Build a DMR-6X2 Code Plug: Learn the Lingo

By Dan Romanchik, KB6NU

Because DMR radios have so many features, it stands to reason that programming them can be complex, much more complex than programming analog FM transceivers. To help you make sense of this complex topic, we'll be running a series of posts on DMR and how to program and use the DMR-6X2, BTECH's dual-band VHF and UHF radio with both DMR (Tier I and II) and analog capabilities. In this post, we'll define some of the terms used in DMR.

When you purchase a DMR radio, the first thing that you're usually advised to do is to obtain a *code plug* for your radio. Simply put, a code plug is a file that contains all of the programming information for a radio. It defines not only the frequencies on which a radio can transmit and receive, but also which *talk groups* that the radio can communicate over, as well as other operating parameters. (We'll talk more about talk groups later.) You can download a starter code plug for the BTECH DMR-6X2 and other DMR radios from the miklor.com resource website.

To program a DMR radio, that is to say build a code plug, you'll need a program called a *CPS*, which is short for 'customer programming software'. The CPS imports existing code plugs and downloads them to the radio, or you can build a new code plug from the ground up. The CPS also allows you to modify code plugs and export the files. Code plugs for the BTECH DMR-6X2 have an .rdt file extension.

Perhaps the most important parameter in a code plug is the *Radio ID*. Your radio ID is a unique number assigned to you (and your callsign) and identifies you on DMR networks and repeaters around the world. If you live in North America, South America, Asia and Oceania, go to RadioID.net to get your Radio ID. If you live in Europe or Africa, go to https://register.ham-digital.org/.

Next, you'll want to decide which talk groups that you want to use. Talk groups, sometimes called *contacts*,are kind of like chat rooms. Once you've connected to a talk group, all of your transmissions will be relayed to the other stations connected to that talk group. Talk groups can be local, that is to say only users of your local repeater will hear your transmissions, or statewide, nationwide, or worldwide. Each talk group has an ID number and a name. You use the CPS to build the list of talk groups that you want to communicate over.

Once you've created your list of talk groups, you can create a list of *channels*. A channel connects a talk group or contact with a specific frequency. For example, if you want to access a particular talk group through your local repeater, then you program the channel to used the repeater's receive and transmit frequencies. You have to set up a channel for each talk group that you want to access.

Two important bits of information that you'll need to set up a channel is the *color code* and *time slot*. A color code is like a CTCSS tone. If this parameter is not set properly, then the repeater will not respond to your transmissions. The time slot is the time slot that the repeater uses for a particular talk group. For example, W8UM, our repeater here in Ann Arbor, uses time slot 1 for the local talk group and the Michigan statewide talk group. It uses time slot 2 for all other talk groups.

Channels can be analog or digital. To access DMR talk groups or contacts, you'd program a channel as a digital channel. To access and analog repeater, you'd program a channel as an analog channel.

Channels are grouped into *zones*. Zones are logical groups of channels. You might, for example, set up a zone to include all of the repeaters that you can access in your town. Another zone might include repeaters that you can access on your commute to work. The BTECH DMR-6X2 allows you to program up to 4,000 channels, so logically grouping them into zones will help you quickly access the channels you want to use. A channel must be in at least one zone or you won't be able to access it.

A *receive group* allows you to selectively monitor talkgroups. You generally would leave this blank if you want to listen to all of the incoming talkgroups on the channel.

A *scanlist* is a group of channels that can be monitored when scan is selected, either from the DMR-6X2 main menu or using one of the programmable side keys.

The *digital contact list* is a list of information about DMR users. It contains their radio ID, call sign, name, and location. When you receive a transmission via a DMR talk group, you also receive the radio ID of the transmitting station. The DMR-6X2 looks up this ID in its digital contacts list, and if that ID is in the list, the radio displays the name and callsign of the transmitting station. You can download a database of DMR users for the DMR-6X2 from the Miklor resource website.

In the next post, we'll show you how to use the DMR-6X2 CPS to enter all of this information and download the code plug to the radio.
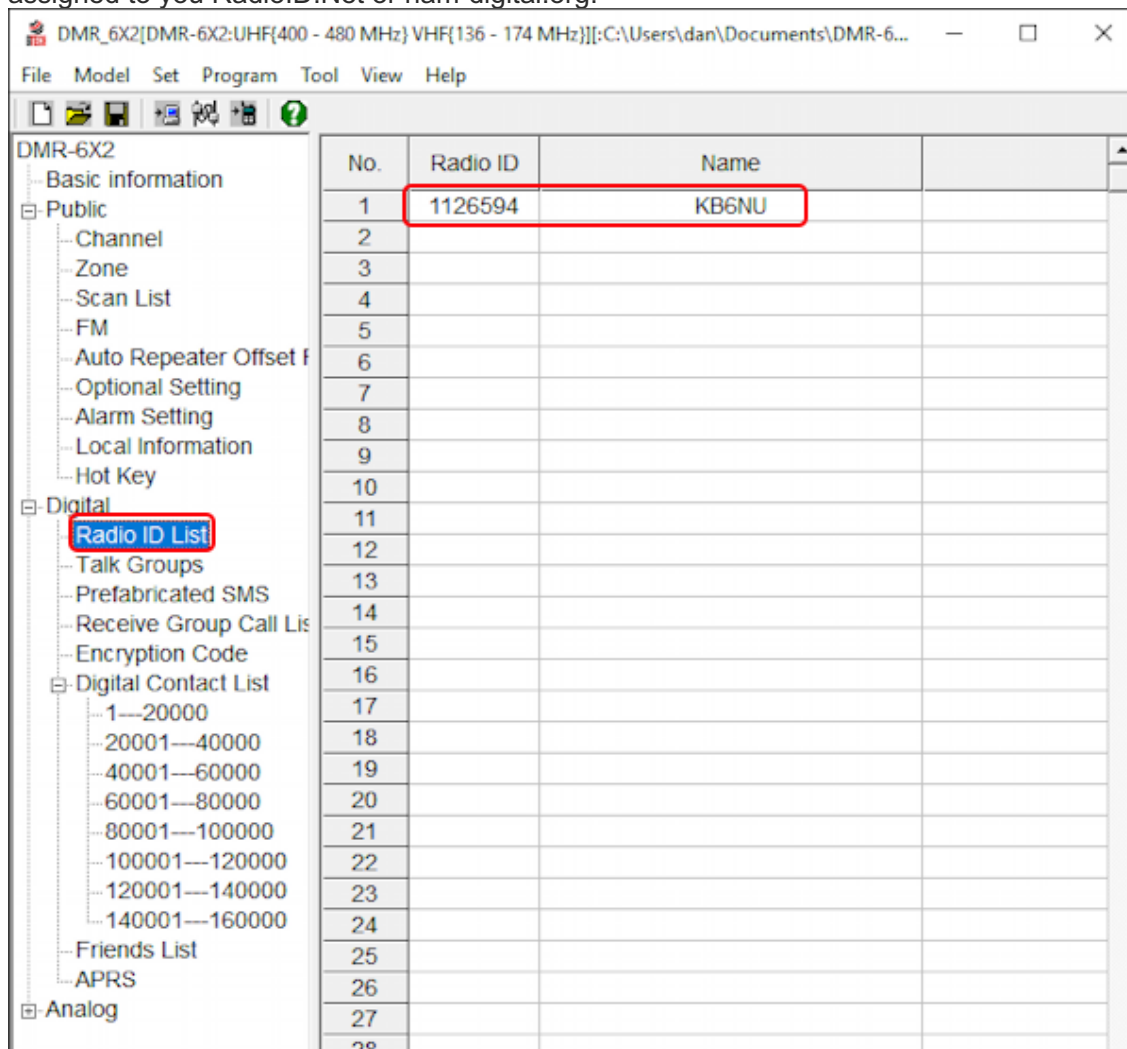
Build a DMR-6X2 Code Plug: A Basic Code Plug for your DMR Radio

Now that you know the lingo, it's time to build a simple code plug. (If you haven't read the blog post, Build a DMR-6X2 Code Plug: Learning the Lingo yet, please do so.)

The first thing that you need to do is to download the customer programming software, or *CPS.* You'll find the CPS for the DMR-6X2 here on the BTECH website. The download includes Includes a USB driver, the latest firmware for the DMR -6X2, and the CPS software.

You'll also need the USB cable that came with the DMR-6X2. This is very important. I tried using the USB cable that came with my BTECH UV-5X3, but it didn't work right with this CPS.

Once you have installed the CPS, the first thing that you will want to do is to set up the radio ID. To do this, select Radio ID List as shown below. You can actually program the DMR-6X2 to have several IDs, but at this stage, just use the one assigned to you RadioID.Net or ham-digital.org.

The next step is to set up your talk groups. As shown below, you do this by clicking Digital -> Talk Groups. To enter a new entry or edit a current entry, double-click on the talk group number. When you do this, a dialogue box, like the one shown below, will pop up. Enter the name you want to use for the talk group and the TG/DMR ID for the particular talk group. Leave the Call Type as Group Call.

As you can see for this simple code plug, I am only going to set up three talk groups. W8RP.Local is the local talk group for our repeater. I use that talk group only when I want to talk with other users of our W8RP repeater. The MI talk group is carried by other repeaters throughout the state of Michigan. TAC 310 is a talk group carried by repeaters worldwide.

Although not mandatory, the next step would be setting up a receive group. What a receive group allows you to do is monitor several talk groups simultaneously on a channel. You can set up many different receive groups and switch between them, but for this simple code plug, I'll set up only one. It contains all three talk groups that I previously programmed into the radio. You can ignore this step if all you want to do is to listen to same talk group that your channel would transmit

The next step is to create channels. You'll need to set up a channel for each talk group and for each analog channel that you want to use. In the screens below, you'll see that I have set up two analog channels and three digital channels. When you program a digital channel, you have to make sure that you not only set up the correct transmit and receive frequencies, but also the correct color code and time slot for the talk groups. For example, on our repeater, the W8RP.Local and MI talk groups are on time slot 1, while TAC310 is on time slot 2.

NOTE: In the example below, you'll see that I've selected Receive Group 1 as the Receive Group List. if you did not set up a receive group, then select NONE from the drop-down menu.

Channel Information Edit---3   ✕

Channel Name | W8RP.Local

Receive Frequency	443.50000		APRS Report	Off
Transmit Frequency	448.50000		APRS Report Channel	1
Channel Type	D-Digital		☐ TX Prohibit	☐ Talk Around
Transmit Power	High		☐ Work Alone	☐ Through Mode
Band Width	12.5K			
TX Permit	Always			

Digital

Contact	W8RP.Local
Radio ID	KB6NU
Color Code	1
Slot	Slot1
Receive Group List	Group List 1
Digital Encryption	Off
Encryption Type	Normal Encryption

☐ Simplex TDMA   ☐ Call Confirmation
☐ TDMA Adaptive   ☐ Ranging

Scan List

Scan List 1   Edit

Analog

CTCSS/DCS Decode	Off		☐ Reverse	
CTCSS/DCS Encode	Off			
Squelch Mode	Carrier		Custom CTCSS	131.8
Optional Signal	Off		PTT ID	Off
DTMF ID			DTMF Own ID	1
2Tone ID	1		2TONE Decode	1
5Tone ID	1		5TONE Own ID	1

Finally, you have to set up a zone. As I found out, if you don't set up a zone, you still won't be able to access any of the channels. You can set up many different zones and switch between them, but for simplicity, I'm going to put all five channels in a single zone. When you set up a zone, you can select the channels that the radio will initially be set to on the A channel and B channel. I've select a digital channel for A and an analog channel for B.
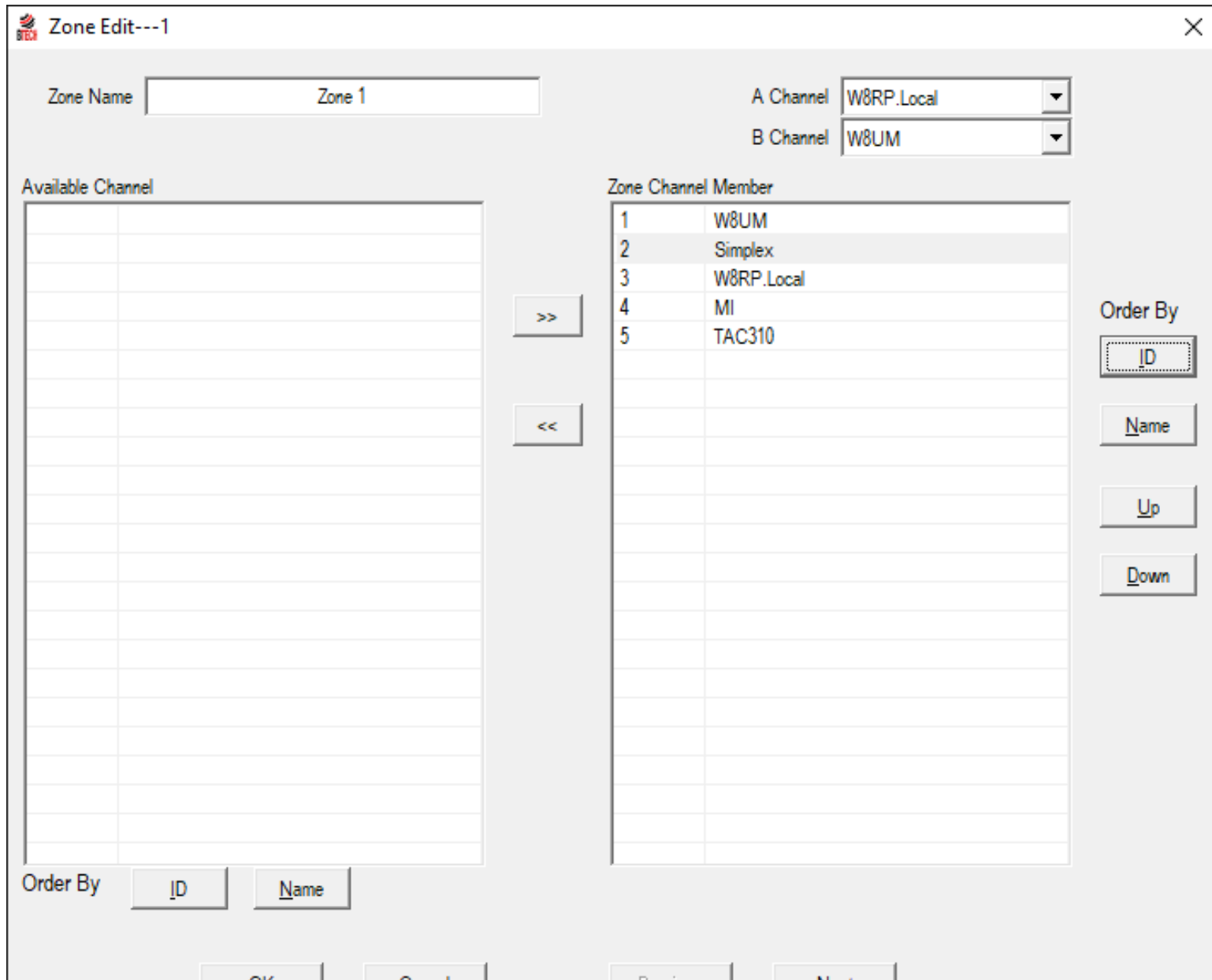
DMR_6X2[DMR-6X2:UHF{400 - 480 MHz} VHF{136 - 174 MHz}][:C:\Users\dan\Documents\DMR-6X2-105\dmr-6x2-20190330.rdt]

File   Model   Set   Program   Tool   View   Help

DMR-6X2
- Basic information
- Public
  - Channel
  - Zone
  - Scan List
  - FM
  - Auto Repeater Offset F
  - Optional Setting
  - Alarm Setting
  - Local Information
  - Hot Key
- Digital
  - Radio ID List
  - Talk Groups
  - Prefabricated SMS
  - Receive Group Call Lis
  - Encryption Code
  - Digital Contact List
    - 1---20000
    - 20001---40000
    - 40001---60000
    - 60001---80000
    - 80001---100000
    - 100001---120000
    - 120001---140000
    - 140001---160000
  - Friends List
  - APRS
- Analog

No.	Name	Zone Channels	A Channel	B Channel	
1	Zone 1	5	W8RP.Local	W8UM	
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					
31					
32					
33					
34					
35					
36					
37					
38					

Once you've done all that, you should be able to start talking on the DMR (and analog) channels.

There are a bunch of other things that you can program your radio to do, such as setting up scan lists and setting up a digital contact list. I'll be covering those in subsequent blog posts.