



TRANSITIONING WWARA REPEATERS TO NARROWBAND

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WHAT DO COORDINATION BODIES DO?

- Repeater coordination
 - Promote efficient use of spectrum
 - Ensure fair access to spectrum and minimize interference
 - 95% paperwork Processing, 5% Arbitration
- Publish Repeater Listings
 - Much more accurate than online and crowd sourced offerings
 - WWARA site updated nightly
- Publish Local VHF/UHF Band Plans
 - Avoid interference by following the plan
 - Simplex, crossband and shared repeater pairs identified



BAND PLANS

- VHF/UHF band plans managed by coordination bodies
 - Oregon Radio Relay Council
 - www.orrc.org
 - Local Band Plans available
 - Western Washington Amateur Relay Association
 - www.wwara.org
 - Repeater list published nightly
 - Local Band plans available
 - Inland Empire Coordination Council
 - British Columbia Amateur Radio Coordination Council
 - www.bcarcc.org

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VHF/UHF Band plans are a local option and generally published by the local coordinating bodies. These band plans show differentiate weak signal, satellite, packet, simplex, repeater and crossband repeater areas.

TYPICAL WWARA COORDINATION PROCESS

- Repeater owner chooses repeater pair and applies for coordination
- Repeater owner puts equipment on air
- Coordination requires a test period (3-6 months)
- If no complaints, coordination request is processed and published publicly
- Absent any concerns, coordination is issued
- Renewal period is 5 years

REPEATER TIMELINE

- 1970s – Shift from AM to analog FM repeaters
- 1980s – WWARA moved 2m from 25kHz to 20kHz spacing
- 1989 – Project 25 started (P25 digital solution)
- 1997 – FCC requires narrowband in land mobile radios
- 2005 – Icom introduced first DSTAR system (first open ham radio digital solution)
- 2007 – First DMR solutions released (commercial radio solution, adapted to ham radio)
- 2011 – WWARA designates 10 narrowband 2m channels
- 2013 – FCC requires all commercial stations to go narrowband (12.5kHz)
- 2013 – Yaesu announces System Fusion

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Let's take a step back in time and look at the history of repeaters a little bit. Most of us weren't around for the first two shifts. It's clear from reading old issues of 73' magazine that it wasn't entirely a smooth transition from AM to FM in the early days. Now fast forward to the early 2000's (2005) when Icom came out with the first 'ham radio specific' digital mode called DSTAR. This was a pretty big deal at the time and Icom put a lot of money into making it happen. This was also about the time that internet connectivity was widely available in most parts of the US, so when a couple different groups of hams figured out how to 'connect' DSTAR repeaters, things blew up. People could talk to hams in other states and countries with an HT.

Fast forward another 5 to 10 years and DMR (or MotoTurbo) has gotten a strong foothold in the commercial space, but more importantly the Chinese start producing the \$40 HT's and another explosion of digital happens. Along with the cheap handhelds, the first generation of Motorola repeaters are starting to show up on the surplus market and another group of industries hams figures out how to adapt it to ham radio. (minus the nice benefits like using call signs in the protocol)

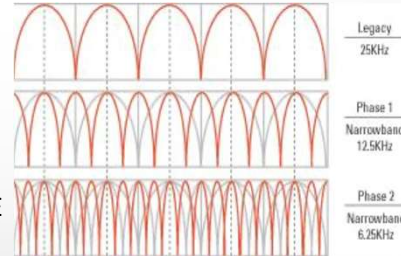
The final piece of the puzzle is the FCC mandate that said all commercial radios

must be narrowband capable by February 14, 1996. Amateur radios are often based on commercial platforms and many inherited this capability immediately after. The FCC required systems move to a 'narrowband' solution by January 1, 2013, which was the final nail in the coffin for wide band analog FM commercially. Additionally, many land mobile products no longer support wideband operation in the VHF/UHF spectrum. This makes it problematic to use commercial land mobile radios and repeaters in the amateur service.

Yaesu announced their System Fusion digital mode in 2013 and we can only anticipate more modes in the future. M17 is on the way. Analog narrow modes like Analog Compandored Single Sideband (ACSSB) may also reappear.

DEFINITIONS

- Wide Band Analog FM
 - 20/25 kHz channel spacing
 - 5 kHz deviation, 16K0F3E
- Narrowband Analog FM
 - 12.5 kHz channel spacing
 - 2.5 kHz deviation, 11K2F3E
- Narrowband Digital
 - 9K80D7W (P25), 9K36F7W (Fusion), 7K60FXW (DMR), etc.
- Ultra-Narrowband
 - 6.25 kHz channel spacing
 - 4K00F1W (NXDN), 6K00F7W (DSTAR), 5K00J3E (ACSSB)



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Narrowband is defined fitting into a 12.5kHz channel width. This includes the modulated signal width and some guard band space. The FCC emission designator shows the actual modulated bandwidth without channel guard space.

VHF VS. UHF NARROWBANDING

- 70cm currently has 25kHz channels
 - Narrowbanding to 12.5kHz is straight forward
- 2m has 20kHz channels
 - 12.5kHz doesn't divide into 20kHz evenly
 - Users will have to move a little

| Existing | New | Existing | New | Existing | New |
|----------|----------------------|----------|----------------------|----------|----------------------|
| 145.1100 | 145.1000 145.1125 | 146.6200 | 146.6250 | 147.0000 | 147.0000 147.0125 |
| 145.1300 | 145.1250 145.1375 | 146.6400 | 146.6375 146.6500 | 147.0200 | 147.0250 147.0375 |
| 145.1500 | 145.1500 145.1625 | 146.6600 | 146.6625 146.6750 | 147.0400 | 147.0500 147.0625 |
| 145.1700 | 145.1750 145.1875 | 146.6800 | 146.6875 146.7000 | 147.0600 | 147.0750 147.0875 |
| 145.1900 | 145.2000 145.2125 | 146.7000 | 146.7125 146.7250 | 147.0800 | 147.1000 147.1125 |
| 145.2100 | | 146.7200 | | 147.1000 | |

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At UHF, each 25kHz channel simply becomes 2 narrowband channels. At VHF it's more complicated because the channels don't divide evenly. WWARA already migrated from 25kHz channels to 20kHz long ago to create extra channels. Approximately 4 of 5 users have to move a little. It's not entirely necessary to even retune cavities. If two adjacent users migrate to narrowband, a third channel is created.

LIMITED 2M SIMPLEX CHANNELS

- WWARA recommends some simplex narrowband
- 2m has two designated simplex ranges
 - 146.520-146.580 (4 channels)
 - 147.520-147.600 (5 channels)
- The 146MHz range contains simplex call channel
 - 146.520 and adjacent channels remain wide
- The 147MHz frequencies can be narrowbanded
 - The five channels become eight
 - Tone encode is recommended

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There has been a constant demand for simplex channels on the 2m band. Narrowbanding the area around the national calling channel of 146.520 is inappropriate and not valuable. The spectrum at 147MHz can yield an additional 3 channels. Users should consider using tone encode to help eliminate unwanted signals. FM Capture Effect should help eliminate interference and using at least tone encode provides to option to decode tone to silence unwanted signals.

NARROWBANDING SAVES LIVES

- Hasn't been a 'open' 2m pair in over a decade* and for the first time in 2018, all WWARA 70cm pairs were full
- Commercial world shifted to narrowband in 2013
- Multiple digital solutions in use already for repeaters
 - All digital solutions are narrowband
- WWARA Coordinations of new repeaters has increased 23% since 2013
 - Digital repeaters has increased 77% in the same time period
 - Hams want more repeaters, mostly narrowband digital

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Although an occasional pair becomes available briefly, for more than a decade the best way to get a 2m pair has been to bump off a current owner. While the number of repeaters has gone up and some bands like 2m are 'full' at this point, it seems the level of activity has dropped off. There are exceptions. Some systems key down around 6am and hardly un-key until midnight each day. But many systems sit idle all week until the weekly net. Our recommendation is to use them, most repeater owners love to have their systems used, just be respectful of others and leave chances for people to join in.

WWARA NARROWBAND PROPOSAL

- May 2019 - Public proposal to narrowband VHF/UHF at WWARA
 - Presentations at more than a dozen clubs and SeaPac
 - Provides band plan for 12.5 kHz channels for 2m and 440 bands
 - 2m pairs increase ~50%, 440 pairs increases ~100%
 - Currently 13% of 2m and 22% of 70cm systems already narrowband
 - 70% of new systems in 2024 are narrowband digital

WWARA has been socializing these changes wherever possible.

FACTS ABOUT NARROWBANDING

- Provides more repeater pairs for new modes
 - There will be more new modes
- All (current) digital voice modes are narrowband
- Most WWARA new requests are for digital voice systems
 - 70% in 2024
 - Currently wasting wide space with narrow modes
- Supported in all commercial gear since 1997
 - Most amateur gear supports narrowband after 2000
 - New wideband gear is hard to find
- Only the repeater may need to change, nothing else
 - No antennas, feedlines, entrance panels, duplexers, etc.

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The process of moving to narrowband is happening now with additional digital voice modes. By allocating only wideband channels, we are wasting spectrum. The only wideband users are analog FM and they could also be narrowband.

Older repeaters may not support narrowband and will need to be replaced. This isn't happening immediately. There are still years to replace the repeater (if necessary) and it will be at least 30+ years old at that point.

ANTICIPATED ISSUES

- Narrowband systems must be narrow on the output regardless of input signal
- Training users how to program narrow FM
- Potential loss of range on high altitude systems
- Coordinating moves of adjacent systems
- Tracking wide and narrow systems simultaneously
- Coordinating changes with adjacent regions

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A wideband signal must be made narrow on the output to ensure it doesn't splatter onto adjacent channels. The largest issue is likely to get users to program narrow FM on repeaters, particularly as things change. It may be difficult to keep programming current. Migrating from wide to narrow FM does potentially result in a loss of range. Low level sites in Western Washington are generally terrain limited. No mode or power level will change the maximum range. Higher sites could see some reductions in coverage unless power level, antennas, feedlines or other equipment are improved. Tracking these changes against our wide and narrow band plans and minimizing interference will be a huge issue for WWARA. WWARA also has to manage issues with adjacent regions (primarily BC and Oregon).

WWARA NARROWBAND PLAN

- In 2023 the new band plan is accepted
 - Allows allocating narrowband pairs
- By 2025 all new coordinations must be narrowband
 - The WWARA stops accepting applications for new wide band analog systems
 - Wideband FM systems can still be renewed
- By 2030 no wideband systems can be renewed
 - No wide band systems will be renewed, need to convert to narrowband or lose coordination
- By 2035 all systems on 2m/70cm will be narrowband

This plan was accepted by the WWARA membership December 7, 2025. There are still details around this which are yet to be decided.

JOIN OR CONTACT US

- Join us and help shape the future
 - Decisions are made by those who show up
 - All licensed amateurs are welcome
 - Cost is minimal and meetings are only quarterly
- WWARA - <https://www.wwara.org/>
 - Next WWARA meeting Feb 22, 2025 @ 10:00 AM

WWARA RESOURCES

- WWARA Repeater Listings -
<https://www.wwara.org/coordinations/coordination-data-files/>
- WWARA Band Plans -
<https://www.wwara.org/documents/band-plan/>
- WWARA Narrowband Plan -
<https://www.wwara.org/documents/narrowband-plan/>
- Getting Coordinated with WWARA -
<https://www.wwara.org/coordination-process/howto-get-coordinated/>