ConSEL PLUS– Configuration of ConSEL PLUS hardware and software for Capacity Plus Single Site

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1. Basic assumptions for Capacity Plus (Capacity Plus Single Site) system design.

- The repeaters operate in **digital mode** (digital channel) in the **DMR** standard **with a purchased licence (for Capacity Plus Single Site operation –HKVN4013A)**. Setting up the repeaters in analogue or mixed mode does not allow for network connectivity.
- The repeaters are connected to each other via an IP network. The IP network must have stable parameters, i.e. the resulting transmission delays must not exceed **90 ms** and must have a stable character. The manufacturer recommends that network fluctuations be less than 60 ms.
- One of the repeaters is defined as **Master repeater,** the others as **Peer** repeaters**.** The **Master repeater** requires **a static address in the IP network**. Repeaters defined as Peer can have an IP address assigned from a DHCP server.

2. Tasks of devices / applications in the system.

2.1. Devices in Capacity Plus Single Site system.

- **Master:** a repeater responsible for registering new repeaters/applications and notifying other repeaters/applications about changes in the network. After registering Peer devices or applications, the Master repeater distributes information about current participants to all network users. The Master repeater does not verify every transmission from Peers. Disconnecting the Master repeater from the network does not break up the established IPSC system.
  Note: Master repeater requires a STATIC IP ADDRESS.
- **Peer:** a repeater that retransmits audio and signals received from another site.

2.2. Applications running on Capacity Plus Single Site system

- **RDAC** (Repeater Diagnostics and Control):An application for system administration, allowing for monitoring (control) of operation of repeaters in the MOTOTRBO system. The RDAC software is seen as an additional repeater in the IP Site Connect system network.
- **MNIS (**MOTOTRBO Network Interface Service) is a Windows service application handling data between computer applications and MOTOTRBO radios. It is used on systems where Control Station cannot be used or is not needed. For IP Site Connect operation, repeaters used for data traffic require a **NAI Data License**.
- **DDMS** - Device Discovery and Mobility Service (DDMS) is a Windows application running as a service (i.e. launches automatically on Windows startup and runs in the background).It processes presence and mobility information from radios in the MOTOTRBO radio system. If DDMS is implemented with MNIS, both radio presence (radio is there) and mobility notification (radio is present and where) are supported. The channel and site where the radio transmits the ARS message shall be recorded. MNIS subscribes to DDMS to receive mobility information and uses this information to route data to the radio, wherever it is in the system.
- **ConSEL PLUS–** dispatcher application from **Aksel Sp. z o.o**.

3. Capacity Plus Single Site system design

For repeaters operating in digital DMR mode, there are two time slots to use, based on which logical communication channels can be created. After uploading the Capacity Plus Single Site system licence (HKVN4013A) to the repeater, the repeater can operate with dynamic allocation of logical talk channels (time slots). When operating several repeaters in one location, a system can be created consisting of (2x repeater) logical talk or data channels.

In a Capacity Plus Single Site system it is possible to connect up to 15 devices in one location / site, of which one is of **Master** type and the rest are of **Peer** type.

These 15 connected devices include:
- Disabled repeaters
- Enabled repeaters operating in analogue mode
- Enabled repeaters operating in digital mode
- Maximum of 5 RDAC application connections to the system
- Third-party applications (the application is seen by the system as Peer)

Repeaters in a Capacity Plus Single Site system operate with a virtual dynamic rest channel. A rest channel is a virtual "token" toggled between available radio resources. After setting up a call for a specific conversation, the virtual "token" informs other radios about the radio channel on which the next radio call will be set up.

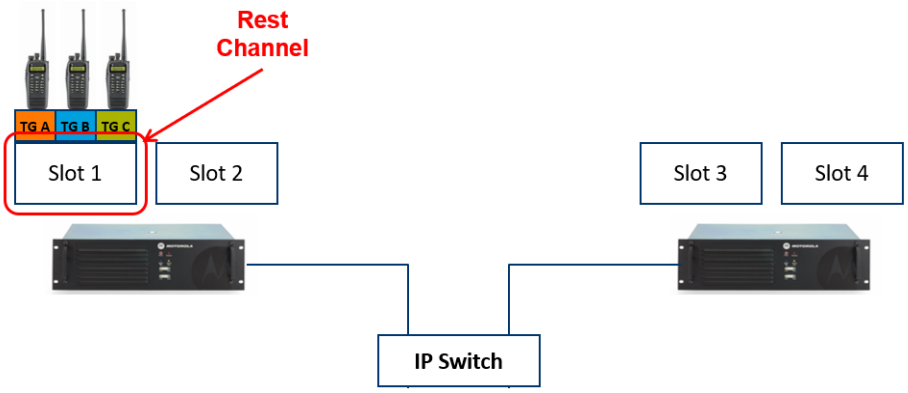

Figure 1 Capacity Plus Single Site design with 2 repeaters = 4 logical channels.

4. Repeater configuration for Capacity Plus Single Site operation.

CPS and RM Configuration Client are Motorola's software applications for configuration of MotoTRBO devices.

Figure 2 CPS – repeater configuration software.

CPS is a software that allows you to configure repeaters and upload configurations via USB port.
RM Configuration Client is a software that allows you to configure repeaters and upload configurations via USB and LAN.

Note: The first programming of the repeater must be carried out via USB port.

After reading the device, an SLR5000 repeater can be configured in both programs.
When choosing to edit the configuration for a selected repeater in RM Configuration Client, a window opens identical to that for CPS configuration.

4.1. Reading the radio in CPS.

Figure 3 CPS – radio reading.

4.2. Reading the radio in RM.

The device you want to read must be added to the database with complete information.

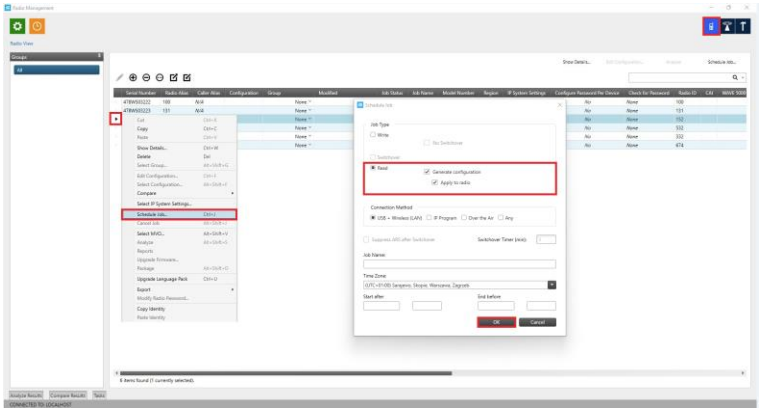

Figure 4 RM – radio reading.

Once a configuration has been created on the server, the selected configuration can be edited.

4.3. Editing the configuration.

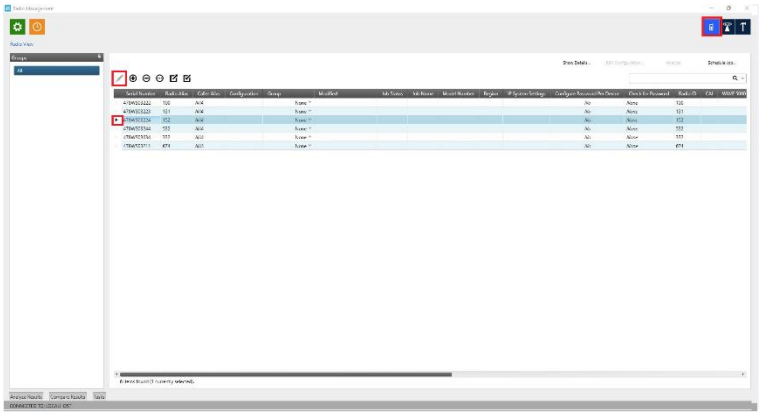

Figure 5 RM – editing configuration for selected device – select from icons

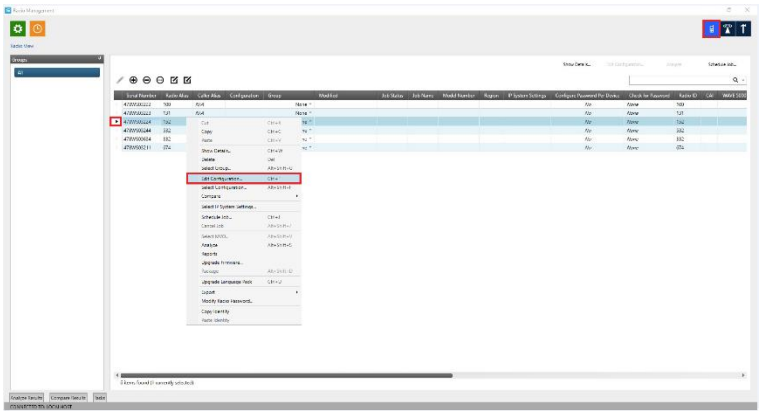

Figure 6 RM – editing configuration for selected device – right-click selection.

When choosing to edit the configuration for a selected device in RM Configuration Client, a window opens identical to that for configuration in CPS.

5. Repeater Configuration for Capacity Plus Single Site operation

After reading the device in CPS or editing the configuration in RM, you need to verify that the repeater is enabled for Capacity Plus Single Site operation.

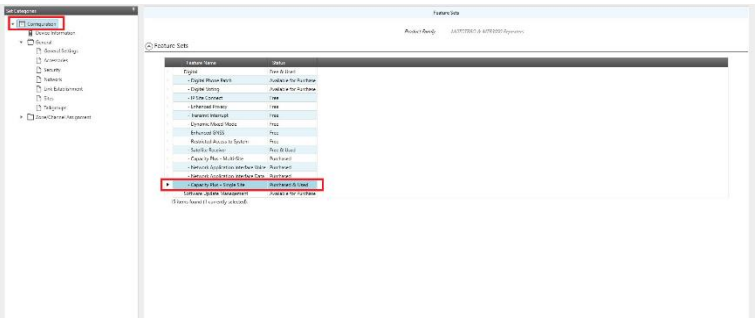

Figure 7 Repeater settings for Capacity Plus Single Site – licence verification.

Next you can see the tabs that need to be configured for operation in Capacity Plus Single Site.

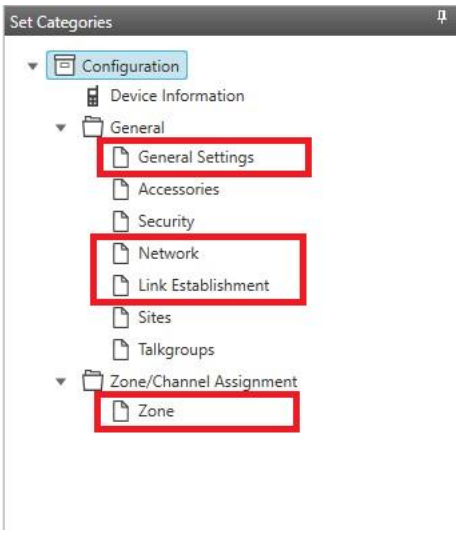

Figure 8 Repeater settings for Capacity Plus Single Site – necessary changes.

5.1. General settings.

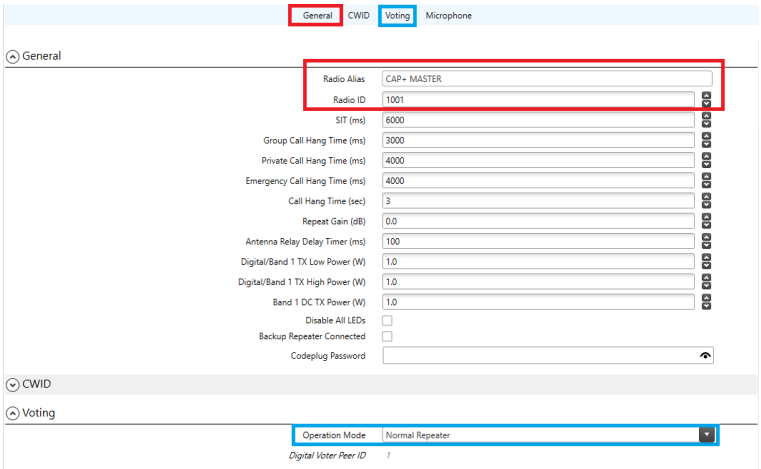

Figure 9 Repeater settings for Capacity Plus Single Site – general settings.

Enter the following:

- Repeater/radio name: any description
- Repeater/Radio ID: to be placed outside the subscriber contact list
- Operating mode: working as a normal repeater.

5.2. Network settings.

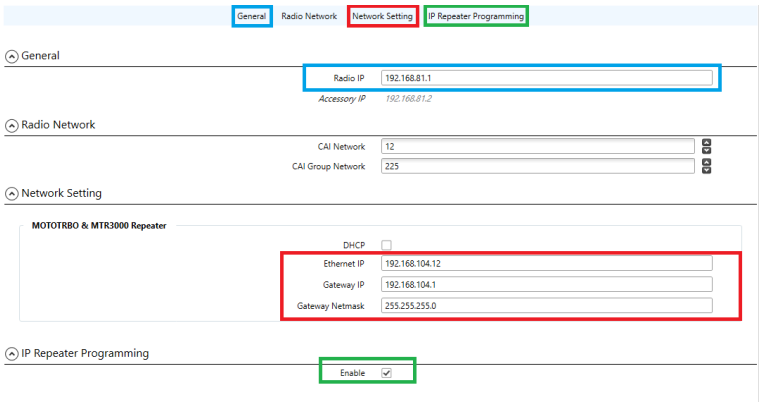

Figure 10 Repeater settings for Capacity Plus Single Site – network settings.

Radio's IP address as seen from the PC at the USB port.
It is necessary to define IP addresses for repeaters from the network side.
Master repeaters must have static IP addresses.
Peer repeaters may have DHCP settings.
If repeaters are to be reprogrammed via the IP network, it is necessary to enable the IP Repeater Programming option.

5.3. Connection setup

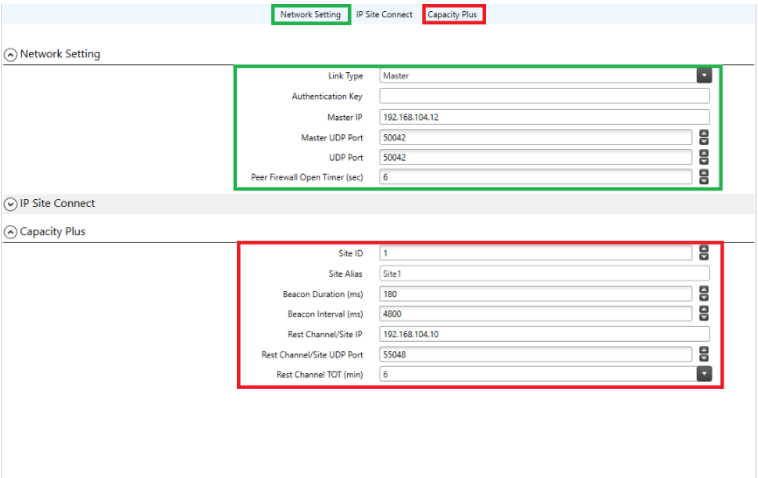

Figure 11 Settings for Capacity Plus Single Site – connection setup.

Define the repeater's function in the system: **Master.**
In each repeater to operate in the Capacity Plus Single Site system, you can enter the authentication key for logging on to the Master device (the key provides a type of device authentication).
By default, Peer devices communicate with the Master via port **50000**. In the IPSC system, the Master's UDP port number is port **50000** for connection setup – notification to the Master and registration.
The operating port of the Master repeater can have any number; when changing it, remember to enter the port number correctly in Peer devices.
In the Capacity Plus tab, define the rest channel ("virtual token") parameters as IP / port.
Enter the same rest channel parameters for all repeaters in the Capacity Plus Single Site system.

5.4. Channel zone assignment.

Under Zone / Channel Assignment tab, add a channel working in Capacity Plus Single Site system and edit it.

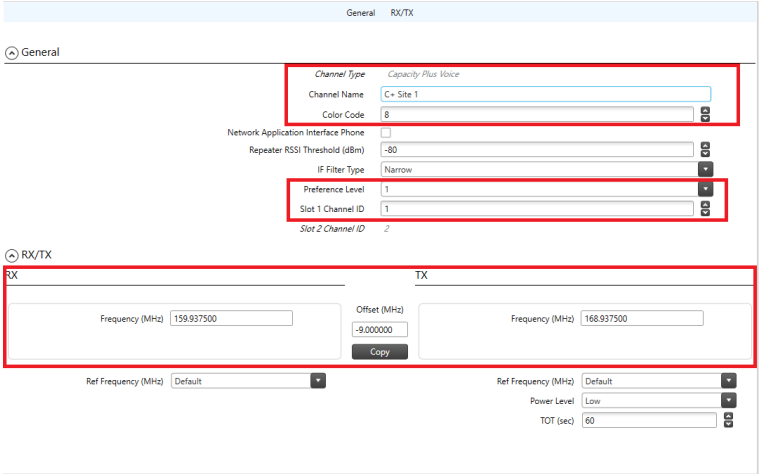

Figure 12 Repeater settings for Capacity Plus Single Site – zone – representation of channels in a table.

Once a zone is selected, you can add (+) a channel: Audio Capacity Plus
Specify the Preference Level (1 is the highest preference level) to determine channel priority.
Specify the channel ID of the slot reflecting the number of repeaters in the sites, with subsequent odd values up to: 2*(number of repeaters) -1.
For the radio channel, specify the RX/TX operating frequencies and the colour code.

6. Configuration of subscriber radios for Capacity Plus Single Site

In CPS, in the General/General settings tab, enter the subscriber radio ID according to the acquired contact list.

In CPS under the General/Network tab, set the network parameters and communication ports for the service.

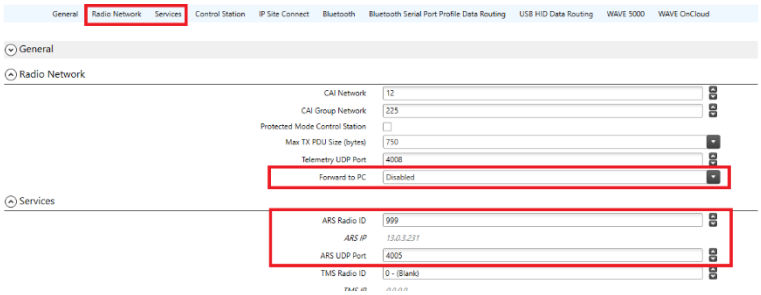

Figure 13 Subscriber radio settings (Capacity Plus Single Site) – network settings.

In the Radio Networks tab, disable computer data transfer.

In the ARS ID Services tab, enter the ID of the managed base radio.

For the subscriber radio in the CPS, similarly to the managed base radio, enter the parameters for: contacts, receive lists, Capacity Plus System Lists according to the template presented earlier.

In the Capacity Plus Personality tab, modify the setting for ARS sending.

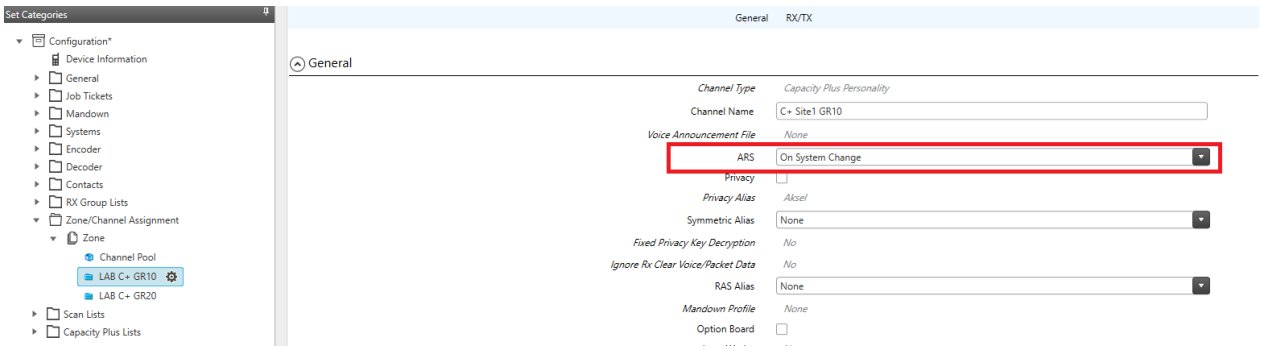

Figure 14 Subscriber radio settings (Capacity Plus Single Site) – network settings.

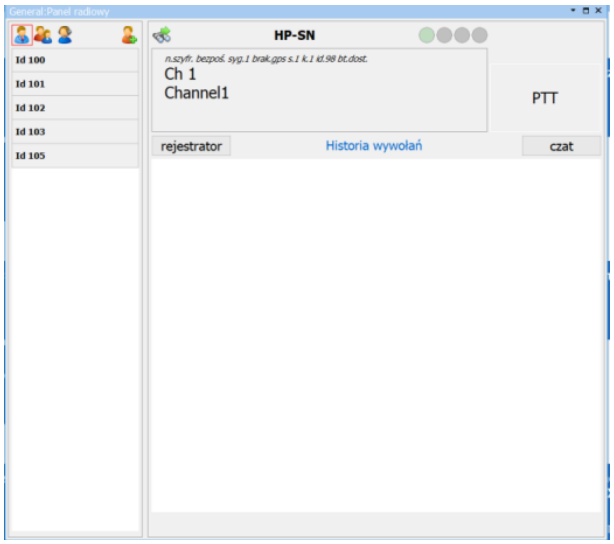

Figure 15 Radio console view for base radio (Capacity Plus Single Site).

7. SCK Client configuration – working with NAI protocols.

The use of NAI protocols in ConSEL PLUS software requires the purchase of a licence in the form of a HASP hardware key.

It is necessary to activate the licence in the repeaters:
NAI Voice HKVN4211A
NAI Data HKVN4212A

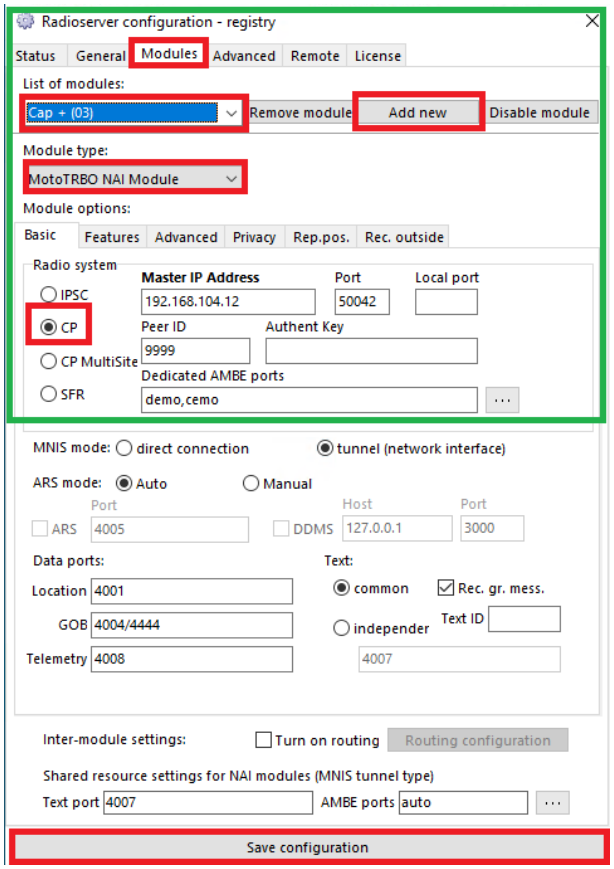

Figure 16 ConSEL PLUS settings – radio server for NAI (Capacity Plus Single Site).

In the Modules tab, add a new module under a new name (Capacity Plus) or use the default basic module.
Once the module has been added, set the module type as MotoTRBO NAI.
Specify in which radio system the module will work – select CP.
For the selected system, enter:

- address of the Master repeater working in Capacity Plus;
- port on which the Master communicates
- ID with which to operate the SCK Client (application ID similar to connecting a Peer drive with a specific ID)
- authenticate the key

The ConSEL PLUS SCK Client software is based on AMBE software audio codecs.

After entering these parameters, Save the settings and restart the service.
After restarting the service, the Status tab shows successful connection of the service to the Master repeater.

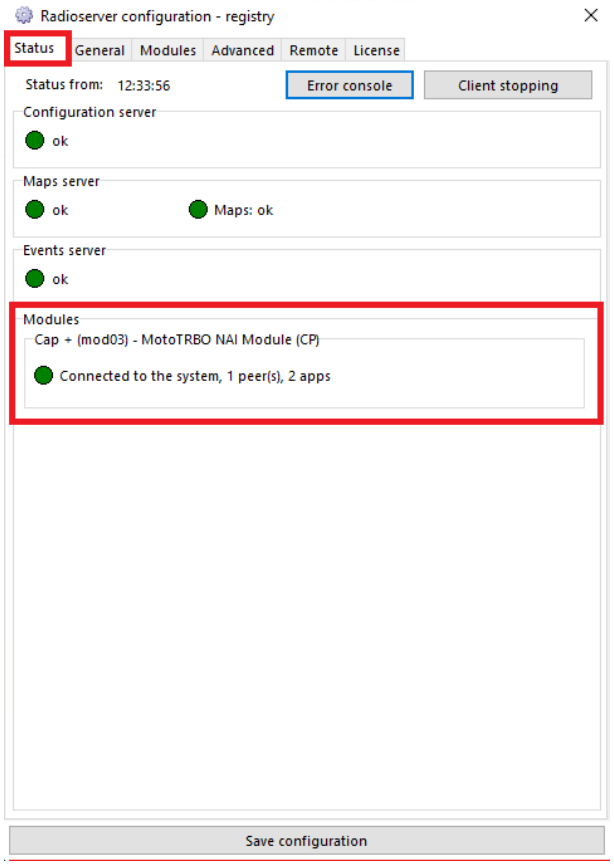

Figure 17 ConSEL PLUS Status – radio server for NAI (Capacity Plus Single Site).

8. ConSEL PLUS console configuration – operation with NAI protocols.

When using NAI protocols and direct connection of the radio server to the repeater. Two software defined (virtual) radios can be connected to a single repeater in the ConSEL PLUSsystem client.
In the ConSEL PLUSsystem client, select:
Side menu/Administration/Radio Consoles Configuration
Select Add Radio Module to create the first virtual radio.

Select the module to work as a console.
Enter:

- Radio server address – network address of the computer on which the radio server is running (local address 127.0.0.1 in case radio server and console are installed on the same computer).
- SckClient module number – use the α icon to read available radio server modules and select a module for the configured radio network from the list of radio modules running on the radio server – the basic module is selected by default.
- Playback device – from the list of devices available in the system, select the device which will play back the voice communications on the console.
- Recording device – from the list of devices available in the system, select the device to act as a microphone.
- Module Type: NAI CP(M)

Select Add Radio Module to create the second virtual radio and enter the same data as for the first virtual radio.

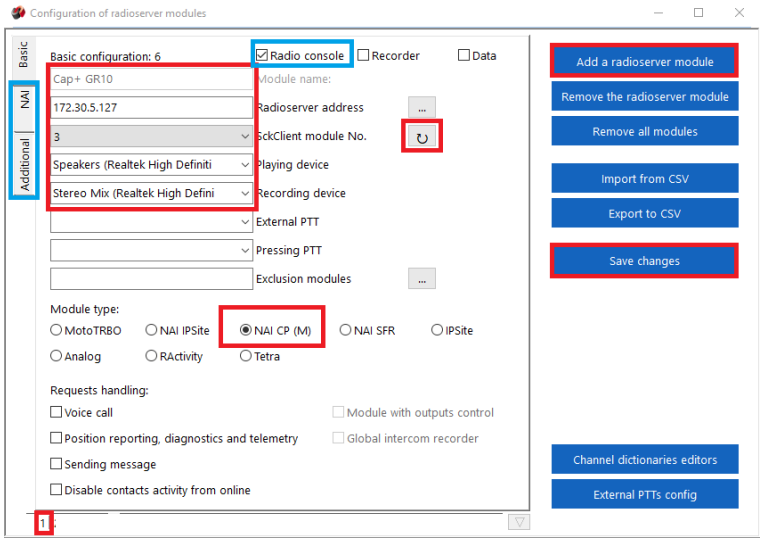

Figure 18 ConSEL PLUS radio console settings for NAI (Capacity Plus Single Site).

For the virtual radio created in the NAI tabs, you need to enter:

- ID of virtual base radio
- Default receive and transmit talkgroups

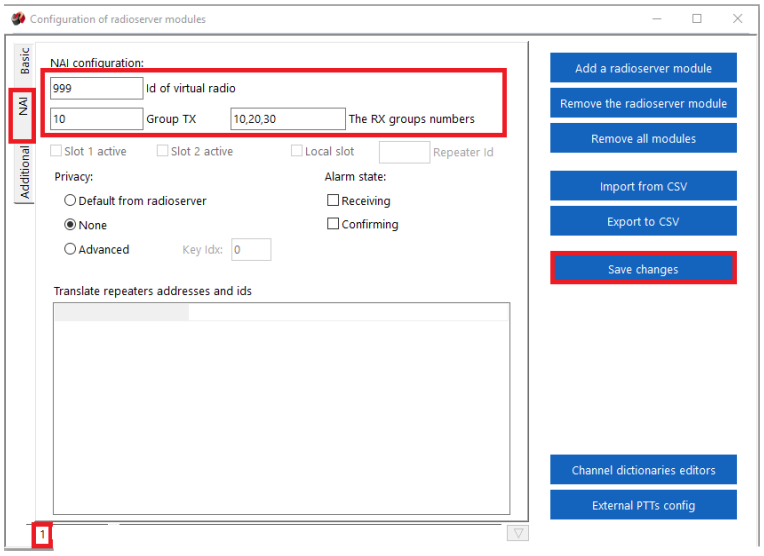

Figure 19 ConSEL PLUS radio console settings for NAI (Capacity Plus Single Site).

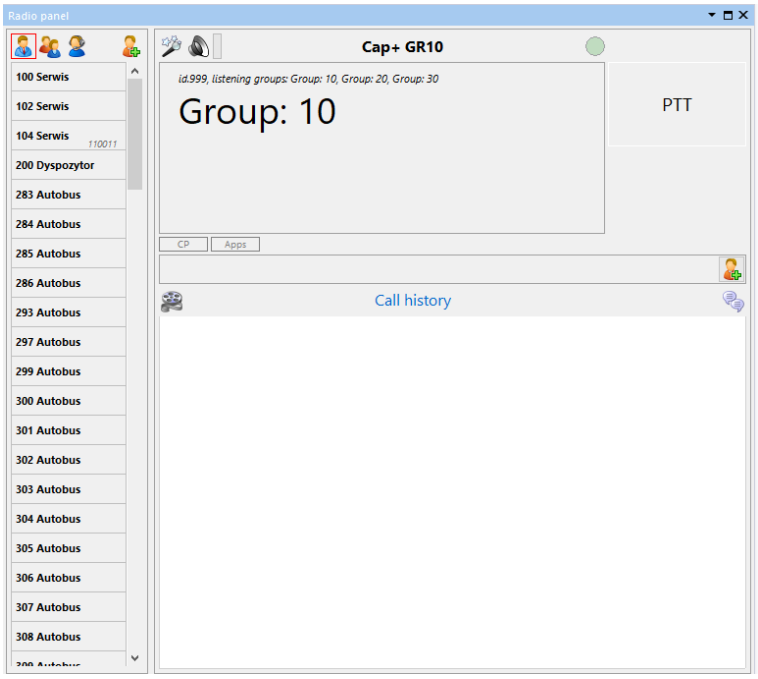

Figure 20 ConSEL PLUS radio console view for NAI (Capacity Plus Single Site).