

MultiMode Cocoa Version 6.9.0 January 13, 2021

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Morse Code (CW)

FAX - Weather and Satellite

RTTY -Radio-Teletype, Baudot and ASCII

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ACARS - VHF aircraft messaging

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ZVEI3, PZVEI, DZVEI, PDZVEI, NATEL, EURO, MODAT, CCITT, VDEW, CCIR7,
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HELL

PSK31

SSTV - Slow Scan TV

GWB - Globe Wireless Bitanalysis

GMDSS - Global Maritime Distress and Safety System

DGPS- Differential GPS

LORAN-C - Navigation transmissions

BIT ANALYSIS - Automatically determine RTTY settings

Requirements

Computer

Macintosh computer running Mac OS X 10.6.8 or later, Intel based.

Sound input is required. If you have a Macintosh model without sound input, a USB sound input device (such as the Griffin iMic) may be used.

If you wish to control the PTT (Push To Talk) line of a transmitter, a serial port and appropriate interface hardware (such as the RigBlaster) is required. Most USB/serial adapters work fine, we have usually had good luck with FTDI based adapters.

Radio

For receive only, a shortwave radio or scanner may be used, depending on which modes of operation you wish to listen to. Weather fax requires an HF (shortwave) radio with single sideband capability, while ACARS mode requires a VHF radio (scanner) with AM aircraft band (118-136 MHz) capability.

For transmitting, an appropriate amateur transmitter is required, of course.

Connecting Your Radio

Connecting your radio to your Mac

Note: Connecting your Mac to your radio is generally quite simple. Some tips: We find that it is best to get receive mode working before diving into transmit mode, and trying to control the Push To Talk (PTT) line of your rig.

If you only want to receive transmissions. 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 stores like Radio Shack, or indeed most general purpose stores like WalMart or KMart. 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 for me to give you a definitive answer for your particular setup.

If you also want to transmit, you'll need to connect the audio output (speaker) jack of your Mac to your radio's microphone input jack. You may need to reduce the audio amplitude using a potentiometer, or attenuating audio cable. Many have successfully used the SignalLink.

For transmitting, you may want to be able to control your radio's PTT (Push To Talk) line. A PTT output is generated from the DTR output of the Mac's serial port. A CW key output is generated from the Transmit Data output. You need to select which port to use (if any) from the Preferences.

Since Macs no longer have a built in serial port, you can use a USB to serial converter. We have tested MultiMode with the Keyspan Twin Serial Adapter, and found it to work, as well as adapters using the FTDI chipset. Most adapters with a Mac OS X driver should work.

Starting Up MultiMode

Double click on the MultiMode icon. MultiMode will start up. The first step is to select the sound channels. There is a set of two popup menus near the right side of the window. The top one selects the sound input channel, the bottom one selects the sound output channel. Select the channels/ports that will be used to get sound from your radio, and play sound into your radio (if you're going to transmit).

If the PLAYTHRU button is turned on, MultiMode will play sound from the radio through the default sound output channel on your Mac. If you are going to transmit, this could be a bad idea, unless you have another sound output channel specified for the transmitted (not playthru) audio. The slider under the PLAYTHRU button sets the volume of the transmitted audio.

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.

To the left of this is a display of the tuned frequency and received mode, this works only with the SdrDx SDR software. See the preferences section for information on how to configure this.

The TX button will put MultiMode into transmit mode, there are also transmit and receive items under the Mode menu.

Assuming you still have your radio connected and tuned into a signal, you should see activity in the volume indicator. This verifies that MultiMode 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 various modes.

Modes are selected from the Mode menu. As you change mode, you will see a different set of buttons and input fields for each mode. There's a description of each mode in the following sections of this documentation.

At the bottom of the window is the text input buffer. Any characters you type are displayed here, and are transmitted when you switch to transmit mode. If you're already in transmit mode, they are displayed here and immediately sent as well. If you make an error typing a character, you can of course hit the DELETE key to remove that character - assuming it hasn't already been transmitted of course!

If you place a ® (option-R) in the input buffer, MultiMode will automatically switch to receive

mode when it gets to this character (with a several second delay).

Just above this input buffer is a blank area, just below the text display area. When you transmit in text modes, the characters being sent will scroll across here, so you can see what has been sent. There may be a second or two delay between when they appear here, and are actually played out the Mac's sound output, of course. When you leave transmit mode, this display is cleared.

You can also transmit the contents of a text file. Select Send Text File... from the File menu to specify the file. It's contents will be added to the output buffer.

Most of the skill in using MultiMode does not come from learning how to use the software, but instead from learning how to use your radio.

Morse Code (CW) is one of the easier modes to start with. I would advise beginning with that mode, then perhaps RTTY and WEFAX, before moving to some of the more advanced modes. We have found the many users have great difficulty using MultiMode if they just dive right in, and don't learn how to properly tune their radios, set audio levels, etc. Please do not install MultiMode, connector your radio, turn it on for the first time,

and expect to be decoding SSTV or PSK31 in 5 minutes. It is not going to happen.

The following sections describe operation for each mode. Please take the time to read the sections for the modes you're interested in decoding.

MultiMode Menus

MultiMode Cocoa menu

About MultiMode

This displays some brief information about MultiMode.

Preferences

This displays the preferences dialog, which is explained in a later section of this manual.

File menu

Decode From Sound 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 Hz monophonic.

Stop Decoding From File...

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

New Log File...

This allows you to start up a log file. All subsequent text decoded will be saved in this file. Ideal for unattended monitoring.

Append To Log File...

Similar to the above, except that it appends new information on to the end of an existing text file.

Close Log File...

Stops writing decoded text to a log file, and flushes any unwritten text to the file. You must select this option when you are done storing interceptions to a file, or some information may be lost.

Send Text File ...

Allows you to specify a text file to be transmitted.

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.

Save Text As...

This allows you to save the decoded text to disk. It is stored as a plain text file.

Edit menu

Copy

This allows you to copy the decoded text. Select the text you want to copy to the clipboard, and select Copy from the menu, shortcut cmd-C.

Copy All

This allows you to copy all of the the decoded text to the clipboard, or a picture to the clipboard, depending on which mode you are in.

Clear Decode Text

This allows you to clear the text window. To clear the Fax window, click the CLR button.

Copy Image

Copies the image to the clipboard.

Clear Input Buffer

This allows you to clear the text input display.

Select All

This selects all of the text in the display window.

Upload Image to Imgur

Allows you to upload a decoded SSTV picture to the Imgur image hosting service. Select this after an image has been completely received. Enter in a title and description for the image when prompted. It will then be uploaded, and a window will appear with the URL to the image that you

can copy and then paste/use elsewhere. Note that Imgur has a restriction on the total number of images that can be uploaded from an app each day (by all of the users of that app) so this function is NOT GUARANTEED TO ALWAYS WORK.

Enter Registration Code...

Select this to register your copy of MultiMode. You'll be asked to enter your name and registration number. Optionally, you can enter your email address.

Prepare SSTV Transmission

To send an SSTV picture, use this function to specify the file containing the image to be sent. The image will be converted to the SSTV to eventually be transmitted, in the currently selected SSTV mode. Then select Transmit mode, and the transmission will begin (providing you are indeed in SSTV mode).

Mode Menu

Transmit Mode

Places MultiMode in the transmit mode, allowing you to send information, via your Mac's audio output. As a keyboard shortcut, T will place you into transmit mode.

Receive Mode

Places MultiMode in the receive mode, allowing you to decode audio fed into your Mac's sound input port. As a keyboard shortcut, R will place you into transmit mode.

Modes also appear in this menu. Selecting a mode here will switch to that mode, and change the various buttons and fields that appear in the main window.

Modes which are grayed out are either not available because you are running the Lite version,

or because they are still under development and are not yet functional.

Macros Menu

Will add the text from one of the macros to the transmit buffer. Please see the section on macros for more information.

Window Menu

Main Window

Selects the main MultiMode window.

Spectrum Window

Selects or opens a window showing the audio spectrum.

Spectrum Window

Selects or opens a window showing the audio spectrum as a waterfall.

Macros Window

Opens the window to define each text macro.

Preferences

Many of these settings are self explanatory, but here they are:

Call

Your callsign.

Fax

Allows you to specify a folder into which fax images are auto-saved, when auto-save checkbox is enabled. The image format is selected from the popup menu to the right.

SSTV

Allows you to specify a folder into which SSTV images are auto-saved, when auto-save checkbox is enabled. The image format is selected from the popup menu to the right.

PTT:

Specifies which serial port to use to control the PTT (Push To Talk) line of a transmitter. By default, the DTR line is set to active when in transmit mode. The RTS line is keyed for CW mode. You can select CW/PTT to use the RTS line instead for PTT and DTR for CW keying. You can also invert DTR and RTS, if you need to.

Assert PTT in CW Mode:

Check this box if you want the PTT serial port line to be asserted when in CW transmit mode.

TCP Port:

Selects the TCP/IP port MultiMode should listen for connections on. Any client connected to this port will receive an echo of all decoded characters in any of the text modes. Note that under OSX, it is not possible to listen to ports below 1024 unless the programs runs as root, so you should select a port number higher than this.

SdrDx/SDRuno Control:

Select SdrDx Control if you want to be able to control a copy of the SdrDx app with MultiMode. Then be sure to set the UDP Send and Receive port values to match those in SdrDx. The default values should work if

you have not changed them in SdrDx. See the section on SdrDx Control later in this documentation for more information.

Select BCS Plugin Control if you want to interface with SDRuno via the Black Cat Systems plugin, or with Kiwi Konnect. See the section later in this documentation entitled Streaming Audio.

Macros

MultiMode allows you to define macros, which are strings of text which can be sent with just one keystroke. Macros are very handy for sending CQ calls, QTH/name information, or other messages that are commonly sent.

To bring up the Macro window, type cmd-M or select it from the Edit menu.

The letter at the far left of each line is the hotkey for that macro. Typing that character, while holding down the control and command keys, will cause the text for that macro to be placed in the transmit buffer window, just as though you typed it.

To edit an existing macro, double click on the macro line. You can then edit the text for that macro.

If you place a ® (option-R) in the macro, MultiMode will automatically switch to receive mode when it gets to this character (with a several second delay).

If you place a † (option-T) in the macro, MultiMode will automatically switch to transmit mode when it gets to this character.

If you place a μ (option-M) in the macro, MultiMode will automatically switch to transmit mode when it gets to this character.

If you place a â (option-A) in the macro, MultiMode will automatically insert your name from the Macro Window into the text that is sent.

If you place a Ω (option-Z) in the macro, MultiMode will automatically insert your call sign from the Macro Window into the text that is sent.

If you place a ç (option-C) in the macro, MultiMode will automatically insert the other operator's name from the Macro Window into the text that is sent.

If you place a ⌘ (option-D) in the macro, MultiMode will automatically insert the other operators call sign from the Macro Window into the text that is sent.

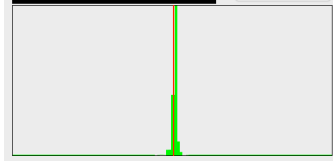
These last four special characters let you set up various macros to use in QSOs that will be automatically personalized when they are sent.

Brag Files

You can also send one of ten text files, by typing the characters command-shift-option-0 through command-shift-option-9. Each of these special macros will send the text file MACROn.TXT where n is the number 0 through 9. These macro files must be plain ASCII text files. Some dummy files are included with MultiMode. You can use these files to send long, seldom changing macros, such as your equipment brag list, QTH/personal information, etc.

Morse Code

This mode translates standard International Morse Code into text. Speeds up to 40 wpm are supported.



The tuning display shows a real-time spectrum of the received signal. Tune your receiver so that the received signal is displayed in the center of the display, centered on the vertical red line. Adjust the audio level so that the volume bar graph shows a reasonable signal, without overdriving. I



find that having it reach about the midway point on peaks works well.

The demodulated audio from your radio is displayed in the Signal Window (shown above) in an amplitude vs. time basis. The audio is sampled in one half second chunks, which is evident in the update rate of this display. When properly tuned in, you'll see something like the above, with the dots and dashes plainly visible.

The program's audio filter center frequency may be varied, to match that in your receiver. The filter is rather tight, so careful tuning is required.

When receiving CW, your radio's AGC should of course be turned off, or set to slow.

Controls

Speed is manually set via the WPM text field.

Clicking on the AUTO button will enable auto-tracking mode, where MultiMode will try to determine the correct WPM setting. Please note that you need to still have the station properly tuned in, and the audio volume correctly set, or the Auto mode will not work. Noise or erratic sending will affect the reliability of this feature. It will take several seconds for the software to lock on to a new speed.

The center frequency may be set by entering it into the text box. If you click the AFC (Automatic Frequency Control) button so it is on, MultiMode will attempt to track the strongest signal, and automatically tune it in. A stronger interfering station will cause AFC to seek that signal, you can turn AFC off after it has locked onto the correct station, to prevent this from happening.

The bandwidth popup allows you to select the bandwidth of the audio filter used to detect received morse code. Values from 50 to 1000 Hz are available. Smaller values (more narrow bandwidth) filters generally do a better job of rejecting other signals. However, they can smear the dots and dashes, especially at higher speeds. You may find that you need to adjust the filter width based on the CW speed. Also, if you are listening to multiple stations that are slightly off frequency, it is possible that too narrow of a bandwidth will only allow proper decoding of one station, and you will need to retune your radio for each station, although the AFC function can help with this.

There is also a bandwidth option of "Corr" which is the demodulation method that was previously used, it is available for users that wish to continue to use it rather than the new method of variable filters.

Transmitting Morse Code

It is also possible to use MultiMode to transmit Morse code. When you are in CW mode, any keys you type will be converted to Morse code and sent.

MCW

If you place MultiMode into transmit mode while in morse code mode, then any time you type a key, that character is transmitted as audio. This is sometimes referred to as MCW for Modulated CW. This audio can be fed into your transmitter's microphone jack, possibly through isolation/matching transformers. You'll have to experiment with your particular brand of radio.

The audio is transmitted at the same frequency that MultiMode decodes morse code, so that you could feed your Mac's audio output into the microphone jack, and monitor what you're sending, for example.

If you have a serial port selected for PTT, the RTS line will also be keyed, if you wish to interface that line to the CW key input of your radio, through appropriate hardware.

Hints

Careful adjustment of the AGC time on your receiver is helpful in getting the best copy. You want to make the AGC long enough so the receiver gain does not increase between characters or words, producing loud static that is misinterpreted as dots or dashes. You also need to set the volume such that the CW audio is loud enough, but noise pulses are not decoded. If you see strings of letters E and T, chances are the audio level is too loud.

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, MultiMode will clear the display, lock onto the fax signal,

and properly align the image. When a stop tone is detected, if auto-save is enabled in the Preferences, 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 MultiMode 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 MultiMode 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 MultiMode can detect the start and stop tones, or images will not be saved.

Hints

WEFAX is one of the easiest modes to tune in, partially because it is "analog" not digital, so slight tuning errors only slightly degrade the picture quality. Almost all WEFAX transmissions use 1200 LPM, and an IOC of 576, so use these settings as default.

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.

RTTY

Baudot is the standard mode for transmitting teletype over shortwave radio. It uses a 5 bit code, which only allows for 32 symbol total, obviously not enough for all the letters, digits, and punctuation. Therefore, two special characters may be transmitted - letters shift (LTRS) and figures shift (FIGS). These two modes determine which character will actually be printed when a 5 bit symbol is received.

ASCII uses the standard 7 bit computer format. Other than ham radio, there is very little use of ASCII on HF.

Controls

The various controls perform the following functions:

The BAUDOT and ASCII buttons select those modes, respectively. The CYRILLIC button allows decoding of third shift (Cyrillic, etc) transmissions.

The INV button selects Inverted shift, otherwise Normal shift is selected. The ABC button acts as an LTRS shift, and will return the program to letters mode, from figures mode. Very useful if a burst of noise shifts the program into numbers mode. The UOS enables Unshift On Space, useful when decoding Russian (Cyrillic) and other third shift alphabet transmissions.

Tuning Indicator:

As shown above, tune your radio so that two spikes are visible, representing the mark and space tones. You want to center between these tones to be centered as close as possible. Select the appropriate shift frequency as described above.

When properly tuned, the mark/space tones are represented by black pulses. if you don't see this, then either the station isn't properly tuned in, or the shift isn't correct. It's also possible that there may be too much interference.

Select the combination of speed and polarity (Normal or Inverted) for proper display of decoded text.

ASCII Mode

When ASCII mode is selected, an additional popup menu will appear, allowing the word length and number of stop bits to be selected. 7 or 8 data bits, and 1, 1.5, or 2 stop bits may be chosen. In addition, there is an option to decode the FSK time data sent by radio station CHU (3330, 7335, 14670 kHz) between 30 and 40 seconds past each minute.

KG-84

Clicking on the KG84 button will enable identification of KG-84 crypto streams. You can't decode them of course, but you will get a display of the state of the link (traffic or idle) as well as when the headers are sent. Useful to identify a station as one you can ignore trying to decode. Most KG-84 stations seem to use 75 baud, 850 Hz shift.

Transmit Mode

Selecting Transmit Mode (from the Control menu, or -T) will place MultiMode in the transmitting mode. RTTY audio will be played out the Mac's sound and/or speaker ports. Characters that you type will be converted into baudot code at the selected baud rate and shift. During transmission, the DTR line of the selected serial port will be active, this may be used as a PTT signal to a transmitter.

Hints

Other than ham radio transmissions and weather forecasts, most RTTY on the air today is encrypted, and can not be decoded. So if you try to tune in a station and can't get proper decode under any settings, it may be an encrypted transmission. Unfortunately most of the news agencies have abandoned HF as well.

SITOR-A SITOR-B / FEC / NAVTEX

There are two buttons switch between SITOR-A and SITOR-B. The INV button inverts the polarity of the received signals. The Center field allows the center frequency to be specified. The shift is always set at 170 Hz, standard for these modes.

SITOR-B is an error-correcting mode of text transmission, commonly used in the maritime services. There is also a ham version called AMTOR. Characters are transmitted three at a time, with an ACK or NAK sent back by the receiving station, indicating whether the characters were correctly received, or if they need to be re-sent. Multimode decodes SITOR-A transmissions, but does not send them.

SITOR-B is an error-correcting mode of text transmission. It is commonly used in the maritime services, and is most well known as the method used to send NAVTEX transmissions. NAVTEX is a worldwide network of transmitters, typically using 518 kHz, although 490 and 424 kHz are also used. Information of interest to mariners is sent, including weather.

There are only a few things to set to use this mode. First, the center frequency of the received audio (much as in RTTY mode). You may also need to click on the INV button to set inverse mode, if the mark/space tones coming out of your radio are reversed from what MultiMode expects.

When a SITOR-B/NAVTEX transmission is detected, MultiMode will automatically synchronize to the transmission, and start printing decoded text.

While this is an error-correcting mode, it is still possible to get receive errors, especially under poor conditions. When a garbled character is received, MultiMode displays an asterisk (*) in place of that character.

Should severe noise cause a loss of synchronization, MultiMode will attempt to re-sync. The SYNC button may also be clicked to force re-synchronization.

There are three text indicators that appear to the left of the buttons:

PHASE: MultiMode is receiving phasing/sync characters

GOOD: MultiMode is receiving correctly

BAD: MultiMode is receiving garbled characters, has lost sync, or there is no transmission detected, just static.

When Parse NAVTEX is checked, MultiMode will parse out correctly received NAVTEX messages, usually transmitted on 518 kHz.

ACARS

ACARS is the acronym for Aircraft Communications Addressing and Reporting System. It is a data transmission between airplanes and ground stations. The purpose is to handle many types of traffic that would normally be done by voice in the past. ACARS transmissions are on VHF.

Frequencies

The following frequencies are commonly used:

- 131.550 Primary Channel worldwide
- 130.025 Secondary channel for USA and Canada
- 129.125 Additional channel for USA & Canada
- 130.450 Additional channel for USA & Canada
- 131.125 Additional channel for USA
- 136.700 Additional channel for USA
- 136.800 Additional channel for USA
- 131.725 Primary channel in Europe
- 131.525 European secondary
- 131.475 Air Canada company channel
- 131.450 Primary channel for Japan
- 136.900 European secondary
- 136.925 ARINC European Channel
- 136.850 SITA Canadian Frequency

As with all other VHF-Aeronautical transmissions, AM mode is used. Most scanners automatically change to AM mode when tuning the 108-136 MHz aircraft band, but you may want to verify your scanner does this. Make sure to have the squelch turned off!

The transmissions sound like data bursts ranging from about 0.2 second to 1 second in length. Due to the high altitude of aircraft, transmissions from aircraft may be monitored for several hundred miles. Those living close to airports may also hear the ground transmissions sent to aircraft.

Tuning in ACARS transmissions is fairly easy - just select ACARS mode and adjust the radio's volume for proper decoding. Please note - it is very

important to have the squelch of your radio completely off, that is, so you always hear the background static. The squelch action of any radio is too slow, and you'll miss the packet!

I find that for my setup, it works best if the background static is three - fifths of the volume indicator.

Status

The status shows the number of good and bad packets received, and the percentage good. This is useful for adjusting your radio setup, obviously you want to maximize the percentage of packets which are good.

Clicking the Clear button will reset the BAD/GOOD packet counters back to zero.

You will find that many transmissions are garbled or not decoded. This is a very difficult mode to demodulate without external hardware, so good reception quality and strong signals are required. You'll see many packets are repeated, this is because the ground station didn't get the message, so the aircraft had to re-send it. Since the nicely equipped ground stations don't copy 100%, don't be surprised if your setup doesn't either! I find that under good conditions, slightly less than half of the packets decode properly.

Packet Display

MultiMode displays the transmitted packet, and parses out some of the information, such as the plane's wing number, flight number, etc. It does not attempt to parse out other specific information in the text portion of the packet, which is displayed on the second line. A timestamp is also displayed on the first line.

Here is an example of a received ACARS transmission:

```
.N655UA  Q0 0    [23 Nov 2002   17:59:23][UAL Boeing 767  
25393]  
S54A UA0950
```

N55UA is the aircraft registration, note the leading period(s), to force it to 7 characters. Q0 is the message type
0 is the downlink block identifier

[23 Nov 2002 17:59:23] is the date and time, added by MultiMode

S54A is the message sequence, minutes and seconds past the hour

UA0950 is the carrier and flight number (United flight 950)

There was no text sent in this message, if there was, it would follow the flight number.

[UAL Boeing 767 25393] This is the type of aircraft, it was automatically pulled from the AIRCRAFT.CSV file, described below.

You may create a file called ACARS.LST, which is a listing of plane registration numbers, along with text that you may enter. This file is read in when MultiMode first starts up, and must be located in the same folder as the MultiMode application. When a packet is decoded, the plane registration number is compared to the registration numbers of the planes in the ACARS.LST file. If a match is found, the text from that line of the file is displayed after the timestamp. You may use this file to display text or comments about each aircraft.

An example of the file format follows below:

.N814US This is plane number 1 .N320US This is plane number 2 .NIM5AA
This is plane number 3 .N781NC This is plane number 4 .N609AA This is
plane number 5

Note that the first 7 characters of each line are the plane registration number, followed by a

space. The rest of the line contains the text to be displayed. Leading periods are required to force the registration number to be seven characters long.

If you are not interested in using the ACARS.LST file, you may simply remove it from the MultiMode folder.

MultiMode can now import the AIRCRAFT.CSV aircraft database file, which is available from <http://www.ziplink.net/~acars/alaceqip.htm>

Please be sure to obtain the correct file, which is comma delimited. A copy is included with MultiMode, but you may wish to get the most recent version.

Here are some Web Pages devoted to ACARS which you may find of interest:

<http://patriot.net/~acars/> <http://patriot.net/~jetset/acars.html>
http://www.euronet.nl/users/bart_b/
<http://web.inter.NL.net/hcc/Hans.Wildschut/>

ACARS-Link

Northern Virginia ACARS Page

Bart 'Beaver' Hoekstra ACARS Page ACARSWeb

There is also the ACARS mailing list, available from www.qth.net.

There is a book out on ACARS, called "UNDERSTANDING ACARS, 3rd Ed." written by Ed Flynn, with Robert E. Evans, ISBN 1-882123-36-0. This book should be available at your local shortwave store. I bought my copy from Universal Radio. It does a good job of explaining the formats of the various messages.

Robert E. Evans also wrote the column "ACARS Downlink", which appeared bimonthly in Popular Communications magazine.

Two Letter Airline Codes

AS Alaska Airlines

AQ Aloha Airlines

AA American Airlines

MQ American Eagle

HP America West

TZ American Trans Air

DY Atlantic Coast Airlines

5Y Atlas Air

B0 Boeing
C8 Chicago Express
CO Continental Airlines
DL Delta Airlines
W9 Eastwind
EB Emery Air Freight
9E Express 1/NW Airlink FX Fedex
GR Gemini Air Cargo
B6 Jet Blue
LC Legend
XJ Mesaba/Northwest Airlink NW Northwest Airlines
PO Polar Air Cargo
OO Skywest Airlines
NK Spirit Airlines
SY Sun Country
SM Sunworld
TW T.W.A.
UP U.P.S.
UA United Airlines
MC U.S.A.F.
US US Airways
AC Air Canada
TS Air Transat
2T Canada 3000
CP Canadian Airlines

Packet

Introduction

First a note - MultiMode does not operate like a full TNC!

At present, MultiMode decodes 300 and 1200 baud packet. It can also transmit Unnumbered Information (UI) packets. It is designed to show all packets that are received, and does not attempt to organize them, as a TNC would, into the correct stream of data. All packets, including supervisory, are shown.

By selecting the DEBUG mode, even packets with bad checksums are displayed.

By selecting the INFO mode, only information packets are displayed. Supervisory packets are not displayed.

Packet Display

Below is an example of some packet transmissions copied off of HF (300 baud) on 14099 kHz:

```
[ RR][AJ00 7][W60AV?]  
[ I][W60AV?][AJ00 7] DXdelu6hdf: 14260.0 AY0N/X [ UI][BEACON0][AJ00 0][W0TX 0]  
[ RR][EA8DW2][EA3RKD2]  
[ I][W0TX 7][W9UW 0] SPW60AV  
[ I][W60AV?][AJ00 7] DXdewa6yfd: 14217.3 RN6BY  
[ I][W0TX 7][W9UW 0] HelloBill...hopethatalliswe [ I][W0TX 7][W9UW 0] llwithyou. Wehadaverynice [ I][W0TX 7][W9UW 0] dayheretoday.Sunandthehigh
```

The format is as follows:

```
[ type] [ dest ] [ source ] [ digipeaters]
```

Packet Types

Message

DISC DM
I FRMR R E J RNR R R SABM UA

UI

Disconnect Request Disconnected Mode Information
Frame Reject Reject

Receive Not Ready Receive Ready
Connect Request Unnumbered Acknowledge Unnumbered Information

Transmitting

To transmit, enter transmit mode (from the menu, or command-T). Type a string, and then press enter, the string is sent. The destination callsign is "CQ", and your callsign (from preferences) is used. If you have enabled one of the serial ports to serve as the PTT line, that handshake line will be used. Right now, the delays between turning on PTT and transmitting, and after transmitting and before turning off PTT are around 400 milliseconds, fixed.

You can change the mark and space tone frequencies. If you change them, and forget what the default values are, here is a table of the standard tone pairs:

HF (300 baud): 2110 / 2310 Hz VHF (1200 baud): 1200 / 2200 Hz

Tone Modes

This mode decodes several types of tones which are commonly heard on the shortwave and VHF/UHF bands. Many of these modes can be transmitted as well.

These buttons select which type of tone to decode:

CCIR - Paging tones

DTMF - Dual Tone Multi Frequency (ie: TouchTone) EIA - Paging tones

ICAO - SELCAL tones used in civil aviation

CTCSS - Continuous Tone Coded Squelch System

The decoded information is displayed in the text window. A brief description of some of the tone modes:

DTMF

Also known as “Touch Tone” which is probably a trademark of the telephone company.

This is the common set of tone pairs used to dial telephones. It is also sometimes used for paging and remote control applications. You can transmit DTMF tones, switch to transmit mode, and type the digit (or letter A-D) to send.

EIA

Electronic Industry Association. Another set of tones, used for paging. You can transmit EIA tones, switch to transmit mode, and type the digit (or letter A-D) to send.

CCIR

Yet another set of paging tones. You can transmit CCIR tones, switch to transmit mode, and type the digit (or letter A-D) to send.

CTCSS

Continuous Tone Coded Squelch System, often referred to as "PL" (Motorola's trade name). When decoding in this mode, the currently received tone will be added to the text display. The valid tones are shown below. You can transmit a CTCSS tone by switching to transmit mode, and typing the two letter identifier for the tone.

67.0	XZ	97.4	ZB	141.3	4A	206.5	8Z
69.3	WZ	100.0	1Z	146.2	4B	210.7	M2
71.9	XA	103.5	1A	151.4	5Z	218.1	M3
74.4	WA	107.2	1B	156.7	5A	225.7	M4
77.0	XB	110.9	2Z	162.2	5B	229.1	9Z
79.7	WB	114.8	2A	167.9	6Z	233.6	M5
82.5	YZ	118.8	2B	173.8	6A	241.8	M6
85.4	YA	123.0	3Z	179.9	6B	250.3	M7
88.5	YB	127.3	3A	186.2	7Z	254.1	0Z
91.5	ZZ	131.8	3B	192.8	7A		
94.8	ZA	136.5	4Z	203.5	M1		

ICAO

International Civil Aviation Organization. This tone mode is also referred to as SELCAL, for SElective CALling. It is used to alert the pilots of aircraft that they are about to receive a transmission. When their radio receives the correct pair of dual tones, the squelch is broken. This means that they don't have to listen to hours of static between messages. Each aircraft in the world is assigned its own dual tone pair.

You can transmit SELCAL tones by switching to transmit mode, and typing the four letter ID you wish to send. The valid letters are A, B, C, D, E, F, G, H, J, K, L, M, P, Q, R, S.

In late 2016, the mode is being extended to include 16 additional characters: T, U, V, W, X, Y, Z, 1, 2, 3, 4, 5, 6, 7, 8, 9.

Some SELCAL frequencies:

3016 5598 8906 13306 17946 2899 5616 8864 13291
2962 6628 8825 11309 13354 2872 5649 8879 11336 13306 2971
4675 8891 11279 13279 3476 6622 8831 13291

EAS

Emergency Alert System. This mode is used in the USA to transmit emergency weather and other information, over both NOAA Weather Radio, as well as broadcast stations. An alert tone and digital burst (which MultiMode decodes) is sent, which specifies the type of alert, and the locations affected. This is then followed by the actual alert information as normal audio. An example decoded message follows:

Start of Message

Org: EAS Broadcast station or cable system

Event: RWT Required Weekly Test

Location: 024031-024033-051013-051059-051600-051107-051153-051683- 051685-051510-051610-011001

Valid time: 0015

Julian Date: 346 Time: 1647

ID: WTOP AM

End of Message

MultiMode can transmit EAS messages, if you want to test an EAS decoder. MultiMode is not designed to generate actual EAS messages for use on the air, and has not been tested for compliance with any necessary FCC requirements. To produce an EAS message, you need to type it in, followed by a return, the MultiMode in transmit mode. MultiMode will then send the EAS burst. To speed things up, you can of course put the string in a macro, so you just need to use that macro to send the burst. You can embed a return in the macro by including an option-M at the end of the macro.

Here is a sample EAS message: ZCZC-WXR-TOR-051059-051600-051610+0100-0201849-KWVE FM

ALE

Automatic Link Establishment. This system was developed by the US government, and is now in use by many organizations and countries worldwide. It is a modem system using eight tones. It exists to allow stations to contact each other, not to transmit data. This is handled by other methods after the stations are in contact. But, it is still possible to monitor the ALE transmissions to see what stations are on the air.

ALE mode uses tones ranging from 750 to 2500 Hz, so you may want to use the wide filter setting on your radio, to not clip any of the tones. MultiMode displays a set of eight indicators in ALE mode, one for each tone. The intensity of each indicator indicates the amplitude of tone(s) at that frequency. It is normal for them all to not light up at the same intensity:

For each received transmission, MultiMode displays one line of text, as follows: [Date Time][Type][Message]

The message types are as follows:

DATA THRU TO TWAS FROM TIS CMD REP

Data Thru

To

This was From This is

Command Repeat

Example Transmissions:

[12 Apr 2000 19:26:11] [T0] [BOB] [12 Apr 2000 19:26:34] [TIS] [TOM]

In North America, 11250 kHz is a very popular ALE frequency.

Hellschreiber (HELL)

Introduction

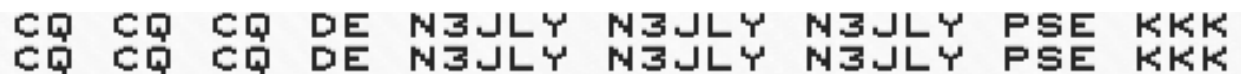
Hellschreiber is a method of sending text by radio. Each character is sent as an image, pixel by pixel. It was invented in 1929 by Dr. Rudolf Hell, of Bavaria, Germany.

Each character is encoded as a 7 by 7 matrix of pixels. 150 characters are transmitted per minute. A character takes 400 milliseconds to send. As there are 49 pixels per character, each pixel is 8.163ms long. The effective baud rate is 122.5 baud, and 2.5 characters are sent each second, for an average speed of about 25 WPM.

The following is an example of a received Hellschreiber transmission:

Since the transmitting and receiving system may not be precisely in sync, nor transmitting at exactly the same speed, each received line is displayed twice. This way, the text can always be read, even if it slants up or down.

There is an excellent web site devoted to Hellschreiber, the URL is <http://www.qsl.net/zl1bpu/>



Common Hell Frequencies

80m 40m 30m 20m 17m 15m 10m

3.575

7.030 - 7.040

10.135 - 10.145 14.063 - 14.070 18.101 - 18.107 21.063 - 21.070
28.063 - 28.070

28.100 - 28.110

(Region 1) 3.559 (Region 3)
(many operators watch 14.063 MHz)

(novice)

PSK31

Introduction

This mode handles the PSK31 mode, which has recently started to gain interest in the amateur community. This mode is ideal for conversations, as it supports effective rates of around 50 wpm.

PSK31 is sort of a cross between CW and RTTY. Data is transmitted at 31.25 baud (hence the name). A tone (typically 1000 Hz) is continuously transmitted, and the phase is inverted if the next bit is a zero. This produces a distinctive trilling sound, somewhat like a treefrog.

However, unlike RTTY, and much like CW, the length of each character varies, from a minimum of one bit (for a space) to a maximum of ten bits (for seldom used characters). Two zero bits are sent between characters. When no data is being sent (idle), continuous zero bits are transmitted, so there are phase reversals 31 times per second, meaning there is always a signal to lock onto.

The above picture shows the waterfall that you see when using PSK31 mode. There are marker dots every 100 Hz, and the frequency is shown every 200 Hz. The waterfall shows frequencies between 600 and 2200 Hz.

In this case, for clarity, there is only one transmission. It's centered at 1000 Hz. The lower part, with two vertical lines, is what you see when the transmission is idling. The upper part shows what you see when text is being transmitted.

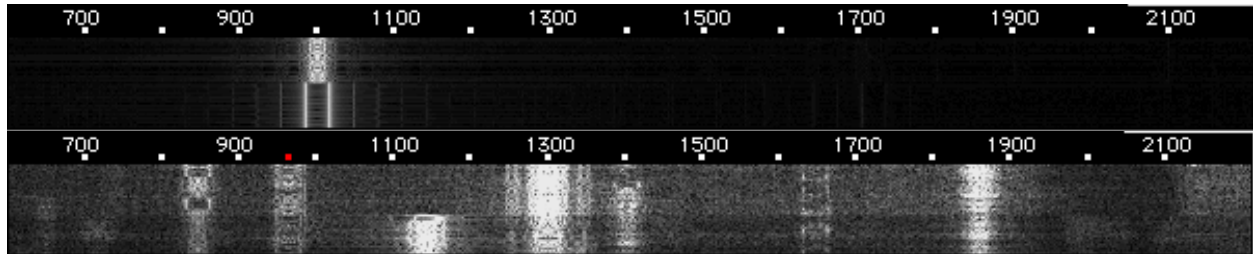
To select the center frequency, just click on the center of the transmitted bandwidth. Correct receiver tuning is extremely critical for successful PSK31 reception. You do need to be fairly close, within a few Hz. If you don't get good decoding, try clicking again closer to the center, or manually change the center frequency. A small red marker will show up on the current center frequency.

1000 Hz is the generally used center frequency. But on a busy day, you'll see lots of transmissions at the same time, each slightly offset (either by

changing the transmitter frequency, or the audio frequency within the PSK31 program)

Above is a capture from 14070, the popular 20m PSK31 frequency, showing many transmissions. I can see at least 9, there may be some more!

You can use the COLOR button to make the waterfall a false-color image.



The RIT offset allows you to specify an offset, in Hz for the receive frequency, relative to the main center frequency, which is used for transmit. The + and - buttons adjust the RIT offset by 1 Hz, and the CLR button restores it to 0 Hz.

Frequencies

Suggested frequencies for PSK31 operation are:

1838.150 3580.150 7035.150 10140.150 14070.150 18100.150
21080.150 24920.150 28120.150

SSTV

SSTV stands for Slow Scan TeleVision. It is a mode used by amateur radio operators to send images, both color and black and white. An SSTV image takes from 8 seconds to several minutes to receive, depending on the mode used. In North America, Scottie S1 is the most commonly used mode. In Europe, Martin M1 is the most commonly used mode.

Controls

There is a popup menu which allows you to select the SSTV mode to use.

If AUTO TYPE is checked, MultiMode will automatically select the mode based on the VIS code sent. However, it is possible for the VIS code to get garbled, or you may manually start reception. Under these conditions, you need to select the correct SSTV mode. You may do so even while receiving an image, the old data is preserved, and the image display will be automatically adjusted and updated.

The slant slider is used to adjust for timing differences between your Mac and the computer sending the SSTV image. Small offsets in timing can cause large skewing of the image. If the vertical edges of the image are slanted, then this control should be used to correct the timing. You can change the slant while receiving an image, and the display will be automatically updated in real-time.

The phase slider is used to shift the image to the left and right. This is useful when reception was manually started. You can change the phase while receiving an image, and the display will be automatically updated in real-time.

The START button allows you to manually start receiving an SSTV image. This is useful if the start signal and/or VIS code are not correctly received. It is also useful if you tune into a transmission that is already in progress. You can also hit the spacebar to start reception.

The STOP button will stop reception of an image. Normally this occurs after reception of the picture is complete, but it can be manually triggered, if the image is garbled.

The AUTO TYPE mode button instructs MultiMode to detect the VIS start signal of an SSTV transmission, and automatically select the correct SSTV mode.

If AUTO is enabled, MultiMode will start picture decoding when a VIS signal is detected. Normally you would leave this on, but it can be turned off if you are tuned to a non-SSTV station, and are getting false decodes.

Clicking the SAVE button will let you manually save the decoded image. Holding down the option key while clicking will save the image to the last filename, this can be useful if you need to tweak the slant or skew sliders and re-save the image.

The + and - buttons adjust the magnification level of the displayed SSTV image.

You can also select Copy Image from the Edit menu, and the image is saved to the clipboard, where it can be pasted into another application.

SSTV Transmission

At present you can transmit only in some of the SSTV modes. To transmit an SSTV image, perform the following steps:

1. Select SSTV Mode.
2. Select the SSTV mode you wish to use.
3. Select Prepare SSTV Transmission from the Control menu. Or click the PREP button.
4. You can pick a recently sent image, use the Choose button to select an image file, or, if you have an iSight, click the camera button and take a picture of yourself.
5. Click Set
6. A preview of the image to send is shown.
7. Click TX to send the image.

SSTV Frequencies

The following SSTV frequencies are commonly used. 14230 MHz is by far the most popular frequency. SSTV nets may be heard throughout the weekend.

3720 kHz LSB 3730 kHz LSB 7033 kHz LSB

14230 kHz USB 18160 kHz USB 21340 kHz USB 28680 kHz USB 28700 kHz USB 50300 kHz USB

144.500 MHz FM

144.525 MHz FM

145.985 MHz FM (MIR space station on weekends) 433.700 MHz FM

433.925 MHz FM

Overlay

You can add text and lines as an overlay on transmitted images. Each overlay is specified by a text file. These text files should be put in the Library -> Application Support -> MultiMode -> SSTV-Overlays folder, referenced from the home directory for your user account.

The file contains several lines. The first line is free for your use as a name, that name will be displayed in the popup menu in the lower right corner of the SSTV modes control panel. Each additional line specifies either a piece of text, or a line to be drawn over the transmitted image.

To display text, an entry like this is used:

`TEXT;30;242;5fffffff;Times;48;45;CQ DE N3JLY;`

Each field is separated by a semicolon. The required fields are: TEXT

X Position

Y Position

Alpha and Color Font Name

Font Size

Rotation (degrees) Text to be displayed

Most of these fields are obvious. The Alpha and Color field is a 32 bit value expressed as 8 hex digits. Think of it as 4 bytes. The first is the alpha or transparency of the text. An alpha of FF means a completely opaque text that you cannot see through. Lower values allow some of the background image to be visible, down to a value of 00 which would be

completely invisible text. Next are the red, green, and blue components of the color.

This is an example of drawing a line:

```
LINE;0;0;320;240;e0ff0000;1;
```

The fields are: LINE

Starting X Position Starting Y Position Ending X Position Ending Y Position

Alpha and Color Line thickness

Hints

The Auto Select Mode requires very good receiving conditions. Most SSTV operations take place using S1 or M1 modes, so it is usually best to manually set the mode, and sometimes even manually start receiving. Just tap the spacebar when you hear the transmission begin. You may have to adjust the picture alignment slightly, but this is very easy to do, and can be done while you're still receiving the image.

GWB - Globe Wireless Bit analysis

Globe Wireless stations (used by the maritime fleets) often send idle packets when not sending traffic. The idle packet contains an identification of the station sending it. This mode detectects these packets, finds the identification, and displays it when properly decoded.

The following stations are presently identified:

0x33 LFI, Rogaland, Norway

0x4e VCS, Halifax, Nova Scotia, Canada

- . 0x5d KEJ, Honolulu, Hawaii, USA

- . 0x5e CPK Santa Cruz, Bolivia

- . 0x5f A9M, Bahrain

0xc6 9HD, Malta

0xc9 ZLA, Awanui, New Zealand 0xcc HEC, Bern, Switzerland 0xd2 ZSC, Capetown, South Africa

- . 0xd7 KPH, San Francisco Radio, San Francisco, California, USA

- . 0xd8 WNU, Slidell Radio, New Orleans, Louisiana, USA

- . 0xdb KHF, Guam

- . 0xdc KFS, Palo Alto, California, USA

- . 0xdd LSD836, Buenos Aires, Argentina

. Oxde SAB, Goeteborg, Sweden

Oxe3 8PO, Bridgetown, Barbados

GMDSS

GMDSS stands for Global Maritime Distress and Safety System. It is used to send both routine and emergency messages over maritime channels. The entire GMDSS protocol is very complex, and MultiMode only parses out part of it for the time being. More sections will be parsed out in the future, if there is interest.

GMDSS messages are transmitted on 2187.5, 4207.5, 6312, 8414.5, 12577 and 16804.5 kHz. To receive transmissions, just park your receiver on one of these frequencies (I find 8414.5 kHz to be active), set the center frequency to match that of your receiver's filters, and MultiMode will decode and display each GMDSS message it detects.

DGPS Differential GPS

DGPS stations transmit information used to improve the accuracy of GPS positioning. In this mode, MultiMode will use information transmitted by the station to identify the station. Tune the station in CW or SSB mode on your receiver, such that the center frequency of the audio is 800 Hz. Select either 100 or 200 Baud using the pushbuttons. When a valid DGPS packet is decoded, it will be displayed, along with the location of the station and other information, such as the station frequency (based on the ID, which can be used as a check that this is indeed the station being heard, as decoding errors can cause the wrong station ID to be determined).

Example packet display:

```
PREAMBLE 66 MSG 9 ID 130 PARITY 2e Z-TIME 50:16.2
SEQ 6 LEN 5 HEALTH
2 PARITY 04 834 130 131 307.0 Hagerstown, MD United
States
```

If you toggle the “Short Demod” button on, a different demodulation routine will be used, that decodes fewer bits in the DGPS packet, which can allow more decodes under poor reception conditons.

```
[11:34:53 11/20/15] 263 881 262 263 302.0 kHz
Point Loma, CA United States 32.6769 -117.25
3697.45 km 272.2 deg
```

The distance to the station, as well as the bearing, will be displayed. Be sure to enter your location in decimal units, such as 39.5 for 39 degrees and 30 minutes. Use negative numbers for south and west, positive for north and east.

LORAN-C

LORAN-C is a navigation system transmitting on 100 kHz. This mode allows you to display the timing pulses received, and by varying the integration period using by selecting the chain, display pulses from a given chain.

Some detailed knowledge about Loran-C operation is expected from users of this mode, it is not self explanatory.

The custom chain setting enables a field where you can enter in a user defined integration period (in milliseconds). This allows chains not listed in the Chain popup menu to be detected, as well as the use of this mode for integration of arbitrary signals of interest, other than LORAN-C.

When set to custom, you can also use the markers field to specify, again in milliseconds, the spacing for the timing markers drawn under the integration display.

Chain

Popup menu selects the chain to monitor.

Averages

Controls the filtering of the signal. Longer averaging periods will help bring weak stations “out of the noise”.

Timing Offset

This is to correct for the fact that your computer does not sample sound exactly at 44100 kHz. Any error in the sampling rate will cause a drift in the displayed LORAN pulses. Adjusting the timing can correct that drift. Make the timing 1.0, and note the direction of drift. Values less than 1.0 will correct drifts to the left, values larger than 1.0 will correct shifts to the right. You will have to watch the drift over long time periods (minutes) usually with long averaging periods, to determine the correct value to use for your system. It will take some time to fine- tune. And of course the sound sampling rate on your computer will drift over time.

Usually the number will be extremely close to 1.0. For example, on my particular system, I use a value of 1.000037.

Controls

The slider will adjust the relative position of the integrated signal, so you can align it with the stations. Note that you will have slight offsets, due to the distance between you and each station not being the same.

The CLR button will clear the integration results.

BIT ANALYSIS

This mode will attempt to automatically determine the center frequency, shift, and baud rate of RTTY/FSK transmissions. Note that these measurements are highly sensitive to noise. A good clean signal is required for the best accuracy. Under poor conditions, the displayed values will jump around, but the correct value can often be eyeballed.

Tune in the signal of interest. The mode will attempt to determine the center frequency. Once this is displayed, and you are reasonably sure the value is correct, enter it into the text field to the right of the measured value.

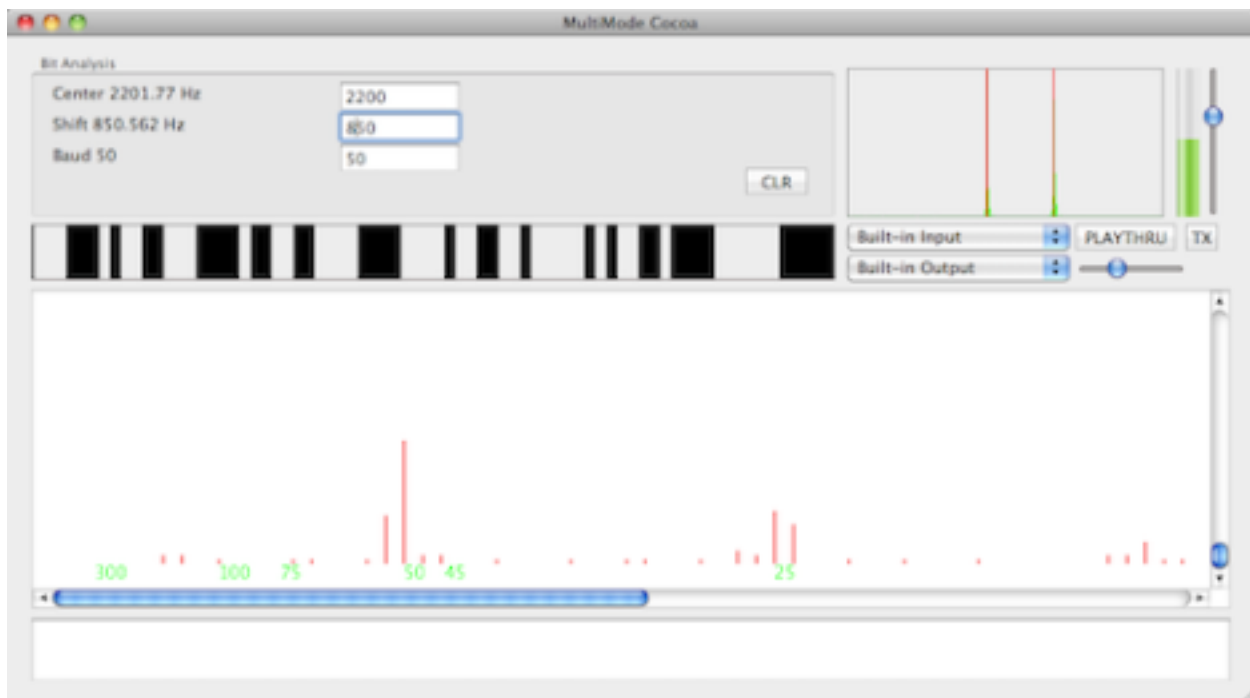
Then the shift will be estimated. Once this value seems correct, enter it into the text field to the right of the measured value.

Finally the baud rate will be estimated. While you can enter it into the text field to the right of the measured value, currently this value is not used.

A histogram of baud rate values is displayed at the bottom of the display. Generally, the peak will correspond to the actual baud rate, and there will be smaller peaks at half, one third, etc. This can also be used to help estimate the actual baud rate.

Above the histogram, the demodulated bits are shown. This can be helpful in verifying the correct settings have been estimated. When they are correct, it should look like the display below, with the black bar widths being integer multiples of the smallest value, which is one data bit. When they are incorrect, the bars will often be of random widths.

The CLR button is not presently used.



SdrDx Control

MultiMode can control a copy of SdrDx running on the same computer. SdrDx is an SDR program that works with several SDR models. It can be downloaded from this website:

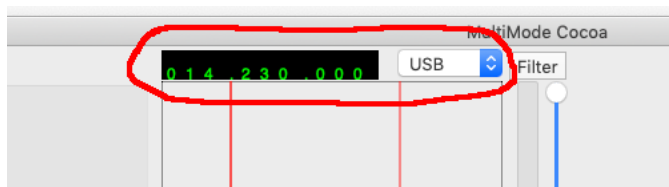
<http://fyngyrz.com/?p=915>

First, go to the MultiMode preferences, and enable this option, and make sure the UDP Send and Receive port values match those in SdrDx.

MultiMode will poll SdrDx to get the current frequency and mode. The frequency is displayed in a black area above the tuning indicator in the upper right corner of the MultiMode window. The mode is in a popup menu to the right.

You can change the mode using the popup menu.

You can change the frequency by clicking in the frequency display. Left (normal) clicks on a digit decrement that digit, right clicks increment it.



Streaming Audio

MultiMode can interface with SDRUno via the Black Cat Systems plugin as well as Kiwi Konnect, both for frequency control as well as streaming audio from SDRUno into MultiMode.

The SDRUno plugin is free, note that SDRUno and the plugin are only for Windows, not macOS. Details here:

https://www.blackcatsystems.com/software/sdruno_plugin.html

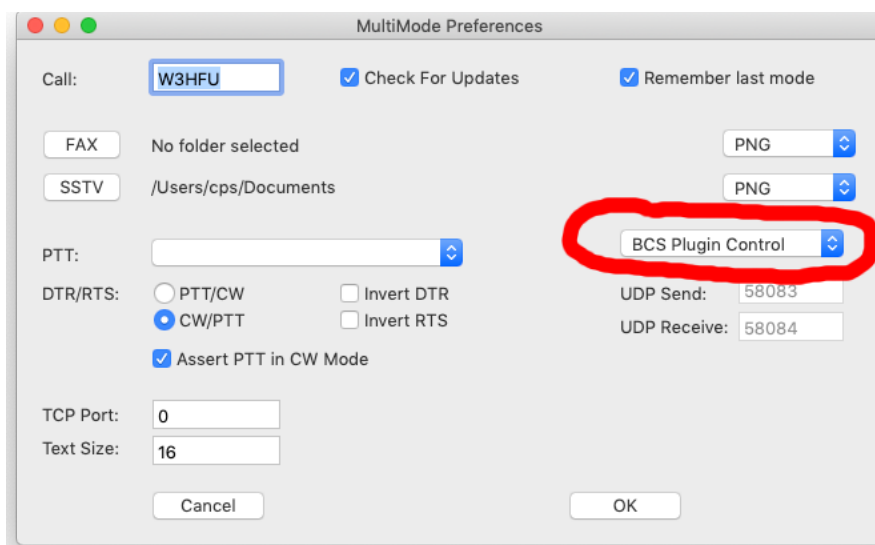
Kiwi Konnect may be downloaded here:

https://www.blackcatsystems.com/software/kiwisdr_software.html

In both cases, please see the respective webpages for instructions on setting up the plugin or Kiwi Konnect.

Setup in MultiMode:

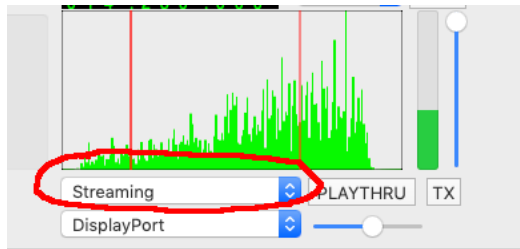
Open the MultiMode Preferences, and select BCS Plugin Control for use with either the SDRUno plugin or Kiwi Konnect. The UDP port values do not need to be configured.



The SDR frequency and mode can be set in the same way as with SdrDx Control, please scroll up to the previous section of this documentation for details.

Streaming audio:

Select Streaming from the input device popup menu:



Assuming you have SDRuno with the Black Cat Systems plugin, or Kiwi Konnect running, you will start to receive streaming audio from that source. This works over your local LAN, assuming it is properly configured and both machines are on the same subnet. Network setup can be complicated, I *cannot* assist users with configuring their network.

Purchasing MultiMode

MultiMode is only \$89. Take a moment to compare this to the prices charged for commercial decoding programs, which, in addition to being many times more expensive (often by around a factor of ten), are also only available for the PC. When you buy MultiMode, you'll get a year's worth of upgrades.

By buying your copy of MultiMode, you'll help support my efforts to develop newer versions, which will further increase the number of modes which can be monitored, and the features available. I'd like to be able to continue developing new versions of MultiMode, so that we Mac users won't be forced to abandon the Macintosh for the wintel platform.

When you buy and receive your registration code, select Enter Registration Code from the Edit menu, and enter the code. If you purchase and don't get your registration code within a week, please send me an email at info@blackcatsystems.com.

To buy online with a credit card, go to the following URL:

<http://www.blackcatsystems.com/register/multimode.html>

Please make sure you include your correct email address when you buy online. That is the only way we can send the registration code to you, so you must include your email address. If you do not send me a valid email address, we have no way to send you the code.

The following section explain how to buy MultiMode by check/money order, if you wish to pay that way.

Thanks again for giving MultiMode a try. 73's !

Chris Smolinski, N3JLY Black Cat Systems
4708 Trail Court Westminster, MD 21158

email: info@blackcatsystems.com

Web: <http://www.blackcatsystems.com/software/multimode.html>

Purchasing by Check or Money Order

To order by check, please fill out and mail the following form, along with your payment. You can pay with a wide variety of cash from different countries but at present if you pay via check, it must be a check drawn in US Dollars on a US Bank. While there is the risk of loss in the mail, currency is also OK, including foreign currency (I collect foreign banknotes).

----- MultiMode CHECK / MONEY-ORDER ORDER FORM -----

I would like to buy ____ copies of MultiMode, at \$89 US per copy.

Please make sure you include your email address with your payment. That way we can send the registration code to you, so you must include your email address. If you do not send us a valid email address, we have no way to send you the code.

Name: _____

Address: _____

City: _____ State/Province: _____

ZIP/Postal Code: _____ Country: _____

Email Address: _____

Including your email address is VERY important as this is how we will contact you with your registration code.

Please make checks or money orders out to: Black Cat Systems. All payments must be in US funds on a US bank, or by international money order if outside the US. Maryland residents please add 6% sales tax.

Enclosed, please find my check / money order / cash in the amount of \$_____

Mail this form, along with payment, to:

Black Cat Systems

4708 Trail Court Westminster, MD 21158 USA

Release History

6.9.0 1/13/2021

Added support for streaming audio from SDRuno / Kiwi Konnect.

6.8.0 12/20/2016

Improvements to Morse Code (CW) decoding.

6.7.5 11/3/2016

Added tooltips.

Several bug fixes for SSTV mode.

Option-clicking on SAVE button in SSTV uses last filename.

6.7.2 7/6/2016

Added support for the additional 16 tones added to ICAO SELCAL.

6.7.0 11/22/2015

Added Short Demod mode to DGPS.

Added ability to upload received SSTV images to Imgur.

Fixed bugs that could cause a crash when the Spectrum or Waterfall windows were opened. Many misc user interface improvements.

6.6.0 1/20/2015

Added audio filters for many modes.

Added variable bandwidth for CW demodulation.

Faster responding Auto WPM detection in CW mode.

Added an option to open the documentation from within the app.

6.5.0 10/1/2014

Added SdrDx interface.

Added color option to the waterfall.

6.4.1 6/29/2014

Fixed a bug that could cause the app to become unresponsive at startup.

6.4.0 6/26/2014 Added Bit Analysis mode.

6.3.1 10/5/2012

Improvements to CW auto speed measurement. Better accomodation for CW space variations.

6.3.0 6/21/2012

Mark/Space tones can be changed by the user in Packet mode.

The Option and Shift keys can be used in Fax mode to change the timing delta by larger amounts. Improvements to SSTV decoding.

+/- buttons in SSTV mode to magnify the image size.

6.2.4 12/15/2011

Improvements to Packet mode decoding performance.

6.2.3 1/20/2011

Fixed several bugs dealing with macros.

6.2.2 12/29/2010

Fixed a bug that caused the end tone in FAX mode to not always be detected.

6.2.1 10/17/2010

Fixed a bug that caused too much CPU time to be used.

6.2.0 10/14/2010

Added TCP/IP data stream.

6.1.7 9/16/2010

Fixed bugs dealing with the PowerPC platform.

Added a bandpass filter for improved Hellschreiber mode decoding.

6.1.5 8/19/2010

Fixed a bug that could cause a crash when an SSTV image was saved to disk.

6.1.3 8/12/2010

Fixed a bug that caused incorrect colors for SSTV images on PowerPC Macs. Fixed a bug twith tone mode.

6.1.2 7/5/2010

Fixed a memory leak with the waterfall window.

6.1.1 5/7/2010

Fixed a bug that caused distorted audio on PowerPC Macs.

6.1.0 3/25/2010

Added slider to adjust audio input gain.

6.0.2 12/25/2009

10.6 Bugfix - waterfall display not updating.

6.0.1 12/22/2009

Fixed bugs for 10.6 Snow Leopard.

Changed modifier key combinations for brag files. Fixed bug with ACARS plane files not loading.

6.0.0 12/10/2009

First release of Cocoa re-write Added Wrasse SSTV Modes.

5.9.1 2/27/2007

Fixed some bugs in CW mode that affected the accuracy of the speed.

5.9.0 2/8/2007

Added DGPS mode

Added 2 kHz option to MT63 mode

Fixed a bug with the TCP/IP port echo option

Fixed a bug in SSTV mode, the mode would be automatically set even if the AUTO button was off. Added custom integration period to LORAN-C mode.

Added display offset to LORAN-C mode.

5.8.0 8/17/2006

Added tuning indicators for several modes.

SSTV mode displays a status showing the percent of the image transmitted.

Macros can have the other operators call and name automatically inserted when they are sent. The macro window will automatically open and position itself to the previously used size and location when MultiMode

starts.

Bug fix: selecting a different sound input source didn't always actually change the source.

5.7.0 6/11/2006

Improvements to SSTV start of picture and VIS code detection.

5.6.1 3/1/2006

Fixed bugs with Robot 36C and Scottie DX SSTV modes.

5.6.0 10/1/2005

Added these VHF Tone Modes: EEA, ZVEI1, ZVEI2, ZVEI3, PZVEI, DZVEI, PDZVEI, NATEL, EURO, MODAT, CCITT, VDEW, CCIR7, PCCIR

Improved recognition of start and stop tones in weather fax mode.

5.5.1 8/7/2005

Fixed a problem under Tiger, where log, text, and image files could not be opened.

5.5.0 4/11/2005

Added EAS (Emergency Alert System) decode and transmit.

Added RIT (Receiver Incremental Tuning) to PSK31 mode.

Added ability to change the audio input source and device while MultiMode is running. Fixed a bug where the generate cw audio preferences setting was not being saved correctly. Fixed bug in ACF mode, the wrong center frequency was used.

5.4.0 1/17/2005

Improvements to SSTV mode, including VIS auto detection of mode type.

5.3.0 12/2/2004

Support for keying CW transmitter now.

Can switch between DTR/RTS for PTT/CW keying in preferences.

Shortened delay when switching to receive mode.

Option-T (†) in a macro switches to transmit mode.

Added menu item to select main window.

Sped up Hell mode display updates.

Fixed bug that could cause File->Save Text As... to not work.

Fixed bug that prevented Macro window from being refreshed when

program brought back from background.
Fixed ALE tone display indicators.

5.1.0 10/18/2004

Added RIT offset to PSK31 mode.
Added 7/8 bit and 1/1.5/2 stop bit selections to ASCII mode.
Improved ASCII demodulation under poor reception conditions.
Added CHU FSK decode mode to decode atomic clock time of day transmission. Fixed a bug that could cause MT63 mode to crash.
Changed the text display font to one with a slash through the zero.

5.0.0 9/30/2004

Fixed a bug that caused the SYNC button for SITOR mode to not be visible.

5.0.0a2 8/6/2004

Fixed a bug that caused the psk31 waterfall and demod view in some modes not to show.

5.0.0a1 8/3/2004

Added MT63 Mode.
Added GMDSS Mode.
Created Mode menu.
ACF mode has option to dump raw bits for later analysis.

4.9.0 7/15/2004

Added macro keys to send text files.
Window title now indicates if currently transmitting. Fixed a bug that could cause a crash if a macro was too long. Updated GW stations.
Improvements to KG-84 mode.

4.8.0 6/23/2004

® (option-R) in transmit buffer automatically switches MultiMode over to receive mode. Transmit text display is cleared when you enter receive mode.
option-Fkey to automatically edit that macro function key.
Fixed a bug in RTTY transmit mode that cause the wrong polarity to be transmitted.

4.7.0 5/30/2004

Improvements to RTTY demodulation.

Improvements to FAX synchronization at the start of a picture.

Fixed a bug in Hellschreiber mode where the display would not update.

4.6.3 4/22/2004

Added IMD display to PSK31 mode.

RTS line is now toggled as well as DTR on the selected serial port for PTT.

Fixed a bug where the display of transmitted text would not be updated/shown. Added @ symbol to morse code mode.

Added invert button to fax mode.

Option click << or >> in Fax mode now shifts ten times as much.

Fixed a bug in RTTY mode - startup baud and shift were not correct.

Some user interface enhancements.

4.6.2 4/13/2004

Removed some unnecessary screen updates to speed up operation.

Fixed a bug with the tuning indicator display in 300 baud packet mode.

4.6.1 4/7/2004

Added identification of Globe Wireless idle packets. Added identification of KG-84 crypto headers.

4.6.0 3/4/2004

Added display of which characters have been transmitted.

Added ability to send from a text file.

Can load PICT, GIF, JPEG, TIFF,PNG, BMP files now to send via SSTV.

Added macro editing window.

Added text input box at bottom of main window.

Added ACF Auto-Correlation Function.

Added TCP/IP connections, clients can receive a stream of decoded text.

Can now copy decoded text from the display to the clipboard.

Improvements to waterfall display.

Fixed some bugs dealing with CW and RTTY transmitting.

Added ASCII transmitting.

Fixed bug with HELL mode display not updating.

Added font size to preferences.

Can past text into transmit buffer.
Fixed a bug that could cause a crash when selecting a serial port.
Increased maximum length of received fax transmissions.
Improved SSTV VIS code detection
Added several additional SSTV modes

4.5.0 1/26/2004

Added Sitor-A decoding.
Added shift display to Bit Rate mode.
Fixed several bugs that could cause a crash.

4.4.1 12/26/2003

Fixed several bugs that could cause a crash on program startup.

4.4.0 1/12/2004

Added Sitor-B / NAVTEX mode.

4.3.3 12/26/2003

Fixed a bug that could cause a crash if more than 5 sound input devices are present.

4.3.2 12/22/2003

Fixed a bug in DTMF and SELCAL transmit modes that caused noise to be added to the transmitted sound.

4.3.1 11/28/2003

Added "No RX on TX" option to preferences.

4.3.0 11/28/2003

Fixed a bug which could cause a crash on startup.

4.2.2 11/5/2003

Fixed a bug where MultiMode wouldn't report all available serial ports.
Added checkbox to instruct MultiMode to check for serial ports.

4.2.1 10/25/2003

Make PSK31 waterfall switchable between color and B&W

Fixed a bug that could cause a crash on startup

4.2.0 10/25/2003

Added clickable waterfall display for PSK31 mode

4.1.0 9/28/2003

Bug fixes for transmit mode - sound not always playing Added CTCSS decoding

Added transmitting for Hell Mode

Added transmitting for CTCSS Mode

Added transmitting for DTMF Mode

Added transmitting for ICAO Selcal Mode

Added transmitting for EIA Mode

Added transmitting for CCIR Mode

Typed text now appears in red

4.0.2 6/15/2003

Improvements to PSK31 demodulation

Bug fixes dealing with transmit mode to fix problems with no sound under OSX 10.2.6

4.0.1 3/6/2003 Lite version released

4.0.0 1/11/2003

Fixed bug in spectrum waterfall mode Added 1000 Hz RTTY shift

Final release

4.0.0b2 1/5/2003 Added Applescript support

4.0.0b1 11/24/2002

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