DTR signal line to + 12 V (default -12 V)</td>
</tr>
<tr>
<td>&lt;DTRPTT&gt;BOOL&lt;/DTRPTT&gt;</td>
<td>BOOL true, false</td>
<td>toggle DTR signal line for PTT</td>
</tr>
<tr>
<td>&lt;CMDPTT&gt;BOOL&lt;/CMDPTT&gt;</td>
<td>BOOL true, false</td>
<td>use command string for PTT (not supported by all xcvrs)</td>
</tr>
<tr>
<td>&lt;ECHO&gt;BOOL&lt;/ECHO&gt;</td>
<td>BOOL true, false</td>
<td>xcvr/interface echoes all chars (typical of CI-V interface)</td>
</tr>
<tr>
<td>&lt;WAIT_FOR_DEVICE&gt;nnn&lt;/WAIT_FOR_DEVICE&gt;</td>
<td>nnnn in milliseconds</td>
<td>used for correct startup of K9MJ CI-V router</td>
</tr>
<tr>
<td>&lt;VSP&gt;BOOL&lt;/VSP&gt;</td>
<td>BOOL true/false</td>
<td>serial port is a virtual device</td>
</tr>
</tbody>
</table>

5.7.2 Poll Interval

The rigCAT code operates in a separate thread during which the various queries are made with a default interval of 100 milliseconds between the last query and the start of the next cycle. The actual cycle period is dependent on the serial communications baud rate, the size of the commands, and the responsiveness of the transceiver. It will always be greater than the poll interval.

You can specify a poll interval in milliseconds in the xml file:

<POLLINT>mmm</POLLINT>

Generated by Doxygen
where \( mmm \) is the poll interval in milliseconds.

5.7.3 Modes

The transceiver modes are specified within the `<MODES>` tag pair. Each entry or element associated with a mode has a symbol name (text) and a way to specify what the data transfer consists of. The data transfer might be a single byte, multiple bytes, or a string.

Example 1, for the Icom-746PRO

```xml
<MODES>
  <ELEMENT><SYMBOL>LSB</SYMBOL><BYTE>00</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>USB</SYMBOL><BYTE>01</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>AM</SYMBOL><BYTE>02</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>CW</SYMBOL><BYTE>03</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>RTTY</SYMBOL><BYTE>04</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>FM</SYMBOL><BYTE>05</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>CW-R</SYMBOL><BYTE>07</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>RTTY-R</SYMBOL><BYTE>08</BYTE></ELEMENT>
</MODES>
```

Example 2, for the Kenwood 850

```xml
<MODES>
  <ELEMENT><SYMBOL>LSB</SYMBOL><BYTE>31</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>USB</SYMBOL><BYTE>32</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>CW</SYMBOL><BYTE>33</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>FM</SYMBOL><BYTE>34</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>AM</SYMBOL><BYTE>35</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>FSK</SYMBOL><BYTE>36</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>CW-R</SYMBOL><BYTE>37</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>FSK-R</SYMBOL><BYTE>39</BYTE></ELEMENT>
</MODES>
```

Example 3, for the FT-100

```xml
<MODES>
  <ELEMENT><SYMBOL>LSB</SYMBOL><BYTE>00</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>USB</SYMBOL><BYTE>01</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>CW</SYMBOL><BYTE>02</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>CW-R</SYMBOL><BYTE>03</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>AM</SYMBOL><BYTE>04</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>DIG</SYMBOL><BYTE>05</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>FM</SYMBOL><BYTE>06</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>WS-FM</SYMBOL><BYTE>07</BYTE></ELEMENT>
</MODES>
```

The modes which are supported by lower sideband in the transceiver are specified in the `<LSBMODES>` tag pair. The string data for the LSB modes must match those given in the modes id specifier. For example in the Icom 746 Pro:

```xml
<LSBMODES>
  <STRING>LSB</STRING>
  <STRING>RTTY</STRING>
  <STRING>CW-R</STRING>
</LSBMODES>
```

5.7.4 BandwidthSpecifier

If the transceiver data stream uses identically the same format for the bandwidth data then it is specified in the `<BANDWIDTHS>` tag pair.

Example for the Icom 746 Pro:

```xml
<BANDWIDTHS>
  <ELEMENT><SYMBOL>50</SYMBOL><BYTE>00</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>100</SYMBOL><BYTE>01</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>150</SYMBOL><BYTE>02</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>200</SYMBOL><BYTE>03</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>250</SYMBOL><BYTE>04</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>300</SYMBOL><BYTE>05</BYTE></ELEMENT>
</BANDWIDTHS>
```
If the bandwidth data stream is unique for send and receive data streams then they are specified separately with a `<BW-CMD>`/<BW-CMD>` tag pair for data sent to the transceiver, and a `<BW-REPLY>`/<BW-REPLY>` tag pair for data returned to the computer. The number and symbol name for these must match.

Example: FT-100:

```
<BW-CMD>
  <ELEMENT><SYMBOL>300</SYMBOL><BYTE>00</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>500</SYMBOL><BYTE>01</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>2400</SYMBOL><BYTE>02</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>6000</SYMBOL><BYTE>03</BYTE></ELEMENT>
</BW-CMD>

<BW-REPLY>
  <ELEMENT><SYMBOL>300</SYMBOL><BYTE>03</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>500</SYMBOL><BYTE>02</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>2400</SYMBOL><BYTE>01</BYTE></ELEMENT>
  <ELEMENT><SYMBOL>6000</SYMBOL><BYTE>00</BYTE></ELEMENT>
</BW-REPLY>
```

5.7.5 Commands and Replies

CAT command strings are defined within a `<COMMAND>...</COMMAND>` block. Each block structure appears as:

```xml
<COMMAND>
  <SYMBOL>...</SYMBOL>
  <SIZE>...</SIZE>
  <STRING>...</STRING>
  <DATA>...
    <DTYPE>...</DTYPE>
    <SIZE>...</SIZE>
    <MAX>...</MAX>
    <MIN>...</MIN>
    <RESOL>...</RESOL>
  </DATA>
</COMMAND>
```

noun name of symbol
number of bytes in CAT string
string literal (optional)
data block (optional)
type of data in data block
number of bytes in data block
maximum value of data value
minimum value of data value
resolution of data value
Here are three examples from the KX3.xml definition file

```xml
<COMMAND>
  <SYMBOL>INIT</SYMBOL>
  <SIZE>12</SIZE>
  <STRING>A10;DT0;K31;</STRING>
</COMMAND>

<COMMAND>
  <SYMBOL>SETFREQ</SYMBOL>
  <SIZE>14</SIZE>
  <STRING>FA</STRING>
  <DATA>
    <DTYPE>DECIMAL</DTYPE>
    <SIZE>11</SIZE>
    <MIN>00000490000</MIN>
    <MAX>99999999999</MAX>
    <RESOL>1</RESOL>
  </DATA>
  <STRING>;</STRING>
</COMMAND>

<COMMAND>
  <SYMBOL>GETFREQ</SYMBOL>
  <SIZE>3</SIZE>
  <STRING>FA;</STRING>
  <INFO>FREQ</INFO>
</COMMAND>
```

A command string may have a corresponding reply string sent by the transceiver. The SYMBOL noun name for each command - reply pair is the same.

Fidigi can parse and decode message returned from the transceiver that define 4 aspects of the transceiver operation:

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK</td>
<td>data accepted by the transceiver</td>
</tr>
<tr>
<td>BAD</td>
<td>data rejected by the transceiver</td>
</tr>
<tr>
<td>MODE</td>
<td>current operating mode of the transceiver</td>
</tr>
<tr>
<td>BW</td>
<td>current bandwidth setting of the transceiver</td>
</tr>
<tr>
<td>FREQ</td>
<td>frequency of the active VFO (might be either A or B for example)</td>
</tr>
</tbody>
</table>

These are all contained within multiple `<REPLY>` tag pairs. The REPLY block structure is:

```xml
<REPLY>
  <SYMBOL>...</SYMBOL> noun name of symbol
  <SIZE>...</SIZE> number of bytes in reply string
  <BYTES>...</BYTES> space separated hexadecimal values
  <BYTE>...</BYTE> single hexadecimal value
  <STRING>...</STRING> returned character string
</REPLY>
```

This is an example of a fixed format message with no variable fields. It is the OK message sent back by the Icom-746 PRO:

```xml
<REPLY>
  <SYMBOL>OK</SYMBOL>
  <SIZE>6</SIZE>
  <BYTES>FE FE E0 66</BYTES>
  <BYTE>FB</BYTE>
  <BYTE>FB</BYTE>
</REPLY>
```

The `<SYMBOL>` element pair and the command definition are mandatory. The `<SIZE>` element field is
mandatory and specifies the number of bytes contained in this reply. The above definition could also have been coded as:

```xml
<REPLY>
  <SYMBOL>OK</SYMBOL>
  <SIZE>6</SIZE>
  <BYTES>FE FE E0 66 FB FD</BYTES>
</REPLY>
```

When the reply contains variable data it is specified in a contained tag pair `<DATA>` and `/DATA>`. This data field contains specifiers that describe the kind and size of the data. The `<DTYPE>` and `/DTYPE>` tag pair may be one of:

- BINARY
- DECIMAL

This is an example for the reply to a mode query that is returned by the Icom-746 PRO:

```xml
<REPLY>
  <SYMBOL>MODE</SYMBOL>
  <SIZE>8</SIZE>
  <BYTES>FE FE E0 66</BYTES>
  <BYTE>04</BYTE>
  <DATA>
    <DTYPE>BINARY</DTYPE>
    <SIZE>1</SIZE>
    <DATA>
    <FILL>1</FILL>
    <BYTE>FD</BYTE>
  </DATA>
</REPLY>
```

Fldigi rigCAT will check for both the preamble and postamble to insure that a valid reply has been sent by the transceiver.

This is an example for the reply to a frequency query that is returned by the Elecraft KX3. The corresponding query command structure is shown above.

```xml
<REPLY>
  <SYMBOL>FREQ</SYMBOL>
  <SIZE>14</SIZE>
  <STRING>FA</STRING>
  <DATA>
    <DTYPE>DECIMAL</DTYPE>
    <SIZE>11</SIZE>
    <MAX>99999999999</MAX>
    <MIN>00001500000</MIN>
    <RESOL>1</RESOL>
    <DATA>
    <STRING>;</STRING>
  </DATA>
</REPLY>
```

### 5.7.6 Meters

Fldigi rigCAT can query the transceiver for both Smeter and Power Meter. The fldigi user interface controls that display these values have a range of 0 to 100. You need to provide the scale conversion from queried value to fldigi UI control scale. The `<SMETER>` and `/SMETER>` and `<PMETER>` and `/PMETER>` are reserved pairs that are used to define the conversions. The program will interpolate between values as it converts the queried value to the user interface control range.

Here are two examples of scale specifiers:

```xml
<!-- smeter scale mapping for FT-950 -->
<SMETER> 0,0; 255,100 </SMETER>

<!-- power meter scale mapping for FT-950 -->
<PMETER>
  0,0; 16,1; 32,4; 48,7;
  64,12; 80,18; 96,24; 112,32;
  128,40; 144,50; 160,61; 176,73;
  192,85; 208,100
</PMETER>
```
The query and respective responses are coded as any other command/reply pair:

For the FT-950:

```xml
<REPLY>
  <SYMBOL>SMETER</SYMBOL>
  <SIZE>7</SIZE>
  <STRING>RM1</STRING>
  <DATA>
    <DTYPE>DECIMAL</DTYPE>
    <SIZE>3</SIZE>
  </DATA>
  <STRING>;</STRING>
</REPLY>

<COMMAND>
  <SYMBOL>GET_SMETER</SYMBOL>
  <SIZE>4</SIZE>
  <STRING>RM1;</STRING>
  <INFO>SMETER</INFO>
</COMMAND>

<REPLY>
  <SYMBOL>PWRMETER</SYMBOL>
  <SIZE>7</SIZE>
  <STRING>RM5</STRING>
  <DATA>
    <DTYPE>DECIMAL</DTYPE>
    <SIZE>3</SIZE>
  </DATA>
  <STRING>;</STRING>
</REPLY>

<COMMAND>
  <SYMBOL>GET_PWRMETER</SYMBOL>
  <SIZE>4</SIZE>
  <STRING>RM5;</STRING>
  <INFO>PWRMETER</INFO>
</COMMAND>

and for the IC-706MkIIG:

```xml
<REPLY>
  <SYMBOL>SMETER</SYMBOL>
  <SIZE>10</SIZE>
  <BYTES>FE FE E0 58 15 02</BYTES>
  <DATA>
    <DTYPE>BCD</DTYPE>
    <SIZE>3</SIZE>
    <MAX>255</MAX>
    <MIN>0</MIN>
    <RESOL>1</RESOL>
  </DATA>
  <BYTE>FD</BYTE>
</REPLY>

<COMMAND>
  <SYMBOL>GET_SMETER</SYMBOL>
  <SIZE>7</SIZE>
  <BYTES>FE FE 58 E0 15 02 FD</BYTES>
  <INFO>SMETER</INFO>
</COMMAND>

5.7.7 Notch Control

The transceiver manual notch can be both read and controlled using rigCAT. There are a few requirements that may not be met by all transceivers.
- it must support a CAT manual notch on/off string
- it must support a CAT manual notch value string
- the conversion between notch audio frequency and the CAT value must be bilateral.

Here is an example for the FT-950:

```xml
<NOTCH>
1,10; 300,3000;
</NOTCH>

<COMMAND>
  <SYMBOL>SET_NOTCH_ON</SYMBOL>
  <SIZE>8</SIZE>
  <STRING>BP00001;</STRING>
</COMMAND>

<COMMAND>
  <SYMBOL>SET_NOTCH_OFF</SYMBOL>
  <SIZE>8</SIZE>
  <STRING>BP00000;</STRING>
</COMMAND>

<COMMAND>
  <SYMBOL>SET_NOTCH_VAL</SYMBOL>
  <SIZE>8</SIZE>
  <STRING>BP01</STRING>
  <DATA>
    <DTYPE>DECIMAL</DTYPE>
    <SIZE>3</SIZE>
  </DATA>
  <STRING>;</STRING>
</COMMAND>

<REPLY>
  <SYMBOL>NOTCH_ON</SYMBOL>
  <SIZE>8</SIZE>
  <STRING>BP00001;</STRING>
</REPLY>

<COMMAND>
  <SYMBOL>GET_NOTCH_ON</SYMBOL>
  <SIZE>5</SIZE>
  <STRING>BP00;</STRING>
  <INFO>NOTCH_ON</INFO>
</COMMAND>

<REPLY>
  <SYMBOL>NOTCH</SYMBOL>
  <SIZE>8</SIZE>
  <STRING>BP01</STRING>
  <DATA>
    <DTYPE>DECIMAL</DTYPE>
    <SIZE>3</SIZE>
  </DATA>
  <STRING>;</STRING>
</REPLY>

<COMMAND>
  <SYMBOL>GET_NOTCH</SYMBOL>
  <SIZE>5</SIZE>
  <STRING>BP01;</STRING>
  <INFO>NOTCH</INFO>
</COMMAND>

The notch is controlled from fldigi using the alt-ctl-left-click on the waterfall. The same keyboard-mouse combination is used to both set and clear the notch. Point the cursor to an offending signal, and then use the keyboard-mouse combination to set the manual notch at that frequency. Repeat the keyboard-mouse combination anywhere in the waterfall to clear the notch. The SET notch is indicated by a dashed vertical line on the waterfall display at the audio frequency being notched. You should also see a pronounced reduction in signal at that point. fldigi will also annunciate any transceiver changes made to the manual notch.
5.7.8 Power Level Control

rigCAT can control the power level of the transceiver if that is a supported CAT command. The definitions for the power level are similar to the notch in that the conversion should be bilateral.

Another example using the FT-950 transceiver:

```xml
<PWRLEVEL>
  0,0; 100,100;
</PWRLEVEL>

<REPLY>
  <SYMBOL>PWRLEVEL</SYMBOL>
  <SIZE>6</SIZE>
  <STRING>PC</STRING>
  <DATA>
    <DTYPE>DECIMAL</DTYPE>
    <SIZE>3</SIZE>
  </DATA>
  <STRING>;</STRING>
</REPLY>

<COMMAND>
  <SYMBOL>GET_PWRLEVEL</SYMBOL>
  <SIZE>3</SIZE>
  <STRING>PC;</STRING>
  <INFO>PWRLEVEL</INFO>
</COMMAND>

<COMMAND>
  <SYMBOL>SET_PWRLEVEL</SYMBOL>
  <SIZE>6</SIZE>
  <STRING>PC</STRING>
  <DATA>
    <DTYPE>DECIMAL</DTYPE>
    <SIZE>3</SIZE>
  </DATA>
  <STRING>;</STRING>
</COMMAND>

The rigCAT controls for

- Transceiver-Mode
- Transceiver-Bandwidth
- Smeter
- Power-Meter and
- Power-Level

all share a common space on the main fldigi display.

![Figure 5.3 Mode/Bandwidth controls](image1)

![Figure 5.4 S-meter](image2)
The transition between Mode/Bandwidth and the other control/displays is made using the button just to the right of
the bandwidth control.
The transition from either S-meter or Power-meter to the Power Level is make by left clicking on the S-meter or
Power-meter.

### 5.7.9 Debugging

To assist in debugging an xml file you may place the following statement within the body of the `<rigdef>...</rigdef>`
pair.

```
<DEBUG>true</DEBUG>
```

fldigi will then record critical events as they occur during the execution of the rigCAT loop. Remove the debug
statement from the xml when the file has been proven and before publishing.
You can test an xml to observe the CAT send sequences by inhibiting the actual connection to the serial port.

```
<NOSERIAL>true/false</NOSERIAL> - default false
```

The serial i/o events are normally recorded as a sequence of HEX values. This behavior can be changed to record
the events as a string of ASCII characters.

```
<ASCII>true/false</ASCII> - default false
```

You can use the xml remarks brackets

```
<!--
...
-->
```

to surround sections of the xml document to inhibit certain functions if they have already been proven.
You can increase the polling interval to slow things down during debugging.

---

**5.8 ualr telnet**

snip ----------- copy the following to ~/.fldigi/scripts/ualr-telnet.pl

```
#!/usr/bin/perl

# Author: Stelios Bounanos, M0GLD
# Date: 20090103
#
# ualr-telnet is free software; you can redistribute it and/or modify
```
# it under the terms of the GNU General Public License as published by
# the Free Software Foundation; either version 3 of the License, or
# (at your option) any later version.
#
# ualr-telnetl is distributed in the hope that it will be useful,
# but WITHOUT ANY WARRANTY; without even the implied warranty of
# MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
# GNU General Public License for more details.
#
# You should have received a copy of the GNU General Public License
# along with this program. If not, see <http://www.gnu.org/licenses/>.
# mimic---------------------------------------------------------------------

use strict;
use warnings;

die "Usage: $0 CALLSIGN\n" unless (@ARGV == 1);

use Net::Telnet();

sub error { print "\$NAME?\$QTH?\n"; exit(1); }

my $t = new Net::Telnet( Host => "callsign.ualr.edu", Port => 2000, Timeout => 10,
  errmode => \&error );
$t->open();
$t->waitfor(/LOOKUP>.*$/);
$t->print($ARGV[0]);

$_ = $t->getline();        # blank line
$_ = $t->getline();        # call
error() if (m/No match found/);
$_ = $t->getline();        # name
chomp; s/+.\s+//; s/\s.+//;
print "\$NAME$_\n";
$_ = $t->getline();        # addr
$_ = $t->getline();        # qth
chomp;
$_ = "$\n";
$_ = $'
;
print "\$QTH$_\n";
$t->waitfor('/LOOKUP>.*$/);
$t->print("bye");

snip------------------------------------------------

5.9 Xmlrpc Control

XML-RPC data is transported via simple HTTP and client implementations exist for most programming languages. A Perl client that can be used as a control script is included in the source tar ball as scripts/fldigi-shell. This control method is currently used by several external programs including flrig, logger32 and Xlog. The following command line arguments become available when XML-RPC support is compiled into fldigi, as described in the build instructions:

--xmlrpc-server-address HOSTNAME
  Set the XML-RPC server address. The default is 127.0.0.1.

--xmlrpc-server-port PORT
  Set the XML-RPC server port. The default is 7362.

--xmlrpc-allow REGEX
  Allow only the methods whose names match REGEX

--xmlrpc-deny REGEX
  Allow only the methods whose names don’t match REGEX
--xmlrpc-list
  List all available methods

The `--xmlrpc-deny` and `--xmlrpc-allow` switches can be used as a simple access control mechanism. REGEX specifies a POSIX extended regular expression. This invocation disables the methods that may cause fldigi to transmit:

```
--xmlrpc-deny 'main\.(tx|tune|run_macro)'
```

By default all methods are allowed.
The `--xmlrpc-list` switch outputs the method list and exits the program. If preceded by `--xmlrpc-deny` or `--xmlrpc-allow`, it shows the list of methods as filtered by those switches.
The methods are listed below. The three columns are method name, signature (return_type:argument_types), and description. Refer to the XML-RPC specification for the meaning of the signature characters.
5.9.1 XML Command Symbol Interpretation

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>bytes</td>
</tr>
<tr>
<td>A</td>
<td>array</td>
</tr>
<tr>
<td>b</td>
<td>boolean</td>
</tr>
<tr>
<td>d</td>
<td>double</td>
</tr>
<tr>
<td>i</td>
<td>integer</td>
</tr>
<tr>
<td>n</td>
<td>nil</td>
</tr>
<tr>
<td>s</td>
<td>string</td>
</tr>
<tr>
<td>S</td>
<td>struct</td>
</tr>
</tbody>
</table>

5.9.2 Table of XML Commands

<table>
<thead>
<tr>
<th>Method Name</th>
<th>Sig (ret:arg)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>fldigi.config_dir</td>
<td>s:n</td>
<td>Returns the name of the configuration directory</td>
</tr>
<tr>
<td>fldigi.list</td>
<td>A:n</td>
<td>Returns the list of methods</td>
</tr>
<tr>
<td>fldigi.name</td>
<td>s:n</td>
<td>Returns the program name</td>
</tr>
<tr>
<td>fldigi.name_version</td>
<td>s:n</td>
<td>Returns the program name and version</td>
</tr>
<tr>
<td>fldigi.terminate</td>
<td>n:i</td>
<td>Terminates fldigi. &quot;i&quot; is bitmask specifying data to save: 0=option; 1=log; 2=macros</td>
</tr>
<tr>
<td>fldigi.version</td>
<td>s:n</td>
<td>Returns the program version as a string</td>
</tr>
<tr>
<td>fldigi.version_struct</td>
<td>S:n</td>
<td>Returns the program version as a struct</td>
</tr>
<tr>
<td>io.enable_arq</td>
<td>n:n</td>
<td>Switch to ARQ I/O</td>
</tr>
<tr>
<td>io.enable_kiss</td>
<td>n:n</td>
<td>Switch to KISS I/O</td>
</tr>
<tr>
<td>io.in_use</td>
<td>s:n</td>
<td>Returns the IO port in use (ARQ/KISS).</td>
</tr>
<tr>
<td>log.clear</td>
<td>n:n</td>
<td>Clears the contents of the log fields</td>
</tr>
<tr>
<td>log.get_az</td>
<td>s:n</td>
<td>Returns the AZ field contents</td>
</tr>
<tr>
<td>log.get_band</td>
<td>s:n</td>
<td>Returns the current band name</td>
</tr>
<tr>
<td>log.get_call</td>
<td>s:n</td>
<td>Returns the Call field contents</td>
</tr>
<tr>
<td>log.get_country</td>
<td>s:n</td>
<td>Returns the Country field contents</td>
</tr>
<tr>
<td>log.get_exchange</td>
<td>s:n</td>
<td>Returns the contest exchange field contents</td>
</tr>
<tr>
<td>log.get_frequency</td>
<td>s:n</td>
<td>Returns the Frequency field contents</td>
</tr>
<tr>
<td>log.get_locator</td>
<td>s:n</td>
<td>Returns the Locator field contents</td>
</tr>
<tr>
<td>log.get_name</td>
<td>s:n</td>
<td>Returns the Name field contents</td>
</tr>
<tr>
<td>log.get_notes</td>
<td>s:n</td>
<td>Returns the Notes field contents</td>
</tr>
<tr>
<td>log.get_province</td>
<td>s:n</td>
<td>Returns the Province field contents</td>
</tr>
<tr>
<td>log.get_qth</td>
<td>s:n</td>
<td>Returns the QTH field contents</td>
</tr>
<tr>
<td>log.get_rst_in</td>
<td>s:n</td>
<td>Returns the RST(r) field contents</td>
</tr>
<tr>
<td>log.get_rst_out</td>
<td>s:n</td>
<td>Returns the RST(s) field contents</td>
</tr>
<tr>
<td>log.get_serial_number</td>
<td>s:n</td>
<td>Returns the serial number field contents</td>
</tr>
<tr>
<td>log.get_serial_number_sent</td>
<td>s:n</td>
<td>Returns the serial number (sent) field contents</td>
</tr>
<tr>
<td>Method Name</td>
<td>Sig (ret:arg)</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>log.get_state</td>
<td>s:n</td>
<td>Returns the State field contents</td>
</tr>
<tr>
<td>log.get_time_off</td>
<td>s:n</td>
<td>Returns the Time-Off field contents</td>
</tr>
<tr>
<td>log.get_time_on</td>
<td>s:n</td>
<td>Returns the Time-On field contents</td>
</tr>
<tr>
<td>log.set_call</td>
<td>n:s</td>
<td>Sets the Call field contents</td>
</tr>
<tr>
<td>log.set_exchange</td>
<td>n:s</td>
<td>Sets the contest exchange field contents</td>
</tr>
<tr>
<td>log.set_locator</td>
<td>n:s</td>
<td>Sets the Locator field contents</td>
</tr>
<tr>
<td>log.set_name</td>
<td>n:s</td>
<td>Sets the Name field contents</td>
</tr>
<tr>
<td>log.set_qth</td>
<td>n:s</td>
<td>Sets the OTH field contents</td>
</tr>
<tr>
<td>log.set_rst_in</td>
<td>n:s</td>
<td>Sets the RST(r) field contents</td>
</tr>
<tr>
<td>log.set_rst_out</td>
<td>n:s</td>
<td>Sets the RST(s) field contents</td>
</tr>
<tr>
<td>log.set_serial_number</td>
<td>n:s</td>
<td>Sets the serial number field contents</td>
</tr>
<tr>
<td>main.abort</td>
<td>n:n</td>
<td>Aborts a transmit or tune</td>
</tr>
<tr>
<td>main.get_afc</td>
<td>b:n</td>
<td>Returns the AFC state</td>
</tr>
<tr>
<td>main.get_char_rates</td>
<td>s:n</td>
<td>Returns table of char rates</td>
</tr>
<tr>
<td>main.get_frequency</td>
<td>d:n</td>
<td>Returns the RF carrier frequency</td>
</tr>
<tr>
<td>main.get_lock</td>
<td>b:n</td>
<td>Returns the Transmit Lock state</td>
</tr>
<tr>
<td>main.get_max_macro_id</td>
<td>i:n</td>
<td>Returns the maximum macro ID number</td>
</tr>
<tr>
<td>main.get_reverse</td>
<td>b:n</td>
<td>Returns the Reverse Sideband state</td>
</tr>
<tr>
<td>main.get_rsid</td>
<td>b:n</td>
<td>Returns the RSID state</td>
</tr>
<tr>
<td>main.get_txid</td>
<td>b:n</td>
<td>Returns the TxRSID state</td>
</tr>
<tr>
<td>main.get_squelch</td>
<td>b:n</td>
<td>Returns the squelch level</td>
</tr>
<tr>
<td>main.get_squelch_level</td>
<td>d:n</td>
<td>Returns the squelch level</td>
</tr>
<tr>
<td>main.get_status1</td>
<td>s:n</td>
<td>Returns the contents of the first status field (typically s/n)</td>
</tr>
<tr>
<td>main.get_status2</td>
<td>s:n</td>
<td>Returns the contents of the second status field</td>
</tr>
<tr>
<td>main.get_trx_state</td>
<td>s:n</td>
<td>Returns T/R state</td>
</tr>
<tr>
<td>main.get_trx_status</td>
<td>s:n</td>
<td>Returns transmit/tune/receive status</td>
</tr>
<tr>
<td>main.get_tx_timing</td>
<td>n:6</td>
<td>Returns transmit duration for test string (samples:sample rate:secs).</td>
</tr>
<tr>
<td>main.get_wf_sideband</td>
<td>s:n</td>
<td>Returns the current waterfall sideband</td>
</tr>
<tr>
<td>main.inc_frequency</td>
<td>d:d</td>
<td>Increments the RF carrier frequency. Returns the new value</td>
</tr>
<tr>
<td>main.inc_squelch_level</td>
<td>d:d</td>
<td>Increments the squelch level. Returns the new level</td>
</tr>
<tr>
<td>main.run_macro</td>
<td>n:i</td>
<td>Runs a macro</td>
</tr>
<tr>
<td>main.rx</td>
<td>n:n</td>
<td>Receives</td>
</tr>
<tr>
<td>main.rx_only</td>
<td>n:n</td>
<td>Disables Tx.</td>
</tr>
<tr>
<td>main.rx_tx</td>
<td>n:n</td>
<td>Sets normal Rx/Tx switching.</td>
</tr>
<tr>
<td>main.set_afc</td>
<td>b:b</td>
<td>Sets the AFC state. Returns the old state</td>
</tr>
<tr>
<td>main.set_frequency</td>
<td>d:d</td>
<td>Sets the RF carrier frequency. Returns the old value</td>
</tr>
<tr>
<td>main.set_lock</td>
<td>b:b</td>
<td>Sets the Transmit Lock state. Returns the old state</td>
</tr>
<tr>
<td>main.set_reverse</td>
<td>b:b</td>
<td>Sets the Reverse Sideband state. Returns the old state</td>
</tr>
<tr>
<td>main.set_rsid</td>
<td>b:b</td>
<td>Sets the RSID state. Returns the old state</td>
</tr>
<tr>
<td>main.set_sqelch</td>
<td>b:b</td>
<td>Sets the squelch state. Returns the old state</td>
</tr>
<tr>
<td>main.set_sqelch_level</td>
<td>d:d</td>
<td>Sets the squelch level. Returns the old level</td>
</tr>
<tr>
<td>main.set_wf_sideband</td>
<td>n:s</td>
<td>Sets the waterfall sideband to USB or LSB</td>
</tr>
<tr>
<td>main.toggle_afc</td>
<td>b:n</td>
<td>Toggles the AFC state. Returns the new state</td>
</tr>
<tr>
<td>main.toggle_lock</td>
<td>b:n</td>
<td>Toggles the Transmit Lock state. Returns the new state</td>
</tr>
<tr>
<td>main.toggle_reverse</td>
<td>b:n</td>
<td>Toggles the Reverse Sideband state. Returns the new state</td>
</tr>
<tr>
<td>Method Name</td>
<td>Sig (ret:arg)</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------</td>
<td>--------------------------------------------------------------</td>
</tr>
<tr>
<td>main.toggle_rsid</td>
<td>b:n</td>
<td>Toggles the RSID state. Returns the new state</td>
</tr>
<tr>
<td>main.toggle_tsid</td>
<td>b:n</td>
<td>Toggles the TxRSID state. Returns the new state</td>
</tr>
<tr>
<td>main.toggle_squelch</td>
<td>b:n</td>
<td>Toggles the squelch state. Returns the new state</td>
</tr>
<tr>
<td>main.tune</td>
<td>n:n</td>
<td>Tunes</td>
</tr>
<tr>
<td>main.tx</td>
<td>n:n</td>
<td>Transmits</td>
</tr>
<tr>
<td>modem.get_afc_search_range</td>
<td>i:n</td>
<td>Returns the modem AFC search range</td>
</tr>
<tr>
<td>modem.get_bandwidth</td>
<td>i:n</td>
<td>Returns the modem bandwidth</td>
</tr>
<tr>
<td>modem.get_carrier</td>
<td>i:n</td>
<td>Returns the modem carrier frequency</td>
</tr>
<tr>
<td>modem.get_id</td>
<td>i:n</td>
<td>Returns the ID of the current modem</td>
</tr>
<tr>
<td>modem.get_max_id</td>
<td>i:n</td>
<td>Returns the maximum modem ID number</td>
</tr>
<tr>
<td>modem.get_name</td>
<td>s:n</td>
<td>Returns the name of the current modem</td>
</tr>
<tr>
<td>modem.get_names</td>
<td>A:n</td>
<td>Returns all modem names</td>
</tr>
<tr>
<td>modem.get_quality</td>
<td>d:n</td>
<td>Returns the modem signal quality in the range [0:100]</td>
</tr>
<tr>
<td>modem.inc_afc_search_range</td>
<td>n:i</td>
<td>Increments the modem AFC search range. Returns the new value</td>
</tr>
<tr>
<td>modem.inc_bandwidth</td>
<td>n:i</td>
<td>Increments the modem bandwidth. Returns the new value</td>
</tr>
<tr>
<td>modem.inc_carrier</td>
<td>i:i</td>
<td>Increments the modem carrier frequency. Returns the new carrier</td>
</tr>
<tr>
<td>modem.olivia.get_bandwidth</td>
<td>i:n</td>
<td>Returns the Olivia bandwidth</td>
</tr>
<tr>
<td>modem.olivia.get_tones</td>
<td>i:n</td>
<td>Returns the Olivia tones</td>
</tr>
<tr>
<td>modem.olivia.set_bandwidth</td>
<td>n:i</td>
<td>Sets the Olivia bandwidth</td>
</tr>
<tr>
<td>modem.olivia.set_tones</td>
<td>n:i</td>
<td>Sets the Olivia tones</td>
</tr>
<tr>
<td>modem.search_down</td>
<td>n:n</td>
<td>Searches downward in frequency</td>
</tr>
<tr>
<td>modem.search_up</td>
<td>n:n</td>
<td>Searches upward in frequency</td>
</tr>
<tr>
<td>modem.set_afc_search_range</td>
<td>n:i</td>
<td>Sets the modem AFC search range. Returns the old value</td>
</tr>
<tr>
<td>modem.set_bandwidth</td>
<td>n:i</td>
<td>Sets the modem bandwidth. Returns the old value</td>
</tr>
<tr>
<td>modem.set_by_id</td>
<td>i:i</td>
<td>Sets the current modem. Returns old ID</td>
</tr>
<tr>
<td>modem.set_by_name</td>
<td>s:s</td>
<td>Sets the current modem. Returns old name</td>
</tr>
<tr>
<td>modem.set_carrier</td>
<td>i:i</td>
<td>Sets modem carrier. Returns old carrier</td>
</tr>
<tr>
<td>navtex.get_message</td>
<td>s:i</td>
<td>Returns next Navtex/SitorB message with a max delay in seconds.. Empty string if timeout.</td>
</tr>
<tr>
<td>navtex.send_message</td>
<td>s:s</td>
<td>Send a Navtex/SitorB message. Returns an empty string if OK otherwise an error message.</td>
</tr>
<tr>
<td>rig.get_bandwidth</td>
<td>s:n</td>
<td>Returns the name of the current transceiver bandwidth</td>
</tr>
<tr>
<td>rig.get_bandwidths</td>
<td>A:n</td>
<td>Returns the list of available rig bandwidths</td>
</tr>
<tr>
<td>rig.get_mode</td>
<td>s:n</td>
<td>Returns the name of the current transceiver mode</td>
</tr>
<tr>
<td>rig.get_modes</td>
<td>A:n</td>
<td>Returns the list of available rig modes</td>
</tr>
<tr>
<td>rig.get_name</td>
<td>s:n</td>
<td>Returns the rig name previously set via rig.set_name</td>
</tr>
<tr>
<td>rig.get_notch</td>
<td>s:n</td>
<td>Reports a notch filter frequency based on WF action</td>
</tr>
<tr>
<td>rig.release_control</td>
<td>n:n</td>
<td>Switches rig control to previous setting</td>
</tr>
<tr>
<td>rig.set_bandwidth</td>
<td>n:s</td>
<td>Selects a bandwidth previously added by rig.set_bandwidths</td>
</tr>
<tr>
<td>rig.set_bandwidths</td>
<td>n:A</td>
<td>Sets the list of available rig bandwidths</td>
</tr>
<tr>
<td>rig.set_frequency</td>
<td>d:d</td>
<td>Sets the RF carrier frequency. Returns the old value</td>
</tr>
<tr>
<td>rig.set_mode</td>
<td>n:s</td>
<td>Selects a mode previously added by rig.set_modes</td>
</tr>
<tr>
<td>rig.set_modes</td>
<td>n:A</td>
<td>Sets the list of available rig modes</td>
</tr>
<tr>
<td>rig.set_name</td>
<td>n:s</td>
<td>Sets the rig name for xmlrpc rig</td>
</tr>
<tr>
<td>rig.set_pwrmeter</td>
<td>n:i</td>
<td>Sets the power meter returns null.</td>
</tr>
<tr>
<td>rig.set_smeter</td>
<td>n:i</td>
<td>Sets the smeter returns null.</td>
</tr>
<tr>
<td>rig.take_control</td>
<td>n:n</td>
<td>Switches rig control to XML-RPC</td>
</tr>
<tr>
<td>rx.get_data</td>
<td>6:n</td>
<td>Returns all RX data received since last query.</td>
</tr>
</tbody>
</table>
### Method Name | Sig (ret:arg) | Description
---|---|---
rttx.get_data | 6:n | Returns all RTTX combined data since last query.
spot.get_auto | b:n | Returns the autospotter state
spot.pskrep.get_count | i:n | Returns the number of callsigns spotted in the current session
spot.set_auto | n:b | Sets the autospotter state. Returns the old state
spot.toggle_auto | n:b | Toggles the autospotter state. Returns the new state
text.add_tx | n:s | Adds a string to the TX text widget
text.add_tx_bytes | n:6 | Adds a byte string to the TX text widget
text.clear_rx | n:n | Clears the RX text widget
text.clear_tx | n:n | Clears the TX text widget
text.get_rx | 6:i | Returns a range of characters (start, length) from the RX text widget
text.get_rx_length | i:n | Returns the number of characters in the RX widget
tx.get_data | 6:n | Returns all TX data transmitted since last query.
wefax.end_reception | s:n | End Wefax image reception
wefax.get_received_file | s:i | Waits for next received fax file, returns its name with a delay. Empty string if timeout.
wefax.send_file | s:i | Send file. Returns an empty string if OK otherwise an error message.
wefax.set_adif_log | s:b | Set/reset logging to received/transmit images to ADIF log file
wefax.set_max_lines | s:i | Set maximum lines for fax image reception
wefax.set_tx_abort_flag | s:n | Cancels Wefax image transmission
wefax.skip_apt | s:n | Skip APT during Wefax reception
wefax.skip_phasing | s:n | Skip phasing during Wefax reception
wefax.state_string | s:n | Returns Wefax engine state (tx and rx) for information.

#### Deprecated methods:

### Method Name | Sig | Resolution
---|---|---
log.get_sideband | s:n | use main.get_wf_sideband
main.get_rig_bandwidth | s:n | use rig.get_bandwidth
main.get_rig_bandwidths | n:A | use rig.get_bandwidths
main.get_rig_mode | s:n | use rig.get_mode
main.get_rig_modes | A:n | use rig.get_modes
main.get_sideband | s:n | use main.get_wf_sideband and/or rig.get_mode
main.rsid | n:n | use main.{get,set,toggle}_rsid
main.set_rig_bandwidth | n:s | use rig.set_bandwidth
main.set_rig_bandwidths | n:A | use rig.set_bandwidths
main.set_rig_frequency | d:d | use rig.set_frequency
main.set_rig_mode | n:s | use rig.set_mode
main.set_rig_modes | n:A | use rig.set_modes
main.set_rig_name | n:s | use rig.set_name
main.set_sideband | n:s | use main.set_wf_sideband and/or rig.set_mode
5.9.3 Minimized WF Window

If your external control program duplicates some of the fldigi controls such as the Rx and Tx pane you can run fldigi in a fully minimized mode. Fldigi then only provides the controls necessary for signal acquisition and waterfall management. Minimization is accomplished by setting the command line switch (--wo). The user interface then has this appearance:

![Figure 5.7 Simplified WF Window Display](image)

The documentation for the external control program will provide additional information if this user interface is desired.
Chapter 6

Contesting with fldigi

fldigi supports a full range of contests, either using its internal logbook or when linked to one of the N3FJP loggers. Each contest's unique data exchange is captured either in a generic multi word exchange field, or in contest specific fields that are displayed in the main dialog logging group.

![Figure 6.1 UI Contest](image)

<table>
<thead>
<tr>
<th>Contest Type</th>
<th>State/Province QSO Party</th>
<th>Out of St/Pr/Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generic contest</td>
<td>Alabama QSO Party</td>
<td>ALQP</td>
</tr>
<tr>
<td>Africa All-Mode International</td>
<td>Arizona QSO Party</td>
<td>AZQP</td>
</tr>
<tr>
<td>ARRL Field Day</td>
<td>Arkansas QSO Party</td>
<td>ARQP</td>
</tr>
<tr>
<td>ARRL International DX (cw)</td>
<td>British Columbia QSO Party</td>
<td>BCQP</td>
</tr>
<tr>
<td>ARRL Jamboree on the Air</td>
<td>California QSO Party</td>
<td>CAQP</td>
</tr>
<tr>
<td>ARRL Kids Day</td>
<td>Colorado QSO Party</td>
<td>COQP</td>
</tr>
<tr>
<td>ARRL Rookie Roundup</td>
<td>Delaware QSO Party</td>
<td>DEQP</td>
</tr>
<tr>
<td>ARRL RTTY Roundup</td>
<td>Florida QSO Party</td>
<td>FLQP</td>
</tr>
<tr>
<td>ARRL School Club Roundup</td>
<td>Georgia QSO Party</td>
<td>GAQP</td>
</tr>
<tr>
<td>ARRL November Sweepstakes</td>
<td>Hawaii QSO Party</td>
<td>HIQP</td>
</tr>
<tr>
<td>Winter FD</td>
<td>Idaho QSO Party</td>
<td>IDQP</td>
</tr>
<tr>
<td>BARTG RTTY contest</td>
<td>Illinois QSO Party</td>
<td>ILQP</td>
</tr>
<tr>
<td>CQ WPX</td>
<td>Indiana QSO Party</td>
<td>INQP</td>
</tr>
<tr>
<td>Event Type</td>
<td>State QSO Party</td>
<td>Abbreviation</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>CQ WW DX</td>
<td>Iowa QSO Party</td>
<td>IAQP</td>
</tr>
<tr>
<td>CQ WW DX RTTY</td>
<td>Kansas QSO Party</td>
<td>KYQP</td>
</tr>
<tr>
<td>Italian A.R.I. International DX</td>
<td>Kentucky QSO Party</td>
<td>KYQP</td>
</tr>
<tr>
<td>North American QSO Party</td>
<td>Louisiana QSO Party</td>
<td>LAQP</td>
</tr>
<tr>
<td>North American Sprint</td>
<td>Maine QSO Party</td>
<td>MEQP</td>
</tr>
<tr>
<td>Ten Ten</td>
<td>Maryland QSO Party</td>
<td>MDQP</td>
</tr>
<tr>
<td>VHF</td>
<td>Michigan QSO Party</td>
<td>MIQP</td>
</tr>
<tr>
<td></td>
<td>Minnesota QSO Party</td>
<td>MNQP</td>
</tr>
<tr>
<td></td>
<td>Missouri QSO Party</td>
<td>MOQP</td>
</tr>
<tr>
<td></td>
<td>Mississippi QSO Party</td>
<td>MSQP</td>
</tr>
<tr>
<td></td>
<td>Montana QSO Party</td>
<td>MTQP</td>
</tr>
<tr>
<td></td>
<td>Nebraska QSO Party</td>
<td>NEQP</td>
</tr>
<tr>
<td></td>
<td>New Jersey QSO Party</td>
<td>NJQP</td>
</tr>
<tr>
<td></td>
<td>New Mexico QSO Party</td>
<td>NMQP</td>
</tr>
<tr>
<td></td>
<td>New York QSO Party</td>
<td>NYQP</td>
</tr>
<tr>
<td></td>
<td>North Carolina QSO Party</td>
<td>NCQP</td>
</tr>
<tr>
<td></td>
<td>North Dakota QSO Party</td>
<td>NDQP</td>
</tr>
<tr>
<td></td>
<td>Ohio QSO Party</td>
<td>OHQP</td>
</tr>
<tr>
<td></td>
<td>Oklahoma QSO Party</td>
<td>OKQP</td>
</tr>
<tr>
<td></td>
<td>Ontario QSO Party</td>
<td>ONQP</td>
</tr>
<tr>
<td></td>
<td>Pennsylvania QSO Party</td>
<td>PAQP</td>
</tr>
<tr>
<td></td>
<td>South Carolina QSO Party</td>
<td>SCQP</td>
</tr>
<tr>
<td></td>
<td>South Dakota QSO Party</td>
<td>SDQP</td>
</tr>
<tr>
<td></td>
<td>Tennessee QSO Party</td>
<td>TNQP</td>
</tr>
<tr>
<td></td>
<td>Texas QSO Party</td>
<td>TXQP</td>
</tr>
<tr>
<td></td>
<td>Vermont QSO Party</td>
<td>VTQP</td>
</tr>
<tr>
<td></td>
<td>Virginia QSO Party</td>
<td>VAQP</td>
</tr>
<tr>
<td></td>
<td>Washington Salmon Run QSO Party</td>
<td>WAQP</td>
</tr>
<tr>
<td></td>
<td>Wisconsin QSO Party</td>
<td>WIQP</td>
</tr>
<tr>
<td></td>
<td>West Virginia QSO Party</td>
<td>WVQP</td>
</tr>
<tr>
<td></td>
<td>7QP QSO Party</td>
<td>7QP</td>
</tr>
</tbody>
</table>
6.1 Contesting with fldigi's built-in logbook

Select the contest type from the Contest combo:

![Figure 6.2 UI Contest](image)

If you select the State QSO parties, you need to make a second selection for the specific state, province, area, or region contest in which you will be participating.

![Figure 6.3 UI Contest](image)

The serial number out (#Out) is automatically initialized and updated by the built-in serial number generator. You can enter the appropriate exchange information via the keyboard or mouse. Text in the Rx pane can be selected by mouse left-click/right-click. Make your selection and the info is placed in the correct text box. Note that the popup menu changes with the QSO logging view and also with a change in "Quick entry". A full description is found in the description of operating the Logbook. The important thing to note for contest operation is that the Call and Serial # are single word captures. The Xchg capture can be either single word or multiple word (mark/right click). If the Xchg field has text contents then the new capture is appended to end of the current text in that field. That means you can point to the word representing the field, right click and select from the menu. You do not need to highlight the text for the word capture. You can very rapidly fill in the serial number and the exchange data (even if multi value) by simply pointing and right clicking on the desired word.

Set up the Generic contesting on the UI/Contest tab. The Send Xchg control is the text you want the appropriate macro tag. ie...if the contest requires RST and name you would fill in the Exchange Out box with your name. The contents of this field are accessed from a macro with the `<XOUT>` tag. You will also need to check the RST always 599 box as this is the de-facto signal report in contests.

If you are participating in a CW contest you may want to select the "Send CW cut numbers", cut numbers is the norm for a CW contest. The cut numbers will send N for 9 and T for zero.
The next box contains the needed requirements to use serial numbers for a contest. You will always want to use leading zeros, start with 1 and use 3 digits. Press reset to initialize the #Out QSO field to the Start number.

Check the appropriate fields for determining if this is a duplicate call. If a duplicate is detected the Call entry will be highlighted as shown in the “Dup Color” button. Pressing this button opens a color selector so you may customize the color. There are many choices to alert you to a duplicate contact. The duplicate is based on the logical AND of all of the fields to be checked. The DUPE is cleared when you press the clear QSO log button (the brush icon).

After you have filled in all the required information, make sure you save and close.

Remember YOU MUST click the Reset button in the Serial number panel for the serial number counter to be initialized. You should also press the QSO clear button (broom) in the QSO entry widget for the other changes to take effect.

It would be best to create a new log for each contest. You create a new log by selecting the menu item File/Logs/New logbook. The default new log name will be newlog.adif on Linux and newlog.adl on Windows. You can rename the new log file now or later by using the system file manager or when you save the log. The import/export feature of fldigi will allow you to export the log into your everyday logging software or the built-in fldigi logbook.

You can check for duplicates by any combination of the specified named fields. You can also specify that the duplicate had to occur within a given time interval. Some VHF contests allow a duplicate CALL after a given time interval.

6.1.1 Field Day Contest

The log fields and associated Rx Text popup menu changes to appropriate fields when the Field Day check box is enabled on the contest configuration tab:

The field day station station callsign is your fldigi user callsign. Enter the operator's call (if different). Enter the Class and Section for your station. These will all be available as macro tags for writing macros appropriate for participating in the field day event.

fldigi can connect to external Field Day logging programs such as N3FJP's FDL and/or a TclTk application called "fdserver" that is a part of the family of fldigi programs. Fdserver operation is described in a separate document.

Additional instructions on the field day server is available at Field Day Server setup.

6.1.2 Capturing Rx data strings

Capturing exchange text from the Rx text panel has been simplified for contest operations. All text capture is based on a single mouse left click on the word of interest, or on the first word in a sequence:

- LEFT click - capture single word
- SHIFT LEFT click - capture two words
- CONTROL LEFT click - capture three words
6.2 Contest Macros

This section contributed by W3NR, Ed

It is recommended that you make a separate macro file for contesting. Start with the generic set of macros and modify them as described in this section. Then save the modified macros with a suitable file name such contest.mdf. This will give you 48 macros to use based on the type of contest you are entering.

Take a good look at the following examples and you will notice there are no commas, hyphens or other extraneous items. Your contest exchange should be brief and concise. These are examples of what not to do:

- w3nr you are 599 in Alabama your serial number is 001-001-001 how copy ?
- hello ed thanks for the call you are 599-599-001-001 QTH Alabama back to you

Capturing data from that kind of exchange is nearly impossible. Contest macros should be written to expedite the exchange of data.

When you enter a contest you have to decide whether you are going to sit on one frequency and call CQ (Run) or are you going to tune the band looking for stations to work (S&P). So lets set up some macros that should cover both cases.

Several new macro tags have been created to facilitate contesting, these include the following tags.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;LOG&gt;</td>
<td>add QSO data to the logbook &amp; clear the QSO data fields</td>
</tr>
<tr>
<td>&lt;CNTR&gt;</td>
<td>insert current contest serial number into the text stream</td>
</tr>
<tr>
<td>&lt;INCR&gt;</td>
<td>increment contest serial number</td>
</tr>
<tr>
<td>&lt;DECR&gt;</td>
<td>decrement contest serial number</td>
</tr>
<tr>
<td>&lt;XOUT&gt;</td>
<td>contest exchange</td>
</tr>
<tr>
<td>&lt;QSOTIME&gt;</td>
<td>current log time in Zulu HHMM format</td>
</tr>
<tr>
<td>&lt;LDT&gt;</td>
<td>local date time</td>
</tr>
<tr>
<td>&lt;ILDTP&gt;</td>
<td>LDT in iso-8601 format</td>
</tr>
<tr>
<td>&lt;ZDT&gt;</td>
<td>Zulu date time</td>
</tr>
<tr>
<td>&lt;IZDT&gt;</td>
<td>ZDT in iso-8601 format</td>
</tr>
<tr>
<td>&lt;QSOTIME&gt;</td>
<td>actual time of execution of the macro ... useful where exact times are used to match contest log submissions</td>
</tr>
<tr>
<td>&lt;SAVEXCHG&gt;</td>
<td>save entire contents of the expanded macro text to the &quot;Exchange Out&quot; field in the logbook</td>
</tr>
<tr>
<td>&lt;XBEG&gt;</td>
<td>mark the beginning of a text string that is to be saved to the &quot;Exchange Out&quot; field in the logbook</td>
</tr>
<tr>
<td>&lt;XEND&gt;</td>
<td>mark the end of the text string that is to be saved to the &quot;Exchange Out&quot; field in the logbook</td>
</tr>
</tbody>
</table>

Note: <SAVEXCHG> and the <XBEG>...<XEND> macro tags are mutually exclusive. <XBEG>...<XEND> is given priority if all three are specified in a single macro.
See Macros for additional information on editing and using the fldigi macro system.

### 6.2.1 RUN Macros

We need just a few, starting with a CQ macro - Put this in the F1 key definition

```xml
<TX>
cq test de <MYCALL>  <MYCALL>  cq k
</RX>
```

Notice that I left 2 spaces between my call and 3 spaces at the end before the k. This will make it easier for a station to grab my call and the k on the end eliminates garbage characters before my macro finishes. The tx/rx are on separate lines as I want to be sure my macro is on a line by itself and not mixed in with screen garbage. This does not apply to the CW mode as there is no CR/LF function in CW. fldigi will convert the CR/LF to a space in the CW mode.

Now the exchange macro - Put this in the F2 key definition

```xml
<TX>
<CALL> 599  <CNTR>  <CNTR>  <XOUT>  <XOUT>  <CALL>  k
</RX>
```

Why do I have his call at the beginning as well as the end, to make sure I have copied his call correctly. You will also see that I have not as yet logged the contact, why, well are you sure he does not need to correct his call or ask for a repeat.

You are asked to repeat the exchange, you can just re-send the exchange macro, this verifies all of the information. Now he sends you his info and if you have copied it correctly you need a TU macro. - Put this in the F3 key definition.

```xml
<TX>
qsl tu qrz test <MYCALL>  k
</RX><LOG><INCR>
```

Here we have done all the necessary items to complete the exchange. Notice that I did not log the contact until after everything was correct. I have fldigi set to clear on save, so when the <LOG> part of the macro executes the QSO area is cleared.

That's the end of my RUN macro setup, told you it was rather simplistic and generic.

### 6.2.2 S & P Macros

I rarely if ever use S&P, but there are times I need to, especially if my QSO rate drops while running. Again the macros are very generic with only the needed info. If band conditions warrant you may want to send your call 3 times. Put this in the F5 key definition

```xml
<TX>
<MYCALL>  <MYCALL>  k
</RX>
```

Why just my call ?? Well I assume the other guy already knows his call!

The exchange macro is basically the same as the RUN macro. Put this one in the F6 key definition

```xml
<TX>
599  <CNTR>  <CNTR>  <XOUT>  <XOUT>  k
</RX>
```

As you see I have not as yet logged the QSO or incremented the serial number. This is the final S&P macro. Put this one in the F7 key definition.

```xml
<LOG><INCR>
```

Now this is the most important macro you will ever need......trust me. Put it where you won't fail to find it. How about F9 ?
You will see that it is used many times during a contest, especially with weak stations and heavy QRN/QRN.

- `<QSOTIME>` - time sent in Tx stream
  - repeat execution of `<QSOTIME>` before a `<LOG>` macro or a save to log button press will resend the original time

- `<LOG>` macro or a save-to-log button press appends the QSOTIME to the STX_STRING field in the adif log record and clears the QSOTIME.

- `<XBEG>` - use at end of a contest exchange to save the entire exchange string in STX_STRING
  - usurps QSOTIME if both are contained in same macro text, ie:
    "<RST> <CNTR> <QSOTIME> <SAVEXCHG>" will send the exchange as
    599 024 1125
    if RST = 599, Counter = 024 and time of execution is 1125
  - repeats the same as `<QSOTIME>`

- `<LOG>` - or a save-to-log button press saves the associated macro text (after expansion).
  - QSOTIME and the saved exchange text are cleared after the save occurs.

An example of the SAVEXCHG macro tag

```
<RST> <CNTR> <XOUT> <QSOTIME><SAVEXCHG>
```

Where RST = 599, CNTR = 0125, XOUT = AL, QSOTIME = 1433

Will save this string to the Exchange Out field in the logbook: "599 0125 AL 1433"

Please note that you should not include any text or macro tags that are not to be a part of Exchange Out. If your macro had this:

```
<TX><CALL> UR <RST> <CNTR> <XOUT> <QSOTIME> de <MYCALL> k<RX><SAVEXCHG>
```

Where CALL = W3NR, MYCALL = W1HKJ

the saved Exchange Out field would contain: "W3NR UR 599 0125 AL 1433 de W1HKJ k"

Probably not what you want. Use separate function keys for the "<TX><CALL>..." and the "de <MYCALL> k<RX>..." or use the next set of macro tags

```
<XBEGIN>...<XEND>
```

These two macro tags are delimiters for capturing the transmitted exchange data, for example:

```
<TX><CALL> de <MYCALL> QSL <XBEG><RST> <CNTR> <QSOTIME><XEND> K<RX>
```

Will place the expanded `<RST> <CNTR> <QSOTIME>` into the Exchange Out field of the logbook when the contact is saved. This is much better illustrated with a screen shot. This one shows the macro editor contents, the logbook entry in Exchange Out, and the transmit text buffer.
6.3 Contesting with N3FJP logger connection

Fldigi and the N3FJP logging software have been interfaced to form a very powerful combination that allows the avid contester to perform CW and digital communications in the most popular ARRL, National, International, and State contests. This combination also assists the Handi-ham in communicating in CW. They allow the operator to send and receive contest exchanges as well as control their rig. The N3FJP logger behaves as a log data base server and fldigi the modem client for the purposes of data exchange. The N3FJP logger can reside either on the same host computer (Windows) or on a LAN connected Windows host computer. The fldigi/N3FJP combination has been tested on a single Windows 7/8/10 computer, and on a LAN with fldigi running on a second Windows computer, a Linux computer, and an Apple OS-X computer.

Although the contests are varied, certain parts of the set up are the same for all. These include the Sound Card (Rig Interface such as Rig Blaster, Signalink, or home brew) and the API (Application Program Interface.), and transceiver control. Both fldigi and the N3FJP program can provide transceiver control. You should use fldigi / flrig for transceiver control as then can provide a broader range of control functions.

The N3FJP logger will maintain and provide the SENT serial number to fldigi. That serial number will be used in all macros which reference the sent serial number.

The N3FJP logger software is independently sold and distributed by Scott and Kimberly Davis. Download the appropriate logging software from http://www.n3fjp.com.

Either fldigi or the N3FJP logger can be started first. When so configure fldigi will periodically attempt to connect to the logger. The two programs can reside on a single or multiple computers with LAN access. The N3FJP logger will only run on an MS operating system. fldigi can be on any of the supported operating systems. The connection has been tested between Linux, OS X, and MS operating systems.
6.3 Contesting with N3FJP logger connection

6.3.1 N3FJP logger setup

- Click on Setup and configure your station information.
- Set up API. This is necessary even if both fldigi and the logger are on the same machine. Select API from the Setup menu. Check the box in the upper section for API port 1100.

6.3.2 Fldigi setup

- Open configuration dialog to the UI/Logs/N3FJP... tab

![Figure 6.5 N3FJP connect](image)

- Enter the LAN address, either as the machine name or it’s numeric uniform resource locator, i.e: LENOVO-DUALBOOT (192.168.1.81)
  - If both fldigi and the N3FJP logger are on the same Windows computer, then the machine address is 127.0.0.1.
- Check the box “Enable data stream” to view the connect and data transfer process.
- Check the “Connect” box

Fldigi should connect to the logger with a few seconds. You will see the connect stream processing as above, and the GREEN connect triangle should illuminate.

Disconnecting is as simple as unchecking the “Connect” box.

Fldigi’s contest selectors will be set by the initial information exchange with the N3FJP logger. Exiting the N3FJP logger and starting a different one will be reflected in fldigi’s contest configuration almost immediately. The fldigi main dialog title bar and the fldigi logging controls will reflect the change in contest usage. Here is an example for an automatic connection to the CQ WW DX contest

![Figure 6.6 CQ WWDX contest](image)
fldigi will query the N3FJP logger for duplicate checks. Both the N3FJP logger and the fldigi logging control for CALL should provide a duplicate indication.

For more information on fldigi/N3FJP loggers see N3FJP Log/Contest Setup.
Fidigi supports a full range of contests. Each contest's unique data exchange is captured either in a generic multi-word exchange field, or in contest specific fields that are displayed in the main dialog logging group.

- Generic contest
- Africa All-Mode International
- ARRL Field Day
- ARRL International DX (cw)
- ARRL Jamboree on the Air
- ARRL Kids Day
- ARRL Rookie Roundup
- ARRL RTTY Roundup
- ARRL School Club Roundup
- ARRL November Sweepstakes
- ARRL Winter FD
• BARTG RTTY contest
• CQ WPX
• CQ WW DX
• CQ WW DX RTTY
• Italian A.R.I. International DX
• North American QSO Party
• North American Sprint
• Ten Ten
• VHF

State QSO parties
• Alabama QSO Party, ALQP (Out of State)
• Arizona QSO Party, AZQP (Out of State)
• Arkansas QSO Party, ARQP (Out of State)
• British Columbia QSO Party, BCQP (Out of Province)
• California QSO Party, CAQP (Out of State)
• Colorado QSO Party, COQP (Out of State)
• Delaware QSO Party, DEQP (Out of State)
• Florida QSO Party, FLQP (Out of State)
• Georgia QSO Party, GAQP (Out of State)
• Hawaii QSO Party, HIQP (Out of State)
• Idaho QSO Party, IDQP (Out of State)
• Illinois QSO Party, ILQP (Out of State)
• Indiana QSO Party, INQP (Out of State)
• Iowa QSO Party, IAQP (Out of State)
• Kansas QSO Party, KSQP (Out of State)
• Kentucky QSO Party, KYQP (Out of State)
• Louisiana QSO Party, LAQP (Out of State)
• Maine QSO Party, MEQP (Out of State)
• Maryland QSO Party, MDQP (Out of State)
• Michigan QSO Party, MIQP (Out of State)
• Minnesota QSO Party, MNQP (Out of State)
• Missouri QSO Party, MOQP (Out of State)
• Mississippi QSO Party, MSQP (Out of State)
• Montana QSO Party, MTQP (Out of State)
• North Carolina QSO Party, NCQP (Out of State)
• Nebraska QSO Party, NEQP (Out of State)
• New Jersey QSO Party, NJQP (Out of State)
• New Mexico QSO Party, NMQP (Out of State)
• New York QSO Party, NYQP (Out of State)
• North Dakota QSO Party, NDQP (Out of State)
• Ohio QSO Party, OHQP (Out of State)
• Oklahoma QSO Party, OKQP (Out of State)
• Ontario QSO Party, ONQP (Out of Province)
• Pennsylvania QSO Party, PAQP (Out of State)
• South Carolina QSO Party, SCQP (Out of State)
• South Dakota QSO Party, SDQP (Out of State)
• Tennessee QSO Party, TNQP (Out of State)
• Texas QSO Party, TXQP (Out of State)
• Vermont QSO Party, VTQP (Out of State)
• Virginia QSO Party, VAQP (Out of State)
• Washington Salmon Run QSO Party, WAQP (Out of State)
• Wisconsin QSO Party, WIQP (Out of State)
• West Virginia QSO Party, WVQP (Out of State)
• 7QP QSO Party, 7QP (Out of Region)
• New England QSO Party, NEQP (Out of Region)

Select the contest type from the Contest combo:

![Contest combo](Figure 7.2 UI Contest)

If you select the State QSO parties, you need to make a second selection for the specific state, area, region contest in which you will be participating.
Enter the exchange you want to send. You can force the RST in/out to always be 599. That seems to be a norm for many contests. When operating in a CW contest you can have fldigi send cut numbers, T for 0, N for nine. The serial number can be set to use leading zeros. You can specify the starting number for the sequence and how many digits are sent, i.e.: 0024. Pressing Reset will set the starting number to the QSO logging serial out field. See Contest How To for more info.

You can check for duplicates by any combination of the specified named fields. You can also specify that the duplicate had to occur with a given time interval. Some VHF contests allow a duplicate CALL after a given time interval.

7.1 Contesting with N3FJP logger connection

Fldigi and the N3FJP logging software have been interfaced to form a very powerful combination that allows the avid contester to perform CW and digital communications in the most popular ARRL, National, International, and State contests. This combination also assists the Handi-ham in communicating in CW. They allow the operator to send and receive contest exchanges as well as control their rig. The N3FJP logger behaves as a log data base server and fldigi the modem client for the purposes of data exchange.

Since the contests differ greatly in their exchanges, these instructions will be rather lengthy and will have many screen shots. These instructions will be broken down by contests that are similar and require similar settings. Although the contests are varied, certain parts of the set up are the same for all. These include the Sound Card (Rig Interface such as Rig Blaster, Signalink, or home brew) and the API (Application Program Interface.)

The first thing that you will need to do is to bring up the N3FJP program for the contest that you want to participate in. To do this go to [http://www.n3fjp.com](http://www.n3fjp.com) and select it from the Contest Logs drop down menu. The N3FJP logger software is independently sold and distributed by Scott and Kimberly Davis. Either fldigi or the N3FJP logger can be started first. When so configure fldigi will periodically attempt to connect to the logger. The two programs can reside on a single or multiple computers with LAN access. The N3FJP logger will only run on an MS operating system. fldigi can be on any of the supported operating systems. The connection has been tested between Linux, OS X, and MS operating systems.

7.1.1 N3FJP logger setup

- Click on Setup and configure your station information.
- Set up API. This is necessary even if both fldigi and the logger are on the same machine. Select API from the Setup menu.
- Check the box in the upper section for API port 1100.

7.1.2 Fldigi setup

- Open configuration dialog to the UI/Logs/N3FJP... tab
7.1 Contesting with N3FJP logger connection

- Enter the LAN address, either as the machine name or it's numeric uniform resource locator, i.e: LENOVO-DUALBOOT (192.168.1.81)
- Check the box “Enable data stream” to view the connect and data transfer process.
- Check the “Connect” box

fldigi should connect to the logger with a few seconds. You will see the connect stream processing as above, and the GREEN connect triangle should illuminate. Disconnect is as simple as unchecking the “Connect” box. fldigi will follow suite as you stop and start various N3FJP loggers. The fldigi main dialog title bar and it’s logging controls will reflect the change in contest usage. Here is an example for an automatic connection to the CQ WW DX contest

Figure 7.4 N3FJP connect

Figure 7.5 CQ WWDX contest

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Chapter 8

Configure Scripting

8.1 Configure Scripting

Figure 8.1 Scripts

WARNING:

If you do anything with this option, ensure FLDIGI is configured to your preferences. Then generate a restore script. In doing so, any alterations performed below can be returned to it's intended state.

NOTICE:

Because of different hardware and Operating Systems it's advisable to avoid commands that are hardware/OS dependent when creating standard configuration scripts.

Configure scripting uses:

- Configuring FLDigi to support a specific net operation.
- Restore user data when issues with FLdigi requires the deletion or reset of fldigi.prefs and fldigi_def.xml files.

Net Operations

A script can be created for setting the rig frequency, waterfall offset, modem, rig mode, and custom macros. See Configure Script Commands for other available options.

Configuration Reset

After reset, a configure script can be executed to restore User Data. The commands available do not support a full restore. Some option may need manual entry. See Configure Script Commands for limits.

8.1.1 Executing Scripts

From FLDigi's main window select menu item File->Config Scripts->Execute. This will bring up a file browser. Search and select the file in question, then press [Open]. At this point the script will execute.
If problems are encountered the above dialog box is used to inform the user. To ascertain the extent of the issue(s), select menu item Help -> Event Log. The log entries will contain the reason and line number for each reported error. Some issues reported are the result of preset data that is specific to a particular operating system. These can be safely ignored until configured to operate on your system.

Some configuration options will required FLDigi restart. Ensure configuration is saved prior to restarting.

NOTE:
Some script commands are specific to operating system and hardware combination. If your system does not support these commands, they will be ignored. The easiest way to determine what your system supports is to generate a script and note it's content.

8.1.2 Generating Scripts

To generate a script the operator selects FLDigi's menu items File -> Config Scripts -> Generate. A file save dialog box is opened for the user to select a name and where the file is saved. Pressing [Save] initiates the process. To create custom scripts there are two ways of doing this. With a Text editor (see Scripting Syntax) or changing the content/settings of FLDigi prior to the script generation. If the latter is used, your are advised to generate a script prior to changing any of FLDigi's settings. Just in case restoration is needed. Prior to editing any script file, take the time to read the relevant sections of this document. See Scripting Syntax and Example Script

NOTE:
Generated script contents are specific to the operating system and hardware available on the host machine. If a device is not supported on your system, script code will not be generated for it.
8.2 Configure Script Commands

FLDIGI

| FREQ | MODE | WFDZ | RXID | TXID | SPOT | REV | AFC | LOCK | SQL | KPSQL | MODEM |

OPERATOR

| CALLSIGN | NAME | QTH | LOC | ANT |

AUDIO DEVICE

| OSS | OSS DEV | PA | PA PLAYBACK | PA CAPTURE | PUA | PUA SERVER |

AUDIO SETTINGS

| CAPTURE | PLAYBACK | CONVERTER | RX PPM | TX PPM | TX OFFSET |

AUDIO RT CHANNEL

| MONO AUDIO | MODEM LR | REV LR | PTT RT CHAN | QSK RT CHAN | FSK RT CHAN |

AUDIO WAVE.SRATE

| PTT RT CHAN | SERIAL PORT | DEVICE | RTS | DTR | RTSV | DTRV | START PTT DELAY | END PTT DELAY | UHROUTER | PARALLEL | INIT |

RIGCAT

| STATE | DESC FILE | DEV PATH | RETRIES | RETRY INT | WDELAY | IDELAY | BRATE | SBITS | ECHO | TOGGLE RTS PTT | TOGGLE DTR PTT | RESTORE | PTT COMMAND | RTS 12V | DTR 12V | HRDWR FC | VSP | INIT |

HAMLIB

| STATE | RIG | DEV PATH | RETRIES | RETRY INT | WDELAY | PWDELAY | BRATE | SBITS | SBAND | PTT COMMAND | DTR 12V | RTS 12V | HRDWR FC | SFTWR FC | ADV CONF | INIT |

XMLRPC RC

| STATE | BWDELAY | INIT |

IO

| LOCK | PORT | CSMA | KISS | KISS.IPA | KISS.IOPN | KISS.OPN | KISS.DP | KISS.BUSY | KISS.CONT | KISS.ATTEN | ARQ | ARQ.IPA | ARQ.IOPN | XMLRPC | XMLRPC.IPA | XMLRPC.IOPN |

MISC NBEMS
8.3 Scripting Syntax

The script syntax is formatted into a multi-tier system using two variations. The first is a structured syntax. The second uses a hierarchy system employing dot ‘.’ notation. The command text used closely mimics the GUI configuration panel tabs hierarchy and contents to easily discern the connection between commands and the effected settings.

8.3.1 Structured Commands

Each command ends with a colon (‘:’). This separates the command section with the parameter section. A command may or may not contain a parameter. Structured statements are terminated using "END:" statement.

```plaintext
<TOP_TIER>:
<SUB_TIER>:<Parameter>
<SUB_TIER>:<No Parameter>
END:
```

8.3.2 Dot Notation Commands

Each command ends with a colon (‘:’). This separates the command section with the parameter section. A command may or may not contain a parameter. The inclusion of a period (‘.’) within the command section denotes the separation of upper and lower tier segments.

```plaintext
<TOP_TIER>.<SUB_TIER>,...:<Parameter>
<TOP_TIER>.<SUB_TIER>,...:<No Parameter>
```

8.3.3 Parameters

Parameter content varies on the command used. The various parameters types are:

- **Integers** (whole numbers, ie 0, 10, 100, 234).
- **Real Numbers** (floating point numbers, ie 1.2, 10.3).
- **Characters Strings** (one or more words, "Madison, AL", "Toney, AL").

8.3.4 Script Files

The script file name is expected to contain a .txt extension. The editing of these files must utilize a true text editor¹. Preferably one that understands the various line ending sequences used between the different Operating Systems.
8.4 FLDigi Commands

8.4 FLDigi Commands

The first line in the script file must contain "FLDIGI_CONFIG" tag. This is used to verify the "text" file is a configuration script for FLDigi. If it's not present the file will not be processed.

- One command : parameter pair per line.
- Command indentations with spaces or tabs are not required (cosmetic).
- Parameters are separated by a comma ','.
- Parameters regardless of type can be encapsulated in quotes (" "). However, if a parameter contains spaces or commas it must be encapsulated.
- One or more commands per file.
- One or more empty lines per file.
- Any text entry after the '#' pound sign is considered a 'comment' and will be ignored.

Note: 1
Windows: Notepad++, Geany
Macintosh: TextWrangler
Linux: Geany, Gedit, Pluma

http://en.wikipedia.org/wiki/Category:Linux_text_editors

8.4 Frequency Control

Frequency Control

Sets the RF Carrier frequency (effects rig control).
FREQ:<Real Number>
<Real Number> values are entered directly or as exponential notation. The following frequencies represent the same frequency value.
Frequency Value = Parameter Syntax

- 14.070 MHz = 14.070e+06
- 14070.00 KHz = 14070.0e+03 - Using this exponent magnitude represents the scale of the frequency display
- 14070000 Hz = 14070000 - Directly in Hz

8.4.2 Mode

Mode

Sets the rig modulation mode (ie. USB, LSB, FM, etc). The actual values are dependent on the rig and the interface used.
MODE:<Character String>

8.4.3 Waterfall Offset (Hz)

Waterfall Offset (Hz)

Sets the audio tone offset in the waterfall.
WFHZ:<Integer>
Valid values range from 0 - 4000 +/- 50% of the bandwidth needed for the selected modem.
8.4.4 RxID
Enable or disable the use of RSID reception.
RXID:<ENABLE | DISABLE>

8.4.5 TxID
Enable or disable the use of RSID transmission.
TXID:<ENABLE | DISABLE>

8.4.6 Spot
Enable or disable the use of the PSKreporter mechanism.
SPOT:<ENABLE | DISABLE>

8.4.7 Rev
Enable or disable the use of upper and lower tone reversal. Allowing modems like MFSK to receive/transmit LSB signal while the rig is in USB. RSID will not decode when this option is selected and not all modems are supported.
REV:<ENABLE | DISABLE>

8.4.8 AFC
Enable or disable the use of Automatic Frequency Control.
AFC:<ENABLE | DISABLE>

8.4.9 Lk
Enable or disable the use of frequency lock. The behavior of this feature can be altered depending on the settings of the RSID / Video / ID Configuration panel.
LOCK:<ENABLE | DISABLE>

8.4.10 SQL
Enable or disable the use of the squelch.
SQL:<ENABLE | DISABLE>

8.4.11 KPSQL
Enable or disable the use of the KISS power squelch. This option is only available when KISS IO interface option is selected.
See Configure ARQ/KISS I/O
KPSQL:<ENABLE | DISABLE>

8.4.12 MODEM Control
Sets the desired modem to receive and transmit from. Some modems will not be available if KISS IO interface option is selected. See Mode Table under ‘mode’ column for proper modem parameter syntax.
MODEM:<Character String>

8.4.13 Examples

<table>
<thead>
<tr>
<th>Structured</th>
<th>Dot Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLDIGI:</td>
<td>FLDIGI.FREQ:3853.0e+03</td>
</tr>
<tr>
<td>FREQ:14.070e+06</td>
<td>END:</td>
</tr>
</tbody>
</table>
8.5 Operator Commands

See Configure Operator

8.5.1 Callsign:
OPERATOR.CALLSIGN:<Region Specific>

8.5.2 Name:
OPERATOR.NAME:<Your Name>

8.5.3 QTH:
OPERATOR.QTH:<City, State, Country, etc>

8.5.4 Locator:
Maidenhead Grid Locator. A series of alpha numerical characters representing a position on earth.
OPERATOR.LOC:<AAnnaann>
A: Uppercase characters
n: Numerical data (0-9)
a: Lowercase characters


8.5.5 Operators Antenna Description
OPERATOR.ANT:<Antenna type, height, etc>

8.5.6 Examples

<table>
<thead>
<tr>
<th>Structured</th>
<th>Dot Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPERATOR: CALLSIGN:KK5VD END:</td>
<td>OPERATOR.CALLSIGN:w1hkj</td>
</tr>
<tr>
<td>OPERATOR: NAME:Robert END:</td>
<td>OPERATOR.NAME:Dave</td>
</tr>
<tr>
<td>OPERATOR: QTH:&quot;Madison, AL&quot; END:</td>
<td>OPERATOR.QTH:&quot;Toney, AL&quot;</td>
</tr>
<tr>
<td>OPERATOR: LOC:EM64pr END:</td>
<td>OPERATOR.LOC:EM64</td>
</tr>
<tr>
<td>OPERATOR: ANT:&quot;Inverted 'V' @22FT AGL&quot; END:</td>
<td>OPERATOR.ANT:&quot;15 EL LP @ 200 FT AGL&quot;</td>
</tr>
</tbody>
</table>

8.6 Audio Device Commands
See Sound Card Configuration

8.6.1 OSS
Enable or disable OSS. This option is not available on all operating systems.
OSS:<ENABLE | DISABLE>

8.6.2 Device:
OSS DEV:<Character String>
Parameter: dev/path

8.6.3 PortAudio
Enable or disable Port Audio. This option may or may not be available to all operating systems.
PA:<ENABLE | DISABLE>

8.6.4 Playback:
The device name is specific to the hardware installed.
8.6 Audio Device Commands

PA PLAYBACK:<Integer>,<Character String>
Parameter: Menu Index, Device Name

Note:
Parameter Menu Index is specific to the fldigi/hardware combination. If the device name is available on other systems it will be set to the first occurrence of that device name.

8.6.5 Capture:
The device name is specific to the hardware installed.
PA CAPTURE:<Integer>,<Character String>

Note:
Parameter Menu Index is specific to the fldigi/hardware combination. If the device name is available on other systems it will be set to the first occurrence of that device name.

Parameter: Menu Index, Device Name

8.6.6 PulseAudio
Enable or disable Pulse Audio. This option is not available on all operating systems.
PUA:<ENABLE | DISABLE>

8.6.7 Server string:
PUA SERVER:<Character String>
Parameter: See Note: † below.

8.6.8 Examples

<table>
<thead>
<tr>
<th>Structured</th>
<th>Dot Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUDIO DEVICE: OSS:ENABLE END:</td>
<td>AUDIO DEVICE.OSS:ENABLE</td>
</tr>
<tr>
<td>AUDIO DEVICE: OSS DEV:/dev/path END:</td>
<td>AUDIO DEVICE.OSS DEV:/dev/path</td>
</tr>
<tr>
<td>AUDIO DEVICE: PA:ENABLE END:</td>
<td>AUDIO DEVICE.PA:ENABLE</td>
</tr>
<tr>
<td>AUDIO DEVICE: PA CAPTURE:2,&quot;USB Audio CODEC&quot; END:</td>
<td>AUDIO DEVICE.PA CAPTURE:2,&quot;USB Audio CODEC&quot;</td>
</tr>
<tr>
<td>AUDIO DEVICE: PA PLAYBACK:3,&quot;USB Audio CODEC&quot; END:</td>
<td>AUDIO DEVICE.PA PLAYBACK:3,&quot;USB Audio CODEC&quot;</td>
</tr>
<tr>
<td>AUDIO DEVICE: PUA:ENABLE END:</td>
<td>AUDIO DEVICE.PUA:ENABLE</td>
</tr>
<tr>
<td>AUDIO DEVICE: PUA SERVER:† END:</td>
<td>AUDIO DEVICE.PUA SERVER:†</td>
</tr>
</tbody>
</table>
8.7 Audio Settings

See Sound Card Configuration

8.7.1 Capture Audio Sample Rate

Set the input signal sample rate. The sample rate availability is dependent on the ADC hardware. Auto, Native, 8000,...
CAPTURE:<Character String>

8.7.2 Playback Audio Sample Rate

Set the output signal sample rate. The sample rate availability is dependent on the DAC hardware. Auto, Native, 8000,...
PLAYBACK:<Character String>

8.7.3 Converter

CONVERTER:<Character String> Best, Medium, Fastest, Linear

8.7.4 Receive Audio PPM Correction

RX PPM:<Integer> negative, 0, positive values

8.7.5 Transmit Audio PPM Correction

TX PPM:<Integer> negative, 0, positive values

8.7.6 Transmit Audio Hertz Offset Correction

TX OFFSET:<Integer> negative, 0, positive values (Hertz)

8.7.7 Examples

<table>
<thead>
<tr>
<th>Structured</th>
<th>Dot Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUDIO SETTINGS: CAPTURE:48000</td>
<td>AUDIO SETTINGS.CAPTURE:Auto</td>
</tr>
<tr>
<td>END:</td>
<td></td>
</tr>
<tr>
<td>AUDIO SETTINGS: PLAYBACK:8000</td>
<td>AUDIO SETTINGS.PLAYBACK:Native</td>
</tr>
<tr>
<td>END:</td>
<td></td>
</tr>
<tr>
<td>AUDIO SETTINGS: CONVERTER:&quot;Best&quot;</td>
<td>AUDIO SETTINGS.CONVERTER:&quot;Fastest&quot;</td>
</tr>
<tr>
<td>END:</td>
<td></td>
</tr>
<tr>
<td>AUDIO SETTINGS: RX PPM:17</td>
<td>AUDIO SETTINGS.RX PPM:17</td>
</tr>
<tr>
<td>END:</td>
<td></td>
</tr>
</tbody>
</table>
8.8 Audio Right Channel Commands

See Right Channel Audio Output

8.8.1 Mono audio output
Enable or disable monophonic signal output.
MONO AUDIO:<ENABLE | DISABLE>

8.8.2 Modem signal on left and right channels
Enable or disable audio signal to both left and right channels
MODEM LR:<ENABLE | DISABLE>

8.8.3 Reverse Left/Right channels
Enable or disable audio signal reversal on Left/Right channels.
REV LR:<ENABLE | DISABLE>

8.8.4 PTT tone on right audio channel
Enable or disable PTT use by suppling a signal on the right channel.
PTT RT CHAN:<ENABLE | DISABLE>

8.8.5 CW QSK signal on right channel
QSK RT CHAN:<ENABLE | DISABLE>

8.8.6 Pseudo-FSK on right audio channel
FSK RT CHAN:<ENABLE | DISABLE>

8.8.7 Examples

<table>
<thead>
<tr>
<th>Structured</th>
<th>Dot Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUDIO RT CHANNEL:</td>
<td>AUDIO RT CHANNEL.MONO AUDIO:DISABLE</td>
</tr>
<tr>
<td>MONO AUDIO:DISABLE</td>
<td>END:</td>
</tr>
<tr>
<td>AUDIO RT CHANNEL:</td>
<td>AUDIO RT CHANNEL.MODEM LR:DISABLE</td>
</tr>
<tr>
<td>MODEM LR:DISABLE</td>
<td>END:</td>
</tr>
<tr>
<td>AUDIO RT CHANNEL:</td>
<td>AUDIO RT CHANNEL.CONVERTER:&quot;Best&quot;</td>
</tr>
<tr>
<td>CONVERTER:&quot;Best&quot;</td>
<td>END:</td>
</tr>
</tbody>
</table>
8.9 Wav write sample rate

See WAV File Sample Rate
Sets the record wave file sample rate.

**AUDIO WAVE.SRATE:<Integer>**
Available Parameters: 8000, 11025, 16000, 22050, 24000, 44100, 48000

<table>
<thead>
<tr>
<th>Structured</th>
<th>Dot Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUDIO RT CHANNEL:</td>
<td>AUDIO RT CHANNEL.REV LR:DISABLE</td>
</tr>
<tr>
<td>REV LR:DISABLE</td>
<td></td>
</tr>
<tr>
<td>END:</td>
<td></td>
</tr>
<tr>
<td>AUDIO RT CHANNEL:</td>
<td>AUDIO RT CHANNEL.PTT RT CHAN:DISABLE</td>
</tr>
<tr>
<td>PTT RT CHAN:DISABLE</td>
<td></td>
</tr>
<tr>
<td>END:</td>
<td></td>
</tr>
<tr>
<td>AUDIO RT CHANNEL:</td>
<td>AUDIO RT CHANNEL.QSK RT CHAN:DISABLE</td>
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<tr>
<td>QSK RT CHAN:DISABLE</td>
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</tr>
<tr>
<td>END:</td>
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</tr>
<tr>
<td>AUDIO RT CHANNEL:</td>
<td>AUDIO RT CHANNEL.FSK RT CHAN:DISABLE</td>
</tr>
<tr>
<td>FSK RT CHAN:DISABLE</td>
<td></td>
</tr>
<tr>
<td>END:</td>
<td></td>
</tr>
</tbody>
</table>

8.10 Hardware PTT Option Commands

8.10.1 PTT tone on right audio channel

**PTT RT CHAN:<ENABLE | DISABLE>**

8.10.2 Use separate serial port PTT

**SERIAL PORT:<ENABLE | DISABLE>**

8.10.3 Device:

**DEVICE:<Character String>**
Parameter: A device path (/dev/ptt)

8.10.4 Use RTS

**RTS:<ENABLE | DISABLE>**

8.10.5 Use DTR

**DTR:<ENABLE | DISABLE>**
8.10.6 RTS = +V
RTSV:<ENABLE | DISABLE>

8.10.7 DTR = +V
DTRV:<ENABLE | DISABLE>

8.10.8 PTT delays valid for all CAT/PTT types
START PTT DELAY:<Integer>

8.10.9 PTT delays valid for all CAT/PTT types
END PTT DELAY:<Integer>

8.10.10 Use uHRouter PTT
UHROUTER:<ENABLE | DISABLE>

8.10.11 Use parallel port PTT
PARALLEL:<ENABLE | DISABLE>

8.10.12 Initialize Changes
INIT:

8.10.13 Examples

<table>
<thead>
<tr>
<th>Structured</th>
<th>Dot Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIG HRDWR PTT: PTT RT CHAN:DISABLE END:</td>
<td>RIG HRDWR PTT.PTT RT CHAN:DISABLE</td>
</tr>
<tr>
<td>RIG HRDWR PTT: SERIAL PORT:DISABLE END:</td>
<td>RIG HRDWR PTT.SERIAL PORT:DISABLE</td>
</tr>
<tr>
<td>RIG HRDWR PTT: DEVICE:/dev/ptt END:</td>
<td>RIG HRDWR PTT.DEVICE:COM1</td>
</tr>
<tr>
<td>RIG HRDWR PTT: RTS:DISABLE END:</td>
<td>RIG HRDWR PTT.RTS:DISABLE</td>
</tr>
<tr>
<td>RIG HRDWR PTT: RTSV:DISABLE END:</td>
<td>RIG HRDWR PTT.RTSV:DISABLE</td>
</tr>
<tr>
<td>RIG HRDWR PTT: DTR:DISABLE END:</td>
<td>RIG HRDWR PTT.DTR:DISABLE</td>
</tr>
<tr>
<td>RIG HRDWR PTT: DTRV:DISABLE END:</td>
<td>RIG HRDWR PTT.DTRV:DISABLE</td>
</tr>
<tr>
<td>RIG HRDWR PTT: PARALLEL:DISABLE END:</td>
<td>RIG HRDWR PTT.PARALLEL:DISABLE</td>
</tr>
<tr>
<td>RIG HRDWR PTT: UHROUTER:DISABLE END:</td>
<td>RIG HRDWR PTT.UHROUTER:DISABLE</td>
</tr>
</tbody>
</table>
8.11 RIGCAT Commands

See RigCAT xcvr control

8.11.1 Use RigCAT

STATE: <ENABLE | DISABLE>

8.11.2 Rig description file:

DESC FILE: <Character String>
Parameter: directory/path/file.xml

8.11.3 Device:

DEV PATH: <Character String>
Parameter: /dev/path

8.11.4 Retries

RETRIES: <integer>

8.11.5 Retry interval (ms)

RETRY INT: <integer>

8.11.6 Write delay (ms)

WDELAY: <integer>

8.11.7 Init delay (ms)

IDELAY: <integer>

8.11.8 Baud rate:

BRATE: <integer>

8.11.9 Stopbits

SBITS: <integer>
8.11.10 Commands are echoed

ECHO:<ENABLE | DISABLE>

8.11.11 Toggle RTS for PTT

TOGGLE RTS PTT:<ENABLE | DISABLE>

8.11.12 Toggle DTR for PTT

TOGGLE DTR PTT:<ENABLE | DISABLE>

8.11.13 Restore Settings on Close

RESTORE:<ENABLE | DISABLE>

8.11.14 CAT command for PTT

PTT COMMAND:<ENABLE | DISABLE>

8.11.15 RTS +12 v

RTS 12V:<ENABLE | DISABLE>

8.11.16 DTR +12 v

DTR 12V:<ENABLE | DISABLE>

8.11.17 RTS/CTS flow control

HRDWR FC:<ENABLE | DISABLE>

8.11.18 VSP Enable

VSP:<ENABLE | DISABLE>

8.11.19 Initialize Changes

INIT:

8.11.20 Examples

<table>
<thead>
<tr>
<th>Structured</th>
<th>Dot Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIGCAT:</td>
<td>RIG HRDWR PTT.STATE:ENABLE</td>
</tr>
<tr>
<td>STATE:ENABLE</td>
<td>END:</td>
</tr>
<tr>
<td>RIGCAT:</td>
<td>RIGCAT.DEV PATH:COM1</td>
</tr>
<tr>
<td>DEV PATH:/dev/tty.usbserial-RT071600</td>
<td>END:</td>
</tr>
<tr>
<td>RIGCAT:</td>
<td>RIGCAT.DESC FILE:/Users/.fldigi/rigs/FT-817.xml</td>
</tr>
<tr>
<td>DESC FILE:/Users/.fldigi/rigs/FT-817.xml</td>
<td>END:</td>
</tr>
<tr>
<td>RIGCAT:</td>
<td>RIGCAT.RETRIES:2</td>
</tr>
<tr>
<td>RETRIES:2</td>
<td>END:</td>
</tr>
<tr>
<td>Structured</td>
<td>Dot Notation</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
</tr>
<tr>
<td>RIGCAT: RETRY INT:500</td>
<td>RIGCAT.RETRY INT:500</td>
</tr>
<tr>
<td>RIGCAT: WDELAY:5</td>
<td>RIGCAT.WDELAY:5</td>
</tr>
<tr>
<td>RIGCAT: IDELAY:0</td>
<td>RIGCAT.IDELAY:0</td>
</tr>
<tr>
<td>RIGCAT: BRATE:4800</td>
<td>RIGCAT.BRATE:4800</td>
</tr>
<tr>
<td>RIGCAT: SBITS:1</td>
<td>RIGCAT.SBITS:1</td>
</tr>
<tr>
<td>RIGCAT: ECHO:DISABLE</td>
<td>RIGCAT.ECHO:DISABLE</td>
</tr>
<tr>
<td>RIGCAT: TOGGLE RTS PTT:DISABLE</td>
<td>RIGCAT.TOGGLE RTS PTT:DISABLE</td>
</tr>
<tr>
<td>RIGCAT: RESTORE:DISABLE</td>
<td>RIGCAT.RESTORE:DISABLE</td>
</tr>
<tr>
<td>RIGCAT: PTT COMMAND:DISABLE</td>
<td>RIGCAT.PTT COMMAND:DISABLE</td>
</tr>
<tr>
<td>RIGCAT: TOGGLE DTR PTT</td>
<td>RIGCAT.TOGGLE DTR PTT</td>
</tr>
<tr>
<td>RIGCAT: TOGGLE RTS PTT:DISABLE</td>
<td>RIGCAT.TOGGLE RTS PTT:DISABLE</td>
</tr>
<tr>
<td>RIGCAT: RTS 12V:DISABLE</td>
<td>RIGCAT.RTS 12V:DISABLE</td>
</tr>
<tr>
<td>RIGCAT: DTR 12V:DISABLE</td>
<td>RIGCAT.DTR 12V:DISABLE</td>
</tr>
<tr>
<td>RIGCAT: HRDWR FC:DISABLE</td>
<td>RIGCAT.HRDWR FC:DISABLE</td>
</tr>
<tr>
<td>RIGCAT: VSP:DISABLE</td>
<td>RIGCAT.VSP:DISABLE</td>
</tr>
<tr>
<td>RIGCAT: INIT:</td>
<td>RIGCAT.INIT:</td>
</tr>
</tbody>
</table>

### 8.12 HAMLIB Commands

See Hamlib xcvr control
8.12 HAMLIB Commands

8.12.1 Use Hamlib
Enable to disable Hamlib Rig Control interface.
STATE:<ENABLE | DISABLE>

8.12.2 Rig:
Set the rig to control. The list of Rigs are derived from internal list provided by HAMLIB.
RIG:<Character String>
Parameter: HAMLIB Device Names

8.12.3 Device:
The device path for controlling the Rig.
DEV PATH:<Character String>
Parameter: Device path

8.12.4 Retries
The number of tries at sending commands to the Rig
RETRIES:<Integer>

8.12.5 Retry Interval (ms)
RETRY INT:<Integer>

8.12.6 Write delay (ms)
WDELAY:<Integer>

8.12.7 Post write delay (ms)
PWDELAY:<Integer>

8.12.8 Baud rate:
BRATE:<Integer>

8.12.9 Stopbits
SBITS:<Integer>

8.12.10 Sideband:
SBAND:<Character String>

8.12.11 PTT via Hamlib command
PTT COMMAND:<ENABLE | DISABLE>

8.12.12 DTR +12
DTR 12V:<ENABLE | DISABLE>

8.12.13 RTS +12
RTS 12V:<ENABLE | DISABLE>
8.12.14 RTS/CTS flow control
HRDWR FC:<ENABLE | DISABLE>

8.12.15 XON/XOFF flow control
SFTWR FC:<ENABLE | DISABLE>

8.12.16 Advanced configuration:
ADV CONF:<Character String>

8.12.17 Initialize Changes
INIT:
Parameters: None

8.12.18 Examples

<table>
<thead>
<tr>
<th>Structured</th>
<th>Dot Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HAMLIB:</strong> STATE:DISABLE</td>
<td><strong>HAMLIB.STATE:DISABLE</strong></td>
</tr>
<tr>
<td>END:</td>
<td></td>
</tr>
<tr>
<td><strong>HAMLIB:</strong> RIG:&quot;Yaesu FT-817 (Beta)&quot;</td>
<td>**HAMLIB.RIG:&quot;Yaesu FT-817 (Beta)&quot;</td>
</tr>
<tr>
<td>END:</td>
<td></td>
</tr>
<tr>
<td><strong>HAMLIB:</strong> DEV PATH:/dev/tty.usbserial-RT071600</td>
<td>**HAMLIB.DEV PATH:COM1</td>
</tr>
<tr>
<td>END:</td>
<td></td>
</tr>
<tr>
<td><strong>HAMLIB:</strong> RETRIES:2</td>
<td>**HAMLIB.RETRIES:2</td>
</tr>
<tr>
<td>END:</td>
<td></td>
</tr>
<tr>
<td><strong>HAMLIB:</strong> RETRY INT:10</td>
<td>**HAMLIB.RETRY INT:10</td>
</tr>
<tr>
<td>END:</td>
<td></td>
</tr>
<tr>
<td><strong>HAMLIB:</strong> WDELAY:0</td>
<td>**HAMLIB.WDELAY:0</td>
</tr>
<tr>
<td>END:</td>
<td></td>
</tr>
<tr>
<td><strong>HAMLIB:</strong> PWDELAY:5</td>
<td>**HAMLIB.PWDELAY:5</td>
</tr>
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<td>END:</td>
<td></td>
</tr>
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<td><strong>HAMLIB:</strong> SBITS:1</td>
<td>**HAMLIB.SBITS:1</td>
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<tr>
<td>END:</td>
<td></td>
</tr>
<tr>
<td><strong>HAMLIB:</strong> SBAND:&quot;Rig mode&quot;</td>
<td>**HAMLIB.SBAND:&quot;Rig mode&quot;</td>
</tr>
<tr>
<td>END:</td>
<td></td>
</tr>
<tr>
<td><strong>HAMLIB:</strong> PTT COMMAND:DISABLE</td>
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</tr>
<tr>
<td>END:</td>
<td></td>
</tr>
<tr>
<td><strong>HAMLIB:</strong> DTR 12V:DISABLE</td>
<td>**HAMLIB.DTR 12V:DISABLE</td>
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<tr>
<td>END:</td>
<td></td>
</tr>
</tbody>
</table>
8.13 XMLRPC Rig Control Commands

See External program XmlRpc control

8.13.1 Use XML-RPC program

STATE: <ENABLE | DISABLE>

8.13.2 Mode/BW delay

BWDELAY: <Real Number>

8.13.3 Initialize Changes

INIT:
Parameters: None

8.13.4 Examples

<table>
<thead>
<tr>
<th>Structured</th>
<th>Dot Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAMLIB: RTS 12V:DISABLE END:</td>
<td>HAMLIB.RTS 12V:DISABLE</td>
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<tr>
<td>HAMLIB: HRDWR FC:DISABLE END:</td>
<td>HAMLIB.HRDWR FC:DISABLE</td>
</tr>
<tr>
<td>HAMLIB: SFTWR FC:DISABLE END:</td>
<td>HAMLIB.SFTWR FC:DISABLE</td>
</tr>
<tr>
<td>HAMLIB: ADV CONF: END:</td>
<td>HAMLIB.ADV CONF:</td>
</tr>
<tr>
<td>HAMLIB: INIT: END:</td>
<td>HAMLIB.INIT:</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Structured</th>
<th>Dot Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>XMLRPC RC: STATE:DISABLE END:</td>
<td>XMLRPC RC.STATE:DISABLE</td>
</tr>
<tr>
<td>XMLRPC RC: BWDELAY:0.5 END:</td>
<td>XMLRPC RC.BWDELAY:0.5</td>
</tr>
<tr>
<td>XMLRPC RC: INIT: END:</td>
<td>XMLRPC RC.INIT:</td>
</tr>
</tbody>
</table>
8.14 IO

See Configure ARQ/KISS I/O

8.14.1 Lock

Used to lock the panel from user GUI access. Has no effect on script commands.

LOCK:<ENABLE | DISABLE>

8.14.2 Enable ARQ or KISS IO Access

Select the active IO port for data operation between programs.

PORT:<Character String>

Parameters:
ARQ: Used to control the FL Suite of auxiliary programs.
KISS: KISS protocol over UDP/IP interface

8.14.3 AX25 Decode

Enable or disable Ax25 decoding. Only available when the KISS IO port is active.

AX25D:<ENABLE | DISABLE>

8.14.4 Enable CSMA

Enable or disable Carrier Sense Multiple Access. Only available when the KISS IO port is active.

CSMA:<ENABLE | DISABLE>

8.14.5 KISS Sub Command

KISS related sub commands.

8.14.5.1 IP Address

IP address for program to program communication
IPA:<Character String>

8.14.5.2 I/O

IP address I/O port number for program to program communication
IOPN:<Integer>

8.14.5.3 O

IP address Output port number for program to program communication. Required when FLDigi and auxiliary programs reside on the same host.
OPN:<Integer>

8.14.5.4 Dual Port

Enable or disable the use of dual port io.
DP:<ENABLE | DISABLE>

8.14.5.5 Enable Busy Channel

Enable or disable busy channel. Allows for the cooperative use of the frequency.
BUSY:<ENABLE | DISABLE>
8.14.5.6 Continue After (sec)
The number of seconds the frequency must be clean clear before transmissions resume. Enabled by busy channel activation.
CONT: <Integer>

8.14.5.7 KPSQL Attenuation
Controls the gain sensitivity of the KISS Power Squelch (KPSQL). The attenuation is measure in fractions. If the value is ‘4’ then the gain is reduced to 1/4th. Maximum gain (sensitivity) requires a value of 1.
ATTEN: <Integer>

8.14.6 ARQ Sub Command
ARQ sub commands

8.14.6.1 IP Address
IP address for program to program communication
IPA: <Character String>

8.14.6.2 Port
IP address I/O port number for program to program communication
IOPN: <Integer>

8.14.7 XMLRPC Sub Command
8.14.7.1 IP Address
IP address for program to program communication
IPA: <Character String>

8.14.7.2 Port
IP address I/O port number for program to program communication
IOPN: <Integer>

8.14.8 Examples

<table>
<thead>
<tr>
<th>Structured</th>
<th>Dot Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>IO: LOCK:ENABLE END:</td>
<td>IO.LOCK:ENABLE</td>
</tr>
<tr>
<td>IO: PORT:ARQ END:</td>
<td>IO.PORT:ARQ</td>
</tr>
<tr>
<td>IO: AX25D:DISABLE END:</td>
<td>IO.AX25D:DISABLE</td>
</tr>
<tr>
<td>IO: CSMA:DISABLE END:</td>
<td>IO.CSMA:DISABLE</td>
</tr>
<tr>
<td>Structured</td>
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</tr>
<tr>
<td>------------</td>
<td>--------------</td>
</tr>
<tr>
<td>IO: KISS: IPA:127.0. ← 0.1 END: END:</td>
<td>IO.KISS.IPA:127.0.←0.1</td>
</tr>
<tr>
<td>IO: KISS: CONT:3 END: END:</td>
<td>IO.KISS.CONT:3</td>
</tr>
<tr>
<td>IO: KISS: ATTEN:2 END: END:</td>
<td>IO.KISS.ATTEN:2</td>
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<thead>
<tr>
<th>Structured</th>
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</tr>
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<tbody>
<tr>
<td>IO: ARQ: IPA:127.0. ← 0.1 END: END:</td>
<td>IO.ARQ.IPA:127.0.←0.1</td>
</tr>
<tr>
<td>IO: ARQ: IOPN:7322 END: END:</td>
<td>IO.ARQ.IOPN:7322</td>
</tr>
</tbody>
</table>
8.15 Misc NBEMS Commands

See NBEMS (flmsg / flwrap) interface

8.15.1 Enable

NBEMS data file interface
STATE:<ENABLE | DISABLE>

8.15.2 Open message folder

OPEN MSG:<ENABLE | DISABLE>

8.15.3 Open with flmsg

OPEN FLMSG:<ENABLE | DISABLE>

8.15.4 FLMsg executable path

PATH:<Character String>
Parameter: Directory and file name to the executable file location.

8.15.5 Open in browser

OPEN BRWSR:<ENABLE | DISABLE>

8.15.6 Timeout (secs)

TIMEOUT:<Character String>

8.15.7 Examples

<table>
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<th>Structured</th>
<th>Dot Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>MISC NBEMS:STATE:DISABLE END:</td>
<td>MISC NBEMS.STATE:DISABLE</td>
</tr>
<tr>
<td>MISC NBEMS:OPEN MSG:DISABLE END:</td>
<td>MISC NBEMS.OPEN MSG:DISABLE</td>
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</tbody>
</table>
Configure Scripting

<table>
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<th>Dot Notation</th>
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<td>MISC NBEMS: OPEN FLMSG:ENABLE END:</td>
<td>MISC NBEMS.OPEN FLMSG:ENABLE</td>
</tr>
<tr>
<td>MISC NBEMS: OPEN BRWSR:DISABLE END:</td>
<td>MISC NBEMS.OPEN BRWSR:DISABLE</td>
</tr>
<tr>
<td>MISC NBEMS: TIMEOUT:4.0 END:</td>
<td>MISC NBEMS.TIMEOUT:4.0</td>
</tr>
<tr>
<td>MISC NBEMS: PATH:c:/applications/nbems/flmsg END:</td>
<td>MISC PATH:c:/applications/nbems/flmsg</td>
</tr>
</tbody>
</table>

8.16 ID

See RSID / Video / ID Configuration

8.16.1 RsID

8.16.1.1 Notify only

Notify operator of RSID reception, disabling waterfall, frequency, and modem changes.
NOTIFY:<ENABLE | DISABLE>

8.16.1.2 Searches passband

Search the entire band pass for RSID signatures (Enabled). Otherwise search center frequency +/- 200Hz
SRCH BP:<ENABLE | DISABLE>

8.16.1.3 Mark prev freq/mode

Annotate on receive panel previous frequency and modem on RSID reception.
MARK PREV:<ENABLE | DISABLE>

8.16.1.4 Disables detector

Ignore RSID tone sequence.
DETECTOR:<ENABLE | DISABLE>

8.16.1.5 Disable alert dialog

Display Dialog box indicating reception of RSID tone sequence (Enabled).
ALRT DIALOG:<ENABLE | DISABLE>

8.16.1.6 Retain tx freq lock

Retain frequency/waterfall transmit position on modem switches (enabled).
TX FREQ LOCK:<ENABLE | DISABLE>

8.16.1.7 Disable freq change

Do not change frequency when RSID tones received.
FREQ CHANGE:<ENABLE | DISABLE>

8.16.1.8 Allow errors

Adjust RSID reception accuracy at the expense of sensitivity.
ALLOW ERRORS:<Character String>
Parameters: Low, Medium, High
8.16.1.9  Squelch open (sec)
On RSID reception disable squelch for n seconds.
SQL OPEN:<Integer>
Parameters: 0 - 20

8.16.1.10 Pre-Signal Tone Seconds
On RSID reception disable squelch for n seconds.
PRETONE:<Real Number>
Parameters: 0.0 - 10.0 in 0.1/1.0 increments

8.16.1.11 End of xmt ID
Transmit an RSID tone sequence at the end of the data transmission.
END XMT ID:<ENABLE | DISABLE>

8.16.2 Video
8.16.2.1 Transmit mode ID
Enable/Disable the transmission of video text modem name.
ID MODE:<ENABLE | DISABLE>

8.16.2.2 Transmit video text
Enable/Disable the transmission of custom video text.
VIDEO TXT:<ENABLE | DISABLE>

8.16.2.3 Custom Video Text Input
Enable/Disable the transmission of custom video text.
TEXT INPUT:<Character String>

8.16.2.4 Use small font
Enable/Disable the of small font for video text.
SMALL FONT:<ENABLE | DISABLE>

8.16.2.5 500 Hz limit
Enable/Disable 500 Hz video width limit
500HZ:<ENABLE | DISABLE>

8.16.2.6 Mode width limit
Enable/Disable video width limit based on modem bandwidth use.
WIDTH LIMIT:<ENABLE | DISABLE>

8.16.2.7 Chars/Row:
Maximum number of video text character per "line"
CHAR ROW:<Integer>
Parameters: 1 - 8 Characters

8.16.3 CW
8.16.3.1 Transmit callsign
Enable/Disable post callsign CW ID
TX CALL:<ENABLE | DISABLE>
8.16.3.2 Speed (WPM):
Enable/Disable post callsign CW ID transmit speed
SPEED:<Integer>
Parameters: 15 - 40 WPM

NOTE:
Check the specifications imposed by your country on the maximum speed allowing for CW identifying.

8.16.4 Examples

<table>
<thead>
<tr>
<th>Structured</th>
<th>Dot Notation</th>
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<tr>
<td>RSID:</td>
<td></td>
</tr>
<tr>
<td>NOTIFY:DISABLE</td>
<td></td>
</tr>
<tr>
<td>END:</td>
<td></td>
</tr>
<tr>
<td>END:</td>
<td></td>
</tr>
<tr>
<td>ID:</td>
<td>ID.RSID.Srch BP:DISABLE</td>
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<tr>
<td>RSID:</td>
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<td>Srch BP:DISABLE</td>
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<td>END:</td>
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<tr>
<td>ID:</td>
<td>ID.RSID.MARK PREV:DISABLE</td>
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<td>RSID:</td>
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<td>Freq Change:DISABLE</td>
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<td>ID.VIDEO.VIDEO TXT:DISABLE</td>
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<td>END:</td>
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<td>END:</td>
<td>ID.VIDEO.TEXT INPUT:CQ</td>
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<td>SMALL FONT:ENABLE</td>
<td>ID.VIDEO.500HZ:ENABLE</td>
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<td>END:</td>
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<td>ID.VIDEO.WIDTH LIMIT:ENABLE</td>
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<td>ID:</td>
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<td>CHAR ROW:8</td>
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</tr>
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<td>END:</td>
<td></td>
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<tr>
<td>END:</td>
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</tbody>
</table>
8.17 Load Macro Command

See Macros

The Macro command is a structured command only, dot notation is not supported.

MACRO, row, column, label
<Macro Content>
END:

Parameters:
row - This is the macro bar number seen to the right of the macro buttons (1-4)
column - The physical macro button position from left to right (1-12).
label - The macro buttons label. See Macro Display Symbols for special label glyphs.

No syntax checking is performed for the macro content. User responsibility.

The following example sets the first button in the first macro bar as seen above.

MACRO:1,1,"CQ @>|"
<TXRSID:on><TX>
cq cq cq de <MYCALL> <MYCALL> <MYCALL> pse k
<RX>
END:

8.18 Example Script

NOTE:

This example script may report errors if used as is. Modification is required to meet your particular setup.

FLDIGI_CONFIG
# Fldigi Generated Config Script
# Created: Wed Jan 21 15:44:14 2015

FLDIGI:
  FREQ:1.407000000e+07
  MODE:USB
  WFRZ:1500
  RXID:DISABLE
  TXID:DISABLE
  SPOT:ENABLE
  REV:DISABLE
AFC:DISABLE
LOCK:DISABLE
SQL:DISABLE
KPSQL:DISABLE
MODEM:BPSK31
END:
OPERATOR:
  CALLSIGN: kk5vd
  QTH: Robert
  NAME: "Madison, AL"
  LOC: EM640r
  ANT: "Invert 'V' @ 22FT AGL"
END:
AUDIO DEVICE:
  PA: ENABLE
  PA CAPTURE: 2, "USB Audio CODEC"
  PA PLAYBACK: 3, "USB Audio CODEC"
END:
AUDIO SETTINGS:
  CAPTURE: Auto
  PLAYBACK: Auto
  CONVERTER: "Medium Sinc Interpolator"
  RX FPM: 17
  TX FPM: 17
  TX OFFSET: 0
END:
AUDIO RT CHANNEL:
  MONO AUDIO: DISABLE
  MODEM LR: DISABLE
  REV LR: DISABLE
  PTT RT CHAN: DISABLE
  QSK RT CHAN: DISABLE
  FSK RT CHAN: DISABLE
END:
AUDIO WAVE:
  S RATE: 16000
END:
RIG HRDWR PTT:
  PTT RT CHAN: DISABLE
  SERIAL PORT: DISABLE
  DEVICE: /dev/ptt
  RTS: DISABLE
  RTSV: DISABLE
  DTR: DISABLE
  DTRV: DISABLE
  PARALLEL: DISABLE
  UNROUTER: DISABLE
  START PTT DELAY: 1
  END PTT DELAY: 1
INIT:
END:
RIGCAT:
  STATE: ENABLE
  DEV PATH: /dev/tty.usbserial-RT071600
  DESC FILE: /Users/.fldigi/rigs/FT-817.xml
  RETRIES: 2
  RETRY INT: 500
  WDELAY: 5
  IDELAY: 0
  BRATE: 4800
  SBITS: 1
  ECHO: DISABLE
  TOGGLE RTS PTT: DISABLE
  RESTORE: DISABLE
  PTT COMMAND: DISABLE
  TOGGLE DTR PTT: DISABLE
  TOGGLE RTS PTT: DISABLE
  RTS 12V: DISABLE
  DTR 12V: DISABLE
  HRDWR FC: DISABLE
  VSP: DISABLE
INIT:
END:
HAMLIB:
STATE:DISABLE
RIG:"Yaesu FT-817 (Beta)"
DEVPATH:/dev/tty.usbserial-RT071600
RETRIES:2
RETRY INT:10
WDELAY:0
PDELAY:5
BRATE:4800
SBITS:1
SBAND:"Rig mode"
PTT COMMAND:DISABLE
DTR 12V:DISABLE
RTS 12V:DISABLE
HRDWR FC:DISABLE
SFTWR FC:DISABLE
ADV CONF:
INIT:
END:
XMLRPC RC:
STATE:DISABLE
BNDELAY:0.500
INIT:
END:
IO:
LOCK:ENABLE
PORT:ARQ
AX25D:DISABLE
CSMA:DISABLE
KISS:
IPA:127.0.0.1
IOPN:7342
OPN:7343
DP:DISABLE
BUSY:DISABLE
CONT:3
ATTEN:2
END:
ARQ:
IPA:127.0.0.1
IOPN:7322
END:
XMLRPC:
IPA:127.0.0.1
IOPN:7362
END:
END:
MISC NBEMS:
STATE:ENABLE
OPEN MSG:DISABLE
OPEN FMSG:ENABLE
PATH:/Applications/flmsg-2.0.6AB.app/Contents/MacOS/flmsg
OPEN BRWSR:ENABLE
TIMEOUT:2.000
END:
ID:
RSID:
NOTIFY:DISABLE
SRCH BP:DISABLE
MARK PREV:ENABLE
DETECTOR:DISABLE
ALRT DIALOG:DISABLE
TX FREQ LOCK:DISABLE
FREQ CHANGE:DISABLE
ALLOW ERRORS:Medium
SQL OPEN:5
PRETONE:0.000
END XMT ID:DISABLE
END:
VIDEO:
ID MODE:DISABLE
VIDEO TXT:DISABLE
TEXT INPUT:CQ
SMALL FONT: ENABLE
500HZ: ENABLE
WIDTH LIMIT: ENABLE
CHAR ROW: 8
END:
CW:
TX CALL: DISABLE
SPEED: 18
END:
END:

MACRO: 1, 1, "CQ"
<TXRSID: on><TX>
cq cq cq de <MYCALL> <MYCALL> <MYCALL>/qrp pse k
<RX>
END:

MACRO: 1, 2, "ANSWER"
<TX><CALL> <CALL> de <MYCALL> <MYCALL> <MYCALL> kn
<RX>
END:

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Chapter 9

Cabrillo Report

Figure 9.1 Cabrillo Report

Fldigi can generate a basic Cabrillo report that meets most contest needs.

Selecting the "File/Log/Cabrillo report" menu item opens the following dialog:

If you want to export every record press the "Check All" in the left panel.

Select the Contest type from the pull down menu in the right panel. Fldigi knows how to format the various fields for each contest. When satisfied with the setup press OK. You will then have the opportunity to specify the location and name of the cabrillo output file.

If you use the Contest - How To \textless XBEG\textgreater ...\textless XEND\textgreater to capture your outgoing exchange, OR if you choose to capture all received exchange information in the "Exch" field on the Logbook panel then you should be careful not to duplicate the data in the Cabrillo report. For example:

You captured outgoing exchange data as \textless XBEG\textgreater \textless RST \textgreater \textless CNTR \textgreater \textless XEND\textgreater. Do not enable the "RST sent" and "Serial # out" check boxes as this info is already contained in the "Exchange in" field.

You captured incoming exchange data into the Exch field as RST SER# TIME. Do not enable the "RST rcvd" or the "Serial # in" check boxes.
You must then open the file with a plain text editor and modify the appropriate entries. Check with each contest sponsor to see what their requirements are.

Here is an example of a generated cabrillo report format before being edited:

```
START-OF-LOG: 3.0
CREATED-BY: fldigi 3.11

# The callsign used during the contest.
CALLSIGN: W1HKJ

# ASSISTED or NON-ASSISTED
CATEGORY-ASSISTED:

# Band: ALL, 160M, 80M, 40M, 20M, 15M, 10M, 6M, 2M, 222, 432, 902, 1.2G
CATEGORY-BAND:

# Mode: SSB, CW, RTTY, MIXED
CATEGORY-MODE:

# Operator: SINGLE-OP, MULTI-OP, CHECKLOG
CATEGORY-OPERATOR:

# Power: HIGH, LOW, QRP
CATEGORY-POWER:

# Station: FIXED, MOBILE, PORTABLE, ROVER, EXPEDITION, HQ, SCHOOL
CATEGORY-STATION:

# Time: 6-HOURS, 12-HOURS, 24-HOURS
CATEGORY-TIME:

# Transmitter: ONE, TWO, LIMITED, UNLIMITED, SWL
CATEGORY-TRANSMITTER:

# Overlay: ROOKIE, TB-WIRES, NOVICE-TECH, OVER-50
CATEGORY-OVERLAY:

# Integer number
CLAIMED-SCORE:

# Name of the radio club with which the score should be aggregated.
CLUB:

# Contest: AP-SPRINT, ARRL-10, ARRL-160, ARRL-DX-CW, ARRL-DX-SSB, ARRL-SS-CW,
# ARRL-SS-SSB, ARRL-UFH-AUG, ARRL-VHF-JAN, ARRL-VHF-JUN, ARRL-VHF-SEP,
# APR-222-RTTY, BARTG-RTTY, CQ-160-CW, CQ-160-SSB, CQ-WPX-CW, CQ-WPX-RTTY,
# CQ-WPX-SSB, CQ-VHF, CQ-WW-CW, CQ-WW-RTTY, CQ-WW-SSB, DARC-WAEDC-CW,
# DARC-WAEDC-RTTY, DARC-WAEDC-SSB, FCG-FQP, IARU-HF, JIDX-CW, JIDX-SSB,
# NAQP-CW, NAQP-RTTY, NAQP-SSB, NA-SPRINT-CW, NA-SPRINT-SSB, NCCC-CQP,
# NEQP, OCEANIA-DX-CW, OCEANIA-DX-SSB, RXDC, RSGB-IOTA, SAC-CW, SAC-SSB,
# STEW-PERRY, TARA-RTTY
CONTEST: ARRL-RTTY

# Optional email address
EMAIL:

# Operator name
NAME:

# Maximum 4 address lines.
ADDRESS:
ADDRESS:
ADDRESS:

# A space-delimited list of operator callsign(s).
OPERATORS:

# Offtime yyyy-mm-dd nnnn yyyy-mm-dd nnnn
# OFFTIME:
```
# Soapbox comments.

QSO: 14095 RY 2009-01-04 1952 W1HKJ 599 GA 12345 ND2T 599 CA 67890
QSO: 14098 RY 2009-01-04 1949 W1HKJ 599 GA W0SD 599 SD
QSO: 14099 RY 2009-01-04 1948 W1HKJ 599 1234567890 KB7Q 599 1234567890
QSO: 14100 RY 2009-01-04 1948 W1HKJ 599 GA N6WS 599 CA
QSO: 14103 RY 2009-01-04 1946 W1HKJ 599 GA VE6AO 599 AB

END-OF-LOG:

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Chapter 10
Logbook

10.1 Logbook Dialog

You open the logbook by selecting from the Logbook menu; Logbook/View. The logbook title bar will show you which logbook you currently have open. Fldigi can maintain an unlimited (except for disk space) number of logbooks.

You can resize the dialog to suit your screen size and operating needs. Fldigi will remember the placement and size for subsequent use.

You can create new entries, update existing entries, and delete entries using this dialog. You can also search for
an entry by callsign. The browser can be sorted by Date, Callsign, Frequency or Mode. The sort can be forward or
backward with the most recent being the default selected entry after each sort. You execute the sort by clicking on
the column button at the top of the column to be sorted. Each click causes the sort to reverse. I like to view my log
with the most recent at the top. You might want to view it with the most recent on the bottom.

Recent changes to the support code has reduced the time and cpu load associated with reading, writing, and up-
dating the adif data file. The following statistics should give the user some idea as to the performance expectations.
These were measured on a Linux Mint-17 32 bit OS; CPU: Intel Pentium 4 CPU @ 3.20 GHz; solid state drive 250
GB. Depending on OS version, Windows users should expect to see larger times for read and sort. The increase
primarily due to the way that the Windows OS handles disk buffering and it's multi-threading implementation.

<table>
<thead>
<tr>
<th># records</th>
<th>read</th>
<th>sort</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>60 msec</td>
<td>2 msec</td>
</tr>
<tr>
<td>2000</td>
<td>100 msec</td>
<td>6 msec</td>
</tr>
<tr>
<td>4000</td>
<td>170 msec</td>
<td>15 msec</td>
</tr>
<tr>
<td>8000</td>
<td>360 msec</td>
<td>45 msec</td>
</tr>
<tr>
<td>16000</td>
<td>620 msec</td>
<td>90 msec</td>
</tr>
<tr>
<td>32000</td>
<td>1.340 sec</td>
<td>250 msec</td>
</tr>
<tr>
<td>64000</td>
<td>2.630 sec</td>
<td>550 msec</td>
</tr>
<tr>
<td>128000</td>
<td>11.61 sec</td>
<td>1.40 sec</td>
</tr>
</tbody>
</table>

10.1.1 Tab Views

![Figure 10.2 Log Book](image-url)
10.2 List of Log Fields

Fldigi maintains a large set of QSO logbook fields that will probably be sufficient for casual operating, contesting and some certificate logging. All of the fields that are captured in the logbook are maintained in an ADIF database that can be read by any logbook program that can read the ADIF text format.

The complete set of logbook fields are:

<table>
<thead>
<tr>
<th>ADIF FIELD</th>
<th>USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAND</td>
<td>QSO band (computed from frequency)</td>
</tr>
<tr>
<td>ADIF FIELD</td>
<td>USE</td>
</tr>
<tr>
<td>------------</td>
<td>-----</td>
</tr>
<tr>
<td>CALL</td>
<td>contacted stations call sign</td>
</tr>
<tr>
<td>COMMENT</td>
<td>comment field for QSO</td>
</tr>
<tr>
<td>COUNTRY</td>
<td>contacted stations DXCC entity name</td>
</tr>
<tr>
<td>CNTY</td>
<td>secondary political subdivision, ie: county</td>
</tr>
<tr>
<td>CQZ</td>
<td>contacted stations CQ Zone</td>
</tr>
<tr>
<td>CONT</td>
<td>contacted stations continent</td>
</tr>
<tr>
<td>DXCC</td>
<td>contacted stations DXCC country code</td>
</tr>
<tr>
<td>FDCLASS</td>
<td>Field Day class received</td>
</tr>
<tr>
<td>FDSECTION</td>
<td>Field Day section received</td>
</tr>
<tr>
<td>FREQ</td>
<td>QSO frequency in MHz</td>
</tr>
<tr>
<td>GRID SQUARE</td>
<td>contacted stations Maidenhead Grid Square (Loc)</td>
</tr>
<tr>
<td>IOTA</td>
<td>Islands-On-The-Air designator</td>
</tr>
<tr>
<td>ITUZ</td>
<td>ITU zone</td>
</tr>
<tr>
<td>MODE</td>
<td>QSO mode</td>
</tr>
<tr>
<td>MYXCHG</td>
<td>sent contest exchange</td>
</tr>
<tr>
<td>NAME</td>
<td>contacted operators name</td>
</tr>
<tr>
<td>QSLRDATE</td>
<td>QSL received date</td>
</tr>
<tr>
<td>QSLSDATE</td>
<td>QSL sent date</td>
</tr>
<tr>
<td>QSO_DATE</td>
<td>QSO date at start of contact</td>
</tr>
<tr>
<td>QSO_DATE_OFF</td>
<td>QSO date at end of contact</td>
</tr>
<tr>
<td>QSL_VIA</td>
<td>contacted stations QSL path</td>
</tr>
<tr>
<td>QTH</td>
<td>contacted stations city</td>
</tr>
<tr>
<td>RST_RCVD</td>
<td>received signal report</td>
</tr>
<tr>
<td>RST_SENT</td>
<td>sent signal report</td>
</tr>
<tr>
<td>SRX</td>
<td>QSO received serial number</td>
</tr>
<tr>
<td>STATE</td>
<td>contacted stations state</td>
</tr>
<tr>
<td>STX</td>
<td>QSO transmitted serial number</td>
</tr>
<tr>
<td>TIME_OFF</td>
<td>QSO time at end of contact HHMM or HHMMSS in UTC</td>
</tr>
<tr>
<td>TIME_ON</td>
<td>QSO time at start of contact HHMM or HHMMSS in UTC</td>
</tr>
<tr>
<td>TX_PWR</td>
<td>power transmitted by this station</td>
</tr>
<tr>
<td>VE_PROV</td>
<td>2 letter abbreviation for Canadian Province</td>
</tr>
<tr>
<td>XCHG1</td>
<td>received contest exchange</td>
</tr>
<tr>
<td>OP_CALL</td>
<td>Callsign of person logging the QSO</td>
</tr>
<tr>
<td>STA_CALL</td>
<td>Callsign of transmitting station</td>
</tr>
<tr>
<td>MY_GRID</td>
<td>Xmt station locator</td>
</tr>
<tr>
<td>MY_CITY</td>
<td>Xmt station location</td>
</tr>
</tbody>
</table>

- These fields are either captured on the main dialog, computed from internal values, or determined by configuration.

The data in the fldigi logbook can be exported to external text files; ADIF, text, and CSV (comma separated value). The ADIF can be read by any ADIF compatible logbook program. The text output is suitable for use in a word-processor and for printing. The CSV can be read into many spreadsheet programs such as Excel, Open Office or Gnumeric.
10.3 Digital Modes Signal Reports

Fldigi does not enforce any rules on signal reporting. It could very well do so for many of the modes in which signal quality is inherently measured as a part of the decoder. Learning how to evaluate a signal, to properly report it, and then help in correcting deficiencies should be the goal of every amateur operator. Please read further on using both RST and RSQ signal reports.

10.4 Capturing QSO Data

Fldigi supports two QSO capture panels. The first for casual QSO logging

![Figure 10.7 QSO capture panel](image1.png)

and the second for contest fields

![Figure 10.8 Contest capture panel](image2.png)

You might prefer a more minimal view of the logging fields. You can select to completely suppress the log panel or to use a single line view as in either of these two:

![Figure 10.9 Minimal QSO Capture Panel](image3.png)

![Figure 10.10 Minimal Contest Capture Panel](image4.png)

These are selectable from the View menu:

![Figure 10.11 Log controls selection](image5.png)
These three buttons are associated with logbook entries.

- The globe button provides access to QRZ queries
- The brush button clears all of the logging entries
- The save-into button saves the current logging entries into the logbook

![Log Buttons](image)

Figure 10.12 Log Butons

The frequency, Off (time off), and #Out are filled by the program. All the others can be populated by manual keyboard entry or by selection from the Rx panel. The time off, Off, is continuously update with the current GMT. The time on, On, will be filled in when the Call is updated, but can be modified later by the operator.

A right click on the Rx panel brings up a context sensitive menu that will reflect which of the two QSO capture views you have open.

![Normal Menu](image)

Figure 10.13 Normal Menu

![Contest Menu](image)

Figure 10.14 Contest Menu
If you highlight text in the Rx pane then the menu selection will operate on that text. If you simply point to a word of text and right click then the menu selection will operate on the single word.

Certain fields may also be populated with automatic parsing, Call, Name, QTH and Loc. You point to the Rx pane word and then either double-left-click or hold a shift key down and left click. The program will attempt to parse the word as a regular expression to populate the Call, Name, QTH, and Loc fields in that order. It may place some non-standard calls into the Loc field if they qualify as a proper Maidenhead Grid Square, such as MM55CQ. That may be a special event station, but it also looks like a grid square locator value. You need to decide whether that occurs and use the pop up menu for those special cases. The first non-Call non-Loc word will fill the Name field and subsequent qualify words will go into the QTH field.

A highlighted section of text, can always be copied to the clipboard for subsequent pasting elsewhere. The Copy menu item will be active when text in the Rx pane has been highlighted. That text can also be saved to a file. Use the "Save as..." menu item for that purpose. All data fields in fldigi share a common set of keyboard shortcuts. Linux users will recognize these as familiar Emacs shortcuts. There is also a small popup menu that can be opened for each field by right clicking the contents with the mouse:

![Figure 10.15 Menu Popup Edit Field](image)

Figure 10.15 Menu Popup Edit Field

Highlighted text will be overwritten when a paste is selected. Otherwise the clipboard will be pasted at the current cursor position.

The two most extreme right fields in the casual and contest views require some explanation. The topmost field in a multi-line edit control and it's contents are for notes or comments. When a remote database query is made this control will be populated with the street address of the queried call sign (if available). The small button on the lower line of controls is used to toggle the usage of the entry control to it's right. That entry control is "Country" when the button face shows 'C', and "County" when the button face shows 'c'. These two controls provide a convenience for county hunters.

You can query on-line and local CD based data base systems for data regarding a Call. Set up your query using the Callsign DB configuration tab. You make the query by either clicking on the globe button, or selecting "Look up call" from the menu. The latter will also move the call to the Call field and make the query.

If you have previously worked a station the logbook will be searched for the most recent qso and fill the Name, Qth and other fields from the logbook. If the logbook dialog is open that last QSO will be selected for viewing in the logbook.

Fldigi's logbook is primarily a capture function. You can export your data for use with an external database or for uploading to LOTW or eQSL. Data from those sources can also be used for importing into the logbook.

LoTW: LoTW configuration and use

Fldigi can connect to 3rd party Logbook and Contest Log programs such as N3FJP ACL and the N3FJP contest programs. On OS X, it can automatically export data to the MacLogger program.
Exporting logbook data: Log Exports.

Cabrillo reporting: Contest Reports.
Chapter 11

DX Cluster

fldigi can connect to and display data from DX cluster servers. The three most common server types are AR-Cluster, CC-Cluster, and DX Spider. Open the dxcluster dialog from the View menu:

11.1 Logging on to remote host

Enter the DX HOST hostname/IP, the Port and your Login call. Then check the "Connect" control. The "Connected" label will be visible only after the remote host connection has been made. The above dialog shows the 4 hosts that I routinely use.
• k4zr.no-ip.org, a DX Spider server
• dxc.wb3ffv.us, a DX Spider server
• nk7z-cluster.ddns.net, an AR Cluster server
• dxspots.com, a CC Cluster server

Immediately after checking the "Connect" control the dxcluster dialog should change to the "TelNet stream" tab. This tab displays the raw telnet data stream, shown here for the three server types:

The dxcluster connect and disconnect events are recorded in fldigi's event log.
11.2 Configuring

11.2.1 Managing Hosts

You can maintain a list of remote hosts to which you can reliably connect and which provide good information relative to your QRA (Maidenhead locator). The following refers to the Config tab on the dxcluster dialog as shown above.

- Add the current host to the list using the "Add" button.
- Highlight an entry and press the "Select" button to transfer the elements to the connect controls.
- Highlight an entry and press the "Delete" button to delete an entry.
- Use the menu item "Configure / Save Config" to save the modified list. It will be restored the next time fldigi is executed.

Press the "Servers" button if you are unfamiliar with the telnet address and port number of a convenient dxcluster server. fldigi will open up a local html document with a list of recently verified servers:

```
l: connect: Connecting to [50.80.4.208]:7300
l: DXcluster_doconnect: Connected to dxserver k4zr.no-ip.org:7300
l: DXcluster_doconnect: Disconnected from dxserver
l: connect: Connecting to [50.80.4.208]:7300
l: DXcluster_doconnect: Connected to dxserver k4zr.no-ip.org:7300
l: DXcluster_doconnect: Disconnected from dxserver
l: connect: Connecting to [67.171.221.247]:7373
l: DXcluster_doconnect: Connected to dxserver nk7z-cluster.ddns.net:7373
l: DXcluster_doconnect: Disconnected from dxserver
```
**11.2.2 Initial Host Commands**

Most cluster servers will save your setup commands from a previous telnet session. You can also store those commands in the text editing control, "Cluster Server Setup Cmds."

You can save and reload any number of command sequences. Each is saved in a plain text file in the fldigi files subfolder "Scripts". The default extension for the dxcluster scripts is "dxc". Be sure you add the extension to your saved files. It will not be added if you do not with the result that file may not be visible when you try to load it.

Send the script to the remote server using the "Send" button. The transmission and response will be available for viewing on the "TelNet stream" tab.

**11.2.3 Command Macros**

Configure each of the 8 command macro buttons. The m1...m8 controls are the button label and the corresponding multi-line text control are the associated server commands.

DX cluster command help can be viewed for each of the 3 server types.

Press the corresponding help button:
### Overview of AR-Cluster User Commands

The following list is a summary of AR-Cluster commands. The upper case part of the commands is required and the lower case part of the command is optional. Thus the command A/T is the same as the Announce/Full command.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Announce</td>
<td>Announcement to all locally users</td>
</tr>
<tr>
<td>Announce/Full</td>
<td>Announcement to all users</td>
</tr>
<tr>
<td>Bye</td>
<td>Terminate the connection to the cluster</td>
</tr>
<tr>
<td>CLEAR/QSL</td>
<td>Remove a QSL route from the local QSL database</td>
</tr>
<tr>
<td>CONFERence</td>
<td>Enter a local conference</td>
</tr>
<tr>
<td>CONFERence/Full</td>
<td>Enter a network wide conference</td>
</tr>
</tbody>
</table>

### CC Cluster Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANnounce</td>
<td>Send an announcement to local USERS. (AN&lt;Text Message&gt;)</td>
</tr>
<tr>
<td>ANnounce/Full</td>
<td>Send an announcement to all nodes and USERS. (AN/F &lt;Text Message&gt;)</td>
</tr>
<tr>
<td>BYE</td>
<td>Disconnect from the node. (BYE) or (B)</td>
</tr>
<tr>
<td>DX</td>
<td>Send a DX spot. (DX &lt;Callsign&gt; &lt;Frequency&gt; or DX &lt;Frequency&gt; &lt;Callsign&gt;)</td>
</tr>
<tr>
<td>DXTest</td>
<td>Returns to USER only (DXT P5NOW 14006.06) Good for testing RES 1 &amp; RES 2</td>
</tr>
</tbody>
</table>
DX Spider Command Reference

Contents

- **1 ACCEPT**
  - 1.1 accept/announce
  - 1.2 accept/spots
  - 1.3 accept/wcy
  - 1.4 accept/wwy
- **2 ANNOUNCE**
  - 2.1 announce
  - 2.2 announce full
- **3 APROPOS**
  - 3.1 apropos
- **4 BLANK**
  - 4.1 blank
- **5 BYE**
  - 5.1 bye
- **6 CHAT**
  - 6.1 chat
- **7 CLEAR**
  - 7.1 clear/announce
  - 7.2 clear/route

### 11.2.4 DX cluster color scheme

You can change the text colors, and text fonts from the main fldigi configuration dialog:
11.2.5 Spot when logged

Enable the "Spot when logged" check box if you want to create the spot report whenever you log a contact from the fldigi main dialog. You will still have to review the spot report and submit it with the Submit button.

11.2.6 Auto Connect to Host

Enable the "Auto Connect" if you want to connect to the host when starting fldigi.

11.3 TelNet stream

The raw data to and from the cluster server is shown on the TelNet stream tab. Sent data is in red and received data is in black. The image shows the automatic log on activity between my station and the K4ZR DXSpider cluster server. Those 4 lines are created based on your fldigi user configuration.

The TelNet stream text display is context sensitive to the right mouse button. You can copy marked text or delete the display contents using the right mouse button.

You can send individual commands to the remote host using the "Cmd:" control. Enter the command, for example: "SHow/FILTER", or "SH/FILTER". Then press the "Submit" button. The command string will be sent to the remote
server and you can view the results on the "TelNet stream" tab.

During a logon to the remote host fldigi will send some default commands depending on the host type. If the remote host is either an CC-Cluster or DX Spider host then fldigi will send this sequence:

```
set/page 0
set/name [user name]
set/qth [user qth]
set/qra [user locator]
```

Where the [] values are those entered on the main "User" configuration tab.

Sending prepared (macro) commands or dx spot reports to the remote server is either a single or two step process.

- Pressing any of the 8 macro buttons will transfer the macro string to the Cmd: control. You can modify the command string before pressing the Submit button.
- The command will be executed immediate upon pressing the macro button if the command text contains the exclamation mark ! as the first character.

### 11.3.1 Submitting a spot

You generate a spot report using the Spot button on the TelNet stream tab. Fldigi will generate a spot report that tries to provide the cluster with some mode details. For example:

```
dx 3512.4 K2LBM RTTY [85]  mode is RTTY, Mark frequency @ 3512.485
ndx 3581.1 K2LBM MFSK16 [50]  mode is MFSK16, center frequency @ 3581.150
ndx 3580.8 K2LBM OLIVIA [00]  mode is OLIVIA (8-500), center frequency @ 3580.800
```

Unfortunately, the ADIF mode specifier does not provide details regarding mode characteristics. The [0..99] values in the notes field denote the additional Hertz and tens-of-Hertz needed to specify the frequency to the nearest Hertz rather than rounded as is usually reported in the cluster spot report. This field is only added to the report if the "Report [0..99 Hz]" control is enabled on the dxcluster configure tab.

Pressing either of the SPOT buttons only adds the spot report to the Cmd: control. You can then modify the spot report before actually submitting the report using the Submit button.

### 11.4 DX cluster reports

Fldigi parses the received data stream and displays each dx spot in a tabular form on the "DX Reports" tab:
11.4 DX cluster reports

Left clicking on a spotted report line will transfer the frequency and mode to fldigi's operating parameters. The mode change is contingent on the mode being reported by the spotter and included in the 'Notes' block.

You can elect to view the reports with the most recent on either the top or the bottom of the list.

11.4.1 DX Cluster QSY logic

A cluster spot report line has this format:

```
--SPOTTER--<--FREQ--><--DX STA--><--NOTES--<--UTC<--LOC--
```

fldigi will change mode if and only if the NOTES block contains a valid ADIF mode specifier, i.e. CW, PSK31, QPSK63, RTTY, etc.

The QSY logic does not make any assumptions regarding band, sub band in determining the RF carrier and AF injection frequency.

If the fldigi mode is SSB (available on the mode menu), then the QSY is to the FREQ value with no change in the WF tracking frequency.

Otherwise the existing mode or the mode detected in the NOTES is used to determine the QSY values:

- **CW**: QSY is based on the CW sweet spot
- **RTTY**: QSY is based on the RTTY sweet spot
- **PSK**: QSY is based on the PSK sweet spot
- **DIGI**: QSY is based on the PSK sweet spot

Most DX reports do not include a mode usage. Ergo it is up to the user to know what mode he or she is interested in. Are you spotting SSB, then change the fldigi mode to SSB. Are you interested in CW? Then change the mode to CW. This is really a KISS approach that is constrained by the very limited amount of data contained in the DX spot report.
11.5 On Line Cluster Help

The Help tab provides a convenient access to help obtained directly from the dxcluster server. It is the equivalent of using the HELP command from the Cmd: control. The difference is that the server reply is parsed and presented in a separate text viewer.

HELP The HELP Command HELP is available for a number of commands. The syntax is:
   HELP <cmd>  Where <cmd> is the name of the command you want help on. All commands can be abbreviated, so SHOW/DX can be abbreviated to SH/DX, ANNOUNCE can be shortened to AN and so on. Look at the APROPOS <string> command which will search the help database for the <string> you specify and give you a list of likely commands to look at with HELP.
Chapter 12

Field Day Server setup

fldigi can connect to and share data with an external program called "fdserver." fdserver is implemented in a scripting language called TclTk. TclTk scripts can be run on Linux, OS X, and all current versions of Windows. The look and feel of the TclTk application is nearly identical across all of the platforms. fdserver uses a socket interface to communicate with compatible clients on the same computer or with others on a LAN configuration. The fdserver main dialog on a Linux computer:

with two clients shown as connected, W1HKJ on 40 meter digital, and K2LM on 17 meter digital.

12.1 Fdserver Connect

Open fldigi's fdclient dialog from the main Log menu:
Enter the operator callsign which may be the same as the station callsign or different in the case of multi-operator participation. Make sure that the tcpip address and port are correct (the same as configured for the server). If the fdserver is on a different computer then the tcpip addr is either the 32 bit address in Dot-decimal notation (xxx.xxx.xxx.xxx), or the LAN recognized DNS name such as "daves-linux-box". Most LAN routers maintain a DNS server that matches noun name to the 32 bit address. (see https://en.wikipedia.org/wiki/IPv4).

Enable the "connect" check box and fldigi should immediately find and connect to the fdserver. The connected indicator will change from medium grey to green.

fdserver will only allow a single position to be logged in for a band/mode. Event management is up to the event participants.

fdserver stores each contact with the operator Call. Refer to the separate fdserver/fdclient documentation for details.

Immediately after connecting the fdserver will provide fldigi with:

- FD Call
- FD Class
- FD Section
- FD Mult
- Score

The server will broadcast changes to the various logging events, such as a new 20 meter CW contact. Each fdserver client, whether the TclTk fdclient application or fldigi can quickly see the event activities on the client dialog.

Logging off of the fdserver is as simple as unchecking the "connect" box.

### 12.2 FDserver/FDclient

Here are some simple startup and running instructions for the TclTk applications, fdserver.tcl and fdclient.tcl.

You must have the tcltk/wish interpreter installed on your computer. When installed the file manager will usually associate the .tcl extension with the server and allow the interpreter to be run and execute the target script file. tcltk script files are plain ASCII text and can be edited with a proper text editor (DO NOT use Notepad on Windows). Notepad++ and Geany are both available for Windows and are free.

**fdserver**

Start fdserver.tcl and you are presented with it's configuration dialog:
Enter

- Station - the station call for the FD event
- Mult - the station multiplier for the FD event
- Class - the station class for the FD event
- Section - the station section for the FD event
- Autosave - interval in seconds between updating the database file
- DBfile - name of the field day log file
- TCPIP_address - use 127.0.0.1, local host
- TCPIP_port - default is 20001

Press OK and the main fdserver dialog opens and is ready to accept clients.

**fdclient**

Start fdclient.tcl and the main fdclient dialog opens:

Press the "LogOn" button to open the client log on dialog

Select the band and mode. Enter the Operator Callsign and press OK.
The fdclient main dialog will show connected with the same type of information that is shown on the fldigi fdclient dialog.

The fdclient.tcl application can be used for phone, and CW operations that do not use fldigi.

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Chapter 13

Mac Logger Setup

13.1 Config Maclogger

This logbook interface only applies to OS X users who want fldigi to connect to and share data with the application MacLogger.
Open the configuration dialog and select the Maclogger configure item from the tree menu.

Enable the “Connect to MacLogger” check box and fldigi should find Maclogger and begin data exchanges. UDP socket streams will be displayed in the logging text control.

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Chapter 14

N3FJP Log/Contest Setup

14.1 N3FJP ACL

Starting N3FJP loggers with fldigi

You should start the N3FJP ACL or contest software before starting fldigi. The logging program ACL and the N3FJP contest logs are tcpip socket servers. fldigi will recognize the N3FJP logger that is being used, whether ACL or one of the contest logs.

Exiting the programs

You should exit fldigi before exiting the logging program.

Setting up fldigi for use with ACL

Open the configuration dialog and select the N3FJP_logger from tree menu:

The default address, 127.0.0.1 (localhost) is used when both fldigi and ACL are on the same computer. The values shown above are for the instance where fldigi and ACL are running on different machines on the same local area network. Fldigi is on a Linux machine and ACL on a Windows 7 machine.

You can observe the two way socket communications between the two programs by enabling the “Enable Data Stream” check box.

Open the Settings / Application Program Interface (API) menu item on ACL. Make sure that the box TCP API Enabled (Server) is checked and that the Port 1100 corresponds to the Port setting in the above dialog. Enable the “Connect” check box and fldigi should find ACL and begin data exchanges.

The command pair `<CWCOMPORTKEYDOWN> ... <CWCOMPORTKEYUP>` is sent to change the PTT state if the N3FJP software is used for transceiver control. You can change this to `<RIGTX> ... <RIGRX>` by enabling the check box control, “PTT via `<RIGTX>` and `<RIGRX>`.”

Capturing Rx text in fldigi

The fldigi user can capture text, both word delimited and mouse high-lighted from the received text panel. The text
will capture either with a double-left or single-left mouse click. This is selectable on this fldigi configuration tab:

![Configuration tab](image)

Single-click is faster, but makes marking text a bit more difficult, especially if the text is being moved vertically as it is being decoded. I hardly ever mark-bound a text to capture, so I prefer the single-click paradigm.

The behavior of the left-click transfer is dependent on whether fldigi is configured for casual contacts or contesting (include field day). The word capture for both casual and contesting will always transfer a recognized CALL to the fldigi logging entry for CALL. Call recognition uses a Regular Expression Parser.

A word that passes the rules for RST will be transferred to the RSTin entry.
A word that passes the rules for Maidenhead locater (grid square) will be transferred to the Loc entry.

For casual contacts, the fields are then populated in order: NAME, QTH.
Contest fields are populated in a similar way for CALL. If the contest fields for Xchg are visible then the left click paradigm is to append each clicked word LEFT to RIGHT with a space separator to the XchngIn entry control.
If the Field Day contest fields CLASS and SECTION are visible then the left-clicked Rx text words will be entered in that order.

Capturing the Field Day values for CALL, CLASS and SECTION can take as few as 3 mouse clicks.

### Trigger Actions

Immediately after the call field is updated, the CALLTAB command is sent to ACL. This doesn't actually change focus in ACL, but performs all the functions associated with tabbing from the Call field in ACL, including duplicate check, listing previous contacts and retrieving previous contact info. In ACL, it also initiates call book lookup (if enabled), checks Watch List, etc.

This action takes place when:

- fldigi's log call field is populated from the Rx text transfer
- fldigi's log call field is exited via ENTER or TAB key

The TXTENTRY in ACL will change whenever a 3 or more keystrokes occurs in the fldigi log call field, or when the log call field is populated from the Rx text grab.

Clearing the fldigi log fields will clear the N3FJP call fields.
Clearing the fldigi log call field using the right-click-clear paradigm will clear the N3FJP call fields.

### 14.2 N3FJP FD Contest

You will need to perform some additional configuration in fldigi to fully appreciate the data capture and FD event logging. Open the Contest configuration tab and make the following entries: FD operator CALL, your CLASS, your SECTION.

### 14.3 N3FJP CQWW RTTY Contest logger

Select the CQWW contest on the Contest configuration tab. The fields for CQzone and CQstate are then visible, as are the respective Rx text, right click popup menu items.
Chapter 15

Exporting Logbook Data

Fldigi provides automatic export of log records as they are recorded. On Linux the data is forwarded to Xlog compatible programs using the SysV message queue system. On Windows the records are exported via a temporary file structure and are accepted by Logger32.

The user may also export all or selected records consisting of all or selected fields. Access to this export function is available from the menu "File/Log/Export ADIF", "File/Log/Export Text", and "File/Log/Export CSV".

15.1 Export ADIF

Selecting the Export ADIF menu item opens the following dialog:

![Figure 15.1 Export Setup](image)

If you want to export every record press the "Check All" in the left panel. You can also select and deselect individual records. Choose which fields you want to export with the right panel controls. Press the OK button to continue or...
Cancel to abort the operation. A file chooser dialog will open which allows you to specify the name and location of the exported file. Use the extension ".adi" on Windows and ".adif" on the other OS's.

### 15.2 Export Text / CSV

The same Export Setup dialog is used for Text and CSV exports.

The Text export produces a simple space delimited file with columns set at locations dictated by the field size for each field that is exported. It is suitable for use with a word processing program or for printing a hardcopy of your activities.

The CSV is a "Character Separated Value" file with the TAB character used as the field separator. This type of file can be imported into nearly all spreadsheet programs such as Gnumeric, Open Office or MS Excel.
Chapter 16

Contest - How To

16.1 Contest Fields

Fldigi supports a generic and a few popular contesting formats. Select the menu item View/Contest fields to see how the QSO entry entry fields change for contest data. You will see that fldigi has fields to support received and sent contest numbers as well as generic contest exchange information. At the same time open the configuration dialog for contesting:

Select the type of logging fields which will be displayed by enabling either Generic, Field Day, CQWW RTTY, or BART RTTY as the contest type.

16.2 Generic Contest

The serial number out (#Out) is automatically initialized and updated by the built-in serial number generator. You can enter the appropriate exchange information via the keyboard or mouse. Text in the Rx pane can be selected by the usual left-click-swipe of highlighting. Then right click anywhere after highlighting the desired text and a popup menu will appear allowing you to select the destination QSO field. Make your selection and the info is placed in the
correct text box. Note that the popup menu changes with the QSO logging view and also with a change in "Quick entry". A full description is found in the description of operating the Logbook. The important thing to note for contest operation is that the Call and Serial # are single word captures. The Xchg capture can be either single word or multiple word (mark / right click). If the Xchg field has text contents then the new capture is appended to end of the current text in that field. That means you can point to the word representing the field, right click and select from the menu. You do not need to highlight the text for the word capture. You can very rapidly fill in the serial number and the exchange data (even if multi value) by simply pointing and right clicking on the desired word.

Set up the Generic contesting on the UI/Contest tab. The Send Xchg control is the text you want the appropriate macro tag. ie...if the contest requires RST and name you would fill in the Exchange Out box with your name. The contents of this field are accessed from a macro with the <XOUT> tag. You will also need to check the RST always 599 box as this is the de-facto signal report in contests.

If you are participating in a CW contest you may want to select the "Send CW cut numbers", cut numbers is the norm for a CW contest. The cut numbers will send N for 9 and T for zero.

The next box contains the needed requirements to use serial numbers for a contest. You will always want to use leading zeros, start with 1 and use 3 digits. Press reset to initialize the #Out QSO field to the Start number.

Check the appropriate fields for determining if this is a duplicate call. If a duplicate is detected the Call entry will be highlighted as shown in the "Dup Color" button. Pressing this button opens a color selector so you may customize the color. There are many choices to alert you to a duplicate contact. The duplicate is based on the logical AND of all of the fields to be checked. The DUPE is cleared when you press the clear QSO log button (the brush icon).

After you have filled in all the required information, make sure you save and close.

Remember YOU MUST click the Reset button in the Serial number panel for the serial number counter to be initialized. You should also press the QSO clear button (broom) in the QSO entry widget for the other changes to take effect.

It would be best to create a new log for each contest. You create a new log by selecting the menu item File/Logs/← New logbook. The default new log name will be newlog.adif on Linux and newlog.adi on Windows. You can rename the new log file now or later by using the system file manager or when you save the log. The import/export feature of fldigi will allow you to export the log into your everyday logging software or the built-in fldigi logbook.

### 16.3 Field Day Contest

The log fields and associated Rx Text popup menu changes to appropriate fields when the Field Day check box is enabled on the contest configuration tab:

The field day station station callsign is your fldigi user callsign. Enter the operator's call (if different). Enter the Class and Section for your station. These will all be available as macro tags for writing macros appropriate for participating in the field day event.

fldigi can connect to external Field Day logging programs such as N3FJP’s FDLlog and/or a TclTk application called "fdserver" that is a part of the family of fldigi programs. Fdserver operation is described in a separate document.
16.4 CQWW RTTY Contest

Selecting the CQWW RTTY checkbox changes the logging controls and the Rx text popup menu items accordingly:

![Screenshot of fldigi interface with CQWW RTTY options]

16.5 BART RTTY Contest

under development

16.6 Restarting a contest session

You might have closed down fldigi in the middle of a contest, everyone needs a break now and then. You then start fldigi and want to continue the contest. Here are the steps to insure that you continue operations with no glitches.

- Load your macro file that contains your contest macros (more on that below)
- Select the menu item View/Contest fields
- Select the menu item View/Logbook
- Make sure you have the contest logbook open ... if not then this is the time to open that logbook database. Select the menu item "File/Logs/Open logbook..." and find your log data file.
- Look at the last record and check the serial number sent. Enter that number plus one in the Start entry on the config contest tab (see above).
- Press the Reset button in that panel.

You are ready to keep on contesting

16.7 Remembering a contact

If you are copying a potential contact but you are not being heard you can save fldigi's modem state using one of two methods

1. double click the signal on the waterfall
2. right click on the Rx panel and select "Insert marker"

A line of text will be inserted at the end of the Rx text buffer. It will appear similar to this:

< 2008-12-30T10:06Z BPSK-31 @ 3580000+0781 >

The date-time, the mode, the transceiver operating frequency and the audio offset will be recorded. The text line is in blue and behaves in a way that you might expect a url reference to behave in a web browser window. Work a few more contacts (even on a different band or frequency) and then scroll the Rx pane to that special divider. Left click on the line of text and fldigi will restore the transceiver to its frequency, change the mode to the saved mode and put
the waterfall cursor at the audio offset frequency. Changing the transceiver frequency will only work if you are using CAT control of your transceiver. If you are not using CAT control the mode and waterfall cursor will still be restored.

There is no limit to the number of divider lines that can be inserted into the Rx pane. They will all be removed when the Rx pane is cleared.

16.8 Saving the entire session

Select the menu item "File/Logs/Log all RX/TX text". If this toggle menu is checked your entire session of received and sent text will be saved to a file in the fldigi default files folder. It will be given a name synonymous with the date and time it is started, ie: fldigi20081230.log. You can review this log by selecting the menu item "File/Show config" which will open your OS default file explorer to the fldigi files folder. The file is an ASCII text file.

The format of the daily log is shown in Working Logs.

16.9 Contesting Macro Tips

OK, now we have fldigi setup for basic contesting, lets move on to some ideas on macros to use. I tend to make generic one size fits all macros. I recommend that you make a new macro file, mine is named contest.mdf, this will give you 48 macros to use based on the type of contest you are entering. Take a good look at the examples I have listed, you will notice there are no commas, hyphens or other extraneous items. I have seen just about every example of a poorly thought out macro there is or has ever been dreamed up. Classic examples are:

- w3nr you are 599 in Alabama your serial number is 001-001-001 how copy ?
- hello ed thanks for the call you are 599-599-001-001-001 QTH Alabama back to you

The list goes on and on. Just think, you have to try and capture the exchange, try it and you will see what I mean.

When you enter a contest you have to decide whether you are going to sit on one frequency and call CQ (Run) or are you going to tune the band looking for stations to work (S&P). So lets set up some macros that should cover both cases.

Several new macro tags have been created to facilitate contesting, these include the following tags.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;LOG&gt;</code></td>
<td>add QSO data to the logbook &amp; clear the QSO data fields</td>
</tr>
<tr>
<td><code>&lt;CNTR&gt;</code></td>
<td>insert current contest serial number into the text stream</td>
</tr>
<tr>
<td><code>&lt;INCR&gt;</code></td>
<td>increment contest serial number</td>
</tr>
<tr>
<td><code>&lt;DECR&gt;</code></td>
<td>decrement contest serial number</td>
</tr>
<tr>
<td><code>&lt;XOUT&gt;</code></td>
<td>contest exchange</td>
</tr>
<tr>
<td><code>&lt;QSOTIME&gt;</code></td>
<td>current log time in Zulu HHMM format</td>
</tr>
<tr>
<td><code>&lt;LDT&gt;</code></td>
<td>local date time</td>
</tr>
<tr>
<td><code>&lt;ILDT&gt;</code></td>
<td>LDT in iso-8601 format</td>
</tr>
<tr>
<td><code>&lt;ZDT&gt;</code></td>
<td>Zulu date time</td>
</tr>
<tr>
<td><code>&lt;IZDT&gt;</code></td>
<td>ZDT in iso-8601 format</td>
</tr>
<tr>
<td><code>&lt;QSOTIME&gt;</code></td>
<td>actual time of execution of the macro ... useful where exact times are used to match contest log submissions</td>
</tr>
<tr>
<td><code>&lt;SAVEXCHG&gt;</code></td>
<td>save entire contents of the expanded macro text to the &quot;Exchange Out&quot; field in the logbook</td>
</tr>
</tbody>
</table>
See Macros for additional information on editing and using the fldigi macro system.

### 16.10 RUN Macros

We need just a few, starting with a CQ macro - Put this in the F1 key definition

```
<TX>
cq test de <MYCALL> <MYCALL> cq k
<RX>
```

Notice that I left 2 spaces between my call and 3 spaces at the end before the k. This will make it easier for a station to grab my call and the k on the end eliminates garbage characters before my macro finishes. The tx/rx are on separate lines as I want to be sure my macro is on a line by itself and not mixed in with screen garbage.

Now the exchange macro - Put this in the F2 key definition

```
<TX>
<CALL> 599 <CNTR> <CNTR> <X1> <X1> <CALL> k
<RX>
```

Why do I have his call at the beginning as well as the end, to make sure I have copied his call correctly. You will also see that I have not as yet logged the contact, why, well are you sure he does not need to correct his call or ask for a repeat.

You are asked to repeat the exchange, you can just re-send the exchange macro, this verifies all of the information. Now he sends you his info and if you have copied it correctly you need a TU macro. - Put this in the F3 key definition.

```
<TX>
qsl tu qrz test <MYCALL> k
<RX><LOG><INCR>
```

Here we have done all the necessary items to complete the exchange. Notice that I did not log the contact until after everything was correct. I have fldigi set to clear on save, so when the <LOG> part of the macro executes the QSO area is cleared.

That's the end of my RUN macro setup, told you it was rather simplistic and generic.

### 16.11 S & P Macros

I rarely ever use S&P, but there are times I need to, especially if my QSO rate drops while running. Again the macros are very generic with only the needed info. If band conditions warrant you may want to send your call 3 times. Put this in the F5 key definition
Why just my call?? Well I assume the other guy already knows his call!

The exchange macro is basically the same as the RUN macro. Put this one in the F6 key definition.

As you see I have not as yet logged the QSO or incremented the serial number. This is the final S&P macro. Put this one in the F7 key definition.

Now this is the most important macro you will ever need......trust me. Put it where you won't fail to find it. How about F9?

You will see that it is used many times during a contest, especially with weak stations and heavy QRN/QRM.

**<QSOTIME>**
- time sent in Tx stream
- repeat execution of <QSOTIME> before a <LOG> macro or a save to log button press will resend the original time
- <LOG> macro or a save-to-log button press appends the QSOTIME to the STX_STRING field in the adif log record and clears the QSOTIME.

**<XBEG>**
- use at end of a contest exchange to save the entire exchange string in STX_STRING
- usurps QSOTIME if both are contained in same macro text, ie: "<RST>\<CNTR>\<QSOTIME>\<←SAVEXCHG>" will send an exchange as 599 024 1125 if RST = 599, Counter = 024 and time of execution is 1125
- repeats the same as <QSOTIME>
- <LOG> macro or a a save-to-log button press saves the associated macro text (after expansion). QSOTIME and the saved exchange text are cleared after the save occurs.

An example of the SAVEXCHG macro tag

```
<RST> <CNTR> <XOUT> <QSOTIME><SAVEXCHG>
```

Where RST = 599, CNTR = 0125, XOUT = AL, QSOTIME = 1433

Will save this string to the Exchange Out field in the logbook: "599 0125 AL 1433"

Please note that you should not include any text or macro tags that are not to be a part of Exchange Out. If your macro had this:
Where CALL = W3NR, MYCALL = W1HKJ

the saved Exchange Out field would contain: "W3NR UR 599 0125 AL 1433 de W1HKJ k"

Probably not what you want. Use separate function keys for the "<TX><CALL> ..." and the "de <MYCALL> k" or use the next set of macro tags

These two macro tags are delimiters for capturing the transmitted exchange data, for example:

Will place the expanded <RST> <CNTR> <QSOTIME> into the Exchange Out field of the logbook when the contact is saved. This is much better illustrated with a screen shot. This one shows the macro editor contents, the logbook entry in Exchange Out, and the transmit text buffer.

Figure 16.1 Exchange Begin-End
Chapter 17

LoTW

fldigi does not have a direct connection for uploading and downloading LoTW records. Instead, it uses the tqsl program that each LoTW user will have on his or her computer. The tqsl program is usually used with it's graphics user interface, especially on Windows and OS X computers. But it also can be opened in a 'command line' mode in which the user dialog is never visible. fldigi passes the logbook records as a batch adif file via tqsl using this command line mode.

Open the LoTW configuration dialog from the Logbook menu:

![LoTW configuration dialog](image)

17.1 LoTW configuration

Use the " Locate" button to open an OS file finder dialog to locate the tqsl binary. Click on it when found. The above image shows this on a Linux computer. On OS X you need to open the Applications folder, and then drag and drop
the tqsl icon on to the 'tqsl:' control. You will see /Applications/tqsl.app in that control after the drag and drop. The Callsign Certificate used to digitally sign QSOs being uploaded (and typically specified in a Station Location) can optionally be password protected if the user is running TQSL on a public or physically unprotected computer. For typical home use, this is unnecessary; instructions for removing a password from a Callsign Certificate are here:

<https://lotw.arrl.org/lotw-help/removecertificatepassword/>

If you use are using a password protected certificate you need to enter that in the Password control and also enable the "Use password..." check button.

Many users will need only one "Callsign Certificate", but those who operate using club or contest call signs, who occasionally operate /P or /QRP, or who operate from other DXCC entities will have more than one. Users who operate from more than one geographic location, e.g. county or NPOTA or SOTA activators, must define a "Station Location" for each such location. When submitting a group QSOs to LoTW via TQSL’s command line interface, you must specify a Station Location; if the specified Station Location doesn't specify a Callsign Certificate, you must also specify a Callsign Certificate. All QSOs in the submitted group must thus have been made using the same over the air callsign and from the same geographic location.

Leave the "Quiet mode" unchecked until you are comfortable with fldigi's LoTW interface. If unchecked the tqsl dialog will open each time the "Send" button is selected. Checked and the tqsl dialog will not open.

If you never tweak the logbook entries, then enable the "Send QSO data..." check box. If checked each saved logbook entry will be sent individually to LoTW via the tqsl interface. Leave it unchecked if you want to review and possibly modify the records before the LoTW upload. When unchecked, fldigi will accumulate the adif records in an adif upload file. This file is not on disk. It is only a memory image of the file and is therefore volatile. Exit fldigi before submitting the LoTW records for upload and the memory image is lost. BUT the data is still available for LoTW upload.

### 17.2 LoTW usage

fldigi sends adif records to LoTW via the tqsl command line interface. tqsl acts upon a set of adif records in an upload file that fldigi creates for that purpose. All update files are in the fldigi files sub-folder "LOTW". The upload file is created when the Send button is pressed and the tqsl binary is invoked. An in memory image of that file is created as described above and can be reviewed and edited using the Check button. The LoTW Review dialog will only appear if there are records ready for upload.

The text box is an fairly complete text editor. You can modify or delete a record line, or just clear the entire image file contents. If you modify the file then you must save it before taking any subsequent action to upload the file to LoTW. Be sure you fully understand how to change the ADIF record before attempting to make changes. tqsl will reject mangled records.

You can create a new update file image, or append new (or corrected) records using the Export button. This will open the Export dialog:
17.3 Matching with online LoTW records

Press the LoTW button to present the field selection. Then select the desired records either individually, all, or within a date block. The above image shows a date selection of all records between July 1 and October 31 of this year. When OK is pressed the upload image file will either be newly created or appended with the selected records. View the upload image file again to insure you have not duplicated any records. tqs1 will reject any that are duplicates if you forget this step.

When all looks OK you can upload the records using the Send button on the LoTW config dialog.

17.3 Matching with online LoTW records

Download a set of adif records from LoTW using the LoTW web interface. Save the download file to a convenient location. Then press the "Match" button and fldigi will try to match your records with each LoTW download record; updating each matched record's LoTW date received data element. If the LoTW download was made using an extended format than fldigi will also update these adif fields if present in the LoTW record:

- LOTWDATE - LoTW received date
- DXCC - dxcc entity number
- CNTY - county name
- COUNTRY - country name
- CQZ - CQ zone number
- GRIDSQUARE - Maidenhead grid square reported by QSL's station

A brief report will be given in a message dialog at the conclusion of the matching effort.
Chapter 18

Macros

Macros are short text statements that contain imbedded references to text data used by the program fldigi. A macro is accessed via the macro button bar or function key.

Macro definition files(s) are located in the $HOME/.fldigi/macros/ directory and all have the extension ".mdf". The default set of macros are contained in the file $HOME/.fldigi/macros/macros.mdf. Fldigi will create this file with a set of default macros on its first execution.

Fldigi supports up to 48 macro definitions in sets of 12. Macro definitions are not recursive, that is; a macro cannot reference another macro or itself. All 48 macro buttons can be displayed in a matrix.

The imbedded references are similar to those used by DigiPan and other modem programs. The imbedded reference is an uppercase plain text descriptor contained with the <> brackets.

18.1 Macro tags
<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;FREQ&gt;</td>
<td>my frequency</td>
</tr>
<tr>
<td>&lt;MODE&gt;</td>
<td>mode</td>
</tr>
<tr>
<td>&lt;MYCALL&gt;</td>
<td>configuration call</td>
</tr>
<tr>
<td>&lt;MYLOC&gt;</td>
<td>configuration locator</td>
</tr>
<tr>
<td>&lt;MYNAME&gt;</td>
<td>configuration name</td>
</tr>
<tr>
<td>&lt;MYQTH&gt;</td>
<td>configuration QTH</td>
</tr>
<tr>
<td>&lt;MYRST&gt;</td>
<td>my RST</td>
</tr>
<tr>
<td>&lt;ANTENNA&gt;</td>
<td>configuration antenna</td>
</tr>
<tr>
<td>&lt;VER&gt;</td>
<td>Fldigi version</td>
</tr>
<tr>
<td>&lt;DIGI&gt;</td>
<td>insert ADIF mode specifier</td>
</tr>
<tr>
<td>&lt;WFFREQ&gt;</td>
<td>audio tracking frequency</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;CALL&gt;</td>
<td>other stations callsign</td>
</tr>
<tr>
<td>&lt;INFO1&gt;</td>
<td>S/N or other data contained in first info field of status bar</td>
</tr>
<tr>
<td>&lt;INFO2&gt;</td>
<td>IMD or other data contained in second info field of status bar</td>
</tr>
<tr>
<td>&lt;LOC&gt;</td>
<td>other stations locator</td>
</tr>
<tr>
<td>&lt;NAME&gt;</td>
<td>other stations name</td>
</tr>
<tr>
<td>&lt;QTH&gt;</td>
<td>other stations QTH</td>
</tr>
<tr>
<td>&lt;RST&gt;</td>
<td>other stations RST</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;MAPIT&gt;</td>
<td>map other stations locator on google</td>
</tr>
<tr>
<td>&lt;MAPIT:adr</td>
<td>map other stations address, latitude-longitude locator as specified</td>
</tr>
<tr>
<td>lat loc&gt;</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;CLRRX&gt;</td>
<td>clear RX pane</td>
</tr>
<tr>
<td>&lt;CLRTX&gt;</td>
<td>clear TX pane</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;FOCUS&gt;</td>
<td>rig freq has keyboard focus</td>
</tr>
<tr>
<td>Macro</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td><code>&lt;GET&gt;</code></td>
<td>text to NAME/QTH</td>
</tr>
<tr>
<td><code>&lt;TALK:on/off/t&gt;</code></td>
<td>Digitalk On, Off, Toggle; this is a Windows only tag and Digitalk must be running</td>
</tr>
<tr>
<td><code>&lt;LOG&gt;</code></td>
<td>save QSO data to logbook immediately</td>
</tr>
<tr>
<td><code>&lt;LNW&gt;</code></td>
<td>log at xmt time</td>
</tr>
<tr>
<td><code>&lt;CLRLOG&gt;</code></td>
<td>clear log fields</td>
</tr>
<tr>
<td><code>&lt;EQSL:message&gt;</code></td>
<td>submit the current log entry to <a href="http://www.eQSL.cc">www.eQSL.cc</a> This macro tag should be put before <code>&lt;LOG&gt;</code> or <code>&lt;LNW&gt;</code></td>
</tr>
</tbody>
</table>

### Macro tags

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;QSOTIME&gt;</code></td>
<td>insert current logbook time HHMM, ie 0919</td>
</tr>
<tr>
<td><code>&lt;ILDT[:fmt]&gt;</code></td>
<td>insert current local date-time in iso-8601 format, ie 2011-08-28 04:16-0500</td>
</tr>
<tr>
<td><code>&lt;LDT[:fmt]&gt;</code></td>
<td>insert Local date-time, ie 2011-08-28 04:16-0500</td>
</tr>
<tr>
<td><code>&lt;IZDT[:fmt]&gt;</code></td>
<td>insert Zulu date-time in iso-8601 format, ie 08/28/2011 04:16 CDT</td>
</tr>
<tr>
<td><code>&lt;ZDT[:fmt]&gt;</code></td>
<td>insert Zulu date-time, ie 2011-08-28 09:16Z</td>
</tr>
<tr>
<td><code>&lt;LT[:fmt]&gt;</code></td>
<td>insert local time, ie 0416</td>
</tr>
<tr>
<td><code>&lt;ZT[:fmt]&gt;</code></td>
<td>insert zulu time, ie 0916Z</td>
</tr>
<tr>
<td><code>&lt;LD[:fmt]&gt;</code></td>
<td>insert local date, ie 2011-08-28</td>
</tr>
<tr>
<td><code>&lt;ZD[:fmt]&gt;</code></td>
<td>insert Zulu date, ie 2011-08-28</td>
</tr>
</tbody>
</table>

See date time specifiers below for fmt

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;WX&gt;</code></td>
<td>insert current weather data from METAR as specified on WX configuration tab. see WX configure replace xxxx with the 4 letter METAR designator for a report on a station other than the one specified on the weather configuration tab.</td>
</tr>
</tbody>
</table>

### Macro tags

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;CNTR&gt;</code></td>
<td>insert current value of contest counter</td>
</tr>
<tr>
<td><code>&lt;DECR&gt;</code></td>
<td>decrement contest counter</td>
</tr>
<tr>
<td><code>&lt;INCR&gt;</code></td>
<td>increment contest counter</td>
</tr>
<tr>
<td><code>&lt;XIN&gt;</code></td>
<td>send exchange in string</td>
</tr>
<tr>
<td><code>&lt;XOUT&gt;</code></td>
<td>send exchange out string</td>
</tr>
<tr>
<td><code>&lt;XBEG&gt;</code></td>
<td>mark exchange in start</td>
</tr>
<tr>
<td><code>&lt;XEND&gt;</code></td>
<td>mark exchange in end</td>
</tr>
<tr>
<td><code>&lt;SAVEXCHG&gt;</code></td>
<td>save marked text to contest exchange in</td>
</tr>
<tr>
<td><code>&lt;FDCLASS&gt;</code></td>
<td>recvd FD class</td>
</tr>
<tr>
<td><code>&lt;FDSECT&gt;</code></td>
<td>recvd FD section</td>
</tr>
</tbody>
</table>

Generated by Doxygen
<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="">ALERT:[snd]</a></td>
<td>audio alert using internal sound where [snd] is one of bark, checkout, doesnot, phone, beeboo, diesel, steam_train, dinner_bell</td>
</tr>
<tr>
<td><a href="">ALERT:</a></td>
<td>alert using external wav file</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;RX&gt;</td>
<td>receive</td>
</tr>
<tr>
<td>&lt;TX&gt;</td>
<td>transmit</td>
</tr>
<tr>
<td>&lt;TX/RX&gt;</td>
<td>toggle Transmit / Receive</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;SRCHUP&gt;</td>
<td>search UP for next signal</td>
</tr>
<tr>
<td>&lt;SRCHDN&gt;</td>
<td>search DOWN for next signal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;GOHOME&gt;</td>
<td>return to waterfall cursor to sweet spot</td>
</tr>
<tr>
<td><a href="">GOFREQ:NNNN</a></td>
<td>move waterfall cursor to freq NNNN Hz</td>
</tr>
<tr>
<td>&lt;QSYTO&gt;</td>
<td>same as left-clk on QSY button</td>
</tr>
<tr>
<td>&lt;QSYFM&gt;</td>
<td>same as right-clk QSY button</td>
</tr>
<tr>
<td>&lt;QSY:triad; triad...&gt;</td>
<td>QSY to new transceiver RF, Waterfall Audio and Mode triad is RF[:AF][:MD] RF - transceiver suppressed carrier in Hz AF - waterfall frequency in Hz MD - digital mode (see &lt;MODE...&gt;) A rolex of triads may be specified, QSY to next triad each time macro is executed. 1-&gt;2-&gt;3...-&gt;1 Each triad may be one of: RF, RF:AF, or RF:AF:MD.</td>
</tr>
<tr>
<td>&lt;PUSH:m</td>
<td>f&gt;</td>
</tr>
<tr>
<td>&lt;PUSH&gt;</td>
<td>Push both mode and freq for later retrieval</td>
</tr>
<tr>
<td>&lt;POP&gt;</td>
<td>Pop (restore) pushed mode and/or freq</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="">RIGMODE:mode</a></td>
<td>send mode change request to flrig</td>
</tr>
</tbody>
</table>
### 18.1 Macro tags

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;FILWID:width&gt;</code></td>
<td>send filter width change request to flrig</td>
</tr>
<tr>
<td><code>&lt;FLRIG:hex hex&gt;</code></td>
<td>send CAT command sequence to flrig</td>
</tr>
<tr>
<td><code>&lt;FLRIG:&quot;string&quot;&gt;</code></td>
<td>hex hex ... are sequential hexadecimal values e.g. xFF xfe string is Ascii char sequence No return values, use set commands only</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;FILE:</code></td>
<td>insert text file; a file selection box will open when this tag is selected during editing</td>
</tr>
<tr>
<td><code>&lt;IMAGE:</code></td>
<td>insert image file; a file selection box will open when this tag is selected during editing</td>
</tr>
<tr>
<td><code>&lt;IMAGE:G&gt;</code></td>
<td>insert image file; transmit in grey scale</td>
</tr>
<tr>
<td><code>&lt;VIDEO:text&gt;</code></td>
<td>transmit video text</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;IDLE:NN.nn&gt;</code></td>
<td>transmit idle signal for NN.nn sec</td>
</tr>
<tr>
<td><code>&lt;TUNE:NN&gt;</code></td>
<td>transmit single tone tune signal for NN sec</td>
</tr>
<tr>
<td><code>&lt;AFTER:NN&gt;</code></td>
<td>repeat this macro after waiting NN sec</td>
</tr>
<tr>
<td><code>&lt;TIMER:NN&gt;</code></td>
<td>repeat this macro every NN sec</td>
</tr>
<tr>
<td><code>&lt;WAIT:NN&gt;</code></td>
<td>insert delay of NN seconds before transmitting</td>
</tr>
<tr>
<td><code>&lt;REPEAT&gt;</code></td>
<td>repeat macro continuously</td>
</tr>
<tr>
<td><code>&lt;SKED:hhmm[:YYYYDDMM]&gt;</code></td>
<td>schedule execution to begin at time and optionally date specified</td>
</tr>
<tr>
<td><code>&lt;LOCAL&gt;</code></td>
<td>all scheduled times are local usage: <code>&lt;LOCAL&gt;:&lt;SKED:...&gt;</code> in current macro</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;CWID&gt;</code></td>
<td>transmit a CW callsign identifier</td>
</tr>
<tr>
<td><code>&lt;ID&gt;</code></td>
<td>transmit mode ID using waterfall video text</td>
</tr>
<tr>
<td><code>&lt;TEXT&gt;</code></td>
<td>transmit video text defined on ID configuration tab</td>
</tr>
<tr>
<td>`&lt;TXRSID:on</td>
<td>off</td>
</tr>
<tr>
<td>`&lt;RXRSID:on</td>
<td>off</td>
</tr>
<tr>
<td><code>&lt;NRSID:NN&gt;</code></td>
<td>transmit multiple RsID bursts NN &lt; 0 will transmit NN bursts for current modem and then return to Rx NN &gt; 0 will transmit NN bursts for current modem and continue in Tx NN = 0 will transmit 1 bursts and continue (same as NN = 1)</td>
</tr>
<tr>
<td><code>&lt;DTMF:[Wn]:[Ln]:&gt;</code></td>
<td>tones transmit DTMF tone sequence at start of transmission; options W-wait n msec, default 0 L-tone symbol length n in msec; default 50 msec ' . , ' and ' ' insert silence symbol eg: <code>&lt;DTMF:W250:L100:1-256-827-3200&gt;</code></td>
</tr>
<tr>
<td>Macro</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td><code>&lt;POST:+/-nn.n&gt;</code></td>
<td>CW QSK post-timing in milliseconds</td>
</tr>
<tr>
<td><code>&lt;PRE:nn.n&gt;</code></td>
<td>CW QSK pre-timing in milliseconds</td>
</tr>
<tr>
<td><code>&lt;RISE:nn.n&gt;</code></td>
<td>CW rise time in milliseconds</td>
</tr>
<tr>
<td><code>&lt;RISE:nn.n&gt;</code></td>
<td>CW rise time in milliseconds</td>
</tr>
<tr>
<td><code>&lt;WPM:ww[.ff]&gt;</code></td>
<td>CW WPM, ww = word rate, optional ff = Farnsworth rate</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;RIGCAT:hex hex:retnbr&gt;</code></td>
<td>RigCAT user commands</td>
</tr>
<tr>
<td><code>&lt;RIGCAT:“string”:retnbr&gt;</code></td>
<td>hex hex ... are sequential hexadecimal values string is Ascii char sequence retnbr is number of bytes in xcvr response ‘retnbr’ is optional; retnbr set to 0 if missing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>`&lt;AFC:on</td>
<td>off</td>
</tr>
<tr>
<td>`&lt;LOCK:on</td>
<td>off</td>
</tr>
<tr>
<td>`&lt;REV:on</td>
<td>off</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;QRG:text&gt;</code></td>
<td>Insert current operating info with &quot;text&quot; into Rx stream, ie: info text <code>&lt;2013-01-12T21:18Z RTTY @ 14005000+0760&gt;</code> which can be used to return to a mode, rf, audio frequency.</td>
</tr>
<tr>
<td><code>&lt;PAUSE&gt;</code></td>
<td>Cause transmission to pause at place of occurance in macro text. &quot;Pause/Break&quot; key on keyboard resumes transmission</td>
</tr>
<tr>
<td><code>&lt;TXATTEN:nn.n&gt;</code></td>
<td>set fldigi tx attenuator to value -30 dB &lt;= val &lt;= 0</td>
</tr>
<tr>
<td><code>&lt;COMMENT:text&gt;</code></td>
<td>allow macro to contain a comment field; everything between <code>&lt; and &gt;</code> is ignored by macro parser</td>
</tr>
<tr>
<td><code>&lt;SAVE&gt;</code></td>
<td>save the current macro definitions to the current file</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Macro</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;MACROS:</code></td>
<td>load a new macro defs file; file prompt when editing macro</td>
</tr>
</tbody>
</table>
Macro | Description
--- | ---
\(<\text{CPS\_TEST}>\) | modem timing test internal string
\(<\text{CPS\_FILE}>\) | modem timing test, spec file
\(<\text{CPS\_STRING:s}>\) | modem timing test, string 's'

Macro | Description
--- | ---
\(<\text{WAV\_TEST}>\) | WAV file; internal string
\(<\text{WAV\_FILE}>\) | WAV file; spec file
\(<\text{WAV\_STRING:s}>\) | WAV file; string 's'

18.2 Modem macro tags

Macro tags are also assigned to each supported modem type and sub-modem type that is supported by fldigi:
### 18.3 Date Time Specifiers

<table>
<thead>
<tr>
<th>Format</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%a</td>
<td>The abbreviated weekday name according to the current locale</td>
</tr>
<tr>
<td>%A</td>
<td>The full weekday name according to the current locale</td>
</tr>
<tr>
<td>%b</td>
<td>The abbreviated month name according to the current locale</td>
</tr>
<tr>
<td>%B</td>
<td>The full month name according to the current locale</td>
</tr>
<tr>
<td>%c</td>
<td>The preferred date and time representation for the current locale</td>
</tr>
<tr>
<td>%C</td>
<td>The century number (year/100) as a 2-digit integer</td>
</tr>
<tr>
<td>%d</td>
<td>The day of the month as a decimal number (range 01 to 31)</td>
</tr>
<tr>
<td>%D</td>
<td>Equivalent to %m/%d/%y. (Americans only)</td>
</tr>
<tr>
<td>%e</td>
<td>Like %d, the day of the month as a decimal number, leading space</td>
</tr>
<tr>
<td>%E</td>
<td>Modifier: use alternative format, see below</td>
</tr>
<tr>
<td>%F</td>
<td>Equivalent to %Y-%m-%d (the ISO 8601 date format)</td>
</tr>
<tr>
<td>%G</td>
<td>The ISO 8601 week-based year with century as a decimal number</td>
</tr>
<tr>
<td>%g</td>
<td>Like %G, but without century, that is, with a 2-digit year (00-99)</td>
</tr>
<tr>
<td>%h</td>
<td>Equivalent to %b</td>
</tr>
<tr>
<td>%H</td>
<td>The hour as a decimal number using a 24-hour clock (range 00 to 23)</td>
</tr>
<tr>
<td>%I</td>
<td>The hour as a decimal number using a 12-hour clock (range 01 to 12)</td>
</tr>
<tr>
<td>%j</td>
<td>The day of the year as a decimal number (range 001 to 366)</td>
</tr>
<tr>
<td>%k</td>
<td>The hour (24-hour clock) as a decimal number (range 0 to 23)</td>
</tr>
<tr>
<td>%l</td>
<td>The hour (12-hour clock) as a decimal number (range 1 to 12)</td>
</tr>
<tr>
<td>%m</td>
<td>The month as a decimal number (range 01 to 12)</td>
</tr>
<tr>
<td>%M</td>
<td>The minute as a decimal number (range 00 to 59)</td>
</tr>
<tr>
<td>%n</td>
<td>A newline character</td>
</tr>
<tr>
<td>%O</td>
<td>Modifier: use alternative format</td>
</tr>
<tr>
<td>%p</td>
<td>Either &quot;AM&quot; or &quot;PM&quot; according to the given time value</td>
</tr>
<tr>
<td>%P</td>
<td>Like %p but in lowercase: &quot;am&quot; or &quot;pm&quot;</td>
</tr>
<tr>
<td>%r</td>
<td>The time in a.m. or p.m. notation. Equivalent to %I:%M:%S %p</td>
</tr>
<tr>
<td>%R</td>
<td>The time in 24-hour notation (%H:%M)</td>
</tr>
<tr>
<td>%s</td>
<td>The number of seconds since the Epoch, 1970-01-01 00:00:00 +0000 (UTC)</td>
</tr>
<tr>
<td>%S</td>
<td>The second as a decimal number (range 00 to 60)</td>
</tr>
</tbody>
</table>
18.4 Other Modems

The following modems perform other functions not involving data transportation:

<table>
<thead>
<tr>
<th>Non Data Modems</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;MODEM:NULL&gt;</code></td>
<td>Null modem - Rx stream is discarded. Tx stream is silent but PTT is enabled</td>
</tr>
<tr>
<td><code>&lt;MODEM:SSB&gt;</code></td>
<td>SSB modem (place holder)</td>
</tr>
<tr>
<td><code>&lt;MODEM:ANALYSIS&gt;</code></td>
<td>Analyze Frequency</td>
</tr>
<tr>
<td><code>&lt;MODEM:WWV&gt;</code></td>
<td>Calibrate Sound Card</td>
</tr>
</tbody>
</table>

Some date time examples:

Macros:

- `<ZT>`
- `<ZT:%H%M%S Z>`
- `<ZT:%H hours, %M minutes, %S seconds UTC>`
- `<ZT:%T UTC>`
- `<ZDT>`
- `<ZDT:%a %d %b %Y %T UTC>`

Resulting transmit strings:

```
2237Z
223715 Z
22 hours, 37 minutes, 15 seconds UTC
22:37:15 UTC
02/24/2017 22:37Z
Fri 24 Feb 2017 22:37:15 UTC
```
Local references are specified during the program configuration and can be changed during program operation.

Remote references are all part of the qso log field definitions and are routinely changed from contact to contact.

Global references are for items like Greenwich Mean Time.

The macros.mdf file can be edited with any ascii text editor such as kedit, gedit, geany, nano etc. But it is much easier to use the built-in macro editor provided in the program.

18.5 Macro Editor

Right click on any macro key (or the alternate set) and a macro editing dialog opens with the current copy of that macro and its label. This looks very similar to the DigiPan macro editor at the urging of Skip Teller, KH6TY.

The Text box is a mini-editor with a very limited set of control functions. You can mark, bound and select text for deletion (ctrl-X), copy (ctrl-C), and paste (ctrl-V). Marked text can also be deleted with the delete or the backspace keys. Marked text modification can also be invoked by using the mouse right click after highlighting.

The macro reference in the pick list can be transferred to the current editing cursor location. Highlight the desired macro reference and then press the double << arrow key for each occurrence of the reference to be put into the macro text. You can change the label name but any more than 8 characters may exceed the width of the button for the default sized main dialog.

The <TIMER:NN> and <IDLE:NN> macro tags should have the NN replaced with the time interval in seconds.

<TX><IDLE:5>CQ CQ de <MYCALL> <MYCALL> k<RX><TIMER:20>

- will enable the PTT
- cause 5 seconds of idle signal
- send the CQ CQ de W1HKJ W1HKJ k
- disable PTT
- and count down 20 seconds before repeating the macro
- after sending the text the count down timer button (upper right hand corner of main dialog) will display the current timer value in seconds. Press this button to disable the timer.
18.6 Macro Display Symbols

- During transmission, the timer will be disabled if the Escape key is pressed, the T/R is pressed, and macro key is pressed, or if a callsign is copied from the Rx text area to the callsign logbook entry.
- The timer will be disabled if any mouse activity occurs in the waterfall control.

The label associated with each macro key can be individually annotated with a symbol. Here are the symbols that are recognized by the button label drawing routine:

![Figure 18.4 Symbols](image)

The @ sign may also be followed by the following optional "formatting" characters, in this order:

- '#' forces square scaling, rather than distortion to the widget's shape.
- '+'[1-9] or '-[1-9]' tweaks the scaling a little bigger or smaller.
- '$' flips the symbol horizontally, '' flips it vertically.
- '[0-9]' - rotates by a multiple of 45 degrees. '5' and '6' do no rotation while the others point in the direction of that key on a numeric keypad. '0', followed by four more digits rotates the symbol by that amount in degrees.

Thus, to show a very large arrow pointing downward you would use the label string '@+92\.'<n>

Here are my macro buttons suitably annotated:

![Figure 18.5 Macro Buttons](image)

There are 4 sets of 12 macro functions. You can move between the 4 sets using the keyboard and the mouse.
1. Left click on the "1" button to move to set #2. Right click on the "1" button to move to set #4.

2. Move the mouse to anywhere on the macro buttons. Use the scroll wheel to move forward & backward through the macro sets.

3. Press the Alt-1, Alt-2, Alt-3 or Alt-4 to immediately change to that macro set.
   - The label for CQ is "CQ @\\>|", denoting that both <TX> and <RX> are present in the macro text.
   - The label for QSO is "QSO @$>|", denoting that only <TX> is present in the macro text.
   - The label for KN is "KN @|||", denoting that only <RX> is present in the macro text.

You could use any label that is symbolic to the function required. Refer to the FLTK web site for a full list of label types.

If you modify the macros and do not save them ("Files/Save Macros" on the main window) fldigi will prompt you to save the macros when you exit the program if you have the Exit Prompts option selected.

### 18.7 Contest macro tags

Refer to Contest-How-To

Return to Top of Page
Return to Main Page
Chapter 19

Inline Macros

The following macro tags will be parsed and acted upon then they occur during the transmission of the macro.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;!WPM:NN&gt;</td>
<td>CW words per minute</td>
</tr>
<tr>
<td>&lt;!POST:+/-nn.n&gt;</td>
<td>CW post delay</td>
</tr>
<tr>
<td>&lt;!PRE:nn.n&gt;</td>
<td>CW pre delay</td>
</tr>
<tr>
<td>&lt;!RISE:nn.n&gt;<a href="">RISE:nn.n</a></td>
<td>CW rise/decay time</td>
</tr>
<tr>
<td>&lt;!MODEM: ....&gt;</td>
<td>Change to specified modem with parameters</td>
</tr>
<tr>
<td>&lt;!GOHOME&gt;</td>
<td>Move audio carrier to mode sweet spot frequency</td>
</tr>
<tr>
<td>&lt;!GOFREQ:NNNN&gt;</td>
<td>Move audio carrier to specific audio frequency</td>
</tr>
<tr>
<td>&lt;!QSY:FFF .F[:NNNN]&gt;</td>
<td>Move to specific RF and Audio frequency</td>
</tr>
<tr>
<td>&lt;!IDLE:NN.nn&gt;</td>
<td>Transmit idle signal for specified number of seconds</td>
</tr>
<tr>
<td>&lt;!WAIT:NN&gt;</td>
<td>Wait (no audio) for specified number of seconds</td>
</tr>
<tr>
<td>&lt;!WPM:ww[ff]&gt;</td>
<td>CW - ww = WPM, optional ff = Farnsworth wpm</td>
</tr>
</tbody>
</table>

<!PUSH:m|f> | Push (save) current mode(m), freq(f) for later retrieval
<!PUSH> | Push both mode and freq for later retrieval
<!POP> | Pop (restore) pushed mode and/or freq
<!DIGI> | insert ADIF mode specifier
<!FREQ> | RF transmit modem center frequency

Note that each of these tags is identical to their immediate mode counterparts. The exception is the addition of the exclamation mark following the leading '<'. The use of these tags is best explained by example.

19.1 CW Code Practice Transmission

<!MODEM:CW><TX>
<!GOFREQ:600><!WPM:10:15>
NOW IS THE TIME - now 180 wpm
<!IDLE:2><RISE:1.0><PRE:0.4><POST:+0.2><WPM:180>
FOR ALL GOOD MEN TO COME TO THE AID of their country.
now 30 wpm<!IDLE:2>
<!WPM:30>de <MYCALL> k
<!RX>

- Modem type is changed to CW before start of transmission (<MODEM:CW>) does not have the addition of the ! symbol
- Audio carrier is changed to 600 Hertz
• Transmit WPM set to 30 words per minute, followed by text
• Transmit is silent for 2 seconds
• Rise time, pre and post delays are adjusted and the WPM changed to 180 words per minute
• Text is sent at 180 WPM
• WPM changed to 30 words per minute, followed by identification string and signoff
• Return to receive

This is a more complex macro that might be used for a code practice transmission such as the W1AW broadcast on 3580 KHz.

19.2 QSY:ffff.f:aaaa test

• Change modem type to NULL to suppress sending any signal when transmit enabled. This is necessary to allow the transmit data stream to be processed.
• Send frequency change command to transceiver, new frequency is 3583.0 kHz. Set audio frequency to 1750 Hz
• Change modem to RTTY, 170 Hz shift, 45.45 Baud, 5 Bit code (standard Baudot)
• Send RY... text
• Return to receive

19.3 Advanced QSY operations

Several QSY frequencies or ranges of frequencies provided by one increment, can be proposed, in which case the first frequency after the current frequency is chosen.

Advanced QSY operations
19.4  ARRL style broadcast in multiple modes

• Change modem type to NULL to suppress transmission and start the Tx data stream processor

• Send frequency change command to transceiver, new frequency is 3594 kHz, audio frequency 915 Hz. Note that this puts the MARK tone at 1000 Hz.

• Change modem to RTTY 170 Hz shift, 45.45 baud (default is 5 bits). Idle for 2 seconds.

• Send the file contents of specified file

• Change to NULL modem. Turns off the RTTY diddle ... audio stream is silent.

• Change audio frequency to 1000 Hz. Idle for 5 seconds (complete silence of transmit)

• Change modem type to BPSK-31. Send BPSK idle for 2 seconds

• Send the file contents of specified file

• Return to receive (note that the <TX> can appear anywhere is the macro definition as it is executed when the macro text is parsed). <RX> is always moved to the end of the Tx buffer. It could also have appeared anywhere in the macro string.

19.5 Appearance of tx buffer

This is the contents of the ARRL broadcast macro text at the time the macro button is pressed. Each of the !... macro tags has been specified by the string "^!" which the Tx processor interprets as the command to process the top most tag in the first-in, first-out sequence of tags. As each "^!" is executed the referenced tag is printed to the Rx buffer using color coded text.

<!QSY:3594:915>
<!MODEM:RTTY:170:45.45:5><!IDLE:2>
QST DE W1HKJ
TEST BULLETIN FOR 9/7/2011
QST DE W1HKJ SK
<!IDLE:2>
<!MODEM:NULL>
QST de W1HKJ
Test bulletin for 9/7/2011
QST de W1HKJ SK
Chapter 20

Delayed Execution Macro Tags

The following macro tags will be parsed and queued for action after fldigi returns to the receive mode, i.e. after the `<RX>` tag ("r") is executed.

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;@MODEM: ..., &gt;</code></td>
<td>Change to specified modem with parameters</td>
</tr>
<tr>
<td><code>&lt;@RIGCAT:hex hex:retnbr&gt;</code></td>
<td>RigCAT user commands</td>
</tr>
<tr>
<td><code>&lt;@RIGCAT:&quot;string&quot;:retnbr&gt;</code></td>
<td>hex hex ... are sequential hexadecimal values; string is Ascii char sequence; retnbr is number of bytes in xcvr response; <code>:retnbr</code> is optional; retnbr set to 0 if missing</td>
</tr>
<tr>
<td><code>&lt;@GOHOME&gt;</code></td>
<td>return waterfall cursor to sweet spot</td>
</tr>
<tr>
<td><code>&lt;@GOFREQ:NNNN&gt;</code></td>
<td>move waterfall cursor to freq NNNN Hz</td>
</tr>
<tr>
<td><code>&lt;@RIGMODE:mode&gt;</code></td>
<td>send CAT command to transceiver to change to a valid mode</td>
</tr>
<tr>
<td><code>&lt;@FILWID:width&gt;</code></td>
<td>send CAT command to transceiver to change to a valid filter width example to QSY to sweetspot (center of bandpass filter) and select narrow filter</td>
</tr>
<tr>
<td>`&lt;@TXRSID:on</td>
<td>off</td>
</tr>
</tbody>
</table>

Note that each of these tags is identical to their immediate mode counterparts. The exception is the addition of the `@` symbol following the leading `<`. The use of these tags is best explained by example.

### 20.1 Check in to a net with video ID

```
<TXRSID:off>
<MODEM:NULL>
<TX>
<!GOFREQ:2200>
<VIDEO:K7KY>
<!GOFREQ:1200>
<MODEM:MFSK32>
<TXRSID:on>
<RX>
```

- TxRSID is disabled before any other action
- modem is changed to NULL to prevent anything but VIDEO transmission
- Audio carrier is changed to 2200 Hertz
- The callsign K7KY is transmitted as video text at 2200 Hertz
• Return to receive
• Waterfall carrier is set to 1200 Hertz
• Modem is changed to MFSK-32
• TxRSID is enabled
Chapter 21

Advanced QSY operations

The `<QSY:FFF:F[:NNNN]>` macro tag and its delayed flavour `<!QSY:FFF:F[:NNNN]>` allows the user to set the transceiver frequency to FFF:F (In kHz) and optionally set the audio frequency to NNNN (In Hz).

It is possible to give several frequencies, which specify a frequency set. When the macro is executed, it chooses the first frequency of this set greater than the current one. If the current frequency is greater than any frequency of the set, then the macro chooses the smallest, first frequency of this set.

The utility of this feature is to allow a scan of a range of frequencies by re-executing the same macro over and over. Each time the macro is executed, the next frequency of the set is selected. It can typically be used to iteratively try several frequency for a given test.

The frequency set can be specified in two distinct ways, which can be freely combined together.

21.1 Distinct frequencies

Several distinct separated with a semi-column, in increasing order. For example:

```
<QSY:2616.6;3287.6;3853.1;4608.1;4780.1;7878.1;8038.1:1900>
```

It means that the transceiver frequency will be set to 2616.6 kHz, then at next execution to 3853.1 kHz etc... and will loop back to 2616.6 kHz. Each time the same (optional) audio frequency will be set to 1900 Hz. In this specific case, it allows to test several Weather Fax broadcast stations, until the operator finds an active one.

21.2 Frequencies with increments

A frequency can come with an increment: This means an implicit range of frequencies from this one to the next frequency. If the last frequency has an increment, it is never taken into account: The last frequency is always an upper limit. Let's consider this example:

```
<QSY:89000+100;102000>
```

It is equivalent to:

```
<QSY:89000;89100;89200;89300;...;101900;102000>
```

In this case, it allows fldigi to scan all FM frequencies by clicking the macro button.
21.3 Combination with \texttt{<TIMER>} macro tag.

If the macro is automatically reexecuted using the \texttt{<TIMER>}, the same logic applies. At each run of the macro, the next frequency is chosen. The following macro transmits the same message on the frequencies 144800 MHz, 144900 ... until 146000 then loops back, waiting five seconds between each transmission.

\begin{verbatim}
<TX><QSY:144800.00+100;146000><MODEM:NULL><!MODEM:PACKET>
<FREQ> CQ CQ de <MYCALL><RX><TIMER:5>
\end{verbatim}

21.4 Execution errors.

Several error messages can be displayed in the macro editor in case of a parameter. If this happens, the execution of the macro is stopped. Here is the list of possible messages:

21.5 Invalid frequency range

There must be valid frequencies. This macro will display the message:

\begin{verbatim}
<QSY:abcdef>
\end{verbatim}

21.6 Increment must be positive

The frequency increment must be positive. This macro will fail:

\begin{verbatim}
<QSY:89000-1000;88000>
\end{verbatim}

21.7 Frequency not positive

All frequencies must be strictly positive.

21.8 Frequencies must be increasing

The sequence of frequencies must be strictly increasing. Thus, this error message can appear with a macro such as:

\begin{verbatim}
<QSY:89000;88000>
\end{verbatim}

21.9 Inline Macro Tags

Unless otherwise noted all of the macro tags discussed thus far are meant to be executed at the time that the macro is invoked by the button closure. It is possible by execution of the tag to be delayed until it appears in the transmit data stream. This delayed execution capability is limited to a select number of tags. See Inline Macro Tags for a list of these tags and examples.
21.10 Delayed Execution Macro Tags

It is possible for the execution of the tag to be delayed until after the macro execution returns to the receive state. This delayed execution capability is limited to a select number of tags. See Delayed Execution Macro Tags for a list of these tags and example.

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Chapter 22

Exec Macro

The `<EXEC>` ... `</EXEC>` macro is designed to be used on the Linux OS as it supports fully functional pipes. Windows' version of file pipes is not fully POSIX compliant, but the function might work in the environment. Consider all that the following allows you to do from within fldigi and you might want to consider changing over to Linux. The `<EXEC>` macro defines an external child process (or processes) that will be called by fldigi when the macro key is invoked.

22.1 Exported variables

Fldigi exports a set of variables to the child process and adds `~/.fldigi/scripts` to the PATH variable before running the shell code. This is the directory location for all executable scripts and programs which you might want to call from within the macro. Some examples will be given later. Open the macro editor for an undefined macro key and enter the following:

```bash
<EXEC>env | grep FLDIGI</EXEC>
```

Save the macro; call it ENV. Then press the newly defined macro key. All of the exported variables will be shown in the transmit window.

Here is an example of the results:

```
FLDIGI_RX_IPC_KEY=9876
FLDIGI_LOG_LOCATOR=FM02BT
FLDIGI_TX_IPC_KEY=6789
FLDIGI_LOG_RST_IN=
FLDIGI_LOG_FREQUENCY=3581.000
FLDIGI_AZ=108
FLDIGI_MY_CALL=W1HKJ
FLDIGI_LOG_TIME=2113
FLDIGI_MY_NAME=Dave
FLDIGI_VERSION=3.0preG
FLDIGI_LOG_NOTES=
FLDIGI_LOG_QTH=Mt Pleasant, SC
FLDIGI_MY_LOCATOR=EM64qv
FLDIGI_DIAL_FREQUENCY=3580000
FLDIGI_CONFIG_DIR=/home/dave/.fldigi/
FLDIGI_LOG_RST_OUT=
FLDIGI_MODEM=BPSK31
FLDIGI_LOG_CALL=KH6TY
FLDIGI_MODEM_LONG_NAME=BPSK-31
FLDIGI_AUDIO_FREQUENCY=1000
```

Generated by Doxygen
22.2 Detection of existing scripts

In anticipation of a collection of useful "fldigi scripts", the macro browser contains a \texttt{<exec> \textbackslashᴩrɪm> macro line for each executable file found in the scripts directory. The EXEC macro allows the text that is read from the child process to be parsed for more fldigi macros. For example, try this macro:

\texttt{<EXEC>cat foo</EXEC>}

where foo is a file that contains:

\texttt{<MYCALL>}

This may have some interesting uses but, if it is undesirable, it can be suppressed with an extra layer of redirection. Instead of \texttt{<EXEC>command</EXEC>}, you would use \texttt{<EXEC>noexp command</EXEC>} where noexp is the following very simple script:

\begin{verbatim}
#!/bin/bash
echo -n "<STOP>"
"$@" # run the command
r=$? # save its exit code
echo -n "<CONT>"
exit $? 
\end{verbatim}

There are three additional MACRO definitions that expand the capability of the \texttt{<EXEC>} command: \texttt{<STOP>}, \texttt{<CONT>} and \texttt{<GET>}. The \texttt{<STOP>} and \texttt{<CONT>} macros stop and resume the expansion of all \texttt{<MACRO>} strings. For example, \texttt{<STOP><MYCALL><CONT><MYCALL>} would only expand the second \texttt{<MYCALL>}. By wrapping the command output in this way we can be sure that no text will be expanded. You might even use

\texttt{"$$" | sed "s/<CONT>//g"}

if you feel paranoid. You can "fork and forget" with an exec macro defined as: \texttt{<EXEC>exec command -args >/dev/null</EXEC>}

Any of the text that appears between the \texttt{<EXEC>} and \texttt{</EXEC>} can reference an executable program or shell command found in the \~/.fldigi/scripts directory.

Any text output that is returned by the program or script program (or the result of the in-line command) is always returned to the transmit buffer and appears as appended to the transmit window.

22.3 Querying an external database

The \texttt{<GET>} command captures returned text from the external process and parses it for the following content:

\begin{verbatim}
$NAMEtext_name$QTHtext_qth
\end{verbatim}

If either \texttt{$NAME} or \texttt{$QTH} is present the trailing text is transferred to the LOG_NAME or LOG_QTH widgets respectively. This means that you can create a script that accesses a local or net based database of callsign data and parse that data to form the above console output. Fldigi will accept that output, parse it and populate the associated log entries. Cool! Now for some examples. Here is a perl script that performs the above for the University of Arkansas on-line callsign database, ualr-telnet. The matching macro key definition for the above is:

\texttt{<EXEC>ualr-telnet.pl $FLDIGI_LOG_CALL</EXEC><GET>}

which I named "ualr ?"
Here is a really cool perl script, Google Earth Mapping, that accepts the current "Loc" field in the logging area and generates a Google Earth map which is displayed in your default browser.

The macro call is:

\texttt{<EXEC>map.pl</EXEC>}

### 22.5 Custom dates/times

You can use \texttt{<EXEC>...<\EXEC>} to create custom date/time entries. For example, BARTG contesters use HM, but in other circumstances a user might prefer H:M or H.M etc. Create the following script file in the \texttt{~/.fldigi/scripts} directory, call it mytime:

```bash
#!/bin/sh
date --utc "+%H:%M"
```

This script calls strftime, the same C function used by fldigi for the ZDT/LDT expansion, so it has an equally vast number of format strings to choose from. Look for them in its manual page.

Give "mytime" execute permissions with a file manager or with chmod:

```
chmod u+x ~/.fldigi/scripts/mytime
```

Test it on the command line and make sure it works correctly:

```
~/./.fldigi/scripts/mytime
```

Restart fldigi. The mytime script will now appear at the end of the list in the macro browser, and can be entered with the \texttt{<<} button as usual. Test that macro and you will see that \texttt{<EXEC>}mytime</EXEC> inserts the datetime in the specified format. Of course you could have entered:

```
<EXEC>date --utc "+%H:%M"</EXEC>
```

in the macro body text directly. Many other uses for the \texttt{<EXEC>...<\EXEC>} macro pair can be imagined when used the with ENV parameters. For example you could send Azimuth data to an automated antenna rotor. The exported variables should be sufficient for a script writer to create custom loggers and clients.
Chapter 23

CW

23.1 CW Audio

Fldigi generates CW in one of several ways:

- inserting a keyed tone at the current waterfall audio frequency,
- **WinKeyer Interface** keyline control via a Winkeyer (or compatible) unit,
- **nanoIO Interface** keyline control via a Mortty or NanoIO unit,
- **CW Keyline Configuration** keyline control via DTR or RTS on a serial port,

The inserted keyed tone CW carrier frequency is the USB carrier + the audio frequency, or the LSB carrier - the audio frequency. If fldigi is tracking and receiving a CW signal on the waterfall your transmitted signal will be exactly on the frequency of the other operator. You probably cannot use your transceivers CW filter unless that filter can be used with the SSB mode.

23.2 QSK and the TAB KEY

If you are operating QSK with a separate transmitter / receiver you can very quickly stop your transmit signal with the TAB key. In the CW mode only the TAB key causes the program to skip over the remaining text in the transmit text buffer. The text that is skipped will be color coded blue. The program remains in the transmit mode (PTT enabled), but since the buffer is now empty no A2 CW signal is generated. Code transmission will then restart with the very next keyboard closure of a valid CW character.

23.3 Pausing transmit

The Pause/Break momentarily key stops sending text. Pressing it again resumes transmission.

23.4 Aborting transmit

The Escape key is used to immediately stop text transmission. The Tx buffer is cleared.

23.5 WPM adjustment

In CW mode the status bar is changed to include a transmit WPM adjuster. Use the arrow buttons or the mouse. Mouse wheel up/down changes transmit WPM by +/- 1. Hold the shift and mouse mouse wheel changes transmit
WPM by +/- 10. The "*" button immediately to the right of the WPM adjuster is used to toggle between the current and the default transmit WPM.

The transmit WPM can also be adjusted with three hot keys:

- Numeric keypad "+" increases the transmit WPM by 1
- Numeric keypad "+" decreases the transmit WPM by 1
- Numeric keypad "*" toggles between the selected transmit WPM and the default transmit WPM

The "Default" control on the CW tab sets that default value. If during a QSO you needed to slow down to give the other op a better chance to copy what you are sending, just hit the "*" on the numeric keypad and the CW code will immediately switch to sending CW at the set default value (18 wpm in this example). Press the "*" again to return back to the CW speed that you were previously using.

Each time the transmit WPM is changed the receive decoder WPM tracking is reset to the new transmit WPM. This allows you to quickly force the decoder to a new WPM range.

Figure 23.1 The Rx and Tx WPM are shown in the status bar.

Figure 23.2 + indicates that default WPM is selected

23.6 Farnsworth keying

You might want to use farnsworth keying to provide a character rate that is faster than the word per minute rate.

Figure 23.3 Farnworth Timing

Set the F-WPM slider to the character rate and enable the Use Farnsworth timing check box. When the TX WPM is set to a speed below the Farnsworth value then the character rate will be at the Farnsworth setting and the word rate will be at the TX WPM rate. You can also set the TX WPM and F-WPM from within a Macros.
23.7 CW configuration

The CW Configuration is easily reached from the Config menu or by right clicking on the left most entry in the status bar (CW).

23.8 Prosigns

The prosigns are configurable (see CW Configuration). The defaults are:

<table>
<thead>
<tr>
<th>PROSIGN</th>
<th>KEYBOARD</th>
<th>DISPLAYED AS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BT</td>
<td>=</td>
<td>&lt;BT&gt;</td>
</tr>
<tr>
<td>AA</td>
<td>~</td>
<td>&lt;AA&gt;</td>
</tr>
<tr>
<td>AR</td>
<td>&gt;</td>
<td>&lt;AR&gt;</td>
</tr>
<tr>
<td>AS</td>
<td>&lt;</td>
<td>&lt;AS&gt;</td>
</tr>
<tr>
<td>HM</td>
<td>{</td>
<td>&lt;HM&gt;</td>
</tr>
<tr>
<td>INT</td>
<td>&amp;</td>
<td>&lt;INT&gt;</td>
</tr>
<tr>
<td>SK</td>
<td>%</td>
<td>&lt;SK&gt;</td>
</tr>
<tr>
<td>KN</td>
<td>+</td>
<td>&lt;KN&gt;</td>
</tr>
<tr>
<td>VE</td>
<td>)</td>
<td>&lt;VE&gt;</td>
</tr>
</tbody>
</table>

23.9 Operating Break-in

fldigi is not designed to operate full break in CW, but it does not prevent you from operating the transceiver in full or semi break-in mode. fldigi is always in one of three states: receive, transmit, or tune. Using either a

- Winkeyer-USB,
- Mortty,
- or a homebrew nanoIO CW interface

I operate both full and semi break-in as follows:

- fldigi mode set to CW with appropriate interface enabled (config CW / Winkeyer / nanoCW)
- transceiver set to CW, either full or semi break in ( I operate both IC7200 and FT-897D with no change in procedure) disable CAT Ptt
- press the keyboard Pause/Break (P/B) key to toggle fldigi between Rx and Tx states
- Alt/Meta-R will perform the same function as the Pause/Break key
- in the Tx state you can enter keyboard text and it will immediately begin sending
- in the Rx state you can enter keyboard text and it will begin sending when the P/B key toggles to Tx
- toggling the P/B key will immediately change state
- toggling to Rx using the P/B key does not clear the transmit buffer, transmit text begins again at the transmit cursor position
- to clear the Tx panel use the right-click popup menu in the Tx panel, if transmitting, press the T/R button to return to Rx and clear the panel
- create a clear Tx panel macro button
- add a "^r" or "^R" two character sequence to the end of the Rx text to automatically return to Rx and clear the Tx panel buffers.
- during transmit you can modify any text that has not yet been sent.
• during transmit you can left click on the remaining text to move the text insert cursor to that point.

• during transmit you can press the "Home" key to put the transmit cursor at the beginning of the transmit buffer, transmission will pause when the insert cursor point is reached

• characters will be sent as soon as entered from the keyboard, moving remaining text to the right for subsequent transmission

• pressing the "End" key will move the transmit text insert cursor to the end of the text and the remaining transmit buffer text will begin transmission.

• During transmit you can skip all remaining text by pressing the "Tab" key. Keyboard entry is enabled as above.

• During transmit you can press the "Esc" key to abort transmission. The Tx text buffers are cleared.

• Pressing the control-r will insert the "\r" sequence.

• Pressing control-t is the same as pressing the T/R key.

• Pressing control-Tab will toggle the transmit insert cursor between end-of-text and the current transmit character point. Easiest way to insert text at current transmit point.
  Keypad '+' increases WPM by 1 for each closure
  Keypad '-' decreases WPM by 1 for each closure

If the transceiver is set to full break in you will hear Rx between code elements. If it is set to semi break in you will probably hear Rx after the delay interval set in the transceiver.
You will need to modify your operating paradigm to fit the above model.

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Chapter 24

DominoEX

The modem code for dominoEX uses a wide band multiple frequency detector that can lock on and detect the incoming signal even when badly mistuned. Frequency domain oversampling is used to allow proper tone detection without the need for AFC. The AFC control does not alter the decoder in any way.

The waterfall and digiscope will appear as:

![Figure 24.1 DominoEX](image1)

The text displayed in the status area is the secondary text being sent by the transmitting station. When the keyboard buffer is empty the dominoEX modem transmits text from the secondary text buffer. Your secondary text buffer can be edited on the DominoEX configuration tab.

The digiscope display represents the tone pairs moving through the tone filters. You can also use an alternate digiscope display (left click on the digiscope display area).

![Figure 24.2 DominoEX](image2)

In this display mode the red line represents the center of the multiple tone bins that are in the detector. The dots will be blurry if the AFC is not locked on and become very distinct when AFC lock has been achieved. The tone dots will move from bottom to top (opposite the direction of the waterfall).
This is the same signal mistuned:

![Figure 24.3 DominoEX Mistuned](image1)

and with the signal badly mistuned:

![Figure 24.4 DominoEX Mistuned](image2)

See DominoEX Configuration.
Chapter 25

DominoEX Micro

DominoEX Micro is a new soundcard based digital mode designed for the 2200 meter, 600 meter, 160 meter, and higher amateur radio bands.

This new mode is:

- As robust as Olivia (perfect copy at -15 dB SNR)
- As narrow as PSK31 (36 Hz bandwidth)

The major limiting factors on the LF and MF amateur radio bands are low radiated power and high noise. Antennas at these low frequencies suffer from very low efficiency and little of the power sent to them is converted into RF.

In order to overcome the low power output at these frequencies, DominoEX micro's speed is slowed down to 2 baud. This increases the watts/Hz (spectral density) of the transmitted signal, focusing the power into a very-narrow bandwidth.

On the receive side this sharp signal translates into an increased signal-to-noise ratio. Further gain can be achieved by using very-narrow receive filters.

This mode is also a great tool for low-power digital operation, or in place of QRSS.

Figure 25.1 Signal 36 Hz wide
The modem code for DominoEX uses a wide band multiple frequency detector that can lock on and detect the incoming signal even when badly mistuned. Frequency domain oversampling is used to allow proper tone detection without the need for AFC. The AFC control does not alter the decoder in any way.

There is just one mode of DominoEX micro

<table>
<thead>
<tr>
<th>Name</th>
<th>Baudrate</th>
<th>Bitrate</th>
<th>Datarate</th>
<th>FEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>DominoEX Micro</td>
<td>2</td>
<td>8 bits/sec</td>
<td>8 bits/sec</td>
<td>None</td>
</tr>
</tbody>
</table>

### 25.1 Performance

DominoEX Micro can achieve 100% decode at signal to noise ratios lower than -15 dB, which makes it more robust than Olivia. This mode can be decoded properly even when to the human ear, the incoming signal sounds like pure noise.

Such performance is achieved by using a very low baudrate, which increases the spectral density (watts-per-Hz) of the transmitted signal.

The signal to noise ratio (SNR) for any mode is calculated as a ratio of the Energy-per-bit / Noise-Level. For DominoEX Micro the energy-per-bit (at 25 watts) would be 25 watts X 0.5 seconds, or 12 watt/sec per symbol: 3 watt/sec per bit.

For Olivia 8-250, the lowest SNR Olivia mode: 25 watts X 0.032 seconds or 0.8 watt/sec per symbol: 0.26 watt/sec per bit. The effective DominoEX Micro signal strength is 11 times that of the equivalent Olivia signal.

Having a very-low baudrate is how DominoEX Micro is comparable to Olivia, even without forward error correction. The modulation for this micro mode can be decoded when an equivalent Olivia modulation fails. No amount of Forward Error Correction can compensate for a complete loss of decode at the de-modulation step.

On the 2200, 630, and 160 meter bands this increase in effective received-signal power helps overcome the massive system losses and high-noise levels encountered when using these low frequencies.

### 25.2 Multi-language UTF-8 Support

DominoEX Micro supports sending all UTF-8 characters. This means the mode can be used to communicate in any language.

Please ensure the font chosen in Fldigi has the characters for the language you are trying to use, otherwise Fldigi will just display every character as an empty box.

### 25.3 IFK+ Modulation

DominoEX Micro uses a modulation scheme known as Incremental Frequency Keying Plus (IFK+). It is very similar to 18-tone MFSK modulation, but with many benefits.

Using IFK+ modulation is what allows DominoEX Micro to achieve it's very-narrow bandwidth. IFK+ modulation is much easier to tune than an MFSK signal of the same baudrate. For MFSK, a signal must be tuned to an accuracy of baudrate / 3. This results in an accuracy requirement of less than 1 Hz (at 2 baud).
The tuning accuracy requirement of IFK+ is bandwidth / 2. This is about 18Hz for a 2 baud IFK+ signal. This tuning can easily be achieved by manually clicking on the signal in the waterfall display, just like a PSK31 signal, or by presetting the receiver to within +/- 18 Hertz of the target frequency.

IFK+ is a differential-type MFSK modulation where the data-bits are encoded as the frequency difference between the previous tone and the next tone.

- Number (bits) to be sent: 3 (0011)
- Previous tone: 4 (0100)
- Transmitted tone: 3 + 4 + 2 = 9 (1001)

Since there are only 18-tones in DominoEX micro, the number simply wraps around back to 0 when it reaches number 19.

The current tone always has 2 added before transmitting. This introduces a known pattern within the signal that benefits soft-decision decoding, and improves resistance to intersymbol interference.
Chapter 26

Hellschreiber

26.1 Hellschreiber modem

All Hellschreiber modes are based on character scanning, reproducing characters in a similar way to a dot-matrix printer. This technique uses a digital transmission, yet allows the received result to be interpreted by eye, a similar concept to the reception of Morse by ear. The character is scanned upwards, then left to right. There are typically 14 pixels (transmitted dot elements) per column (although single pixels are never transmitted) and up to seven columns per character including inter-character space.

These remarkably simple modes are easy to use, easy to tune, and although not especially sensitive, are entirely suited to HF/VHF since they use no sync and the eye can discern the text even in high levels of noise. fldigi can operate in the following:

26.2 Hellschreiber modes

<table>
<thead>
<tr>
<th>Mode</th>
<th>Symbol Rate</th>
<th>Typing Speed</th>
<th>Duty Cycle</th>
<th>Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feld-Hell</td>
<td>122.5 baud</td>
<td>~ 2.5 cps (25 wpm)</td>
<td>~ 22%</td>
<td>350 Hz</td>
</tr>
<tr>
<td>Slow Hell</td>
<td>14 baud</td>
<td>~ 0.28 cps (2.8 wpm)</td>
<td>~ 22%</td>
<td>40 Hz</td>
</tr>
<tr>
<td>Feld-Hell X5</td>
<td>612.5 baud</td>
<td>~ 12.5 cps (125 wpm)</td>
<td>~ 22%</td>
<td>1750 Hz</td>
</tr>
<tr>
<td>Feld-Hell X9</td>
<td>1102.5 baud</td>
<td>~ 22.5 cps (225 wpm)</td>
<td>~ 22%</td>
<td>3150 Hz</td>
</tr>
<tr>
<td>FSK-Hell</td>
<td>245 baud</td>
<td>~ 2.5 cps (25 wpm)</td>
<td>~ 80%</td>
<td>490 Hz</td>
</tr>
<tr>
<td>FSK-Hell 105</td>
<td>105 baud</td>
<td>~ 2.5 cps (25 wpm)</td>
<td>~ 80%</td>
<td>210 Hz</td>
</tr>
<tr>
<td>Hell 80</td>
<td>245 baud</td>
<td>~ 5.0 cps (50 wpm)</td>
<td>100%</td>
<td>800 Hz</td>
</tr>
</tbody>
</table>

26.3 Hellschreiber Waterfall

Feld-Hell look like this when being received by fldigi:
Feld-Hell seems to be the most commonly used and use can usually be found on 80 and 40 meters at the high end of the digital sub bands. Extreme linearity is required in the transmit path in order to control the bandwidth of the transmitted signal. Feld-Hell X5, Feld-Hell X9 and Hell 80 should probably not be used on HF in the US. They can be used on VHF and UHF.

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Chapter 27

Contestia

Fidigi can operate on the following Contestia modes without special setup by the operator:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Symbol Rate (Baud)</th>
<th>Typing speed (WPM)</th>
<th>Bandwidth (Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contestia 4-250</td>
<td>62.5</td>
<td>~ 40</td>
<td>250</td>
</tr>
<tr>
<td>Contestia 8-250</td>
<td>31.25</td>
<td>~ 30</td>
<td>250</td>
</tr>
<tr>
<td>Contestia 4-500</td>
<td>125</td>
<td>~ 78</td>
<td>500</td>
</tr>
<tr>
<td>Contestia 8-500</td>
<td>62.5</td>
<td>~ 60</td>
<td>500</td>
</tr>
<tr>
<td>Contestia 16-500</td>
<td>31.25</td>
<td>~ 30</td>
<td>500</td>
</tr>
<tr>
<td>Contestia 8-1000</td>
<td>125</td>
<td>~ 117</td>
<td>1000</td>
</tr>
<tr>
<td>Contestia 16-1000</td>
<td>62.5</td>
<td>~ 78</td>
<td>1000</td>
</tr>
<tr>
<td>Contestia 32-1000</td>
<td>31.25</td>
<td>~ 48</td>
<td>1000</td>
</tr>
</tbody>
</table>

Unusual combinations of symbol rate and bandwidth can be selected using the Contestia Configuration tab.

Contestia is a digital mode directly derived from Olivia that is not quite as robust - but more of a compromise between speed and performance. It was developed by Nick Fedoseev, UT2UZ, in 2005. It sounds almost identical to Olivia, can be configured in as many ways, but has essentially twice the speed. Contestia has 40 formats just like Olivia - some of which are considered standard and they all have different characteristics. The formats vary in bandwidth (125, 250, 500, 1000, and 2000 hz) and number of tones used (2, 4, 8, 16, 32, 64, 128, or 256). The standard Contestia formats (bandwidth/tones) are 125/4, 250/8, 500/16, 1000/32, and 2000/64. The most commonly used formats right now seem to be 250/8, 500/16, and 1000/32.

Contestia performs very well under weak signal conditions. It handles QRM, QRN, and QSB very well also. It decodes below the noise level but Olivia still outperforms it in this area by about 1.5-3 db depending on configuration. It is twice as fast as Olivia per configuration. It is an excellent weak signal, ragchew, QRP, and DX digital mode. When ragchewing under fair or better conditions it can be more preferable to many hams than Olivia because of the faster speed. For contests it might also be a good mode IF the even faster configurations such as 1000/8 or 500/4 are used.

Contestia get it's increased speed by using a smaller symbol block size (32) than Olivia (64) and by a using 6bit decimal character set rather than 7bit ASCII set that Olivia does. Therefore, it has a reduced character set and does not print out in both upper and lower case (like RTTY). Some traffic nets might not want to use this mode because it does not support upper and lower case characters and extended characters found in many documents and messages. For normal digital chats and ham communications that does not pose any problem.
MFSK

MFSK16 and MFSK8 are multi-frequency shift keyed (MFSK) modes with low symbol rate. A single carrier of constant amplitude is stepped (between 16 or 32 tone frequencies respectively) in a constant phase manner. As a result, no unwanted sidebands are generated, and no special amplifier linearity requirements are necessary. The tones selected are set by the transmitted (4 or 5 bit) bit pattern and a gray-code table. The mode has full-time Forward Error Correction, so it is very robust. Tuning must be very accurate, and the software will not tolerate differences between transmit and receive frequency. The mode was designed for long path HF DX, and due to its great sensitivity is one of the best for long distance QSOs and skeds. MFSK8 has improved sensitivity, but is very difficult to tune, and suffers more from Doppler. It is useful as the band fades out.

MFSK-32 and MFSK-64 are high baud rate and wide bandwidth modes designed for use on VHF and UHF. These are very useful for send large documents or files when some transmission errors are can be tolerated.

This is an example of properly tuned MFSK16 signal with a s/n of approximately 9 dB.

![Figure 28.1 MFSK16 signal](image1)

The same signal viewed with the waterfall expanded to the x2 factor.

![Figure 28.2 MFSK16 signal](image2)

### 28.1 MFSK Picture Mode

Fldigi can send and receive images using all MFSK baud rates. When operating with other modem programs you should limit sending pictures to the MFSK-16 baud rate. The program can send and receive MFSK images in both
black and white and in 24 bit color. The transmission mode for MFSKpic is similar to FAX.

Reception of an MFSKpic transmission is fully automatic. The MFSKpic transmission has a preamble sent which will be visible on the text screen. The preamble reads as "Pic:WWWxHHH;" or "Pic:WWWxHHHC;" for b/w or color respectively. The WWW and HHH are numbers specifying the width and height of the picture in pixels.

The successful reception of a MFSKpic is highly dependent on s/n conditions. The data is transmitted as an FM modulated signal and is subject to burst and phase noise on the transmission path. It can provide excellent photo transmission on a really good path.

Images should be carefully selected for size before beginning a transmission. To calculate the transmit time for an image use the following formula:

\[
\text{Time(sec)} = \frac{W \times H}{1000} \text{ for black and white}
\]

\[
\text{Time(sec)} = \frac{W \times H \times 3}{1000} \text{ for color}
\]

Where the W and H are the dimensions of the photo in pixels. A 200 x 200 image will take 120 seconds to transmit in color and 40 seconds to transmit in b/w. The symbol rate for this mode is 1000 data bytes per second. The color image consists of 3 bytes; red, blue and green for each pixel.

![Figure 28.3 Picture received from K0OG](image)

This is an example of a picture received live on 80 meters (thanks K0OG)

Received images are saved in the default folder `$HOME/.fldigi/images` (Linux) or `<defaultpath>/fldigi.files/images` (Windows).
28.2 Transmitting an Image

You can only transmit an image while in the MFSK-16/32/64/128 modes. The image can be prepared for transmission while in the receive mode. Right click in the transmit text box and select "Send Image" from the popup menu. This will open up the transmit image dialog which will be blank to start.

Press the "Load" button and a file selection dialog will allow you to select a suitable image for transmit. The file selection dialog also has a preview capability so you will see what the image looks like.

You may also open a window manager file browser and drag and drop an image to the center part of the Send image dialog.

The "X1" button is a three-way toggle that allows you to transmit an image file in X1 - normal and compatible with other modem programs
X2 - double speed, and
X4 - quadruple speed. X2 and X4 are fldigi specific image modes.

The Send image dialog after the image was drag and dropped onto the dialog.

The properties box said this image was 120 x 119 24 bit color. So it should take 42.8 seconds to transmit in full...
color. You can send a color or a b/w image in either color mode or b/w mode. If you transmit a color image in b/w the program will convert the image before transmitting. If you transmit a b/w image as full color you are in effect transmitting redundant information, but it can be done. I selected the "XmtClr" button for a trial run. Pressing either the "XmtClr" or "XmtGry" will put the program and the transceiver into the transmit mode if it was in the receive mode. The image is cleared and then repainted as the transmission proceeds. You see the same image progression that the receiving station should see. The main display also displays the % completion on the status bar. Hold the mouse over either the XmtClr or the XmtGry button and the tooltip will tell you the transmit time for this image.

You may abort the transmission at any time by pressing the "Abort Xmt" button. That will return you to the text mode for MFSK. You will then have to toggle the T/R button if you want to return to receive.

There is an alternate way of sending an image, but one which only transmits a color image with no provision for slant correction. This may be more convenient for sharing images when you do not need the additional utility of the image dialog.

Open a file folder to the location of your image files that are suitable for MFSK transmission. These images should be constrained to be 240 x 200 or less for reasonable transmit times. Optionally prepare fdigi for the MFSK image transmission by entering some suitable text to precede the transmission. You may be sending the image, blossoms.jpg, for example.

You may be sending the image, blossoms.jpg, for example.

One might enter:

```
Here is an image of my apple trees in full bloom.
```

Then drag and drop the image file from the files folder to the transmit text panel in fdigi.

The TX panel text will then change to

```
Here is an image of my apple trees in full bloom.
Image: blossoms
```

The ^! is the character sequence used by the fdigi TX parser to indicate that there is a pending execution command. In this case it is to transmit the blossoms.jpg file.

Add some suitable ending text and the sequence ^r to the next line and then press the T/R button (if not already transmitting). At the end of the image the TX parser will find the ^r and return the program to the receive mode. The Rx panel will echo the transmitted data:
28.3 Receiving an Image

The receiving program decodes the "Pic:240x160C;" as a color picture 240 wide by 160 high.

![Received MFSK Image](image)

**Figure 28.7 Received MFSK Image**

This is what the waterfall will look like during the reception of an MFSK-64 image.

![MFSK Image - Waterfall](image)

**Figure 28.8 MFSK Image - Waterfall**

The actual spectrum signature will vary with the image bytes being transmitted. The image was being transmitted in 24 bit color for this screenshot. The waterfall clearly shows that the image transmission is within the bandwidth occupied by MFSK-64.

Received images are automatically saved to the images folder and annotated with a date-time stamp.
28.4 Picture with a slant

If either the send, receive or both ends of the transmission are using an uncalibrated sound card whose sampling rate is not an exact multiple of 8000 Hz the resulting picture at the receive end will appear slanted. The degree of slant is directly related to the accumulation of the frequency error at both ends of the transfer. Stations wishing to send and receive MFSK pic’s should calibrate their sound card. The WWV calibration mode is used to measure and set the parts per million (ppm) correction factor for the sound card.

Your sound system may be fully corrected, but the sending station may have an uncorrected sound card. You can usually correct for small errors in the following way. After the full picture is received move the mouse to bottom left or right corner of the slanted images (the corner that clearly visible). Then left click on that corner. The program will correct for the slant. The correction will not be perfect but it may help to make the image more viewable. Right click to undo the slant correction. Slant corrections are not saved to the Rx image file.
MT63 is an Orthogonal Frequency Division Multiplexed mode consisting of 64 parallel carriers each carrying part of the transmitted signal. The tones are differential BPSK modulated. MT63 employs a unique highly redundant Forward Error Correction system which contributes to it robustness in the face of interference and facing. The tones have synchronous symbols, and are raised cosine moduled. This mode requires a very linear transmitter. Over-driving leads to excessive bandwidth and poorer reception.

The mode is very tolerant of tuning and fldigi will handle as much as 100 Hz of mistuning. This is very important since MT63 is often used in very low Signal to Noise ratios. There are three standard modes:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Symbol Rate</th>
<th>Typing Speed</th>
<th>Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT63-500</td>
<td>5.0 baud</td>
<td>5.0 cps (50 wpm)</td>
<td>500 Hz</td>
</tr>
<tr>
<td>MT63-1000</td>
<td>10.0 baud</td>
<td>10.0 cps (100 wpm)</td>
<td>1000 Hz</td>
</tr>
<tr>
<td>MT63-2000</td>
<td>20 baud</td>
<td>20.0 cps (200 wpm)</td>
<td>2000 Hz</td>
</tr>
</tbody>
</table>

In addition there are two interleaver options (short and long) which can be set on the MT63 configuration tab. The default calling mode is MT63-1000. If the short interleaver is used then one can expect some compromise in robustness. The long interleaver results in somewhat excessive latency (delay between overs) for keyboard chatting. MT63-1000 with the long interleaver has a latency of 12.8 seconds.

You can change from receive to transmit immediately upon seeing the other stations signal disappear from the waterfall. You do not need to wait until the receive text completes. Any remaining data in the interleaver will be flushed and the associated receive text printed quickly to the Rx pane. Tx will commence right after the buffer is flushed.

MT63 may be operated in the default fixed audio frequency mode. In this mode you are not allowed to randomly place of the signal on the waterfall. Your transmit signal, and also the received signal should be centered at 750 Hz for MT63-500, 1000 Hz for MT63-1000, and 1500 Hz for MT63-2000. If you click on the waterfall to move the tracking point it will be restored to the required position. The default mode, MT63-1000, looks like this on fldigi's waterfall.
You can also elect to operate the MT63 modem in a "manual tune" mode (MT63 configuration tab). The manual tune allows you to place both the Rx and the Tx signal to be anywhere within the confines of your SSB bandwidth. This screen shot shows this capability:

This view also demonstrates how immune MT63 is to interference. The multiple PSK31 signals that appear on top of the MT63 signal did not degrade the decoder. MT63 is usually used above 14073 MHz to avoid the possibility of this type of mode conflict.

Edited excerpts from Pawel Jalocha's official mt63 code release

The MT63 modem is intended for amateur radio as a conversation (RTTY like) mode where one station transmits and one or more other stations can listen. In short, the modem transmits 64 tones in its baudrate specific bandwidth. The differential bipolar phase modulation is used to encode 10 bits of information per second on each tone. The user data in the form of 7-bit ASCII characters is encoded as a set of 64-point Walsh functions. The bits are interleaved over 32 symbols (3.2 seconds) to provide resistance against both pulse and frequency selective noise or fading. The character rate equals to the symbols rate thus the modem can transmit 10 7-bit characters per second.

This modem can as well run in two other modes obtained by simple time scaling, the possible modes are summarized here:

<table>
<thead>
<tr>
<th>Bandwidth</th>
<th>Symbol Rate</th>
<th>Character Rate</th>
<th>Interleave / Char.</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 Hz</td>
<td>5 baud</td>
<td>5 char / sec</td>
<td>6.4 or 12.8 sec</td>
</tr>
<tr>
<td>1000 Hz</td>
<td>10 baud</td>
<td>10 char / sec</td>
<td>3.2 or 6.4 sec</td>
</tr>
<tr>
<td>2000 Hz</td>
<td>20 baud</td>
<td>20 char / sec</td>
<td>1.6 or 3.2 sec</td>
</tr>
</tbody>
</table>
For each mode the interleave factor can be doubled thus each character becomes spread over twice as long period of time.

The MT63 modem is made for single side band operation. The audio generated by the modem (sound card output) is applied to the SSB modulator. On the receiver side, the output of the SSB demodulator is put into the sound card input. The envelope of the MT63 signal is not constant as in other multi-tone systems - it is rather noise-like. One must be careful not to overdrive the transmitter.

The receiver of the MT63 is self-tuning and self-synchronizing thus the radio operator is only required to tune into the signal with +/- 100 Hz accuracy. The modem will tell the actual frequency offset after it is synchronized. The operator should not try to correct this offset unless he is able to tune the radio receiver very slowly, because MT63 as a low rate phase modulated system cannot tolerate sudden frequency changes. Signal synchronization is improved by filtering the timing measurement of the received signal. For very low signal to noise ratios you can improve the synchronization by selecting "Long Receive Integration" factor. Think of the process as a digital AFC. PSK31 does something very similar. One would expect there to be some correlation since mt63 is the equivalent of 64 simultaneous binary phase shift signals. The synchronizer filtering can be reduced to 1/2 it's normal value by selecting "Long Receive Integration". It takes twice as long for decoding to begin and the synchronizer is more immune to noise.

You probably never need to enable "Long Receive Integration" unless you are trying to receive an mt63 signal buried in the noise.

The MT63 is a synchronous system and it relies on the sampling rate to be the same at the receiver and the transmitter. At least the sampling rates should not be different by more that $10^{-4}$.

If you have calibrated your sound card to WWV, then you will meet this requirement.
Chapter 30

FSQ

FSQ, Fast Simple QSO, is an Incremental-Frequency-Keyed mode using an offset differential modulation scheme similar to DominoEX, and Thor. It is a unique mode for fldigi users in that it is a line by line transmission rather than character by character. FSQ uses 33 tones spaced by 3 times the 3 baud symbol rate or 8.8 Hz. The offset rotation of the IFKP sequence offers improved performance under NVIS conditions, because the rotation significantly reduces the risk of adjacent symbols causing inter-symbol interference.

fldigi can operate on the following FSQ modes without special setup by the operator:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Symbol Rate</th>
<th>WPM</th>
<th>Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSQ 2</td>
<td>1.95 baud</td>
<td>~20</td>
<td>290 Hz</td>
</tr>
<tr>
<td>FSQ 3+</td>
<td>2.93 baud</td>
<td>~30</td>
<td>290 Hz</td>
</tr>
<tr>
<td>FSQ 4,5</td>
<td>3.91 baud</td>
<td>~40</td>
<td>290 Hz</td>
</tr>
<tr>
<td>FSQ 6</td>
<td>5.86 baud</td>
<td>~60</td>
<td>290 Hz</td>
</tr>
</tbody>
</table>

- FSQ-3 is the base rate.

At the time of this release there is only one other amateur modem application that supports FSQ, FSQCALL, written by Con Wassilieff, ZL2AFP. FSQ is an invention of Murray Greenman, ZL1BPU. Both Murray and Con were very supportive during the development and testing of fldigi's FSQ implementation.

cldigi-fsq supports the undirected, directed and image modes of FSQCALL.

This FSQ help content borrows shamelessly from Murray Greenman's (ZL1BPU) "FSQ Explained" document.
The main dialog fsq user interface provides an Rx-text panel, a Tx-text panel, a "Heard" list, fsq specific control buttons, and a signal to noise indicator.

The Rx-text panel displays all decoded text in the UnDirected Mode. The Tx-text panel is for entering all transmitted text, including directives. These two panels can be resized vertically by dragging the dividing bar which separates them.

![Figure 30.2 Undirected Mode](image1)

![Figure 30.3 Directed Mode](image2)

The Rx-text panel displays only recognized text in the Directed Mode. The text parser must be satisfied that the sending stations callsign/crc8 agree and that the directed station callsign is your own or "allcall". FSQ is case sensitive, and your sending case must match the senders case, i.e. w1hkj and W1HKJ are not the same for the purposes of FSQ Directed Mode.

- **FSQ-ON**
  - when on the xmt and rcv are in FSQ directed mode
  - when off the xmt and rcv are in FSQ undirected mode
- **ACTIVE**
  - when on the decoder will accept all incoming directed traffic
  - when off the decoder will only respond to the wake-up * trigger
- **MON**
  - when on the monitor panel is visible
- **QTH**
  - appends the myQTH text to the tx panel
- **QTC**
  - appends the myQTC text to the tx panel
- **CQ**
  - sends the FSQ cq call ‘cqcqcq’

![Figure 30.4 Heard List Panel](image3)

The "Heard" list displays the callsign, s/n, and time of reception of all correctly decoded transmissions.

**NOTE:** fldigi function keys are inoperative in the FSQ mode!
30.1 Modulation Scheme

FSQ is designed to use 32 tone differences between 33 equally spaced tones; so it is possible to allocate 29 different individual differences directly to the most frequently used characters. These characters are all lower case, a-z, plus the most common punctuation symbols: space, full stop (period), and new line (CR/LF). The three ‘spare’ differences are used to define further code tables.

The total alphabet includes upper case and a reasonable range of symbols, yielding a total alphabet of 104 ASCII characters. The extra characters are allocated to three additional code tables, which are sent as two sequential tone differences. These are characterized by an initial difference, describing the character, and a continuation difference, defining the code table.

When the receiver sees a tone difference in the range 0 – 29, followed by another in the range 0 – 29, it recognises a single-tone character (lower case etc). If the tone difference is followed by a difference in the range 30 – 31, it uses the second difference to decide which code table to select the character from, and the first difference to choose the character from that table. The encoding process is the reverse of this.

<table>
<thead>
<tr>
<th>Symbol(s)</th>
<th>Char</th>
<th>Symbol(s)</th>
<th>Char</th>
<th>Symbol(s)</th>
<th>Char</th>
<th>Symbol(s)</th>
<th>Char</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>SPACE</td>
<td>0-29</td>
<td>@</td>
<td>0-30</td>
<td>~</td>
<td>0-31</td>
<td>=</td>
</tr>
<tr>
<td>1</td>
<td>a</td>
<td>1-29</td>
<td>A</td>
<td>1-30</td>
<td>1</td>
<td>1-31</td>
<td>[</td>
</tr>
<tr>
<td>2</td>
<td>b</td>
<td>2-29</td>
<td>B</td>
<td>2-30</td>
<td>2</td>
<td>2-31</td>
<td>\</td>
</tr>
<tr>
<td>3</td>
<td>c</td>
<td>3-29</td>
<td>C</td>
<td>3-30</td>
<td>3</td>
<td>3-31</td>
<td>]</td>
</tr>
<tr>
<td>4</td>
<td>d</td>
<td>4-29</td>
<td>D</td>
<td>4-30</td>
<td>4</td>
<td>4-31</td>
<td>^</td>
</tr>
<tr>
<td>5</td>
<td>e</td>
<td>5-29</td>
<td>E</td>
<td>5-30</td>
<td>5</td>
<td>5-31</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>f</td>
<td>6-29</td>
<td>F</td>
<td>6-30</td>
<td>6</td>
<td>6-31</td>
<td>{</td>
</tr>
<tr>
<td>7</td>
<td>g</td>
<td>7-29</td>
<td>G</td>
<td>7-30</td>
<td>7</td>
<td>7-31</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>h</td>
<td>8-29</td>
<td>H</td>
<td>8-30</td>
<td>8</td>
<td>8-31</td>
<td>}</td>
</tr>
<tr>
<td>9</td>
<td>i</td>
<td>9-29</td>
<td>I</td>
<td>9-30</td>
<td>9</td>
<td>9-31</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>j</td>
<td>10-29</td>
<td>J</td>
<td>10-30</td>
<td>0</td>
<td>10-31</td>
<td>±</td>
</tr>
<tr>
<td>11</td>
<td>k</td>
<td>11-29</td>
<td>K</td>
<td>11-30</td>
<td>1</td>
<td>11-31</td>
<td>±</td>
</tr>
<tr>
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<td>l</td>
<td>12-29</td>
<td>L</td>
<td>12-30</td>
<td>quote</td>
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<tr>
<td>13</td>
<td>m</td>
<td>13-29</td>
<td>M</td>
<td>13-30</td>
<td>#</td>
<td>13-31</td>
<td>x</td>
</tr>
<tr>
<td>14</td>
<td>n</td>
<td>14-29</td>
<td>N</td>
<td>14-30</td>
<td>$</td>
<td>14-31</td>
<td>£</td>
</tr>
<tr>
<td>15</td>
<td>o</td>
<td>15-29</td>
<td>O</td>
<td>15-30</td>
<td>%</td>
<td>15-31</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>p</td>
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<td>P</td>
<td>16-30</td>
<td>&amp;</td>
<td>16-31</td>
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</tr>
<tr>
<td>17</td>
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<td>Q</td>
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<td>17-31</td>
<td></td>
</tr>
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<td>18</td>
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<td>R</td>
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<td>(</td>
<td>18-31</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>s</td>
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<td>S</td>
<td>19-30</td>
<td>)</td>
<td>19-31</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>t</td>
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<td>T</td>
<td>20-30</td>
<td>*</td>
<td>20-31</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>u</td>
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<td>U</td>
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<td>21-31</td>
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</tr>
<tr>
<td>22</td>
<td>v</td>
<td>22-29</td>
<td>V</td>
<td>22-30</td>
<td>-</td>
<td>22-31</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>w</td>
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<td>23-30</td>
<td>/</td>
<td>23-31</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>x</td>
<td>24-29</td>
<td>X</td>
<td>24-30</td>
<td>:</td>
<td>24-31</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>y</td>
<td>25-29</td>
<td>Y</td>
<td>25-30</td>
<td>;</td>
<td>25-31</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>z</td>
<td>26-29</td>
<td>Z</td>
<td>26-30</td>
<td>&lt;</td>
<td>26-31</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>.</td>
<td>27-29</td>
<td></td>
<td>27-30</td>
<td>≥</td>
<td>27-31</td>
<td>BS</td>
</tr>
<tr>
<td>28</td>
<td>CRLF</td>
<td>28-29</td>
<td></td>
<td>28-30</td>
<td>IDLE</td>
<td>28-31</td>
<td>DEL</td>
</tr>
</tbody>
</table>

Figure 30.5 FSQ Varicode Table

IFK codes the data (the initial and continuation codes) as differences between two tones, rather than as an absolute tone. This is the MFSK equivalent of differential BPSK, as used in PSK31, etc. MFSK modes such as Piccolo, Coquelet and MFSK16 use direct MFSK modulation, assigning the code directly to a tone number. These modes may suffer from more inter-symbol interference than desirable, cannot tolerate frequency drift, and can be difficult to tune.

FSQ uses very narrow tone spacing. IFK+ reduces inter-symbol interference by ensuring that the chance of the same or an adjacent tone being used for sequential symbols would be very remote.
Since the tones always change due to the differential action and the tone rotation of IFK+, there is no opportunity for the tones to remain the same for two consecutive symbols, which allows the sync-less process to operate correctly.

For example, without IFK+, repeated space characters could be seen as a single character.

Finally, since the coding is differential, any drift and frequency offset is cancelled out during decoding. IFK+ can handle frequency drift of about a third of the tone spacing per symbol, or in FSQ about 18 Hz drift per second at 6 baud. Frequency error tolerance is a matter of decoder design, but ± 50 Hz is tolerated easily by FSQ.

IFK+, an acronym for Offset Incremental Frequency Keying, was suggested by Murray Greenman ZL1BPU (2009), and first used in DominoEX. With each symbol transmitted, as well as adding the difference from the alphabet-coding table to the previous tone number, an addition rotation offset is added. In the case of FSQ, this value is ONE.

Only one tone is transmitted at a time.

In order for the first difference (first character) to be correctly decoded, a dummy tone needs to be transmitted first. This could be the lowest tone, but in fact any permitted tone will suffice since only the difference to the next tone is important. The software simply sends a space character to achieve this.

### 30.2 Transmit Functions

The user types text into the Tx panel, which can be edited before transmission. Transmission starts when an ENTER character is pressed. It will also start as a result of one of the automatic processes, such as ‘Sounding’ or automated replies.

The characters in the Tx panel are then encoded, and transmitted at the currently set symbol rate. As they are transmitted, the characters are transferred to the receive pane as a record of what has been transmitted.

**BOT Sequence**

At the start of transmission in directed and non-Directed Mode, the BOT sequence, a SPACE followed by a LINE-FEED, is sent. The space serves as a dummy symbol to allow the next tone difference to be measured. The LF character ensures that reception starts on a new line.

In Directed Mode, the LF also serves as one delimiter for the callsign search algorithm. The other delimiter is the colon that follows the callsign. This also locates the two callsign checksum characters.

**EOT Sequence**

At the end of transmission in UnDirected Mode, the transmitter is simply turned off once the last useful character is sent. In Directed Mode, however, a special character sequence is sent just before the transmission stops, to signal EOT.

The BS (backspace) character is not required in FSQ, so the corresponding character in the table has been reallocated as an EOT marker.

The purpose of the EOT sequence is to cause the Squelch to close quickly in Directed Mode. Print will continue through fades without fidigi closing and stopping print partway through a sentence. If the sentence transmission were to finish without the EOT, the squelch would close slowly, and junk would print unnecessarily. The EOT ‘shorts out’ the Squelch time constant, closing the Squelch instantly.

The transmission consists of 33 tones spaced 8.7890625 Hz, resulting in a spread of tones of 290.0390625 Hz. Using the ITU-R SM.1138 assessment method, the signal easily meets 300 Hz useful bandwidth, at all signalling speeds, and its ITU Emission Designator is therefore 300HF1B.

In Directed mode, a conventional network model CSMA protocol decides when the station may have access to the radio channel. This protocol defines three classes of message (chat, responses and soundings), and applies priorities to them. Priority is provided by means of delays after Squelch has closed. In addition, to limit clashes between stations wanting access for the same priority message, random delays are also added.

<table>
<thead>
<tr>
<th>Priority</th>
<th>Delay</th>
<th>Message Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Short</td>
<td>Chat sentences</td>
</tr>
<tr>
<td>2</td>
<td>Med</td>
<td>Automated responses to commands</td>
</tr>
<tr>
<td>3</td>
<td>Long</td>
<td>Sounding</td>
</tr>
</tbody>
</table>
Sounding
In Directed Mode, the user may elect to send regular ‘soundings’. These are very short messages with no trigger command and no message body. The message consists only of the callsign, colon and checksum of the FSQCall preamble.

These sentences do not print at any station, but appear in the Heard List and are logged in the Heard Log. This allows all stations on the channel to know what other stations are there with minimum use of channel bandwidth. Sounding is sent with the lowest message priority. Sounding is essentially random, although the time between Sounds is selectable at 1, 10 and 30 minute intervals. The start time is set by user action, and essentially random.

30.3 FSQ Protocol

FSQ is designed as a ‘chat’ mode, not a long-over QSO mode. It is capable of sending multiple sentences in each transmission, but it is easiest and quickest when just one sentence is sent.

Each transmission starts with the fldigi station callsign (converted to lowercase).

For example, if the user (say zl1xyz) types:
Hello John – how are you this evening

The software actually transmits:
zl1xyz:Hello John – how are you this evening

Nothing could be simpler. Every station within range will print this message.

Performance
There is no error correction involved, so users rely on the inherent robustness of the mode, and if there are errors, either due to ‘typos’ or reception errors, the users will quickly recognise these. If an error causes confusion, they can always ask for a repeat.

Operating 20W on the 40m band during the middle of the day, an automated station 300 km away was used to return transmitted sentences. From 250 words transmitted, at 6 baud, 223 were returned correct (89.2% copy), while at 3 baud, copy was 100%. For practical purposes, 80% copy is considered adequate for a comfortable QSO.

Tests using an ionospheric simulator bear these measurements out. Reception is essentially 100% for white-noise tests with the signal above –15dB S/N.

30.4 Directed Mode

FSQ Directed Mode operates as a simple extension of the FSQ protocol. The preamble is changed a little, a direction (address and command) is applied, and finally a short EOT signal is added to the end of each message.

These differences are simple to apply, as the user only needs to learn a few simple commands and remember to add a direction and command to each sentence. The rest is automatic.

Further, directed sentences in FSQ mode can be read easily in undirected FSQ mode, and undirected text is visible in the monitor panel which can be viewed in Directed Mode. In Directed Mode, only text directed to your callsign will print in the Rx panel, and only commands directed to your station will be responded to.

![Figure 30.6 FSQ Monitor Panel](image)

The Monitor Panel is only shown during Directed Mode operation. It is hidden when Undirected Mode is in use. All incoming traffic is printed on the Monitor Panel. This includes both Directed and Undirected traffic. The decoding is affected by the fldigi squelch setting.
You may see what appears to be a perfectly good Directed data stream on the Monitor Panel which never appears on the Rx Panel. When this occurs, the data stream has failed to parse correctly:

1. the BOT is missing or corrupt,
2. the CRC8 check has failed,
3. the EOT is missing or corrupt,
4. or it is not directed to your callsign or allcall.

The lower half of the monitor panel displays text that is queued for transmission, for example the response to a ? or a $ trigger. Automated responses are not sent immediately, but after a small random delay AND when the squelch is not open.

**FSQCall Preamble**

The FSQCall preamble consists of the sending station’s callsign, a colon, and a two character hexadecimal checksum. For example, the simplest transmission, a Sounding message, consists of only this. For example: 

```
zl1bpu:b6
```

The checksum is a standard CCITT CRC8 calculated on the callsign and the colon. The maximum callsign length is 16 characters, and the CRC is capable of detecting up to four errors in this distance reliably. Pseudo-callsigns (such as place names or personal names) can be used, which is very convenient for Public Service and Emergency applications.

**Directions and Triggers**

All FSQ Directed Mode messages, apart from the Sounding, carry at least one direction and a trigger. The direction is the callsign or callsigns of the recipient station or stations, in other words, where the message is directed. The trigger is one of a short list of one-letter commands sent to the directed station, which define what it should do with the message. There may or may not be a message body following the directions and triggers.

Here are some simple examples:

```
zl1bpu:b1z1abc hello john
w1hkj:efw3tqn k2lbnm hello guys
w1hkj:efk2lbnm?
```

**Figure 30.7 Directed Mode Examples**

In the first example, ZL1BPU is simply chatting to ZL1ABC. He starts typing by giving the direction, the other station’s callsign. The trigger used is a space, which is understood by the receiving station as an invitation to print the message that follows.

The second example illustrates how you can send the same sentence to two stations. There is also an ‘all stations’ direction (allcall) that can be used to send messages and some commands to all stations within range.

The third is an example of a simple automated query. It is the FSQ way of asking for a signal report. The queried station will respond with your s/n report as measured by the FSQ program that is being used.

**Error Checking**

FSQ Directed Mode sentences are checked at the receiver in two ways. First, the sender’s callsign is checked against the checksum received: if this is incorrect, the sentence is rejected. If it is correct, the rest of the sentence is checked to find the recipient’s callsign. If this is not received correctly, the sentence is again rejected. If the callsign is received correctly, only the remainder of the message following the recipient’s callsign is printed or acted upon.
When (and if) the incoming message is displayed, the preamble is shown without the checksum, so it looks like the preamble in the UnDirected Mode. However, the callsign displayed is in this case the callsign verified by the checksum.

Checking the validity of the originator's callsign ensures that the message is correctly attributed, is correctly logged, and most significantly, responses can be sent to the correct station.

**Logging**

In Directed Mode, FSQ maintains a log of all stations heard, in chronological order. With each entry, verified callsign, the date/time, and measured SNR are recorded in CSV (comma separated value) format. This is suitable for examination as a spreadsheet. The heard log file is named "fsq_heard_log.txt" and is located in the fldigi.files/temp folder.

A complete audit log of transactions is also maintained in Directed Mode. This includes regular time stamps, all raw received text, and all transmitted sentences. The audit log is named "fsq_audit_log.txt" and is located in the fldigi.files/temp folder.

**Directed Callsigns**

1. Each station responds to three ‘callsigns’.
2. The operator callsign (fldigi converts operator call to lowercase).
3. The ‘callsign’ allcall, to which the software will act upon certain messages, including chat, file and image transfer, and alerts. This mechanism is widely used in nets to send chat to everyone in range.
4. The ‘callsign’ cqcqcq is recognised as a legitimate chat ‘callsign’.

**Use of Lower Case**

FSQ is case sensitive, so messages directed (for example) to ‘ZL1EE’ will not be recognised by the station with its callsign set to ‘zl1ee’. Lower case is not mandatory for operator callsigns, but is encouraged for these reasons:

1. Lower case is quicker and easier to type.
2. Lower case is faster to send (most characters are sent in one symbol).
3. The error rate is half that of upper case characters.

### 30.5 Triggers

All the command triggers (currently) consist of one reserved character. These are taken from a pool of characters that are not permitted in callsigns. As far as possible, the characters have a meaning easily associated with the character.

This list shows all the reserved characters, and their current or planned use. Blank entries are reserved, with no currently planned application.

<table>
<thead>
<tr>
<th>CHAR</th>
<th>ASCII</th>
<th>USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space</td>
<td>32</td>
<td>Directed chat</td>
</tr>
<tr>
<td>!</td>
<td>33</td>
<td>Repeat command</td>
</tr>
<tr>
<td>&quot;</td>
<td>34</td>
<td>--</td>
</tr>
<tr>
<td>#</td>
<td>35</td>
<td>Message or file transfer</td>
</tr>
<tr>
<td>$</td>
<td>36</td>
<td>Request Heard List</td>
</tr>
<tr>
<td>%</td>
<td>37</td>
<td>Receive image</td>
</tr>
<tr>
<td>&amp;</td>
<td>38</td>
<td>Report QTC message</td>
</tr>
<tr>
<td>'</td>
<td>39</td>
<td>--</td>
</tr>
<tr>
<td>(</td>
<td>40</td>
<td>--</td>
</tr>
<tr>
<td>)</td>
<td>41</td>
<td>--</td>
</tr>
<tr>
<td>*</td>
<td>42</td>
<td>Restore FSQ to ACTIVE from SLEEP</td>
</tr>
</tbody>
</table>

Generated by Doxygen
30.6 Commands

Command sentences consist of a direction followed immediately by a command. Multiple directions can be used in the same sentence under limited circumstances. Two directions in the same sentence, which are understood by the same station, will cause confusion, and only the second will be responded to. For example, one should not send 'zil1xyz@ allcall message', as the first part will be ignored by station zil1xyz.

Command Syntax
The syntax for currently defined commands is listed below.

- `callsign text` Addressee station starts to print text. No trigger character used except space following callsign. You MUST use a space or the trigger will not be recognised.

- `callsign? text` (Is station hearing me?) Addressee station starts to print text. When squelch closes, station responds: origin_callsign snr=xxdB

- `callsign*` Switches station to ACTIVE if FSQSEL is in SLEEP. Addressee station starts to print. When squelch closes, station responds: callsign:CRC-VAL Active

- `callsign! message` (Repeat my message) Addressee station starts to print. When squelch closes, station responds: callsign:CRC-VAL message. This is a simple relay mechanism. message may contain further trigger commands.

- `callsign~ message` (Repeat my message later) Addressee station starts to print. When squelch closes, after a delay of about 15 seconds, station responds: callsign:CRC-VAL message. This delayed relay is useful when stations mentioned in message can hear and respond to the original message.

- `callsign; [relay_to][trigger][message]` Relay my message to the 'relay_to' station. See Relay section for details.

- `callsign!sendto message` Relay message to the 'sendto' station. Addressee station starts to print. When squelch closes, station relays the message.
30.7 Relaying messages

This is a relay mechanism which preserves the origin callsign as the message propagates so that any response can be relayed back to that station. Message can contain further trigger commands.

Originating station: relay_callsign; dest_callsign message
Example 1. Simple relay with no response

k1a types: k2a;k3a hi
k1a sends: k1a:11k2ak3a hi
k2a sees: k1a::k3a hi
k2a sends: k2a:22k3a [k1a] hi
k3a sees: k2a:[k1a] hi

Example 2: Relay with response

k1a types: k2a;k3a@
k1a sends: k1a:11k2ak3a@
k2a sees: k1a::k3a@
k2a sends: k2a:22k3a@ [k1a]@
k3a sees: k2a:[k1a]@
k3a sends: k3a:33k2ake Vienna, va 1m181w
k2a sees: k3a::k1a Vienna, va 1m181w
k2a sends: k2a:22k1ake [k3a] Vienna, va 1m181w
k1a sees: k2a:[k3a] Vienna, va 1m181w

Example 3: Relayed allcall

k1a types: k2a;allcall Calling NET. Any Relays?
k1a sends: k1a:11k2a;allcall Calling the NET. Any Relays?
k2a sees: k1a;allcall Calling the NET. Any Relays?
k2a sends: k2a:22allcall [k1a] Calling the NET. Any Relays?

A checking in station might type

k2a;k1a K4cdn (Mike)
k1a would see the check-in relayed through k2a as
k2a:[k1a] K4cdn (Mike)

Figure 30.8 Relay Examples

30.8 Special keys

Pressing the F1 key will transfer the "last call" selected from the heard list to the Tx panel. "last call" defaults to
allcall on program startup.
Pressing the F2 key will transfer the last command to the Tx panel. The last command is an empty string on program
startup.

30.9 Heard List

The FSQ heard list is automatically added to, modified, and aged in accordance with the FSQ user configuration
parameters. Each time a valid callsign/crc8 pair is discovered it is either added to the heard list, or it’s entry is
updated with the last GMT and signal-to-noise ratio.
A single click on a heard list entry will make it the "last call" string.
A double click on a heard list entry will also add the call to the Tx panel. If multiple heard list entries are double
clicked each one is added to the Tx panel separated by a space.
Heard list entries have an associated pop-up menu, available by right-clicking on the desired entry:

30.10 Image Mode

fldigi-fsq has the ability to transmit and receive small digital images selected from those stored on the disk. The image transmission is similar to but not compatible with the MFSKpic modes. FSQ images are always transmitted in a fixed width to height ratio. The W x H format is not limited to a single ratio, nor is it limited to just color, or just gray scale.

The start of the picture is signalled digitally, and the receiver simply captures data continuously for W lines of H pixels, as requested, resulting in a WxH pixel image, then reception stops.

The images are approximately in 4:3 or 3:4 aspect ratio. Images must be sent and received in Directed Mode, and can be sent to just one recipient, to several recipients, or everyone on the channel, just as with other messages.

Available image aspect ratios / formats include:

- 160x120 color (1)
- 320x240 color (1)
- 640x480 grey (1)
- 640x480 color (1)
- 240x300 color
- 240x300 grey
- 120x150 color
- 120x150 grey

(1) compatible with the program FSQCALL

Narrow-Band Images

FSQ Image Mode was designed for NVIS propagation on the lower HF bands. Unlike SSTV, the pictures are sent relatively slowly, in a narrow bandwidth (1/4 of SSTV), and as a result the picture signal to noise ratio is generally better than SSTV for the same transmission power. As a guideline, FSQ signals (before the picture is started) need to be about +10dB SNR for noise-free picture reception.

FSQ pictures also offer significantly better reception than SSTV under NVIS conditions. Because there is no picture sync, there is no risk of the picture tearing due to timing changes, or breaking up during selective fades. All that happens is that the image may noise up momentarily, but will stay correctly aligned. The mode is also significantly less affected by ghosting.

Image Format

The image mode sampling rate is 12,000 samples/sec, the same as the text mode. Each pixel consists of 10 samples, and there are P pixels/line. Therefore the line period is 10 x P/12000 seconds, or the line rate 12000/(10 x P) lines/sec. In colour, each line is sent three times, in BGR order.

As an example, if there were 320 pixels per line, and 240 lines, the line rate would be 3.75 lines/sec, and 240 x 3 (for RGB) lines would take 192 seconds, or 3.2 minutes for a colour picture containing 76,800 pixels.

There is no horizontal (line) sync sent with the picture, and no vertical sync at the start of the picture. As a result, it is possible for reception to start slightly earlier or later than the standard delay from the time of the command, depending on the relative speed of the computers used at either end. This has two effects: first, the picture may be recorded shifted left or right, and the pixel colour order may be wrong. This is easily fixed after reception using the Phase control.

If the sound cards in the transmitting and receiving computers differ markedly in sample rate, the resulting picture can also be skewed. A small timing difference is enough to cause a noticeable slant in the picture. This is easily fixed after reception using the Slant control. High quality sound cards should be better than 5ppm, and result in barely noticeable slant, but some cheaper computer built-in sound modules may be rather worse. If you plan to send FSQ images you should calibrate your sound card to WWV.

Receive Image

![Figure 30.12 Image Reception](image)
Reception is completely automatic. Provided the software is in Directed Mode, and the sending station uses the correct callsign and trigger command, the decoder will identify the picture start, and record the picture. In doing so, it automatically opens a separate "FSQ Rx Image" dialog.

Demodulation uses a phase detection algorithm based on quadrature demodulation using the current and previous samples at 12000 samples/sec. All the samples are converted to pixels and stored, but only the average over every 10 samples is displayed. The raw image is stored in a temporary buffer of expanded size, which allows fine adjustment of the slant and phase to be made before the image is sampled and displayed.

If the transmitting station goes off the air or reception is lost during recording of a picture, the recording will continue until the necessary number of samples has been made, then reception stops.

The Rx Image dialog controls from left to right are:

- Reset: clears all rx data
- Phase adjustment: moves image left and right
- Slant adjustment: slews image diagonally
- Save: saves the image to the fldigi image folder with a date-time stamped file name
- Close: closes the image dialog
Image phase and slant should not be adjusted before the picture reception has finished, as then only part of the image will be corrected.

**Transmit Image**
Access to the transmit image functions is only available via the heard list pop-up menus. Right click on the recipient call sign and select the "Send Image to ..." item from the pop-up menu.
A file open dialog is displayed when the "Load" button is pressed on the TX Image dialog. This allows the user to select any image in a number of different standard formats. The image is rendered to the selected image size using a resampling process. fldigi will try to force fit the image to the selected aspect ratio. You should try to work with images that are in a 4:3 or a 3:4 aspect ratio. The selected image does not need to be the same size.Fldigi will enlarge or reduce the image using a resampling technique to fit the selected image size. The example photo of Star Gazer lilies is a 3.2 MB file, 3008 x 2000 pixels. It was taken in my lily patch in June 2014.

Once the image has been loaded, the user starts the transmission by pressing the "Xmt" button on the transmit image dialog. fldigi formats the correct command sequence and starts the transmission.

The recipient callsign for image transmission can be a single callsign, or allcall.

Sending to a single recipient or to allcall is accomplished as described above. To send to multiple addresses you must add their callsigns to the Tx panel, separated by spaces and with a trailing space. Then press the Xmt button on the Tx Image dialog.

fldigi remains in transmit mode when the image transmission is completed and the deadman timer is started.

30.11 Disable RxID

You will probably want to disable the RxID detector during FSQ operations. If RxID is enabled and an RsID signal is detected the program will switch to the mode specified by the RxID. That will completely alter the user interface.

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Chapter 31

IFKP

31.1 Incremental Frequency Keying Plus

Figure 31.1 ifkp main dialog

The main dialog ifkp user interface provides an Rx-text panel, a Tx-text panel, a "Heard" list, and an ifkp signal to noise indicator, and an avatar image. The default avatar is the "Tux" logo. Sending, receiving and saving avatars is discussed in the avatar section.

Keyboard operation in ifkp is identical to other digital modes such as PSK, MFSK, DominoEX, etc. with a primary difference; the alphabet is a truncated version of the MicroSoft Code Page 1250, CP1250. This alphabet is described in the ifkp varicode section.

Unlike FSQ, which uses a similar incremental frequency keying technique, IFKP does not employ any special protocols. The exception to this rule is for the transmission and reception of IFKP images. IFKP transmission and reception can occur anywhere within the nominal passband of 500 to 3500 Hertz. fldigi will adjust the waterfall tracking point if the center frequency selected would create a signal that is either above or below the nominal passband.

The default audio frequency is 1500 and most operators will elect to use the default.

31.2 IFKP heard list

The IFKP decoder includes a parser which continuously examines the received text stream looking for a sequence of characters which begins with `<SP>de<SP>`, independent of case. `<SP>` is the space character. The ensuing
word is then tested for validity as a callsign. The following examples would all be qualified as a valid callsign:

" DE W1HKJ "
" de k17cfg "
" de W3FQN "
" de K2LBM<LF>" 
"<LF>de N2IKY<LF>"

Note that the white space can be extended between the "de" and the callsign. The callsign can be terminated with either a space character or a new line character.

When a valid callsign is discovered it is added to the heard list along with the time and detected signal to noise ratio.

New callsigns are always prepended to the top of the heard list. Any older heard list entries with the same callsign are purged.

Left clicking on a heard list entry inserts that callsign in the Tx panel at the cursor position. Right clicking on a heard list entry deletes that entry from the list.

### 31.3 IFKP specification

IFKP is a incremental frequency keyed mode with an offset of +1. It is designed for very high coding efficiency. This version uses 33 tones (32 differences), a Varicoded Alphabet, with a rotating difference frequency. Modem statistics:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samplerate</td>
<td>16000</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>386</td>
</tr>
<tr>
<td>Center freq</td>
<td>1500(1)</td>
</tr>
<tr>
<td>Symbol length</td>
<td>4096</td>
</tr>
<tr>
<td>Lower case cps</td>
<td>3.65</td>
</tr>
</tbody>
</table>

(1) nominal, adjustable from 500 to 3500 Hertz

Tone differences are expressed as decimal numbers 0 - 31. The alphabet design uses single-symbol and two-symbol character codes. The character set does not include much extended ASCII, and has only 116 different codes. It is a strongly 'unsquare' design (29 x 3), which restricts the number of codes, but we don't need the maximum anyway. This 'unsquare' code maximizes the single-symbol set to 29, so will fit all lower case in one symbol. Using 29 initials means using a comparison process to discover where the initial symbols are.

Amateur communications does not follow standard English text for letter frequency. It has a higher incidence of letters such as Q, X and Z (in Q codes and callsigns).

Lower case letters are more common than upper case. Numbers are considered equal in frequency of occurrence to upper case characters.

The IFKP character set has been designed for one set of 29 single-symbol characters, and three two-symbol sets of upper case letters, number and punctuation. There is some spare space, and a few extended ASCII characters have been included (± ÷ ° £ ×).

There are 29 single-symbol characters, 87 two-symbol codes, and a total alphabet of 116 codes. This allows coding all upper case, lower case and punctuation. The most common symbol is the NULL, a non printing character and is assigned a single symbol entry in the table.

The nomenclature used for the character symbol numbers in the tables is

[1st_symbol], ([2nd_symbol])

expressed in decimal, where the [1st_symbol] always has values less than 29, and the [2nd_symbol] will have a
value of 30 or 31.

## 31.4 IFKP Varicode

The IFKP varicode table is defined as shown in the following tables:

<table>
<thead>
<tr>
<th>CHAR</th>
<th>ASCII</th>
<th>VAR</th>
<th>CHAR</th>
<th>ASCII</th>
<th>VAR</th>
<th>CHAR</th>
<th>ASCII</th>
<th>VAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDLE</td>
<td>0</td>
<td>0</td>
<td>@</td>
<td>64</td>
<td>0,29</td>
<td>`</td>
<td>96</td>
<td>9,31</td>
</tr>
<tr>
<td>!</td>
<td>33</td>
<td>11,30</td>
<td>A</td>
<td>65</td>
<td>1,29</td>
<td>a</td>
<td>97</td>
<td>1</td>
</tr>
<tr>
<td>*</td>
<td>34</td>
<td>12,30</td>
<td>B</td>
<td>66</td>
<td>2,29</td>
<td>b</td>
<td>98</td>
<td>2</td>
</tr>
<tr>
<td>#</td>
<td>35</td>
<td>13,30</td>
<td>C</td>
<td>67</td>
<td>3,29</td>
<td>c</td>
<td>99</td>
<td>3</td>
</tr>
<tr>
<td>$</td>
<td>36</td>
<td>14,30</td>
<td>D</td>
<td>68</td>
<td>4,29</td>
<td>d</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>%</td>
<td>37</td>
<td>15,30</td>
<td>E</td>
<td>69</td>
<td>5,29</td>
<td>e</td>
<td>101</td>
<td>5</td>
</tr>
<tr>
<td>&amp;</td>
<td>38</td>
<td>16,30</td>
<td>F</td>
<td>70</td>
<td>6,29</td>
<td>f</td>
<td>102</td>
<td>6</td>
</tr>
<tr>
<td>*</td>
<td>39</td>
<td>17,30</td>
<td>G</td>
<td>71</td>
<td>7,29</td>
<td>g</td>
<td>103</td>
<td>7</td>
</tr>
<tr>
<td>(</td>
<td>40</td>
<td>18,30</td>
<td>H</td>
<td>72</td>
<td>8,29</td>
<td>h</td>
<td>104</td>
<td>8</td>
</tr>
<tr>
<td>)</td>
<td>41</td>
<td>19,30</td>
<td>I</td>
<td>73</td>
<td>9,29</td>
<td>i</td>
<td>105</td>
<td>9</td>
</tr>
<tr>
<td>*</td>
<td>42</td>
<td>20,30</td>
<td>J</td>
<td>74</td>
<td>10,29</td>
<td>j</td>
<td>106</td>
<td>10</td>
</tr>
<tr>
<td>+</td>
<td>43</td>
<td>21,30</td>
<td>K</td>
<td>75</td>
<td>11,29</td>
<td>k</td>
<td>107</td>
<td>11</td>
</tr>
<tr>
<td>,</td>
<td>44</td>
<td>27,29</td>
<td>L</td>
<td>76</td>
<td>12,29</td>
<td>l</td>
<td>108</td>
<td>12</td>
</tr>
<tr>
<td>-</td>
<td>45</td>
<td>22,30</td>
<td>M</td>
<td>77</td>
<td>13,29</td>
<td>m</td>
<td>109</td>
<td>13</td>
</tr>
<tr>
<td>.</td>
<td>46</td>
<td>27</td>
<td>N</td>
<td>78</td>
<td>14,29</td>
<td>n</td>
<td>110</td>
<td>14</td>
</tr>
<tr>
<td>/</td>
<td>47</td>
<td>23,30</td>
<td>O</td>
<td>79</td>
<td>15,29</td>
<td>o</td>
<td>111</td>
<td>15</td>
</tr>
<tr>
<td>0</td>
<td>48</td>
<td>10,30</td>
<td>P</td>
<td>80</td>
<td>16,29</td>
<td>p</td>
<td>112</td>
<td>16</td>
</tr>
<tr>
<td>1</td>
<td>49</td>
<td>1</td>
<td>Q</td>
<td>81</td>
<td>17,29</td>
<td>q</td>
<td>113</td>
<td>17</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>2,30</td>
<td>R</td>
<td>82</td>
<td>18,29</td>
<td>r</td>
<td>114</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>51</td>
<td>3,30</td>
<td>S</td>
<td>83</td>
<td>19,29</td>
<td>s</td>
<td>115</td>
<td>19</td>
</tr>
<tr>
<td>4</td>
<td>52</td>
<td>4,30</td>
<td>T</td>
<td>84</td>
<td>20,29</td>
<td>t</td>
<td>116</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>53</td>
<td>5,30</td>
<td>U</td>
<td>85</td>
<td>21,29</td>
<td>u</td>
<td>117</td>
<td>21</td>
</tr>
<tr>
<td>6</td>
<td>54</td>
<td>6,30</td>
<td>V</td>
<td>86</td>
<td>22,29</td>
<td>v</td>
<td>118</td>
<td>22</td>
</tr>
<tr>
<td>7</td>
<td>55</td>
<td>7,30</td>
<td>W</td>
<td>87</td>
<td>23,29</td>
<td>w</td>
<td>119</td>
<td>23</td>
</tr>
<tr>
<td>8</td>
<td>56</td>
<td>8,30</td>
<td>X</td>
<td>88</td>
<td>24,29</td>
<td>x</td>
<td>120</td>
<td>24</td>
</tr>
<tr>
<td>9</td>
<td>57</td>
<td>9,30</td>
<td>Y</td>
<td>89</td>
<td>25,29</td>
<td>y</td>
<td>121</td>
<td>25</td>
</tr>
<tr>
<td>:</td>
<td>58</td>
<td>24,30</td>
<td>Z</td>
<td>90</td>
<td>26,29</td>
<td>z</td>
<td>122</td>
<td>26</td>
</tr>
<tr>
<td>;</td>
<td>59</td>
<td>25,30</td>
<td>[</td>
<td>91</td>
<td>1,31</td>
<td>{</td>
<td>123</td>
<td>6,31</td>
</tr>
<tr>
<td>&lt;</td>
<td>60</td>
<td>26,30</td>
<td>\</td>
<td>92</td>
<td>2,31</td>
<td></td>
<td></td>
<td>124</td>
</tr>
<tr>
<td>=</td>
<td>61</td>
<td>0,31</td>
<td>]</td>
<td>93</td>
<td>3,31</td>
<td>}</td>
<td>125</td>
<td>8,31</td>
</tr>
<tr>
<td>&gt;</td>
<td>62</td>
<td>27,30</td>
<td>_</td>
<td>94</td>
<td>4,31</td>
<td>~</td>
<td>126</td>
<td>0,30</td>
</tr>
<tr>
<td>?</td>
<td>63</td>
<td>28,29</td>
<td></td>
<td>95</td>
<td>5,31</td>
<td>DEL</td>
<td>127</td>
<td>28,31</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHAR</th>
<th>ASCII</th>
<th>VAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRLF</td>
<td>13/10</td>
<td>28,30</td>
</tr>
<tr>
<td>SPACE</td>
<td>32</td>
<td>28</td>
</tr>
<tr>
<td>±</td>
<td>241</td>
<td>10,31</td>
</tr>
<tr>
<td>÷</td>
<td>246</td>
<td>11,31</td>
</tr>
<tr>
<td>°</td>
<td>248</td>
<td>12,31</td>
</tr>
<tr>
<td>×</td>
<td>158</td>
<td>13,31</td>
</tr>
<tr>
<td>£</td>
<td>156</td>
<td>14,31</td>
</tr>
<tr>
<td>BS</td>
<td>8</td>
<td>27,31</td>
</tr>
</tbody>
</table>
Here is a simple analysis of projected text efficiency compared with DominoEX:

<table>
<thead>
<tr>
<th>Symbols</th>
<th>Nbr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message</td>
<td>The Quick Brown Fox jumps over the lazy dog 1234567890.</td>
</tr>
<tr>
<td>DominoEX</td>
<td>221122122121121222222112112112122122222222211211</td>
</tr>
<tr>
<td>IFKP</td>
<td>21112111121111111111111111111111111111111111122222222221</td>
</tr>
</tbody>
</table>

It is about 27% more efficient than DominoEX. Note especially the score sending typical 'ham speak' - some 30% more efficient than DominoEX. The typing speed at 3.65 cps is about 37 WPM. Q codes and callsigns should be sent in lower case when possible.

Character rate statistics for various character sets when sent using IFKP,

- text: abcdefghijklm nopqrstuvwxyz 
  chars/sec: 3.65
- text: ABCDEFGHIJKLMNOPQRSTUVWXYZ 
  chars/sec: 1.84
- text: 0123456789 
  chars/sec: 1.84
- text: !#$%&*()_+-=\[]{}$|;:'",<>/?<bs><lf>
  chars/sec: 1.84

31.5 IFKP xmt speed

fldigi-ifkp can transmit text in one of 3 speeds, 0.5X, 1.0X and 2.0X. The 1.0X speed is the natural speed of the modem. The 0.5X and 2.0X speeds are obtained by dividing or multiplying the symbol length by 2 respectively. You can expect to experience decreased decoding errors with the 0.5X speed. Use it when s/n conditions are well below minux 10 dB on the IFKP signal strength meter. The 2.0X speed should probably not be used unless the s/n is well above plus 10 dB on the IFKP signal strength meter.

The three speeds can be selected at the time that IFKP is chosen from the mode menu. The speed can also be changed using the IFKP modem configuration tab. The quickest way to change speed is to left click on the left-most status indicator on the fldigi status bar (lowest set of controls on the main dialog). A pop-up menu will appear with the speed selections. The quick mode change and the configuration tab changes will occur immediately even during transmission. The selection from the mode menu will cause a complete reset of the IFKP modem.

31.6 IFKP Image Mode

fldigi-ifkp has the ability to transmit and receive small digital images selected from those stored on the disk. The image transmission is similar to but not compatible with the MFSKpic modes. IFKP images are always transmitted in a fixed width to height ratio. The W x H format is not limited to a single ratio, nor is it limited to just color, or just gray scale. The image mode is nearly identical to the FSQ image mode with the exception of the RGB transmission sequence. IFKP transmits in Blue-Green-Red order, whereas IFKP transmits in Red-Green-Blue order. The IFKP image bandwidth is less than 400 Hz.

The start of the picture is signalled digitally, and the receiver simply captures data continuously for W lines of H pixels, as requested, resulting in a WxH pixel image, then reception stops.

IFKP Image Mode was designed for NVIS propagation on the lower HF bands. Unlike SSTV, the pictures are sent relatively slowly, in a narrow bandwidth (1/4 of SSTV), and as a result the picture signal to noise ratio is generally
better than SSTV for the same transmission power. As a guideline, IFKP signals (before the picture is started) need to be about +10dB SNR for relatively noise-free picture reception.
IFKP pictures also offer significantly better reception than SSTV under NVIS conditions. Because there is no picture sync, there is no risk of the picture tearing due to timing changes, or breaking up during selective fades. All that happens is that the image may noise up momentarily, but will stay correctly aligned. The mode is also significantly less affected by ghosting.

**Image Format**
The images are approximately in 4:3 or 3:4 aspect ratio. IFKP images can be received by any IFKP capable decoder. Available image aspect ratios / formats include:

- 59x74 color
- 160x120 color
- 320x240 color
- 640x480 grey scale
- 640x480 color
- 240x300 color
- 240x300 grey scale
- 120x150 color
- 120x150 grey scale

These formats correspond roughly to a portrait (3x4) and landscape (4x3) photo. fldigi will scale any computer stored image to the target image. You should edit the images off line to be at least close to the 3x4 or 4x3 ratio. That will prevent the fldigi loader from distorting the loaded image.
The image mode sampling rate is 16,000 samples/sec, the same as the text mode. Each pixel consists of 8 samples, and there are P pixels/line. Therefore the line period is 8 x P/16000 seconds, or the line rate 16000/(8 x P) lines/sec.
In colour, each line is sent three times, in Red-Green-Blue (RGB) order.
As an example, if there were 320 pixels per line, and 240 lines, the line rate would be 6.25 lines/sec, and 240 x 3 (for RGB) lines would take 115.2 seconds, or 1.92 minutes for a colour picture containing 76,800 pixels.
There is a single sync signal sent at the beginning of each image. This sync signal is a tone placed 186 Hz below the center frequency, or at 1384 Hertz. The sync signal is 1.5 symbol lengths in duration, or 5.8 seconds.
If the sound cards in the transmitting and receiving computers differ markedly in sample rate, the resulting picture can also be skewed. A small timing difference is enough to cause a noticeable slant in the picture. This is easily fixed after reception using the Slant control. High quality sound cards should be better than 5ppm, and result in barely noticeable slant, but some cheaper computer built-in sound modules may be rather worse. If you plan to send IFKP images you should calibrate your sound card to WWV.

**Transmit Image**
Transmitting an image in IFKP is initiated by selecting the "Send image" menu item from the pop up Tx menu. Right click on the Tx panel

![Send Image](image.png)
This selection opens up the Send Image dialog

![Send Image Dialog](image1.png)

Figure 31.3 Send Image Dialog

shown with a 160x120 color image loaded and ready to transmit.
Transmission begins when you press the "Xmt" button. fldigi will insert the text preamble and immediately begin the image transmission. fldigi remains in transmit mode when the image transmission is completed and the deadman timer is started.

![Image Mode Waterfall](image2.png)

Figure 31.4 Image Mode Waterfall

There is an alternate way of sending an image, but one which only transmits a color image with no provision for slant correction. This may be more convenient for sharing images when you do not need the additional utility of the image dialog.

Open a file folder to the location of your image files that are suitable for MFSK transmission. These images should be constrained to be 240 x 200 or less for reasonable transmit times. Optionally prepare fldigi for the MFSK image transmission by entering some suitable text to precede the transmission.
You may be sending the image, blossoms.jpg, for example.
One might enter:

```
Here is an image of my apple trees in full bloom.
```

Then drag and drop the image file from the files folder to the transmit text panel in fldigi. The program will automatically resize the image to the nearest scale-aspect ratio less than or equal to the actual image size.

The TX panel text will then change to

```
Here is an image of my apple trees in full bloom.∧!]
```

The `∧!` is the character sequence used by the fldigi TX parser to indicate that there is a pending execution command. In this case it is to transmit the blossoms.jpg file.

Add some suitable ending text and the sequence `∧r` to the next line and then press the T/R button (if not already transmitting). At the end of the image the TX parser will find the `∧r` and return the program to the receive mode. The Rx panel will echo the transmitted data:

The transmit progress dialog will close at the conclusion of the image transmission.

**Receive Image**

Reception is completely automatic. The decoder will identify the picture start, and record the picture. In doing so, it automatically opens a separate “IFKP Rx Image” dialog.
Demodulation uses a phase detection algorithm based on quadrature demodulation using the current and previous samples at 16000 samples/sec. All the samples are converted to pixels and stored, but only the average over every 16 samples is displayed. The raw image is stored in a temporary buffer of expanded size, which allows fine adjustment of the slant and phase to be made before the image is sampled and displayed. If the transmitting station goes off the air or reception is lost during recording of a picture, the recording will continue until the necessary number of samples has been made, then reception stops.

The Rx Image dialog controls from left to right are:

- **Reset**: clears all rx data
- **Phase adjustment**: moves image left and right
- **Slant adjustment**: slews image diagonally
- **Save**: saves the image to the fldigi image folder with a date-time stamped file name
- **Close**: closes the image dialog

Image phase and slant should not be adjusted before the picture reception has finished, as then only part of the image will be corrected.
31.7 Avatars

Avatar images are 59 x 74 (width x height) color images that are associated with a call sign. The avatar images are stored in the folder

C:\Documents and Settings\<user>\fldigi.files\avatars\nC:\Users\<user>\fldigi.files\avatars\n/home/<user>/.fldigi/avatars/

as "png" images.
You should prepare an image file for your own call sign, in lower case. For example

/home/dave/.fldigi/avatars/w1hkj.png

in a 4x5 aspect ratio, preferably in the 59x74 format, but any larger 4x5 image can be used. fldigi will scale the image to 59x74 when it is read from the file.
You can send your avatar very simply by right clicking on the IFKP avatar.
If you receive an avatar from another station it will automatically be displayed in the avatar box. You should have previously entered the call sign of the other station in the Call logging control. Left clicking on the avatar will then save the image in the avatars folder with the appropriate callsign. The correct avatar will then be displayed the next time you enter that call sign in the Call logging control. This is an example of a received avatar with timing misalignment.

The received image may be misaligned left or right in the image box. This is caused by an error in the start timing of the reception. You can realign the image using a combination of SHIFT, CONTROL and LEFT/RIGHT mouse clicks on the image. Be careful to use either the SHIFT or CONTROL in combination with the mouse button. Mouse left and right click without the SHIFT/CONTROL will cause either a save or an own avatar transmit to occur.

CONTROL LEFT click - move image left by 1 pixel
SHIFT LEFT click - move image left by 5 pixels
CONTROL RIGHT click - move image right by 1 pixel
SHIFT RIGHT click - move image right by 5 pixels

The same image after alignment.
You will probably need to manage the avatar images using your OS file explorer. Easy access to the image folder is obtained by the menu item File/Folders.

The avatar image format is identical to the IFKP image 59x74 format. If you receive and save a 59x74 image you can always rename the saved image (date-time-stamped) to a "callsign.png" in the avatar folder.
NAVTEX and SITOR-B

**NAVTEX** (Navigational Telex) is an international automated service for delivery of meteorological and marine safety information to ships. These broadcasts are sent with the SITOR collective B-mode (Also known as AMTOR-B or AMTOR-FEC), using the CCIR 476 character set. SITOR-B is also used in amateur radio, where it is known as AMTOR-B or AMTOR-FEC.

It transmits at 100 baud FSK modulation with a frequency shift of 170 Hz. The frequencies are:

- 518 kHz: International frequency, always in English.
- 490 kHz: Regional transmission, in local languages (Not used in the United States).
- 4209.5 kHz: Marine Safety Information.

The implementation reflects this structure: The Navtex modem is a specialization of the SITOR-B modem. Fldigi supports both modes. We will specify when their behaviors are different.
32.1 Transmitting a text

Transmitting a text is done with the usual GUI. The only difference between the SITOR-B and Navtex modes, is that data (Whether sent with the GUI or with XML/RPC) are untouched in SITOR-B. In Navtex, on the contrary:

- They are preceded by a phasing signal of several seconds.
- A "ZCZC B₁B₂B₃B₄" preamble is sent.
- Then the original message is transmitted.
- ... followed by the "NNNN" terminator,
- ... and another phasing signal.

32.2 Receiving a text

The only difference between the SitorB and Navtex modes, is that messages are processed (Parsed and optionally stored) only in Navtex mode. Here is a typical transmission showing:

- The end of a previous message : "NNNN"
- The preamble of a new message: "EA85": 85th navigational warning ('A') of the Niton station in England ('E').
- The message itself, without the terminator (Which should come soon).

The modem has some flexibility when interpreting messages, and is able to deal with missing or incomplete preamble and terminator.
32.3 AFC: Automatic Frequency Control

As shown in the reception screen hard-copy, it is possible to tick "AFC". The consequence is that the frequency is continuously monitored.

32.4 Logging Navtex data to ADIF files

Navtex messages are delimited with the usual separators ZCZC and NNNN. Their format is:

\[
\text{ZCZC } B_1B_2B_3B_4 \\
\text{(message text ...)} \\
\text{NNNN}
\]

These four characters are:

- \(B_1\): The station origin, used for lookups in the Navtex stations file. The same character is associated to several stations. Therefore, we use other criteria such as the frequency and the distance to the receiver, to eliminate the ambiguity. It is therefore important to specify correctly your Maidenhead locator.
- \(B_2\): The subject indicator, used by the receiver to identify the message class, such as ice reports or meteorological messages.
- \(B_3B_4\): A serial number between 00 and 99.
32.5 Configuration

As for any modem, there is a specific configuration tab for Navtex which allows:

- To specify whether messages should be stored in the current Adif log file.
- To choose the Text file containing stations definitions.
Navtex messages can be logged to the ADIF file. This is done with other extra data:

- Date and time of the contact.
- Frequency and mode.
- Station name, country, Maidenhead locator and callsign deduced from the message header and the Navtex stations file (See below). The locator is calculated using the station coordinates.
- The message content itself. Note that carriage-returns which cannot be displayed on a single line, are transformed into a tilda "~".
32.7 Stations file

The emitter station is extracted from the Navtex message, and used to extract latitude, longitude, station name and other characteristics from a file containing well-known station, data/NAVTEX_Stations.csv. It is possible to edit this text file, or to choose another one.

![Figure 32.5 Choosing Stations File](image)

32.8 XML/RPC functions

Two XML/RPC functions are create:

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>navtex.get_message</td>
<td>Returns next Navtex/SitorB message with a max delay in seconds passed as an integer parameter. Empty string if timeout.</td>
</tr>
<tr>
<td>navtex.send_message</td>
<td>Send a Navtex/SitorB message, passed as a string. Returns an empty string if OK otherwise an error message</td>
</tr>
</tbody>
</table>
Chapter 33

PSK Single and Multi-Channel Modems

33.1 BPSK, QPSK, 8PSK modems

PSK are narrow band low to moderate symbol rate modes using either single or multiple carrier differential Phase Shift Keying.

Current supported variants:
BPSK: Binary, 2 constellations (1)
QPSK: Quadrature, 4 constellations
8PSK: Octal, 8 constellations

(1)

A convenient way to represent PSK schemes is on a constellation diagram. This shows the points in the complex plane where, in this context, the real and imaginary axes are termed the in-phase and quadrature axes respectively due to their 90° separation.

NOTE:
Multi-Channel PSK modems use BPSK modulation.

PSK63FEC and the PSKxxxR modes are forward error correcting modes. PSK63FEC is compatible with the Multi-Psk mode of the same name. The PSKxxxR, or robust, modes use both forward error correction and interleaving to achieve about 4 dB s/n improvement over standard PSK. These modes are used primarily by the PskMail user community. They are the invention of John Douyere, VK2ETA, a member of the fldigi development team.

In addition to the binary phase shift keying the signal is 100% raised-cosine amplitude modulated at the symbol rate. This reduces the power to zero at the phase change. Because of this amplitude modulation, the signal bandwidth is relatively narrow. Synchronization at the receiver is straightforward because it can be recovered from the amplitude information. Differential PSK is used to provide continuous phase changes when idle (to maintain sync), and by allowing the receiver to measure phase difference from symbol to symbol, to reduce the effects of ionospheric Doppler phase changes which modulate the signal. The slower modes are more affected by Doppler, and the QPSK and 8PSK modes are particularly affected.

With no interleaver and limited coding length, the QPSK mode Forward Error Correction coding gain is limited, and under burst noise conditions on HF the performance is usually worse than the BPSK option at the same baud rate. In general the narrow-band BPSK modes work well on a quiet single-hop path, but give poor performance in most other conditions.

Many of the multi-carrier and 8PSK modes exceed the baud and bandwidth limitations imposed by the FCC (US operators only). These modes are intended for use on VHF/UHF and have proven to be very robust on FM even when used with repeaters.
33.2 Multi-Channel BPSK modems

Figure 33.5 PSK63R20C signal transmitting text data - waterfall view
33.3 8PSK modems

The 8 PSK modes are intended for use on VHF/UHF FM systems. They provide a very high data rate suitable for use with both flmsg and flamp and the transfer of digital data.

FM Modes - There are five modes specifically intended for usage on FM:

<table>
<thead>
<tr>
<th>Mode</th>
<th>WPM</th>
<th>Baud</th>
<th>Bitrate</th>
<th>Datarate</th>
<th>FEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-PSK 500</td>
<td>2540</td>
<td>500</td>
<td>1500 bps</td>
<td>1500 bps</td>
<td>None</td>
</tr>
<tr>
<td>8-PSK 1000</td>
<td>5080</td>
<td>1000</td>
<td>3000 bps</td>
<td>3000 bps</td>
<td>None</td>
</tr>
<tr>
<td>8-PSK 500F</td>
<td>1690</td>
<td>500</td>
<td>1500 bps</td>
<td>1000 bps</td>
<td>2/3 Rate K=13</td>
</tr>
<tr>
<td>8-PSK 1000F</td>
<td>3386</td>
<td>1000</td>
<td>3000 bps</td>
<td>2000 bps</td>
<td>2/3 Rate K=7</td>
</tr>
<tr>
<td>8-PSK 1200F</td>
<td>4170</td>
<td>1200</td>
<td>3600 bps</td>
<td>2400 bps</td>
<td>2/3 Rate K=7</td>
</tr>
</tbody>
</table>

- 8-PSK 500F works with nearly all radios and FM repeater systems.
- Center-frequencies of 1500Hz and 1750Hz have been reported to work best.

SSB Modes - There are six modes which can be used for weak signal 10m/6m+ SSB or FM VHF/UHF.

<table>
<thead>
<tr>
<th>Mode</th>
<th>WPM</th>
<th>Baud</th>
<th>Bitrate</th>
<th>Datarate</th>
<th>FEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-PSK 125</td>
<td>635</td>
<td>125</td>
<td>375 bps</td>
<td>375 bps</td>
<td>None</td>
</tr>
<tr>
<td>8-PSK 250</td>
<td>1270</td>
<td>250</td>
<td>750 bps</td>
<td>750 bps</td>
<td>None</td>
</tr>
<tr>
<td>8-PSK 125F</td>
<td>317</td>
<td>125</td>
<td>375 bps</td>
<td>187 bps</td>
<td>1/2 Rate K=16</td>
</tr>
<tr>
<td>8-PSK 250F</td>
<td>635</td>
<td>250</td>
<td>750 bps</td>
<td>375 bps</td>
<td>1/2 Rate K=16</td>
</tr>
<tr>
<td>8-PSK 125FL</td>
<td>312</td>
<td>125</td>
<td>375 bps</td>
<td>187 bps</td>
<td>1/2 Rate K=13</td>
</tr>
<tr>
<td>8-PSK 250FL</td>
<td>635</td>
<td>250</td>
<td>750 bps</td>
<td>375 bps</td>
<td>1/2 Rate K=13</td>
</tr>
<tr>
<td>8-PSK 500F</td>
<td>1690</td>
<td>500</td>
<td>1500 bps</td>
<td>1000 bps</td>
<td>2/3 Rate K=13</td>
</tr>
</tbody>
</table>

These modes can be used on HF SSB like PSK-31, but do require a high-degree of frequency accuracy (± 10Hz). The heavy forward error correction allows these signals to be decoded even when quite weak. This also helps overcome their sensitivity to transmitter / amplifier distortions and non-linearities.

The FEC modes do not all use the same Viterbi polynomials to achieve the forward error correction. That is why the WPM rates for the FEC modes are not multiples of the base 125 baud. The WPM rates are only an indication of relative rates. The actual transfer rate is highly dependent on the data content. This is always true for modes which use a VARICODE.
The 8psk signal is similar to both bpsk and qpsk, but with 8 possible phase states instead of the 2 and 4 associated with bpsk, qpsk. The format of the signal does not lend itself easily to a conventional AFC. Instead, the modes should be used with RsID enabled. The RsID signal will both determine the mode and the mode center frequency (to the nearest 2.6 Hz). A finer resolution of the mode center frequency can be made using the optional pilot carrier. This pilot carrier is placed at the frequency

\[ f_0 = \frac{\text{samplerate}}{\text{symbollen}}, f_0 \text{ is modem center frequency} \]

\[ \text{samplerate} / \text{symbollen} \text{ is the same as the mode bandwidth.} \]

The waterfall and spectrum signature for the 8psk500 mode is shown here with and without the pilot carrier:

The two oscilloscope views above clearly show the combined phase and amplitude modulation of these modes.
Decoding errors are reduced as the tracking point nears the actual transmit center frequency. The loss of signal power is more than offset by the decoder improvement. Field testing has shown that the pilot tone needs to be at -40 dB or greater (less negative).

The 8-PSK pilot carrier is a continuous-phase & continuous-frequency tone transmitted slightly lower in frequency than the 8-PSK data signal. Since 8-PSK cannot use the same auto-frequency controls (AFC) as BPSK or PSK31 can, this tone is used to provide a frequency/phase reference. The addition of a pilot carrier to the 8-PSK modes allows for expanded usage of 8-PSK over HF Single-Sideband, even with older radios that experience frequency drift. This carrier helps improve decode by:

- Compensating for frequency drift, common with older radios
- Providing a stable frequency reference with ± 1/2 Hz accuracy
- Providing information on the RF channel quality, by measuring the RF channel real-time

Pilot tone detection does require a bit more cpu power. The pilot tone is detected using a sliding fast Fourier transform, sfft, which computes the frequency of the pilot to approximately 1 Hz resolution. The sfft only evaluates the signal at 11 discrete frequencies, so it is necessary that either the RsID, or manual tuning is used for the initial
signal acquisition. The detector is set to provide lock when the pilot s/n is 2:1 or better. The signal tracking point is then adjusted to place the pilot tone at the correct frequency location. For example, if the RsID put the tracking point at 1502 Hz, the pilot would then adjust for 1500 (if that is the correct tracking frequency). The adjustment is made once per second. Unlike AFC, which is continuous, the pilot adjustment is discrete and occurs in 1 Hz steps. If the pilot s/n is less than 2:1 then no adjustment is made to the tracking point. The pilot tone is transmitted during the 8psk preamble as well as during the data transmission. You should see the tracking point adjust once at the beginning of the transmission and then stay fixed.

With these modes, a very linear transmitter is required. Over-driven operation results in excessive bandwidth, poorer reception and difficult tuning. Overdrive usually occurs by having the audio signal much too large. These are very sensitive modes and usually very little power is required. QRP operation of 80, 40, 30 and 20 meters can provide nearly 100% copy over multi-hop paths. In many instances PSK can provide better decoding than CW.

Setting up for a good clean on air signal that will receive the accolades of your QSO partners is easy. Follow the instructions on using the Tune button and you will have a clean on signal.

Good reception of PSK signals requires that the demodulator be phase locked to the incoming signal. Fldigi has both a fast acquire / slow tracking AFC system. Place the red bandwidth bar (see above) so that it overlies the desired signal and then press the left mouse button. The signal should quickly lock on a decoding should commence immediately. It is almost impossible to visually tell whether a BPSK or QPSK signal is being received. Under very high s/n you might be able to hear the difference, but that is even difficult for most operators. If you are not able to decode a signal that looks like a BPSK and the bandwidth of the signal matches the baud rate then it might be a QPSK signal. Just change mode a try reacquiring the signal.

For further information about Phase Shift Keying

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## Chapter 34

### OFDM modes

<table>
<thead>
<tr>
<th>Figure 34.1 OFDM 500F</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 250 bits per sec</td>
</tr>
<tr>
<td>• 4 carriers</td>
</tr>
<tr>
<td>• 62.5 baud 4PSK</td>
</tr>
<tr>
<td>• 500Hz bandwidth</td>
</tr>
<tr>
<td>• 1/2 rate K=15 FEC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Figure 34.2 OFDM 750F</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 562 bits per sec</td>
</tr>
<tr>
<td>• 3 carriers</td>
</tr>
<tr>
<td>• 125 baud 8PSK</td>
</tr>
<tr>
<td>• 750Hz bandwidth</td>
</tr>
<tr>
<td>• 1/2 Rate K=13 FEC</td>
</tr>
</tbody>
</table>
368 OFDM modes

• 2000 bits per sec
• 8 carriers
• 125 baud 8PSK
• 2Khz bandwidth
• 1325Hz center
• 2/3 rate K=11 FEC

34.1 Microphone Jack Modes

These modes can be used with almost any SSB or FM transceiver unmodified, and with any SignalLink soundcard interface (either with the old or new transformers).

<table>
<thead>
<tr>
<th>Name</th>
<th>Usage</th>
<th>BW Hz</th>
<th>Baud</th>
<th>Carriers</th>
<th>Mod'</th>
<th>Bit/Sec</th>
<th>Datarate</th>
<th>FEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFDM 500F</td>
<td>SSB</td>
<td>500</td>
<td>62.5</td>
<td>4</td>
<td>4PSK</td>
<td>500</td>
<td>250</td>
<td>K=15 @ 1/2 rate</td>
</tr>
<tr>
<td>OFDM 750F</td>
<td>SSB</td>
<td>750</td>
<td>125</td>
<td>3</td>
<td>8PSK</td>
<td>1125</td>
<td>562</td>
<td>K=13 @ 1/2 rate</td>
</tr>
<tr>
<td>OFDM 1250F</td>
<td>SSB</td>
<td>1250</td>
<td>125</td>
<td>5</td>
<td>8PSK</td>
<td>1875</td>
<td>937</td>
<td>K=13 @ 1/2 rate</td>
</tr>
<tr>
<td>OFDM 2000F</td>
<td>SSB/FM</td>
<td>2000</td>
<td>125</td>
<td>8</td>
<td>8PSK</td>
<td>3000</td>
<td>2000</td>
<td>K=11 @ 2/3 rate</td>
</tr>
<tr>
<td>OFDM 2000</td>
<td>SSB/FM</td>
<td>2000</td>
<td>250</td>
<td>4</td>
<td>8PSK</td>
<td>3000</td>
<td>3000</td>
<td>NONE</td>
</tr>
</tbody>
</table>

• OFDM 500F /750F are intended for NVIS and regular HF-skip usage.
• OFDM 2000F is intended for HF skip, and through FM-repeaters.
• OFDM 2000 is intended for line-of-sight HF/VHF/UHF SSB.
• The OFDM 500F and 750F modes are tx/rx frequency-agile modes.
• Modes OFDM 2000, and 2000F are transmit-frequency locked (rx agile only).

34.2 9600 Port Modes

These modes can be used with almost any 9600-capable FM transceiver unmodified.

<table>
<thead>
<tr>
<th>Name</th>
<th>Usage</th>
<th>BW Hz</th>
<th>Baud</th>
<th>Carriers</th>
<th>Mod'</th>
<th>Bit/Sec</th>
<th>Datarate</th>
<th>FEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFDM 3500</td>
<td>FM 9600-port</td>
<td>3500</td>
<td>250</td>
<td>7</td>
<td>8 PSK</td>
<td>5,250</td>
<td>5,250</td>
<td>NONE</td>
</tr>
</tbody>
</table>

Generated by Doxygen
34.3 Performance

<table>
<thead>
<tr>
<th>Name</th>
<th>Usage</th>
<th>BW Hz</th>
<th>Baud</th>
<th>Carriers</th>
<th>Mod'</th>
<th>Bit/Sec</th>
<th>Datarate</th>
<th>FEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFDM 6000</td>
<td>FM 9600-port</td>
<td>6000</td>
<td>250</td>
<td>12</td>
<td>8 PSK</td>
<td>9,000</td>
<td>9,000</td>
<td>NONE</td>
</tr>
<tr>
<td>OFDM 7000</td>
<td>FM 9600-port</td>
<td>7000</td>
<td>250</td>
<td>14</td>
<td>16 QAM</td>
<td>14,000</td>
<td>14,000</td>
<td>NONE</td>
</tr>
</tbody>
</table>

- OFDM 3500 requires a SignalLink soundcard interface that has the new transformers (built after June 2018). To use this mode, the soundcard interface must be connected to the radio's 9600-port (set JP4 on SignalLink).
- DRA adapters from Masters Communications (or similar) are used for modes OFDM 3500, 6000, and 7000.
- The mode OFDM 3500 is intended for VHF/UHF line of sight communications.
- The OFDM 3500 signal is far too wide to operate through FM repeaters.

Use of the radio's 9600-port bypasses the pre-emphasis, de-emphasis, and audio-bandpass filters giving far less distortions and a wider usable bandwidth.

34.3 Performance

34.3.1 OFDM 500F

This mode can survive with 100% decode the "Mid-Latitude Disturbed NVIS" simulation, including multiple 2 second deep-fades causing complete-losses of reception. Simulation results confirmed by real-world testing.

34.3.2 OFDM 750F

This mode can survive with 100% decode the "Mid-Latitude Disturbed NVIS" simulation including multiple 1.5
→ 5 second deep-fades causing complete-losses of reception. Simulation results confirmed by real-world testing.

34.3.3 Other Modes

Currently in Testing.

34.4 UTF-8 Support

The OFDM modes support sending all UTF-8 characters. This means the mode can be used to communicate in any language. Please ensure the font chosen in Fldigi has the characters for the language you are trying to use, otherwise Fldigi will just display every character as an empty box.

34.5 RSID Usage

OFDM modes require a high-degree of frequency accuracy to operate. This is achieved by utilizing RSID to set the receive frequency to ± 3Hz. RSID is mandatory for the OFDM 500F, OFDM 750F, and OFDM 2000F modes. When received, the RSID triggers the receiver end to flush the long interleaver and soft-decision viterbi decoder. This prepares the viterbi decoder and interleaver for the data about to be received and is required for the long 3200 millisecond interleaver.

Flushing any received noise-bits before decoding the actual signal decreases the probability of error and provides FEC gain. This gain comes from not mixing the good data-bits with bad noise-bits by pre-filling interleaver and soft-decoder instead with punctures.

34.6 Technical Details

34.6.1 Vestigial AFC

OFDM sends a continuous-phase & continuous-frequency tone slightly lower in frequency than the data-signal. This tone is used to provide an accurate frequency/phase reference, allowing for denser PSK modulations on HF.
This vestigial tone is used for Automatic Frequency Control, after RSID. Vestigial AFC improves decode by:

- Compensating for frequency drift, common with older radios
- Providing a stable AFC frequency reference: +/− 0.5 Hz accuracy
- Automatically adjusting for mobile doppler-shifts (up to around 900MHz)
- Adjusting for +/− 5Hz instantaneous shifts mid-transmission
- Allowing for drift-rates of up to 1Hz/second (60Hz/minute)
- Maintaining receive orthogonality by keeping the center-frequency highly accurate.

34.6.2 Forward Error Correction

The forward error correction used by the OFDM modes are inspired by the longer constraint length codes used by NASA for deep-space communications. Only in recent years have home computers become powerful enough to run these FEC algorithms realtime. The long-codes provide extra FEC power needed to handle normal HF noise combined with NVIS-distortions or deep-fades.

Use of soft-decision Viterbi FEC and long-tracebacks help the OFDM FEC provide additional coding gain, allowing the modes work well even with highly-distorted signals and multiple complete losses of signal.

- OFDM 500F
  - A constraint length 15 convolutional FEC is used at 1/2 rate. This gives a free distance of 18 (can correct a 8-bit error). FEC achieves up to 8.6dB in coding gain (equivalent to using 7.2X more transmitter power)
- OFDM 750F
  - A constraint length 13 convolutional FEC is used at 1/2 rate. This gives a free distance of 16 (can correct a 7-bit error). This provides up to 7.8dB in coding gain (equivalent to using 6X more transmitter power)
- OFDM 2000F
  - A constraint length 11 convolutional FEC is used at 2/3 rate. This gives a free distance of 9 (can correct a 4-bit error). This provides up to 7.8dB in coding gain (equivalent to using 7X more transmitter power)

A traceback of 10 times the constraint length is used for modes 500F and 750F (un-punctured). This is increased to 14-times the constraint length for 2000F (punctured).

The 8-bit K=15 FEC is used for 500F because the datarate is low enough to ensure low CPU usage.
The 7-bit K=13 FEC is used for 750F simply to keep the CPU usage low at these faster datarates.
The 4-bit K=11 FEC is used for 2000F simply to keep the CPU usage low at these faster datarates.

34.6.3 Long Interleaving

The OFDM interleaver length has been modeled after MT63 and tailored for multicast-usage. This allows for a high level of robustness to fades at the expense of having a quite long turnaround time.

For NBEMS usage, where transmit times are many seconds long, a long interleaver gives coding-gain without negatively impacting throughput.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Bits</th>
<th>msec</th>
<th>Survives fade of</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFDM 500F</td>
<td>2000</td>
<td>4000</td>
<td>&lt; 2000 msec</td>
</tr>
<tr>
<td>OFDM 750F</td>
<td>3600</td>
<td>3200</td>
<td>&lt; 1600 msec</td>
</tr>
<tr>
<td>OFDM 1250F</td>
<td>4800</td>
<td>2400</td>
<td>&lt; 1200 msec</td>
</tr>
<tr>
<td>OFDM 2000F</td>
<td>4800</td>
<td>1600</td>
<td>&lt; 800 msec</td>
</tr>
</tbody>
</table>

Using interleavers this long provides additional coding-gain, but also requires the longer constraint length FEC in
34.6 Technical Details

order to function properly. This is due to the FEC having to handle both normal HF noise in addition to correcting over fades of up to 2-seconds from NVIS. For OFDM-2000F the interleaver length is moderately-sized for the HF bands, and meant for moderate to good channels. This allows for a better hybrid digital-mode robust enough for strong HF signals, but without excessive delays on VHF/UHF. The OFDM FEC modes are NOT meant to be used with any stop-and-wait protocols, like AX.25 or PSKmail. Stop-and-wait protocols will timeout if trying to use with an OFDM FEC mode.

34.6.4 Intercarrier Spacing

For OFDM-500F and OFDM-750F each subcarrier is spaced to twice minimum orthogonality. This reduces intercarrier-interference making the modes usable at the signal to low-to-medium signal-to-noise ratios common of the amateur HF bands. Increased intercarrier spacing also increases the modes resistance to HF doppler-spread.

34.6.5 Pulse Shaping

Raised-cosine pulse-shaping is used on each symbol within each OFDM subcarrier. This reduces the sidelobes of each carrier, which reduces inter-carrier-interference (ICI). By lowering ICI, these modes become more sensitive and usable at lower signal to noise ratios. Pulse-shaping also decreases Inter-Symbol Interference (ISI) within the same carrier. The point of zero-amplitude provided by this pulse shaping serves as a reference to recover accurate signal timing. Due to the low baudrates used, the zero-points of the pulse-shaping also acts as a minimally effective guard interval.

34.6.6 Timing Recovery

Since each symbol is raised-cosine pulse-shaped, there is a tiny moment of silence between each symbol. This silence is used for timing-recovery on the receiving side. The low baudrates used allow the intersymbol zero-amplitude moments to be long enough the be detected and used for accurate timing-recovery. Even with a constant string of 1's or 0's accurate timing synchronization is maintained.

34.6.7 Side Lobes

The orthogonal stacking of carriers to create an OFDM based mode causes multiple sidelobes, with only the side-lobes closest to the fundamental signal being significant. The first side lobe is below the fundamental signal by -18dB and the second side lobe by -22dB. The side lobes only become an issue at higher power-levels of ~500 watts and above. Below this power-level, the sidelobes are likely at or below the noise floor for HF.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Width @ 25 watts</th>
<th>Width @ 250 watts</th>
<th>Width @ 500 watts</th>
<th>Width @ 1500 watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFDM-500F</td>
<td>62.5 Hz</td>
<td>0.0016 watts/Hz</td>
<td>0.016 watts/Hz</td>
<td>0.032 watts/Hz</td>
</tr>
<tr>
<td>OFDM-750F</td>
<td>125 Hz</td>
<td>0.0008 watts/Hz</td>
<td>0.008 watts/Hz</td>
<td>0.016 watts/Hz</td>
</tr>
<tr>
<td>OFDM-1250F</td>
<td>62.5 Hz</td>
<td>0.0013 watts/Hz</td>
<td>0.013 watts/Hz</td>
<td>0.026 watts/Hz</td>
</tr>
<tr>
<td>OFDM-2000F</td>
<td>125 Hz</td>
<td>0.0004 watts/Hz</td>
<td>0.004 watts/Hz</td>
<td>0.008 watts/Hz</td>
</tr>
<tr>
<td>OFDM-2000</td>
<td>250 Hz</td>
<td>0.0004 watts/Hz</td>
<td>0.004 watts/Hz</td>
<td>0.008 watts/Hz</td>
</tr>
</tbody>
</table>

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Chapter 35

Olivia

fldigi can operate on the following Olivia modes without special setup by the operator:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Symbol Rate</th>
<th>Typing Speed</th>
<th>Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olivia 8-250</td>
<td>31.25 baud</td>
<td>1.46 cps (14.6 wpm)</td>
<td>250 Hz</td>
</tr>
<tr>
<td>Olivia 8-500</td>
<td>62.5 baud</td>
<td>2.92 cps (29.2 wpm)</td>
<td>500 Hz</td>
</tr>
<tr>
<td>Olivia 16-500</td>
<td>31.25 baud</td>
<td>1.95 cps (19.5 wpm)</td>
<td>500 Hz</td>
</tr>
<tr>
<td>Olivia 32-1000</td>
<td>31.25 baud</td>
<td>2.44 cps (24.4 wpm)</td>
<td>1000 Hz</td>
</tr>
</tbody>
</table>

Unusual combinations of symbol rate and bandwidth can be selected using the Olivia configuration tab.

These are unconnected, simplex chat modes with full time Forward Error Correction. Olivia is a very robust mode with low error rates, but the penalty can be an annoyingly slow transfer of information. If you are a one finger typist then Olivia is your cup of tea. The tones are spaced the same as the baud rate, for example 31.25 Hz for the default baud rates. The default calling mode is 32-1000. It has the following appearance on fldigi's waterfall:

Excerpts from the web pages of Gary, WB8ROL
Oliva Mode is a little different than PSK, RTTY, and many other digital modes. Below are tips on how to maximize your use of this mode.

**Disable your software squelch or turn it down as low as you can**

Generally turn your squelch setting in your software off or set it as low as it will go. You will see some "garbage" letters get printed out if there is NO Olivia signal present but it doesn't harm anything. When an Olivia signal is there it will start decoding it and print out the text without garbage at that time. It doesn't do much good to use a digital mode like Olivia that can decode signals -14 db below the noise lever IF you squelch it AT the noise level! It would be like getting a pair of high power binoculars and using them only in a 10x10 room with no windows.

**Be Patient!**

When you call CQ on this mode be patient and wait at least 45-60 seconds before you put out another call. When the other person who hears your CQ clicks on the waterfall it may take 4-20 seconds or even longer before they might actually start decoding your signal. That varies a lot depending on the software they are using AND value they have their Sync Integration Period set to.

The Sync Integration Period setting determines how "deep" the Olivia decoding algorithm searches in the noise to get the signal. A higher settings takes longer BUT usually decodes with more accuracy - at least to a point. However, a higher setting (since it does more work and takes longer) will increase the delay factor. So, when you finish your CQ and your transmitter switches to receive - the station listening to you (depending on his Sync Integration Periods setting) MAY NOT finish decoding your CQ for another 4-20 seconds. The same applies during a QSO when you pass it back to the other guy for his turn – be patient if he doesn't come back right away because his software may still be decoding your signal long after you stopped transmitting.

It DOES NOT PAY to be impatient on this mode and send SHORT CQ's or NOT wait at least 45-60 seconds between CQ's. Generally a 2x2 CQ sent at least 2 or 3 times is going to work much better for you than a short one. Below is the normal CQ I use though on real fast Olivia formats (like 500/4) I will do a 3x3 and send it 3 times.

CQ CQ de WB8ROL WB8ROL
CQ CQ de WB8ROL WB8ROL
CQ CQ de WB8ROL WB8ROL pse K

**Don't set your Sync Integration Period setting TOO high**

If you set your Sync Integration Period too high it MAY take minutes before your software will start decoding a signal AND there is no or little benefit to doing that past a certain point. I usually set mine so that the delay factor is about 15-20 seconds. I can time this delay factor by sending a very short test and then when it is done and the software switches back to receive - time the number of seconds before you see random garbage start appearing on the screen (assuming you have your SQUELCH OFF). For the standard Olivia modes like 2000/64, 1000/32, 500/16, 250/8, and 125/4 that usually means my Sync Integration Period is set between 3-5 most of the time. If I use the faster formats I set it higher often between 6-10. As long as my delay factor is approx. 15-20 seconds. Any higher than that and I don't see any real improvement in the quality of the decoding. But play with your own settings and see what does best for you. If you leave it always on one setting, though, and use standard and non standard formats of Olivia you are short changing yourself.

**Generally keep your Search (Tune Margin) setting to about 8**

The setting of 8 is usually good for most situations and this setting is usually not all that critical. However, under a few band conditions it might (or might not) help to temporarily adjust this. If you find other Olivia signals very very close to you - almost adjacent or even overlapping it might help to reduce this setting to 4 or even 2. This setting determines how far, either side of your center frequency, Olivia will search for a signal to decode. If you reduce this when another Olivia signal is close or overlapping it may keep it from locking onto the other signal instead of yours. Also .... if you are trying to decode an extremely weak signal and can't even tell exactly WHERE to click on the waterfall because the trace is too faint or non existent then it might help to increase this setting to 16 or 32 temporarily. Then it would perhaps decode the signal even if you were OFF his center frequency by a large margin.
If the slow speed of Olivia bothers you some...

If you find yourself wanting things to go a little faster then start using more (ham) common abbreviations like "hw" for how and "ur" for your. Don't waste time sending words like "the" and "and" all the time. An example: The weather here is nice and sunny today and the high will get to 85 degrees — instead send: Wx nice + sunny - high 85 deg — No need to spell out everything and use superfluous words like the, and, many others. And why use words like HERE and TODAY in the above context when the other station already knows you are telling the weather for YOUR QTH for TODAY. You aren't writing a novel, an article, or in a spelling bee. Also after you establish the QSO don't send BOTH calls all the time at the beginning and end of every transmission. After the QSO is in progress come back to the station like this: .. de WB8ROL – instead of: W9ZZZ de WB8ROL – and when you sent it back to the other guy send: BTU - de WB8ROL KN – That will help speed things up too. You don't need to send the other stations call continually to fulfill your legal obligation to identify your own station.

Don't be afraid to switch to a NON standard Olivia format if conditions warrant it.

If signals are real strong and you prefer to be sending and receiving at a faster speed - don't be afraid to ask the other station if they would like to speed things up and switch to another Olivia format - even a non-standard one. If you, for instance, were talking to me on 500/16 Olivia format and we both had very strong signals and not much QRM, QRN, etc. then ask me if I would like to go to 500/8 format or even 500/4 format. 500/16 format is approximately 20wpm while 500/8 is close to 30wpm and 500/4 close to 40wpm. If you do end up switching to the faster modes you may also want to increase your Sync Integration Period setting substantially too - to maintain the best quality decoding. If not, you might get more errors in the decoded text. And if the band conditions become worse - go back to the original format AND remember to reset your Sync Integration Period setting or the delay in decoding will be way too long! Also, if the band starts getting real crowded and say, for example, you were on 500/16 mode - you might suggest to the other station to switch to 250/4 mode (increase Sync Integration Period setting too) to save space and be a "good neighbor" to all the other operators nearby. 250/4 is the SAME speed as 500/16 and nearly as sensitive with the correct settings.

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Chapter 36

RTTY

The RTTY modulator and demodulator have been extensively changed with version 3.21.67. The new design was a cooperative effort of Stefan, DO2SMF, and Dave, W1HKJ with extensive testing performed by Ed, W3NR, and Dick, AA5VU. Chen, W7AY, was a silent contributor to the design by virtue of his excellent technical papers on RTTY modulation and demodulation, which he so generously placed in the public domain.

fldigi can operate on a wide range of RTTY symbol rates and bandwidths. The selection of symbol rate and bandwidth is made on the RTTY configuration tab. The three most common in amateur radio use can be selected from the mode menu. These are

<table>
<thead>
<tr>
<th>Mode</th>
<th>Symbol Rate</th>
<th>Typing Speed</th>
<th>Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTTY 45</td>
<td>45.45 baud</td>
<td>6.0 cps (60 wpm)</td>
<td>270 Hz</td>
</tr>
<tr>
<td>RTTY 50</td>
<td>50.0 baud</td>
<td>6.6 cps (66 wpm)</td>
<td>280 Hz</td>
</tr>
<tr>
<td>RTTY 75</td>
<td>75.0 baud</td>
<td>10.0 cps (100 wpm)</td>
<td>370 Hz</td>
</tr>
</tbody>
</table>

These modes were a result of mechanical and electrical designs of the early TTY machines. The 45.45 baud and 75 baud machines were for the US / Canadian market and used 60 Hz synchronous motors. The 50 baud machines were for the European market and used 50 Hz synchronous motors.

fldigi can encode and decode many other symbol rates and bandwidths. "Custom" combinations are set up on the RTTY configuration tab. You probably will never have to do that unless you like experimenting with unusual RTTY modes.

36.1 RTTY modulator

All of the modem signals that fldigi produces are audio signals. That includes the RTTY signal. fldigi can encode and decode an RTTY signal that is anywhere within the passband of the sideband transceiver. It is not limited to the traditional tone pairs around 2100 Hz. Each of the generated Mark / Space signals are on-off-keyed (OOK), bandwidth limited signals. The resultant waveform is not an FM type signal of constant amplitude. Therefore the transmit audio and RF amplifiers must be linear, just like the requirement for PSK signals. There are performance gains using this approach. The principal being a reduction in inter symbol interference which gives much improved performance by the receiver. The waterfall, time domain, and spectrum signatures of the transmitted
signal look like this:

![Figure 36.1 W1AW on air signal](image1)

You must operate your transceiver in the USB mode for the fldigi RTTY signal to be the correct polarity. If your transceiver is set to LSB then use the fldigi "Rev" button to reverse the sense of the mark and space signals.

You must maintain transmitter LINEARITY in the AUDIO AMPLIFIERs. Do not think that you can improve performance by over driving the audio input. A good operating procedure for most transceivers is the set the audio level to the level for which there is just barely a hint of ALC. Then reduce the input to 80% of that power level. Over driving an AFSK signal is as disastrous as over driving a PSK signal. This is an actual on air signal that was being over driven (but not on purpose):

![Figure 36.2 AFSK signal](image2)

![Figure 36.3 Spectrum](image3)
Joe also performed a series of tests on an Icom 706 mkIIg transceiver. The results of those tests are very enlightening.

"Two views - the 2 KHz span and a 10 KHz span. The 10 KHz span shows the one failing of the IC-706mkIIg and other rigs with analog modulation - opposite sideband and carrier leakage. This one isn't too bad but one can see carrier at -50 dBc and opposite sideband at -55 dBc +/- . I do use a high audio frequency to minimize harmonic issues.

For fun I've attached versions at 70 W in 10K, 5K, and 2K spans. The narrow spans clearly show the benefits of reducing the audio until output power drops 1.5 dB.

Audio was connected to the IC-706mkIIg via the "DATA" jack rather than the mic connector or "Mod In" pin of the ACC jack. Using this input avoids several potential problems - including the constant swapping between mic and digital connections and remembering to turn off the compressor when switching to digital operation. The "Data" input is also 6 dB less sensitive than "Mod in" making it that much less likely that one will significantly overdrive the transceiver and create distortion in the audio stages ahead of the modulator.

The green area is 400 Hz wide.
Transceiver operated in FSK mode
Power: 100 W

Transceiver in USB, fldigi AFSK audio drive
Space at 2125, Mark at 2295 Hz
Power: 100 Watts, ALC just extinguished
Transceiver in USB, fldigi AFSK audio drive
Space at 2125, Mark at 2295 Hz
Power: reduced to 80 Watts (-1 dB)

Transceiver in USB, fldigi AFSK audio drive
Space at 2125, Mark at 2295 Hz
Power: reduced to 70 Watts (-1.5 dB)
Transceiver in USB, fldigi AFSK audio drive
Space at 830 Hz, Mark at 1000 Hz
Power: 70 Watts. The LSB leakage is clearly seen at approximately -55 dB.
36.2 RTTY demodulator

Fidigi's demodulator uses a design based on theoretical work published by Kok Chen, W7AY, [http://www.w7ay.net/site/Technical/ATC/](http://www.w7ay.net/site/Technical/ATC/).

The mark and space signals are converted to base band and then filtered in a low pass filter. Each filter is a variant of Chen's enhanced Nyquist filter. It is implemented using a Fast Overlap-and-Add Fourier Transform.

Each time the baud rate is selected the program must "rebuild" the digital RTTY filter. The filter parameters are optimized for the baud rate.

The detector is an optimized Automatic Threshold Correcting (ATC) type described in Chen's paper.
To start decoding a signal simply left click on the signal and the AFC should lock on to the signal.

The digiscope display will extinguish when the Rx signal level falls below the squelch setting.

Many amateur transceivers offer native FSK support for RTTY. This support also included RTTY-centric filters and optimizations that operators have wanted to use. This native transceiver RTTY support is where the radio itself creates the MARK and SPACE signals but the key up/down and timing is done externally via say a hardware TNC or other device.

It is possible to use fldigi to generate the keying waveform for use with such a transceiver. See Pseudo FSK for a description of how this can be accomplished.

Fldigi also supports a few external hardware devices for FSK-based RTTY support

See nanoIO Interface for additional information on nanoIO and MORTTY interface.

See Navigator Interface for additional information on using the Navigator interface.

See RTTY Configuration Page

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Thor

Thor is a new forward error correcting incremental frequency shift keyed communications mode. It was developed specifically to meet the needs of ARQ transfers in the HF spectrum. It is particularly well suited under conditions of atmospheric static noise. Thor borrows from two current modem technologies, MFSK and DominoEX.

Thor emits a distinctive double rising tone sequence at the beginning of each transmission. It is used to flush the receive decoder and also provides a visual and audible clue to its being used.

The modem code for Thor uses a wide band multiple frequency detector that can lock on and detect the incoming signal even when badly mistuned. Frequency domain oversampling is used to allow proper tone detection without the need for AFC. The AFC control does not alter the decoder in any way.

The fldigi implementation of the Thor modem includes the ability to send and receive images and avatars. The default avatar is the “Tux” logo.

Sending, receiving and saving avatars is discussed in the avatar section.

The waterfall and digiscope will appear as:

![Thor Image](image.png)

Figure 37.1 Thor

The text displayed in the status area is the secondary text being sent by the transmitting station. When the keyboard buffer is empty the Thor modem transmits text from the secondary text buffer. Your secondary text buffer can be edited on the Thor configuration tab.

The digiscope display is similar to the DominoEX display and represents the tone pairs moving through the tone filters. You can also use an alternate digiscope display (left click on the digiscope display area).

In this display mode the red line represents the center of the multiple tone bins that are in the detector. The dots will be blurry if the AFC is not locked on and become very distinct when AFC lock has been achieved. The tone dots will move from bottom to top (opposite the direction of the waterfall).
37.1 Thor Image Mode

fldigi-thor can send and receive images and avatars when the modem is set to 11, 16 or 22 baud.
Small digital images are selected from those stored on the disk. The image transmission is similar to but not
compatible with the IFKP image mode.
Thor images are always transmitted in a fixed width to height ratio.
The W x H format is not limited to a single ratio, nor is it limited to just color, or just gray scale. Thor transmits the
image in Blue-Green-Red order. The thor image bandwidth is the same as the signal bandwidth for for Thor mode
in use.
The start of the picture is signalled digitally, and the receiver simply captures data continuously for W lines of H
pixels, as requested, resulting in a WxH pixel image, then reception stops.
A brief period of silence, followed by a sync signal will be transmitted at the beginning of each image or avatar. The
sync signal is used to align the start of the received image. This is the equivalent of a vertical sync signal in an
analog television signal. There is no equivalent of horizontal sync, therefore there is no risk of the picture tearing
due to timing changes, or breaking up during selective fades. All that happens is that the image may noise up
momentarily, but will stay correctly aligned.

Image Format
The images are approximately in 4:3 or 3:4 aspect ratio. thor images can be received by any thor capable decoder.
Available image aspect ratios / formats include:

- 59x74 color
- 160x120 color
- 320x240 color
- 640x480 grey scale
- 640x480 color
- 240x300 color
- 240x300 grey scale
- 120x150 color
- 120x150 grey scale

These formats correspond roughly to a portrait (3x4) and landscape (4x3) photo. fldigi will scale any computer
stored image to the target image. You should edit the images off line to be at least close to the 3x4 or 4x3 ratio.
That will prevent the fldigi loader from distorting the loaded image.
The image mode sampling rate is the same as the base baud sample rate:

- Thor-11 11025 samples/sec
- Thor-16 8000 sampels/sec
- Thor-22 11025 sampels/sec

Each pixel consists of 10 samples, and there are P pixels/line. Therefore the line period is 10 x P/sample-rate
seconds, or the line rate sample-rate/(10 x P) lines/sec. In colour, each line is sent three times, in Red-Green-Blue
(RGB) order.
The is a single sync signal sent at the beginning of each image is a tone placed 186 Hz below the center frequency.
The sync signal is 20 symbol lengths of silence followed by 20 symbol lengths of the tone.
If the sound cards in the transmitting and receiving computers differ markedly in sample rate, the resulting picture
can be skewed. A small timing difference is enough to cause a noticeable slant in the picture. This is easily fixed
after reception using the Slant control. High quality sound cards should be better than 5ppm, and result in barely
noticeable slant, but some cheaper computer built-in sound modules may be rather worse. If you plan to send thor
images you should calibrate your sound card to WWV. There should be no slant if both the transmit and receive
sound cards are calibrated to WWV

Transmit Image
Transmitting an image in thor is initiated by selecting the “Send image” menu item from the pop up Tx menu. Right
click on the Tx panel
This selection opens up the Send Image dialog shown with a 160x120 color image loaded and ready to transmit. Transmission begins when you press the "Xmt" button. fldigi will insert the text preamble and immediately begin the image transmission. fldigi remains in transmit mode when the image transmission is completed and the deadman timer is started.

There is an alternate way of sending an image, but one which only transmits a color image with no provision for slant correction. This may be more convenient for sharing images when you do not need the additional utility of the image dialog.

Open a file folder to the location of your image files that are suitable for MFSK transmission. These images should be constrained to be 240 x 200 or less for reasonable transmit times. Optionally prepare fldigi for the MFSK image transmission by entering some suitable text to precede the transmission. You may be sending the image, blossoms.jpg, for example.
One might enter:

```
Here is an image of my apple trees in full bloom.
Image: blossoms ^!
```

Then drag and drop the image file from the files folder to the transmit text panel in fldigi. The program will automatically resize the image to the nearest scale-aspect ratio less than or equal to the actual image size.

The TX panel text will then change to

```
Here is an image of my apple trees in full bloom.
Image: blossoms ^!
```

The ^! is the character sequence used by the fldigi TX parser to indicate that there is a pending execution command. In this case it is to transmit the blossoms.jpg file.

Add some suitable ending text and the sequence ^r to the next line and then press the T/R button (if not already transmitting). At the end of the image the TX parser will find the ^r and return the program to the receive mode. The Rx panel will echo the transmitted data:

```
Apple blossoms photo
Image: blossoms <IMAGE:/home/dave/fldigi/images/MFSKpics/blossoms.jpg>
```

The transmit progress dialog will close at the conclusion of the image transmission.

**Receive Image**
Reception is completely automatic. The decoder will identify the picture start, and record the picture. In doing so, it automatically opens a separate "thor Rx Image" dialog.
Demodulation uses a phase detection algorithm based on quadrature demodulation using the current and previous samples. All the samples are converted to pixels and stored, but only the average over every 10 samples is displayed.

The raw image is stored in a temporary buffer of expanded size, which allows fine adjustment of the slant and phase to be made before the image is sampled and displayed.

If the transmitting station goes off the air or reception is lost during recording of a picture, the recording will continue until the necessary number of samples has been made, then reception stops.

The Rx Image dialog controls from left to right are:

- Reset: clears all rx data
• Phase adjustment: moves image left and right
• Slant adjustment: slews image diagonally
• Save: saves the image to the fldigi image folder with a date-time stamped file name
• Close: closes the image dialog

Image phase and slant should not be adjusted before the picture reception has finished, as then only part of the image will be corrected.

37.2 Avatars

Avatar images are 59 x 74 (width x height) color images that are associated with a call sign. The avatar images are stored in the folder

C:\Documents and Settings\<user>\fldigi.files\avatars\nC:\Users\<user>\fldigi.files\avatars\n/home/<user>/.fldigi/avatars/

as "png" images.
You should prepare an image file for your own call sign, in lower case. For example

/home/dave/.fldigi/avatars/w1hkj.png

in a 4x5 aspect ratio, preferably in the 59x74 format, but any larger 4x5 image can be used. fldigi will scale the image to 59x74 when it is read from the file.
You can send your avatar very simply by right clicking on the thor avatar. If you receive an avatar from another station it will automatically be displayed in the avatar box. You should have previously entered the call sign of the other station in the Call logging control. Left clicking on the avatar will then save the image in the avatars folder with the appropriate callsign. The correct avatar will then be displayed the next time you enter that call sign in the Call logging control. This is an example of a received avatar with timing misalignment.

The received image may be misaligned left or right in the image box. This is caused by an error in the start timing of the reception. You can realign the image using a combination of SHIFT, CONTROL and LEFT/RIGHT mouse clicks on the image. Be careful to use either the SHIFT or CONTROL in combination with the mouse button. Mouse left and right click without the SHIFT/CONTROL will cause either a save or an own avatar transmit to occur.

CONTROL LEFT click - move image left by 1 pixel
SHIFT LEFT click - move image left by 5 pixels
CONTROL RIGHT click - move image right by 1 pixel
SHIFT RIGHT click - move image right by 5 pixels

Figure 37.7 received avatar
The same image after alignment.

![Avatar Image](image.png)

Figure 37.8 received avatar

You will probably need to manage the avatar images using your OS file explorer. Easy access to the image folder is obtained by the menu item File/Folders.

The avatar image format is identical to the thor image 59x74 format. If you receive and save a 59x74 image you can always rename the saved image (date-time-stamped) to a "callsign.png" in the avatar folder.

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Chapter 38

Thor Micro

THOR Micro is a new soundcard based digital mode designed for the 2200 meter, 600 meter, 160 meter, and higher amateur radio bands.

This new mode is:

- More robust than Olivia (perfect copy at -18db SNR)
- As narrow as PSK31 (36 Hz bandwidth)

The major limiting factors on the LF and MF amateur radio bands are low radiated power and high noise. Antennas at these low frequencies suffer from very low efficiency and little of the power sent to them is converted into RF.

In order to overcome the low power output at these frequencies, THOR micro's speed is slowed down to 2 baud. This increases the watts/Hz (spectral density) of the transmitted signal, focusing the power into a very-narrow bandwidth.

On the receive side this sharp signal translates into an increased signal-to-noise ratio. Further gain can be achieved by using very-narrow receive filters.

This mode is also a great tool for low-power digital operation, or in place of QRSS.
Thor Micro emits a distinctive double rising tone sequence at the beginning of each transmission. It is used to flush the receive decoder and also provides a visual and audible clue to its being used.

The modem code for Thor uses a wide band multiple frequency detector that can lock on and detect the incoming signal even when badly mistuned. Frequency domain oversampling is used to allow proper tone detection without the need for AFC. The AFC control does not alter the decoder in any way.

There is just one mode of THOR micro

<table>
<thead>
<tr>
<th>Name</th>
<th>Baudrate</th>
<th>Bitrate</th>
<th>Datarate</th>
<th>FEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>THOR Micro</td>
<td>2</td>
<td>8 bits/sec</td>
<td>4 bits/sec</td>
<td>K=7 @ 1/2 Rate</td>
</tr>
</tbody>
</table>

38.1 Performance

THOR Micro can achieve 100% decode at signal to noise ratios lower than -18dB, which makes it more robust than Olivia. This mode can be decoded properly even when to the human ear, the incoming signal sounds like pure noise.

Such performance is achieved by using a very low baudrate, which increases the spectral density (watts-per-Hz) of the transmitted signal.

The signal to noise ratio (SNR) for any mode is calculated as a ratio of the Energy-per-bit / Noise-Level. For THOR Micro the energy-per-bit (at 25 watts) would be 25 watts X 0.5 seconds, or 12 watt/sec per symbol: 3 watt/sec per bit. For Olivia 8-250, the lowest SNR Olivia mode: 25 watts X 0.032 seconds or 0.8 watt/sec per symbol: 0.26 watt/sec per bit. The effective Thor Micro signal strength is 11 times that of the equivalent Olivia signal. THOR Micro uses a 7.5 dB gain soft-decision FEC code.

On the 2200, 630, and 160 meter bands this increase in effective received-signal power helps overcome the massive system losses and high-noise levels encountered when using these low frequencies.

38.2 Multi-language UTF-8 Support

THOR Micro supports sending all UTF-8 characters. This means the mode can be used to communicate in any language.

Please ensure the font chosen in Fldigi has the characters for the language you are trying to use, otherwise Fldigi will just display every character as an empty box.

38.3 Preamble

A special preamble precedes each THOR micro transmission. It consists of a bit-sequence that is invalid in the normal data stream: a string of 64 zeros. This preamble is the distinctive rising tone sequence that occurs twice before any data modulation.

When received, this preamble triggers the receiver end to flush the long interleaver and the soft-decision viterbi decoder. This flush prepares the viterbi decoder and interleaver for the data about to be received.

Flushing any received noise-bits before decoding the actual signal decreases the probability of error and provides FEC gain. This gain comes from not mixing the good data-bits with bad noise-bits by filling interleaver and soft-decoder instead with punctures.
38.4 Forward Error Correction

A constraint length 7 convolutional FEC is used at 1/2 rate. This long constraint-length code gives a free distance of 10 (can correct a 4-bit error). The coding gain is about 7.5 dB.

2.5 dB of soft-decision coding-gain has been added to all coding-gain calculations.

38.5 IFK+ Modulation

THOR Micro uses a modulation scheme known as Incremental Frequency Keying Plus (IFK+). It is very similar to 18-tone MFSK modulation, but with many benefits.

Using IFK+ modulation is what allows THOR Micro to achieve its very-narrow bandwidth. IFK+ modulation is much easier to tune than an MFSK signal of the same baudrate. For MFSK, a signal must be tuned to an accuracy of baudrate / 3. This results in an accuracy requirement of less than 1 Hz (at 2 baud).

The tuning accuracy requirement of IFK+ is bandwidth / 2. This is about 18 Hz for a 2 baud IFK+ signal. This tuning can easily be achieved by manually clicking on the signal in the waterfall display, just like a PSK31 signal, or by presetting the receiver to within +/- 18 Hertz of the target frequency.

IFK+ is a differential-type MFSK modulation where the data-bits are encoded as the frequency difference between the previous tone and the next tone.

Number (bits) to be sent: 3 (0011)
Previous tone: 4 (0100)
Transmitted tone: 3 + 4 + 2 = 9 (1001)

Since there are only 18-tones in THOR micro, the number simply wraps around back to 0 when it reaches number 19.

The current tone always has 2 added before transmitting. This introduces a known pattern within the signal that benefits soft-decision decoding, boosts the forward error correction, and improves resistance to intersymbol interference.

38.6 Interleavers

Even though the THOR Micro interleaver is quite short in bitcount, the mode's slow baudrate spreads the bits over a long timeframe.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Bits</th>
<th>Msec</th>
</tr>
</thead>
<tbody>
<tr>
<td>THOR Micro</td>
<td>16</td>
<td>1500</td>
</tr>
</tbody>
</table>

From the perspective of "number of bits": it is a short interleaver.

From the perspective of "number of milliseconds": it is a long interleaver.

Constraint Length 7 FEC details:
  constraint length = 7
  polynomial 1 octal: 0155
  polynomial 2 octal: 0117
  polynomial 1 decimal: 109
  polynomial 2 decimal: 79

Interleaver Details:
  4x4 self synchronizing
  1500 milliseconds
Chapter 39

Throb

The THROB family of modes use two tones at a time. These tones are also amplitude modulated and can be a single tone for some symbols.

The mode has no Forward Error Correction, and is difficult to tune. It is fairly sensitive and moderately robust. Keyboard-to-keyboard QSOs are reasonably fast.

Tuning must be very accurate, and the software will not tolerate differences between transmit and receive frequency.

The amplitude modulation component of THROB is a raised cosine AM modulation of each symbol. This combined with two tones transmitted at the same time, means that a very linear transmitter is required. It also gives the mode its very unique sound. You will never mistake Throb for any other mode.

For THROB, nine tones are used, spaced 8 or 16 Hz. For THROBX, 11 tones are used, spaced 7.8125 or 15.625 Hz.

Fidigi supports the following:

### 39.1 Throb baud rates and tone spacings

<table>
<thead>
<tr>
<th>Mode</th>
<th>Symbol Rate</th>
<th>Typing Speed</th>
<th>Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>THROB1</td>
<td>1.0 baud</td>
<td>1.0 cps (10 wpm)</td>
<td>72 Hz</td>
</tr>
<tr>
<td>THROB2</td>
<td>2.0 baud</td>
<td>2.0 cps (20 wpm)</td>
<td>72 Hz</td>
</tr>
<tr>
<td>THROB4</td>
<td>4.0 baud</td>
<td>4.0 cps (40 wpm)</td>
<td>144 Hz</td>
</tr>
<tr>
<td>THROBX1</td>
<td>1.0 baud</td>
<td>1.0 cps (10 wpm)</td>
<td>94 Hz</td>
</tr>
<tr>
<td>THROBX2</td>
<td>2.0 baud</td>
<td>2.0 cps (20 wpm)</td>
<td>94 Hz</td>
</tr>
<tr>
<td>THROBX4</td>
<td>4.0 baud</td>
<td>4.0 cps (40 wpm)</td>
<td>188 Hz</td>
</tr>
</tbody>
</table>
Chapter 40

Digiscope Display

Fldigi provides several different views of the decoded signal with its waterfall, text and a scope displays. The scope display is either a separate moveable, resizable dialog that is opened from the "View/Digiscope" menu item or a docked scope.

40.1 CW

![Figure 40.1 Digiscope CW](image)

The CW signal will consist of the time domain amplitude detected signal. The horizontal timing is dependent on CW speed, so that the display will appear similar independent of CW speed.

![Figure 40.2 Digiscope CW](image)
40.2 DominoEX / Thor

DominoEX and Thor have two alternate views available on the digiscope display. You can toggle between the views by left clicking on the digiscope display area. The triangular view shows data propagation through the interleave filter. As signal s/n degrades this display will become more wavy.

The second view is the decoded data stream viewed in the frequency domain. The dots will be very distinct when the signal is fully acquired and decoding properly. It will be fuzzy when the decoder is not locked or there is interference present.

40.3 MFSK

This is what you expect to see for all of the MFSK type modes. The number of steps in the slant lines will change with the various modes, but they will all have the same general appearance. If the signal is mistuned the sloped lines will become bowed and distorted.

40.4 PSK

The digiscope display just to the right of the waterfall displays signal quality in various formats. The display for PSK modes is the vector scope:
You can see the effect of mistuning by slewing the carrier carrier control moving from low to high over the signal. You must do this with AFC off. Engage the AFC and the vectors will immediately snap to vertical positions.

You can alter the appearance of the phase vectors by left clicking on the digiscope display. One click will give you a history of phase vectors that fade with time. A second click will give you a history of phase vectors that both fade with time and are amplitude significant. The third click returns you to the original phase vector display.

The effect is the same with QPSK signals except you will see 4 vectors that are 90 degrees from each other.

**40.5 RTTY**

The signal can be viewed in two different ways on the digiscope. This is the time domain representation of the detected FSK signal. The two yellow lines represent the MARK and SPACE frequencies. This display is for Baudot, 45.45 baud, 182 Hz shift. If the transmitting station were transmitting at 200 Hz shift the signal extremes would lie above and below the yellow lines. Try tuning across the RTTY signal with the AFC disabled. You will see the signal move above and below the yellow lines as you tune. Then enable the AFC and the signal should rapidly move into the center region of the display. This signal was about 3 - 6 dB above the noise floor. It looked marginal on the waterfall but still gave good copy.
This is the other digiscope display for RTTY. You obtain this view by left clicking anywhere in the digiscope display window. You can toggle back and forth between these views. The MARK / SPACE frequencies are represented by the quadrature ellipses. When the RTTY signal is properly tuned in the lines will be in quadrature and aligned as shown. Tune across the RTTY signal and the MARK/SPACE lines will rotate around the center. If the sending station is using a shift that is smaller than you have the decoder setting then the two lines will close toward the NW/SE quadrants. If the sending station is using a shift that is greater than the decoder setting then the two lines will close toward the NE/SW quadrants.
Chapter 41

Spectrum Scope

41.1 Spectrum Scope Description

The Spectrum Scope is an analysis tool used to evaluate received signals. It can be used to measure signal integrity, audio-codec noise floor, transceiver passband characteristics, Rx signal spectrum, etc. The time domain audio stream is converted to the frequency domain using a Fast Fourier Transform, FFT. The FFT uses a snapshot of 8192 audio samples obtained from a sliding window. At any instance in time the FFT is computed from the immediate past 8192 samples. A 8192 sample set in the time domain results in a set of 4096 complex values in the
frequency domain.

The fldigi modems use a sampling rate of 8000, 11025, 12000 and 16000 samples per second. The respective FFT’s then can display values up to 1/2 of the sample rate. The viewed frequency range is constrained to 0 to 4000 Hertz.

The display is signal magnitude in dB versus frequency.

41.2 Operating Controls

The Spectrum Scope operating controls are used to set:

- the averaging of FFT conversions, ‘# scans’
- top to bottom range of dB scale, ‘dB Range’
- the upper vertical scale value in dB, ‘upper dB’
- the center frequency in Hertz, ‘F-center’
- the frequency range in Hertz, ‘F-range’
- reset frequency range to 0...4000 Hertz, ‘Reset’
- go to the current waterfall tracking frequency ‘Goto’
- SHIFT-left click on the spectrum display will also center the selected point in the display

When the Spectrum Dialog first opens, or when the # scans is changed that control is displayed in the gray background color. When the scan count has reached or exceeds the # scans then that control changes to green as shown above.

The scope graticule is always 10 dB per division on the vertical scale. The horizontal scale is dependent on the the selected frequency range:

- greater than 2000 Hertz - 500 Hertz per division
- between 1001 Hertz and 2000 Hertz - 200 Hertz per division
- between 501 and 1000 Hertz - 100 Hertz per division
- between 251 and 500 Hertz - 50 Hertz per division
- less than or equal to 250 Hertz - 25 Hertz per division
41.3 Signal Characteristics

41.3.1 Basic Signal Measurement

A measurement of amplitude and frequency is made by left clicking on the display with the center of the cross-hair cursor placed on the data point of interest. The FFT display can be paused to take a snapshot of the values.

- Right click on the display to toggle between running and paused, or
- Press the Running/Paused button to toggle between running and paused.

The label will change to indicate the state of the FFT processing; "Running" or "Paused".

The above image shows a psk-31 idle (no modulation) test signal whose characteristics are

- S/N 40 dB
- IMD minus 20 dB

a signal that no one wants to put on the air, but is too often observed. The frequency / dB readout to the right of the "Paused" indicator was obtained by left clicking on the signal just to right of center. The 3rd order intermodulation frequency is clearly 20 dB below the fundamental phase modulation signal. A clean psk-31 should be better than minus 25 dB IMD. Modern transmitters can achieve IMD levels at or better than -30 dB when not overdriven. No ALC is the rule. Set the transmitter power level to full power and then reduce the audio drive to no more than 25% of full power. This will usually result in a PSK signal of which you can be proud.

Here is the same signal during modulation:
41.3.2 Differential Signal Measurement

You can measure the dB difference between two points:

- '1' + left mouse click: first point (cyan line)
- '2' + left mouse click: second point (magenta line)
- '3' or 'c' + left mouse click: clear both points

The signal level and frequency differences will be shown in the right most top status control. Entry of points 1 and 2 need not be in order and either the #1 or #2 point can be selected multiple times to extract dB differences over a range of point pairs. Selecting measurement points will be easier if you pause the FFT display.

41.4 Agreement with main fldigi dialog

fldigi measures the S/N and IMD of a psk signal on it's main dialog. These measurements are made only during idle. During modulation the values are either blanked or dimmed at the user's discretion. This illustrates the test signal display both on the spectrum viewer and on the main waterfall.
41.5 Menu

Select whether the Signal Measurement points are shown with amplitude, frequency or both as linear graticules.

You can capture the current full FFT spectrum at any time, both when running or paused. Select the "Save to CSV" menu item and a comma separated value file will be saved to the fldigi temp folder.

Close the spectrum viewer by either selecting the "Close" menu item or clicking the dialog decoration "X" button.
41.6 Filter Evaluation

This illustrates using the Spectrum Scope to view and evaluate a transceiver filter. This is 40 meter noise on an IC-7200 with the filter set to 3000 Hertz.

41.7 Interaction with waterfall

The spectrum scope view and the waterfall tracking point can be coordinated in one of two ways

- Pressing the "Goto" button on the Spectrum Scope dialog
- Normal left-click selection of a waterfall signal.

In either case the waterfall tracking point will become the new center of the spectrum display and the width a multiple of the current mode bandwidth. You can configure the waterfall interaction on the Waterfall/Mouse configuration tab.

- select "left click transfers..." to enable the waterfall left-click / scope interaction.
- set the multiplier factor for the initial Spectrum Scope frequency range.
- select "use waterfall range/limit values" to set the Spectrum Scope dB Range and upper dB initial values.

41.8 CSV file usage

The comma separated value file can be opened using any spread sheet program. My personal preference is the program Gnumeric (available for Unix, Linux and Windows). The file contains columnar data for frequency and magnitude (linear). You can use the spread sheet program mathematics to generate a column of $20\log_{10}(\text{mag})$ values.
Chapter 42

Mouse and Keyboard Shortcuts

Fldigi has a bewildering number of keyboard and mouse shortcuts, some of which may help make your particular style of operation more efficient. You do not need to know them all to make effective use of the program!

42.1 Main window

42.1.1 Text input fields

Most text fields use a combination of CUA (PC) and Unix-style keybindings. Text can be marked, copied, pasted, saved to a file as well as transfer to other main panel controls. A right click on any text control will open a context sensitive menu for that particular control. A full list can be found on the FLTK web site

The received/transmitted text widgets use CUA key bindings with some modifications:

42.1.1.1 RX text

This widget is read-only and ignores shortcuts that would modify its contents.

42.1.1.2 TX text

The text that has already been sent is protected, but can be deleted one character at a time with the Backspace key. Right clicking on the Tx text panel opens the following popup menu:

Figure 42.1 Fldigi Receiving Editing Tx text
Mouse and Keyboard Shortcuts

- **Transmit**
  put the program into the transmit operation

- **Receive**
  during a transmit or tune, end the transmit and restore receive operation

- **Abort**
  during a transmit, receive without waiting for the modem to finish sending

- **Send image**
  for MFSK only, send an image using MFSKpic mode

- **Clear**
  clear all of the text

- **Cut**
  delete the marked text (by left click drag over text)

- **Copy**
  copy the marked text to the clipboard

- **Paste**
  the clipboard text to the current text insertion point

- **Insert file**
  select a file from file browser to insert in text at insertion point

- **Word wrap**
  turn word wrap on/off

The Tx panel is fully drag and drop aware. That means you can add a file to the transmit text by simply opening up a file manager (different for different OS and choice of desktop). Select the file from the manager and then drag and drop it onto the Tx panel. The mouse pointer will move the cursor insert point for the drop.

A number of additional shortcuts can be found in the **Keyboard Operation** section.
42.1.2 Waterfall display

Most of fldigi's unusual shortcuts are specific to this widget.

42.1.2.1 Waterfall display - Keyboard

- Shift Left/Right - move the b/w marker by 1 Hz
- Ctrl Left/Right - move the b/w marker by 10 Hz

42.1.2.2 Waterfall display - Mouse

- Left click/drag - move the b/w marker to, and start decoding at the cursor frequency
- Right click/drag - as above, but return to previous position on release
- Middle click - toggle AFC
- Ctrl-Left click - replay audio history at b/w marker position
- Ctrl-Right click - replay at cursor frequency and return on button release
- Ctrl-Middle click copy the frequency under the cursor to the currently selected (or first) channel in the PSK viewer, and select the next channel
- Shift-Left click/drag same as unmodified left click; no signal search
- Shift-Right click/drag likewise, with a return to the previous frequency when the button is released, no signal search
- Shift-mouse wheel - move the squelch slider
- Scroll wheel usage is dependent upon the configuration (see ConfigWaterfall)
  - None - no mouse wheel activity in waterfall panel
  - AFC range or BW - adjust the AFC range/BW up/down
  - Squelch level - adjust the squelch level up/down
  - Modem carrier - adjust the audio tracking point +/- Hz increments
  - Modem - select modem type from a full rotary of available modes
  - Scroll - move the waterfall left/right in 100 Hz increments (for 2x, 4x expanded waterfall view)
  - Ctrl-mouse wheel - change the AFC search width in PSK modes, or the bandwidth in CW and FeldHell
- Ctrl-Alt-Left click on the mouse when the mouse pointer is in the waterfall - if operating with flrig and a supported transceiver such as the FT-950, will set the transceiver manual notch frequency to the frequency under the mouse cursor. Repeat the Ctrl-Alt-Left click to disengage the notch. Disengagement is not dependent on where the cursor is on the waterfall, just that it be in the waterfall.

42.1.2.3 Waterfall "Store" button

- Left click - Add a new item for the current frequency and modem
- Shift-Left click - Delete all items
- Middle click - Select last item in menu
- Right click - Pop up menu
  - Left/right click - Select item (and switch to that frequency/modem)
  - Shift-Left/right click Delete item
  - Middle click - Update (replace) item
42.1.2.4 Digiscope display

- Mouse wheel - Change AFC/BW, same as Ctrl-mouse wheel on the waterfall

42.1.2.5 Rig control window

There are some shortcuts in addition to those described in the Rig Control

42.1.2.6 Frequency display

- Left/Right arrow key - change the frequency by one 1 Hz
- Up/Down arrow key - change the frequency by 10 Hz

42.1.2.7 Frequency list

- Shift-Left click - delete the line under the cursor
- Middle click - replace the line under the cursor with the current frequency/mode/modem

42.1.2.8 PSK viewer window

- Besides the bindings mentioned in the PSK Viewer section, there are mouse shortcuts to change the nominal frequency of a viewer channel:
  - Middle click copy the current waterfall b/w marker frequency to the channel under the cursor, overwriting that channel's nominal frequency
  - Right click - restore a channel's nominal frequency
  - Right click on Clear - as above, for all channels
Chapter 43

Operating Multiple Copies

There are times that you may need to simultaneously operate two or more instances of fldigi. Or you might simply want to maintain two different configurations based on hardware usage.

The screenshot shows how this is done on Vista, but the process is nearly the same on XP, Win7 and Linux. When you install fldigi it creates a desktop icon launcher. Most of the Linux window managers allow you to create a desktop launch icon. Make as many copies of the launcher as needed for your applications and rename them accordingly. Then change the executable target entry to include the command line switch ‘--config-dir’ followed by the full pathname of the folder that will hold that particular configuration. You do not need to create that folder as...
fidigi will do so the first time it is launched from that desktop icon.

If the various configurations all use independent hardware, i.e., sound cards and rig control ports, then you can have them operating simultaneously. Each instance will have its own configuration files, status file, macros, and logbook. It is possible to have each instance use the same logbook, but then simultaneous operation is not possible as the logbook file is not currently designed to allow that type of sharing.

If each instance will be paired with a separate flarq (similarly set up for multiple operation) then you will also need to add the command line switch for `arq-server address and port`. The same is true for use with applications that talk to fidigi via its xml-rpc socket port. You change the address/port pairs on both the fidigi launcher and the paired application such as flarq or firig.
Chapter 44

Notifier

This dialog available is used to specify search patterns and alerts that are triggered when the decoded Rx text matches those patterns. This only happens when the Spot button on the main window is activated, as with the PSK Reporter client.

![Notifications screenshot](image)

Figure 44.1 Notifications
First, here's how it works in general. You specify a regular expression (RE) that contains one or more parenthesised capturing groups. Fldigi's spotter matches it against the incoming text (main window or Signal Browser, so it works with both PSK and RTTY) and, if the RE matches, it performs one or more of the following:

Displays an alert window with some text and a "go to that frequency" button.

Enters some arbitrary text into the Transmit pane. The text may contain \texttt{<MACRO>}-s and these will be expanded as usual.

Runs a program (Unix/Linux only for now).

The text described by the capturing group(s) can be used in all of the above. There is an example of this at the end of this page.

Not everyone is at ease in writing regular expressions for the notifier to act upon. So a few "canned" searches are coded into the notifier and are selected from the event chooser at the upper left of the dialog.

1. My Callsign de CALL. Can be used to alert you when CALL calls you.

2. Station heard twice. Pretty much the same search that the PSK reporter client does.

3. Custom text search. This reveals an input field where you type your own RE.

4. RSID reception.

Both (1) and (2) are special cases of (3), but with some extra processing available because in each case fldigi knows what it has just found.

The Filter pane is available for the first two event types only, i.e. not the custom text search. In this pane you can specify some properties that the spotted callsign must have for the actions to take place:

a) The Callsign radio button reveals a text field when selected. If you enter something in that field, the event will be accepted only if the text matches the spotted callsign (I may change this to a RE match).

b) The "DXCC entity" radio button reveals a button that brings up a list of DXCC entities. Select entities by clicking or dragging. If you select any at all, the spotted callsign's country will have to be one of those or the event will be ignored. Having no entities selected is the same as selecting all of them, i.e. any country, but is a more efficient.

The entity list can be sorted by clicking on the row headers, and there is a right click context menu that can (de)select by continent and CQ zone. The buttons and search fields at the bottom behave as you'd expect.

The list is also available with the menu item "View / Countries" in the main window.

\textbf{You need cty.dat for all this to work}
c) The "Not worked before" check button asserts that, if you have selected (a) above, the callsign must not be in your logbook. Same with (b), but now you must not have had any QSOs with stations from that country in the log.

d) The "LotW user" and "eQSL user" buttons specify that the callsign must be on one of these two lists (the documentation explains where to get the user lists from and where to put the files).

The Action pane is where you choose how fldigi will alert you when an event matches the filter bits.

a) The text in the "Show alert text" box, if not empty, is shown in a pop-up window. The alert window has a timer and dismisses itself after a configurable time interval (the "Hide after" control). The user can click anywhere inside the window to stop the timer.

![Figure 44.3 Notifier Popup](image)

The button next to the text box enters the default alert text for the event you have selected. There are a few variables that are substituted when the window is displayed:

For all three event types: $MODEM (modem name), $DF_HZ (dial frequency), $RF_HZ (actual receive frequency), $RF_KHZ, $AF_HZ (modem audio frequency)

For the 1st event type (my call): $CALLSIGN, $TEXT (all matched text).

For the 2nd event type (station): $CALLSIGN, $TEXT, $COUNTRY.

For the 3rd event type (custom): you're on your own here, but fldigi will helpfully list all the possible substrings found in your RE.

The whole text is passed through strftime(3) so you can customize the date. Here's a reference for the % characters:

http://www.opengroup.org/onlinepubs/007908799/xsh/strftime.html

b) The "Append to TX text" box – self explanatory. The same variable substitutions apply, as well as macro expansion. The nearby button shows the macro editor. The appended rx text is clickable. Clicking it will move the waterfall frequency (and transceiver if under CAT) to the detected signal and change to the indicated mode.

![Figure 44.4 Notifier RX Text](image)

c) The "Run program" field and browse button are only available on Unix systems. Field contents are passed to the shell ("/bin/sh -c"), as with system(3). No variable or `backref substitution is done for this field, but all substrings are
exported as environment variables, such as FLDIGI_NOTIFY_STR_1. The usual `<EXEC>` macro variables are also there and your '~/.fldigi/scripts directory will be in the shell's path. Try it out with a test script for the full list of variables.

d) The trigger limit box specifies how much time must pass between subsequent invocations of whatever actions you have specified.

The Duplicates pane has a check button that displays the rest of that group when checked. If you enable this, fldigi will remember what it has seen and ignore the event if it is a duplicate. The other controls in that pane determine what constitutes a duplicate:

a) The menu tells fldigi what to look at. For the first two event types, the menu will display "Callsign", and for the custom search it will contain a list of \X references for the RE.

b) The time box is also essential; it determines how close the events must be in time to be considered duplicates.

c) The Band and Mode check boxes further restrict the comparison.

An example:
You are looking at callsigns, with a dup time of 600s, and both Band and Mode checked. A callsign is found once and fldigi alerts you. Now if this callsign is spotted again, less than 600s later and in the same band and mode, it is a duplicate and will be ignored. With (say) Band and Mode unchecked, it is a duplicate regardless of frequency band or mode as long as it's heard before the 600s elapse.

Three of the four buttons at the bottom left are pretty much self-explanatory. Add to the list an event you have just specified, or select an event from the list and Remove it, or change some of its parameters and Update it.

The Test... button allows you to test an event with some text of your choice. This is particularly useful with the custom text search, as it's too easy to enter a RE that will never match. The dialog will show you the default test string for the two fixed event types. Careful: the "Station heard twice" event type expects a non-alphanumeric character at the end of its input. The default test string has a space at the end.

If nothing happens, it may be because you have not specified any actions, or because the event's filter does not match, or because the trigger limit or dup handling are preventing the actions from happening. In the latter case, updating an event will reset its dup data. But it's better to add the dup and trigger limits at the end, after you've tested the event.

The list at the bottom of the window shows the events you have added. All contents are saved in the file '~/.fldigi/notify.prefs.

The list has a context menu for quick access to Update, Remove, and Toggle. The first two have the same effect as clicking on the button of the same name.

The Toggle item lets you flip the "Enabled" status of an event: this is like selecting an event, clicking on the "Enabled" button in the Event pane to (de)activate it, and then clicking "Update". Disabled events are kept on the list but are not registered with the spotter and so they are never triggered.

If you disable all the events and there is nothing else using the spotter (e.g. PSK Reporter), the Spot button will disappear from the main window.

A 2nd example:
Here's how to do the "my call" event using the custom text search:

a) Select "Custom text search" in the event pane

b) In the RE box, enter (without the quotes or leading white space):
"<YOUR_CALL>.+de\[[:space:]\]+([[:alnum:]]?[[:alpha:]/\+][[:digit:]]+[[:alnum:]/\+])" and remember to replace <YOUR_CALL> with your callsign.

c) In the actions pane you can now use \0 for the whole text matched by the above RE, and \1 for the first capturing group (the callsign).

d) Select \1 in the duplicates menu if you want dup filtering.

e) Test with "<YOUR_CALL> de <SOME_OTHER_CALL>" and you should see the alert window with the text you specified.

Additional examples:
Add a "My callsign de CALL" event with a script that will do something to get your attention when someone calls you.

Add a "Station heard twice" with the DXCC filter and the "Not worked before" option. Also set the LotW or eQSL options if desired.

Add a "Station heard twice" with no callsign/dxcc/etc. filter but with duplicate filtering. Write a script that sends the data to a DX cluster or similar.

Here is a simple Perl script that uses notify-send (in the package libnotify-bin on Debian) to display desktop notification "bubbles". A better version would use the libnotify bindings for Perl or Python directly.

```
#!/usr/bin/perl
exec("notify-send", "-t", "5000", "-i", ".share/pixmaps/fldigi.xpm",
     "Heard " . $ENV{"FLDIGI_NOTIFY_CALLSIGN"} . " ($ENV{"FLDIGI_NOTIFY_COUNTRY"})",
     $ENV{"FLDIGI_NOTIFY_STR_0"});
```

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Chapter 45

Operating Controls and Displays

The main display for fldigi is the waterfall display shown above in color and in scale x1.

The button \textbf{WF} toggles the display between a waterfall, a spectrum display and an oscilloscope type view of the Rx and Tx signals. This button acts as a rotary. Left clicking moves the display selection in one direction and right clicking in the other direction. The three display modes are \textbf{WF} - waterfall, \textbf{FFT} - spectrum (Fast Fourier Transform) and \textbf{Sig} - oscilloscope time domain. Let the mouse cursor hover over any one of the controls and a small hint box will open to help you navigate the various controls.

The \textbf{Norm} button controls the speed of the waterfall drop. This is also a rotary type of button control. The speeds available are SLOW, NORM, FAST and PAUSE. The load on the cpu will be directly proportional to this selection. If your cpu is slow you might want to select the SLOW or PAUSE option for the waterfall.

The scale control (X1, X2, X4) expands or contracts the view into the fast fourier transform that is displayed on the waterfall or the FFT display. fldigi always computes the FFT to a 1 Hz resolution, and displays the results according to the scale control.
The next three controls are positional controls for the waterfall. The waterfall can display 4096 data points, where each one can be thought of as a spectral line at the equivalent Hertz. The ratio is actually 8000/8192 and is related to the ratio of sound card sampling rate to Fast Fourier Transform length. This ratio changes for some modems that require a sampling rate other than 8000 Hz. The left arrow key will shift the display to the right (displays a lower section of the spectrum). The right arrow key moves the display higher in frequency. These two buttons are repeating buttons. Hold them down and the display slews at about 20 shifts / sec. The center button with the two vertical block lines is a "center the signal" button. The current cursor (red signal cursor in the waterfall) will be centered in the display area.

**NOTE:** these controls are only functional if the current waterfall or spectrum view is smaller than the full view available. This is usually the case when the X2 or X4 expansion is selected. But it also might be the case when the width of the main dialog is reduced so that the waterfall display does not extend over the entire available width.

Try moving the cursor around in the waterfall area. You will see a set of yellow cursor blocks that show the center point and bandwidth of the current operating mode (psk31 = 31.25 Hz for example). To capture a received signal just click near the signal and the AFC will perform a multi-step acquisition. This will be very fast and should not require additional operator intervention. **Casual tuning** You can take a look at any received signal by right-clicking and holding the mouse button on or near the signal. The modem will begin to decode that signal if it is in the currently selected mode. The text will be a unique color on the Rx text widget so that you can discern the difference between casual and normal tracking. Release the mouse button and the tracking returns to the previously selected normal tracking point.

**Audio History** Fldigi maintains a history buffer of the received audio. This buffer is approximately 2 minutes in duration. After tracking commences on a signal you can decode the audio history for that signal. The audio history is invoked by a Ctrl-Left click anywhere on the waterfall. You can also invoke the audio history for the casual tuning mode by pressing Ctrl-Right click on the waterfall.

The next control is your transceive audio frequency. In the display above you can see that the audio signal is 1500 Hz. The red cursor is centered beneath 14071.500 Mhz. The transceiver was set to 14070 Mhz. The arrow key pairs move up/down in cycles and tens of cycles. You can fine tune the receive point using this control.

The next two controls to the right of the audio frequency control are for the receive signal processing. The one that reads -10 is the max signal level for the waterfall/spectrum display. The one that reads 51 is for the range over which that control will display signals. Both of these are in dB. The default of -10 / 40 is a good starting point, but you need to adjust these for band conditions. You can see the impact of these controls most easily by putting the
The QSY button is very specific to transceivers interfaced with either hamlib, rigcat or when fldigi is used with flrig. Each transceiver has a sweet spot associated with its bandwidth controller. For the FT950 is 1500 when the transceiver is set to PKT-U. As the transceivers bandwidth is changed the changes occur centered at this frequency. Set the "Sweet spot" frequency (Config / Misc / Sweet Spot) to 1500. Let's say that I just started copying a rare dx at 1758 Hz and I wanted to put the signal at the sweet spot so I could easily narrow the receiver bandwidth. Click on the signal on the waterfall. Let the AFC capture and then press the QSY button. The tranceiver frequency will be shifted and the fldigi audio tracking point shifted in unison such that the signal is now at the receivers sweet spot. Very fast and very convenient! The QSY button will be dimmed and not activated if you do not have a method of transceiver control enabled for your transceiver. Right click on the QSY button to undo the action.

This can also be achieved with the `<QSYTO>` and `<QSYFM>` macro tags. If you combine these two with the `<FILWID:nnn>` command you can center the signal in the passband and also narrow the transceiver passband, i.e. when used with the FT950

- `<QSYTO><FILWID:200>`
- `<QSYFM><FILWID:2400>`

The Store button allows you to store, recall and manage mode/frequency pairs. If you want to save the current mode and frequency simply left click the button. A right click will enable a popup menu from which you can select a previously stored set. You can quickly move between modes and audio sub carrier using this technique. A shift-left click will clear the memory. When the popup menu is visible you left click on an entry to select it. You can shift-left click on an entry to delete that single entry.

The T/R button should be self-explanatory. It's your transmit/receive button. Action is immediate, so if you were transmitting some text and hit the button the PTT is disabled, the transmit text area cleared and the program returned to receive mode. The T/R button is a "lighted button" that shows when transmitting. All other lighted buttons show YELLOW when they are in the active state.

The Lck button locks the transmit audio frequency to its present value. You can then continue to QSY around your transmit position. I have used this to reply to a DX station that wanted a +500 Hz response. The DX was at 690 Hz audio, and wanted a response at +500. I moved the display cursor (or the audio frequency control) to 1190 Hz. Hit the Lck button and then went back to 690 with the waterfall cursor. Now the program is receiving on 690 Hz and transmitting on 1190 Hz. Caught him on the first try. Use this button also as a Master Station control. Not all rigs are equal in their VFO performance. Some exhibit a shift between receive and transmit. If this occurs then the stations find themselves chasing each other with every t/r exchange. Locking your transmit frequency with this control will inhibit that from happening. Be sure to disable the control when that qso is over or you may forget and transmit over top of another qso!

If the "Lck" is enabled the TX frequency does not follow the AFC action applied to the RX frequency.

For transceivers which are either hamlib or memmap enabled, if the "Qsy" button is pressed BOTH the RX and TX frequencies are changed to synchronize to where the RX was positioned.

Perhaps some numbers will help to make that a little clearer.

<table>
<thead>
<tr>
<th>&quot;Lck&quot;</th>
<th>Before &quot;Qsy&quot;</th>
<th>After &quot;Qsy&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RX</td>
<td>TX</td>
</tr>
<tr>
<td>OFF</td>
<td>1002 / 7071.002</td>
<td>1002 / 7071.002</td>
</tr>
<tr>
<td>ON</td>
<td>1002 / 7071.002</td>
<td>1000 / 7071.000</td>
</tr>
<tr>
<td>ON</td>
<td>1000 / 7071.000</td>
<td>1800 / 7071.800</td>
</tr>
</tbody>
</table>

Generated by Doxygen
With "Lk" off the TX audio frequency is always synchronized with the RX frequency.

With "Lk" on the TX audio frequency is fixed with respect to the RX frequency UNLESS the "Qsy" button is pressed in which case it shifts to the RX frequency, the Transceiver VFO is shifted and both the RX and TX audio frequencies are shifted to put both into the middle of the transceiver passband. The TX continues to be locked, but at the new audio frequency.

If the "Lk" is ON moving the cursor around will ONLY AFFECT the RX frequency and NOT the TX frequency.

---

The **AFC** and **SQL** buttons enable or disable the respective function in the software. The slider just above the AFC & SQL controls is the squelch level control. The bar indicator just above it is the equivalent of received signal level and relates on a 1:1 basis with the squelch level slider. The SQL button illuminates YELLOW when the SQL is selected, but the signal is below the squelch level. It illuminates GREEN when the the SQL is selected and the signal is above the squelch level.

The indicator just to the left of the AFC button is the overload indicator. It will be GREEN if your audio drive to sound card is satisfactory, YELLOW if the audio signal is marginally high and turn red when it is in overload. Back down the mixer control or the audio pad from the rig to computer. Fldigi will not perform well if the sound card is over driven. You will see ghost signals on the waterfall and the modem decoders will not work correctly.

---

**PSM** operates on the power aspect of a signal unlike SQL which measures the reception quality of the signal. For PSM to operate correctly the waterfall speed setting must set to FAST. The level setting slider is active for PSM when the PSM button is enabled (indicated by either a yellow or green square on the button surface). When disabled the slider adjustment effects SQL. With PSM button selected the user sets the threshold using the slider to the right of the vertical level indicator.
45.1 Mode Status Indicators

SQL and PSM functional differences:
SQL - Inhibits character reception.
PSM - Inhibits the data transfer to the modem modulator.

Receive audio level should be adjusted so that the overload indicator does not illuminate red. When observing the received signals on the oscilloscope view you should expect that they do not exceed a peak-to-peak amplitude of 3/4 of the full display height.

45.1 Mode Status Indicators

The lower left corner of the main display (MFSK-16) in the view above is actually a button disguised as a status panel. This button responds to the mouse in several ways:

- Left Click - opens a quick pick list of associated modem types; you can switch to a new modem type from this popup menu
- Right Click - opens the configuration dialog at the tab associated with the current modem type
- Scroll Wheel - rotates forward and backwards through the various modem types in accordance with the modem menu hierarchy. Stop at the one you want and you are now in that mode

The next status indicator to the right provides information relative to the current modem, for PSK it indicates the received signal strength in dB.

The third status indicator from the left provides additional information relative to the current modem, IMD for PSK measured in dB.

Note that for PSK these values are only measured during periods when the PSK idle signal is being received.

45.2 Transmit level attenuator

![Figure 45.8 TX level](image)

It is often difficult to adjust the audio drive for the point where ALC is just barely active. Mixer controls are OK, but not usually designed for very small changes. They are after all designed for adjusting listening levels. fldigi provides the ability to control the audio drive in increments of 0.1 dB over a 30 dB range. This control is located in the bottom right corner of the main dialog:

Set this control for -6 dB and then adjust the sound card mixer control for the best ALC level you can achieve. Then adjust the Tx-level control for best "just visible" ALC on the transceiver. That should give you a very clean PSK signal.
45.3 Operating split with fldigi / flrig

![TTY Split Ops](image)

Note: In the above example most features are disable as they are not available for the indicated radio.

On flrig:

Unless specifically supported by the transceiver and implemented in flrig.

- VFO A is always the RX frequency.
- VFO B is always the TX frequency.
- Left Click on the A/B swaps A & B VFO frequencies.
- Right Click on the A/B assignes A VFO frequency to B VFO.
- Using the mouse wheel adjust VFO B to where you want to transmit.
- Click the SPLIT button, it will change color when it is active.
- Press the VFO B button to listen on the Tx frequency, be sure to press Split again before capturing that rare DX station.

On fldigi:

- Tune the waterfall cursor to the Rx signal
- Transmit as usual, be sure you are not doubling.

See [FLRIG Help](#) for specific operating procedures.

Some additional information can also be found here [Rig Control Page](#)

[Return to Top of Page](#)
[Return to Main Page](#)
Chapter 46

RST and RSQ Reporting

46.1 RST

Is the traditional Readability, Strength, Tone reporting system used for CW operations for nearly as long as amateurs have enjoyed the airwaves.

46.1.1 READABILITY

1. Unreadable
2. Barely readable, occasional words distinguishable
3. Readable with considerable difficulty
4. Readable with practically no difficulty
5. Perfectly readable (that is 100% print in today's jargon)

46.1.2 SIGNAL STRENGTH

1. Faint signals, barely perceptible
2. Very weak signals
3. Weak signals
4. Fair signals
5. Fairly good signals
6. Good signals
7. Moderately strong signals
8. Strong signals
9. Extremely strong signals

46.1.3 TONE

1. Sixty cycle AC or less, very rough and broad
2. Very rough AC, very harsh and broad
3. Rough AC tone, rectified but not filtered
4. Rough note, some trace of filtering
5. Filtered rectified ac, but strongly ripple modulated

Generated by Doxygen
6. Filtered tone, definite trace of ripple modulation
7. Near pure tone, trace of ripple modulation
8. Near perfect tone, slight trace of modulation
9. Perfect tone, no trace of ripple, or modulation of any kind

46.2 RSQ

Give the report as RSQ for digital modes, but especially BPSK and QPSK; see: http://www.psb-info.net/RSQ-Reporting-Table.html

46.2.1 READABILITY
1. 0% undecipherable
2. 20% occasional words distinguishable
3. 40% considerable difficulty, many missed characters
4. 80% practically no difficulty, occasional missed characters
5. 95%+ perfectly readable

46.2.2 STRENGTH
1. Barely perceptible trace
2. n/a
3. Weak trace
4. n/a
5. Moderate trace
6. n/a
7. Strong trace
8. n/a
9. Very strong trace

46.2.3 QUALITY
1. Splatter over much of the visible waterfall
2. n/a
3. Multiple visible pairs
4. n/a
5. One easily visible pair
6. n/a
7. One barely visible pair
8. n/a
9. Clean signal - no visible unwanted sidebar pairs
Chapter 47

PSK Reporter

The PSK reporter can generate reception reports from three different sources:

- The decoded text, obtained from the Rx Panel text or the multi-channel browser. Note: the psk browser must be visible or decoding and subsequent psk reporting will not occur. If you do not want the psk browser panel visible in the main dialog then use the separate browser dialog. It can be minimized and signal decoding will continue.
- The log data
- Data entered manually

The configuration for the PSK reporter is in Misc/Spotting. PSKR needs the following fields from the Oper tab to be non-empty:

1. Callsign (freeform because it's impossible to verify, and because we need to support SWLs without callsigns)
2. Locator (standard 6 character format)
3. Antenna info (freeform, should be kept reasonably short)

Sources (1) and (2) are configurable from Misc/Spotting configuration tab, while (3) is always enabled. To keep the code sane, changing the PSKR options (or the above station info) does not take immediate effect. Instead, the Initialize button changes color to indicate that the changes have not been applied. Clicking on the button will do so (or display an error) for the current and future sessions. This is similar to the Initialize buttons in the rig control configuration.

Here are the options in some more detail:

47.1 Automatically spot callsigns in decoded text

The text that is sent to the main window or the PSK browser is continuously searched for callsigns. If this option is enabled, the main window gets a "Spot" light button that can toggle the auto-spotter on and off. It is automatically turned off when playback is selected in the Files menu. The main window text is not searched if the viewer is active, i.e., if it is displayed and the current modem is PSK.

47.2 Send reception report when logging a QSO

A reception report is queued for every QSO as soon as it's logged
47.3  Report QRG (etc.)

This makes the reception reports include the current rig frequency, adjusted for modem audio frequency and rig sideband. It does not need a click on "Initialize" to take effect. This needs to be an option because it is impossible to tell whether the user has real or "fake" rig control with 100% certainty. Besides that, users may want to run a dedicated spotter for a narrow modes sub-band, and in that case they won't have to synchronise fldigi's frequency display with the rig all that often.

47.4  Host and port

With the port set to 14739 the reports will not be entered in the main database, but instead will be analysed and displayed here:

   http://pskreporter.info/cgi-bin/psk-analysis.pl

Probably of no interest to anyone who is not hacking on a PSKR client but may be useful for debugging. The PSKR protocol uses UDP with no acknowledgements or retransmissions, so don't be surprised if the occasional report never makes it to the server. There should be enough coverage overlap to make packet loss irrelevant (and save a lot of bandwidth and CPU cycles).

The spotter needs to see a repeated callsign within a short search window, but stations do not always repeat their callsigns. In addition, some operators like to be creative with their macros, and as a result some signals will decode 100% but the callsign will never be auto-captured. Such callsigns can be reported manually.

The manual spotting is done by right-clicking the QRZ "globe" icon. This will generate a report for whatever is in the Call & Loc fields, so make sure that those are correct! You should also verify the frequency (e.g. by placing the waterfall marker on the signal being spotted).

There is a confirmation popup that will open when you right click the "globe" button. The aim of course is to avoid accidentally sending rubbish reports to the PSK reporter database.

Reception reports are filtered for duplicates among all data sources: a report is queued only once every hour for each callsign and frequency band. The queue is flushed every five minutes. You can see what the spotter is doing in the Event Log window or on the terminal if you set the log level to "Info". "Debug" will show all the gory details.

---

A button and popup text field on the rig control frame give access to the most recent receptions reports in your geographic area. The area is determined by the contents of the field to the right of the button, or by the locator text on the operator tab if the mini field is empty. The first two characters of the locator are used. If the locator is not set, the pskreporter.info uses the current IP geolocation to approximate it.
A popup is displayed when the user clicks the button or presses the Enter key from within the field. The popup shows the frequencies by measure of activity that gives more weight to transmissions. If rig control is active, the user can click on one of the lines to go to that band. Clicking on the 18100000 (1 report) line would immediately QSY the transceiver to 18.1 MHz.

The data is retrieved from [http://pskreporter.info/cgi-bin/psk-freq.pl](http://pskreporter.info/cgi-bin/psk-freq.pl)

or with a filled text field, [http://pskreporter.info/cgi-bin/psk-freq.pl?grid=TEXT](http://pskreporter.info/cgi-bin/psk-freq.pl?grid=TEXT)

There is a link to the pskreporter.info map page in the Help menu.
Chapter 48

SYNOP decoding

48.1 What is Synop

48.1.1 Weather data

SYNOP, which stands for *surface synoptic observations* is a numerical code used for reporting weather observations made by manned and automated fixed land weather stations. It is also called FM-12 by the World Meteorological Organization. It is closely associated to FM 13-XIV SHIP, for report of surface observation from a sea station (Created in 1982) and FM 14-XIV SYNOP MOBIL, for reports of surface observation from a mobile land station.

Here is an example of undecoded SYNOP weather report:

```
13586 31530 80000 10036 20029 39821 40218 53002 71022 886//
333 20029 88715=
```

Many SYNOP reports are available on web sites such as [Ogimet](https://www.ogimet.com).

48.1.2 Synop reports broadcasts

The most important broadcaster on SYNOP data is DWD, in RTTY mode.

48.1.2.1 Deutsche Wetterdienst schedule

SYNOP reports are typically sent every six hours by Deutscher Wetterdienst on shortwave and low frequency using RTTY. The baud rate must be 50 bauds.

<table>
<thead>
<tr>
<th>Freq</th>
<th>Station</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>147,300 kHz</td>
<td>DDH47</td>
<td>05.00 - 22.00</td>
</tr>
<tr>
<td>4583,000 kHz</td>
<td>DDK2</td>
<td>00.00 - 24.00</td>
</tr>
<tr>
<td>7646,000 kHz</td>
<td>DDH7</td>
<td>00.00 - 24.00</td>
</tr>
<tr>
<td>10100,800 kHz</td>
<td>DDK9</td>
<td>00.00 - 24.00</td>
</tr>
<tr>
<td>11039,000 kHz</td>
<td>DDH9</td>
<td>05.00 - 22.00</td>
</tr>
<tr>
<td>14467,300 kHz</td>
<td>DDH8</td>
<td>05.00 - 22.00</td>
</tr>
</tbody>
</table>
48.1.2.2 Other broadcasters

Until recently, many shore stations used to transmit Synop reports by Morse Code ("Ocean Yacht Navigator", Kenneth Wilkes, 1976). Still, according to WMO information for shipping, a couple of maritime stations might broadcast these informations in different mode that RTTY, but this has not been tested yet. There are just anecdotically cited here.

**Maritime Radio Station of Mumbai**

Met codes: FM 12 - SYNOP, FM 13 - SHIP for Sea areas I.

<table>
<thead>
<tr>
<th>Band</th>
<th>Freq</th>
</tr>
</thead>
<tbody>
<tr>
<td>WT (MF)</td>
<td>500 kHz</td>
</tr>
<tr>
<td>WT (MF)</td>
<td>521 kHz</td>
</tr>
<tr>
<td>WT (HF)</td>
<td>8630 kHz</td>
</tr>
<tr>
<td>WT (HF)</td>
<td>12710 kHz</td>
</tr>
</tbody>
</table>

SYNOP decoding is not accessible from Morse CW modem yet.

**Navtex station of Mumbai. COMCEN**

FM 12 SYNOPSIS, FM 13 SHIP for sea area I (Time schedule 0900, 2100)

<table>
<thead>
<tr>
<th>Freq</th>
</tr>
</thead>
<tbody>
<tr>
<td>518 kHz</td>
</tr>
</tbody>
</table>

SYNOP decoding is not accessible from Navtex modem yet.

**Marine Rescue Co-ordination Centre: Guayaquil, Radio IOA (Instituto Oceanografico Armada) o Radio Naval**

Meteorological information in process: Text, SHIP, SYNOP.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Freq</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>1515 kHz</td>
</tr>
</tbody>
</table>

48.2 Parameters

Figure 48.1 Synop configuration in RTTY tab
By default, there is not SYNOP decoding of RTTY reception, so its behavior does not change. However, it receives three new parameters related to Synop decoding. SYNOP reports can be saved to the current ADIF log file: They are visible in the journal of QSOs with the content of the report, the timestamp, and the Maidenhead locator equivalent to the geographical coordinates of the emitter of the report. SYNOP weather reports can also be plotted on KML files: They can then be visualized in KML viewers such as Google Earth. If SYNOP reports are saved either to ADIF or KML files, fldigi attempts to detect and decode RTTY messages. When these messages are detected, they are displayed in the reception window. An extra parameter allows to replace the coded Synop message, giving clarity at the risk of losing information, or mix the decoded reports with the original group of digits (Interleaving of SYNOP and text).

### 48.3 Reception window

When SYNOP messages are detected, they are displayed in the reception window in "red" characters (depicted here in "italic"). Here are some examples (Interleaved text and SYNOP reports):

```
13661 16123 99276 70216 46///
WMO Station=13661
WMO station=WMO_13661
UTC observation time=2013-02-16 12:00
QLLLL token=Present
Longitude=-21.6
Latitude=27.6
/// 40206 52011
222// 00203;
Sea surface temperature=20.3 °C
Temperature type=Intake measurement

64522 16123 99591 70347 46///
WMO Station=64522
WMO station=WMO_64522
UTC observation time=2013-02-16 12:00
QLLLL token=Present
Longitude=-34.7
Latitude=59.1
/./ 49920 57004.
::(1056;
, 26555 16123 998#6
WMO Station=26555
WMO station=WMO_26555
UTC observation time=2013-02-16 12:00

70269 46/// //// / 40168 52008;
WMO Station=70269
WMO station=WMO_70269
Precipitations=Omitted, no observation
Station type=Automated station. No observation (No 7WW)
Visibility=Missing
Wind direction=No motion or no waves
Wind speed=0 knots (Estimated)
Sea level pressure=1016 hPa
Pressure tendency=Increasing steadily. Raises
Pressure change=0.8 hPa
```
25617 16123 99867 1173!(6;
WMO Station=25617
WMO station=WMO_25617
UTC observation time=2013-02-16 12:00
QLLLL token=Present

149 52001;

13660 16123 992!;
WMO Station=13660
WMO station=WMO_13660
UTC observation time=2013-02-16 12:00

).'/ ///// 40222 52&17

52"// 08)02;

44551 16123 99376 70378 46//.
WMO Station=44551
WMO station=WMO_44551
UTC observation time=2013-02-16 12:00
QLLLL token=Present
Longitude=-37.8
Latitude=37.6

/// 40185 52022;
Sea level pressure=1018 hPa
Pressure tendency=Increasing steadily. Raises
Pressure change=2.2 hPa

62680 16123
9958"
WMO Station=62680
WMO station=Atbara
UTC observation time=2013-02-16 12:00

70265 66//? BMPROIIO TUPEQ

222!/ 00078;

64527 16123 99593 70483 46///
WMO Station=64527
WMO station=WMO_64527
UTC observation time=2013-02-16 12:00
QLLLL token=Present
Longitude=-48.3
Latitude=59.3
/// 40095 52004

### 48.4 Data files

Several data files containing public information are used to decrypt SYNOP data. They come from various places on the Internet, with redundancy.
<table>
<thead>
<tr>
<th>Source</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOAA</td>
<td>WMO identifier, name and coordinates of thousands of weather stations in the world. <a href="http://weather.noaa.gov/data/nsd_bbss.txt">http://weather.noaa.gov/data/nsd_bbss.txt</a></td>
</tr>
<tr>
<td>UK’s National Weather Service</td>
<td>Name, country and description of weather ships <a href="http://www.metoffice.gov.uk/media/csv/e/7/ToR-Stats-SHIP.csv">http://www.metoffice.gov.uk/media/csv/e/7/ToR-Stats-SHIP.csv</a></td>
</tr>
</tbody>
</table>

There is a specific window for downloading the latest version of these data files. It can be reached with the command "File/Folders":

![Image of Fldigi interface with Data files menu](image)

Figure 48.2 How to reach the data files sources menu

These data files can also be found:

- At installation time your fldigi binary comes with a package. All data files are silently installed on your machine.
- When building your own binary from the sources, with the command `make install`. Similarly, all files are installed.
- At first use and automatic installation, this opens the Data files sources menus, where you can download all or some data files used by fldigi.
48.4.1 Outputs

Each message is a set of key-value pairs, associated to:

<table>
<thead>
<tr>
<th>Description</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind direction</td>
<td>315 degrees</td>
</tr>
<tr>
<td>Wind speed</td>
<td>8 m/s (Anemometer)</td>
</tr>
<tr>
<td>Temperature</td>
<td>0.0 deg C</td>
</tr>
<tr>
<td>Dew point temperature</td>
<td>-3.8 deg C</td>
</tr>
<tr>
<td>Station pressure</td>
<td>1006 hPa</td>
</tr>
<tr>
<td>Sea level pressure</td>
<td>1030 hPa</td>
</tr>
</tbody>
</table>

48.4.2 Output formats

48.4.2.1 ADIF

When the option is ticked, SYNOP weather reports are saved in a new ADIF record, in the default logfile.

The report itself is saved with field `<NOTES:xx>`. The length can be of several hundredth of chars, and accordingly to the ADIF standard, new-lines can appear in each report.

Example of `<NOTES>` field in an ADIF record:

```
Header
ICAO indicator=LOWM
Identification and location
Land station observation
Land observations
Precipitations=Precipitation omitted, no precipitation
Station type=Manned station. 7WW omitted, not significant
Cloud base=600 to 1000 m
Visibility=15 km
Cloud cover=7/8
```
48.4.2.2 KML

SYNOP reports can generate KML files for fixed stations, mobile weather ships, buoys etc... that is, every observation which can be associated to a set of coordinates. Several reports of the same station can be aggregated in a single place mark. Mobile stations have their path drawn, linking all coordinates spotted for a given station with an unique name.

KML data are are also saved in a display-independent format in `<description>` tags, and thus can easily be reused by other software.

48.5 Command-line SYNOP decoder program: synop_tool

The decoder comes with `synop_tool`, a command-line tool able to decode input text files and generate the same output files as fldigi. It is intended as a development for checking internal consistency, and accuracy of SYNOP decoding without the complexity of the graphical interface.

It is accessible in the directory `fldigi/src/synop-src` and must be built with the command `make`.

Its command-line options are displayed with the option `-help`:

```
[fldigi/src/synop-src]$ ./synop_tool --help
```

Valid options are:

- `data_dir` # Where the data files are stored. For example `/usr/local/share/fldigi/`
- `kml_dir` # Output directory of created KML files.
- `load_dir` # Input directory of KML files loaded at startup.
- `dbg` # Verbose mode.
- `usage` # Print this message.
- `test` # Decoding preceded by an internal test.
- `matrix` # KML output in aggregated matrices (See KML documentation).
- `regex` # Text output of regular expressions, not decoded reports.
- `version` # Prints version number.
- `help` # Prints this message.
Chapter 49

Rig Control

The same control is used for both manual entry of the transceiver frequency or with full CAT control. When no CAT is available the control is simply a convenient way of keeping track of the transceiver USB/LSB suppressed carrier frequency, the mode and the audio tracking point. If fldigi is being used with an FM transceiver you probably should enter the simplex frequency or the input frequency of a repeater being used. This frequency value is used with the waterfall audio frequency to compute the logged frequency. The logged frequency value will only be correct for LSB and USB operation.

The combo box on the left will allow the selection and control of the operating mode of the transceiver.

The combo box on the right will allow the selection and control of the transceiver bandwidth.

The frequency display is in fact a set of special buttons. Each digit may be increment by clicking/pressing on the upper half of the digit and decrement by clicking/pressing the lower half of the digit. The leading digits will follow suit if a decade rollover occurs. You can also place the mouse cursor on a digit and then use the mouse wheel to roll the frequency up and down.

The frequency display becomes the focus of keyboard activity once a digit has been accessed with the mouse (above). You can then modify the current frequency entry a number of ways:

- right / left arrow keys: +/- 1 Hz
- up / down arrow keys: +/- 10 Hz
- shift right / left arrow keys: +/- 100 Hz
- shift up / down arrow keys: +/- 1000 Hz
- direct entry of desired frequency

Use the numeric keys for direct entry of the frequency (in Khz). Press <return> or <enter> to complete the entry and return the frequency display to an active state. Don't forget the decimal point if you are entering a fractional KHz value, (i.e. 14070.125).

The frequency display will reverse its color scheme when in the direct frequency entry mode, and the decimal point will occult.
The Smeter / Power-meter display is only active if fldigi is configured for xmlrpc control with flrig. The transceiver must support the smeter and power out CAT query. fldigi does not try to estimate the smeter reading based on the audio stream. You can toggle viewing the Smeter / Power-meter display using the button just to the right of the shared space used by the “Smeter/Power-meter” and the “Mode/Bandwidth” controls. Be sure to save the configuration for this to persist the next time fldigi is executed.

The mode combobox, the bandwidth combobox and the frequency display also annunciate the current transceiver status. If you change operating mode on the transceiver, that will be annunciated in the respective combobox and FLDigi will adjust any internal parameters accordingly. FLDigi queries the transceiver 10 times per second to maintain a lock step with the transceiver.

49.1 Frequency List

The frequency/mode pick list is displayed when the book button is pressed. Pressing the book button a second time will restore the original logging panel.

The pick list buttons control selecting, adding and deleting entries in the frequency/mode list.

- add the current frequency / mode / audio track point to the list
- select the current list entry
- delete the highlighted entry from the list
- delete all entries from the list (a warning prompt will appear)
- show active frequencies based on either the entry field to the right or the stations locator, see pskreporter/spotter.
- entry field for active frequencies search, for example "EM."

The browser list contains frequency, sideband, modem type, audio frequency, and a text describing usage. To edit the usage string:
- highlight the entry to be edited
- press the combination of SHIFT and right arrow while pointing to the line
This will hide the frequencies browser and display the data relative to that line

![Figure 49.5 Edit frequency list entry](image)

Edit the text entry and press the "Enter" button when finished.
The list is saved when fldigi is shut down.

---

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Chapter 50

UTF-8 support

Fldigi supports the UTF-8 character set in all of it's labels and widgets (controls). The Rx and Tx text panels accept both keyboard and text stream that is in UTF-8 format. Transmission of UTF-8 characters is supported by these modes:

- PSK, PSKR, and Multi-Channel PSK/PSKR
- Olivia - must enable 8 bit extended characters
- MT63 - must enable 8 bit extended characters
- MFSK - all baudrates supported

For example, the following Russian and annotated texts can be sent and received:

![UTF-8 Encoded Characters](image)

Figure 50.1 UTF-8 Encoded Characters

UTF-8 characters are represented by 2 bytes which means that a single character will take longer to transmit. Transmission speed will be further reduced on modes like PSK where the character to bit stream conversion has been optimized for the English language.
Chapter 51

Signal Browser

Signals can be viewed in a multi-channel context for the following modes:

- CW
- PSK-31, PSK-63, PSK-63F, PSK-125, PSK-250, PSK-250, PSK-500
- PSK-125R, PSK-250R, PSK-500R
- QPSK-31, QPSK-63, QPSK-125, QPSK-250, QPSK-500
- RTTY

You can open an embedded or a separate dialog to access the browser. These browsers can help to locate a signal of interest on a busy band. The browsers can be visible at any time, but are only active when fldigi is in one of the PSK or RTTY modes. Open the external by clicking on the View/Signal browser menu item.

![Figure 51.1 View Menu](image)

It looks like this:
Figure 51.2 Browser Panel

Toggle the visibility of the embedded viewer by selecting the **View/Hide Channels** on the same menu list. Your main fldigi screen then opens a browser panel on the left side of the Tx/Rx panel(s).

Figure 51.3 Main Dialog Browser
This panel can be resized horizontally by dragging the interface between the browser and the Rx panel to the left and right. You can drag all the way to the left to close the panel (or use the menu button). The drag to the right is limited to prevent sizing the Rx/Tx panels below their allowable limits.

The browser can decode up to 30 simultaneous signals. As each signal is acquired within a 100 Hz channel width it is printed on the associated line. The user can elect to have each line annotated with

- a channel number,
- the waterfall audio frequency,
- the transceiver HF frequency + waterfall, or
- no annotation.

Left click on a line of received text to move the waterfall frequency and Rx panel tracking to that signal. The contents of the line of text is transferred to the Rx text widget, and the main signal processing loop begins to track and decode that signal. Right click on a line of received text and that line is cleared and the channel reset for a new detection. You may have to do this occasionally if the detector for that channel has locked on to a sideband of a PSK signal. This is most likely to occur when the received signal as a marginal or bad IMD. Use the >Clear button to clear and reset all of the channels. Channel signal detection and processing should restart immediately.

The slider control is a squelch for the channel detectors. Move it to the left until the decoders are displaying noise, then to the right to squelch the noise.

Configuring the browser:

Figure 51.4 Browser Configure

1. select the number of 100 Hz channels you want visible
2. select the start frequency for the browser (your transceiver may not rx signals below this value)
3. select the inactivity timeout for the browser. After this number of seconds the channel will be cleared and prepared for the next detection cycle.
4. select whether you want a Marque type of continuous scrolling, or simply clear the line when it is filled.
5. select what kind of label annotation you want on each line
6. select the font and font size to be used in the browser
7. You can enter any text you want to search for in the Seek Regular Expression widget. This text can be a simple text snippet such as "CQ" or any regular expression. With a regex you can specify...
a more generic pattern, which means that you can match more things and your search is somewhat noise
tolerant. Here is an example for a CQ from a US station (should match most callsigns):

cq.+[aknw][a-z]?[0-9][a-pr-z][a-z]{1,2}

This says "cq followed by at least one character, followed by one A, K, N, or W, followed by an optional
letter, followed by a digit, followed by a letter that is not q, followed by one or two letters". The search is
case-insensitive.
All plain text is a valid regular expression, unless you really had been looking for these metacharacters:

.\[(\d++?)\]^\$

These will have to be escaped with a backslash.
Chapter 52

DXCC List etal

Fldigi uses several data files that are not included with the distribution. These must be downloaded from the list maintenance web sites for the most current data. These lists include:

<table>
<thead>
<tr>
<th>List Data</th>
<th>List Name</th>
<th>Web source</th>
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</thead>
<tbody>
<tr>
<td>LOTW</td>
<td>lotw1.txt</td>
<td><a href="http://www.hb9bza.net/lotw/lotw1.txt">http://www.hb9bza.net/lotw/lotw1.txt</a></td>
</tr>
<tr>
<td>EQSL</td>
<td>AGMemberList.txt</td>
<td><a href="http://www.eqsl.cc/QSLcard/DownloadedFiles/AGMemberList.txt">http://www.eqsl.cc/QSLcard/DownloadedFiles/AGMemberList.txt</a></td>
</tr>
</tbody>
</table>

These files should be downloaded and placed in the fldigi files directory. The most convenient way to open the fldigi files directory is via the menu item "File / Show config".

The DXCC list browser is shown by selecting the menu item "View / Countries".
You can sort the list by Country, Continent, ITU or CQ zone by clicking on the various column headers.

Figure 52.1 DXCC List

Return to Top of Page
Return to Main Page
Chapter 53

Keyboard Operation

The transmit buffer for fldigi is type ahead which means that you can be typing text while the program is sending an earlier part of your transmitted message. Newly entered text appears in black and text which has been transmitted is changed to red. You can backspace into the red area. When you do and the modem in use supports the BS character it will be sent to the receiving station. If you monitor PSK and MFSK signals you will often find operators backspacing over previously sent text. It's probably just as easy to just send XXX and retype that part of the message, but we have gotten used to word processors, email, etc. that allow us to send perfect (right) text, so we expect our digital modems to do the same. Let's see, what was that prosign often used in CW for ooops.

All of the alpha numeric keys perform as you would expect, entering text into the transmit buffer. There is one very important exception:

The caret \(^{\wedge}\) symbol, which fldigi uses as a meta character. The \(^{\wedge}\) is used in the macro expansion routine and also used by the transmit buffer evaluator. A \(^{\wedge}r\) puts fldigi into receive mode. So you can enter the \(^{\wedge}r\) (caret followed by the r) at the end of your transmit buffer and when the sent character cursor (red chars) gets to that point the program will clear the text and return to the receive mode.

Other useful meta combinations:

- \(^{\wedge}l^{\wedge}L\) - save the log entry when meta combination parsed
- \(^{\wedge}p^{\wedge}P\) - pause transmission at this point in transmit text
- \(^{\wedge}r^{\wedge}R\) - return to receive clear all transmit text

You can load the transmit buffer with any ASCII Text file of your choice. Merely right click in the buffer window and select from the pop-up menu. You can also short cut to the \(^{\wedge}r\) from this popup.

Many ops (including me) do not like to be tied to a mouse. The fldigi text widget supports some short cuts to make your life easier:

- Pause/Break - a transmit / receive - pause button.
  - if you are in the receive mode and press the Pause/Break key the program will switch to the transmit mode. It will begin transmitting characters at the next point in the transmit buffer following the red (previously sent text). If the buffer only contains unsent text, then it will begin at the first character in the buffer. If the buffer is empty, the program will switch to transmit mode and depending on the mode of operation will send idle characters or nothing at all until characters are entered into the buffer.
  - if you are in the transmit mode and press the Pause/Break key the program will switch to the receive mode. There may be a slight delay for some modes like MFSK, PSK and others that require you to send a postamble at the end of a transmission. The transmit text buffer stays intact, ready for the Pause/Break key to return you to the transmit mode.
- Think of the Pause/Break key as a software break-in capability.

- **Esc**
  - Abort transmission. Immediately returns the program to receive, sending the required postamble for those modes requiring it. The transmit buffer is cleared of all text.
  - Triple press on Esc terminates the current transmission without sending a postamble - The PANIC button.

- Ctrl-R will append the \^r (return to receive) at the end of the current text buffer.

- Ctrl-T will start transmitting if there is text in the transmit text window.

- Alt/Meta-R will perform the same function as the Pause/Break key

- Tab moves the text insert cursor to the end of the transmitted text (which also pauses tx). Characters entered from the keyboard will be transmitted as entered until the tx text entry point is returned to the end of the tx buffer. A tab press at that position returns the cursor to the end of the text buffer. Transmitted text and text pending transmit are color coded red and black respectively (default colors):

![Figure 53.1 Tx Cursor Position](image)

Be aware that fldigi will NEVER transmit past the text insert cursor! You may be caught by that behavior if you are modifying the buffer and transmitting at the same time. Or you may have accidentally mouse clicked in the middle of the Tx text with the result that fldigi suddenly stops transmitting. In either case the Tab key will return the text insert cursor to the end of the tx buffer.

CW operation is slightly different, see the help for CW.

- Extended UTF-8 characters can be entered into all text entry controls using Ctrl + three digits. These characters can also be entered using the right-click pop-up menu item "Spec Char ". The extended character transmitted by fldigi will actually be a 2 byte UTF-8 string.

  see [Extended Characters](#)

- insert operating controls text, use combination of SHIFT-CONTROL-letter
  - 'c': add <CALL>
  - 'm': add <MYCALL>
  - 'n': add <NAME>
  - 'r': add <RST> received
  - 's': add <RST> sent
  - 'l': add <MYLOC>
  - 'h': add <MYQTH>
  - 'a': add <ANTENNA>
  - 'g': add <BEL> 0x07
53.1 Function Keys

Keys F1 through F12 are used to invoke the macro F1 - F12. You can also just click on the macro key button associated with that function key. There are 4 sets of 12 macros. If you press the numbered button on the macro button bar the next set of macros are referenced by the F1 - F12. A right click on the numbered button provides a reverse rotation through the 4 sets of macro keys. The respective macro set can be made available by pressing the Alt-1, Alt-2, Alt-3 or Alt-4 key combination. Note that this is not Alt-F1 etc.
Extended Characters

Extended UTF-8 characters can be entered into all text entry controls using Ctrl + three digits. These characters can also be entered using the right-click pop-up menu item "Spec Char". The extended character transmitted by fldigi will actually be a 2 byte UTF-8 string.

Extended character set

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<tr>
<td>244</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>245</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>246</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>247</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>248</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>249</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>251</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>252</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>253</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>254</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>255</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional symbols include "-".

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Chapter 55

PSM Power Signal Monitor

55.1 Description

PSM was originally introduced when the KISS IO interface was added and is specifically designed for the unattended operator portion of the Amateur Radio Bands; there are however other possible uses.

NOTE:

PSM was originally called KPSQL and the name was change to better differentiate it's function over the function of SQL.

To configure see Configure PSM.

55.1.1 CSMA Carrier Sense Multiple Access

It’s function is to monitor for signals within the bandpass of the modem and place a TX inhibit anytime a signal was present. This feature is reminiscent of the hardware TNC’s during the heydays of packet radio. Hardware TNC’s with TNC2 firmware supported a feature called CSMA. CSMA stands for Carrier Sense Multiple Access. CSMA would monitor for a signal and inhibit transmit when a signal is present. But CSMA does more then just monitor for signals it controls the aspect of how and when a transmit will occur. To assist in the prevention of transmit collisions the transmit schedule included a short random delay in the transmit process. Additionally CSMA provided other parameters to control the frequency or how aggressive the transmits are allowed and the duration of quite periods so other stations have the opportunity to transmit. As you can tell this is designed to allow multiple stations to cooperate on a single frequency. CSMA is not exclusive to TNC’s either in hardware or software. The communications provided by your ISP using Ethernet is another example.

55.1.2 Busy Channel

Busy Channels is an extension to the CSMA methodology by incorporating programming code to consider gaps in the transmission. This is either the results of QSB or other broken/intermittent transmissions like the gaps between RSID’s and the data that follows. The side effect of this feature is, it can be used to allow casual operators the use of a busy forward and store BBS frequency. When enable the frequency would have to be clear for the given set time before BBS operations would be allowed to continue.

55.1.3 Histogram

Histogram operation is pretty much experimentally at this stage. The basic intent is to keep the detection threshold just above the noise level. In doing so, the triggering of a transmit is highly aggressive, as far as software is concerned. The actual aggressiveness is pretty slow when compared to hardware detection used in TNC’s. This option should only be used with FM modulation and is not compatible with Busy Channel.
WARNING Histogram: Experimental

You may not make many friends if you use this on FM AFSK packet frequencies. The Author tested this on APRS frequencies and it fundamentally works. But wasn't left on to instigate a riot.

55.2 Possible Use(s)

As stated above it's primary designed for unattended operations. However, it's reasonable to assume this might work during a digital net operation when multiple stations are involved. Since PSM (KPSQL) has been moved out of KISS IO interface, it's functionality is available to keyboard, KISS, ARQ, and XMLRPC interfaces. This has the potential to cooperatively transmit between multiple stations while using FLDIGI's suite of tools. Namely, FLMSG, FLAMP, etc, and third party programs that makes using of the aforementioned interfaces.

55.3 PSM Characteristics

For those who have never used a CSMA device directly this may take a little getting used to. Without PSM enabled you have direct control as to when the transmit occurs. The human mind is pretty good at telling (by monitoring the waterfall) when the best time to transmit is, far better then the current implementation use in FLDIGI (detection wise). Patience is a PSM virtue, a prerequisite for cooperative activities. Not to say operators don't have this attribute, it's just PSM is more consistant in it's application.

With PSM enabled the operator can only instruct FLDIGI that transmit has been requested. CSMA decides when the appropriate time to do so. How and when CSMA transmits is dictated by adjustable parameters located on the PSM configuration panel (Configure Power Signal Monitor (PSM)). Expect delays in the transmitting of data. The amount of delay will vary with each TX/RX cycle.

Be mindful of the adjustments made. The human nature side of this story revolves around the impatient side of us. As an example during the packet heydays (again) it's wasn't unusual for an operator to adjust CSMA parameters to gain an unfair advantage and capitalize the limited bandwidth available with our "slow" bitrate modems. You can not expect "high" throughput on a frequency used by multiple operators. This doesn't even include the other restrictions with limited bandwidth radio's and the rule of law.

The correct CSMA parameters other then the defaults for any given condition is to varied, ie, number of users, band conditions, etc. Experimentation is the only recourse. Dont be afraid of tweaking the values, just be mindful of the outcome and it's effect on the other operators using the frequency.

55.4 Adjustment of PSM Threshold and Options

In order to adjust PSM threshold enable the following:

1. From the PSM configuration panel. Enable "Show and enable Power Signal Monitor button (PSM)" checkbox.

2. Enable PSM button located in the lower right hand side of FLDIGI's main window.

When PSM button is enabled on FLDIGI's main window. The Signal Level indicator and SQL threshold slider are now active for PSM. A green box on the PSM button indicates an active transmit inhibit. A yellow box indicates the possibility of a transmit. Transmit may or may not occur depending on the set parameters located on the PSM configuration panel.

Moving the SQL slider up changes the internal threshold reference, requiring a higher signal level to trigger a detection that will inhibit transmit. Setting the SQL slider lower allows a weaker signal to inhibit transmit, which if set to low, means that inhibit may be triggered by the base noise level. To determine where detection/non-detection
threshold resides monitor the PSM button's square colored indicator. When this boundary is reached the color will toggle between green and yellow. It's easier to determine the threshold point when Busy Channel is disabled.

When Busy Channel is enabled and set to 3 seconds (for example) each time the signal crosses the set threshold of the SQL slider position a 3 second transmit inhibit is activated. If a signal crossing the threshold occurs again while inhibit is active the internal timer is reset to 3 seconds and the inhibit continues until the timer expires or reset again by another signal. This ensures there will be a 3 second period of "silence" before the transmitter is allowed to transmit.

Enabling CSMA adds a randomness to the transmit event and is controlled by the Persistence parameter. The values for Persistence ranges from 0-255 which is translated to a percent value as seen on the PSM configuration panel. When set to "63" this equates to a 25% chance of transmitting each time a random number is generated and compared to the persistence value. Higher values results in the greater likelihood transmit will occur. Slot Time is the no transmit period between transmissions and is measure in milliseconds. Transmit data delay is used to send idle data before the relevant information is sent. This feature is only available if the modem selected has an idle transmit state.

NOTE:
Deselecting PSM either by the configuration panel or by the PSM button provided on FLDIGI's main window returns the SQL slider and signal level indicator back to the SQL function. This enables the user to make SQL threshold adjustment to inhibit character quality receptions.

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Chapter 56

KML

Figure 56.1 KML Logo

Section data_source Data sources

Keyhole Markup Language (KML) is an XML file format for geographic visualization in two-dimensional maps such as Google Maps and three-dimensional earth browsers such as Google Earth or Marble.

Fldigi can generate data with geographical locations, which can be used to generate KML data. This list might expand in the future

• The emitting station of a Navtex message.

• The origin of a SYNOP weather report.

• The Maidenhead locator of the user, as entered in fldigi user's profile.

56.1 KML generation from Navtex messages

Figure 56.2 Navtex configuration tab with KML option

Generated by Doxygen
Each Navtex message comes with the code of the sending station, also called origin. These messages are displayed, in KML files, at the coordinates of the sender. That is: KML placemarks are created or updated with these coordinates. Fldigi parses the Navtex reports, uses the station identifier to make a lookup in the Navtex stations file which contains geographical coordinates. These coordinates are used to create KML placemarks.

More explanation about how station coordinates are used, are given at the Navtex page.

Navtex messages are quite often sent with embedded coordinates of the event they describe (Ship wreck, oil exploration etc...). For example: "LIGHT BUOY MARKING DANGEROUS WRECK 58°01.2 NORTH 005°27.1 WEST" or "THREE MEN OVERBOARD IN PSN 39°07.7N 026°39.2E". A future version will parse the content of the message, extracting raw coordinates, and will display a graphic entity at the location of the described event.

56.2 KML generation from SYNOP reports

SYNOP is a code used for reporting weather information and as such, is used to broadcast meteorological data by radio. One of the most important emitter is Deutsche Wetterdienst which transmits them in RTTY, and fldigi is able to decode them and generate KML placemarks at the location of the weather information.

56.3 KML files structure

The KML data are made of different files

<table>
<thead>
<tr>
<th>File</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>fldigi.kml</td>
<td>Entry point. Only this one has to be loaded. It never changes.</td>
</tr>
<tr>
<td>styles.kml</td>
<td>KML style sheet. Freely changeable by the user, for example to customize the icons.</td>
</tr>
<tr>
<td>User.kml</td>
<td>Location of the user based on his/her Maidenhead locator.</td>
</tr>
<tr>
<td>Synop.kml</td>
<td>Synop weather reports displayed at the location of the WMO station, or ship, or buoy.</td>
</tr>
<tr>
<td>Navtex.kml</td>
<td>Navtex reports, displayed at the place of the emitting station. A future version will plot the position of the coordinates indicated in the Navtex messages themselves.</td>
</tr>
</tbody>
</table>

56.4 Extended data

When creating a new placemark, written in of the KML data files (Synop.kml, Navtex.kml etc...) data are sent to the KML module in the form of key-value pairs and are written into two forms:

- HTML content, in the <description> tag, surrounded by CDATA directives. The HTML format is chosen exclusively for display purpose and might change at any new version.
- Regular <ExtendedData> XML tags: These data are internally used by Fldigi to reload the previous session. The format is stable and can be used by external applications. All useful data are saved.
56.5 Parameters

Fldigi maintains in an internal container, a set of placemarks which are data associated to geographical coordinates, an unique name, a set of key-value pairs and a timestamp. At regular intervals, a thread is woken up to save these geographical data to a KML file, in a specific directory. At this moment, a process can be started, running an external command. Depending on the type of data, a given file name will be used.

All KML files are accessible from an unique KML filename. Placemarks are identified with an unique name, for example a vessel name, or their WMO identifier. Placemark with a moving position such as ships, can have their path visualized because they still can be identified in two different reports. These reports can be kept as separate, or they can be merged into a single placemark: This depends on the distance between two placemarks with the same name, compared to the merging distance parameter.

Data can be kept for a given retention time, after which delay they are purged. At startup, former KML data can be reloaded, or cleaned up. Data as key-value pairs associated to a given placemarks can be displayed several ways.

All these parameters are controlled by the KML configuration tab.
56.6 Destination directory

The default destination directory where KML files are saved is a subdirectory called /kml in the fldigi users directory. For example on Linux: 

```
$HOME/.fldigi/kml/
```

and <defaultpath>/fldigi.files/kml on Windows™. This destination can be freely changed.

The file fldigi.css is created at installation, and is not changed later. Therefore it is possible to customize it by adding specific icons.

The file fldigi.kml is created by fldigi when it is not there, or when the refresh interval is changed.

If this destination directory is accessible from the internet, then it can be published to Google Maps.

**Note:**

Files updates are atomic. This means that a file is not accessible by a reader until it is completely written and closed. This is achieved by writing into temporary files, which are atomically renamed (POSIX function `rename()` ) at the end of operation.

Therefore, the KML destination directory can safely be accessed by one writer and multiple readers. Several sessions of fldigi might also updates different KML files, as long as the main `fldigi.kml` file is not changed.

56.7 KML root file

This is the default name of the entry file of the generated KML document, which by default is `fldigi.kml`. If it does not exist, it is generated with the list of possible source of KML data (Synop, Navtex etc...). If Google Earth or Marble are installed on your machine, then they are associated to the file extension .kml and you just need to
click on fldigi.kml to visualize it. It is automatically refreshed when fldigi adds new Synop weather reports or Navtex messages to it.

56.8 KML refresh interval

This delay, in seconds, is used at two places:

• This is the frequency at which new KML files are created, if new data is available
• This is the refresh interval specified in the KML file with tag `<refreshInterval>`.

This should not be too small, especially if the data files are big, otherwise fldigi will spend most of its time refreshing KML data, and accordingly Google Earth or Marble, reloading them.

56.9 Cleanup on startup

By default, at startup, fldigi reloads the existing KML files, extracting the key-value pairs contained in the "Extended Data" tags. However, it is possible to force fldigi to restart from scratch.

56.10 Merging distance

Different reports with the same placemark name can be merged into a single report if their distance is below a given threshold which is the merging distance. Otherwise, separate placemarks are created and joined by a red line, visible in the KML document.

56.11 KML balloon display type

Reports are inserted in the KML document one after the other. These description data are visible as KML balloons, or when getting placemark properties. If they have the same name and are within the merging distance, they will form a single placemark. The descriptions of each report will be displayed and merged by three possible ways.

56.11.1 Plain text

Description are inserted without any HTML formatting. Only special HTML entities such as ampersands are reformatted. This is especially useful if the KML document is later converted to GPX, because many GPS devices are not able to display HTML data.

56.11.2 HTML tables

Each description of placemark is transformed into a HTML table labelled with the time stamp of the insertion. Here is an example of two Navtex messages from the same station at different times:

<table>
<thead>
<tr>
<th align="left">2013-02-14 23:18</th>
<th>Callsign</th>
<th>Country</th>
<th>Locator</th>
<th>Message number</th>
</tr>
</thead>
<tbody>
<tr>
<td align="left"></td>
<td>OST</td>
<td>Belgium</td>
<td>JO11JE</td>
<td>35</td>
</tr>
</tbody>
</table>

Generated by Doxygen
56.11.3 Distinct HTML matrix

For the same KML placemark, the key will typically the same for all reports. More, some data are numeric. This is therefore convenient to group them in matrices:

Here is an example for SYNOP weather data, made of three reports:

<table>
<thead>
<tr>
<th></th>
<th>2012-12-16 00:00</th>
<th>2012-12-17 06:00</th>
<th>2012-12-18 00:00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dewpoint temperature</td>
<td>Undefined</td>
<td>Undefined</td>
<td>Undefined</td>
</tr>
<tr>
<td>Figure</td>
<td></td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Humidity</td>
<td>Unspecified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precipitations</td>
<td>Omitted, no observation</td>
<td>Omitted, no observation</td>
<td></td>
</tr>
<tr>
<td>Pressure change</td>
<td>Not specified</td>
<td>Not specified</td>
<td>Not specified</td>
</tr>
<tr>
<td>Sea level pressure</td>
<td>994 hPa</td>
<td>1000 hPa</td>
<td>1013 hPa</td>
</tr>
<tr>
<td>Ship average speed</td>
<td>0 knots</td>
<td>0 knots</td>
<td></td>
</tr>
<tr>
<td>Ship direction</td>
<td>Calm</td>
<td>Calm</td>
<td></td>
</tr>
<tr>
<td>Station type</td>
<td>Automated station. No observation (No 7WW)</td>
<td>Automated station. No observation (No 7WW)</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>9.5 deg C</td>
<td>9.3 deg C</td>
<td>10.3 deg C</td>
</tr>
<tr>
<td>Value</td>
<td></td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>Visibility</td>
<td></td>
<td>4 km</td>
<td>4 km</td>
</tr>
<tr>
<td>Wave height</td>
<td>3.6 meters</td>
<td>4.7 meters</td>
<td></td>
</tr>
<tr>
<td>Waves height</td>
<td>3.5 meters</td>
<td>4.5 meters</td>
<td></td>
</tr>
<tr>
<td>Waves period</td>
<td>8 seconds</td>
<td>8 seconds</td>
<td></td>
</tr>
</tbody>
</table>
56.12 **Data Retention Time**

Data may be automatically purged based on their time-stamp and a maximum retention time in hours. If the retention time is zero, then data are kept for ever.

56.13 **Command run on KML creation**

This command is executed at regular times, by default 180 seconds, and only if new data was written to any KML files. The first time this command is run, its process id is stored. Next time this command must be run, we check if this process is still running. If yes, no new process is created.

The intention is to handle the same way, programs which should always be running, for example KML visualizers, and on the other hand, one-shot scripts or converters. Typical situations are:

- Starting a program such as [Google Earth](http://www.google.com) or [Marble](http://www.marble3d.org), only once per session.
- They will be automatically restarted if they crash, because their process identifier is not present anymore.
- Run as needed conversion programs such as GpsBabel, to another format ([GPX](http://www.gpx.info)). Or a [FTP](http://www.ftp.org) transfer to a remote platform, for inclusion of KML files in Google Maps.
- Accordingly, do not restart this conversion process as long it is not finished (FTP transfers might take long)

56.13.1 **Example of commands**

56.13.1.1 **FTP Transfer**

A new transfer - and a new process - must be initiated at each KML file save. A script is created for this purpose, and the command can be:

```bash
fldigi/scripts/ftp_kml_files.sh ftperso.free.fr MyFtpUserName MyPassword kml
```
An obvious use is to save these file to a remote machine where they can be accessed with a public URL. This URL can then be given as CGI parameter to Google Maps which will display the placemarks on a map. There are limitations on the maximum size of KML files which have to be smaller than 10 megabytes.

Note that KML files are for the moment not compressed into KMZ files.

An FTP copy is not necessary if the destination directory for KML files storage is public (That is, accessible from the Internet).

56.13.1.2 Launch google-earth

The program will only be launched once, because its process id is still present. The command can be:

googleearth $HOME/.fldigi/kml/fldigi.kml

It is possible to change the icons by customizing the file styles.kml.
56.13 Command run on KML creation

56.13.1.3 GPS Babel conversion

The command **GpsBabel**, for example, will selectively convert the KML file of Synop reports. It is generally advised to generate plain text description tags in the KML files, because GPS devices might not be able to correctly display HTML data. The command can be:

```bash
gpsbabel -i kml -f $HOME/.fldigi/kml/Synop.kml -o gpx -F out.gpx
```

The generated files can for example be fed into **Xastir**.
Chapter 57

Supporting Data Files Acquisition

Figure 57.1 Data File Menu

To update support data file(s). Mouse click on the 'Data files...' menu item located in the above drop down menu.

Figure 57.2 Data File Source

The dialog box contains a list of the available file(s) for downloading. Click on the 'Update' button to initiate the data transfer.
The buttons under WWW column are direct links to the data source. Selecting them either displays or downloads the data from your web browser.

Note: Data source selection contain a single entry. User selection not required.

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Chapter 58

Menus

58.1 Menu Heirarchy

58.1.1 Files

58.1.1.1 Folders

- Fldigi config... - open the OS native file explorer to the folder containing the fldigi operating & data files.
- NBEMS files... - open the OS native file explorer to the folder containing the NBEMS data files
- FLMSG files... - open the OS native file explorer to the folder containing the NBEMS/FLAMP data files
- Data files. See Supporting Data Files Acquisition
58.1.1.2 Macros

- Open Macros - open a macro definition file ... changes the MACRO keys immediately
- Save Macros - save the current macro definitions to a designated file

58.1.1.3 Text Capture

Capture all received and transmitted text to a date-time stamped file. Each day's data will be stored in a single file in which the text is appended: fidigiYYYYMMDD.log. This file will be in the "Fidigi config..." folder which can be accessed per the File/Folders menu item. A brief example log of Rx data:

--- Logging started at Wed Jan 5 18:42:51 2011 UTC ---
RX 14071955 : PSK31 (2011-01-05 18:42Z): d dx sk S
RX 14071756 : PSK31 (2011-01-05 18:42Z): PSE -lr dACQ CQ de WX1GRS WX1GRS
RX 14071756 : PSK31 (2011-01-05 18:42Z): CQ CQ de WX1GRS WX1GRS
--- Logging stopped at Wed Jan 5 18:43:04 2011 UTC ---

Each line contains the program state, RX or TX, the frequency, the mode, the date-time, and the data stream.
58.1.4 Audio

Figure 58.5 Audio

- Rx Capture - allows capturing the incoming audio to a wav file
- Tx Generate - allows capturing the generated tx audio to a wav file
- Playback - playback a previously captured or generated wav file

58.1.5 Exit

Figure 58.6 Exit

Exit - exit the program closing down the various interfaces in a nice controlled manner.

58.1.2 Configure Scripts

Executing and Generating Scripts

Figure 58.7 Config Scripts
58.1.3 Op Mode

Op Mode - the current operating mode will show as a highlighted menu item.

![Op Mode Menu](image)

Figure 58.8 Op Mode

58.1.3.1 CW

CW - receive CW 5 to 200 WPM and transmit on any audio frequency using AF CW.

Additional information:
- CW Configuration
- WinKeyer Interface
58.1.3.2 Contestia

![Contestia Menu](image)

Figure 58.9 Contestia

Additional information:
- Contestia
- Contestia Configuration
- Contestia Mode Table

58.1.3.3 DominoEX

![DominoEX Menu](image)

Figure 58.10 DominoEX

Additional information:
- DominoEX
- DominoEX Configuration
- DominoEX Mode Table
58.1.3.4  Hell

![Figure 58.11 Hell](image1.png)

Additional information:
- Hellschreiber
- Feld Hell Configuration
- Hell Mode Table

58.1.3.5  MSFK

![Figure 58.12 MSFK](image2.png)

Additional information:
- MFSK
- MSFK Mode Table

58.1.3.6  MT-63

![Figure 58.13 MT63](image3.png)
58.1 Menu Heirarchy

Additional information:
MT63
MT63 Configuration
MT-63 Mode Table

58.1.3.7 PSK

Figure 58.14 PSK

Figure 58.15 Multi Carrier PSK

Additional information:
PSK Single and Multi-Channel Modems
PSK Mode Table
58.1.3.8 PSKR

All PSKR modes are phase shift keying, with FEC and interleaving.

Additional information:
PSK Single and Multi-Channel Modems
PSK/PSKR Mode Table

58.1.3.9 QPSK

Additional information:
PSK Single and Multi-Channel Modems
QPSK Mode Table
58.1 Menu Hierarchy

58.1.3.10 8PSK

Figure 58.18 8PSK

Additional information:
PSK Single and Multi-Channel Modems
8PSK Mode Table

58.1.3.11 Olivia

Figure 58.19 Olivia

Additional information:
Olivia
Olivia Configuration
Olivia Mode Table

58.1.3.12 RTTY

Figure 58.20 RTTY
58.1.3.13 THOR

![THOR Diagram](image1)

Additional information:
Thor
Thor Configuration
Thor Mode Table

58.1.3.14 THROB

![Throb Diagram](image2)

Additional information:
Throb
Throb Mode Table

58.1.3.15 WEFAX

![WEFAX Diagram](image3)

Additional information:
WEFAX-IOC576
WEFAX-IOC288

Figure 58.21 THOR

Figure 58.22 throb

Figure 58.23 WEFAX
58.1 Menu Hierarchy

Additional information:
WEFAX

58.1.3.16 NAVTEX / SITOR

Figure 58.24 NAVTEX / SITOR

Additional information:
NAVTEX and SITOR-B

58.1.3.17 SSB, WWV, Freq Anal, FMT

Figure 58.25 Analysis / WWV

- SSB - fldigi does not transmit, but can be used for rig control, signal frequency analysis and logging
- WWV - special receive only modem used for calibrating sound card
- Freq Anal - used for carrier detection and frequency measurement
- FMT - Frequency Measurement Tests modem

Additional information:
Frequency Analyzer
WWV codec PPM measurement

58.1.4 Configure

See Initial Configuration Page
58.1.5 View

- View/Hide Channels - Opens / Closes multi-signal viewer, shares space with Rx/Tx panels
- Signal browser - open the psk/rtty viewer dialog to display up to 30 simultaneously decoded psk signals Dialog viewer contains shared data / control with the View/Hide Channel viewer
- View/Hide 48 macros - toggle display of 4 rows of macros
- DX Cluster - open DX cluster dialog
- Floating Scope - Opens a resizable, moveable scope display
- Spectrum scope - Opens the spectrum analysis dialog
- MFSK Image - Opens the MFSK picture image (if being received)
- THOR Raw Image - Opens the THOR picture image (if being received)
58.1 Menu Heirarchy

- IFKP Raw Image - Opens the IFKP picture image (if being received)
- Weather Fax Image RX - Opens WEFAX receive dialog
- Weather Fax Image TX - Opens WEFAX transmit dialog
- Countries - Opens DXCC entities dialog
- Rig/Log Controls
  - Full - show all logbook and rig controls
  - Partial - reduce number of rig and logging controls to those essential for normal QSO or contest
  - None - removes the Rig Control / Log panel from the main User Interface
- Waterfall
  - Docked scope - toggles the visibility of the docked scope display to the right of the waterfall
  - Min WF Controls - toggles the visibility of various waterfall controls as configured by the user

58.1.6 Logbook

58.1.7 Help

Figure 58.29 Help
• Beginners' Guide
• On line documentation... - open up default browser to the on-line Help site
• Fldigi web site... - open up default browser to the www.w1hkj.com primary web page
• Reception reports... - open up browser to the http://pskreporter.info web page preset to your callsign
• Command line options - display a list of all command line switches available to the fldigi user
• Audio device info - displays information about all audio devices detected on the computer system
• Build info - displays all relevant information regarding the compilation and link for the application
  -- build info
• Event log - opens a text display window that records various events depending on the level of reporting depth selected. This is a useful window for reporting problems with the program to the developers.
• Check for updates... fldigi silently opens a download web site, checks and reports on whether a new version is available.
• About - Version number and a little about the programmers

58.1.8 Spot, Tx RSID, Rx RSID, and Tune Buttons

![Figure 58.30 Menu](image)

• Spot button - The "Spot" light button is visible if callsign spotting is enabled. Use this button to toggle the callsign spotting reporter on and off. It is automatically turned off when playback is selected in the Files menu. The main window text is not searched if the viewer is active, i.e., if it is displayed and the current modem is PSK. See PskReporter and Notifier.
• RxID button - toggles the detection of Reed Solomon Identification codes.
• TxID button - toggles the transmission of the RSID signal.
• Tune button - toggles the "Tune" mode which causes fldigi to insert a tone at the current waterfall frequency. The peak-to-peak amplitude of this tone is the standard by which you should set your transmitter drive or adjust your antenna matching network.
• The right most button is normally not visible. This is the count-down timer button that is enabled when a macro button has been configured to repeat after a specified number of seconds. This button shows the count-down to the next transmission. Pressing the button disables the count and restores fldigi to normal keyboard operation.
Chapter 59

Mode Table

59.1 PSK

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<th>Mode</th>
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<th>WPM</th>
<th>BW (Hz)</th>
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**59.9 FSQ**

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<th>RSID-2</th>
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<td>33-FSK</td>
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### 59.10 IFKP

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### 59.11 MT-63

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<td>50</td>
<td>500</td>
<td>64 x 2-PSK</td>
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<td>500HJ2DEN</td>
<td>9</td>
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<td>MT63-1000</td>
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<td>100</td>
<td>1000</td>
<td>64 x 2-PSK</td>
<td>-14</td>
<td>1K00J2DEN</td>
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<td>MT63-2000</td>
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### 59.12 Olivia

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### 59.13 RTTY

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<td>RTTY 50</td>
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## 59.14 THOR

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<td>1800</td>
<td>2x tone spacing 1 sec interleave</td>
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<td>0.5 sec interleave</td>
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## 59.15 THROB

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<td>THROB2</td>
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<td>20</td>
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<td>1/2 of 9-FSK</td>
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<td>THROBX2</td>
<td>2</td>
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<td>188</td>
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<td></td>
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<td>146</td>
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</table>
Chapter 60

CW Keying

![Figure 60.1 Timing and QSK](image)

Click on the Configure menu item to open the `fldigi` configuration dialog. Click on the Modems tab and then on the QSK tab.

1. Set the Pre Timing and Post Timing to zero.
2. Activate the QSK feature by clicking "QSK on right channel".

Click the CW tab and adjust the CW settings to your preference. Use the Test char and the Send continuous controls to ease the adjustment process.

FLdigi is now ready to generate a 1600 hertz CW tone on the right channel of the stereo audio out of your sound card.

The left channel will be the normal raised cosine shaped CW wave form that you may use for your side tone.

The following circuit may be used to take the FLdigi QSK OUT signal from the right channel of your SOUND CARD to key your transmitter or a QSK circuit.
NOTE: L1 - Radio Shack has two items that may be used for this isolation transformer.

- Catalog # 270-054
- Catalog # 273-1374

Attach an audio cable from the Rt. Channel out of the your computer's SOUND CARD to the input of this QSK INTERFACE CIRCUIT (input of L1). Attach another cable from the output of this circuit to your Rig's Keying Jack.

Every CW tone that is generated by FLdigi is rectified by this FULL WAVE VOLTAGE DOUBLER circuit. The resultant voltage turns the Q1 transistor on and "grounds" the collector, which takes the RIG'S CW KEYING JACK to ground and "keys" the transmitter.

You can adjust the start and stop timing of the QSK circuit relative to the CW waveform with the "pre" and "post" settings.
Chapter 61

nanoIO Circuit Diagram

- J1 - FSK signal line
- J3 - CW signal line
- J5 - PTT signal line
- J7 - unused

Return to nanoIO page
Chapter 62

Using the FLdigi Rt. Channel for transmitter PTT

This interface is designed to take advantage of the Right Speaker tone output in FLdigi for actuating the PTT. It is especially useful for interfacing a small notepad with minimal I/O capability to a radio. It has been my experience that complete ground isolation between a laptop and the radio (including eliminating any kind of rig control) provides the minimum QRM to the receiver from the laptop. The Headphone and Mic connections are the only computer connections necessary.

The tone output is coupled through a transformer to maintain complete ground isolation between the computer and the radio. There is no external power required for this interface and an FET is used to provide the PTT output. I use transformers in both the audio input and output paths to complete the isolation.

Note that two of the transformers are wired to the single stereo jack from the Speaker output of the computer. The normal Left Speaker Output (TIP) is used to provide the modulating audio for the radio transmit input while the Right Speaker Output (RING) provides the tone output that drives the PTT circuit. The SHELL of the connector provides the return path for both signals.

Audio from the radio is supplied to the MIC input on the computer for demodulation by the FLdigi program.

Somewhat higher output from the computer is required to reliably operate the PTT circuit and the audio balance control in the computer is used to reduce the output to the radio to the level required for normal modulation. Since the right speaker tone output is not the same audio used to modulate the radio, no signal distortion is caused by the clipping action of the diode rectifiers used in the PTT circuit.

To configure FLdigi to use this interface go to (Configure/Rig Control/Hardware PTT) and check only the (PTT tone on right audio channel) box.
Figure 62.1 W5ZIT Interface

Figure 62.2 TS-2000 ACC-2 to DB9 Adapter
Chapter 63

Command Line Switches

63.1 Linux Terminal

Usage:
   fldigi [option...]

fldigi options:

--home-dir DIRECTORY
   Set the home directory to full pathname of DIRECTORY
   fldigi will put the file stores
   .fldigi.files, and .nbems.files
   in this directory
   The default is: /Users/robert/

--config-dir DIRECTORY
   Look for configuration files in DIRECTORY
   The default is: /Users/robert/.fldigi/

--enable-io-port <1|2> ARQ=1 KISS=2
   Select the active I/O Port
   The default is: 1

--kiss-server-address HOSTNAME
   Set the KISS UDP server address
   The default is: 127.0.0.1

--kiss-server-port-io I/O PORT
   Set the KISS UDP server I/O port
   The default is: 7342

--kiss-server-port-o Output PORT
   Set the KISS UDP server output port
   The default is: 7343

--kiss-server-dual-port Dual Port Use (0=disable / 1=enable)
   Set the KISS UDP server dual port flag
   The default is: 0

--arg-server-address HOSTNAME
   Set the ARQ TCP server address
   The default is: 127.0.0.1

--arg-server-port PORT
   Set the ARQ TCP server port
   The default is: 7322

--flmsg-dir DIRECTORY
   Look for flmsg files in DIRECTORY
   The default is

--auto-dir DIRECTORY
   Look for wrap_auto_file files in DIRECTORY
   The default is WRAP/auto/
--xmlrpc-server-address HOSTNAME
   Set the XML-RPC server address
   The default is: 127.0.0.1

--xmlrpc-server-port PORT
   Set the XML-RPC server port
   The default is: 7362

--xmlrpc-allow REGEX
   Allow only the methods whose names match REGEX

--xmlrpc-deny REGEX
   Allow only the methods whose names don’t match REGEX

--xmlrpc-list
   List all available methods

--cpu-speed-test
   Perform the CPU speed test, show results in the event log
   and possibly change options.

--noise
   Unhide controls for noise tests

--wfall-only
   Hide all controls but the waterfall

--debug-level LEVEL
   Set the event log verbosity

--debug-pskmail
   Enable logging for pskmail / arq events

--debug-audio
   Enable logging for sound-card events

--version
   Print version information

--build-info
   Print build information

--help
   Print this option help

Standard FLTK options:

-bg COLOR, -background COLOR
   Set the background color

-bg2 COLOR, -background2 COLOR
   Set the secondary (text) background color

-di DISPLAY, -display DISPLAY
   Set the X display to use DISPLAY,
   format is ''host:port''

-dn, -dnd or -nodn, -nodnd
   Enable or disable drag and drop copy and paste in text fields

-fg COLOR, -foreground COLOR
   Set the foreground color

-g GEOMETRY, -geometry GEOMETRY
   Set the initial window size and position
   GEOMETRY format is ''WxH+X+Y''
   ** fldigi may override this setting **

-i, -iconic
   Start fldigi in iconified state

-k, -kbd or -nok, -nokbd
   Enable or disable visible keyboard focus in non-text widgets
-na CLASSNAME, -name CLASSNAME
  Set the window class to CLASSNAME

-ti WINDOWTITLE, -title WINDOWTITLE
  Set the window title

Additional UI options:

--font FONT[:SIZE]
  Set the widget font and (optionally) size
  The default is: ArialMT:12

63.2 Windows Icon Properties

Setting command line parameters on all versions of Windows is accomplished by modifying the parameters of fldigi's
desktop icon. Open the icon by right clicking on the icon. This is an example of modifying the font size:

![Figure 63.1 Windows 8.1 Properties](image1)

The before and after for changing the font size:

![Figure 63.2 Windows 8.1 Original Font](image2)

![Figure 63.3 Windows 8.1 Larger Font](image3)
Note the space between the location of the executable and the command line parameter. Multiple parameters can be entered. Each parameter must be exactly as shown in the list and separated from its neighbors by at least 1 space. If the parameter has spaces in the value then it must be enclosed in quotations. For example:

```
–home-dir "C:\Documents and Settings\dave\fldigi-vhf.files"
```

For `–home-dir` I would also recommend changing the name of the launcher icon.

### 63.3 Mint Launcher Properties

Linux users may also change the command line parameters. Here is an example of modifying the fldigi icon that was added to a Mint-17 launch bar:

![Figure 63.4 Mint Launch Bar Icon Properties](image)

![Figure 63.5 Mint Larger Font](image)

Changing the font or font size can result in some loss of text on a control label. The size of a control and its label space do not change when the font is modified on the command line.
Chapter 64

License(s)

64.1 Copyright

Copyright ©

- 2006 through 2014 Dave Freese, W1HKJ
- 2007, 2008, 2009 Stelios Bounanos, M0GLD
- 2008, 2009 Stephane Fillod, F8CFE
- 2009 John Douyere, VK2ETA
- 2013 Remi Chateauneu, F4ECW
- 2013, 2014 Robert Stiles, KK5VD
- 2014, John Phelps - KL4YFD

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You should have received a copy of the GNU Library General Public License along with the source code for fldigi; if not, write to the Free Software Foundation, Inc. 51 Franklin Street, Fifth Floor Boston, MA 02110-1301 USA.
Chapter 65

Recognitions

This software would not have been possible without the contribution of many programmers who have given their best to the open source community. The application is built upon the foundation of the Fast Light Tool Kit (http://www.fltk.org), a wonderfully fast and efficient graphical user interface design library. Many have asked what the Fast Light means. There are probably as many answers as there are programmers using the toolkit. I prefer to think of it as lightning fast and light on the code size. Take a look at the size of the executable for fldigi and then compare it with similar applications. I think you will be surprised by how small it is for what it does.

The active current development team consists of:

- Dave Freese - W1HKJ
- Stelios Bounanos - M0GLD
- Remi Chatauneu - F4ECW
- Leigh Klotz - WA5ZNU
- Stéphane Fillod - F8CFE
- John Douyere - VK2ETA
- Joe Veldhuis - N8FQ
- Chris Sylvain - KB3CS
- Gary Robinson - WB8ROL
- Stefan Fendt - DO2SMF
- John Phelps - KL4YFD
- Andrej Lajovic - S57LN
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  - Christian W. Correa - HK4QWC
- Deutsch - German
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- Français - French
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  - Pierfrancesco Caci - IK5PVX
- Język - Polish
  - Roman Bagiński - SP4JEU
- Nederlands - Dutch
  - Peter van der Post - PA1POS

Several authors have placed their digital modem code and signal processing code in the public domain and their source was either an inspiration or in some cases formed the backbone of the code used in Fldigi.
• AE4JY - WinPsk - a windows application
• Tomi Manninen, OH2BNS - gmfsk - a great digital modem program for Linux
• Hamish Moffatt, VK3SB - dominoEX code originally for gmfsk
• Dr. Steven W. Smith - author of "Digital Signal Processing", who has kindly placed an entire book on digital signal processing on the internet. (http://www.dspguide.com)

If you make a side-by-side comparison between gmfsk and fldigi source code you will see that they follow the same general structure. The primary difference is that gmfsk is written in the C language and uses the gnome/gtk libraries for the user interface. Fldigi is a C++ application that uses the Fast Light Tool Kit (Fltk) gui library. The design of Fldigi puts emphasis on separating the user interface from the sound card and transceiver input/output operations. Nearly all modern digital modem programs use a programming paradigm called "threads." Threads are light weight processes that share the same memory space, but each has its own stack. The use of threads makes the program look and feel responsive to the user while a lot of code is being executed in the background.

Many of the modem source code files are C to C++ rewrites from the gmfsk application. They say that copying is the best form of flattery and gmfsk simply had the best explanations and the easiest source code to read and understand. The author had also spent several months creating improvements and fixing bugs in the original gmfsk application. That exercise was the impetus to create Fldigi.

The Fast Fourier Transform used by Fldigi is a rewrite of John Green's public domain FFT code (FFT for RISC for MAC). The rewrite is in C++ and is implemented as a C++ template. Some of the signal processing algorithms used in Fldigi are from Dr. Smith's book. His on-line publication is sufficient to allow you to become fluent in FFT analysis and the creation of digital filters. I printed the relevant pdf files and then purchased the hard bound copy. Improvements to the original gmfsk signal processing algorithms can all be attributed to this excellent source.

And last but certainly not least, I must thank the crew who perform alpha testing and on-line support of the application. These are stalwart amateurs who risk their operating system and radio equipment in testing, testing and more testing. Their only reward is in being able to influence the design of the application and the fun of seeing it work and the bugs disappear. Thank you to:

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<td>KL7NA Rob</td>
<td>PA3GWH Richard</td>
<td>WU9Q Bob</td>
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and many others whose names are not listed, please accept my apology.

The test team is representative of users on Windows, Linux, Free BSD and OS X operating systems. They have varying interests from very slow speed CW to high speed keyboard full break-in CW, from RTTY contesters to PSK rag chewers. They have insisted that fldigi perform well under all of those operations. I have been amazed by the global distribution of the testing team. It is easy to think that the internet will be the death of amateur radio. On the
contrary it opens up so many additional ways for us to be cooperative.
Chapter 66

Using KISS compatible programs with FLDIGI

The below listed host programs make use of FLDIGI extended KISS TNC hardware commands. While any KISS over IP compatible program should work, only the following have been tested by the developers of FLDIGI. Setting up FLDIGI to use KISS require the use of the KISS I/O port. see Configure ARQ/KISS I/O page for instructions.

66.1 BPQ32

BPQ32 is beyond the scope of this document. The following links are available for detailed information about the program and it's use with FLDIGI.

Documentation:
  - BPQ32 Documents
  - BPQ32 Documents (FLDIGI)

Installation files:
  - Program and Support Data

Note:

The Macintosh Binary located on John's website are for PowerPC systems. Binaries for Intel systems are available on request by contacting Robert, KK5VD kk5vd(at)yahoo(dot)com or via John's email listed below.

Any inquires about the software can be directed to:
John Wiseman, G8BPQ john(dot)wiseman(at)cantab(dot)net

66.2 UIChat

For those who have used FLDIGI's FSQ interface, Mitch Winkle AB4MW has created a Java application that mimics FSQ interface while allowing the operator to use any of FLDIGI 8 bit KISS compatible modems.

Program and Source code: https://sourceforge.net/projects/uichat/

66.3 YAAC - "Yet Another APRS Client"

Andrew Pavlin, KA2DDO has created a APRS client and Internet gateway package. Details about this software can be found in the following links.

YAAC website: http://www.ka2ddo.org/ka2ddo/YAAC.html
YAAC source code: https://sourceforge.net/projects/yetanotheraprsc/

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