DMR PROGRAMMING

WORKSHOP – RMHAM-U

KØNGA MIKE

ROCKY MOUNTAIN HAM RADIO

MIKE'S DMR DOCTRINE

DMR is a commercial radio protocol.

It was never designed nor intended for Amateur Radio use.

Some things about DMR are not going to make sense.

Accept this. It will make your life easier.

WRITE THIS DOWN

- 438.6 / -5mhz offset
- Color Code 1
- Time Slot 2
- Talk Group 3108
  - BM Colorado

AGENDA

- Basics Review
- Vendor/CPS differences
- What you need to know
- Programming workflow

BASICS REVIEW

"No, I will not fix your computer." -Me, constantly

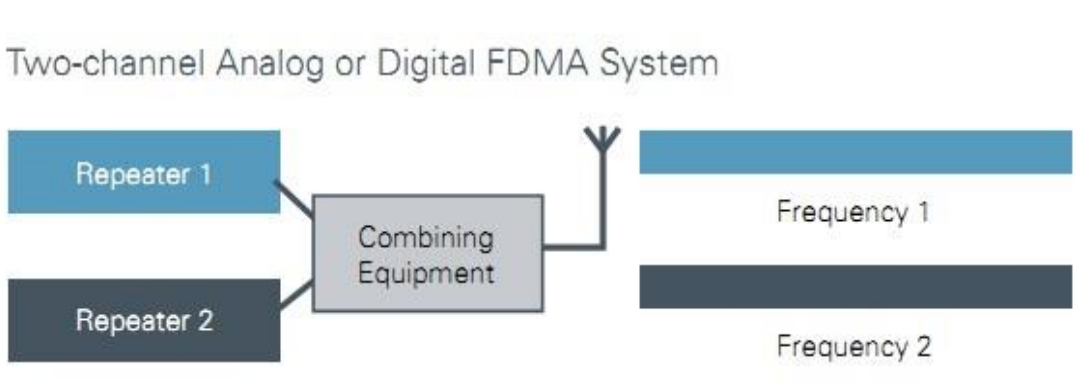
WHAT IS DMR/TRBO?

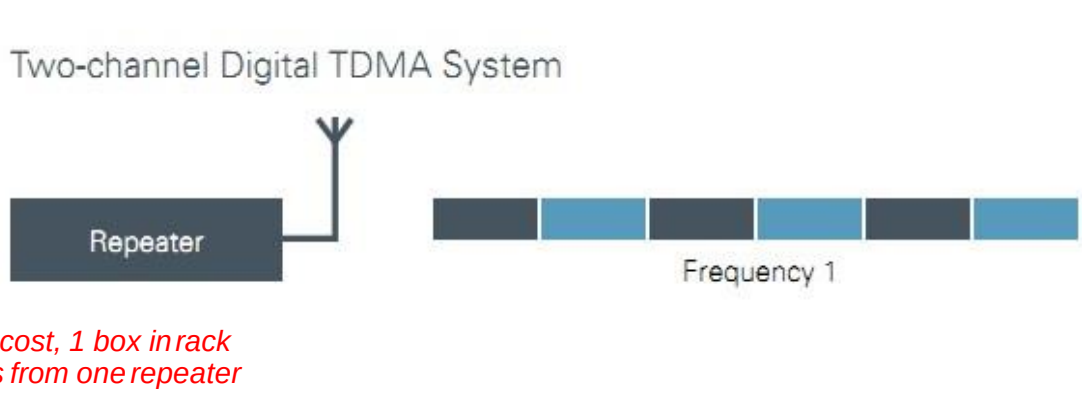
- DMR (Digital Mobile Radio) is an international commercial digital radio standard (ETSI) that originated in Europe
- TRBO refers to MotoTRBO which is Motorola's implementation of the DMR standard
- Many Amateur Radio repeater networks use MotoTRBO equipment, which is why they are commonly referred to as "TRBO" networks
- You do not need to use a Motorola MotoTRBO radio to use these networks

DMR
DIGITAL MOBILE RADIO ASSOCIATION

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





Lower infrastructure cost, 1 box in rack
TWO voice channels from one repeater

NEW CONCEPTS

- Frequency Pair – not new
- Color Code – Functions similar to a CTCSS or DCS access tone
- Repeater Slot – Each DMR Repeater has two, you must specify which one to use
- Talk Group – Each repeater slot can be logically segmented further into talk groups
- Receive Group – List of talk groups to monitor on the channel's assigned repeater slot

VENDOR/CPS DIFFERENCES

"What do you mean there's no codeplug for this brand-new bleeding-edge DMR radio from a company nobody's ever heard of?" -Too many people, too often

RANT, SORT OF

- Chinese radios are typically more affordable than Motorola
  - Less expensive to purchase
  - CPS typically free
- Typically, each Chinese radio (and, more often than not, each model) comes with its own CPS, which wont work with other radios/models
- Each CPS will have its own quirks
  - Terms will differ
  - Things that should be pull-downs will be buttons for some reason
  - Settings will be in different places
- Just because it's the newest doesn't mean it's better than what came before

WHAT YOU NEED

"Yes, you need a computer to run computer software."
-Me, on an actual AOL support call.

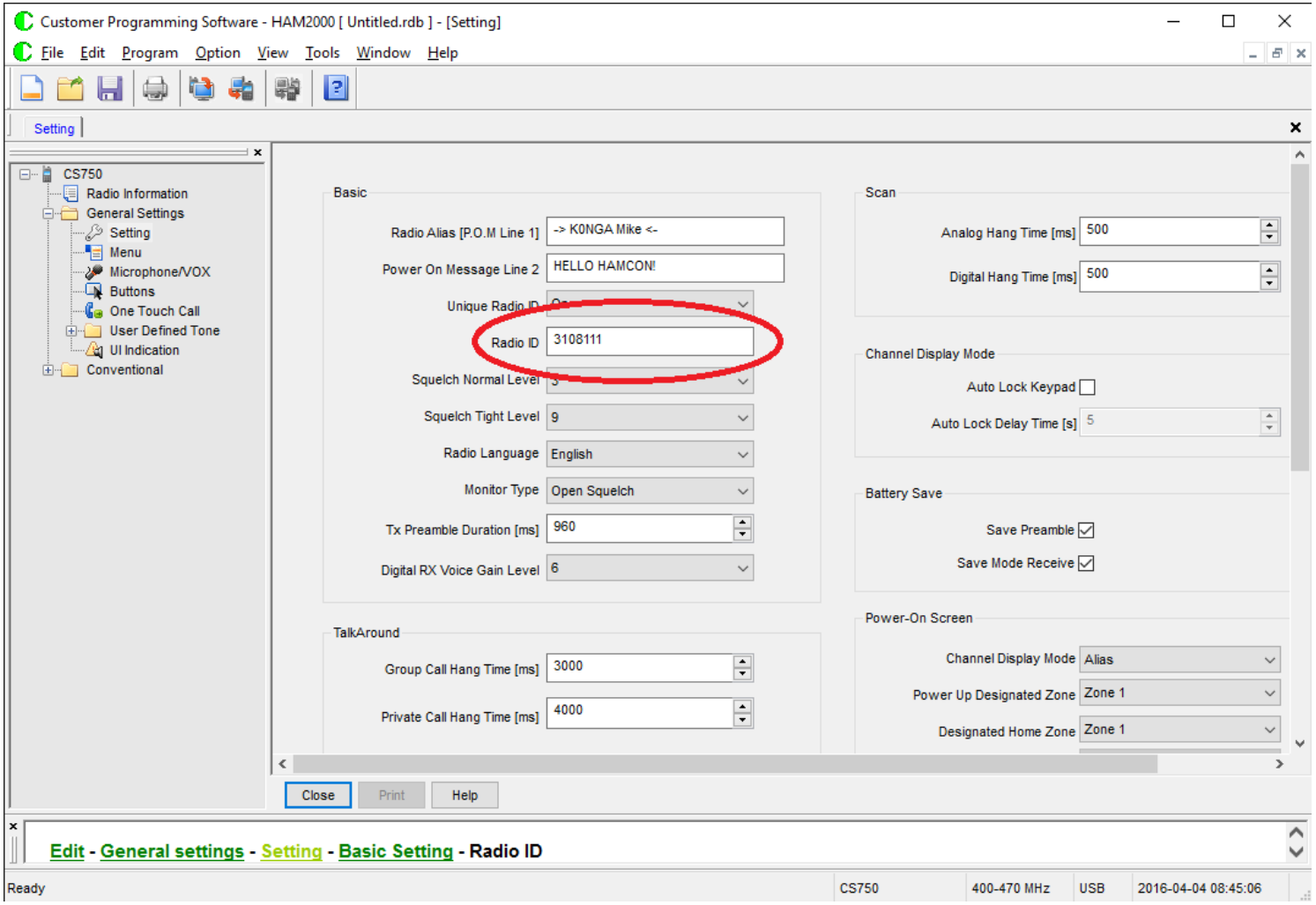
WHAT YOU NEED

- Tier 2 DMR Radio (very common)
  - Programming cable
  - Programming software (Customer Programming Software – CPS)
  - Windows Computer
- Radio ID
  - https://radioid.net
  - Create an account
  - You'll need a downloaded copy of your license
- Information about the repeater
  - Frequency pair
  - Color code
  - Talk group(s)
  - Time slot / repeater slot

PROGRAMMING WORKFLOW

"To experience true DMR freedom, you must learn to program your radio yourself." -Me, constantly

RADIO ID


Customer Programming Software - HAM2000 [Untitled.rdb] - [Setting]
File Edit Program Option View Tools Window Help
Setting
CS750
Radio Information
General Settings
Setting
Menu
Microphone/VOX
Buttons
One Touch Call
User Defined Tone
UI Indication
Conventional
Basic
Radio Alias [P.O.M Line 1] -> K0NGA Mike <-
Power On Message Line 2 HELLO HAMCON!
Unique Radio ID
Radio ID 3108111
Squelch Normal Level
Squelch Tight Level 9
Radio Language English
Monitor Type Open Squelch
Tx Preamble Duration [ms] 960
Digital RX Voice Gain Level 6
TalkAround
Group Call Hang Time [ms] 3000
Private Call Hang Time [ms] 4000
Scan
Analog Hang Time [ms] 500
Digital Hang Time [ms] 500
Channel Display Mode
Auto Lock Keypad
Auto Lock Delay Time [s] 5
Battery Save
Save Preamble
Save Mode Receive
Power-On Screen
Channel Display Mode Alias
Power Up Designated Zone Zone 1
Designated Home Zone Zone 1
Close Print Help
Edit - General settings - Setting - Basic Setting - Radio ID
Ready CS750 400-470 MHz USB 2016-04-04 08:45:06

BASIC PROGRAMMING CONCEPTS

- In order to program a DMR radio for repeaters, you must know:
  - Repeater frequencies
  - Repeater Color Code
  - Desired Talk Group/Receive Group
  - The Repeater Slot that Talk Group is on
- The order you need to add them to your codeplug:
  - Talk Groups
  - Receive Groups
  - Create Channels where you bring it all together
  - Add Channels to Zones so your radio knows what to do

EXAMPLE CHANNELS

Channel	Color Code	Time Slot	Receive Frequency	Transmit Frequency	Talk Group
Thorodin Rky Mtn	7	Slot 1	441.8	446.8	Rocky Mountain
Thorodin Central	7	Slot 2	441.8	446.8	Central
Lee Hill WW	1	Slot 1	445.05	440.05	DMR MARC WW
Lee Hill WW Eng	1	Slot 1	445.05	440.05	DMR MARC WW Eng
Lee Hill NA	1	Slot 1	445.05	440.05	DMR MARC NA
Lee Hill LCL	1	Slot 2	445.05	440.05	DMR MARC LCL
Lee Hill MTN	1	Slot 2	445.05	440.05	DMR MARC MTN

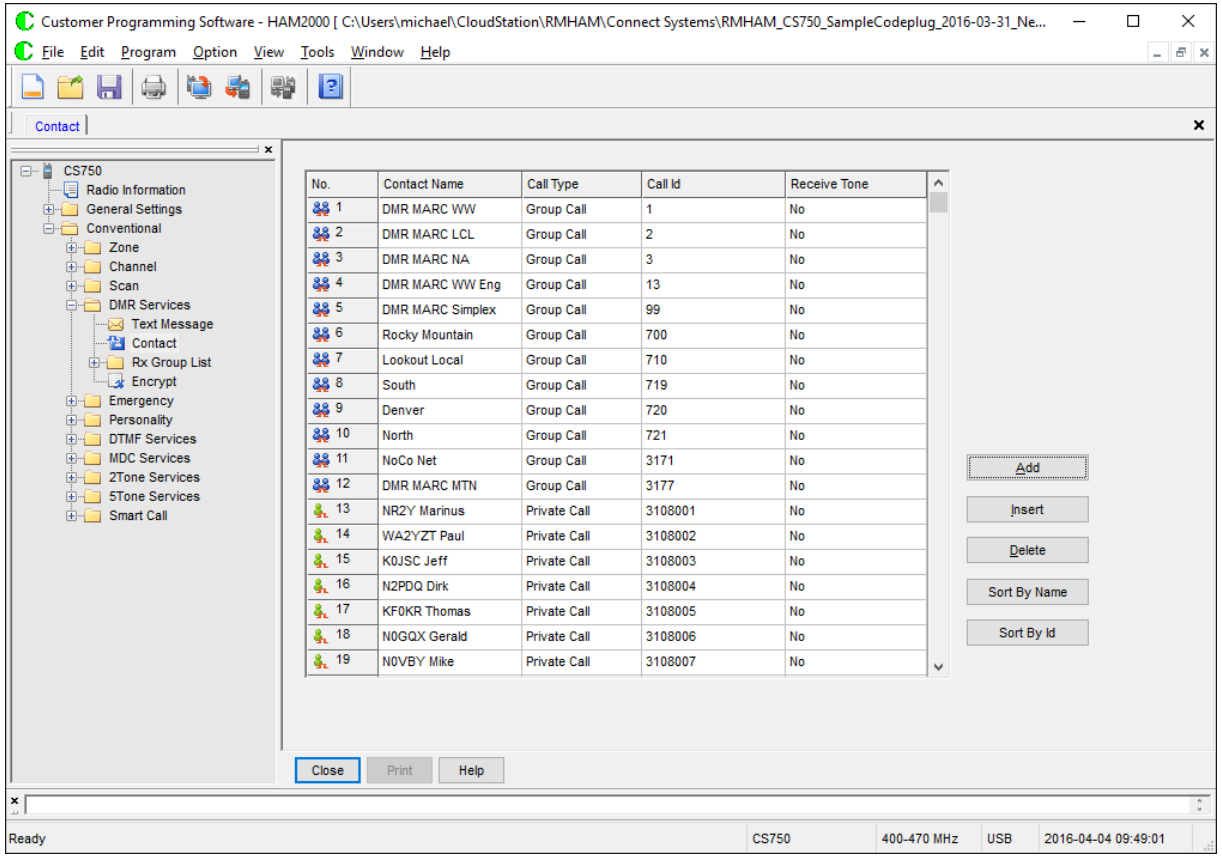
TALK GROUPS

- Access Control (analogous to tones on analog radios) is accomplished with Talk Groups
- If a repeater uses Talk Groups, you must know which Talk Groups the repeater uses in order to use the repeater with your radio
- Talk Groups are assigned to a Repeater Slot in a repeater
- More than one Talk Group can be assigned to a single Repeater Slot, but only one Talk Group can use the slot at any given time

CONTACT LIST

- DMR radios use a Contact List for:
  - Private Call (used for Radio IDs)
  - Talk Groups (required for most repeaters)
  - All Call (often used for simplex)
- Radios with displays will show the Radio ID of person who is transmitting
- If you have the Radio ID in your radio's Contact List, the contact name or tag will display instead of the Radio ID
- Typical contact names include call sign and name

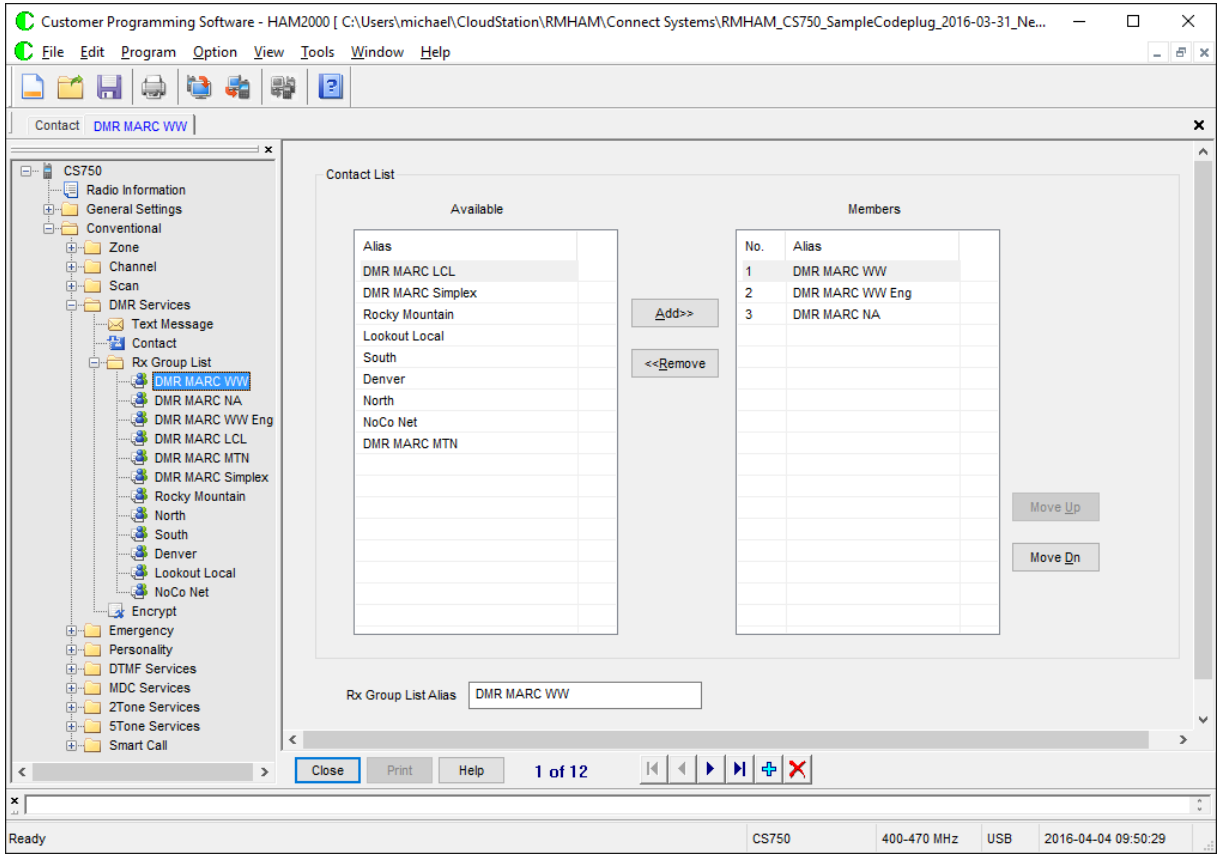
CONTACT LIST EXAMPLE



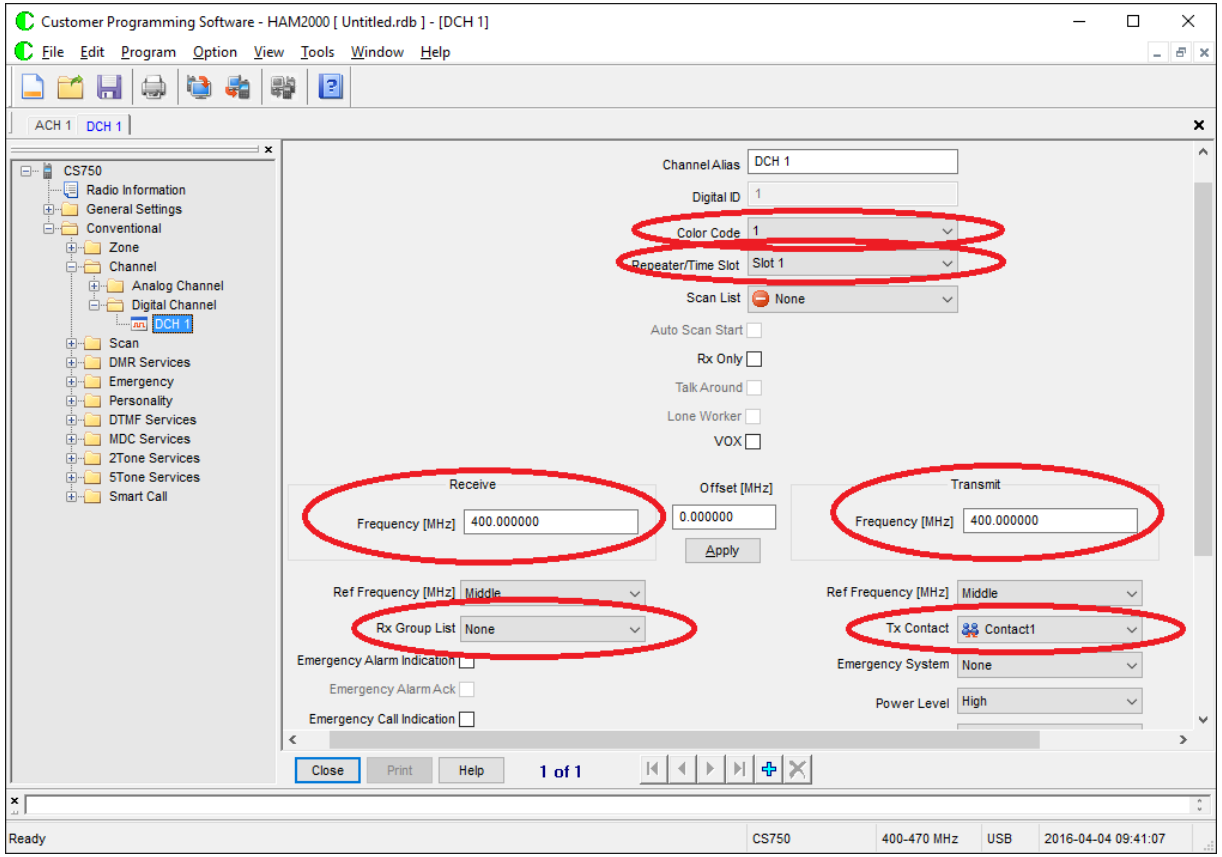
RECEIVE GROUPS

- Receive Groups are how DMR radios use Talk Groups when receiving signals
- Talk Groups are assigned to Receive Groups. Receive Groups are assigned to the receive frequency on the channel in your radio.
- More than one Talk Group can be assigned to a Receive Group
  - Recommended config by DMR-MARC
  - Can cause confusion when scanning
- Remember Mike's DMR Doctrine

RECEIVE GROUP EXAMPLE



CHANNEL EXAMPLE



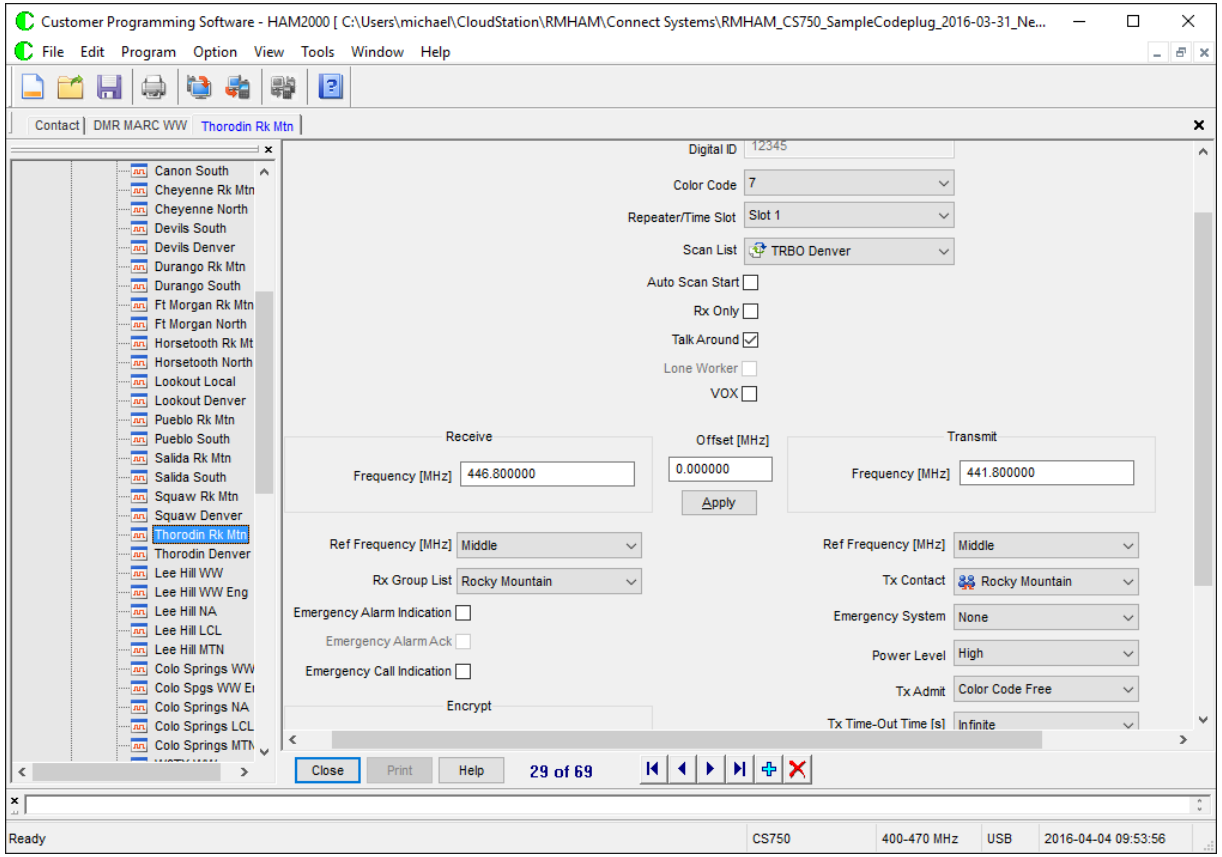
COLOR CODE

- DMR repeaters use a Color Code as the first access point after the receive frequency
- Color Codes are designed to allow two repeaters with the same frequency to operate effectively if they are relatively close to each other
- You must know the Color Code of the repeater in order to successfully use the repeater

REPEATER SLOTS

- DMR repeaters have 2 "time slots" that share a frequency, allowing for two separate, simultaneous conversations
- This means one repeater can do the work of two while using less bandwidth than a single analog repeater
- You must know which Repeater Slot you wish to use in order to set up your radio (more on this later)

EXAMPLE CHANNEL - RMHAM



ZONES

- Channels are assigned to Zones
- Only one (1) Zone can be in use at a time
- On HTs (and some mobiles), corresponds with channel selection dial
- Radios can have numerous zones
- Channels can be a member of more than one Zone

QUESTIONS?

STUFF AND THINGS

- RMHAM Website – http://www.rmham.org
- Interactive DMR repeater map: http://bit.ly/rmham-trbo-map
- Radio ID – https://www.radioid.net/
- DMR-MARC Website – http://www.dmr-marc.net
- Brandmeister
  - Dashboard: https://brandmeister.network/
  - Audio Feeds: http://hose.brandmeister.network/
  - Wiki: https://wiki.brandmeister.network
- Colorado Hotspot Frequencies: https://www.ccarc.net/wordpress/hot-spots/
- Contact Me: K0NGA@arrl.net