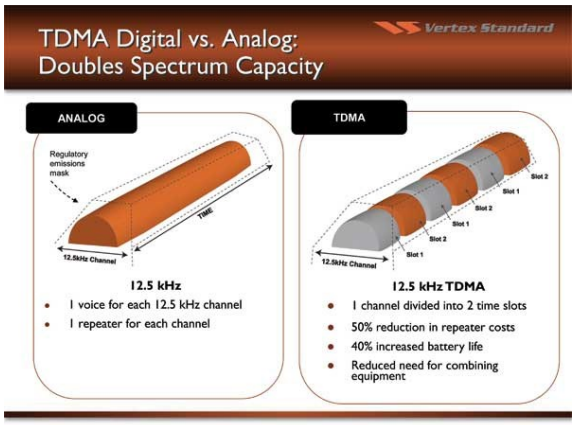
Programming DMR

Digital Mobile Radio **(DMR)** differs from normal analog as it uses a digital protocol called Time Division Multiple Access **(TDMA).** This allows for two discreet time slots **(TS)** or conversations in the same bandwidth as an analog signal. When you key up a DMR repeater, the digital tone acknowledges the timing of the timeslots, between the subscriber radio and the repeater. Each channel you program in your subscriber radio will be assigned to either TS1 or TS2.



With the analog signal, anyone monitoring the output of the repeater will hear your transmission, so one conversation on analog. Mechanically, with DMR, you can have two subscribers speaking simultaneously with one subscriber on TS1 and another subscriber on TS2, into the same DMR repeater. The subscriber radios actually only transmit on the assigned Time Slot and turns off on the other Time Slot. So the subscriber radio transmits for 30ms then goes quiet for 30ms then transmits for 30ms and quiet for 30ms and on and on for as long as the subscriber transmits. Being digital, the network will reassemble the information into an understandable normal voice to be received by anyone listening to the Talk Group, anywhere in the world.

Talk Groups **(TG)**, not to be confused with Time Slots, are a way for people with a common interest to talk to each other. Talk Groups can be found here. You might program one channel with TG 93 (North America) and another channel with TG 95 (Australia, New Zealand). Here in Hawaii, we have TG 3115 (Hawaii Statewide), TG 31150 (Hawaii Statewide 2), TG 31151 (Maui County), TG 31152 (Honolulu County), TG 31153 (Hawaii Island County), TG 31155 (Hawaii Tactical) and TG 31158 (Hawaii Mainland All Star Network).

In order to program your DMR subscriber radio, you'll need to obtain a unique 7 digit number from here. Think of it as your own private IP address. Every time you transmit, this 7 digit Radio ID is sent out. When a subscriber radio receives your Radio ID, the subscriber radio can look up in its database, if programmed, and display your Call Sign, Name, City, State and Country.

Customer Programming Software (CPS) is the software application which allows you to input all the components needed to program your radio, save and upload your information to the radio. The file saved to upload is called a Code Plug.

In the CPS, the Radio ID list is where you enter your unique Radio ID

In the CPS, Contact/Talk Group is where you enter your Talk Group ID

Here's some information needed before trying to program your radio:

- Your unique Radio ID from here
- The Talk Groups you wish to talk to from here
- All the Talk Groups the Call Type is Group Call with the exception of Parrot 9990 which is Private Call
- The TX and RX frequencies of the DMR repeater you wish to access
- The Color Code **(CC)** the repeater uses
    - Color Code is the DMR equivalent of CTCSS, without the correct CC, you won't be able to access the repeater
    - When programming channels, there is a field referencing Transmit Permit which must be set to Color Code Free or Same Color Code. Which means that you can only transmit when the Color Code is not in use so only one person may use the timeslot at a time.
- The repeater TS allocation
    - All the Hawaii DMR repeaters have TS1 dedicated to TG 3115
    - All the Hawaii DMR repeaters have TS2 as User Access **(UA)** Push to Talk **(PTT)**
        - UA and PTT are the same. It means whatever TG you have programmed for the channel will be activated

Channel Programming

Let's say you want to program TG HI-1, HI-2 and Honolulu County on the EARC Mauna Kapu and the same Talkgroups on the Whitmore Village repeaters.

Repeater Site	**Channel 1**	**Channel 2**	**Channel 3**	**Channel 4**
Manua Kapu	RX 444.100 TX 449.100 Ch Type – Digital TX Permit -CC free Radio ID – your ID Color Code 4 TS1 – TG 3115	RX 444.100 TX 449.100 Ch Type – Digital TX Permit -CC free Radio ID – your ID Color Code 4 TS2 – TG 31150	RX 444.100 TX 449.100 Ch Type – Digital TX Permit -CC free Radio ID – your ID Color Code 4 TS2 – TG 31158	RX 444.100 TX 449.100 Ch Type – Digital TX Permit -CC free Radio ID – your ID Color Code 4 TS2 – TG 9990
Whitmore Village	RX 443.250 TX 448.250 Ch Type – Digital TX Permit -CC free Radio ID – your ID Color Code 6 TS1 – TG 3115	RX 443.250 TX 448.250 Ch Type – Digital TX Permit -CC free Radio ID – your ID Color Code 6 TS2 – TG 31150	RX 443.250 TX 448.250 Ch Type – Digital TX Permit -CC free Radio ID – your ID Color Code 6 TS2 – TG 31158	RX 443.250 TX 448.250 Ch Type – Digital TX Permit -CC free Radio ID – your ID Color Code 6 TS2 – TG 9990

In the CPS, I will have multiple entries for one repeater. Each entry is identical with the exception of the Time Slot and Talk Group. I group all my channels by repeater. I will have maybe a dozen channels for one repeater, then I add a space as a delineator then program a dozen channels for another repeater, often with the same Talk Groups as the first repeater.

DMR CPS has a great logic feature called Zones. All a Zone does is organize various channels and the channels can be a mix of analog and DMR digital channels. Example you may have one Zone for just the Mauna Kapu DMR repeater which allows you to quickly change Talk Groups by changing channels. I have one Zone for just Mauna Kapu so that if I'm in the area and I want traffic, I can first key up Parrot to ensure the repeater is working and connected to the Internet, then I can monitor Hawaii-1 Talk Group or the Hawaii All Star Network. You may want one Zone to contain all of the Department of Emergency Management linked repeaters. Another Zone could contain all the Simplex frequencies. As you can see, Zones are a great way of organizing channels.