Black Cat HF Weather Fax Version 2.3.0 February 24, 2024

Black Cat HF Weather Fax is an app to receive weather fax transmission sent over shortwave radio. The emphasis of this app is good reception of even weak signals received under marginal conditions.

Requirements:

Macintosh: macOS 10.9.5 or later.

Windows: Windows 8, 10, 11.

Installation:

Presumably you've gotten this far, and have downloaded and unzipped the .zip file.

If you are running on macOS, move the application anywhere you wish.

If you are running Windows, you can move the entire download directory/folder wherever you wish, but you must keep the Libs and Resources directories with the EXE file, or the app will not run.

First Things First:

Run the program by double clicking on the app's icon. You'll see the main window.

You need to set a few things up.

First, the directory where saved images will be stored. Select Set Image Save Directory from the File menu to do this.

Second, select the correct sound input device. This is done via the Sound Input popup menu. Also set the input gain appropriately (note that not all sound input devices let you change the gain).

Third, if you wish to use the Black Cat SDRuno plugin, select Preferences from the Edit menu, and check the Use SDRuno Plugin checkbox. Note that communications between SDRuno and this app use UDP ports 58283, 58284, and 58286. Make sure you do not have any Firewall or other settings blocking these ports or blocking this application or SDRuno from using networking, or the plugin will not work. If you wish to

directly receive sound from SDRuno via the plugin rather than use a virtual sound device, select Streaming as the sound input device.

Control of SDR# and Elad SW2 is also possible, please see the section further down titled Preferences Window for details about configuring this.

The Basics:

I'd strong suggest reading the entire documentation below, so you know how to use the app. But here are the basics, to receive weather fax images.

Make sure you have selected the correct sound input device and set the gain appropriately.

Feed sound into that device from your radio, set the volume of the radio appropriately. The volume indicator should be showing activity, but not pegged to the right.

Tune to a radio fax frequency, using USB mode on your radio. Most guides list the carrier frequency, you should tune your receiver 1.9 kHz lower than this.

For a first test, make sure the Free Run box is checked. This will allow the program to continuously display received fax data, even without receiving the start of fax signal. This will let you make sure things are working correctly, and allow you to set the slant.

You should see activity in the spectrum display, with most of the audio between the two darker ticks on the X axis, representing 1500 Hz (black) and 2300 Hz (white) audio. You should also see a picture start to form on the display, updating at to lines per second. Hopefully it looks like something recognizable, but it might be slanted.

You can set the colors of the spectrum display by right clicking on it.

Fax software requires the audio sample rate to be precisely calibrated. Unfortunately, it varies from computer to computer. So it needs to be configured, usually just once.

While the fax is being received, check to see if the black line on the edge is running straight up and down the page (it will probably not be at the edge like it should be, that is OK for this test), or if it slants to the left or right. Use the six slant buttons to adjust the slant to make it vertical. The buttons with just one arrow > or < adjust the slant a little bit, with two arrows more, and three arrows even more per step. Just iterate back and forth until it is straight up and down. That's it. The slant value will be saved, and you most likely will not need to change it again, unless the fax station in question has timing that is off, then you may need to slightly adjust it.

You can then use the offset buttons to adjust the received image to the left or right, to align the edge of the transmitted “paper’ with the edge of the display. Normally you will be receiving in Auto mode, and this is not necessary, but you can do it manually if needed, such as if you tuned in to a fax transmission already underway, and had to manually start it.

Check the Auto box, and the software will listen for the special start and stop tones sent at the beginning and end of faxes, and use that to trigger reception. Note that you need a good quality signal from the radio, if there is a lot of static or noise, they may not be properly detected. Normally you would want the Free Run box unchecked when using Auto mode.

If the Auto Save box is checked, the end of fax tone will be used to automatically save the image, the filename will be a timestamp. You can also click the Save button to save an image, this can be done even when the image is only partially received. The popup menu selects whether JPG or PNG format is used for saved images.

The invert checkbox will reverse the audio tones, it can be used if your radio only receives in LSB, and not USB mode.

The 576/288 popup menu is used to set the IOC for the fax image, 576 is standard and should always be used, unless you know the station uses 288.

The 60/120 popup menu is used to select the lines per minute (LPM). Virtually all fax sent today is 120 LPM, the exception being Kyodo Japan which uses 60 LPM.

The 0 / 90 / 180 / 270 degrees popup menu can be used to rotate the received image display.

There is another popup to switch between grayscale ,black and white images, and Sat (137 MHz APT Satellite mode) normally grayscale is used, B&W can be selected if you know the transmitted image is B&W, it will sometimes improve legibility.

The Zoom In and Out buttons can be used as expected to make the image larger or smaller.

Start and Stop can be used to manually start or stop reception, and Clear will clear the received image and restart reception.

137 MHz APT Satellite Mode:

Select Sat from the mode popup menu. Tune your receiver to the satellites frequency, note you need to use FM mode with a bandwidth of about 30 kHz. Currently there is no

auto alignment of the received image, so use the offset buttons to correctly align the image, as well as the slant buttons as necessary.

Upcoming Transmissions Window:

Select Upcoming Transmissions from the Edit menu to display a window with a list of fax transmission schedules. This are sorted, so the transmissions currently on the air are at the top of the list, upcoming transmissions are next, in chronological order. Not that the start/stop times are **approximate** and that many fax stations do not continuously transmit, but have breaks between images.

Click on a transmission, and the frequency will be copied to the clipboard, so you can paste it into your SDR app. No more typing!

If you select a future transmission (not on the air now), you will get a notification when it starts. The Alert time can be used to get this notification early, enter in the number of seconds of lead time.

Enter a value into the Freq Offset box, and it will be added to the carrier frequency. In general, enter -1.9 into this box and the displayed frequencies will adjusted so they are the correct frequency to tune your radio to in USB mode.

This window can also keep track of the appropriate slant value to use for each fax transmitter, since they can vary from station to station. This is accomplished by using the Slant column in the window. You can enter a slant value here for each entry. If there are multiple transmission times for a given frequency and station, it will be automatically entered into the slant field for these other additional entries. Values are saved when you quit the program. To make entering values easier, if you click on the current slant value in the main window, it will be copied to the text clipboard. You can then paste it into the list, instead of having to type it.

When you double click on an entry in the list, that slant value will be applied to the main window. This way it is automatically set, and you don't need to manually change it. Note that you may need to tweak the value sometimes, as the timing of a fax station can vary/drift. As can the audio sample rate of your computer sound card, SDR program, etc. But it will at least get you into the correct ballpark.

Preferences Window:

Auto copy saved image to clipboard – handy if you want to paste the image elsewhere.

External software control type popup menu – selects which SDR program can be controlled (tuned frequency set by double clicking an entry in the fax schedule window):

No control – not controlling any programs
SdrDx Control
sdrUNO Plugin
Elad SW2
SDR# NetRemote

Based on the above selection some additional settings may become visible:

Loopback – restricts packets to address 127.0.0.1 vs the entire network

UDP Send Port: Used to manually set the UDP port for inter app communications.

UDP Rcv Port: Used to manually set the UDP port for inter app communications.

Address: The IP Address of the machine running the SDR software.

Satellite Auto Start Min/Max Elevations: In satellite mode, elevation data from DX ToolBox is used to trigger start/stop and saving images.

Custom Filtering: When checked, you are able to adjust the audio filtering parameters in the software's DSP code from their default values. There are two values that can be changed:

Length: The length of one of the filters, which has a default value of 24, and can be varied from 1 to 24. Shorter values imply less filtering.

Decay: Controls the exponential decay filter, can be varied from 0.01 to 1.00, the default value is 0.03. Larger values imply less filtering, smaller values less filtering.

There are tradeoffs between the amount of filtering, image quality, noise rejection, etc. Too little filtering can also affect detection of the start/stop tones (or cause spurious detection of them). In general, more filtering reduces noise but can produce a blurry/smeared image, less filtering means a sharper image but potentially with more noise (and other issues).

If you want to use custom values, you will need to experiment to see what works best for you. If you ask me what the "best" values are, I will suggest that you to use the default values ☺

Frequency tuning script: See the section further down in the documentation for more details.

Image Editing Window:

This window lets you perform some basic editing on saved fax images:

• Scroll the image to the left or right, useful if it was not correctly horizontally sync'd
• Adjust the slant of the image
• Crop the top or bottom of the image

Select Open and Edit Received Image from the File menu and select the saved weather fax image.

Editing is performed by use of several keys. Make sure the image has keyboard focus by clicking on it first.

To scroll the image to the left or right, use the left or right arrow keys. The shift key can be held down to scroll more with each keypress, and both control and shift even more.

To adjust the slant of an image, use the up and down arrow keys. Again, shift or control and shift can be used to increase the amount of change with each keypress.

To crop (remove) some of the top of the image use the] and [keys. Holding down shift, so you use the } and { keys, will increase the amount of change with each keypress.

To crop (remove) some of the bottom of the image use the , and . keys. Holding down shift, so you use the < and > keys, will increase the amount of change with each keypress.

You can copy the edited image to the clipboard by selecting Copy Image from the Edit menu.

You can save the edited image by selecting Save Edited Image from the File menu.

Logging Window:

Black Cat HF Weather Fax can log reception of fax transmissions, either manually or automated. Open the Logging Window by selecting it from the Edit menu.

In the main window, there is a text field called Frequency. If this field contains a frequency, then when the fax image is manually saved, or the end tone is detected, the station will be logged and added to the list of logs displayed in the Logging Window. If you click the Void button to the right of this field, the frequency will be cleared, so subsequent receptions will not be logged.

If the Auto Set Freq checkbox in the schedule window is checked, then whenever a station is selected in this window (by double clicking on the entry) the frequency in the main window will be automatically set.

Stations are logged based on their frequency (with the assumption all frequencies are unique), which is the center frequency minus the frequency offset as set in the schedule window (normally -1.9 kHz). Please keep this in mind if you manually set the frequency! If the frequency is not valid for any known fax station, it will not be logged.

You can edit any fields in the logging window by clicking on them twice to go into text edit mode.

The starting and ending timestamps must be of this format:

YYYY-MM-DD HH:MM:SS

For example:

2022-03-29 13:56:22

Graphical Schedule and Loggings Window:

Select this window from the Edit menu. It displays a list of fax frequencies, including the station callsign and name, as well as a graph of the times they may be on the air, along with a graph of times of the day they have been logged in the above Logging Window.

The times the station may be on the air are indicated in red, the times they have been logged in blue. In addition, the current time is indicated by a thin yellow line.

Note that fax stations often have gaps in their transmission schedule when no images are being sent.

Only show logged can be checked to only display stations you have logged, to reduce clutter.

Programmable Schedule Window:

Select this window from the Edit menu. This window lets you create a schedule of fax frequencies to automatically tune to at defined times, allowing for un-attended monitoring of several stations.

Create a new entry by going to the fax transmissions schedule window and right clicking on an entry and select Add to programmable schedule window. It will be added, and you can then edit the start time as desired (you can edit other fields as well if you wish). At that time of the day (when this window is open with the schedule loaded) the frequency will automatically be set (assuming you have enabled and configured radio control in the software), the slant value will also be set.

You can then create additional entries as desired. Right click on an entry if you wish to delete it, or duplicate it, to edit the time and create an additional entry for the same station.

Take care not to have two or more entries set to the same start time, or only one will be used.

SDRuno and SDR# Integration:

Please refer back to “First Things First” section near the beginning of this documentation, and consider using the Black Cat SDRuno plugin instead of UnoUDP, as it is the preferred interface now, and UnoUDP is no longer officially supported.

Our free UnoUDP app can be used to let Black Cat HF Weather Fax control SDRuno as well as SDR#, and set the received frequency by double clicking on an entry in the transmission schedules window

Download UnoUDP from this URL:

http://blackcatsystems.com/download/UnoUDP.zip

There is an included README.txt file with instructions, but in a nutshell:

Open the Preferences window from the Edit menu in Black Cat HF Weather Fax.

Set the UDP Send port numbers to what you set the UDP Rcv Port number in Uno UDP.

That is, if you used the example above, you will enter 58084 into the UDP Send Port.

This app does not use the UDP Rcv Port, but you need to set it to a number larger than 1023 anyway.

You do not want to set it to the same port as DX ToolBox, so I suggest setting it to 58085.

Close the preferences window.

You should be able to double click on a entry in the Fax Transmissions Schedule window, and SDRuno will be set to that frequency.

If you would like Black Cat HF Weather Fax to automatically launch Uno UDP at startup, click on the Uno UDP button in the Preferences window, and navigate your hard drive and select the Uno UDP application. The path to the application will be displayed. If you want to stop the automatic launch, click the button and don’t select a file, and the path will be cleared.

KiwiSDR Python Sound Script Integration:

I wrote a Python script which connects to a local or remote KiwiSDR, and streams the audio to a virtual audio device on your computer in real time, so you can route it to a decoding program, such as for SSTV, FAX, RTTY, and so on. The script may be downloaded here:

https://www.blackcatsystems.com/software/kiwiSdr-sound-client-virtual-audio-device.html

The webpage offers some basic instructions for using the script. Please note that I unfortunately I cannot offer any technical support with getting this script to run on your computer, or with Python in general. I apologize, but there are too many variables involved to be able to offer any practical support. Thank you in advance for your understanding.

Black Cat HF Weather Fax can be configured to automatically execute this script, so you can tune into a fax station and decode it, whether on your personal KiwiSDR or a remote KiwiSDR. Before trying to do this, make sure the script is functional on your computer and you know how to invoke and use it.

To launch the script, select a transmission in the Fax Transmissions Schedule window (click on a line) and then select KiwiSDR from the Edit menu (shortcut cmd/control-B). A window will open. The first time it opens, nothing will happen, because you have not yet specified the path and script information.

You need to enter this information in the Script path text box. The text you enter should be exactly the same text you need to invoke the script from a command/terminal window, with a full path to the script, but without some of the arguments. For example on one of my Macs:

python /Users/Chris/kiwiclient/kiwisound.py -s 192.168.0.75 -p 8073 -m usb -L 1300 -H 2500 --out-device 5 --ncomp --resample 12000

Note this will NOT work on your system of course! You need to use the path to the script on your computer. Also note that we're leaving out the frequency (-f) and echo (—echo) arguments as they will be supplied by the Fax program. So paste the correct text into the box. I'd advise checking the Echo Audio box. Close the window. The information you entered will be saved.

Now open the window again the same way as before, to tune in a fax station. Hopefully it will work this time. If it does, you will hear audio, and you will see a few lines of scrolling next with the real time signal strength information for the tuned station. The bottom of the window will display the actual command line text that was executed, with the frequency and echo arguments added.

If it does not work, then you will probably see some sort of error message instead returned from the shell. Hopefully this will provide a clue as to why it did not work, and you can edit the script path/arguments and try again. As before, please note that I cannot provide assistance with debugging errors.

When you close the KiwiSDR Python Sound Script window, the script will stop executing.

Frequency Tuning Script:

Black Cat HF Weather Fax can call a user supplied script to tune your radio when you double click on an entry in the transmissions schedule window.

To set the script select Preferences in the Edit menu. A window will open with a text field. In this field you can type the shell command to be issued. For example, I have it set to issue this command to execute a Python script:

```
C:\Python27\python.exe c:\Users\Chris\uno.py
```

The first part of the text executes Python, the second part is the path to the script. When the script is executed, Black Cat HF Weather Fax will append the frequency in kHz which your script can parse out as an argument, and use.

Here is the script itself, it sends a message to SDRuno via a virtual COM port.

```
from serial import Serial
import sys

argc=len(sys.argv)-1

if argc>0:
    freq=float(sys.argv[1])
    freq=freq*1000 ## hz
    ser=Serial('COM3')
    s=str(int(freq))

    while len(s)<11:
        s='0'+s

    s1="FA"+s+";"
    ser.write(s1)
```

Please note that you need to write/supply your own script. Due to all the various radio models out there, the vast majority of which I do not own and have no experience with, I am unable to provide assistance with writing, troubleshooting, or otherwise helping with such scripts. Not even the above script and SDR app :) Thank you in advance for your understanding.

Revision History

February 24, 2024 – 2.3.0
Fixed bug – help tooltips not always displaying.

March 29, 2022 – 2.2.0
Added logging window.
Added graphical schedule window.
Stores/restores window positions.

January 25, 2021 – 2.1.0
Added interfacing with Elad FDM-SW2 and SDR Sharp.
Added custom signal filtering options.
Fixed a bug that could cause a crash.
Added and corrected tooltip text for some of the controls.

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