DMR for Beginners

DMR — DIGITAL MOBILE RADIO ASSOCIATION
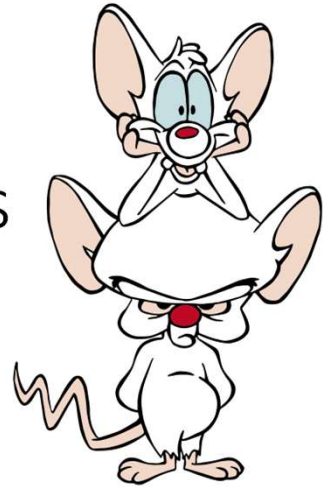
1

What Are We Going to Cover?

- What is DMR?
- A Little Technomumbojumbo
- DMR Network
- Competitors to DMR
- How to DMR
- Equipment
- How to Program a Radio
- Help and Resources

4

What Is DMR?

Source: https://en.wikipedia.org/wiki/Digital_mobile_radio

5

Common Terms

- Talk Groups
- Digital Contacts
- Tier I, II, III
- Zones
- Color Codes
- Channels
- Code Plugs

6

Tier I, II and III

DMR DIGITAL MOBILE RADIO ASSOCIATION

- DMR Tier 1
  - Short Range Simplex Communication
- DMR Tier 2
  - Two Slot TDMA on 12.5KHz Channels
  - Simple Messaging / GPS Data

12.5KHz { | TS 1 | TS 2 | TS 1 | TS 2 | TS 1 | TS 2 |

30 ms
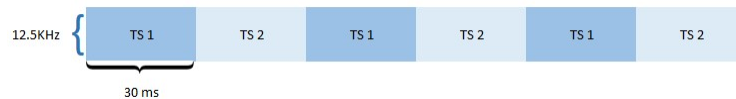
- DMR Tier 3
  - Two Slot TDMA on 12.5KHz Channels
  - Simple Messaging / GPS Data
  - Trunked Systems

7

What is a DMR Network?

- A collection of Repeaters and Hotspots that are networked together over TCP/IP and pass traffic from one device to another.
  - Can use private network(s) or public network(s) (Internet)
- Networks can be stand-alone or cross connected to other networks
- Networks can be cross connected to other Digital Mode networks
  - Talk Groups can cross connect to Yaesu System Fusion Rooms
  - Talk Groups can cross connect to D-Star Reflectors
- A network can be a single repeater and an HT
  - You can still use DMR if there is no Internet!

8

DMR Networks

- DMR+ otherwise known as DMR-MARC
  - Largest DMR Network Worldwide
- Brandmeister
  - Largest DMR Network in US
- TGIF
  - Started in Florida, growing fast
- DMR-SE Cbridge
- AmComm, QuadNet, FreeDMR.US
- … there are more, the list keeps growing

9

What are Some Other Digital Modes?

- System Fusion (C4FM)
- D-Star
- M-17
- NXDN
- Project 25 (P25 or APCO-25)

10

Digital Mode Comparison Chart

Mode	Analog	D-Star	DMR	YSF
Networks	IRLP, EchoLink, All-Star	REF, XLX, DCS	Brandmeister, DMR-MARC, TGIF, DMR+, many others	Wires-X, YSF, FCS
Server Nomenclature	Reflector	Reflector	Talk Group	Room, Reflector
Signal Validation	CTCSS, Tone, Tone-Squelch	RPT 1	Color Code	N/A
Modulation	FM	GMSK	4-State FSK with TDMA	C4FM
Creator	N/A	JARL	ETSI	Yaesu
Verbal ID Required?	Yes	No	Yes	No

11

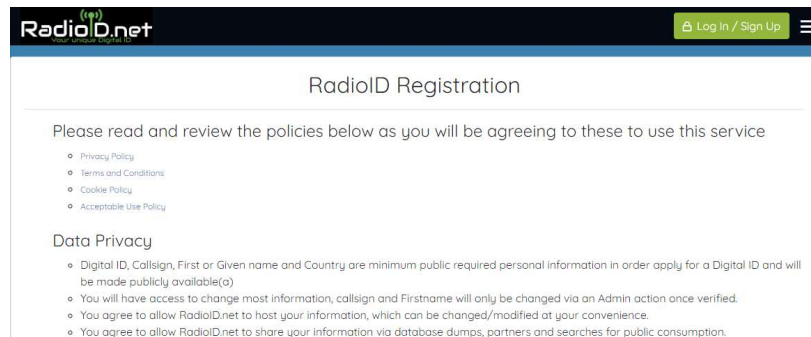## How Do I 'DMR'?

Things you will need:

- DMR ID
- Radio with an AMBE+2 Vo-coder
- Connect to a DMR Network
  - Repeater Network or via MMDVM Hotspot
  - Stand-alone Repeater or Simplex

12

DMR ID

- Be a Licensed Amateur Radio Operator
- https://www.radioid.net

13

What DMR Equipment Should I Buy?

- What features are you looking for?
  - Memories (Contacts & Channels)
  - Availability of Programming Software

- What's your budget?

- HT vs Mobile
  - Hotspot?
  - Repeater?

- USB Dongle

Manufacturer	Model	Price
Baofeng	DM-1702	$ 69.99
TYT	MD-380	$ 99.00
Retevis	RT3S	$ 119.99
AnyTone	AT-D168UV	$ 199.99
Radioddity	GD-88	$ 219.99
Btech	DMR-6X2 Pro	$ 299.99
AnyTone	AT-D878UVII Plus	$ 349.99
ComJot	CJ-1	$ 999.95
Rfinder	B1-Plus	$ 999.00
Rfinder	P10	$1,450.00

14

Hotspots?

- ZUMradio ZUMspot Mini ($175)
- ZUMradio ZUMspot Elite ($250)
- AMBE+2 Board or USB Dongle * BlueDV Software ($140)
- TGIFSpot ($368.00)
- Bridgecom SkyBridge MAX ($621.98)
- Hamspot 4 ($150)
- SharkRF OpenSpot 4 (Pro) ($230 US)
  - The "Pro" version has transcoding
- Generic, Cloned and Custom MMDVM Boards

15

What is Pi-Star?

- https://www.pistar.uk
  - First update in 3 years, January 2024

16

The WPSD Project

- https://w0chp.radio/wpsd/
  - Updates almost every week

W0CHP.radio

THE WPSD PROJECT

Welcome to the *official* web page of the WPSD Project.

WPSD is a **next-generation** digital voice software suite for amateur radio use, enjoyed by many thousands of hams around the globe. It is used for personal hotspots and repeaters alike. It supports M17, DMR, D-Star, Yaesu System Fusion (YSF/C4FM), P25, NXDN digital voice modes & POCSAG data/paging.

WPSD is available as installable disk images, and multiple platforms & devices are supported. The WPSD Project is free and open-source software (FOSS).

Table of Contents:
- Getting Help/Support
- Download WPSD
- Installing WPSD
- Updating WPSD

17

What's the Frequency Kenneth?

Hot Spot
- Ever heard of Southeastern Repeater Association?
- They are the frequency coordinator for the State of Mississippi.

- Avoid 432.0000 to 433.0000 (SSB & Weak Signal)

- Hot Spots qualify as Link and Control
- 441.1875 – 446.1875
- 441.2625 – 446.2625

- to

- 441.6500 – 446.6500
- 441.7250 – 446.7250

Simplex
- Remember Southeastern Repeater Association?
- They also recommend simplex frequencies for digital

440.9125	441.0375	441.1625
440.9250	441.0500	441.1750
440.9375	441.0625	
440.9500	441.0750	
440.9625	441.0875	
440.9750	441.1000	
440.9875	441.1125	
441.0000	441.1250	
441.0125	441.1375	
441.0250	441.1500	

Remember: You are responsible for not causing interference to other stations. Especially on coordinated frequencies!

18

SERA Link & Control Channel Pairs

- 446.1875 – 441.1875
- 446.2000 – 441.2000
- 446.2125 – 441.2125
- 446.2250 – 441.2250
- 446.2375 – 441.2375
- 446.2500 – 441.2500
- 446.2625 – 441.2625
- 446.2750 – 441.2750

- 446.2875 – 441.2875
- 446.3000 – 441.3000
- 446.3125 – 441.3125
- 446.3250 – 441.3250
- 446.3375 – 441.3375
- 446.3500 – 441.3500
- 446.3625 – 441.3625
- 446.3750 – 441.3750

- 446.3875 – 441.3875
- 446.4000 – 441.4000
- 446.4125 – 441.4125
- 446.4250 – 441.4250
- 446.4375 – 441.4375
- 446.4500 – 441.4500
- 446.4625 – 441.4625
- 446.4750 – 441.4750
- 446.4875 – 441.4875

Note: These frequencies are only valid in Mississippi, you are responsible for not interfering when you travel out of state.

19

How Do I Program My Radio?
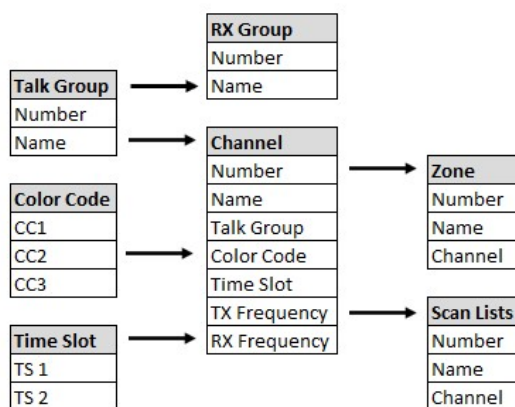
- Create your talk groups
- Create your channels
- Create zone(s)
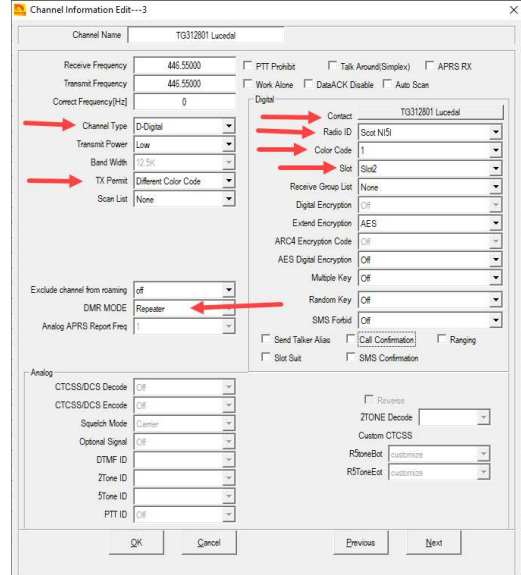- Add your channels to zones

Putting the pieces together…

20

Programming Your Channel(s)

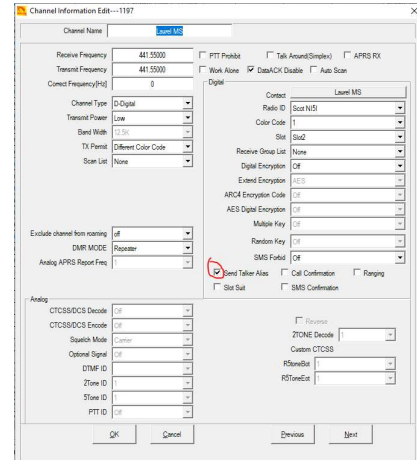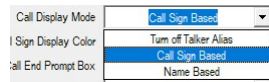The Important Things:

Channel Type
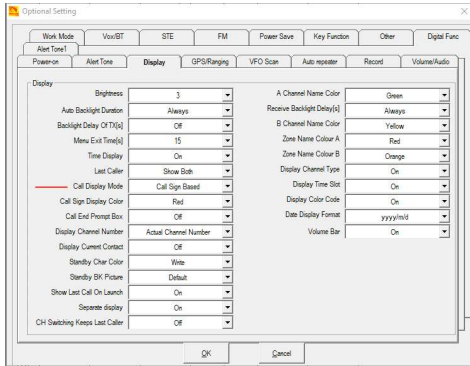Transmit Power
TX Permit

Contact
Radio ID
Color Code
Slot

DMR Mode

21

Talker Alias

22

Talker Alias

➢This does not replace the necessity to properly ID.

➢Contrary to popular belief, AnyTone's support for Talker Alias does not cause problems for Motorola Radios

➢Motorola Radios need to update their firmware to support TA

➢Motorola repeaters that are on the DMR SE C-Bridge network are not compatible with Talker Alias in that it causes distortion and drop-outs.

23

Programming Made Easier

Make Your Own Lists (Excel, Google Sheets, etc)
- Contacts List
- Talk Group List
- Zone List
- Scan Lists

Saving Time

- https://www.pistar.uk/downloads/anytone/
- http://www.dmrcontacts.com/
- https://amateurradio.digital/ ($12/year)
  - Picture to right →

Digital Contacts Wizard

AnyTone AT-D868UV
AnyTone AT-D878UV
AnyTone AT-D578UV
Ailunce HD1
Alinco DJ-MD5
Baofeng DM1701
BTECH DMR-6X2
Connect Systems CS800
Connect Systems CS800D
Radioddity GD-77
Retevis RT3S/RT84
Retevis RT52
Retevis RT82
Retevis RT90
Tera TR-7400
TYT MD-380/390 & UV380/UV390
TYT MD-2017
TYT MD-9600
Generic (RAW)
DMRX c-Bridge
N0GSG DMR Contact Manager
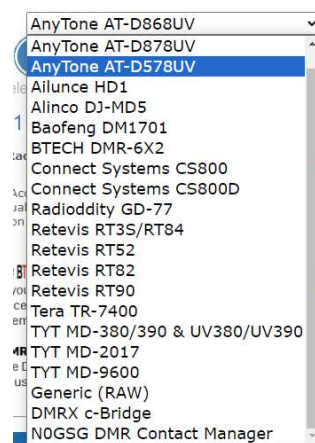
24

Programming Tips

- Programming Lucedale Talk group 312801
  - Using the talk group:
    - For the repeater is one channel
    - For your hot spot, it is another channel
- Use Zones to your advantage.
  - Create a Zone for the Lucedale Repeater or (George County) (Stone County)
  - Create a Zone for your hot spot
- Create Disconnect and Parrot channels in each zone.

25

Operating Tips

- Remember to ID!
  - First transmission, last transmission and every 10 minutes in between.
  - Your Brandmiester ID is not ID'ing. Neither is Talker Alias

- Do not quick key - Leave a pause between transmissions
  - There can be up to a 6 second delay between networks
  - We have timed a 4.5 second delay between the Lucedale repeater and a Brandmeister Hot Spot.

26

Where Can I Get Info / Help?

- Here at our meeting!
- https://amateurradionotes.com/pi-star.htm *
- https://www.dmrfordummies.com
- https://sera.org

* Good information, but is no longer being updated.

27

A Few Good Resources:

- https://dmr-marc.net
  - https://dmr-marc.net/media/Amateur_Radio_Guide_to_DMR_Rev_I_20150510.pdf
  - https://dmr-marc.net/media/DMR_MARC_Best_Practice_Guide_Rev_BB.pdf
- https://github.com/ni5i
- https://pistar.uk
- https://radioid.net
- https://w0chp.radio/wpsd

28