



# RG-2000 Adapter 1.3.5

## Installation and Configuration Guide

# Revision History

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1.1	Second release of the document. The document is compliant with RG-2000 1.3.5	March 2023
1.0	First release of the document. The document is compliant with RG-2000 1.3.5	November 2022

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# About This Document

This user guide describes the purpose, characteristics, functioning principles, setup and configuration of RG-2000. This guide is aimed at engineers responsible for installation and maintenance of the SmartPTT dispatch system and MOTOTRBO equipment.

It is assumed that users responsible for setting up RG-2000 are familiar with the following:

- The principles of building IP networks and radio networks using MOTOTRBO equipment manufactured by Motorola Solutions, and
- SmartPTT software developed by Elcomplus Inc.

## **Important**

Improper testing, operation, maintenance, installation, alteration, modification, or adjustment causes warranty cancellation!

It is strongly recommended to read this guide before you start using RG-2000!

## **Disclaimer**

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# 1 General information

Remote Adapter RG-2000 (here and after referred to as RG-2000) is used in SmartPTT dispatch systems to provide remote control for the MOTOTRBO control station(s) or radios through SmartPTT Radioserver (here and after referred to as Radioserver) in the corporate IP network or on the Internet. It may be used with MOTOTRBO Radios: EMEA region DM46\*\*e, DM44\*\*e, DM46\*\*, DM44\*\*; APAC region XiR M8600i, XiR M8600; NA region XPR 5\*\*\*e, XPR 5\*\*\*; LA region DGM 8\*\*\*e, DGM 5\*\*\*e, DGM 8\*\*\*, DGM 5\*\*\*.

RG-2000 provides conversion of audio signals and radio control commands into IP packets and transmission of these packets over IP network. RG-2000 is an alternative to control stations direct connection to Radioserver via a USB/RS-232 interfaces.

RG-2000 also may be used for connection of non-Mototrbo radios to Radioserver. Mobile radios and/or repeaters (analog or digital) are connected to RG-2000 using just 6 wires: PTT, CSQ, RX Audio, TX Audio, SWB+ and GND. It delivers basic talk-groups voice exchange capability between SmartPTT Dispatchers and field radios of non-Mototrbo radio networks.

RG-2000 is connected and interacts with Radioserver that is used for traffic exchanging with control stations connected to RG-2000. For establishing an IP network connection, RG-2000 is equipped with the 10BASE-T/100BASE-TX Ethernet interface with the cable type auto-detection. To provide interaction between the system components, RG-2000 and Radioserver are assigned static IP addresses and TCP and UDP/RTP port numbers. They are used for sending radio control commands and audio transmissions from the dispatch console. RG-2000 can be used in the following cases:

- As a remote dispatcher's workplace outstation in digital networks without repeaters (Direct Mode communication).
- In conventional or trunking MOTOTRBO networks where direct IP connection to repeaters is unavailable.
- In conventional or trunking non-MOTOTRBO networks where RG-2000 is connected to control station and/or repeater using GPIO lines.

The system offers the following advantages:

- You can organize a dispatch system in the networks where direct connection of the dispatch system to the MOTOTRBO repeaters via an IP network is unavailable.
- You do not have to instal the radioserver in close proximity to the control stations within the radio network coverage area.
- You can avoid interference and induced noise between the control stations located close to each other.

When planning the system, it must be taken into account that the packet delivery delay in the IP network leads to the corresponding delay in radio responses to control commands and voice calls.

## 1.1 Technical specification

RG-2000 technical parameters are listed below.

**Table 1. RG-2000 technical parameters.**

<b>Network interface parameters</b>	
Connector	RJ45
Standard	10BASE-T (IEEE 802.3) / 100BASE-TX (IEEE 802.3u)
Supported TCP/IP protocols	UDP, ICMP, IPv4, ARP
Operation mode auto-selection	Transmission rate —10/100 Mbps
	Operation mode —duplex/half-duplex
	Cable type —Auto-MDI/MDI-X
<b>Radio interface parameters</b>	
Number of ports for device connection	One port
Voice ADC-DAC conversion	768 kbps (48 kHz x 16 bits) PCM, duplex
Frequency band of voice channel	60–3800 Hz / 60–7600 Hz (OPUS WB)
VoIP codec	64 kbps (G711 A-Law/Mu-Law) / 128 kbps (PCM linear) / 16 kbps OPUS NB (narrow band) / 30 kbps OPUS WB (wide band)
Transport protocol of control channel	UDP and TCP
Required bandwidth for control channel	~15 kbps for each IP connection
Transport protocol of voice channel	UDP and RTP
Required bandwidth for VoIP channel	~128 kbps for each IP connection using G711 A-Law/Mu-Law codec ~256 kbps for each IP connection using PCM linear codec ~30 kbps for each IP connection using OPUS NB (narrow band) codec ~40 kbps for each IP connection using OPUS WB (wide band) codec
Time delay/latency, ms	Up to 150 ms one-way (300 ms round-trip)
<b>Support of radio operation modes</b>	
MOTOTRBO radio models	EMEA region: DM4600e, DM4400e, DM4600, DM4400 APAC region: XiR M8600i, XiR M8600 NA region: XPR 5000e, XPR 5000 LATAM region: DGM8000e, DGM 5000e, DGM 8000, DGM 5000
Radio operation modes	Digital Mototrbo / Analog MOTOTRBO mode I/O mode (connection to non-MOTOTRBO devices over GPIO just for talk group voice exchange) Bridge mode (peer-to-peer connection without using a host application server)

MOTOTRBO network topologies	Talkaround mode
	Single repeater
	Multisite conventional network (IP Site Connect)
	Single site trunking network (Capacity Plus)
	Multisite trunking network (Linked Capacity Plus, Capacity Max)
<b>Power supply</b>	
Supply voltage	11–15.0 VDC, power can be applied via Power socket only
Power consumption	2A or less
<b>Design</b>	
Dimensions	210x165x35 mm
Ethernet port	RJ45 8P8C (8 pins)
Device port	High density D-SUB 26 pins 3 rows socket, UBS-B 2.0 socket
Power port	3 Position Terminal Block Header, Male, Step 0.150" (3.81mm) 90°, Right Angle
SD Card	Internal micro SD card holder mounted on the pbc
USB optional ports	2 pcs. USB-A 2.0 socket
<b>Operating conditions</b>	
Operating temperature range	–4° to 140°F (–35° to +55°C)
Relative humidity	Up to 85% at 86°F (30°C)
Operating hours	24x7
<b>Device management</b>	
Internal Web Configurator	Microsoft Edge, Opera, Chrome, Firefox browsers

## 1.2 Delivery set

RG-2000 delivery set includes the following components:

- RG-2000 1 pcs.
- FTP5E shielded cable, 6.56 feet (2 m) 1 pcs.
- DC power cable 1 pcs.
- Mounting kit:
  - bracket 2 pcs.
  - M3x6 screw 4 pcs.
  - M5x8 screw 2 pcs.

Radio interface cables should be purchased separately.

For information on prices and availability of radio interface cables contact your supplier or send request via support desk on [www.smartptt.com](http://www.smartptt.com).

## 1.3 Cables compatibility chart

Please take into account presented information before planning future dispatching system.

	SmartPTT 9.13
2C-DM4 for DM4/XPR5/XiRM8/DGM8(5) radios, RG-2000 mode - <i>Mototrbo</i>	+
2C-MTM for MTM radios, RG-2000 mode - <i>I-O</i>	+
2C-APX for APX radios, RG-2000 mode - <i>I-O (including I-O Add_mode)</i>	+
2C-GM for GM/CDM/CM radios, RG-2000 mode - <i>I-O</i>	+
2C-Generic flying ends cable, RG-2000 mode - <i>I-O</i>	+

## 2 Using samples

### 2.1 Conventional mode

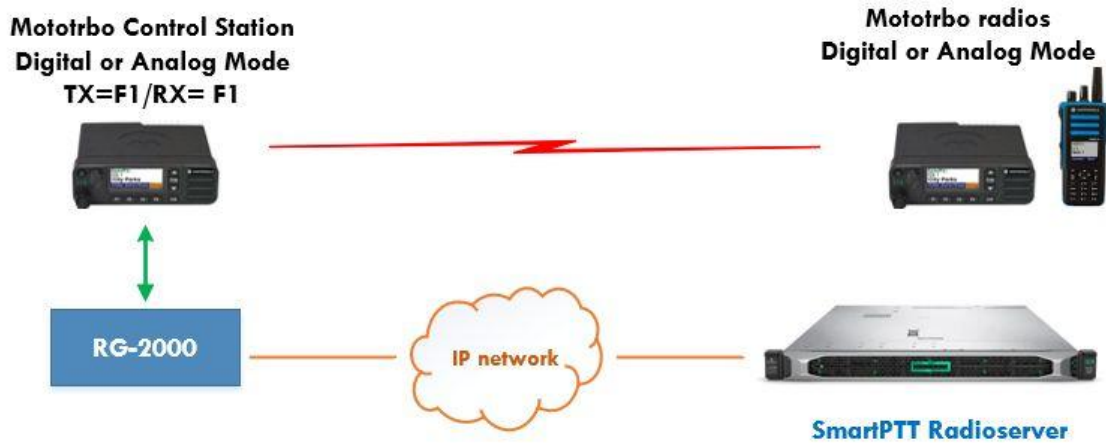


Fig. 1 Conventional direct channel mode digital or analog

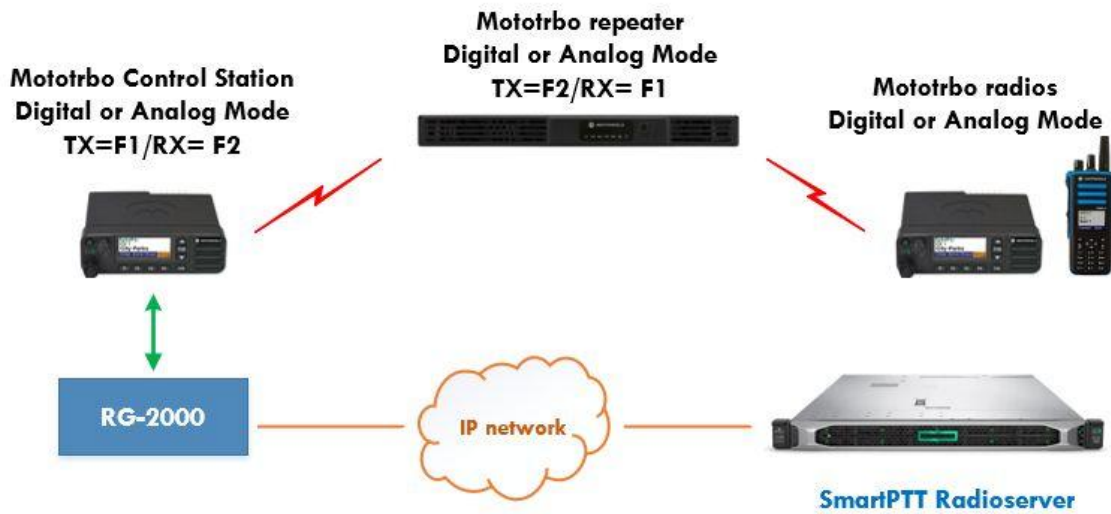


Fig. 2 Conventional Mode Repeater (1)

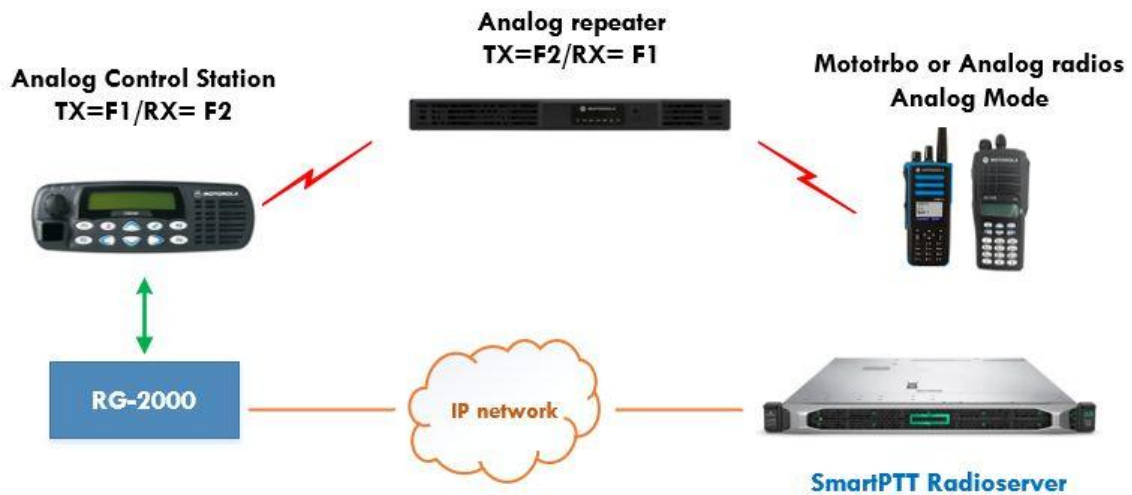


Fig. 3 Conventional Mode Repeater (2)

In examples shown above, RG-2000 manages a control station that operates on its individual frequency channel and can be programmed to operate both in digital and analog modes. If dispatchers need to operate on more than two frequency channels simultaneously, more RG-2000 with donor radios can be connected to the radioserver.

In digital mode, Mototrbo control station support receiving subscribers data (ARS, GPS, TMS, etc.), transmitting control commands to subscribers and voice message exchange. In analog mode, a radio support only voice message exchange with subscribers.

Control station can be programmed to operate on multiple channels. They can switch to the required channel at the dispatch console command.

To transmit and receive subscriber voice calls, control station must belong to the same talkgroups as subscribers.

Private Calls between subscribers will not be received by control stations and, consequently, will not be transmitted to the radioserver and the dispatch console.

For more information on control stations capabilities and configuration, see "MOTOTRBO SYSTEM PLANNER" (the "System Topologies" chapter), "SmartPTT Installation&Configuration Guide" and the "SmartPTT Radioserver Configurator" software help file.

## 2.2 I-O mode

RG-2000 may be used for connection of non-MOTOTRBO radios to Radioserver. Mobile radios and/or repeaters (analog or digital) are connected to RG-2000 using six wires: PTT, CSQ, RX Audio, TX Audio, SWB+ and GND. This mode is called the I/O Mode. It provides voice exchange between SmartPTT Dispatchers and talkgroups from the connected non-MOTOTRBO radio networks.

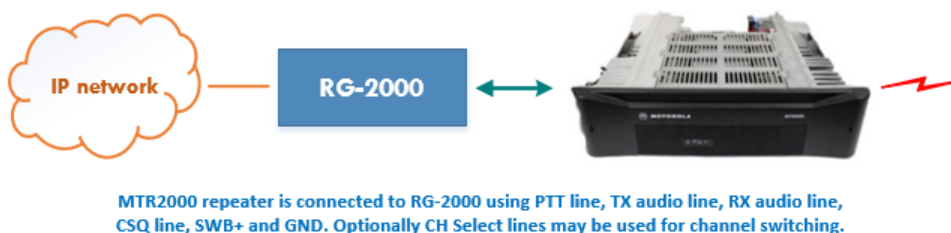
The following figures show examples of using RG-2000 with non-MOTOTRBO control stations.



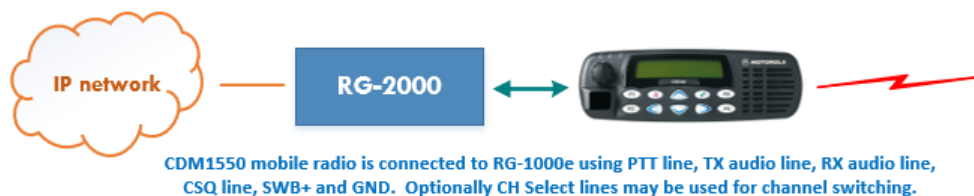
**Fig. 4 Motorola APX\XTL radio connection to RG-2000**



**Fig. 5 Motorola MTM radio connection to RG-2000**



**Fig. 6 Motorola MTR2000 repeater connection to RG-1000e**



**Fig. 7 Motorola CDM\GM\PRO mobile radio connection to RG-1000e**

If the connected control station does not have Output CSQ/COR/TG-Detect/PL-Detect signal line, it is possible to use RG-2000 built-in RX VOX for generating the CSQ signal. For example, it is useful for connecting to MTM5000 family radios that are not equipped with the CSQ output signal line.



## 2.3 Bridge mode

RG-2000 Bridge Mode can be used for interconnecting multiple radios and/or repeaters in a single radio network. It creates a simple "geographically distributed" repeater. In the Bridge Mode, mobile radios and/or repeaters (analog or digital) are connected to RG-2000 using six wires: PTT, CSQ, RX Audio, TX Audio, SWB+ and GND. The Bridge Mode does not support any signaling systems (CTCSS, DQS, MDC1200, QT, Select V, DMR, dPMR) and does not use digital links (USB, RS-232) to exchange commands with radios/repeaters.

In Bridge Mode, RG-2000s communicate with each other directly via IP networks, creating transparent links for audio streams and PTT/CSQ commands. SmartPTT Radioserver does not take part in this process. The following figure shows how RG-2000 can be used in Bridge Mode:

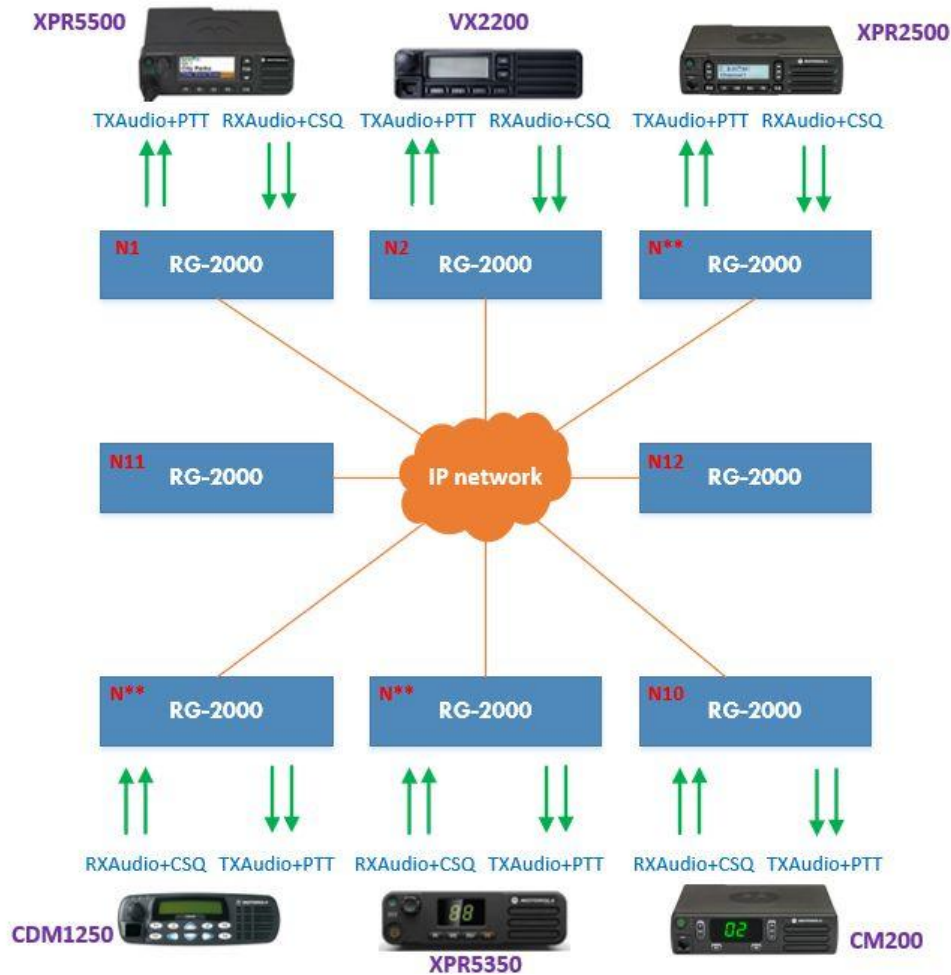


Fig. 8 12-nodes network with 12 RG-2000 units in Bridge Mode (each-to-each topology)

## 3 Installation and connection

### 3.1 Front panel



Fig. 9 RG-2000 front view

**NODE:** Application layer connection status LED. ON if at least one remote node (server or other RG-2000) is connected.

**DEV:** External device connection status LED. ON if an external device is connected.

**TRM:** Transmission to an external device LED. ON when RG-2000 is transmitting audio/data to an external device.

**RCV:** Receiving from an external device LED. ON when RG-2000 is receiving audio/data from an external device.

**PWR:** Power LED. ON if the internal 3.3VDC power source is OK.

**ON - OFF:** POWER switch.

## 3.2 Rear panel



Fig. 10 RG-2000 rear view

**PWR 11-15 VDC:** Socket for an external power supply connection (11-15 VDC).

**DEV I\O:** Socket for an external device connection via GPIO lines and In-Out audio lines.

**DEV USB:** Socket for an external device connection via USB line.

**USB1 - USB2:** Socket for optional USB devices connections.

**ETH 10/100:** Ethernet socket for connection to IP network.

**GND (≡):** Grounding terminal, screw M4.

### 3.3 First time settings, connection and operation check

Before installing RG-2000, you must perform visual inspection of the delivery set to examine it for mechanical damage to packaging and connection elements. Before connecting the radio, it is required to program RG-2000 operation mode. Only the interface cable from the delivery set can be used for the radio connection.

RG-2000 can be placed on its rubber feet or can be attached to any vertical or horizontal surface. For rigid mounting to surfaces, use the brackets from the delivery set. A radio can be fixed on the upper cover with a standard radio bracket.

External parts must be mounted on RG-2000 case with the screws from the delivery set only. Longer screws may damage PCB or its elements.

It is recommended that you adhere to the following sequence of connection and configuration procedures:

1. Make sure RG-2000 is powered down (POWER switch on RG-2000 front panel is in 0 position, PWR Blue LED is Off) and external cables are plugged into it.
2. Before the first start and configuration, RG-2000 must be connected to an external power supply via Power socket. It is recommended to use the power cable from RG-2000 delivery set.

Picture below shows RG-2000 power cable.



Fig. 11 RG-2000 power cable.

#### WARNING

16.0 VDC is the maximum allowed power supply voltage for RG-2000. Higher voltage values must not be used.

Connect Wire 1 - the positive lead "+" (wire marked with Red heat-sink or has Red color) of Power cable to +V port of an power supply.

Connect Wire 2 - the negative lead "-" (wire has Blue or Black color) of Power cable to -V port of an power supply.

#### WARNING

GND screw terminal of RG-2000 must be connected to Protective Earth bus of the site where RG-2000 is located.

Yellow-green wire, from RG-2000 power cable, is may be used for connecting to Protective Earth bus also. However using GND screw terminal is preferred way for proper the device protection.

**WARNING**

Do not connect RG-2000 GND screw terminal or Yellow-green wire to GND terminal that locates on Power Supply Unit(s).

**Important**

It is recommended to use a shared power supply unit for RG-2000 and a control station radio. If independent power supply units are used, the negative leads of all power supply units must be interconnected using the copper wire with a cross-section area no less than 14 AWG (2 mm<sup>2</sup>)!

3. Turn on RG-2000 power supply.
4. Turn on RG-2000 using POWER switch on the device front panel. Using Ethernet cable connect RG-2000 to IP network where your PC is allocated. Run Internet browser on your PC, log-on into RG-2000 Web configurator, set RG-2000 Network parameters and RG-2000 UserDevice parameters.
5. Turn off RG-2000 using POWER switch.

**WARNING**

Using Ethernet cables installed outdoors is strongly prohibited. Only indoor Ethernet cables are allowed.

6. Configure SmartPTT Radioserver by specifying the IP address, XCMP port of RG-2000.
7. Connect the radio to RG-2000 using the interface cable.
8. Connect the power cable and antenna to the radio.
9. Connect the radio power cable to RG-2000 power supply unit.

**WARNING**

Pay special attention to quality and reliability of the connection of the negative radio supply lead of the power cable to the power supply terminal. The cable accidental disconnection may lead to RG-2000 breakdown!

10. Turn on the power supply of RG-2000 and the radio.
11. Turn on the radio and RG-2000.
12. Run the SmartPTT Radioserver. Wait for 2-3 minutes.
13. Check the LEDs on the front panel of RG-2000. If the NODE LED is constantly On and DEVICE LED is constantly On, the installation and configuration have been successfully completed.
14. Check the SmartPTT Radioserver Configurator Activity Tab. If the installation and configuration have been successfully completed, the Remote Control Station "connected" message appears.

## 4 Configuration

RG-2000 has the internal Web Configurator that allows:

- To gain access to RG-2000 parameters and its modification.
- To update and recover RG-2000.
- To control the remote radio stations over the IP network.

Microsoft Edge, Opera, Chrome, Firefox explorers may be used for access to RG-2000 Web Configurator.

## 4.1 Web Configurator access

By default, RG-2000 Web Configurator access page locates on IP address 192.168.10.10.

Login (by default): **admin**

Password (by default): **admin**



Fig. 12 Web Configurator access page.

## 4.2 Web Configurator start page

After you successfully logged on into RG-2000 Web Configurator you see the start page that is shown below.

The screenshot displays the Web Configurator interface. On the left is a vertical menu with the following items: [Statuses, statistics](#) (highlighted in green), [Network](#), [UserDevice](#), [Audio levels adjusting](#), [Date&time](#), [Logs](#), [Network tools](#), [Access management](#), [Save and restore settings](#), and [FW updates & plugins](#). The main content area has tabs for 'UserDevice and IP interfaces', 'Ethernet port', 'Session archive', and 'Others'. The 'UserDevice and IP interfaces' tab is active. Below the tabs, there is a section titled 'Status & statistics, UserDevice and allocated IP interfaces' with an 'Extended view' checkbox and a 'Reset counters' button. The 'UserDevice' section shows 'UserDevice type and status' as 'GPIO device (DonorRadio mode), available, is used'. Below this, 'Outcoming / incoming calls counters' shows 0 for both. 'Control signals' shows 'PIT' and 'CSQ' buttons, and 'Channel: --'. The 'Link with Remote Nodes' section shows 'IP-interfaces: 2 total, 0 connected'. Under 'IP-interfaces', two entries are listed: 'IP-interface 0: Ethernet port 1, -:30010' and 'IP-interface 1: Ethernet port 1, -:30010', both showing 'Server-mode, Remote Node not connected' and '0 connection attempts'.

Fig. 13 Web Configurator start page.

Web Configurator main vertical menu locates on the left screen side. It includes following tabs:

- [Statuses, statistics](#)
- [Network](#)
- [UserDevice](#)
- [Audio levels adjusting](#)
- [Data&time](#)
- [Logs](#)
- [Network tools](#)
- [Access management](#)
- [Save and restore settings](#)
- [FW updates and plugins.](#)

To open the desirable section single click mouse cursor on the proper tab. Selected tab is highlighted with back green color.

[Audio levels adjusting](#)

For log-out from Web Configurator single click mouse cursor on **Logout** button that locates on the up right screen corner.

[Logout](#)



## 4.3 Access mangement

The section allows you to change **login** and **password** that used for Web Configurator access.

### Access mangement

Old login	<input type="text" value="admin"/>	
Old password	<input type="password" value="....."/>	
New login	<input type="text" value="admin"/>	Only Latin letters, numbers and underscores are allowed in the login
New password	<input type="password" value="....."/>	
Re-type new password	<input type="password" value="....."/>	
<input type="button" value="Change login and password"/>		

Fig. 14 Access mangement.

For changing you should specify Old login, Old password, New login, New password, Re-type new password and single click mouse cursor on **Change login and password** button. It will take around 10-15 seconds for applying new sets.

## 4.4 Statuses, statistisc

**Statuses, statistics** section provides useful information for implementation and maintenance. The section includes four tabs: *Others*, *Session Archive*, *Ethernet port*, *UserDevice*, and *IP interfaces*.

Fig. 15 Statuses&statistics

**Others** tab shows Current time, Up-time, System average loads for past 1 min./5 min./15 min., CPU temperature and PCB temperature, FW version, Kernel versions, Device serial number, Hardware version, CPU S/N.

**The device status:**

Current time:	Tue Oct 11 07:14:02 UTC 2022
Uptime:	29 min
System load averages:	1.06 (1m), 0.34 (5m), 0.15 (15m)
CPU temperature:	44 °C / 111 °F
PCB temperature:	30 °C / 86 °F

**Version and serial numbers**

FW version:	1.03.04
Build kernel date (protocol v1):	2022-07-22
Build kernel date (protocol v2):	2022-07-22
The device S/N:	10
Hardware version:	NGRG R1_08
CPU S/N:	59a78755 334469d7

Fig. 16 Others.

**Session Archive** tab shows Archiver current status. If Archiver is disabled, you will see the following info:

**Sessions archive status**

Archiver: disabled

Fig. 17 Archiver is off.

If Archiver is On, but MicroSD card or USBFlash drive is not installed, you will see the following info:

**Sessions archive status**

Archiver: enabled

PC browser current date and time: Tue, 11 Oct 2022 07:14:38 GMT

The device current time: Tue Oct 11 07:14:38 UTC 2022

Memory card (MicroSD is recommended): not installed or broken

Memory card is not installed or broken. For sessions archiving insert memory card (MicroSD or MicroSDHC), formatted into FAT filesystem. It is also possible to use a USB stick also, formatted into FAT filesystem. Other file systems (NTFS, exFAT) are not supported! You should use only one type of storage, or MicroSD or USB flash drive. Don't connect/use two storages at the same time! MicroSD is preferred.

Fig. 18 Archiver is On, without a memory drive.

If Archiver is On, MicroSD card or USBFlash drive is installed and operates properly, you will see the following info:

Archiver: enabled

PC browser current date and time: Tue, 11 Oct 2022 07:25:23 GMT

The device current time: Tue Oct 11 07:25:22 UTC 2022

Memory card (USB): total 31.26 GB      available 10.27 GB

The memory card is connected and now used for sessions archive. The memory card should be turned-off before extracting. To turn-off memory card

Fig. 19 Archiver is On, the memory is Ok.

Before extracting MicroSD card or USBFlash drive you should turn-off it by clicking **To turn-off memory card** button. Once the memory storage is off, you may see the following info:

Archiver:	enabled
PC browser current date and time:	Tue, 11 Oct 2022 07:25:47 GMT
The device current time:	Tue Oct 11 07:25:46 UTC 2022
Memory card (MicroSD is recommended):	disabled
Memory card disconnected and can be safely removed from the device. The card may be connected for sessions archive.	<input type="button" value="To turn-on memory card"/>

Fig. 20 Archiver is On, the memory is turned-off.

You may turn on MicroSD card or USBFlash drive by clicking **To turn-on memory card** button.

**Ethernet port** tab shows Ethernet port current status, the amount of received and sent frames, and the percentage of received broken packets.

Ethernet ports statistics		<input type="button" value="Reset counters"/>
Ethernet port 0:	Connected, 100 Mbit/sec. full duplex	
Sent:	188773 ethernet frames	25518208 bytes at ethernet-frames
Received:	100508 ethernet frames	9535426 bytes at ethernet-frames
	0 broken ethernet frames	0 % received packets are broken

Fig. 21 Ethernet port statistics.

**UserDevice and IP interfaces** tab shows statuses&statistics about UserDevice, GPIO lines, front panel LEDs, links with Remote Nodes, and IP interfaces.

<b>UserDevice:</b>		
UserDevice type and status	MotoTRBO, available, is used	
Counter of success connection to UserDevice:	1	
Outcoming / incoming calls counters:	0	4
Control data, sent:	0 XCMP-packets	0 byte in XCMP-packets
Control data, received:	111 XCMP-packets	7325 byte in XCMP-packets
Control data, sent:	0 XNL-packets	0 bytes in XNL-packets
Control data, received:	0 XNL-packets	0 bytes in XNL-packets

Fig. 22 UserDevice statistics (1).

The figure above shows UserDevice selected type and current status. Counters show the amount of connections with UserDevice, the quantity of incoming and outgoing calls, and the amount of sent/received XCMP/XLN packets to/from UserDevice.

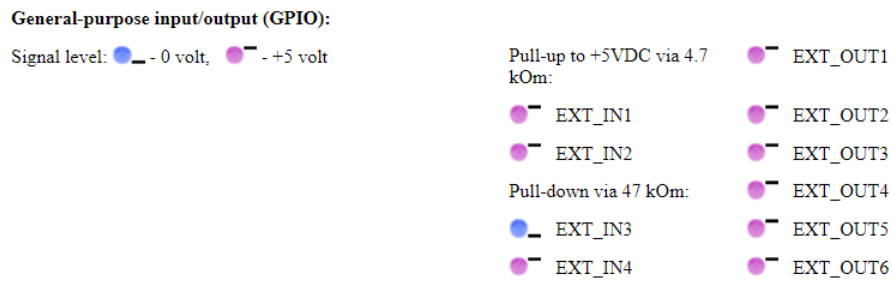


Fig. 23 UserDevice statistics (2).

The picture above shows General Purpose Input Output discrete lines statuses. Blue color - 0V (low level), Pink color - 5V (high level).

**Front panel LEDs:**

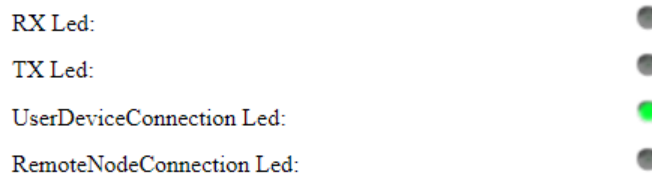


Fig. 24 UserDevice statistics (3).

The picture above shows front LEDs statuses. Legend is:

- TX led: Grey - Off, Red - On
- RX led: Grey - Off, Yellow - On
- UserDevice Connection led: Grey - Off, Green - On
- RemoteNode Connection link led: Grey - Off, Green - On

**Link with Remote Nodes:**

IP-interfaces:	1 total	1 connected
XCMP security:	Set-up performs by the remote node	
Control data, sent:	25 XCMP-packets	401203 byte in XCMP-packets
Control data, received:	17 XCMP-packets	458 byte in XCMP-packets
Sent audio-data (RTP, RTCP):	5 packets	260 bytes in packets
Received audio-data (RTP, RTCP):	7 packets	364 bytes in packets
Discarded broken UDP-packets:	0 packets	0 % received packets are broken
Discarded invalid UDP-packets received on RTP-ports:	0 packets	0 bytes in packets

Fig. 25 UserDevice statistics (4).

The picture above shows Link with Remote Nodes statuses&statistics info: the amount of IP interfaces that are configured and using for communications, the quantity of sent/received XCMP/RTCP packets and the amount of broken&invalid incoming UDP packets.

**IP-interfaces:**

<a href="#">IP-interface 0</a> : Ethernet port 1, 192.168.10.250/24:30050	Server-mode, Remote Node	1 connection attempts connected
---	--------------------------	------------------------------------



Fig. 26 UserDevice statistics (5).

The picture above shows IP interfaces info: IP interfaces numbers, IP interfaces addresses, Port numbers, network role server-client, connected/disconnected current statuses, the amount of connections.

## 4.5 Network

**Network section** allows to configure IP interfaces settings for Web-configuration access and RG-2000 communications with Remote Nodes.

### Network settings

Select IP-interface for configuration:  :  
*IP-interface is dedicated for web-interface access*

Add an IP-interface

### Interface network settings

DHCP use

Only static address is possible for web-configurator interface

Interface IP address

192.168.10.10 N.N.N.N

Network mask

255.255.255.0 N.N.N.N

Network\_Gateway IP address

192.168.10.1 N.N.N.N

Save and apply settings

Delete the interface

IP-interface for web-configurator access cannot be deleted.

Fig. 27 Network settings (1).

In order to select and open the desirable IP interface for configuration it needs to click mouse cursor on the proper IP interface icon.



Desktop PC icon opens IP interface settings that is used for Web Configurator access.



Desktop Radio icon opens IP interface settings that is used for interactions between UserDevice and Remote Node.



The selected IP interface is highlighted with back green color.

The selected interface may be deleted by clicking mouse cursor on **Deleted the interface** button.

New IP interface may be added by clicking mouse cursor on **Add an interface** button.

To apply new settings it needs to click mouse cursor on **Save and apply settings** button. After clicking the device will be unavailable for operations during 15-20 sec.

**IP interface for Web Configurator access**

**Interface network settings**

DHCP use  Only static address is possible for web-configurator interface

Interface IP address  N.N.N.N

Network mask  N.N.N.N

Network\_Gateway IP address  N.N.N.N

IP-interface for web-configurator access cannot be deleted.

Fig. 28 Network settings (2).

**IP interfaces for communications with Remote Nodes**

**Interface network settings**

DHCP use

Interface IP address  N.N.N.N

Network mask  N.N.N.N

Network\_Gateway IP address  N.N.N.N

**Remote Node connection settings**

Control link protection    
*The parameter is global and impacts on all IP-interfaces related to the UserDevice*

The device connection mode (network role)

Control port (XCMP, local)  TCP, 1025-65000

Audio port  UDP, 1025-65000

Fig. 29 Network settings (3).

IP addresses for communications with Remote Nodes may be static or assigned by DHCP.

For the device communication mode (network role) "Server" IP addresses should be static (DHCP is off).

In major cases Control port, Audio port, UDP ports of CAI network (ARS, TMP, LRRP, TP) may be set the same, for instance 30050.

In very rare case listed ports should be set different.



## 4.6 UserDevice

**UserDevice** section allows to perform settings for proper communication between Remote Node and UserDevice connected to RG-2000.

Some UserDevice configuration samples are presented in chapter [7. UserDevice port configuration samples](#)

**NOTE**

Do not forget to press Save and apply setting button every time when you want to change settings!

**Remote Node connection protocol version:**

Remote Node connection protocol version

version 2 ▼

- Select v2 is for using RG-2000 with Radioserver version 9.13 and above. Protocol v1 is for interoperability with Radioserver version 9.12 and earlier that supports only legacy RG devices.

**UserDevice type and mode:** Select desirable UserDevice mode. Available options are:

- Mototrbo
- GPIO device (Bridge mode)
- GPIO device (DonorRadio)
- GPIO device (Add. mode 1), for basic interaction with APX radios, channel switching is supported

Also UserDevice port may be disabled.

Interaction settings Device ↔ UserDevice

UserDevice type and mode

GPIO device (DonorRadio mode) ▼  
 UserDevice port is disable  
 MotoTRBO  
 GPIO device (DonorRadio mode)  
 GPIO device (Bridge mode)  
 GPIO device (Add. mode 1)

**UserDevice ID:** If protocol v2 is selected RG-2000 aliasing label may be assigned for service purposes.

UserDevice ID

*Any label for displayed in the equipment map*

anylabel

Any char except "\"

For UserDevice **Mototrbo** it needs to set Port for different traffics processing and set rule to start VoIP streaming.

**Ports for interaction with UserDevice**

ARS port (Auto Register Service)	<input type="text" value="4005"/>	UDP, 0, 1025-65000
TMP port (Text Message Protocol)	<input type="text" value="4007"/>	UDP, 0, 1025-65000
LRRP port (Location Request and Response Protocol)	<input type="text" value="4001"/>	UDP, 0, 1025-65000
Port TP (Telemetry Protocol)	<input type="text" value="4008"/>	UDP, 0, 1025-65000
LIP port (Location Information)	<input type="text" value="5017"/>	UDP, 0, 1025-65000
Job ticketing port	<input type="text" value="4013"/>	UDP, 0, 1025-65000
User defined port 1	<input type="text" value="0"/>	UDP, 0, 1025-65000
User defined port 2	<input type="text" value="0"/>	UDP, 0, 1025-65000
User defined port 3	<input type="text" value="0"/>	UDP, 0, 1025-65000

*Not in use when set to 0.*

**Addition UserDevice command/control via GPIO pins**

Duplicate the PTT signal via GPIO-line

Audio RTP from UserDevice to Remote Node streaming starting rules  ▼

Speaker\_On status

Speaker\_On status

Speaker\_On status or CSQ

Speaker\_On status CSQ

Audio IP steaming is activated by Speaker\_On status from UserDevice.

**ARS** port by default 4005.

**TMP** port be default 4007.

**LRRP** port by default 4001.

**TP** port by default 4008.

**LIP** port by default 5017.

**Job ticketing** port by default 4013.

**User defined ports** are reserved.

If it is necessary PTT signal (to UserDevice) may be duplicated via GPIO OUT line: check the box and select GPIO EXT\_OUT line.

Duplicate the PTT signal via GPIO-line

PTT signal output  ▼ Active level (low - 0v, high - 5v)

**VoIP streaming starting rule** may be selected from three options:

- Speaker\_On status from UserDevice, *it is recommended option for Mototrbo radio.*
- Speaker\_On status or CSQ signal triggering.
- Speaker\_On status is received from UserDevice, and CSQ signal is trigged concurrently (for streaming both conditions must be fulfilled).

If CSQ is needed for VoIP streaming starting EXT\_IN input line should assigned for CSQ signal and active level selected:

CSQ signal input  ▼ Active level (low - 0v, high - 5v)

For UserDevice **GPIO (Bridge mode) & GPIO (DonorRadio mode)** it needs to set GPIO discrete lines and set rule to start VoIP streaming.

GPIO pins for interaction with UserDevice	GPIO alias	Active level (low - 0v, high - 5v)
PTT signal output	EXT_OUT1	low
CSQ signal input	EXT_IN1	low
Donor Radio connecting detector	EXT_IN4	high
Channel switching line 1 signal output (LSB)	EXT_OUT2	low
Channel switching line 2 signal output	EXT_OUT3	low
Channel switching line 3 signal output	EXT_OUT4	low
Channel switching line 4 signal output	EXT_OUT5	low
Channel switching line 5 signal output (MSB)	EXT_OUT6	low
Audio RTP from UserDevice to Remote Node streaming starting rules	CSQ VOX CSQ or VOX CSQ and VOX	CSQ signal triggering

It is recommended to set:

- PTT signal for EXT\_OUT1 line, active level Low
- CSQ signal for EXT\_IN1 line, active level Low
- Donor Radio connecting detector for EXT\_IN4 line, active level High
- Channel switching line 1 signal for EXT\_OUT2 line, active level Low
- Channel switching line 2 signal for EXT\_OUT3 line, active level Low
- Channel switching line 3 signal for EXT\_OUT4 line, active level Low
- Channel switching line 4 signal for EXT\_OUT5 line, active level Low
- Channel switching line 5 signal for EXT\_OUT6 line, active level Low

**VoIP streaming starting rule** may be selected from four options:

- CSQ
- VOX
- CSQ or VOX
- CSQ &VOX, CSQ signal triggering and VOX detector triggering concurrent (for streaming both conditions must be fulfilled)

If VOX is needed for VoIP streaming starting **VOX detector settings** should be done:

**VOX detector settings (Voice Operated eXchange)**

Audio activity duration for the detector triggering (ms, multiple 20)	40	20-80
Triggering level (RMS, mv)	60	1-5000
Audio inactivity duration for the detector releasing (ms, multiple 20)	500	20-7000
Releasing level (RMS, mv)	20	1-5000

*Depends on Rx level control adjusting some VOX detector voltage ranges may be not available*

For UserDevice **GPIO (Add. mode 1)** it needs to select how to send PTT command to a donor radio and set rule to start VoIP streaming.

PTT sends to UserDevice via

▼
 PUINPUT status  
PUINPUT status  
 PTT signal triggering  
 PUINPUT status and PTT signal triggering

PTT may be send to a donor radio:

- as PUINPUT command via USB
- as PTT signal triggering via GPIO discrete line
- as both USB PUINPUT & PTT signal triggering concurrently

If PTT signal triggering is selected it needs to select GPIO line for PTT signal ans set Active level:

PTT signal output

GPIO alias  

EXT\_OUT1 ▼

Active level (low - 0v,  
high - 5v)  

low ▼

**VoIP streaming starting rule** may be selected from two options:

Audio RTP from UserDevice to Remote Node streaming starting rules

▼
 Speaker\_On status  
Speaker\_On status  
 CSQ signal triggering

- Speaker\_On status (via USB line)
- CSQ signal triggering (via GPIO discrete line)

If CSQ signal triggering is selected it needs to select GPIO line for CSQ signal ans set Active level:

CSQ signal input

GPIO alias  

EXT\_IN1 ▼

Active level (low - 0v,  
high - 5v)  

low ▼

## IP voice settings

### IP voice settings

Voice codec for IP streaming to Remote Node

OPUS, Narrow Band

sample rate 48000 Hz, 20 ms, 16 (30) kbps bitrate, audio bandwidth 4 KHz

In-band FEC enable (Forward Error Correction)



Mirroring TX audio stream to all IP interfaces



Send test audio signal to Remote Node



Archiving sessions on SD card



Timeout transmit (TOT), seconds

60

**Voice codec for IP streaming to Remote Node:** Select desirable VoIP codec.

### NOTES

The list of available codecs depends on selected protocol version and selected UserDevice mode.

Selected codec on Radioserver side should match selected codec on RG-2000 side.

For protocol v1 available codecs are:

- PCM (sample rate 8000 Hz, 20 ms, 128 (150) kbps bitrate)
- G711a (sample rate 8000 Hz, 20 ms, 64 (86) kbps bitrate)
- G711m (sample rate 8000 Hz, 20 ms, 64 (86) kbps bitrate)

For protocol v2 available codecs are (except GPIO device (Bridge mode):

- PCM (sample rate 8000 Hz, 20 ms, 128 (150) kbps bitrate)
- G711a (sample rate 8000 Hz, 20 ms, 64 (86) kbps bitrate)
- G711m (sample rate 8000 Hz, 20 ms, 64 (86) kbps bitrate)
- OPUS Narrow Band (sample rate 48000 Hz, 20 ms, 16 (30) kbps bitrate, audio bandwidth 4 KHz)

For protocol v2 GPIO device (Bridge mode) two extra codecs are available:

OPUS Wide Band (sample rate 48000 Hz, 20 ms, 30 (40) kbps bitrate, audio bandwidth 8 KHz).

- OPUS Super Wide Band (sample rate 48000 Hz, 20 ms, 45 (55) kbps bitrate, audio bandwidth 12 KHz)
- OPUS Full Band (sample rate 48000 Hz, 20 ms, 60 (70) kbps bitrate, audio bandwidth 20 KHz)

If OPUS codec is selected **FEC correction** may be turn-on to reduce audio losses on IP pipeline.

### NOTE

For protocol V2 Opus codec is recommended, PCM may be used also. For Protocol v1 PCM is recommended.

**Mirroring TX audio stream to all IP interfaces:** Not used. Keep the box unchecked.

**Send test audio signal to Remote Node:** Just for service purposes. Do not use during regular operations.

**Archiving sessions on SD card:** Check-on the box to save all sessions on MicroSD card (card slot locates on the device pcb, under top case cove) or USB Flash drive. SD card max size is 32Gb, FAT.

**Timeout transmit (TOT), seconds:** For GPIO modes it needs to set TOT. Default value is 60 sec.

## ToS-byte for link with Remote Node

**ToS-byte for link with Remote Node**

Class of service (0 - low, 7 - high priority, D0..D2)

 0-7 summary: 0x0

Low delay (D3)

Throughput (D4)

Reliability (D5)

Set necessary parameters. Consult with your IT service provider about using these settings.

Press **Save and apply setting** button to use new settings.

## 4.7 Audio levels adjusting

**Audio levels adjusting** section allows to adjust tx&rx audio levels and monitor tx&rx audio levels in real time.

### Audio level monitoring and adjusting

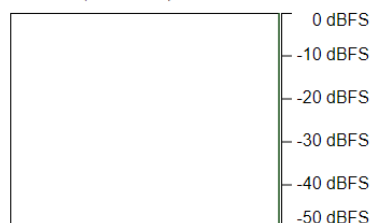
Differential input mode

RX audio gain/attenuation (from the air)



Gain/Attenuation level and point 0 dB are not linked with predefined audio level.

RX audio (from the air) monitor



The vertical scale: [30 mv](#) [100 mv](#) [300 mv](#) [1 v](#) [3 v](#) [6 v](#)

It is recommended to adjust gain/attenuation to get average audio level  $-22..-18$  dBFS.

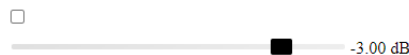
Graphs view modes:

- [Peak dBFS](#)
- [Peak2peak](#)
- [RMS](#)
- [Waveform](#)

$-\infty$  dBFS level meter  
(maximum for 1.0 second time frame)

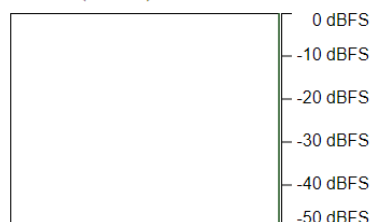
Differential output mode

TX audio gain/attenuation (to the air)



Gain/Attenuation level and point 0 dB are not linked with predefined audio level.

TX audio (to the air) monitor



The vertical scale: [30 mv](#) [100 mv](#) [300 mv](#) [1 v](#) [3 v](#) [6 v](#)

It is recommended to adjust gain/attenuation to get average audio level RMS  $80..100$  mv.

Graphs view modes:

- [Peak dBFS](#)
- [Peak2peak](#)
- [RMS](#)
- [Waveform](#)

$-\infty$  dBFS level meter  
(maximum for 1.0 second time frame)

Fig. 30 Audio levels adjusting and monitor

Boxes [Differential input mode](#) & [Differential output mode](#) allow switching between balanced-unbalanced tx&rx audio lines types. Majority mobile radios have unbalanced tx&rx audio input-output lines.

*Un-checked boxes are recommended.*

[RX audio gain/attenuation \(from the air\)](#) regulator allows to adjust input audio signal level that the device gets from connected UserDevice. A lot of mobile radios has rx audio output level around 200-300 mV RMS.

For this case *-18dB attenuation is recommended.*

[TX audio gain/attenuation \(from the air\)](#) regulator allows to adjust output audio signal level that the device sends to connected UserDevice. A lot of mobile radios requires tx audio mic level around 80 mV RMS.

For this case *-3dB attenuation is recommended.*

[RX audio \(from the air\) monitor](#) & [TX audio \(to the air\) monitor](#) deliver tx&rx audio graphic visualizations. Both graphic monitors may be switch to Peak\_dBFS, Peak2peak, RMS, Waveform modes.

Graphs view vertical scale may be changed in Peak2peak, RMS and Waveform modes.

## 4.8 Data&time

**Data&time** section allows to set-up the device data&time. Also using NTP servers for automatic synchronization may be set up in the section.

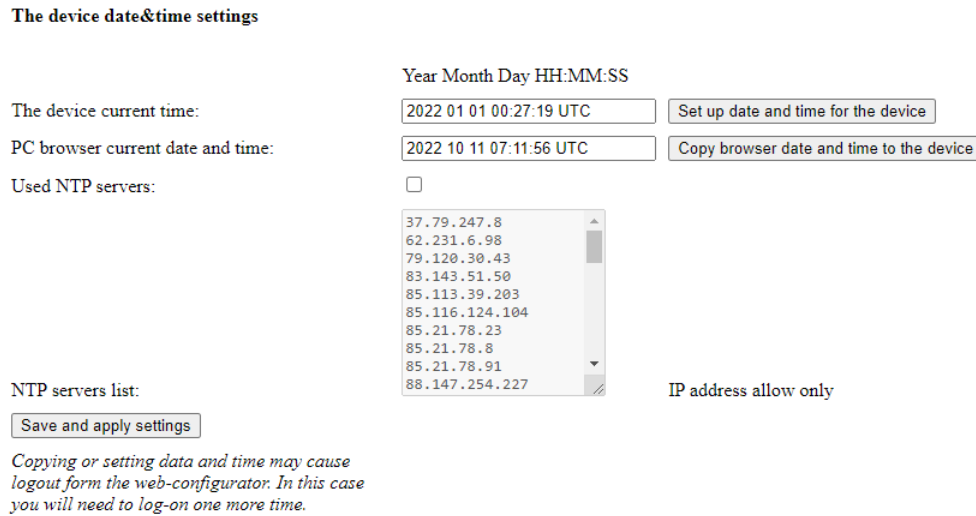
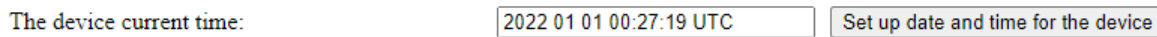


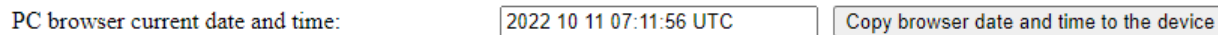
Fig. 31 Data&time

You may directly specify the device current data&time in the proper gap,



and after click mouse cursor on **Set up data and time for the device** button.

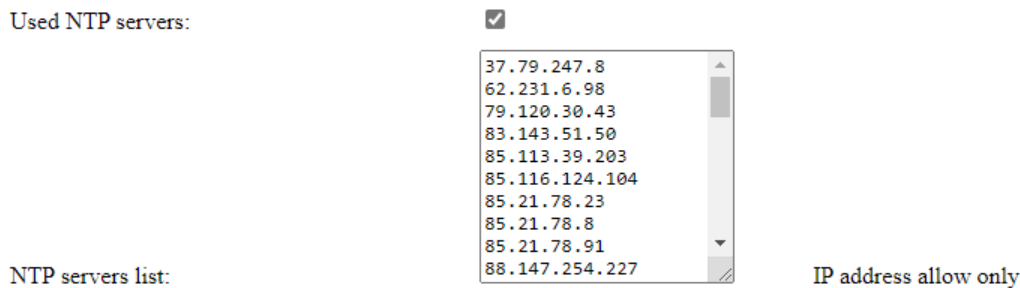
You may copy data&time form the browser to the device.



Just click mouse cursor on **Copy browser data and time to the device** button.

In order to user NTP servers it needs to check-on box **Used NTP servers**. After that NTP servers list become available for editing.

Servers addresses may be added or deleted or edited manually.



The top record in the list has the highest priority. The bottom record in the list has the lowest priority.



**NOTE**

Copying or setting data and time may cause log-out from Web Configurator. In this case you will need to log-on one more time.

Click mouse cursor on **Save and apply settings** button for using new settings.

## 4.9 Logs

**Logs** section provides real-time information about all events and actions that RG-2000 is currently performing and was performed since last time power-on. **Logs** is very useful engineering tool for debugging during implementation and maintenance.

[All messages](#) [Important only](#) [Critical only](#)  
[Download logs as file](#)

**Logs**

```

Jan 1 00:04:13 GPIO: unexport EXT_IN3 (64) pin
Jan 1 00:04:13 GPIO: unexport EXT_IN4 (65) pin
Jan 1 00:04:24 NGRG 2017-2022 (c) Elcom+ Inc. ver 2.00.08
Jan 1 00:04:24 Build: Jul 22 2022 02:28:28
Jan 1 00:04:24 Options: protocol 2v
Jan 1 00:04:28 GPIO: open EXT_OUT1 (119) success as #5 for output
Jan 1 00:04:28 GPIO: open EXT_OUT2 (120) success as #6 for output
Jan 1 00:04:28 GPIO: open EXT_OUT3 (121) success as #7 for output
Jan 1 00:04:28 GPIO: open EXT_OUT4 (122) success as #8 for output
Jan 1 00:04:29 GPIO: open EXT_OUT5 (123) success as #9 for output
Jan 1 00:04:29 GPIO: open EXT_OUT6 (124) success as #10 for output
Jan 1 00:04:29 GPIO: open LED_RX (113) success as #11 for output
Jan 1 00:04:29 GPIO: open LED_TX (114) success as #12 for output
Jan 1 00:04:29 GPIO: open LED_RAD_CON (116) success as #13 for output
Jan 1 00:04:29 GPIO: open LED_APL_CON (115) success as #14 for output
Jan 1 00:04:29 GPIO: open KERN_ACT (128) success as #15 for output
Jan 1 00:04:29 GPIO: open EXT_IN1 (110) success as #16 for input
Jan 1 00:04:29 GPIO: open EXT_IN2 (112) success as #17 for input
Jan 1 00:04:29 GPIO: open EXT_IN3 (64) success as #18 for input
Jan 1 00:04:29 GPIO: open EXT_IN4 (65) success as #19 for input
Jan 1 00:04:29 LL-NET: server[0]: create socket (port 30010)...
Jan 1 00:04:29 LL-NET: server[0]: waiting for incoming TCP connections, fd 30, port 30010...
Jan 1 00:04:29 LL-NET: server[1]: create socket (port 30010)...
Jan 1 00:04:29 LL-NET: server[1]: waiting for incoming TCP connections, fd 31, port 30010...
Jan 1 00:04:29 MAIN: 2 IP-channel(s) total
Jan 1 00:04:29 ALSA:
Jan 1 00:04:29 period: 20000 mks, 960 frames, 1920 bytes
Jan 1 00:04:29 buffer: 320000 mks, 15360 frames
Jan 1 00:04:31 AUDIO MIXER TLV320: init complete
Jan 1 00:04:31 AUDIO MIXER: init complete
Jan 1 00:04:31 AUDIO TUNNEL: open
Jan 1 00:04:31 AUDIO TUNNEL: open request
Jan 1 00:04:31 XNL: can't access to transceiver address file: No such file or directory
Jan 1 00:04:31 XNL: (/run/dhclient/MotoTRB0.p1.IP)
Jan 1 00:04:31 MAIN TUNNEL: Unable to connect to the transceiver
Jan 1 00:04:32 EVENT: watchdog charged, beware all !
Jan 1 00:13:19 MAIN TUNNEL: ethernet carrier lost, close all Radius connections
Jan 1 00:13:20 LL-NET: channel 0 close socket -1
Jan 1 00:13:20 LL-NET: channel 1 close socket -1
Jan 1 00:13:20 MAIN TUNNEL: all connection closed
Jan 1 00:13:20 XNL: can't access to transceiver address file: No such file or directory
Jan 1 00:13:20 XNL: (/run/dhclient/MotoTRB0.p1.IP)

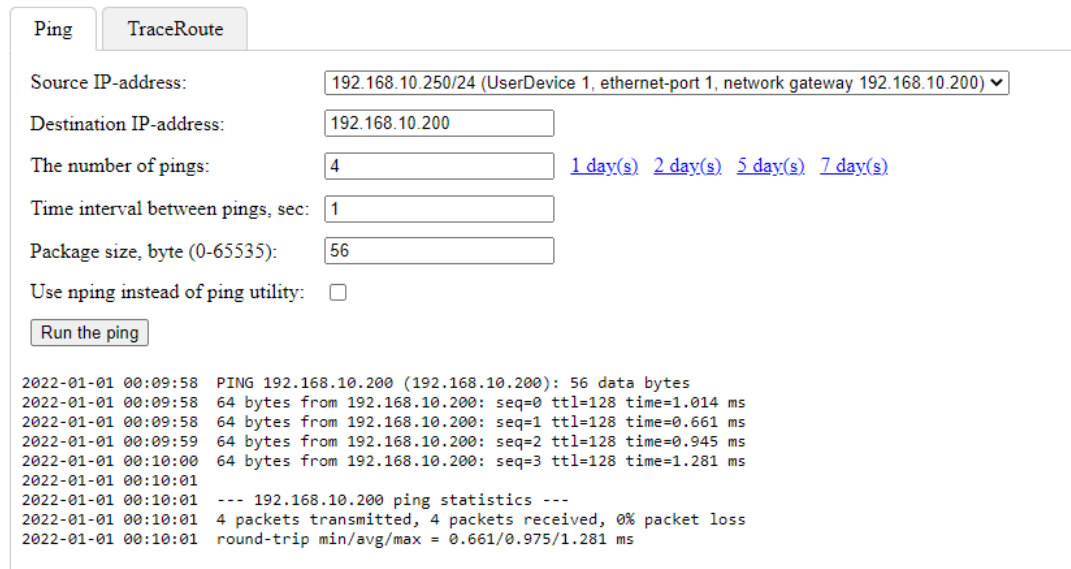
```

Fig. 32 Logs

You may switch between three type of **Logs** views: All messages, Important only and Critical only. Logs records may be download and save on PC.

## 4.10 Network tools

**Network tools** section allows to use during implementation and maintenance two popular tools, [Ping](#) and [TraceRT](#).



The screenshot shows the 'Ping' tab selected. The configuration fields are as follows:

- Source IP-address: 192.168.10.250/24 (UserDevice 1, ethernet-port 1, network gateway 192.168.10.200)
- Destination IP-address: 192.168.10.200
- The number of pings: 4 (with links for 1 day(s), 2 day(s), 5 day(s), 7 day(s))
- Time interval between pings, sec: 1
- Package size, byte (0-65535): 56
- Use nping instead of ping utility:

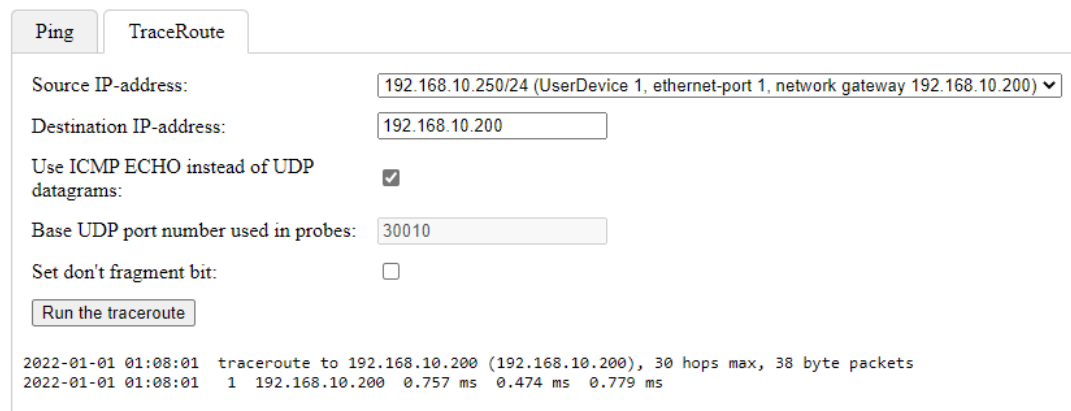
A 'Run the ping' button is visible. Below the form, the output of the ping command is displayed:

```
2022-01-01 00:09:58 PING 192.168.10.200 (192.168.10.200): 56 data bytes
2022-01-01 00:09:58 64 bytes from 192.168.10.200: seq=0 ttl=128 time=1.014 ms
2022-01-01 00:09:58 64 bytes from 192.168.10.200: seq=1 ttl=128 time=0.661 ms
2022-01-01 00:09:59 64 bytes from 192.168.10.200: seq=2 ttl=128 time=0.945 ms
2022-01-01 00:10:00 64 bytes from 192.168.10.200: seq=3 ttl=128 time=1.281 ms
2022-01-01 00:10:01
2022-01-01 00:10:01 --- 192.168.10.200 ping statistics ---
2022-01-01 00:10:01 4 packets transmitted, 4 packets received, 0% packet loss
2022-01-01 00:10:01 round-trip min/avg/max = 0.661/0.975/1.281 ms
```

Fig. 33 Network tools, Ping.

To start [Ping](#) command it needs to select source IP address (from the drop list), specify destination IP address, indicate the amount of outgoing Ping requests (or select the time interval for performing Ping command in days), set time interval between pings, indicate package size and click mouse cursor on **Run the ping** button. The result will be presented in the same window.

Also [Nping](#) command may be selected to use instead of classic [Ping](#).



The screenshot shows the 'TraceRoute' tab selected. The configuration fields are as follows:

- Source IP-address: 192.168.10.250/24 (UserDevice 1, ethernet-port 1, network gateway 192.168.10.200)
- Destination IP-address: 192.168.10.200
- Use ICMP ECHO instead of UDP datagrams:
- Base UDP port number used in probes: 30010
- Set don't fragment bit:

A 'Run the traceroute' button is visible. Below the form, the output of the traceroute command is displayed:

```
2022-01-01 01:08:01 traceroute to 192.168.10.200 (192.168.10.200), 30 hops max, 38 byte packets
2022-01-01 01:08:01 1 192.168.10.200 0.757 ms 0.474 ms 0.779 ms
```

Fig. 34 Network tools, TraceRT.

To start [TraceRT](#) command it needs to select source IP address (from the drop list), specify destination IP address, select ICMP ECHO or UDP datagrams for using, indicate base UDP port and click mouse cursor on **Run the traceroute** button. The result will be presented in the same window.

## 4.11 Save and restore settings

**Save and restore settings** section allows to:

- download settings from RG-2000 and save it on PC
- read settings from a selected file and upload it into RG-2000
- reset settings to default
- perform soft restart
- perform hard restart

### Download and save config file

[Click to download and save config file](#)

### Upload config file

Select file for upload

File not selected

After uploading the config file, communication with the device will be lost for a while to one minute. Don't forget to refresh the browser page: after uploading the file wait for 15-20 sec and click Refresh browser button.

### Reset settings to default

Settings reset restores factory default settings including web configurator IP-address and access password, and removes installed plug-ins.

### To restart Operation System

Restarting Operation System is a secure operation, however the device will be unavailable for communication with remote nodes and inaccessible for the browser for some time (1-2 minutes).

### Power down the device temporary

The device performs self-power down for 5 sec, next the device turns-on power and performs normal start. The device will be unavailable for communication with remote nodes and inaccessible for the browser for some time (1-2 minutes).

The operation performs without proper Operation Systems preparation and may cause the device settings crashing, logs crashing and destroying any data saved at the device memory.

**Consulting with The Technical Support Team before using the option! Do not use the option at your discretion only!**

Fig. 35 Save and restore settings

Useful tips and comments are presented on **Save and restore settings** page.

#### NOTE

Upload settings, reset settings to defaults, soft restart, hard restart operations cause drop communications with remote nodes and Web Configurator inaccessibility for some time (up to 2 minutes) since RG-2000 performs rebooting.

[Restart Operation System](#) and [Reset settings to default](#) operations may be done using physical buttons located on RG-2000 printed circuit board.

How to perform it:

- Unscrew 4 screws located on the left-right sides of device top cover and remove the device top cover.
- Navigate to **S3** button for [Restart Operation System](#) or **S1** button for [Reset settings to default](#).

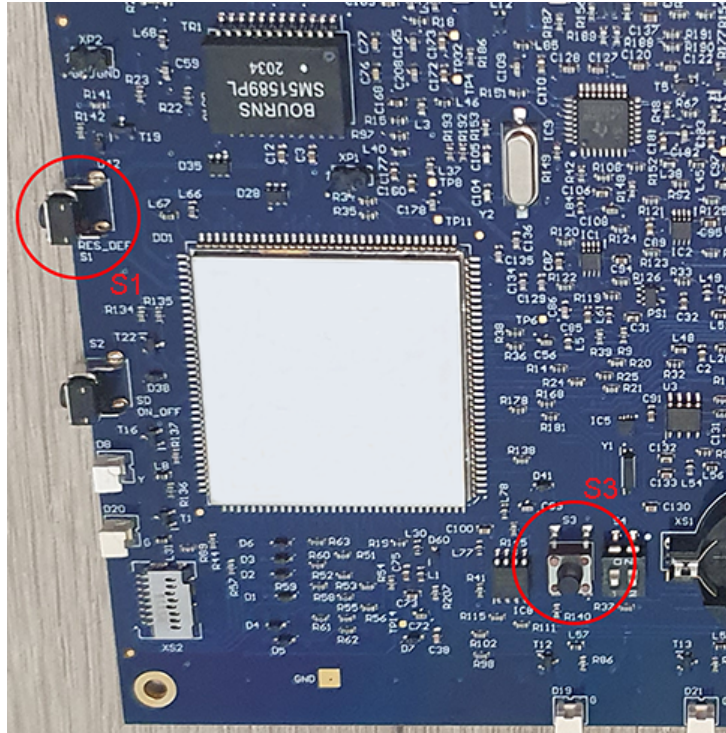


Fig. 36 S1 S3 buttons locations

- To [Restart Operation System](#) press S3 button for 2 sec. and release it.
- To [Reset settings to default](#):
  - turn-off RG-2000 power using power the front panel power button
  - press and hold S1 button
  - turn-on RG-2000 power using power the front panel power button
  - wait for 15 sec. until all front LEDs are On and release S1 button
  - wait for 3-4 minutes and try to log-on to Web Configurator using defaults IP address, login and password.
- Return the device top cover back and fix it using 4 screws.

## 4.12 FW updates and plugins

**FW updates and plugins** section allows to instal FW updates, install and delete plugins.

### Device firmware upload

This section allows to install firmware updates. Also you may install and uninstall additional software plugins. Ask your supplier about possible options.

File not selected

### No plugins installed

Fig. 37 FW updates and plugins

Detailed information about the proper operations will be provided with FW updates and plugins packages.

# 5 Radio settings

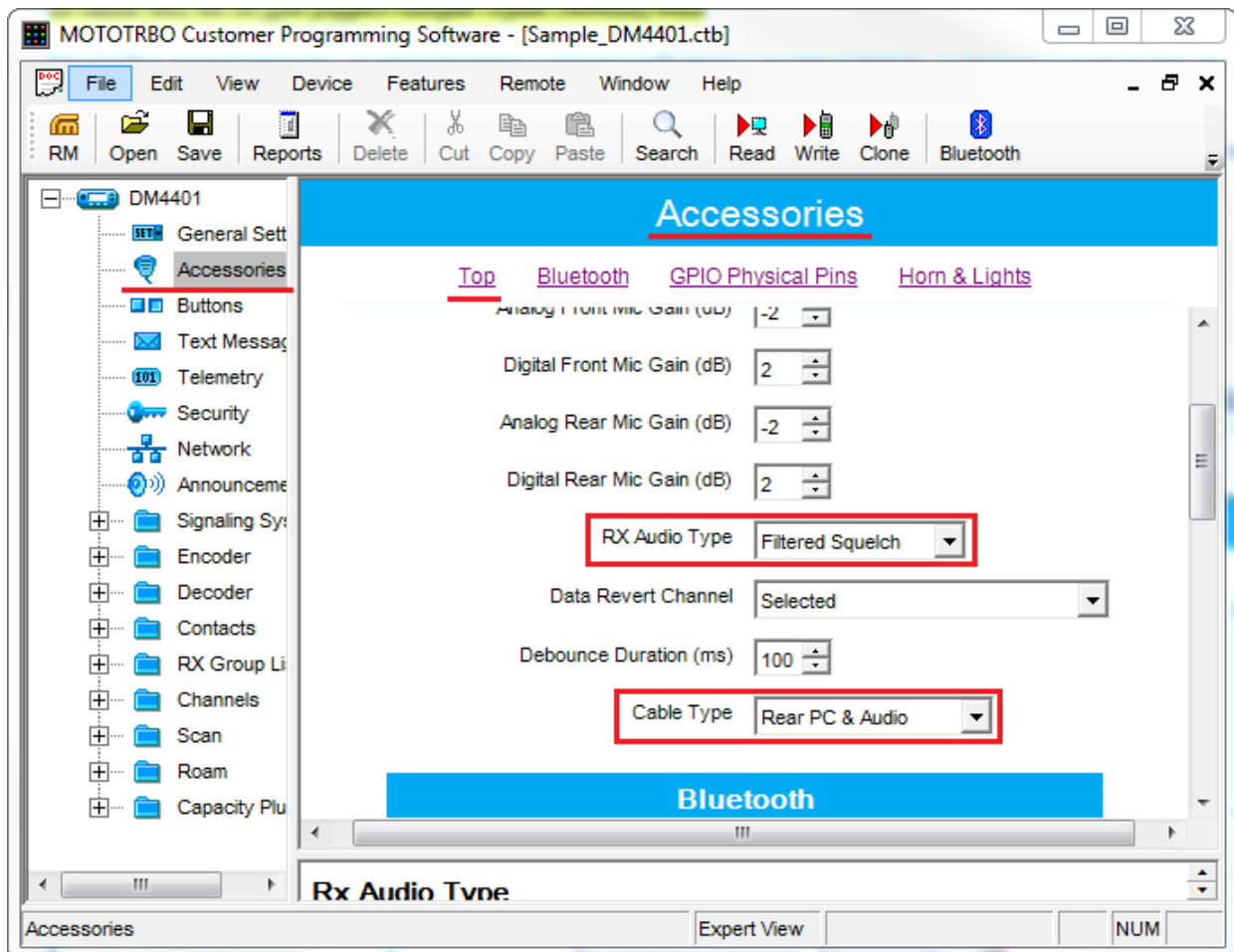
This section describes the radio settings that are directly related to the interaction with RG-2000 and does not cover all other radio settings.

## 5.1 MOTOTRBO settings

Firmware version of the MOTOTRBO radio connected to RG-2000 can't be older than R02.40.10.

Before connecting the MOTOTRBO radio to RG-2000 in the MOTOROLA DM mode, it is required to configure the following radio parameters in MOTOTRBO CPS:

1. Set up the accessory connector modes. Click **Accessories** tab in the radio settings and in **Top** section specify the following values:
  - Select *Filtered Squelch* in **RX Audio Type** field, and
  - Select *Rear PC & Audio* in **Cable Type** field.



2. In the **Top** section of **Accessory** tab specify the following values for **Pin #17**:
  - Select *Ext Mic PTT* in **Feature** column, and
  - Select *Low* in **Active Level** column.

MOTOTRBO Customer Programming Software - [Sample\_DM4401.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

DM4401

- General Settings
- Accessories**
- Buttons
- Text Messages
- Telemetry
- Security
- Network
- Announcement
- Signaling Systems
- Encoder
- Decoder
- Contacts
- RX Group Lists
- Channels
- Scan
- Roam
- Capacity Plus

## Accessories

[Top](#) [Bluetooth](#) [GPIO Physical Pins](#) [Horn & Lights](#)

### GPIO Physical Pins

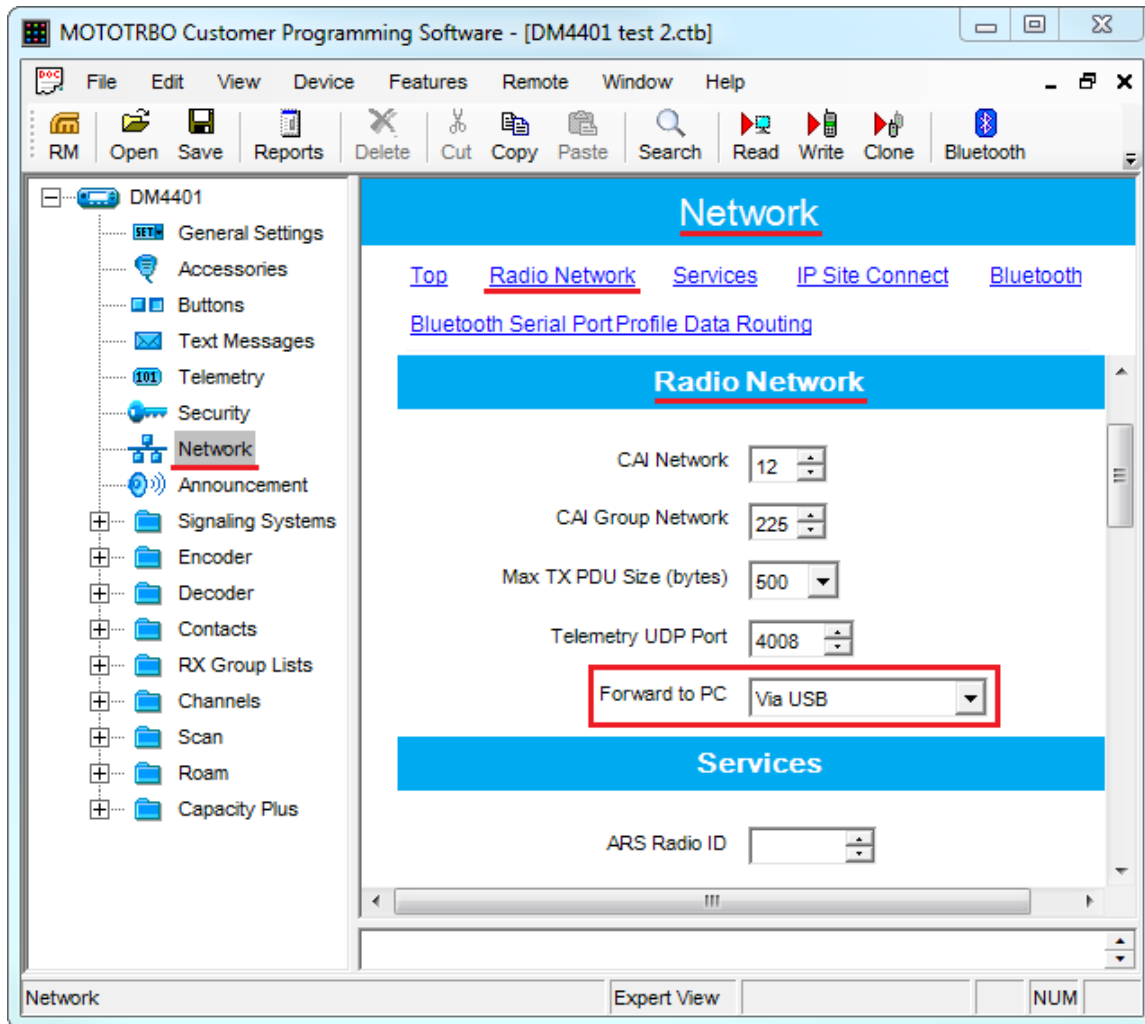
	Feature	Active Level	Debounce	GPS Report
Pin #17	Ext Mic PTT	Low	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Pin #19	Monitor	Low	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Pin #20	Unassigned	High	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Pin #21	Unassigned	High	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Pin #22	Unassigned	Low	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Pin #24	Unassigned	Low	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Pin #26	Ext Alarm/Horn & Lights	High	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**Horn & Lights**

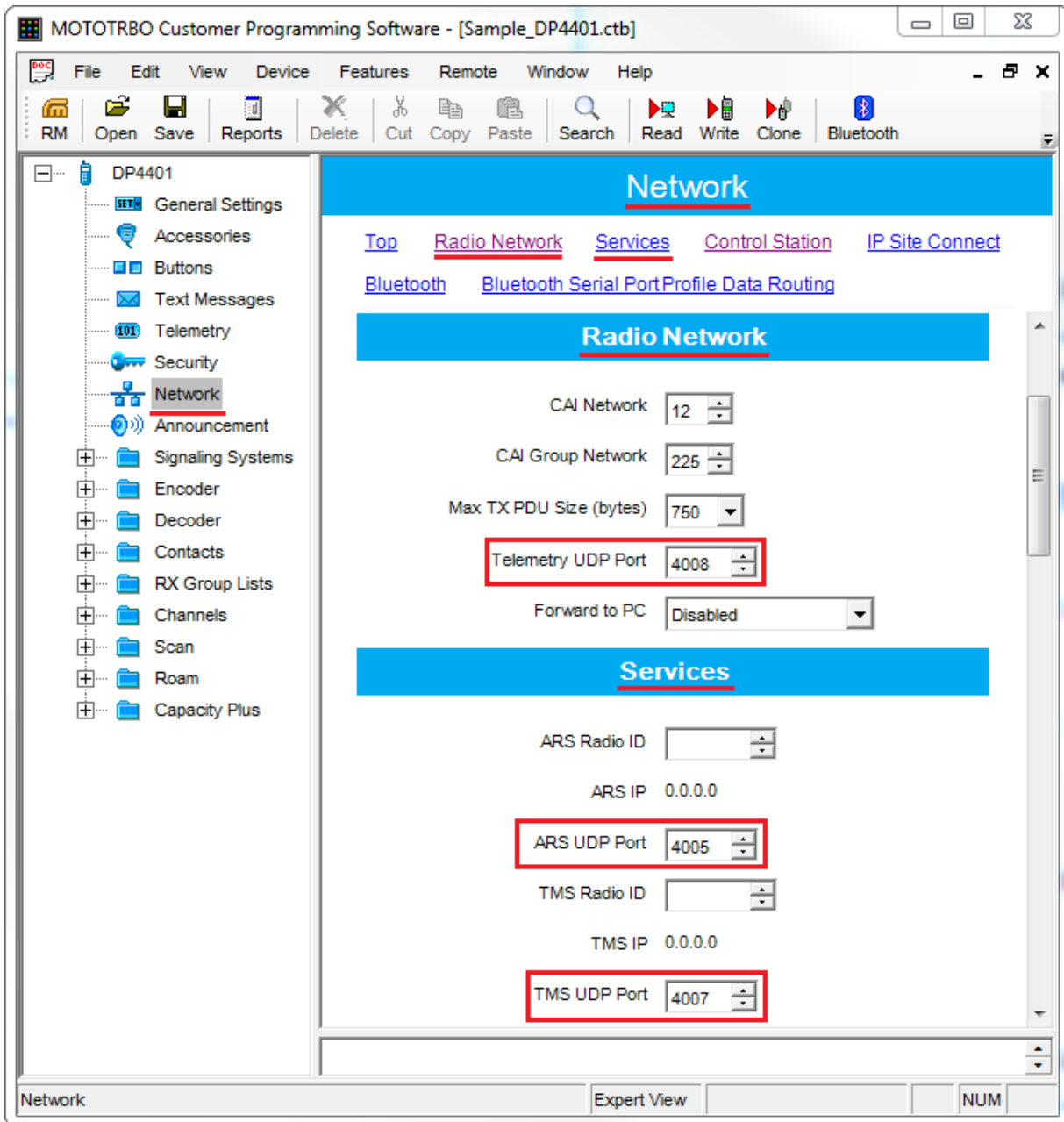
Accessories Expert View NUM

- Click **Network** tab in the radio settings. In **Radio Network** section, select *Via USB* in **Forward to PC** field.

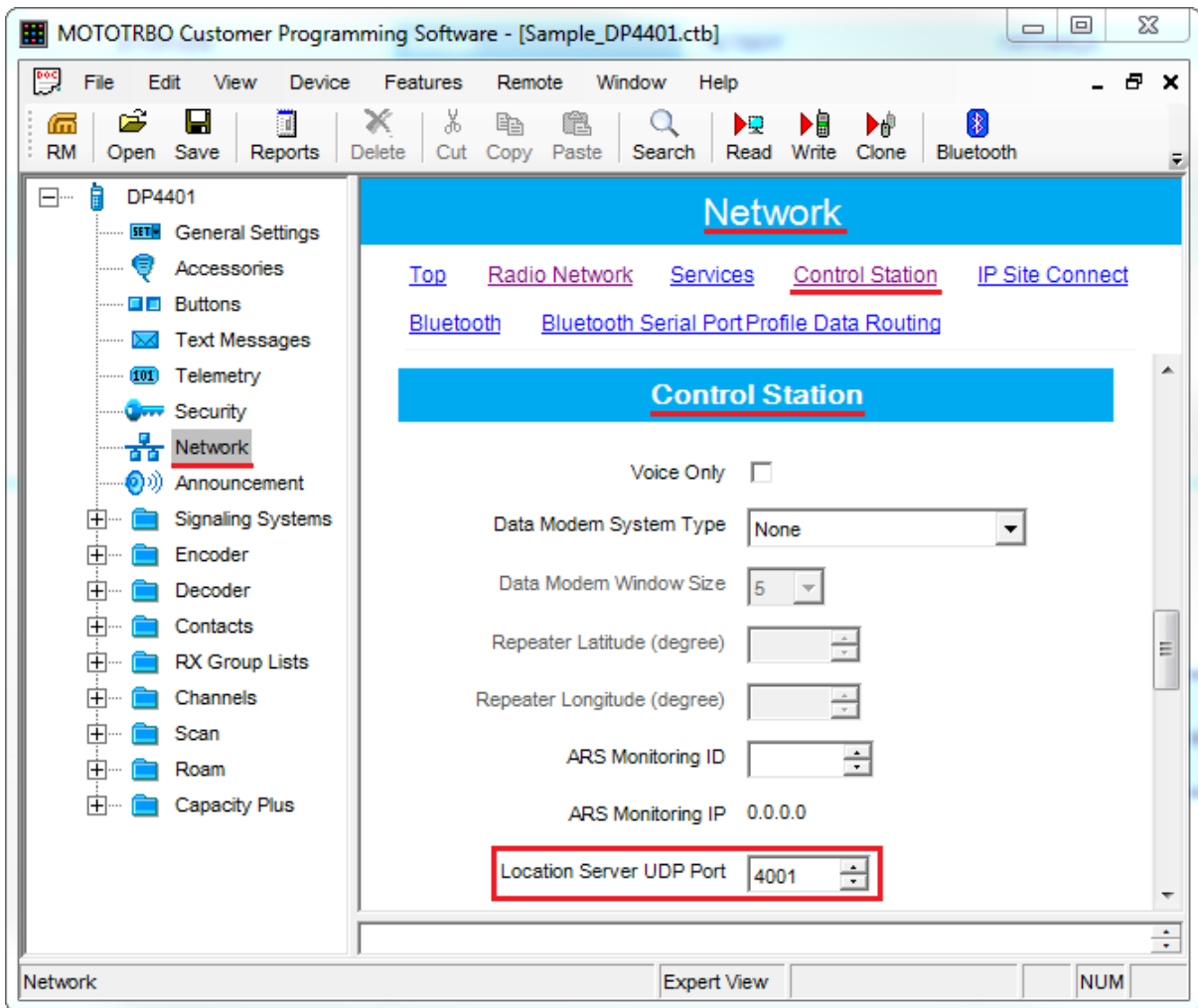




4. In **Network** tab, ensure that the UDP ports values of the Telemetry, ARS, TMS and Location services match the corresponding values, configured in the gateway (see the **Settings** tab of **Settings** subsection in **Radio** section of **Controller** panel). Check the values in the following fields:
- the **Telemetry UDP Port** field in **Radio Network** section,
  - the **ARS UDP Port** field in **Services** section,
  - the **TMS UDP Port** field in **Services** section, and



- the **Location Server UDP Port** field in **Control Station** section.



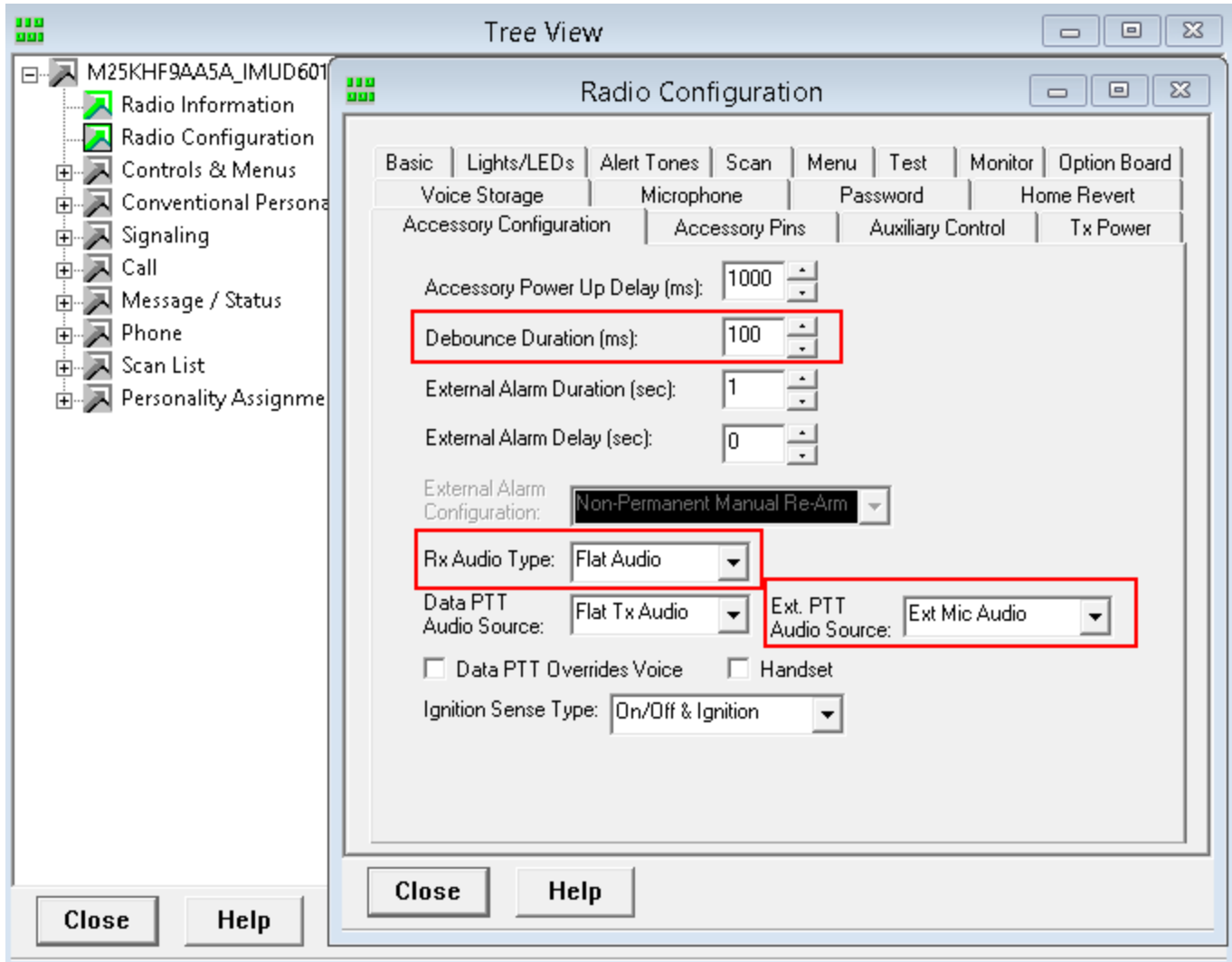
## 5.2 non-Mototrbo settings

### 5.2.1 CDM/PRO

#### CDM/PRO mobile radios

##### 1. Radio configuration menu, Accessory Configuration tab,

- Select *Flat Audio* in **Rx Audio Type**
- Select *Ext Mic Audio* in **External PTT Audio Source**
- Set *100 msec* in **Accessory Debounce Duration**



##### 2. Radio configuration menu, Accessory Pins tab,

- Set **pin 3** - External Mic PTT, active level low
- Set **pin 4** - PL and CSQ Detect/Talkgroup Detect, active level low

Optionally pins 6, 8, 12, 14 may be used for channel switching

- Set **pin 6** - Channel Select 1, active level low
- Set **pin 8** - Channel Select 2, active level low

- Set **pin 12** - [Channel Select 3, active level low](#)
- Set **pin 14** - [Channel Select 4, active level low](#)

The screenshot shows the 'Radio Configuration' window for device M25KHF9AA5A\_IMUD601. The 'Accessory Pins' tab is selected, displaying a table of pin configurations. The table has four columns: Pin #, Function Selection (Direction), Active Level, and Debounce Enable. Two groups of rows are highlighted with red boxes: one group containing pins 3, 4, 6, and 8, and another group containing pins 12 and 14. In both groups, the 'Active Level' is set to 'Low' and 'Debounce Enable' is checked.

Pin #	Function Selection (Direction)	Active Level	Debounce Enable
3	External Mic PTT (Input)	Low	<input checked="" type="checkbox"/>
4	PL and CSQ Detect/Talkgroup Detect (Output)	Low	<input checked="" type="checkbox"/>
6	Channel Select 1 (Input)	Low	<input checked="" type="checkbox"/>
8	Channel Select 2 (Input)	Low	<input checked="" type="checkbox"/>
9	Null	Low	<input type="checkbox"/>
12	Channel Select 3 (Input)	Low	<input checked="" type="checkbox"/>
14	Channel Select 4 (Input)	Low	<input checked="" type="checkbox"/>

## 5.2.2 XPR8300/XPR8400/XIRR8200

**XPR 8300/XPR8400/XIRR8200 repeaters (valid only for analog mode)**

### Accessory menu

- Select *Filtered Squelch* in **Audio Type**
- Select *External PTT* in **Audio Priority**
- Set **100 msec** in **Debounce Duration**
- Set **pin 17** - *External Mic PTT*, active level low
- Set **pin 19** - *PL/Talkgroup Detect*, active level low

Optionally pins 20, 21, 22 may be used for channel switching.

Accessories

[Top](#)   [GPIO Physical Pins](#)

---

Analog Rear Mic Gain (dB)

Analog Accessory Emphasis

Audio Type

Audio Priority

Disable Repeat Path

Debounce Duration (ms)

GPIO Physical Pins

	Feature	Active Level	Debounce
Pin #17	<input type="text" value="Ext Mic PTT"/>	<input type="text" value="Low"/>	<input checked="" type="checkbox"/>
Pin #19	<input type="text" value="PL/Talkgroup Detect"/>	<input type="text" value="Low"/>	<input checked="" type="checkbox"/>
Pin #20	<input type="text" value="Channel Select 1"/>	<input type="text" value="Low"/>	<input checked="" type="checkbox"/>
Pin #21	<input type="text" value="Channel Select 2"/>	<input type="text" value="Low"/>	<input checked="" type="checkbox"/>
Pin #22	<input type="text" value="Channel Select 3"/>	<input type="text" value="Low"/>	<input checked="" type="checkbox"/>

## 5.2.3 MTM5\*\*\*

Screen-shots below show settings that are important for proper communication between MTM5\*\*\* и RG-2000.

### Important

MTM5\*\*\* radio should carry on-board at least MR17.3 software.

Disable all tones, except *Group Call Received Tone*.

Tetra CPS - [TMO\_SN[938TUL2508]\_TEI[000148232113700]\_ISSI[5131]\_CP[0886]\_SW[R27.000.9289]\_USB3.cpe]

File Edit Tools Release Packet License View Window Help

Field Name	Field Value	Set Default
1 Clear to Send Tone	<input type="checkbox"/>	
2 Periodic Tone	<input type="checkbox"/>	
3 DTMF	<input type="checkbox"/>	
4 Group Call Received Tone	<input checked="" type="checkbox"/>	
5 Talk Permit Tone	<input type="checkbox"/>	
6 Duplex Ring Tone	Ring Tone 1	
7 Simplex Ring Tone	Ring Tone 2	
8 Periodic Alerting	<input type="checkbox"/>	
9 Periodic Alerting Period	2 min	Set Default
10 D-PTT Mode	<input type="checkbox"/>	
11 D-PTT Activation Time, msec	1000	Set Default
12 D-PTT Tone Output Volume	0	Set Default
13 D-PTT Tone Style	Single	Set Default
14 Incoming Emergency Tone Selection	Default Emergency Tone	Set Default
15 Tones Pack	Classic Tones	Set Default
16 DMO Simplex Ring Tone	<input type="checkbox"/>	
17 D-PTT Key	<input type="checkbox"/>	
18 Keypad Tone	<input type="checkbox"/>	

Codeplug

- Subscriber Unit Parameters
- Feature Flags
- Security
- End-to-End Encryption
- Clock System Broadcast Information
- Emergency Options
- TMO Voice Services
- Control Head Configurations
  - Common Settings
  - Ergonomic Parameters
    - Tones
    - Keypad
  - ADD Settings
  - Volume Settings
  - Buttons, Keys
  - GPIO Options
- Control Head Settings
- Transceiver Accessories Settings
- DMO Parameters
  - DMO Repeater Parameter
  - DMO Gateway Parameter
- Ergonomic Parameters
- Language Parameters
- Audio Settings
- Display Parameters
- TalkGroups
- Contact Book
- My Favorites
- Data Services
- Mobility and System Parameters
- Location
- User Application
- SIM

Help Invalid Warning Find Result

Set Active Accessory Selection = *Transceiver Accessory*.

The screenshot shows the Tetra CPS software interface. On the left is a tree view of settings categories, with 'Accessories Options' highlighted. On the right is a table of settings. The first row of the table is highlighted with a red border.

	Field Name	Field Value	Set Default
1	Active Accessory Selection	Transceiver Accessory	Set Default
2	Upper PTT	Disabled	
3	Telephone Handset Enable External Speaker on Hook for Group Mode	Enabled	Set Default
4	Telephone Handset Enable External Speaker on Hook for Private Mode	Enabled	Set Default
5	Preferred Emergency Accry - Control Head	Last Active Mic	Set Default
6	Preferred Output Audio for FDPC	Speaker	Set Default

At the bottom of the interface, there is a status bar with the text: Help Invalid Warning Find Result



Set Rx Audio Line Output Type = *0dBr*.

Tetra CPS - [TMO\_SN[938TUL2508]\_TEI[000148232113700]\_ISSI[5131]\_CP[0886]\_SW[R27.000.9289]\_USB3.cpe]

File Edit Tools Release Packet License View Window Help

	Field Name	Field Value	Set Default
1	Rx Audio Line Output Type	0dBr Point	Set Default
2	Preferred Emergency Accry - Transceiver	Last Active Mic	Set Default
3	Visor Mic Rear Accry Interface	MIC1/EXT_MIC (pin #13 RAC)	Set Default

Codeplug

- Subscriber Unit Parameters
- Feature Flags
- Security
- End-to-End Encryption
- Clock System Broadcast Information
- Emergency Options
- TMO Voice Services
- Control Head Configurations
  - Common Settings
    - Ergonomic Parameters
      - Tones
      - Keypad
    - ADD Settings
      - Volume Settings
      - Buttons, Keys
        - Menu Shortcuts
        - One-Touch Options
        - One-Touch Buttons
        - Rotary Knob Options
      - GPIO Options
    - Control Head Settings
      - Accessories Options
        - CH Accessories Setup
        - MMI Options
      - Backlight
      - GPIO
        - GPIO1
        - GPIO2
    - Transceiver Accessories Settings
      - Transceiver Accessories Setup
  - DMO Parameters
  - DMO Repeater Parameter
  - DMO Gateway Parameter

Set Line In Rear Accy = *Line-In*.

Tetra CPS - [TMO\_SN[938TUL2508]\_TEI[000148232113700]\_ISSI[5131]\_CP[0886]\_SW[R27.000.9289]\_USB3.cpe]

File Edit Tools Release Packet License View Window Help

	Field Name	Field Value	Set Default
1	Visor Mic Rear Accry	Unassigned	
2	Handset Rear Accry	Unassigned	
3	Fist Mic Rear Accry	Unassigned	
4	Ext Speaker Rear Accry	RSN4004	Set Default
5	Line In Rear Accry	LINE-IN	Set Default
6	Expansion Head Accry	Unassigned	Set Default

Codeplug

- Subscriber Unit Parameters
- Feature Flags
- Security
- End-to-End Encryption
- Clock System Broadcast Information
- Emergency Options
- TMO Voice Services
- Control Head Configurations
  - Common Settings
    - Ergonomic Parameters
      - Tones
      - Keypad
    - ADD Settings
    - Volume Settings
    - Buttons, Keys
      - Menu Shortcuts
      - One-Touch Options
      - One-Touch Buttons
      - Rotary Knob Options
    - GPIO Options
  - Control Head Settings
    - Accessories Options
      - CH Accessories Setup
    - MMI Options
    - Backlight
    - GPIO
      - GPIO1
      - GPIO2
  - Transceiver Accessories Settings
    - Transceiver Accessories Setup
- DMO Parameters
  - DMO Repeater Parameter
  - DMO Gateway Parameter

Help Invalid Warning Find Result

Check settings below, it should be as presented.

Tetra CPS - [TMO\_SN[938TUL2508]\_TEI[000148232113700]\_ISSI[5131]\_CP[0886]\_SW[R27.000.9289]\_USB3.cpe]

File Edit Tools Release Packet License View Window Help

	Field Name	Field Value	Set Default
▶ 1	Periodic Alerting	<input type="checkbox"/>	
2	Periodic Alerting Period	5 min	Set Default
3	Keypad Auto Lock	<input type="checkbox"/>	
4	Keypad Lock on Start-Up	<input type="checkbox"/>	
5	Keypad Tone	<input type="checkbox"/>	
6	Keypad Autolock Time, sec	300	Set Default
7	Clear to Send Tone	<input type="checkbox"/>	
8	All Tones	<input type="checkbox"/>	
9	Covert Mode	<input type="checkbox"/>	
10	Talk Permit Tone	<input type="checkbox"/>	
11	TXI Activated	<input type="checkbox"/>	
12	Default TG	TG1:DIPM TMO:10010001:Any	Set Default
13	Audio Profile	User Profile 1:General 1	Set Default

Help Invalid Warning Find Result

Check General Notification - Group Call Received settings, Scale Factor should be -20 and Total level should be -26.

Tetra CPS - [TMO\_SN[938TUL2508]\_TEI[000148232113700]\_ISSI[5131]\_CP[0886]\_SW[R27.000.9289]\_USB3.cpe]

File Edit Tools Release Packet License View Window Help

	Tone Name	Event	Category	Scale Factor	Total Level	Reset Entry
14	Device Disconnect	Single CH	Alert	-20	-24	Reset Entry
15	Device Disconnect	USB/Charger Disconnect	Alert	-20	-24	Reset Entry
16	Device Error/Failed to Connect	Dual CH Error (link failed)	Alert	-20	-26	Reset Entry
17	Sys Notification	In Service after DMO	Alert	-20	-20	Reset Entry
18	Sys Notification	Back to Home Network	Alert	-20	-20	Reset Entry
19	Sys Notification	Coverage Restored	Alert	-20	-20	Reset Entry
20	Sys Notification	Individual Call Hold	Alert	-20	-20	Reset Entry
21	Sys Error	Out of Range	Alert	-20	-17	Reset Entry
22	Sys Error	Call Disconnected	Alert	-20	-17	Reset Entry
23	Sys Error	Coverage Low	Alert	-20	-17	Reset Entry
24	Sys Error	System Congestion	Alert	-20	-17	Reset Entry
25	Sys Error	Call Disconnected by System	Alert	-20	-17	Reset Entry
26	Sys Error	GW Mode Override	Alert	-20	-17	Reset Entry
27	Sys Error	Individual Call Transferred	Alert	-20	-17	Reset Entry
28	General Notification	In Local Site Trunking	Alert	-20	-26	Reset Entry
29	General Notification	TXI Mode	Alert	-20	-26	Reset Entry
30	General Notification	Group Call Received	Alert	-20	-26	Reset Entry
31	General Notification	DMO Different Call Source	Alert	-20	-26	Reset Entry
32	General Notification	Ongoing ETE Provisioning	Alert	-20	-26	Reset Entry
33	General Notification	Call Waiting	Alert	-20	-26	Reset Entry
34	General Notification	Encryption Enable/Disable	Alert	-20	-26	Reset Entry
35	General Notification	Clear Call	Alert	-20	-26	Reset Entry
36	General Notification	Clear Tx Alert	Alert	-20	-26	Reset Entry
37	General Notification	Clear Rx Alert	Alert	-20	-26	Reset Entry
38	General Notification	Timeout Timer (TOT) Warning	Alert	-20	-26	Reset Entry
39	General Notification	Individual Call Waiting Repetitive	Alert	-20	-26	Reset Entry
40	Positive Notification	Mail Sent	Alert	-20	-27	Reset Entry
41	Positive Notification	DMO Emrg Status Sent	Alert	-20	-27	Reset Entry
42	Positive Notification	Pinlock	Alert	-20	-27	Reset Entry

Help Invalid Warning Find Result

# Line Out In-Call



Check General Notification Field Value should be -6.

Tetra CPS - [TMO\_SN[938TUL2508]\_TEI[000148232113700]\_ISSI[5131]\_CP[0886]\_SW[R27.000.9289]\_USB3.cpe]

File Edit Tools Release Packet License View Window Help

	Field Name	Field Value	Set Default
1	Default Beep	1	Set Default
2	Invalid/Illegal Action	1	Set Default
3	Device Connect	-4	Set Default
4	Device Disconnect	-4	Set Default
5	Device Error/Failed to Connect	-6	Set Default
6	Sys Notification	0	Set Default
7	Sys Error	3	Set Default
8	General Notification	-6	Set Default
9	Positive Notification	-7	Set Default
10	Negative Notification	-4	Set Default
11	RC Notification	-4	Set Default
12	Item Received	-7	Set Default
13	Talk Permit	-7	Set Default
14	Clear to Send	1	Set Default
15	Emergency	-1	Set Default
16	Emergency 2	-1	Set Default
17	DTMF 0	0	Set Default
18	DTMF 1	0	Set Default
19	DTMF 2	0	Set Default
20	DTMF 3	0	Set Default
21	DTMF 4	0	Set Default
22	DTMF 5	0	Set Default
23	DTMF 6	0	Set Default
24	DTMF 7	0	Set Default
25	DTMF 8	0	Set Default
26	DTMF 9	0	Set Default
27	DTMF Asterisk	0	Set Default
28	DTMF Hash	0	Set Default
29	Over the Air 1	3	Set Default

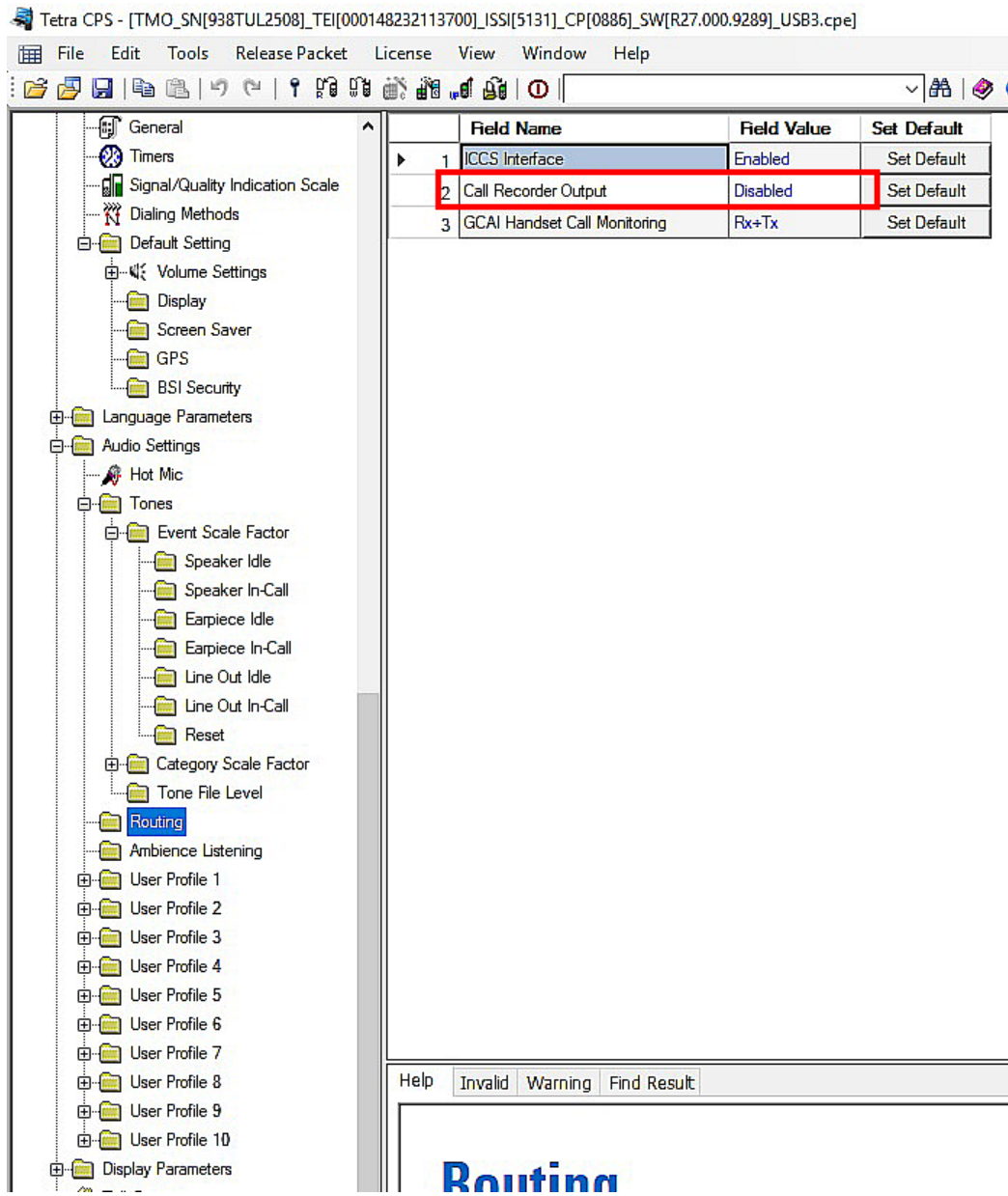
Help Invalid Warning Find Result

# General Notification

## Disabled Call Recorder Output.

Tetra CPS - [TMO\_SN[938TUL2508]\_TEI[000148232113700]\_ISSI[5131]\_CP[0886]\_SW[R27.000.9289]\_USB3.cpe]

File Edit Tools Release Packet License View Window Help



The screenshot shows the 'Routing' settings in the Tetra CPS software. The 'Call Recorder Output' field is highlighted in red and set to 'Disabled'. The 'Set Default' button is also highlighted in red. The 'Field Name', 'Field Value', and 'Set Default' columns are visible in the table below.

	Field Name	Field Value	Set Default
1	CCS Interface	Enabled	Set Default
2	Call Recorder Output	Disabled	Set Default
3	GCAI Handset Call Monitoring	Rx+Tx	Set Default

Help Invalid Warning Find Result

## Routing

# 6 Radioserver settings

The SmartPTT Radioserver can be configured in different ways to work with RG-2000. It depends on the topology of the MOTOTRBO network to which the radioserver is connected.

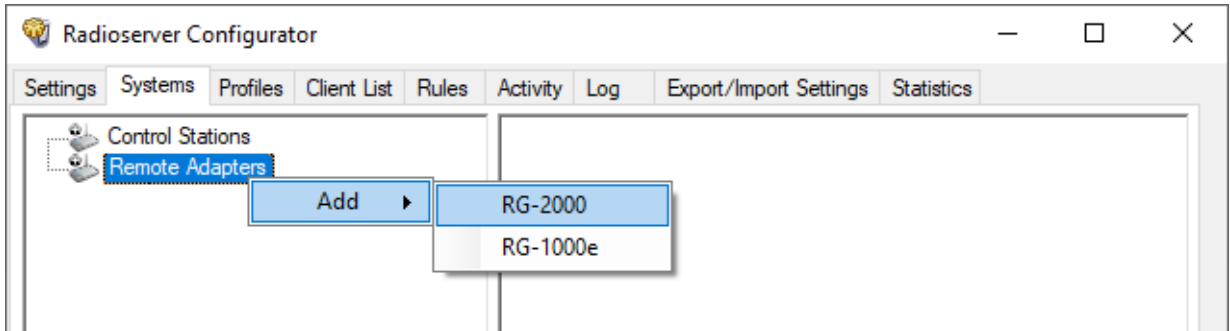
## 6.1 Interaction with Mototrbo remote control station

For connection to each of the pre-configured IP channels on RG-2000, a separate connection on the radioserver (remote MOTOTRBO control station) should be created.

To create the connection to RG-2000 perform the following actions:

1. Right click **Remote Adapters** in the settings tree of Radioserver Configurator.

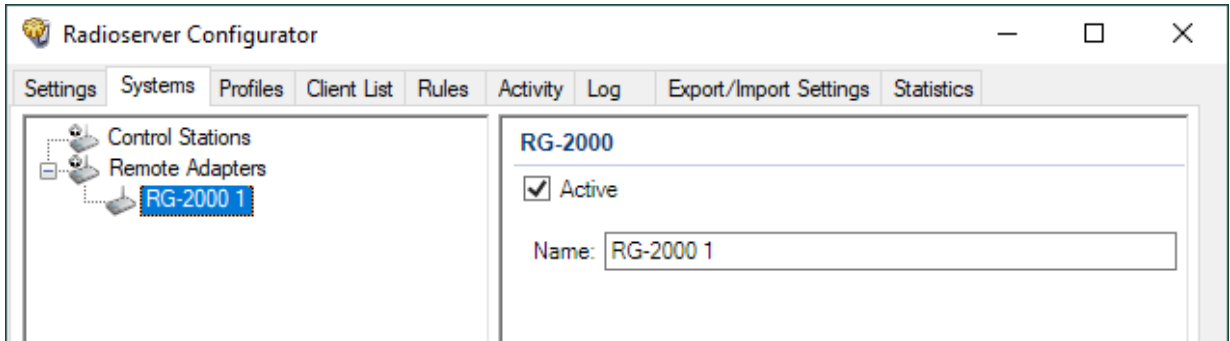
Click **Add > RG-2000**.



After that new remote device will appear in the settings tree. Select the **Active** check box.

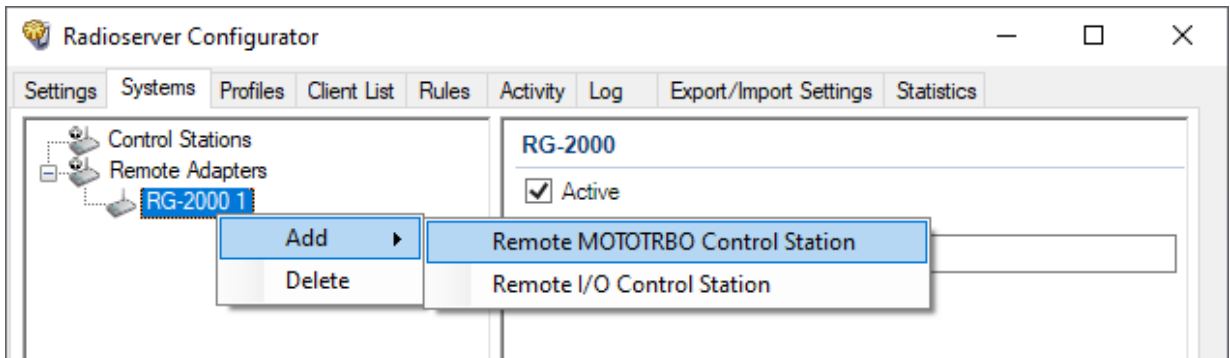


Type desirable aliasing name in Name Gap and press **Save** button



2. Right click **new remote adapter** (on the sample picture above it is **RG-2000\_1**) in the settings tree.

Click **Add > Remote Mototrbo control station**.



3. In the window that opens specify the parameters of the connection to the remote control station.



The screenshot shows the Radioserver Configurator interface. On the left is a tree view with 'Remote control station 1' selected. The main panel is titled 'Remote MOTOTRBO Control Station' and contains the following settings:

- Active
- Name: Remote control station 1
- Network ID: 1 (with 'Edit Network ID' button)
- Connection mode: Client
- Control station IP address: 192.168.10.1 (with 'Test' button)
- TCP Control Port: 30010
- Local interface: Any
- Local ports section:
  - Local Ports Allocation:  Auto  Set manually
  - TCP Control Port: 30011
  - Audio UDP Port: 30012
- Encrypted Connection
- Radio ID: 1
- CAI Network: 12
- CAI Network for Groups: 225
- Data Channel
- Phone Calls
- Location Service (LIP): UDP Port: 5017
- Location Service (LRRP): UDP Port: 4001
- Automatic Registration Service: UDP Port: 4005
- Text Message Service: UDP Port: 4007
- Telemetry Service: UDP Port: 4008
- User Service 1: UDP Port: 0
- User Service 2: UDP Port: 0
- User Service 3: UDP Port: 0
- TX Criteria: Channel Free
- Analog Call Hangtime, ms: 3000
- GPS section:
  - GPS Transmission Mode: Data
  - Register radios when receiving GPS coordinates
- 5 Tone signaling
- Buttons: Add, Delete
- Table:

System	PTT ID Telegram Number
--------	------------------------

**Active:** Activates the connection to the remote control station. To disable the remote control station from the connection list, clear the **Active** check box.

**Name:** Aliasing remote control station name. The name will be shown on Dispatcher console.

**Network ID:** Configurator automatically assign ID for each network. If you need you may assign ID manually.

**Connection mode:** Select desirable network role, "server" or "client".

**Remote adapter IP address:** RG-2000 network IP address. The IP address in this field must match the value specified in the settings of the gateway IP channel for this remote control station. See in Web Configurator the corresponding **IP interface for communication with Remote Nodes** in the **Network** section.

**TCP control port:** RG-2000 Control (XCMP) port. The XCMP port in this field must match the value specified in the corresponding field in Web Configurator. See **Control port (XCMP, local)** in the corresponding **IP interface for communication with Remote Nodes** of **Network** section.

**Local interface:** The local network interface (address) that will be used for connection to RG-2000. It is recommended to select a particular interface and do not set Any.

For the case when Radioserver is set as network "server" it needs to select **Local interface** and specify **Local TCP control port** (for incoming connection).

The image shows a configuration interface with three fields:

- Connection mode:** A dropdown menu with "Server" selected.
- Local interface:** A dropdown menu with "Any" selected.
- Local TCP Control Port:** A text input field with "30011" entered and up/down arrow buttons.

**Local ports:** Local Ports Allocation may be done Automatically or Set manually. For majority cases Auto option works ok. However, if on IP pipeline between Radioserver and RG-2000 there are routers/firewalls manual local ports setting may be required (due to specific routers/firewalls configurations).

**Radio ID:** Unique identifier of the remote control station. Radio ID is to be set in the range from 1 to 16776415.

**CAI Network:** CAI network identifier. To be set in the range from 1 to 126. Use the default value of 12.

**CAI Network for Groups:** Group CAI network identifier. To be set in the range from 225 to 239. Use the default value of 225.

**Data Channel:** If selected, the remote control station is used for data transmit only and is not displayed on Dispatcher PC and is not available for voice calls.

**Phone calls:** Allows you to enable voice calls to telephone subscribers.

**Location service LIP:** Enables location service LIP which provides coordinates of the subscribers, whose radios are equipped with a built-in GPS receiver. Port 5017 is used as default.

**Location service LRRP:** Enables location service LRRP which provides coordinates of the subscribers, whose radios are equipped with a built-in GPS receiver. Port 4001 is used as default.

**ARS:** Enables registration service. When the radio powers up, the radio automatically registers with the server. Port 4005 is used as default.

**TMS:** Enables the service for exchanging text messages between dispatchers and radio subscribers. Port 4007 is used by default.

**Telemetry Service:** Enables the service responsible for transmitting and processing of telemetry signals between SmartPTT Dispatcher and subscriber stations. Port 4008 is used by default.

**User service 1 / User service 2 / User service 3:** Reserved for future.

TX Criteria:

Analog Call Hangtime, ms:

GPS

GPS Transmission Mode:

Register radios when receiving GPS coordinates

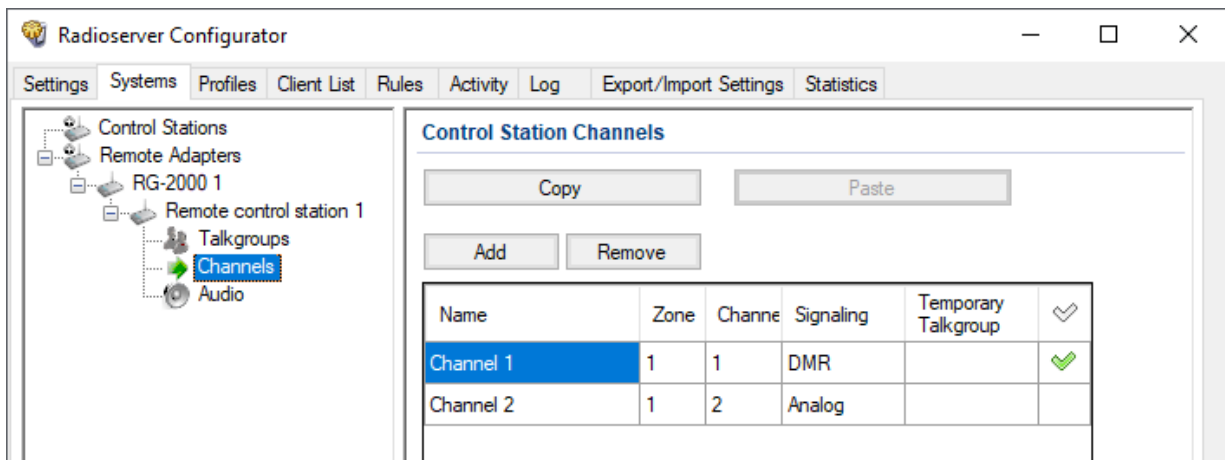
**TX Criteria list:** Select one of the following options: *Channel Free, Tx Interrupt, Always*. Since Dispatcher should have the top priority Always supposed to be reasonable choice.

**Analog Call Hang-time:** Virtual hang-time which is used for uniting analog calls into one. This was done to not overload the event log with too many records of analog calls. During this hang-time the channel is not reserved, anyone can start transmitting. The hang-time applies only if the remote control station is configured to operate in analog mode.

**GPS Transmission Mode:** Allows you to select the way how to transmit location updates: as a data packet in multiple bursts, as a single CSBK (Control Signaling Block) or as Enhanced CSBK. CSBK options work under LRRP protocol only.

**Register radios when receiving GPS coordinates:** Allows Radioserver register field radios when it receives their GPS coordinates.

4. Add or edit the channels of the remote control station in the **Control Station Channels** window. These settings allows remote switching between the control station channels and must match with the radio settings in the MOTOTRBO CPS.



**Name:** Channel alias visible on Dispatcher PC.

**Zone:** Serial number of a channel group.

**Channel:** Channel sequence number.



: Selected channel will be set at the control station, when you start the radioserver.

**Copy:** Copies added channels of the remote control station to the clipboard

**Paste:** Pastes copied channels of the remote control station from the clipboard.

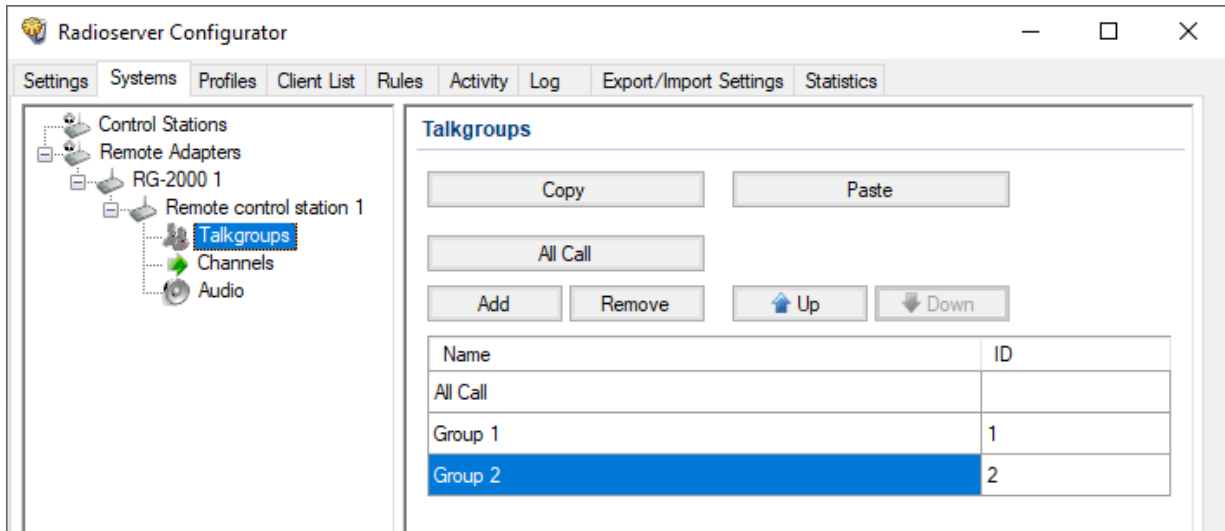
**Add:** Adds a new channel.

**Remove:** Deletes the channel from the list.

To edit channel name, zone or channel number, place the cursor on the corresponding field and make changes.

**Note:** The maximum number of zones and channels of the MOTOTRBO control station depends on the model and version of the parameter block.

- In the **Control Station Talkgroups** window, add or edit the talkgroups, which the dispatcher(s) may use for making a call via the remote control station.



To add a talkgroup, click **Add**. To add All Call (is used in profiles), click **All Calls**. To change the order of groups in the list, use the **Up** and **Down** arrows. The order defined in the window will be used in SmartPTT Dispatcher.

**Name:** Talkgroup alias displayed by the control station.

**ID:** Talkgroup unique identifier used during communications. To be set in the range from 1 to 16776415.

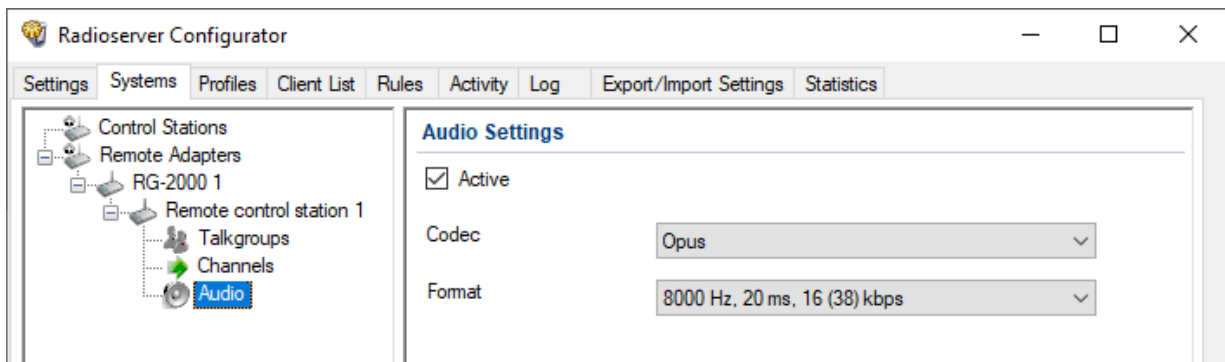
**Copy:** Copies added groups (their names and IDs) to the clipboard.

**Paste:** Pastes copied groups from the clipboard.

**Remove:** Deletes the selected talkgroup.

To edit talkgroup name or ID, set the cursor on the corresponding field, double click and make changes.

- To select audio devices and set up VoIP parameters, click **Audio** in the settings tree of Radioserver Configurator. At that, the **Audio Settings** window will open.



The **Active** check box activates transmission and receiving of the audio signals for the remote control station.

**Codec:** Outgoing audio stream compression method. The recommended value is *OPUS* or *Linear PCM*.

**Format:** Sampling frequency of an outgoing audio stream and the RTP packet size. Linear PCM supports only value 8000 Hz, 20 ms, 128 (150) kbps. OPUS supports values 8000 Hz, 20 ms, 12 (34) kbps and 16000 Hz, 20 ms, 22 (44) kbps. The recommended value is 8000 Hz, 20 ms, 12 (34) kbps.

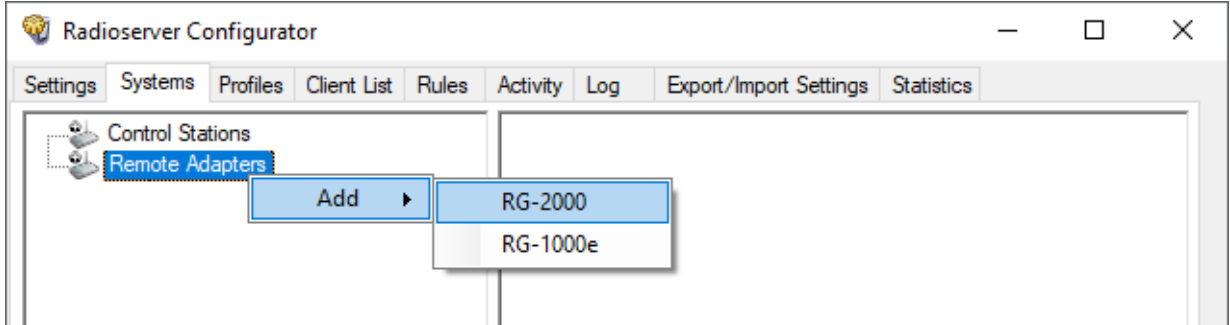
7. If you need to create more than one connection to the remote control stations, repeat steps 1 to 6 for each new remote control station.

## 6.2 Interaction with non-Mototrbo control stations (I/O mode)

To create the connection to RG-2000 for interaction with non-Mototrbo control station (RG-2000 GPIO mode) you should configure the following settings in Radioserver Configurator:

1. Right click **Remote Adapters** in the settings tree of Radioserver Configurator.

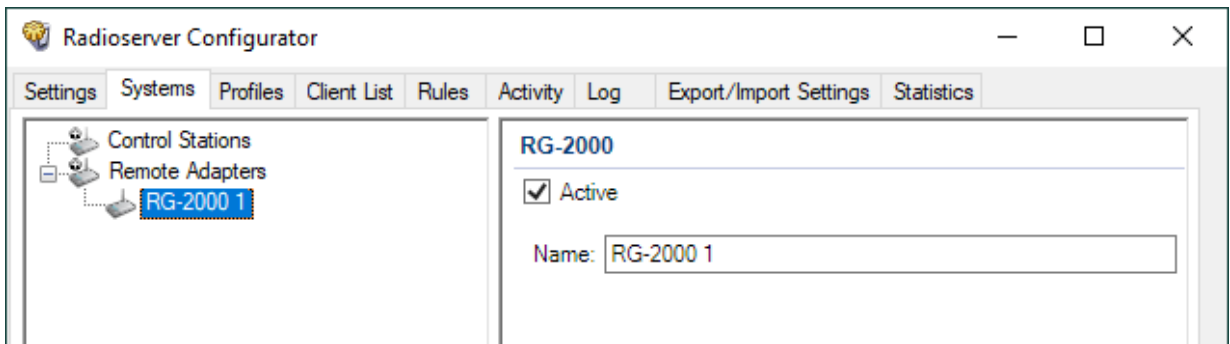
Click **Add > RG-2000**.



After that new remote device will appear in the settings tree. Check-on box **Active**.

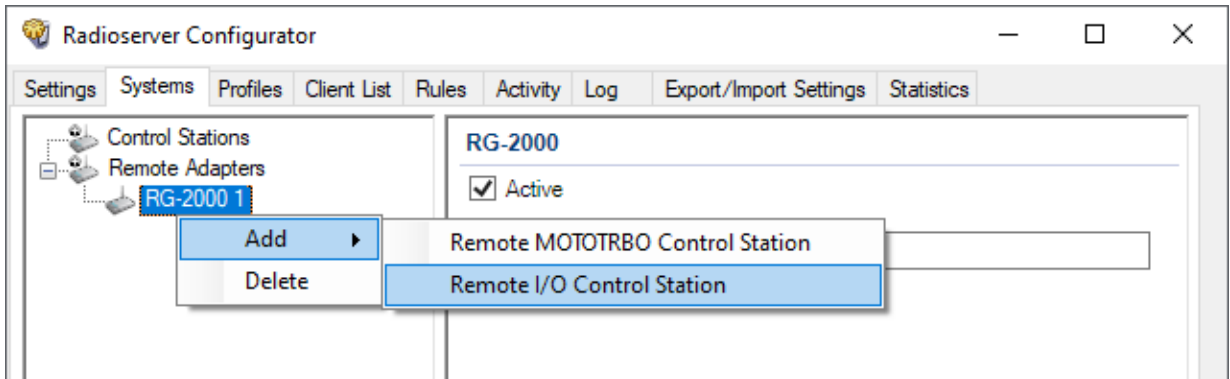


Type desirable aliasing name in Name Gap and press **Save** button



2. Right click **new remote device** (on the sample picture above it is **RG-2000\_1**) in the settings tree.

Click **Add > Remote I/O control station**.



3. In the window that opens specify the parameters of the connection to the remote control station.

The screenshot shows the Radioserver Configurator window with the 'Remote I/O Control Station' configuration panel. The left sidebar shows a tree view with 'Remote control station 1' selected. The main panel contains the following settings:

- Active:**  Active
- Name:** Remote control station 1
- Network ID:** 1 (with an 'Edit Network ID' button)
- Connection mode:** Client (dropdown menu)
- Control station IP address:** 192.168.10.1 (with a 'Test' button)
- TCP Control Port:** 30010 (spinners)
- Local interface:** Any (dropdown menu)
- Local ports:**
  - Local Ports Allocation:  Auto  Set manually
  - TCP Control Port: 30011 (spinners)
  - Audio UDP Port: 30012 (spinners)
- Encrypted Connection:**  Encrypted Connection
- Talkgroup name:** All Call
- TX Criteria:** Channel Free (dropdown menu)
- TX Time-Out Timer, s:** 60 (spinners)
- Analog Call Hangtime, ms:** 3000 (spinners)

**Active:** Activates the connection to the remote control station. To disable the remote control station from the connection list, clear the **Active** check box.

**Name:** Aliasing remote control station name. The name will be shown on Dispatcher console.

**Network ID:** Configurator automatically assign ID for each network. If you need you may assign ID manually.

**Connection mode:** Select desirable network role, "server" or "client".

**Remote adapter IP address:** RG-2000 network IP address. The IP address in this field must match the value specified in the settings of the gateway IP channel for this remote control station. See in Web Configurator the corresponding **IP interface for communication with Remote Nodes** in the **Network** section.

**TCP control port:** RG-2000 Control (XCMP) port. The XCMP port in this field must match the value specified in the corresponding field in Web Configurator. See **Control port (XCMP, local)** in the corresponding **IP interface for communication with Remote Nodes** of **Network** section.

**Serial number:** Radio serial number. Just for your reference, for instance 1234567890.

**Local interface:** The local network interface (address) that will be used for connection to RG-2000. It is recommended to select a particular interface and do not set Any.

For the case when Radioserver is set as network "server" it needs to select **Local interface** and specify **Local TCP control port** (for incoming connection).

Connection mode: 
  
 Local interface: 
  
 Local TCP Control Port:

**Local ports:** Local Ports Allocation may be done Automatically or Set manually. For majority cases Auto option works ok. However, if on IP pipeline between Radioserver and RG-2000 there are routers/firewalls manual local ports setting may be required (due to specific routers/firewalls configurations).

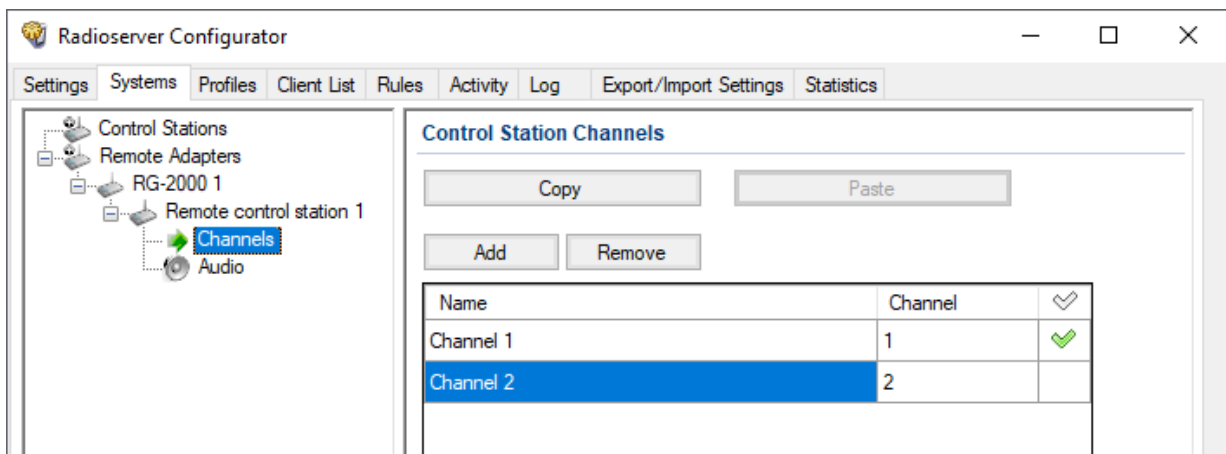
**Talkgroup name:** Put talkgroup name. Just for your reference, for instance All Call.

**TX Criteria list:** Select one of the following options: *Channel Free, Tx Interrupt, Always*. Since Dispatcher should have the top priority Always supposed to be reasonable choice.

**TX Time-Out Timer, s:** Continuous radio transmission timeout. After this time the transmission is interrupted.

**Call Hangtime, ms:** Virtual hang time which is used for uniting calls into one. This was done to not overload the event log with too many records of calls. During this hang time the channel is not reserved, anyone can start transmitting.

4. Add or edit the channels of the remote control station in the **Control Station Channels** window. These settings allows remote switching between the control station channels and must match with the radio settings in the remote non-Mototrbo control station.



**Name:** Channel alias visible on Dispatcher PC.

**Channel:** Channel sequence number.



: Selected channel will be set at the control station, when you start the radioserver.

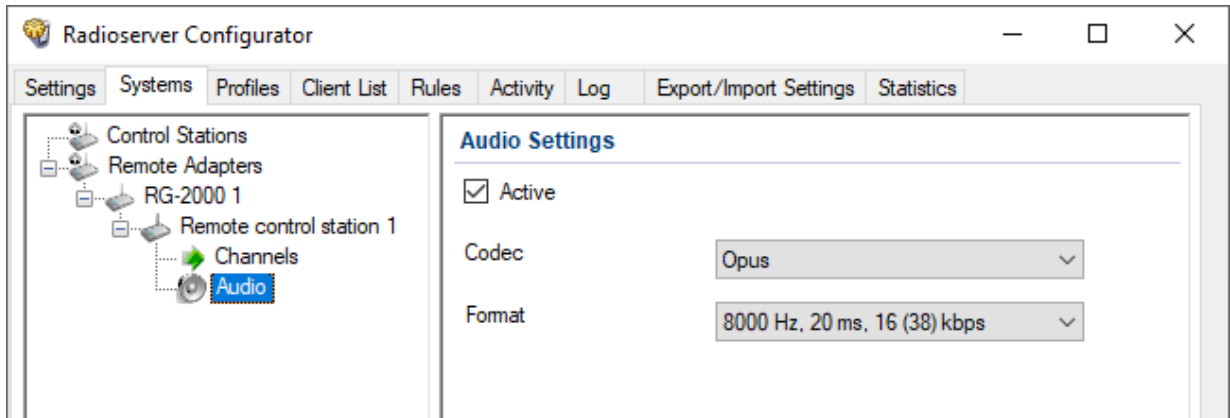
**Copy:** Copies added channels of the remote control station to the clipboard. **Paste:** Pastes copied channels of the remote control station from the clipboard.

**Add:** Adds a new channel. **Remove:** Deletes the channel from the list.

To edit channel name place the cursor on the corresponded field, double click and make changes.

5. To select audio devices and set up VoIP parameters, click **Audio** in the setting tree of SmartPTT Radioserver Configurator. At that, the **Audio Settings** window will open.





The **Active** check box activates transmission and receiving of the audio signals for the remote control station.

**Codec:** Outgoing audio stream compression method. The recommended value is *OPUS* or *Linear PCM*.

**Format:** Sampling frequency of an outgoing audio stream and the RTP packet size. Linear PCM supports only value *8000 Hz, 20 ms, 128 (150) kbps*. OPUS supports values *8000 Hz, 20 ms, 12 (34) kbps* and *16000 Hz, 20 ms, 22 (44) kbps*. The recommended value is *8000 Hz, 20 ms, 12 (34) kbps*.

6. If you need to create more than one connection to the remote control stations, repeat steps 1 to 6 for each new remote control station.

# 7 UserDevice port configuration samples

Figures below show UserDevice port settings for interaction RG-2000 with different donor radios. Hope it makes RG-2000 implementation process easier and faster. Shown Device port settings may be considered as recommended. At the same time settings may vary depends on a project technical requirements.

## 7.1 UserDevice Mototrbo

**Remote Node connection protocol version** version 2 ▾

**Interaction settings Gateway ⇌ UserDevice**

UserDevice type and mode MotoTRBO ▾

UserDevice ID anylabel Any char except "\"  
*Any label for displayed in the equipment map*

**Ports for interaction with UserDevice**

ARS port (Auto Register Service)	<input type="text" value="4005"/>	UDP, 0, 1025-65000
TMP port (Text Message Protocol)	<input type="text" value="4007"/>	UDP, 0, 1025-65000
LRRP port (Location Request and Response Protocol)	<input type="text" value="4001"/>	UDP, 0, 1025-65000
Port TP (Telemetry Protocol)	<input type="text" value="4008"/>	UDP, 0, 1025-65000
LIP port (Location Information)	<input type="text" value="5017"/>	UDP, 0, 1025-65000
Job ticketing port	<input type="text" value="4013"/>	UDP, 0, 1025-65000
User defined port 1	<input type="text" value="0"/>	UDP, 0, 1025-65000
User defined port 2	<input type="text" value="0"/>	UDP, 0, 1025-65000
User defined port 3	<input type="text" value="0"/>	UDP, 0, 1025-65000

*Not in use when set to 0.*

**Addition UserDevice command/control via GPIO pins**

Duplicate the PTT signal via GPIO-line

Audio RTP from UserDevice to Remote Node streaming starting rules Speaker\_On status ▾ Audio IP steaming is activated by Speaker\_On status from UserDevice.

**IP voice settings**

Voice codec for IP streaming to Remote Node OPUS, Narrow Band ▾ sample rate 48000 Hz, 20 ms, 16 (30) kbps bitrate, audio bandwidth 4 KHz

In-band FEC enable (Forward Error Correction)

Mirroring TX audio stream to all IP interfaces

Send test audio signal to Remote Node

Archiving sessions on SD card

Fig. 38 UserDevice settings for Mototrbo, protocol v2.

**Remote Node connection protocol version** version 1 ▾

**Interaction settings Gateway ↔ UserDevice**

UserDevice type and mode MotoTRBO ▾

**Ports for interaction with UserDevice**

ARS port (Auto Register Service)	4005	UDP, 0, 1025-65000
TMP port (Text Message Protocol)	4007	UDP, 0, 1025-65000
LRRP port (Location Request and Response Protocol)	4001	UDP, 0, 1025-65000
Port TP (Telemetry Protocol)	4008	UDP, 0, 1025-65000

*Not in use when set to 0.*

**Addition UserDevice command/control via GPIO pins**

Duplicate the PTT signal via GPIO-line

Audio RTP from UserDevice to Remote Node streaming starting rules Speaker\_On status ▾

Audio IP steaming is activated by Speaker\_On status from UserDevice.

**IP voice settings**

Voice codec for IP streaming to Remote Node OPUS, Narrow Band ▾

sample rate 48000 Hz, 20 ms, 16 (30) kbps bitrate, audio bandwidth 4 KHz

In-band FEC enable (Forward Error Correction)

Mirroring TX audio stream to all IP interfaces

Send test audio signal to Remote Node

Archiving sessions on SD card

Fig. 39 UserDevice settings for Mototrbo, protocol v1.

## 7.2 UserDevice GPIO DonorRadio general case

UserDevice GPIO mode is suitable for simple interaction (a-ka E&M stile) with various radios that may be used only on "one channel - one talk group" basis without CallerID detecting functionality and with or without channel switching.

For instance, it may be used for connection with XTL radios. Aliasing name for each channel may be specified on Radioserver side and that specified name will be shown on Dispatcher PC.

**Remote Node connection protocol version** version 2 ▾

**Interaction settings Gateway ↔ UserDevice**

UserDevice type and mode GPIO device (DonorRadio mode) ▾

UserDevice ID anylabel Any char except "\"  
Any label for displayed in the equipment map

**GPIO pins for interaction with UserDevice**

PTT signal output	EXT_OUT1 ▾	low ▾
CSQ signal input	EXT_IN1 ▾	low ▾
Donor Radio connecting detector	EXT_IN4 ▾	high ▾
Channel 1 signal output (LSB)	EXT_OUT2 ▾	low ▾
Channel 2 signal output	NONE ▾	low ▾
Channel 3 signal output	NONE ▾	low ▾
Channel 4 signal output	NONE ▾	low ▾
Channel 5 signal output (MSB)	NONE ▾	low ▾

Audio RTP from UserDevice to Remote Node streaming starting rules CSQ ▾ CSQ signal triggering

**IP voice settings**

Voice codec for IP streaming to Remote Node OPUS, Narrow Band ▾ sample rate 48000 Hz, 20 ms, 16 (30) kbps bitrate, audio bandwidth 4 KHz

In-band FEC enable (Forward Error Correction)

Mirroring TX audio stream to all IP interfaces

Send test audio signal to Remote Node

Archiving sessions on SD card

Timeout transmit (TOT), seconds 60

Fig. 40 UserDevice GPIO, protocol v2.

### 7.3 UserDevice GPIO MTM radio

Remote Node connection protocol version	<input type="text" value="version 2"/>	
Interaction settings Gateway ↔ UserDevice		
UserDevice type and mode	<input type="text" value="GPIO device (DonorRadio mode)"/>	
UserDevice ID <i>Any label for displayed in the equipment map</i>	<input type="text" value="anylabel"/>	Any char except "\
GPIO pins for interaction with UserDevice		
PTT signal output	<input type="text" value="EXT_OUT1"/>	<input type="text" value="low"/>
CSQ signal input	<input type="text" value="EXT_IN1"/>	<input type="text" value="low"/>
Donor Radio connecting detector	<input type="text" value="EXT_IN4"/>	<input type="text" value="high"/>
Channel 1 signal output (LSB)	<input type="text" value="EXT_OUT2"/>	<input type="text" value="low"/>
Channel 2 signal output	<input type="text" value="NONE"/>	<input type="text" value="low"/>
Channel 3 signal output	<input type="text" value="NONE"/>	<input type="text" value="low"/>
Channel 4 signal output	<input type="text" value="NONE"/>	<input type="text" value="low"/>
Channel 5 signal output (MSB)	<input type="text" value="NONE"/>	<input type="text" value="low"/>
Audio RTP from UserDevice to Remote Node streaming starting rules	<input type="text" value="VOX"/>	VOX detector triggering
VOX detector settings (Voice Operated eXchange)		
Audio activity duration for the detector triggering (ms, multiple 20)	<input type="text" value="40"/>	20-80
Triggering level (RMS, mv)	<input type="text" value="60"/>	1-5000
Audio inactivity duration for the detector releasing (ms, multiple 20)	<input type="text" value="500"/>	20-7000
Releasing level (RMS, mv)	<input type="text" value="20"/>	1-5000
<i>Depends on Rx level control adjusting some VOX detector voltage ranges may be not available</i>		
IP voice settings		
Voice codec for IP streaming to Remote Node	<input type="text" value="OPUS, Narrow Band"/>	sample rate 48000 Hz, 20 ms, 16 (30) kbps bitrate, audio bandwidth 4 KHz
In-band FEC enable (Forward Error Correction)	<input type="checkbox"/>	
Mirroring TX audio stream to all IP interfaces	<input type="checkbox"/>	
Send test audio signal to Remote Node	<input type="checkbox"/>	
Archiving sessions on SD card	<input type="checkbox"/>	
Timeout transmit (TOT), seconds	<input type="text" value="60"/>	

Fig. 41 UserDevice MTM radio (GPIO), protocol v2.

## 7.4 UserDevice GPIO SLR5500\XPR8300\XPR8400\XIRR8200

**Remote Node connection protocol version** version 2 ▾

**Interaction settings Gateway ↔ UserDevice**

UserDevice type and mode GPIO device (DonorRadio mode) ▾

UserDevice ID anylabel Any char except "\"  
Any label for displayed in the equipment map

**GPIO pins for interaction with UserDevice**

PTT signal output	EXT_OUT1 ▾	Active level (low - 0v, high - 5v) low ▾
CSQ signal input	EXT_IN1 ▾	low ▾
Donor Radio connecting detector	EXT_IN4 ▾	high ▾
Channel 1 signal output (LSB)	EXT_OUT2 ▾	low ▾
Channel 2 signal output	NONE ▾	low ▾
Channel 3 signal output	NONE ▾	low ▾
Channel 4 signal output	NONE ▾	low ▾
Channel 5 signal output (MSB)	NONE ▾	low ▾

Audio RTP from UserDevice to Remote Node streaming starting rules CSQ ▾ CSQ signal triggering

**IP voice settings**

Voice codec for IP streaming to Remote Node OPUS, Narrow Band ▾ sample rate 48000 Hz, 20 ms, 16 (30) kbps bitrate, audio bandwidth 4 KHz

In-band FEC enable (Forward Error Correction)

Mirroring TX audio stream to all IP interfaces

Send test audio signal to Remote Node

Archiving sessions on SD card

Timeout transmit (TOT), seconds 60

Fig. 42 UserDevice SLR5500/XPR8300/XPR8400/XIRR8200 (GPIO), protocol v2.

## 7.5 UserDevice GPIO Add. mode 1

UserDevice GPIO Add. mode 1 is for simple interaction with APX radios (a-ka E&M stile) and channel select feature supporting. All APX channels should be allocated in zone 1. CallerID&CalingID are not supported.

<b>Remote Node connection protocol version</b>	<input type="text" value="version 2"/>	
<b>Interaction settings Device ↔ UserDevice</b>		
UserDevice type and mode	<input type="text" value="GPIO device (Add. mode 1)"/>	
UserDevice ID <i>Any label for displayed in the equipment map</i>	<input type="text" value="anylabel"/>	Any char except "\"
<b>UserDevice command/control via GPIO pins of controller</b>		
PTT sends to UserDevice via	<input type="text" value="PUINPUT status"/>	
Audio RTP from UserDevice to Remote Node streaming starting rules	<input type="text" value="Speaker_On status"/>	
<b>IP voice settings</b>		
Voice codec for IP streaming to Remote Node	<input type="text" value="OPUS, Narrow Band"/>	sample rate 48000 Hz, 20 ms, 16 (30) kbps bitrate, audio bandwidth 4 KHz
In-band FEC enable (Forward Error Correction)	<input type="checkbox"/>	
Mirroring TX audio stream to all IP interfaces	<input type="checkbox"/>	
Send test audio signal to Remote Node	<input type="checkbox"/>	
Archiving sessions on SD card	<input type="checkbox"/>	
<b>ToS-byte for link with Remote Node</b>		
Class of service (0 - low, 7 - high priority, D0..D2)	<input type="text" value="0"/> 0-7	summary: 0x0
Low delay (D3)	<input type="checkbox"/>	
Throughput (D4)	<input type="checkbox"/>	
Reliability (D5)	<input type="checkbox"/>	
<input type="button" value="Save and apply settings"/>		

For the case when discrete lines are used for PTT and CSQ signal set [UserDevice command/control via GPIO pins of controller](#) in this way.

**UserDevice command/control via GPIO pins of controller**

PTT sends to UserDevice via

PTT signal triggering ▾

GPIO alias

Active level (low - 0v,  
high - 5v)

PTT signal output

EXT\_OUT1 ▾

low ▾

Audio RTP from UserDevice to Remote Node streaming starting rules

CSQ signal triggering ▾

GPIO alias

Active level (low - 0v,  
high - 5v)

CSQ signal input

EXT\_IN1 ▾

low ▾



## 8 Storage and transportation requirements

RG-2000 equipment must be stored at a temperature between +41°F and +104°F (+5°C and +40°C), relative humidity less than 80% at the temperature of +77°F (+25°C).

The storage site must be free of dust, corrosive vapors, and gases.

RG-2000 equipment can be shipped via any means of transport under the following conditions:

- The air temperature is between –22°F and +122°F (–30°C and +50°C).
- The relative humidity is less than 95 % at the temperature of +77° F(+25°C).
- The equipment is protected from the direct precipitation and dust.

If RG-2000 equipment is transported by air, it must be put in a pressurized compartment.

It is prohibited to turn over or throw the package with RG-2000 equipment during handling and carriage.

# 9 Manufacturer warranty

## 9.1 What this warranty covers and for how long

Elcomplus warrants the RG-2000 against defects in material and workmanship under normal use and service for 1 year from the date of the RG-2000 shipping by Elcomplus.

Elcomplus, at its option, will at no charge either repair RG-2000 (with new or reconditioned parts), replace it (with a new or reconditioned RG-2000), or refund the purchase price of the RG-2000 during the warranty period provided it is returned in accordance with the terms of this warranty. Replaced parts or boards are warranted for the balance of the original applicable warranty period. All replaced parts of the RG-2000 will be owned by Elcomplus.

Elcomplus extends this express limited warranty to the original end user purchaser only and is not assignable or transferable to any other party. This is the complete warranty for the RG-2000 manufactured by Elcomplus. Elcomplus assumes no obligations or liability for additions or modifications to this warranty unless made in writing and signed by an officer of Elcomplus. Unless made in a separate agreement between Elcomplus and the original end user purchaser, Elcomplus does not warrant the installation, maintenance or service of the RG-2000.

Elcomplus cannot be responsible in any way for any ancillary equipment not furnished by Elcomplus, which is attached to or used in connection with the RG-2000, or for operation of the RG-2000 with any ancillary equipment. This equipment is expressly excluded from this warranty. Due to the fact that each system where the RG-2000 is used, is unique, Elcomplus disclaims liability for range, coverage, or operation of the system as a whole under this warranty.

## 9.2 General provisions

This warranty sets forth the full extent of Elcomplus' responsibilities regarding the RG-2000. Repair, replacement or refund of the purchase price, at Elcomplus' option, is the exclusive remedy. THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER EXPRESS WARRANTIES. IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO THE DURATION OF THIS LIMITED WARRANTY. IN NO EVENT SHALL ELCOMPLUS BE LIABLE FOR DAMAGES IN EXCESS OF THE PURCHASE PRICE OF THE RG-2000, FOR ANY LOSS OF USE, LOSS OF TIME, INCONVENIENCE, COMMERCIAL LOSS, LOST PROFITS OR SAVINGS OR OTHER INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE RG-2000, TO THE FULL EXTENT THIS MAY BE DISCLAIMED BY LAW.

## 9.3 How to get warranty services

You must provide proof of purchase (bearing the date of purchase and the RG-2000 serial number) in order to receive warranty service and, also, deliver or send the RG-2000, transportation and insurance prepaid, to an authorized warranty service location. Elcomplus will provide warranty service through authorized service locations. If you first contact the company, which sold you the RG-2000, it can facilitate your obtaining warranty service.

You can contact Elcomplus Inc office by phone at the following phone numbers:

North and South America: +1 786 362 5525

## 9.4 What this warranty does not cover

- Defects or damage caused by using the RG-2000 in other than its normal and customary manner.
- Defects or damage caused by misuse, accident, water, neglect, etc.
- Defects or damage caused by improper testing, operation, maintenance, installation, alteration, modification, or adjustment.
- RG-2000 subjected to unauthorized modification, disassemble or repair (including, without limitation, the addition to the RG-2000 of non-Elcomplus supplied equipment) which adversely affect performance of the RG-2000 or interfere with Elcomplus normal warranty inspection and testing of the RG-2000 to verify any warranty claim.

- RG-2000, which has had the serial number removed or made illegible.
- Freight costs to the repair depot.
- RG-2000 which, due to illegal or unauthorized alteration of the software/firmware in the RG-2000, does not function in accordance with Elcomplus published specifications.
- Scratches or other cosmetic damage to RG-2000 surfaces that don't affect its operation.

# 10 Appendix. Pin numberings and interface cable schematics

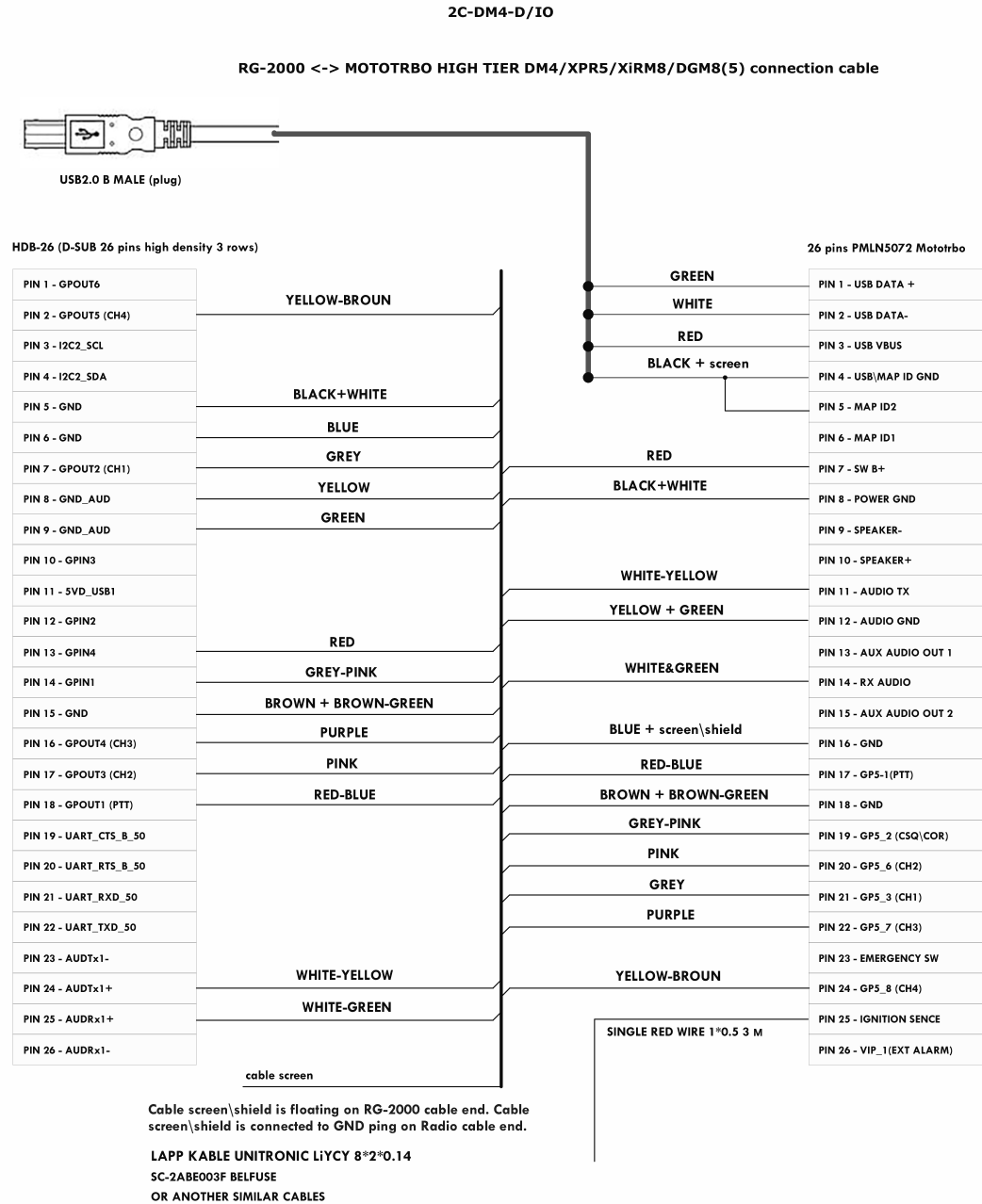


Fig. 43 RG-2000 MOTOTRBO HIGH TIER DM4/XPR5/XiRM8/DGM8(5) connection cable



2C-MTM5-I/O

RG-2000 <-> Motorola MTM5200/5400/5500 connection cable

HDB-26 (D-SUB 26 pins high density 3 rows)

26 pins PMLN5072 Motorola



Cable screen\shield is floating on RG-2000 cable end.  
Cable screen\shield is connected to GND ping on Radio cable end.

LAPP KABLE UNITRONIC LIYCY 8\*2\*0.14  
OR ANOTHER SIMILAR CABLES

YELLOW-BROUN  
PURPLE  
GREY  
GREY-PINK  
PINK  
ARE NOT USED!

SINGLE RED WIRE 1\*0.5 3 M

Fig. 45 RG-2000 Motorola MTM5200/5400/5500 connection cable

2C-Generic

RG-2000 <-> "Flying leads" connection cable

HDB-26 (D-SUB 26 pins high density 3 rows)

PIN 1 - GPOUT6	YELLOW-BROWN
PIN 2 - GPOUT5 (CH4)	
PIN 3 - I2C2_SCL	
PIN 4 - I2C2_SDA	
PIN 5 - GND	BLACK+WHITE
PIN 6 - GND	BLUE
PIN 7 - GPOUT2 (CH1)	GREY
PIN 8 - GND_AUD	YELLOW
PIN 9 - GND_AUD	GREEN
PIN 10 - GPIN3	RED
PIN 11 - 5VD_USB1	
PIN 12 - GPIN2	
PIN 13 - GPIN4	
PIN 14 - GPIN1	GREY-PINK
PIN 15 - GND	BROWN + BROWN-GREEN
PIN 16 - GPOUT4 (CH3)	PURPLE
PIN 17 - GPOUT3 (CH2)	PINK
PIN 18 - GPOUT1 (PTT)	RED-BLUE
PIN 19 - UART_CTS_B_50	WHITE-YELLOW
PIN 20 - UART_RTS_B_50	
PIN 21 - UART_RXD_50	
PIN 22 - UART_TXD_50	
PIN 23 - AUDTx1-	WHITE-GREEN
PIN 24 - AUDTx1+	
PIN 25 - AUDRx1+	
PIN 26 - AUDRx1-	
cable screen	

Cable screen\shield is floating on RG-2000 cable end.

Cable screen\shield should be connected to GND ping on Radio cable  
ALL GND wires should be connected to GND ping on Radio cable end.

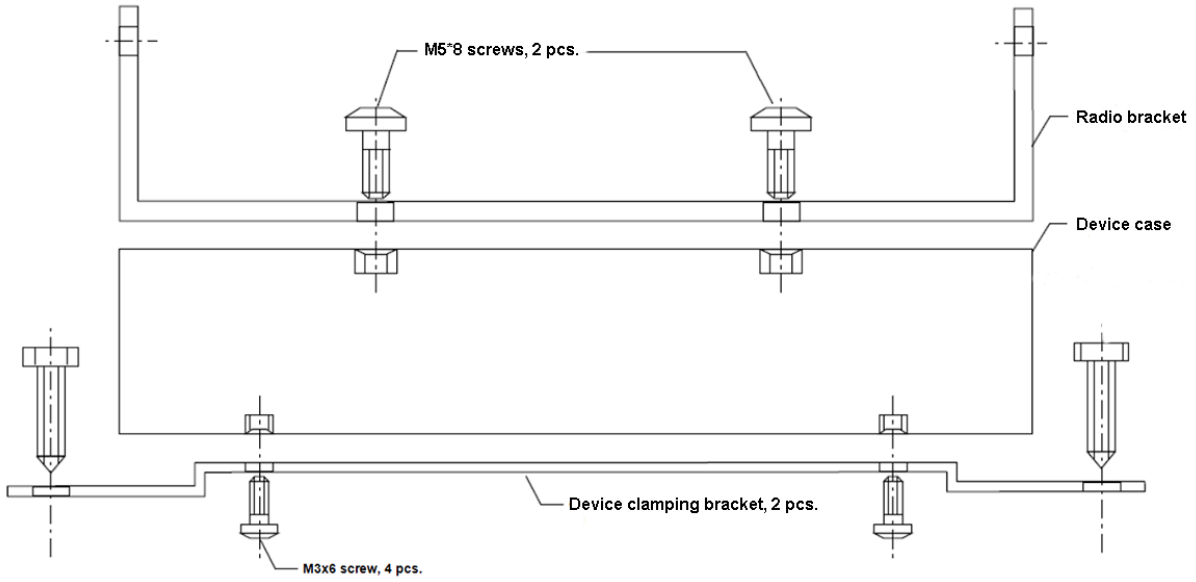
LAPP KABLE UNITRONIC LiYCY 8\*2\*0.14

OR ANOTHER SIMILAR CABLES

Fig. 46 RG-2000 "Flying leads" connection cable

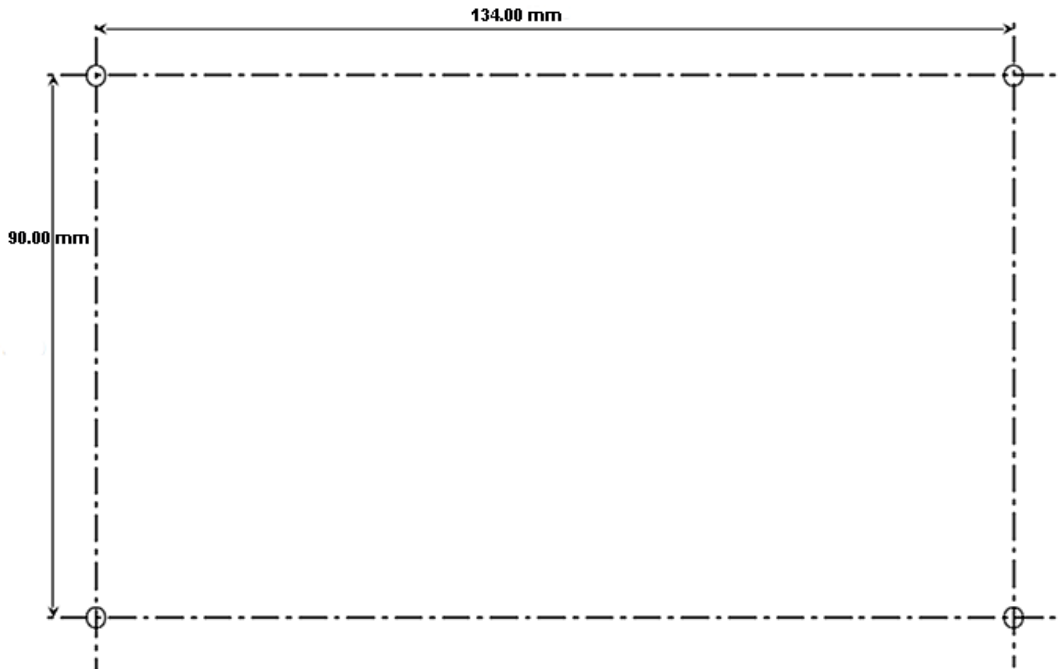
# 11 Appendix. Mounting elements

The picture below shows RG-2000 mounting elements and the radio bracket.



**Fig. 47 RG-2000 Mounting elements and a radio bracket**

The picture below shows the mounting points of RG-2000 brackets collocations.



**Fig. 48 RG-2000 Mounting points of the brackets**



# Contact Us

If you have a request or want to learn more about our solutions, please contact our sales managers via email [sales@smartptt.com](mailto:sales@smartptt.com)

Customer support is provided by SmartPTT Technical Support Center. You can contact a support engineer via email [support@smartptt.com](mailto:support@smartptt.com) or by submitting a request on the official support website [support.smartptt.com](http://support.smartptt.com)

You can find the full SmartPTT Terms of Technical Support on the official website <https://smartptt.com/smartptt-terms-of-technical-support/>

SmartPTT Technical Support Center does not consult on deployment and maintenance of Motorola Solutions products except on settings related to SmartPTT connection and data communication.

For technical support on Motorola Solutions products, please contact an authorized Motorola Solutions representative in your region.

To share your feedback on the product, documentation, and services, email us at [feedback@smartptt.com](mailto:feedback@smartptt.com)



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