

# PSK31 Information

## 10 Tips for the PSK31 Digital Mode

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- Use the center of your *waterfall* (see definitions of italicized terms below) display. Testing will show that your transmit (TX) and receive (RX) will be strongest there. Don't blindly use a 1000 Hz tone or strictly follow the VFO "set it and forget it" concept. You can easily lose 20% or more of your power on each edge of your *passband*. Passband centering of the signal will give the best results of both RX and TX.
- There's no need to have the waterfall streaking bright red. Set your rig's volume to a low level (less than 25% of maximum) and adjust your waterfall and *sound card* levels for good contrast. Do not *overdrive* your sound card! Get the background noise and the transmit trace well defined and separate. Keep in mind that how your waterfall looks does not impact decoding, but it is harder to work it if you can't see it.
- Use UPPER CASE characters sparingly. Lower case text in PSK31 *varicode* transmits fewer bits of data. You'll increase transmit speed and improve the likelihood of proper decoding on the other end by using lower case text as much as possible. (For example, the difference between a lowercase "e" (11) and an uppercase "E" (1110111) is three times more bits.)
- Enable your RF attenuation and increase the volume. This can help keep a strong signal from wiping out the weaker ones. Attenuation will probably be around 20 dB, but by dropping the noise level, the signal readability may improve. AGC (Automatic Gain Control) does nothing for a weak signal; it only levels the louder ones.
- Use your digital mode's software, or a program like *Spectrogram*, to see what your noise level is with the radio off. This will give you an idea of how "clean" your sound card is. Typically, onboard (built-in) sound hardware (as found in most "mainstream" computers like Dell or HP) does not have a signal-to-noise ratio as good as an inexpensive (less than \$50) separate sound card. When purchasing a sound card, look for one with a signal-to-noise ratio over 100 dBA. [A-weighted *decibels*; a scale of sound "loudness" used in acoustics that simulates the response of human hearing. — Ed.] [Many onboard sound interfaces, while not optimum for high fidelity stereo sound, perform well for many amateur applications. For a technical review of various sound cards see J. Taylor, K1RFD, "Computer Sound Cards for Amateur Radio," QST, May 2007, pp 63 — 70. — Ed.]
- Consider dual monitors (most modern video cards have two jacks). This allows you to have the waterfall or spectrum display on one screen and your logger, text window, etc on the other. It makes a huge difference in speed and ease-of-use when you don't have to swap between screens or use smaller windows for your contact.
- When transmitting, keep your *ALC* reading as close to zero as possible. This will help keep your signal clean and your *IMD* at an acceptable level (-20 dB or better is ideal). Your power output will drop, but there's no need to overload the transmit level. PSK31 uses an 80% duty cycle. Even with a full duty cycle rig, it still needs to dissipate heat! Besides, 20 W more makes little difference. Output of around 50 W is enough to work the world, and your fellow operators will appreciate the courtesy. Also be sure your voice processor is *not* enabled when using digital modes.
- Ask for an RSQ (readability, strength, quality) report. When in a contact, send just a tone and ask for your IMD and a report on how your trace looks. This will give you a better idea of what adjustments may be needed.
- There are hundreds of digital modes. To get started or to learn more about the most common ones, refer to the list of digital mode references at the end of this article.

### Bonus Tip:

- Try 30 meters PSK31. It's a robust band, offering the best of 20 meters and 40 meters. Only digital modes and CW are permitted and contesting is not allowed. Be sure to operate within your privileges. PSK31 can typically be found around 10.140 MHz.

### Definitions of Terms:

**AGC (automatic gain control):** The ability to reduce signal strength on-the-fly, giving you more level audio reception on stronger stations.

**ALC (automatic level control):** A voltage adjustment or reading, indicating your transmit signal levels. ALC is designed to control voice and carrier signal levels, not digital modes. Typically for digital modes, if the ALC meter moves, then the microphone gain is too high.

**Signal-to-noise ratio (S/N):** A comparison of the signal levels to the relative noise level. Ideally, a perfect signal would have no noise, but realistically, you'll want an S/N ratio well within the tolerances of the mode you're using. PSK31 tolerates about a 10 dB S/N ratio.

**dB:** a logarithmic unit of relative measurement that expresses the ratio of two levels.

**Digital mode:** Any method for conveying digital information using radio signals. Much like a computer modem, a digital feed is converted to analog, sent across a transmission medium, then reconverted back to a readable signal at

the receiving station.

**Duty cycle:** The total time during a transmission period that the transmitter is delivering power to the antenna. When your radio is transmitting, there's an on/off process that takes place. Transmitting at a 100% duty cycle indicates that you are using 100% of your radio's power, 100% of the time. Better radios will allow this, while others will eventually fail under the pressure of such a load.

**IMD (intermodulation distortion):** The ratio, in dB, used to determine the quality of your transmission. Unwanted modulation products or signals will reduce IMD levels. More power does not mean better copy!

**Overdrive:** Turning the volume of your radio up so high that you risk damage to the sound card, or cause signal "splatter." Similar to maintaining your ALC levels.

**Passband:** The range of frequencies that your transceiver can receive when on a single frequency; typically around 3000 Hz wide.

**PSK (Phase Shift Keying):** A form of modulation that shifts the phase of the transmit signal in order to carry more information. **PSK31** is a digital mode, created in the 1990s by Peter Martinez, G3PLX, which has a 31.25 Hz bandwidth on your waterfall display.

**RF (radio frequency) attenuation:** A suppression of signals received. You'll often see a noise level reduction, with a minor sacrifice to the desired signal reception. Check your radio's manual on how to adjust it.

**RSQ (Readability, Strength, Quality):** Much like the familiar "RST" reports, using a 599-type reporting scheme. Instead of "Tone" (Morse code), use "Quality." 95%+ readable, with a very strong waterfall trace and a clean (no splatter) signal would warrant a 599 report.

**Sound card:** A piece of hardware in your computer that acts as an analog-to-digital or digital-to-analog converter of audio frequency signals. A microphone input is often included.

**VFO (variable frequency oscillator):** An oscillator whose frequency is controlled by varying the value of either the capacitance or inductance of its tuned circuit. In analog transceivers the main tuning dial is used to adjust the VFO's tuned circuit capacitance or inductance and thereby the transceiver's operating frequency.

**Varicode:** A streamlined coding system that uses letter codes that are shorter than those of the ASCII or Baudot coding systems

**Waterfall:** A visual display of radio signals (and other sounds) found on the tuned frequency.

**For More Information:**

S. Ford, *WB8IMY, The ARRL HF Digital Handbook*, 4th edition. Available from your local ARRL dealer, or from the ARRL bookstore: [www.arrl.org/shop](http://www.arrl.org/shop)

R. Prosch, DF3LZ, *Technical Handbook for Radio Monitoring I*

S. Brown, HB9DRV, *Digital Master 780: Spectrogram* and other software.