

## HFFAX Documentation

### Connecting Your Radio

Connecting your radio to your Mac:

You simply need to connect the audio output of your radio to your Mac's audio input (this is the jack on the back, usually with a little microphone icon). A standard 1/8" phono plug will work fine. Monophonic is fine. You can pick up a patch cable from any consumer electronics store. Get a cable with the correct plug to fit into your radio.

You may wish to place an isolation transformer in the cable, to reduce hum caused by ground loops.

If you have a Mac without sound input, you can use a USB microphone. We've successfully used the iMic by Griffin, as well as many other USB sound input/output devices.

You can either tap the audio from your radio's headphone or external speaker jack, or a line level or "Record" output. You'll need to experiment to see what works, and what the signal levels are. There are too many possible combinations and Mac models to give you a definitive answer for each particular setup.

### Starting Up

Double click on the app icon. The first step is to select the sound input device. There is a popup menu near the right side of the window, which selects the sound input channel. Usually the options are Built-In Microphone and Built-In Input, select the latter to use the cable you plugged into the Mac.

If the PLAYTHRU button is turned on, the app will play sound from the radio through the default sound output channel on your Mac. This can be handy to verify your Mac is getting audio from your radio.

Directly above the sound input popup menu and PLAYTHRU button is a display of the received audio spectrum. This display will often have one or more red vertical lines, used as a guide to help tune in signals correctly.

Directly to the right is a volume indicator. To the right of this is a slider which adjusts the audio input gain. This slider is grayed out if the input device you selected does not support gain adjustment.

Above this is the Filter button. For many modes, this button can be used to apply an audio filter centered on the signals of interest, improving decoding accuracy.

Assuming you still have your radio connected and tuned into a signal, you should see activity in the volume indicator. This verifies that the app is getting the audio input, and can be used to help set the audio volume level from your radio. You want to avoid it staying pegged too high, this would mean the audio is being clipped, which will cause problems when trying to decode the signal.

For most HF FAX decoding, make sure these buttons are toggled ON:

GRAY (greyline)

576 (IOC)

120 (LPM)

HF (Fax Mode)

## Menus

### File menu

#### Decode From File...

This allows you to select an AIFF or WAVE format sound file, and decode using the recorded sound in that file. This is very handy if you've previously recorded some audio, or someone sends you a digitized sound file. Please note that the file must be in the WAVE format, sampled as 16 bit audio at 44100 kHz monophonic.

#### Stop Decoding From File...

Stops decoding from the file, goes back to line audio.

#### Save Image ...

This allows you to save a FAX or SSTV picture to disk. It can be stored in various formats, such as PICT, JPEG, TIFF, etc. You'll be asked which image format you'd like to use. Images are saved in a directory named com.blackcatsystems.hffax1 in the Pictures directory for your user account.

### Edit menu

#### Copy Image

Copies the image to the clipboard.

## FAX

Fax mode is commonly used to decode weather maps, this is also referred to as HFFAX or WEFAX mode. It is also possible to decode pictures directly from weather satellites. Since these two modes use different modulation methods, it is necessary to select which mode should be decoded.

You may also want to visit the following web site for more information about FAX mode, including station schedules:

<http://www.blackcatsystems.com/radio/fax.html>

## Buttons

Two buttons, called HF and SAT, select the mode. HF is used for weather fax over HF (shortwave) radio, SAT is used to decode APT transmissions from weather satellites.

Next, the correct speed must be selected. The speed is measured in lines per minute (LPM), and possible selections are 60, 90, 120, 240 LPM. For HFFAX, 120 LPM is almost always used. For POES satellites, 120 LPM is generally used, for GEOS, 240 LPM.

The IOC (Index of Cooperation) must be selected. For HF FAX, this is almost always 576, as is also used

for POES satellites. GEOS satellites use 288.

You may select whether to display gray scale, or line mode (black and white). Gray scale should be used for satellite images (which are also sent via HFFAX stations) and other images where shades of gray are sent. Line mode is useful when weather maps are sent that have no shading information. It is possible to display these in gray mode, but improper tuning and noise may affect the picture quality. In these cases, line mode may provide a better image quality.

AUTO mode attempts to use the phasing and start/stop tones sent by HFFAX stations to properly synchronize to the fax signal. When a start tone is detected, the app will clear the display, lock onto the fax signal, and properly align the image. When a stop tone is detected, if the auto-save button is on, the fax image will automatically be saved to disk with a unique filename based on the date and time of day. This mode can be useful for unattended reception of weather fax.

When you start decoding in fax mode, the decoded fax document is displayed in real time in the Window. Proper tuning of your receiver is necessary to correctly decode and view the fax. If the image appears negative (white on black) you may want to change from LSB to USB mode, or vice-versa. You need to very carefully tune the radio to achieve proper reception. Note that proper tuning for FAX decoding may NOT mean tuning your radio to the actual frequency of the station, an offset may be necessary. For most fax stations, you must tune 1.9 kHz below the carrier frequency. For example, the USCG in Boston uses a carrier frequency of 6340.5 kHz. Tune your radio to 6338.6 kHz (in USB mode) for proper reception.

To aid this process a tuning display is available located in the information window near the buttons. This displays a spectrum of the received signal. The two red line indicates 1200 Hz and 2300 Hz, the black and white pixel fax frequencies. You want the signal to be between them, usually you will see spikes on both red lines when properly tuned in, as most fax images consist mostly of black and white pixels.

If you find that the picture is slanted, then the Timing Delta will have to be adjusted. See below for details.

The + and - buttons zoom the display out and in. This can be helpful if you're trying to fit a large fax onto a small monitor.

Chances are, when you start to decode a fax, you won't be correctly aligned in the horizontal direction. Pressing the << or >> button will slightly shift the decoding to the left or the right. If you hold down the option key while clicking, the shift will be ten times as large, allowing you to make large shifts quickly.

When you reach the bottom of the window, no new image information is displayed. You can click the clear button to clear the display, and start decoding new information at top of the display..

The >- and <+ buttons adjust the "Timing Delta". This is a correction for computers that do not sample audio at exactly 44.1 kHz. As you press them, the Timing Delta is changed by 0.1 units. This is displayed in the status display under the buttons such as FAX @ 0.0. If you find that decoded fax images are slanted, you can use these keys to adjust the received timing. We find that on most modern Macs, the timing is excellent, and this can be left at or close to 0.0.

Holding down the option key while clicking one of the Timing Delta buttons will change the value by ten, and holding down shift will change it by 100. This is useful if you need to make large changes.

It is possible to scroll around the fax window using the scroll bars. The window size may also be changed to suit your display.

The INV button, when clicked, will invert the image (black becomes white, white becomes black, etc). This is useful if your radio only tunes “SSB”, not both USB and LSB, and you are in the wrong sideband mode.

When AUTO SAVE is enabled, received fax images will be saved to disk. Note that the received fax signal must be of good enough quality that the app can detect the start and stop tones, or images will not be saved. They will be saved to your Pictures directory. You can also click SAVE to do this manually.

The Auto mode does require careful tuning - an error of a few hundred Hz will cause it to not work properly, or not at all. Also, sources of interference (other stations, noise/static on the radio, etc) can cause Auto mode to not recognize the start/stop tones transmitted by the fax station, or false detect them when they were not sent. Shortwave radio is not perfect, so you may need to manually start and stop reception of images, save them, or align them.