

# {TESS+} VHF Training

## Module 3: Motorola equipment programming

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Read more about {TESS+}: [www.wfp.org/telecommunications-security-standards](http://www.wfp.org/telecommunications-security-standards)

Email: [TESS@wfp.org](mailto:TESS@wfp.org)



# Session objectives

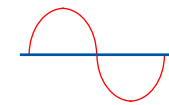
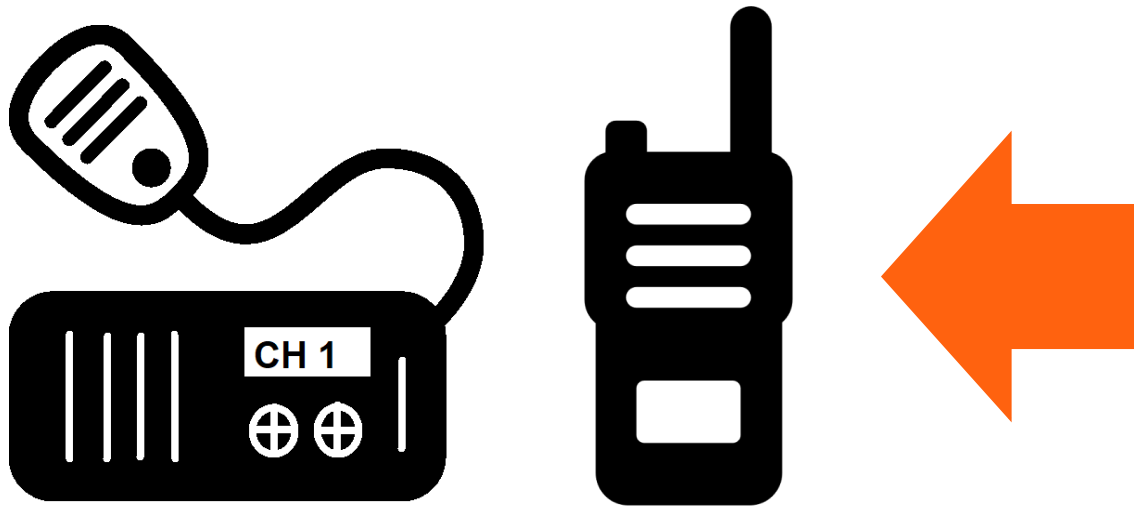
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- Program Motorola radios with the standard codeplug
- Test admin functionality (stun, un-stun, silent interrogate, emergency)
- Program Motorola repeater with the standard codeplug



# Radio configuration - program radio

- Run the equipment software and connect the programming cable
- Identify the callsign and SelV ID
- Identify a channel (simplex frequency)



Frequencies

1.2.3.

Channels

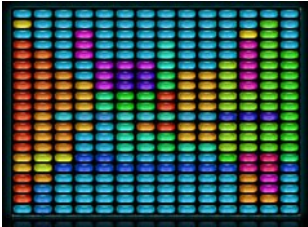
***ID***

SelV ID

# Program Motorola handheld radio



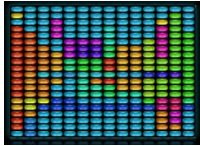
**MOTOROLA**



# Radio configuration – software (CPS16)

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- Install the following software for Motorola radios with old firmware:

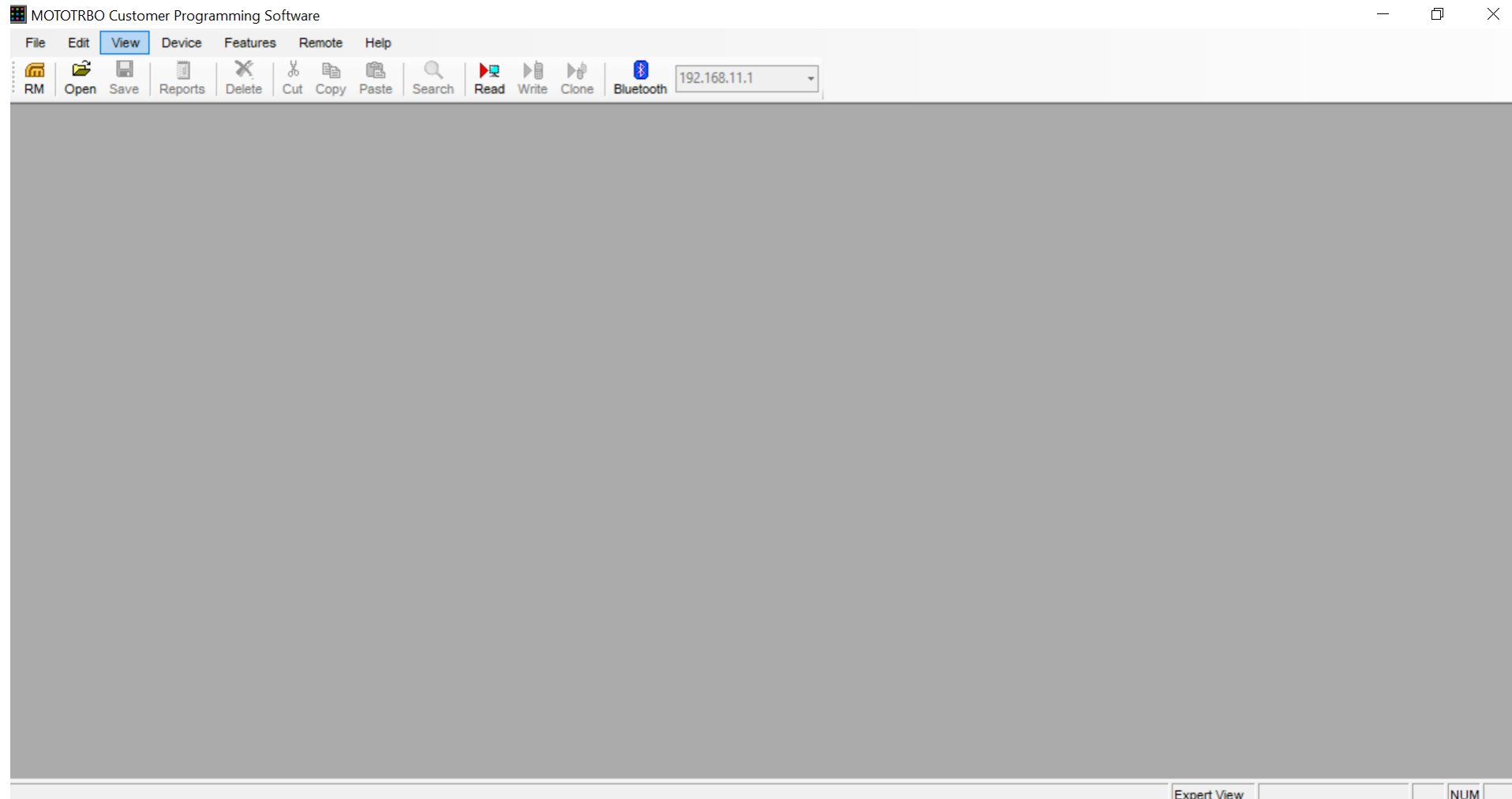


## **MOTOTRBO CPS16**

**Customer Programming Software** (*old firmware*)

# Program Motorola radio (CPS16)

- Run CPS16 – read standard codeplug



# Program Motorola radio (CPS16)

- Check and modify SelV ID

MOTOTRBO Customer Programming Software - [Admin PTT ID DP4801e.ctb]

General Settings

To CWI Audio Pr Microph Backli Battery S Alert Over-the-Air Progr Persistent LRRP Lone Wo Power Password an Front Programming Delete 5 Tone Rad

**Password and Lock**

Enable

Password 1111

**Front Programming Password**

Mode User

Password 12345678

**Delete All**

Text Mess

Job Tickets

Call Log

User Contact

**5 Tone Radio ID**

U U U U U U U U

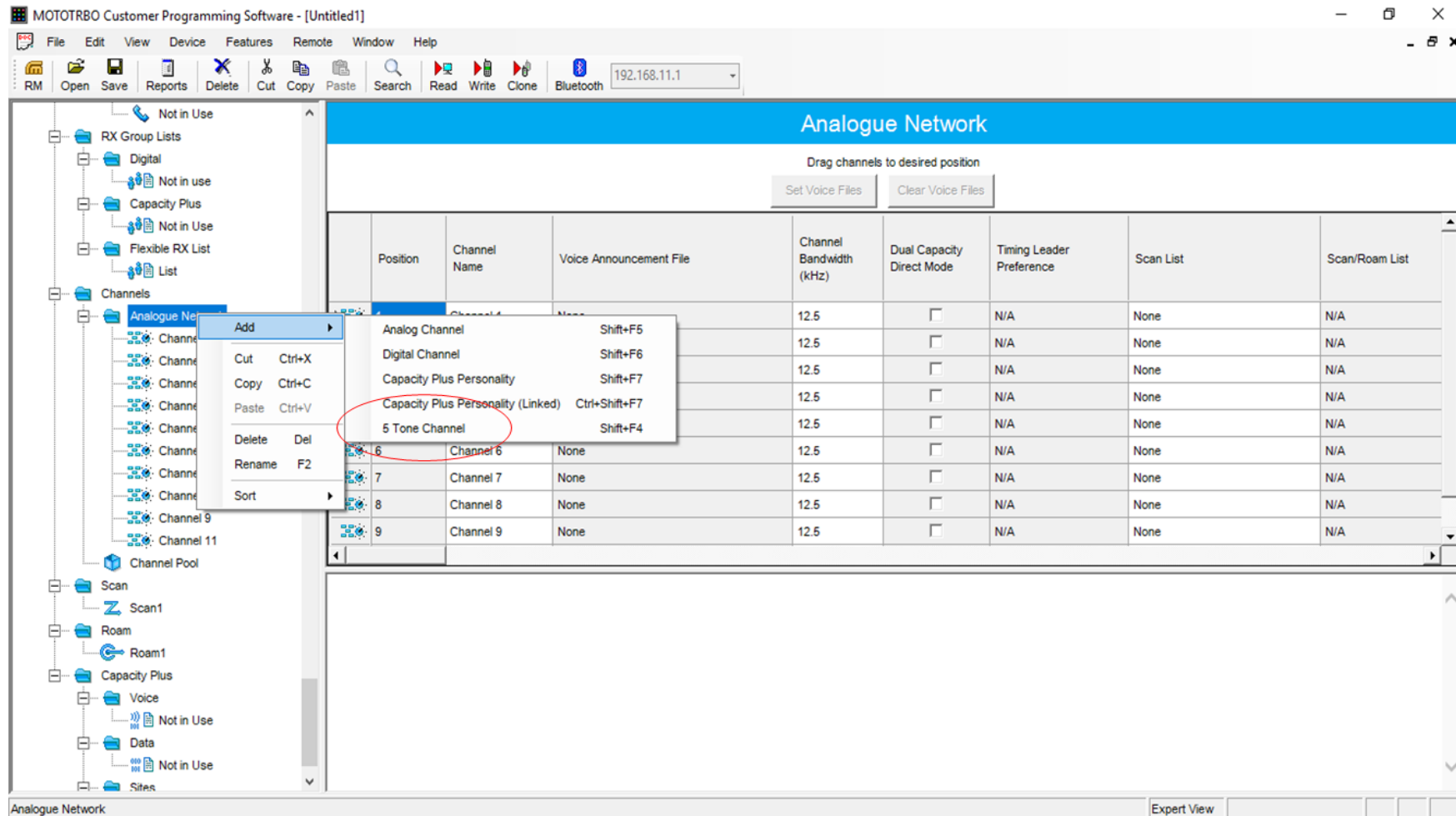
7 0 2 0 6 9 0 0

General Settings Expert View NUM



# Program Motorola radio (CPS16)

- Add SelV channel



MOTOTRBO Customer Programming Software - [Untitled1]

File Edit View Device Features Remote Window Help

RM Open Save Reports Delete Cut Copy Paste Search Read Write Clone Bluetooth 192.168.11.1

### Analogue Network

Drag channels to desired position

Set Voice Files Clear Voice Files

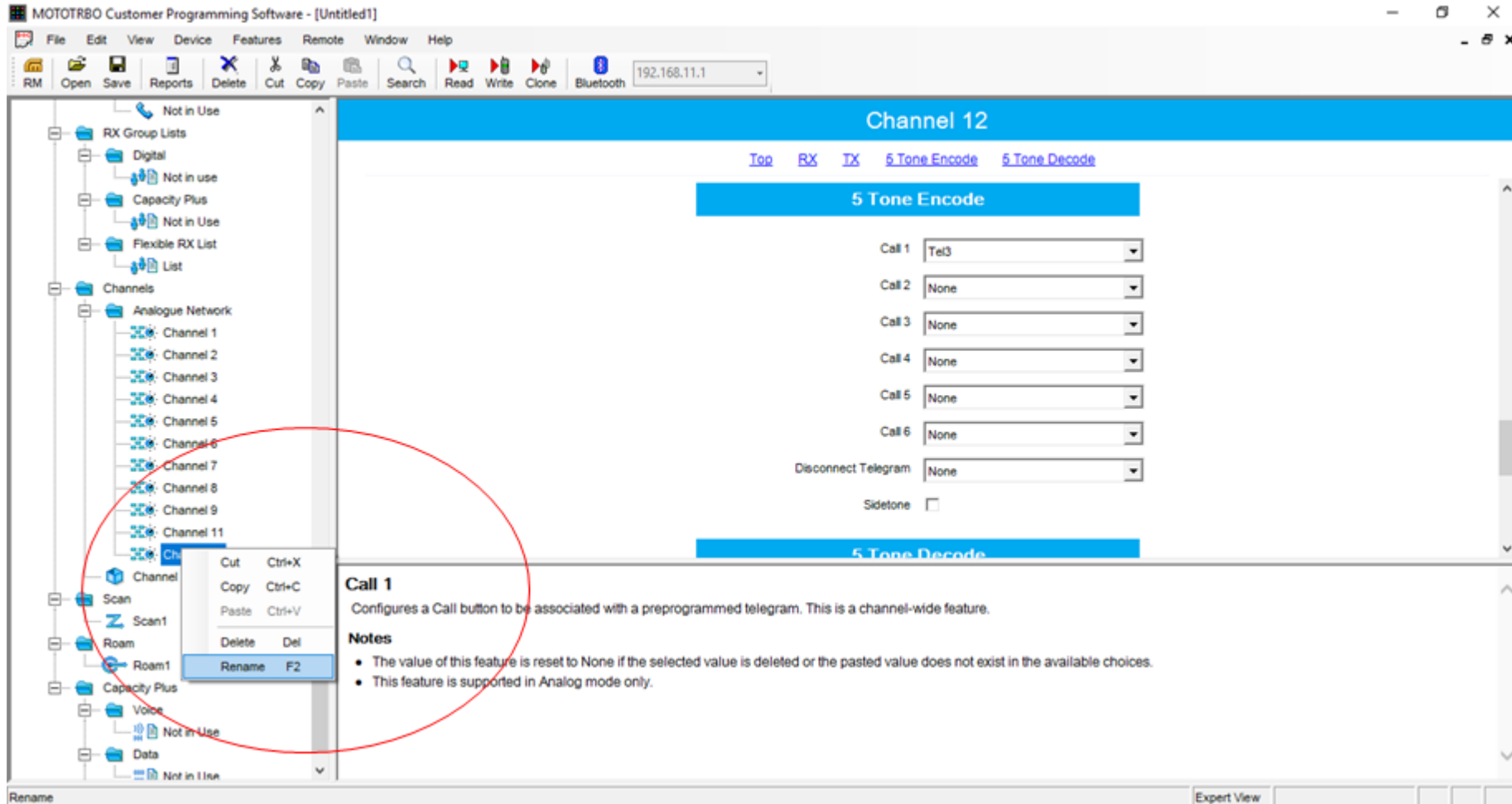
Position	Channel Name	Voice Announcement File	Channel Bandwidth (kHz)	Dual Capacity Direct Mode	Timing Leader Preference	Scan List	Scan/Roam List
	Analog Channel		12.5	<input type="checkbox"/>	N/A	None	N/A
	Digital Channel		12.5	<input type="checkbox"/>	N/A	None	N/A
	Capacity Plus Personality		12.5	<input type="checkbox"/>	N/A	None	N/A
	Capacity Plus Personality (Linked)		12.5	<input type="checkbox"/>	N/A	None	N/A
	5 Tone Channel		12.5	<input type="checkbox"/>	N/A	None	N/A
6	Channel 6	None	12.5	<input type="checkbox"/>	N/A	None	N/A
7	Channel 7	None	12.5	<input type="checkbox"/>	N/A	None	N/A
8	Channel 8	None	12.5	<input type="checkbox"/>	N/A	None	N/A
9	Channel 9	None	12.5	<input type="checkbox"/>	N/A	None	N/A

Analogue Network Expert View



# Program Motorola radio (CPS16)

- Rename channel



# Program Motorola radio (CPS16)

- Update the frequency and PL tone

The screenshot displays the MOTOTRBO Customer Programming Software interface. The left sidebar shows a tree view of the device configuration, with 'Channel 1' selected under 'Analog Network'. The main window shows the configuration for 'Channel 1', with tabs for 'RX' and 'TX'. Both sections are circled in red. The RX section shows the following settings: Frequency (MHz) 158.000000, Squelch Type TPL, DPL Code (Octal) 023, TPL Frequency (Hz) 141.3, and TPL Code 4A. The TX section shows identical settings. A text box at the bottom of the screen states: 'Identical to GP radios' and 'Frequencies and PL tone need to be added'.

# Program Motorola radio (CPS16)

- Add SelV functions to the channel and then write/clone

The screenshot displays the MOTOTRBO Customer Programming Software interface. The left sidebar shows a tree view of the programming structure, with 'Channel 12' selected under 'Channels'. The main window shows the configuration for 'Channel 12'. At the top, there are tabs for 'Top', 'RX', and 'TX'. The 'TX' tab is active, and within it, the '5 Tone Encode' sub-tab is selected and circled in red. Below this, there are six dropdown menus for 'Call 1' through 'Call 6', and a 'Disconnect Telegram' dropdown. The 'Call 1' dropdown is currently set to 'Tel3'. Below the dropdowns is a 'Sidetone' checkbox, which is unchecked. At the bottom of the main window, there is a 'Call 1' section with a description and notes.

**Call 1**  
Configures a Call button to be associated with a preprogrammed telegram. This is a channel-wide feature.

**Notes**

- The value of this feature is reset to None if the selected value is deleted or the pasted value does not exist in the available choices.
- This feature is supported in Analog mode only.

# Radio configuration – software (CPS2.0)

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- Install the following software for Motorola radios with new firmware:

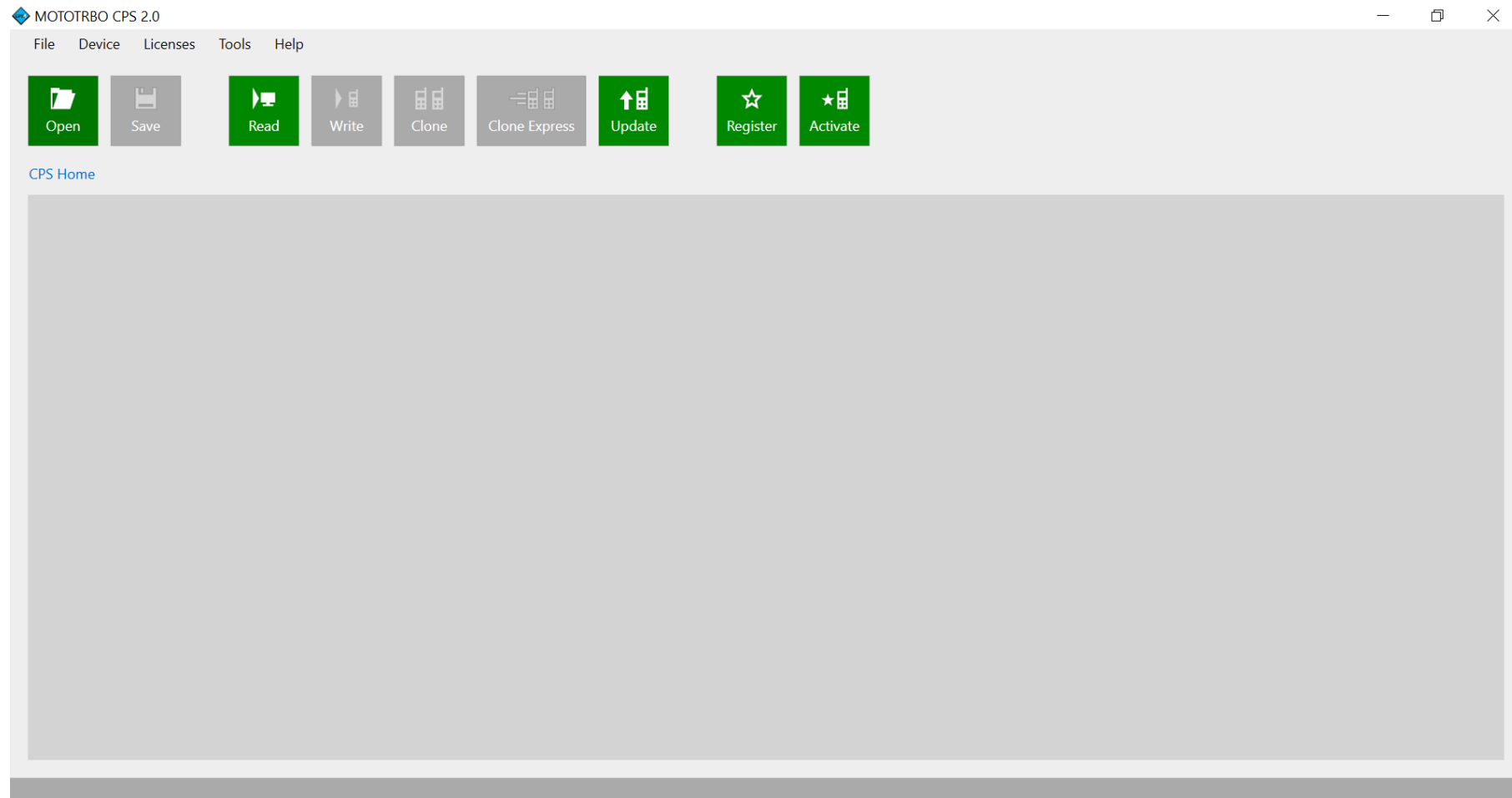


## **MOTOTRBO CPS2.0**

**Customer Programming Software** (*new firmware*)

# Program Motorola radio (CPS2.0)

- Run CPS2.0 – read standard codeplug



# Program Motorola radio (CPS2.0)

- Check and modify SelV ID

The screenshot shows the Motorola CPS 2.0 software interface. The window title is "Admin PTT ID DP4801e.ctb2 - MOTOTRBO CPS 2.0". The menu bar includes "File", "Device", "Licenses", "Tools", and "Help". The toolbar contains icons for "Open", "Save", "Read", "Write", "Clone", "Clone Express", "Update", "Register", and "Activate". The left sidebar shows a tree view of "Set Categories" with "General Settings" selected. The main area displays the "General Settings" for "Admin PTT ID DP4801e". The "5 Tone ID" section is expanded, showing a list of tones (U1 through U8) with corresponding numeric values in input fields. The values are: U1: 7, U2: 0, U3: 2, U4: 0, U5: 6, U6: 9, U7: 0, U8: 0. A red circle highlights the U1 through U8 input fields. Other sections like "Delete All" and "Text Messages" are also visible.

Tone	Value
U1	7
U2	0
U3	2
U4	0
U5	6
U6	9
U7	0
U8	0

# Program Motorola radio (CPS2.0)

- Add SelV channel

The screenshot displays the MOTOTRBO CPS 2.0 software interface. The main window title is "Admin PTT ID DP4801e.ctb2 - MOTOTRBO CPS 2.0". The menu bar includes "File", "Device", "Licenses", "Tools", and "Help". A toolbar contains icons for "Open", "Save", "Read", "Write", "Clone", "Clone Express", "Update", "Register", and "Activate". The breadcrumb path is "Admin PTT ID DP4801e > Zone > Channel Pool".

The "Set Categories" pane on the left shows a tree view with "Configuration" expanded to "Zone/Channel Assignment" > "Zone" > "Channel Pool".

The main area shows a table with the following data:

Zone Name	Channel Pool
	Channel Pool
Voice Announcement File	None

A "Zone Items" list is visible below the table, showing "0 items found (0 currently selected)".

A "Choose Set Type" dialog box is open, with "Type" set to "5 Tone". The dialog has "OK" and "Cancel" buttons.

At the bottom of the window, there are tabs for "Validation Results", "Warning Messages", "Search Results", and "Help".







# Program Motorola radio (CPS2.0)


- Rename channel

*Zone Name*    *Channel Pool*

*Voice Announcement File*    *None*

Zone Items

	Position	Channel Type	Channel Name	Voice Announcement File	Channel Bandwidth (kHz)	Scan/Roam L
	1	5 Tone	<input type="text" value="Channel5"/>	None	12.5	None

1 items found (0 currently selected).





# Program Motorola radio (CPS2.0)

- Update the frequency and PL tone

General RX/TX 5 Tone Encode 5 Tone Decode

Frequency (MHz)	<input type="text" value="136.025000"/>	Offset (MHz)	<input type="text" value="136.025000"/>	
Squelch Type	TPL		<input type="text" value="0.000000"/>	
DPL Code (Octal)	023	<input type="button" value="Copy"/>	DPL Code (Octal)	023
DPL Invert	No		DPL Invert	No
TPL Frequency (Hz)	<input type="text" value="67.0"/>	TPL Frequency (Hz)	<input type="text" value="67.0"/>	
TPL Code	XZ	TPL Code	XZ	
Ref Frequency (MHz)	Default	Ref Frequency (MHz)	Default	
Unmute Rule	Std Unmute, Mute	DPL Turn-Off Code	Yes	
Squelch Mode	PL & Tone	VOX	<input type="checkbox"/>	
PL Override	<input type="checkbox"/>	TPL Reverse Burst	Standard	
Auto Reset Mode	Carrier Override	Power Level	High	
		TOT (sec)	<input type="text" value="60"/>	

# Program Motorola radio (CPS2.0)

- Add SelV functions to the channel and then write/clone

⤴ 5 Tone Decode

Available

Decode Telegrams

(1) Called In  
(29) Stun  
(3) Unstan  
(4) Silent Int  
(5) Incming Emgcy  
(6) Emgcy Exit  
(7) Ack1  
(9) PTT-ID

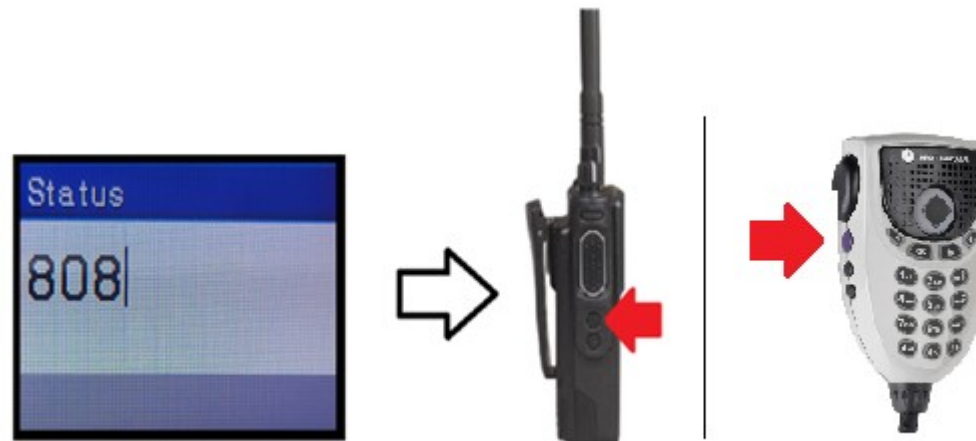
Add

Remove



# Program Motorola radio - admin functionality

- Test admin functionality (stun, un-stun, silent interrogate, emergency)



# Live demonstration – program Motorola handheld

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- The facilitator will now show you how to program a Motorola handheld radio with SelV functionality.

Time needed:  
**appx 30mins**



# Admin functionality using Motorola radios

- Divide into three groups of 4 people
- Use a handheld radio and do the following:
  - Program it with a network controller codeplug
  - Stun / un-stun and silently interrogate another user radio
  - Initiate and deal with an emergency alert
  - Confirm the features work as expected



## Exercise



The network controller codeplug contains features that, when used incorrectly, can seriously disrupt network operations. Make sure to program this codeplug in network controller radios only!

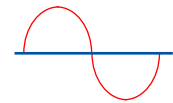
# Questions and remarks

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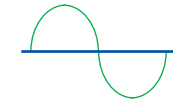


# Program a repeater with standard codeplug

- Parameters to program a repeater:



Tx Frequency



Rx Frequency



TPL tone



Power level

# Program a repeater with standard codeplug

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## ***Resources:***

- See the programming manual "Programming Motorola repeaters" in the {TESS+} online repository which will guide you on how to program a Motorola repeater.



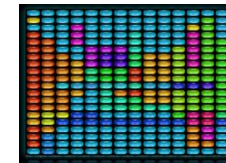


# Programming Motorola repeater

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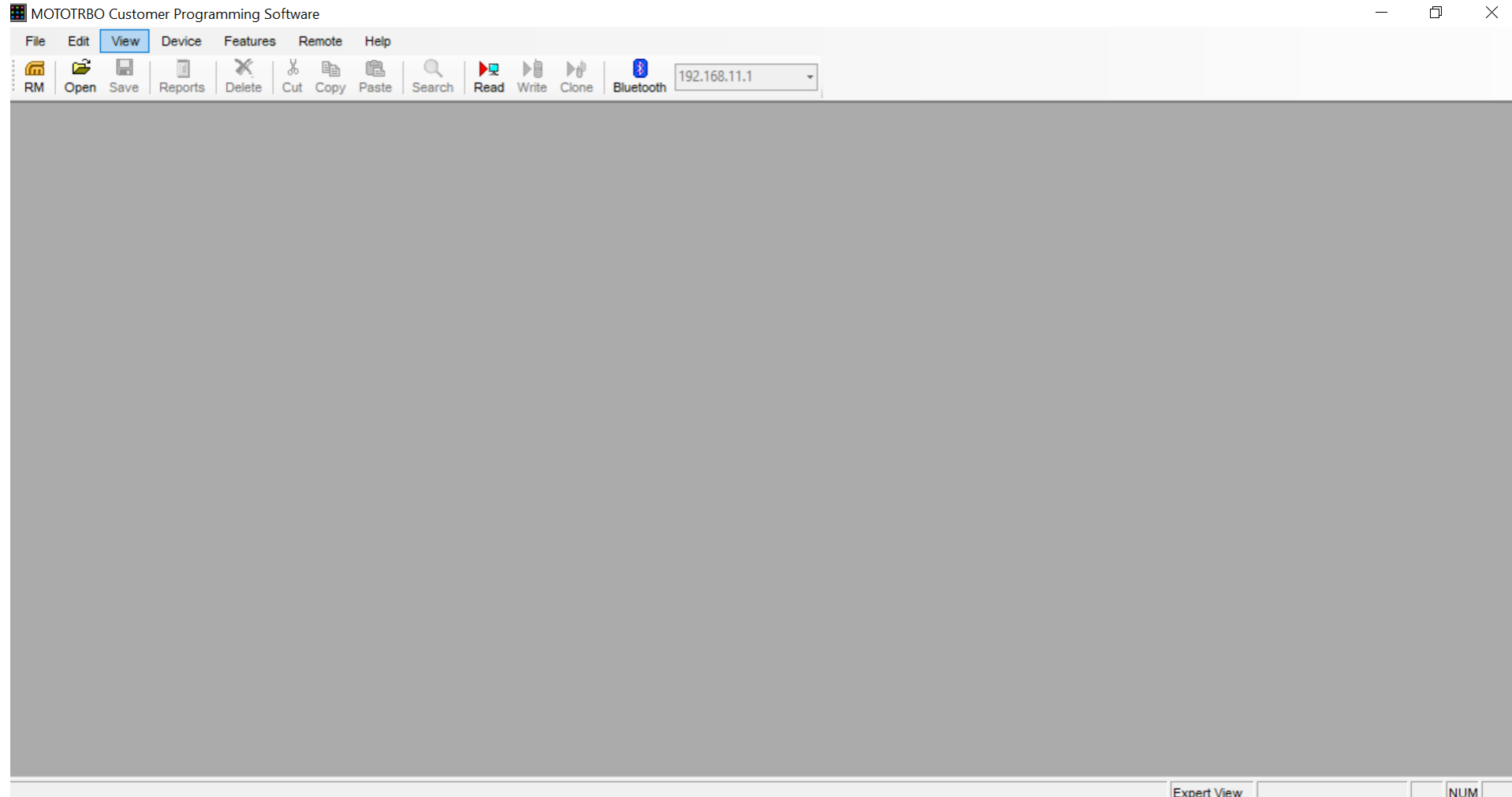


**MOTOROLA**



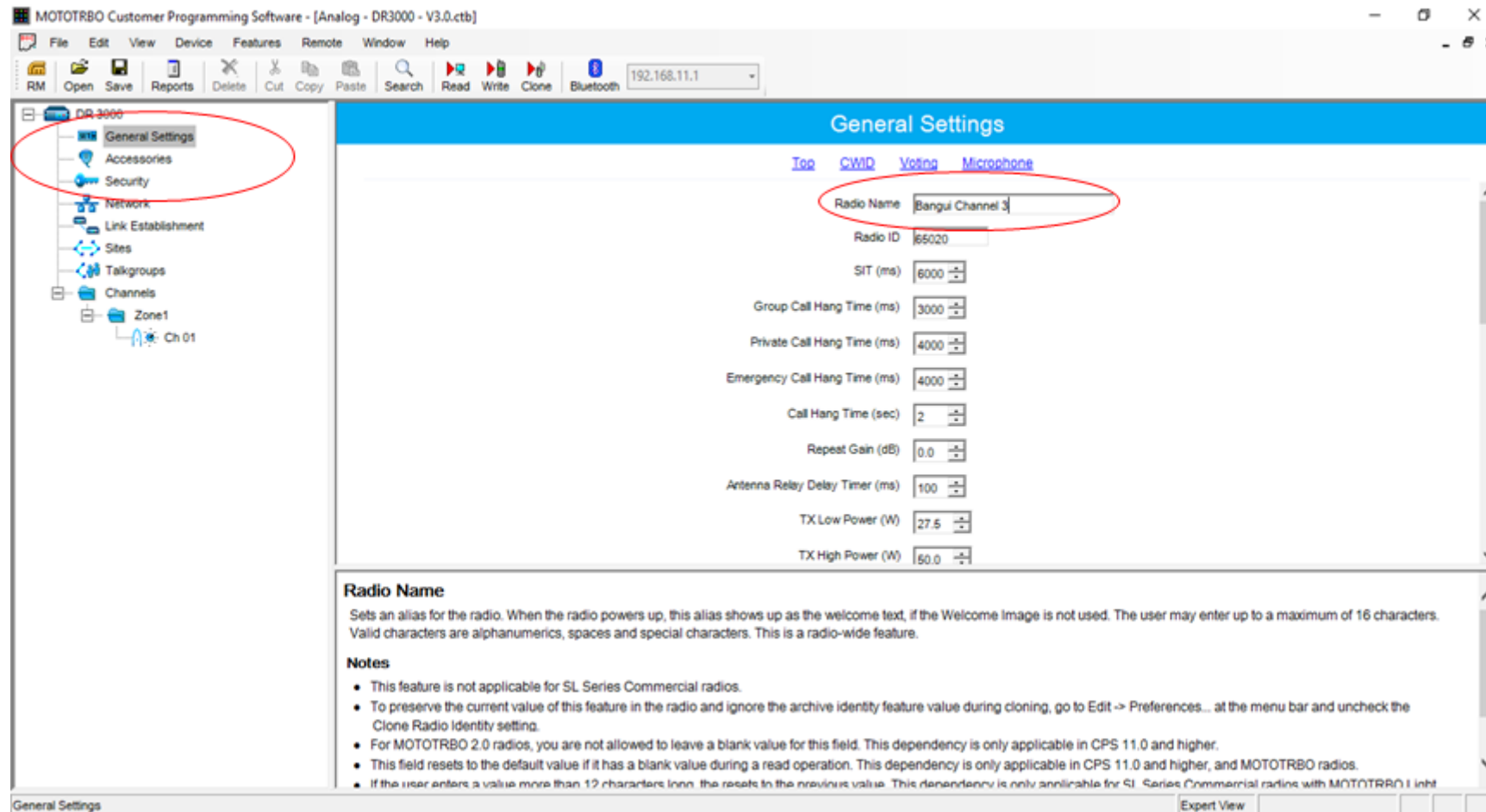
# Programming Motorola repeater (CPS16)

- Run CPS16 – read standard codeplug



# Programming Motorola repeater (CPS16)

- Change repeater name



MOTOTRBO Customer Programming Software - [Analog - DR3000 - V3.0.ctb]

File Edit View Device Features Remote Window Help

RM Open Save Reports Delete Cut Copy Paste Search Read Write Clone Bluetooth 192.168.11.1

DR 3000

- General Settings
- Accessories
- Security
- Network
- Link Establishment
- Sites
- Talkgroups
- Channels
  - Zone1
    - Ch 01

### General Settings

Top CWID Voice Microphone

Radio Name Bengui Channel 3

Radio ID 65020

SIT (ms) 6000

Group Call Hang Time (ms) 3000

Private Call Hang Time (ms) 4000

Emergency Call Hang Time (ms) 4000

Call Hang Time (sec) 2

Repeat Gain (dB) 0.0

Antenna Relay Delay Timer (ms) 100

TX Low Power (W) 27.5

TX High Power (W) 50.0

#### Radio Name

Sets an alias for the radio. When the radio powers up, this alias shows up as the welcome text, if the Welcome Image is not used. The user may enter up to a maximum of 16 characters. Valid characters are alphanumerics, spaces and special characters. This is a radio-wide feature.

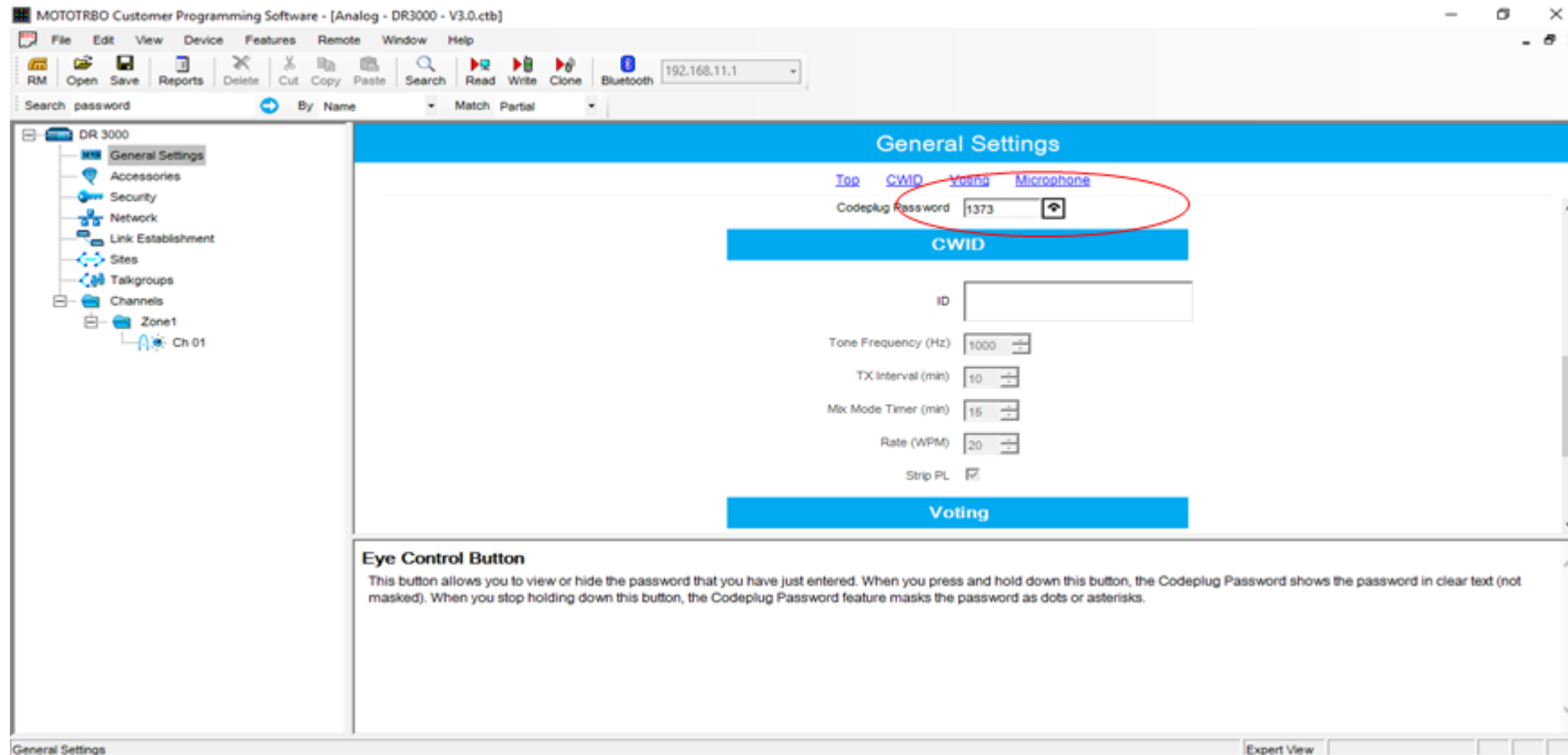
#### Notes

- This feature is not applicable for SL Series Commercial radios.
- To preserve the current value of this feature in the radio and ignore the archive identity feature value during cloning, go to Edit -> Preferences... at the menu bar and uncheck the Clone Radio Identity setting.
- For MOTOTRBO 2.0 radios, you are not allowed to leave a blank value for this field. This dependency is only applicable in CPS 11.0 and higher.
- This field resets to the default value if it has a blank value during a read operation. This dependency is only applicable in CPS 11.0 and higher, and MOTOTRBO radios.
- If the user enters a value more than 12 characters long, the result is the previous value. This dependency is only applicable for SL Series Commercial radios with MOTOTRBO 1.0

General Settings Expert View

# Programming Motorola repeater (CPS16)

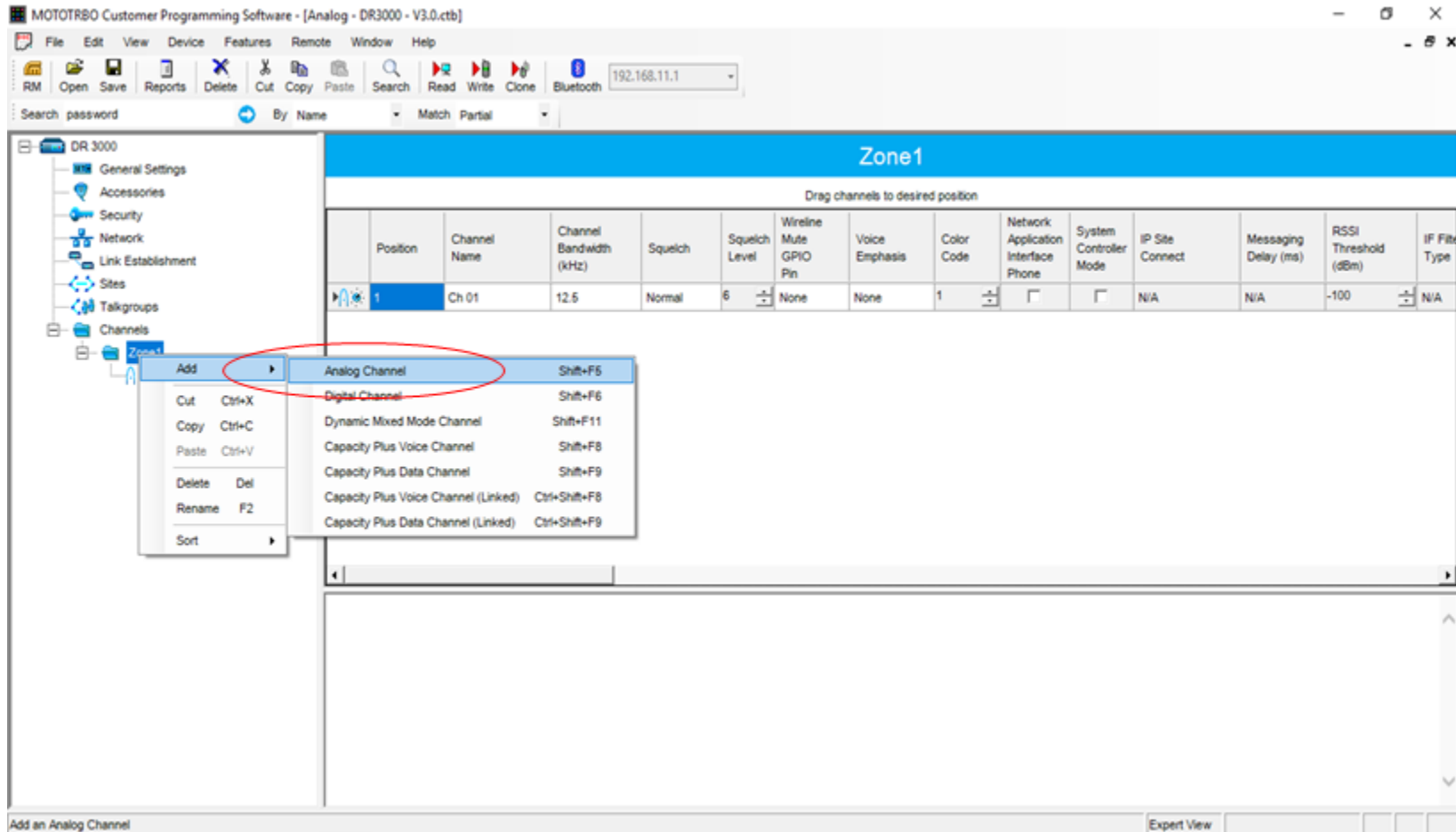
- Add/change codeplug password



The screenshot displays the MOTOTRBO Customer Programming Software interface. The main window is titled "General Settings" and features a navigation pane on the left with categories like General Settings, Accessories, Security, Network, Link Establishment, Sites, Talkgroups, Channels, and Zone1. The "Codeplug Password" field is highlighted with a red oval, showing the value "1373". Below this, the "CWID" section includes fields for ID, Tone Frequency (Hz), TX Interval (min), Mix Mode Timer (min), Rate (WPM), and Strip PL. The "Voting" section is also visible. At the bottom, there is an "Eye Control Button" section with a descriptive text: "This button allows you to view or hide the password that you have just entered. When you press and hold down this button, the Codeplug Password shows the password in clear text (not masked). When you stop holding down this button, the Codeplug Password feature masks the password as dots or asterisks."

# Programming Motorola repeater (CPS16)

- Add repeater analogue channel



# Programming Motorola repeater (CPS16)

- Add Tx/Rx frequencies

The screenshot displays the MOTOTRBO Customer Programming Software interface for configuring a Motorola DR3000 repeater. The main window is titled "Ch 01" and shows the configuration for a specific channel. The interface is divided into two main sections: "RX" (Receiver) and "TX" (Transmitter). Both sections have their respective frequency fields circled in red. The RX frequency is 161.462500 MHz and the TX frequency is 170.587500 MHz. Other settings include Squelch Type (TPL), DPL Code (023), DPL Invert (unchecked), TPL Frequency (141.3 Hz), and TPL Code (4A). The "TX Squelch Type" section is also visible, providing a detailed description of the feature and its applicability.

MOTOTRBO Customer Programming Software - [Analog - DR3000 - V3.0.ctb]

File Edit View Device Features Remote Window Help

RM Open Save Reports Delete Cut Copy Paste Search Read Write Clone Bluetooth 192.168.11.1

Search password By Name Match Partial

DR 3000

- General Settings
- Accessories
- Security
- Network
- Link Establishment
- Sites
- Talkgroups
- Channels
  - Zone1
    - Ch 01

Ch 01

Audio Enhancement None

RX TX

Frequency (MHz) 161.462500 Offset (MHz) 0.000000

Squelch Type TPL

DPL Code (Octal) 023

DPL Invert

TPL Frequency (Hz) 141.3

TPL Code 4A

Copy

Frequency (MHz) 170.587500

Squelch Type TPL

DPL Code (Octal) 023

DPL Invert

TPL Frequency (Hz) 141.3

TPL Code 4A

**TX Squelch Type**

Sets the type of encoding the radio transmits on this channel. The options are Carrier Squelch (CSQ), Tone Private Line (TPL) and Digital Private Line (DPL). This feature allows for more privacy on a frequency. This is a channel-wide feature.

**Notes**

- The RX Only feature must be disabled.
- This feature is applicable to MOTOTRBO Conventional radios, MOTOTRBO SLR Series repeaters and Analog mode and 3600 Trunking capable radios in Conventional mode only.

Ch 01 Expert View

# Programming Motorola repeater (CPS16)

- Set TPL tones

The screenshot displays the MOTOTRBO Customer Programming Software interface for channel Ch 01. The RX and TX sections are highlighted with red circles, indicating the TPL settings. The RX section shows a Frequency of 161.462500 MHz, Squelch Type set to TPL, DPL Code of 023, TPL Frequency of 141.3 Hz, and TPL Code of 4A. The TX section shows a Frequency of 170.587500 MHz, Squelch Type set to TPL, DPL Code of 023, TPL Frequency of 141.3 Hz, and TPL Code of 4A. The TX Squelch Type section is also visible, providing a description and notes for the TPL feature.

**TX Squelch Type**  
Sets the type of encoding the radio transmits on this channel. The options are Carrier Squelch (CSQ), Tone Private Line (TPL) and Digital Private Line (DPL). This feature allows for more privacy on a frequency. This is a channel-wide feature.

**Notes**

- The RX Only feature must be disabled.
- This feature is applicable to MOTOTRBO Conventional radios, MOTOTRBO SLR Series repeaters and Analog mode and 3600 Trunking capable radios in Conventional mode only.

# Programming Motorola repeater (CPS16)

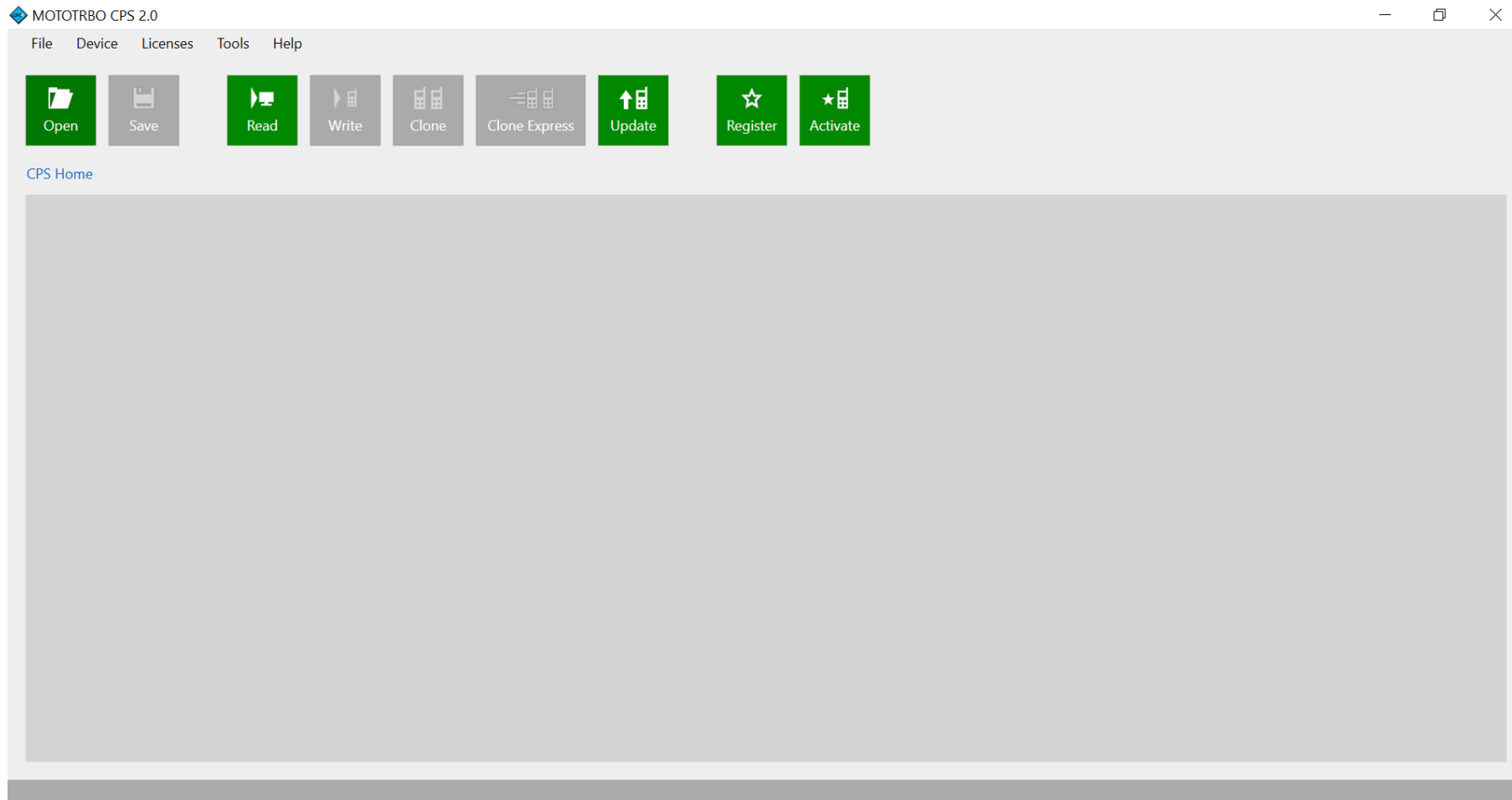
- Set power level and write/clone

The screenshot displays the MOTOTRBO Customer Programming Software interface for configuring a Motorola DR3000 repeater. The main window is titled "Ch 01" and shows two identical configuration panels side-by-side. The left panel is for TX (Transmit) and the right panel is for RX (Receive). The RX panel has a red circle around the "Power Level" dropdown menu, which is currently set to "Low". Other settings visible include DPL Code (Octal) set to 023, TPL Frequency (Hz) set to 141.3, and TPL Code set to 4A. The "TX Squelch Type" section at the bottom provides instructions on encoding radio transmissions and lists notes such as "The RX Only feature must be disabled" and "This feature is applicable to MOTOTRBO Conventional radios, MOTOTRBO SLR Series repeaters and Analog mode and 3600 Trunking capable radios in Conventional mode only."



# Programming Motorola repeater (CPS2.0)

- Run CPS2.0 – read standard codeplug



# Programming Motorola repeater (CPS2.0)

- Change repeater name

The screenshot displays the Motorola CPS2.0 software interface. The title bar reads "Admin PTT ID DP4801e.ctb2 - MOTOTRBO CPS 2.0". The menu bar includes "File", "Device", "Licenses", "Tools", and "Help". A toolbar contains icons for "Open", "Save", "Read", "Write", "Clone", "Clone Express", "Update", "Register", and "Activate". The main window shows "Admin PTT ID DP4801e" with "General Settings" selected in the left-hand "Set Categories" pane. The "General" settings tab is active, showing various configuration options. The "Radio Alias" field is circled in red and contains the text "AB 1". Other visible settings include "Radio ID" (1), "GNSS" (checked), "GNSS" (GPS/QZSS), "Private Calls" (checked), "Site Search Timer (sec)" (15), "ARS Initialization Delay (min)" (0), "TX Preamble Duration (ms)" (960), and "TX Inhibit Quick Key Override" (checked).

# Programming Motorola repeater (CPS2.0)

- Add/change codeplug password

The screenshot displays the 'SLR 5500.cfb - MOTOTRBO CPS 2.0' software interface. The main window is titled 'SLR 5500 - General Settings'. On the left, a 'Set Categories' tree shows 'Configuration' expanded, with 'General' selected and 'General Settings' highlighted. The main panel shows various settings under the 'General' tab. A red circle highlights the 'Codeplug Password' field, which contains four asterisks (\*\*\*\*). Other visible settings include 'Disable All LEDs' (checkbox), 'Backup Repeater Connected' (checkbox), 'Illegal Carrier Timer (sec)' (1), 'Illegal Carrier RSSI Threshold (dBm)' (-100), and 'Illegal Carrier Feature Enable' (checkbox). Below the 'General' tab, the 'Battery' section shows 'Battery' (checkbox), 'DC Operation Only' (checkbox), 'DC Primary Source' (checkbox), 'Battery Charging' (checkbox), and 'Output Charger Voltage (V)' (13.8). The 'Alarm Type' section shows 'Reference Clock Source Type' (Internal Only) and 'External Clock Frequency' (5MHz).

# Programming Motorola repeater (CPS2.0)

- Add repeater analogue channel

The screenshot displays the MOTOTRBO CPS 2.0 software interface. The title bar reads "SLR 5500.ctb - MOTOTRBO CPS 2.0". The menu bar includes "File", "Device", "Licenses", "Tools", and "Help". A toolbar contains icons for "Open", "Save", "Read", "Write", "Clone", "Clone Express", "Update", "Register", and "Activate". The breadcrumb path is "SLR 5500 > Zone > Zone1".

On the left, a "Set Categories" tree shows the following structure:

- Configuration
  - Device Information
  - General
    - General Settings
    - Accessories
    - Security
    - Network
    - Link Establishment
    - MOTOTRBO Link
    - Sites
    - Talkgroups
  - Zone/Channel Assignment
    - Zone (highlighted)

The main area shows "Zone Name" as "Zone1". Below it, the "Zone Items" section features a toolbar with a red circle around the "+" icon, indicating the action to add a new channel. A table below lists the channel configuration:

	Position	Channel Type	Channel Name	Channel Bandwidth (kHz)	Squelch	Squelch Level	Voice Emphasis
	1	Analog	Channel1	12.5/15	Normal	6	None

At the bottom, a status bar indicates "1 items found (0 currently selected)." The TESS+ logo is visible in the bottom right corner.

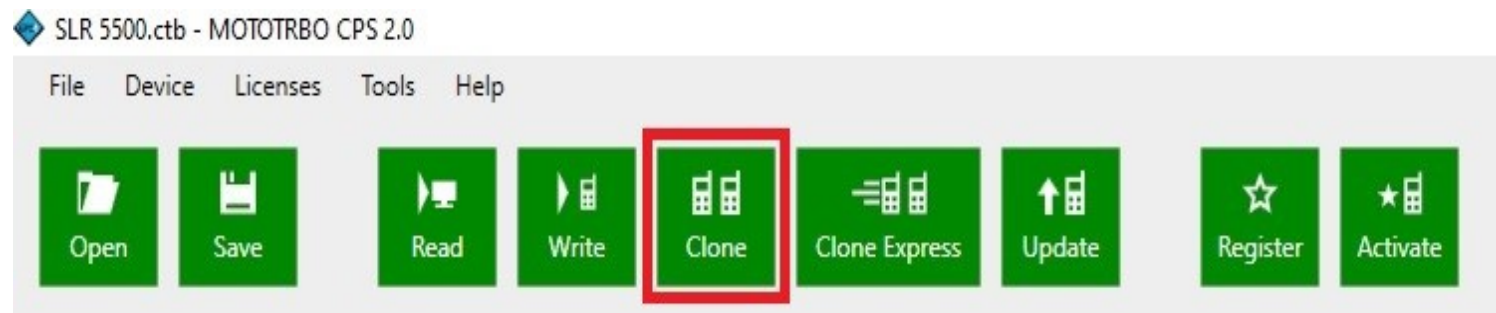
# Programming Motorola repeater (CPS2.0)

- Add Tx/Rx frequencies, TPL tones and power level

The screenshot displays the Motorola CPS2.0 programming interface. On the left, a navigation menu includes: General Settings, Accessories, Security, Network, Link Establishment, MOTOTRBO Link, Sites, Talkgroups, and Zone/Channel Assignment (with a sub-item 'Zone' highlighted). The main area is titled 'RX/TX' and is split into two columns: 'RX' and 'TX'. In the 'RX' column, the 'Frequency (MHz)' is set to 150.675000 and 'Squelch Type' is TPL. Below this, 'DPL Code (Octal)' is 023 and 'DPL Invert' is No. The 'TPL Frequency (Hz)' is 141.3 and 'TPL Code' is 4A. The 'Unmute Rule' is set to 'Std Unmute, Mute'. In the 'TX' column, the 'Frequency (MHz)' is 145.675000 and 'Squelch Type' is TPL. Below this, 'DPL Code (Octal)' is 023 and 'DPL Invert' is No. The 'TPL Frequency (Hz)' is 141.3 and 'TPL Code' is 4A. The 'DPL Turn-Off Code' is Yes, 'TPL Reverse Burst' is Standard, 'Power Level' is High, and 'TOT (sec)' is 60. A 'Copy' button is located between the RX and TX sections. Red ovals highlight the Frequency (MHz) and TPL Frequency (Hz) fields in both RX and TX sections.

# Programming Motorola repeater (CPS2.0)

- Write/clone



# Live demonstration

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- The facilitator will now show you how to program a Motorola repeater.

Time needed:  
**appx 30mins**

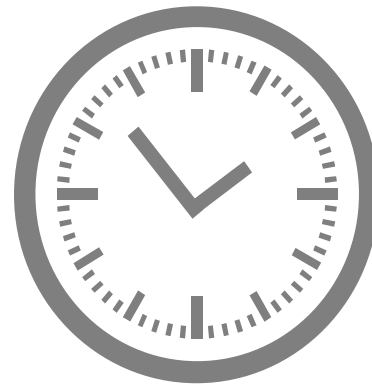


# Group exercise: programming a Motorola repeater

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- The class will now come together for a group exercise where you will setup a Motorola repeater. This exercise is subject to the availability of equipment.

Time needed:  
**appx 45mins**





# Student resources & manuals

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- SCS VHF-UHF standards V64
- TESS VHF standard codeplugs
- Equipment manuals (Motorola)

Please also see the following **manuals**:

- Programming manuals SelV - Admin functions Motorola SelV
- Programming manuals - Programming Motorola repeater

# Questions and remarks

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