

This is an example of how the new operator is listed in the **Security** tab:

CORNING EVERON™ 6000 SOLUTIONS

ADMIN

Security

Session Timeout Settings

**Never**  
Session will never timeout

DEFAULT\_OPERATOR

| User Name | Access Level | Actions     |
|-----------|--------------|-------------|
| admin     | Group Admin  | Edit Delete |

ATT

| User Name | Access Level | Actions     |
|-----------|--------------|-------------|
| admin     | Group Admin  | Edit Delete |

SPRINT

| User Name | Access Level | Actions     |
|-----------|--------------|-------------|
| admin     | Group Admin  | Edit Delete |

**T-MOBILE**

| User Name | Access Level | Actions     |
|-----------|--------------|-------------|
| admin     | Group Admin  | Edit Delete |

VERIZON

| User Name | Access Level | Actions     |
|-----------|--------------|-------------|
| admin     | Group Admin  | Edit Delete |

POWER SHARING

Note: Clicking on the **POWER SHARING** button, displays a pop up window with a link to the power sharing screen.

**Redirect To Power Sharing**

Please go to power sharing screen and verify all operators/bands are configured.

[Link to Power Sharing Screen](#)

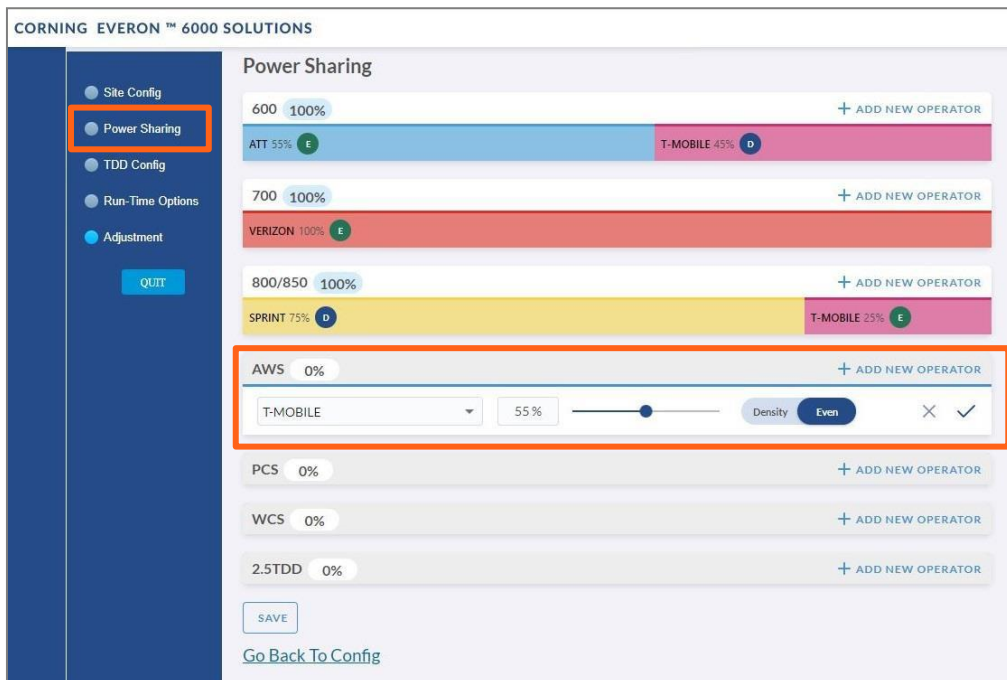
**CANCEL** **GO**

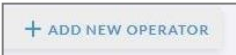
### 5.3 Set power sharing for the operators

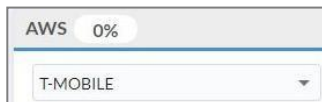
The **Power Sharing** tab shows all supported frequency bands and the carriers sharing each band. The carriers are sharing the power associated with the frequency band. It is required to enter the power sharing parameters as follows.

➤ **To set power sharing for the defined operators: For each band perform the following:**

1. Verify you have accessed the system as an admin user.
2. In the main menu options, click on . The configuration screen appears
3. In the displayed screen, select the **Power Sharing** radio button



4. Select the desired band (in the above example: AWS is selected)
5. Click on **add new operator** 
6. Select the operator from the drop-down options (in the above example – T-mobile is selected)



*Note: if an operator is not selected – the data cannot be entered*

7. Select the parameters to configure the power sharing for that operator



8. Click on the V sign  in the row of the updated band.
9. Click on the **SAVE** button  at the bottom of the screen.

## 5.4 Set channels

This section explains how to set the system RF channels and submit the CPRI map.

When configuring a new system, the user is required to create a new map and then add channels to it, Where the map determines the configuration of all the system RF channels.

*Note: For more information on maps and channels refer to section 9.5.*

### ➤ To create a new map:

1. Verify that you have accessed the system as an admin user.



2. In the main menu bar, click on . The channels screen appears:

| Phase | Result  | Source Id | Error Description |
|-------|---------|-----------|-------------------|
| HCM   | Success | aaaa      | sdksksdjsdjsd     |
| DCM   | Success | bbbb      | sdksksdjsdjsd     |
| DRU   | Failed  | cccc      | sdksksdjsdjsd     |
|       |         | aaaa      | sdksksdjsdjsd     |
|       |         | bbbb      | sdksksdjsdjsd     |
|       |         | cccc      | sdksksdjsdjsd     |

| CELL ID   | DL CF (MHz) | UL CF (MHz) | UL BW (MHz) | DL BW (MHz) | Operator | SCs (KHz) | Technology | TOD | Power Reduction (dB) | RIM Number | RIM Type | MIMO | Channel Mute |       |
|-----------|-------------|-------------|-------------|-------------|----------|-----------|------------|-----|----------------------|------------|----------|------|--------------|-------|
| Channel 1 | Lobby       | 2500        | 2500        | 5           | 5        | test      | 15         | 4G  | YES                  | 0          | 1        | TDD  | 1T1R         | False |
| Channel 2 | sss         | 2600        | 2600        | 40          | 40       | test      | 60         | 5G  | YES                  | 0          | 2        | TDD  | 1T1R         | False |

3. Click the button.
4. Add all required channels:
  - Click on the **New Channel** button
  - Update the relevant information (for details, see section 9.5.3).
5. Click on the **Submit** button, to validate the map.
6. If there are no errors, the map is saved as the valid map (for more information see section 9.5).

## 5.5 TDD Config

The **TDD Config** tab allows the user to configure TDD related parameters per stack.

*Note: the system provides default values. If your system does not include TDD channels, you may skip this section.*

**TDD Configuration**

**4G Table**

| Sub Frame | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-----------|---|---|---|---|---|---|---|---|---|----|
|           | D | S | U | D | D | D | S | U | D | D  |

**5G Table**

| Slot | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------|---|---|---|---|---|---|---|---|---|----|
|      | D | S | U | D | D | D | S | U | D | D  |

**TDD 2.5 Config Form**

Allocation Mode: 2

CP Type: Normal

Frame Format: 7

Sub Carrier Spacing [5G]: 15

**SAVE**

### ➤ To configure the TDD parameters:

- For each of the above screen's fields (allocation mode, CP type, Frame format), click the arrow near the field to show the list of optional values:

2

Normal

7

Optional Values:

- Allocation Mode:** 0-6
- CP Type:** Normal, Extended
- Frame Format:** 0-8

*Note: Sub Carrier Spacing (SCS) is read only in the screen. It can be configured in the **Channels** screen (refer to 9.5.3).*

- Select the relevant values

**SAVE**

- Click SAVE

*Note: the 5G/4G tables are updated by the system according to the parameters filled-in by the user:*

| 4G Table  |   |   |   |   |   |   |   |   |   |    |
|-----------|---|---|---|---|---|---|---|---|---|----|
| Sub Frame | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|           | D | S | U | D | D | D | S | U | D | D  |
| 5G Table  |   |   |   |   |   |   |   |   |   |    |
| Slot      | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|           | D | S | U | D | D | D | S | U | D | D  |

## 5.6 Adjustment

The **Adjustment** tab allows the user to start the adjustment process. This process performs system calibration. It is done automatically, and the user only needs to verify that all steps were successfully run.

*Note: if any of the steps fail, verify that the hardware (including cables) is connected properly and re-run the process. If the problem persists, contact corning support help desk.*

During adjustment the status and relevant information are updated for each process.

### ➤ To perform adjustment:

1. Verify you have accessed the system as an admin user.



2. In the main menu options, click on . The configuration screen appears
3. Select the **adjustment** radio button
4. Click on **Start Adjustment**.

 The screenshot shows a web interface for system adjustment. On the left is a dark blue sidebar with a list of menu items: Site Config, Power Sharing, TDD Config, Run-Time Options, and Adjustment. The 'Adjustment' item is selected and highlighted with an orange rectangle. Below the menu is a 'QUIT' button. The main content area has a header 'Adjustment' with 'Last Run: 03/01/21 11:13:06'. Below this is a table with columns 'Process', 'Status', and 'Info'. The table lists several steps, all with a 'Success' status. At the bottom of the table is a 'START ADJUSTMENT' button, also highlighted with an orange rectangle. Below the button, it says 'One Adjustment Result Success'.
 

| Process          | Status  | Info |
|------------------|---------|------|
| Initialization   | Success |      |
| IHU Balancing    | Success |      |
| RIM DL Balancing | Success |      |
| HEU Balancing    | Success |      |
| RIM UL Balancing | Success |      |
| Finalization     | Success |      |

BIT

**START ADJUSTMENT**

One Adjustment Result **Success**

## 5.7 Review the auto-set Site Config

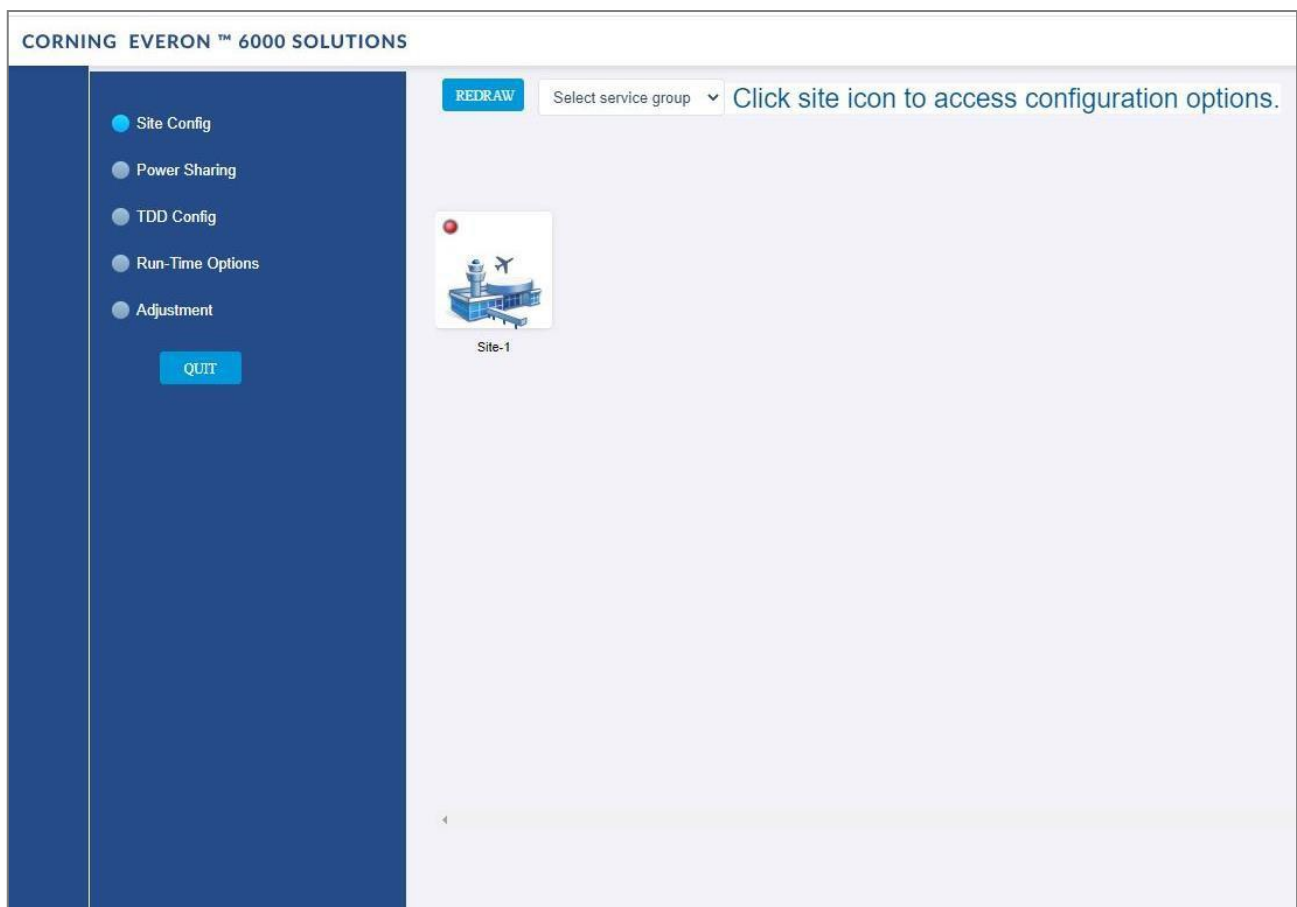
The site configuration is automatically performed by the system: When the hardware is connected, the system identifies the modules and indicates the connected sites on the following screen.

➤ **To view the site config settings**

1. Verify you have accessed the system as an admin user.

2. In the main menu options, click on . The configuration screen appears

3. Choose the **Site Config** radio button. the following screen appears:



*Note: Each relevant site is presented by an image. By clicking on the site image, the configuration options for the specific site appears. The configuration options are described below*

4. Select the required option to be displayed:
  - a. Operator, see 5.7.1
  - b. RF path, see 5.7.2
  - c. Max input, see 5.7.3

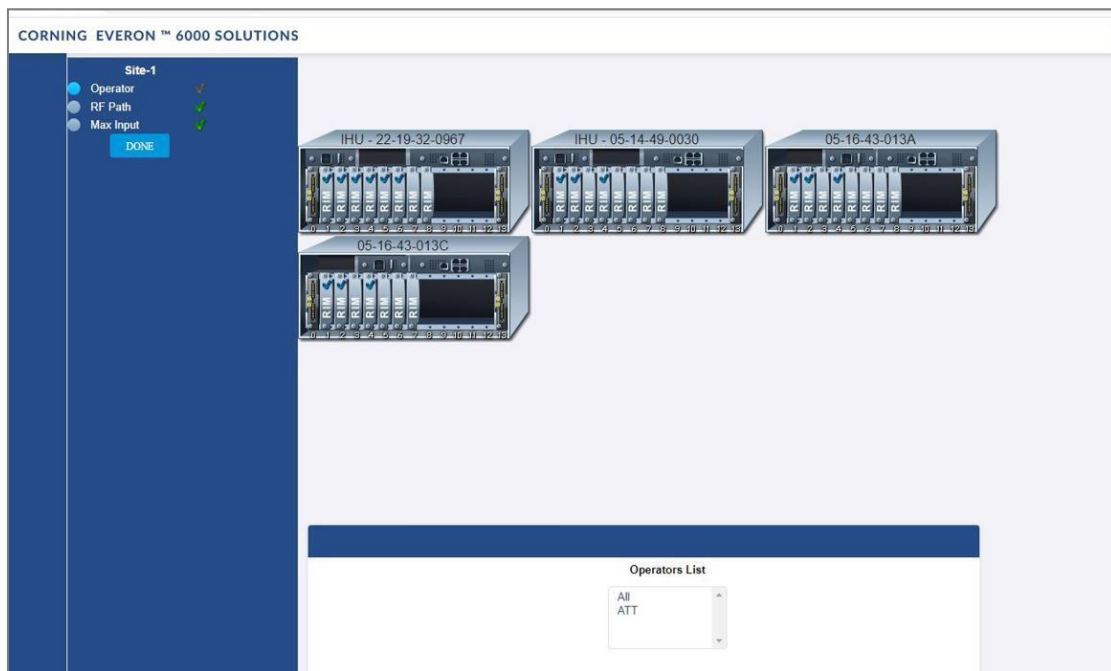
### 5.7.1 Operator (read only)

The **Operator** tab shows all system chassis with the RIMs inside each chassis. It displays a full list of the operators at the bottom of the screen (for large lists the user may scroll-down). The user can click on a RIM to have the carrier name displayed.

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*Note: This view is read only, where changes to RIM carrier assignments can only be done via the **Channels** tab in the main menu.*

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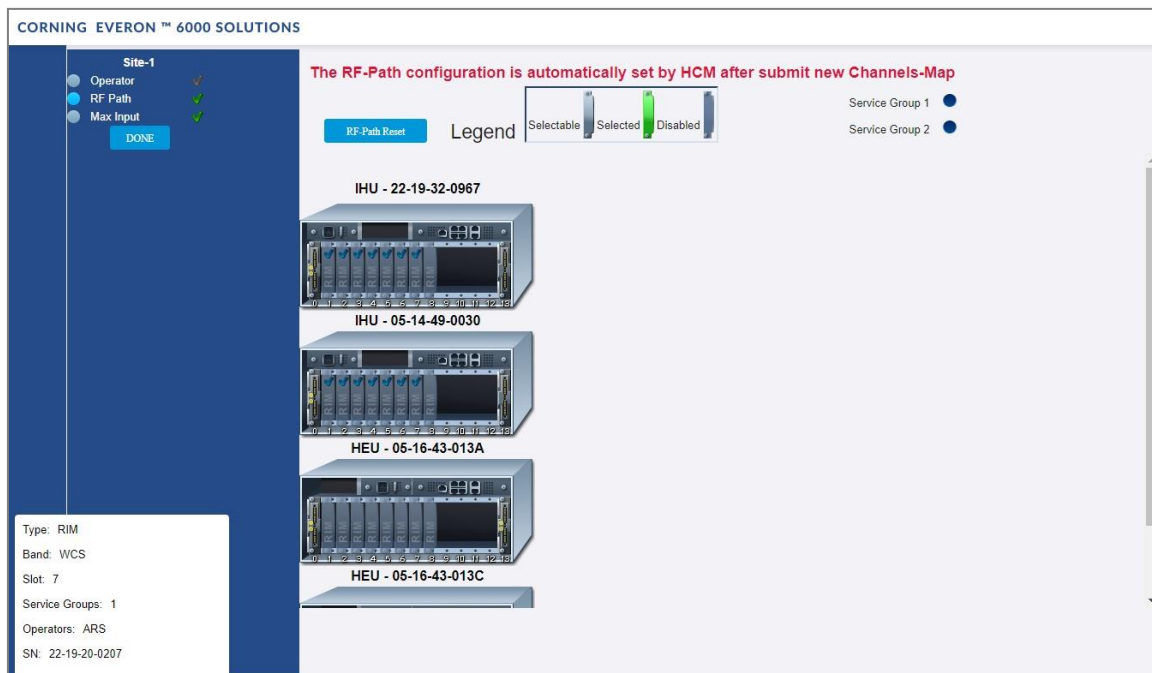
## 5.7.2 RF Path (read only)

The **RF Path** tab enables the user to easily see which RIMs belong to which service operator.

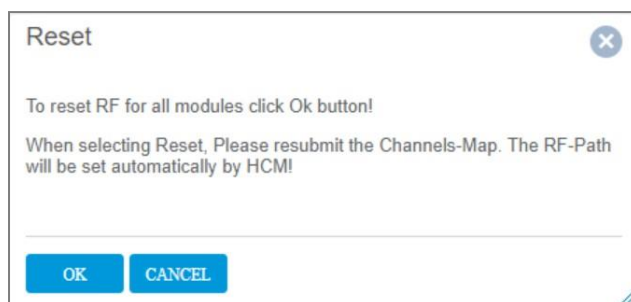
A service operator consists of one or more RIMs which are connected to a DCM, and via a DRU to one or more remote units. Up to 2 service operators are supported. This view is read only.

A RIM can be selected to show to which service operator it belongs. Alternatively, a service operator can be selected to show all the RIMs which belong to it.

*Note: Modules may not be set from this screen.*



*Note: You can delete all RF configurations by clicking the **RF-Path Reset** button. A pop up window is displayed when clicking the button:*



If you wish to reset the RF configurations, click **OK**. Go to the **Channels** screen from the main menu to reconfigure the RF-Path and submit a new map (see section 9.5).

### 5.7.3 Max Input (configurable)

Configure the max input according to specific needs.

The **Max Input** tab allows to configure three parameters for each RIM:

- Max Expected Power - UL gain range enabled is determined by the max expected power setting
- UL Gain Mode - Set the UL Gain Mode for the selected RIM
- UL Gain Value – Set UL gain (dB) for the selected RIM

#### ➤ To configure a single RIM

1. Click on the RIM to be updated

Select a RIM to configure



2. set the values
  - a. Max Expected Power
  - b. UL Gain Mode
  - c. UL Gain Value

➤ **To set a filter for RIMs configuration (by group / chassis / band / select all)**

1. In the Max-input screen, select a group (operator) or chassis or band, in the lower part of the screen



The screenshot shows a web interface for configuring RIMs. At the top right is a 'Select All' button with a small square icon. Below this is a form with three rows of configuration options. Each row has a dropdown menu on the left and a text input field on the right. The first row is for 'Set Max Expected Power' with a value of '37'. The second row is for 'Select UL Gain Mode' with a value of 'Manual'. The third row is for 'Select UL Gain Value' with a value of '0'. To the right of the form are two buttons: 'SUBMIT' and 'DEFAULT'.

| Filter Type        | Value                       |
|--------------------|-----------------------------|
| - Select Group -   | Set Max Expected Power: 37  |
| - Select Chassis - | Select UL Gain Mode: Manual |
| - Select Band -    | Select UL Gain Value: 0     |

2. All the related RIMs are lit in green on the view
3. Set the relevant data for the selected RIMs:
  - a. Max Expected Power
  - b. UL Gain Mode
  - c. UL Gain Value

## 5.8 Run time options – for future use only

NA (This screen is for future use only).

## 6. Using the System GUI

This section provides general guidelines and tools for navigating the system GUI:

- Screen layout, see 3.1
- Main menu options, see 3.2
- Default network settings, see 3.3
- Supported access options, see 3.4

### 6.1 Screen Layout

The main menu (located to the left of the window) lists all the available management options.

Next to the main menu either the system tree or the corresponding sub-options are displayed. The display changes according to the option selected from the main menu.

The screenshot displays the CORNING EVERON™ 6000 SOLUTIONS GUI. The interface is divided into several sections:

- Main Menu (Left):** A vertical sidebar containing icons for Device View, Events, Admin, Multi-stack, and Chassis Map. A callout box labeled "Main Menu options" points to this sidebar.
- System Tree (Left):** A tree view showing the hierarchy of devices. Under "Stack - FORD", there is a sub-tree for "IHU" containing various RIM and DCM components. A callout box labeled "System tree: sub-options" points to this tree.
- Device View (Right):** A table displaying the status of various RIM (Radio Interface Module) units. The table has columns for Name, Inconsistent Version, DL Input Power Low, DL Power Overload, Service OFF, Temperature, Adjustment Fault, and HW Failure. A callout box labeled "Parameters Display area" points to the "Info" tab below the table, which shows detailed parameters for a selected RIM unit.

| Name | Inconsistent Version | DL Input Power Low | DL Power Overload | Service OFF | Temperature | Adjustment Fault | HW Failure |
|------|----------------------|--------------------|-------------------|-------------|-------------|------------------|------------|
| RIM  | ●                    | ●                  | ●                 | ●           | ●           | ●                | ●          |
| RIM  | ●                    | ●                  | ●                 | ●           | ●           | ●                | ●          |
| RIM  | ●                    | ●                  | ●                 | ●           | ●           | ●                | ●          |
| RIM  | ●                    | ●                  | ●                 | ●           | ●           | ●                | ●          |
| RIM  | ●                    | ●                  | ●                 | ●           | ●           | ●                | ●          |
| RIM  | ●                    | ●                  | ●                 | ●           | ●           | ●                | ●          |
| RIM  | ●                    | ●                  | ●                 | ●           | ●           | ●                | ●          |
| RIM  | ●                    | ●                  | ●                 | ●           | ●           | ●                | ●          |
| RIM  | ●                    | ●                  | ●                 | ●           | ●           | ●                | ●          |

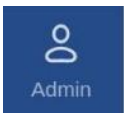
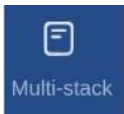
**Parameters Display area (Info tab):**

|                       |               |            |                 |             |          |
|-----------------------|---------------|------------|-----------------|-------------|----------|
| Name                  | N/A           | Slot Index | 3               | IP Address  | 11.0.0.5 |
| Chassis Serial Number | 22-19-32-0067 | Band Type  | FN700           | Temperature | 32       |
| Serial Number         | 22-19-40-01C1 | SW Version | RIME_6C64_36.04 | Operators   | ATT      |
|                       |               |            | Identity        | OFF         |          |

## 6.2 Main Menu Options

The table below lists the management options provided by the main menu:

Table 12: Main Menu Options

| Icon                                                                                | Enables user to...                                                                                              |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
|    | View the system topology and information about the different system elements.                                   |
|    | View all system events and generate reports.                                                                    |
|    | Perform initial system configurations. <b>This option is only visible to the system administrator.</b>          |
|    | Administrative options to perform system configurations, implement updates, define and monitor user's activity. |
|  | View the information of the different stacks of the system.                                                     |
|  | Manage the system RF channels.                                                                                  |

### 6.3 Default Network Settings

The system devices are managed via a web session to the headend control module (HCM) that is installed as either a headend unit (HEU) or integrated headend unit (IHU)



The HCM has three types of RJ45 Ethernet ports: LOCAL port, LAN port and four INTERNAL ports.

- LOCAL Port: 1 Gb Ethernet connection for a local setup session.

By default, the port is configured to have a static IP address: 172.16.1.1; Subnet Mask: 255.255.0.0.

Alternatively, the port can be configured as a DHCP server (connected to a DHCP client computer).

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*Note: The LOCAL port is designated for a local connection. However, the port may be used for a remote session as well, for troubleshooting and service purposes. In any case, don't connect a network device to the port if it's configured as a DHCP server, as the server will disrupt the LAN IP addressing.*

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- LAN Port: 1 Gb Ethernet connection to the customer's network for remote management.

By default, the port is configured to have a static IP address: 192.168.1.1; Subnet Mask: 255.255.0.0.

Alternatively, the port can be configured as a DHCP client.

IPv4 and IPv6 network protocols can be simultaneously supported.

- INTERNAL Ports: Four RJ45, 100 Mb Ethernet ports used for management of connected ACMs.

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*Note: Any one of these ports can also be used for a local connection if required.*

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Default settings: IP: 10.0.0.1; Subnet Mask: 255.0.0.0

### 6.4 Supported Access Options

This section describes the HW and SW required to connect to the HCM.

First connection to the HCM should be done with a laptop or a tablet.

The following browsers are supported:

- Microsoft Internet Explorer 11.0 and above
- Mozilla Firefox 42.0, 43.0, and above
- Google Chrome 45.0, 46.0, and above

After the initial configurations are done, it is recommended to establish remote access to the HCM by using the following:

*LAN Ethernet connection to the HCM with a minimum connectivity and throughput capability of 256 Kbps.*

## 7. Session Access and first-time settings

Once all the system elements are installed, the system administrator can log into the system GUI and perform initial configurations.

It is recommended to begin working with the Corning® Everon™ 6000 by following these steps:

4. **Open a local session to the HCM**, see section 4.1.
5. **Configure the LAN IP settings** (remote management) to allow remote access, see section 4.2
6. **Perform the initial configurations (commissioning)** using the system GUI, see, chapter 5

### 7.1 Open a Local Session

Below are the instructions for opening a local management session, to perform basic system configurations via the system GUI.

➤ **To Open the system GUI**

4. Connect a computer (i.e., laptop) to the HCM LOCAL port via an RJ45 Cat 5 Ethernet cable, as shown below:



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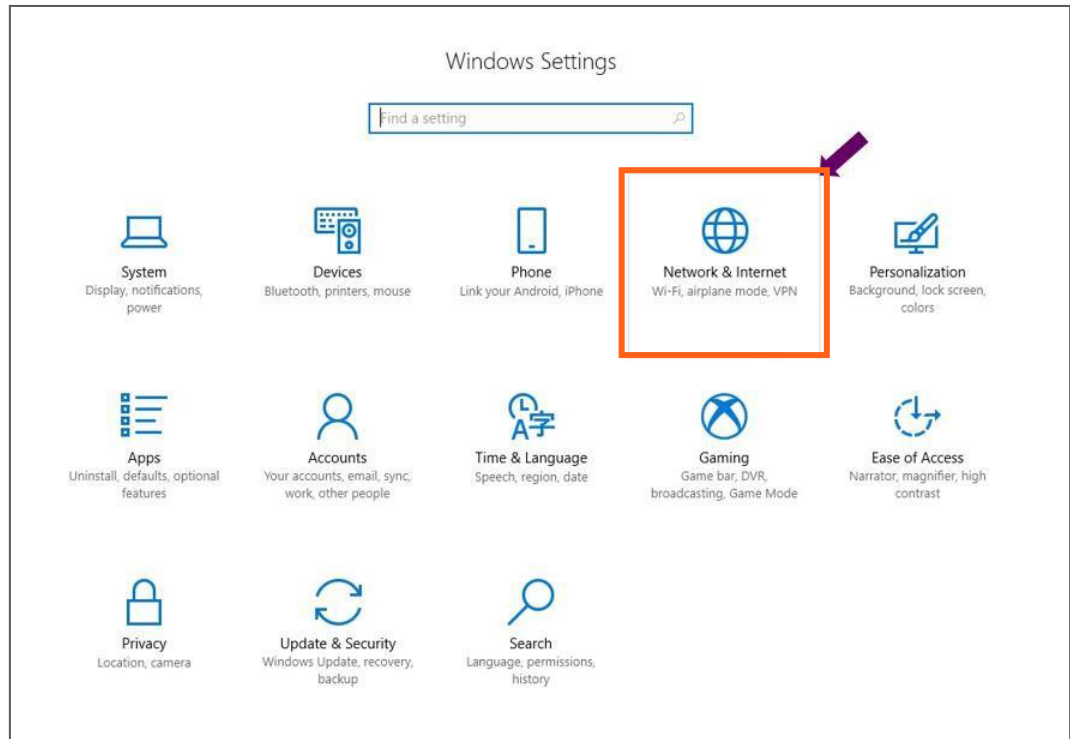
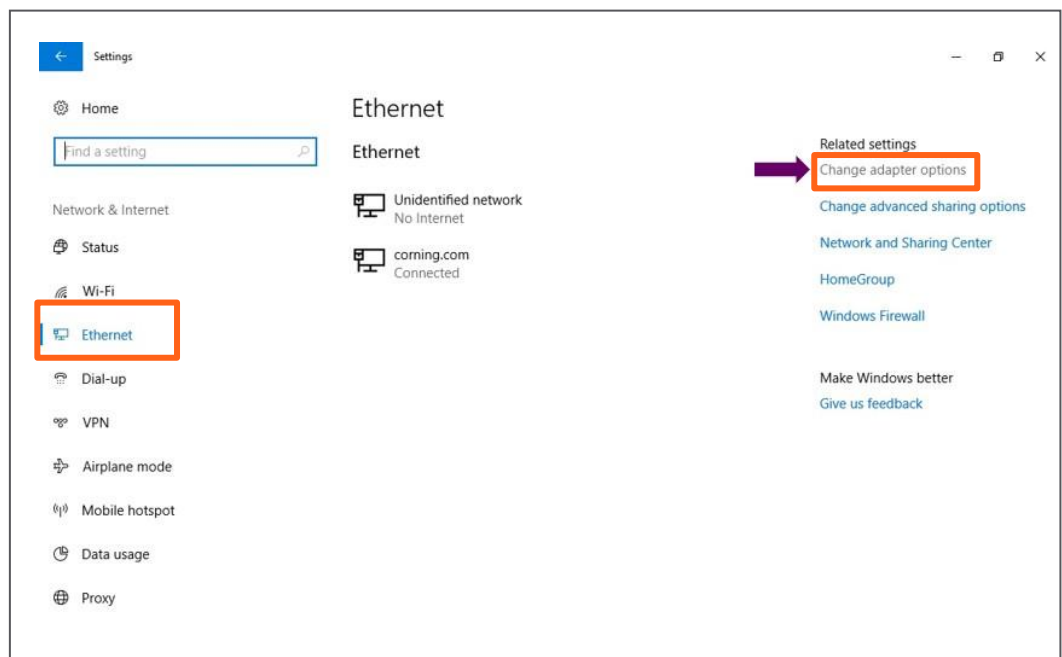
**Notes:**

\* The LOCAL port is set to a static IP Address by default: 172.16.1.1; Subnet Mask: 255.255.0.0. Your laptop/tablet network parameters must be set to match the subnet of the default IP address.

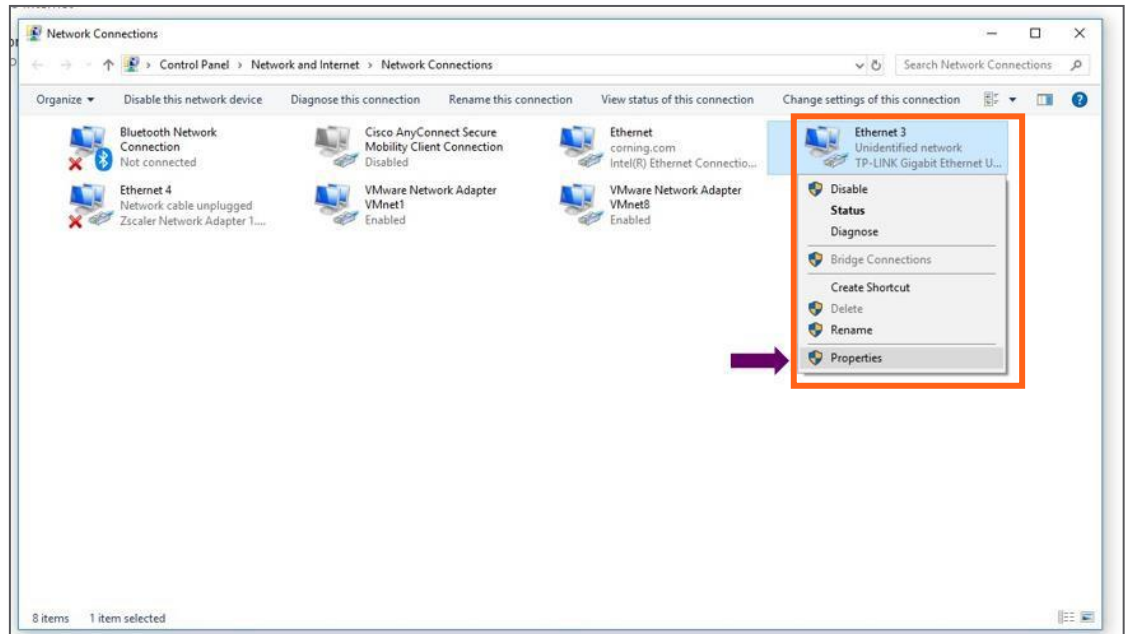
\* The laptop/tablet IP address must be different than the LOCAL port IP address.

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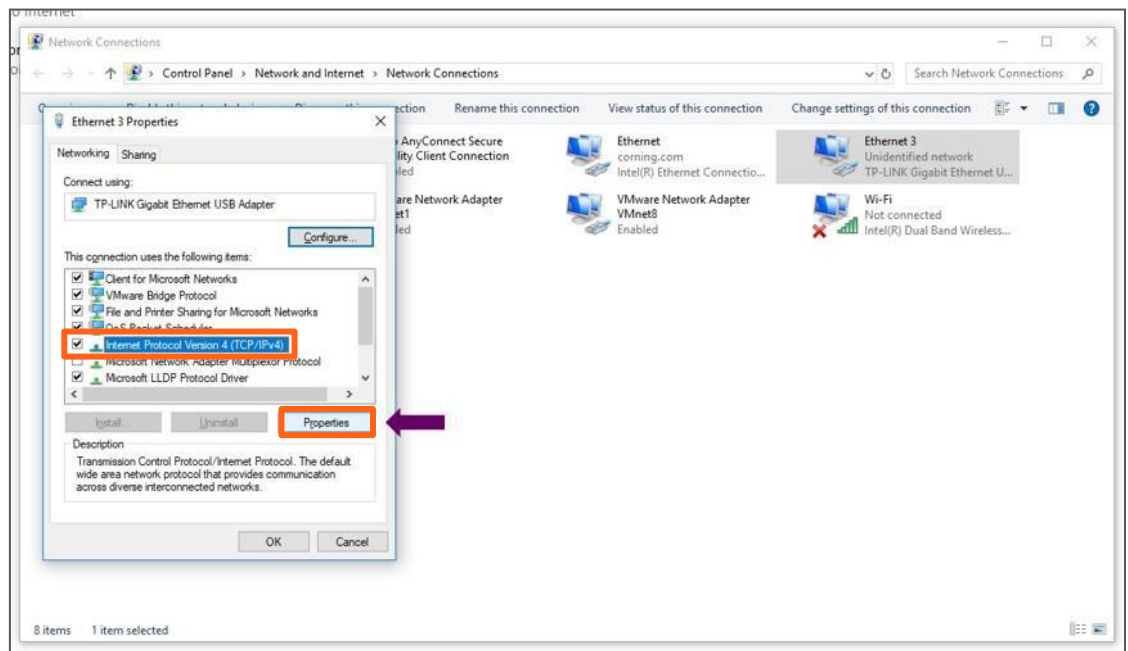
5. Set up your laptop/tablet network parameters by following the steps below (the steps may vary slightly depending on the OS version used):

a. Go to **Start → Settings → Network & Internet**b. Select **Ethernet → Change adapter options**

- c. Right-click on the **Ethernet USB adapter** or ethernet cable and select **Properties**



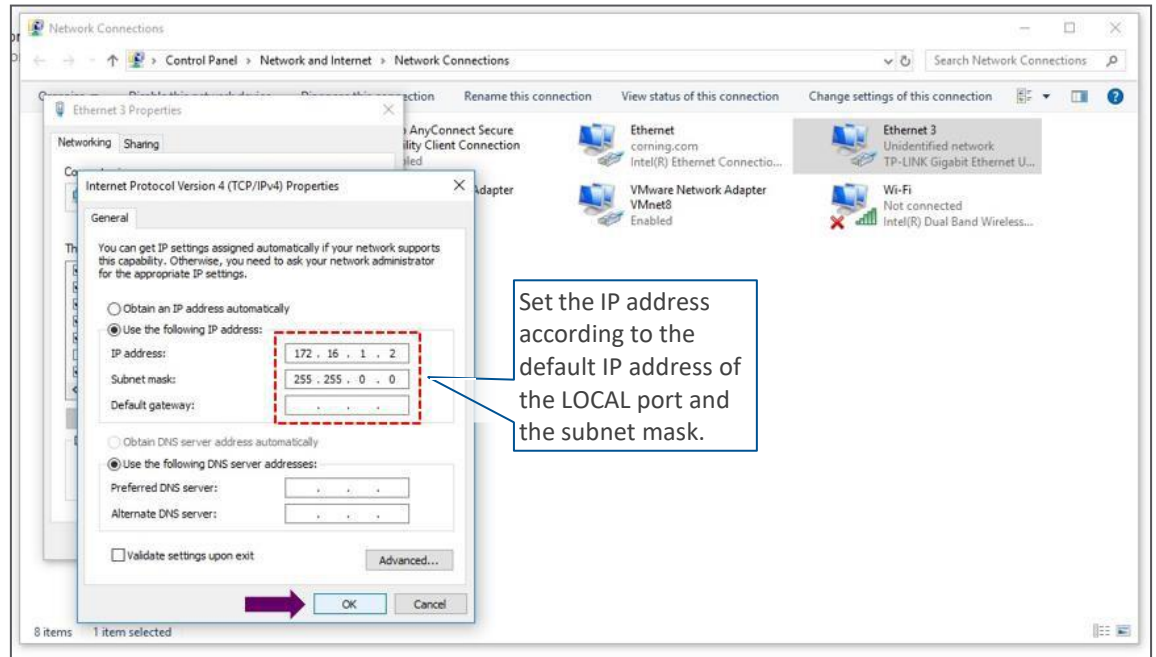
- d. Select **TCP/IPv4** and click **Properties**



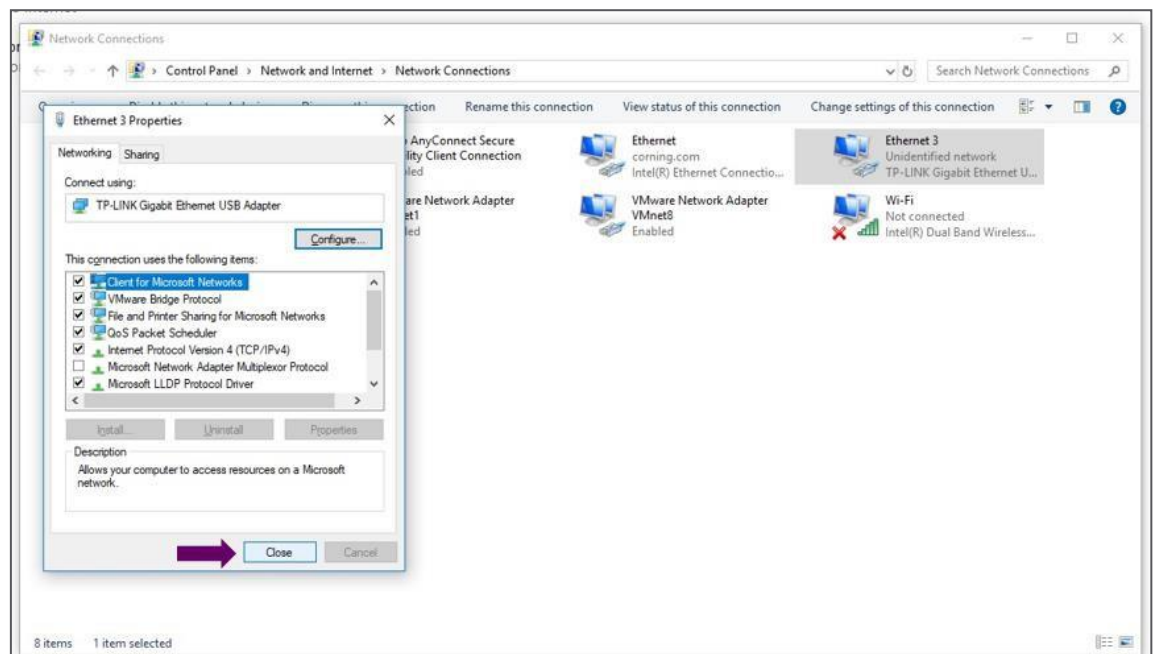
- c. Type in the properties: 172.16.1.2 : 255.255.0.0 → click **OK**

Examples of IP addresses:

- **Allowed: 172.16.1.5.**
- **Not allowed: 172.16.1.1 (this IP is used by the LOCAL port).**



- d. Click on **Close** and close the control panel



6. Once the connection is established (can be verified by accessing through command prompt: cmd → ipconfig), open a browser and type-in the LOCAL port default IP address in the address bar: 172.16.1.1. You can also ping the 172.16.1.1 IP address. See section 4.2 for instructions on how to continue.

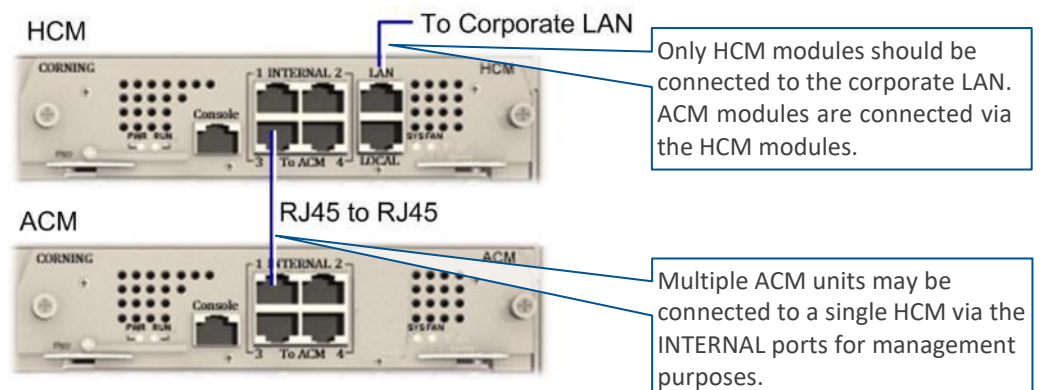
## 7.2 Remote Management (Configure the LAN IP settings)

After doing the preliminary configuration (see section 4.1), the system can be used for remote management, and needs to be configured as follows.

This section describes the configurations required for remote session access using Ethernet connection via the LAN port.

At this point the system is ready to be connected to the LAN according to the instructions below.

For HCM modules only – using the provided RJ45/RJ45 communication cable, connect the HCM LAN port to the corporate LAN:



The LAN port is set to a static IP address by default: 192.168.1.1; Subnet Mask: 255.255.0.0.

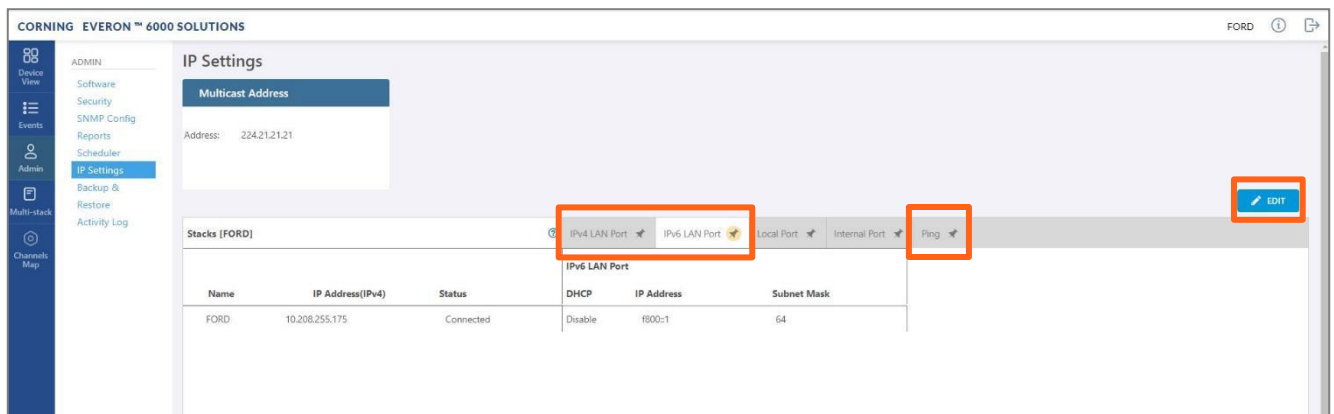
### ➤ To configure the HCM LAN port

- IMPORTANT:** Make sure the HCM LAN port is connected to the corporate LAN.

- In the main menu bar, click



- Select the **IPv4 LAN Port** or **IPv6 LAN Port** tabs and click the  button.



- The LAN port is set to a static IP address, by default: 192.168.1.1; Subnet Mask: 255.255.0.0.

You may change the **static IP address**, **subnet mask** and **default gateway** manually to legal IP values.

*Note: make sure the values you enter in the above fields aren't used by other system elements, and are different than the default values.*

*Make sure the address format matches IPv4 or IPv6, according to the tab being updated.*

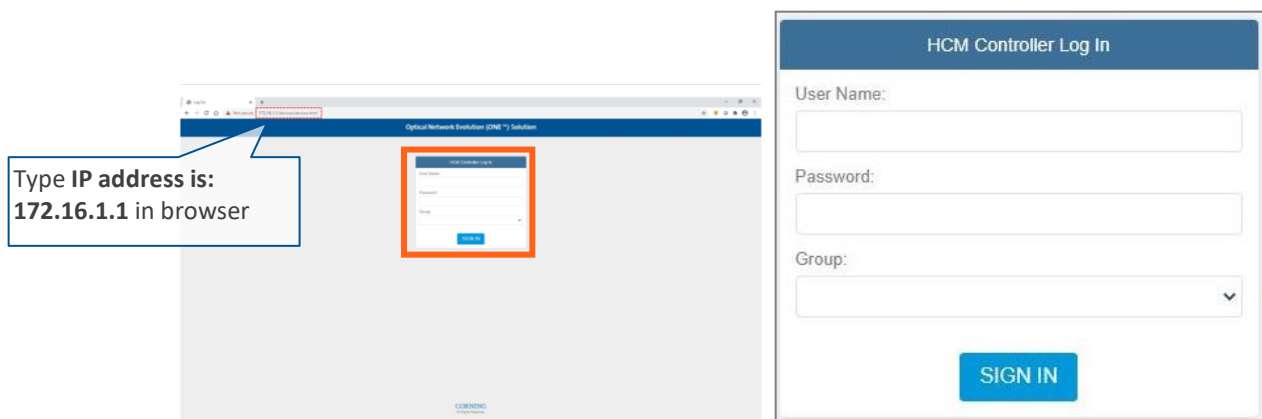
For Dynamic IP Address — set **DHCP** as **Client**, then click **OK**.

15. The HCM restarts after the LAN IP address is updated.
16. To open a remote management session: Open a browser and enter the **LAN port IP Address** in the **address bar**.

*Note: A Ping Tool option is provided to verify access to IP hosts (rather than opening another application). For more information about the ping tool and the IP Settings tab refer to section 9.3.6.*

17. Once the connection is established (can be verified by accessing through command prompt: cmd → ipconfig), open a browser and type-in the LOCAL port default IP address in the address bar: 172.16.1.1.

The HCM Controller Log In dialog appears:

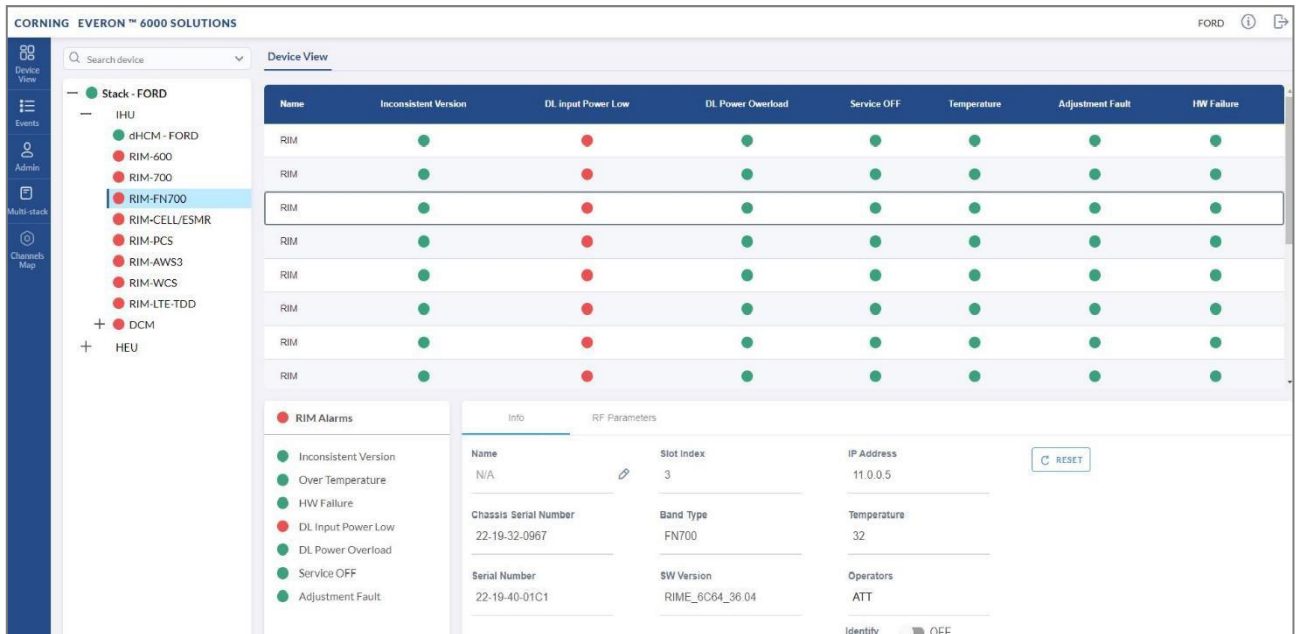


18. For first-time authentication use the following default values:

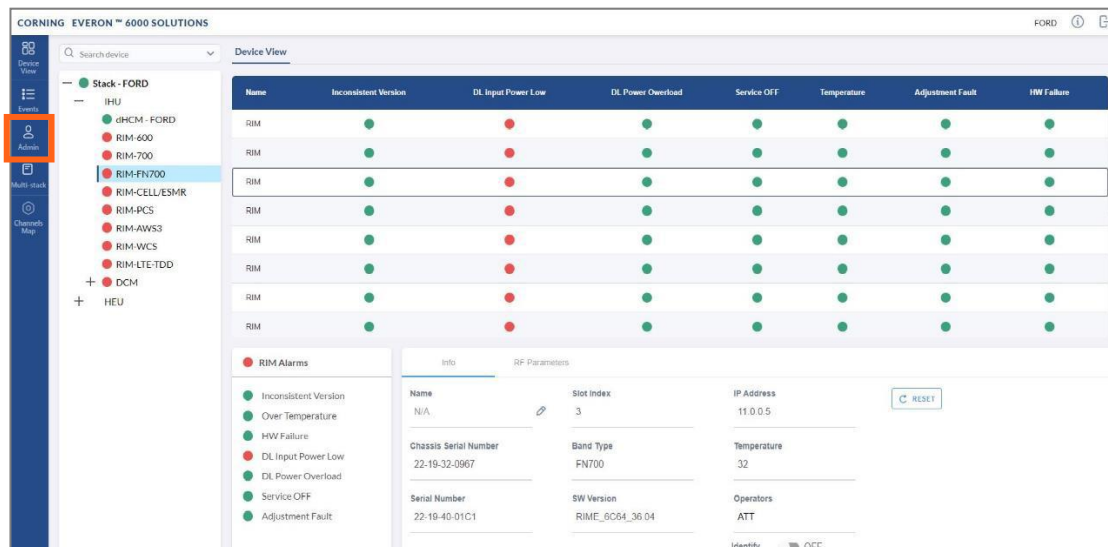
- Username: *admin*
- Password: *default provided with your system*
- Group: *leave blank*

**Note: IMPORTANT!** For security reasons it is highly recommended to immediately change the password (via the "Admin" -> "Security" tab) and log in again using the new password.

19. Click the "SIGN IN" button. System GUI main screen appears.

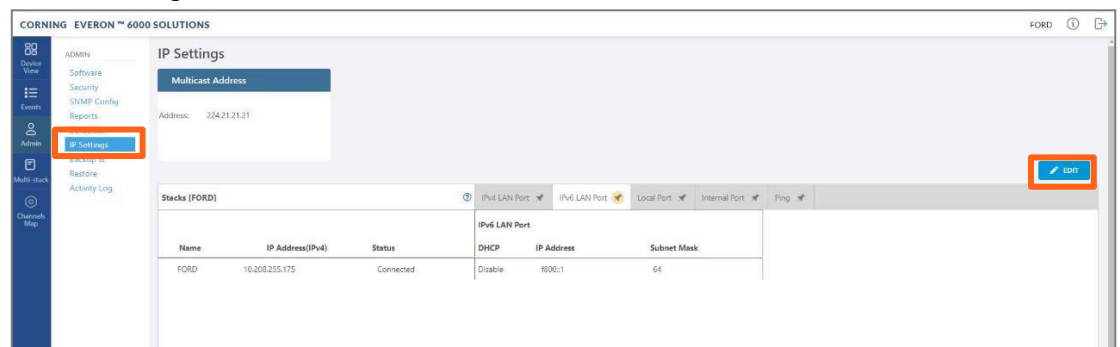


20. Configure the IP settings (to allow working through LAN IP address and not only via the local port connection) as follows:

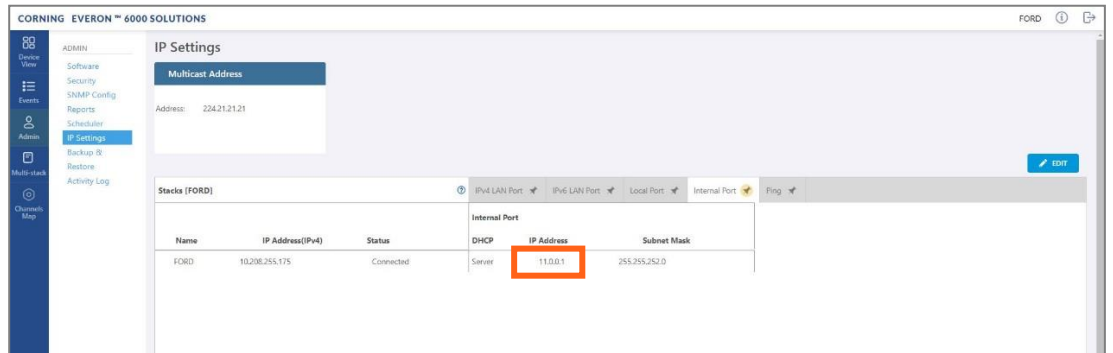


j. From the main menu select **Admin**

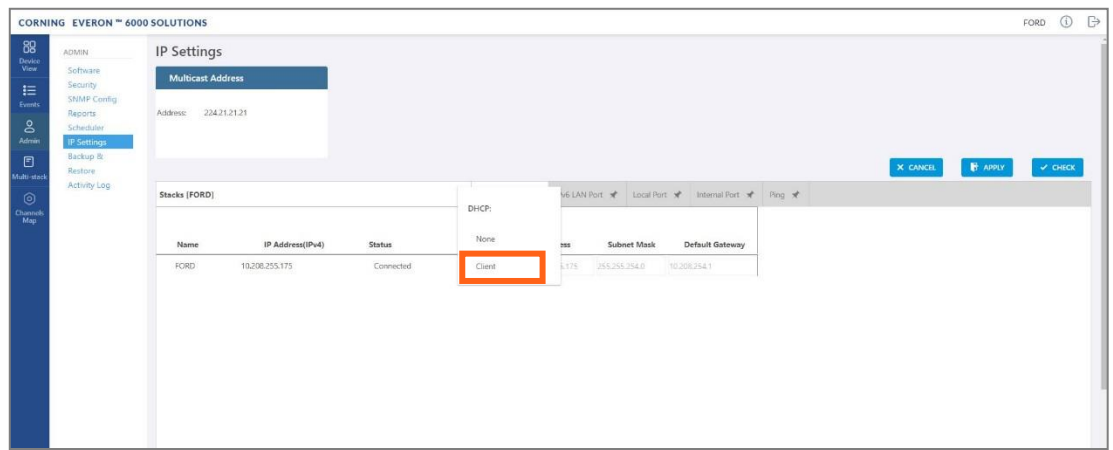
k. Select **IP Settings** and click on **Edit**



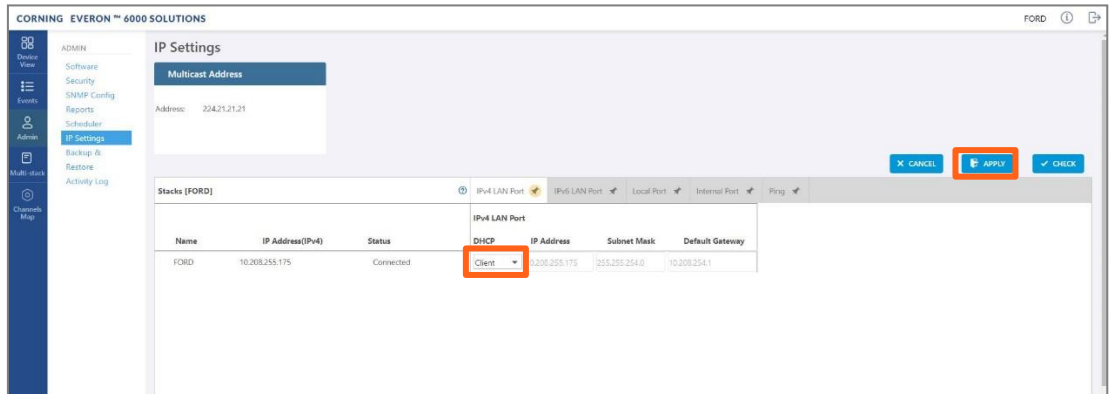
- l. Set internal ports to the required IP address (in this example 11.0.0.1)



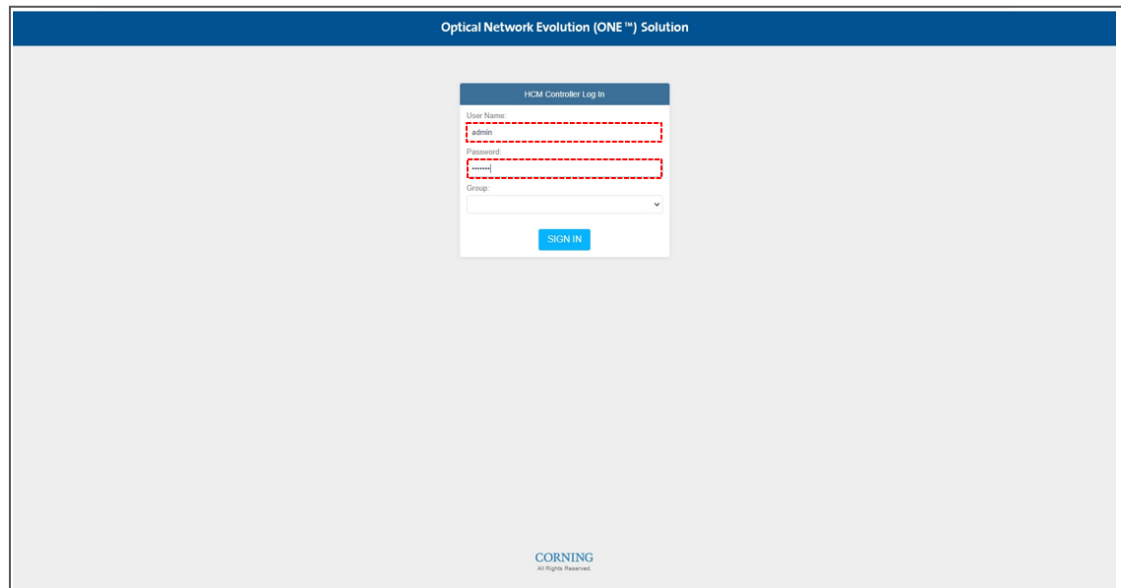
- m. Click on LAN port to display the roll-down menu and select **Client**



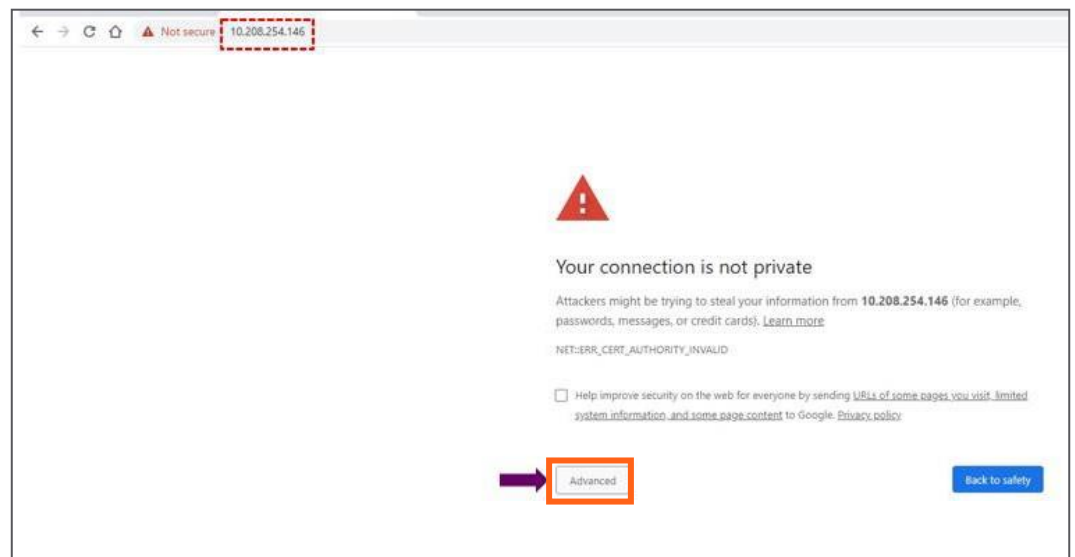
- n. Click on **Apply**



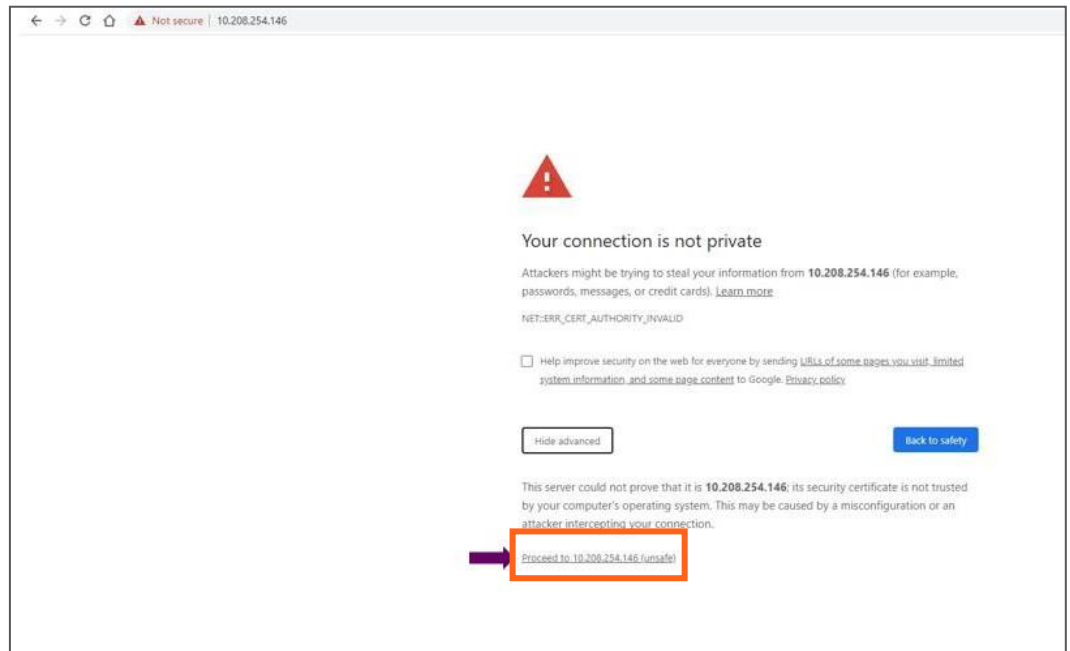
- o. Enter the credentials



- p. Sign out of the application. Then re-access the application:  
In your browser address bar type the IP address again:



- q. Select advanced → proceed to (the IP address)

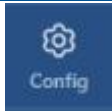


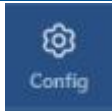
- r. The application appears.

## 8. Commissioning (Initial configurations)

This section describes all the initial configurations (commissioning) that **must** be done by the system administrator, in order to add operators and perform commissioning. Also – to configure maps:

5. Verify all the hardware and modules have been connected, see 5.1
6. Create new user operators, see 5.2
7. Set the system parameters:
  - Set power sharing for the operators, see 5.3
  - Set channels, see 5.4
  - Set TDD config, see 5.5
  - Perform adjustment, see 5.6
8. Review the auto-set site configurations, see 5.7



*Note: The  option in the main menu is only visible to the system administrator. This section describes the configurations that only the system administrator can perform.*

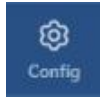
---

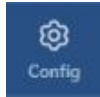
## 8.1 Verify Hardware-modules connection (auto discovery)

Verify that all the hardware and modules have been connected. This is indicated by the message: “system is in discovery mode”. When the message disappears, you may view the system hardware configuration through the site-config auto set screen.

### ➤ To verify Hardware and modules are connected

4. Verify you have accessed the system as an admin user.

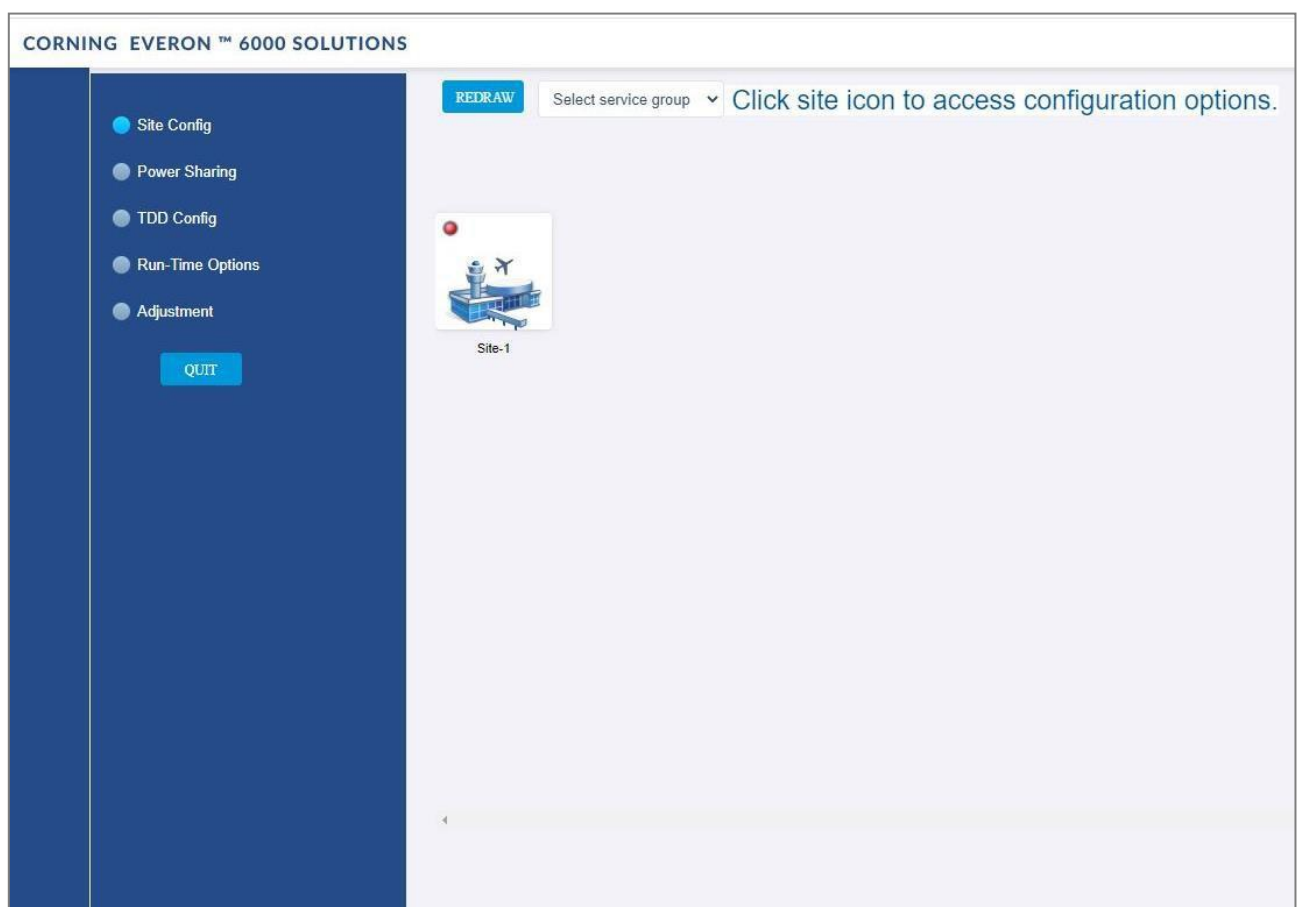


5. In the main menu options, click on . The configuration screen appears
6. Select the Site Config radio button. The site configuration screen appears.

---

#### Notes:

1. The config option is only available for admin users.
  2. While the system discovery mode is in progress, new user operators can be created.
  3. This screen indicates if the auto discovery procedure has been completed. While the system identifies the elements, a message appears: “system is in discovery mode”.
- 



## 8.2 Create new user operators

Initially the system administrator is the only system user. To enable other users to log in to the system, the system administrator must create user operators for the different providers/carriers.

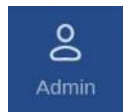
When a new operator is created the administrator of the new operator must log in to add users to the operator.

Only the system administrator can create new operators.

For more information about system security refer to section 9.3.2.

### ➤ To create a new operator

5. Log in as the **system** administrator.



6. In the main menu bar, click
7. Click the **Add operator** button → enter the new operator name (alphanumeric characters only, no spaces) and click OK. Up to 31 operators can be created.
8. The new operator name is added to the list of defined operators and the operator administrator is automatically created with the following default authentication:
  - Username: admin
  - Password: admin
  - Operator: operator name

---

*Note: Default Passwords should be changed when the relevant users first log in to the system. System admin can't change the operator admin password.*

---

This is an example of how the new operator is listed in the **Security** tab:

The screenshot displays the 'Security' tab in the CORNING EVERON™ 6000 SOLUTIONS interface. The 'Session Timeout Settings' are set to 'Never'. Below this, a list of operators is shown, including DEFAULT\_OPERATOR, ATT, SPRINT, T-MOBILE, and VERIZON. The T-MOBILE operator is highlighted with a red box. The interface includes a sidebar with navigation options like Device View, Events, Config, Admin, Multi-stack, Channels Map, and Devices Grid. Top right buttons include + ADD OPERATOR, + ADD USER, MODIFY PASSWORD, and POWER SHARING.

*Note: Clicking on the **POWER SHARING** button, displays a pop up window with a link to the power sharing screen.*

**Redirect To Power Sharing**

Please go to power sharing screen and verify all operators/bands are configured.

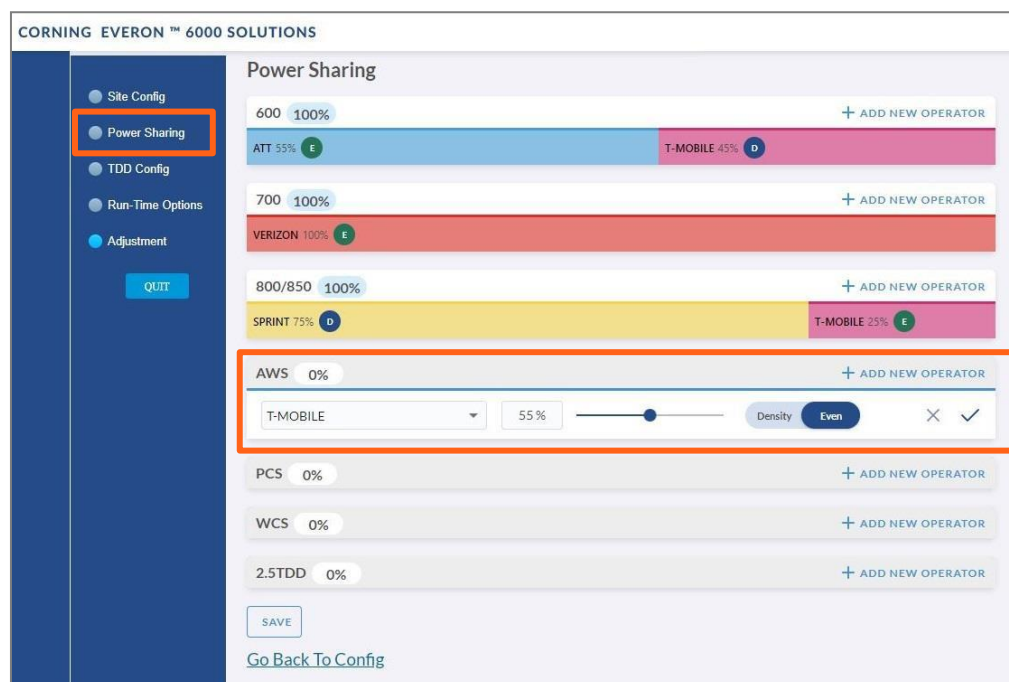
**CANCEL** **GO**

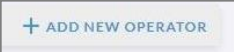
### 8.3 Set power sharing for the operators

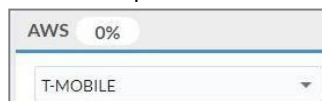
The **Power Sharing** tab shows all supported frequency bands and the carriers sharing each band. The carriers are sharing the power associated with the frequency band. It is required to enter the power sharing parameters as follows.

➤ **To set power sharing for the defined operators: For each band perform the following:**

10. Verify you have accessed the system as an admin user.
11. In the main menu options, click on . The configuration screen appears
12. In the displayed screen, select the **Power Sharing** radio button



13. Select the desired band (in the above example: AWS is selected)
14. Click on **add new operator** 
15. Select the operator from the drop-down options (in the above example – T-mobile is selected)



*Note: if an operator is not selected – the data cannot be entered*

16. Select the parameters to configure the power sharing for that operator



17. Click on the V sign  in the row of the updated band.
18. Click on the SAVE button  at the bottom of the screen.

## 8.4 Set channels

This section explains how to set the system RF channels and submit the CPRI map.

When configuring a new system, the user is required to create a new map and then add channels to it. Where the map determines the configuration of all the system RF channels.

*Note: For more information on maps and channels refer to section 9.5.*

### ➤ To create a new map:

7. Verify that you have accessed the system as an admin user.



8. In the main menu bar, click on . The channels screen appears:

| Phase | Result  | Source Id | Error Description |
|-------|---------|-----------|-------------------|
| HCM   | Success | aaaa      | sdksksdjsdjsd     |
| DCM   | Success | bbbb      | sdksksdjsdjsd     |
| DRU   | Failed  | cccc      | sdksksdjsdjsd     |
|       |         | aaaa      | sdksksdjsdjsd     |
|       |         | bbbb      | sdksksdjsdjsd     |
|       |         | cccc      | sdksksdjsdjsd     |

| CELL ID   | DL CF (MHz) | UL CF (MHz) | UL BW (MHz) | DL BW (MHz) | Operator | SCs (KHz) | Technology | TOD | Power Reduction (dB) | RIM Number | RIM Type | MIMO | Channel Mute |       |
|-----------|-------------|-------------|-------------|-------------|----------|-----------|------------|-----|----------------------|------------|----------|------|--------------|-------|
| Channel 1 | Lobby       | 2500        | 2500        | 5           | 5        | test      | 15         | 4G  | YES                  | 0          | 1        | TDD  | 1T1R         | False |
| Channel 2 | sss         | 2600        | 2600        | 40          | 40       | test      | 60         | 5G  | YES                  | 0          | 2        | TDD  | 1T1R         | False |

9. Click the button.
10. Add all required channels:
  - Click on the **New Channel** button
  - Update the relevant information (for details, see section 9.5.3).
11. Click on the **Submit** button, to validate the map.
12. If there are no errors, the map is saved as the valid map (for more information see section 9.5).

## 8.5 TDD Config

The **TDD Config** tab allows the user to configure TDD related parameters per stack.

*Note: the system provides default values. If your system does not include TDD channels, you may skip this section.*

**TDD Configuration**

**4G Table**

| Sub Frame | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-----------|---|---|---|---|---|---|---|---|---|----|
|           | D | S | U | D | D | D | S | U | D | D  |

**5G Table**

| Slot | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------|---|---|---|---|---|---|---|---|---|----|
|      | D | S | U | D | D | D | S | U | D | D  |

**TDD 2.5 Config Form**

Allocation Mode: 2

CP Type: Normal

Frame Format: 7

Sub Carrier Spacing [5G]: 15

**SAVE**

### ➤ To configure the TDD parameters:

- For each of the above screen's fields (allocation mode, CP type, Frame format), click the arrow near the field to show the list of optional values:

2

Normal

7

#### Optional Values:

- Allocation Mode:** 0-6
- CP Type:** Normal, Extended
- Frame Format:** 0-8

*Note: Sub Carrier Spacing (SCS) is read only in the screen. It can be configured in the **Channels** screen (refer to 9.5.3).*

- Select the relevant values

**SAVE**

- Click SAVE

*Note: the 5G/4G tables are updated by the system according to the parameters filled-in by the user:*

| 4G Table  |   |   |   |   |   |   |   |   |   |    |
|-----------|---|---|---|---|---|---|---|---|---|----|
| Sub Frame | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|           | D | S | U | D | D | D | S | U | D | D  |
| 5G Table  |   |   |   |   |   |   |   |   |   |    |
| Slot      | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|           | D | S | U | D | D | D | S | U | D | D  |

## 8.6 Adjustment

The **Adjustment** tab allows the user to start the adjustment process. This process performs system calibration. It is done automatically, and the user only needs to verify that all steps were successfully run.

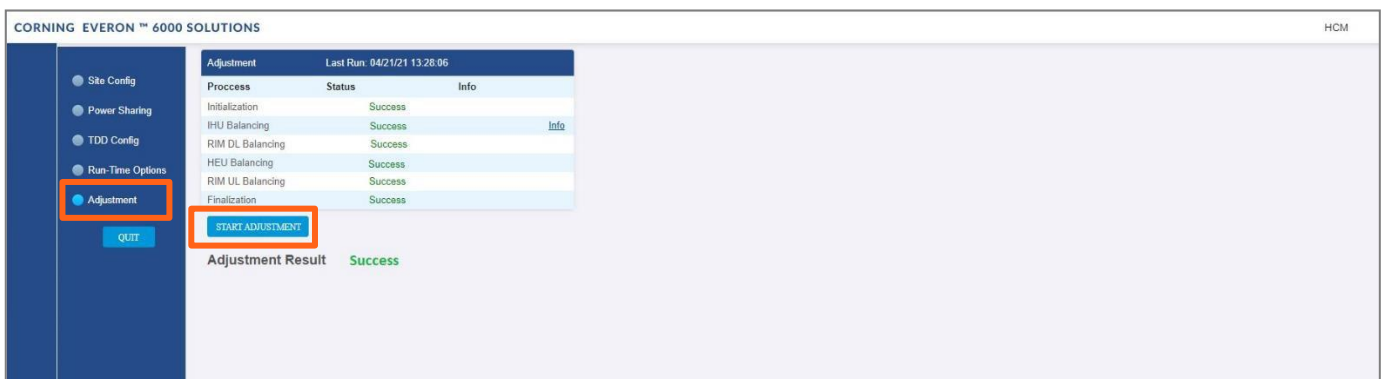
*Note: if any of the steps fail, verify that the hardware (including cables) is connected properly and re-run the process. If the problem persists, contact corning support help desk.*

During adjustment the status and relevant information are updated for each process.

### ➤ To perform adjustment:

*Note: before adjustment you need to make sure there is a valid map of channels (see section 5.4).*

5. Verify you have accessed the system as an admin user.
6. In the main menu options, click on . The configuration screen appears
7. Select the **adjustment** radio button
8. Click on **Start Adjustment**.
9. Once the adjustment process is complete, the DCMs will automatically reboot. The reboot process is approximately 3 minutes long.



## 8.7 Review the auto-set Site Config

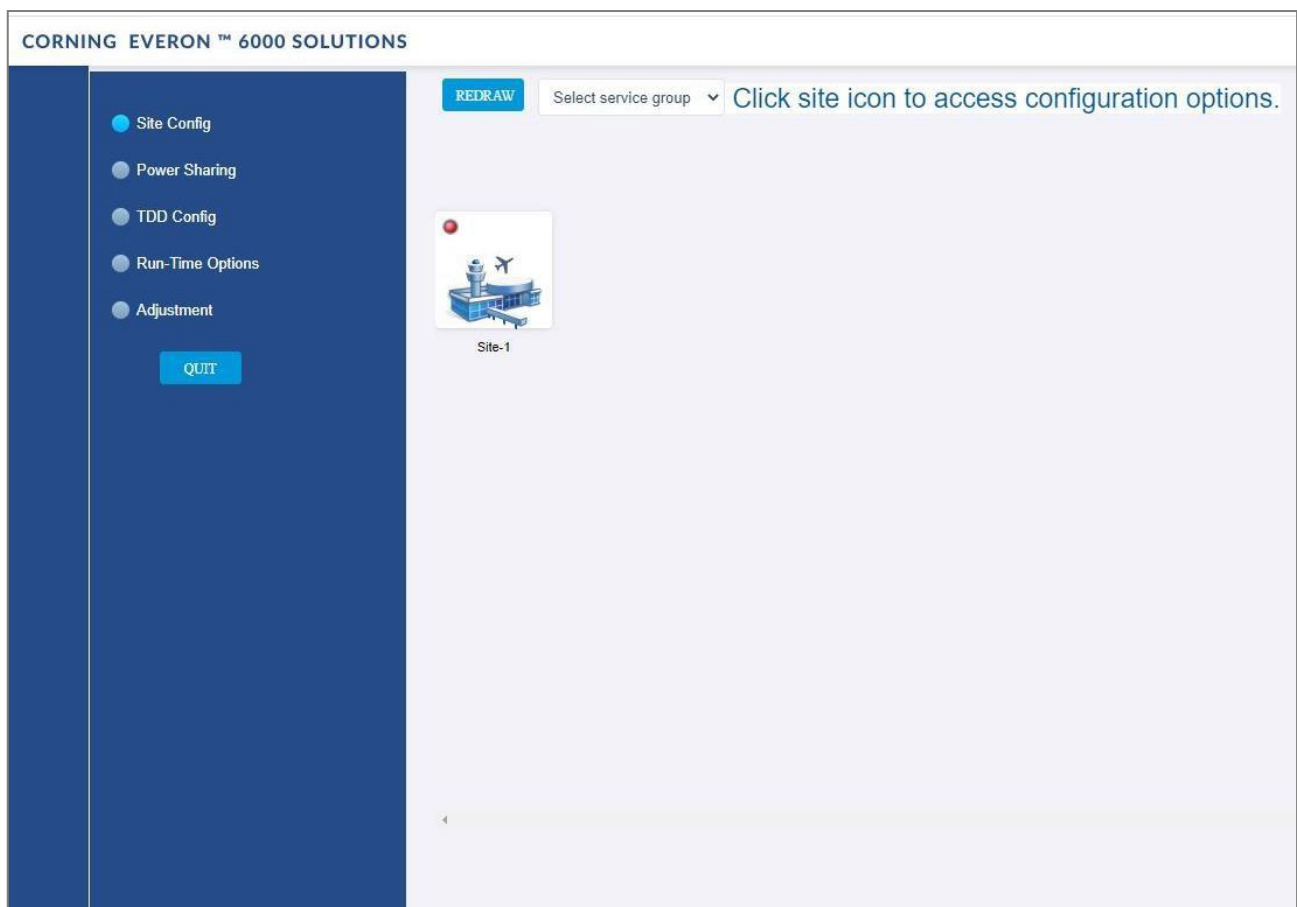
The site configuration is automatically performed by the system: When the hardware is connected, the system identifies the modules and indicates the connected sites on the following screen.

➤ **To view the site config settings**

5. Verify you have accessed the system as an admin user.



6. In the main menu options, click on . The configuration screen appears
7. Choose the **Site Config** radio button. the following screen appears:



*Note: Each relevant site is presented by an image. By clicking on the site image, the configuration options for the specific site appears. The configuration options are described below*

8. Select the required option to be displayed:
  - a. Operator, see 5.7.1
  - b. RF path, see 5.7.2
  - c. Max input, see 5.7.3

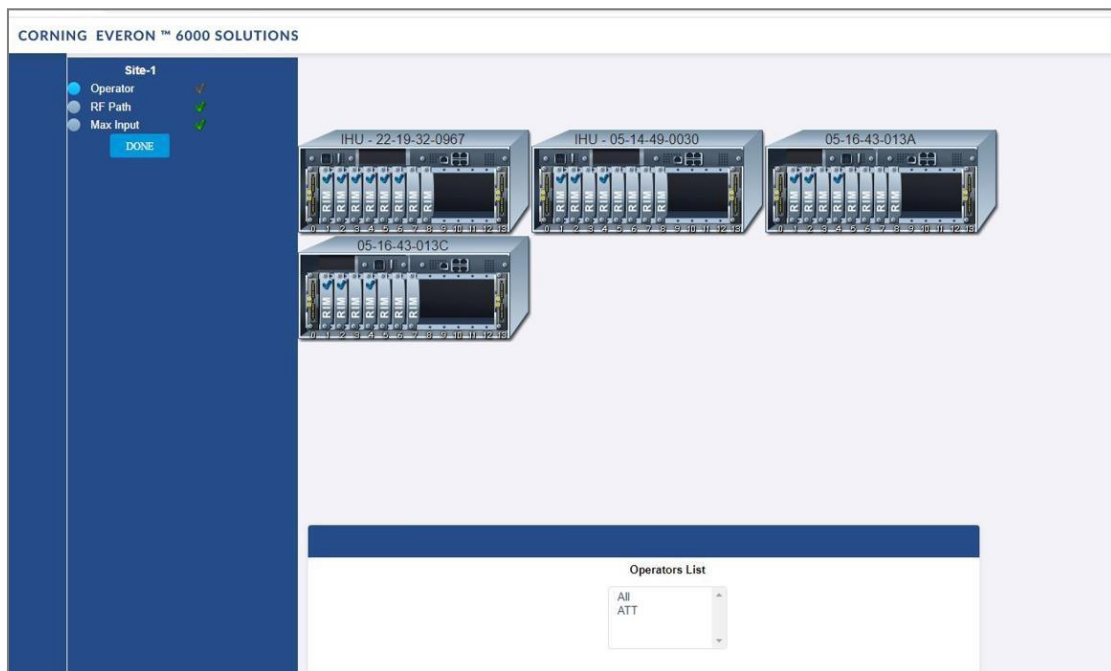
### 8.7.1 Operator (read only screen)

The **Operator** tab shows all system chassis with the RIMs inside each chassis. It displays a full list of the operators at the bottom of the screen (for large lists the user may scroll-down). The user can click on a RIM to have the carrier name displayed.

---

*Note: This view is read only, where changes to RIM carrier assignments can only be done via the **Channels** tab in the main menu.*

---



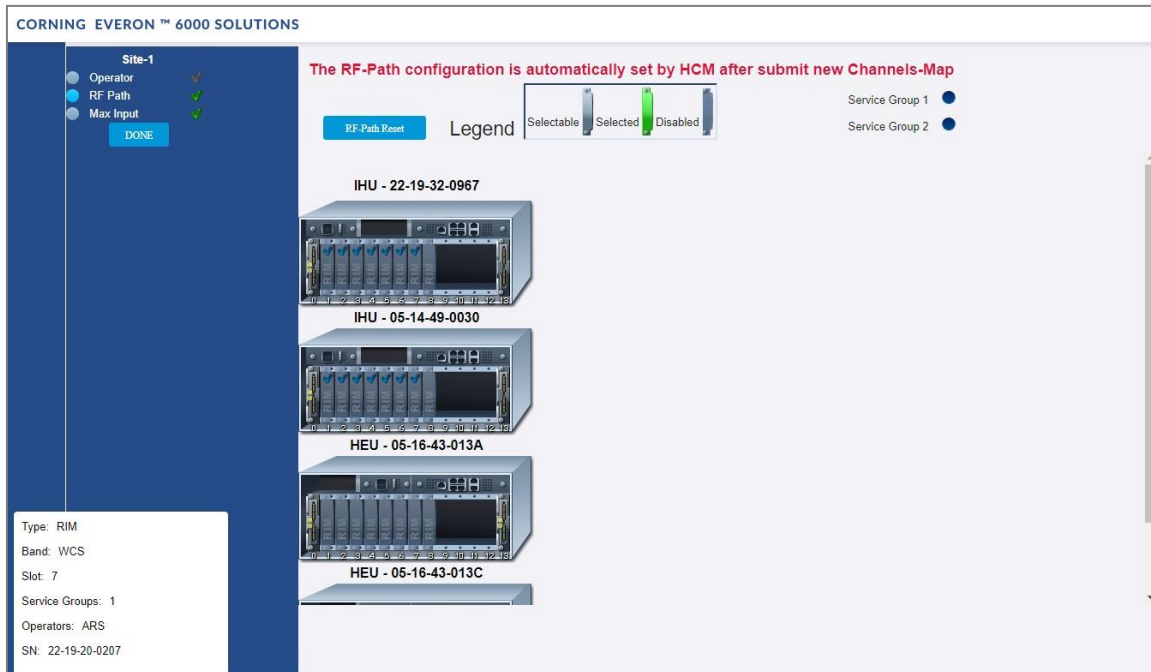
## 8.7.2 RF Path (read only screen)

The **RF Path** tab enables the user to easily see which RIMs belong to which service operator.

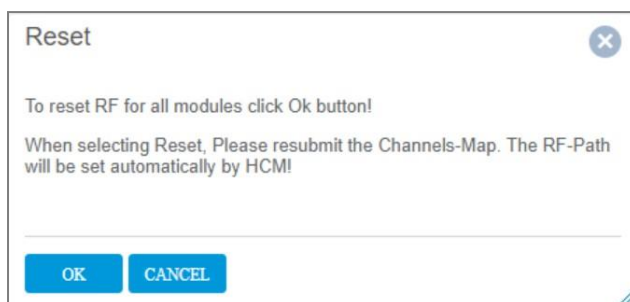
A service operator consists of one or more RIMs which are connected to a DCM, and via a DRU to one or more remote units. Up to 2 service operators are supported. This view is read only.

A RIM can be selected to show to which service operator it belongs. Alternatively, a service operator can be selected to show all the RIMs which belong to it.

*Note: Modules may not be set from this screen.*



*Note: You can delete all RF configurations by clicking the **RF-Path Reset** button. A pop up window is displayed when clicking the button:*



If you wish to reset the RF configurations, click **OK**. Go to the **Channels** screen from the main menu to reconfigure the RF-Path and submit a new map (see section 9.5).

### 8.7.3 Max Input (configurable)

Configure the max input according to specific needs.

The **Max Input** tab allows to configure three parameters for each RIM:

- Max Expected Power - UL gain range enabled is determined by the max expected power setting
- UL Gain Mode - Set the UL Gain Mode for the selected RIM
- UL Gain Value – Set UL gain (dB) for the selected RIM

#### ➤ To configure a single RIM

3. Click on the RIM to be updated

Select a RIM to configure



4. set the values
  - a. Max Expected Power
  - b. UL Gain Mode
  - c. UL Gain Value

➤ **To set a filter for RIMs configuration (by group / chassis / band / select all)**

4. In the Max-input screen, select a group (operator) or chassis or band, in the lower part of the screen



The screenshot shows a web interface for configuring RIMs. At the top right is a 'Select All' button with a small square icon. Below this is a form with three rows of controls. The first row has a dropdown menu labeled '- Select Group -', a text input labeled 'Set Max Expected Power' with the value '37', and a 'SUBMIT' button. The second row has a dropdown menu labeled '- Select Chassis -', a dropdown menu labeled 'Select UL Gain Mode' with the value 'Manual', and a 'DEFAULT' button. The third row has a dropdown menu labeled '- Select Band -' and a dropdown menu labeled 'Select UL Gain Value' with the value '0'.

5. All the related RIMs are lit in green on the view
6. Set the relevant data for the selected RIMs:
- Max Expected Power
  - UL Gain Mode
  - UL Gain Value

## 8.8 Run time options – for future use only

NA (This screen is for future use only).

## 9. Using the System GUI

This section explains how to use the system GUI options:

- Device screen, see 9.1
- Events screen, see 9.2
- Admin screen, see 9.3
- Multi-stack screen, see 9.4
- Channels screen, see 9.5

### 9.1 Devices Screen (Element Management)

The Devices option provides visual information on the system layout, connected units and hierarchy, alarms etc. The system elements hierarchy tree is detected via an auto-discovery process, executed upon system start-up. The system units' alarms are indicated according to severity, type, masked/unmasked alarms, etc.

This section explains the following options:

- System tree alarm coding icons, see section 9.1.1
- List of alarms per system element, see 9.1.2
- Access elements data view, see 9.1.3
- DRU to DCM connection, see 9.1.4

### 9.1.1 System Tree Alarm icons

This section includes a description of the different alarm icons.

For each element, the system displays the most severe status in the system tree. Each device status is indicated by a colored circle to its left, according to the symbols shown in the table that follows.

Table 13: Alarm Icons

| Icon Unmasked                                                                                      | Masked                                                                            | Indicates that...                                                    |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|----------------------------------------------------------------------|
| <br>Red circle    |  | There is a major alarm related to the element                        |
| <br>Green circle  |  | No alarm is related to the element                                   |
| <br>Orange circle |  | There is a minor alarm related to the element                        |
|                   |                                                                                   | Unit is disconnected                                                 |
|                  |                                                                                   | Indication on DRU-DCM connection – no alarms                         |
|                 |                                                                                   | Indication on DRU-DCM connection – major alarm                       |
|                 |                                                                                   | Indication on DRU-DCM connection – minor alarm                       |
|                 |                                                                                   | Indication on DRU-DCM connection – no DCM connected to this DRU port |

Any status changes are reported via SNMP to a monitoring system. If an alarm is masked, it isn't reported to the monitoring system. In addition, the system events log, lists only unmasked alarms which were set or unset. Unmasked alarms are listed separately (see section 9.2).

The status of the element in the system tree doesn't change due to alarm masking.

For example: DCM status icon is red due to HW Failure alarm. If HW Failure alarm is masked, DCM status icon remains red.

## 9.1.2 Lists of alarms per system element

The following tables details all the alarms per system element type.

*Table 14: HCM Alarms Descriptions*

| Alarm Name           | Description                                                                                                                               |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| HW Failure           | Faulty HCM hardware.                                                                                                                      |
| Adjustment Failure   | Unsuccessful Adjustment procedure.                                                                                                        |
| Installation Failure | Faulty physical installation between chassis.                                                                                             |
| SW Release Mismatch  | A module (or modules) in the system do not have the defined active release. Several modules may not have corresponding software versions. |
| Connectivity         | Faulty connectivity state in one of the previously discovered system modules (module should appear gray in the network topology).         |
| Overall Status       | Overall status of enabled (unmasked) alarms.                                                                                              |

*Table 15: ACM Alarms Descriptions*

| Alarm Name                       | Description                                                                                                                                                                                                                                                                                                                           |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Overall Status                   | Overall status of enabled (unmasked) alarms.                                                                                                                                                                                                                                                                                          |
| HW Failure                       | ACM faulty hardware upon initialization or during operation.                                                                                                                                                                                                                                                                          |
| Over Temperature                 | Ambient temperature inside the ACM is greater than 75°C.                                                                                                                                                                                                                                                                              |
| Inconsistent Version/ SW Version | The module does not have the defined active release.                                                                                                                                                                                                                                                                                  |
| Adjustment Fault                 | Unsuccessful Adjustment procedure.                                                                                                                                                                                                                                                                                                    |
| Ext1/Ext2 Clock Failed           | Failure in master reference clock. Only relevant when ACM is installed in an HEU or IHU chassis as follows: <ul style="list-style-type: none"> <li>• For ACM installed in an HEU chassis - Ext1/Ext2 Clock Failed are relevant.</li> <li>• For ACM installed in an IHU chassis - only Ext1 Clock Failed alarm is relevant.</li> </ul> |
| Pilot Clock Failed               | Relevant for IHU and OIU. Indicates failure in reference in the pilot clock in the OIX Expander.                                                                                                                                                                                                                                      |
| Fan Failure                      | Fault in at least one of the fan modules (i.e., fan does not match duty cycle set value). Displays the highest severity alarm.                                                                                                                                                                                                        |
| Power Failure                    | Power failure in one or both (if two are installed) of the PSMs.                                                                                                                                                                                                                                                                      |
| Output Under Voltage             | The ACM has detected an input voltage value under 10.8 V DC from one of the PSM modules (severity – minor) or both (severity – major) during three consequent samplings.                                                                                                                                                              |
| Input Under Voltage              | The ACM has detected an input voltage value of under 60 V AC from either one PSM module (severity – minor) /both PSMs (severity – major).                                                                                                                                                                                             |

Table 16: RIM Alarms Descriptions

| Alarm Name                                       | Description                                                                                                    |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| Overall Status                                   | Overall status of enabled (unmasked) alarms.                                                                   |
| HW Failure                                       | Hardware failure during startup or during normal operation.                                                    |
| Over Temperature/Temp                            | Ambient temperature inside the RIM is more than 75°C.                                                          |
| Inconsistent Version/SW Version                  | The module does not have the defined active release.                                                           |
| Adjustment Fault                                 | Unsuccessful adjustment procedure for the selected module.                                                     |
| Service State                                    | Service has been disabled by the user.                                                                         |
| DL Input Power Low                               | BTS RF power input to the RIM is at least 15 dB lower than the configured max expected power.                  |
| DL Power Overload                                | BTS RF power input to the RIM is at least 3 dB higher than the value measured during the adjustment procedure. |
| Sync Loss<br>Only applicable for RIM TDD         | Green — indicates TDD sync lock between RIM and input signal.<br>Red — TDD sync lock error (unlocked).         |
| Clock Synthesizer<br>Only applicable for RIM TDD | UL/DL Synthesizer and Reference Clock lock/unlock status.                                                      |
| Band Mismatch<br>Only applicable for RIM AWS     | RIM bands are overlapping.                                                                                     |

Table 17: DRU Alarms Descriptions

| Alarm Name                | Description                                                  |
|---------------------------|--------------------------------------------------------------|
| Inconsistent Version      | The module does not have the defined active release.         |
| Temperature               | Ambient temperature inside the DRU is high                   |
| HW Failure                | DRU faulty hardware upon initialization or during operation. |
| Overall Optical DCM Links | Overall status of enabled (unmasked) alarms in input links.  |
| Overall Optical RU Links  | Overall status of enabled (unmasked) alarms in output links. |

Table 18: DCM Alarms Descriptions

| Alarm Name            | Description                                                          |
|-----------------------|----------------------------------------------------------------------|
| Inconsistent Version  | The module does not have the defined active release.                 |
| Temperature           | Ambient temperature inside the DCM is high                           |
| HW Failure            | DCM faulty hardware upon initialization or during operation.         |
| Adjustment Fault      | Unsuccessful Adjustment procedure.                                   |
| Overall Optical Links | Overall status of enabled (unmasked) alarms in output optical links. |

Table 19: dLRU/dMRU/dHRU Alarms Descriptions

| Alarm Name             | Description                                                                      |
|------------------------|----------------------------------------------------------------------------------|
| HW_ALARM               | Indicates un-recoverable HW failure. Applicable for module or sub-module.        |
| TEMP_ALARM_Minor_X     | Over temperature indication. X is sensor number.                                 |
| TEMP_ALARM_Critical_X  | Critical temperature indication. X is sensor number.                             |
| SERVICE_OFF_X          | X band is OFF. Only applied if there is a channel in that band, but band is OFF. |
| ANT                    | Antenna issues.                                                                  |
| UL_LIMITER_X           | UL limiter active due to high UL signal at antenna.<br>X is band number.         |
| DL_RF_LOW_X            | X channel power at CPRI input is low.                                            |
| CLK                    | CLK/CPRI un-synchronized.                                                        |
| DISCONNECTED_PORT      | dLRU/dMRU/dHRU ports connected to different DRUs.                                |
| LOW_TRANSMISSION_ALARM | Digital power and analog power mismatch.                                         |
| OVERFLOW               | Digital signal overflow.                                                         |
| VSWR_X                 | VSWR alarm on band X.                                                            |
| SELF_PROTECTION        | Self-protection alarm                                                            |

| Alarm Name       | Description                                          |
|------------------|------------------------------------------------------|
| TDD_OUT_OF_SYNC  | The TDD band lost the sync on the TDD pattern.       |
| PA_OVERCURRENT   | The current consumption of the PA exceeds the limit. |
| CONNECTION_ERROR | Connection error                                     |

The following table lists alarms related to the CPRI protocol. These alarms are relevant for the optical links that some of the system elements have (see sections 9.1.3.4 - 9.1.3.6 below).

*Table 20: CPRI Alarms Descriptions*

| Alarm Name    | Description                                    |
|---------------|------------------------------------------------|
| LOS           | Loss of signal.                                |
| LOF           | Loss of frame synchronization.                 |
| RAI           | Remote alarm indication.                       |
| SDI           | SAP (service access point) default indication. |
| Certified SFP | Indicates whether SFP certified.               |

### 9.1.3 Access elements data

➤ To access the Devices View screen

1. Select **Devices** from the main menu. The following screen appears
2. From the system tree (in the left), click on the relevant element to be viewed in detail (e.g. HCM, RIM, etc.). The selected element details appear in the main area.

*Note: the displayed system tree is updated according to system topology.*

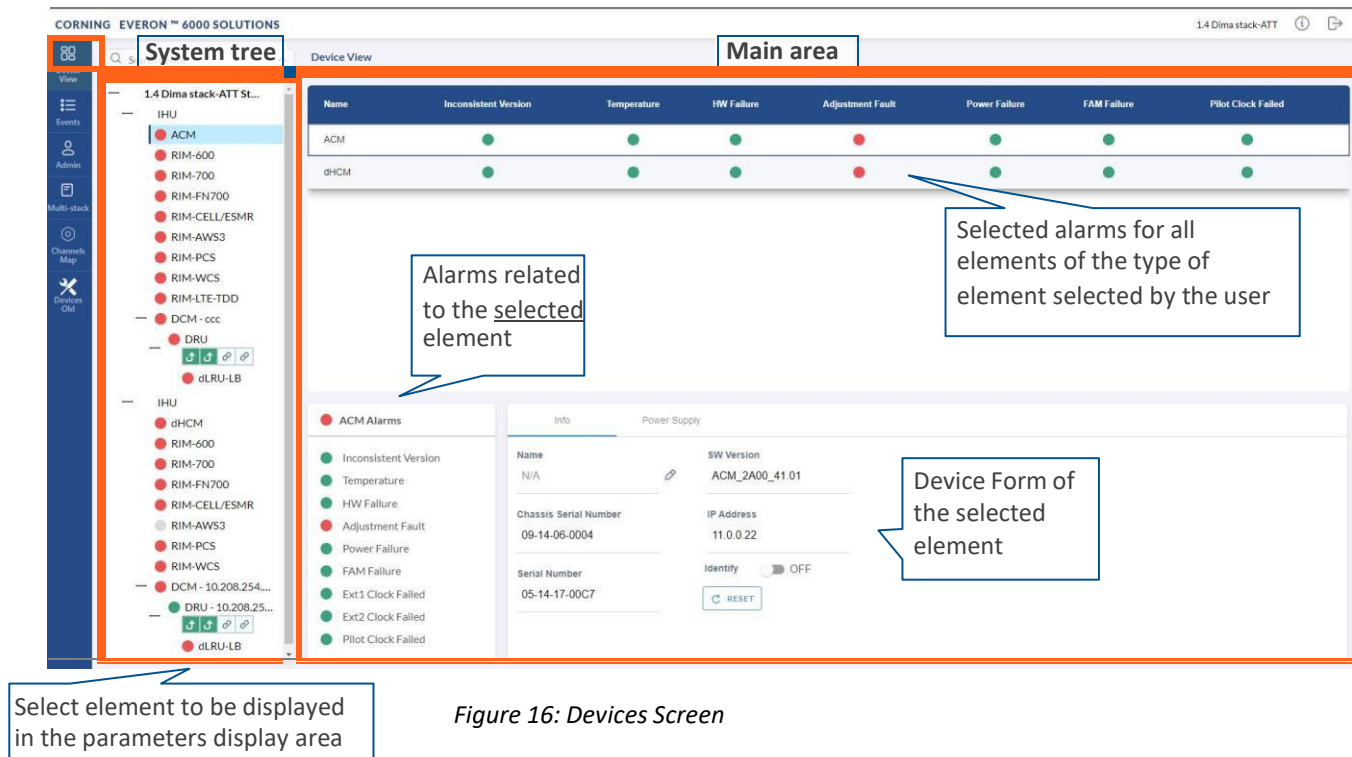


Figure 16: Devices Screen

3. Refer to the relevant sub-section for details on the displayed element:
  - HCM, see 9.1.3
  - ACM, see 9.1.3.2
  - RIM, see 9.1.3.3
  - DCM, see 9.1.3.4
  - DRU, see 9.1.3.5
  - dLRU, dMRU, dHRU, see 9.1.3.6

*Note: The same DRU may appear in the system tree multiple times if it is connected to different DCMs. For details see section 9.1.4 DRU to DCM Connection.*

### 9.1.3.1 HCM Device Form

The device form of an HCM has two tabs: **Info** and **Power Supply**. The Info tab displays general information about the system element:

Table 21: HCM Info Device Form Fields

| Field                 | Information                                               |
|-----------------------|-----------------------------------------------------------|
| Name                  | The name of the element as it appears in the system tree. |
| Chassis Serial Number | The serial number of the chassis the HCM resides in.      |
| Serial Number         | The serial number of the HCM.                             |
| IP Address            | The IP address of the HCM.                                |
| SW Version            | SW version updated in HCM.                                |
| Current Date          | Current system date and time.                             |

The **Power Supply** tab shows the relevant alarms status for both power supplies. There are two power supplies for backup and the switch between the power supplies is automatic. Explanation of the alarms can be found in section 9.1.2, under HCM Alarms Descriptions. In the example below there are no active alarms related to power supply A and power supply B is disconnected.

Info

Power Supply

**Power Supply A**

● Temperature

● Input Under Voltage

● Output Under Voltage

**Power Supply B**

Disconnected PS

### 9.1.3.2 ACM Device Form

The device form of an ACM has two tabs: **Info** and **Power Supply**. The Info tab displays general information about the system element:

The screenshot shows the 'Info' tab of the ACM Device Form. The form is divided into two main sections: 'Info' and 'Power Supply'. The 'Info' section contains the following fields:

- Name:** ACM1 (with an edit icon)
- IP Address:** 11.0.0.13
- Chassis Serial Number:** 09-14-06-0001
- Serial Number:** 05-14-34-019F
- SW Version:** ACM\_2A00\_33.04
- Identify:** A toggle switch currently set to OFF.

Table 22: ACM Info Device Form Fields

| Field                    | Information                                                                                                             |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Name                     | The name of the element as it appears in the system tree                                                                |
| Chassis Serial Number    | The serial number of the chassis the ACM resides in                                                                     |
| Serial Number            | The serial number of the ACM                                                                                            |
| SW Version               | SW version updated in ACM                                                                                               |
| IP Address               | The IP address of the ACM                                                                                               |
| Identify (ON/OFF switch) | When the switch is ON the ACM LEDs are blinking (can be used to identify the specific module among many other modules). |

The **Power Supply** tab shows the relevant alarms status for both power supplies. There are two power supplies for backup and the switch between the power supplies is automatic. Explanation of the alarms can be found in section 9.1.2, under ACM Alarms Descriptions. In the example below there are no active alarms related to any of the power supplies.

| Power Supply                               |                                            |
|--------------------------------------------|--------------------------------------------|
| Power supply A                             | Power supply B                             |
| <input type="radio"/> Temperature          | <input type="radio"/> Temperature          |
| <input type="radio"/> Output Under Voltage | <input type="radio"/> Output Under Voltage |
| <input type="radio"/> Input Under Voltage  | <input type="radio"/> Input Under Voltage  |

### 9.1.3.3 RIM Device Form

The device form of a RIM has at least two tabs: **Info** and **RF Parameters**. A RIM which supports TDD also has a **TDD** tab in its Device Form. The Info tab displays general information about the system element:

| Info                  |                 |                                       |
|-----------------------|-----------------|---------------------------------------|
| Name                  | Slot Index      | IP Address                            |
| LTE Band 14           | 8               | 11.0.0.12                             |
| Chassis Serial Number | Band Type       | Temperature                           |
| 22-19-24-08B9         | 14              | 38                                    |
| Serial Number         | SW Version      | Carrier                               |
| 22-20-11-0068         | RIMT_6B64_36.03 | 0                                     |
|                       |                 | Identify <input type="checkbox"/> OFF |

Table 23: RIM Info Device Form Fields

| Field                    | Information                                                                                                             |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Name                     | The name of the element as it appears in the system tree.                                                               |
| Chassis Serial Number    | The serial number of the chassis the RIM resides in.                                                                    |
| Serial Number            | The serial number of the RIM.                                                                                           |
| Slot Index               | The number of the slot in the chassis the RIM resides in.                                                               |
| Band Type                | Band number according to LTE frequency bands. Band number is mapped directly to a frequency range.                      |
| SW Version               | SW version updated in RIM.                                                                                              |
| IP Address               | The IP address of the RIM.                                                                                              |
| Temperature              | Current temperature of the RIM.                                                                                         |
| Carrier                  | Identification of the supplier the RIM belongs to (telecommunications company).                                         |
| Identify (ON/OFF switch) | When the switch is ON the RIM LEDs are blinking (can be used to identify the specific module among many other modules). |

The RF Parameters tab includes information about the RIM UL and DL signals:

The screenshot shows the 'RF Parameters' configuration page. It includes the following controls:

- DL Power Detector:** An empty text input field.
- Automatic Limit Control:** A toggle switch currently turned ON.
- Service State:** A toggle switch currently turned ON.
- Max Exp. Power [dBm]:** A dropdown menu with '37' selected.
- UL Gain Mode:** A dropdown menu with 'Manual' selected.
- UL Gain [dBm]:** A dropdown menu with '0' selected.

Table 24: RIM RF Parameters Device Form Fields

| Field                                   | Information                                                                                                                                                                                                         |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DL Power Detector[dBm]                  | Power of base station down link transmission. Range is -10 to +37[dBm].                                                                                                                                             |
| Automatic Limit Control (ON/OFF switch) | enable (On = default)/disable (Off) ALC function for RIM                                                                                                                                                            |
| Service State (ON/OFF switch)           | Service State OFF simulates RIM is disconnected. Transmission disabled by user.                                                                                                                                     |
| Max Exp. Power [dBm]                    | User defined max power for the base station transmission.<br>An alarm is triggered if the value in DL Power Detector field deviates from this value.                                                                |
| UL Gain Mode                            | Auto Symmetrical – equalizes the UL Gain<br>Manual (default) – select a value in the range of -19 dB to +15 dB (in 1dB steps). Note that the enabled UL gain range is determined by the max expected power setting. |
| UL Gain [dBm]                           | The configured maximum expected power determines the maximum UL gain range enabled for configuration                                                                                                                |

Table 25: Max Expected Power Settings

| Max Expected Power Value [dBm] | Max UL Gain Range [dB] |
|--------------------------------|------------------------|
| 0                              | -19 to +10             |
| 1                              | -19 to +11             |
| 2                              | -19 to +12             |
| 3                              | -19 to +13             |
| 4                              | -19 to +14             |
| 5 to 37                        | -19 to +15             |

A RIM which supports TDD (Time Division Duplexing) has an additional tab: **TDD**

Table 26: RIM TDD device form fields

| Field                   | Information                                                                        |
|-------------------------|------------------------------------------------------------------------------------|
| UL/DL Allocation Mode   | 0 to 6                                                                             |
| CP Type                 | Cycle Prefix: Normal/Extended                                                      |
| S Frame Format          | 0 to 8                                                                             |
| Central Frequency (MHz) | Low – 2526<br>Medium – 2593<br>High – 2660<br>Custom – 2526 to 2660 (0.1MHz steps) |

### 9.1.3.4 DCM Device Form

The device form of a DCM element has two tabs: **Info** and **Optical Links**. The Info tab has general information about the system element.

| Info                  |             | Optical Links                                   |
|-----------------------|-------------|-------------------------------------------------|
| Name                  | Slot Index  | Carrier                                         |
| First                 |             | 1                                               |
| Chassis Serial Number | SW Version  | Identify <input checked="" type="checkbox"/> ON |
| 1234567               |             |                                                 |
| Serial Number         | IP Address  |                                                 |
| 123456                | 192.168.1.1 |                                                 |

Table 27: DCM Info Device Form Fields

| Field                    | Information                                                                                                             |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Name                     | The name of the element as it appears in the system tree.                                                               |
| Chassis Serial Number    | The serial number of the chassis the DCM resides in.                                                                    |
| Serial Number            | The serial number of the DCM.                                                                                           |
| Slot Index               | The number of the slot in the chassis the DCM resides in.                                                               |
| SW Version               | SW version updated in DCM.                                                                                              |
| IP Address               | The IP address of the DCM.                                                                                              |
| Carrier                  | Identification of the supplier the DCM belongs to (telecommunications company).                                         |
| Identify (ON/OFF switch) | When the switch is ON the DCM LEDs are blinking (can be used to identify the specific module among many other modules). |

The **Optical Links** tab has information about the optical links of the DCM. Each optical link displays the color of the most severe alarm related to it. In the example below, links 1 and 3 have no alarms, link 2 has a major alarm and link 4 has a minor alarm.

The screenshot shows a web interface with two tabs: 'Info' and 'Optical Links'. The 'Optical Links' tab is selected and underlined. Below the tabs, the text 'Output Links (1-4):' is displayed. Underneath, there are four colored circles, each with a number above it: 1 (green), 2 (red), 3 (green), and 4 (yellow). These colors represent the severity of alarms for each link.

#### 9.1.3.5 DRU Device Form

The device form of a DRU element has two tabs: **Info** and **Optical Links**. The Info tab has general information about the system element:

The screenshot shows a web interface with two tabs: 'Info' and 'Optical Links'. The 'Info' tab is selected and underlined. The form contains the following fields and controls:

| Name                                                                                     | IP Address                            |
|------------------------------------------------------------------------------------------|---------------------------------------|
| TEST  | 10.0.0.1                              |
| Serial Number                                                                            | Identify <input type="checkbox"/> OFF |
| 22-19-27-9bdc                                                                            |                                       |
| SW Version                                                                               |                                       |
| dru_d719_10_50                                                                           |                                       |

Table 28: DRU Info device form fields

| Field                    | Information                                                                                                             |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Name                     | The name of the element as it appears in the system tree.                                                               |
| Serial Number            | The serial number of the DRU.                                                                                           |
| SW Version               | SW version updated in DRU.                                                                                              |
| IP Address               | The IP address of the DRU.                                                                                              |
| Identify (ON/OFF switch) | When the switch is ON the DRU LEDs are blinking (can be used to identify the specific module among many other modules). |

The Optical Links tab shows information about the optical links of the DRU. Each optical link indicates the colour of the most severe alarm related to it. The DRU can have up to 4 optical input links and 32 optical output links.

The user can click on one of the inputs or outputs to view information about the link. In the example below output link number 6 was clicked and the information about this link is displayed:

The screenshot displays the 'Optical Links' tab of the DRU Info device form. It features a grid of 36 optical links, categorized into 4 input links (1-4) and 32 output links (1-32). Link 6 is selected. To the right of the grid, details for Port Number 6 are shown, including IP Address (11.0.0.11), Part Number (998), SFP Tx Level (59 dBm), SFP Temperature (25 C), SFP Rx Level (89 dBm), and SFP VCC (89 V). SFP Alarms (IO Error, Certified SFP, 64/66 Errors) and CPRI Alarms (LOS, LOF, RAI, SDI) are also displayed.

### 9.1.3.6 dLRU/dMRU/dHRU Device Form

The device form of a dL/M/HRU element has three tabs: **Info**, **Supported Bands** and **Optical Links**. The Info tab has general information about the system element:

| Info             |                              | Supported Bands | Optical Links |
|------------------|------------------------------|-----------------|---------------|
| Name             | HE Chassis SN                |                 |               |
| I'm remote Align | 123-456-789                  |                 |               |
| Serial Number    | DRU's Ports                  |                 |               |
| 17-897-1563-5    | 1,4,17                       |                 |               |
| SW Version       | Temperature [C]              |                 |               |
| Digital-YadaYada | 25                           |                 |               |
|                  | Identify                     |                 |               |
|                  | <input type="checkbox"/> OFF |                 |               |

Table 29: dLRU/dMRU/dHRU Info Device Form Fields

| Field                    | Information                                                                                                                  |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Name                     | The name of the element as it appears in the system tree.                                                                    |
| Serial Number            | The serial number of the dL/M/HRU.                                                                                           |
| SW Version               | SW version updated in dL/M/HRU.                                                                                              |
| HE Chassis SN            | The serial number of the Head End chassis the dL/M/HRU is connected to.                                                      |
| DRU's Ports              | The DRU ports the dL/M/HRU is connected to. Same dL/M/HRU can be connected to several DRU ports.                             |
| Temperature              | The current temperature of the dL/M/HRU.                                                                                     |
| Identify (ON/OFF switch) | When the switch is ON the dL/M/HRU LEDs are blinking (can be used to identify the specific module among many other modules). |

The **Supported Bands** tab lists all the bands supported by the dL/M/HRU. Clicking on a band shows the band information. In the example below information about the AWS band is displayed:

The screenshot shows the 'Supported Bands' tab with a list of bands: 700, 600, PCS, 850, AWS, and 2.5TDD. The 'AWS' band is highlighted with a blue box and a callout labeled 'Bands supported'. Below the list, the 'DL Power Detector' section shows a value of 10. The 'Max DL Power' section shows a value of 15. The 'Power Reduction' section shows a value of 5. The 'Service State' is set to ON. A grid of 12 status indicators is displayed, all with green circles, indicating no active alarms.

| DL Power Detector | 10 | HW Failure       | UL Limiter        | Digital Signal Overflow |
|-------------------|----|------------------|-------------------|-------------------------|
| Max DL Power      | 15 | Over Temperature | DL Power Low      | VSWR                    |
| Power Reduction   | 5  | Over Temperature | Clock Unsync      | Self Protection         |
| Service State     | ON | Service Off      | Disconnected Port | TDD Unsync              |
|                   |    | Antenna Fault    | Low Transmission  | PA Overcurrent          |

The **Optical Links** tab has information about the optical links of the dL/M/HRU. Each optical link indicates the color of the most severe alarm related to it. When clicking on one of the inputs, information about the link appears. In the example below there are 3 input links because the DRAUL is connected to 3 DRU ports. link number 2 was clicked and the information of this link is displayed:

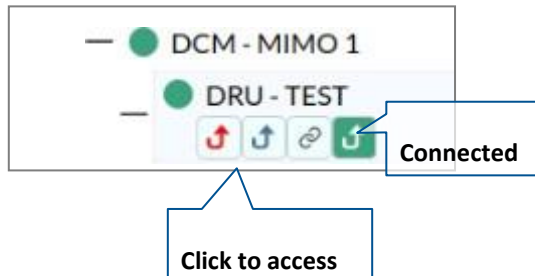
The screenshot shows the 'Optical Links' tab with three input links (1, 2, 3). Link 2 is selected. The details for Port Number 2 are displayed, including IP Address (11.0.0.12), Part Number (98), SFP Tx Level (59), SFP Temperature (25), SFP Rx Level (89), and SFP VCC (89). A grid of 8 status indicators is displayed, all with green circles, indicating no active alarms.

| Input Links (1-3): | Port Number 2:         | Part Number             | SFP Alarms    | CPRI Alarms |
|--------------------|------------------------|-------------------------|---------------|-------------|
| 1, 2, 3            | IP Address: 11.0.0.12  | 98                      | IO Error      | LOS         |
|                    | SFP Tx Level [dBm]: 59 | SFP Temperature [C]: 25 | Certified SFP | LOF         |
|                    | SFP Rx Level [dBm]: 89 | SFP VCC [V]: 89         | 64/66 Errors  | RAI         |
|                    |                        |                         |               | SDI         |

### 9.1.4 DRU to DCM Connection

#### ➤ Example: DRU to DCM(s) Connection

The following figures indicate connectivity between DRU and DCM(s). For DRU the device status per DCM is shown in the following manner:



The number of arrows is the number of DCMs the DRU is connected to. The user may skip between the DRUs connected DCMs by clicking the arrow of the desired DCM.

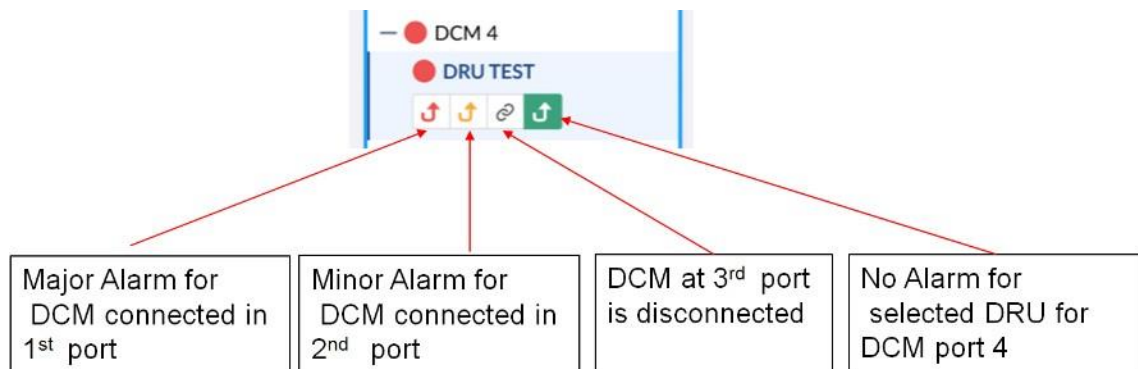


Figure 17: Example – alarms for connected DCMs

## 9.2 Events Screen

The events option provides indications on the different events in the system. This includes: alarms, upgrades, admin-actions, etc. The events may be sorted according to the time they occurred, severity, source, etc. The user may choose to display the alarms history, masked alarms or active alarms.

### ➤ To view system events

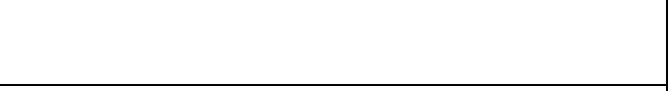
1. From the main menu, select **Events**. The following screen appears:

The screenshot shows the 'Events History' screen in the CORNING EVERON™ 6000 SOLUTIONS interface. The sidebar on the left contains navigation options: Device View, Events (highlighted with a red box and labeled 'Events list options'), Admin, Multi-stack, Channels Map, and Discontinuity. The main content area displays a table of events with columns: Severity, Seq, Time, Source, Name, and Info. The table lists 10 events with various statuses (green and red dots). Annotations highlight the 'Events list options' in the sidebar, 'Operation buttons' (FILTERS, SAVE, REFRESH) at the top right, and the 'System Events log' at the bottom right.

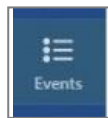
Figure 18 Events Screen

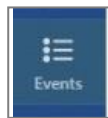
Table 19: Events Screen Sub-Options

| Tab     | Information                               | Screen Example |
|---------|-------------------------------------------|----------------|
| History | View all events in a certain time period. |                |
| Active  | View events which are currently active.   |                |

| Tab                                                                               | Information                           | Screen Example                                                                     |
|-----------------------------------------------------------------------------------|---------------------------------------|------------------------------------------------------------------------------------|
| Masked                                                                            | View events which are masked by user. |  |
|  | Set filters for displayed events      |  |
|  | Save to file                          |  |
|  | Refresh screen view                   |  |

➤ **To filter the events list**



1. Access the events screen (choose  from the main menu bar)
2. Select the type of events to view: active, masked or history events



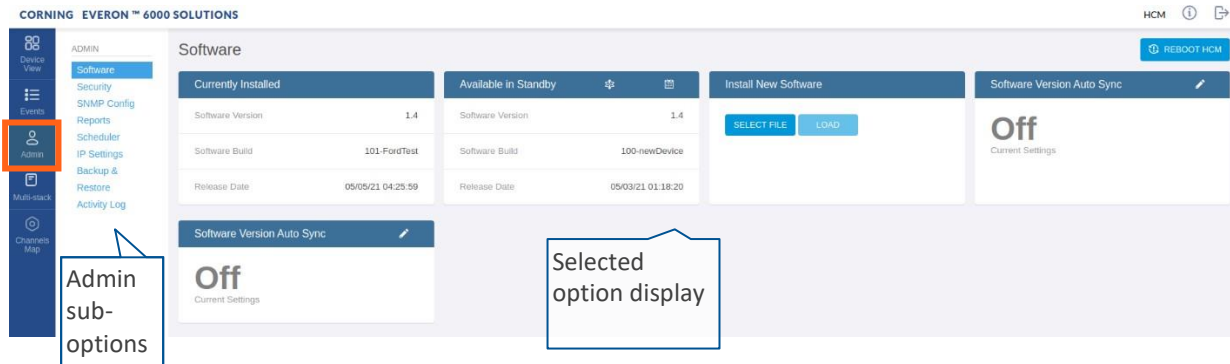
3. To fine tune the view:
  - **To customize the number of events displayed per page:** expand the Rows dropdown.
  - **To find a specific event:** Search by name.
  - **To save the list of events:** click on the  button.

## 9.3 Admin Screen

The admin screen allows the user to define administrators, update credentials, upgrade the HCM software, generate reports and other admin options as detailed in the table below.

### ➤ To access the Admin screen

1. Choose **Admin** from the main menu. the following screen appears:



The following table describes the admin options.

Table 20: Admin Screen Sub Options

| Tab              | Enables user to...                                                                                                                                                        |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Software         | Update HCM SW and enable SW auto synchronization.<br>Lists which SW version is currently installed and what versions are available. See section 9.3.1.                    |
| Security         | Create and manage multi-user account operators and monitor user activities. See section 9.3.2.                                                                            |
| SNMP Config      | Use any SNMP manager. See section 9.3.3.                                                                                                                                  |
| Reports          | View the summary of the information of various types of devices in the network along with basic physical and configuration information on each device. See section 9.3.4. |
| Scheduler        | Schedule specified system operations and administrative procedures. See section 9.3.5.                                                                                    |
| IP Settings      | Change IP addresses that were auto assigned by DHCP, ping a manually typed IP address, etc. See section 9.3.6.                                                            |
| Backup & Restore | Choose the stacks to be backed-up or re-stored to/from a backup file or SD card(s). See section 9.3.7.                                                                    |
| Activity Log     | View activities such as configuration changes, according to a range of criteria such as User, Date, Device or Activity type. See section 9.3.8.                           |

### 9.3.1 Software

The **Software** tab allows the user to upgrade the software version of the system elements.

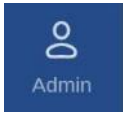
The HCM upgrade procedure consists of downloading the new software version, setting it as the “Active” version, and restarting the HCM. The new software can be activated either immediately or at a more convenient time as defined by the user. The procedures are performed via the **Software** submenu.

By default, Auto Sync option is enabled, hence the software of all installed devices at the site is updated to the software version of the HCM. If this automatic update is not desired, the “Auto Sync” option can be set to “OFF.”

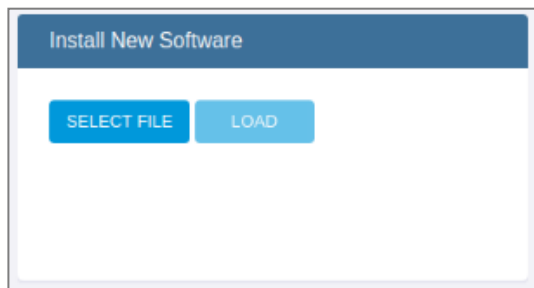


The button can be used when a reboot is required.

➤ **To upgrade the software version**

1. In the main menu bar, click  → .
2. **Download the new image file:** In the **Install New Software** area (see image below), click the **SELECT FILE** option and then browse for the required \*.img file. For the latest build, refer to the Corning Everon™ 6000 software release notes.

Once the required file is selected, click **LOAD**. The download progress is indicated in the progress bar and may take up to 10 minutes to complete. When the download is complete click **OK**.

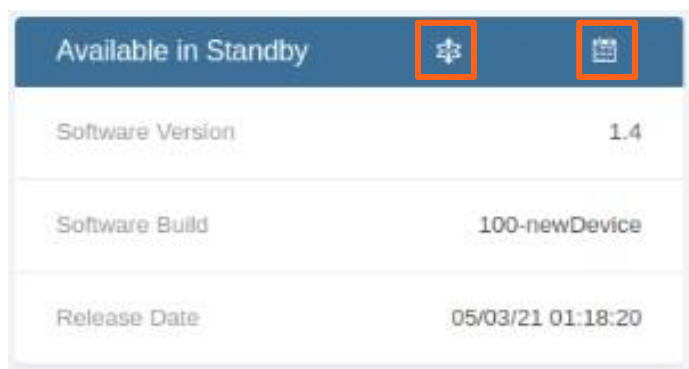



---

*Note: Do not attempt to refresh the browser or perform any operation before the download procedure is complete.*

---

3. **Activate the new software version:** After the download is complete, the new software version should appear in the **Available in Standby** area:





**Activate the new software** – either immediately by using the icon or at a scheduled (user defined)



time by using the icon.

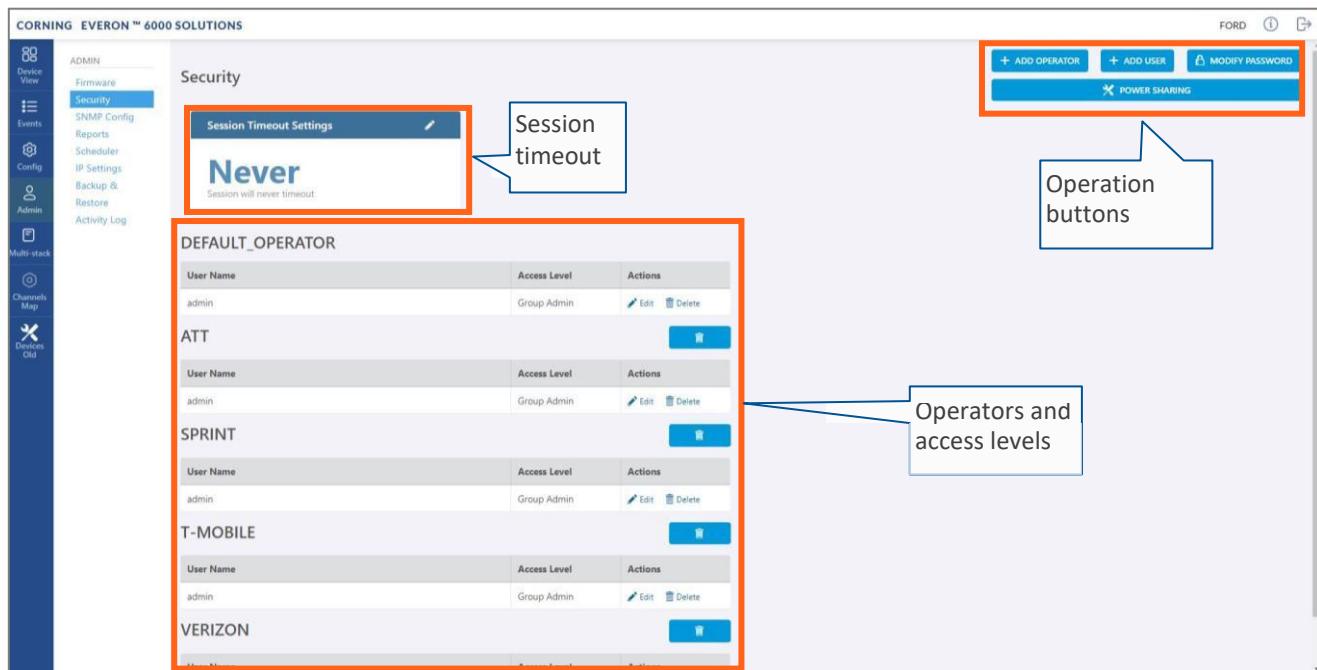
4. After the new software is activated, and the controller automatically restarts: **Log in to the system.**

The new software version should appear in the **Currently Installed** area:

| Currently Installed |                   |
|---------------------|-------------------|
| Software Version    | 1.4               |
| Software Build      | 15                |
| Release Date        | 02/11/21 06:24:29 |

### 9.3.2 Security

Access security is provided by definitions of user operators created by the system administrator. Operators are used to limit access to specific devices so that only devices allocated to an operator are accessible by members of that operator.



The **Security** tab allows the definition of the operators and the system users. The following three types of users are supported:

- **System administrator:** Single user of the highest level that can create operators with dedicated operator administrators. Only the system administrator can create new operators.
- **Operator administrator:** Automatically created for each operator that is created by the system administrator.
- **Operator users:** Defined by the corresponding operator administrator. Five hard-coded access levels are available per operator:

Table 30: Operator Users Access Levels

| Level     | Description                                                                                                                                                                                       |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operator  | R/O access to Devices and Events screens.                                                                                                                                                         |
| Installer | R/O Access to Devices and Events screens.<br>Write access to <i>free text parameters</i> to allow the definition of location and identification information.                                      |
| RF Tech   | Access to the Devices, Config, Events and Channels screens: <ul style="list-style-type: none"> <li>• Write access to all <i>RF</i> parameters.</li> <li>• R/O to all other parameters.</li> </ul> |
| IT Tech   | Access to the Devices and Admin screens: <ul style="list-style-type: none"> <li>• Write access to all non-<i>RF</i> parameters.</li> </ul>                                                        |

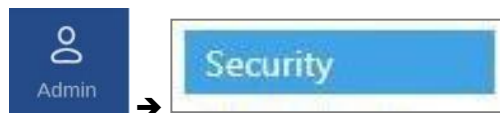
| Level          | Description                                                                                                                                                                |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | <ul style="list-style-type: none"> <li>Access to activity logs of all users and operators.</li> <li>HCM software upgrade.</li> <li>R/O to all other parameters.</li> </ul> |
| Operator Admin | The operator admin has the capabilities of all the other access levels and the permissions to create and manage the users in the operator.                                 |

➤ **To create a new operator**

See section 5.2.

➤ **To add users to an operator**

1. Log in as the **operator** administrator (use relevant operator name at log in).



2. In the main menu bar, click



3. Click the button. The following form appears:

4. Enter the relevant data:

- The Name of the user (alphanumeric characters, no spaces)
- An access level according to Table 30: Operator Users Access Levels.
- Set the user Password (at least 8 characters) and type it again in the Confirm (password) field.

---

*Note: The strength of the password is indicated upon entering it in the field (i.e., very weak/weak/reasonable/strong). Weak passwords will not be accepted.*

---

When done filling in the information, click **OK**.

---

*Note: An operator can have up to 20 users. Maximum of 31 operators and 500 users per HCM.*

---

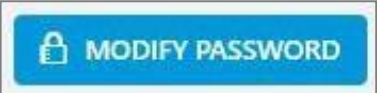
5. The new user account is added to the operator list. For example:  
ATNT operator has three users defined: admin, RF and Installer.

| ATNT      |              |                                                                                          |                                                                                            |
|-----------|--------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| User Name | Access Level | Actions                                                                                  |                                                                                            |
| admin     | Group Admin  |  Edit |  Delete |
| RF        | RF Tech      |  Edit |  Delete |
| Installer | Installer    |  Edit |  Delete |

6. Users can be removed from the operator list using the  icon. User information, including password, can be modified using the  icon. The operator administrator can change the passwords of the users in the operator.

*Note: Users with "Operator Admin" access level can be added by the operator admin. The original operator admin can be removed.*

#### ➤ To modify Password by the user

- In the main menu bar, click  → .
- Click the  button. The following form appears:

**Modify Password**

Enter old password

Enter new password

Confirm new password

- Enter the old password and the new password, confirm the new password and then click "SAVE".  
The password must consist of at least 8 alphanumeric characters, no spaces. Weak passwords will not be accepted.

*Note: The operator admin can change the passwords of the users in his operator as explained in the flow above: "To add users to a operator" step 5.*

### ➤ Session Access and Timeout

Sessions are accessed or terminated according to the following criteria:

- Up to ten simultaneous sessions for multiple users are supported.
- The login of users is enabled according to priority. When the maximum number of multiple users are logged in and another user attempts to login, the outcome depends on the level of the user attempting the login:
  - For a higher-level user, the lowest-level user with the longest session time is logged out and the appropriate session termination message appears.
  - For the same level or lower level than the lowest logged in level, session access is denied, and the appropriate message appears.
  - If no session activity is detected for the configured amount of time, i.e. session timeout, the session is terminated.

### ➤ To configure the session timeout

1. In the main menu bar, click  → .

2. In the **Session Timeout Settings** area, click the  icon.



3. Enter a timeout value between 1-255 (minutes) or **Never**. Then click **OK**.

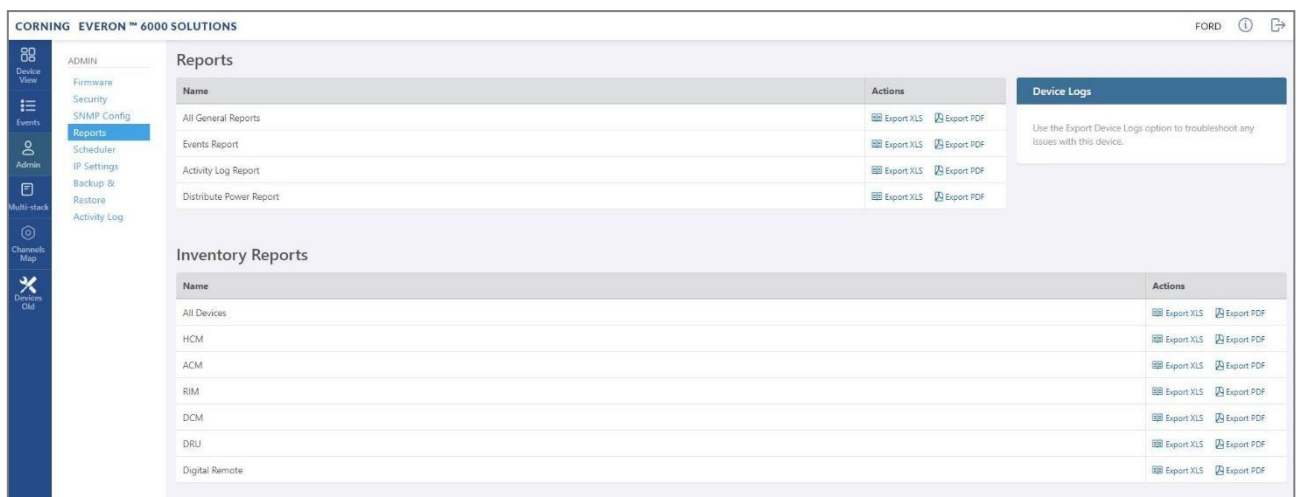
### 9.3.3 SNMP Config

The SNMP config allows configuring and using any SNMP manager. For more information on SNMP management refer to chapter 10.



### 9.3.4 Reports

The **Reports** option, provides access to all the reports provided by the system, including the **general** and **Inventory** Reports. The reports can be generated either in XLS or in PDF format. In addition, **Device Logs** can be exported for troubleshooting by the system administrator.



#### General Reports

The **General Reports** options are detailed in the table below.

Table 31: General Reports

| Report Type             | What does the report include                                                                           |
|-------------------------|--------------------------------------------------------------------------------------------------------|
| All General Reports     | This report includes the events, activity log and distribute power reports.                            |
| Events Report           | Three reports are generated: History (all events), active events and masked events.                    |
| Activity Log report     | Lists the user activity with information such as time stamp, affected module, username, operator, etc. |
| Distribute Power Report | Lists the RF power distribution, configured and actual output power, for all system remotes and RIMs.  |

The General reports can be exported individually or simultaneously, using the **All General Reports** option, in PDF or XLS format. When all General files are exported in PDF format, the files are provided as a single ZIP file that includes individual PDF files; when exported in XLS format, the files are provided in a single XLS file with dedicated tabs.

#### ▪ Inventory Reports

**Inventory reports** provide detailed information in the selected format of "All Devices" or a specific system element. The information includes location, installed versions, IP Address, and more.

#### ▪ Device Logs

**Device logs** are the HCM logs, which are accessible to system admin level users only; used for tech support troubleshooting.

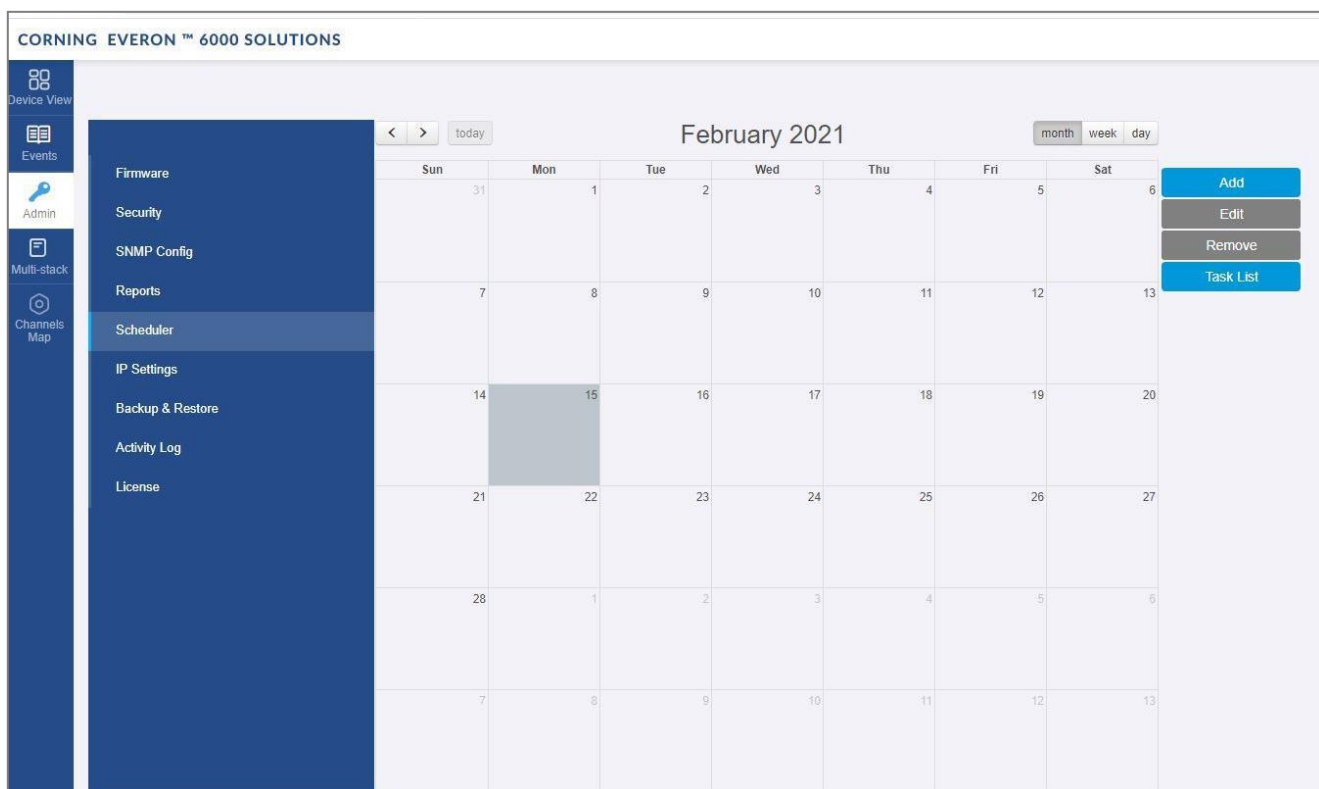
#### ➤ To generate a report



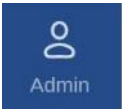
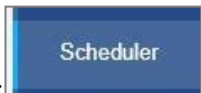
1. In the main menu bar, click **Admin**.
1. Choose the type of report to generate and click **Export XLS** or **Export PDF** in the appropriate line.
2. The report is downloaded to your computer.

## 9.3.5 Scheduler

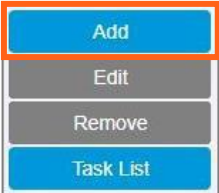
The task scheduler enables schedule-specified system operations and administrative procedure scheduling. HCM software update and TDD configurations change can be scheduled. You can also set reminders by adding **Maintenance** notices to your calendar.



➤ **To add an event to the scheduler**

1. In the main menu bar, click  → 
2. You can change the calendar view to show today, the current week or the current month by clicking the

option you prefer: 

3. Click on  to schedule an event

4. Select the event to schedule: 

- TDD configurations change – specify the new TDD parameters by clicking **Schedule TDD Params** (refer to 5.5)
  - Swap – update the HCM software to a version **Available in Standby** (refer to 9.3.1)
  - Maintenance – add a reminder to the calendar
5. Specify the time for which you want to schedule the event and whether it's a one-time event or recurring. You can also add a comment
  6. Click **OK**

### 9.3.6 IP Settings

The **IP Settings** tab allows the configuration of all stacks in the current MS operator. It allows changing IP addresses that were auto assigned by DHCP, pinging a manually typed IP address and more. For more information about remote access configuration refer to section 4.2.

**IP Settings**

**Multicast Address**

Address: 224.21.21.21

MS group IP – used for communication between the group stacks

Edit stack specific info

Stacks [FORD]

| Name | IP Address(IPv4) | Status    |
|------|------------------|-----------|
| FORD | 10.208.255.175   | Connected |

List of stacks in the current MS group

All HCMs in the MS-operator are automatically updated when one stack in the operator is updated. The update is done using the Multicast Address which is used for communication between the stacks in the operator.

Each HCM has three types of RJ45 Ethernet ports: local port, LAN port and four internal ports.



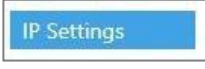
The local port is usually used for first time local access – refer to section 4.1.

The LAN port is used for remote access – refer to section 4.2.

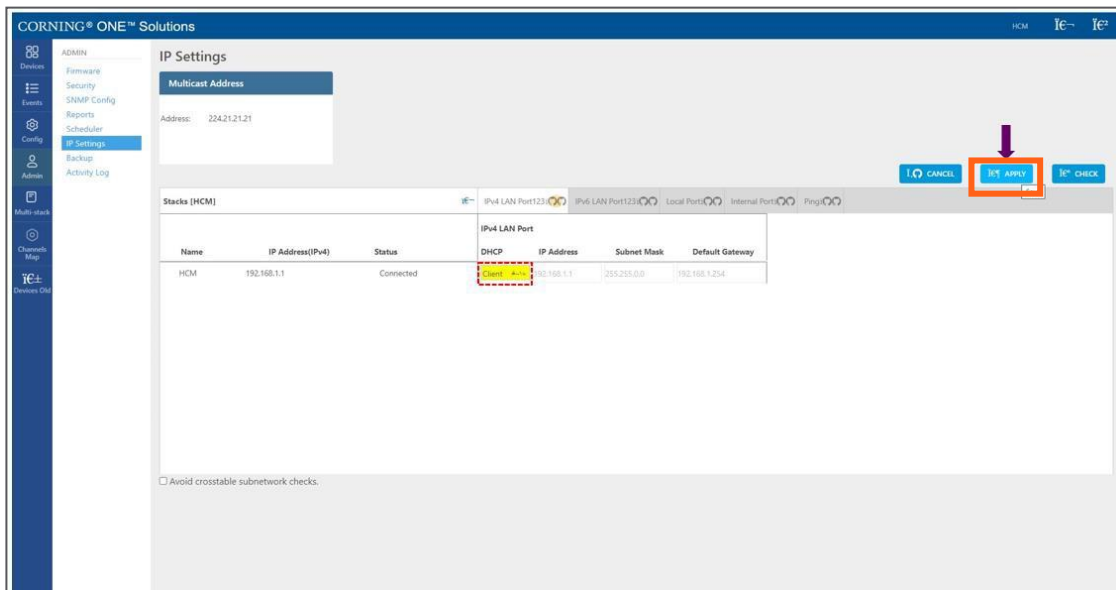
The internal ports are used for management of the connected ACMs.

Each port DHCP can be set to "Client" for dynamic IP addressing. If DHCP is set to "None" the IP address, subnet mask and default gateway must be set manually.

➤ **To modify the IP settings**

1. In the main menu bar, click  → .
2. Click  and then select the port which settings you want to modify:
 

IPv4 LAN Port123
IPv6 LAN Port123
Local Port
Internal Port
3. Set DHCP as client for dynamic IP addressing or set it to None to enter the IP settings manually.



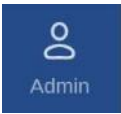
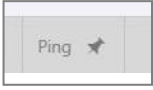
4. Click on **Apply** to save the settings.

*Note: The HCM restarts if the LAN IP address is updated.*

A Ping Tool option is provided in the IP Settings pane. Use this tool to verify access to IP hosts (rather than opening another application).

In the “Ping” work area, enter the IP address and then click the “PING” button. The validity/invalidity result of the IP address appears in the Result line.

#### ➤ To use the Ping tool

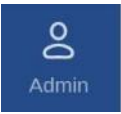
1. In the main menu bar, click  → .
2. Select the Ping tool by clicking on .
3. Enter the IP address you would like to ping.
4. Click **PING**. The ping result is displayed.

## 9.3.7 Backup & Restore

The **Backup** tab allows the **system administrator** to backup and restore system configurations. Other users don't have the permissions to perform these procedures.

The system administrator selects the configuration of which stacks to back up to a file and the Micro SD card inserted in the HCM. It is recommended to perform backup after each configuration change.

#### ➤ To backup and restore configurations

1. In the main menu bar, click  → .
2. Select the stacks to be backed up by checking their boxes.
3. Click **Backup**. A backup file will be created, and the configurations will be saved in the HCM SD card as well.

4. To restore configurations from a file: click the **Select File** button in the **Restore From File** area, select a file from the computer and click **Restore**.

To restore configurations from the HCM Micro SD card: select the configuration file from the drop-down list in the **Restore from SD Card** area and click **Restore**.

### 9.3.8 Activity Log

The **Activity Log** is used to view activities such as configuration changes, according to a range of criteria such as User, Time, Operator, etc. The information can be saved in \*.csv format (can be opened with MS-Excel).

The full log list of all user activities is displayed:

| Seq | Time              | User  | Source                 | Group            | Type | Location           | Name | SN #          | Info                             |
|-----|-------------------|-------|------------------------|------------------|------|--------------------|------|---------------|----------------------------------|
| 511 | 02/15/21 17:28:18 | admin | WEB GUI 149.42.48.228  | ATT              | HCM  | 22-19-32-0967/HCM  | FORD | NDD9C0046     | User Logged In                   |
| 510 | 02/15/21 16:25:36 | admin | WEB GUI 149.42.59.57   | ATT              | RIM  | 22-19-32-0967/RIM7 |      | 22-19-20-0207 | RIM Alarm Mask Changed           |
| 509 | 02/15/21 16:24:49 | admin | WEB GUI 149.42.59.57   | ATT              | ACM  | 22-19-32-0967/ACM  |      | 05-17-01-0123 | ACM Alarm Mask Changed           |
| 508 | 02/15/21 16:18:04 | admin | WEB GUI 149.42.59.57   | ATT              | HCM  | 22-19-32-0967/HCM  | FORD | NDD9C0046     | User Logged In                   |
| 507 | 02/15/21 16:07:40 | admin | WEB GUI 10.208.255.180 | DEFAULT_OPERATOR | HCM  | 22-19-32-0967/HCM  | FORD | NDD9C0046     | User Logged In                   |
| 506 | 02/15/21 15:41:33 | admin | WEB GUI 10.208.254.161 | DEFAULT_OPERATOR | HCM  | 22-19-32-0967/HCM  | FORD | NDD9C0046     | User Logged Off                  |
| 505 | 02/15/21 15:41:18 | admin | WEB GUI 10.208.254.161 | DEFAULT_OPERATOR | HCM  | 22-19-32-0967/HCM  | FORD | NDD9C0046     | User Logged In                   |
| 504 | 02/15/21 15:41:07 |       | WEB GUI 10.208.254.161 | DEFAULT_OPERATOR | HCM  | 22-19-32-0967/HCM  | FORD | NDD9C0046     | User Failed to Log In, Attempt 1 |
| 503 | 02/15/21 15:15:19 | admin | WEB GUI 10.208.255.180 | DEFAULT_OPERATOR | HCM  | 22-19-32-0967/HCM  | FORD | NDD9C0046     | User Logged In                   |
| 502 | 02/15/21 14:47:54 | admin | WEB GUI 10.208.255.180 | DEFAULT_OPERATOR | HCM  | 22-19-32-0967/HCM  | FORD | NDD9C0046     | User Logged In                   |

#### ➤ To filter or fine tune the activity logs view



1. In the main menu bar, click **Admin** → **Activity Log**.
2. If the system includes multiple stacks, select the stack per which you would like to view the activity log.
3. To filter/fine tune the view:
  - **Rows Per Page** can be changed to list a different number of activities per page. Page navigation is at the bottom of the screen.
  - Enter a specific value in **Search** field (serial number, exact time and date, etc.) to display only the activities that match the search criteria.
  - Click on a specific header (i.e. Time) to rearrange activities according to the selected criteria in ascending or descending order.
  - Use the **FILTERS** button to limit the displayed information according to device type, action type, or date.
4. To save the activity log: click on the **EXPORT** button.

## 9.4 Multi-Stack Screen

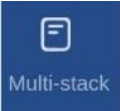
**MS management** allows centralized network management of sites with multiple stacks deployment, sharing common configuration, where user-defined operators of stacks are automatically and immediately updated with common data.

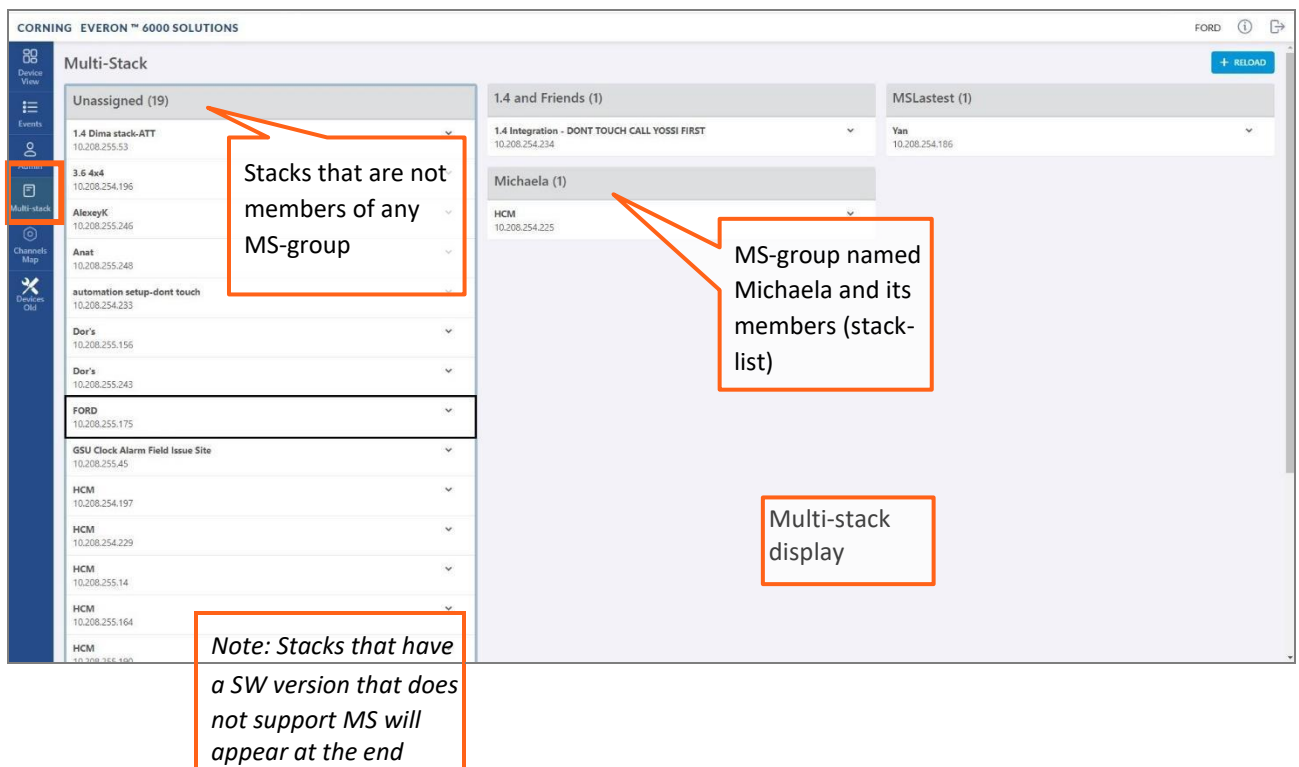
**MS management** allows a main admin (i.e. sysadmin) user to access a single stack GUI and create an **MS-operator** of up to 100 stacks. The network publishes the list of grouped stacks; then, when an **MS-group** stack member is updated, the updates and common-data attributes are immediately distributed and synchronized (according to the latest time-stamped and indexed data) to each of the stacks that are members of that **MS-operator**.

In addition, the system allows access and management of private (per stack) attributes (such as name, stack-tree, etc.).

The system allows up to 5 users to access and manage the **MS-operator** GUI simultaneously (one of them can be sys-admin user).

### ➤ To view the information about the system stacks

1. Select  from the main menu. The following screen appears



The screenshot displays the 'Multi-Stack' interface. On the left, a list of stacks is shown under the heading 'Unassigned (19)'. Some stacks are grouped under an 'MS-group' (e.g., 'Michaela (1)'). Annotations point to these groups, stating 'Stacks that are not members of any MS-group' and 'MS-group named Michaela and its members (stack-list)'. A note at the bottom states: 'Note: Stacks that have a SW version that does not support MS will appear at the end'. The right side of the screen shows details for selected stacks, including '1.4 and Friends (1)' and 'MSLastest (1)'. A 'Multi-stack display' annotation points to the main content area.

2. The user can view the information of the different stacks of the system by clicking the stack name.

## 9.5 Channels Screen

The Channels screen allows the user to create, view and modify the system RF channels.

The configuration is done via a map: each map is an operator of channels. The system allows storage of two map configurations: one that is currently being used by the system (named VALID map), and another map configuration that may be edited for future use (named INVALID map), where each map determines the configuration of all the system RF channels.

### ➤ To configure the system RF channels



1. Select  from the main menu. The following screen appears

**Channels Map Validation Phase:**

| Phase | Result  | Source Id | Error Description |
|-------|---------|-----------|-------------------|
| HCM   | Success | aaaa      | sdkfjskdfksdjf    |
| DCM   | Success | bbbb      | sdkfjskdfksdjf    |
| DRU   | Failed  | cccc      | sdkfjskdfksdjf    |
|       |         | aaaa      | sdkfjskdfksdjf    |
|       |         | bbbb      | sdkfjskdfksdjf    |
|       |         | cccc      | sdkfjskdfksdjf    |

| CELL ID   | DL CF (MHz) | UL CF (MHz) | UL BW (MHz) | DL BW (MHz) | Operator | SCs (KHz) | Technology | TDD | Power Reduction (dB) | RIM Number | RIM Type | MIMO | Channel Mute |       |
|-----------|-------------|-------------|-------------|-------------|----------|-----------|------------|-----|----------------------|------------|----------|------|--------------|-------|
| Channel 1 | Lobby       | 2500        | 2500        | 5           | 5        | test      | 15         | 4G  | YES                  | 0          | 1        | TDD  | 1T1R         | False |
| Channel 2 | sis         | 2600        | 2600        | 40          | 40       | test      | 60         | 5G  | YES                  | 0          | 2        | TDD  | 1T1R         | False |

Buttons: IMPORT, EXPORT, + NEW CHANNELS MAP, SUBMIT, EXIT

2. To configure a new system, the user is required to create a new map and then add channels to it. Channels can be added to existing maps as well. For more information:

- Map options and status, see section 9.5.1
- Map management flows, see section 9.5.2
- Add a new channel, see section 9.5.3
- Submit a map, see section 9.5.4

### 9.5.1 Map options and status

The following table shows the available options for managing the RF channels map:

Table 32: Map Options

| Option                                                                              | Enables user to...                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | When clicking this button the following option appears:<br><br>Switch between saved maps: invalid map or valid map.                                               |
|    | Save the map currently loaded in xls format.                                                                                                                                                                                                       |
|    | Load a map from xls file.                                                                                                                                                                                                                          |
|    | Create a new map.                                                                                                                                                                                                                                  |
|    | Add a new RF channel to the map currently loaded.                                                                                                                                                                                                  |
|   | Check validity of the map currently being edited. If the map is successfully validated it will replace the existing valid map. If errors are encountered, the map currently being edited will replace any existing (previously saved) invalid map. |
|  | Exit back to the main menu.<br>NOTE: before exiting, make sure to save changes to the edited map; otherwise, they will be lost.                                                                                                                    |

A map of channels can have one of the following statuses.

Table 33: Map Status

| Map status                                                                          | Enables user to...                                              |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------|
|  | The map was submitted, but errors were found during activation. |
|  | The map was submitted, no errors were found during activation.  |
|  | Map was not submitted yet.                                      |

---

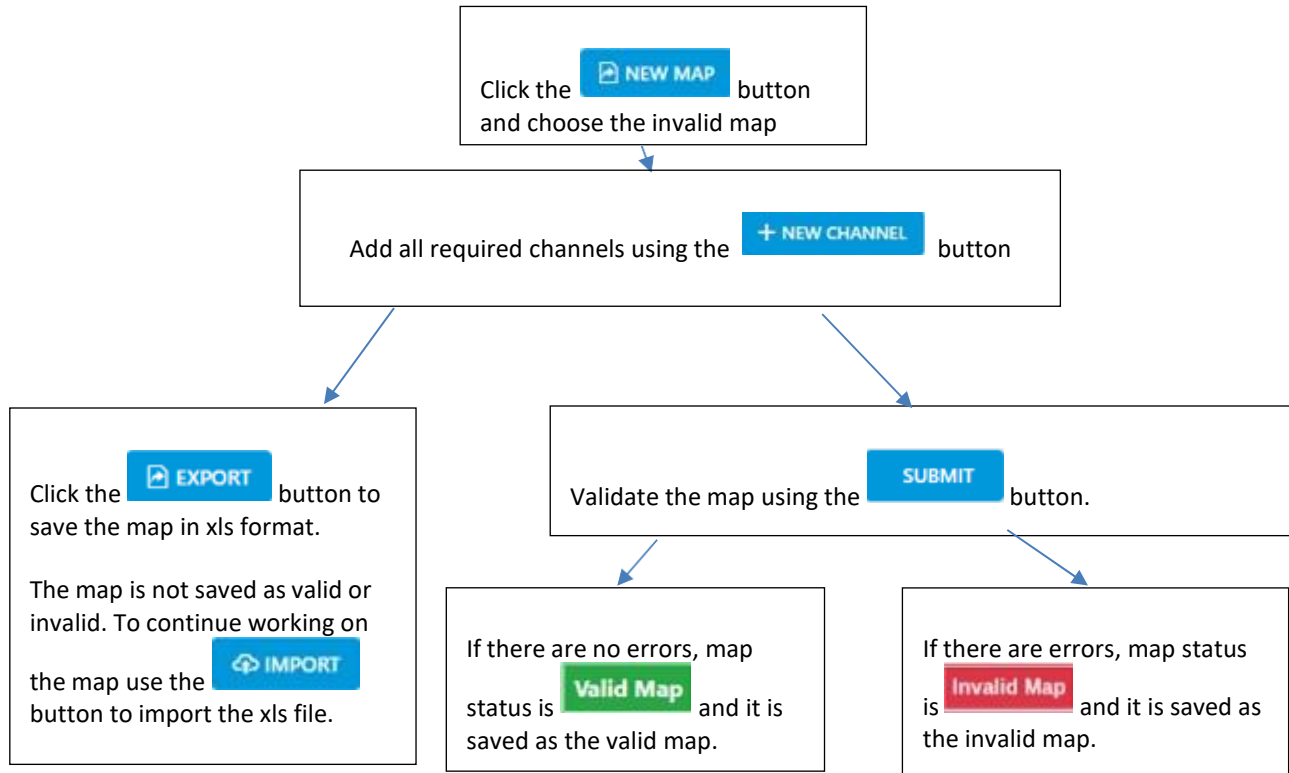
*Note: At any given time only 2 maps are saved: one valid map and one invalid map.*

---

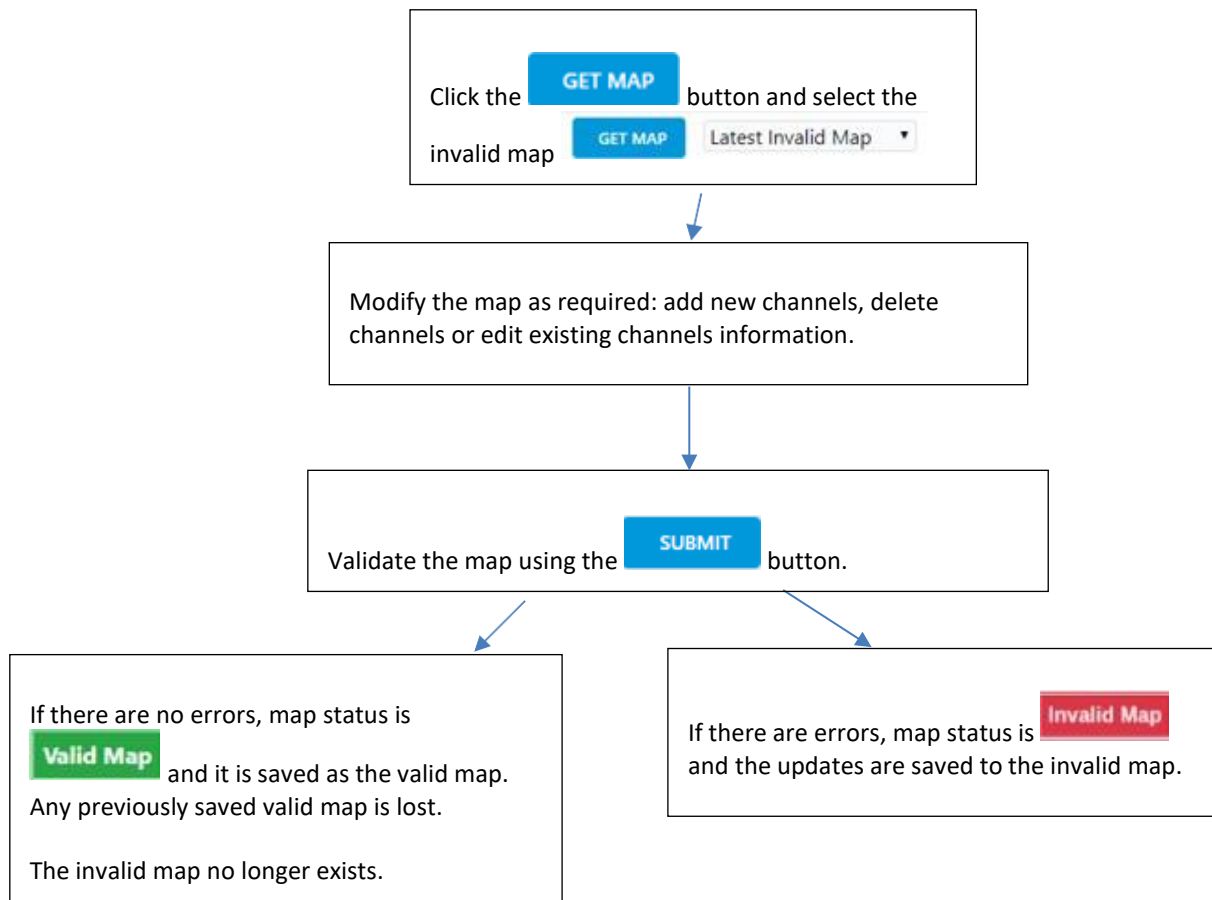
## 9.5.2 Map Management Flows

Below are examples of two map management scenarios.

### ➤ Example1: Create a new map from scratch



➤ **Example 2: Change an invalid map and repeat the validation process:**



### 9.5.3 Add a New Channel

When choosing the **New Channel** option, the following form appears:

Table 34: Add Channel Form

| Field           | Information                                                                                         |
|-----------------|-----------------------------------------------------------------------------------------------------|
| Cell Id         | Channel name entered by the user, may include location and other information regarding the channel. |
| DL CF           | Downlink Center Frequency (MHz).                                                                    |
| UL CF           | Uplink Center Frequency (MHz).                                                                      |
| BW              | Bandwidth (MHz).                                                                                    |
| Operator        | Name of operator (name of telecommunication company).                                               |
| TDD Service     | YES/NO; Indicates whether Time Division Duplexing is enabled.                                       |
| Power Reduction | Indicates a power failure                                                                           |
| RIM Number      | Slot number of the connected RIM. Slots 1-8 are IHU slots and slots 9-20 are HEU slots.             |
| Technology      | The applicable values are 3G/4G/5G.                                                                 |
| SCS             | Sub Carrier Spacing (kHz).                                                                          |
| MIMO            | Number of transmitters and receivers.                                                               |

*Note: Up to 32 channels can be added (16 channels per DCM).*

## 9.5.4 Submit a map

- When changes are made to any map the status of the map is **map in process** until the changes are submitted:

The screenshot shows the map configuration interface. At the top, there are buttons: GET MAP, EXPORT, IMPORT, NEW MAP, and a button labeled 'Map In process' which is circled in red. Below these buttons, there is a status bar showing 'Invalid Map Failures Information : HCM | success DCM | failed DRU | success'. Below this, there are two error messages in a yellow box:

1. Error occurred in cahnnel #4 please fix this error and activate map again
2. Error occurred in cahnnel #5 please fix this error and activate map again

Below the error messages is a table with the following columns: CELL ID, DL CF (MHz), UL CF (MHz), BW (MHz), Operator, SCS (KHz), Technology, TDD, Power Reduction (dB), RIM Number, RIM Type, and MIMO. The table contains four rows of data:

| CELL ID | DL CF (MHz) | UL CF (MHz) | BW (MHz) | Operator | SCS (KHz) | Technology | TDD | Power Reduction (dB) | RIM Number | RIM Type | MIMO |
|---------|-------------|-------------|----------|----------|-----------|------------|-----|----------------------|------------|----------|------|
| 1       | 1000.5      | 1000.5      | 5        | 5        | 30        | 4G         | YES | 10                   | 4          | -        | 4T4R |
| 2       | 1000.5      | 1000.5      | 10       | 5        | 15        | 5G         | NO  | 5                    | 9          | -        | 4T4R |
| 3       | 1000.5      | 1000.5      | 15       | 5        | 60        | 4G         | YES | 7                    | 8          | -        | 1T1R |
| 4       | 1000.5      | 1000.5      | 15       | 5        | 15        | 4G         | NO  | 13                   | 8          | -        | 1T1R |

At the bottom of the interface, there are buttons: + NEW CHANNEL, SUBMIT, and EXIT.

- When done making changes to the map, you may press the **Submit** button. Validation of the map begins, and a progress bar appears:

The system performs a basic check to make sure all parameters have valid values according to system limits, such as: Number of channels per specific BW, channels overlap, etc.

The screenshot shows the map configuration interface during the activation process. At the top, there are buttons: GET MAP, EXPORT, IMPORT, and NEW MAP. Below these buttons, there is a section titled 'Activating Map:' with a message: 'This process may take a several minutes, please wait!'. Below this message is a blue progress bar. A red box with an arrow points to the progress bar, and the text 'Progress bar' is written inside the box. Below the progress bar is the same table as in the previous screenshot:

| CELL ID | DL CF (MHz) | UL CF (MHz) | BW (MHz) | Operator | SCS (KHz) | Technology | TDD | Power Reduction (dB) | RIM Number | RIM Type | MIMO |
|---------|-------------|-------------|----------|----------|-----------|------------|-----|----------------------|------------|----------|------|
| 1       | 1000.5      | 1000.5      | 5        | 5        | 30        | 4G         | YES | 10                   | 4          | -        | 4T4R |
| 2       | 1000.5      | 1000.5      | 10       | 5        | 15        | 5G         | NO  | 5                    | 9          | -        | 4T4R |
| 3       | 1000.5      | 1000.5      | 15       | 5        | 60        | 4G         | YES | 7                    | 8          | -        | 1T1R |
| 4       | 1000.5      | 1000.5      | 15       | 5        | 15        | 4G         | NO  | 13                   | 8          | -        | 1T1R |

At the bottom of the interface, there are buttons: + NEW CHANNEL, SUBMIT, and EXIT.

3. A pop up window indicates the activation status. If activation fails, the errors are displayed, as well as the activation status per module. In the following example, the map status is "invalid map" (the map will be saved as the invalid map).

**Map status**

**Errors found**

**Activation status per module:**  
Activation passed at HCM and DCM levels, but failed in DRU level

| CELL ID | DL CF (MHz) | UL CF (MHz) | BW (MHz) | Power Reduction (dB) | RIM Number | RIM Type | MIMO |
|---------|-------------|-------------|----------|----------------------|------------|----------|------|
| 1       | 1000.5      | 1000.5      | 5        | 10                   | 4          | -        | 4T4R |
| 2       | 1000.5      | 1000.5      | 10       | 5                    | 9          | -        | 4T4R |
| 3       | 1000.5      | 1000.5      | 15       | 7                    | 8          | -        | 1T1R |
| 4       | 1000.5      | 1000.5      | 15       | 13                   | 8          | -        | 1T1R |
| 5       | 1000.5      | 1000.5      | 15       | 13                   | 8          | -        | 1T1R |

**Activation Failed**  
Map activation failed.  
Ok

**Pop up window indicating activation failed**

If activation is successful, the status of the map becomes "valid map" (map is saved as the valid map).

If the user makes changes to an invalid map, submits it and activation passes, the map is saved as the valid map and the invalid map is deleted.

## 10. SNMP Management

The Everon system supports SNMP protocol, which allows standard monitoring via a large variety of 3rd party endpoint monitoring tools, also known as SNMP manager agents (e.g., HP OpenView, CA Unicenter, IBM Tivoli, CastelRock SNMPc): The Everon system sends indications on system events and failures to a user-defined monitoring destination-address, by sending SNMP protocol traps. Integration between the Everon system and the monitoring agent, is done by loading Everon MIB files (Management Information Base) to the SNMP manager agent. These files include system driver-like data required for the two systems to communicate, where one of the parameters is a binding table (provided here in section 10.3), which allows interpretation of the supported traps sent by Everon.

Everon supports simultaneously two SNMP protocol versions - SNMPv2 and SNMPv3. This allows system monitoring by multiple tools that support different SNMP protocol versions.

1. **SNMPv2** is enabled by default and can be disabled by the user. The user can also modify the community string, which is an ID of the SNMP device used for communication with the SNMP manager. The community string is sent with all SNMP requests.
2. **SNMPv3** provides a secure SNMP protocol and facilitates remote configuration of the SNMP entities, thus simplifying remote administration. The security aspect is addressed by offering both strong authentication and data encryption for privacy, whereas the administration aspect focuses on notification originators and proxy forwarders. SNMPv3 authentication and security:
  - Verification for each received SNMP message that it has not been modified during transmission through the network.
  - Verification of the user identity for which the received SNMP message was supposedly generated.
  - Detection of received SNMP messages, requesting or containing management information, whose time of generation is not recent.

---

*Note: Everon allows the user to perform system configurations via the SNMP manager.*

---

➤ **To allow SNMP monitoring, the user needs to perform the following steps:**

1. Perform SNMP Setup, see **Error! Reference source not found.**
2. Optional: Test the configuration using a MIB browser, see 10.2
3. Start monitoring the system

---

*Notes:*

*\* The supported traps are listed in section 10.4*

*\* The information each trap includes is listed in section.*

---

## 10.1 SNMP Setup

This section details the following steps, required to set SNMP trap monitoring:

1. Through Everon GUI: Set the SNMP protocol version parameters (SNMPv2 / SNMPv3), see 10.1.1
2. Through Everon GUI: Set traps monitoring destination addresses, see 10.1.2
3. Through your 3rd party SNMP monitoring tool: Load the MIB files, see 10.1.3

### 10.1.1 Set Protocol Version Parameters (SNMPv2 / SNMPv3)

➤ **To set SNMP version:**

1. Choose **Admin** from the main menu → **SNMP Config**. The following screen appears:



2. In the following instructions, refer to the protocol version relevant in your deployment, and perform the set of instructions listed below.

➤ **To configure SNMPv2 parameters**

1. In the main menu bar, click  → .
2. In the "V2 Configuration" area, click  to change the current configurations.

The **SNMP Community** dialog appears:



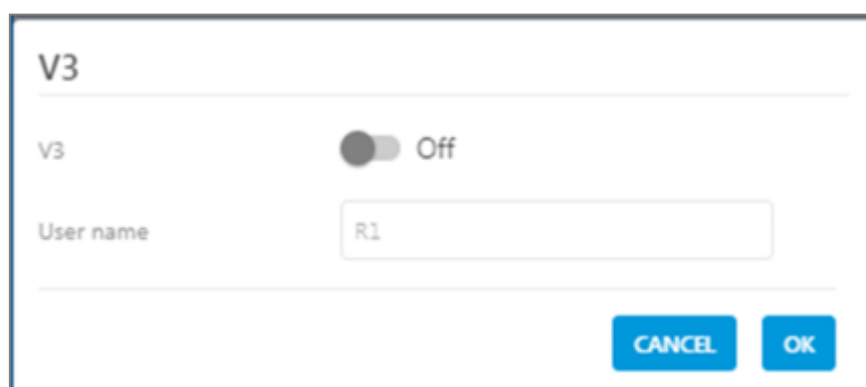
The dialog box is titled "SNMP Community" with a close button (X) in the top right corner. It contains the following fields and controls:

- Modify SNMP community:**
  - Enable V2:** A checkbox that is currently unchecked.
  - Command:** A dropdown menu showing "Read".
  - Community:** A text input field containing "public123".
- At the bottom, there are two buttons: **OK** and **CANCEL**.

3. Select/unselect the checkbox next to "Enable V2" to enable/disable SNMPv2.
4. If necessary, modify the community name in the **Community** field.
5. Click **OK**.

➤ **To configure SNMPv3 parameters**

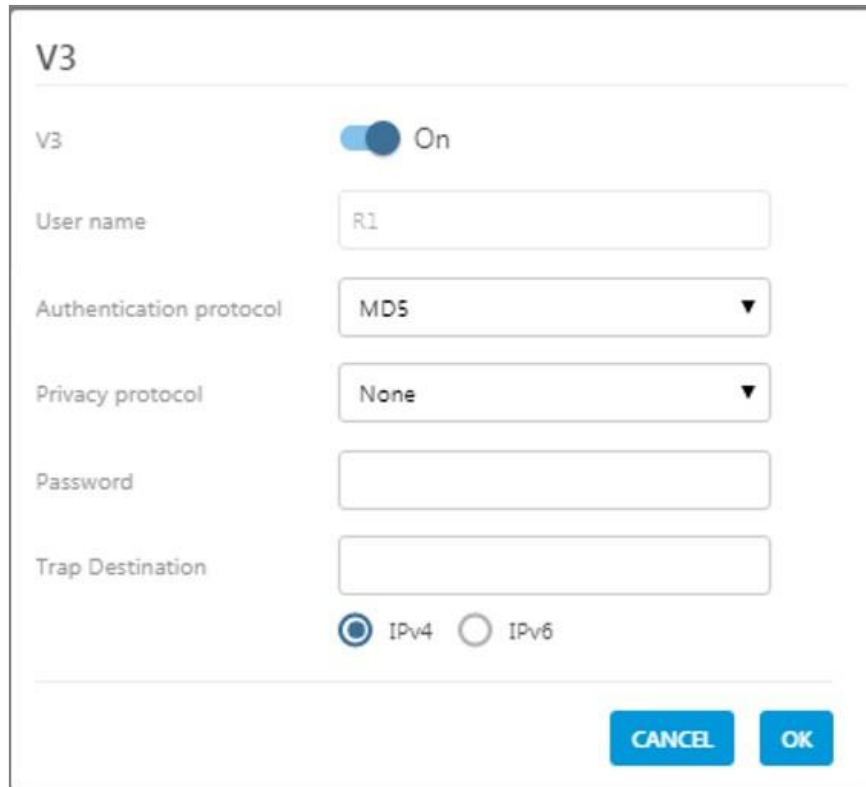
1. In the main menu bar, click  → .
2. Select the required user from the **User Name** list and click . The following dialog appears:



The dialog box is titled "V3" and contains the following fields and controls:

- V3:** A toggle switch that is currently set to "Off".
- User name:** A text input field containing "R1".
- At the bottom right, there are two buttons: **CANCEL** and **OK**.

3. Enable "V3" to get the SNMPv3 configuration options:



The image shows a configuration window titled "V3". At the top, there is a toggle switch for "V3" which is currently turned "On". Below this, there are several input fields and dropdown menus: "User name" with the value "R1", "Authentication protocol" with a dropdown menu showing "MD5", "Privacy protocol" with a dropdown menu showing "None", "Password" with an empty text box, and "Trap Destination" with an empty text box. At the bottom, there are two radio buttons for "IPv4" (which is selected) and "IPv6". In the bottom right corner, there are two buttons: "CANCEL" and "OK".

4. Configure the following SNMPv3 parameters for the user:
  - Authentication protocol – MD5/SHA.
  - Privacy protocol – None/DES/AES-128.
  - Password – one password for both authentication and privacy protocols.
5. Select the internet protocol version (IPv4/IPv6) for the SNMP traps and enter the trap destination address:
  - IPv4 - SNMPv3 trap destination address: IP (x.x.x.x).
  - IPv6 - SNMPv3 trap destination address: IP (0:0:0:0:0:0:0:0).
6. Click **OK**.

### 10.1.2 Set Traps Monitoring Destination Addresses

This section explains how to configure the IP addresses to which SNMP traps are sent. Both IPv4 and IPv6 addresses are supported.

In addition, each SNMP trap destination can be configured with a HB trap timer ("keep alive"). This option enables a periodical trap indicating that the device is operational. The trap is sent every user-configured time interval: 1-59 minutes.

---

*Note: The defined HB interval must be the same for all devices in the system. This option is disabled by default.*

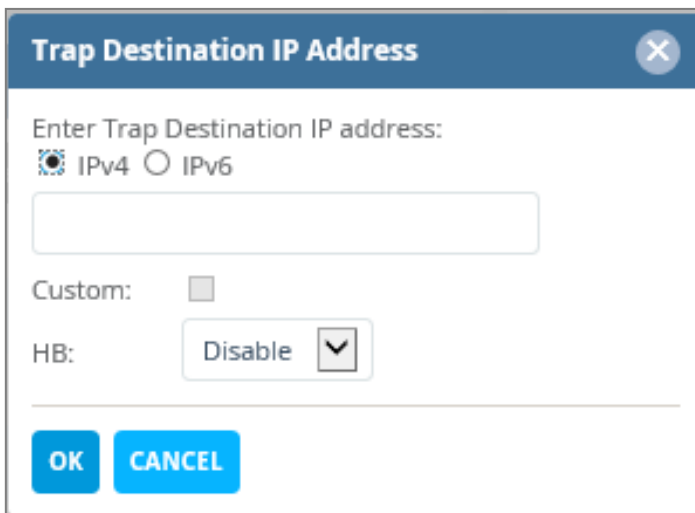
---

➤ **To define the trap destination IP address**

1. In the main menu bar, click  → 

2. Click  in the **Trap Destination List** area.

The **Trap Destination IP Address** dialog appears:



The dialog box titled "Trap Destination IP Address" contains the following elements:

- A header bar with the title and a close button (X).
- A label "Enter Trap Destination IP address:" followed by two radio buttons: "IPv4" (selected) and "IPv6".
- A text input field for the IP address.
- A "Custom:" checkbox, which is currently unchecked.
- An "HB:" label followed by a dropdown menu currently showing "Disable".
- At the bottom, "OK" and "CANCEL" buttons.

3. **Select the protocol version of the IP address:** IPv4/IPv6 and enter the trap destination address.
  - IPv4: IP (x.x.x.x).
  - IPv6: IP (0:0:0:0:0:0:0:0).
4. **If needed: select the Custom checkbox**, to and fill-in the required parameters
5. **If needed: set the Heartbeat (HB):**
  - In the HB box, select Enable from the roll-down menu.
  - Determine the time interval (rate) for sending HBs.

---

*Note: Ensure the HB definition is identical in the whole system.*

---

6. Click **OK**.
7. **DONE:** The IP address is added to the list.

### 10.1.3SNMP manager Setup: Load the MIB Files

This section describes the steps necessary to view the traps sent by the monitored system in the management application.

*Note: It is assumed that the HCM IP address and the trap destination addresses have already been configured.*

➤ **To view interpreted traps through the 3<sup>rd</sup> party management application**

1. Start the management application.
2. Load and compile the MIB-II file (a public domain file which can be found on <http://www.rfc-editor.org>).
3. Load and compile the ma\_events.mib file.
4. Load and compile the maHCM.mib file.

*Note: In most cases MIB files are loaded and compiled using the "MIB menu" tool items in the main menu of the management application.*

5. SNMP monitoring can begin.

### 10.2 Test the Configuration using a MIB Browser Tool (Recommended)

After SNMP is configured, it is recommended that the user verifies that SNMP information is properly received and sent by the monitored system.

To do so, the user may download a MIB browser (free to download). MIB browsers are accessible and easy to use tools, which can be used to check the configurations and view, configure and parse SNMP traps.

### 10.3 Trap Variable Bindings

Data within a trap is encoded in a typical key-value pair configuration. These pairs are called "variable bindings" and they contain extra information related to the trap. For example, a trap has the binding "trapDeviceType", which may have the value "1". This means the Module that generated the trap is the HCM.

The table below lists all bindings supported.

Table 35: Binding Table

| No. | Binding        | Description                                                                                                                                                             |
|-----|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | sysUpTime      | System up time.                                                                                                                                                         |
| 2   | hwFailureSet   | HW failure indication.                                                                                                                                                  |
| 3   | trapSequenceID | Trap sequence ID to be sent with the trap. This is a trapSequenceID var bind that is attached to the trap message in order to allow the manager to track missing traps. |
| 4   | trapTimeStamp  | Time and date the current event occurred; Format H:M:S D/M/Y                                                                                                            |
| 5   | trapDeviceType | Additional data sent with the trap; Type of module that generated the trap:<br>hcm = (1)<br>acm = (2)<br>rim = (3)<br>oim = (4)<br>RAU5 = (5)<br>rxu = (6)              |

| No. | Binding                | Description                                                                                                                                                  |
|-----|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     |                        | fmm = (9)<br>frm = (10)<br>site = (11)<br>mru = (12)<br>lau = (21)<br>och = (24)<br>gx = (25)<br>mxu = (26)                                                  |
| 6   | trapDeviceSerial       | Additional data sent with the trap. This is the serial number of the device that generated the trap (up to remote unit level).                               |
| 7   | trapChassisSN          | Chassis serial number of the module.                                                                                                                         |
| 8   | trapChassisIndex       | Additional data sent with the trap. This is the base controller index that generates the trap (chassis index).                                               |
| 9   | trapSlotIndex          | Additional data sent with the trap. This is the base controller's port index that generates the trap (the slot inside the chassis).                          |
| 10  | trapPortIndex          | Additional data sent with the trap. This is the connector index of the base controller that connects to the generating device (the optical port of the OIM). |
| 11  | trapRemoteIndex        | Additional data sent with the trap. This is the internal index within the generating device (e.g., RxU index).                                               |
| 12  | trapCtrlSerialNum      | Serial number of the controller generating the event; Internal parameter.                                                                                    |
| 13  | trapCtrlName           | Name of controller                                                                                                                                           |
| 14  | trapModuleName         | Name of module                                                                                                                                               |
| 15  | trapSeverity           | The alarm severity: (1) Notify<br>(2) Minor<br>(3) Major                                                                                                     |
| 16  | trapChannel            | Trap channel for remote unit band number for OIM optic port.                                                                                                 |
| 17  | trapChannelDescription | Trap channel for remote unit band name for the OIM optical port.                                                                                             |

## 10.4 List of traps

The system supported traps (i.e., alert messages sent by the system to the SNMP manager, indicating system events or failures), are provided in the following table.

Table 36: List of Traps

| Trap name                      | Description                                      | OID |
|--------------------------------|--------------------------------------------------|-----|
| controllerPowerUp              | Controller power up indication                   | 1   |
| moduleDisconnected             | Module disconnected                              | 4   |
| moduleDetected                 | Module detected                                  | 5   |
| versionMismatchSet             | Module Version Mismatch                          | 6   |
| versionMismatchClear           | Module Version Mismatch clear                    | 7   |
| moduleAdjustmentFaultSet       | Module Adjustment Fault                          | 8   |
| moduleAdjustmentFaultClear     | Module Adjustment Fault clear                    | 9   |
| ModuleHwFailureSet             | HW Failure                                       | 10  |
| moduleHwFailureClear           | HW Failure Clear                                 | 11  |
| moduleInvalidChannelsMapSet    | Module Invalid Channels Map set                  | 12  |
| moduleInvalidChannelsMapClear  | Module Invalid Channels Map clear                | 13  |
| adjustFaultSet                 | Adjustment Procedure Fault set                   | 20  |
| adjustFaultClear               | Adjustment Procedure Fault clear                 | 21  |
| installFaultSet                | Installation Fault set                           | 22  |
| installFaultClear              | Installation Fault clear                         | 23  |
| releaseMismatchSet             | SW Release Mismatch versions set                 | 24  |
| releaseMismatchClear           | SW Release Mismatch versions clear               | 25  |
| connectivitySet                | Connectivity set                                 | 26  |
| connectivityClear              | Connectivity clear                               | 27  |
| hcmHeartbeat                   | HCM Heartbeat (Keep alive)                       | 28  |
| N/A                            | HCM HB Placeholder (not in use)                  | 29  |
| N/A                            | HCM License Placeholder (not in use)             | 30  |
| N/A                            | HCM License Placeholder (not in use)             | 31  |
| hcmInvalidChannelsMapSet       | HCM Invalid Channels Map set                     | 32  |
| hcmInvalidChannelsMapClear     | HCM Invalid Channels Map clear                   | 33  |
| hcmMissingEquipmentSet         | HCM Missing equipment for the Channels Map       | 34  |
| hcmMissingEquipmentClear       | HCM Missing equipment for the Channels Map clear | 35  |
| acmPSMAOverTemperatureSet      | ACM Power Supply A over Temperature              | 100 |
| acmPSMAOverTemperatureClear    | ACM Power Supply A over Temperature Clear        | 101 |
| acmOverTemperatureSet          | ACM Over Temperature                             | 102 |
| acmOverTemperatureClear        | ACM Over Temperature clear                       | 103 |
| acmPSMBOverTemperatureSet      | ACM Power Supply B over Temperature              | 104 |
| acmPSMBOverTemperatureClear    | ACM Power Supply B over Temperature Clear        | 105 |
| acmPSMAOutputUnderVoltageSet   | ACM Power Supply A Output Under Voltage          | 108 |
| acmPSMAOutputUnderVoltageClear | ACM Power Supply A Output Under Voltage Clear    | 109 |
| acmPSMBOutputUnderVoltageSet   | ACM Power Supply B Output Under Voltage          | 110 |
| acmPSMBOutputUnderVoltageClear | ACM Power Supply B Output Under Voltage Clear    | 111 |
| acmExt1ClockDownSet            | ACM Ext1 Clock down                              | 114 |
| acmExt1ClockDownClear          | ACM Ext1 Clock down Clear                        | 115 |
| acmExt2ClockDownSet            | ACM Ext2 Clock down                              | 116 |
| acmExt2ClockDownClear          | ACM Ext2 Clock down Clear                        | 117 |
| acmPilotClockDownSet           | ACM Pilot Clock Down                             | 118 |
| acmPilotClockDownClear         | ACM Pilot Clock Down Clear                       | 119 |

| Trap name                      | Description                                         | OID  |
|--------------------------------|-----------------------------------------------------|------|
| acmPSMAInputUnderVoltageSet    | ACM Power Supply A Input Under Voltage              | 120  |
| acmPSMAInputUnderVoltageClear  | ACM Power Supply A Input Under Voltage Clear        | 121  |
| acmPSMBInputUnderVoltageSet    | ACM Power Supply B Input Under Voltage              | 122  |
| acmPSMBInputUnderVoltageClear  | ACM Power Supply B Input Under Voltage Clear        | 123  |
| acmPowerFailureSet             | ACM Power Failure                                   | 126  |
| acmPowerFailureClear           | ACM Power Failure Clear                             | 127  |
| acmFamFailureSet               | ACM Fam Failure                                     | 128  |
| acmFamFailureClear             | ACM Fam Failure Clear                               | 129  |
| rimDLRFLOWPowerSet             | RIM DL RF Low Power                                 | 200  |
| rimDLRFLOWPowerClear           | RIM DL RF Low Power Clear                           | 201  |
| rimDLOverPowerSet              | RIM DL Over Power                                   | 202  |
| rimDLOverPowerClear            | RIM DL Over Power Clear                             | 203  |
| rimServiceOffSet               | RIM Service Off                                     | 204  |
| rimServiceOffClear             | RIM Service Off Clear                               | 205  |
| rimOverTemperatureSet          | RIM Over Temperature                                | 208  |
| rimOverTemperatureClear        | RIM Over Temperature Clear                          | 209  |
| rimTddSyncLossSet              | RIM TDD Sync Loss                                   | 212  |
| rimTddSyncLossClear            | RIM TDD Sync Loss Clear                             | 213  |
| rimAwsMixConnectionSet         | RIM AWS3 Band mismatch                              | 214  |
| rimAwsMixConnectionClear       | RIM AWS3 Band mismatch Clear                        | 215  |
| Place Holder                   | Place Holder                                        | 216  |
| Place Holder                   | Place Holder                                        | 217  |
| rimUISynthesizerUnlockedSet    | RIM UL Synthesizer Unlocked                         | 250  |
| rimUISynthesizerUnlockedClear  | RIM UL Synthesizer Unlocked Clear                   | 251  |
| rimDISynthesizerUnlockedSet    | RIM DL Synthesizer Unlocked                         | 252  |
| rimDISynthesizerUnlockedClear  | RIM DL Synthesizer Unlocked Clear                   | 253  |
| rimReferenceClockUnlockedSet   | RIM Reference Clock Unlocked                        | 254  |
| rimReferenceClockUnlockedClear | RIM Reference Clock Unlocked Clear                  | 255  |
| siteAdjustFaultSet             | Site Adjustment Fault                               | 700  |
| siteAdjustFaultClear           | Site Adjustment Fault clear                         | 701  |
| siteReleaseMismatchSet         | There are Modules with Version Mismatch in the site | 702  |
| siteReleaseMismatchClear       | All Modules Versions OK in the Site                 | 703  |
| siteConnectivitySet            | There are Disconnected Modules in the site          | 704  |
| siteConnectivityClear          | All Modules are connected in the site               | 705  |
| druOverTemperatureSet          | DRU over temperature                                | 2100 |
| druOverTemperatureClear        | DRU over temperature Clear                          | 2101 |
| druSfpPortSet                  | DRU SFP port X (X from 1 to 36) status              | 2102 |
| druSfpPortClear                | DRU SFP port X (X from 1 to 36) status clear        | 2103 |
| druCpriLinkSet                 | DRU CPRI link X (X from 1 to 36) status             | 2104 |
| druCpriLinkClear               | DRU CPRI link X (X from 1 to 36) status clear       | 2105 |
| dcmOverTempratureSet           | DCM over temperature                                | 2200 |
| dcmOverTempratureClear         | DCM over temperature clear                          | 2201 |
| dcmSfpPortSet                  | DCM SFP port X (X=1,2,3,4) status                   | 2202 |
| dcmSfpPortClear                | DCM SFP port X (X=1,2,3,4) status clear             | 2203 |
| dcmCpriLinkSet                 | DCM CPRI link X (X=1,2,3,4) status                  | 2204 |
| dcmCpriLinkClear               | DCM CPRI link X (X=1,2,3,4) status clear            | 2205 |
| ruSfpPortSet                   | Remote SFP port X (X=1,2,3,4) status                | 2300 |
| ruSfpPortClear                 | Remote SFP port X (X=1,2,3,4) status clear          | 2301 |
| ruCpriLinkSet                  | Remote CPRI link X (port# of remote side) status    | 2302 |

| Trap name                   | Description                                                                                                        | OID  |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------|------|
|                             | (Examples for remotes CPRI links numbers:<br>DLRU Med bands 1,2,3<br>DLRU Low bands 1<br>DMRU 1,2<br>DHRU 1,2,3,4) |      |
| ruCpriLinkClear             | Remote CPRI link X status clear                                                                                    | 2303 |
| ruMinorOverTemperatureSet   | Remote Unit Minor Over temperature - sensor X                                                                      | 2304 |
| ruMinorOverTemperatureClear | Remote Unit Minor Over temperature clear                                                                           | 2305 |
| ruOverTemperatureSet        | Remote Unit Over temperature - sensor X                                                                            | 2306 |
| ruOverTemperatureClear      | Remote Unit Over temperature clear                                                                                 | 2307 |
| ruServiceOffSet             | Remote Unit service off - band X<br>(600/700L/700H/FN/800/850/PCS/AWS/WCS/TDD 2.5)                                 | 2308 |
| ruServiceOffClear           | Remote Unit service off clear                                                                                      | 2309 |
| ruULLimiterSet              | Remote Unit UL Limiter - band X                                                                                    | 2310 |
| ruULLimiterClear            | Remote Unit UL Limiter clear                                                                                       | 2311 |
| ruDIRfLowSet                | Remote Unit DL RF Low                                                                                              | 2312 |
| ruDIRfLowClear              | Remote Unit DL RF Low clear                                                                                        | 2313 |
| ruConnectionErrorSet        | Remote Unit connection error                                                                                       | 2314 |
| ruConnectionErrorClear      | Remote Unit connection error clear                                                                                 | 2315 |
| ruOverflowSet               | Remote Unit Overflow - per channel X                                                                               | 2316 |
| ruOverflowClear             | Remote Unit Overflow clear                                                                                         | 2317 |
| ruVswrSet                   | Remote Unit VSWR Alarm in band X                                                                                   | 2318 |
| ruVswrClear                 | Remote Unit VSWR Alarm clear                                                                                       | 2319 |
| ruPaSelfProtectionSet       | Remote Unit PA Self Protection Alarm - band X                                                                      | 2320 |
| ruPaSelfProtectionClear     | Remote Unit PA Self Protection Alarm clear                                                                         | 2321 |
| ruTddOutOfSyncSet           | Remote Unit TDD out of sync - band X                                                                               | 2322 |
| ruTddOutOfSyncClear         | Remote Unit TDD out of sync clear                                                                                  | 2323 |

## 11. APPENDIX A: Specifications

### ➤ Specifications |

#### ➤ RF Parameters

| Frequency Range Name       | Uplink              | Downlink      |
|----------------------------|---------------------|---------------|
| 600-band 71                | 663-698 MHz         | 617-652 MHz   |
| 700L (Lower Band)- band 12 | 698-716 MHz         | 728-746 MHz   |
| 700U (Upper Band)-band 13  | 776-787 MHz         | 746-757 MHz   |
| FirstNet (700)-band 14     | 788-798 MHz         | 758-768 MHz   |
| 800/850 -band 26           | 817-849 MHz         | 862-894 MHz   |
| 1900 (PCS)-band 25         | 1850-1915 MHz       | 1930-2020 MHz |
| EAWS-band 66               | 1695-1780 MHz       | 2110-2200 MHz |
| WCS -band 30               | 2305-2315 MHz       | 2350-2360 MHz |
| 2500 -band 41              | 2496-2690 MHz (TDD) |               |

#### ➤ Standards and Certifications

| Attribute | Description                                   |
|-----------|-----------------------------------------------|
| EMC       | CE, EMC FCC 47 CFR Part 15 sub part B         |
| Safety    | 62368                                         |
| Radio     | Fire Safety UL 2043 (applicable for LRU only) |

\*Technical spec subject to change without notice

➤ **Radio Interface Frames (IHU/HEU)**➤ **IHU Chassis**

| Radio Interface Frame Modules                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RIMe – up to 8 modules per chassis                       | Single band module (see bands table)<br>Interfaces: UL, DL and duplexed interface ports, QMA RF connectors<br>Weight: 1.9 lbs (0.9 kg)                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| DCM – up to 2 modules per chassis                        | Interfaces:<br>CPRI: 4x SFP+ (optical connectors)<br>Weight: 2.9 lbs (1.3 kg)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| RIX- one module per chassis                              | Interfaces:<br>Two 9-pin coaxial interface connectors (RF and Clock)<br>Two QMA ports for reference clock connections between Radio Interface Frames (IHU, HEU)<br>Weight: 1.54 lbs (0.7 kg)                                                                                                                                                                                                                                                                                                                                                                                            |
| OIX - one module per chassis                             | Interfaces:<br>Two 9-pin coaxial interface connectors (RF and Clock)<br>Weight: 1.54 lbs (0.7 kg)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| PSM – up to 2 modules per chassis                        | Power Consumption 200 Watt (Full Chassis)<br>AC PSM: power input 120-220 VAC; tri-pin<br>DC PSM: power input 48 VDC; 9A Max.; 6-pin terminal block connector<br>On/Off power switch<br>Weight: 1.9 lbs (0.9 kg)                                                                                                                                                                                                                                                                                                                                                                         |
| dHCM – one module per system using IHU and 7 HEU chassis | Interfaces:<br>Four RJ45 100 Mb Ethernet ports - internal interfaces to auxiliary control modules<br>One RJ45 1 Gigabit Ethernet LAN port – for remote management<br>One RJ45 1 Gigabit Ethernet Local port – for local configuration and management<br>One RJ45 console port – for service personnel use only (e.g., debugging, etc.)<br>SD card slot – support for micro SD card up to 32 GB, used for saving and importing system configuration files<br>Status LEDs: indicating power, module operation (RUN), system status and fan operation of chassis<br>Weight: 2.2 lbs (1 kg) |
| ACM -one module per chassis                              | Interfaces:<br>Four RJ45 100 Mb Ethernet ports - internal interfaces to dHCM<br>One RJ45 console port – for service personnel only<br>Status LEDs: indicating power, module operation (RUN), system status and fan operation of chassis To dHCM RJ-45 internal port<br>Weight: 2.2 lbs (1 kg)                                                                                                                                                                                                                                                                                           |

**Mechanical**

|                       |                                                 |
|-----------------------|-------------------------------------------------|
| Dimension (H x W x D) | 7" x 17.3" x 18.95" (177.8 x 440 x 481.7 mm)    |
| Mounting              | 19"/4U                                          |
| Weight                | 58 Lbs. (26.4Kg) for full chassis configuration |

**Environmental**

|                       |                            |
|-----------------------|----------------------------|
| Operating temperature | 0 to +50° C (32 to 122° F) |
|-----------------------|----------------------------|

\*Technical spec subject to change without notice

➤ **HEU Chassis**

| Radio Interface Frame Modules       |                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RIMe – up to 12 modules per chassis | <p>Single band module<br/>(see bands table)</p> <p>Interfaces: UL, DL and duplexed interface ports, QMA RF connectors</p> <p>Weight: 1.9 lbs (0.9 kg)</p>                                                                                                                                                            |
| RIX- one module per chassis         | <p>Interfaces:</p> <p>Two 9-pin coaxial interface connectors (RF and Clock)</p> <p>Two QMA ports for reference clock connections between Radio Interface Frames (IHU, HEU)</p> <p>Weight: 1.54 lbs (0.7 kg)</p>                                                                                                      |
| PSM – up to 2 modules per chassis   | <p>Power Consumption 200 Watt (Full Chassis)</p> <p>AC PSM: power input 120-220 VAC; tri-pin</p> <p>DC PSM: power input 48 VDC; 9A Max.; 6-pin terminal block connector</p> <p>On/Off power switch</p> <p>Weight: 1.9 lbs (0.9 kg)</p>                                                                               |
| ACM -one module per chassis         | <p>Interfaces:</p> <p>Four RJ45 100 Mb Ethernet ports - internal interfaces to dHCM</p> <p>One RJ45 console port – for service personnel only</p> <p>Status LEDs: indicating power, module operation (RUN), system status and fan operation of chassis To dHCM RJ-45 internal port</p> <p>Weight: 2.2 lbs (1 kg)</p> |

**Mechanical**

|                       |                                                |
|-----------------------|------------------------------------------------|
| Dimension (H x W x D) | 7" x 17.3" x 18.95" (177.8 x 440 x 481.7 mm)   |
| Mounting              | 19"/4U                                         |
| Weight                | 64.5 Lbs (29.3) for full chassis configuration |

**Environmental**

|                       |                            |
|-----------------------|----------------------------|
| Operating temperature | 0 to +50° C (32 to 122° F) |
|-----------------------|----------------------------|

\*Technical spec subject to change without notice

➤ **DRU - Digital Routing Unit**

| Interfaces & Mechanical  |                                                                    |
|--------------------------|--------------------------------------------------------------------|
| CPRI ports               | 32 x SFP+ (10.1 Gbps, CPRI line bit rate option 8) to Remote Units |
| CPRI ports               | 4 x SFP+ (10.1 Gbps, CPRI line bit rate option 8) to DCM           |
| Ethernet Ports           | 2x RJ45 - LAN, Local                                               |
| External synchronization | 2*QMA -10MHz In/Out                                                |
| Mounting:                | 19" rack, 1U                                                       |
| Dimension (W x H x D)    | Size: 19" x 1.75" x 16.5" (482.6 x 44.5x 419 mm)                   |
| Weight                   | 19.8 Lbs (9Kg)                                                     |
| Powering                 |                                                                    |
| Powering                 | 48V DC / or AC 220/110V                                            |
| Power Consumption        | 180 Watt                                                           |
| Environmental            |                                                                    |
| Operating temperature    | 0 to +50° C (32 to 122° F)                                         |

\*Technical spec subject to change without notice

- **Low Band LRU-Low power Remote Unit**
- **End to End System Performance**
- **Headend to Digital Low power Remote Unit**



| RF Specifications                         |          |           |                                                               |                        |         |         |
|-------------------------------------------|----------|-----------|---------------------------------------------------------------|------------------------|---------|---------|
| Frequency Range Name                      |          |           | 600                                                           | 700L & 700U & FirstNet |         | 800/850 |
| Frequency Range                           | Uplink   | MHz       | 663-698                                                       | 698-716                | 777-798 | 817-849 |
|                                           | Downlink |           | 617-652                                                       | 728-746                | 746-768 | 862-894 |
| Max. Operating Bandwidth-Non-contiguous   |          | MHz       | Full Band                                                     |                        |         |         |
| Instantaneous Bandwidth                   |          | MHz       | 35                                                            | 18                     | 21      | 32      |
| Downlink Output Power (LRU)               |          | dBm       | 20                                                            | 20                     |         | 20      |
| Attenuation Adjustable Range (1dB step)   |          | dB        | 0-20                                                          |                        |         |         |
| Pass Band Ripple (p-p)                    |          | dB        | ≤ 4                                                           | ≤ 4                    | ≤ 4     | ≤ 4     |
| Channel Bandwidth                         |          | MHz       | 5/10/15/20                                                    |                        |         |         |
| Uplink Noise Figure (typical)             |          | dB        | 12                                                            |                        |         |         |
| Uplink IIP3 (typical)                     |          | dBm       | -14                                                           |                        |         |         |
| VSWR                                      |          |           | ≤ 1.8                                                         |                        |         |         |
| EVM (256 QAM) (TM3.1A @ Rated power)      |          | %         | < 3.5                                                         |                        |         |         |
| Spurious Emission                         |          |           | 3GPP TS 36.106/25.106; 3GPP TS 38.104 V15.5.0 (sections 6; 7) |                        |         |         |
| Electrical Specifications                 |          |           |                                                               |                        |         |         |
| Power Consumption                         |          | Watt      | 70                                                            |                        |         |         |
| DC voltage                                |          | DC        | 37-56                                                         |                        |         |         |
| Interfaces and Mechanical                 |          |           |                                                               |                        |         |         |
| CPRI Port                                 |          |           | 1, SFP+ 10.1Gbps                                              |                        |         |         |
| Antenna Ports                             |          |           | 2, 4.3-10 female                                              |                        |         |         |
| Dimension (W x H x D)                     |          | Inch (mm) | 9.84 x 10.63 x 2.75 (250 x 270 x70)                           |                        |         |         |
| Weight                                    |          | Lbs (Kg)  | 13 (6)                                                        |                        |         |         |
| Mounting and installation                 |          |           | Wall, ceiling and pole mount options                          |                        |         |         |
| Cooling                                   |          |           | Convection                                                    |                        |         |         |
| Environmental                             |          |           |                                                               |                        |         |         |
| Operational Temperature                   |          | °F (°C)   | -40° to 131° (-40° to 55° )                                   |                        |         |         |
| Outdoor installation (Ingress Protection) |          |           | IP 66                                                         |                        |         |         |

\*Technical spec subject to change without notice

- **Medium Band LRU- Low power Remote Unit**
- **End to End System Performance**
- **Headend to Digital Low power Remote Unit**

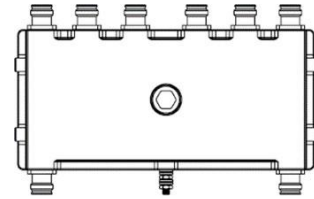


| RF                                        |          |           |                                                                                       |                                                  |           |           |
|-------------------------------------------|----------|-----------|---------------------------------------------------------------------------------------|--------------------------------------------------|-----------|-----------|
| Frequency Range Name                      |          |           | 1900                                                                                  | EAWS                                             | WCS       | 2500      |
| Frequency Range                           | Uplink   | MHz       | 1850-1915                                                                             | 1695-1710<br>1710-1780                           | 2305-2315 | 2496-2690 |
|                                           | Downlink |           | 1930-1995                                                                             | 1995-2000<br>2000-2020<br>2110-2180<br>2180-2200 | 2350-2360 | 2496-2690 |
| Max. Operating Bandwidth-Non-contiguous   |          | MHz       | Full Band                                                                             |                                                  |           |           |
| Instantaneous Bandwidth                   |          | MHz       | 65                                                                                    | 70                                               | 10        | 60 + 60   |
| Downlink Output Power (LRU)               |          | dBm       | 20                                                                                    | 20                                               | 18        | 20        |
| ATT Adjustable Range (1dB step)           |          | dB        | 0-20                                                                                  |                                                  |           |           |
| Pass Band Ripple (p-p)                    |          | dB        | ≤ 4                                                                                   | ≤ 4                                              | ≤ 4       | ≤ 4       |
| Channel Bandwidth                         |          | MHz       | 5/10/15/20<br><br>for 4G<br><br>40 or 60<br>for 5G                                    |                                                  |           |           |
| Uplink Noise Figure (typical)             |          | dB        | 12                                                                                    |                                                  |           |           |
| Uplink IIP3 (typical)                     |          | dBm       | -14                                                                                   |                                                  |           |           |
| VSWR                                      |          |           | ≤ 1.8                                                                                 |                                                  |           |           |
| EVM (256 QAM)                             |          | %         | < 3.5                                                                                 |                                                  |           |           |
| Spurious Emission                         |          |           | 3GPP TS 36.106/25.106; 3GPP TS 38.104 V15.5.0 (sections 6; 7); 3GPP TR 36.846 V12.0.0 |                                                  |           |           |
| Electrical Specifications                 |          |           |                                                                                       |                                                  |           |           |
| Power Consumption                         |          | Watt      | 80                                                                                    |                                                  |           |           |
| DC voltage                                |          | DC        | 37-56                                                                                 |                                                  |           |           |
| Interfaces and Mechanical                 |          |           |                                                                                       |                                                  |           |           |
| CPRI Port                                 |          |           | 3, SFP+ 10.1Gbps                                                                      |                                                  |           |           |
| Antenna Ports                             |          |           | 2 ,4.3-10 female                                                                      |                                                  |           |           |
| Dimension (W x H x D)                     |          | Inch (mm) | 9.84 x 10.63 x 2.75 (250 x 270 x 70)                                                  |                                                  |           |           |
| Weight                                    |          | Lbs (Kg)  | 13 (6)                                                                                |                                                  |           |           |
| Mounting and installation                 |          |           | Wall, ceiling and pole mount options                                                  |                                                  |           |           |
| Cooling                                   |          |           | Convection                                                                            |                                                  |           |           |
| Environmental                             |          |           |                                                                                       |                                                  |           |           |
| Operational Temperature                   |          | °F (°C)   | -40° to 131° (-40° to 55°)                                                            |                                                  |           |           |
| Outdoor installation (Ingress Protection) |          |           | IP 66                                                                                 |                                                  |           |           |

\*Technical spec subject to change without notice

### LRU 2:2 MIMO Antenna Combiner

The LRU combiner is used to combine the 2 LRU's:  
 Low Band LRU and Medium Band LRU.  
 The combiner has a total of 6 input ports and 2 output ports.  
 There are two independent three-frequency combiners inside.  
 The input frequencies are:  
 617-894MHz (connected to LRU Low Band)  
 1695-2690 MHz (connected to LRU Medium Band)  
 3450-4000MHz (for future connection to CBR5 C-Band LRU)



|                           |          | Port1/Port4                         | Port2/Port5                  | Port3/Port6                  |
|---------------------------|----------|-------------------------------------|------------------------------|------------------------------|
| Port Name                 |          | Low Band 1/2                        | Mid Band 1/2                 | C-Band 1/2                   |
| Frequency Range           | MHz      | 617-894                             | 1695-2690                    | 3450-4000                    |
| Bandwidth                 | MHz      | 277                                 | 995                          | 550                          |
| Insertion Loss            | dB       | ≤ 1                                 |                              |                              |
| Pass band Ripple          | dB       | ≤ 0.5                               |                              |                              |
| Out of Band Isolation     | dB       | ≥50@1695-2690<br>≥50@3450-4000      | ≥50@617-894<br>≥40@3450-4000 | ≥50@617-894<br>≥50@1695-2690 |
| PIM                       | dBc      | -155 ( @ 2x1W)                      |                              |                              |
| Return Loss               | dB       | ≥18                                 |                              |                              |
| Isolation                 | dB       | ≥40                                 |                              |                              |
| Impedance                 | Ω        | 50                                  |                              |                              |
| Interfaces and Mechanical |          |                                     |                              |                              |
| Port Type                 |          | 4.3-10 Female                       |                              |                              |
| Dimension                 | Inch(mm) | 10.6 x 4.92 x 1.38 (270 x 125 x 35) |                              |                              |
| Maximum Power             |          | 1W (Average)                        |                              |                              |
| Environmental             |          |                                     |                              |                              |
| Operating temperature     | °F (°C)  | -40 to +185 (-40 to +85)            |                              |                              |
| Ingress Protection        |          | IP66                                |                              |                              |

\*Technical spec subject to change without notice

- **MRU - Medium Power Remote Unit**
- **System performance**
- **Head End to Medium power Remote Unit**

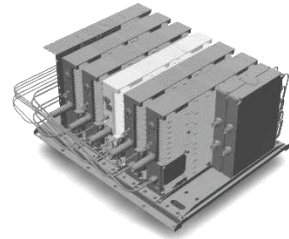


| RF                                      |          |     |                                                               |                        |         |          |           |           |           |                                          |  |
|-----------------------------------------|----------|-----|---------------------------------------------------------------|------------------------|---------|----------|-----------|-----------|-----------|------------------------------------------|--|
| Frequency Range Name                    |          |     | 600                                                           | 700L & 700U & FirstNet |         | 800 /850 | 1900      | EAWS      | WCS       | 2500                                     |  |
| Frequency Range                         | Uplink   | MHz | 663-698                                                       | 698-716                | 777-798 | 817-849  | 1850-1915 | 1695-1780 | 2305-2315 | 2496-2690                                |  |
|                                         | Downlink |     | 617-652                                                       | 728-746                | 746-768 | 862-894  | 1930-1995 | 2110-2180 | 2350-2360 |                                          |  |
| Max. Operating Bandwidth-Non-contiguous | MHz      |     | Full Band                                                     |                        |         |          |           |           |           |                                          |  |
| Instantaneous Bandwidth                 | MHz      |     | 35                                                            | 18                     | 21      | 32       | 65        | 70        | 10        | 60+60                                    |  |
| Downlink Output Power                   | dBm      |     | 33                                                            | 33                     |         | 33       | 37        | 37        | 37        | 37                                       |  |
| Attenuator Adjustable Range (1dB step)  | dB       |     | 0-20                                                          |                        |         |          |           |           |           |                                          |  |
| Pass Band Ripple (p-p)                  | dB       |     | ≤ 4                                                           |                        |         |          |           |           |           |                                          |  |
| Channel Bandwidth                       | MHz      |     | 5/10/15/20                                                    |                        |         |          |           |           |           | 5/10/15/20 for 4G<br><br>40 or 60 for 5G |  |
| Uplink Noise Figure (typical)           | dB       |     | 12                                                            |                        |         |          |           |           |           |                                          |  |
| Uplink IIP3 (typical)                   | dB       |     | -12                                                           |                        |         |          |           |           |           |                                          |  |
| VSWR                                    |          |     | ≤ 1.8                                                         |                        |         |          |           |           |           |                                          |  |
| EVM (256 QAM) (TM3.1A@ Rated power)     | %        |     | < 3.5                                                         |                        |         |          |           |           |           |                                          |  |
| Spurious Emission                       |          |     | 3GPP TS 36.106/25.106; 3GPP TS 38.104 V15.5.0 (sections 6; 7) |                        |         |          |           |           |           |                                          |  |
| CBRS ready frequencies                  | MHz      |     | 3350-3980. Combined with all other services                   |                        |         |          |           |           |           |                                          |  |
| Coupling port                           | dB       |     | 35                                                            |                        |         |          |           |           |           |                                          |  |
| Electrical Specifications               |          |     |                                                               |                        |         |          |           |           |           |                                          |  |
| Power Consumption (Typical)             | Watt     |     | With DC power supply: 515<br>With AC power supply: 550        |                        |         |          |           |           |           |                                          |  |
| DC voltage                              | DC       |     | 48                                                            |                        |         |          |           |           |           |                                          |  |

| Interfaces and Mechanical |           |                                                                                                |
|---------------------------|-----------|------------------------------------------------------------------------------------------------|
| CPRI Port                 |           | 2, SFP+ 10.1Gbps                                                                               |
| Antenna Ports             |           | 1, 4.3-10 female                                                                               |
| CBRS port                 |           | 1, N-Type female                                                                               |
| Coupling port             |           | 1 ,QMA connector that will enable measurement of the DL/UL signals while the system is working |
| Dimension (W x H x D)     | Inch (mm) | 17.45 x 10.5 x 15.75 (443.2 x 266.7 x 400)                                                     |
| Mounting and installation |           | 19",6U -Wall mount and Rack mount options                                                      |
| Weight                    | Lbs (Kg)  | 83.77(38) -Fully populated with 6 RF modules                                                   |
| Cooling                   |           | Active                                                                                         |
| Environmental             |           |                                                                                                |
| Operational Temperature   | °F (°C)   | -40° to 131° (-40° to 55°)                                                                     |
| Indoor installation       |           | For outdoor applications external enclosure is required                                        |

\*Technical spec subject to change without notice

- **HRU -High-Power Remote Unit**
- **System performance (Head End to High power Remote Unit)**



| RF                                      |          |                                                                               |                                                               |                        |         |          |           |           |           |                                          |
|-----------------------------------------|----------|-------------------------------------------------------------------------------|---------------------------------------------------------------|------------------------|---------|----------|-----------|-----------|-----------|------------------------------------------|
| Frequency Range Name                    |          |                                                                               | 600                                                           | 700L & 700U & FirstNet |         | 800 /850 | 1900      | EAWS      | WCS       | 2500                                     |
| Frequency Range                         | Uplink   | MHz                                                                           | 663-698                                                       | 698-716                | 777-798 | 817-849  | 1850-1915 | 1695-1780 | 2305-2315 | 2496-2690                                |
|                                         | Downlink |                                                                               | 617-652                                                       | 728-746                | 746-768 | 862-894  | 1930-1995 | 2110-2180 | 2350-2360 |                                          |
| Max. Operating Bandwidth-Non-contiguous | MHz      |                                                                               | Full Band                                                     |                        |         |          |           |           |           |                                          |
| Instantaneous Bandwidth                 | MHz      |                                                                               | 35                                                            | 18                     | 21      | 32       | 65        | 70        | 10        | 100                                      |
| Downlink Output Power                   | dBm      |                                                                               | 43                                                            | 43                     |         | 43       | 43        | 43        | 43        | 43                                       |
| Attenuator Adjustable Range (1dB step)  | dB       |                                                                               | 0-20                                                          |                        |         |          |           |           |           |                                          |
| Pass Band Ripple (p-p)                  | dB       |                                                                               | ≤ 4                                                           |                        |         |          |           |           |           |                                          |
| Channel Bandwidth                       | MHz      |                                                                               | 5/10/15/20                                                    |                        |         |          |           |           |           | 5/10/15/20 for 4G<br><br>40 or 60 for 5G |
| Uplink Noise Figure (typical)           | dB       |                                                                               | 6                                                             |                        |         |          |           |           |           |                                          |
| Uplink IIP3 (typical)                   | dB       |                                                                               | -20                                                           |                        |         |          |           |           |           |                                          |
| VSWR                                    |          |                                                                               | ≤ 1.8                                                         |                        |         |          |           |           |           |                                          |
| EVM (256 QAM) (TM3.1A@ Rated power)     | %        |                                                                               | < 3.5                                                         |                        |         |          |           |           |           |                                          |
| Spurious Emission                       |          |                                                                               | 3GPP TS 36.106/25.106; 3GPP TS 38.104 V15.5.0 (sections 6; 7) |                        |         |          |           |           |           |                                          |
| Electrical Specifications               |          |                                                                               |                                                               |                        |         |          |           |           |           |                                          |
| Power Consumption (Typical)             | Watt     | OEU (Optical Expansion Unit) –connected to RFU’s                              |                                                               |                        |         |          |           | 50        |           |                                          |
|                                         |          | RFU (RF Unit) – MIMO 2:2 for the bands 600,700,800/850,1700.1900,2300,2500TDD |                                                               |                        |         |          |           | 220       |           |                                          |
| AC voltage                              | AC       |                                                                               | 100-240                                                       |                        |         |          |           |           |           |                                          |

| Interfaces and Mechanical                 |           |                            |                                    |
|-------------------------------------------|-----------|----------------------------|------------------------------------|
| CPRI Port                                 |           | 4, SFP+ 10.1Gbps           |                                    |
| Antenna Ports                             |           | 1 ,4.3-10 female           |                                    |
| Dimension (W x H x D)                     | Inch (mm) | OEU                        | 14.6 x 3.2 x 13.8 (370 x 80 x 355) |
|                                           |           | RFU except 700             | 19.7 x 3.2 x 13.8 (500 x80 x355)   |
|                                           |           | RFU 700                    | 19.7 x4.8 x 13.8 (500 x121 x355)   |
| Mounting and installation                 |           | Wall mount                 |                                    |
| Weight                                    | Lbs (Kg)  | OEU                        | 26.4 (12)                          |
|                                           |           | RFU except 700             | 39.6 (18)                          |
|                                           |           | RFU 700                    | 44 (20)                            |
| Cooling                                   |           | Convection                 |                                    |
| Environmental                             |           |                            |                                    |
| Operational Temperature                   | °F (°C)   | -40° to 131° (-40° to 55°) |                                    |
| Outdoor installation (Ingress Protection) |           | IP 65                      |                                    |

\*Technical spec subject to change without notice

| Low Bands Combiner specifications                                                                                                                 |      |                        |         |         |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------------|---------|---------|-----------|
| The Low band combiner is designed to combine the following services :600MHz,700MHz, 800/850MHz and high frequencies from the Medium Band combiner |      |                        |         |         |           |
| Frequency Name                                                                                                                                    |      | 600                    | 700     | 800/850 | High Freq |
| Port Name                                                                                                                                         |      | Port 1                 | Port 2  | Port 3  | Port 4    |
| Frequency Range                                                                                                                                   | MHz  | 617-716                | 728-798 | 817-894 | 1695-2690 |
| Insertion Loss                                                                                                                                    | dB   | ≥0.3                   |         |         |           |
| Port Isolation                                                                                                                                    | dB   | ≤50                    |         |         |           |
| Return Loss                                                                                                                                       | dB   | ≥20                    |         |         |           |
| Pass band ripple                                                                                                                                  | dB   | ≥0.2                   |         |         |           |
| PIM                                                                                                                                               | dBc  | ≥155@2×43dBm           |         |         |           |
| Power Capacity                                                                                                                                    | Watt | 250 per port           |         |         |           |
| Interface                                                                                                                                         |      |                        |         |         |           |
| Connector                                                                                                                                         |      | 4.3-10 Mini DIN-Female |         |         |           |

\*Technical spec subject to change without notice

**Medium Bands Combiner specifications**

The medium band combiner is designed to combine the following services: 1900, EAWS, WCS and 2.5GHz. If a single module is required a single input (2500) is used.

If 2 \* 2.5GHz RF modules are used (to support 4G and 5G services) 2 inputs are required (2500 IN1 and 2500 IN2) .

| Frequency Name   |      |     | 1900                   | EAWS                   | WCS       | 2500      | 2500 IN1                                        | 2500 IN 2 | 2500 OUT |
|------------------|------|-----|------------------------|------------------------|-----------|-----------|-------------------------------------------------|-----------|----------|
| Port Name        |      |     | Port 1                 | Port 2                 | Port 3    | Port 4    | Port 5                                          | Port 6    | Port7    |
| Frequency Range  |      | MHz | 1850-2020              | 1695-1780<br>2110-2200 | 2305-2360 | 2496-2690 |                                                 |           |          |
| Insertion Loss   | dB   |     | ≥ 0.3                  |                        |           | ≥3.3      |                                                 |           |          |
| Port Isolation   | dB   |     | ≤50                    |                        |           |           | ≥20, 2500 IN1 to 2500 IN2<br>≥50 to Other ports |           |          |
| Return Loss      | dB   |     | ≥20                    |                        |           |           |                                                 |           |          |
| Pass band ripple | dB   |     | ≥ 0.2                  |                        |           |           |                                                 |           |          |
| PIM              | dBc  |     | ≥155@2×43dBm           |                        |           |           |                                                 |           |          |
| Power Capacity   | Watt |     | 250 per port           |                        |           |           |                                                 |           |          |
| Interface        |      |     |                        |                        |           |           |                                                 |           |          |
| Connector        |      |     | 4.3-10 Mini DIN-Female |                        |           |           |                                                 |           |          |

\*Technical spec subject to change without notice

## 12. APPENDIX B: Ordering information

### ➤ Headend Unit Assemblies and RF Modules

| Part Number    | Description                                                                                                |
|----------------|------------------------------------------------------------------------------------------------------------|
| HEU:           | Head End Unit Assembly (without RIMe); provided with ERFC, one PSM and one RIX ( supports up to 12 RIMe's) |
| HEU-1-00-1-A-A | Hosts one RIX module; one ETM. one PSM-AC and one ACM                                                      |
| HEU-1-00-1-D-A | Hosts one RIX module; one ETM. one PSM-DC and one ACM                                                      |
| HEU-1-00-2-A-A | Hosts one RIX module; one ETM , 2 PSM-AC and one ACM                                                       |
| HEU-1-00-2-D-A | Hosts one RIX module; one ETM, 2 PSM-DC and one ACM                                                        |

| Part Number | Description       |
|-------------|-------------------|
| RIMe-25T    | 2500 MHz TDD      |
| RIMe-W23    | WCS 2300 MHz      |
| RIMe-L70    | LTE 700 MHz       |
| RIMe-E80    | CELL/ESMR 800 MHz |
| RIMe-A17    | AWS 1700 MHz      |
| RIMe-P19    | PCS 1900 MHz      |
| RIMe-FN70   | FirstNet® 700 MHz |
| RIMe-L60    | TMO 600 MHz       |

*Note: IHUs support both RIMe and OIMs (ordering information detailed in HEU and OIU ordering information).*

| Part Number     | Description                                                                                                                                       |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| IHU:            | Integrated Headend Unit Assembly (without RIMe and DCM's); provided with ERFC cable, one RIX and one OIX. Supports up to eight RIMe and two DCM's |
| IHU-2-11-1-A-dH | Hosts one RIX; one OIX; one ERFC cable; one PSM-AC module and one dHCM module                                                                     |
| IHU-2-11-2-A-dH | Hosts one RIX; one OIX; one ERFC cable; two PSM-AC modules and one dHCM module                                                                    |
| IHU-2-11-1-A-A  | Hosts one RIX; one OIX; one ERFC cable; one PSM-AC module and one ACM module                                                                      |
| IHU-2-11-2-A-A  | Hosts one RIX; one OIX; one ERFC cable; two PSM-AC module and one ACM module                                                                      |
| IHU-2-11-1-D-dH | Hosts one RIX; one OIX; one ERFC cable; one PSM-DC module and one dHCM module                                                                     |
| IHU-2-11-2-D-dH | Hosts one RIX; one OIX; one ERFC cable; two PSM-DC modules and one dHCM module                                                                    |
| IHU-2-11-1-D-A  | Hosts one RIX; one OIX; one ERFC cable; one PSM-DC module and one ACM module                                                                      |
| IHU-2-11-2-D-A  | Hosts one RIX; one OIX; one ERFC cable; two PSM-DC module and one ACM module                                                                      |

| Part Number | Description                                                      |
|-------------|------------------------------------------------------------------|
| dHCM        | Digital Headed Control Module; Includes two RJ45 cables (2 m)    |
| ACM         | Auxiliary Control Module; Includes two RJ45 cables (2 m)         |
| DCM -4-S    | Digital Conversion Module 4 CPRI ports, SISO (SFP+ not included) |

| Part Number | Description                                                                                                  |
|-------------|--------------------------------------------------------------------------------------------------------------|
| PSM-AC      | AC Power Supply – installed in HEU, OIUc, and IHU chassis; includes U.S. plug power cords                    |
| PSM-DC      | DC Power Supply - installed in HEU, OIUc, and IHU chassis; includes 48 V DC six-pin terminal block connector |

➤ **DRU Part Numbers**

| Part Number      | Description                                                                                                        |
|------------------|--------------------------------------------------------------------------------------------------------------------|
| DRU-1A-32C-4C-AD | Digital Routing Unit, 32 CPRI Ports of Distribution, 4 CPRI ports for uplink, AC and DC Power( SFP+, not included) |

➤ **LRU Part Numbers**

| Part Number                | Description                                                                                                                 |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Stand Alone Modules</b> |                                                                                                                             |
| dLRU-678                   | LRU module, supporting low bands in MIMO configuration: 600, 700 and 800/850                                                |
| dLRU-17192325              | LRU module, supporting mid bands in MIMO configuration: PCS, AWS, WCS and TDD 2500 MHz                                      |
| dLRU-COMB                  | LRU combiner for low, mid band including CBRS/C-Band, including jumper cables, termination loads and combiner plate         |
| dLRU-CABLE                 | Jumper cable between the LRU and the combiner                                                                               |
| dLRU-TL                    | Termination load for LRU combiner                                                                                           |
| <b>Assemblies</b>          |                                                                                                                             |
| dLRU-67817192325           | LRU set including: LRU low band, LRU mid band, mounting brackets, combiner plate, jumper cables, termination load, combiner |
| <b>Wall Mount bracket</b>  |                                                                                                                             |
| BR-dLRU                    | LRU bracket for wall or ceiling mount installation                                                                          |

➤ **MRU Part Numbers**

| Part Number                | Description                                                                         |
|----------------------------|-------------------------------------------------------------------------------------|
| <b>Stand Alone Modules</b> |                                                                                     |
| dMRU-ASM-DC                | MRU Chassis Assembly with: dOPTM ,FAM, Mid-Plane, Cavity Filter, DC power supply    |
| dMRU-ASM-AC                | MRU Chassis Assembly with: dOPTM ,FAM, Mid-Plane, Cavity Filter, AC power supply    |
| dMRU-CHS-ASM               | MRU Chassis Assembly with: dOPTM ,FAM, Mid-Plane, Cavity Filter                     |
| dMRU-dOPTM                 | MRU Digital Optical Module                                                          |
| dMRU-PSM-AC                | MRU Power Supply Module AC feeding                                                  |
| dMRU-PSM-DC                | MRU Power Supply Module DC feeding                                                  |
| dMRU-DPAM-67               | MRU- Digital Power Amplifier Module supporting 600,700 Lower,700 Upper and FirstNet |
| dMRU-DPAM-8                | MRU- Digital Power Amplifier Module supporting 800/850                              |
| dMRU-DPAM-17               | MRU- Digital Power Amplifier Module supporting AWS 1700MHz                          |
| dMRU-DPAM-19               | MRU- Digital Power Amplifier Module supporting PCS 1900MHz                          |
| dMRU-DPAM-23               | MRU- Digital Power Amplifier Module supporting WCS 2300MHz                          |
| dMRU-DPAM-25-TDD           | MRU- Digital Power Amplifier Module supporting TDD 2500MHz                          |
| <b>Assemblies</b>          |                                                                                     |
| dMRU-671719-AC             | MRU-AC Assembly w/ DPAM: 600/700,AWS, PCS                                           |
| dMRU-671719-DC             | MRU-DC Assembly w/ DPAM: 600/700,AWS, PCS                                           |
| dMRU-671923-AC             | MRU-AC Assembly w/ DPAM: 600/700,AWS, PCS, WCS                                      |
| dMRU-671923-DC             | MRU-DC Assembly w/ DPAM: 600/700,AWS, PCS, WCS                                      |
| dMRU-6781719-AC            | MRU-AC Assembly w/ DPAM: 600/700,800/850, PCS , AWS                                 |
| dMRU-6781719-DC            | MRU-DC Assembly w/ DPAM: 600/700,800/850, PCS , AWS                                 |
| dMRU-678171923-AC          | MRU-AC Assembly w/ DPAM: 600/700,800/850, PCS, AWS , WCS                            |
| dMRU-678171923-DC          | MRU-DC Assembly w/ DPAM: 600/700,800/850, PCS, AWS , WCS                            |
| dMRU-67817192325-AC        | MRU-AC Assembly w/ DPAM: 600/700,800/850, AWS, PCS, WCS , TDD 2500                  |
| dMRU-67817192325-DC        | MRU-DC Assembly w/ DPAM: 600/700,800/850, AWS, PCS, WCS , TDD 2500                  |
| dMRU-67819-AC              | MRU-AC Assembly w/ DPAM: 600/700,800/850, PCS                                       |
| dMRU-67819-DC              | MRU-DC Assembly w/ DPAM: 600/700,800/850, PCS                                       |
| dMRU-6781923-AC            | MRU-AC Assembly w/ DPAM: 600/700,800/850, PCS, WCS                                  |
| dMRU-6781923-DC            | MRU-DC Assembly w/ DPAM: 600/700,800/850, PCS, WCS                                  |
| <b>Wall Mount Bracket</b>  |                                                                                     |
| BR-dMRU-W                  | MRU Wall Mounting Bracket                                                           |
| <b>General Information</b> |                                                                                     |

MRU-DC/AC includes: OPTM, FAM, Mid-Plane and Cavity Filter Shipping Box will include:

AC power Cord-3m (in case of AC), BR-DMRU-R

Wall mount BR is not included, should be ordered separately.

**HRU Part Numbers**

| Part Number                | Description                                                                                                   |
|----------------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Stand Alone Modules</b> |                                                                                                               |
| dHRU-dHPOM                 | HRU Digital High Power Optical Module                                                                         |
| dHRU-dHPAM-6               | HRU Digital High Power Amplifier Module supporting 600                                                        |
| dHRU-dHPAM-7               | HRU Digital High Power Amplifier Module supporting 700                                                        |
| dHRU-dHPAM-85              | HRU Digital High Power Amplifier Module supporting 800/850                                                    |
| dHRU-dHPAM-19              | HRU Digital High Power Amplifier Module supporting PCS                                                        |
| dHRU-dHPAM-17              | HRU Digital High Power Amplifier Module supporting AWS                                                        |
| dHRU-dHPAM-23              | HRU Digital High Power Amplifier Module supporting WCS                                                        |
| dHRU-dHPAM-25              | HRU Digital High Power Amplifier Module supporting TDD 2500, 100MHz contiguous BW                             |
| dHRU-COMB-L                | HRU combiner module supporting low bands 600,700,800/850 including cables                                     |
| dHRU-COMB-M                | HRU combiner module supporting low bands AWS,PCS,WCS and TDD 2500 including cables                            |
| dHRU-TL                    | HRU termination load                                                                                          |
| BR-dHRU-L                  | HRU bracket to support low band modules                                                                       |
| BR-dHRU-M                  | HRU bracket to support mid band modules                                                                       |
| dHRU-CABLE                 | HRU 4.3-10 RF Jumper Cable                                                                                    |
| dHRU-INT-SFP               | HRU Internal SFPs (from dHRU-dHPOM to modules) and Fiber                                                      |
| <b>Assemblies</b>          |                                                                                                               |
| dHRU-6781719232525-AC      | HRU assembly supporting low and mid bands in a MIMO configuration: 600, 700, 800/850, PCS, AWS, WCS, TDD 2500 |
| dHRU-678-AC                | HRU assembly supporting low bands in a MIMO configuration: 600, 700, 800/850                                  |
| dHRU-781719-AC             | HRU assembly supporting low and mid bands in a MIMO configuration: 700, 800/850, PCS, AWS                     |
| dHRU-1719232525-AC         | HRU assembly supporting mid bands in a MIMO configuration: PCS, AWS, WCS, TDD 2500                            |

**➤ SFP+ Part Numbers**

| Part Number           | Description                                                                                     |
|-----------------------|-------------------------------------------------------------------------------------------------|
| SFP-10G-10K-BiDi-1270 | SFP+ 10.1Gb/s ,10Km, Bi Directional TX 1270nm, for DCM and DRU output connected to Remote Units |
| SFP-10G-10K-BiDi-1330 | SFP+ 10.1Gb/s ,10Km, Bi Directional TX 1330nm, for Remote Units and DRU input connected to DCM  |
| SFP-10G-10K           | SFP+ 10.1Gb/s ,10Km, dual fiber                                                                 |
| SFP-10G-1.4K          | SFP+ 10.1Gb/s ,1.4Km, dual fiber                                                                |