

Digital Radios



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Disclaimer:

This is not all encompassing. There may be other radio manufactures and aspects that I don't know about or remember. Technology is constantly changing.

Lots of Flavors of Digital Radios



- Amateur Radio Specific
 - Uses VFOs
 - Yaesu System Fusion
 - Icom D-Star
- Commercial / Mission Critical
 - Digital Mobile Radio (DMR)
 - Project 25 (P25)
 - NXDN
 - IDAS (Icom version of NXDN)
 - Not known to be used
 - All channelized
 - Amateur Radio adopted them for their purposes

Digital Protocol Sounds.



- http://www.w2sjw.com/radio_sounds.html

Interoperable?



- All digital protocols are their own language and will not interoperate with other protocols without a bridge
 - Network bridge or audio bridge



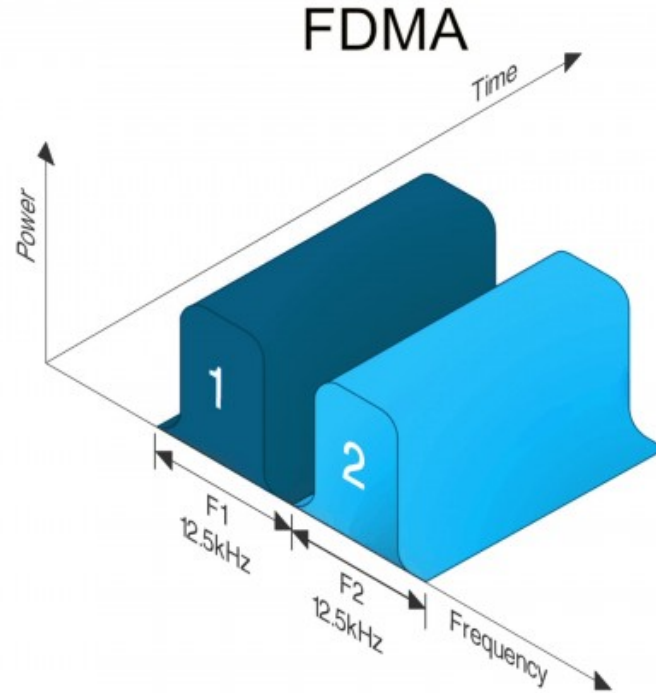
Channelization Protocol

Source: tairadioacademy.com/topic/the-difference-between-fdma-and-tdma-1/

Frequency Division Multiple Access (FDMA)



The first technique is called frequency division multiple access (FDMA). This method separates channels by frequency, so if users want to have two channels they'll have two separate frequencies. If a conversation runs across a channel, it occupies the whole of the channel exclusively. There is only one conversation and one user at a time per radio channel. More radio channels require more frequencies.

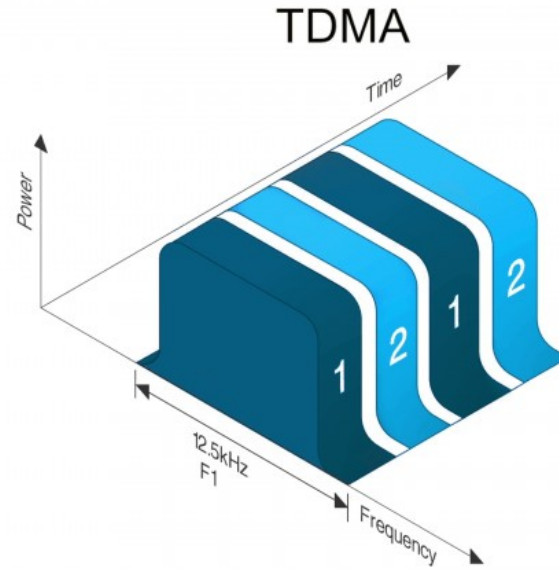


Time Division Multiple Access (TDMA)



TDMA occupies a channel but it allows two users to occupy the same channel at what appears to them to be the same time. An analogy could be the still shot frame rates in cinema, where at around 30 frames per second it gives the illusion of continuous movement but it is actually a time shuttling exercise.

With a 2-time slot TDMA system, two users can share the same frequency in the following manner: User 1 gets to use the frequency for a very short fixed period of time, perhaps 50 milliseconds. Then the channel reverts to user 2 who gets 50 milliseconds. Then it cycles again back to user one who gets a further 50 milliseconds, and so on and so forth.



Amateur Radio Specific



- Yaesu System Fusion,
 - Yaesu proprietary protocol, the modulation scheme is similar to P25, C4FM
 - <http://systemfusion.yaesu.com/>
 - Website does not reflect the older radios, ie FT1D

Amateur Radio Specific



- Icom Digital Smart Technologies for Amateur Radio (D-STAR)
 - An open standard protocol
 - But I have yet to see vendors other than Icom
 - [More Information](#)

Commercial / Mission Critical Grade



- NXDN & IDAS
 - Kenwood and Icom specific protocol
 - I think the 2 manufactures does not interoperate.
 - they use the similar technology
 - NXDNINFO.COM is a resource for NXDN
 - I have no experience with this.

Commercial / Mission Critical Grade



- P25
 - Popular with First Responders, Oil / Gas, etc
 - Most expensive
 - Motorola, Kenwood, Tait, Ef Johnson, L3Harris, Icom, etc
- DMR
 - Popular with Commercial
 - Maybe the least expensive of the Commercial / Mission Critical protocols
 - [DMR for Dummies](#) is a good website to start that explains DMR and vendors
 - May be missing some vendors, like Tait.

DMR Radio Vendors



DMR Portables

- Anytone
- Motorola
- Radioddity
- Hytera
- Retevis
- TYT
- Baofeng
- Anysecu
- Connect Systems
- Kydera

DMR Mobiles

- Anytone
- Motorola
- Kenwood
- Kydera
- Connect Systems
- Vertex
- TYT

DMR Dual-Band Radios

- Anytone
- Radioddity
- Retevis
- TYT
- Baofeng

For Kenwood, Motorola, Vertex, Icom: ebay.com or used-radios.com

Source: dmrfordummies.com/dmr-radios/

Programming



- DMR and P25 radios must be programmed
- Some software can be obtained for free, others you must pay
- D-Star and Fusion, programming software is helpful, but I don't think it is required.

FCC Warning



- Chinese type radios are only to be used on the amateur bands
 - FCC # DA-18-980

Still Confused???



- Ask other ham operators what radios they are using
- Look at some reviews.
 - [You Tube is my best friend](#)
 - [eHam](#)
- Should I buy Fusion or DMR or D-Star or P25 or.....
 - Look in the repeater directory to find out what systems are in your area.
 - RFINDER (pay) or RepeaterBook (free) are apps for your phone.
 - [Repeater Book](#) or [Radio Reference](#)
 - If none in your area, you can install a hotspot.

Where to buy



[Ham Radio Outlet](#) DMR: Anytone & Alinco, Fusion, D-Star

[Universal Radio](#) DMR: Anytone & Alinco, Fusion, D-Star

[DX Engineering](#) DMR: Alinco & Bridgecom, Fusion, D-Star

[Amazon - DMR](#) Various manufactures

You can also buy used.

Local hamfest, Ebay, eHam, QRZ, used-radios.com

Other Network Capable Radios



New Radios with Data/cell phone

- Motorola ION
 - No 25khz
- Rfinder / Runbo
- Programming is over the Internet
- Costly
- Hear some cell providers indicate will not work in future.
 - 2G/3G/LTE (4G)
 - 2G & 3G is being turned off in 2022



RFinder P7 Rugged 10"
Tablet 4G VHF/UHF

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DMR 4G/LTE (FCC
approved version) + FR
extra battery

\$1,099

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Source: www.motorolasolutions.com & rfinder.shop & Network-radios.com