

INTRO TO AMATEUR RADIO DMR & DIGITAL VOICE

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The **D**igital **M**obile **R**adio / DMR standard was published
by the European Telecommunications Standards
Institute (ETSI) in 2005.

What is Digital Voice?

- ⦿ You're all familiar with FM voice
- ⦿ Digital voice modulates FM using tones
- ⦿ Voice is encoded and transmitted as 1's and 0's similar to how FAX machines & dial up modems did it.
- ⦿ Gov't mandated for commercial use, low cost equipment is now available to Hams
- ⦿ Same repeaters, some can flip between FM and digital
- ⦿ Lets compare Digital to FM: similarities vs. the differences

Digital vs. Analog?

Similar vs. Different	Analog	Digital
Squelch Tail	Yes	None
Courtesy Tone	Repeater's EoT	Radio's reset tone
CTCSS TX & RX	Optional (subaudible Hz)	Mandatory (colour code number)
Doubling during TX	Often happens	Repeater's Talk Permit
Repeater out of range?	Kerchunking = no squelch tail	Radio displays "repeater not found" & bonk tone
Conversations	1, on 1 shared channel	2, Simultaneous & isolated ie: Ecomm & normal, from >1,500 channels
Effective bandwidth	25 kHz wide band	12.5 kHz narrow band, (6.25 kHz equivalent for 2 conversations)
Networking	IRLP, AllStar, manual link	Local, regional, global. Reverts to a local repeater w/o internet
Can I have a signal report?	Depends on someone else, subjective	Parrot, plays back your voice. VU meter, shows your levels
There's an App for that?	EchoLink	DudeStar, DroidStar, hotspots

Digital vs. Analog?

Similar vs. Different	Analog	Digital
Repeater Hardware	Traditional w controller	same, digital controller
Radio Hardware	HT, mobiles, base	Same + hot spots
Operation (VHF/MHF/UHF)	Tri-band, FM mode	Tri-band, FM & digital modes
Operation on simplex	Yes, w static	Yes, no static
Range	S/N ratio increases w distance, readability decreases	100% until its not. Up to 35% more distance
Programmability	Basic, “easy”	Complex, “code plug”
HT battery life, on TX	100% duty cycle	45% duty cycle (27.5/60 mS)
Radio display	Channel name / frequency, power	Same, + name, call sign, QTH, talk group, time slot
GPS	Some models	Most models
APRS	TX analog	TX & RX, analog + digital

Digital vs. Analog?

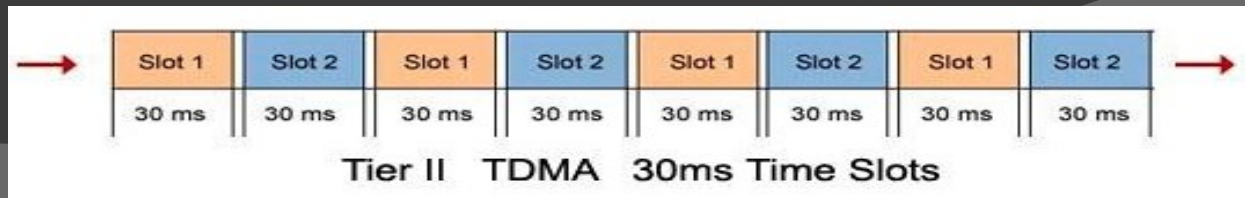
Similar vs. Different	Analog	Digital
Modulation	FM (deviation)	4 FSK, C4FM, or 0.5 GMSK* (phase shift)
Voice Multiplexing	None	2 using TDMA 2 using FDMA 1 using GMSK* + data <small>*Gaussian Minimum Shift Keying (FSK)</small>
Error Correction	None	Yes, using CRC or CRC & Forward Error Correction
Monitor mode	Dual receive, 2 repeaters	Any of >1,500 on either time slot on the same repeater
Acceptance	Universal, w band plans	2005 intro, growing fast
Qty of repeaters in BC	140 LML & FV BCARCC Apr 2020	"Big 3" = 78, + 10 NXDN / P25 Repeaterbook.com Oct 2021
Security	None	Encryption: widely used in Public Safety, not used by Hams.

Push-to-Talk Analog vs Digital

- ⦿ Because of
 - >1500 TGs available, Full & Part Time,
 - 2 time slots available on a repeater,
 - it's *very* possible someone might be using a TG other than the one you are listening to. If this occurs, your signal could interfere with theirs.
 - This is avoided by the way DMR handles the PTT function.
- ⦿ With analog:
 - pressing the PTT button always keys the transmitter.
 - its easy to have a double transmission.
- ⦿ With DMR when the PTT is pressed:
 - a signal is sent to the repeater which checks to see if the Time Slot is available.
 - If it is, a signal is sent back to the radio giving you the All Clear, usually generating a beep tone. This occurs in just under a second.
 - Also a busy light on the handheld if lit = the time slot is already in use.
 - When pressing the PTT, wait 1 or 2 seconds before talking.

Time Slots? Time Division??

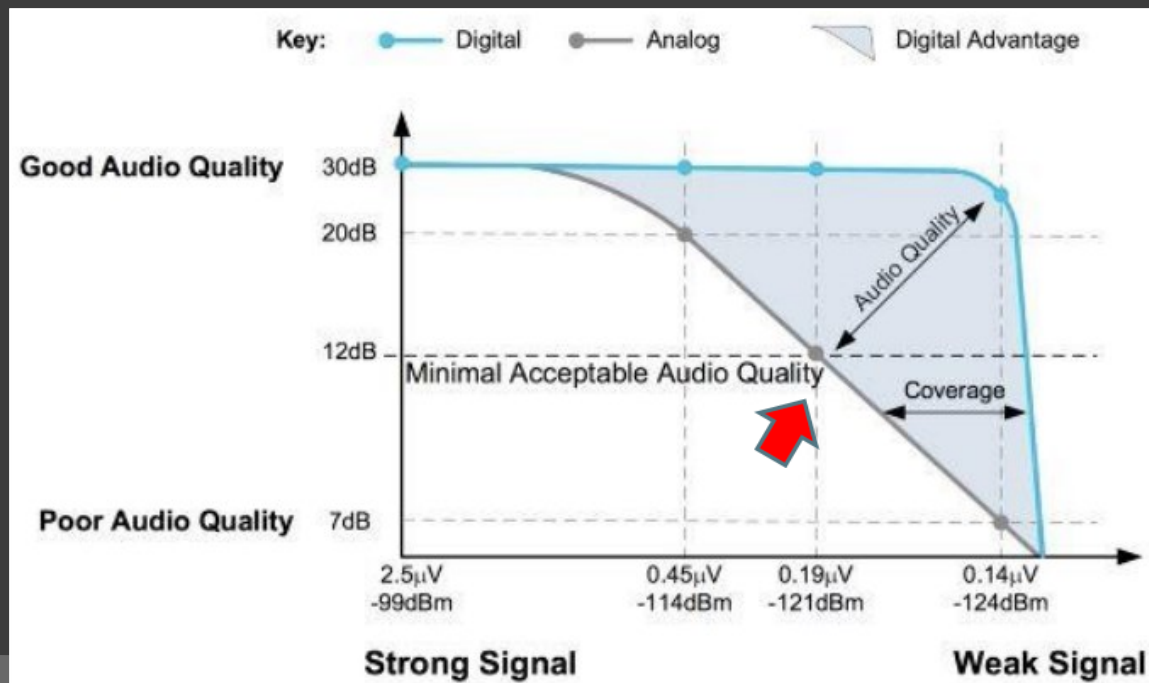
- Analog FM signal bandwidth is 25.0 kHz
- DMR bandwidth is 12.5 kHz
- Digital uses either :
 - TDMA (Time Division Multiple Access) or
 - FDMA (Frequency Division Multiple Access)
- Transmits two separate conversations at the same time in 12.5 kHz (equivalent to 6.25 kHz each).
- TDMA splits the transmitted signal into alternating 30 mS time slices referred to as Time Slots.
- FDMA splits the transmitted signal into concurrent upper and lower “deviations” (like sidebands).



Audio Clarity

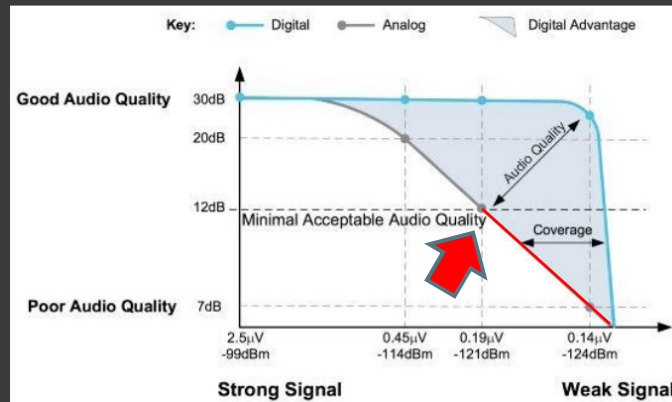
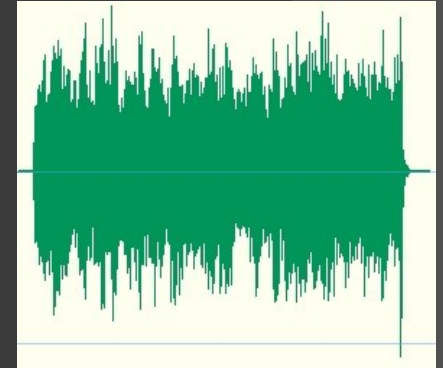
1 of 2

- The most noticeable difference between DMR and analog FM is audio clarity.
 - FM signals get progressively noisier as the signal gets weaker
 - Digital operation remains crystal clear up until the threshold of coverage is reached
 - Then it quickly becomes unusable, & “falls off a cliff” like cell phones drop calls
 - Some radios (DStar or old codecs) have robotized voices due to ‘commercial requirements’ whereas all other / new radios have better ‘amateur radio codecs’
 - DMR has 2 layers of packet recovery:
 - Forward Error Correction and Cyclic Redundancy Codes.

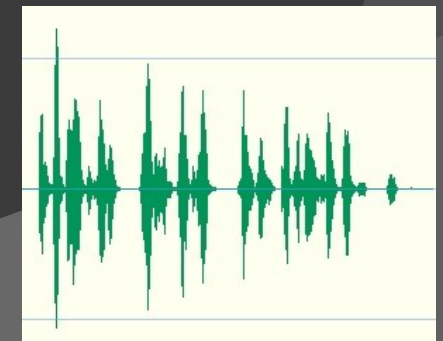


Voice Quality: Analog vs DMR

- ◉ We used 446.000 MHz Simplex
 - Same radio, location, power, & antenna
- ◉ This is an FM UHF simplex call (no sound).
 - ◉ Notice the noise in the waveform



- ◉ This is a DMR UHF simplex call (no sound).
 - ◉ There is no noise in the waveform



Digital Duel: Options & Choices

- Each standard was built for a different audience:
 - DMR, P25 & NXDN for Commercial: good in places where 'terrain' can get in the way
 - DStar by Hams in Japan, close repeaters, less bad terrain, trees etc.
 - Fusion by Hams, also good where 'terrain' can get in the way
 - *AMBE™ = Advanced Multi-Band Excitation, Vocoder = voice encoder decoder

Standard	Modulation	Channels	Bandwidth	Highway Analogy
DMR	4 FSK F Error Correction AMBE+2™	2 TDMA	12.5 kHz (6.25 ea)	1 lane road, 2 cars alternating
D-STAR	0.5 GMSK (2 FSK) Error Correction	1 FDMA	10 / 6.25 kHz data / voice	1 lane, 1 car & small trailer (for data)
System Fusion / C4FM	C4FM Error Correction	1 FDMA	12.5 kHz	Private road. Yaesu only.
NXDN	4 FSK Error Correction AMBE+2™	2 FDMA	12.5 kHz (6.25 ea)	1 lane road, 2 cars parallel
P25 ph2	Control: C4FM Audio: H-CPM & H-DQPSK Error Correction ½ rate IMBE™	2 TDMA	12.5 kHz (6.25 ea)	1 lane road, 2 cars alternating

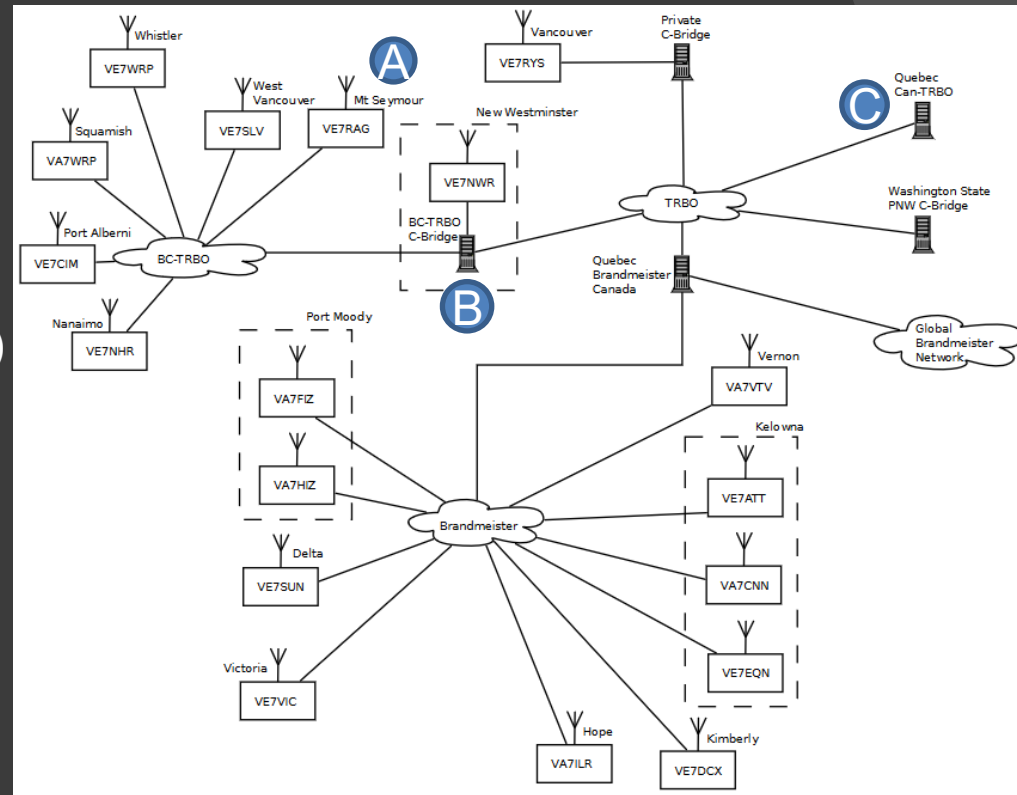
Digital Repeaters Available

(Oct 2021 vs. Feb 2020 repeaterbook.com)

	D-Star	DMR TRBO / Brandmeister	Yaesu Fusion / Wires X	NXDN	P25
Locally Vancouver	9	8 / 7	12 (4 Wires X)	2	8 / 5
BC Total	18	16 / 12	44 (10 Wires X)	2	6 / 5
Canada Total	119 / 120 BC (18 / 17) AB (17 / 17) SK (2) MB (4 / 5) ON (39 / 43) PQ (28 / 25) NB (0) PEI (2) NS (3) NF (2) YK (4) NV & NWT (0)	121 / 93 BC (16 / 12) AB (5 / 3) SK (2 / 1) MB (8 / 4) ON (43 / 31) PQ (34 / 30) NB (5) PEI (1) NS (5 / 4) NF (2) YK (0) NV & NWT (0)	189 / 169 BC (44) AB (16 / 14) SK (6) MB (10 / 8) ON (54 / 52) PQ (32 / 25) NB (6 / 4) PEI (4 / 1) NS (11) NF (6) YK (0) NV & NWT (0)	8 / 9 BC (2) AB (0) SK (0) MB (0) ON (5) PQ (1 / 2) NB (0) PEI (0) NS (0) NF (0) YK (0) NV & NWT (0)	46 / 26 BC (8 / 5) AB (6 / 3) SK (0) MB (4 / 3) ON (24 / 11) PQ (3 / 3) NB (0) PEI (0) NS (0) NF (1) YK (0) NV & NWT (0)
North Am. Inc Canada	1,186 / 1,172	2,029 / 1,725	2,118 / 1,853 (723 Wires X)	118 / 110	495 / 396
Rest of World	1,268 / 1,254	1,810 / 1,434	932 / 773 (271 Wires X)	41 / 24	79 / 67
Total	2,454 / 2,426	3,839 / 3,159	3,050 / 2,626 (994 Wires X)	159 / 134	574 / 463

Repeater Network topology

- Your audio is digitally processed in your handheld
 - Sent over the air to the local repeater (A)
 - Forwarded to the regional network server (B: New West)
 - Forwarded to other servers worldwide (C: Montreal +)
- Latency, by as much as 2 seconds, is a propagation delay in your signal getting to the other end.



DMR Code Plugs (radio programming)

- ⦿ What you'll need:
 - Your own unique DMR ID number.
 - Your radio's programming software "CPS"
 - Each brand has its own, limited cross compatibility
 - A programming cable between your PC & radio
 - Repeater's frequencies for each you use.
 - Each repeater's Colour Code
 - Colour Codes work like CTCSS tones, 16 total.
 - What Talk Groups each carries.
 - Each TG's unique number & Time Slot
- ⦿ Or someone (like BCDMR.net) with a polished code plug you can load and 'just use' while learning.

Talk Groups

- On BC-TRBO the repeater's owner assigns the TG and TS structure most beneficial for their area. (BrandMeister is self serve).
- Not all repeaters carry all Talk Groups (TG).
- This allows a mix of the most popular & less used TG.
- A typical BC-TRBO partial configuration:

Talk Group	Coverage	TG ID #	Time Slot	Timer
Local Net 1	Local Emergency & Nets	3183	1	FT
BC1	Prov call	3027	1	FT
BC2	Prov chat	10327	2	FT
Ontario2	Prov chat	3023	2	PTT
Canada2	National	302	2	FT
NA2	N America	3163	2	PTT
WW English2	Global	13	2	PTT

FT = full time / always on

PTT = part time / push to talk (kerchunk 1st)

Code Plug? What's CPS?

An overview

Configuration Pane

The screenshot shows a software interface for channel programming. On the left is a 'Folder Tree' with categories like 'Public', 'Zone', 'Scan List', 'Roaming Zone', 'FM', 'Auto Repeater Offset Frequencies', 'Roaming Channel', 'Basic information', 'Optional Setting', 'Alarm Setting', 'Local Information', 'Hot Key', 'APRS', 'Digital', 'Radio ID List', 'Talk Groups', 'Prefabricated SMS', 'Receive Group Call List', 'Encryption Code', 'Digital Contact List', and 'Friends List'. A blue arrow points from the 'Folder Tree' label to the left sidebar. In the center, a table lists 31 channels with columns: No., Receive Frequency, Transmit Frequency, Channel Type, Power, Band Width, CTCSS/DCS Decode, CTCSS/DCS Encode, Channel Name, Contact, Radio ID, and Options. A black box labeled 'Menus' is placed over the table. On the right, a 'Configuration Pane' is indicated by a blue arrow pointing to the right side of the table. Below the table, there is a text block providing information about the AT-D868UV software, including instructions on how to start entering channel information and how to export channel data to a CSV file.

No.	Receive Frequency	Transmit Frequency	Channel Type	Power	Band Width	CTCSS/DCS Decode	CTCSS/DCS Encode	Channel Name	Contact	Radio ID	Options
1	147.28000	147.28000	A-Analog	Turbo	25K	Off	110.9	V ASM1705	Analog	Doug Primary	
2	145.03000		A-Analog	Turbo	25K	Off	Off	ts-V PKV	Analog	Doug Primary	
3	146.61000	146.61000	A-Analog	Turbo	25K	Off	110.9	ts-U RVA1461	Analog	Doug Primary	
4	442.02500	447.02500	A-Analog	Turbo	25K	Off	110.9	ts-U RVA	Analog	Doug Primary	
5	442.55000	447.55000	A-Analog	Turbo	12.5K	Off	Off	Abbts-U RVA Dig	DigSimp	Doug Primary	
6	430.75000	439.75000	A-Analog	Turbo	25K	Off	Off	Abbts-U RYY	Analog	Doug Primary	
7	441.60000	446.60000	A-Analog	Turbo	25K	Off	88.5	iAbbts-U WOL1026	Analog	Doug Primary	
8	147.38000	147.98000	A-Analog	Turbo	25K	Off	Off	Aldergrove-V RLY	Analog	Doug Primary	
9	146.72000	146.12000	A-Analog	Turbo	25K	Off	Off	Bowen-V BNV	Analog	Doug Primary	
10	443.67500	448.67500	A-Analog	Turbo	25K	Off	Off	Burnaby-U CBN	Analog	Doug Primary	
11	147.06000	147.66000	A-Analog	Turbo	25K	Off	Off	Burnaby-V FVR	Analog	Doug Primary	
12	442.20000	447.20000	A-Analog	Turbo	25K	Off	110.9	Burnaby-U LNK/R	Analog	Doug Primary	
13	442.47500	447.47500	A-Analog	Turbo	25K	Off	Off	Burnaby-U PRE	Analog	Doug Primary	
14	145.35000	144.75000	A-Analog	Turbo	25K	Off	127.3	Burnaby-V RBY	Analog	Doug Primary	
15	148.85000	147.85000	A-Analog	Turbo	25K	Off	Off	Burnaby-U RBY	Analog	Doug Primary	
16	148.85000	147.85000	A-Analog	Turbo	25K	Off	Off	Burnaby-U REM	Analog	Doug Primary	
17	145.17000	144.57000	A-Analog	Turbo	25K	Off	Off	BurnbyBoot-V TEL	Analog	Doug Primary	
18	442.87500	447.87500	A-Analog	Turbo	25K	Off	Off	BurnbyBoot-U TEL	Analog	Doug Primary	
19	444.82500	449.82500	A-Analog	Turbo	25K	156.7	156.7	Burnby-MT-U VYL	Analog	Doug Primary	
20	146.96000	146.36000	A-Analog	Turbo	25K	Off	110.9	iChllwk-V CRC1759	Analog	Doug Primary	
21	443.00000	448.00000	A-Analog	Turbo	25K	Off	110.9	Chillwk-U CRC	Analog	Doug Primary	
22	444.70000	449.70000	A-Analog	Turbo	25K	Off	Off	Chillwk-U RAD	Analog	Doug Primary	
23	147.10000	147.70000	A-Analog	Turbo	25K	Off	110.9	Chillwk-V RCK	Analog	Doug Primary	
24	444.62500	449.62500	A-Analog	Turbo	25K	Off	Off	Chillwk-U RCK	Analog	Doug Primary	
25	145.11000	144.51000	A-Analog	Turbo	25K	Off	Off	Chillwk-V RSH	Analog	Doug Primary	
26	442.80000	447.80000	A-Analog	Turbo	25K	Off	110.9	Chillwk-U RSH	Analog	Doug Primary	
27	146.86000	146.26000	A-Analog	Turbo	25K	Off	88.5	Chillwk-V VCR	Analog	Doug Primary	
28	145.31000	144.71000	A-Analog	Turbo	25K	Off	127.3	Coq-V MFS	Analog	Doug Primary	
29	442.35000	447.35000	A-Analog	Turbo	25K	Off	127.3	Delta-U EPP1	Analog	Doug Primary	
30	443.35000	448.35000	A-Analog	Turbo	25K	Off	127.3	Delta-U EPP2	Analog	Doug Primary	
31	444.42500	449.42500	A-Analog	Turbo	25K	Off	107.2	Delta-U RDE	Analog	Doug Primary	

The AT-D868UV offers programming of 4,000 channels for UHF and VHF.
 To start entering channel information Double Click on the first line No.1 to open the Channel Information programming window for that channel:
 Enter the appropriate channel information for your Repeater, Simplex, Analog or Digital channel.
 Advanced Sorting and Editing of all Channels can be done by using Tool -> Export / Import features to export channel information to a CSV format file. Opening the Channel CSV file with a program like Excel, changes can be made to all channels at ones, channels can be sorted and the saved the Customer Programming Software (CPS).

- lets look at each of these in turn in more detail...

Channel Folder

D878UV

- Public
 - Channel
 - Zone
 - Scan List
 - Roaming Zone
 - FM
 - Auto Repeater Offset Frequencys
 - Roaming Channel
 - Basic information
 - Optional Setting
 - Alarm Setting
 - Local Information
 - Hot Key
 - APRS

Channel Information Edit---795

Channel Name: BC 1-NWR

Receive Frequency: 444.60000
 Transmit Frequency: 449.60000
 Correct Frequency[Hz]: 0

Channel Type: D-Digital
 Transmit Power: Turbo
 Band Width: 12.5K
 TX Permit: Same Color Code
 Scan List: None
 APRS Report Type: Analog
 Analog APRS PTT Mode: Off
 Digital APRS PTT Mode: Off
 Digital APRS Report Channel: 1
 Exclude channel from roaming: off

TX Prohibit Talk Around Through Mode
 Work Alone Digi APRS RX

Digital

Contact: BC 1
 Radio ID: Doug Primary
 Color Code: 1
 Slot: Slot1
 Receive Group List: None

Encryption Type: Off

Simplex TDMA Call Confirmation Ranging
 TDMA Adaptive 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: 1
 Custom CTCSS: 251.1

OK Cancel Previous Next



No.	Receive Frequency	Transmit Frequency	Channel Type	Power	Band Width	CTCSS/DCS Decode	CTCSS/DCS Encode	Channel Name	Contact	Radio ID	Optional Signal
1	147.28000	147.88000	A-Analog	Turbo	25K	Off	110.9	iAbbts-V ASM1705	Analog	Doug Primary	
2	145.03000	145.63000	A-Analog	Turbo	25K	Off	Off	Abbts-V PKV	Analog	Doug Primary	
3	146.61000	146.01000	A-Analog	Turbo	25K	Off	110.9	iAbbts-V RVA1461	Analog	Doug Primary	
4	442.02500	447.02500	A-Analog	Turbo	25K	Off	110.9	Abbts-U RVA	Analog	Doug Primary	

Zone Folder

D878UV

- Public
 - Channel
 - Zone**
 - Scan List
 - Roaming Zone
 - FM
 - Auto Repeater Offset Frequencies
 - Roaming Channel
 - Basic information
 - Optional Setting
 - Alarm Setting
 - Local Information
 - Hot Key
 - APRS

Zone Edit---1

Zone Name:

A Channel:

B Channel:

Available Channel

5	Abbts-U RVA Dig
7	iAbbts-U WOL1026
8	Aldergrove-V RLY
9	Bowen-V BNV
10	Burnaby-U CBN
12	Burnaby-U LNK/R
13	Burnaby-U PRE
16	Burnaby-U REM
21	Chillwk-U CRC
24	Chillwk-U RCK
29	Delta-U EPP1
30	Delta-U EPP2
37	Langley-U NPN
40	Langley-U RLY
41	Langley-U RMH
42	Langley-U XTT
43	Langley-V TSG
46	New West-U HPS
47	New West-U NWC
52	NVan-V ICS
53	NVan-U RYZ
54	iPmbn-V IP1011

Zone Channel Member

1	iAbbts-V ASM1705
2	Abbts-V PKV
3	iAbbts-V RVA1461
4	Abbts-U RVA
6	Abbts-U RYY
11	Burnaby-V FVR
17	BumbyBoot-V TEL
18	BumbyBoot-U TEL
14	Burnaby-V RBY
15	Burnaby-U RBY
19	Bumby-MT-U VYL
286	Chemns-V RNA its
287	Chemns-U RNA its
20	iChlwk-V CRC1759
22	Chillwk-U RAD
23	Chillwk-V RCK
25	Chillwk-V RSH
26	Chillwk-U RSH
27	Chillwk-V VCR
28	Coq-V MFS
33	Delta-V SUN
31	Delta-U RDF

Order By:

OK Cancel Previous Next



No.	Name	Zone Channels	A Channel	B Channel
1	1 GVRD-Analog	58	iVan-V RPT 1694	iAbbts-V ASM1705
2	2 Amb Dig U SLV	24	TAC 310p-AmSLV	TAC 310p-AmSLV
3	3 NWR Dig UHF	29	TAC 310p-NWR	TAC 310p-NWR
4	4 NVan Dig U RAG	24	TAC 310p-NVnRAG	TAC 310p-NVnRAG
5	5 UBC Dig U RYS	5	BC 2-U UBC RYS	BC 1-U UBC RYS
6	6 Vic Dig U VIC	25	LocalNet 1-UVic	TAC 310p-UVic

Talk Groups Folder

[-] Digital

- Radio ID List
- Talk Groups**
- Prefabricated SMS
- Receive Group Call List
- Encryption Code
- [-] Digital Contact List
 - 1---20000
 - 20001---40000
 - 40001---60000
 - 60001---80000
 - 80001---100000
 - 100001---120000
 - 120001---140000
 - 140001---160000
 - 160001---180000
 - 180001---200000
- Friends List
- Talk Alias



No.	TG/DMR ID	Call Alert	Name	Call Type
1	0	None	Analog	Group Call
2	3102	None	Alaska	Group Call
3	3026	None	Alberta 2	Group Call
4	3104	None	Arizona	Group Call
5	9999	None	Audio Test 9999	Group Call
6	3027	None	BC 1	Group Call
7	103027	None	BC 2	Group Call
8	103100	None	Bridge 2 - BC	Group Call
9			Talk Group Edit---6	
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Talk Group Edit---6

Name:

Call Type:

TG/DMR ID:

Call Alert:



Scan List Folder

D878UV

- Public
 - Channel
 - Zone
 - Scan List**
 - Roaming Zone
 - FM
 - Auto Repeater Offset Frequencys
 - Roaming Channel
 - Basic information
 - Optional Setting
 - Alarm Setting
 - Local Information
 - Hot Key
 - APRS

Scan Edit---1

Scan List Name:

Available Channel

5	Abbts-U RVA Dig
7	iAbbts-U WOL1026
8	Aldergrove-V RLY
9	Bowen-V BNV
10	Bumaby-U CBN
11	Bumaby-V FVR
12	Bumaby-U LNK/R
13	Bumaby-U PRE
16	Bumaby-U REM
21	Chillwk-U CRC
24	Chillwk-U RCK
29	Delta-U EPP1
30	Delta-U EPP2
31	Delta-U RDE
32	Delta-U RPA
37	Langley-U NPN
40	Langley-U RLY
41	Langley-U RMH
42	Langley-U XTT
43	Langley-V TSG
46	New West-U HPS
47	New West-U NWC

Scan Channel Member

51	iNSVn-U RNV 1015
67	iSry-V RSC 1736
68	iSry-U RSC 1737
69	iUBC-V RHS 1000
70	iUBC-U RHS 1010
84	iVan-V RPT 1694
85	iVan-U RPT 1694
17	BumbyBoot-V TEL
18	BumbyBoot-U TEL
14	Bumaby-V RBY
15	Bumaby-U RBY
19	Bumby-MT-U VYL
28	Coq-V MFS
33	Delta-V SUN
49	NSVan-V NSR
50	NSVan-U NSR
48	New West-V NWR
55	PoCo-V RPC
56	PoCo-U UDX
60	Richmond-V RMD
341	SaltSpring-V RSI
342	SaltSpring-U RSI

Order By:

Priority Channel Select:

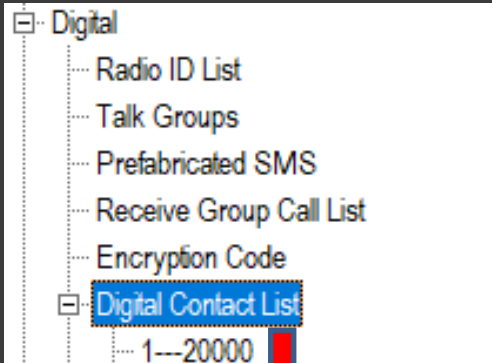
Priority Channel 1:

Priority Channel 2:

Revert Channel:

No.	Name	Channels	Priority Channel 1	Priority Channel 2	Look Back Time A[s]	Look Back Time B[s]	Dropout Delay Time[s]	Dwell Time[s]
1	GVRD Analog	43	Off	Off	2.0	3.0	3.1	3.1
2	Analog Simplex	46	Off	Off	2.0	3.0	3.1	3.1
3	BC Ferries	9	Off	Off	2.0	3.0	3.1	3.1
4	BC Transit	17	Off	Off	2.0	3.0	3.1	3.1
5	FRS/GMRS	22	Off	Off	2.0	3.0	3.1	3.1

DMR Digital Contacts



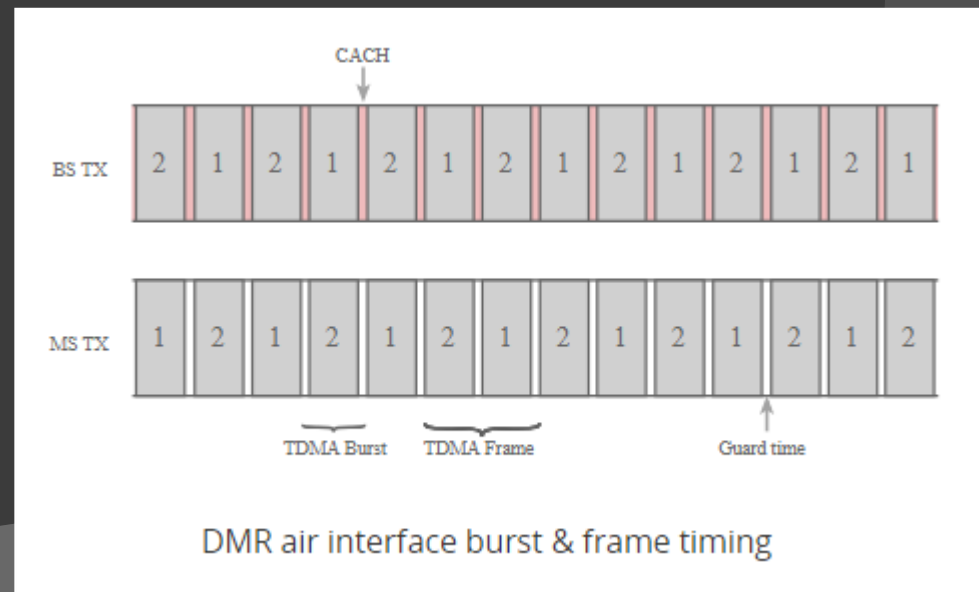
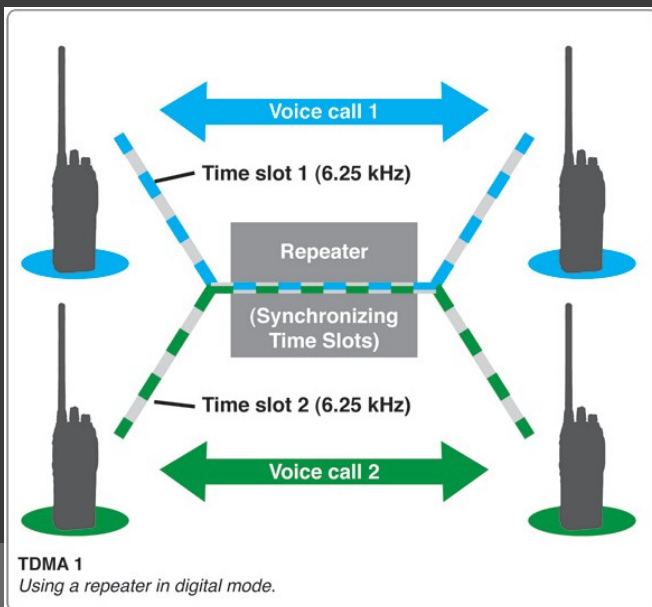
No.	TG/DMR ID	Call Alert	Name	City	Call Type	Callsign	State/Prov	Country
1	302911	None	RadiID net Radi		Private Call	RADIOID	All Regions	None
2	1023001	None	Wayne Edward	Toronto	Private Call	VE3THW	Ontario	Canada
3	1023002	None	Mathieu Goulet	Ottawa Hull	Private Call	VA3ECM	Quebec	Canada
4	1023003	None	Guy Charron	Gloucester	Private Call	VE3QC	Ontario	Canada
5	1023006	None	Allan Timothy Ha	Sparta	Private Call	VA3UZ	Ontario	Canada
6	1023007	None	Hans Juergen Boc	Cornwall	Private Call	VA3BOC	Ontario	Canada
7	1023008	None	Mark	Niagara Falls	Private Call	VE3JMR	Ontario	Canada
8	1023009	None	Rolando Parto	Scarborough	Private Call	VA3AMO	Ontario	Canada
9	1023010	None	Rolando Parto	Scarborough	Private Call	VA3AMO	Ontario	Canada
10	1023013	None	Barry Brousseau	Guelph	Private Call	VE3SLD	Ontario	Canada

206378	7486001	CX2RT	Daniel Mazzul	Maldonado-Lausana-	Maldonado	Uruguay
206379	7486002	CX1RE	Luis Olivera	Maldonado	Maldonado	Uruguay
206380	7486003	CX4RP	Mario Hector Paller Figueiras	Piriapolis Maldonado	Maldonado	Uruguay
206381	7489001	CX7SS	E. Eugenio De Marino	Villa Serrana		Uruguay
206382	7489002	CX2SE	Ruben Cabral Lopez	Minas		Uruguay

206,382 DMR IDs in use world wide, as of Nov 8, 2021 and growing daily!

DMR over the air

- The transmission is split into various blocks:
 - **Burst:** 30 ms long nominally
 - One Time Slot element: 27.5 mS of Tx followed by 2.5 mS gap or CACH.
 - Either Time Slot 1 or 2.
 - **Frame:** 2 Time Slot bursts, 60ms long total .
 - **Super-frame:** 6 frames for voice transmission.
 - **BS TX:** base station transmission, transmits **Frames** continually when repeating.
 - Includes a CACH (Common Announcement Channel) between the individual bursts, used for traffic management and signaling.
 - **MS TX,** mobile station, only transmits 1 Time Slot.
 - Instead of the CACH it has a 2.5 mS Guard Time, for any propagation delays between different mobile stations.



Repeater vs Hot Spots

- ◎ Digital repeater connects to Internet
 - No repeater in range?
 - Travelling and don't know the repeaters?
- ◎ Use a Hot Spot and Internet connection
 - Low power, simplex RF to Internet device
 - At home, connects via your Wifi & ISP
 - Travelling, uses your Cell Phone data plan



For lots more Information

- ◎ Visit the BC DMR web sites:
 - <https://bcdmr.wordpress.com/>
 - <https://www.facebook.com/groups/bcdmr>
- ◎ Join us on the air on Talk Group BC 1:
 - Friday evenings at 8:00 pm Pacific
 - Announcements
 - Check ins, by alphabetical groupings
 - Q & A or technical discussion follows
 - Usually wraps up after 1 hour

Question time

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