Motorola and Kenwood Radio Programming Lab

RMHAM University
01-08-2022

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Agenda

- Some Review
- Code Plug Planning – Getting Started
- Commercial Radios
- Motorola Radio Models
- Kenwood Commercial NX-Series
  - NX-Series Model Review
  - Programing Software – Walk-Through
  - Programming Examples
- Lab

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.

For more on DMR Basics, download Mike's presentation

Mike's DMR Presentation

"Borrowed" from Mike's December 10, 2021 Chinese DMR Prog Workshop

Some Review

- **Mike's DMR Doctrine – Not just for DMR ☺**
- **Some Terms**
  - Code Plug – a file that contains radio programing information including frequencies, access control and other operating parameters that is uploaded to the radio
  - Analog Access Control (These terms are used interchangeable but are the same thing.
    - CTCSS – Continuous Tone – Coded Squelch System
      - 67.0 Hz to 254.1 Hz (in steps of 0.1 Hz)
    - DCS – Digital Coded Squelch
      - D000N to D777N, D000I to D777I (4-digit octal number + Normal or Invert) (in steps of 1)
    - PL – Private Line, TPL – Tone Private Line, TPL – Tone Private Line (Motorola)
    - QT – Quiet Talk, DQT – Digital Quiet Talk (Kenwood)
    - None, CSQ – Carrier Squelch
- **Radio Programming Software**
  - Microsoft Windows Based
  - Have had success running under a Windows Virtual Machine (Do at your own risk!!)
  - CPS - Customer Programming Software (Motorola)
  - FPU - Field Programming Unit (Kenwood KPG-DxN)

Some Review (cont.)

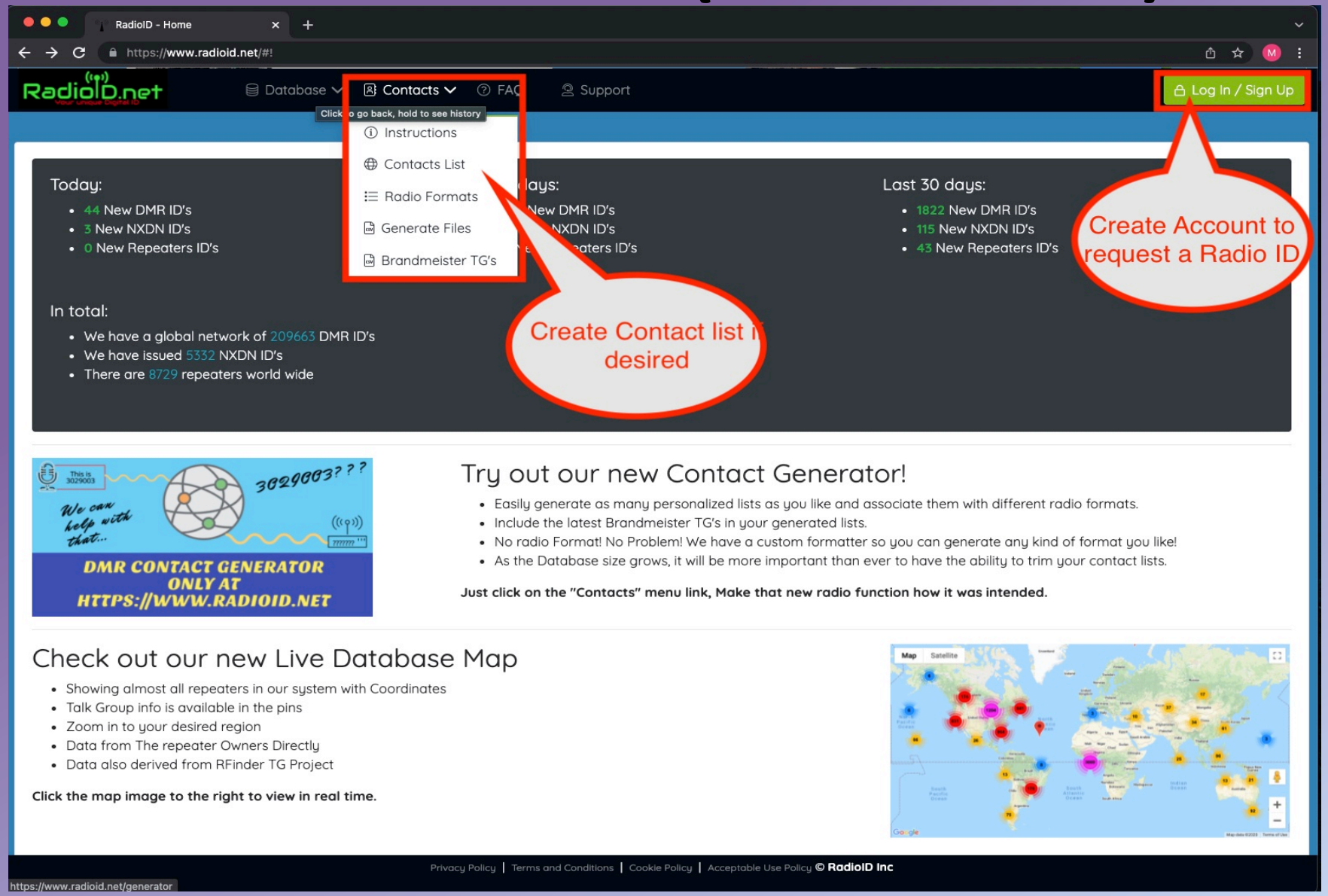
Programming - Needed Information	FM Analog	DMR - Repeater	DMR Simplex	P25
Receive Frequency (MHz)	449.050	446.9875	446.3000	438.5500
Transmit Frequency (MHz)	444.050	441.9875	446.3000	438.5500
Bandwidth (KHz) *Wide or Narrow Band	12.5 or *25.0	12.5	12.5	12.5
Time Slot		TS 1 or TS 2	TS 1 or TS 2	
CTCSS/DCS Encode	NONE/CTCSS/DCS			
CTCSS/DCS Decode	NONE/CTCSS/DCS			
Digital Color Code		Value 1-15	Value 1-15	
NAC Encode (293 Default)				XXX
Nac Decode (293 Defaul)				XXX
TX Group (TX Contact Name, TG ID, Selcall on PTT)		Talk Group	ALL CALL	Talk Group
RX Group		Talk Group/Implied	ALL CALL/Implied	Talk Group/Implied
Admit Criteria, Busy Channel Lockout (BCL)	Always/No	Color Code Free/Correct Color Code	Always/No	Correct NAC
In-Call Criteria		Follow Admit Criteria/Follow BCL	Follow Admit Criteria/Follow BCL	

*** Most Amateur FM analog channels are Wide Band. The programming software defaults to narrow band!!**

Code Plug Planning – Getting Started

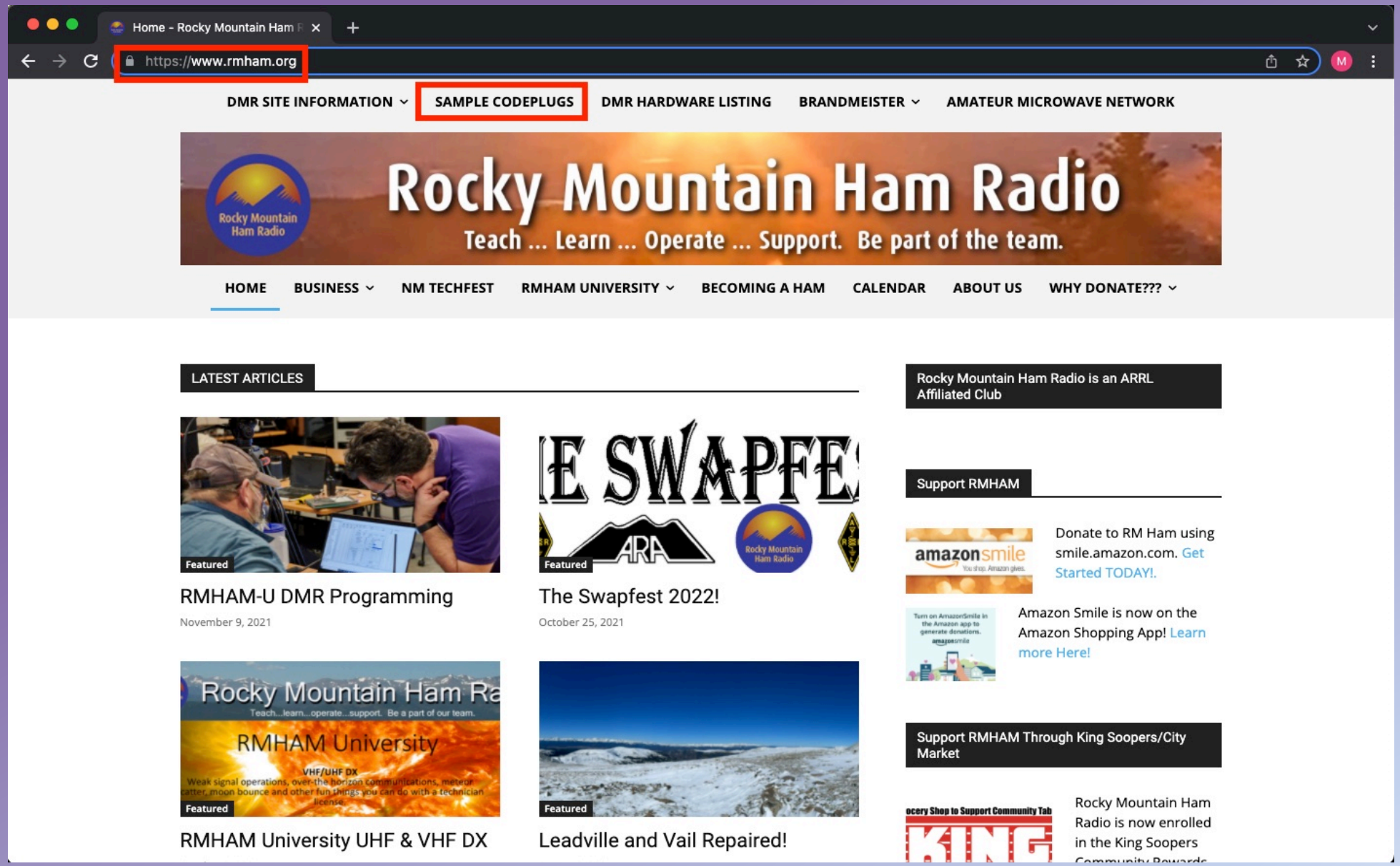
- **Radio ID's**
  - Where to Get Yours
  - Find Other's ID's – Contact List
- **Finding channel programming information**
  - RMHAM Sample Code Plugs
    - Open and existing Code Plug
    - Use an Export from a Chinese Radio Programming Software
    - Copy / Paste this information – Excel can be your friend
  - RMHAM Site Information
    - RMHAM Repeaters
    - RMHAM Talk Groups
    - Example
  - CCARC – Colorado Council of Amateur Radio Clubs
    - Coordinated Repeater List
    - Colorado Hot Spot Frequencies
  - Wyoming DMR information
  - Amateur Radio Club WEB sites
  - Repeater Book – Mileage may Vary
- **Putting it all together**

DMR Radio ID's (Contact List)

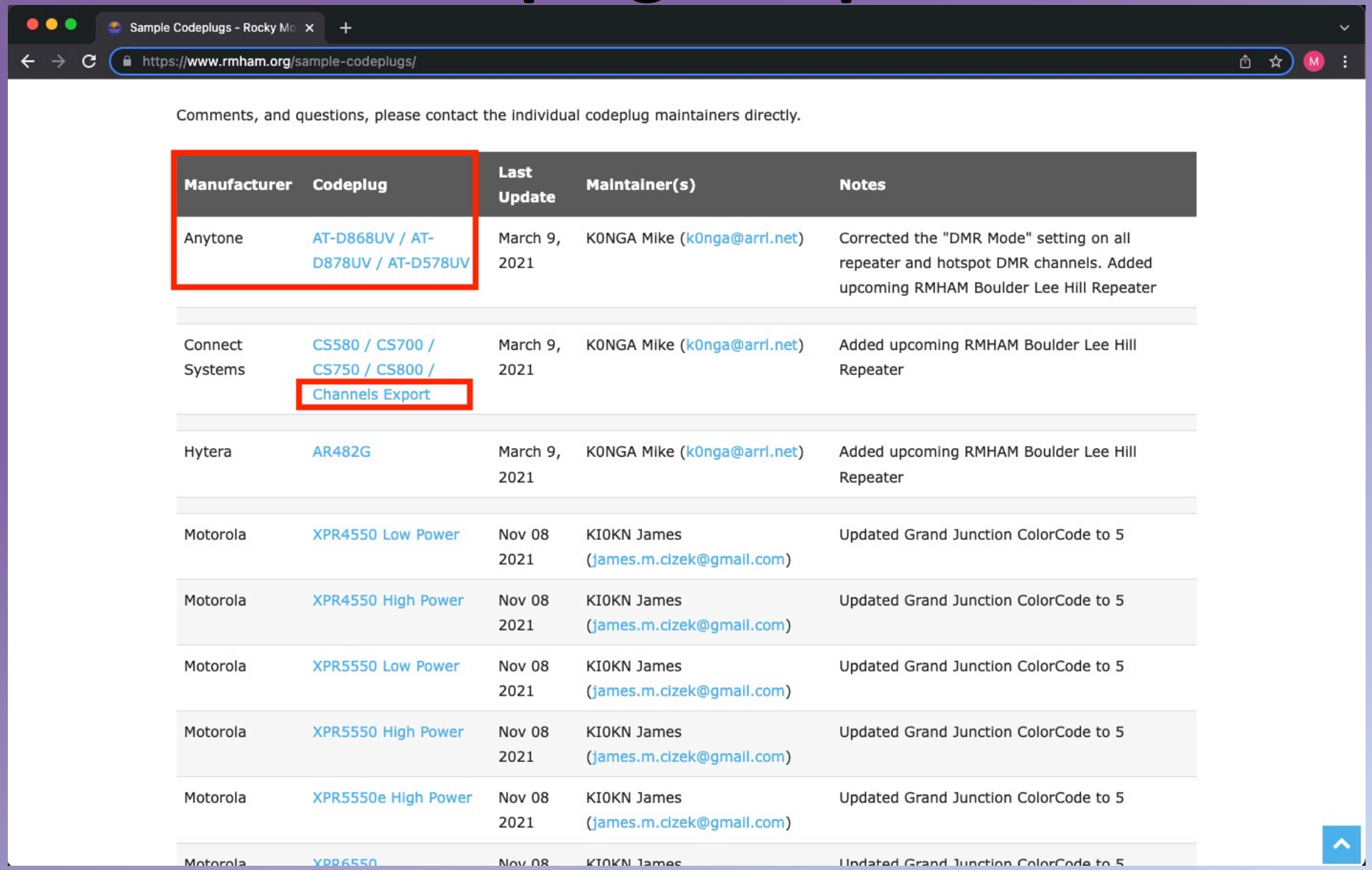


[Radio Id's]

RMHAM Sample Codeplugs



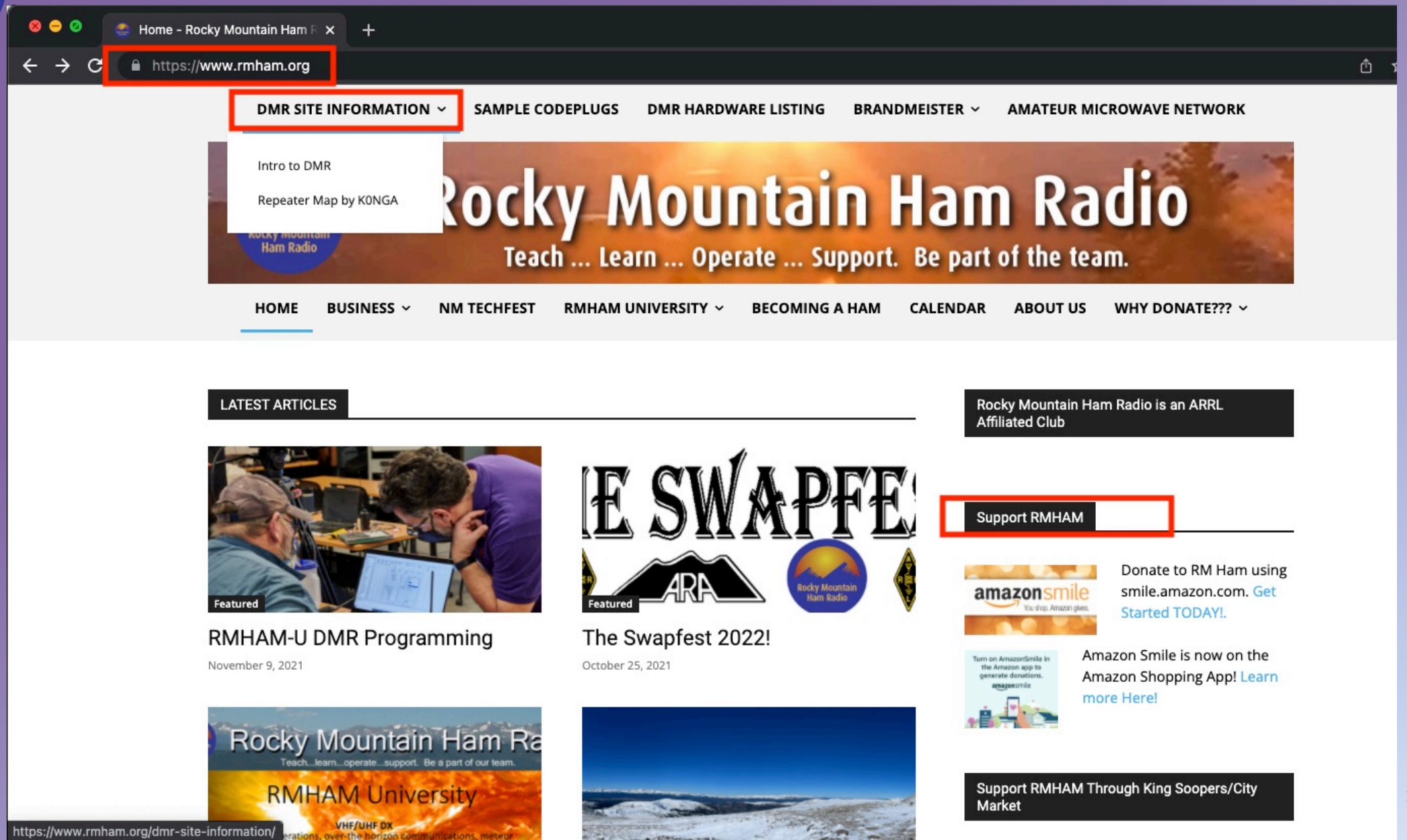
Codeplug Samples



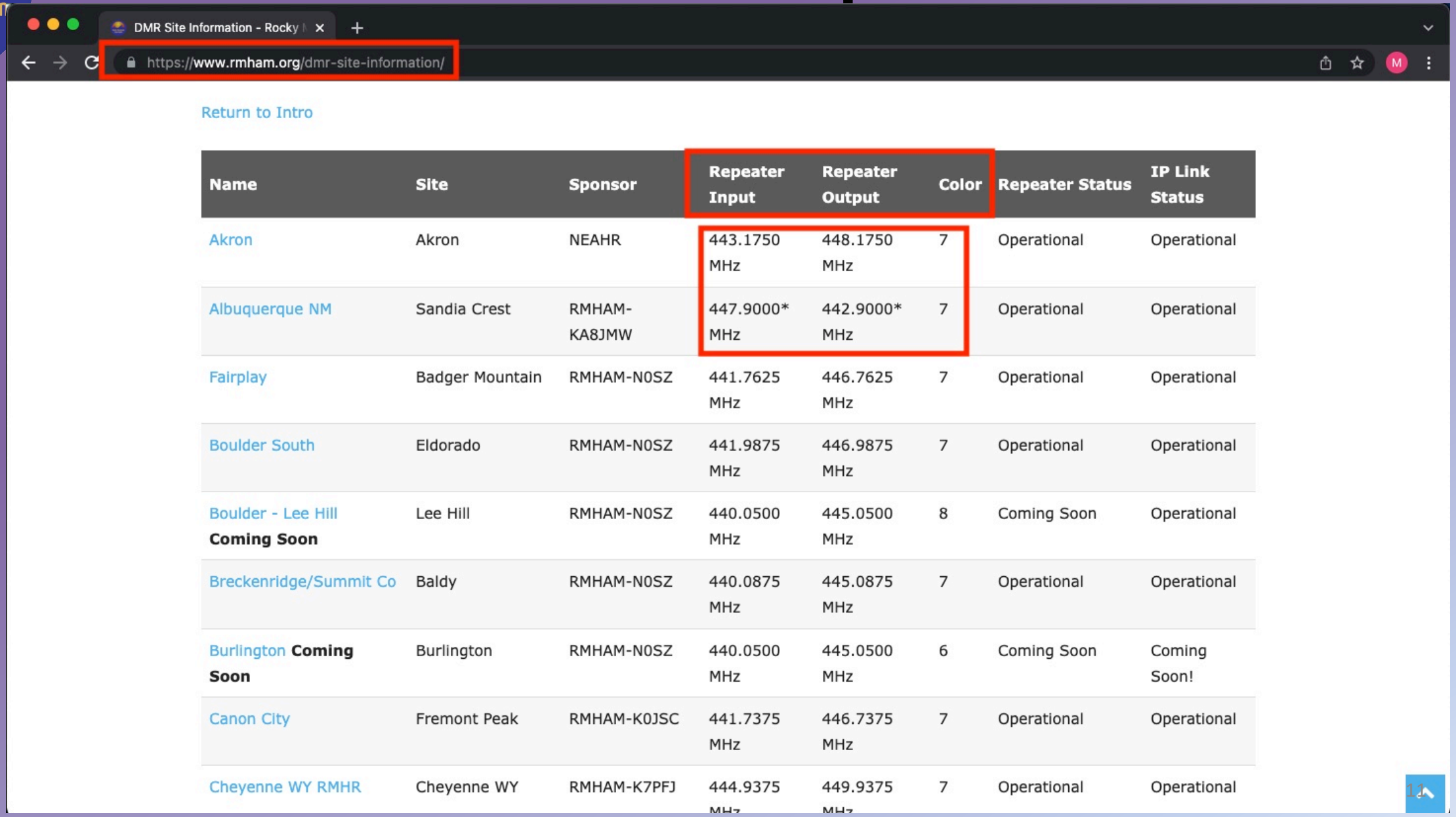
Comments, and questions, please contact the individual codeplug maintainers directly.

Manufacturer	Codeplug	Last Update	Maintainer(s)	Notes
Anytone	AT-D868UV / AT-D878UV / AT-D578UV	March 9, 2021	K0NGA Mike (k0nga@arrl.net)	Corrected the "DMR Mode" setting on all repeater and hotspot DMR channels. Added upcoming RMHAM Boulder Lee Hill Repeater
Connect Systems	CS580 / CS700 / CS750 / CS800 / Channels Export	March 9, 2021	K0NGA Mike (k0nga@arrl.net)	Added upcoming RMHAM Boulder Lee Hill Repeater
Hytera	AR482G	March 9, 2021	K0NGA Mike (k0nga@arrl.net)	Added upcoming RMHAM Boulder Lee Hill Repeater
Motorola	XPR4550 Low Power	Nov 08 2021	KI0KN James (james.m.cizek@gmail.com)	Updated Grand Junction ColorCode to 5
Motorola	XPR4550 High Power	Nov 08 2021	KI0KN James (james.m.cizek@gmail.com)	Updated Grand Junction ColorCode to 5
Motorola	XPR5550 Low Power	Nov 08 2021	KI0KN James (james.m.cizek@gmail.com)	Updated Grand Junction ColorCode to 5
Motorola	XPR5550 High Power	Nov 08 2021	KI0KN James (james.m.cizek@gmail.com)	Updated Grand Junction ColorCode to 5
Motorola	XPR5550e High Power	Nov 08 2021	KI0KN James (james.m.cizek@gmail.com)	Updated Grand Junction ColorCode to 5
Motorola	XPR6550	Nov 08	KI0KN James	Updated Grand Junction ColorCode to 5

RMHAM Site Information



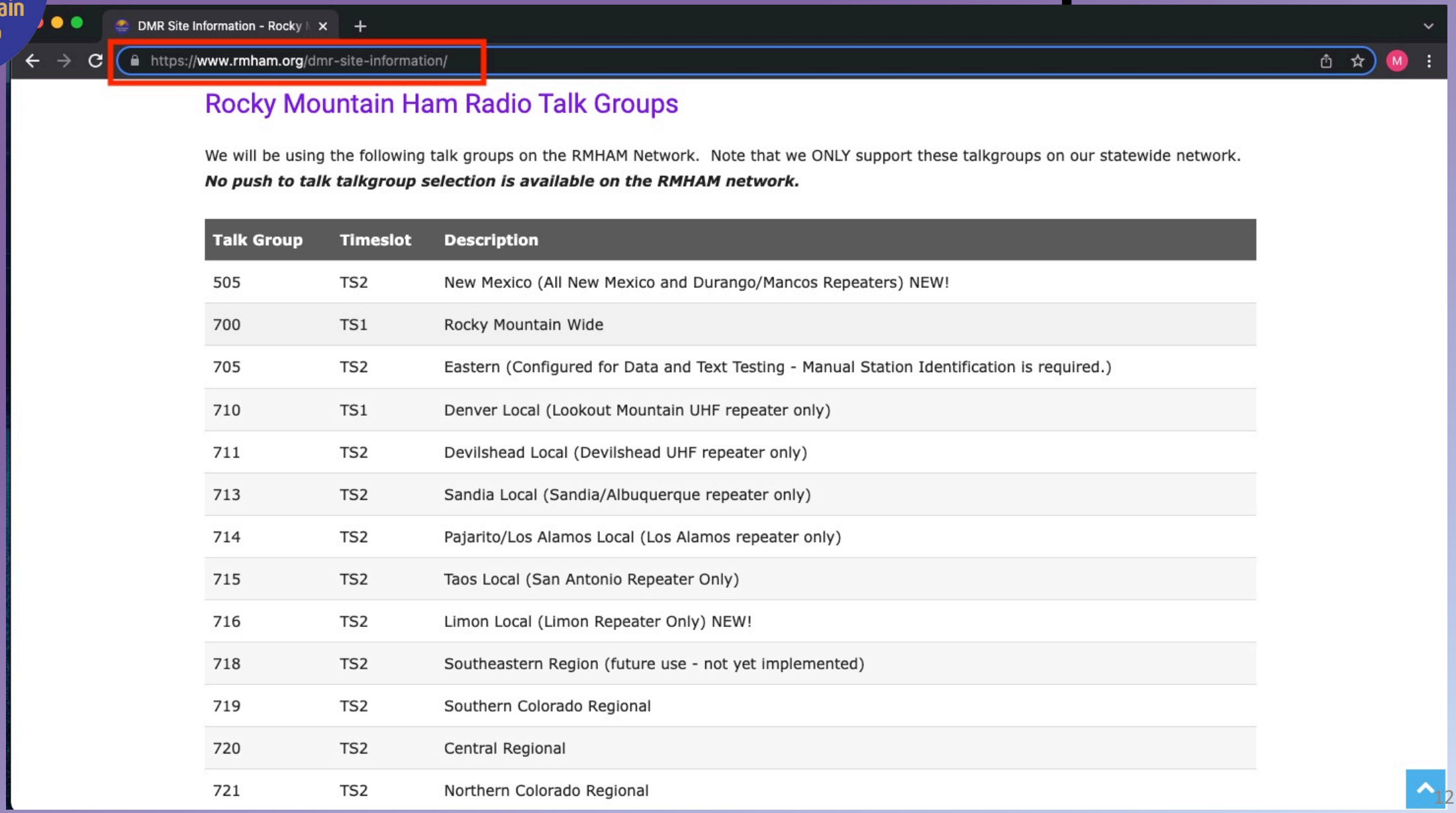
RMHAM DMR Repeaters



Return to Intro

Name	Site	Sponsor	Repeater Input	Repeater Output	Color	Repeater Status	IP Link Status
Akron	Akron	NEAHR	443.1750 MHz	448.1750 MHz	7	Operational	Operational
Albuquerque NM	Sandia Crest	RMHAM-KA8JMW	447.9000* MHz	442.9000* MHz	7	Operational	Operational
Fairplay	Badger Mountain	RMHAM-N0SZ	441.7625 MHz	446.7625 MHz	7	Operational	Operational
Boulder South	Eldorado	RMHAM-N0SZ	441.9875 MHz	446.9875 MHz	7	Operational	Operational
Boulder - Lee Hill **Coming Soon**	Lee Hill	RMHAM-N0SZ	440.0500 MHz	445.0500 MHz	8	Coming Soon	Operational
Breckenridge/Summit Co	Baldy	RMHAM-N0SZ	440.0875 MHz	445.0875 MHz	7	Operational	Operational
Burlington **Coming Soon**	Burlington	RMHAM-N0SZ	440.0500 MHz	445.0500 MHz	6	Coming Soon	Coming Soon!
Canon City	Fremont Peak	RMHAM-K0JSC	441.7375 MHz	446.7375 MHz	7	Operational	Operational
Cheyenne WY RMHR	Cheyenne WY	RMHAM-K7PFJ	444.9375 MHz	449.9375 MHz	7	Operational	Operational

RMHAM DMR Talk Groups



Rocky Mountain Ham Radio Talk Groups

We will be using the following talk groups on the RMHAM Network. Note that we ONLY support these talkgroups on our statewide network.
No push to talk talkgroup selection is available on the RMHAM network.

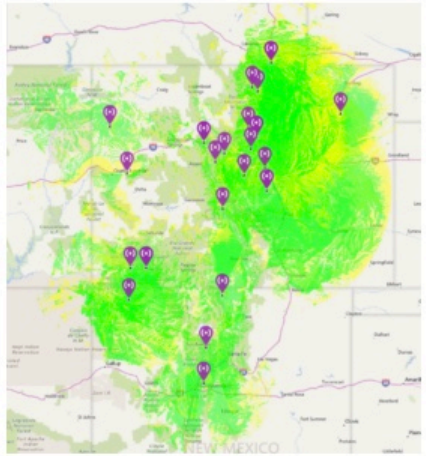
Talk Group	Timeslot	Description
505	TS2	New Mexico (All New Mexico and Durango/Mancos Repeaters) NEW!
700	TS1	Rocky Mountain Wide
705	TS2	Eastern (Configured for Data and Text Testing - Manual Station Identification is required.)
710	TS1	Denver Local (Lookout Mountain UHF repeater only)
711	TS2	Devilshead Local (Devilshead UHF repeater only)
713	TS2	Sandia Local (Sandia/Albuquerque repeater only)
714	TS2	Pajarito/Los Alamos Local (Los Alamos repeater only)
715	TS2	Taos Local (San Antonio Repeater Only)
716	TS2	Limon Local (Limon Repeater Only) NEW!
718	TS2	Southeastern Region (future use - not yet implemented)
719	TS2	Southern Colorado Regional
720	TS2	Central Regional
721	TS2	Northern Colorado Regional

RMHAM DMR Wide Network

DMR Site Information - Rocky

https://www.rmham.org/dmr-site-information/

Rocky Mountain Wide Network – Talk Group 700

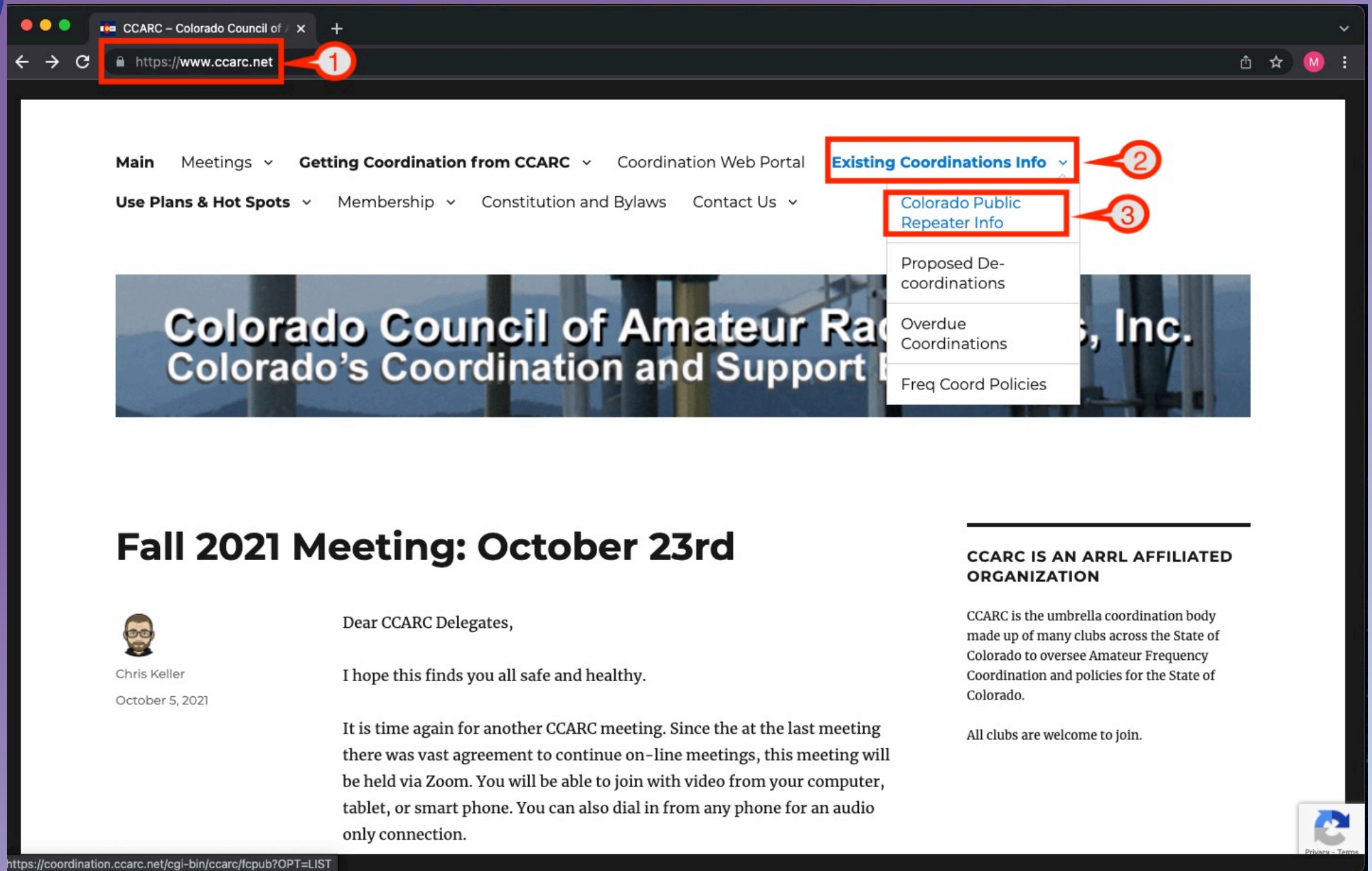


Return to Intro

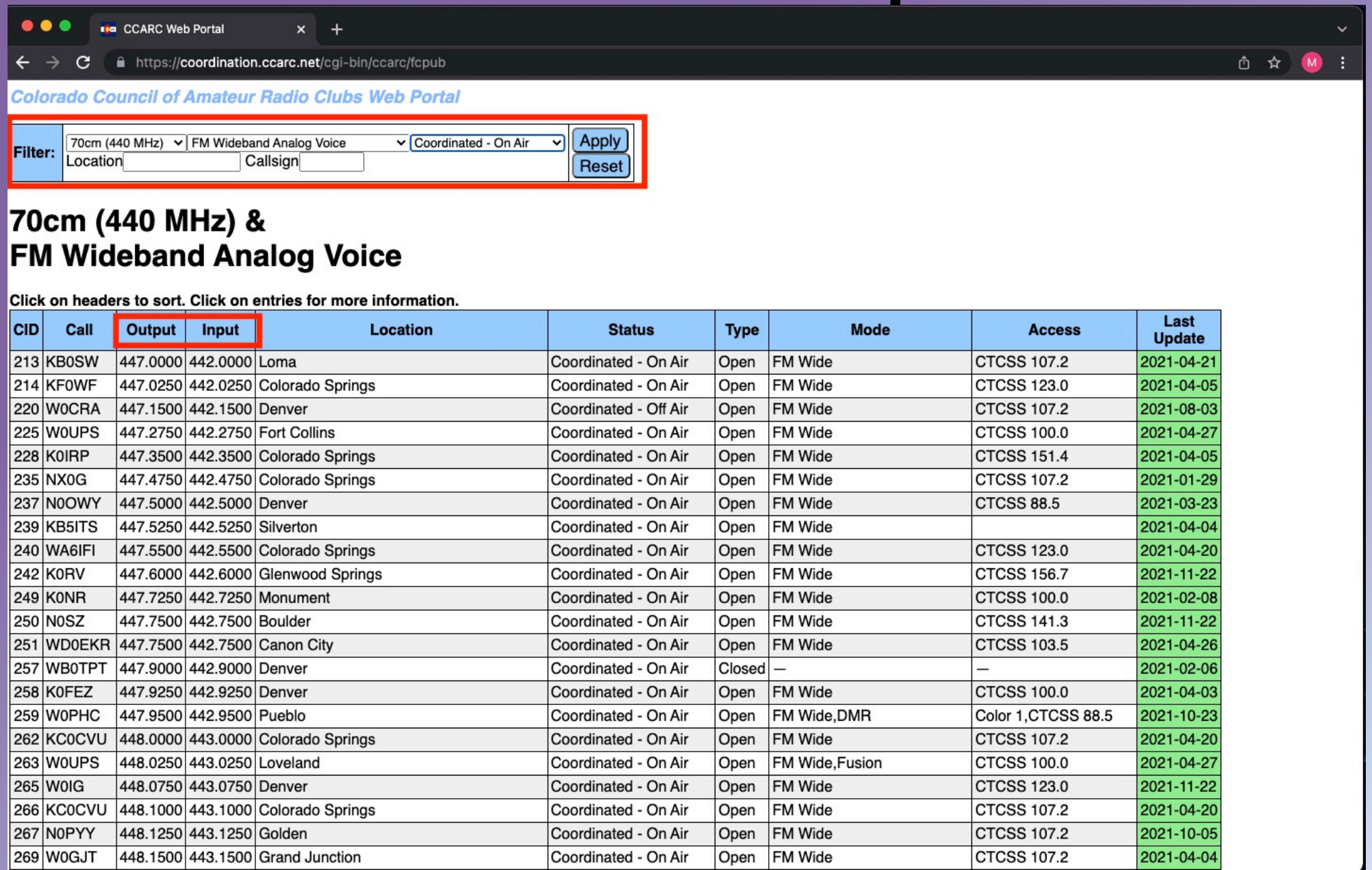
The Rocky Mountain Wide network will provide extremely wide area coverage across much of Colorado. No Data, Texting or locations services are allowed. No Brandmeister Connectivity. Repeaters supporting this talk group are:

Name	Site	Repeater Input	Repeater Output	Color Code	Time Slot	Status
Akron	Akron	443.1750 MHz	448.1750 MHz	7	1	Operational-Linked
Albuquerque	Sandia Crest	447.9000 MHz	442.9000 MHz	7	1	Operational-Linked
Boulder South	Eldorado	441.9875 MHz	446.9875 MHz	7	1	Operational-Linked
Breckenridge	Baldy	440.0875 MHz	445.0875 MHz	7	1	Operational-Linked
Burlington	Burlington	440.0500 MHz	445.0500 MHz	6	1	Coming Soon
Canon City	Fremont Peak	441.7375 MHz	446.7375 MHz	7	1	Operational-Linked
CheyWY RMHR	South Cheyenne	444.9375 MHz	449.9375 MHz	7	1	Operational-Linked

CCARC WEB Site



70cm Coordinated Repeaters

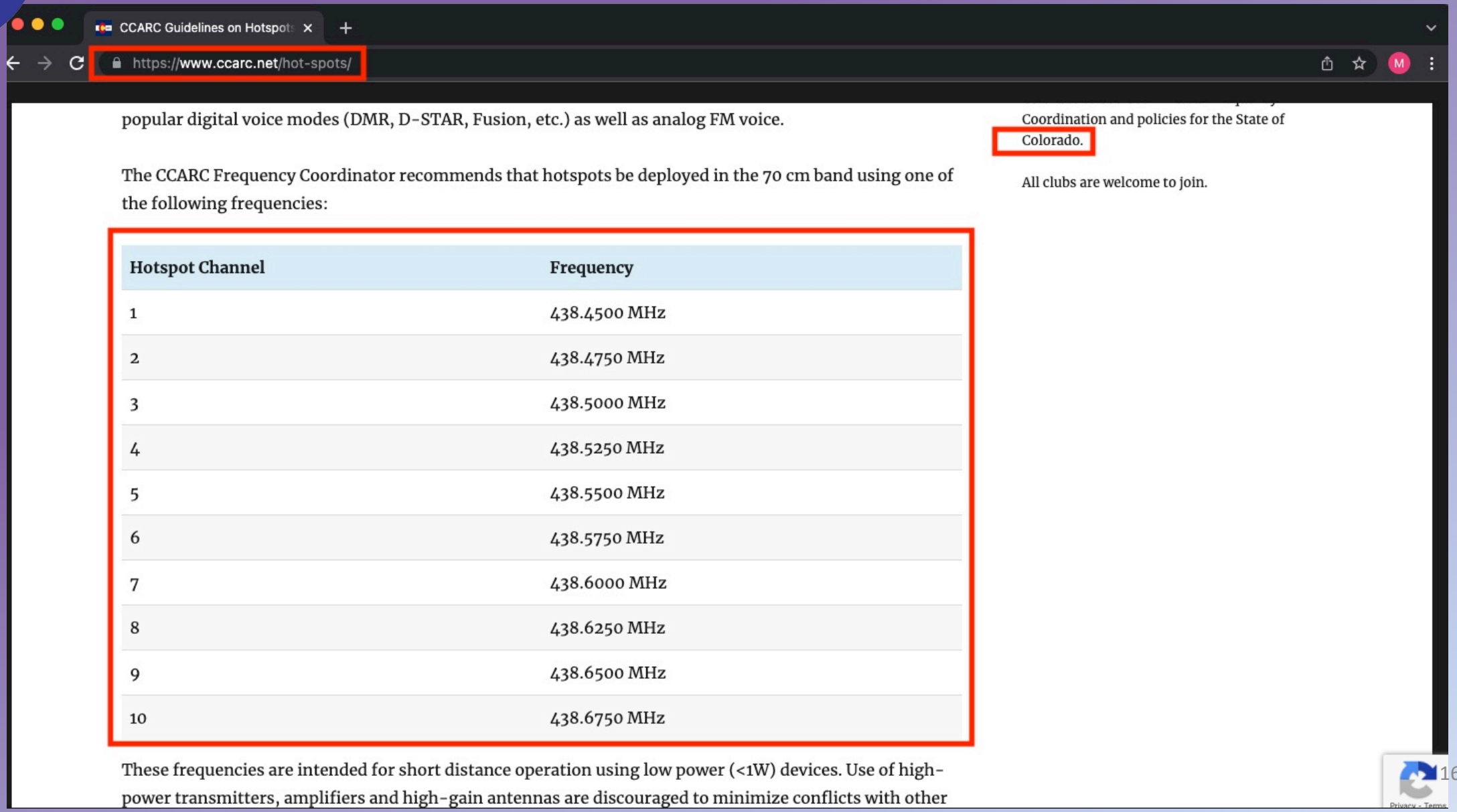


70cm (440 MHz) & FM Wideband Analog Voice

Click on headers to sort. Click on entries for more information.

CID	Call	Output	Input	Location	Status	Type	Mode	Access	Last Update
213	KB0SW	447.0000	442.0000	Loma	Coordinated - On Air	Open	FM Wide	CTCSS 107.2	2021-04-21
214	KF0WF	447.0250	442.0250	Colorado Springs	Coordinated - On Air	Open	FM Wide	CTCSS 123.0	2021-04-05
220	W0CRA	447.1500	442.1500	Denver	Coordinated - Off Air	Open	FM Wide	CTCSS 107.2	2021-08-03
225	W0UPS	447.2750	442.2750	Fort Collins	Coordinated - On Air	Open	FM Wide	CTCSS 100.0	2021-04-27
228	K0IRP	447.3500	442.3500	Colorado Springs	Coordinated - On Air	Open	FM Wide	CTCSS 151.4	2021-04-05
235	NX0G	447.4750	442.4750	Colorado Springs	Coordinated - On Air	Open	FM Wide	CTCSS 107.2	2021-01-29
237	N0OWY	447.5000	442.5000	Denver	Coordinated - On Air	Open	FM Wide	CTCSS 88.5	2021-03-23
239	KB5ITS	447.5250	442.5250	Silverton	Coordinated - On Air	Open	FM Wide		2021-04-04
240	WA6IFI	447.5500	442.5500	Colorado Springs	Coordinated - On Air	Open	FM Wide	CTCSS 123.0	2021-04-20
242	K0RV	447.6000	442.6000	Glenwood Springs	Coordinated - On Air	Open	FM Wide	CTCSS 156.7	2021-11-22
249	K0NR	447.7250	442.7250	Monument	Coordinated - On Air	Open	FM Wide	CTCSS 100.0	2021-02-08
250	N0SZ	447.7500	442.7500	Boulder	Coordinated - On Air	Open	FM Wide	CTCSS 141.3	2021-11-22
251	WD0EKR	447.7500	442.7500	Canon City	Coordinated - On Air	Open	FM Wide	CTCSS 103.5	2021-04-26
257	WB0TPT	447.9000	442.9000	Denver	Coordinated - On Air	Closed	—	—	2021-02-06
258	K0FEZ	447.9250	442.9250	Denver	Coordinated - On Air	Open	FM Wide	CTCSS 100.0	2021-04-03
259	W0PHC	447.9500	442.9500	Pueblo	Coordinated - On Air	Open	FM Wide,DMR	Color 1,CTCSS 88.5	2021-10-23
262	KC0CVU	448.0000	443.0000	Colorado Springs	Coordinated - On Air	Open	FM Wide	CTCSS 107.2	2021-04-20
263	W0UPS	448.0250	443.0250	Loveland	Coordinated - On Air	Open	FM Wide,Fusion	CTCSS 100.0	2021-04-27
265	W0IG	448.0750	443.0750	Denver	Coordinated - On Air	Open	FM Wide	CTCSS 123.0	2021-11-22
266	KC0CVU	448.1000	443.1000	Colorado Springs	Coordinated - On Air	Open	FM Wide	CTCSS 107.2	2021-04-20
267	N0PYY	448.1250	443.1250	Golden	Coordinated - On Air	Open	FM Wide	CTCSS 107.2	2021-10-05
269	W0GJT	448.1500	443.1500	Grand Junction	Coordinated - On Air	Open	FM Wide	CTCSS 107.2	2021-04-04

Hotspots (Colorado)



popular digital voice modes (DMR, D-STAR, Fusion, etc.) as well as analog FM voice.

The CCARC Frequency Coordinator recommends that hotspots be deployed in the 70 cm band using one of the following frequencies:

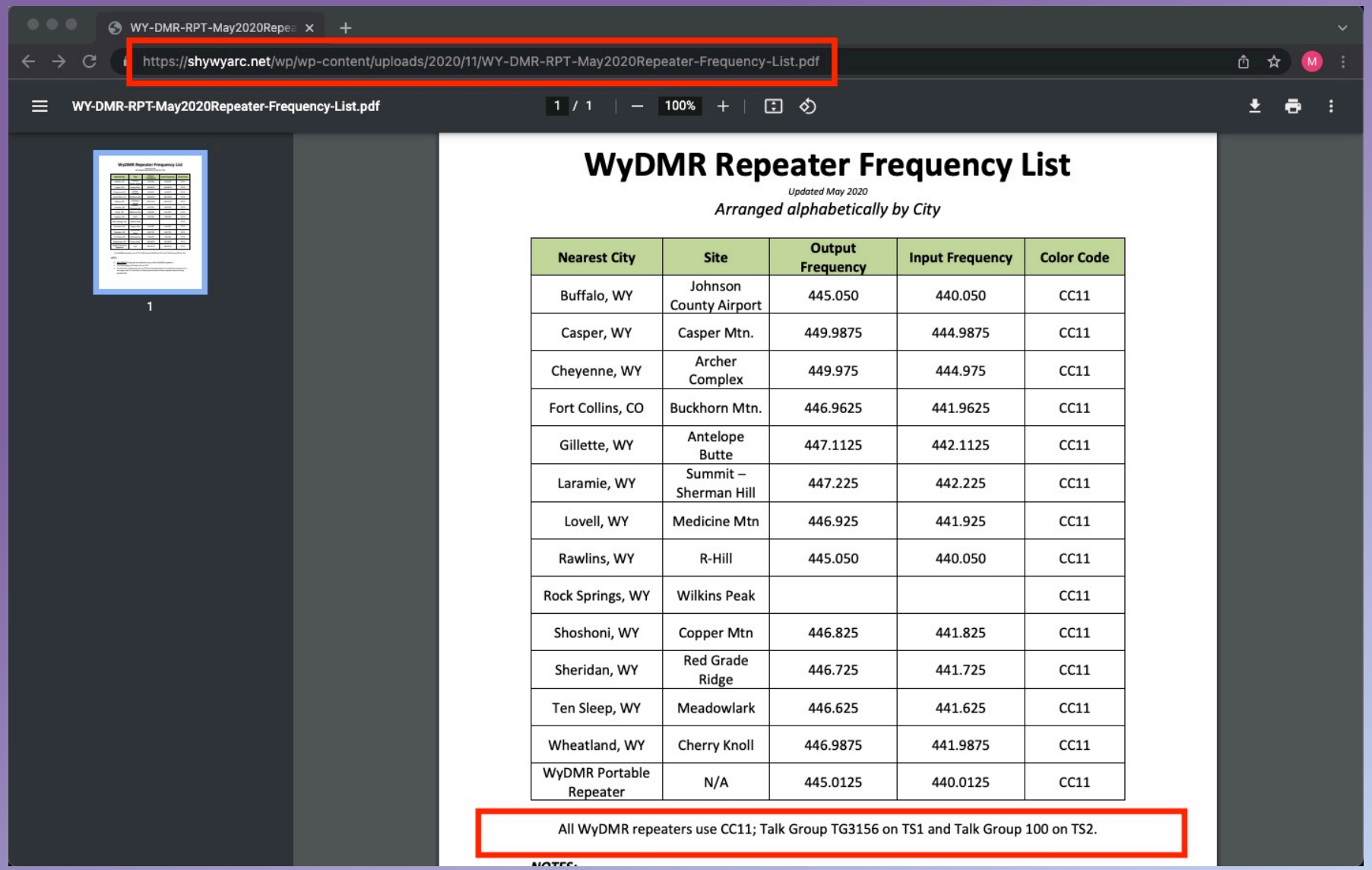
Hotspot Channel	Frequency
1	438.4500 MHz
2	438.4750 MHz
3	438.5000 MHz
4	438.5250 MHz
5	438.5500 MHz
6	438.5750 MHz
7	438.6000 MHz
8	438.6250 MHz
9	438.6500 MHz
10	438.6750 MHz

These frequencies are intended for short distance operation using low power (<1W) devices. Use of high-power transmitters, amplifiers and high-gain antennas are discouraged to minimize conflicts with other

Coordination and policies for the State of Colorado.

All clubs are welcome to join.

Wyoming DMR Information



WyDMR Repeater Frequency List

Updated May 2020

Arranged alphabetically by City

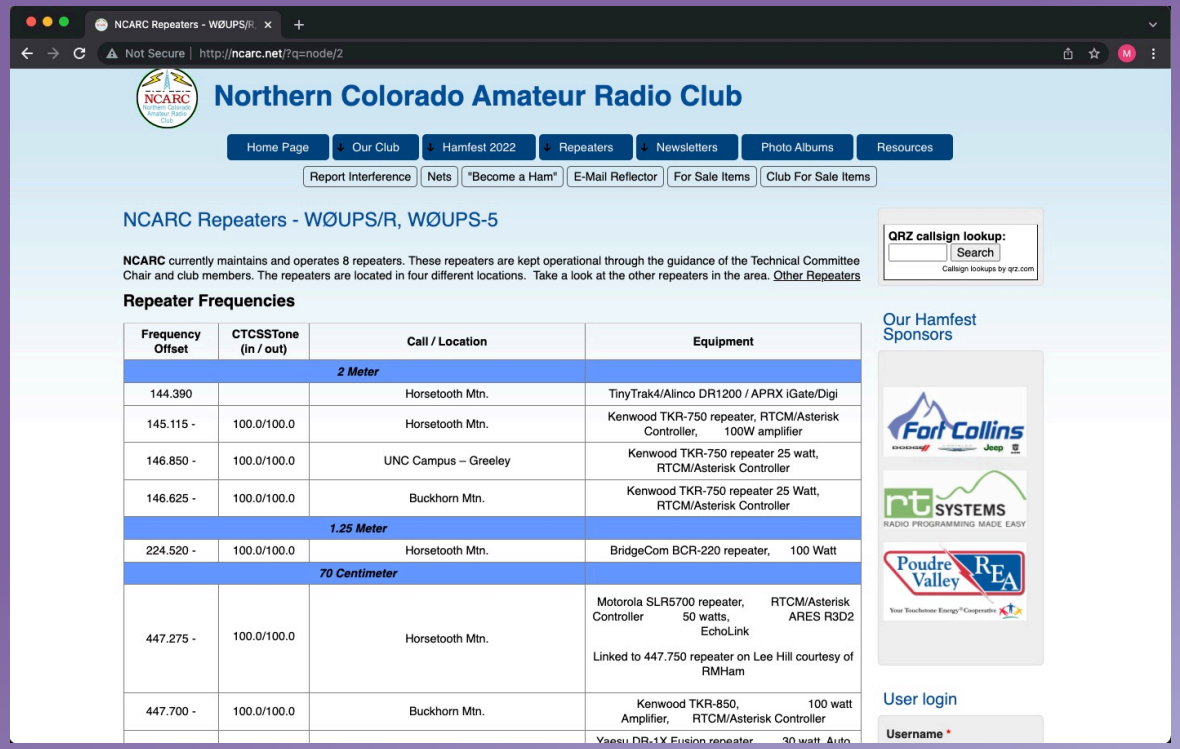
Nearest City	Site	Output Frequency	Input Frequency	Color Code
Buffalo, WY	Johnson County Airport	445.050	440.050	CC11
Casper, WY	Casper Mtn.	449.9875	444.9875	CC11
Cheyenne, WY	Archer Complex	449.975	444.975	CC11
Fort Collins, CO	Buckhorn Mtn.	446.9625	441.9625	CC11
Gillette, WY	Antelope Butte	447.1125	442.1125	CC11
Laramie, WY	Summit – Sherman Hill	447.225	442.225	CC11
Lovell, WY	Medicine Mtn	446.925	441.925	CC11
Rawlins, WY	R-Hill	445.050	440.050	CC11
Rock Springs, WY	Wilkins Peak			CC11
Shoshoni, WY	Copper Mtn	446.825	441.825	CC11
Sheridan, WY	Red Grade Ridge	446.725	441.725	CC11
Ten Sleep, WY	Meadowlark	446.625	441.625	CC11
Wheatland, WY	Cherry Knoll	446.9875	441.9875	CC11
WyDMR Portable Repeater	N/A	445.0125	440.0125	CC11

All WyDMR repeaters use CC11; Talk Group TG3156 on TS1 and Talk Group 100 on TS2.

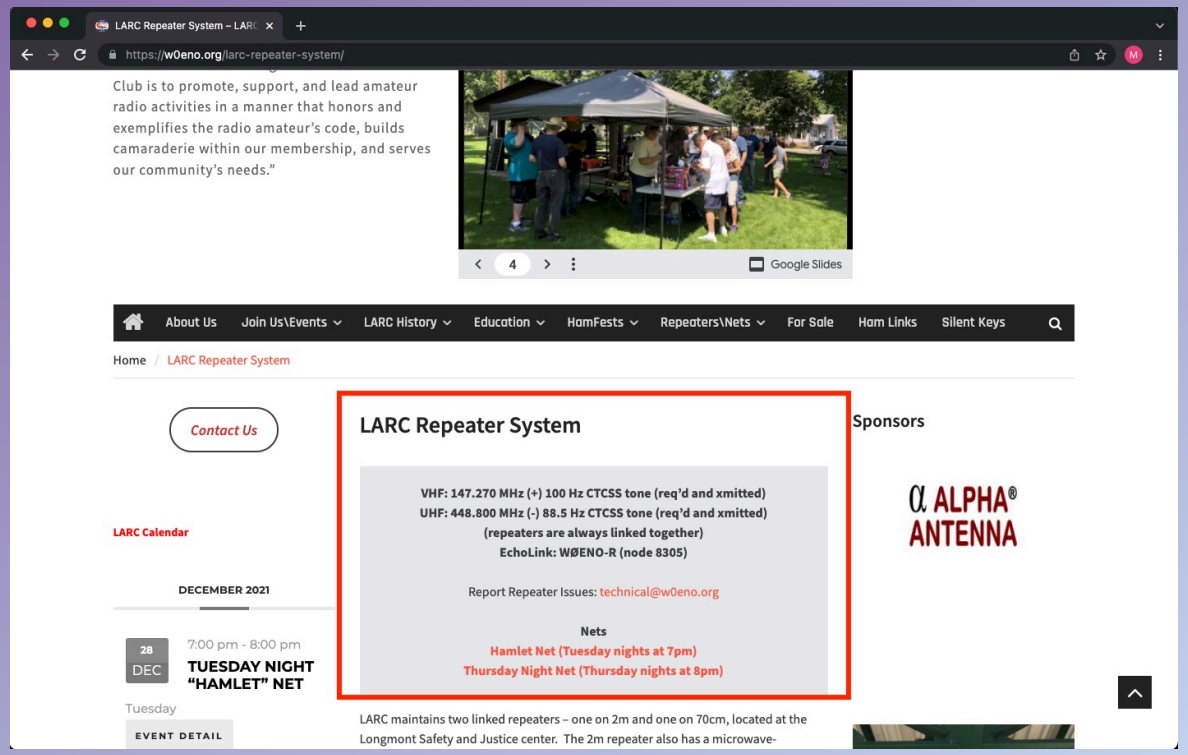
NOTES:

[WY_DMR]

Amateur Radio Club WEB Sites



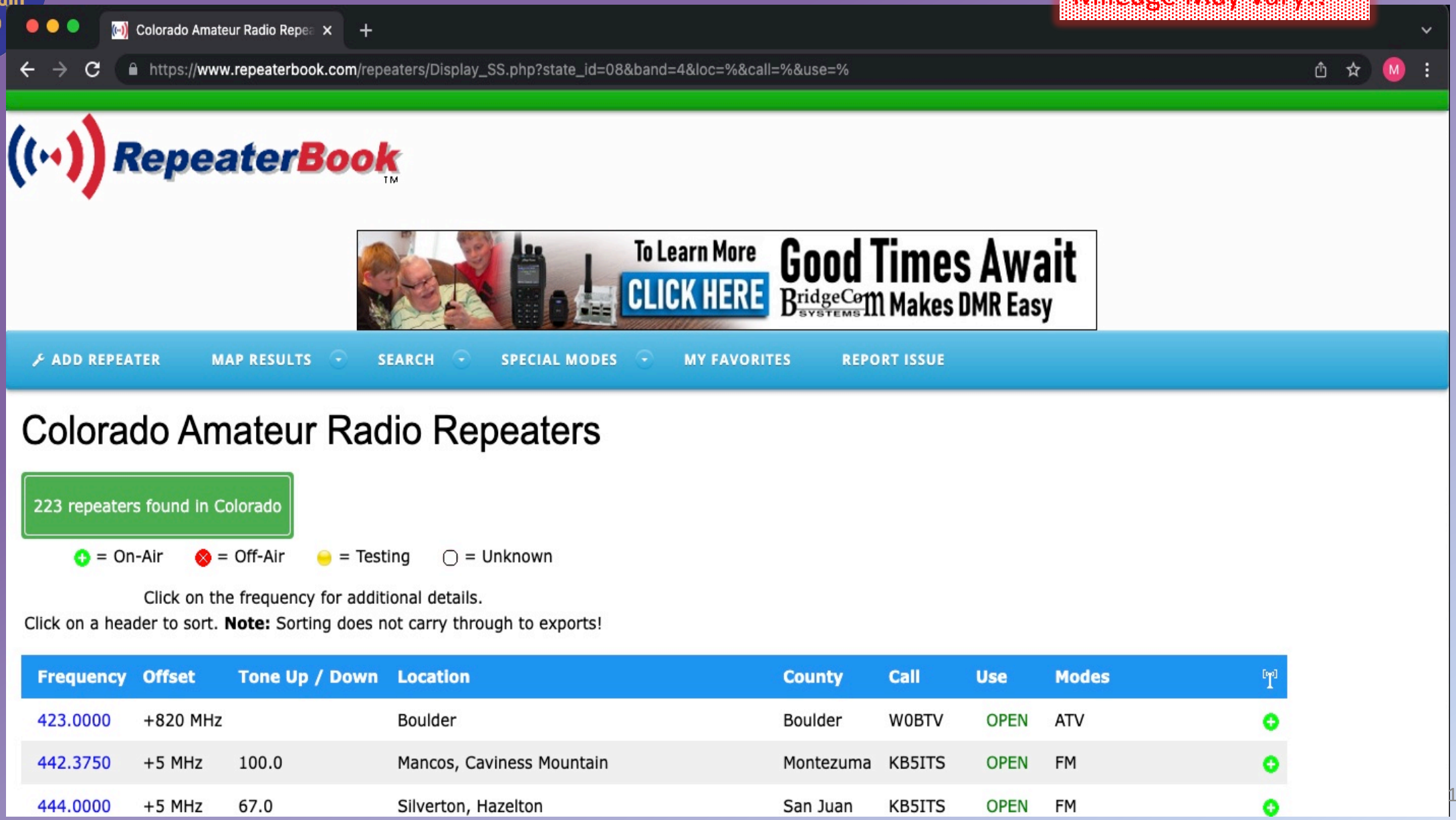
[NCARC Repeaters]



[LARC Repeaters]

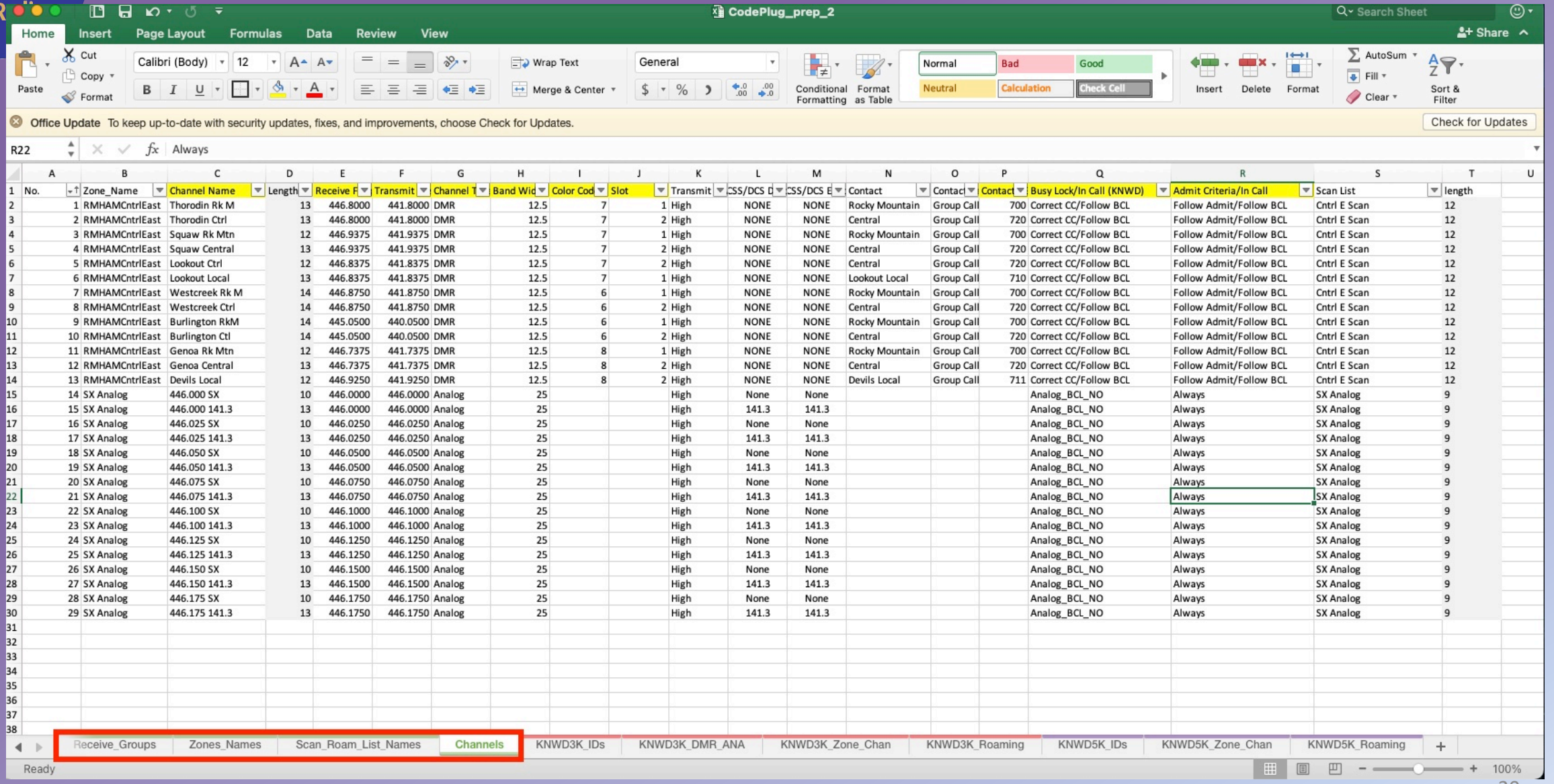
Another Option

Mileage May Vary!!



Frequency	Offset	Tone Up / Down	Location	County	Call	Use	Modes
423.0000	+820 MHz		Boulder	Boulder	W0BTV	OPEN	ATV
442.3750	+5 MHz	100.0	Mancos, Caviness Mountain	Montezuma	KB5ITS	OPEN	FM
444.0000	+5 MHz	67.0	Silverton, Hazelton	San Juan	KB5ITS	OPEN	FM

Putting It All Together



CodePlug_prep_2

Home | Insert | Page Layout | Formulas | Data | Review | View

Office Update To keep up-to-date with security updates, fixes, and improvements, choose Check for Updates.

R22 | Always

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	No.	Zone_Name	Channel Name	Length	Receive F	Transmit	Channel T	Band Wid	Color Cod	Slot	Transmit	CSS/DCS D	CSS/DCS E	Contact	Contact	Contact	Busy Lock/In Call (KNWD)	Admit Criteria/In Call	Scan List	length	
2	1	RMHAMCntrlEast	Thorodin Rk M	13	446.8000	441.8000	DMR	12.5	7	1	High	NONE	NONE	Rocky Mountain	Group Call	700	Correct CC/Follow BCL	Follow Admit/Follow BCL	Cntrl E Scan	12	
3	2	RMHAMCntrlEast	Thorodin Ctrl	13	446.8000	441.8000	DMR	12.5	7	2	High	NONE	NONE	Central	Group Call	720	Correct CC/Follow BCL	Follow Admit/Follow BCL	Cntrl E Scan	12	
4	3	RMHAMCntrlEast	Squaw Rk Mtn	12	446.9375	441.9375	DMR	12.5	7	1	High	NONE	NONE	Rocky Mountain	Group Call	700	Correct CC/Follow BCL	Follow Admit/Follow BCL	Cntrl E Scan	12	
5	4	RMHAMCntrlEast	Squaw Central	13	446.9375	441.9375	DMR	12.5	7	2	High	NONE	NONE	Central	Group Call	720	Correct CC/Follow BCL	Follow Admit/Follow BCL	Cntrl E Scan	12	
6	5	RMHAMCntrlEast	Lookout Ctrl	12	446.8375	441.8375	DMR	12.5	7	2	High	NONE	NONE	Central	Group Call	720	Correct CC/Follow BCL	Follow Admit/Follow BCL	Cntrl E Scan	12	
7	6	RMHAMCntrlEast	Lookout Local	13	446.8375	441.8375	DMR	12.5	7	1	High	NONE	NONE	Lookout Local	Group Call	710	Correct CC/Follow BCL	Follow Admit/Follow BCL	Cntrl E Scan	12	
8	7	RMHAMCntrlEast	Westcreek Rk M	14	446.8750	441.8750	DMR	12.5	6	1	High	NONE	NONE	Rocky Mountain	Group Call	700	Correct CC/Follow BCL	Follow Admit/Follow BCL	Cntrl E Scan	12	
9	8	RMHAMCntrlEast	Westcreek Ctrl	14	446.8750	441.8750	DMR	12.5	6	2	High	NONE	NONE	Central	Group Call	720	Correct CC/Follow BCL	Follow Admit/Follow BCL	Cntrl E Scan	12	
10	9	RMHAMCntrlEast	Burlington RkM	14	445.0500	440.0500	DMR	12.5	6	1	High	NONE	NONE	Rocky Mountain	Group Call	700	Correct CC/Follow BCL	Follow Admit/Follow BCL	Cntrl E Scan	12	
11	10	RMHAMCntrlEast	Burlington Ctl	14	445.0500	440.0500	DMR	12.5	6	2	High	NONE	NONE	Central	Group Call	720	Correct CC/Follow BCL	Follow Admit/Follow BCL	Cntrl E Scan	12	
12	11	RMHAMCntrlEast	Genoa Rk Mtn	12	446.7375	441.7375	DMR	12.5	8	1	High	NONE	NONE	Rocky Mountain	Group Call	700	Correct CC/Follow BCL	Follow Admit/Follow BCL	Cntrl E Scan	12	
13	12	RMHAMCntrlEast	Genoa Central	13	446.7375	441.7375	DMR	12.5	8	2	High	NONE	NONE	Central	Group Call	720	Correct CC/Follow BCL	Follow Admit/Follow BCL	Cntrl E Scan	12	
14	13	RMHAMCntrlEast	Devils Local	12	446.9250	441.9250	DMR	12.5	8	2	High	NONE	NONE	Devils Local	Group Call	711	Correct CC/Follow BCL	Follow Admit/Follow BCL	Cntrl E Scan	12	
15	14	SX Analog	446.000 SX	10	446.0000	446.0000	Analog	25			High	None	None				Analog_BCL_NO	Always	SX Analog	9	
16	15	SX Analog	446.000 141.3	13	446.0000	446.0000	Analog	25			High	141.3	141.3				Analog_BCL_NO	Always	SX Analog	9	
17	16	SX Analog	446.025 SX	10	446.0250	446.0250	Analog	25			High	None	None				Analog_BCL_NO	Always	SX Analog	9	
18	17	SX Analog	446.025 141.3	13	446.0250	446.0250	Analog	25			High	141.3	141.3				Analog_BCL_NO	Always	SX Analog	9	
19	18	SX Analog	446.050 SX	10	446.0500	446.0500	Analog	25			High	None	None				Analog_BCL_NO	Always	SX Analog	9	
20	19	SX Analog	446.050 141.3	13	446.0500	446.0500	Analog	25			High	141.3	141.3				Analog_BCL_NO	Always	SX Analog	9	
21	20	SX Analog	446.075 SX	10	446.0750	446.0750	Analog	25			High	None	None				Analog_BCL_NO	Always	SX Analog	9	
22	21	SX Analog	446.075 141.3	13	446.0750	446.0750	Analog	25			High	141.3	141.3				Analog_BCL_NO	Always	SX Analog	9	
23	22	SX Analog	446.100 SX	10	446.1000	446.1000	Analog	25			High	None	None				Analog_BCL_NO	Always	SX Analog	9	
24	23	SX Analog	446.100 141.3	13	446.1000	446.1000	Analog	25			High	141.3	141.3				Analog_BCL_NO	Always	SX Analog	9	
25	24	SX Analog	446.125 SX	10	446.1250	446.1250	Analog	25			High	None	None				Analog_BCL_NO	Always	SX Analog	9	
26	25	SX Analog	446.125 141.3	13	446.1250	446.1250	Analog	25			High	141.3	141.3				Analog_BCL_NO	Always	SX Analog	9	
27	26	SX Analog	446.150 SX	10	446.1500	446.1500	Analog	25			High	None	None				Analog_BCL_NO	Always	SX Analog	9	
28	27	SX Analog	446.150 141.3	13	446.1500	446.1500	Analog	25			High	141.3	141.3				Analog_BCL_NO	Always	SX Analog	9	
29	28	SX Analog	446.175 SX	10	446.1750	446.1750	Analog	25			High	None	None				Analog_BCL_NO	Always	SX Analog	9	
30	29	SX Analog	446.175 141.3	13	446.1750	446.1750	Analog	25			High	141.3	141.3				Analog_BCL_NO	Always	SX Analog	9	

Receive_Groups | Zones_Names | Scan_Roam_List_Names | Channels | KNWD3K_IDs | KNWD3K_DMR_ANA | KNWD3K_Zone_Chan | KNWD3K_Roaming | KNWD5K_IDs | KNWD5K_Zone_Chan | KNWD5K_Roaming

Ready

Why Commercial? (Pros / Cons)

- Pros:
  - Rugged / Dependable
  - RX (Front end) designed to be tight and interference free in complicated environments
  - There's a reason Public Safety uses them (reliable!)
  - Roaming (although one Chinese mfg now supports too)
  - Part 90 compliant (Auxcomm and for-profit event support)
    - Fake Part 90 certs
    - Timeslot violation / signal cleanliness

Why Commercial? (Pros / Cons)

- Cons:
  - CPS not usually free (but has been made pretty affordable to hams)
  - Usually spend a few more $’s if you want more bands (IE, must have more radios)
    - Single band (at least for VHF / UHF)

Commercial radios programming tips

- Best to use OEM cables (though there are a few trusted 3rd party that work “BlueMax49ers”)

- Use caution when buying cable (serial vs USB)

Motorola Radios - DMR

- Radio Models (XPR, SL, etc.)
- Batteries – Impress (smart) vs. Non-Impress
- Programming (OTA, WiFi, Cable, Bluetooth, Through-Charger)
- Ignition sense!

Motorola Radios - DMR

Motorola Radios – P25

Motorola Radios - DMR

Motorola Radios – P25

Motorola Radios

MOTOTRBO KEY FEATURES BY TIER

	Commercial		Entry	Enhanced	
	Voice		Voice | Basic Systems	Voice | Data | Enhanced Apps	
	CP 200d MSRP: $482-$600	SL300 MSRP: $550-$633	XPR 3000 Series MSRP: $575-$675	XPR 7000 Series MSRP: $1040-$1165	SL Series MSRP:$1,165
Display	N/A	Optional	Monochrome -1 line	Color – 5 lines	Color – 5 Lines
# of Channels	16	2 or 99	128	1,000	1,000
Bluetooth Data	N/A	N/A	N/A	Optional	Optional
Bluetooth Audio	N/A	N/A	N/A	Yes	Yes
Intrinsically Safe	N/A	N/A	N/A	Optional	No
GPS	N/A	N/A	N/A	Yes	No
Expansion Card/ Applications	N/A	N/A	N/A	Integrated	Integrated
Text Messaging	N/A	N/A	Yes	Yes	Yes
IP Rating	IP54	IP54	IP55	IP57	IP54
Intelligent Audio	N/A	N/A	Yes	Yes	Yes
Systems Capable	N/A	N/A	Optional	Yes	Yes
Enhanced Privacy	N/A	N/A	Optional	Yes	Yes
Emergency	N/A	Yes (No Button)	Yes (No Button)	Yes	Yes
Digital Mode	Optional	Yes	Yes	Yes	Yes
Voice Announcement	Yes	Yes	Yes	Yes	Yes

Motorola Radios – ACC

Motorola Radios – ACC

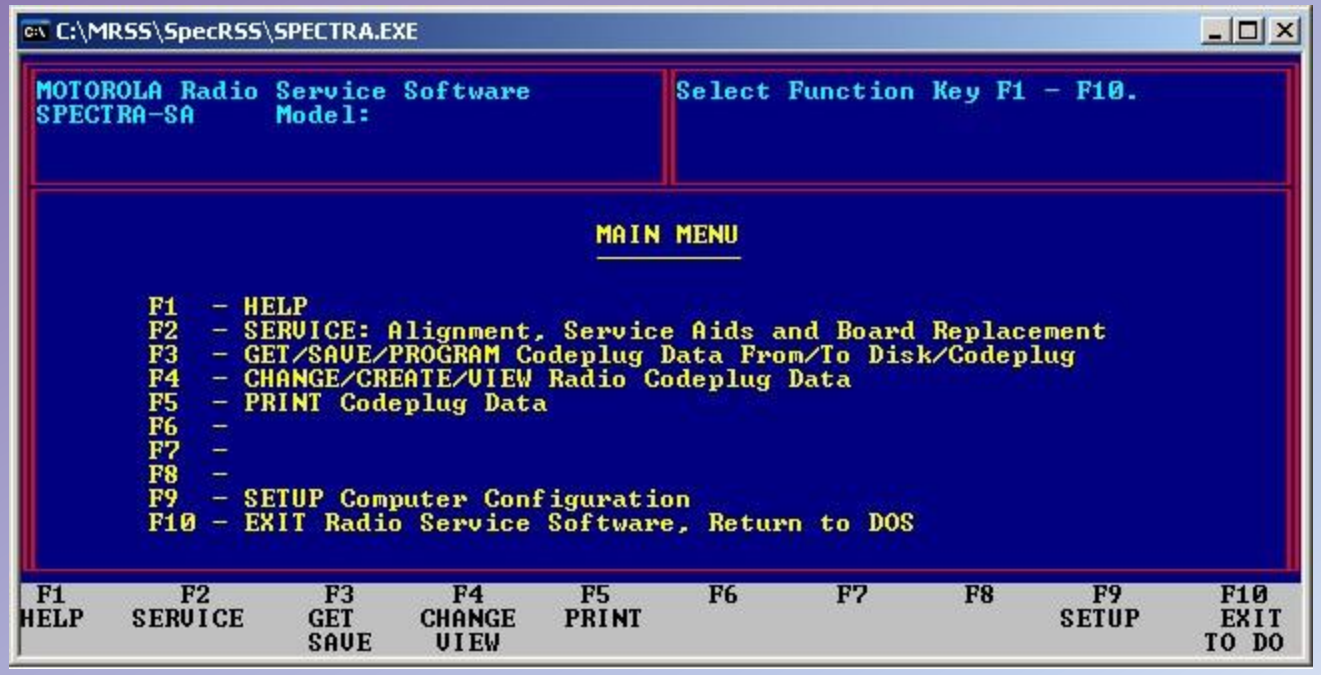
Motorola Radios – older analog

Sidetrack

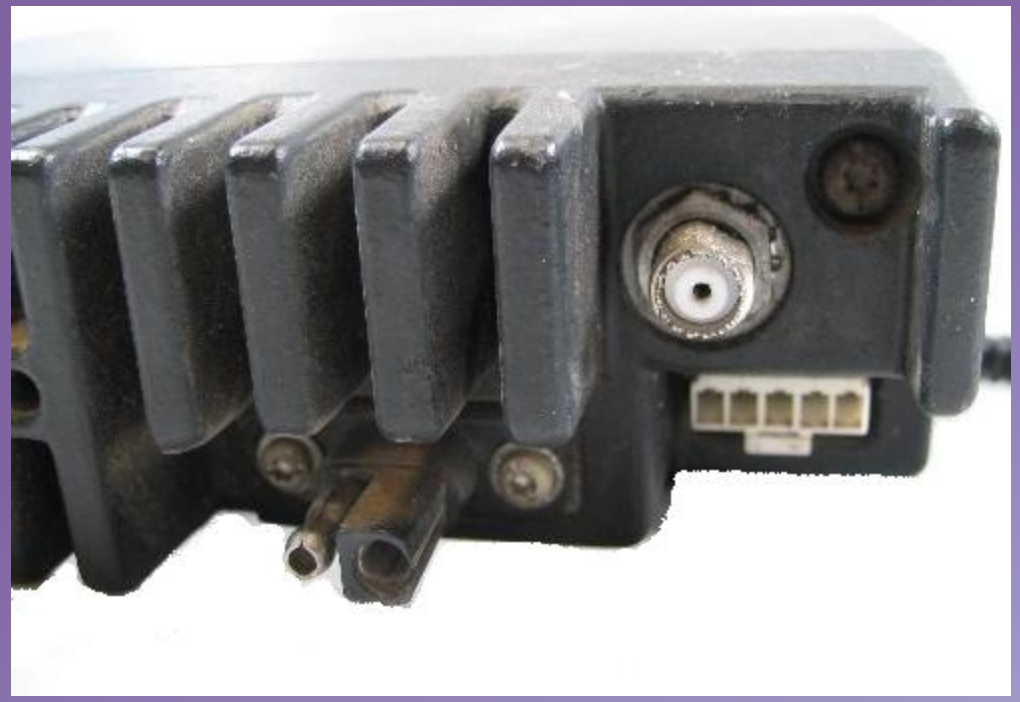
Motorola Radios – older analog

Motorola Radios – older analog

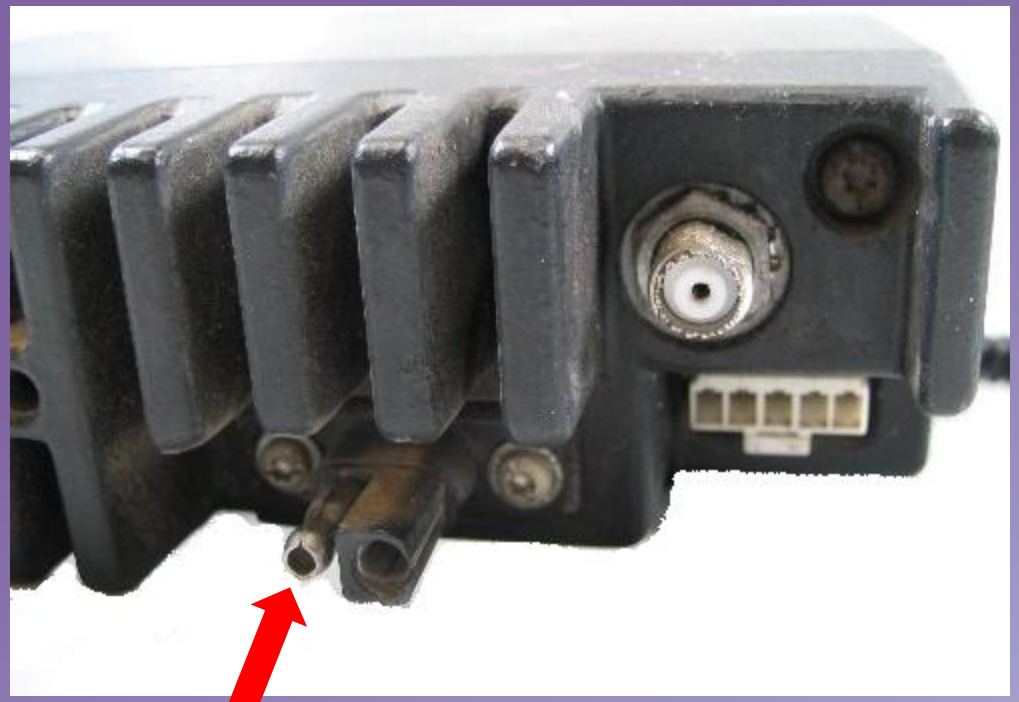
Motorola Radios – older analog



Motorola Radios – older analog



Motorola Radios – older analog



Motorola Radios – older analog

Back to Home

The Motorola®
Index Page

Maintained by Robert Meister WA1MIK

This page has undergone a major reorganization.
Everything is all still here; items just got moved.
Use your browser's SEARCH function
to find things, as they're now sorted better.

Motorola was split into two different companies early in 2011. There is still some confusion out there as to what products are handled by which company:

Motorola Solutions - effectively the old Motorola: deals with land mobile / two-way radio equipment, Canopy wi-fi systems, and some other things that are radio related. If you go to www.motorolasolutions.com you are viewing the Motorola two-way (etc) company.

Motorola Mobility - essentially everything that is not land mobile / two-way radio: cable TV boxes, cellphones and some other things. This is the part Google offered to buy in August 2011 for $12.5 billion. If you go to www.motorola.com you are viewing the Motorola Mobility web site. That web sit has no concept of land mobile / two-way radio - not even a courtesy pointer.

Note: Any Motorola parts or manual prices mentioned on this page (or on any page at this web site) should be taken only as a rough guideline. Motorola adjusts prices quarterly, and offers one set of prices to their dealers/service shops (the so called "National Service Organization" (or "NSO") Pricing), a "self-maintaining" fleet customers (i.e. those that have their own radio shops... cities, counties, police departments, fire departments, etc) and a third set of prices on their telephone order desk (i.e. retail sales). For these reasons readers should use the prices mentioned in an article only as a rough indication. appreciate an emailed update if you discover a major price change on any item.

Note: Many articles on this page (or on any page at this web site) mention manual product numbers. Those manuals were available at the time the article was written but may no longer be available today. Motorola usually discontinues support for radio products that are over ten (10) years old. This mean parts and no more manuals. If you need a manual for a radio, call Motorola and see if it's still available. If not, you'll have to look for a used one being sold privately or on the popular auction sites.

General Information Pages and Articles:

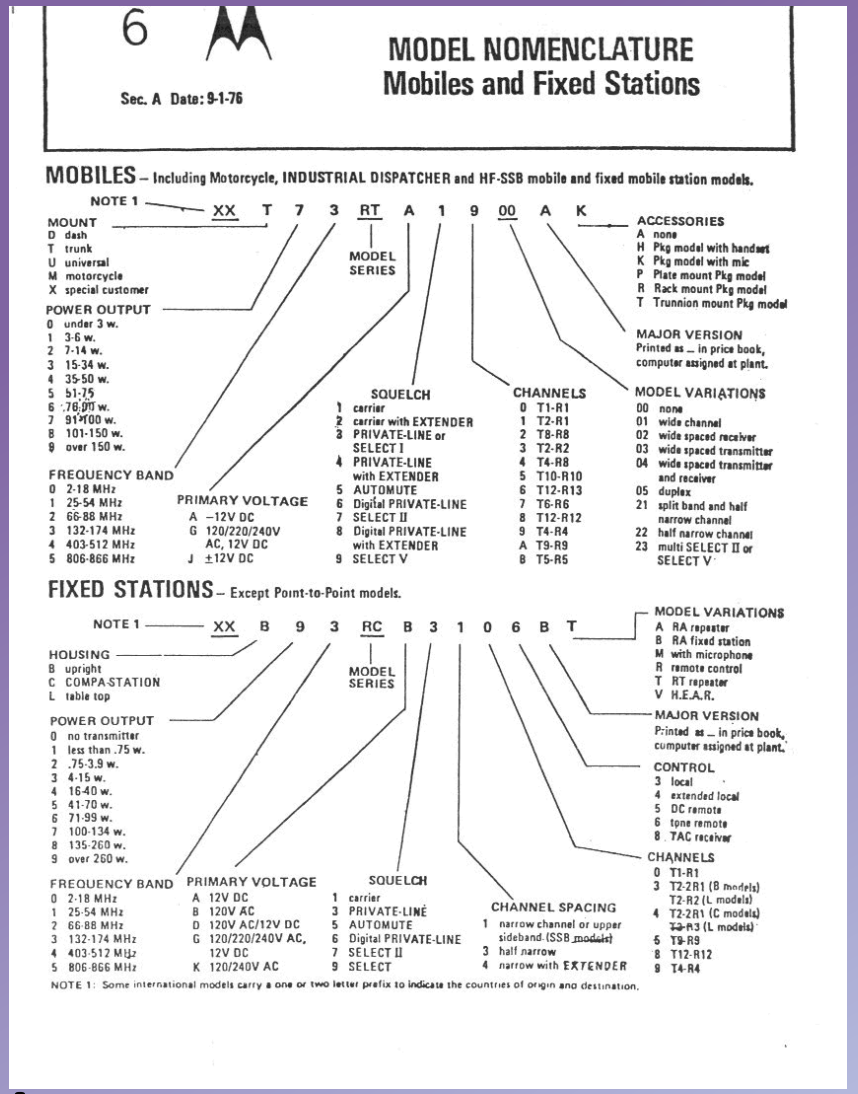
It's probably wise to read some of this first, because it will answer a lot of questions that may pop up as you navigate to other pages and read other articles.

- How to order manuals or parts from Motorola by Mike Morris WA6ILQ.
  Some of the tricks I've picked up over the years...
- Figuring out what you have by Mike Morris WA6ILQ.
  Cracking the model / ID number... with explanations of power levels, frequency bands, and a suffix table.
- Deciphering the three-letter-and-four-digit part numbers by Mike Morris WA6ILQ.
  A web page compilation the number breakdown table. The data is combined from four different vintages of old Motorola Buyer's Guide publications.
- Deciphering the first two digits of part numbers by Robert Meister WA1MIK.
  A list of the parts categories from a 1976 publication.
- Accounting Product Code (APC) List
  Decodes the first three digits of many two-way product serial numbers.
- Translating the battery date code by Mike Pugh KA4MKG
- Determining Date of Manufacture from the Serial Number
- Touch Up Paint Colors by Mike Morris WA6ILQ.
  For years Moto has offered spray cans of color matched paint in their parts catalog. This is a list of the colors and part numbers that I know of, the usage and a few notes on alternate methods of color matching. Corrections and additions to the paint color table are quite welcome.
- Radio Service Software (RSS) and the Radio Interface Box (RIB)
  Some problems and some solutions... Compiled from information provided by several knowledgeable folks. Includes schematics of various RIBs.
- The Motorola Test Equipment Page Radio test equipment made by or for Motorola.
- The Motorola Portable Test Set Page Radio test sets, metering kits and accessories.
  Information on several vintages including the P-8501, TU546, S1056, S1057, S1058, S1059 series, R1033, RTX4005 and several base station / repeater test sets. Also has several portable radio test and programming cables.

Radio-Specific Pages and Articles:

http://repeater-builder.com

Motorola Radios – older analog



6

Sec. A Date: 9-1-76

MODEL NOMENCLATURE
Mobiles and Fixed Stations

MOBILES – Including Motorcycle, INDUSTRIAL DISPATCHER and HF-SSB mobile and fixed mobile station models.

NOTE 1 — XX T 7 3 RT A 1 9 00 A K

MOUNT
D dash
T trunk
U universal
M motorcycle
X special customer

POWER OUTPUT
0 under 3 w.
1 3-6 w.
2 7-14 w.
3 15-34 w.
4 35-50 w.
5 51-75 w.
6 76-100 w.
7 91-100 w.
8 101-150 w.
9 over 150 w.

FREQUENCY BAND
0 2-18 MHz
1 25-54 MHz
2 66-88 MHz
3 132-174 MHz
4 403-512 MHz
5 806-866 MHz

PRIMARY VOLTAGE
A –12V DC
G 120/220/240V AC, 12V DC
J ±12V DC

MODEL SERIES

SQUELCH
1 carrier
2 carrier with EXTENDER
3 PRIVATE-LINE or SELECT I
4 PRIVATE-LINE with EXTENDER
5 AUTOMUTE
6 Digital PRIVATE-LINE
7 SELECT II
8 Digital PRIVATE-LINE with EXTENDER
9 SELECT V

CHANNELS
0 T1-R1
1 T2-R1
2 T8-R8
3 T2-R2
4 T4-R8
5 T10-R10
6 T12-R13
7 T6-R6
8 T12-R12
9 T4-R4
A T9-R9
B T5-R5

MODEL VARIATIONS
00 none
01 wide channel
02 wide spaced receiver
03 wide spaced transmitter
04 wide spaced transmitter and receiver
05 duplex
21 split band and half narrow channel
22 half narrow channel
23 multi SELECT II or SELECT V

MAJOR VERSION
Printed as ... in price book, computer assigned at plant.

ACCESSORIES
A none
H Pkg model with handset
K Pkg model with mic
P Plate mount Pkg model
R Rack mount Pkg model
T Trunnion mount Pkg model

FIXED STATIONS – Except Point-to-Point models.

NOTE 1 — XX B 9 3 RC B 3 1 0 6 B T

HOUSING
B upright
C COMPA-STATION
L table top

POWER OUTPUT
0 no transmitter
1 less than .75 w.
2 .75-3.9 w.
3 4-15 w.
4 16-40 w.
5 41-70 w.
6 71-99 w.
7 100-134 w.
8 135-260 w.
9 over 260 w.

FREQUENCY BAND
0 2-18 MHz
1 25-54 MHz
2 66-88 MHz
3 132-174 MHz
4 403-512 MHz
5 806-866 MHz

PRIMARY VOLTAGE
A 12V DC
B 120V AC
D 120V AC/12V DC
G 120/220/240V AC, 12V DC
K 120/240V AC

MODEL SERIES

SQUELCH
1 carrier
3 PRIVATE-LINE
5 AUTOMUTE
6 Digital PRIVATE-LINE
7 SELECT II
9 SELECT

CHANNEL SPACING
1 narrow channel or upper sideband (SSB models)
3 half narrow
4 narrow with EXTENDER

CHANNELS
0 T1-R1
3 T2-2R1 (B models) T2-R2 (L models)
4 T2-2R1 (C models) ~~T2-R3~~ (L models)
5 T9-R9
8 T12-R12
9 T4-R4

CONTROL
3 local
4 extended local
5 DC remote
6 tone remote
8 TAC receiver

MAJOR VERSION
Printed as ... in price book, computer assigned at plant.

MODEL VARIATIONS
A RA repeater
B RA fixed station
M with microphone
R remote control
T RT repeater
V H.E.A.R.

NOTE 1: Some international models carry a one or two letter prefix to indicate the countries of origin and destination.

http://repeater-builder.com

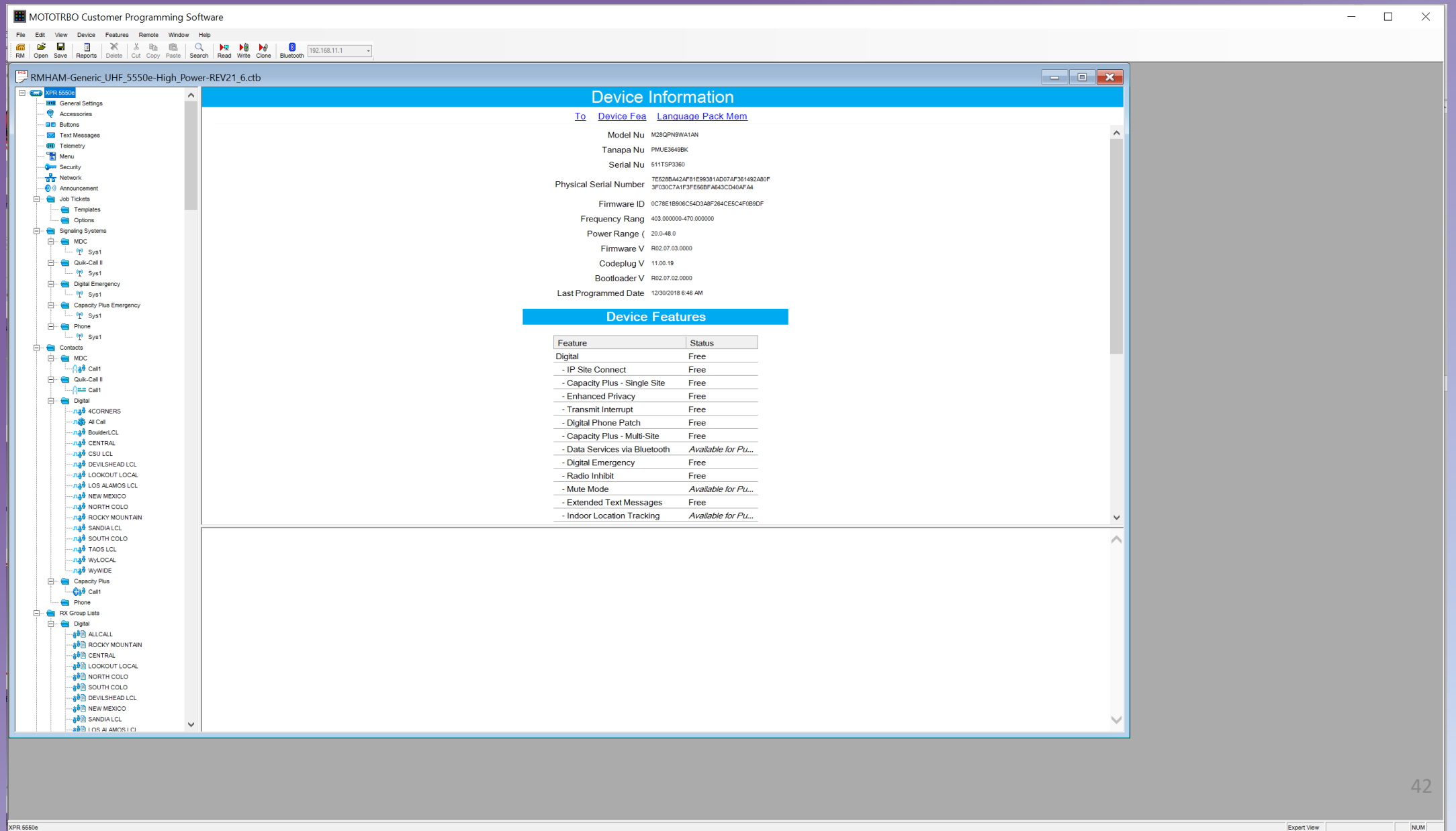
Motorola Radios

Now, back to DMR programming…..

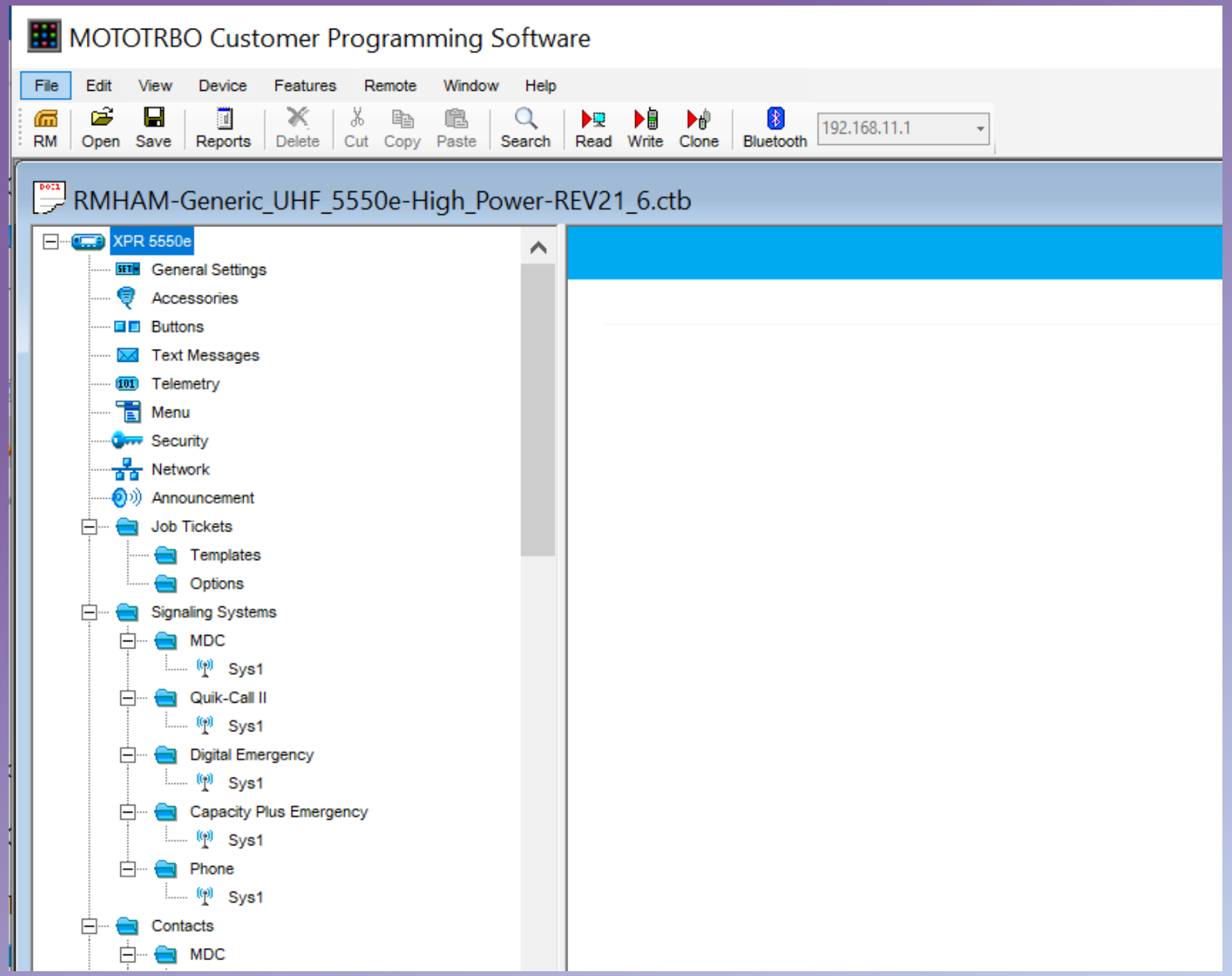
Motorola CPS

- 16.0 vs. 2.0
  - 16.0 Build 828
  - 2.0 (Between 2.0 and 2.10)
- Firmware
- Hardware vs. Software features (EID entitlements)
  - Wideband keys, Audio keys

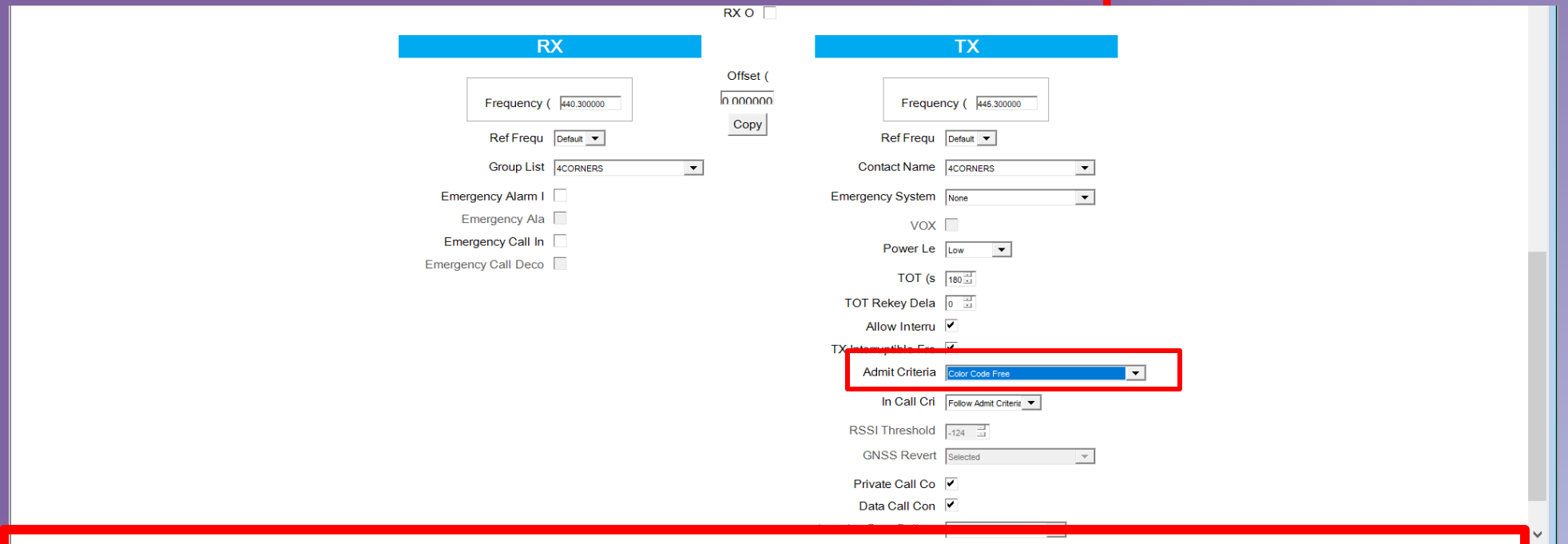
Motorola CPS



Motorola CPS



Motorola CPS – Help!!



Admit Criteria

Determines when voice or data is allowed to be transmitted on the channel. This is used to prevent a radio from transmitting on channels that are already being used. If the radio has different transmit and receive frequencies, only the receive frequency is monitored for activity. If no activity is found on the receive frequency, the radio allows the user to transmit on the transmit frequency even if it is being used. This is a channel-wide feature.

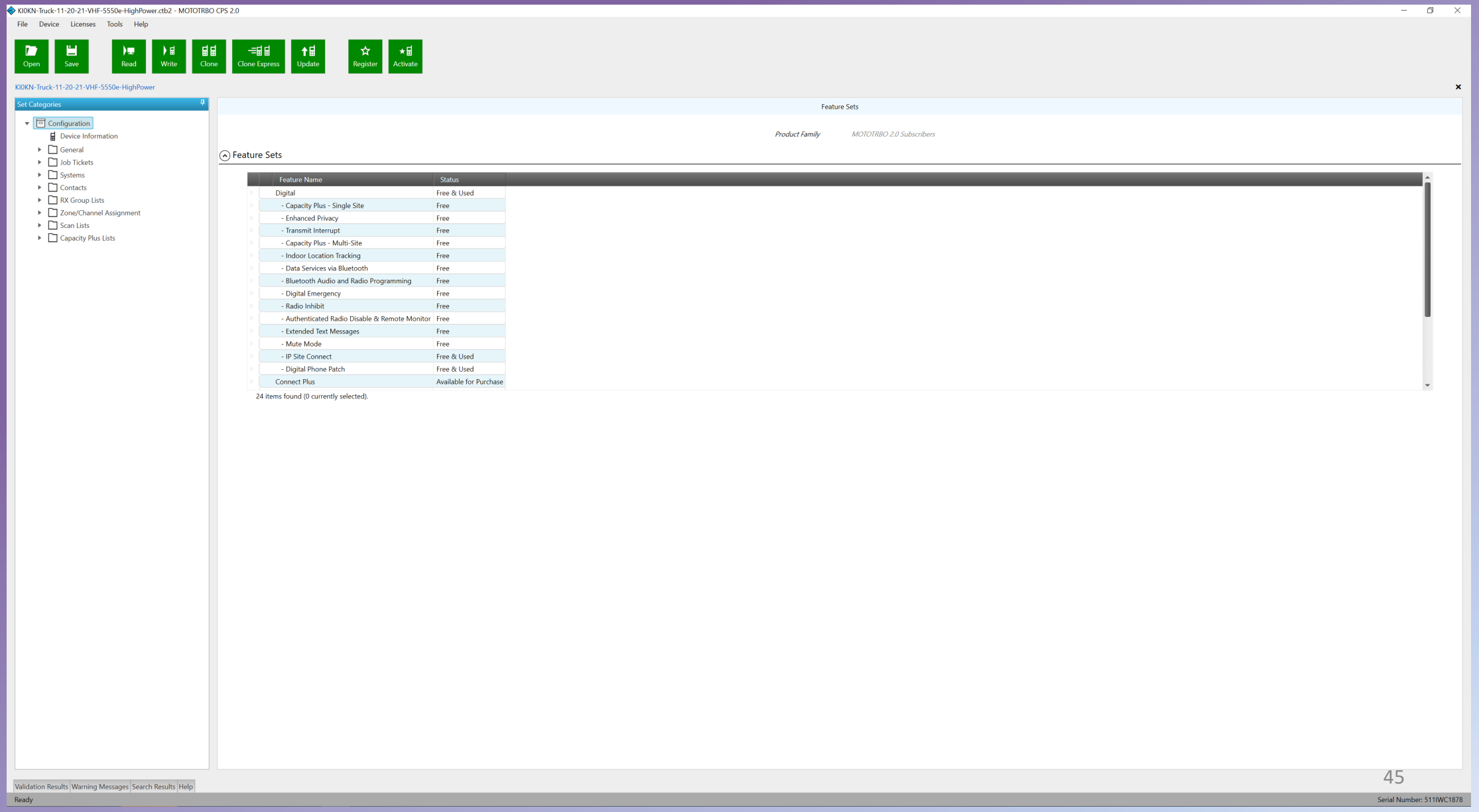
Options

Always	The radio will always transmit when the Push-to-Talk (PTT) button is pressed. This option is also referred to as "Impolite" channel access (not available in a Capacity Plus - Single Site Personality and Capacity Plus - Multi Site Personality channel).
Channel Free	The radio will check for an idle channel prior to allowing a transmission. This option is also referred to as "Polite to All" channel access.
Correct PL	The radio will check for a PL match prior to allowing a transmission. This option is available only when Rx Squelch Type is set to TPL or DPL (for Analog channels only).
Color Code Free	The radio will check if the specified Color Code is not in use prior to allowing transmission (except for Group Calls that are already in progress). This option is also referred to as "Polite to Own Digital System" channel access (for Digital channels only).
Past TPL/DPL Lockout	Transmission is allowed when there is no carrier, or the correct PL has been detected since the latest carrier presence (for 5 Tone channels only).
TPL/DPL Lockout	Transmission is allowed when there is no carrier, or the correct PL has been detected (for 5 Tone channels only).
Carrier Gone Timer Expired	Transmission is allowed when there is no carrier and the Carrier Gone Timer has expired. (for 5 Tone channels only).
TPL/DPL Not Detected	Transmission is allowed if the correct PL is not detected. (for 5 Tone channels only).
No TPL/DPL or Past TPL/DPL	Transmission is allowed when there is no carrier, or the correct PL has not been detected since the latest carrier presence. (for 5 Tone channels only).
Channel Free or No TPL/DPL but Past TPL/DPL	Transmission is allowed when there is no carrier, or the correct PL has been detected since the latest carrier presence but not detected now (for 5 Tone channels only).

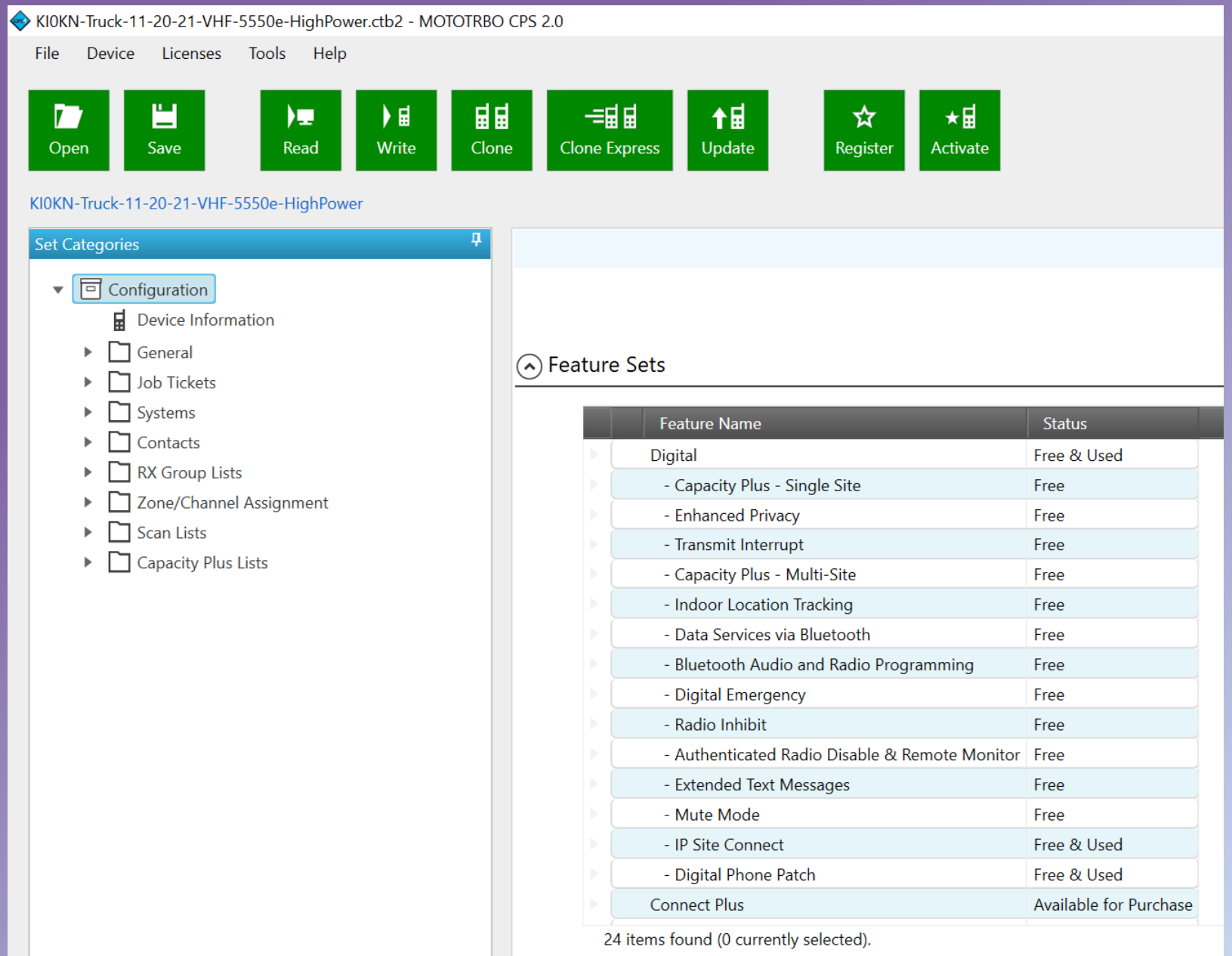
Notes

- Not all transmission types utilize these settings. For example, emergency voice always operates impolitely whereas data and control messages always operates politely. An exceptional case is the emergency alarm that is sent with a mix of impolite and polite channel access.
- The RX Only feature must be disabled.

Motorola CPS

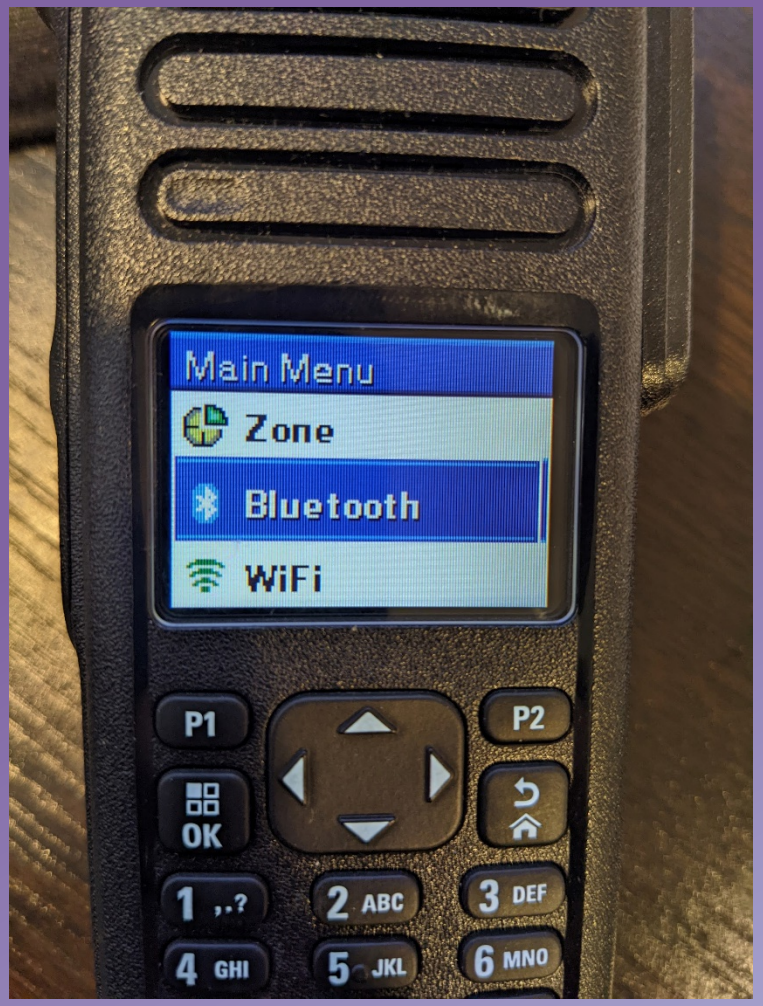


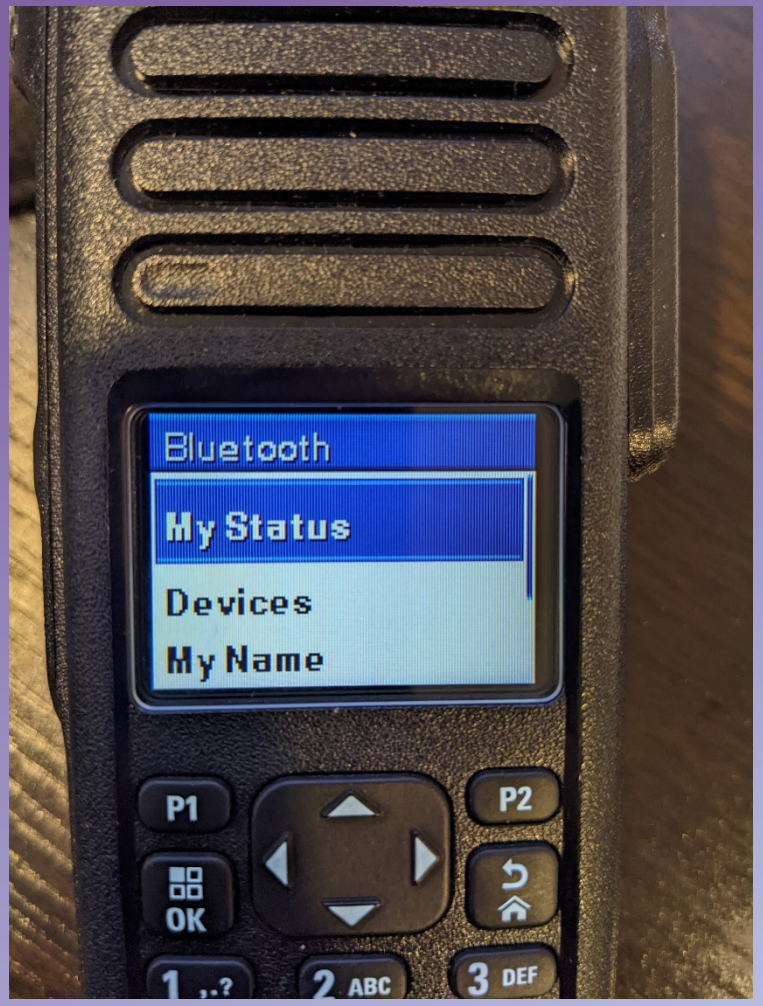
Motorola CPS



Motorola CPS – Bluetooth!

Motorola CPS – Bluetooth!





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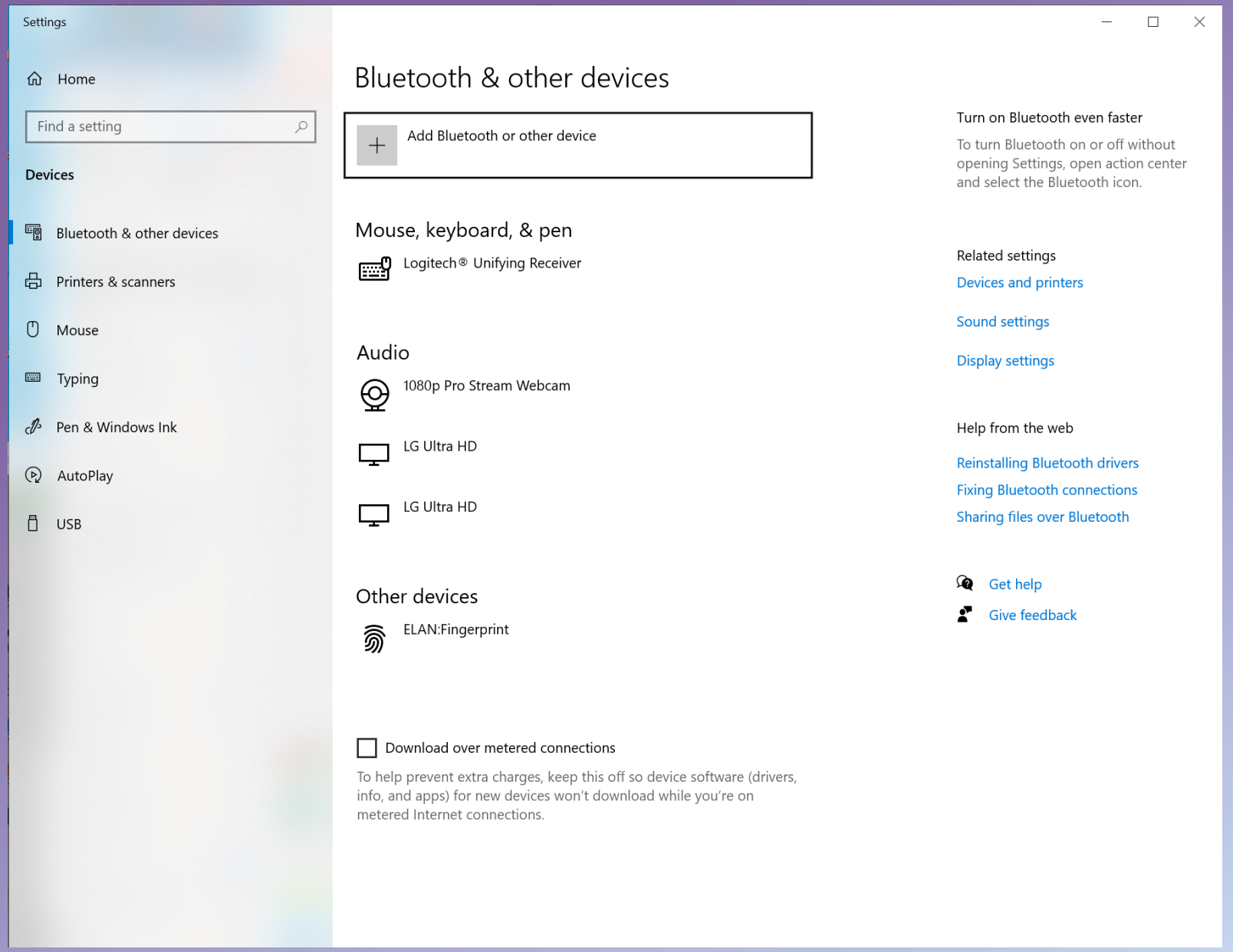

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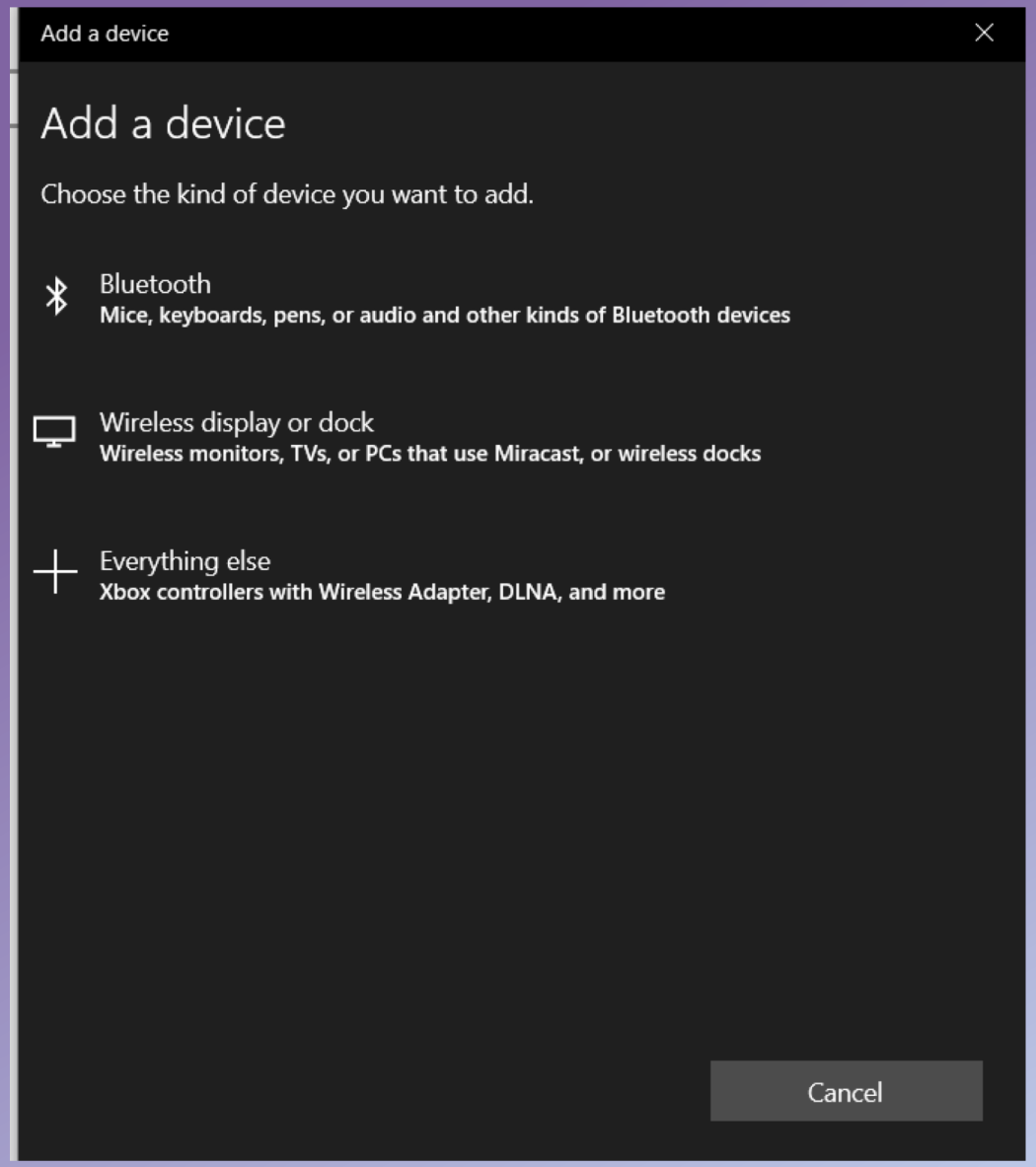
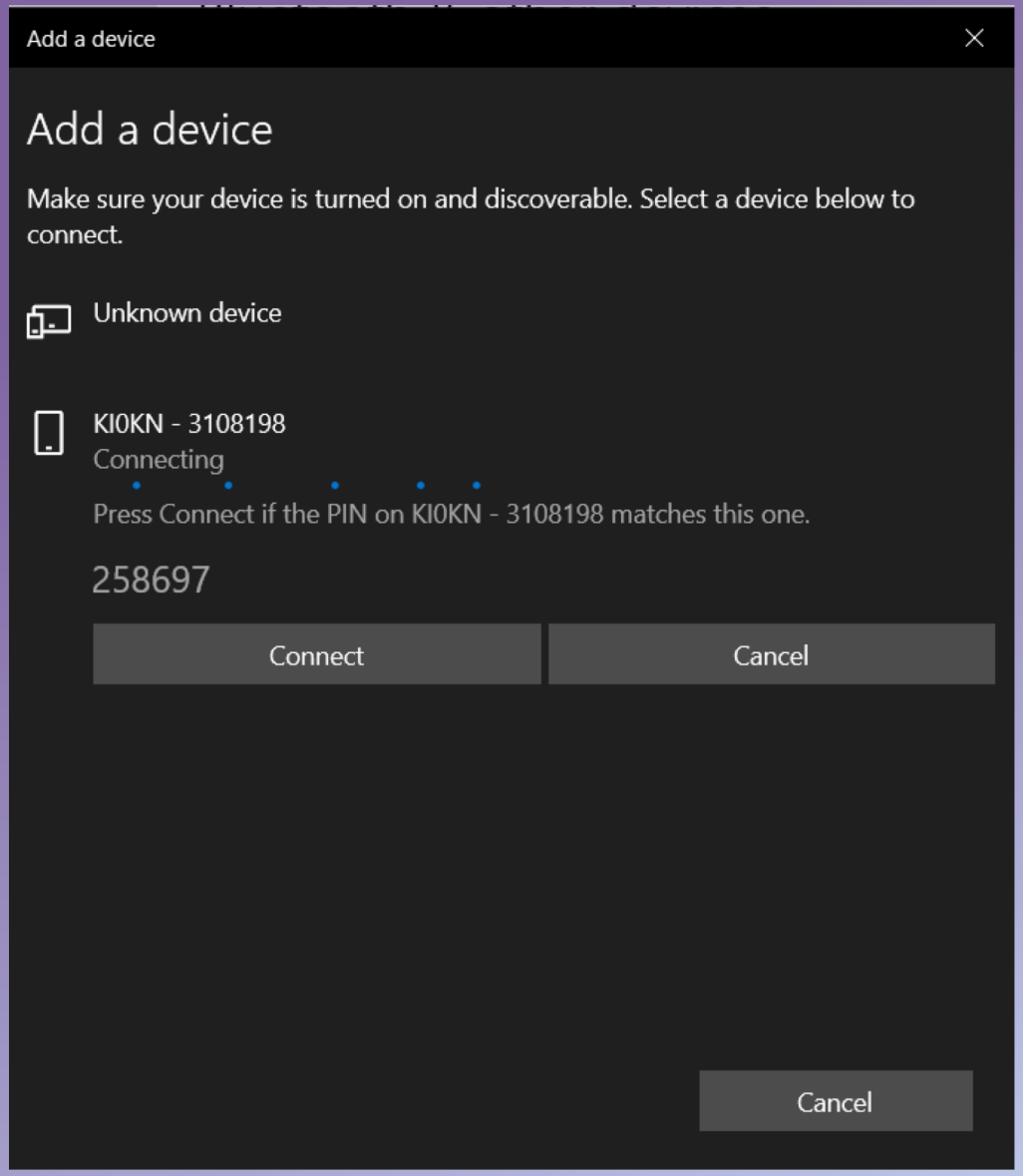


Motorola CPS – Bluetooth!



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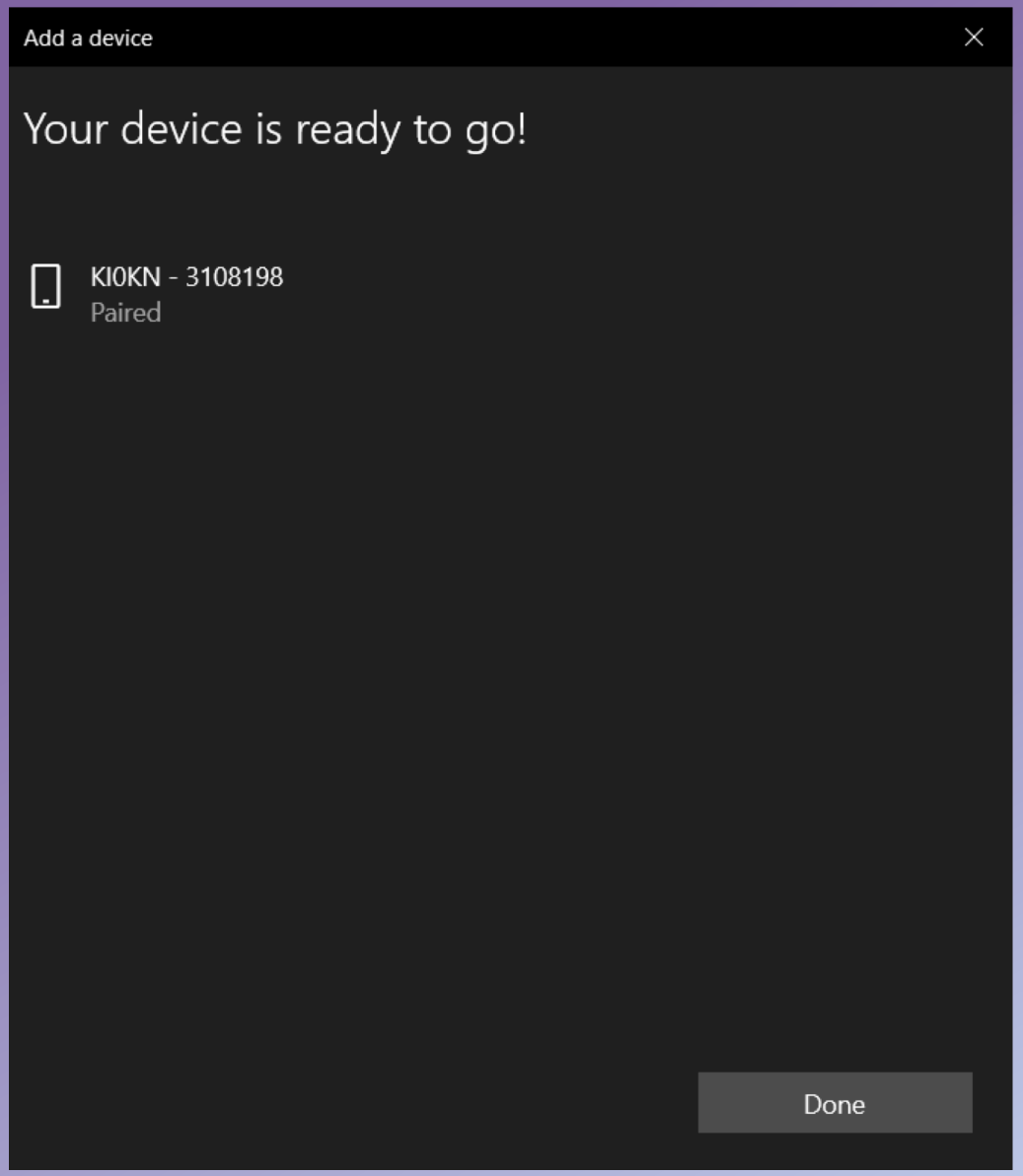
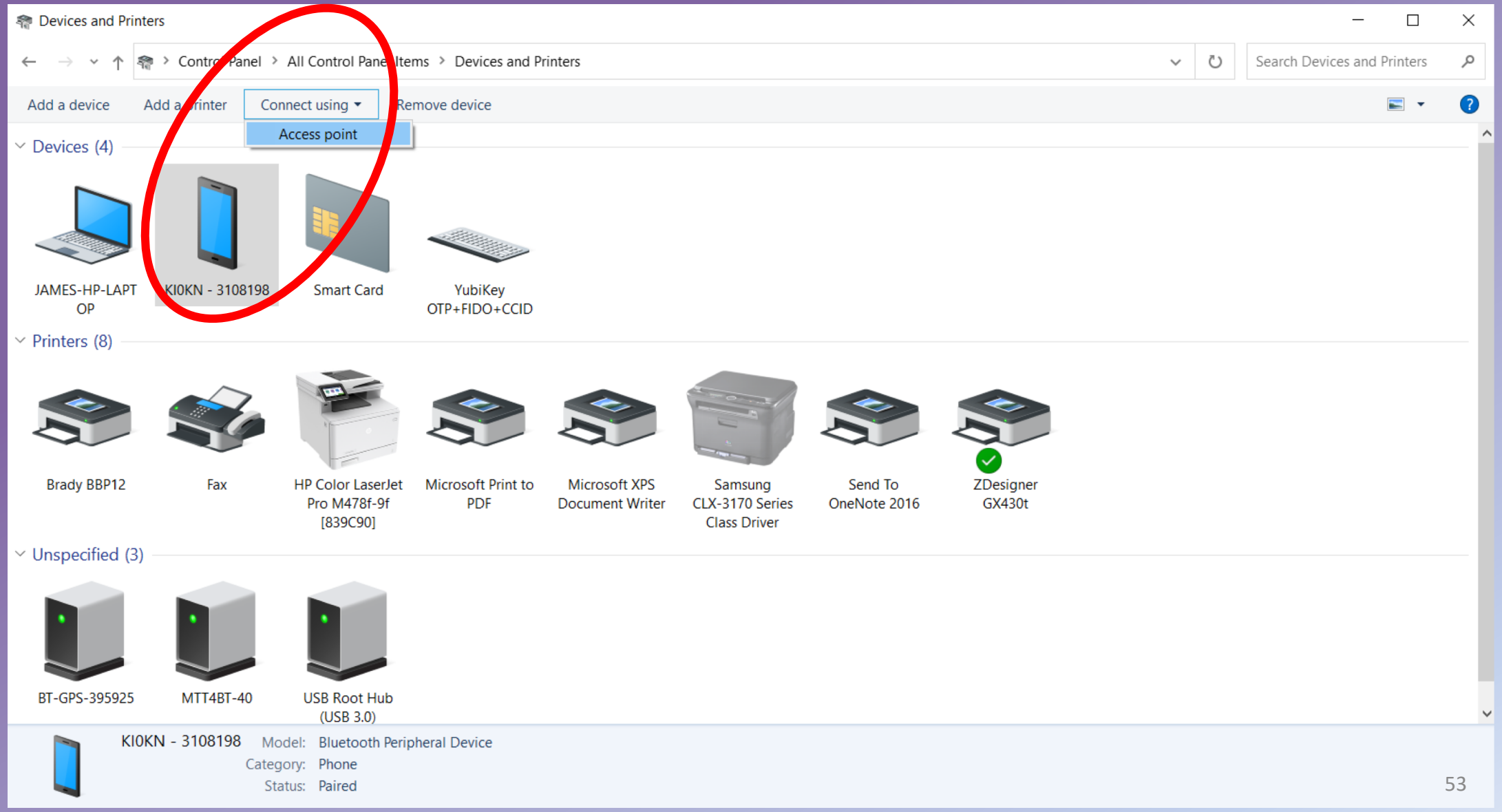


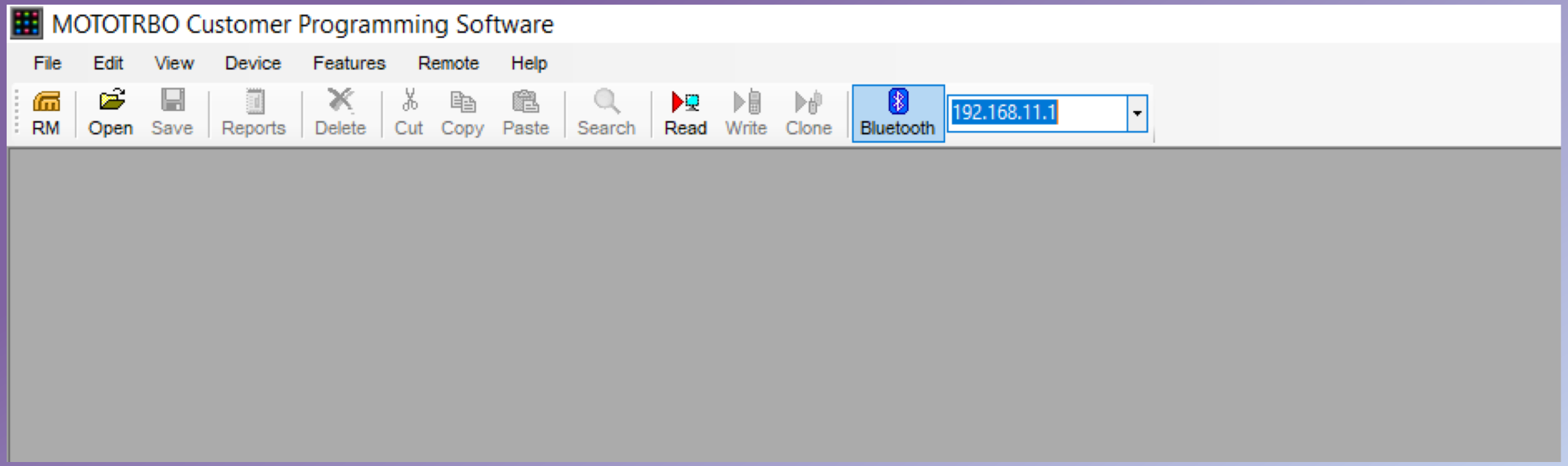
Motorola CPS – Bluetooth!



Motorola CPS – Bluetooth!

BEEP!!!

Motorola CPS – Bluetooth!



Read / Write / Clone (No firmware, no EID)

Motorola Codeplug - Basics

- General settings
  - Radio ID
  - AGC
  - Talk permit
  - Power
- Accessories
  - Ignition sense
- Buttons
- Contacts / RX Groups / Channels / Scan / Roam

Motorola Codeplug – Talking points

- Firmware – update – difference 16.0 vs 2.0
- Wideband entitlements (EID)
  - Software vs Hardware
  - Audio features
    - Features worth licensing (RX audio leveling)
      - Careful, can lose entitlement on radio that doesn't support it!

Motorola Codeplug – Talking points

- General settings
  - Radio name
  - Radio ID
  - High/Low Power
  - Codeplug password
  - Audio profile (Adjust to preference)
  - Microphone (AGC enabled)
  - Talk permit (analog, digital and A+D)

Motorola Codeplug – Talking points

- Accessories
  - Ignition sense
  - Gains (Optimized in RMHAM plugs)
  - GPIO pins

Motorola Codeplug – Talking points

- Buttons
  - Live demo of buttons on HT / Mobiles

Motorola Codeplug – Talking points

- Menu
  - Show / remove items in the radio menu
  - Live demo of radio menu items

Motorola Codeplug – Talking points

- Security
  - Not allowed for HAM, useful for Part 90
  - RAS key can bite you! Make sure it's removed!
    - Defaults to "enabled" in CPS 2.0, but without a value so programming fails.

Motorola Codeplug – Talking points

- Network
  - Mostly for repeaters
  - Bluetooth enable
    - Mic routing

Motorola Codeplug – Talking points

- Contacts
  - Only section – Digital
    - Group contact / Individual contact
    - Must have group contact for each talkgroup
      - Where you enter TG id number
  - Individual contacts
    - Can cut/paste for other plugs
    - Cannot use CSV
      - Tool exists to import CSV
        - » Legality questionable since opening proprietary Codeplug file

CPS

Motorola Codeplug – Talking points

- RX Group lists
  - Must have one “group” list for each TG
    - Group membership should only be digital contact for that TG

Motorola Codeplug – Talking points

- Channels
  - Zones are collection of channels
    - Can be Digital, Analog, or combo
  - Analog channels:
    - Make sure channel bandwidth 25 (very low audio if not)
    - Scan/roam can be set here, easier in top zone view
    - Allow talkaround (explain talkaround vs. reverse)
    - Frequency entry (offset button, make sure ALL data is correct to copy)
    - TPL reverse (reverse burst)
    - Power level
    - TOT set (180 default for sample codeplugs)

Motorola Codeplug – Talking points

- Channels
  - Digital channels:
    - Set Color Code
    - Set timeslot
    - Allow talkaround (explain talkaround)
    - Make sure IP Site connect checked for repeater channels
    - Make sure RX Group set
      - best to set RX Group list for TG, otherwise will hear nothing/everything
    - Make sure TX Contact set
      - Radio will not TX without this!
      - Use “Allcall” for simplex channels
    - TOT set (180 default)
    - Allow interrupt set (can override from repeater if needed)
    - Enhanced channel access set (helps doubling)
      - SOME radios allow same ID reception

Motorola Codeplug – Talking points

- Channels (cont'd)
  - Admit criteria
    - Color Code free (Queries repeater to see if free, make talk permit tone work)
    - Always (Used for analog channels, repeater will keep you from transmitting until it's PTT dropped if this is not set right)

Motorola Codeplug – Talking points

- Channel Pools
  - Use 1 channel + roam
  - Lots more channel than 99 channel radios
  - Use remaining channels for simplex, analog, etc.

CPS

Motorola Codeplug – Talking points

- Scan
  - Scan lists are collections to scan when scan feature is on
    - Button assignment for scan
    - Pitfall of scan when scanning North/Wide, South/Wide etc.
    - Scan hold time

Motorola Codeplug – Talking points

- Roam
  - Radio will “roam” to anything in list based on RSSI of beacon
    - RSSI threshold level important
      - Does not work like cell phone, only when beacon received
      - Radio stays on selected channel until THAT channel drops below RSSI threshold, even if another channel RSSI is stronger
      - Recommend RSSI be set to -91 for RMHAM
    - Don’t add roam list to standard Zone! Radio will not stay put!
      - Generate separate “Roam” zone with 1 channel

Motorola Codeplug – Wrapping up

- Basics to getting a single digital channel working
  - Set radio ID
  - Add digital contact for each talk group
  - Add RX group list for each Talkgroup
    - Assign associated digital contact ID to that RX group list
  - Add channel info
    - Set Color Code
    - Set time slot
    - Check “IP Site connect” and “Talkaround”
    - Set frequencies, Group list, Contact name
    - Set Power Level
    - Set TOT
    - Check “Allow interrupt”
    - Set Admit Criteria to “Color Code Free”
    - Check “Enhanced channel access”

Motorola Codeplug – Wrapping up

- Basics to getting a single analog channel working
  - Add channel info
    - Set Channel Bandwidth to 25
    - Check “Allow talkaround”
    - Enter frequency and CTCSS info
    - Set Power Level
    - Set TOT
    - Set Admit Criteria to “Always”

Motorola Codeplug – Wrapping up

- To write the plug, you have to use “clone” if serial number is different.
  - Has to be exact matching model number though, can’t work around that!
- Naming conventions
  - If name is too long, display will scroll (can be distracting)
    - Field length varies on model, and on display (Front vs. HHCH)
- Remember that the RMHAM plugs are “starters”. We encourage you to use them as a launching point to create your own personal plug!

Kenwood NX Series Model Review

- **Radio Models & Some Specific Factoid ☺**
  - NX-1000 Series
  - NX-3000 Series
  - NX-5000 Series
- **Programming Cables**
  - Multiple cables for the different series
  - Portable / Mobiles
  - Not all aftermarket cables are the same !!
    - Want a high speed cable with UART for high speed code plug transfer
    - Serial only cables will cause frustration with 12+ minutes to download Code Plug
- **Programming Software**
  - Runs on Microsoft Windows Only
  - Have had success running Software on Windows in Virtual Machine on Mac
    - Try at you own risk!!
    - NOT RECOMMENDED to upload Radio License Keys to Radio!!
  - Kenwood Firmware Loader
  - Kenwood License Manager
    - Software
    - Radio
  - **Kenwood calls Software - Field Programming Unit**
    - KPG-D6N (NX-1000 Series), KPG-D3N (NX-3000 Series), KPG-D1N (Nx-5000 Series)

Kenwood NX-1000 Series

- Several Portable Configuration Options to choose from
- VHF and UHF Models
- Supports FM Analog
- Support Digital NXDN OR DMR
  - Digital mode option decided at time of purchase
  - Can purchase feature to change Digital Mode

Kenwood NX-3000 Series

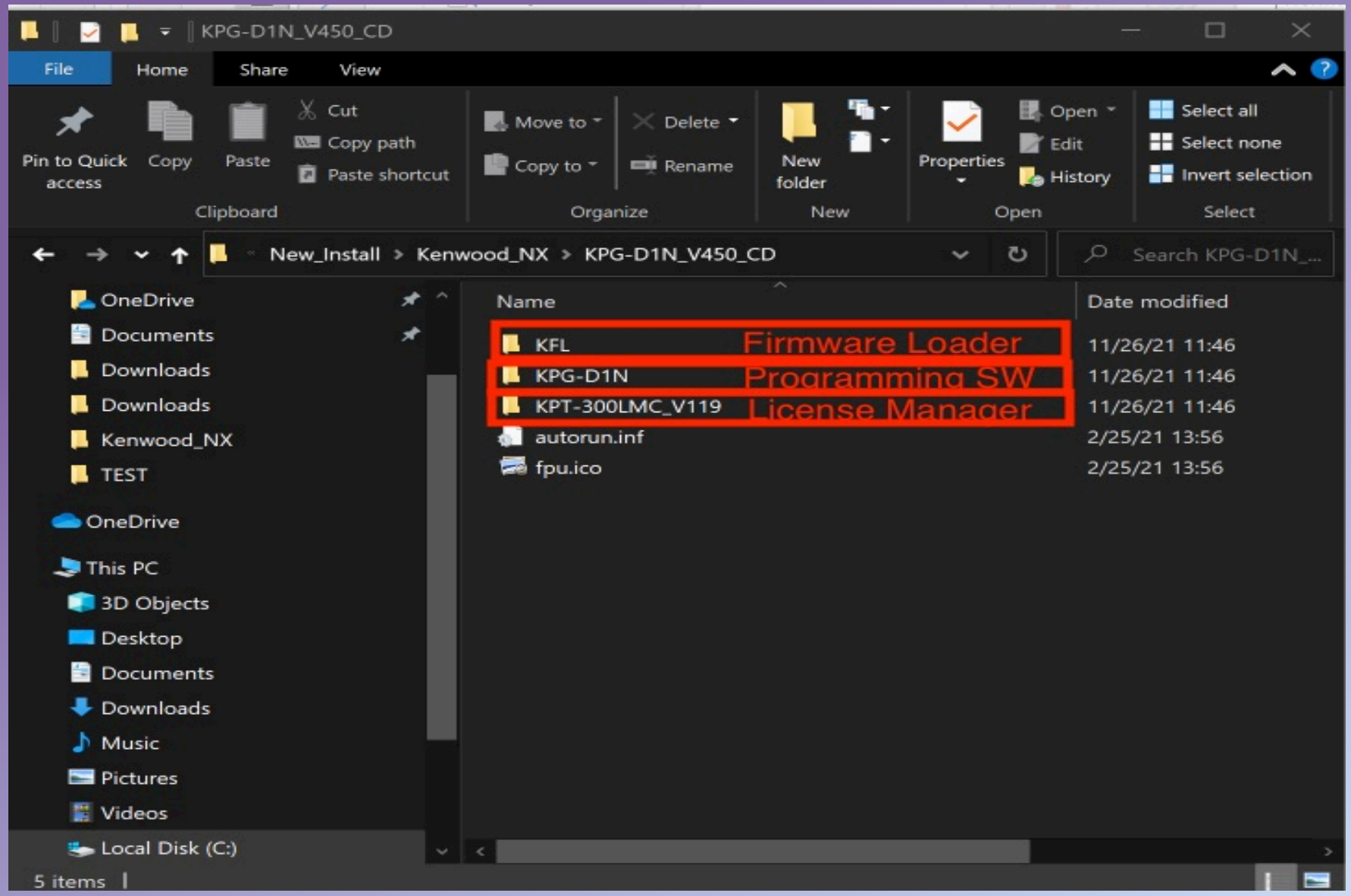
- Several Portable and Mobile Configuration Options to choose from
- VHF and UHF Models
- Supports FM Analog
- Supports NXDN and DMR
- Will support only one digital mode at a time
- 1000 support requires an additional license key

Kenwood NX-5000 Series

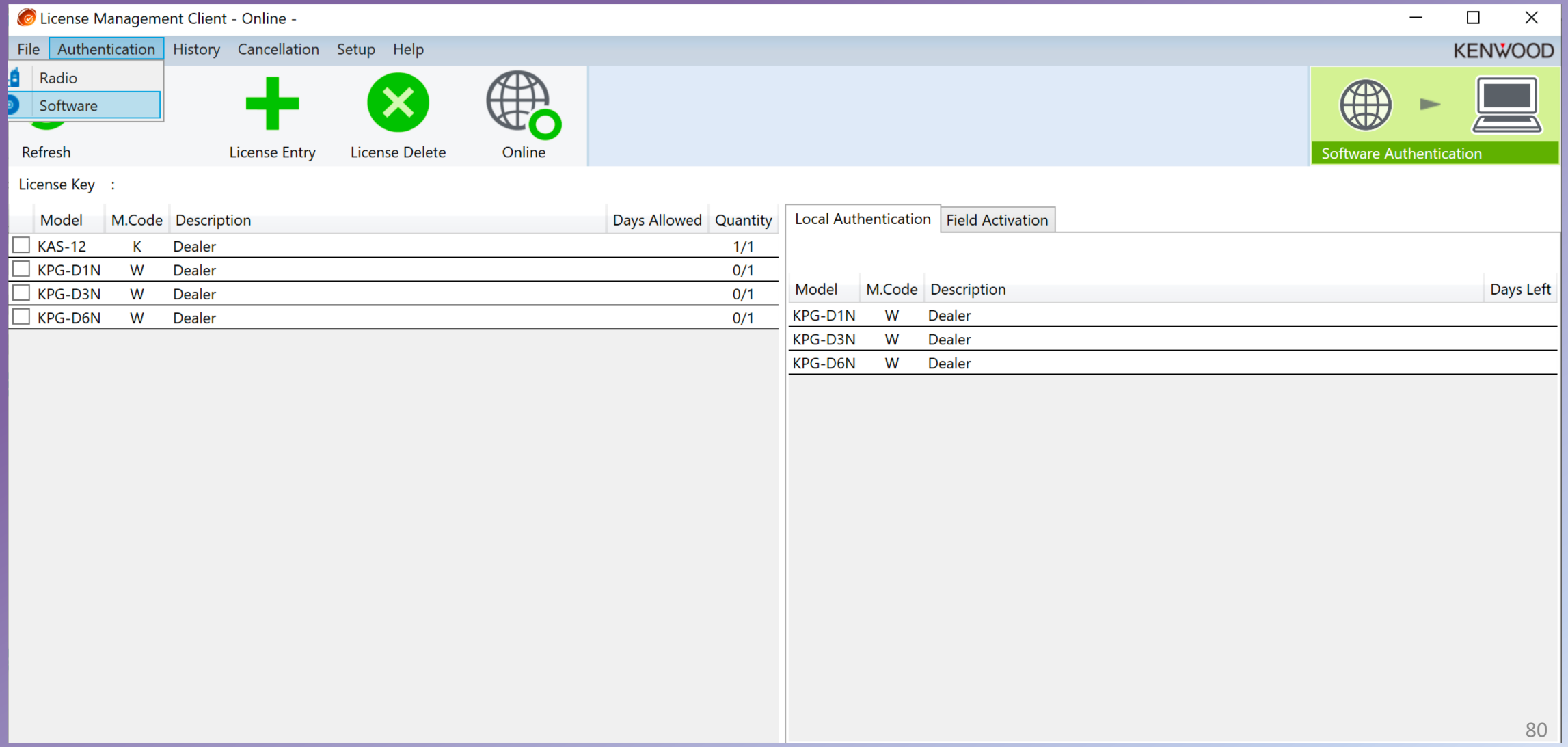
- MANY Portable and Mobile Configuration Options to choose from
- VHF and UHF Models
- Supports FM Analog
- Supports NXDN , DMR and P25
- Will support two digital modes at a time
- Comes standard with NXDN
- DMR and P25 requires an additional license key
- 4000 support requires an additional license key

Kenwood Programming Software

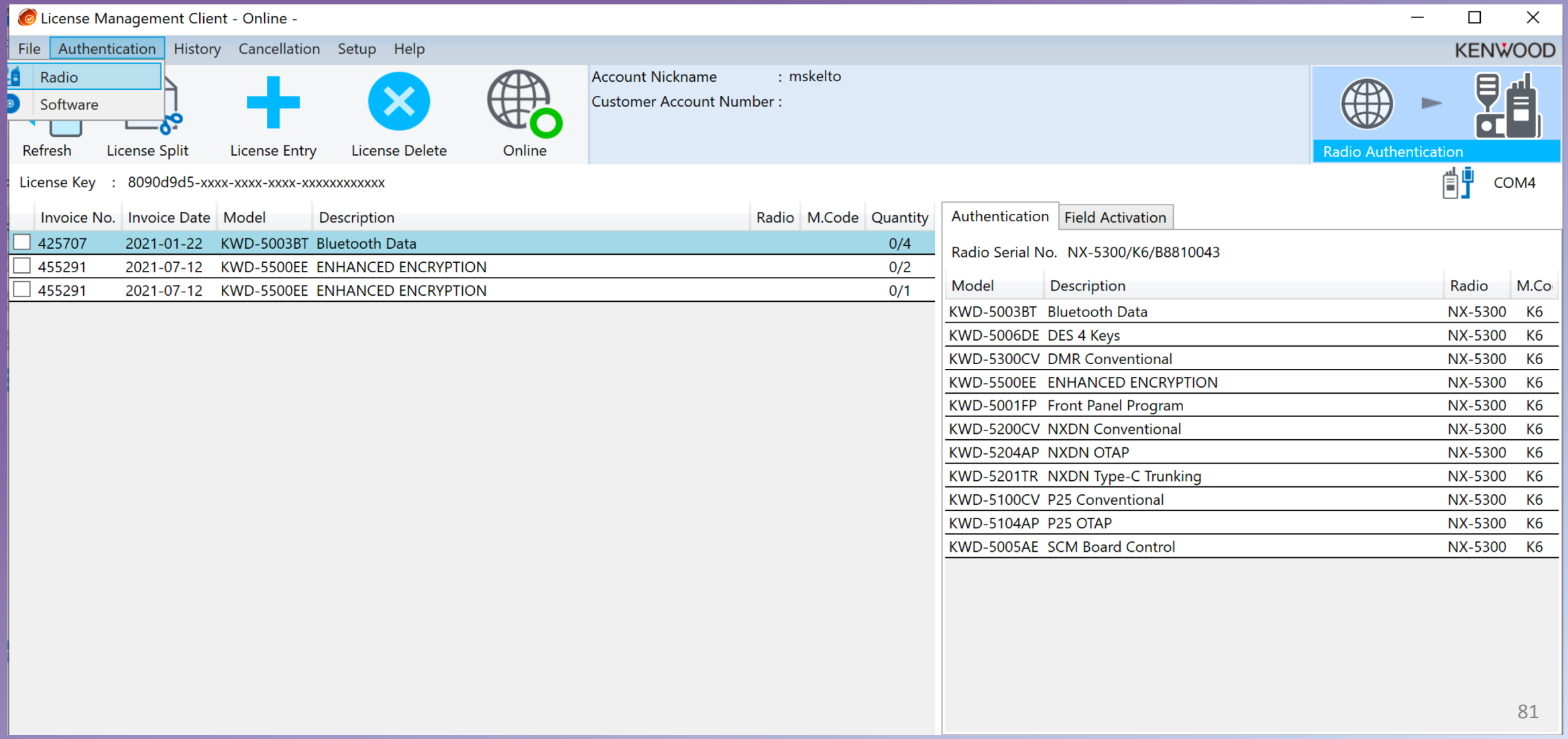
(Field Programming Unit)



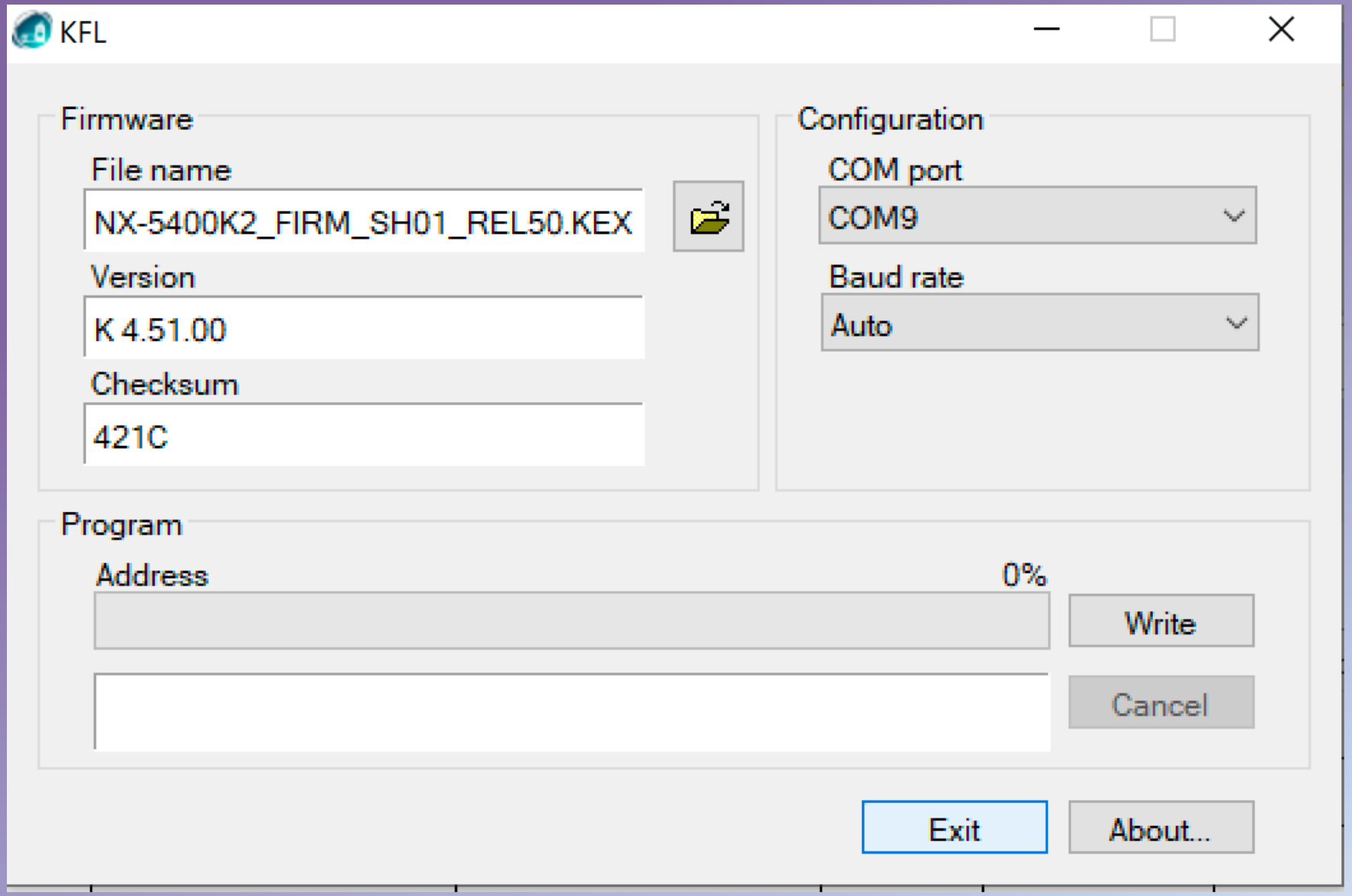
License Management - Software



License Management - Radio



Firmware Loader



NX-Series Programming Software (FPU)

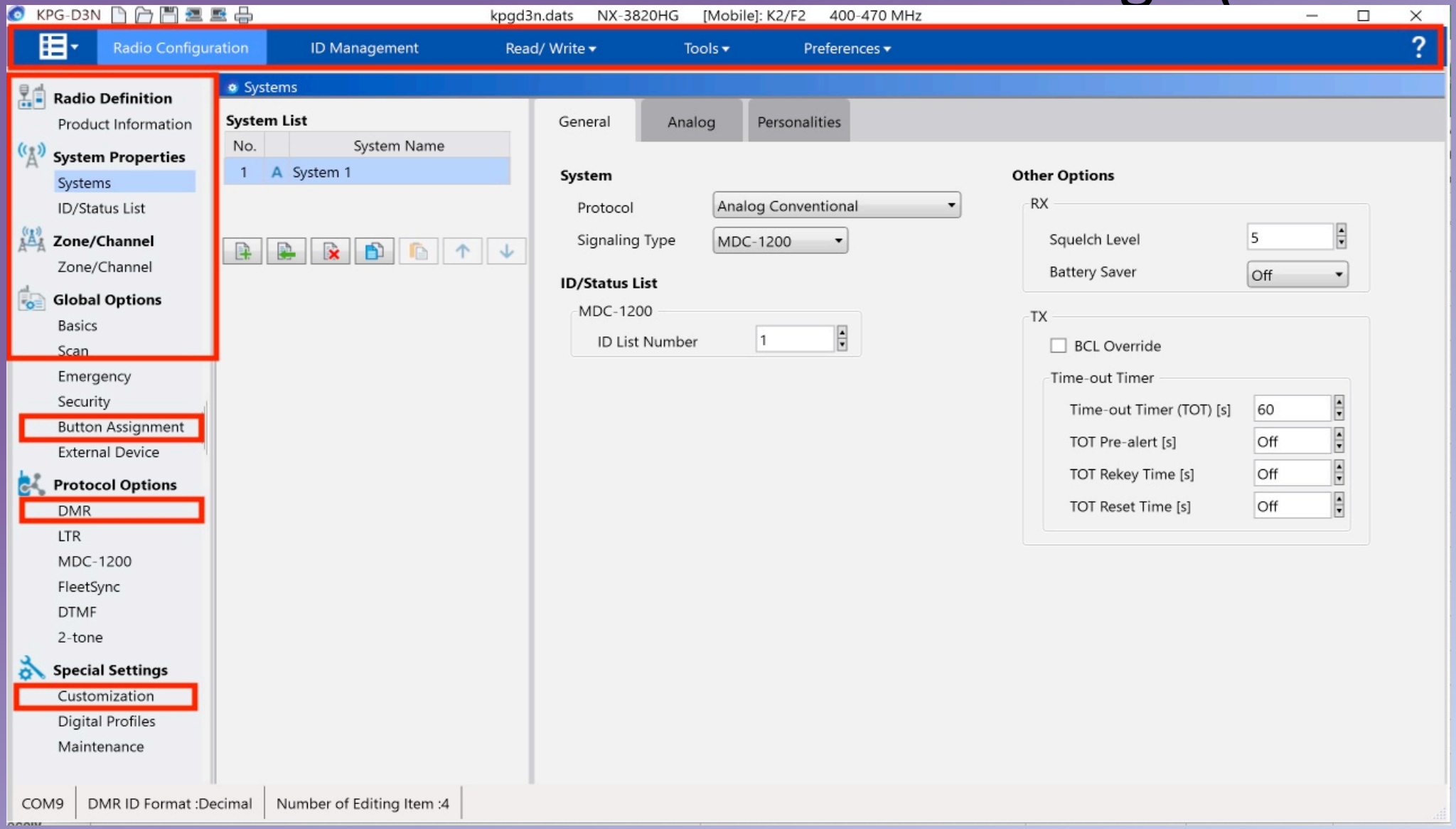
- NX-Series Factoids
- Not going to review NX-1000 series
  - Ask questions if you have them
- NX-3000 Series FPU Live Walk-Through (KPG-D3N)
- NX-3000 Series FPU Live Example (KPG-D3N)
  - Needed Code Plug Information & Programming Steps
- NX-5000 Series FPU Live Walk-Through (KPG-D1N)
- NX-5000 Series FPU Live Example (KPG-D1N)
  - Needed Code Plug Information & Programming Steps

NX-Series Factoids

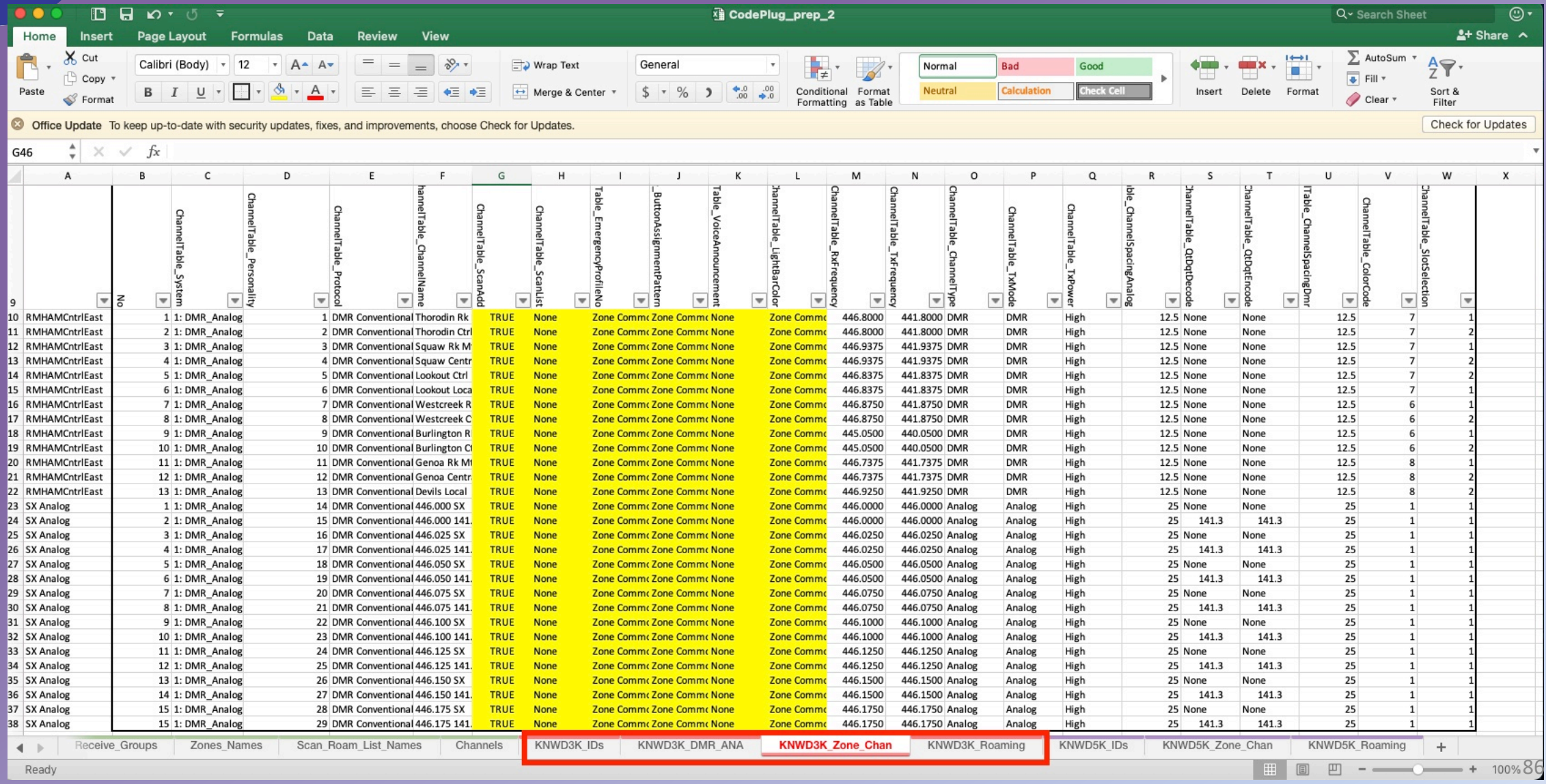
	NX-1000	NX-3000	NX-5000
Programming SW	KPG-D6N	KPG-D3N	KPG-D1N
Max Number of Zones	128	128	128
***Max Channels per Radio**	260	260/1000	1000/4000
Max Channels per Zone/Personality	250	250/512	512
Number of Characters per Zone Name	8	12	16
Number of Characters per Channel Name/Per	8	14	14
Number of Characters for ID lists	8	14	14
Max Number of Systems		32	32
Max number of Characters / system name		14	14
Total Number of ID Allocation	1000	1500	1500

* feature for additional channels can be added

NX-3000 Series FPU Live Walk-Through (KPG-D3N)



NX-3000 Needed Code Plug Information



CodePlug_prep_2

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G46

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
9		No	ChannelTable_System	ChannelTable_Personality	ChannelTable_Protocol	hannelTable_ChannelName	ChannelTable_ScanAdd	ChannelTable_ScanList	Table_EmergencyProfileNo	_ButtonAssignmentPattern	Table_VoiceAnnouncement	hannelTable_LightBarColor	ChannelTable_RxFrequency	ChannelTable_TxFrequency	ChannelTable_ChannelType	ChannelTable_TxMode	ChannelTable_TxPower	ible_ChannelSpacingAnalog	hannelTable_QtDqtDecode	ChannelTable_QtDqtEncode	lTable_ChannelSpacingDmr	ChannelTable_ColorCode	ChannelTable_SlotSelection	
10	RMHAMCntrlEast	1	1: DMR_Analog	1	DMR Conventional	Thorodin Rk	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.8000	441.8000	DMR	DMR	High	12.5	None	None	12.5	7	1	
11	RMHAMCntrlEast	2	1: DMR_Analog	2	DMR Conventional	Thorodin Ctrl	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.8000	441.8000	DMR	DMR	High	12.5	None	None	12.5	7	2	
12	RMHAMCntrlEast	3	1: DMR_Analog	3	DMR Conventional	Squaw Rk M	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.9375	441.9375	DMR	DMR	High	12.5	None	None	12.5	7	1	
13	RMHAMCntrlEast	4	1: DMR_Analog	4	DMR Conventional	Squaw Centr	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.9375	441.9375	DMR	DMR	High	12.5	None	None	12.5	7	2	
14	RMHAMCntrlEast	5	1: DMR_Analog	5	DMR Conventional	Lookout Ctrl	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.8375	441.8375	DMR	DMR	High	12.5	None	None	12.5	7	2	
15	RMHAMCntrlEast	6	1: DMR_Analog	6	DMR Conventional	Lookout Loca	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.8375	441.8375	DMR	DMR	High	12.5	None	None	12.5	7	1	
16	RMHAMCntrlEast	7	1: DMR_Analog	7	DMR Conventional	Westcreek R	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.8750	441.8750	DMR	DMR	High	12.5	None	None	12.5	6	1	
17	RMHAMCntrlEast	8	1: DMR_Analog	8	DMR Conventional	Westcreek C	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.8750	441.8750	DMR	DMR	High	12.5	None	None	12.5	6	2	
18	RMHAMCntrlEast	9	1: DMR_Analog	9	DMR Conventional	Burlington R	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	445.0500	440.0500	DMR	DMR	High	12.5	None	None	12.5	6	1	
19	RMHAMCntrlEast	10	1: DMR_Analog	10	DMR Conventional	Burlington Cl	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	445.0500	440.0500	DMR	DMR	High	12.5	None	None	12.5	6	2	
20	RMHAMCntrlEast	11	1: DMR_Analog	11	DMR Conventional	Genoa Rk Mt	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.7375	441.7375	DMR	DMR	High	12.5	None	None	12.5	8	1	
21	RMHAMCntrlEast	12	1: DMR_Analog	12	DMR Conventional	Genoa Centr	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.7375	441.7375	DMR	DMR	High	12.5	None	None	12.5	8	2	
22	RMHAMCntrlEast	13	1: DMR_Analog	13	DMR Conventional	Devils Local	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.9250	441.9250	DMR	DMR	High	12.5	None	None	12.5	8	2	
23	SX Analog	1	1: DMR_Analog	14	DMR Conventional	446.000 SX	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.0000	446.0000	Analog	Analog	High	25	None	None	25	1	1	
24	SX Analog	2	1: DMR_Analog	15	DMR Conventional	446.000 141.	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.0000	446.0000	Analog	Analog	High	25	141.3	141.3	25	1	1	
25	SX Analog	3	1: DMR_Analog	16	DMR Conventional	446.025 SX	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.0250	446.0250	Analog	Analog	High	25	None	None	25	1	1	
26	SX Analog	4	1: DMR_Analog	17	DMR Conventional	446.025 141.	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.0250	446.0250	Analog	Analog	High	25	141.3	141.3	25	1	1	
27	SX Analog	5	1: DMR_Analog	18	DMR Conventional	446.050 SX	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.0500	446.0500	Analog	Analog	High	25	None	None	25	1	1	
28	SX Analog	6	1: DMR_Analog	19	DMR Conventional	446.050 141.	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.0500	446.0500	Analog	Analog	High	25	141.3	141.3	25	1	1	
29	SX Analog	7	1: DMR_Analog	20	DMR Conventional	446.075 SX	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.0750	446.0750	Analog	Analog	High	25	None	None	25	1	1	
30	SX Analog	8	1: DMR_Analog	21	DMR Conventional	446.075 141.	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.0750	446.0750	Analog	Analog	High	25	141.3	141.3	25	1	1	
31	SX Analog	9	1: DMR_Analog	22	DMR Conventional	446.100 SX	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.1000	446.1000	Analog	Analog	High	25	None	None	25	1	1	
32	SX Analog	10	1: DMR_Analog	23	DMR Conventional	446.100 141.	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.1000	446.1000	Analog	Analog	High	25	141.3	141.3	25	1	1	
33	SX Analog	11	1: DMR_Analog	24	DMR Conventional	446.125 SX	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.1250	446.1250	Analog	Analog	High	25	None	None	25	1	1	
34	SX Analog	12	1: DMR_Analog	25	DMR Conventional	446.125 141.	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.1250	446.1250	Analog	Analog	High	25	141.3	141.3	25	1	1	
35	SX Analog	13	1: DMR_Analog	26	DMR Conventional	446.150 SX	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.1500	446.1500	Analog	Analog	High	25	None	None	25	1	1	
36	SX Analog	14	1: DMR_Analog	27	DMR Conventional	446.150 141.	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.1500	446.1500	Analog	Analog	High	25	141.3	141.3	25	1	1	
37	SX Analog	15	1: DMR_Analog	28	DMR Conventional	446.175 SX	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.1750	446.1750	Analog	Analog	High	25	None	None	25	1	1	
38	SX Analog	15	1: DMR_Analog	29	DMR Conventional	446.175 141.	TRUE	None	Zone Comm	Zone Comm	None	Zone Comm	446.1750	446.1750	Analog	Analog	High	25	141.3	141.3	25	1	1	

Receive_Groups | Zones_Names | Scan_Roam_List_Names | Channels | KNWD3K_IDs | KNWD3K_DMR_ANA | KNWD3K_Zone_Chan | KNWD3K_Roaming | KNWD5K_IDs | KNWD5K_Zone_Chan | KNWD5K_Roaming

Ready

NX-3000 Programming Steps – High Level

1. Create System(s)
2. Input Radio ID(s)
3. Add Talk Groups
4. Add and Configure Channels for each system
5. Create Zone(s)
6. Select Desired Channels to each Zone
7. Save Configuration

NX-3000 Programming Steps

1. Configure Comm Port
2. Read Radio
3. Save Configuration
4. Select Configuration Under Product Information
5. Select Systems
6. Add a DMR system – Name It
7. Select ID Management
8. Add Your Radio ID
9. Select ID/Status List

NX-3000 Programming Steps (cont.)

10. Partition Group ID'S as Desired
11. Type in Planned Group ID's
    - I am going to Copy/Paste from My Excel Spreadsheet
12. Partition DMR Individual ID's as Desired
13. Type in Planned Individual ID's
    - I am going to Copy/Paste from My Excel Spreadsheet
14. SAVE and SAVE Often!!
15. Select Systems

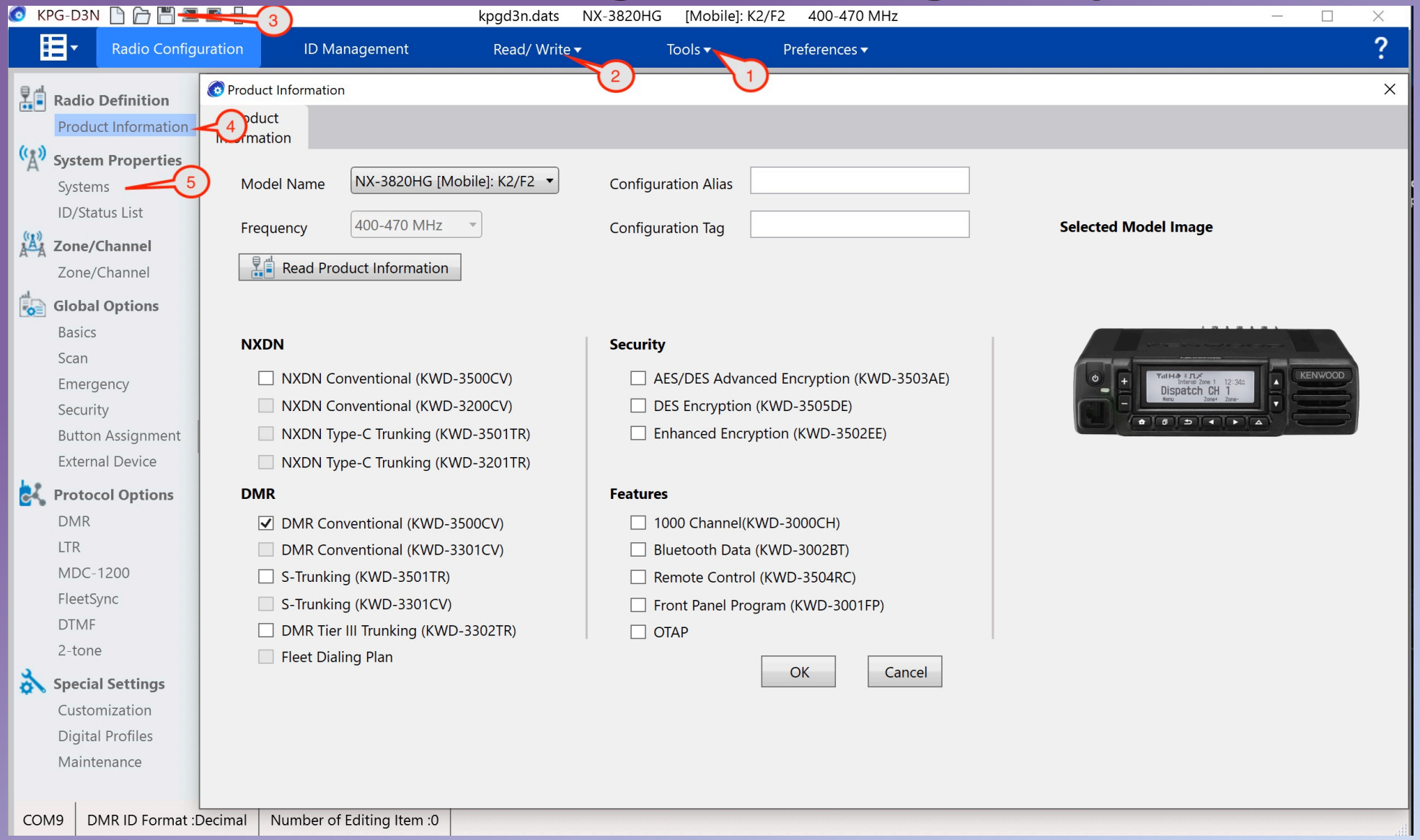
NX-3000 Programming Steps (cont.)

16. Add additional Systems as Desired
17. Select Personalities TAB – There are Two Input Modes
    a. Table – Channel and Options Can be Input Manually or Copy/Paste
    b. Individually – Channel and Options are Input Manually
18. Input Desired Channels
    – I will Paste from my Spreadsheet in Table Mode – 17a
19. Select Zone/Channel
20. Add and Name Desired Zones

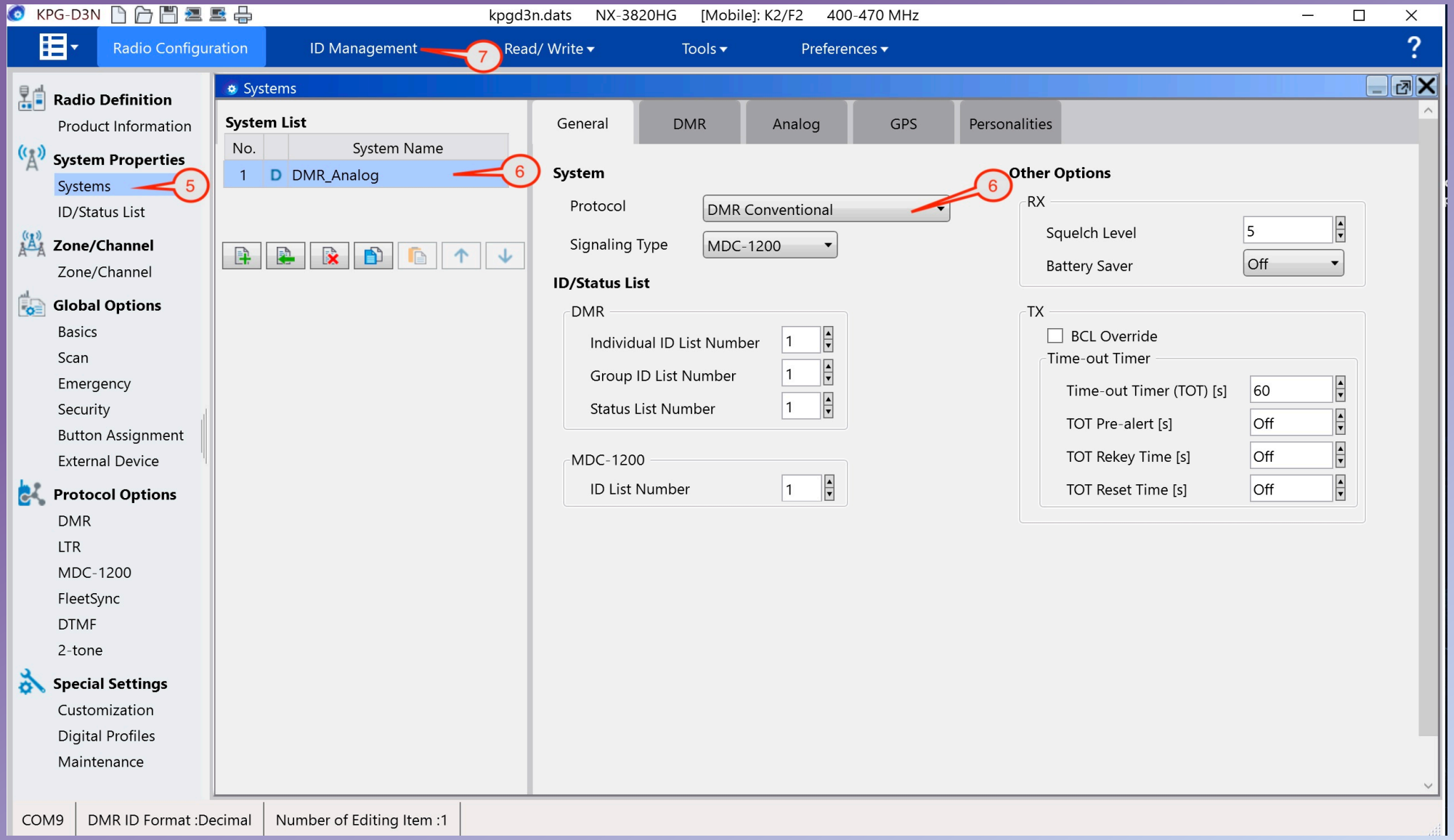
NX-3000 Programming Steps (cont.)

21. SAVE FILE!!
22. Select Desired Input Mode
    a. Table Mode – Manual Entry or Copy/Paste
    b. Individual Mode – Entry is Manual for Each Channel
23. Add Desired Channels to each zone
    – I will Paste from my Spreadsheet in Table Mode – 22a (Non Roam Zones)
    – In Roam Zones, only one channel from the system needs to be added
24. SAVE FILE!!
25. Write Code Plug to the Radio

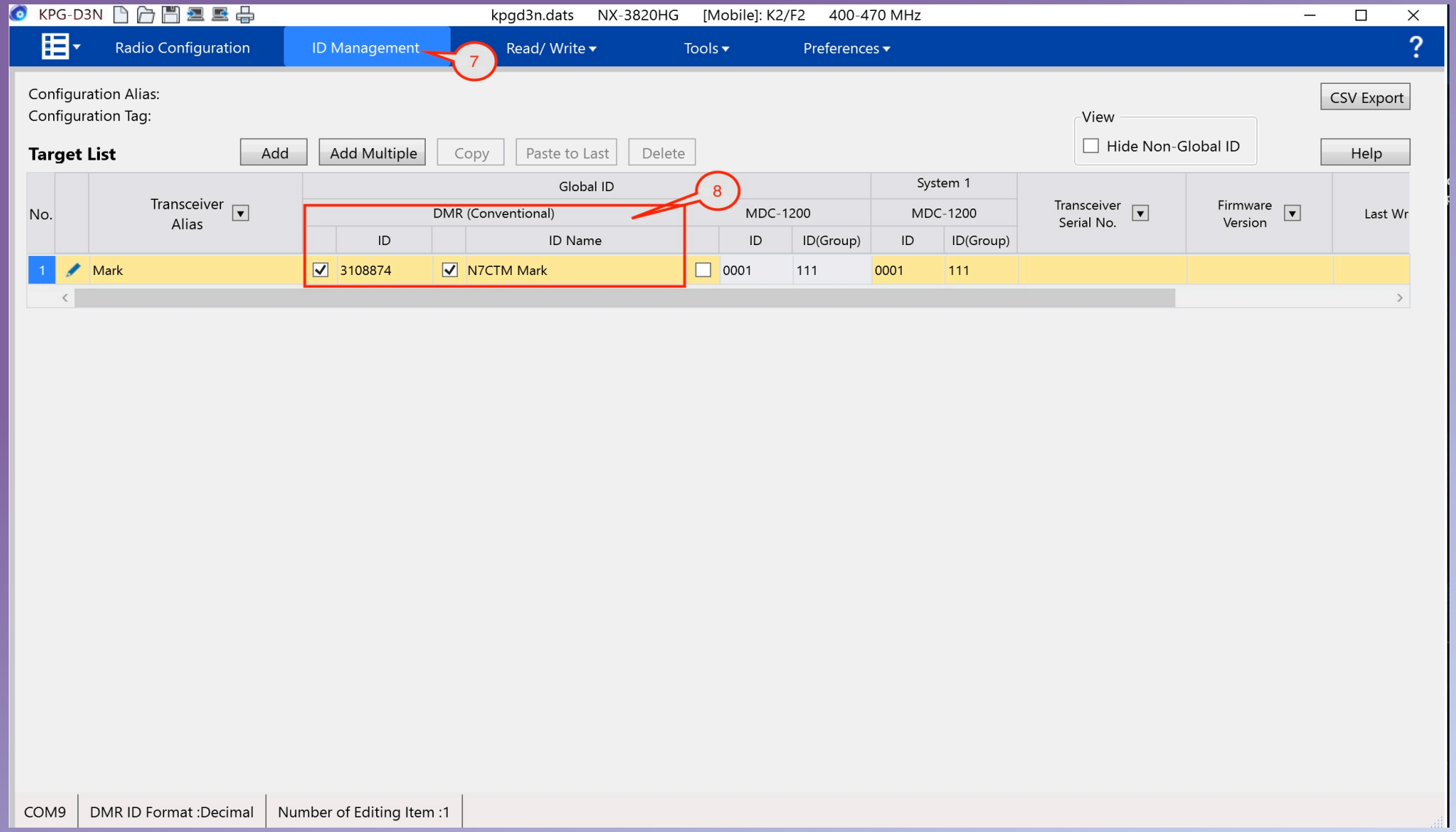
NX-3000 Programming Steps



NX-3000 Programming Steps (cont.)



NX-3000 Programming Steps (cont.)



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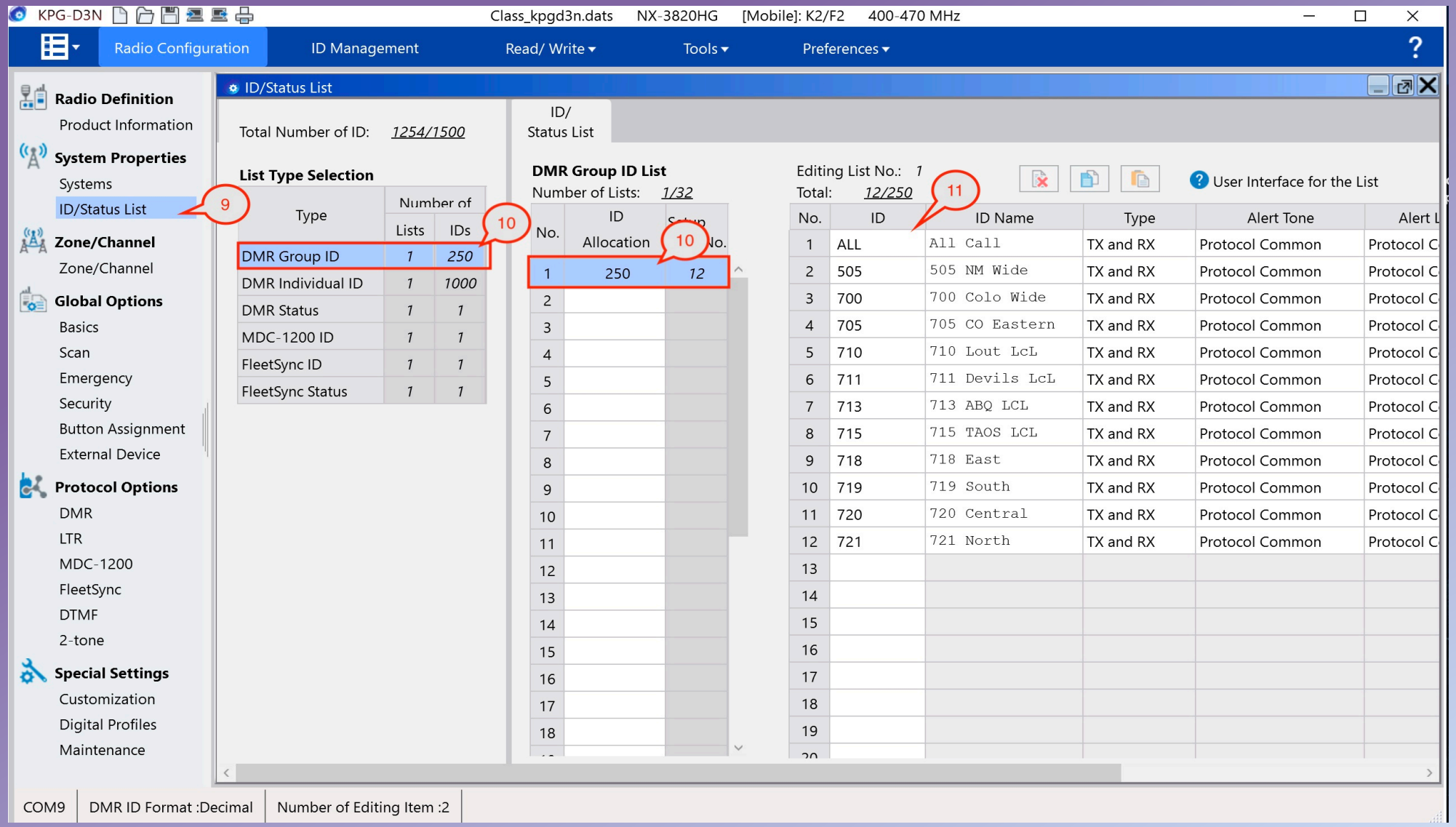
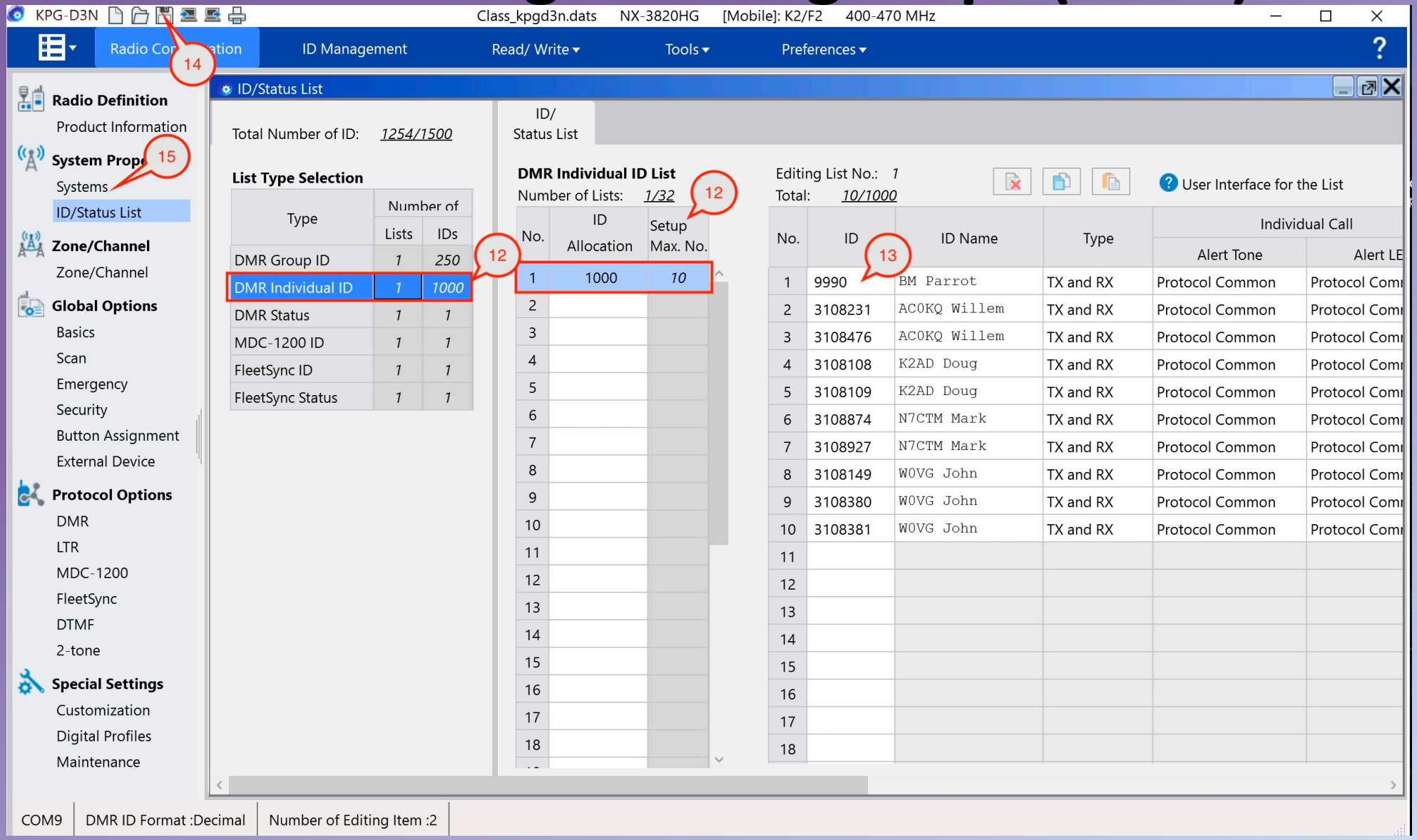
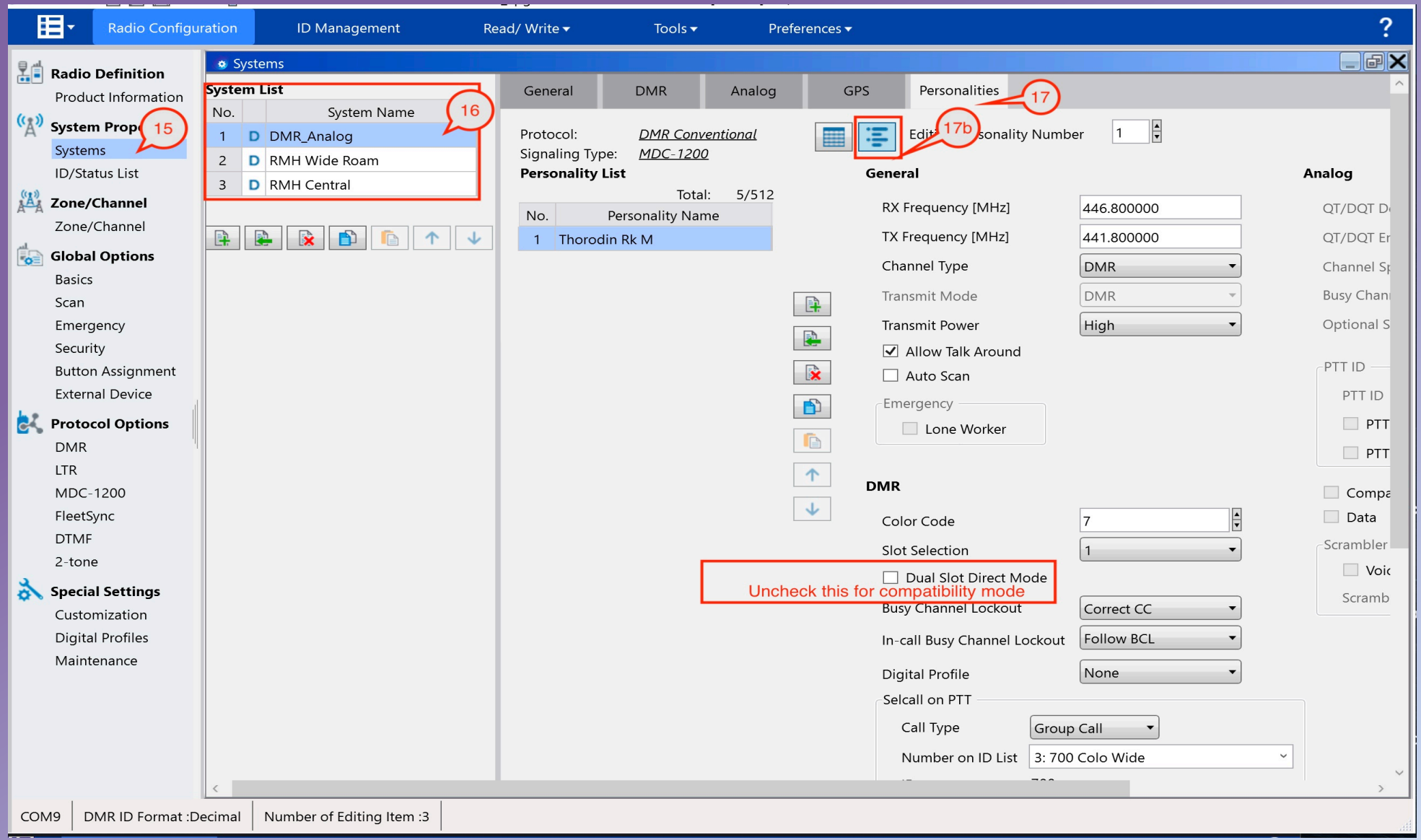


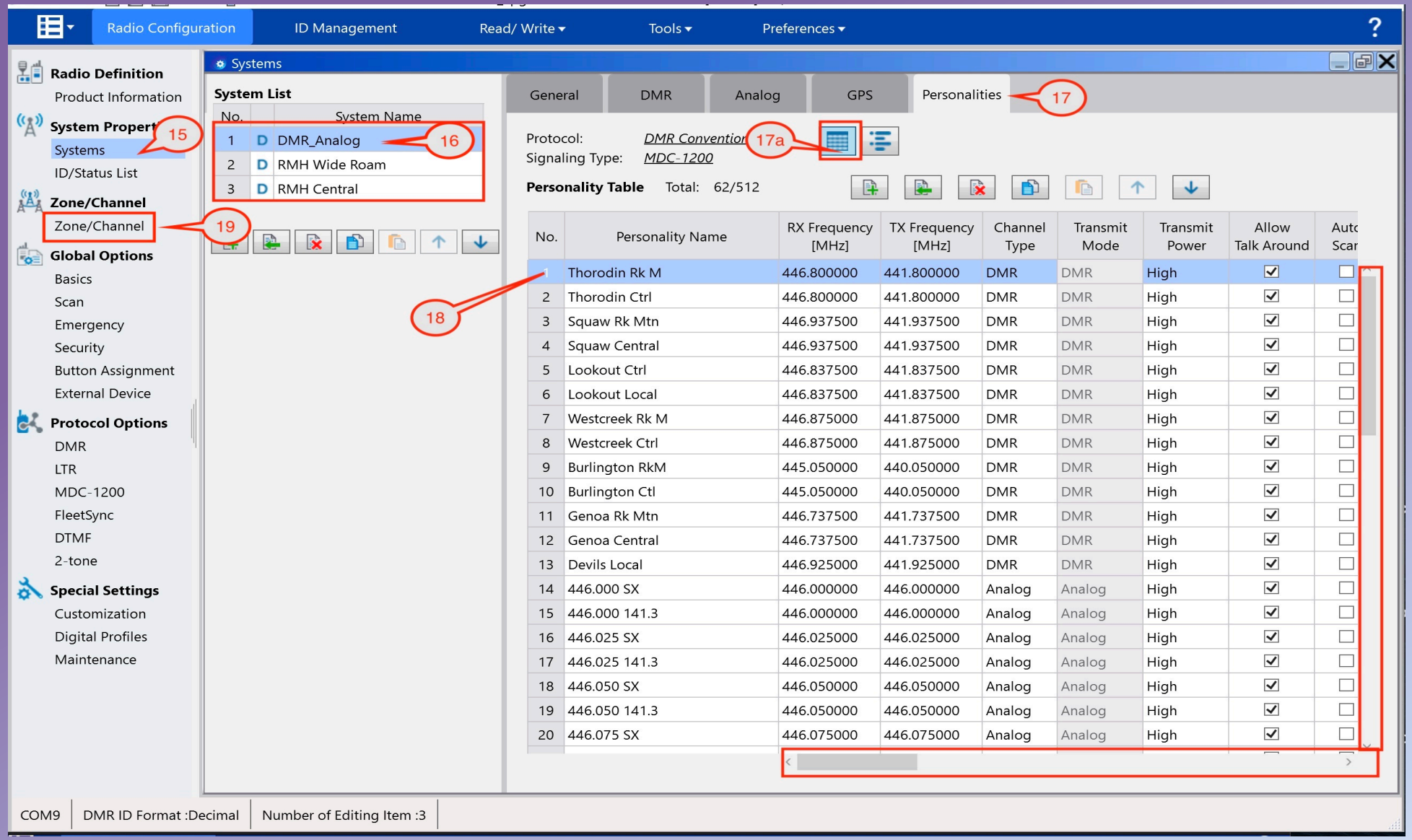
NX-3000 Programming Steps (cont.)



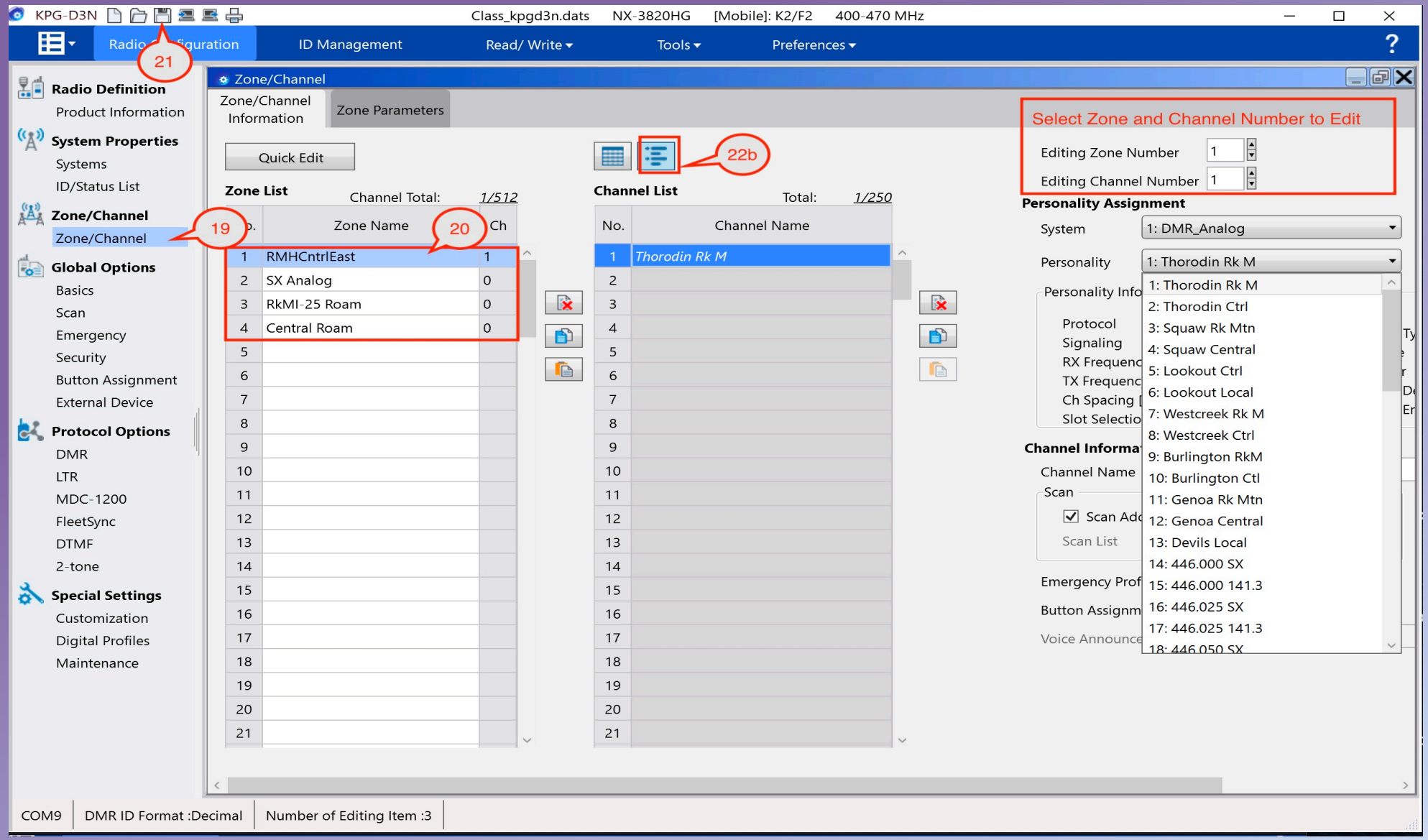
NX-3000 Programming Steps (cont.)



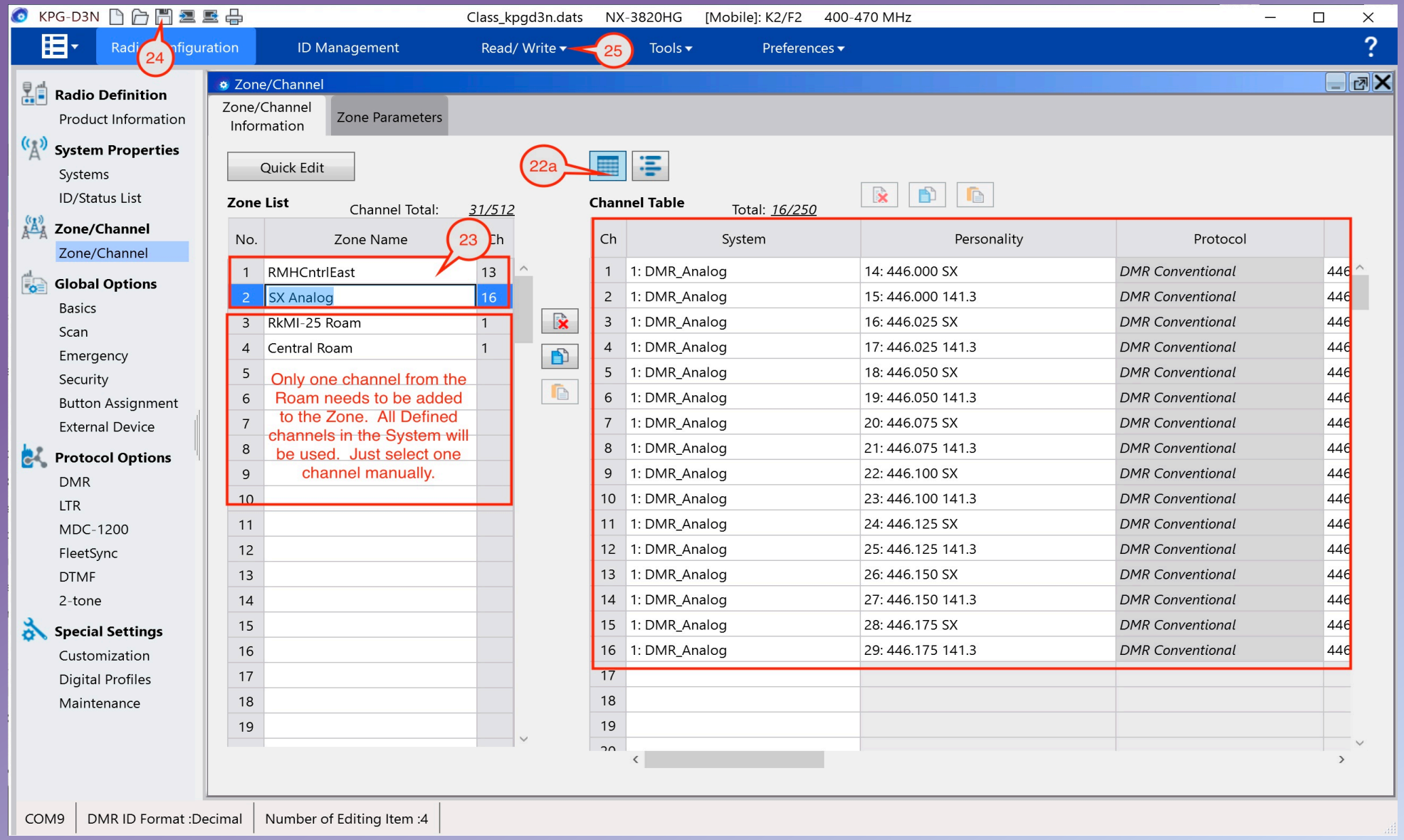
NX-3000 Programming Steps (cont.)



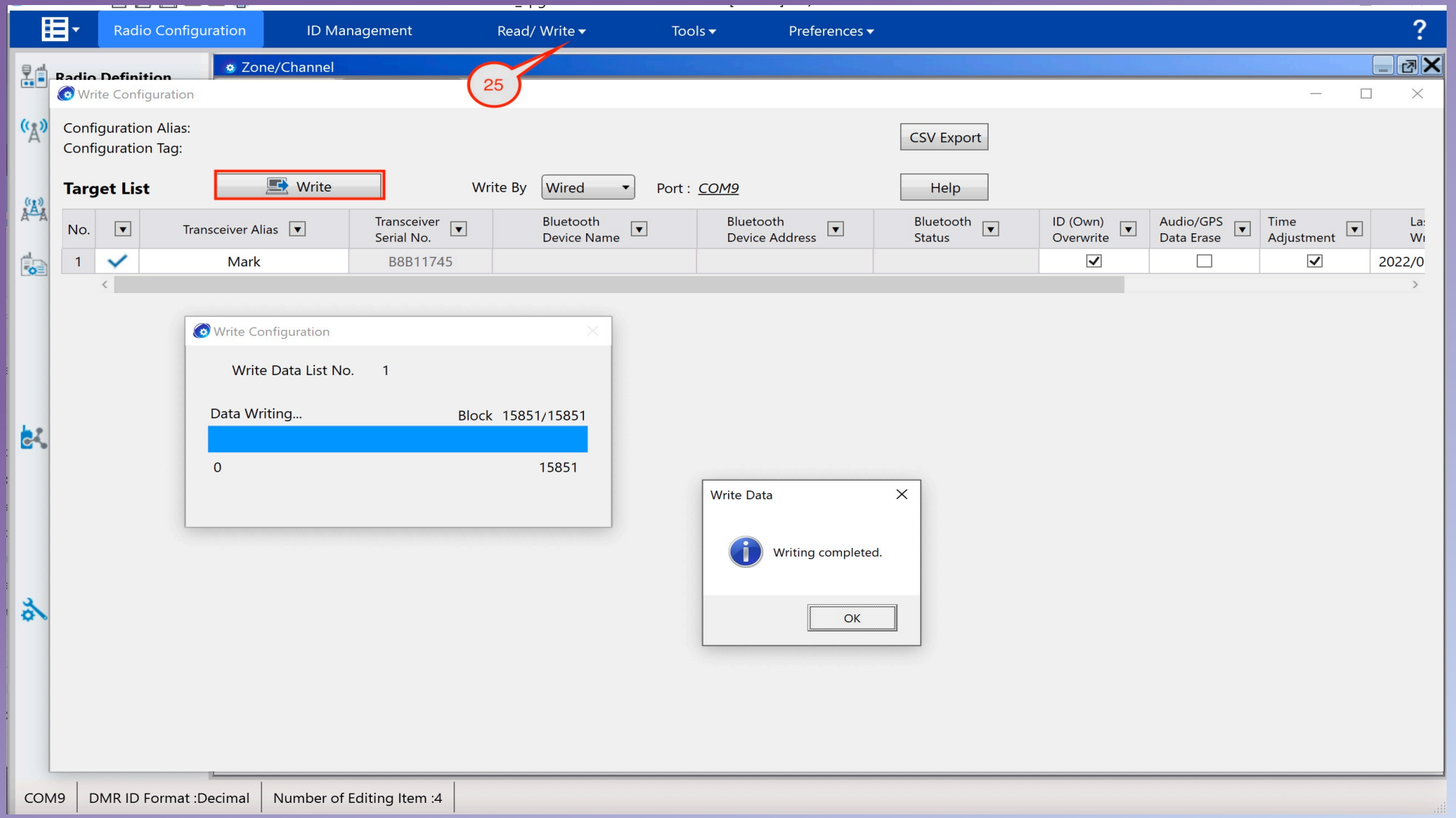
NX-3000 Programming Steps (cont.)



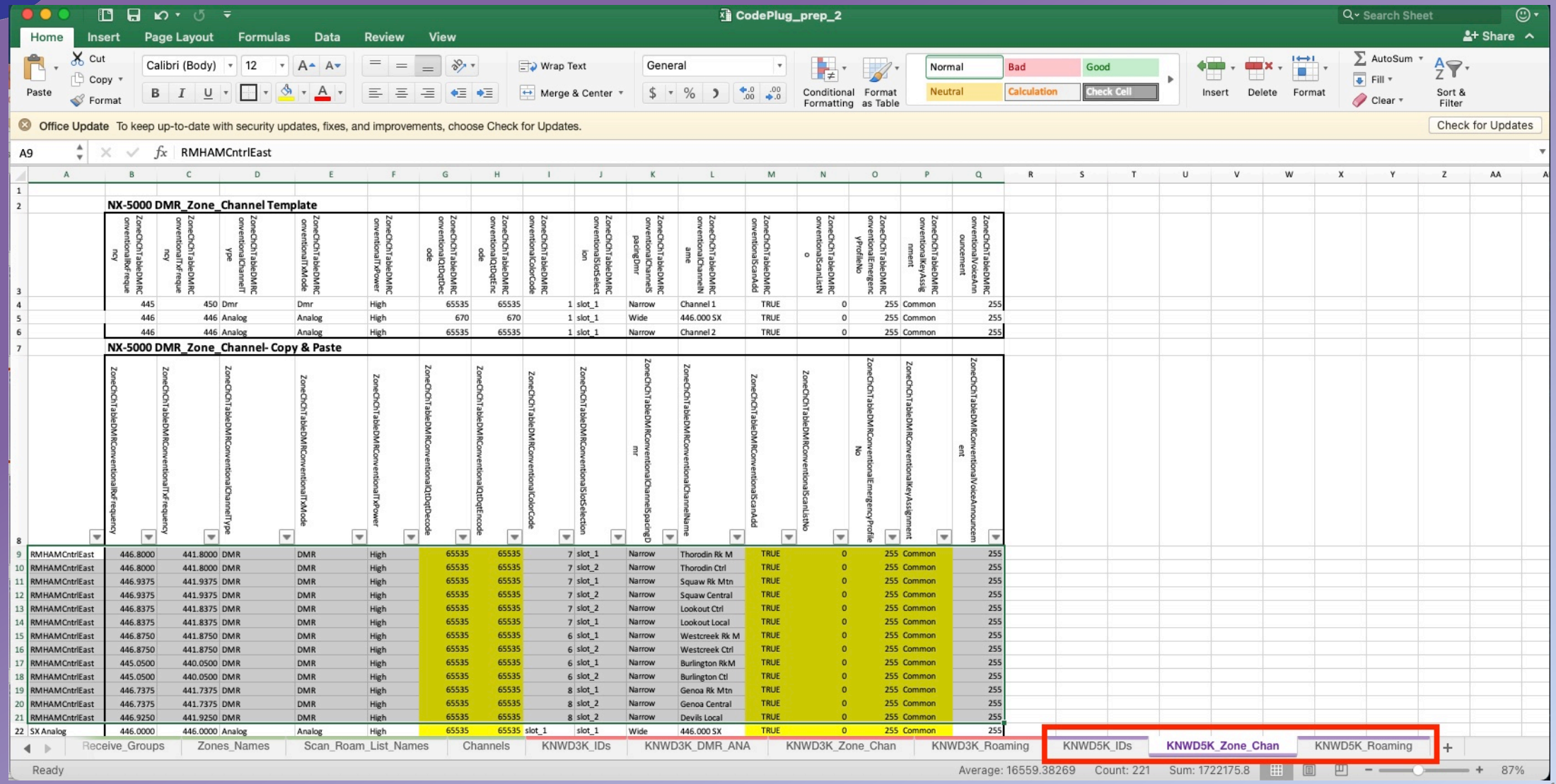
NX-3000 Programming Steps (cont.)



NX-3000 Programming Steps (cont.)



NX-5000 Needed Code Plug Information



CodePlug_prep_2

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A9 RMHAMCntrlEast

NX-5000 DMR_Zone_Channel Template

ZoneChTableDMRConventionalRxFrequency	ZoneChTableDMRConventionalTxFrequency	ZoneChTableDMRConventionalChannelType	ZoneChTableDMRConventionalTxMode	ZoneChTableDMRConventionalTxPower	ZoneChTableDMRConventionalQtDqtDecode	ZoneChTableDMRConventionalQtDqtEncode	ZoneChTableDMRConventionalColorCode	ZoneChTableDMRConventionalSlotSelection	ZoneChTableDMRConventionalChannelSpacingDmr	ZoneChTableDMRConventionalChannelName	ZoneChTableDMRConventionalScanAdd	ZoneChTableDMRConventionalScanListNo	ZoneChTableDMRConventionalEmergencyProfileNo	ZoneChTableDMRConventionalKeyAssignment	ZoneChTableDMRConventionalVoiceAnnouncement
445	450	Dmr	Dmr	High	65535	65535	1	slot_1	Narrow	Channel 1	TRUE	0	255	Common	255
446	446	Analog	Analog	High	670	670	1	slot_1	Wide	446.000 SX	TRUE	0	255	Common	255
446	446	Analog	Analog	High	65535	65535	1	slot_1	Narrow	Channel 2	TRUE	0	255	Common	255

NX-5000 DMR_Zone_Channel- Copy & Paste

ZoneChTableDMRConventionalRxFrequency	ZoneChTableDMRConventionalTxFrequency	ZoneChTableDMRConventionalChannelType	ZoneChTableDMRConventionalTxMode	ZoneChTableDMRConventionalTxPower	ZoneChTableDMRConventionalQtDqtDecode	ZoneChTableDMRConventionalQtDqtEncode	ZoneChTableDMRConventionalColorCode	ZoneChTableDMRConventionalSlotSelection	ZoneChTableDMRConventionalChannelSpacingDmr	ZoneChTableDMRConventionalChannelName	ZoneChTableDMRConventionalScanAdd	ZoneChTableDMRConventionalScanListNo	ZoneChTableDMRConventionalEmergencyProfileNo	ZoneChTableDMRConventionalKeyAssignment	ZoneChTableDMRConventionalVoiceAnnouncement
RMHAMCntrlEast	446.8000	441.8000	DMR	DMR	High	65535	65535	7	slot_1	Narrow	Thorodin Rk M	TRUE	0	255	Common	255
RMHAMCntrlEast	446.8000	441.8000	DMR	DMR	High	65535	65535	7	slot_2	Narrow	Thorodin Ctrl	TRUE	0	255	Common	255
RMHAMCntrlEast	446.9375	441.9375	DMR	DMR	High	65535	65535	7	slot_1	Narrow	Squaw Rk Mtn	TRUE	0	255	Common	255
RMHAMCntrlEast	446.9375	441.9375	DMR	DMR	High	65535	65535	7	slot_2	Narrow	Squaw Central	TRUE	0	255	Common	255
RMHAMCntrlEast	446.8375	441.8375	DMR	DMR	High	65535	65535	7	slot_2	Narrow	Lookout Ctrl	TRUE	0	255	Common	255
RMHAMCntrlEast	446.8375	441.8375	DMR	DMR	High	65535	65535	7	slot_1	Narrow	Lookout Local	TRUE	0	255	Common	255
RMHAMCntrlEast	446.8750	441.8750	DMR	DMR	High	65535	65535	6	slot_1	Narrow	Westcreek Rk M	TRUE	0	255	Common	255
RMHAMCntrlEast	446.8750	441.8750	DMR	DMR	High	65535	65535	6	slot_2	Narrow	Westcreek Ctrl	TRUE	0	255	Common	255
RMHAMCntrlEast	445.0500	440.0500	DMR	DMR	High	65535	65535	6	slot_1	Narrow	Burlington RkM	TRUE	0	255	Common	255
RMHAMCntrlEast	445.0500	440.0500	DMR	DMR	High	65535	65535	6	slot_2	Narrow	Burlington Ctl	TRUE	0	255	Common	255
RMHAMCntrlEast	446.7375	441.7375	DMR	DMR	High	65535	65535	8	slot_1	Narrow	Genoa Rk Mtn	TRUE	0	255	Common	255
RMHAMCntrlEast	446.7375	441.7375	DMR	DMR	High	65535	65535	8	slot_2	Narrow	Genoa Central	TRUE	0	255	Common	255
RMHAMCntrlEast	446.9250	441.9250	DMR	DMR	High	65535	65535	8	slot_2	Narrow	Devils Local	TRUE	0	255	Common	255
SX Analog	446.0000	446.0000	Analog	Analog	High	65535	65535	slot_1	slot_1	Wide	446.000 SX	TRUE	0	255	Common	255

Receive_Groups | Zones_Names | Scan_Roam_List_Names | Channels | KNWD3K_IDs | KNWD3K_DMR_ANA | KNWD3K_Zone_Chan | KNWD3K_Roaming | KNWD5K_IDs | KNWD5K_Zone_Chan | KNWD5K_Roaming

Ready Average: 16559.38269 Count: 221 Sum: 1722175.8 87%

NX-5000 Programming Steps – High Level

Zone Channel Format

Personality Format

1. Create System(s)
2. Input Radio ID(s)
3. Add Talk Groups
4. Add and Configure Channels for each system
5. Create Zone(s)
6. Select Desired Channels to each Zone
7. Save Configuration

Channel Table Format

1. Create System(s)
2. Input Radio ID(s)
3. Add Talk Groups
4. Create Zones
5. Add and Configure Channels for each Zone
6. Save Configuration

NX-5000 Programming Steps

1. Configure Comm Port
2. Read Radio
3. Save Configuration (first time, do a save as)
4. Select Model and then Product Information
   - Configure Options
   - Select Zone-Channel Format
5. Select ”New” to Clear All Current Data (to start from scratch)
6. Select desired System Type for Default System
7. Add Your Radio ID (can use global to apply to all systems)

NX-5000 Programming Steps (cont.)

8. To add additional systems, Highlight System Info and Select add
9. SAVE FILE!!
10. Partition Group/Individual ID's as Desired
11. Type in Planned Group ID's
    - I am going to Copy/Paste from My Excel Spreadsheet
12. Type in Planned Individual ID's
    - I am going to Copy/Paste from My Excel Spreadsheet
13. SAVE and SAVE Often!!

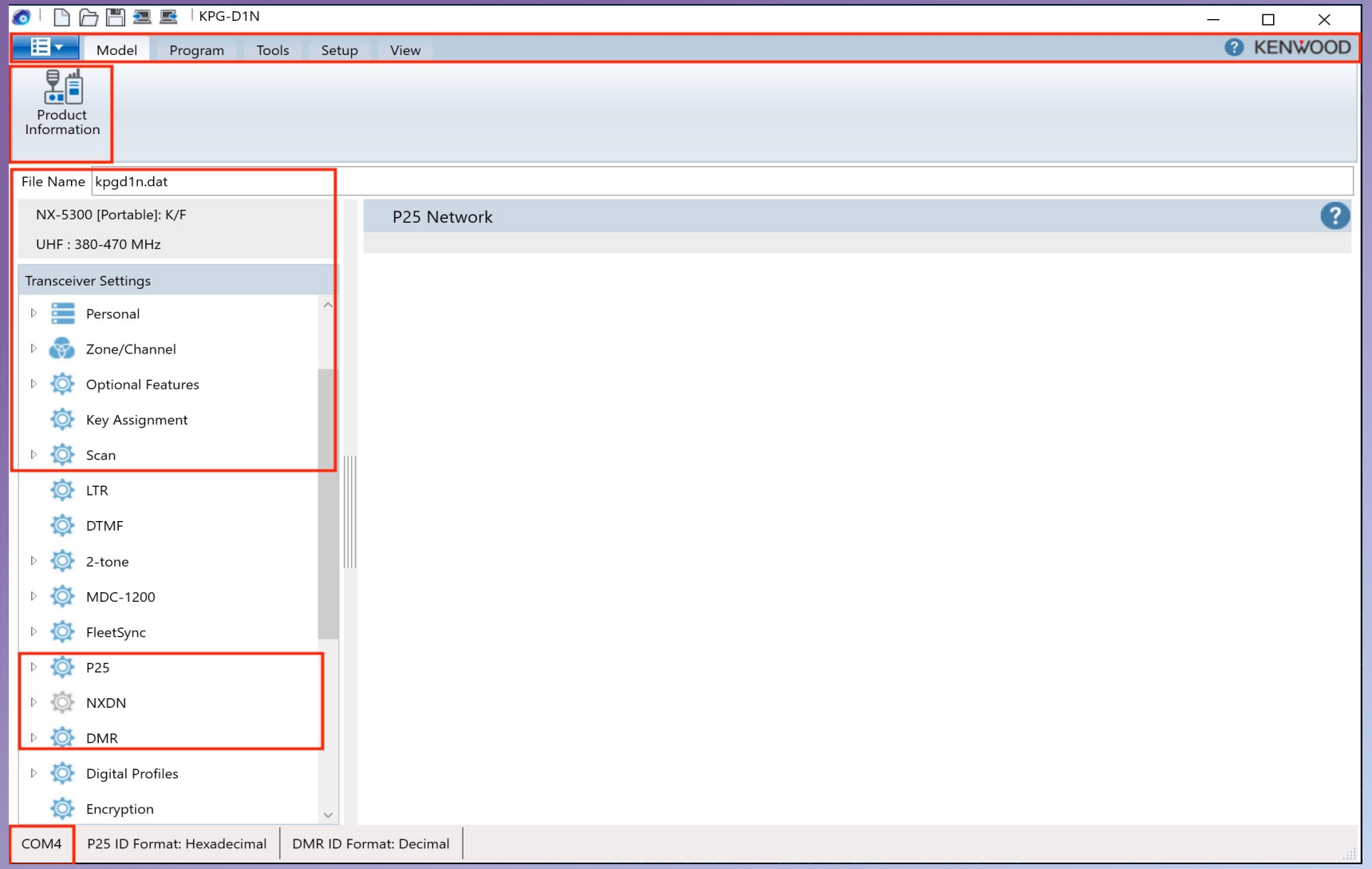
NX-5000 Programming Steps (cont.)

14. Under Zone/Channel
    a. Select Default Zone (1)
    b. Add Additional Zones as needed using the “Add” Button
15. Add Channels
    a. Select Zone/Channel Information for Table Format. Not all Data can be input here. It will have to be done manually under Channel Edit. Input Channel information and “SOME” Options Manually or Copy/Paste. DMR TG will need to be Input under Channel Edit.
    b. Use Channel edit to Manually input Channel Configuration and missing options from Zone/Channel Information.

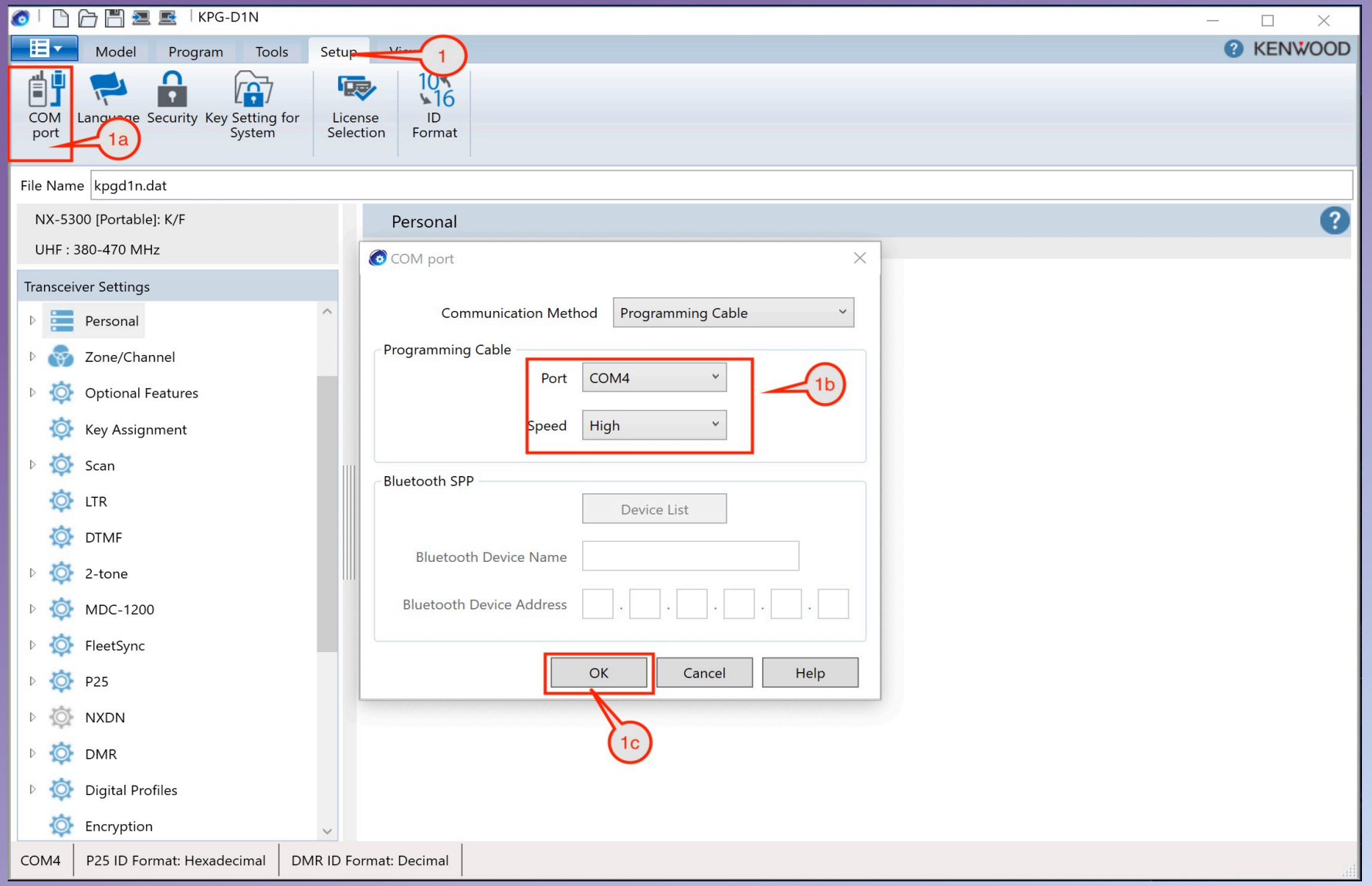
NX-5000 Programming Steps (cont.)

16. SAVE FILE!!
17. Write Code Plug to the Radio

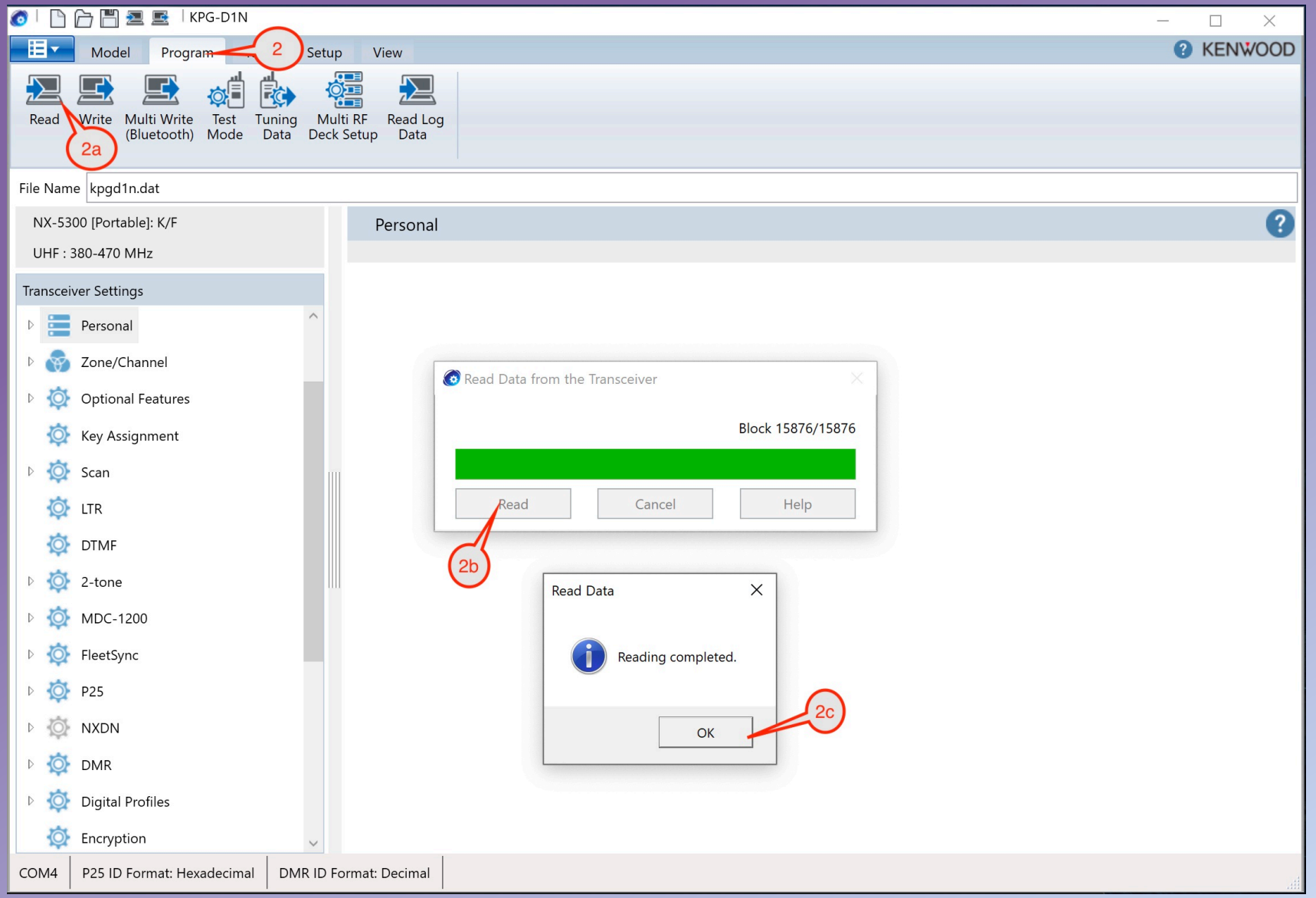
NX-5000 Series FPU Live Walk-Through (KPG-D1N)



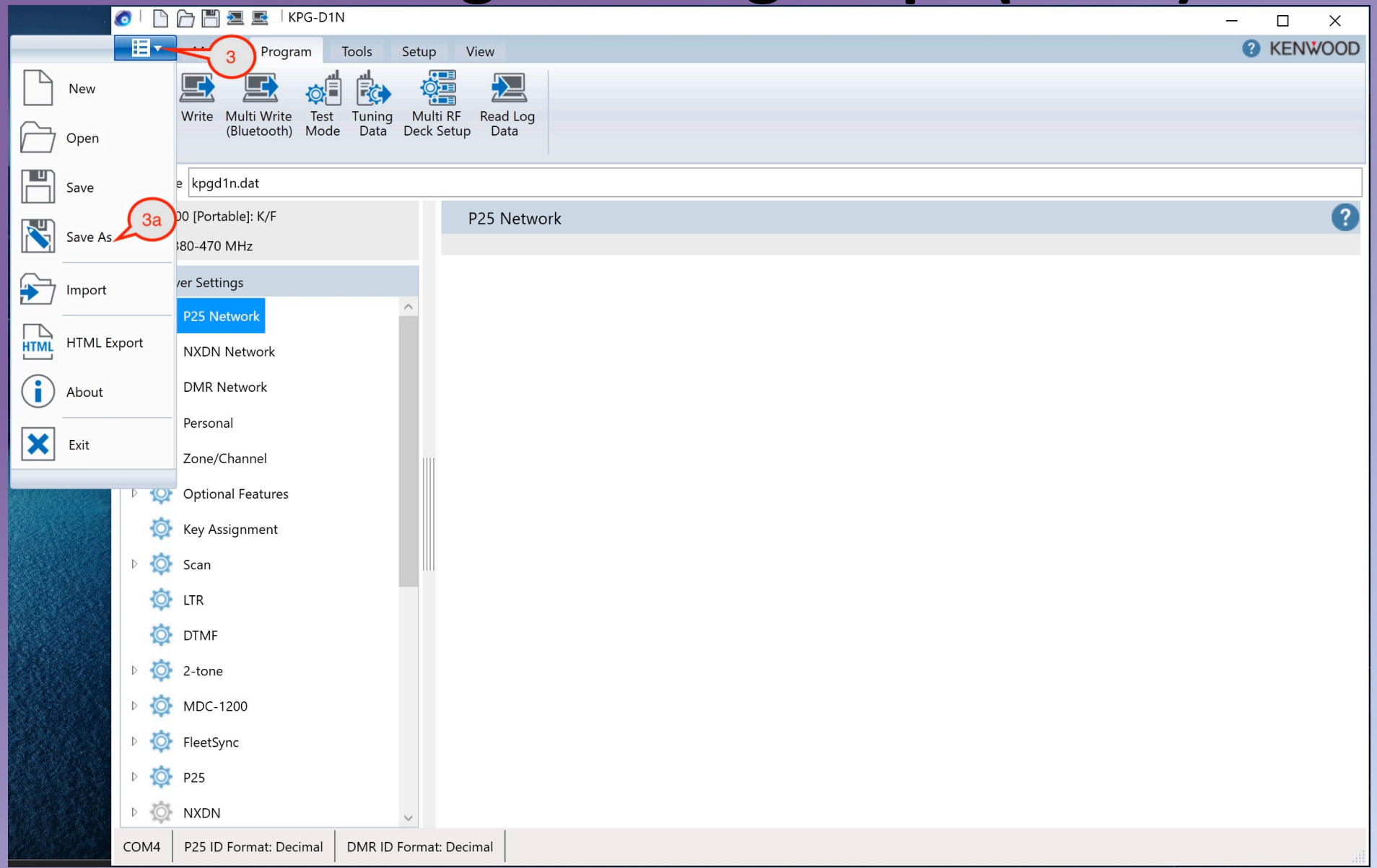
Nx-5000 Programming Steps (cont.)



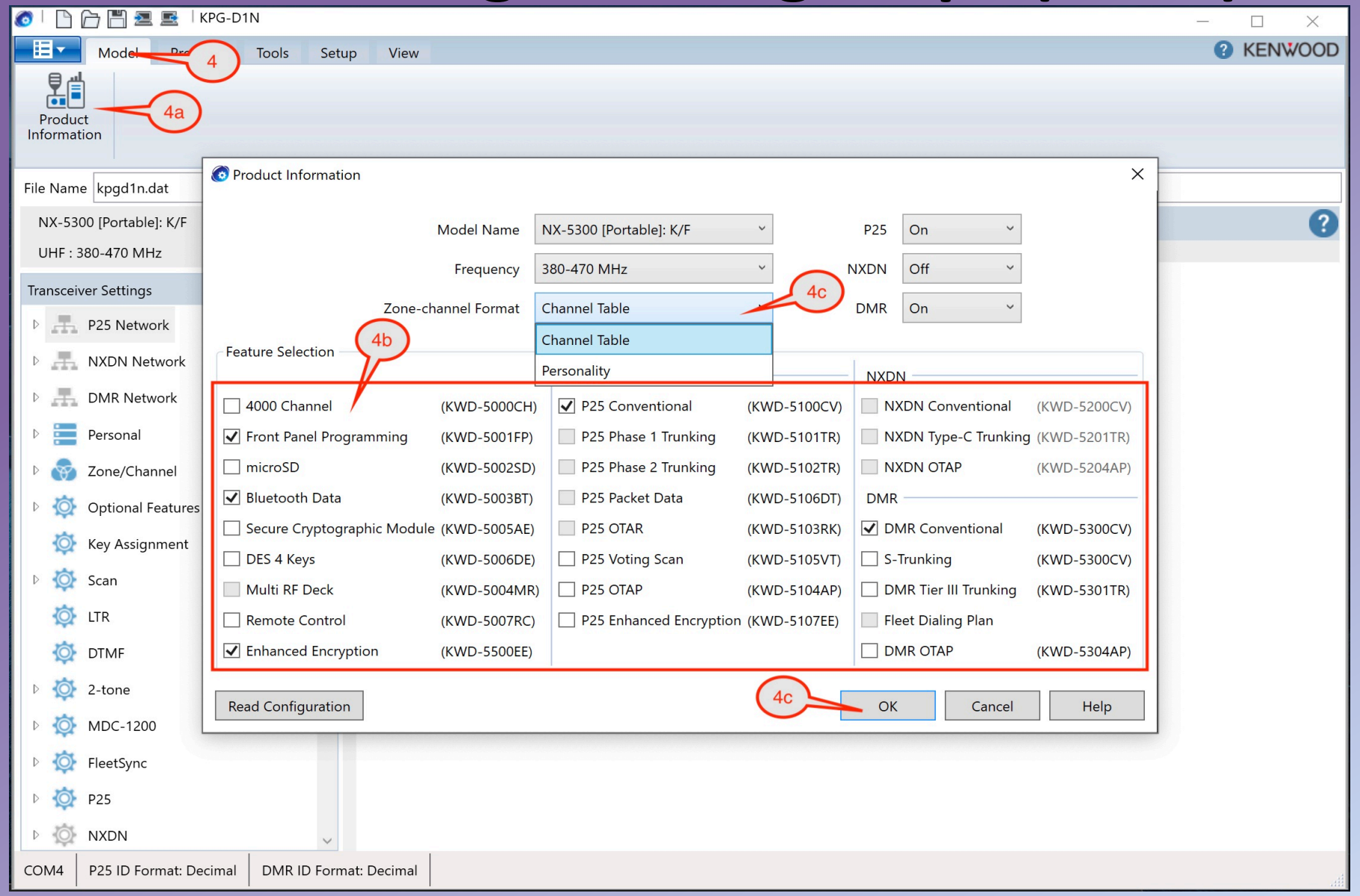
NX-5000 Programming Steps (cont.)



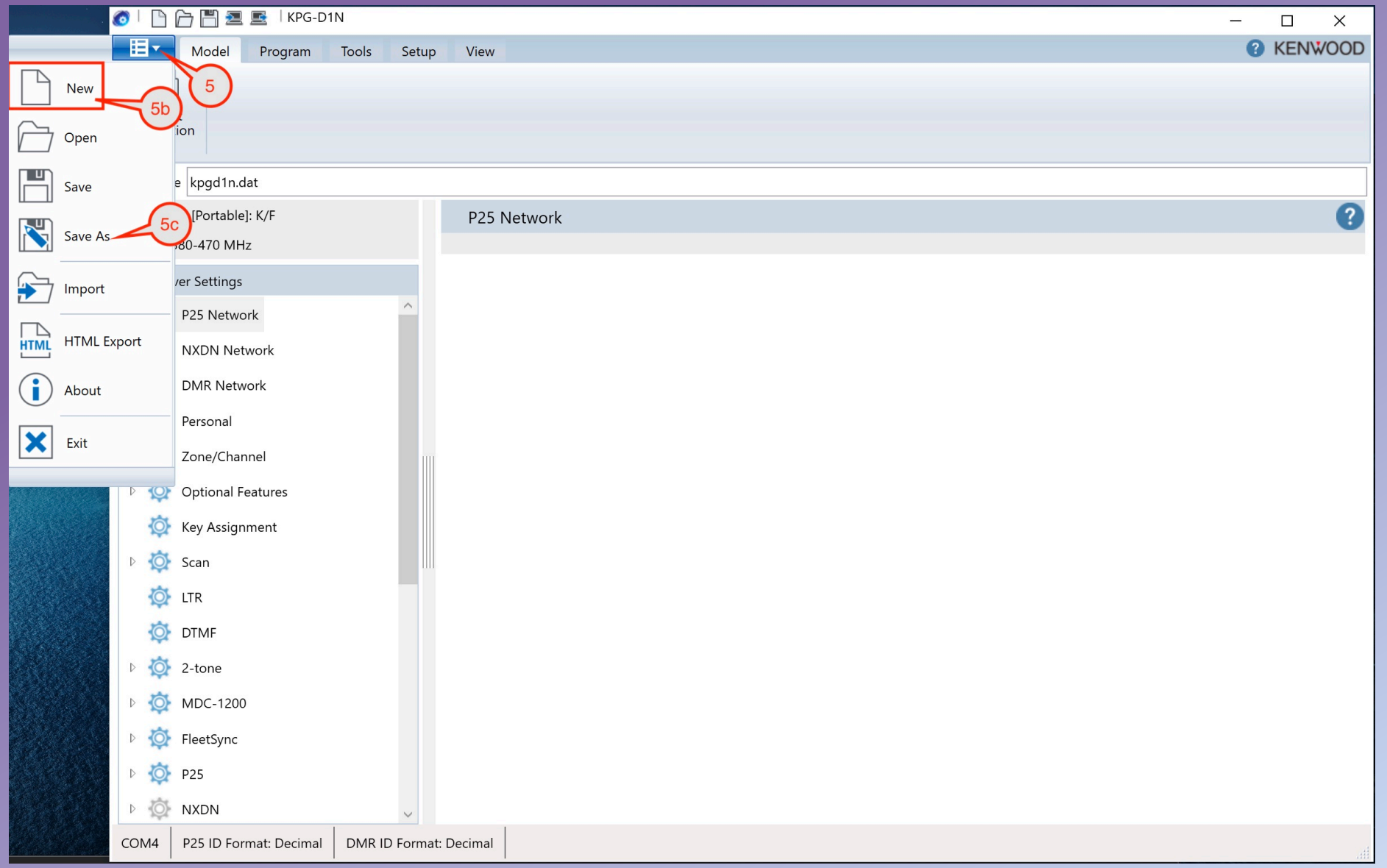
NX-5000 Programming Steps (cont.)



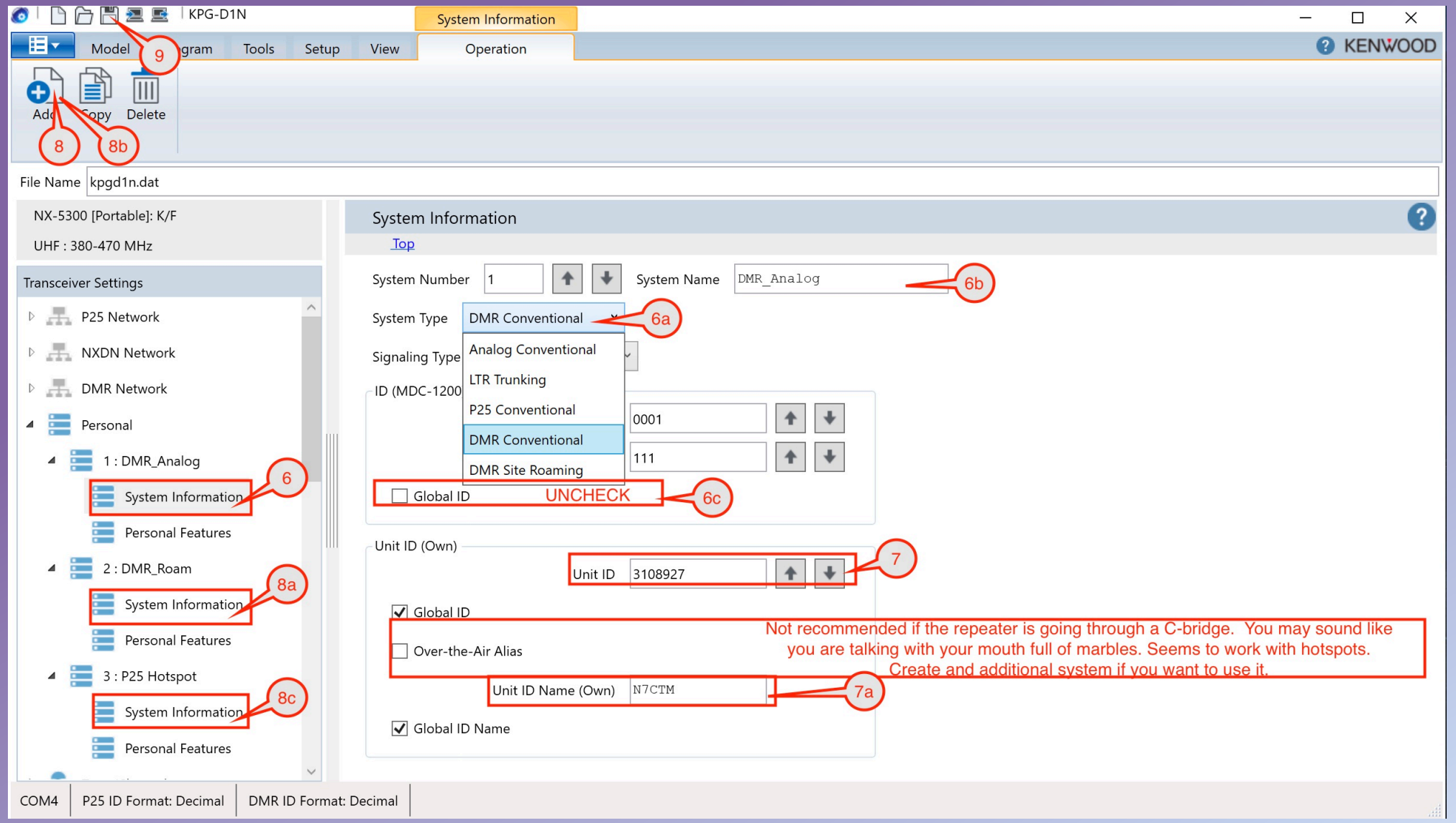
NX-5000 Programming Steps (cont.)



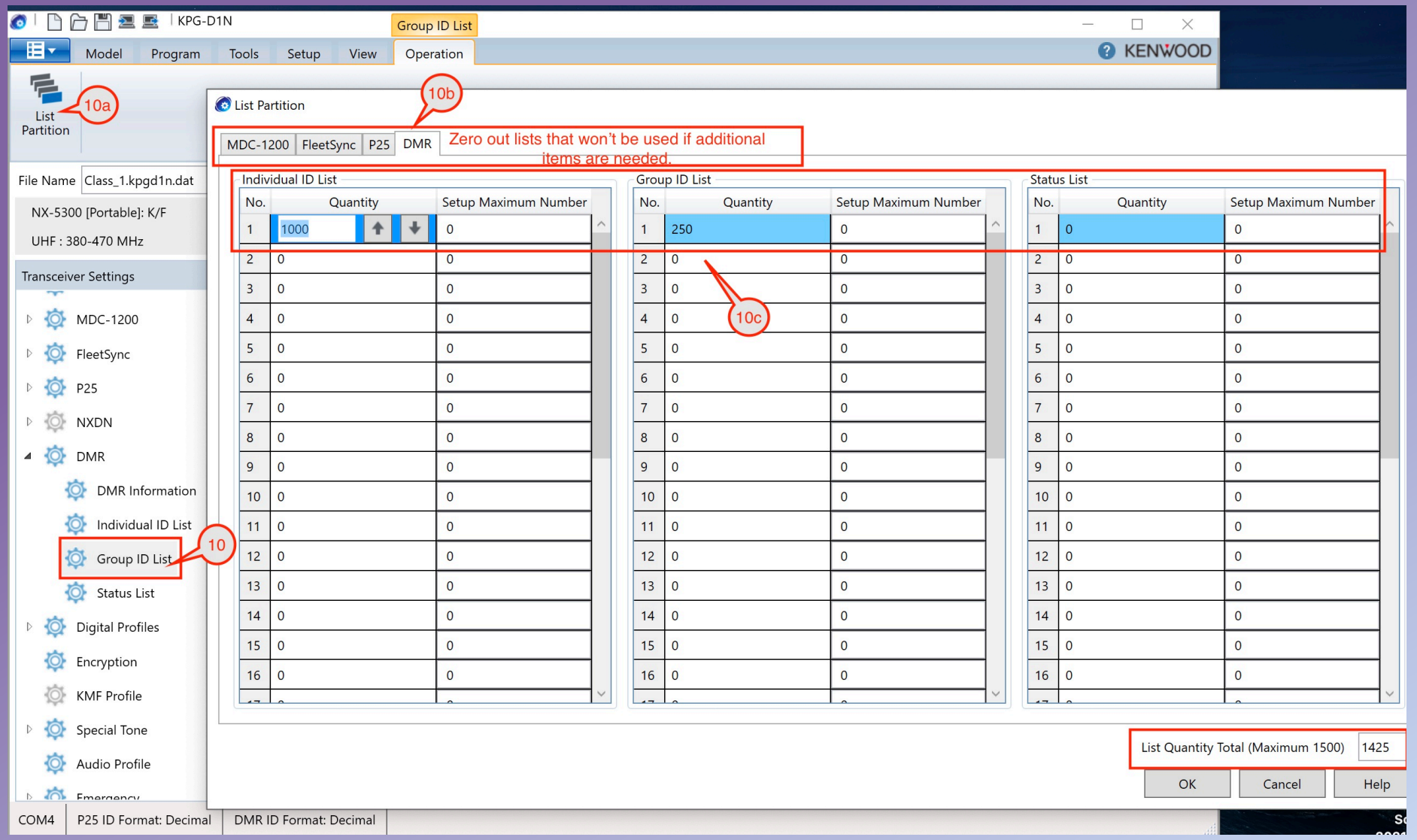
NX-5000 Programming Steps (cont.)



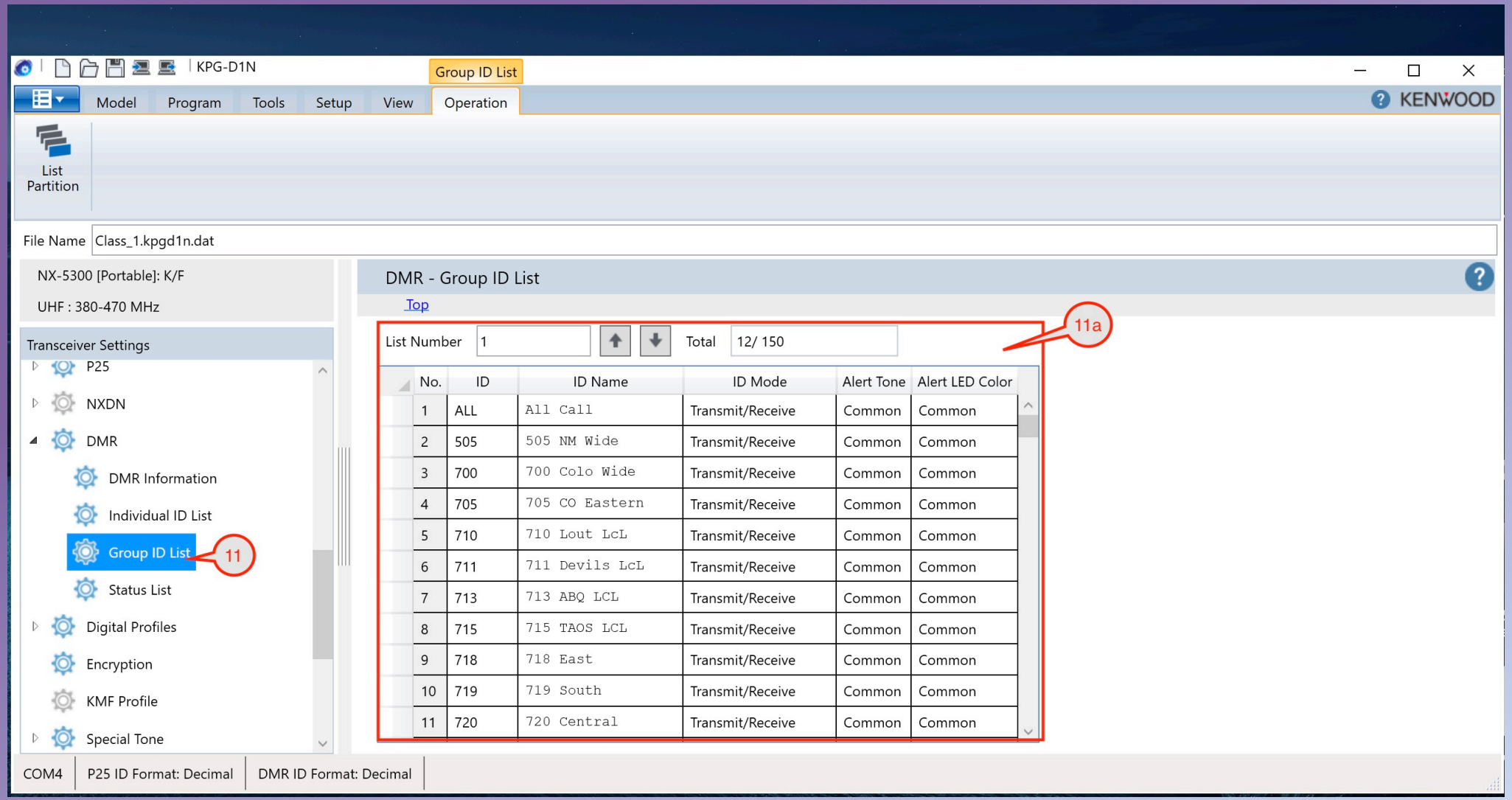
NX-5000 Programming Steps (cont.)



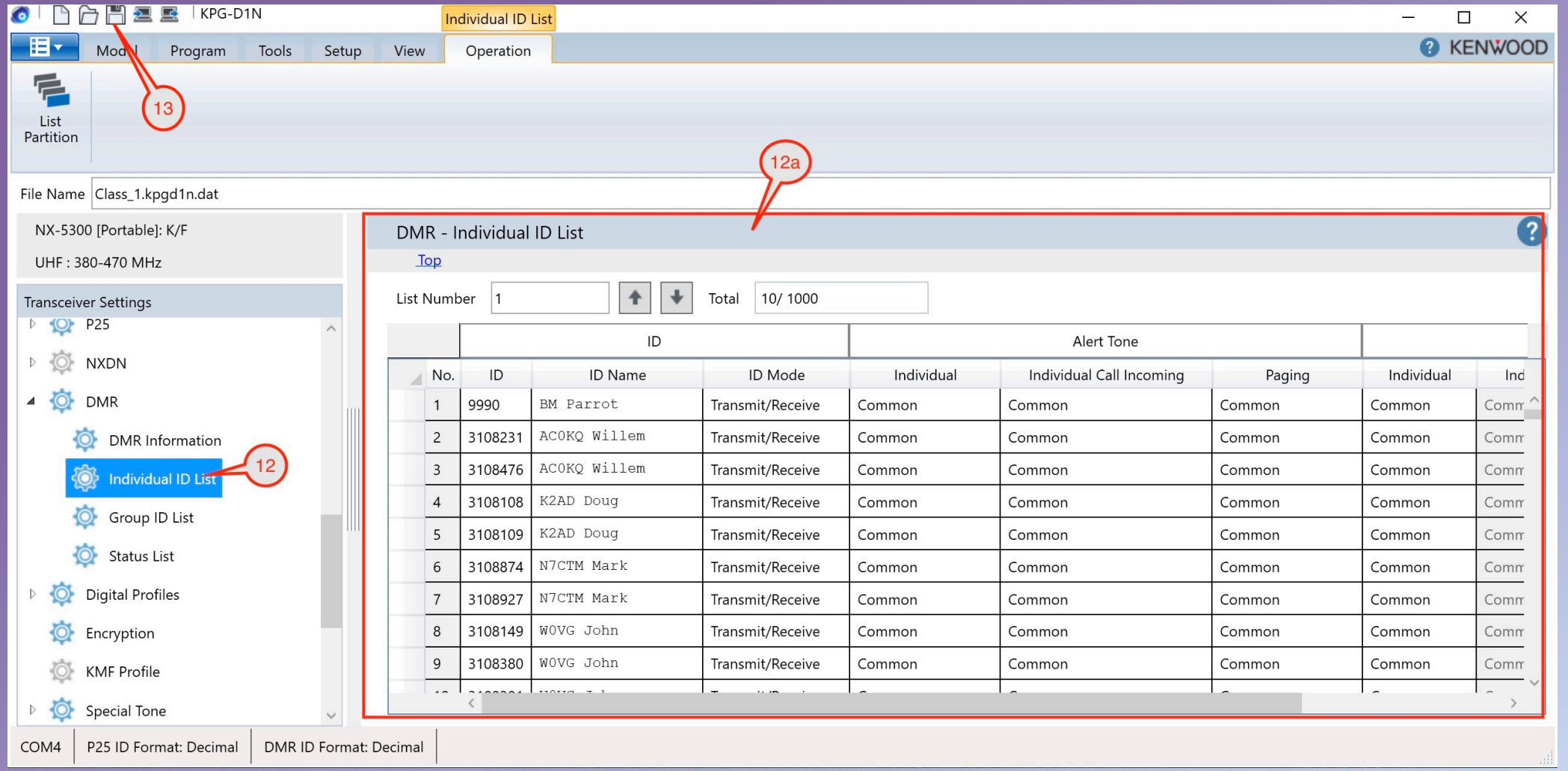
NX-5000 Programming Steps (cont.)



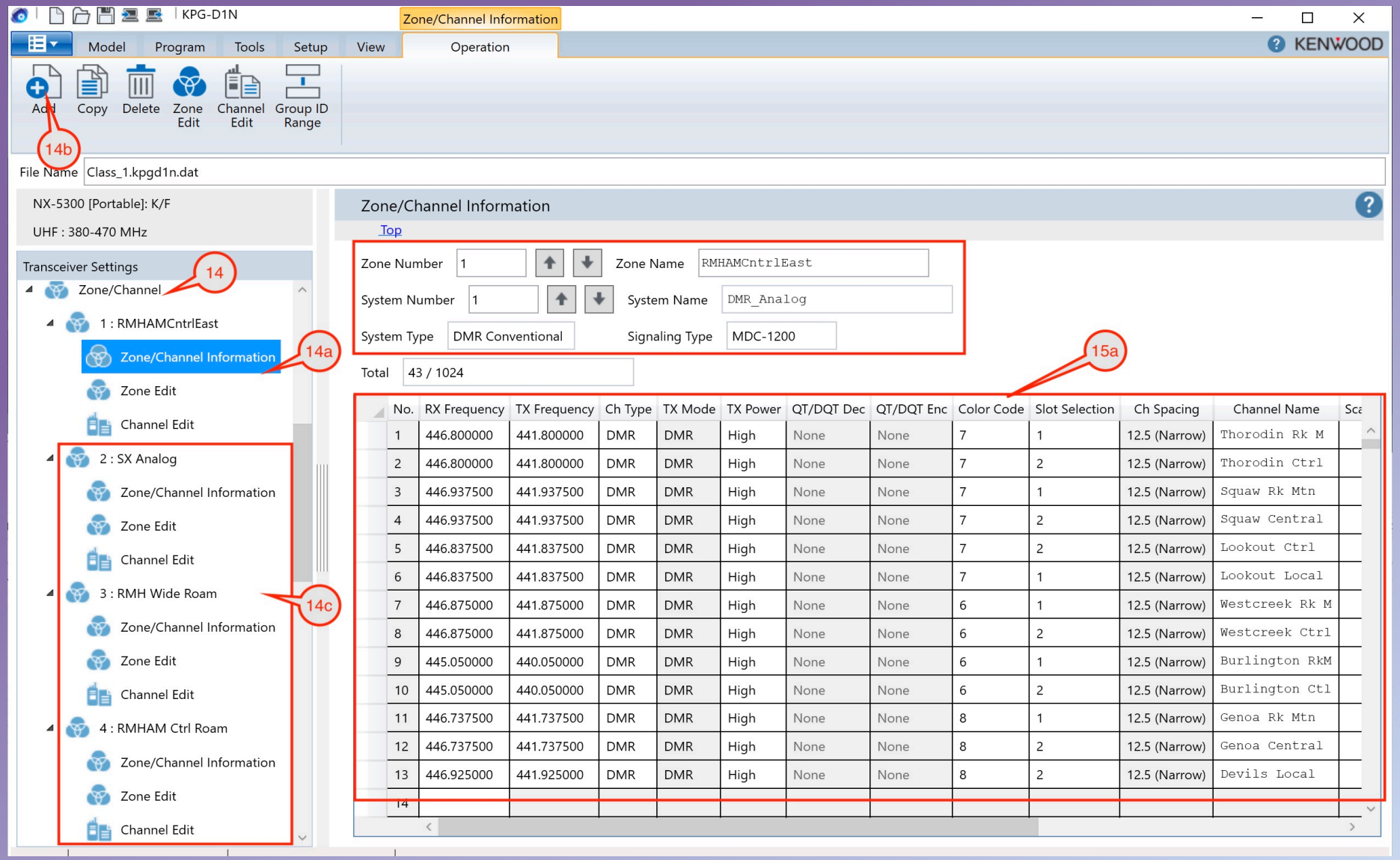
NX-5000 Programming Steps (cont.)



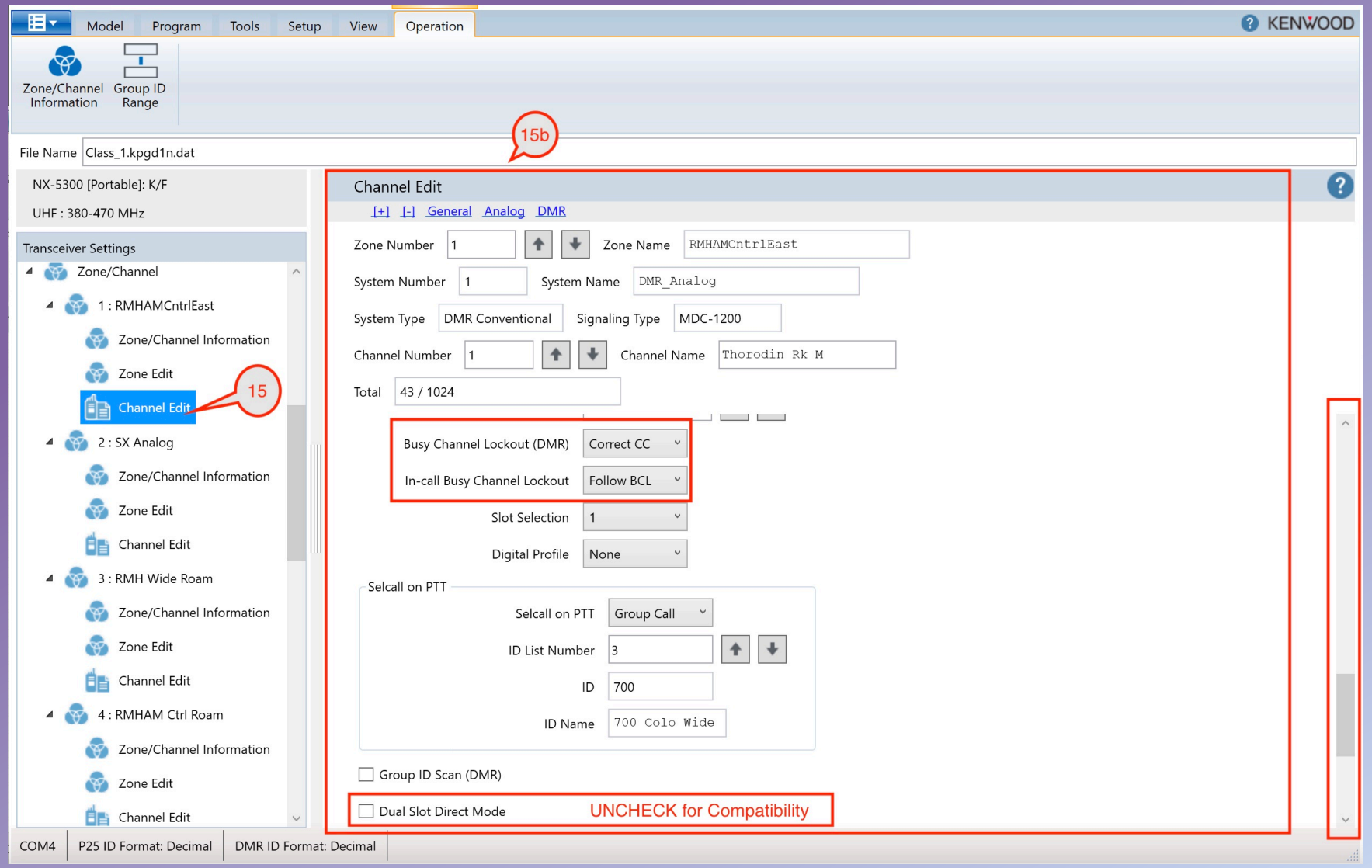
NX-5000 Programming Steps (cont.)



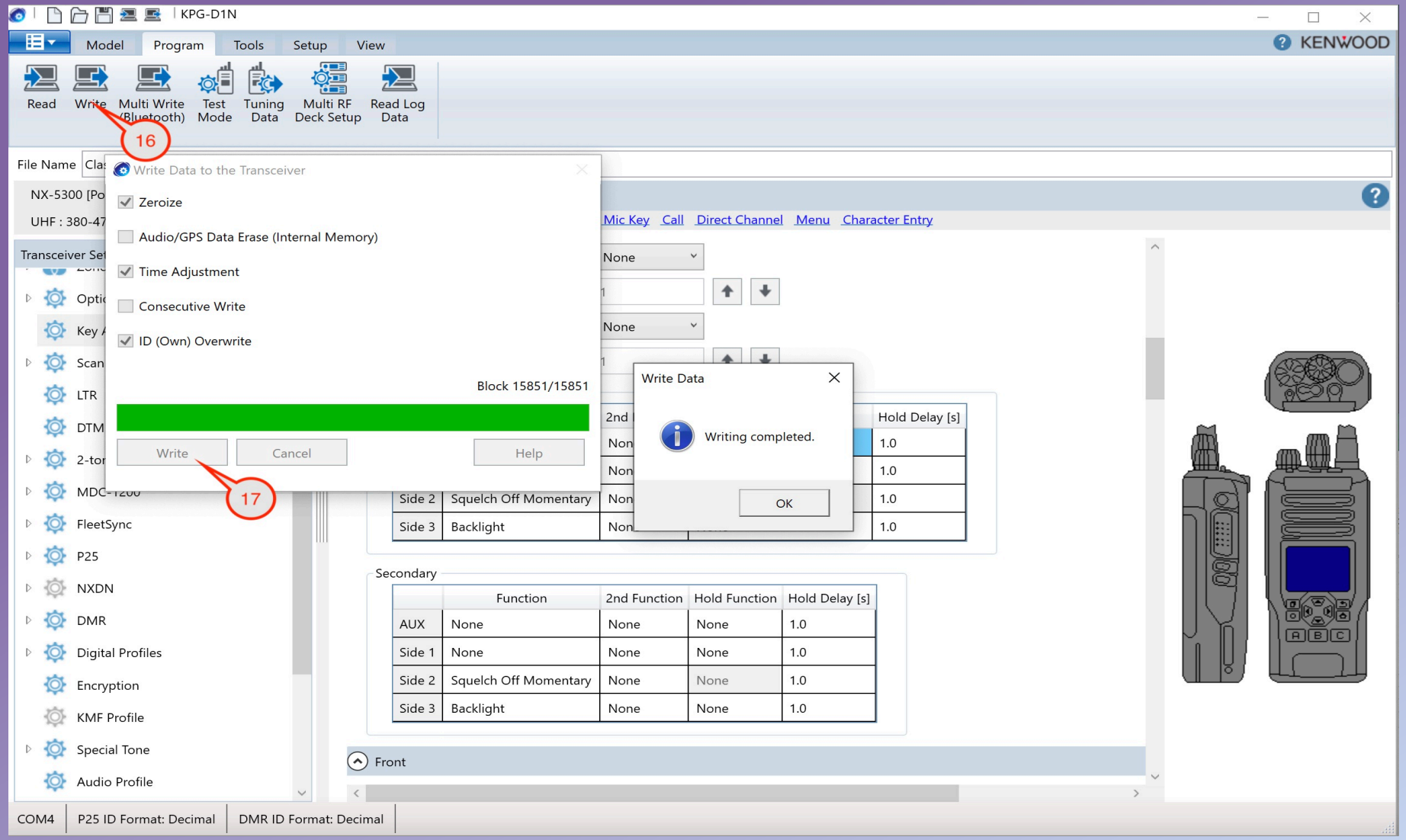
NX-5000 Programming Steps (cont.)



NX-5000 Programming Steps (cont.)



NX-5000 Programming Steps (cont.)



Programming Lab (Your Turn!)

Programming Information	FM Analog	DMR - Repeater	DMR - Repeater	DMR Roam	DMR Roam
Your Radio ID [ ]					
Zone Name	SX Analog	RMH Den	RMH Den	RMH Wide Roam	RMH Wide Roam
Channel Name	446.025 141.3	Thorodin Rk M	Squaw Rk Mtn	Thorodin Rk M	Squaw Rk Mtn
Receive Frequency (MHz)	446.0250	446.8000	446.9375	446.8000	446.9375
Transmit Frequency (MHz)	446.0250	441.8000	441.9375	441.8000	441.9375
Bandwidth (KHz)	25	12.5	12.5	12.5	12.5
Time Slot		1	1	1	1
CTCSS/DCS Encode	141.3				
CTCSS/DCS Decode	141.3				
Digital Color Code		7	7	7	7
TX Group		Group ID 700	Group ID 700	Group ID 700	Group ID 700
RX Group		Group ID 700	Group ID 700	Group ID 700	Group ID 700
Admit Criteria, BCL	Always/No	Color Code Free or Correct Color Code	Color Code Free or Correct Color Code	Color Code Free or Correct Color Code	Color Code Free or Correct Color Code
In-Call Criteria		Follow Admit Criteria or Follow BCL	Follow Admit Criteria or Follow BCL	Follow Admit Criteria or Follow BCL	Follow Admit Criteria or Follow BCL

Rocky Mountain Ham Radio

Thank you!!

73 de
KIØKN & N7CTM