Newcomers and Elmers Net: Digital Communications Part 2
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MFSK16

MFSK16 is an excellent long-distance mode, particularly for lower bands like 40 and 80 meters.
-- In addition to standard text handling, MFSK16 can also send simple images.
-- Recently the Voice of America (VOA) and other large radio broadcast stations have been experimenting with digital modes, and VOA tests have found MFSK16 to be the most reliable and readable across a wide spectrum of testers around the world.
-- I have been able to participate in some of these tests, and I have to say it is a lot of fun! (The idea behind the tests is a serious one: stations like VOA want to have emergency capabilities to get information out when propagation conditions might be poor for one reason or another, and digital modes offer the best chance of getting the signals through the interference and/or normal propagation restrictions.)
-- FLDigi is an excellent program for MFSK16, as is MixW and MultiPSK.

PACTOR

PACTOR is known as a *burst-mode* protocol, meaning that data is sent in bursts rather than in a continuous stream.
-- By sending the data in bursts, analyzing it for errors, and then sending back an acknowledgement code, PACTOR can be virtually error-free. It is highly sophisticated and, therefore, trusted by governments and military groups.
-- There are four versions of PACTOR (I,II,III, IV), and while there is soundcard software to decode basic PACTOR I, extra hardware is needed for the advanced modes or to transmit any version of PACTOR.
-- Another interesting feature of PACTOR is its integration with the Internet, allowing stations to use a combination of strategies to get the signal to its intended destination.

For listening purposes, software such as *MixW* can receive PACTOR 1, but PACTOR II and III & IV need specialized hardware from a company called *SCS* out of Germany.
-- These modems are fairly expensive, so most folks do not use them unless they have a specific need for the faster versions of PACTOR.
-- One common use of PACTOR is the messaging program *WinLink 2000* which is capable of sending E-mail, binary files, and weather bulletins around the world using linked radios and Internet hubs.
-- Since there are a number of HF stations around the world, at least one station should be reachable by radio for sending a message, and then the

Internet forwarding capabilities of the system can forward it around the world to the receiving station, or hold it until the person retrieves it.

Hellschreiber

Hellschreiber (or Hell for short) is actually an old mode of communication, much like a facsimile image, but it is indeed a digital mode.
-- It was developed in the 1920s, used extensively in WWII, and was used for commercial landline services until around 1980.
-- Today it is used by amateur radio folks in several iterations, the most popular being Feld-Hell, and found between 14.077 and 14.082 MHz, and the digital portion of 40 meters.
-- While not all that common, if you have software which will decode Hell you might enjoy trying it out.
-- Unlike other text modes, Hell looks a bit odd, more like a blurry image of the text rather than crisp letters
-- When there is interference Hell can be difficult to read, but it has something of its own error correction built in, in that each character is sent twice.

Part of the fun of the digital modes is trying them and seeing how well things can copy. For regular use if you decide to transmit in the digital modes, you no doubt will find one or two favorites.
-- For receiving purposes and for really using your radio to its fullest, you will want to try all of the modes you can, so have fun with Hellschreiber and RTTY and experience a modern take on a bit of history!

SSTV

Slow-Scan Television (SSTV) is an excellent mode to experiment with since there is regular activity daily on 14.230 MHz (analog signals) or 14.233 MHz (digital signals), both using Upper Sideband.
-- SSTV can be either an analog or a digital radio mode for sending still images, much like a fax machine, but with color. Depending on the quality of the signal the images can be pretty clear, or a bit grainy.
-- Sometimes they look like old scattered TV images (now almost a nostalgic thought since Digital TV has changed everything!), but if propagation is good, the images will be as well.

Analog modes rely on audio frequency shifting to send picture and color information, while digital imaging modes use DRM-type technology (Digital Radio Mondiale) and the JPEG2000 format.
-- Software such as EasyPAL and DIGTRX can translate these digital images, while many digital software suites will include software to render the analog images.

-- There are a number of programs able to decode these images, and it is fun watching them develop on the screen.
-- The only real hiccup in the process is identifying in which mode the analog images are being sent—Scottie is by far the most popular, but there are several common modes.
-- Sometimes the person sending the image will alert the receiving person concerning the mode, but often not. A little experimentation will usually hit on the right mode.

Olivia, Throb, and MT63
These three modes have also be a part of the VOA testing I mentioned above, and they are used sporadically around the amateur bands.
-- Olivia is a very robust mode, but not particularly fast, while MT63 is a very wide signal (almost as wide as voice SSB) but with really good forward error correction.
-- You can hear MARS groups using MT63 regularly outside of the amateur bands, as well as on the low bands.

JT65 was originally designed for Earth-Moon-Earth (EME, or "Moonbounce") communications, but a few years ago the idea arose to try it out on the noisy HF bands to see how it would fare.
-- a special version of JT65 is available, optimized for the HF bands, JT65-HF, written and released by another Joe, Joe Large, W6CQZ.

The JT65 protocol is a structured one, in which only 13 characters are sent in each exchange.

JT65 has a broader bandwidth than WSPR at 200 Hz, and is slightly less sensitive, but it can convey information twice as fast as WSPR and is very capable of detecting signals well below the audible threshold and displaying them with perfect copy.
-- being an FSK mode (Frequency Shift Keying), it is resistant to many natural and manmade sources of interference.
-- additional modes have been developed for the other end of the spectrum, LF work, with very slow repeated copy to allow for error correction from static/noise common in LF signals

VHF/UHF
"Digital" Modes like APRS (Automatic Packet Reporting System), WSJT for moonbounce and meteor scatter, ALE (Automatic Link Establishment) and others are common on VHF and above frequencies, and most can be run without a lot of extra equipment/cost.

Weather stations should not be overlooked as this can be a good means of connecting in with APRS – the weather station data can be broadcast around a city and you can get real-time results at **aprs.fi** – over 30 stations show up right now on the greater Cincinnati map

HSMM – high speed multi media radio
This is not a specific mode itself, but rather a catch-all term for digital modes with a data bit transfer rate above 56 kbps.
- Something called spread spectrum mode is employed in various forms to spread a signal across several pre-programmed patterns so that the communications are wider in bandwidth than a normal signal, perfect for military use (which is what it was designed for).
- now here's a twist – the spread-spectrum mode was developed by an actress and a composer in the 1940s; Hedy Lamar George Antheil; they wee given a patent for their invention
- if someone hears a part of the signal it just sounds like background noise
- D-Star is a form of HSMM because it can send both text and voice at the same time, two different modes at once
-- HSMM uses an IP-transport system making it ideal to use with the PC
- In June of 1986 the FCC made it permissible for amateurs to experiment with this mode above 420 MHz, and it has taken off
- one of the reasons it is so popular is because standard wireless modems (like 802.11 a/b/n can be reconfigured to work in the amateur band plan ranges, and the equipment is cheap nowadays
- he only limitation on which modes an amateur can use is that the modes have to be public – can't do secret transmissions
-- however, unless someone knows what mode you are using and has the receiver programmed to follow the spread-spectrum pattern, your communications are in effect secure
-- this makes it nice for emergency services work where we might not want all information at an emergency easy pickin's for anyone with a scanner

Some advantages to HSMM are:
- low interference
- Security
- Low power and therefore smaller circle of radiation

Best of all you can do some of the same things with HSMM as you can with the Internet, including audio, pictures, video, text, remote controls and mesh networks for sharing information wirelessly on a local level
-- this means one can have networked digital radios, say for field day or a public service event