

# MultiMode

MultiMode OSX Version 5.9.1      February 27, 2007

This documentation describes both MultiMode and MultiMode Lite. The Lite version is limited in the number of modes supported, and does not offer transmit support.

MultiMode allows you to decode (and transmit!) many digital and other specialized radio communications modes on your Mac. Best of all, MultiMode is distributed as shareware! This means that you're free to test and evaluate MultiMode prior to registering (paying for) it. Please read the chapter on Registering to discover how you can register your copy, and help support software for the Macintosh.

This documentation describes both MultiMode and MultiMode Lite. The lite version is identical, except that it is receive only, and only supports CW, RTTY, ASCII, and FAX modes.

If you're an existing MultiMode user, please be sure to check the Release History at the end of this documentation, to see what changes have been made since your last version.

Information on transmitting is scattered throughout this document, in the relevant mode sections.

I've done all testing on a G4, iBook, and an iMac DV. I'm anxious to hear how MultiMode performs on other machines.

Why did I write it? I've always been frustrated with the lack of decent ham/radio software for the Mac. Why should the wintel boys have all the fun? I've written several other Mac radio related programs in the past (check my web page for details), and have often had requests for a CW/RTTY/FAX/SSTV/etc. decoder for the Mac.

Please read through the chapter on registration, to learn how you can register your copy of MultiMode, and help support ham radio software for the Macintosh.

73's  
Chris Smolinski, N3JLY  
Black Cat Systems  
info@blackcatsystems.com

## Contents

**Requirements** - Computer, Operating System, Radio

**Connecting Your Radio** - Audio connections, serial port

**Starting up MultiMode**

**MultiMode Menus** - File, Edit, Control

**Preferences** - File, Edit, Control

**Macros** - Quickly send text

**Modes Supported:**

**Morse Code (CW)**

**FAX** - Weather and Satellite

**RTTY** -Radio-Teletype, Baudot and ASCII

**SITOR** - SITOR-A and SITOR-B/FEC/NAVTEX

**ACF** - Auto Correlation Function

**FFT** - Audio spectrum displays

**BIT RATE** - Helps determine baud rate and shift

**ACARS** - VHF aircraft messaging

**Packet**

**Tone Modes** - ALE, CCIR, DTMF, EIA, ICAO, CTCSS, HELL, EAS, EEA, ZVEI1, ZVEI2, ZVEI3, PZVEI, DZVEI, PDZVEI, NATEL, EURO, MODAT, CCITT, VDEW, CCIR7, PCCIR

**PSK31**

**SSTV** - Slow Scan TV

**LORAN-C** - Navigation transmissions

**GWB** - Globe Wireless Bitanalysis

**MT-63** - Tone mode

**GMDSS** - Global Maritime Distress and Safety System

**DGPS- Differential GPS**

**Applescript Support**

**Purchasing MultiMode**

**Version History**

**Software License Agreement**

## Requirements

### Computer

Macintosh computer with G3 or G4 processor. Some 604 and 603 systems may be able to run some modes of operation. Ancient systems are not supported.

Sound input is required. If you have a Macintosh model without sound input, such as an iBook or Cube, 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.

### Operating System

Mac OS X preferred. May run in Carbon under MacOS 9. Further work will be done to make MultiMode OSX run under Carbon under MacOS 9, but no guarantees at this point of any functionality.

### 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:** While 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, such as an iBook, you can use a USB microphone. We've successfully used the iMic by Griffin.

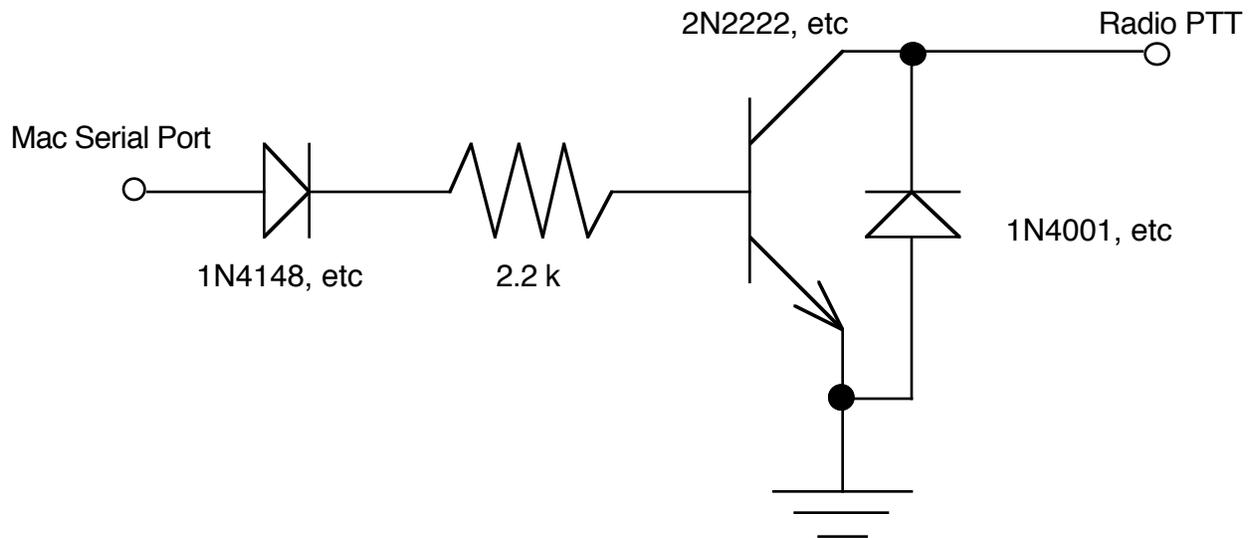
Also, you probably want to tap the audio from your radio's headphone or external speaker jack, rather than a line level or "Record" output, which may be too low in amplitude. You'll need to experiment. There are too many possible combinations and Mac models for me to give you a definitive answer for 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 RigBlaster, made by West Mountain Radio (<http://www.westmountainradio.com/>).

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. After selecting the port, re-start MultiMode to make the change effective.

If you have a Mac without a serial port (such as an iMac or iBook), you can use a USB to serial converter. We have tested MultiMode with the Keyspan Twin Serial Adapter, and found it to work. Other adapters may also work.

The following schematic shows one way to connect a radio. Please note that dangerous voltages may be present in your radio. It is up to you, the user, to determine how to safely connect to your radio, and prevent any damage to your computer (or yourself!) This type of circuit could also be used in CW mode to key a transmitter.



How the circuit works:

When the serial port output goes positive, it biases the transistor, so the collector can sink current. The 1N4148 diode protects the transistor when the serial port output is negative. The 1N4001 protects the transistor against flyback from a relay that might be lurking in the radio. A faster diode would probably offer additional protection.

The connection on the Mac end would go to the DTR output line. If you'd like to use a similar circuit for CW key control, then it would go to the TxD+ line (or TxD- if you need to invert the logic of the output).

Another (perhaps better) way would be to use an opto-isolator.

Finally, if you don't want to roll your own, there are commercial units out there. One that comes to mind is the "Rig Blaster", although we have had difficulties using it with Mac serial ports, it expects the +/- 12V swing of a PC serial port, not the +/- 5V swing of a Mac port.

As a test, select the serial port connected to an old external modem. If you go into transmit mode in RTTY, SSTV, etc modes, the DTR light on the modem will turn on. Or, just connect a voltmeter between the DTR and GND lines, and watch it swing from negative to positive (usually -5 to +5) voltage.

## Mac serial port pinout

- 1 HSKo Handshake (DTR) output.
- 2 HSKi Handshake (CTS) input or external clock.
- 3 TxD- Transmit data (inverted).
- 4 GND Signal ground.

- 5 RxD- Receive data (inverted).
- 6 TxD+ Transmit data.
- 7 GPi General-purpose (DCD) input.
- 8 RxD+ Receive data.

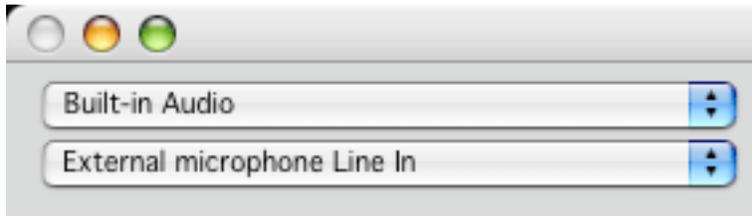
**Serial Port Mini-DIN Connector View:**

8 7 6  
5 4 3  
2 1

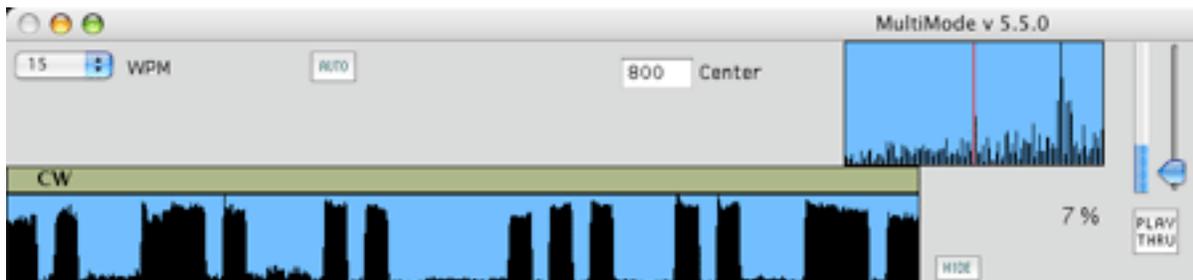
## Starting Up MultiMode

Double click on the MultiMode icon. MultiMode will start up, and display a dialog asking you which sound input device to use. Typically you will want to select “Built-in audio controller”, unless you have an iMic or other sound input device. This dialog will appear every time you start MultiMode (which may get quite annoying!), unless you specify not to show it, which is an option in the preferences.

You can also select the input device and source when MultiMode is in Idle mode, from the two popup menus in the upper left corner of the window:



You will then see the main window for MultiMode. Below is a screen shot showing the top of this window, with MultiMode in CW (morse code) mode.



Assuming you still have your radio connected, you should see activity in the volume indicator, the bar at the upper right of the control section of the main window. 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.

The slider to the right of the volume indicator allows you to vary the audio input gain into your

computer. This lets you adjust the volume of the incoming audio, if it is too weak or too loud. It only has a limited dynamic range, so it is best to make sure that the volume level coming from your receiver is correct. This slider may not have any effect with certain audio input devices, such as the iMic.



Clicking on the Play-Thru button will cause received audio to be played through your Mac's speakers, if supported by your computer's hardware.

Modes are selected from the Mode menu.

Smaller buttons appear at the top of the MultiMode window, depending on which mode you are in. As they are mode specific, the number of buttons/etc and their use changes as you change decoding mode.

In the lower left portion of the top of the window, you see the demodulated signal in most modes. There is also a graph to the left of the volume indicator, it shows a real-time spectrum display, to help you properly tune in the signal.

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.

You can always clear out the text output buffer by selecting Clear Tx buffer from the Edit menu.

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 that 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, connect 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 OSX menu

*About MultiMode OSX...*

This displays some brief information about MultiMode OSX.

*Preferences..*

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

### File menu

*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.

*Save Image As...*

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. The creator/type IDs are set for opening with TeachText or SimpleText, although any of the popular word processors or text editors may be used.

*Page Setup...*

The usual Page Setup dialog is displayed.

*Print...*

Not yet available.

*Decode From File...*

This allows you to select an AIFF or WAVE format sound file, and decode using the recorded sound

in that file. This is very handy if you've previously recorded some audio, or someone sends you a digitized sound file. Please note that the file must be in the WAVE or AIFF format, sampled as 16 bit audio at 44100 kHz monophonic. If you're looking for a program to record sound in this format, please take a look at Audiocorder, also available from Black Cat Systems.

## **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*

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

### *Clear Input Buffer*

This allows you to clear the text input display.

### *Select All*

This selects all of the text in the display window.

### *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.

## **Control 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.

### *Build SSTV File*

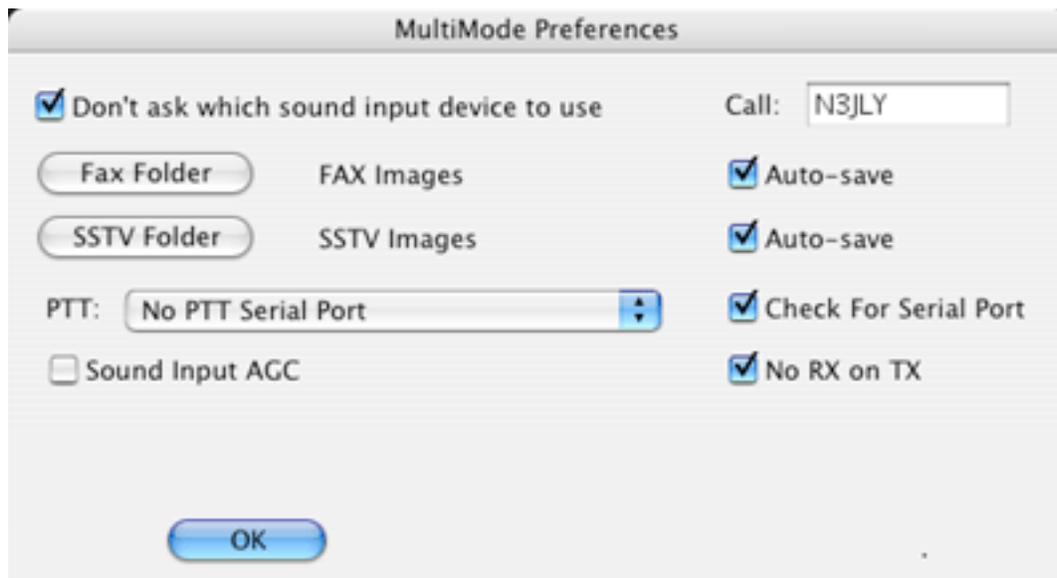
Creates a transmit file which can later be sent in SSTV mode. To send an SSTV picture, use this function to specify the file containing the image to be sent. The image will be converted to the SSTV to eventually be transmitted, in the currently selected SSTV mode. Then select Transmit mode, and the transmission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

## Mode Menu

Modes 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.

## Preferences



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

### **Don't ask which sound input device to use**

MultiMode will use the device you selected last time you ran the program, and not ask you when you start the program.

### **Call:**

Your callsign, added to any SSTV images transmitted.

### **Fax Folder**

Allows you to specify a folder into which fax images are auto-saved, when the auto-save checkbox is marked.

### **SSTV Folder**

Allows you to specify a folder into which SSTV images are auto-saved, when the auto-save checkbox is marked.

### **Fax Folder**

Allows you to specify a folder into which fax images are auto-saved, when the auto-save checkbox is marked.

### **PTT:**

Specifies which serial port to use to control the PTT (Push To Talk) line of a transmitter. The DTR line is set to active when in transmit mode.

### **Check For Serial Port:**

You need to check this box for MultiMode to search for serial ports and put them in the above (PTT) list when it starts up. After checking it, quit and restart MultiMode.

**Sound Input AGC:**

Enables Automatic Gain Control on the sound input. Not functional on all Mac models or sound input devices due to hardware limitations.

**No RX on TX:**

Disables reception while you are transmitting. Useful if you get noise pickup/etc while transmitting which causes reception and display of garbage.

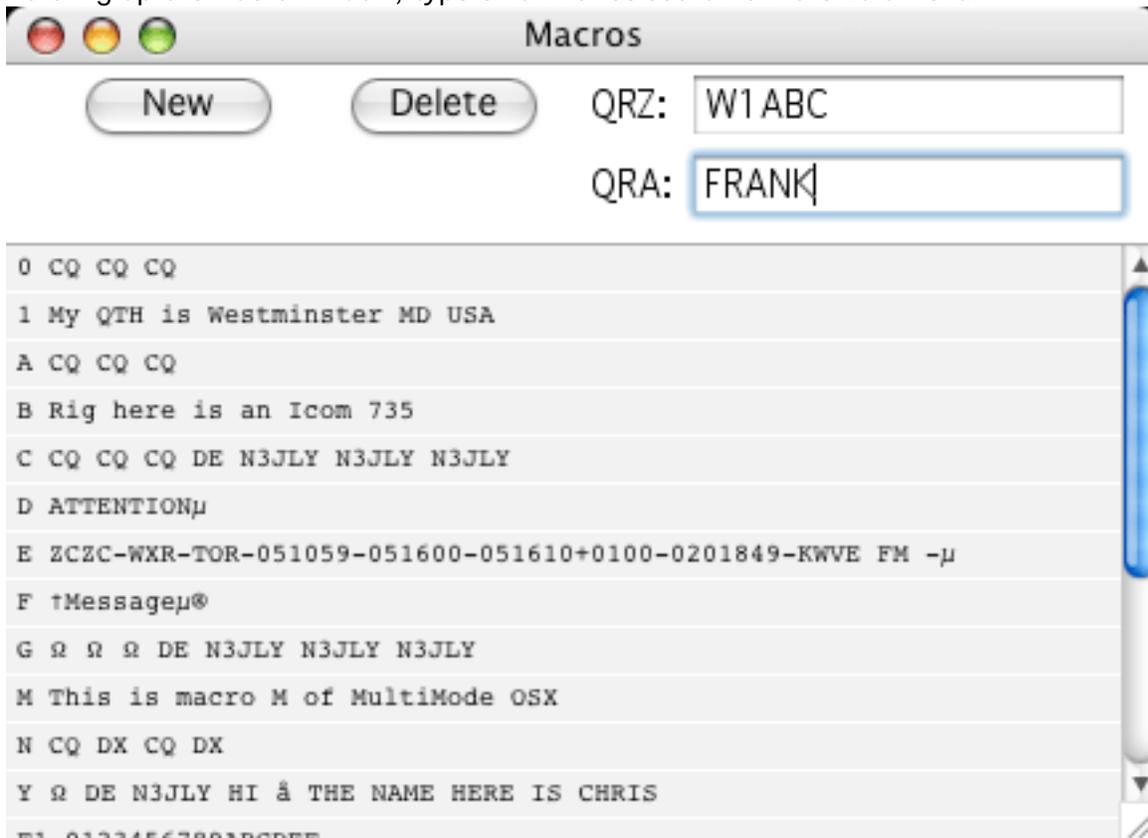
**TCP/IP Port:**

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 program runs as root, so you should select a port higher than this.

## Macros

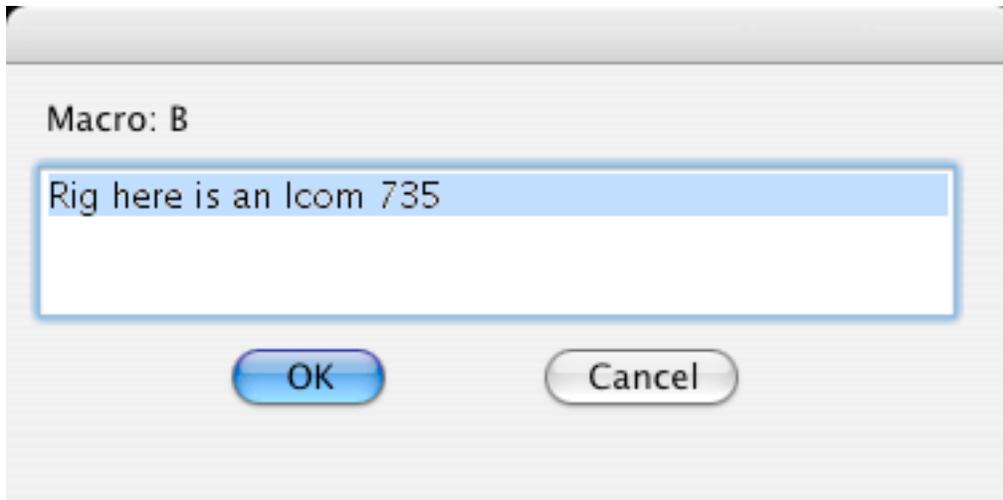
MultiMode allows you to define macros, which are strings of text which can be sent with just one keystroke. Macros are very handy for sending CQ calls, QTH/name information, or other messages that are commonly sent.

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



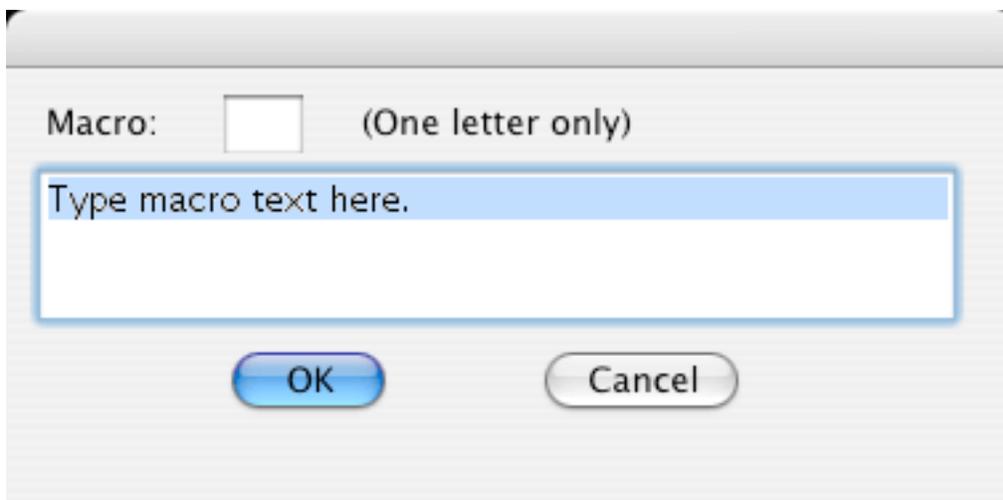
The letter at the far left of each line is the hotkey for that macro. Typing that character, while holding down the control and option keys, will cause the text for that macro to be placed in the transmit buffer window, just as though you typed it.

To edit an existing macro, double click on the macro line. You'll see a window like that below:



Just replace the text with what you want the macro to contain, and click OK.

You can create a new macro by clicking on the New button. You'll get a window like the one below:



It works just like the editing window, except you also need to type in a character in the box to the left of Macro:. Valid characters are the digits 0 to 9 and letters A through Z. Some other punctuation characters may work as well. In addition, one of two of the letters may not work on your system, due to how the Mac handles the keyboard.

You can delete a macro by using the Delete button. First, be sure to double click on the macro you want to delete, and then click on the delete button. The convoluted way of doing this is to make it less likely that you'll accidentally delete a macro.

Function keys F1 to F8 are also available. They are automatically shown in the Macro window, you don't need to define them, just edit them to whatever text you want. And, you can quickly and easily edit them. Just hold down the option key while hitting the function key, and you will automatically be shown the editing window for that key.

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

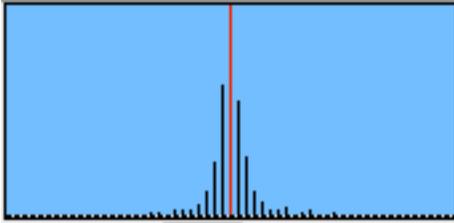
If you place a å (option-A) in the macro, MultiMode will automatically insert the operators name (QRA) from the Macro Window into the text that is sent. This lets you set up various macros to use in QSOs that will be automatically personalized when they are sent.

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

You can also send one of ten text files, by typing the characters shift-option-0 through 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. We 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 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 set via the popup menu

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. Also, it is always more reliable setting the speed by hand than using the Auto mode, as pulses of noise can easily confuse it. Noise or erratic sending will affect the reliability of this feature.

The center frequency may be set by entering it into the text box, and then pressing enter.

## 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 MutliMode 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.

## Hints

Often, it is best to leave the AGC disabled on your receiver, and use your rig's RF gain control to adjust the received volume. You 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.

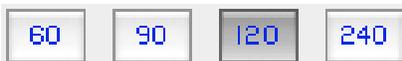
You may also want to visit the following web site for more information about FAX mode, including station schedules:

<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.



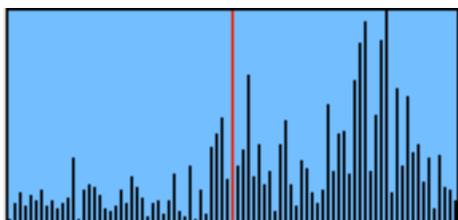
You may select whether to display gray scale, or line mode (black and white). Gray scale should be used for satellite images (which are also sent via HFFAX stations) and other images where shades of gray are sent. Line mode is useful when weather maps are sent that have no shading information. It is 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.



Finally, there is also an AUTO mode, this 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 (shown above) located in the information window near the buttons. This displays a spectrum of the received signal. The red line indicates 1800 Hz, the center fax frequency.

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..



These buttons adjust the Timing Delta. 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  $\delta$  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.

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.

Please note that if insufficient memory is available, the maximum number of shades displayed will be decreased, with only black and white possible as the worst case. Less memory than that will probably cause a crash!



This 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.

## 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 120 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.

## Buttons

The various buttons in the Signal Window perform the following operations:



This menu selects the baud rate.



This menu selects the shift frequency.



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:**



## 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

The A and B 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

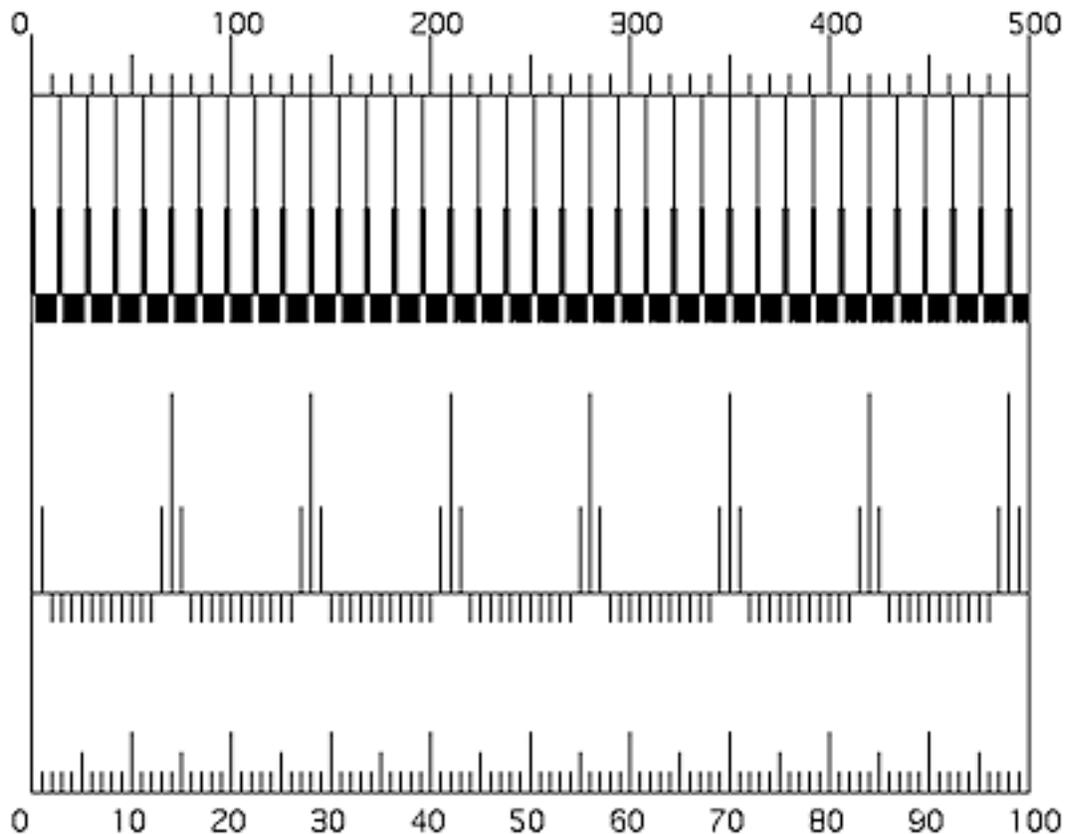
BAD: MultiMode is receiving garbled characters, has lost sync, or there is no transmission detected, just static.

## ACF - Auto Correlation Function

This mode performs comparisons of the demodulated data bits with a time-delayed version of those data bits. This is a useful way of determining the word size being transmitted, and if the data is encrypted. MultiMode performs an ACF with delays of 1 to 500 bits, using a buffer of the last 1000 bits. The result is a graph showing the ACF for each delay, which can range from -1 to +1. For clarity, that information is graphed twice. The first graph shows data for the full 1 to 500 bit delay range. Then below that is a graph showing delays of only 1 to 100, since that is usually the range of greatest interest.

In order for the ACF to be properly computed, you must set the Shift, Center frequency, and Baud rate correctly.

For example, below is an ACF of a SITOR-B idle (phasing) transmission. Looking at the bottom graph, there are ACF peaks at delays of 14, 28, 42, etc. This is due to the nature of the phasing characters sent. It's like a fingerprint.



Stations sending encrypted traffic often have an ACF that is close to zero everywhere, due to the essentially random nature of the data being transmitted.

## FFT

This mode analyzes the sampled sound, and displays the spectrum, showing what audio frequencies are present. In the basic mode, a graph is shown, plotting the amplitude vs frequency.

The range graphed is set by the values entered into the span boxes, in Hz.

The Gain adjusts the height of the graph

The Averages sets the number of samples which are averaged together, to help smooth out variations.

The popup menu selects the number of readings which are run through the FFT algorithm. The more samples, the finer the resolution.

The CLR button clears out the buffers, and is useful when the number of averages is large, and it is wished to discard old readings immediately.

The LOG button selects a logarithmic vertical axis, rather than a linear axes.

When the NUM button is selected, the ten highest amplitude frequencies will have the frequency, in Hz, displayed next to the peak.

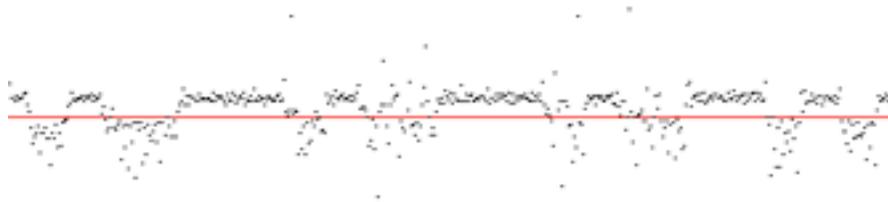
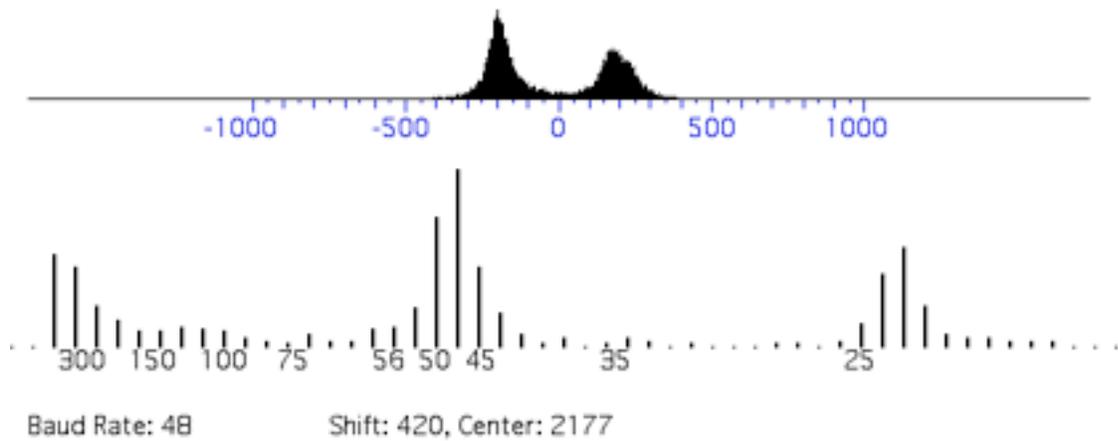
When the PIC button is selected, a scrolling spectrogram is displayed. This can be useful for bringing weak signals up out of the noise.

## Bit Rate

This mode will help you determine the bit (baud) rate and shift of an RTTY station. The length of each bit received is converted into an effective baud rate. The bit lengths are sorted into bins, with the resulting histogram displayed, with a bit of averaging, to get more accurate results and offset the effects of noise. Therefore it takes several seconds to get a good reading.

The CLR button clears all of the buffered readings, and should be pressed whenever a new station is tuned in.

Shown below is a 48 baud station. The graph shows the number of data bits at each possible baud rate, based on the length (in time) of the bit. Since it is possible to get several zero or one bits in a row, it is typical to see smaller peaks at lower baud rates. In this case, MultiMode has determined that it is a 75 baud signal, with a center frequency of 2177 Hz and and 420 Hz shift.



The graph at the bottom shows the raw demodulated signal.

## 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

ACARS 15 GOOD 1 BAD 93%
-------------------------

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.

There is an LED type indicator next to the text Packet, above the status which lights up green when a good ACARS packet is received, and red if a packet is received but it is bad.

Clicking the CLR 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:

<a href="http://patriot.net/~acars/">http://patriot.net/~acars/</a>	ACARS-Link
<a href="http://patriot.net/~jetset/acars.html">http://patriot.net/~jetset/acars.html</a>	Northern Virginia ACARS Page
<a href="http://www.euronet.nl/users/bart_b/">http://www.euronet.nl/users/bart_b/</a>	Bart 'Beaver' Hoekstra ACARS Page
<a href="http://web.inter.NL.net/hcc/Hans.Wildschut/">http://web.inter.NL.net/hcc/Hans.Wildschut/</a>	ACARSWeb

There is also the ACARS mailing list, available from [www.qth.net](http://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
DH	Atlantic Coast Airlines
5Y	Atlas Air
BO	Boeing

C8	Chicago Express
OO	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 ] DX de lu6hdf: 14260.0 AY0N/X
[ UI ] [ BEACON0 ] [ AJ00 0 ] [ W0TX 0 ]
[ RR ] [ EA8DW 2 ] [ EA3RKD2 ]
[ I ] [ W0TX 7 ] [ W9UW 0 ] SP W60AV
[ I ] [ W60AV ? ] [ AJ00 7 ] DX de wa6yfd: 14217.3 RN6BY
[ I ] [ W0TX 7 ] [ W9UW 0 ] Hello Bill...hope that all is we
[ I ] [ W0TX 7 ] [ W9UW 0 ] ll with you. We had a very nice
[ I ] [ W0TX 7 ] [ W9UW 0 ] day here today.Sun and the high
```

The format is as follows:

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

## Packet Types

DISC	Disconnect Request
DM	Disconnected Mode
I	Information
FRMR	Frame Reject
REJ	Reject
RNR	Receive Not Ready
RR	Receive Ready
SABM	Connect Request
UA	Unnumbered Acknowledge
UI	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.

MultiMode uses the following standard tone pairs:

HF (300 baud): 2110 / 2310 Hz

VHF (1200 baud): 1200 / 2200 Hz

For VHF this isn't a problem. For HF, you need to make sure your receiver is properly tuned. The FFT mode is handy for checking the tuning.

## 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:

ALE - Automatic Link Establishment

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

HELL - Hellschreiber, described in detail in the next section

The decoded information is displayed in the text window.

A brief description of the tone modes:

### ALE

Automatic Link Establishment. This system was developed by the US government, and is now in use by many organizations and countries world-wide. 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		Data
THRU		Thru
TO	To	
TWAS	This was	
FROM	From	

TIS        This is  
CMD       Command  
REP       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.

## 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

Some SELCAL frequencies:

3016 5598 8906 1330617946  
2899 5616 8864 13291  
2962 6628 8825 11309 13354  
2872 5649 8879 1133613306  
2971 4675 8891 1127913279  
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

## 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:

```
CQ CQ CQ DE N3JLY N3JLY N3JLY PSE KKK  
CQ CQ CQ DE N3JLY N3JLY N3JLY PSE KKK
```

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/z11bpu/>

### Common Hell Frequencies

80m	3.575	(Region 1) 3.559 (Region 3)
40m	7.030 - 7.040	
30m	10.135 - 10.145	
20m	14.063 - 14.070	(many operators watch 14.063 MHz)
17m	18.101 - 18.107	
15m	21.063 - 21.070	
10m	28.063 - 28.070	
	28.100 - 28.110	(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.

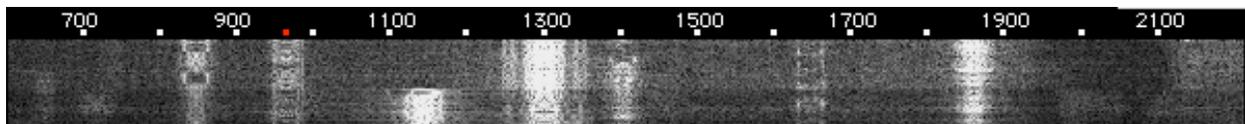


The above picture shows the waterfall that you see when using PSK31 mode. There are marker dots every 100 Hz, and the frequency is shown every 200 Hz. The waterfall shows frequencies between 600 and 2200 Hz.

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:

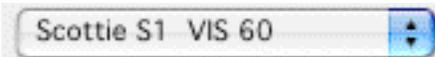
1838.150  
3580.150  
7035.150  
10140.150  
14070.150  
18100.150  
21080.150  
24920.150  
28120.150

The "Official PSK31 Homepage" is located at: <http://www.kender.es/~edu/psk31.html>

## 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



In this popup menu, the current SSTV mode is displayed. Clicking on it will allow you to select a new mode.

If Auto Select Mode 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.



This 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.



This 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 Reception 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 Reception button will stop reception of an image. Normally this occurs after the receive buffer fills up, after about four minutes.



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



This button, when selected, magnifies the image. It displays it double sized.

You can select **Save Image As...** from the **File** menu, and save an SSTV image, in one of many image formats.

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

## SSTV Transmission

There may be some slight timing offsets in some of the modes, please bear with them for now. At present you can transmit only in the Scottie and Martin 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 **Build SSTV File** from the **Control** menu.
4. A file open dialog will appear. Select the picture file. The file can be an image in PICT, GIF, JPEG, TIFF, PNG, or BMP format. The should be the same size as the transmission mode uses, or some distortion may occur as the image is scaled.
5. A preview of the image to send is shown.
6. After the sound output file is built, you may select **Transmit** mode from the **Control** menu, and the picture will be sent. During transmission, the DTR line of the selected serial port will be active (if a port was selected), this may be used as a PTT signal to a transmitter.

It is best to not try to do too much else with your Mac while transmitting an SSTV image, or the audio may start to skip, especially on slower machines.

At present, a 16 line grayscale title is included in all modes. You can enter your callsign into this title by going to the General Preferences, and entering it into the Call field. If your copy of

MultiMode is unregistered, then UNREG will be sent as your callsign.

## SSTV Modes

MultiMode supports the following SSTV modes. Is your favorite mode not listed? Email me with the specifications for the mode, and I'll add support for it!

### Robot Modes

8 Second B&W  
12 Second B&W  
24 Second B&W  
36 Second B&W  
36 Second Color  
72 Second Color

### Martin Modes

Martin M1  
Martin M2  
Martin M3  
Martin M4

### Scottie Modes

Scottie S1  
Scottie S2  
Scottie S3  
Scottie S4  
Scottie DX

## 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

## 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.

## 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”.

### **Scaling**

Controls the horizontal scaling of the display.

### **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.

Usually the number will be extremely close to 1.0. For example, on my particular system, I use a value of 0.99999809.

The field under the timing offset box allows you to enter in a number which will shift the captured data to the left or right. This makes it easy to align the master station, and is probably easier to use than the < and > buttons, described below.

### **Gain**

Adjusts the vertical display.

### **Buttons**

The < button will shift newly captured data to the left. The > button will shift newly captured data to the right. The << and >> buttons perform a larger shift. After shifting, you will need to

wait for the new image to build up, the waiting period will depend on the averaging period.

The CLR button will clear the integration results.

## GWB - Globe Wireless Bitanalysis

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 detects 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
- 0xde SAB, Goeteborg, Sweden
- 0xe3 8PO, Bridgetown, Barbados

## MT-63

MT-63 is a new multi-tone mode. It transmits a fairly wide bandwidth of audio, from 500 to 2000 Hz. The data rate is about 100 wpm, and there is a large amount of forward error correction (FEC) allowing good reception under even poor conditions.

There are only a few settings for this mode:

The bandwidth should be selected, either 500 , 1000 or 2000 Hz. 1000 Hz is the most commonly used.

The integration period should be set for reception: 16, 32, or 64. 16 usually works well.

The interleave should be set, 0 or 1. 0 is most common.

The status bar displays some information about current reception conditions:

Lock: indicates whether or not the software has locked onto a MT-63 transmission

Confidence: Whether or not the software thinks this is an MT-63 transmission

SNR: the signal to noise ratio. Usually greater than 100 when correctly tuned in.

Offset: the tuning offset, in Hz, from the signal.

It usually takes a few seconds to lock onto an MT-63 signal. Also, due to the time diversity methods used, it takes a few seconds for transmitted text to be completely sent (and received). So don't stop transmitting until a few seconds (say 5) after you have typed your last character.

## 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
```

# Applescript

## Introduction

Certain eatures within MultiMode can be controlled using Applescript. Below is a summary of the supplied commands. This is not meant to be a guide explaining how to use or write Applescripts, there are books and websites devoted to this topic, please visit them if you have any questions regarding how to write a script.

### CWSpeed: CW Speed 1-40

CWSpeed integer

### CWAuto: CW Auto-speed mode

CWAuto boolean

### CWCenterFreq: CW Center Frequency

CWCenterFreq integer

### RTTYBaud: RTTY Baud Rate - 45,50,56,75,100,110,150,200,300

RTTYBaud integer

### RTTYShift: RTTY Shift - 170,250,450,600,850

RTTYShift integer

### Mode:

Mode string

### RTTYCenterFreq: RTTY Center Freq

RTTYCenterFreq integer

### RTTYInverse: RTTY Inverse Mode

RTTYInverse boolean

### FAXLPM: Fax Lines Per Minute - 60,90,120,240

FAXLPM integer

### FaxClear: Clear Fax Screen

FaxClear

### SSTVStart: Start SSTV Capture

SSTVStart

### SSTVStop: Stop SSTV Capture

SSTVStop

### SSTVBuild: Image file to build

SSTVBuild file specification

**SSTVMode: SSTV Mode**

SSTVMode string

**PacketBaud: Packet Baud Rate 300 or 1200**

PacketBaud integer

**PacketInfo: Packet Info only mode**

PacketInfo boolean

**PacketDebug: Packet Debug Mode**

PacketDebug boolean

**LoranChain: Loran Chain ID**

LoranChain integer

**LoranAverages: Loran Averages 1,5,10,20,30,40,50**

LoranAverages

**Transmit: Turn on transmit mode**

Transmit

**Receive: Turn on Receive mode**

Receive

**NewLog: Open and start recording text to new log file**

NewLog file specification

**AppendLog: Append to existing log file**

AppendLog file specification

**CloseLog: Stop writing to log file**

CloseLog

**SaveImage:**

Savelmage file specification

**SaveText: Save buffer to text file**

SaveText file specification

**Clear: Clear text display**

Clear

**CopyClip: Copy text or image to clipboard**

CopyClip

**Grab: Returns existing text, clears display**

**Grab**  
Result: string

**PlayThru:** Audio input play-thru  
PlayThru boolean

**Gain:** 0-255  
Gain integer

### Some Examples:

```
tell application "MultiMode OSX"  
    Mode "cw"  
end tell
```

```
tell application "MultiMode OSX"  
    CWSpeed 13  
end tell
```

```
tell application "MultiMode OSX"  
    SaveText file "filename"  
end tell
```

```
tell application "MultiMode OSX"  
    SaveImage file "faximage"  
end tell
```

```
tell application "MultiMode OSX"  
    NewLog file "testlog"  
end tell
```

```
tell application "MultiMode OSX"  
    CloseLog  
end tell
```

## Purchasing MultiMode

MultiMode is shareware. The price 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. There is also a Lite version (limited modes, receive only).

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](mailto:info@blackcatsystems.com).

The following sections explain how to buy MultiMode, by check/money order, or by credit card.

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](mailto: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.

I would like to buy \_\_\_\_\_ copies of MultiMode Lite, at \$29 US per copy.

If you would like a CD-ROM, please add \$10.00 to your order and check here:\_\_\_\_\_

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 5% 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**

## Buying Online by Credit Card

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

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

Please make sure you include your 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.

## Release History

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



# Software License Agreement

This is a legal agreement between you and Black Cat Systems, covering your use of MultiMode (the "Software"). Be sure to read the following agreement before using the Software. BY USING THE SOFTWARE (REGARDLESS IF YOU HAVE REGISTERED THE SOFTWARE OR NOT), YOU ARE AGREEING TO BE BOUND BY THE TERMS OF THIS AGREEMENT. IF YOU DO NOT AGREE TO THE TERMS OF THIS AGREEMENT, DO NOT USE THE SOFTWARE AND DESTROY ALL COPIES IN YOUR POSSESSION.

The Software is owned by Black Cat Systems and is protected by United States copyright laws and international treaty provisions. Therefore, you must treat the Software like any other copyrighted material (e.g., a book or musical recording). Paying the license fee allows you the right to use one copy of the Software on a single computer. You may not network the Software or otherwise use it or make it available for use on more than one computer at the same time. You may not rent or lease the Software, nor may you modify, adapt, translate, reverse engineer, decompile, or disassemble the Software. If you violate any part of this agreement, your right to use this Software terminates automatically and you must then destroy all copies of the Software in your possession.

The Software and its related documentation are provided "AS IS" and without warranty of any kind and Black Cat Systems expressly disclaims all other warranties, expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Under no circumstances shall Black Cat Systems be liable for any incidental, special, or consequential damages that result from the use or inability to use the Software or related documentation, even if Black Cat Systems has been advised of the possibility of such damages. In no event shall Black Cat Systems's liability exceed the license fee paid, if any.

This Agreement shall be governed by the laws of the State of Maryland. If for any reason a court of competent jurisdiction finds any provision of the Agreement, or portion thereof, to be unenforceable, that provision of the Agreement shall be enforced to the maximum extent permissible so as to effect the intent of the parties, and the remainder of this Agreement shall continue in full force and effect.

The Software and documentation is provided with RESTRICTED RIGHTS. Use, duplication, or disclosure by the Government is subject to restrictions as set forth in subdivision (b)(3)(ii) of the Rights in Technical Data and Computer Software clause as 252.227-7013. Manufacturer is Black Cat Systems., 4708 Trail Court, Westminster, MD 21158, United States of America.

The name "Black Cat Systems", and "MultiMode" are trademarks of Black Cat Systems.

MultiMode is ©1997-2007 by Black Cat Systems. All rights reserved worldwide.

Created with the MacZoop framework, ©1994-2003 Graham Cox. All Rights Reserved  
<http://www.maczoop.com/>