

ANYTONE PROGRAMMING

WORKSHOP — RMHAM-U

KØNGA MIKE

ROCKY MOUNTAIN HAM RADIO



MIKE'S DMR DOCTRINE

DMR is a commercial radio protocol.

It was never designed nor intended for Amateur Radio use.

Some things about DMR are not going to make sense.

Accept this. It will make your life easier.



WRITE THIS DOWN

- 438.675 / -5mhz offset
- Color Code 1
- Time Slot 2
- Talk Group 3108
 - BM Colorado



AGENDA

- Basics Review
- Anyone Stuff
- What you need to know
- Programming workflow



BASICS REVIEW

“No, I will not fix your computer.” -Me, constantly



WHAT IS DMR/TRBO?

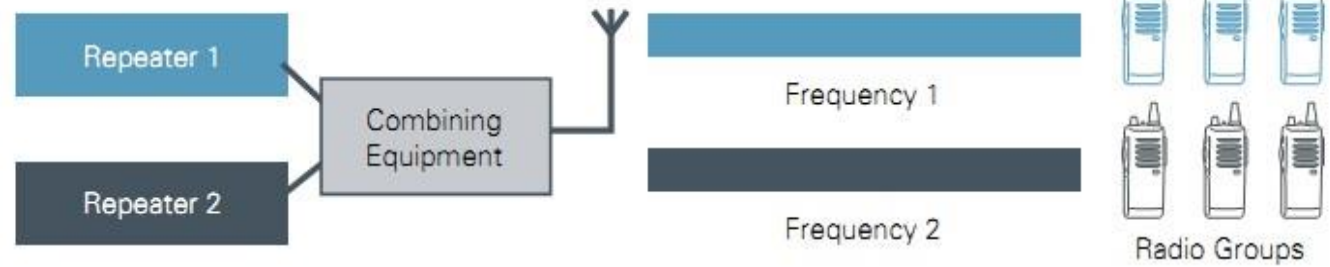
- DMR (Digital Mobile Radio) is an international commercial digital radio standard (ETSI) that originated in Europe
- TRBO refers to MotoTRBO which is Motorola's implementation of the DMR standard
- Many Amateur Radio repeater networks use MotoTRBO equipment, which is why they are commonly referred to as "TRBO" networks
- You do not need to use a Motorola MotoTRBO radio to use these networks



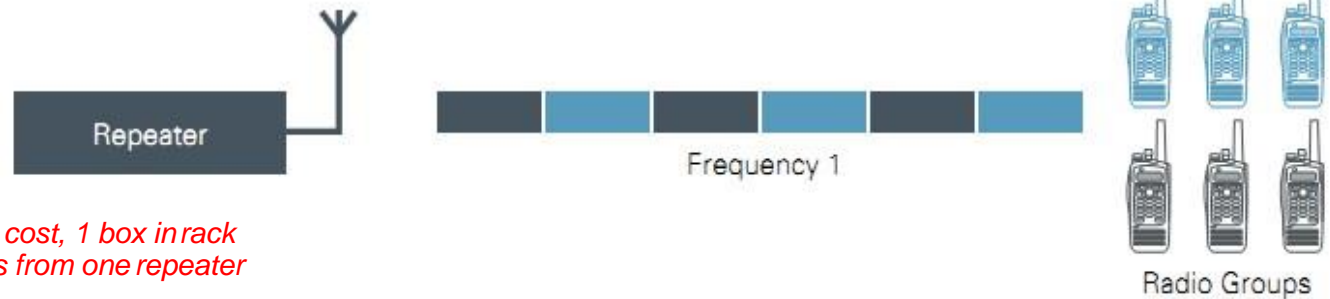
TWO REPEATERS IN ONE!

TDMA saves licensing and equipment costs by enabling the equivalent of two 6.25 kHz channels within a single licensed 12.5 kHz channel

Two-channel Analog or Digital FDMA System



Two-channel Digital TDMA System



*Lower infrastructure cost, 1 box in rack
TWO voice channels from one repeater*



NEW CONCEPTS

- Frequency Pair – not new
- Color Code – Functions similar to a CTCSS or DCS access tone
- Repeater Slot – Each DMR Repeater has two, you must specify which one to use
- Talk Group – Each repeater slot can be logically segmented further into talk groups
- Receive Group – List of talk groups to monitor on the channel's assigned repeater slot



ANYTONE STUFF

“What do you mean there’s no codeplug for this brand-new bleeding-edge DMR radio from a company nobody’s ever heard of?” -Too many people, too often



RANT, SORT OF

- Chinese radios are typically more affordable than Motorola
 - Less expensive to purchase
 - CPS typically free
- Typically, each Chinese radio (and, more often than not, each model) comes with its own CPS, which won't work with other radios/models
- Each CPS will have its own quirks
 - Terms will differ
 - Things that should be pull-downs will be buttons for some reason
 - Settings will be in different places
- Just because it's the newest doesn't mean it's better than what came before



ANYTONE MODELS

- HTs
 - AT-D868UV
 - AT-D878UV
 - AT-D878UVII
 - AT-D168UV *
- Mobile
 - AT-D578UV Pro/Plus
- Each require their own CPS.
- Firmware is specific to each model
 - Watch out for 578 Pro (v1) and Plus (v2)

*New!



WHAT YOU NEED

“Yes, you need a computer to run computer software.” -Me,
on an actual AOL support call.



WHAT YOU NEED

- Tier 2 DMR Radio (very common)
 - Programming cable
 - Programming software (Customer Programming Software – CPS)
 - Windows Computer
- Radio ID
 - <https://radioid.net>
 - Create an account
 - You'll need a downloaded copy of your license
- Information about the repeater
 - Frequency pair
 - Color code
 - Talk group(s)
 - Time slot / repeater slot



PROGRAMMING WORKFLOW

“To experience true DMR freedom, you must learn to program your radio yourself.” -Me, constantly



BASIC PROGRAMMING CONCEPTS

- In order to program a DMR radio for repeaters, you must know:
 - Repeater frequencies
 - Repeater Color Code
 - Desired Talk Group/Receive Group
 - The Repeater Slot that Talk Group is on
- The order you need to add them to your codeplug:
 - Talk Groups
 - Receive Groups
 - Create Channels where you bring it all together
 - Add Channels to Zones so your radio knows what to do



EXAMPLE CHANNELS

Channel	Color Code	Time Slot	Receive Frequency	Transmit Frequency	Talk Group
Thorodin Rky Mtn	7	Slot 1	441.8	446.8	Rocky Mountain
Thorodin Central	7	Slot 2	441.8	446.8	Central
Lee Hill WW	1	Slot 1	445.05	440.05	DMR MARC WW
Lee Hill WW Eng	1	Slot 1	445.05	440.05	DMR MARC WW Eng
Lee Hill NA	1	Slot 1	445.05	440.05	DMR MARC NA
Lee Hill LCL	1	Slot 2	445.05	440.05	DMR MARC LCL
Lee Hill MTN	1	Slot 2	445.05	440.05	DMR MARC MTN



RADIO ID

D878UVII[D878UVII:UHF(Rx(400 - 480 MHz) Tx(430 - 440 MHz)) VHF(Rx(136 - 174 MHz) Tx(144 - 146 MHz))][new.rdt] Version 3.04

FileModelSetProgramToolViewHelp

D878UVII

Common Setting

Channel

Zone

Scan List

Roaming Channel

Roaming Zone

FM

Auto Repeater Offse

Device information

Optional Setting

Alarm Setting

Local Information

Hot Key

APRS

GPS Roaming

Digital

Radio ID List

Contact/Talk Group

Prefabricated SMS

Receive Group Call

Encryption Code

AES Encryption Co

ARC4 Encryption C

Digital Contact List

1---20000

20001---40000

40001---60000

60001---80000

80001---100000

100001---120000

No.	Radio ID	Name
1	3108111	KONGA Mike
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		

D878UVII

List Radio ID

This shows a brief message of 250 Radio IDs

Double click to enter the editing interface

The AT- radio will allow multiple DMR Radio ID numbers to be used with the radio. This feature will allow one radio to be used for example as a Commercial Radio with its own DMR ID, and at the same time also be used as an Amateur radio with

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TALK GROUPS

- Access Control (analogous to tones on analog radios) is accomplished with Talk Groups
- If a repeater uses Talk Groups, you must know which Talk Groups the repeater uses in order to use the repeater with your radio
- Talk Groups are assigned to a Repeater Slot in a repeater
- More than one Talk Group can be assigned to a single Repeater Slot, but only one Talk Group can use the slot at any given time



CONTACT LIST

- DMR radios use a Contact List for:
 - Private Call (used for Radio IDs)
 - Talk Groups (required for most repeaters)
 - All Call (often used for simplex)
- Radios with displays will show the Radio ID of person who is transmitting
- If you have the Radio ID in your radio's Contact List, the contact name or tag will display instead of the Radio ID
- Typical contact names include call sign and name



CONTACT LIST EXAMPLE

D878UVII[D878UVII:UHF(Rx(400 - 480 MHz) Tx(430 - 440 MHz)) VHF(Rx(136 - 174 MHz) Tx(144 - 146 MHz))]:[new.rdt] Version 3.04

File Model Set Program Tool View Help

D878UVII

- Common Setting
 - Channel
 - Zone
 - Scan List
 - Roaming Channel
 - Roaming Zone
 - FM
 - Auto Repeater Offse
 - Device information
 - Optional Setting
 - Alarm Setting
 - Local Information
 - Hot Key
 - APRS
 - GPS Roaming
- Digital
 - Radio ID List
 - Contact/Talk Group
 - Predefined SMS
 - Receive Group Call
 - Encryption Code
 - AES Encryption Co
 - ARC4 Encryption C
- Digital Contact List
 - 1---20000
 - 20001---40000
 - 40001---60000
 - 60001---80000
 - 80001---100000
 - 100001---12000

No.	TG/DMR ID	Call Alert	Name	Call Type	
1	3108	None	BM Colorado	Group Call	
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
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D878UVII

List Talk Group

This shows a brief message of 10000 Talk Groups

Double click to enter the editing interface

The AT-D868UV program looks like an excel spreadsheet once opened, and the left side defines the many aspects of programming. Open the DIGITAL CONTACT Talk Group tab on the left side and double click on the first line (Line No. 1). The

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RECEIVE GROUPS

- Receive Groups are how DMR radios use Talk Groups when receiving signals
- Talk Groups are assigned to Receive Groups. Receive Groups are assigned to the receive frequency on the channel in your radio.
- More than one Talk Group can be assigned to a Receive Group
 - Recommended config by DMR-MARC
 - Can cause confusion when scanning
- Some radios can bypass the need for Receive Groups
- Remember Mike's DMR Doctrine



RECEIVE GROUP EXAMPLE

D878UVII[D878UVII:UHF(Rx(400 - 480 MHz) Tx(430 - 440 MHz)) VHF(Rx(136 - 174 MHz) Tx(144 - 146 MHz))][new.rdt] Version 3.04

File Model Set Program Tool View Help

D878UVII

- Common Setting
 - Channel
 - Zone
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 - Device information
 - Optional Setting
 - Alarm Setting
 - Local Information
 - Hot Key
 - APRS
 - GPS Roaming
- Digital
 - Radio ID List
 - Contact/Talk Group
 - Prefabricated SMS
 - Receive Group Call
 - Encryption Code
 - AES Encryption Co
 - ARC4 Encryption C
 - Digital Contact List
 - 1---20000
 - 20001---40000
 - 40001---60000
 - 60001---80000
 - 80001---100000
 - 100001---120000

No.	Group Name	Group Contacts
1	BM Colorado	1
2		
3		
4		
5		
6		
7		
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9		
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29		

Receive Group Call List Edit---1

Receive Group Name: BM Colorado

Available Receive Group Call Contact

Receive Group Call List Member

Group Name	Group Contacts
BM Colorado	3108

OK Cancel Previous Next

Receive Group Call List Edit Window

You can leave this blank if all you want to do is to listen to the same channel as you transmit on. Then under Channel set-up in the section below you select NONE for the Receive Group List.

If you want to listen to more TG's besides the TG set up in the Channel set-up, add the TG in the Receive Group Call list, then under Channel set-up in the section below you select the list number. You can program up to 64 TG's per receive group.

Note: If the Talk Group List contains a TG with the same number as another one, then this Receive Group List will not work.



COLOR CODE

- DMR repeaters use a Color Code as the first access point after the receive frequency
- Color Codes are designed to allow two repeaters with the same frequency to operate effectively if they are relatively close to each other
- You must know the Color Code of the repeater in order to successfully use the repeater



REPEATER SLOTS

- DMR repeaters have 2 “time slots” that share a frequency, allowing for two separate, simultaneous conversations
- This means one repeater can do the work of two while using less bandwidth than a single analog repeater
- You must know which Repeater Slot you wish to use in order to set up your radio (more on this later)



EXAMPLE CHANNEL - RMHAM

D878UVII[D878UVII:UHF(Rx(400 - 480 MHz) Tx(430 - 440 MHz)) VHF(Rx(136 - 174 MHz) Tx(144 - 146 MHz))][new.rdt] Version 3.04

File Model Set Program Tool View Help

Channel Information Edit---3

Channel Name: Hotspot BM Colo

Receive Frequency: 438.67500
Transmit Frequency: 433.67500
Correct Frequency[Hz]: 0

Channel Type: D-Digital
Transmit Power: Low
Band Width: 12.5K
TX Permit: Different Color Code
Scan List: None
APRS Report Type: Off
Analog APRS PTT Mode: Off
Digital APRS PTT Mode: Off
Digital APRS Report Channel: 1
Exclude channel from roaming: off
DMR MODE: Repeater
Analog APRS Report Freq: 1

PTT Prohibit: ☐
Talk Around(Simplex): ☐
APRS RX: ☐
Work Alone: ☐
DataACK Disable: ☐
Auto Scan: ☐
Ana Aprs Mute: ☐

Digital

Contact: BM Colorado
Radio ID: K0NGA Mike
Color Code: 1
Slot: Slot2
Receive Group List: BM Colorado
Digital Encryption: Off
Extend Encryption: AES
ARC4 Encryption Code: Off
AES Digital Encryption: Off
Multiple Key: Off
Random Key: Off
SMS Forbid: Off

Send Talker Alias: ☐
Call Confirmation: ☐
Ranging: ☐
Slot Suit: ☐
SMS Confirmation: ☐

Analog

CTCSS/DCS Decode: Off
CTCSS/DCS Encode: Off
Squelch Mode: Carrier
Optional Signal: Off
DTMF ID:
2Tone ID:
5Tone ID:
PTT ID: Off

Reverse: ☐
2TONE Decode:
Custom CTCSS
R5toneBot: customize
R5ToneEot: customize

OK Cancel Previous Next

D878UVII

Receive Group List:
Select Receive Group (Predefined List of Talk Groups)
Select NONE to listen to only the programmed Talk Gr

No.	Receiv Frequen
1	440.000
2	155.000
3	
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29	

D878UVII

Contact

BM Colorado
BM Colorado

Status

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ZONES

- Channels are assigned to Zones
- Only one (1) Zone can be in use at a time
- On HTs (and some mobiles), corresponds with channel selection dial
- Radios can have numerous zones
- Channels can be a member of more than one Zone



QUESTIONS?



BONUS!

“You're always making things difficult.”

-Veruca Salt, “Willy Wonka & the Chocolate Factory (1971)”



BONUS — EXPORT/IMPORT

- Anyone updates their firmware and CPS frequently
- Codeplugs don't always open between versions
- Codeplugs aren't always compatible between models
- Codeplugs aren't always compatible between sub-models (Commercial, Amateur, Europe)
- Solve this with Export/Import!
 - Data is saved in .csv files
 - Data can be imported regardless of model or CPS version
 - Unnecessary data is ignored



STUFF AND THINGS

- RMHAM Website – <http://www.rmham.org>
- Interactive DMR repeater map: <http://bit.ly/rmham-trbo-map>
- Radio ID – <https://www.radioid.net/>
- Brandmeister
 - Dashboard: <https://brandmeister.network/>
 - Audio Feeds: <http://hose.brandmeister.network/>
 - Wiki: <https://wiki.brandmeister.network>
- Colorado Hotspot Frequencies: <https://www.ccarc.net/wordpress/hot-spots/>
- Contact Me: K0NGA@arrl.net

