



➤ DMR: THE FUTURE OF TWO-WAY DIGITAL RADIO



INTRODUCTION TO DMR DIGITAL MOBILE RADIO

&

Codeplug Design for the
Tytera MD-380 Handheld

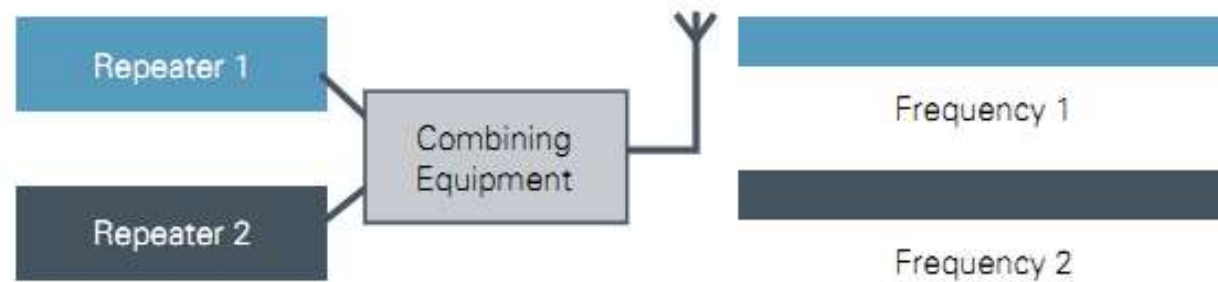
Digital Mobile Radio

- ▣ An ETSI published worldwide standard
- ▣ Over a HALF DOZEN manufacturers of DMR radios
- ▣ Superior voice quality over older digital modes
- ▣ Longer battery life
- ▣ Supports multiple talk groups on one channel
- ▣ Supports data applications
- ▣ Commercial ETSI/TIA specs mean rugged performance over temperature and congested urban RF environments

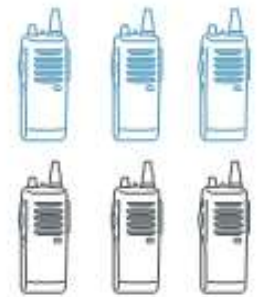
TWO Repeaters in One!

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

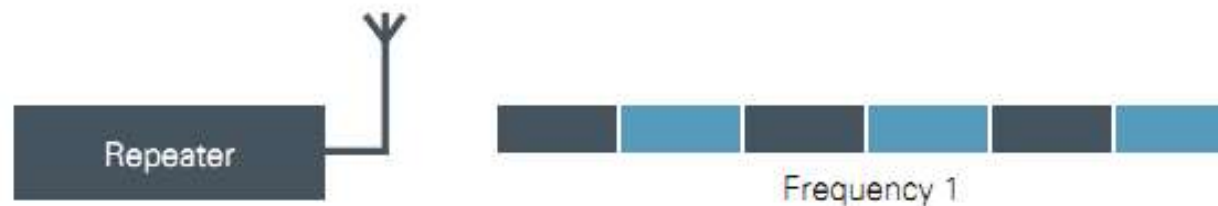


*One call per
repeater and channel*



Radio Groups

Two-channel Digital TDMA System

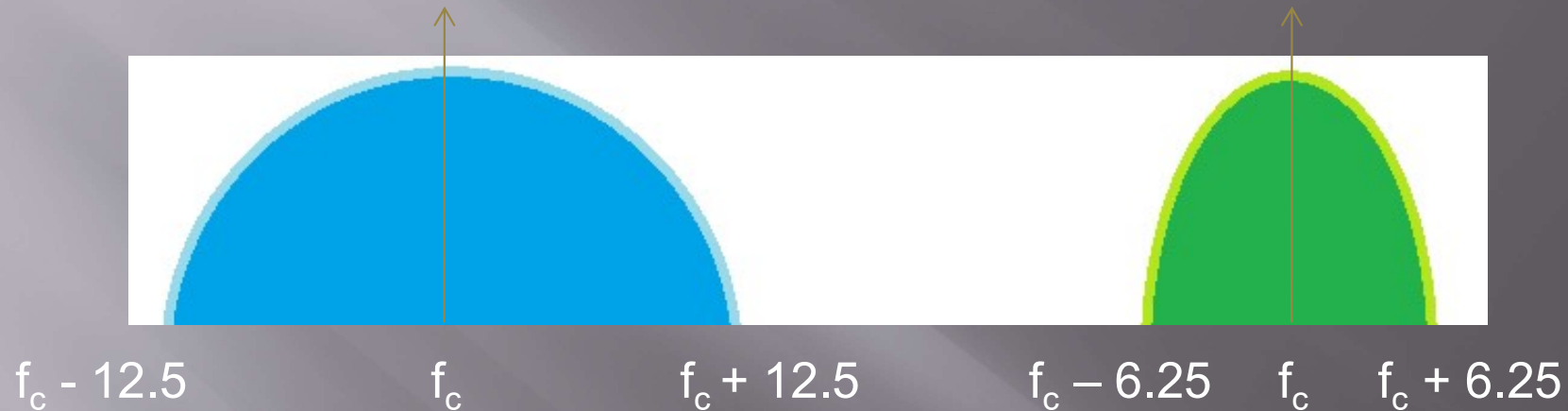


*Two calls per
repeater and channel*



Radio Groups

Half the Channel Bandwidth



Traditional Analog
25 kHz

Channel Bandwidth

1 Channel
1 Repeater

DMR

12.5 kHz

Channel Bandwidth

2 Channels
1 Repeater

Greater Spectrum Efficiency than Older Digital Modes



$f_c - 11.25$ f_c $f_c + 11.25$

$f_c - 6.25$ f_c $f_c + 6.25$

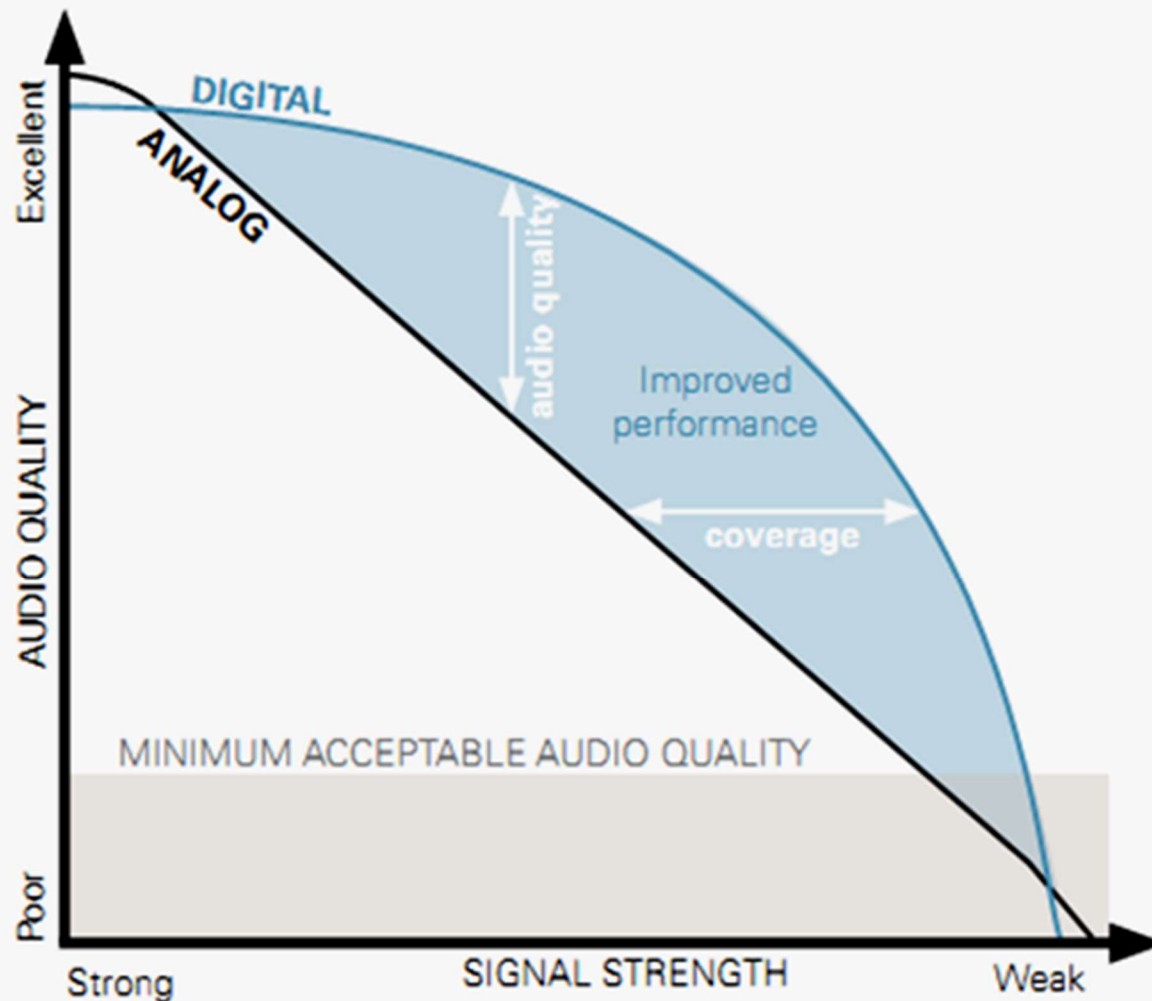
Guard Band
as large as 10 kHz
between channels

Total BW= 22.5 kHz

No Guard Band
between 2
channels

Total BW= 12.5 kHz

Better Signal Quality



Digital voice retains better quality than analog as signal strength decreases.

- ▣ No hiss, popping, or static
- ▣ Better RF range than older digital technologies
- ▣ Forward Error Correction and Cyclic Redundancy Check coders

Longer Battery Life



Older Digital Modes
(FDMA)



DMR
(TDMA)

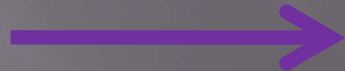
“For each hour of usage the TDMA radios show between 19% and 34% less battery capacity is required than for the older FDMA models.”

“40 percent improvement in talk time in comparison with analogue radios “

Data and Voice at the Same Time



Slot 1 Voice



Slot 2 GPS Location

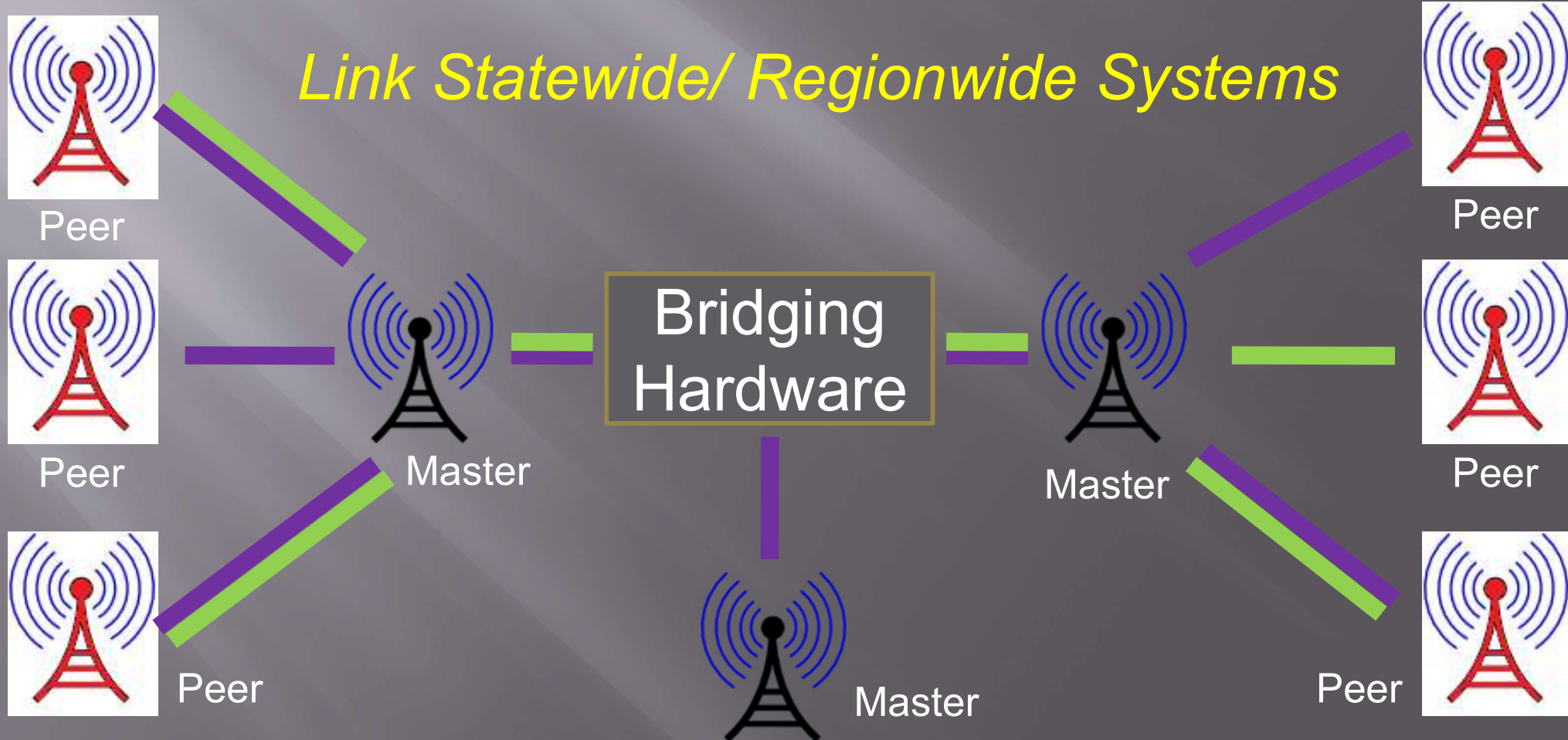
(or second channel voice when not sending GPS data)

Give your location WHILE talking!

IP Site Connect

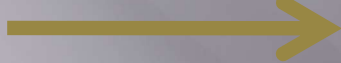
1 or 2 slots (channels)

Link Statewide/ Regionwide Systems



Dynamic Mixed Mode: First in – First Out

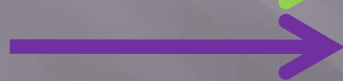
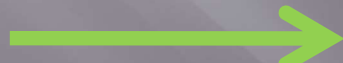
Analog



OR



Slot 1 TDMA

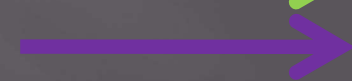


Slot 2 TDMA

Analog



Slot 1 TDMA



Slot 2 TDMA

Free Text Messaging



Send to one person, or a group of people.

- Weather Alerts
- Club Meetings
- Announcements



- ❑ Motorola Amateur Radio Clubs and other private XPR8300/8400 and MTR3000 repeater owners
- ❑ 3700 Site network in USA, Germany, Australia, South Africa, New Zealand, Spain, Switzerland, Austria, Canada, Finland, Sweden, Italy, Mexico, and the UK.
- ❑ 100% Pure Digital. Voice and text messaging supported.
- ❑ Weekly nets to discuss technical issues
- ❑ More than 70,000 registered users Worldwide
- ❑ To register or learn more <http://dmr-marc.net>

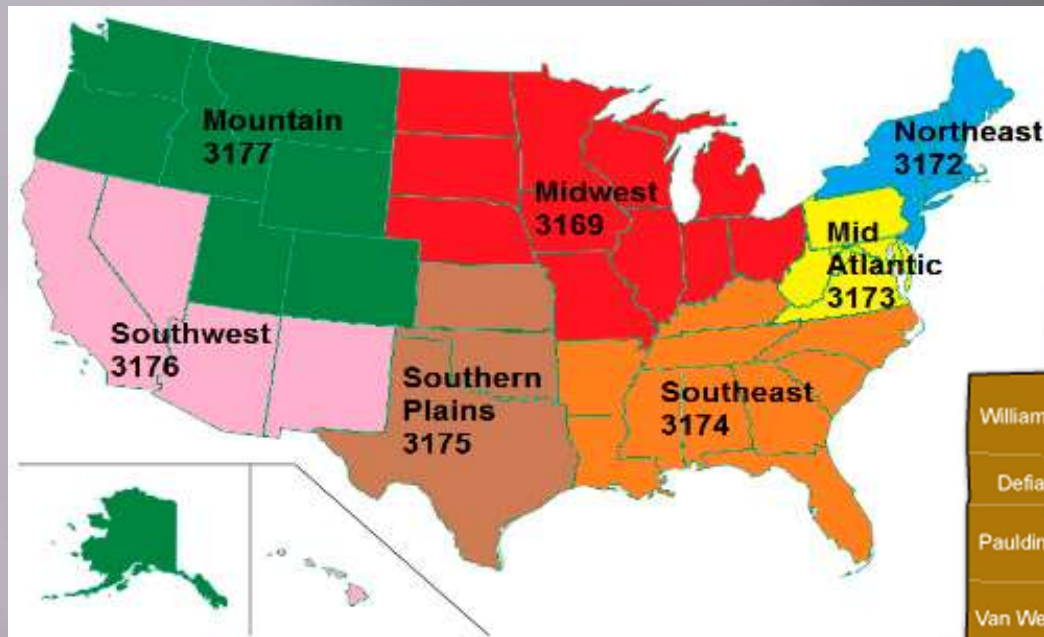
Costs to Get Started

- ▣ Tytera MD-380 less than \$90.00
- ▣ Use current 440 MHz accessories
 - Outdoor antenna with SMA adapter
 - Baofeng speaker mic or other compatible
 - 144/440Mhz whip antennas
 - Mobile antennas with SMA adapter
- ▣ Other radios both mobile and hand held <\$300
 - Connect Systems
 - Hytera
 - Radioddity
 - Used Motorola gear (Software can be expensive)
- ▣ Not tied to a specific manufacturer

Talk Groups Increase Capacity!

- ▣ Time Slot 1, Talk Group 3 – Native English speakers (USA, Canada, Australia, New Zealand, South Africa, and U.K.)
- ▣ Time Slot 1, Talk Group 1 – Primary English language countries to secondary English speaking Europeans
- ▣ Time Slot 2, Talk Group 2 – Local Repeater QSOs.
- ▣ Time Slot 2, first 4 digits of state ID (KS = 3120) for statewide linked TS2 systems. Also, country talk groups are 3 digits (Canada = 302)
- ▣ Be courteous and use the local time slot for local repeater QSOs and don't monopolize the linked network time slot 1 if you don't have to.

Regional and Local Talk Groups



Talk Group Mappings

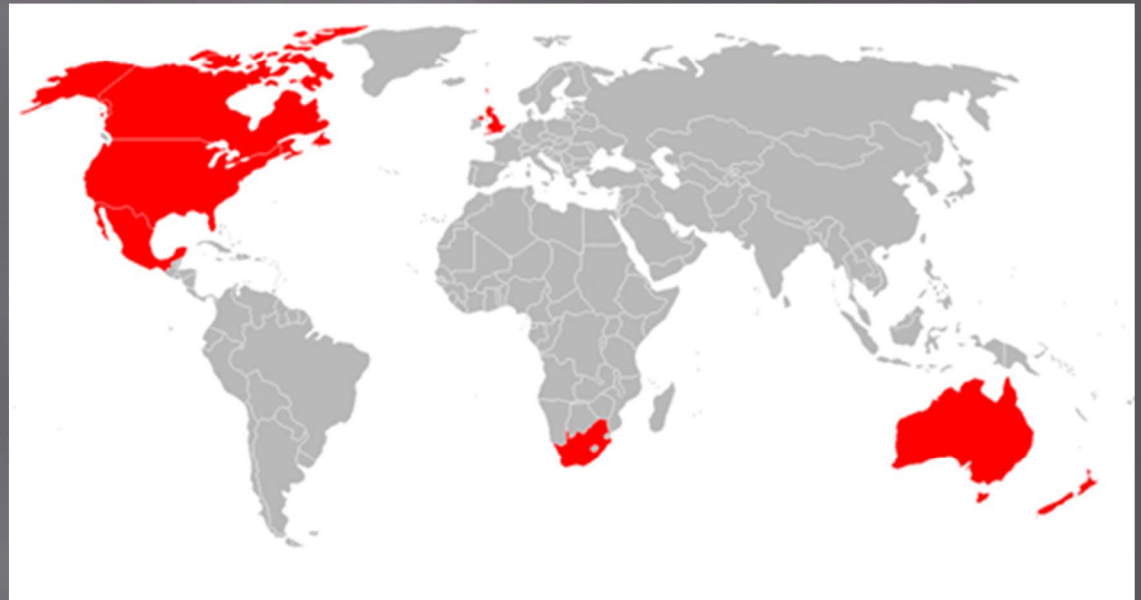


TG1, TS1(World)

- Saturday Nets
- Calls to second language English speakers
- Don't use for UK-> USA or Australia-> Canada, etc.

TG3, TS1 (NAm/English)

- Calls to native English speakers
- Share with other users!
- Use local/regional TG/TS when possible



ID Scheme

- ▣ DMR supports 16777215 IDs. We ask max 2 IDs per person. You can reuse same ID on multiple radios that you use-> Recommended!
- ▣ 8-digits: Admin tools and resources
- ▣ 7-digits: Subscribers (mobiles and portables)
- ▣ 6-digits: Repeaters
- ▣ 4-digits: Regional Talk Groups
- ▣ 3 digits: Country Talk groups

Common Courtesy

- ▣ ALL RADIOS MUST HAVE A VALID 7-DIGIT DMR ID from our website <http://dmr-marc.net>, Under “Contact Us” Radios without an official ID should not be on the system. Period. Do not make up your own ID.
- ▣ Do not key up on TS1 and blow into mic to test your radio. You key up 100+ repeaters and that is annoying to all of us who listen.
- ▣ Do radio tests on TS2 with a voice ID.
- ▣ You must identify with your callsign just like you did in the past on an analog repeater per FCC rules.

DMRplus

- ▣ Reflectors that connect to other:
 - Talk groups
 - Digital Modes
- ▣ Accessed by private call from your contact list
- ▣ More prevalent in Europe
- ▣ All DMRplus reflectors labeled 4xxx
- ▣ Works with open Spot (Shark RF)
- ▣ Can be connected to DMR-MARC repeaters

DMRplus

Connecting to Reflectors on DMRPlus

Step 1: Check status
of repeater

TS2 TG5000
"Status"

Step 2: Choose a
reflector

TS2 TG 4xxx
"Connect to Reflector"

Step 3: Begin your QSO

TS2 TG9
"Converse"

Step 4: End your
QSO

TS2 TG4000
"Disconnect"



Guide Book for DMR

Amateur Radio Guide to Digital Mobile Radio (DMR)



By
John S. Burningham, W2XAB
May 2015

[http://www.trbo.org/docs/
Amateur_Radio_Guide_to_DMR.pdf](http://www.trbo.org/docs/Amateur_Radio_Guide_to_DMR.pdf)

A screenshot of the DCI MotoTRBO Amateur Radio Group website. The page has a navigation bar at the top with links: Home, PNW-DMR, News, Netwatch, Dash, Repeaters, Talkgroups, c-Bridge, Linking, Open IPSC, MTUSA, and Site Map. Below the navigation bar is a header section with the text "Digital Communications Interconnect" and "MotoTRBO™.org", followed by the tagline "not affiliated with Motorola but we sure like their stuff". The main content area features the DCI logo (a blue circle with "DCI" inside) and the text "DCI MotoTRBO Amateur Radio Group". To the right of this is a logo for "PNW DMR". The main text of the page states: "Our mission is to connect to and converse with the regional DMR Ham community by openly sharing our network resources and talkgroups to enable dynamic connections to all regional radio amateur DMR groups. We are no longer actively involved in national efforts due to the politics and divisiveness shown by several major c-Bridge groups."

<http://www.trbo.org>

Good source of DMR Information
Not affiliated with Motorola

User and Repeater Database

- ▣ <https://dmr-marc.net/cgi-bin/trbo-database/>
- ▣ Look up individuals by name, call sign or registration number or search by locations
- ▣ Look up repeaters using Google map references
- ▣ Repeater listing will give all necessary information for the codeplug
- ▣ Repeater information along with additional info from <http://arrl-ohio.org/digital/digital.html>

User Database Search



Translations:        

[Home](#)[Database](#)[Repeaters](#)[About Us](#)[Register ID](#)[Contact Us](#)

DMR Advanced Database Search

[User Database](#)[Rptr Database](#)

User Search Criteria

DMR ID	Equals ▼	<input type="text"/>
Callsign	Equals ▼	<input type="text" value="N8IDA"/>
Surname	Equals ▼	<input type="text"/>
City	Equals ▼	<input type="text"/>
State/Prov	Equals ▼	<input type="text"/>
Country	Equals ▼	<input type="text"/>

Users Search: 1 Results

DMR ID	Callsign	Name	City	State/Prov	Country	Remarks
1139021	N8IDA	Joe Molter Molter	Cincinnati	Ohio	United States	DMR

Codeplug

- ▣ Configuration file for your radio
- ▣ Contains information to access:
 - Local DMR repeater
 - Various talk groups
 - Interconnected repeaters and networks
- ▣ Manufacturer specific software
- ▣ No programming from the radio

Customer Programming SW

Tytera MD-380 Handheld



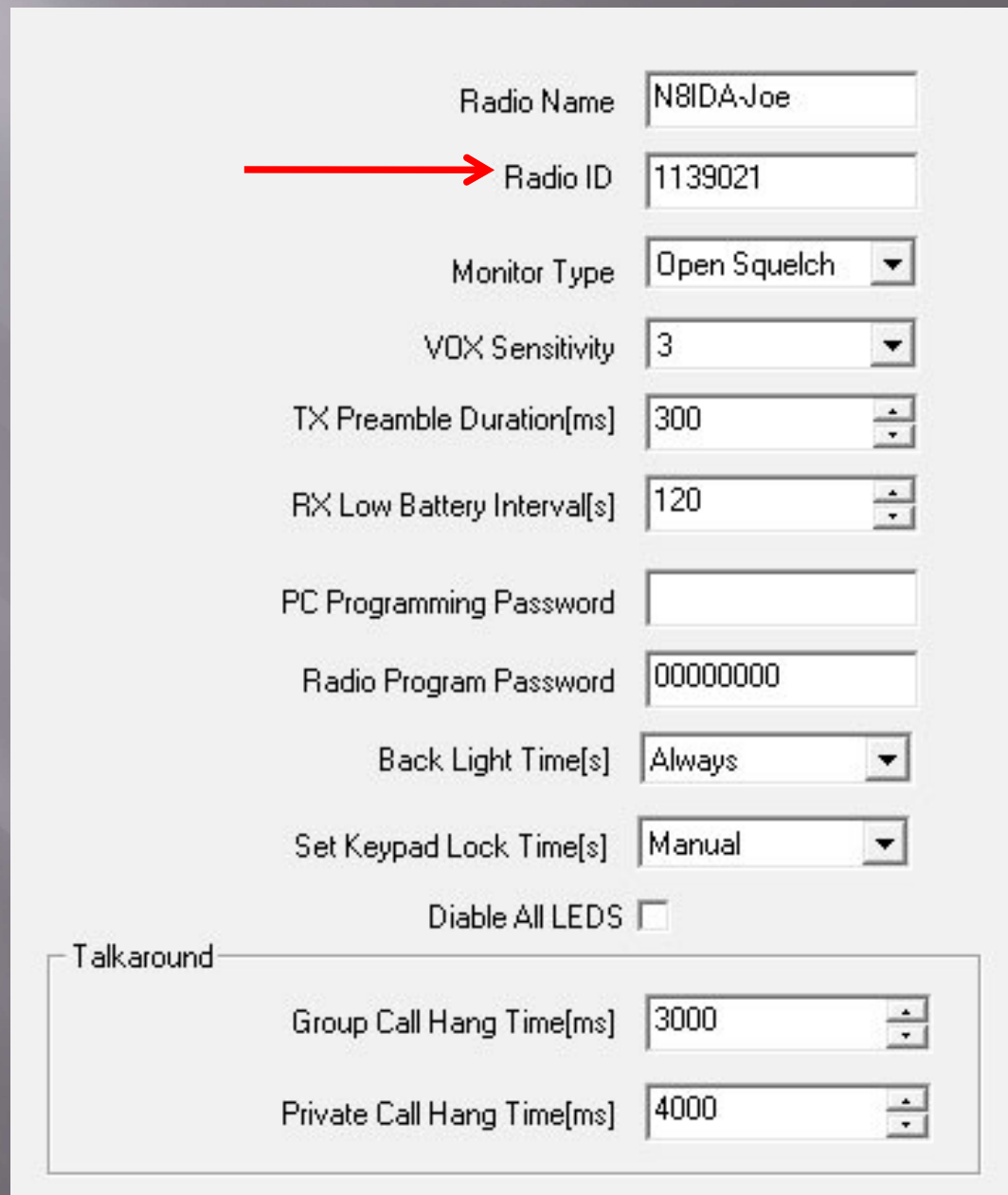
Less than \$100.00

Basic Information

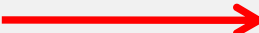
Frequency Range	400-480MHz
Last Programmed Date	2017-05-24 10:23:35
Model Name	MD380
Serial Number	
CPS Software Version	V01.32
Hardware Version	V01.00
MCU Version	D013.032
Unique Device ID	688216Q0081608310814

General Screen on CPS

- ▣ Add registration number



Radio Name

 Radio ID

Monitor Type

VOX Sensitivity

TX Preamble Duration[ms]

RX Low Battery Interval[s]

PC Programming Password

Radio Program Password

Back Light Time[s]

Set Keypad Lock Time[s]

Disable All LEDs ☐

Talkaround

Group Call Hang Time[ms]

Private Call Hang Time[ms]

Programming Your Radio

- ▣ Radios are all based on commercial products
- ▣ Most commercial radios are not programmed by local users
- ▣ You *cannot* program the radio from the keypad
- ▣ Download radio information first
- ▣ Obtain DMR-MARC registration number before using the radio (*Mandatory*)
- ▣ Registration numbers usually take less than 24 hours to be processed dmr-marc.net

Collect Repeater Information

- ▣ Collect the information for the local or regional repeaters that you are going to use
- ▣ Information will include
 - Frequency pair and offset
 - Color Code
 - Talk groups available and their ID number
 - Time Slots
- ▣ Prepare channel names – (limited characters for radio programming determined by your radio)

Typical Repeater Listing

Callsign: K8BIG – Cinci South

Frequency: 443.9000

Offset: +5.000

Color Code: 1

DMR-MARC

Cincinnati, Ohio

Time Slot #1 - Group Call 8 = Local Dayton/Cincinnati

Time Slot #1 - Group Call 3139 = OH Statewide

Time Slot #2 - Group Call 1 = Worldwide All Languages (PTT activated)

Time Slot #2 - Group Call 3 = North America (PTT activated)

Time Slot#2 – Group Call 2 = Local (USD Net)

Time Slot #2 - Group Call 13= Worldwide English

Time Slot #2 - Group Call 9 = DMRPlus Talk

Time Slot #2 - Group Call 4000 = DMRPlus Unlink

Time Slot #2 - Group Call 5000 = DMRPlus Status

Time Slot #2 - Group Call 4xxx = Switch to Reflector 4xxx

The 4xxx reflectors are listed here:

<http://dmr-marc.net/FAQ/dmrplus-america.html>

Create Contact List

- ▣ List contains:
 - All talk groups on the repeaters in your channel list
 - Additional talk groups as needed
 - Personal ID's of other Amateur Radio Operators

No.	Contact Name	Call Type	Call ID
1	Worldwide	Group Call	1
2	Local (USD Net)	Group Call	2
3	North America	Group Call	3
4	Cinci/Dayton	Group Call	8
5	Local Repeater	Group Call	9
6	Simplex	Group Call	99
7	WW English	Group Call	13
8	MA State	Group Call	3125
9	OH State	Group Call	3139
10	MW Regional	Group Call	3169
11	Bridge	Group Call	3100
12	Tactical 1	Group Call	8951
13	Tactical 310	Group Call	310
14	Tactical 311	Group Call	311
15	Canada	Group Call	302
16	Parrot	Group Call	9998
17	McCall Audio Test	Group Call	0000

21	WB8ROL-Gary	Private Call	3139298
22	K8EJM-Bob	Private Call	3139572
23	KY State	Group Call	3121
24	SE Regional	Group Call	3174
25	Tactical 312	Group Call	312
26	WX8P-Art	Private Call	3139201
27	W8NRH - John	Private Call	1139270
28	W8LR - Jerry	Private Call	3139734
29	N8IG - Paul	Private Call	1139332
30	N8EMA - JEFF	Private Call	1139114

Create Digital RX Group Lists

- ▣ Create RX group list
- ▣ These contain the Talk Groups that are in your contact list
- ▣ They can be listed individually or in one list

RX Group List

Digital RX Group Lists

Group List Name: Joe Group1

Available Contact

Contact Member

Worldwide
Local (USD Net)
North America
Cinci/Dayton
Local Repeater
Simplex
W/W English
MA State
OH State
MW Regional
Bridge
Tactical 1
Tactical 310
Tactical 311
Canada
Parrot
NoCal Audio Test
DMRPlus Unlink
DMRPlus Status
W/W Germany
KY State
SE Regional
Tactical 312

Add>>

<<Delete

1 of 1

<- << >> >| Add Delete

Create Channels

- ▣ Channel Name
 - Characters will display on radio
 - Limited number of characters
- ▣ Rx and Tx Frequencies (Determined by Offset)
- ▣ Admit Criteria
 - Always
 - Channel Free
 - Color Code (Recommended)
- ▣ Scanlist Name

Create Channels (continued)

- ▣ Contact Name (from Digital Contacts List)
- ▣ Group List (from Digital RX Group List)
- ▣ Color Code (0 to 15) Similar to CTCSS
- ▣ Repeater Slot (1 or 2)
- ▣ TOT (Time Out Timer) 180 Seconds (Default =60)
(Personal Preference)
- ▣ Power (High or Low)

Channels Information

Digital/Analog Data

Channel Mode	Digital	Channel Name	Cinci N Loc(USD)
Band Width	12.5kHz	RX Frequency(MHz)	443.40000
Scan List	Cinci North	TX Frequency(MHz)	448.40000
Squelch	Normal	Admit Criteria	Color Code
RX Ref Frequency	Low	Auto Scan	<input type="checkbox"/>
TX Ref Frequency	Low	Rx Only	<input type="checkbox"/>
TOT[s]	180	Lone Worker	<input type="checkbox"/>
TOT Rekey Delay[s]	0	VOX	<input type="checkbox"/>
Power	High	Allow Talkaround	<input type="checkbox"/>

Digital Data

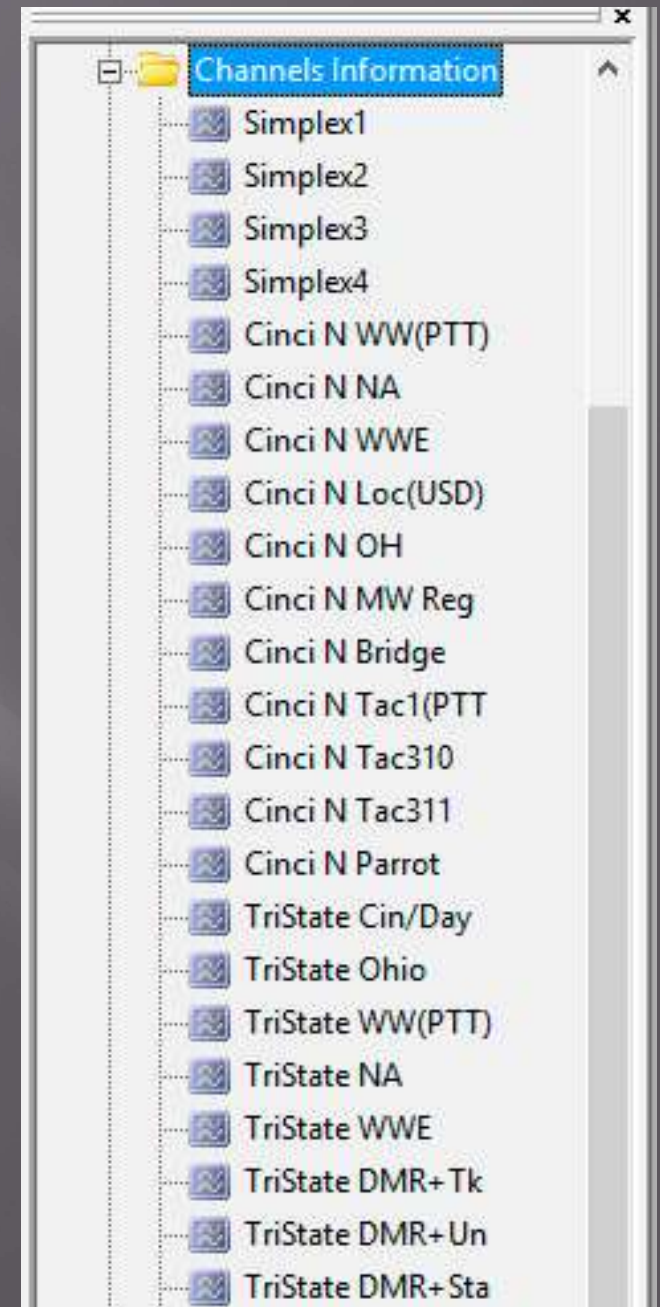
Private Call Confirmed	<input type="checkbox"/>
Emergency Alarm Ack	<input type="checkbox"/>
Data Call Confirmed	<input type="checkbox"/>
Compressed UDP Data Header	<input type="checkbox"/>
Emergency System	None
Contact Name	Local (USD M
Group List	Joe Group1
Color Code	1
Repeater Slot	2
Privacy	None
Privacy No.	1

Analog Data

CTCSS/DCS Dec	None	CTCSS/DCS Enc	None	Decode 1	<input type="checkbox"/>	Decode 5	<input type="checkbox"/>
QT Reverse	180	Tx Signaling System	Off	Decode 2	<input type="checkbox"/>	Decode 6	<input type="checkbox"/>
Rx Signaling System	Off	<input checked="" type="checkbox"/> Reverse Burst/Turn-off Code		Decode 3	<input type="checkbox"/>	Decode 7	<input type="checkbox"/>
<input type="checkbox"/> Display PTT ID				Decode 4	<input type="checkbox"/>	Decode 8	<input type="checkbox"/>

Channel Listing

- ▣ Will be added to:
 - Zone List (Max 16 Channels)
Newer radios may have higher maximum in zone list
 - Scan List (Channels to scan in a particular zone)



Create Scan List and Zone List

- ▣ Create Scan List – Name of Repeater or Call Sign
 - These contain the channels in a zone to scan for activity
- ▣ Create Zone List – Name of Repeater or Call Sign
 - Zone list is limited to 16 channels (Radio Limited)
 - Most repeaters will have less than 16 talk groups listed
- ▣ These will be filled after you have your initial channel list created

Scan List Screen

Scan List

Scan List Name

Cinci North

Available Channel

Simplex1

Simplex2

Simplex3

Simplex4

TriState Cin/Day

TriState Ohio

TriState Ww(PTT)

TriState NA

TriState WwE

TriState DMR+Tk

TriState DMR+Un

TriState DMR+Sta

Cinci S Loc(USD)

Cinci S Cin/Day

Cinci S Local 9

Cinci S Ohio

Cinci S NA

Cinci S WwE

Cinci S Ww(PTT)

Cinci S DMR+ Un

Cinci S DMR+ St

Hills Ww(PTT)

Hills NA

Add>>

<<Delete

Channel Member

Cinci N Ww(PTT)

Cinci N NA

Cinci N WwE

Cinci N Loc(USD)

Cinci N OH

Cinci N MW Reg

Cinci N Bridge

Cinci N Tac1(PTT)

Cinci N Tac310

Cinci N Tac311

Cinci N NoCal Au

Cinci N Local 9

Cinci N WwG(PTT)

Cinci N MA

Cinci N Parrot

Priority Channel 1

None

Signaling Hold Time[ms]

500

Priority Channel 2

None

Priority Sample Time[ms]

2000

Tx Designated Channel

Last Active Channel

2 of 7

K<

<<

>>


>I

Add

Delete

Zone Channel List







Maximum 16 Channels in a Zone

 Zone Information

Zone Name

Available Channel		Channel Member
Simplex1	<div>Add>></div> <div><<Delete</div>	Cinci N W/W(PTT)
Simplex2		Cinci N NA
Simplex3		Cinci N WWE
Simplex4		Cinci N Loc(USD)
TriState Cin/Day		Cinci N OH
TriState Ohio		Cinci N M/W Reg
TriState W/W(PTT)		Cinci N Bridge
TriState NA		Cinci N Tac1(PTT)
TriState WWE		Cinci N Tac310
TriState DMR+Tk		Cinci N Tac311
TriState DMR+Un		Cinci N Parrot
TriState DMR+Sta		Cinci N W/WG(PTT)
Cinci S Loc(USD)		Cinci N MA
Cinci S Cin/Day		Cinci N NoCal Au
Cinci S Local 9		Cinci N Local 9
Cinci S Ohio		
Cinci S NA		
Cinci S WWE		
Cinci S W/W(PTT)		
Cinci S DMR+ Un		
Cinci S DMR+ St		
Hills W/W(PTT)		
Hills NA		

1 of 7

Review Codeplug

- ▣ Review all entries for accuracy
- ▣ Save code plug to computer
- ▣ Name code plug by date and area
- ▣ You can create alternate code plugs
 - Travel specific areas
 - Overseas areas
- ▣ Upload codeplug to radio

Testing Codeplug

- ▣ Check audio with Parrot Talk Group
- ▣ Test with your FCC call sign
- ▣ Make First Contact
 - Mention talk group name when monitoring
 - “Listening on Ohio”
 - “Listening on Cincy/Dayton”
- ▣ Identify yourself with FCC Call Sign
- ▣ Other operators will show up with DMR-MARC registration number and talk group
- ▣ New numbers added to contact list
 - Will show up with name and call sign after being added

Codeplug Issues

- ▣ Using always in “Admit Criteria”
- ▣ Talk on top of someone on another TG with same Time Slot
- ▣ Better to use Color Code in “Admit Criteria”
- ▣ Prevent transmissions on top of existing conversations



Using an Outside Antenna

- ▣ Attach a SMA (Male) to SO-239 Adapter Cable to radio then the 440 MHz antenna feed
- ▣ Do not use a SMA to SO-239 adapter to directly connect radio to antenna feed
- ▣ This will put too much stress on the radio SMA port



MD-380 Hacks

- ▣ MD-380 Tools
- ▣ Custom Firmware
- ▣ Add additional features
- ▣ md380.tools (website)
- ▣ Download latest MD-380 Tools
 - <http://www.george-smart.co.uk/md380tools/>
- ▣ Download entire user database - >70,000
 - See Name, call sign and location
 - Seven digit registration number also present

MD 380 Tools Menu Options

Menu Item	Description
1. M. RogerBeep	Changes the PTT Beep to a more subtle tone.
2. Boot Options	Enables or Disables the Boot Screen at startup
3. Date Format	Allows you to change the Date Format on the front display. If "Alt. Status" is chosen it replaces the clock with the last heard feature.
4. Show Call (formally userscsv)	Select source of callsign display - CPS, UserDB, or TalkerAlias
5. USB Logging	Used to log radio information for debugging
6. Promiscuous	Allows radio to monitor by Timeslot. (Monitor feature)
7. Edit DMR-ID	Edit DMR ID
8. Mic Bargraph	Graphical display of your microphone audio
9. Experimental	Experimental Mode
10. Side Buttons	Change the Side Button Configurations
11. Config Rest	Reset all configurations related to the MD380 Tools.
12. Backlight	Change backlight settings.
13. CoPL Override	Change during the bootup how information is displayed.
14. DevOnly!!	Dev Only type features. NetMonitor and Radio Vitals information.

DMR – Digital Future

- ▣ Growing number of users
- ▣ New repeaters
- ▣ New networks in addition to current ones
 - DMR-MARC
 - Brandmeister
 - K4USD
 - DMR plus
- ▣ International contacts
- ▣ Digital voice quality with upgradeable firmware
 - New vocoders
 - Additional features via firmware upgrades
- ▣ Newer Radios
 - Easier Programming
 - Pre-programmed code plugs for specific regions
 - Lower cost radios for hand held and mobile operations
- ▣ Will the “Big Three” ever jump on the bandwagon?

DMR Definitions

<i>DMR</i>	Digital Mobile Radio
<i>ETSI</i>	European Telecommunications Standards Institute
<i>TIA</i>	Telecommunications Industry Association
<i>TDMA</i>	Time-Division Multiple Access
<i>FEC</i>	Forward Error Correction
<i>FDMA</i>	Frequency Division Multiple Access
<i>DSVI AMBE+2</i>	Digital Voice Encoder or Vocoder . It is the only vocoder on the market.
<i>Tier One</i>	Single Channel , FDMA 6.25 kHz Bandwidth
<i>Tier Two</i>	Two Slot TDMA, 12.5 kHz Bandwidth, Peer to Peer and Repeater Standard
<i>Amateur DMR</i>	DMR for Amateur Radio on Tier Two with Commercial or Amateur DMR Equipment
<i>Tier Three</i>	Tier Two with Trunking and Multiple Repeaters (Public Safety Users)
<i>IPSC</i>	Internet Protocol Site Connect (Connecting Repeaters over the Internet)
<i>C-Bridge</i>	Interconnect IPSC Groups (Rayfield), Compatible with Bridgecom Systems MV-IPSC
<i>TS1</i>	Time Slot One – First Half of Two slot TDMA
<i>TS2</i>	Time Slot Two- Second Half of Two Slot TDMA
<i>TG</i>	Talk Group – Groups of Users Sharing a Time Slot without Disrupting Other Users

<i>Zone</i>	Group of Channels on a Repeater (Limited to 16 Channels per Zone on some radios)
<i>Scanlist</i>	List of Channels in a Zone to Scan for Traffic
<i>Contacts</i>	List of Talk Groups and Individuals and their Respective ID Numbers
<i>Color Code(CC)</i>	Used Like CTCSS for Repeater Access, CC is Mandatory, 16 Color Codes
<i>Channel</i>	Combination of repeater frequency, talk group, time slot, color code, admit criteria
<i>Code Plug (CP)</i>	Radio's Configuration File from Manufacturer's Specific Programming Software
<i>CPS</i>	Manufacturers Specific Software for Writing Code Plugs
<i>ID</i>	Subscriber's ID Number, All Amateurs Need an ID (mandatory) (From DMR-MARC)
<i>DMR-MARC</i>	DMR Motorola Amateur Radio Clubs (www.dmr-marc.net)
<i>DMRplus</i>	Reflectors that point to other talk groups or modes. Numbered 4xxx
<i>Radio Firmware</i>	Software that controls all the radio functions that is flashed into non-volatile memory
<i>MD-380 Tools</i>	Modified Firmware for the Tytera MD-380 Portable Radio (Adds Additional Features)
<i>Amateur Guide</i>	http://dmr-marc.net/media/Amateur Radio Guide to DMR Rev I 20150510.pdf
<i>DCI MotoTRBO Group</i>	Amateur Radio Group for MotoTRBO and DMR http://www.tro.org