

For The New General Class Operator: Tuning SSB Phone on Your New HF Radio

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I received many kind words about the article I wrote for last month's Communicator. So I'm going to try to write an article each month with the new HF operator, or infrequent HF operator, in mind.

Most ARRL material for those new to HF stress *listening* to get a feel for what's happening on the bands. With listening in mind, the next few articles will be centered on mastering the receiver functions of your HF radio, more specifically, SSB receiver functions. There are numerous operating modes available on the HF bands; CW, RTTY, PSK31, SSTV, AM phone, and probably most popular is SSB phone. SSB (Single Side Band, Suppressed Carrier) is almost exclusively my operating mode on HF, first because I enjoy it, and secondly because a wonky sound card in the old PC used at my radios, makes PSK31 and other digital modes difficult. I'd love to work CW and I was licensed in the days of the 5WPM code requirement, but cowardice has prevented me from ever attempting a single CW contact.

This month's topic, don't laugh and don't be insulted, "Tuning SSB Phone on Your New HF Radio". Listen to a pile-up on the bands, and listen carefully. Some number of stations will be off-frequency. Just this evening I worked two DX stations, which had generated fairly large pile-ups. In both pile-ups (20m USB) there were several stations calling who were significantly off the DX station's frequency. These stations were below the actual frequency, a fairly common error for the operator new to HF. Most inexperienced operators tend to err on the high *audio* frequency side of another station's signal, for example if a station is operating on 14.2455MHz many inexperienced operators may tend to tune to 14.2454MHz or even lower frequency.

If you are a new General Class operator and have previously been operating FM phone on the VHF bands, SSB phone is a somewhat different animal.

First, FM phone is rather "channelized"; you really don't operate on continuous frequencies on VHF FM. Your 2m radio, unless it was a high dollar all-mode radio, was programmed to step in discrete frequency increments as you rotate the tuning knob (usually 5kHz, 10kHz or 20kHz increments). The spacing between 2m FM repeater allocations is 20kHz and good practice dictates 20kHz spacing increments between the FM simplex call frequency and your operating frequency. For example, if you establish a contact on the 146.520MHz simplex call frequency, good manners dictate that you quickly move your QSO off the calling frequency. But you don't move to 146.521 or 146.550, you move to 146.540, 20kHz above the calling frequency. This channelized thinking is not the case on HF.

Second, the nature of FM transmission makes it rather forgiving of tuning errors. On 2m FM if you don't exactly match the other station's operating frequency, signal strength will be degraded but audio quality will not suffer severely, within reasonable limits of tuning error.

When you operate SSB on HF you need to consider the fact that two SSB modes exist: Upper Side Band (USB) and Lower Side Band (LSB). Why the two modes exist is based on the way suppressed carrier side band signals were generated in the early days of SSB, it was easier and required less expensive equipment to generate upper side band signals on 20m and higher frequency bands, conversely it was easier to generate lower side band signals on 40m and lower frequency bands. The technical limitations on side band signal generation are long gone, but to this day the convention remains: we operate USB on 20m and higher frequencies and LSB on 40m lower frequencies^{*1}. Most modern radios make the correct choice for you, if you select the 17m band and press SSB the radio will default to USB. On most radios if

you press SSB a second time the mode will switch from USB to LSB; don't do it!! We operate USB on 17m.

As mentioned previously, unlike VHF FM, HF operation is not channelized^{*1}. There are no rules, written or otherwise which prevent operation on 18.150, 18.155, 18.1555, or 18.555555MHz; on HF we use the frequency allocations as continuous frequency allocations not channels.

While researching for this article I found a few postings in some forums, which show just how ingrained channelized thinking can become. The complaint goes like this; station K5A is calling CQ on 14.2501MHz, station K2B responds on 14.250MHz and tells K5A his signal is 59 but he's a little off-frequency. It does work that way folks; station K2B is off-frequency not K5A. K5A established the 14.2501MHz operating frequency; station K2B needs to tune to 14.2501MHz not 14.250MHz. Consider this scenario, many operators prefer to use vintage equipment, build before the days of digital frequency displays. These experienced ops can tune to another station's frequency with high precision. But if calling CQ, their analog-tuning dial may be off by 100Hz, but this isn't an issue, any responding station should match the vintage operator's frequency.

What you hear when tuning SSB signals is very different from what you heard on VHF FM. If on 2m you heard a friend talking on 146.540 and you somehow managed to have your radio tuned to 146.541 (1kHz off-frequency), no big deal, signal strength would be reduced slightly but the audio quality of the signals will be largely unaffected. This is far from the case when operating SSB. If you were 1kHz off-frequency on HF, the other station's audio would not be intelligible. If you hear a strong station on 18.1500MHz (17m) and you radio is tuned to 18.149MHz, 1kHz below the other station's frequency, you will hear only the highest frequencies of the other stations audio; the typical Donald Duck sound associated with SSB phone. If you were tuned to 18.1505MHz, you only hear the lowest frequencies associate with the other station's audio, best described as audio mush. As you tune to the station's actual operating frequency the audio will sound "normal or natural", if the station's signal is strong, this is fairly easy to accomplish. If the station's signal is weak, especially if the operator has an unusually high-pitched or low-pitched voice, tuning to the exact operating frequency can be more difficult. In my experience, the high frequencies associated with a signal are easier to hear when the station is approached from below (tuning up the band) than the low frequencies when the station's operating point is approached from above (tuning down the band). I have formed a habit which works well for me, if operating USB (20m and higher frequency bands), I start at the lowest frequency of interest and tune UP the band looking for stations.

On 40m and lower frequency bands, where we operate LSB, this all reverses. You will hear the low frequencies associated with a station's audio if you approach the station's true operating frequency from a lower frequency and you will hear the high audio frequencies if the station's operating frequency is approached from a higher frequency. On 40m and lower frequency bands my operating procedure reverses; I start at the highest frequency of interest and tune DOWN the band.

So how close is close enough? If you are working a contest, signals are strong, and things are moving pretty fast, if you and your contact are within 100Hz of each other's true operating point you will both easily log the contact and move on. If you are doing some rag chewing with a buddy from across the country or if you are trying to log a DX station, it's best to invest a few seconds listening and tune to the other stations exact operating frequency. But what do you do if the signal is weak and if either because of his accent or the operator's voice characteristics you are having problems determining the exact operating frequency? Listen to the stations calling him and tune to their signal. The vast majority of these stations, either because of experience or because they are hearing the station better than you are hearing, will be tuned to the correct frequency. This obviously does not apply if the DX station is working split.

Because HF SSB is not channelized and because of the transmission characteristics of SSB compared to FM, the new HF operator may find tuning SSB signals on the HF bands a little difficult at first. But listen and tune carefully, in very short order it will all be second nature.

***1** The new 60m allocation is the exception to all of the HF rules. We operate USB on this band and it is channelized with operation allowed only on 6 specified frequencies and 50W maximum ERP.