

# DMR- THE BASICS

Or "What Is That Noise  
Coming From My Radio?"

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**Backyard Repeater Group**  
*Presented to the Johnson County RAC*  
*August 12, 2016*



# THE BACKYARD REPEATER GROUP TECHNICAL COMMITTEE



- Name the Digital Mode:



Fusion



D-STAR



TDMA DMR(Repeaters)

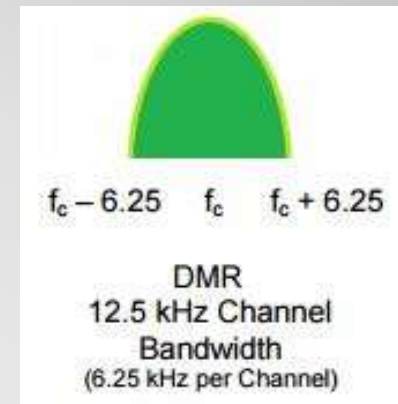
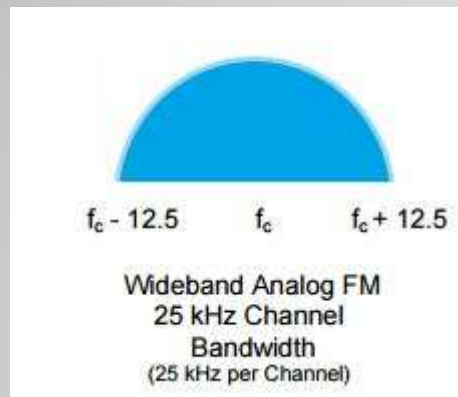


FDMA DMR (Simplex)

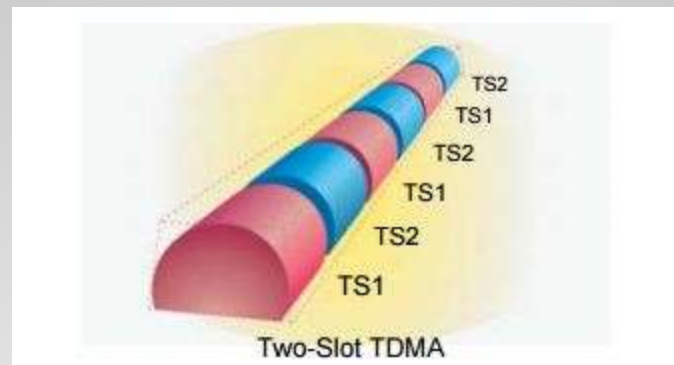
- *What is DMR?*
- *How Does it Work?*
- *What Makes It So Different?*
- *What is a "Color Code"?*
- *What is a Time Slot?*
- *Is it true I need a number? Will just my call work?*
- *What is a Talk Group?*
- *How Do You Program Your Radio?*
- *What's DMR-MARC?*
- *What's BrandMeister?*
- *Are The Radio Expensive?*
- *What Bands Can We Use?*

- DMR- Based on European Telecommunications Standards Institute Standard (ETSI) Standard TS 102 361 parts 1-4
- Hams Use DMR Tier II Specs (as do Commercial Users)
- There are two "networks" used by Hams- DMR-MARC, and BrandMeister (BM)

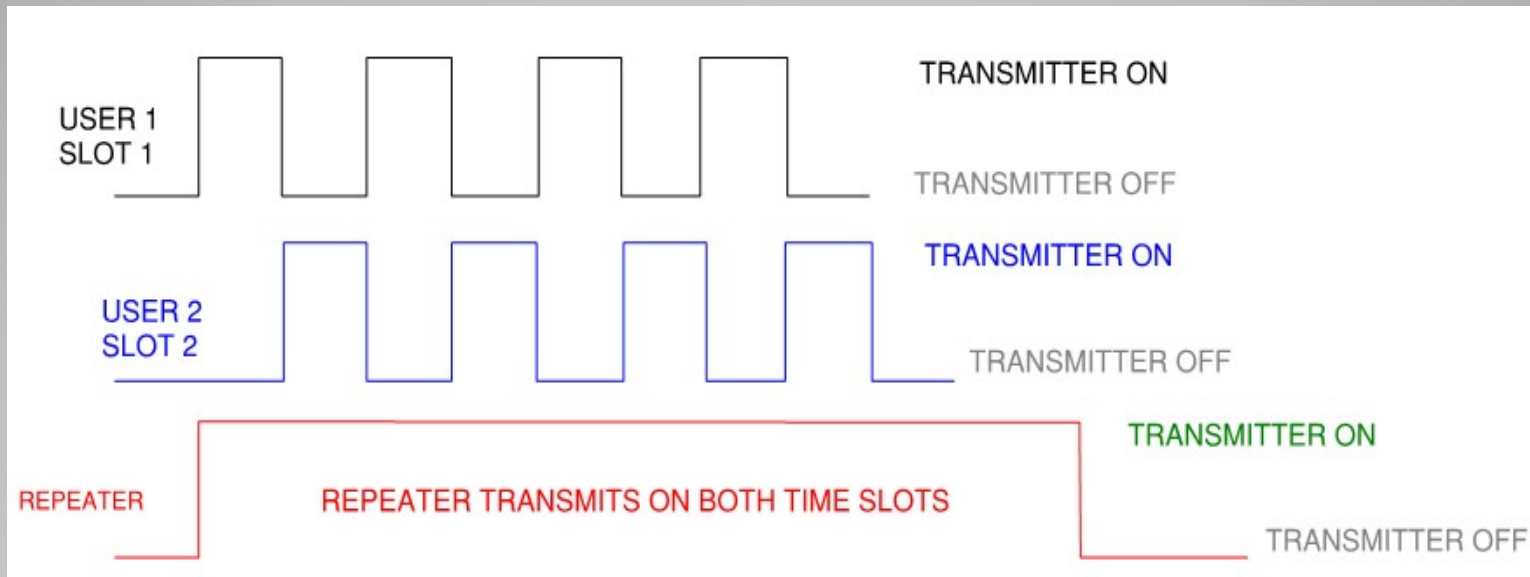
- DMR Basics:
- DMR uses the SAME Chip as D-Star and Fusion
- DMR Uses LESS Bandwidth per Channel



- DMR Allows for TWO Simultaneous Conversations on the SAME Frequency



- When you transmit to a Repeater, your signal looks like this:



If the repeater misses even one of your signals, it will retry, and if you cannot supply a valid signal for it to decode, it will cause your radio to give you a "BOINK" or low tone.



- A Color Code Is Like CTCSS On An Analog Repeater- Required and Must be Correct Code to Access The System
- A Time Slot (there are 2 per frequency in a TIER II system) is a "Slice" of the Overall Signal (Incoming and Outgoing from the System). When one time slot is active, you can use the other. *BUT* if one or both are active and you want to use it- You have to wait.
- To effectively use a DMR repeater you have to register for a DMR-MARC number (free-YAY!!) *Yes you will still have to ID*

- Talk Groups (or Group Contacts or Calls) are MANDATORY. They tell the system what "**GROUP**" you want your signal to be broadcast to. Also referred to as "TG"
- **Talk Groups** reside in the "**Digital Contact**" list in your radio
- There are 2 types: **Group Contacts**- *Minimum necessary* to operate, and **Private Contacts**- nice to have but not necessary (*except for the Parrot- it is a Private Call*)

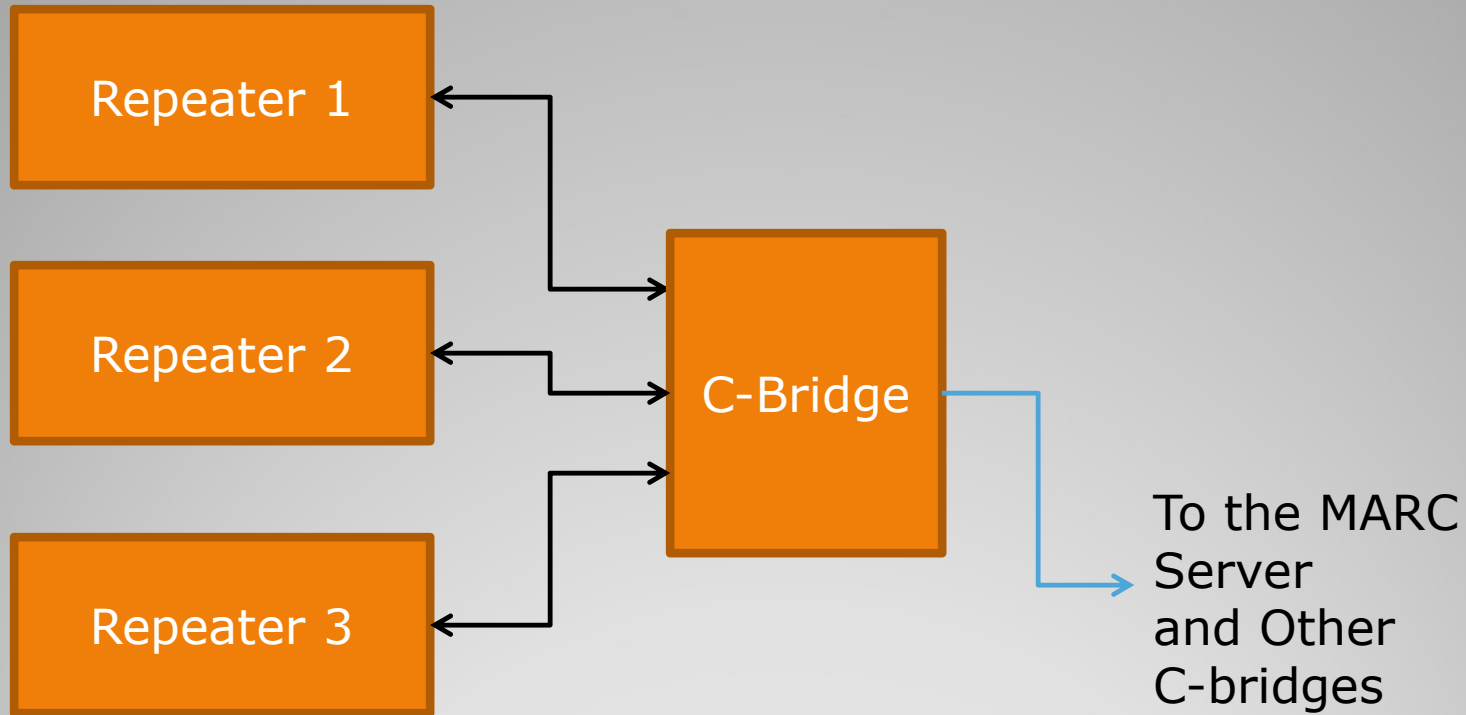
- **Group Calls**- Needed for Talk Groups
- **Private Calls**- Used for Person to Person QSO's (Not really liked by Repeater Owners), and also provides information on who is talking on your screen.
- **Private Calls are derived from your DMR-MARC number or CCS7 (Europe) number.**
- **Group Calls** are distributed by MARC or BM via the C-Bridge Administrator.

- **What is DMR-MARC?**
- DMR-MARC (Digital Mobile Radio-Motorola Amateur Radio Club), are the fore-fathers of DMR Network Systems. For a repeater to be on the MARC network it **MUST** be Motorola and **MUST** have a certain firmware. A MARC basic component is a "C-Bridge" to assist in linking and TG and Slot assignments. They are set up by a "C-Bridge Administrator". K4USD is the biggest in the USA.

- MARC does not allow non-Motorola devices to link in. This includes Hytera repeaters, homebrew repeaters, and hot spots (DV4Mini and DVMega)
- Once a repeater TG/Slot assignment is set up it is not easy to make changes. For the user it is WYSIWYG.
- That is NOT saying they *CANNOT* be changed, it just is not easy.
- MARC repeaters have only those C-Bridge "channels" available for the users.

- **What is BrandMeister?**
- The BrandMeister Network (or BM), was started in Europe.
- BM allows **ANY** DMR device to connect- Motorola, Hytera, Homebrew Repeaters, and DV4Mini and DVMega hotspots.
- **ALL** BM TG's are available on ALL repeaters (No C-bridges)
- BM Repeaters (Peers) connect to a BM Master- in the USA there are 3 masters- East, Central and West (Also an experimental Master is available).

- BM is developing software to give **FULL** control over TG/Slot assignment and UA timers to individual repeater owners. We will be able to make a TG FT or UA, Lock out certain TG's, set how long a UA TG is active after local activity ceases.



ABSOLUTELY **BASIC** MARC System Diagram



- AVAILABLE TALK GROUPS ON DMR-MARC REPEATERS (TYPICAL)

Slot 1

Worldwide (FT)

North America (FT)

TAC 310 (UA)

TAC 311 (UA)

Regional (Call Dist) (FT)

Slot 2

Local (FT)

**FT**=Full Time Activity- anything on TG will

key local repeater

**UA**= User Activated (also known as PTT)- quiet until keyed up locally-

443.10  
(PEER)

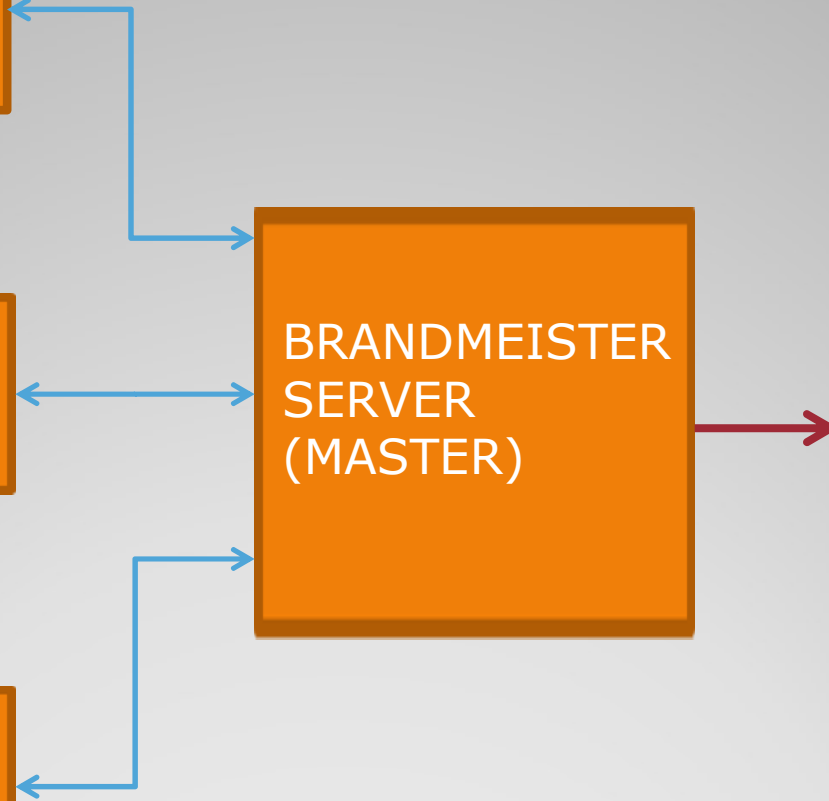
444.025  
(PEER)

442.10  
(PEER)

BRANDMEISTER  
SERVER  
(MASTER)

TO OTHER  
BM Master  
Servers

**BASIC BrandMeister Master/Peer Arrangement**



- AVAILABLE TALK GROUPS ON  
BRANDMEISTER REPEATERS (TYPICAL)

Slot 1

WW (UA)  
NA (FT)  
USA (FT)  
Zero Dist (FT)  
Kansas (FT)  
Missouri (UA)

Slot 2

BYRG (Local) (FT)

*List continued on next page*

- Listing of available Talk Groups on EACH BM repeater:

"250" : "Russia",	"927" : "Nordic",	"228" : "Switzerland",
"2501" : "Russia Global",	"9107" : "XRF007 B",	"2286" : "Regional Swiss",
"2502" : "XRF250 Bridge",	"214" : "Spain",	"734" : "Venezuela",
"2505" : "bridge to Radiocult",	"235" : "United Kingdom",	"88" : "XRF088 B",
"9504" : "*RUSSIA* (EchoLink)",	"262" : "Deutschland",	"881" : "XRF088 A",
"9" : "DMR Reflector",	"240" : "Sweden",	"222" : "Italia",
"255" : "Ukraine",	"2400" : "Regional SM0",	"2220" : "Reg-Zona0",
"655" : "South Africa", "1" : "Local",	"2401" : "Regional SM1",	"2221" : "Reg-Zona1",
"2" : "Local",	"2402" : "Regional SM2",	"2222" : "Reg-Zona2",
"91" : "World-wide",	"2403" : "Regional SM3",	"2223" : "Reg-Zona3",
"92" : "Europe",	"2404" : "Regional SM4",	"2224" : "Reg-Zona4",
"93" : "North America",	"2405" : "Regional SM5",	"2225" : "Reg-Zona5",
"95" : "Australia, New Zeland",	"2406" : "Regional SM6",	"2226" : "Reg-Zona6",
"910" : "German",	"2407" : "Regional SM7",	"2227" : "Reg-Zona7",
"911" : "French",	"228" : "Switzerland",	"2228" : "Reg-Zona8",
"913" : "English",	"2286" : "Regional Swiss",	"2229" : "Reg-Zona9",
"914" : "Spanish",	"734" : "Venezuela",	"4250" : "Ref-ITA",
"915" : "Portuguese",	"88" : "XRF088 B",	"4251" : "Ref-ITA-Zona1",
"920" : "DL, OE, HB9",	"881" : "XRF088 A",	"4252" : "Ref-ITA-Zona2",
"921" : "French",	"222" : "Italia",	"4253" : "Ref-ITA-Zona3",
"922" : "Dutch",	"2220" : "Reg-Zona0", "2221" : "Reg-	"4254" : "Ref-ITA-Zona4",
"923" : "European English", "927" : "Nordic",	Zona1",	"4255" : "Ref-ITA-Zona5",
"9107" : "XRF007 B",	"2222" : "Reg-Zona2",	"4256" : "Ref-ITA-Zona6",
"214" : "Spain",	"2223" : "Reg-Zona3",	"4257" : "Ref-ITA-Zona7",
"235" : "United Kingdom",	"2224" : "Reg-Zona4",	"4258" : "Ref-ITA-Zona8",
"262" : "Deutschland",	"2225" : "Reg-Zona5",	"4259" : "Ref-ITA-Zona9",
"240" : "Sweden",	"2226" : "Reg-Zona6",	"4260" : "Ref-ITA-Zona0",
"2400" : "Regional SM0",	"2227" : "Reg-Zona7",	"8500" : "XRF390 A",
"2401" : "Regional SM1",	"235" : "United Kingdom",	"8505" : "XRF077 D",
"2402" : "Regional SM2",	"262" : "Deutschland",	"8506" : "XRF055 C",
"2403" : "Regional SM3",	"240" : "Sweden",	"8507" : "XRF036 B",
"2404" : "Regional SM4",	"2400" : "Regional SM0",	"8510" : "XRF003 D",
"2405" : "Regional SM5",	"2401" : "Regional SM1",	"9107" : "XRF007 B",
"2406" : "Regional SM6",	"2402" : "Regional SM2",	"4860" : "Norway",
	"2403" : "Regional SM3",	

"242" : "Norway",  
 "4016" : "Berlin-Brandenburg",  
 "4242" : "Norway",  
 "4400" : "United Kingdom",  
 "4401" : "UK - 1",  
 "4402" : "UK Wide",  
 "4403" : "UK DV4 talk",  
 "4404" : "Ireland",  
 "4405" : "Scotland",  
 "4406" : "Wales",  
 "4407" : "UK - 7",  
 "4408" : "UK Test",  
 "2350" : "United Kingdom 4400",  
 "2351" : "UK - 1",  
 "2352" : "UK Wide",  
 "2353" : "UK DV4 talk",  
 "2354" : "Ireland",  
 "2355" : "Scotland",  
 "2356" : "Wales",  
 "2357" : "UK - 7",  
 "2358" : "UK Test",  
 "23550" : "Scotland",  
 "23560" : "UK - North East",  
 "23562" : "UK - M62 Corridor",  
 "23520" : "UK - North West",  
 "7551" : "Belgium Vlaams",  
 "4770" : "Hungary",  
 "204" : "Nederland",  
 "2041" : "Noord Nederland",  
 "2042" : "Midden Nederland",  
 "20421" : "Regio Keistad",  
 "2043" : "Zuid Nederland",  
 "2044" : "Oost Nederland",  
 "20441" : "Regio IJsselmond",  
 "2049881" : "XRF088 A",  
 "2049882" : "XRF088 B",  
 "2049125" : "PI2NOS",  
 "4500" : "Nederland",  
 "4501" : "Noord Nederland",  
 "4502" : "Midden Nederland",  
 "4503" : "Zuid Nederland",  
 "4504" : "Oost Nederland",  
 "334" : "XE",  
 "3341" : "XE 1",  
 "3342" : "XE 2",  
 "3343" : "XE 3",  
 "4790" : "XE (334)",  
 "4791" : "XE 1 (3341)",  
 "4792" : "XE 2 (3342)",  
 "4793" : "XE 3 (3343)",  
 "4799" : "XE Experimental",  
 "4600" : "Florida",  
 "4601" : "Georgia",  
 "4602" : "North Carolina",  
 "4603" : "Texas",  
 "4639" : "USA - Nationwide",  
 "4640" : "USA - Area 0",  
 "4641" : "USA - Area 1",  
 "4642" : "USA - Area 2",  
 "4643" : "USA - Area 3",  
 "4644" : "USA - Area 4",  
 "4645" : "USA - Area 5",  
 "4646" : "USA - Area 6",  
 "4647" : "USA - Area 7",  
 "4648" : "USA - Area 8",  
 "4649" : "USA - Area 9",  
 "31090" : "USA - Area 0 4640",  
 "31091" : "USA - Area 1 4641",  
 "31092" : "USA - Area 2 4642",  
 "31093" : "USA - Area 3 4643",  
 "31094" : "USA - Area 4 4644",  
 "31095" : "USA - Area 5 4645",  
 "31096" : "USA - Area 6 4646",  
 "31097" : "USA - Area 7 4647",  
 "31099" : "USA - Area 8 4648",  
 "31098" : "USA - Area 9 4649",  
 "3100" : "USA - Nationwide 4639",  
 "3101" : "Alabama",  
 "3102" : "Alaska",  
 "3104" : "Arizona",  
 "3105" : "Arkansas",  
 "3106" : "California",  
 "3108" : "Colorado",  
 "3109" : "Connecticut",  
 "3110" : "Delaware", "3111" : "D.C.",  
 "3112" : "Florida",  
 "3113" : "Georgia",  
 "3115" : "Hawaii",  
 "3116" : "Idaho",  
 "3117" : "Illinois",  
 "3118" : "Indiana", "3101" : "Alabama",  
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 "3122" : "Louisiana",  
 "3123" : "Maine",  
 "3124" : "Maryland",  
 "3125" : "Massachusetts",  
 "3126" : "Michigan",  
 "3127" : "Minnesota",  
 "3128" : "Mississippi",  
 "3129" : "Missouri", "3130" : "Montana",  
 "3131" : "Nebraska",  
 "3132" : "Nevada",  
 "3133" : "New Hampshire",  
 "3134" : "New Jersey",  
 "3135" : "New Mexico",  
 "3136" : "New York",  
 "3137" : "North Carolina",  
 "3138" : "North Dakota",  
 "3139" : "Ohio",  
 "3140" : "Oklahoma",  
 "3141" : "Oregon",  
 "3142" : "Pennsylvania",  
 "3144" : "Rhode Island", "3145" :  
 "South Carolina",  
 "3146" : "South Dakota",  
 "3147" : "Tennessee",  
 "3148" : "Texas",  
 "3149" : "Utah",  
 "3150" : "Vermont",  
 "3151" : "Virginia",  
 "3153" : "Washington",  
 "3154" : "West Virginia",  
 "3155" : "Wisconsin",  
 "3156" : "Wyoming",  
 "31050" : "NorCal 1\*",  
 "31051" : "NorCal 5150\*",  
 "31061" : "CAL 1",  
 "31089" : "Hytera USA",  
 "31210" : "XRF210 D",  
 "31254" : "XRF054 C",  
 "31268" : "SNARS 6968",  
 "31274" : "AARG",  
 "31361" : "Upstate NY",  
 "310997" : "Parrot",  
 "5150" : "NorCal 5150\*",  
 "621" : "NorCal 1\*",  
 "8951" : "TAC 1",  
 "9990" : "Parrot",  
 "9999" : "NorCal Meter",

"206" : "Belgium",  
"2061" : "BelgiÃ« Noord",  
"2062" : "BelgiÃ« Zuid",  
"2063" : "BelgiÃ« Oost",  
"4750" : "Belgium",  
"4751" : "BelgiÃ« Noord",  
"4752" : "BelgiÃ« Zuid",  
"4753" : "BelgiÃ« Oost",  
"2064" : "BelgiÃ« OnDemand 4",  
"2065" : "BelgiÃ« OnDemand 5",  
"2066" : "BelgiÃ« OnDemand 6",  
"2067" : "BelgiÃ« OnDemand 7",  
"2068" : "BelgiÃ« OnDemand 8",  
"2069" : "BelgiÃ« OnDemand 9",  
"4000" : "Disconnect",  
"5000" : "Ref info",  
"208" : "France 0", "4300" : "France 0",  
"2081" : "France Mediterranee 1",  
"4301" : "France Mediterranee 1",  
"2082" : "France Alpes 2",  
"4302" : "France Alpes 2",  
"2083" : "France Midi Pyrenees 3",  
"4303" : "France Midi Pyrenees 3",  
"2084" : "France Est 4",  
"4304" : "France Est 4",  
"2085" : "France Ouest",  
"4305" : "France Ouest",  
"2086" : "France Atlantique 6",  
"4306" : "France Atlantique 6",  
"2087" : "France Nord 7",  
"4307" : "France Nord 7",  
"2088" : "France Centre 8",  
"4308" : "France Centre 8",  
"2809" : "France DOM-TOM 9",  
"4309" : "France DOM-TOM 9",  
"2080" : "France Ile De France 10",  
"4310" : "France Ile De France 10",

"2080332" : "France/DCS033C 16",  
"4316" : "France/DCS033C 16",  
"2080673" : "France/XRF067C 17",  
"4317" : "France/XRF067C 17",  
"4370" : "XRF007 B",  
"5059742" : "XRF740 C",  
"314700" : "USA - Tennessee",  
"8710" : "Crossroads Statewide",  
"4326" : "Canada English",  
"3026" : "Canada English (4326)",  
"4327" : "Canada Francais",  
"3027" : "Canada Francais (4327)",  
"30271" : "Canada BC 1",  
"30272" : "Canada BC 2",  
"268940" : "XRF040 A",  
"268941" : "XRF040 B",  
"268942" : "XRF789 B",  
"724942" : "XRF724 B",  
"724943" : "XRF724 C", "724" : "Brazil",  
"2681" : "Regional North",  
"2682" : "Regional Center",  
"2683" : "Capital",  
"2684" : "South",  
"2685" : "Algarve",  
"2686" : "Azores",  
"2687" : "Madeira Is.",  
"268" : "Portugal",  
"505" : "Australia",  
"4805" : "Australia (505)",  
"714" : "Panama",  
"7141" : "Panama City",  
"7142" : "Colon",  
"4636" : "Mi5-STATEWIDE1 (31261)",  
"4637" : "Mi5-STATEWIDE2 (31262)",  
"4638" : "Mi5-EVENT (31263)",  
"31261" : "Mi5-STATEWIDE1",  
"31262" : "Mi5-STATEWIDE2",  
"31263" : "Mi5-EVENT",  
"244" : "Finland",  
"260" : "Poland",

"4280" : "Poland (260)",  
"26040" : "Poland Tech",  
"4281" : "Poland Tech (26040)",  
"899" : "Repeater Testing"

- To use ALL the TG's on BM, contact the repeater trustee and ask 2 questions:
- 1) **Can I use a non-standard TG on your Repeater?**
- 2) {When and IF he gives the ok} **What Time Slot should I use?**
- Once that information is established, program a channel in that repeaters zone to use on your TG.

- **TYPICAL TG EXAMPLES:**

<b><u>DMR-MARC</u></b>	<b>TG NAME</b>	<b><u>BRANDMEISTER</u></b>
1	WW	91
3	NA	93
<b>4639</b>	<b><i>USA</i></b>	<b>3100</b>
<b>310</b>	<b><i>TAC310</i></b>	<b>310</b>
<b>311</b>	<b><i>TAC311</i></b>	<b>311</b>
<b>312</b>	<b><i>TAC312</i></b>	<b>312</b>

***THE TG'S THAT ARE IN BOLD AND ITALICS ARE BRIDGED BETWEEN THE TWO NETWORKS.***



# BrandMeister Dashboard

BrandMeister
Register Login 繁體 EN Settings

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## LastHeard

User Dashboard > LastHeard

||

Time	My call	Source	Destination	Options	RSSI	dBm	Duration	Loss rate
-1 Seconds	NOGSG [Tom] (3129026)	WBOYRG (312010)	BYRG (31201)	YS2 DMR	S4	-99.55	14 Sec.	
21 Seconds	W0DRN [Dennis Nealey] (3120063)	WBOYRG (312010)	BYRG (31201)	YS2 DMR	S4	-97.43	22	0% (0/373)
1 Seconds	KE0AEP [Keith E] (3120062)	WBOYRG (312010)	BYRG (31201)	YS2 DMR	S2	-112.33	20	0% (0/346)
9 Seconds	NOGSG [Tom] (3129026)	WBOYRG (312010)	BYRG (31201)	YS2 DMR	S6	-88.26	10	0% (0/175)
0 Seconds	W0DRN [Dennis Nealey] (3120063)	WBOYRG (312010)	BYRG (31201)	YS2 DMR	S4	-102.64	3	0% (0/64)
0 Seconds	KE0AEP [Keith E] (3120062)	WBOYRG (312010)	BYRG (31201)	YS2 DMR	S1	-116.27	10	0% (0/174)
16 Seconds	KE0AEP [Keith E] (3120062)	WBOYRG (312010)	BYRG (31201)	YS2 DMR	S1	-118.5	15	0.76% (2/264)

- There are a couple of steps in programming.
- *First load the contact list with the Group Contacts*
- Then add in your channels (one for each TG you want to operate on). Program Frequencies, Power Level, Time out timer (usually 180 sec), Color Code, Time Slot for that TG (As decided by the repeater owner), and "Tx Contact"- which is where your Group Call goes (i.e. BYRG TG is 31201 from your Contact list drop down box.)

- Next, after ALL your desired channels are programmed (the channel order does not matter at this point), then move to the “Zones”
- Create a zone which will make those channels you just programmed available for your use, Then add the channels as members to that zone- most radios have a limit of 16 channels to zone.
- Move the channels around in that zone as YOU like them, using the “Move up” or “Move Down” buttons on that screen

- Once all that is established- next we go to our Scan Lists
- Create the scan lists (as many as you like) do not worry about filling them- YET
- Once they are made (each one is named different), then go back to EACH channel.
- On each channel, select the scan list you would like that channel to be in (only 1 scan list can be selected per channel)
- Once the channels are set, go back to the scan lists and populate with the channels.

- Manufacturers who make radios which work in the Ham Bands:
- **Motorola (mobiles and handhelds)**
- **Tytera (handhelds)**
- Hytera (mobiles and handhelds)
- **Connect Systems (mobiles and handhelds)**
- *More are coming*
- THERE ARE NO DUAL BAND DMR RADIOS-  
**AT THIS TIME**
- ***dPMR radios will NOT work for Amateur Radio***

- The BYRG has 1 UHF rptr in play 443.10 near I-35 and I-635 interchange.
- We are testing a 2<sup>nd</sup> repeater in Peculiar and initial tests show it should cover Cass County. Early test show an HT is capable of being used in Clinton Mo.
- We are working with the Platte County Group to add a 3<sup>rd</sup> rptr near KCI Airport
- IF NEEDED we will look for a site to cover the west end of the KC Metro with another rptr.

- Resources:
- <http://byrg.net>
- Questions:
- [dmr@byrg.net](mailto:dmr@byrg.net)
- Programming help or general questions-  
contact Chuck KØXM or Tom NØGSG
- We have one main rule which has 2 parts:
- **Keep it legal**
- HAVE FUN!!!!!!

- **HOW** does 443.10 cover so well?





- Mission 443.10 Coverage



- Peculiar 444.025 Coverage



- Combined UHF Repeaters Coverage

