

IZ8BLY STREAM

For 32 bit Windows
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<http://space.tin.it/computer/aporcino>

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IZ8BLY STREAM is a Windows program for transmitting and receiving MFSK and PSK modes on Amateur Radio bands. To learn more about the MFSK modes, never available to Amateurs before, visit the [MFSK Web Site](#). The IZ8BLY Stream MFSK software is based on information from this web site, and on information from Murray ZL1BPU and others acknowledged below. This software also operates PSK63F and PSK31. Other Amateur modes by IZ8BLY can be operated using companion software to this program. For further information see the [IZ8BLY Web Site](#).

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This help file is intentionally as concise as possible. After all, use of the software is largely intuitive! If you require further assistance, see the web site before firing off emails to all and sundry...

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If you use the program, please send some feedback, so that the authors can be encouraged to make improvements. Donations would of course be welcome, but a friendly e-mail or postcard will suffice. Contact the authors via email - Nino: ninopo@tin.it Murray: as149@detroit.freenet.org or via snail mail:

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MFSK16 users subscribe to the MFSK Email Reflector, which you can join by sending an email to MFSK-subscribe@egroups.com.

To meet Nino and Murray on air, try during weekends (Sat-Sun) in Feld Hell mode, on 14062.5 KHz USB around 13:00 UTC, or on MFSK week days on 18.106 MHz (idle carrier) at around 0530 or 1930 UTC.

Thanks go to the following people:

- | Nino IZ8BLY for the software and many clever DSP ideas
- | Murray ZL1BPU for the original idea, the technical documents and this help file
- | Gary ZL1AN, Paul PA0OCD, Vilnis YL2KF and others for on air tests and FB QSOs
- | Peter G3PLX for Piccolo, alphabet coding and MFSK theory
- | Phil KA9Q for the Viterbi decoder and the code algorithms
- | Lionel G3PPT, Peter G3PLX, Andrew G0TJZ and Hans DL9DRZ for FFT ideas
- | AI WD5GNR for his PSKGNR PTT drivers
- | Moe AE4JY, Johan KC7WW for their technical support
- | H.K. Robin OBE and the British Commonwealth & Foreign Office for the original Piccolo idea

Hardware & Software Requirements

You will need:

- | a computer with Windows 95™, Windows 98™, or Windows NT™ operating system
- | at least a Pentium™ 60 processor (P133 or better preferred)
- | a 16 bit sound card that works with Windows
- | an HF transceiver, preferably with VOX - it must be very stable and have low TX/RX offset!
- | (optional) a Hamcomm interface or similar serial port radio interface (to use PTT).

Installation

Software

If you are reading this prior to installation, then all you need do is download the program file and run it, as it is "self-executing", creating all the necessary directories and files. Nothing is stored in the registry, so deleting the program or upgrading it later is also easy. If you want to uninstall it, or install a later version, use the Windows Control Panel. When installing new releases of the program, you would be wise to uninstall older ones first. An uninstaller is included in the release.

The installation does not create a "Start Menu" link, so you will need to locate the executable file Streamxx.exe and create a shortcut (right click on it), then drag that to the desktop or the start menu.

The latest help file is also available on the internet, and you can add the help to the working program. To do this, download the [HELP.ZIP](#) file, which contains this help file and all the necessary pictures. Unzip it into a subdirectory under the main executable called "Help".

If you are reading this after installation, then you are already halfway there!

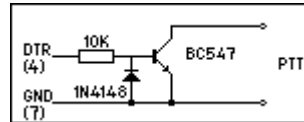
Hardware

Connect the transceiver audio output to the line-in plug of the sound card. Connect the audio output from the soundcard to the transceiver microphone input, or auxiliary input. Note that some transceivers will not provide VOX operation from the auxiliary input. Isolation circuits between the computer and the transceiver using small line transformers are highly recommended. Use the Windows Control Panel to adjust the input and output levels of your soundcard. The Volume Control applet can be called from inside the program - see later.

If you have internet access, a detailed installation procedure is available at <http://www.qsl.net/zl1bpu/FUZZY/IZ8setup.html>, on the "Fuzzy Modes" website. Detailed information on MFSK, how it works, where and how to use it is found on the "MFSK" web site at <http://www.qsl.net/zl1bpu/MFSK>.

If VOX will not work with your transceiver, you may need to fashion a PTT circuit as well. The transmitter can be controlled by a signal from a serial port, the DTR signal (pin 4) on COM1 to COM4. This is set in the `File|Preferences` menu. The circuit required is an NPN open collector transistor with a 10k base series resistor and a shunt diode. This is the same as the PTT circuit of a simple "Hamcomm" type interface often used for RTTY or SSTV, so if you already have such an interface, it will save you building

the circuit.



The IZ8BLY software uses the transceiver in SSB mode. The MFSK modes are all sideband dependent. By convention, please **use USB above 10 MHz and LSB below 10 MHz** (the same as SSB). - You need not worry about narrow filters as the software does not require them for good performance, so just use the SSB settings. Some transceivers are easily modified to use a narrow CW filter in SSB mode, and you may find that comfortable, but you will need to adjust the RX tuning to the filter passband.

MFSK modes require very accurate tuning and a very stable rig. The receiver channels are only 4 Hz wide, so tune with great care. MFSK frequencies are quoted by the **Idle Carrier frequency**, the lowest audio tone. This is typically 1 kHz higher than the receiver dial indication on USB, and 1 kHz lower on LSB.

Configuration

Press **CTRL+P** or choose "**Preferences**" from the File Menu to access the Preferences window. This window has a series of tabs which you can click on to see various mode related settings and alter them. The settings you choose are stored in the IZ8BLY. INI text file.

General Tab

Station Information - enter your details here. These values are used in metacommands and in the logbook. See later for details.

Custom CQ message - the dedicated CQ button can be edited and customised here. Make sure the message finishes with \$OFF or \$CWID and then a space.

Options - set centre frequency. This setting defines the frequency used for the lowest (idle) tone when you right-click on the waterfall display. A handy way to return to your preferred setting.

PTT Port Tab:

PTT control - selects the method used to key the transmitter on/off. Select "None" to use VOX. If you use a Hamcomm-like interface, specify the serial port where this is connected (COM1-4). If you use a radio interface (CAT) it is possible to use the PTT drivers used by the PSKGNR program by Al Williams WD5GNR <http://www.al-williams.com/wd5gnr/pskgnr.htm> or to use the LOGGER program by Bob Furzer K4CY.

WD5GNR Options - Options to use the PSKGNR drivers for or LOGGER program for keying the transmitter. *Program location* is the name of the executable file to be loaded if "Load at startup" is checked. *Close on exit* will unload it when exiting from the Hellschreiber.

Options - the computer can send a little "beep" from its internal speaker when the transmission is complete. This is useful if you are switching the TX manually, as you will then know the right time to switch. If your beep is redirected by Windows to the sound card, the beep will be transmitted as well! In this case it is best to leave the beep off, or disable the redirection.

Advanced Tab

Advanced options - don't mess with these unless you know what you are doing! These are mostly parameters that affect the tuning and signal tracking capabilities of the receiver, and are already optimised. Fortunately there is a "Restore Defaults" button!

- | Clock sync IIR size - adjusts the low pass filter time of the receiver clock recovery
- | Clock sync attack factor - adjusts the response speed of the receiver clock recovery
- | Viterbi decoder traceback path size - sets how far back the FEC decoder works. The bigger the number, the slower the response on the screen, but the more accurate the text.

- | Squelch threshold - sets the S/N for when data starts to print on screen
- | AFC attack factor - controls the rate at which the AFC corrects frequency error
- | Idle tone duration - the length of idle tone at the start of transmission. The number is equivalent to the number of idle symbols sent - the default is 156 (1 sec at 15.625 baud).

Waterfall display - the waterfall tuning display can be logarithmic in response, or linear. The logarithmic response makes it easier to see weak signals but harder to tune. The log display is white data on black background - the linear display is black data on a white background, and is generally easier to see. If you press the Choose Colour button, you can choose a palette of colours for the waterfall. Blue is quite effective - the default is gray.

Waterfall speed - the choices are obvious. Unless your PC is very fast, use normal. If your PC speed is below 100 MHz, you must use slow or the PC may lock up.

Tools Tab:

Tools - here you specify the command line for running your preferred programs, the ones that are called from the "Tools" Menu. Typically these are other digital mode programs that are compatible with IZ8BLY Stream. Use the "Browse" button to locate the executable file to launch. You can also specify any extra parameters needed, e.g. the archive file to open etc.

The Mixer program specified here is the mixer program to be called when the STREAM "Input volume" and "Output volume" toolbar buttons are pressed. The default program "SNDVOL32" is the standard Windows volume utility. Change it if your sound card uses another program (use the "Browse" button to locate the executable file).

Operation

How to Operate

If you are familiar with IZ8BLY Hellschreiber or MT63, operating MFSK will come naturally. The mode is a reasonably easy to use rag-chew mode, with good tuning and operating features. The main things to note are related to the accuracy of tuning, particularly how to tune in the signal. The rig must be very stable, and you must use the software for final frequency tuning, not the rig.

When to use MFSK16

MFSK16 was designed to combat three problems -

- | Ionospheric instability and motion causing doppler effects
- | Ionospheric multi-path effects, causing timing problems and fading
- | Man-made electrical noise, lightning noise and QRM

The first of these, "doppler" is common on the high frequency bands on longer paths, especially "long path" where the signal passes through the polar regions. Multi-path is common on 20 metres, and can be severe on the lower bands. QRM is unfortunately with us everywhere, while lightning and electrical noise are mostly a lower band (LF and 160 - 30m) problem.

Use MFSK16 for long path DX, polar HF paths, and when conditions are poor. If signals are weak but stable, use PSK31! On lower bands, use MFSK16 at night, and PSK31 or PSK63F during the day. If noise or QRM is the problem, use MFSK16. Copy is usually good in S9 noise if the signal is above S6.

MFSK16 will be useful on LF due to the noise rejection properties. Although it is as sensitive as PSK31, it offers no advantage on VHF where the ionosphere has little effect (but try MFSK16 on 6 metres).

When to use MFSK8

Use MFSK8 when conditions are especially poor. The slower baud rate is more resistant to multi-path, and the greater number of tones adds further robustness due to increased diversity, and also adds

greater sensitivity. MFSK8 is great on the lower bands. You have to tune very carefully, as the tuning accuracy requirement is only a few Hz.

When to use PSK63F

PSK63F was designed to provide better performance than PSK31 in two areas - first, the higher baud rate (62.5 baud) significantly reduces the effect of polar doppler instability, and secondly, errors are reduced through the use of full-time FEC. Unlike QPSK31, doppler sensitivity is not increased when FEC is used. Through more efficient coding, it is also slightly faster than PSK31, although the signal bandwidth is doubled.

Use PSK63F for short-haul HF DX, say up to 10,000 km, for local QSOs and for VHF. The mode is very tolerant of drift and inaccurate tuning. It is a good mode for digi-beginners, and an excellent mode for QRP operation. Good for DX on 6m, or 15m - 10m when the band is open. PSK63F is useful for (small) text file transfers under reasonable conditions. It is not as sensitive as PSK31 or as QRM tolerant as MFSK16.

The Waterfall Display

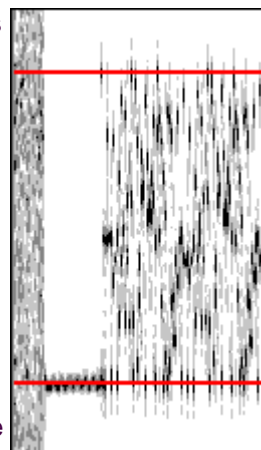
On the right of the Stream display is the "Waterfall", which is a moving graph of frequency (vertically) and time (horizontally). The signals show up as increasingly black or white marks on the display, making tuning easy. The waterfall has two modes, linear, and logarithmic. The linear display is less sensitive, but is easier to see MFSK signals on. It shows black signals on a white background. The logarithmic mode is more sensitive, but shows more noise. It shows white signals on a black background.

You can switch between modes using the Configuration (General tab), or by clicking anywhere in the waterfall with the mouse, WHILE THE "CTRL" KEY IS HELD DOWN. Unlike the waterfall displays in other software, when you click on the waterfall to tune the signal, the tuning lines don't move - the waterfall itself does. This is because of the way the signal detection system works.

Tuning MFSK

The MFSK signal consists of many tones, 16 in this version, but the lowest tone is the one to look for. This is the idle tone when the other guy has run out of things to say, and it also appears briefly at the start of each transmission. Check out the picture on the right.

Notice how on the left of the picture, the lower red line is exactly centred on the thick black line of the signal, the idle carrier (lowest tone), and further to the right, is also exactly centred on some black vertical stripes with fainter grey stripes above and below. It is the black stripes to centre on, not the grey ones above and below. At the same time, the upper red line is also centred on some of the black data stripes, but don't worry about them. This picture is life sized, with the waterfall in Zoom x 3 mode.



The tuning display is of the point-and-click variety, and when you wave the mouse over the display you will see two black lines that you use to bracket the received signal, and then click with the left mouse button to fix the tuning. Set the Waterfall Zoom slider (in the centre of Tool Bar) to x3. Click so the lower black line is EXACTLY in the centre of the lowest tone, just like the red one in the picture. (If the signal is not already correctly tuned, the red lines will be in the same place, but the signal will be somewhere else). Unlike Hellschreiber or MT63 waterfalls, the red lines are fixed - it is the *waterfall that moves!*

Wait a moment and you will see the signal move in from the right, in a new place, hopefully correctly tuned. You can also change the tuning with the frequency window or up/down arrows associated with it. These are useful for checking slight drift, and sometimes you will need to adjust the tuning during the other guy's over, or if you or he has TX/RX offset or drift, you may need to adjust at the beginning of his over. In most cases the AFC will correct minor drift. It is a very good idea to practice by recording a few "CQ"s on a tape recorder, and playing them back to yourself. If the recorder is poor the text won't be very copyable, but the tuning practice is still worth while. Best of all record a WAV file, which you can do if you have a full duplex sound card.

The range of the AFC is only ± 7 Hz, so it will only correct minor errors. The AFC only works on the idle carrier, and when it is operating you will see the needle on the "Phase Scope" indicating the error as it is corrected. The brief idle carrier at the start of each over is usually enough to keep the QSO in line.

NEVER USE
RIT!

If the signal seems not to match the space between the red lines in the display, it might be that you have the wrong mode, or you have too much zoom on the waterfall. The dots making up the received signal must match the spacing of the lines. Once you have the signal roughly bracketed, look closely at the lowest dots (they will in reality be little faint vertical line segments, or a thick line if the signal is idle), and carefully adjust (up/down or mouse click) so the lower black line or the lower red line is EXACTLY centred on the lowest tone. This is much easier if the waterfall ZOOM is on - Zoom x 3 is just right.

The waterfall display works slightly differently to what you may be used to - the red tuning lines are fixed, and the signal moves to meet them. Be aware that you must concentrate on the signal at the right edge of the waterfall. If you click on the waterfall, the dots already displayed don't move to the new tuning - only the new ones! Practice on a few carriers. You'll soon have the idea.

If the tuning is accurate, and the mode is correct (correct speed and bandwidth) the *Clock alignment* display will begin to display a stable series of broad vertical bars, which are the actual received symbols viewed in time. These are a useful guide to the stability of the radio path. (There is no sensible indication on a steady carrier).

Once the signal is locked, be patient - printing will be delayed a couple of seconds by the time it takes for the data to travel through the interleaver and FEC decoder. This is to allow the decoder to work back a few words to check for errors. If you have the correct mode, and the signal locks but nothing sensible prints, check the tuning - you may have tuned one tone too high or too low. The idle carrier is the best way to be sure until you are familiar with the signal appearance on the waterfall. Also look carefully for the idle tone, in case the signal is upside down! If it is, change sidebands on your transceiver, retune, and tell the operator he's the wrong way up! ALL operation should be on the correct sideband - USB above 10 MHz, LSB below 10 MHz.

Tuning PSK63F and PSK31

This is much more straightforward. Set the waterfall zoom to x3 or x4, and simply move the mouse so the two black lines are equally spaced either side of the signal. Then click the left mouse button. From there the AFC will track the signal well.

It will be obvious that the PSK31 signal and the tuning lines for it are more closely spaced than for PSK63F, so use them to measure the signal to check that you have the correct mode.

Transmitting

This is the easy bit - in all modes, just press ENTER and start typing! If you have moved the "focus" of the software away from the TX window (say to adjust the tuning), click the mouse in the TX window again or your typing will not be recognised (this is a Windows "feature").

To type ahead while receiving, just put "*" (asterisk) in the TX buffer as the first character, and then when you are ready, start transmitting with CTRL+T. To end a transmission, press ENTER and then F12. If you press F12 without ENTER, the buffer will empty, but the transmitter will stay on until you press ENTER.

Because of the FEC (Forward Error Correction) there will be a small extra delay at the end of the over as the transmitted data is encoded for transmission, especially in MFSK16. There will also be a small extra delay during reception, from the time the signal first arrives to the printing of the first sensible characters.

The Menus

FILE Menu

Select RX Font (Ctrl+F) - allows selection of any suitable installed Windows font for the display in the receiver window.

Select TX Font - allows selection of any suitable installed Windows font for the display in the transmitter window. It does not affect what is transmitted, as no font information is sent.

Preferences (Ctrl+P) - provides access to the preferences windows for configuration (see [Configuration](#))

Stand by (Ctrl+B) - puts the program in stand-by mode. The com port used for PTT and the soundcard are temporary released to allow the user to switch to another program (e.g. Hellschreiber). The normal execution is resumed when the user switches back again to the MFSK program.

Exit - closes the IZ8BLY MFSK program.

MODE Menu

When selecting the various modes, the baud rate, tone spacing, number of tones, modulation and FEC regime are set automatically. The FEC cannot be independently switched on and off. According to Phil KA9Q, there is always a good reason to use FEC!

MFSK16 (F1) - the default MFSK mode. This mode uses 16 tones, and operates at 16 baud. It also uses standard FEC for error reduction, and results in a typing speed of 31.25 bps (about 42 WPM). Use this mode on 160 - 30m, and on the higher bands when conditions are reasonable to poor. Always return to this mode if you lose contact when changing modes.

MFSK8 (F2) - a more robust MFSK mode, also with FEC error reduction. This mode is for poor conditions, such as severe fading or QRM. This mode uses 32 tones at 8 baud. Typing is slower (19.53 bps). Use this mode to maintain a QSO when conditions are dying. It is also very effective when QRM is bad. Requires very careful tuning.

PSK63F (F3) - a single tone 62.5 baud differential PSK mode suitable for fast typing or small file transfer under good to fair conditions. Data transfer rate is 31.25 bps (42 WPM) with FEC. Not as sensitive as the other modes, but very easy to use.

PSK31 (F4) - the standard PSK mode developed by G3PLX. A good standard of comparison! Note - no FEC is available in this mode.

TRANSMIT Menu

Stop immediately (Ctrl+X) - stops the transmitter. Continuing to type in the TX window will start it again.

End Transmission (F12) - stops the transmission once the transmitter buffer is empty. The last character in the buffer needs to be an ENTER character.

Clear TX buffer (Ctrl+C) - immediately stops the transmission and clears the buffer.

Send file (Ctrl+S) - calls a dialog for opening a text file to insert into the text buffer; e.g. you can store station information in a file, and send it with a simple mouse click. Small binary files can be sent this way if UUENCODED or 7PLUS coded first. Use the `Receive|Log to file` menu item to capture incoming files.

Send CQ call (F9) - sends a standard CQ message.

Send ahead buffer (*) (Ctrl+T) - starts transmission of the transmitter buffer, if it has been loaded with an asterisk "*" as the first character. If the asterisk is not used, the transmitter will start as soon as a word has been completed in the buffer.

RECEIVE Menu

Start (Ctrl+R) - starts the receiver sampling and display process. Has the same effect as the tool bar "Paper" button.

Stop - stops the receiver. Has the same effect as toggling the tool bar "Paper" button.

Log to File - toggles recording the incoming text into the file `stream\log.txt`, in the same directory as the MFSK program.

MACRO Menu

Shows the macros (keyboard shortcuts) that have been defined, and the shortcuts to run them. These are defined by right-clicking on the actual buttons at the bottom of the screen. Macros can contain text and special commands called "metacommands", always preceded by a "\$" symbol. See under "TX Window" for a table of metacommands that can be included in these macros.

The macros are very powerful, and can be used to create brag messages, change modes, start and stop the transmitter, send Morse ID, and even create an endless beacon message.

Logbook window (F11) - opens a small logbook entry window that the top of the screen. Data entered here is stored in the logbook and is available for macros.

TOOLS Menu

Enter password (Ctrl+W) - allows developers and software testers to enter a special password, which enables advanced test options. Without the passwords, only the default modes operate. With them, extra menus for independent selection of baud rate, modulation and FEC are enabled.

Log program (Ctrl+G) - launches your external log book program (has to be previously specified in the configuration window).

Hellschreiber (Ctrl+H) - puts the MFSK program in stand-by mode, and switches to the Hellschreiber program by IZ8BLY, specified in the Preferences window. This lets you a quick switch, avoiding conflicts between the two programs (as both use soundcard and serial port).

PSK31 (Ctrl+K) - puts the MFSK program in stand-by mode and loads the PSK31 program specified in the Preferences window. This lets you switch quickly, avoiding conflicts between the two programs (as both use soundcard and serial port). Before returning to MFSK, close the PSK31 program. The MFSK program is also capable of operating PSK31.

The Tool Bar

Paper Button - this square button on the left with a blue arrow is used to start and stop the decoding of received signals, which will be displayed in the Receive window. Use this button to stop the receiver if you want to copy text from the window onto the clipboard, or if you wish to use another program with the sound card.

Set Input/Output Volume Buttons - call up the sound card mixer program to set input and output volumes and ports.

Make sure that the level does not cause clipping in the transmitter. Setting the level too high will not make the signal any stronger - it will just be harder to read and cause more interference.

Transmitter linearity is not especially important for MFSK, but is still very important that the audio is not distorted in the sound card or transmitter audio circuits, as this will cause extra signals up and down the band, even if the transmitter is linear. It is best to leave the settings as required for PSK and Hellschreiber modes.

Note: With Win95 both buttons generally launch the same Volume Control applet (Set Output Volume), so on this applet use Options/Properties and select Recording to Set Input Volume.

Preferences Button - calls the configuration window.

Clear RX Screen - clears the receiver display.

Logbook window - opens / closes the logbook window.

QSP window - opens a secondary window for copying text. Highlight the text, and press **Forward** to copy to the TX window as a quote. Press **Update** to update the window from the receive window.

Waterfall Zoom - adjusts the magnification of the waterfall display, from x1 to x6. The centre frequency stays at the setting shown in the "Frequency" display.

AFC and Squelch - clicking these options enables or disables them.

S/N Meter - displays the signal to noise ratio of the signal. Note, this is NOT the signal strength. Since this reading is a ratio of the strongest channel to the weakest, it has no units. The display turns red below 3:1, which is the threshold for copy in PSK modes. MFSK will copy right down to 1:1. The range is 1:1 to 40:1.

RX and TX Windows

The **Receive Window** is the main window, and displays lines of received text in black, and your transmitted text in red. You can copy this text to the clipboard using the mouse to highlight it, and CTRL + INSERT to copy. You need to stop the receiving for this to work

(use the "Paper" button, or wait until you are on transmit).

From time to time you will see odd messages like <LF> or <STX>. These indicate that a non-printing control character has been received. These will be very rare, but are likely to show up when receiving noise. There are two exceptions - the messages <STX> and <EOT> are sent to mark the start and finish of each transmission. Other strange characters may be received from time to time, especially on noise. Remember that this software supports extended ASCII, so recognises all the European accented characters, and a host of other symbols as well.

The **Transmit Window** is a small multiline window below the Receive Window, where the characters to be transmitted are typed and buffered. The transmitter will start and text will be sent as soon as you start typing. Press Enter, then F12 when you finish typing and the transmitter will stop when all the data has been sent. If you type an asterisk (*) as the first character, you can type during reception, and the text will only be transmitted when CTRL and T are pressed.

Meters

There are four meter displays at the bottom of the screen, to the right.

Clock alignment - displays the timing of the incoming symbols. Gives a very good idea of the stability of the receiving path. Steady bars mean good conditions - jagged bars mean poor conditions, while sudden shifts mean multi-path problems. Slanting bars imply a sound card timing problem. The display has no meaning when not receiving correctly tuned MFSK.

Bit shape - an oscilloscope display of the average shape of the detected symbols. The shape should be like a smooth sine² peak in the centre, but varies considerably if conditions are poor. The clock system attempts to find the peak and keep it centered.

Phase scope - A typical PSK type symbol phase meter. In MFSK it displays the phase error of the AFC system, so will point straight up when correctly tuned. On PSK modes it should indicate straight up and down alternately if the signal is correctly tuned.

Frequency - displays the frequency represented by the lower red line on the waterfall display. This is the frequency of the lowest tone (the idle tone). This frequency can be changed by clicking on the waterfall, clicking on the UP/DOWN buttons next to the display, or typing in the Frequency window.

Status Bar

The status bar at the very bottom of the Stream display tells you what is going on. The items displayed (from left to right) are:

- | Transmitter status
- | Transmit buffer size
- | FEC regime in use
- | Modulation scheme in use
- | Symbol baud rate (baud)
- | Text (user) bit rate (bps)
- | CPU % load
- | UTC date and time

Metacommands

These are general purpose program commands and are denoted by the dollar sign (\$). They can be typed directly into the Transmit Window, included in user definable buttons, or put in a text file to be sent via a menu option. Metacommands must always be followed by a space. See the following table.

Metacommand	Text sent / action taken
\$QRZ	The station callsign (defined in preferences window)
\$STATION	Sends station information (defined in preferences window)
\$OTHER	Other station's callsign (defined in logbook window)

\$OTHERNAME	Other station's name (defined in logbook window)
\$OTHERQTH	Other station's QTH (defined in logbook window)
\$OTHERRST	The RST received from the other station (defined in logbook window)
\$RST	The RST sent to the other station (defined in logbook window)
\$CQ	Sends standard CQ call
\$CWID	Sends ID in Morse, for countries where this is required
\$UTC	Time stamp (UTC time)
\$TIME	Time stamp (local time)
\$DATE	Date stamp (referred to local time)
\$DATEUTC	Date stamp (referred to UTC time)
\$	The dollar sign (otherwise not printable)
\$Cnn	Sends ASCII character number nn, e.g. \$c65 sends "A"
\$BUTTONn	Sends text assigned to the user definable button n (ranges is from 1 to 12)
\$NOQSO	Clears other party callsign (\$OTHER).
\$Pn	Sets the output power level (soundcard volume) to n. The value ranges from 0 (silence) to 255 (full volume). This metacommand influences the mixer setting.

User Definable Buttons

These are placed below the transmit buffer. You can modify their content, and the name on the button, by right clicking on the desired button. You can store pre-defined phrases and metacommands, then send them later by left clicking on the button or by pressing the CTRL+FKKey shortcut as shown above the button itself.

You can also make a button refer to another button, with the \$BUTTONn command, or even to refer to itself. For example if you put the following text in BUTTON2 it will send CQ forever!

```
CQ DX de $QRZ $QRZ $BUTTON2
```

The CQ button at the left of the User Definable Buttons is preset. If necessary it can be altered using the File/Preferences General tab.

Technical Data

This software transmits and receives a high performance multi-tone frequency shift keyed (MFSK) radio mode, designed for good performance in poor conditions, especially long path DX. Because all the signal processing is performed in software, it is a virtual transmitter and receiver with performance impossible to match with ordinary electronics. The transmitted MFSK signal is relatively narrow (316 Hz) and is clean and pleasant to listen to or tune across. The CCIR designation is **316HF1B**.

It is impossible to generate intermodulation products when transmitting this mode, because only one tone at a time is transmitted. It is however possible to transmit audio harmonics if the audio tones are clipped in the sound card or transmitter audio stages. It is best to check the transmitted signal and keep the tones above 1.4 kHz if you are not sure.

16 phase synchronous tones are used, and since each one, from its frequency information, defines four bits of data, the symbol rate is only 1/4 of the data rate. With a low baud rate (15.625 baud) and 16 tones this mode is very sensitive and is immune to quite serious multi-path propagation problems. Because the 16 tones are received independently using very narrow software filters (4 Hz wide!) the receiver is very resistant to interference and both natural and man-made noise.

This mode adds strong Forward Error Correction, using a technique developed for space communications to significantly reduce the number of received errors under poor conditions. This technique reduces the sending speed, but with other coding efficiency improvements, the resulting performance (about 40 WPM) is still faster than most typists! The speed remains the same no matter how poor the conditions. The [Technical Specifications](#) are available on the MFSK Web Site.

Two differential PSK modes, PSK31 and an easy-to-tune PSK mode with FEC, (PSK63F), are included for performance comparison. PSK63F is quite good, and makes a great beginner's or local chat mode, since it is easy to tune in. Use this mode to make contact if you are having trouble tuning accurately. The other station will recognise it! This mode IS NOT COMPATIBLE WITH PSK31 - only with itself. The CCIR definition of this mode is **100HP1B**.

History

- | Specification Release 1.0, 16 June 2000 by ZL1BPU
- | First QSO 18 June 2000, IZ8BLY to ZL1BPU on 18 Mhz
- | MFSK Reflector started 29 June 2000
- | Alpha 0.5 release for testers 4 July 2000, with FEC and Interleaver
- | Alpha 0.6 release for testers 8 July 2000, with new varicode and idle stuffing
- | 8 July 2000 - ZL1BPU has worked four countries on MFSK! Six stations active
- | 20 July 2000 - Alpha 0.8 released. 50 testers active.

IZ8BLY MFSK for 32 bit windows platform
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