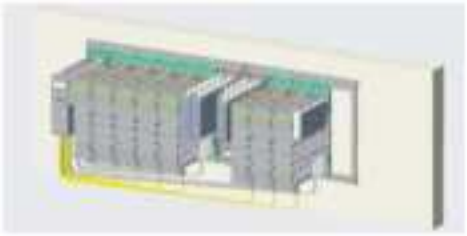
*Note: The following figures demonstrate the wall installation for low and high bands*

●Wall Installation (High bands and low bands RFU separated installed)

High Band Combinations

Low Band Combinations

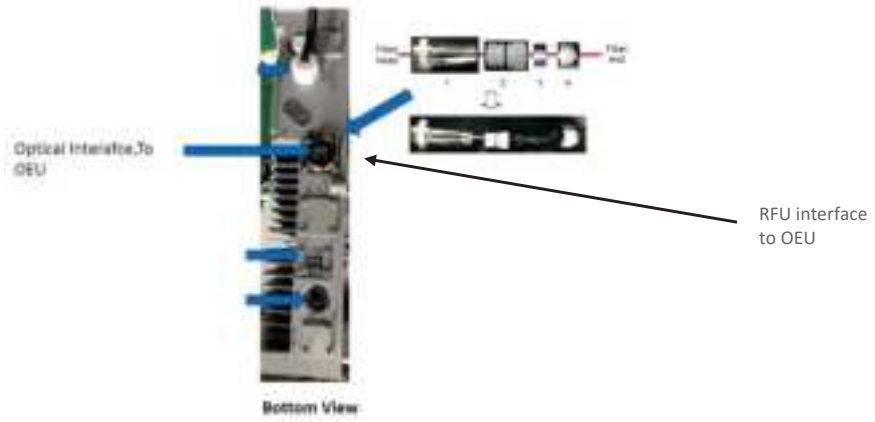


### 2.8.3.2 Connect the Internal cables (OEUs to RFUs)

The internal cable connections include:

1. Connect the modules bottom panel CPRI connections (lower RFU and OEU panels)

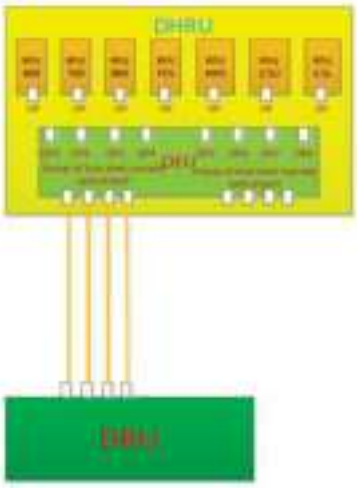
*Note: the internal fibers are provided; the external fibers are not provided.*

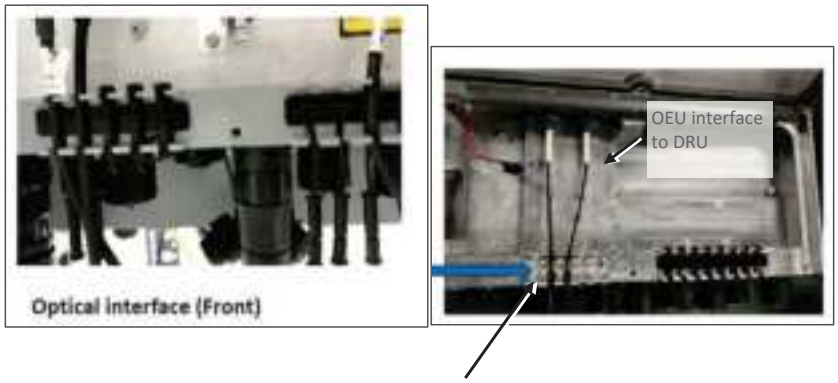

2. Connect the RF between the modules and the combiners in the upper panel (all jumpers – these are provided with the kit)

### 2.8.3.3 Connect the External cables (OEUs to DRUs)

The following figure indicates the connections between the system and the DRU



1. Connect the cables between the OEU and the DRU



### 2.8.3.4 Connect the rest of the Cables

For each of the units, connect the cables as follows:

- Ground, see 2.8.3.4.1
- Power, see 2.8.3.4.2

#### 2.8.3.4.1 Connect Ground

*Note: Ground according to local regulations*

The following additional (not supplied) tools and components are required for connecting the system ground:

- Grounding wire - grounding wire should be sized according to local and national installation requirements. The provided grounding lug supports 14 AWG to 10 AWG stranded copper (or 12 AWG to 10 AWG solid) wire conductors.


1. Use a wire-stripping tool to remove approximately 0.4 inch (10.9 mm) of the covering from the end of the grounding wire
2. Insert the stripped end of the grounding wire into the open end of the grounding lug
3. Crimp the grounding wire in the barrel of the grounding lug. Verify that the ground wire is securely attached to the ground lug by holding the ground lug and gently pulling on the ground wire
4. Prepare the other end of the grounding wire and connect it to an appropriate grounding point at the site to ensure adequate earth ground

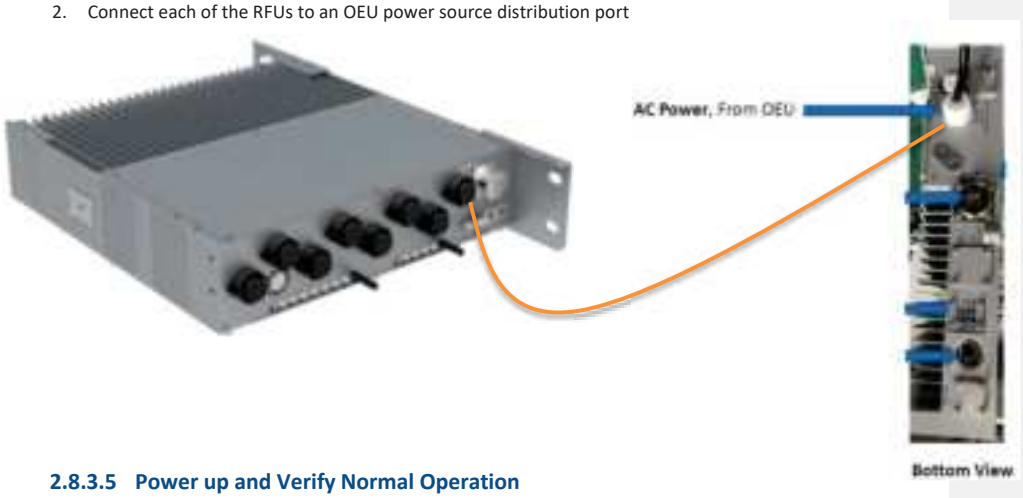
#### 2.8.3.4.2 Connect AC Power

The AC power is connected to the OEU, and is distributed from the OEU to the modules

➢ **To connect the power**

1. Connect the AC power source to the OEU input power port

2. Connect each of the RFUs to an OEU power source distribution port




### 2.8.3.5 Power up and Verify Normal Operation

Power up the system, and verify normal operation according to the following LED guidelines

| Status | Description | Color | State |
|---|---|---|---|
| Power | The RFU was powered up | Green | Solid |
| RUN | The RFU is up and running | Green | Blinking (1s) |
| OP1 | The RFU is sync to the OEU | Green | Solid |
| PA | The PA of RFU is on | Green | Solid |
| ALARM | The RFU is alarm | Red | Solid |

# 3. GUI – General Description

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

## 3.1 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.

## 3.2 Main Menu Options

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

*Table 11: 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. **This option is only visible to the system administrator.** |
|  | 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. |

## 3.3 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).

*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.*

- 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.

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

Default settings: IP: 10.0.0.1; Subnet Mask: 255.0.0.0

## 3.4 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.*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# 4. 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:

1. **Open a local session to the HCM**, see Open a Local Session section 4.1.
2. **Configure the LAN IP settings** to allow remote access, see Remote Management section 4.2
3. **Perform the initial configurations** using the system GUI, see Commissioning, chapter 5

## 4.1 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**

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


*Notes:*

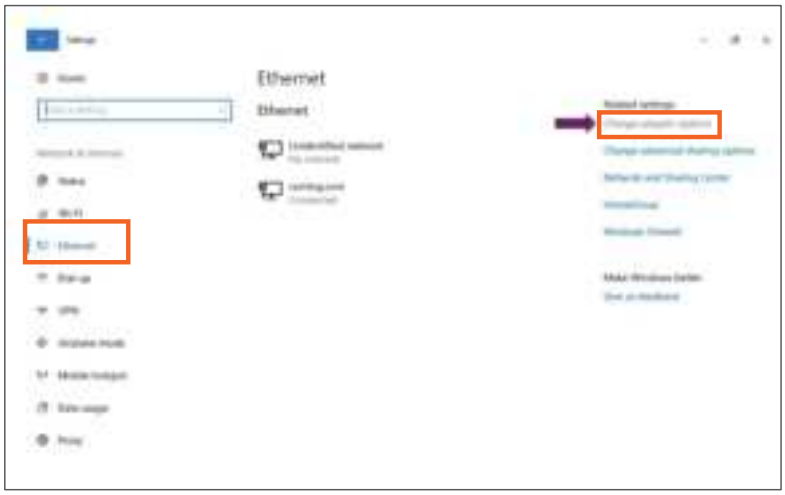
** The LOCAL port is set to a static IP Address by default: 172.16.1.1; Subnet Mask: 255.255.0.0. Your laptop/tablet network parameters must be set to match the subnet of the default IP address.*

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

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

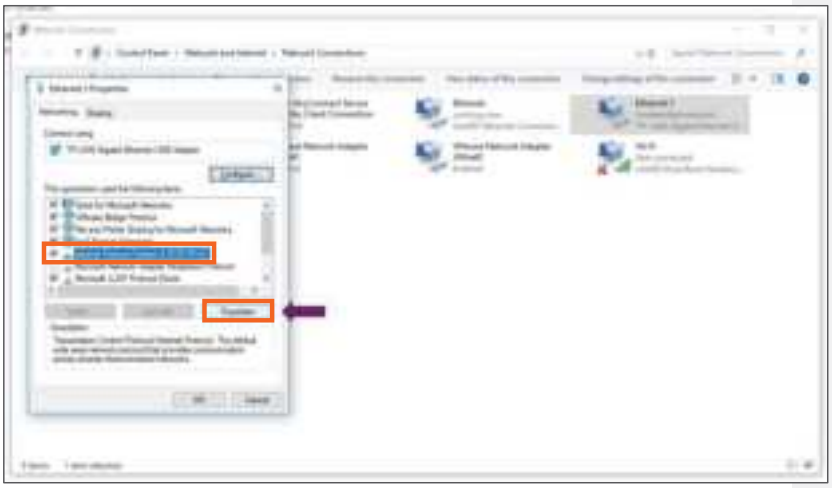
a. Go to the **Windows Settings → Network & Internet**


b. Select **Ethernet → Change adapter options**

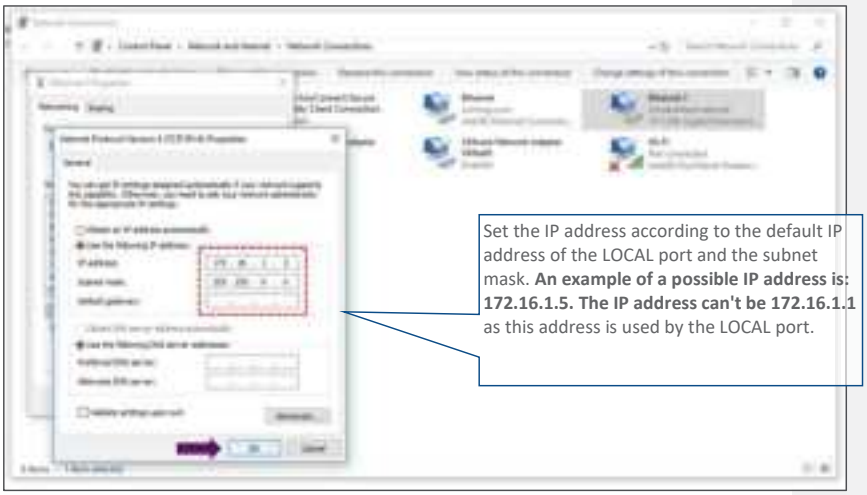


c. Right-click on **Ethernet USB adapter** and select **Properties**

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



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




f. Click on **Close** and close the control panel

3. Once the connection is established (can be verified by accessing through command prompt: cmd→ ipconfig -h) , open a browser and type-in the LOCAL port default IP address in the address bar: 172.16.1.1. See section 4.2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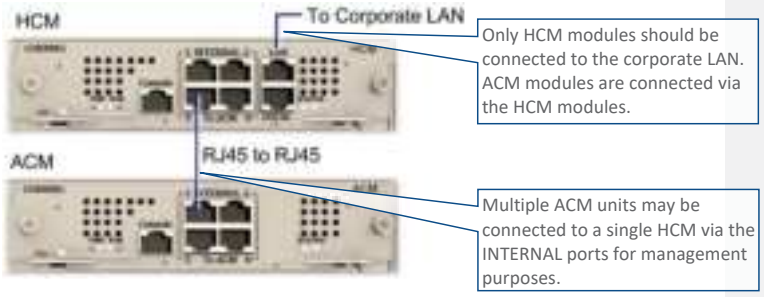
## 4.2 Remote Management

After doing the preliminary configuration (see section 3.4 ), 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**

1. **IMPORTANT:** Make sure the HCM LAN port is connected to the corporate LAN.
2. In the main menu bar, click  → 
3. Select the **IPv4 LAN Port** or **IPv6 LAN Port** tabs and click the  button.

4. 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**.

5. The HCM restarts after the LAN IP address is updated.
6. 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 6.1.3.6.*

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

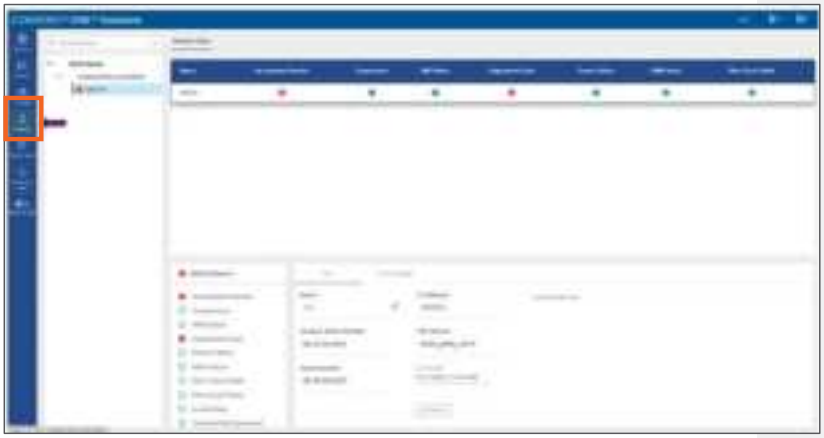
   The HCM Controller Log In dialog appears:


5. 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.*

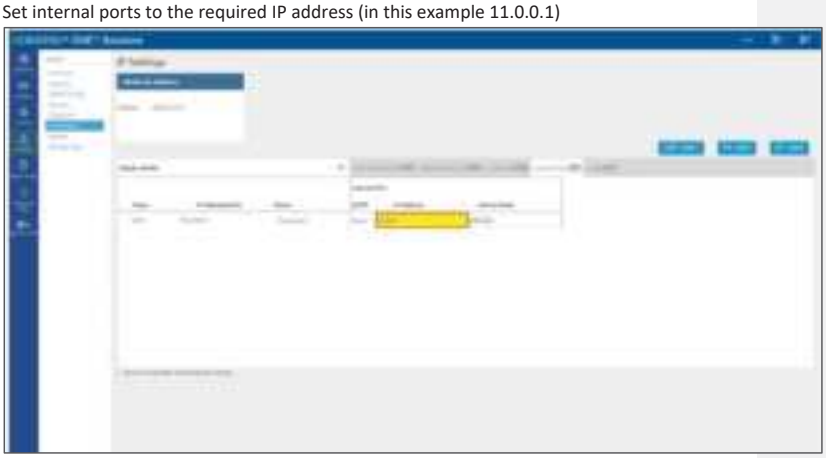
6. Click the "SIGN IN" button. System GUI main screen appears.

7. Configure the IP settings (to allow working through LAN IP address and not only via the local port connection) as follows:
    a. In the Device view Select **Admin**

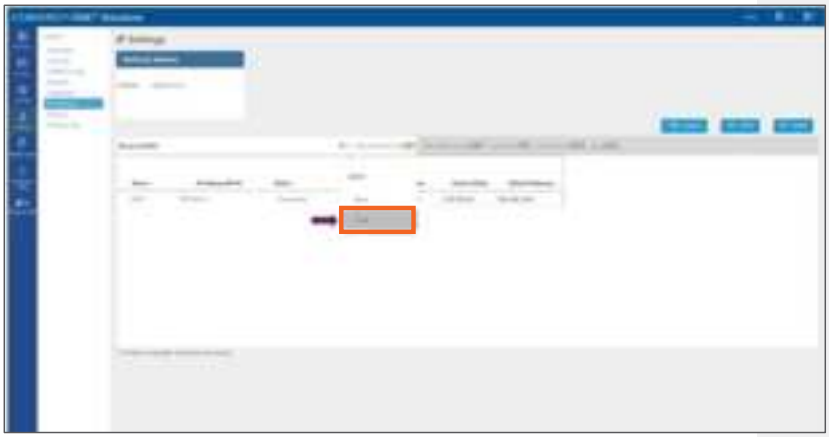


    b. Select **IP Settings** and click on **Edit**

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



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

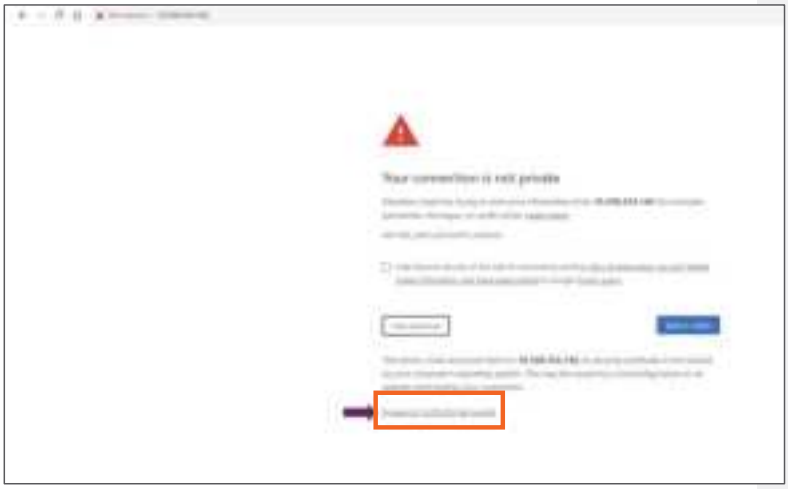


e. Click on **Apply**

f. Enter the credentials

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


h. Select advanced→ proceed to (the IP address)




i. The application appears.

# 5. Commissioning

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

- Create new user operators, see 5.1
- Set the system parameters (site, power sharing, time, TDD, adjustment), see 5.2

## 5.1 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 6.1.3.2.

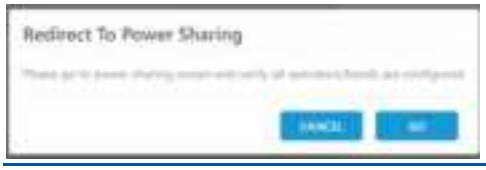
➢ **To create a new operator**

1. Log in as the **system** administrator.
2. In the main menu bar, click  → 
3. 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.
4. 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. See password changing flow below. System admin can't change the operator admin password.*

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


*Note: clicking on the Power Sharing option, displays a pop up window with a link to power sharing*



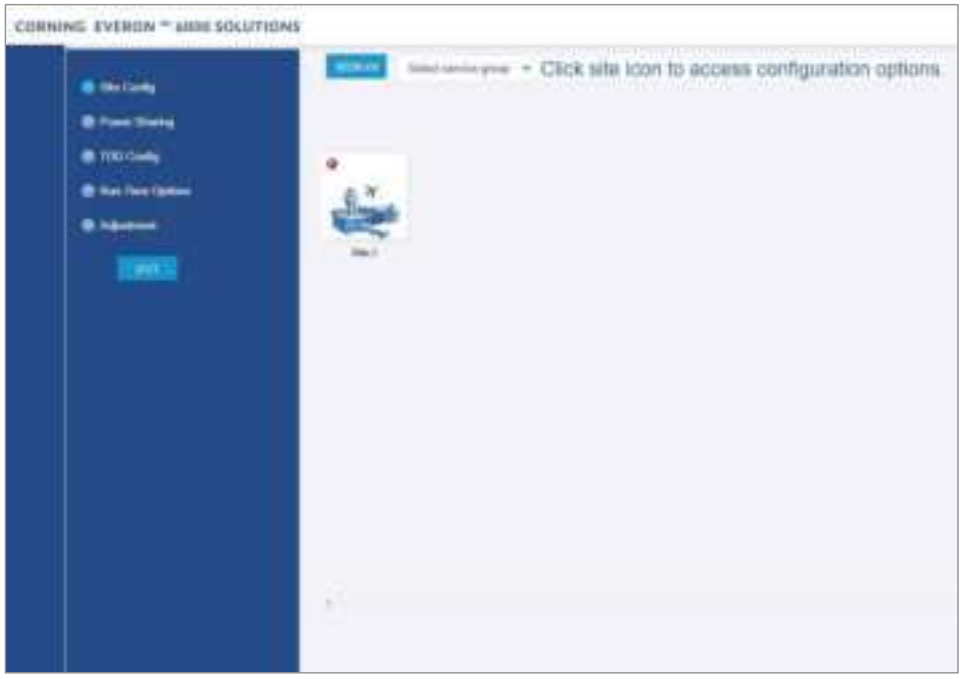
## 5.2 Set system parameters through Main Menu Config Option

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.

### 5.2.1 Set Site config – auto set

- **To view the site config settings**

1. Choose the **Site Config** option from the **Config** submenu. the following screen appears:




2. Each relevant site is presented by an image. By clicking on the site image, the configuration options for the specific site appear. The configuration options are described below Select the required option to be displayed:
    a. Operator, see 5.2.1.1
    b. RF path, see 5.2.1.2
    c. Max input, see 5.2.1.3

### 5.2.1.1 Operator

The **Operator** tab shows all system chassis with the RIMs inside each chassis. It displays a full list of the operators in popup (so for large lists the user may scroll-down)

The user can click on a RIM to have the carrier name displayed. This view is read only, where changes to RIM carrier assignments can only be done via the **Channels** tab in the main menu.

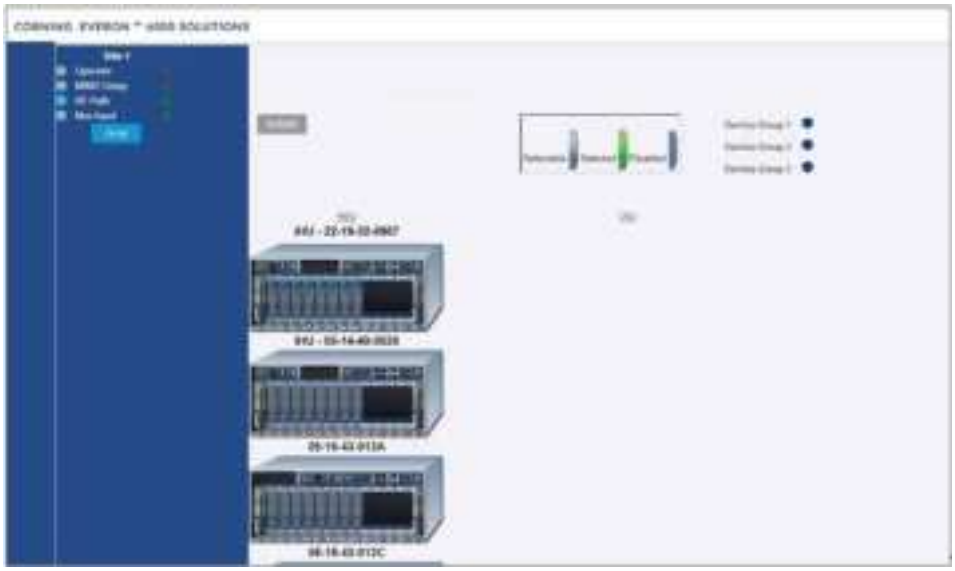
### 5.2.1.2 RF Path

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 mey not be set from this screen.*



### 5.2.1.3 Max Input

The **Max Input** tab allows the configuration of 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

A single RIM can be clicked to be configured. Alternatively, an operator of RIMs can be configured by selecting a service operator, chassis or a frequency band.

### 5.2.2 Power Sharing

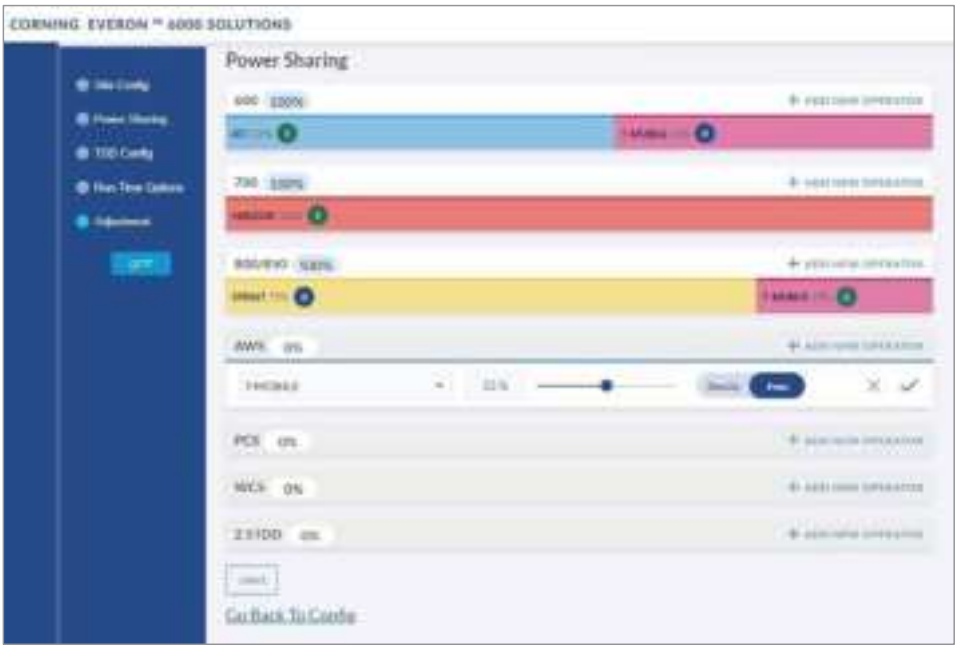
The **Power Sharing** tab shows all supported frequency bands and the carriers sharing each band.

The carriers are sharing the power associated with the frequency band.

The user needs to enter the power sharing parameters as follows:

For each band perform the following:

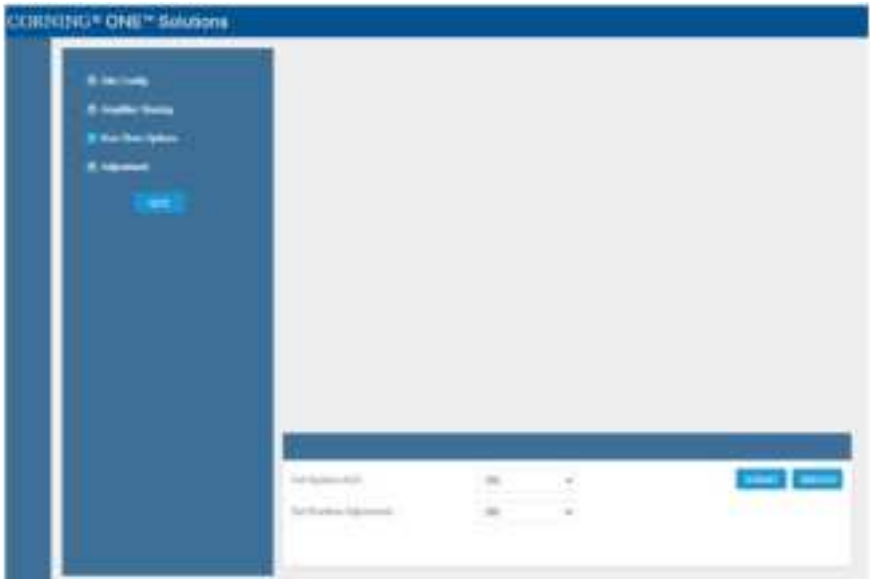
1. Select the band (in the example: AWS is selected)
2. Click on add new operator
3. Select the operator (not: if an operator is nor selected – the data cannot be entered)
4. Select the parameters to configure the power sharing
5. Click on the V sign ✓
6. Click on the SAVE button



### 5.2.3 Run time options

➢ **To perform run-time options**

1. Select the **Run-Time options** radio button
2. Click on **Submit**



### 5.2.4 TDD Config

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


- **To configure the TDD:**
  1. For each of the screen's fields, click the arrow near the field to show the list of optional values.
  2. Select the relevant value
  3. At the end – click SAVE

### 5.2.5 Adjustment

The **Adjustment** tab allows the user to start the adjustment process. During adjustment the status and relevant information are updated for each process.

After completing the configuration above, perform Adjustment.

- **To perform adjustment:**
  1. Select the **adjustment** radio button
  2. Click on **Start Adjustment** (default values: *Do not run sensitive mode; Do not run BIT)*

The process runs automatically, and returns the status (successful / failed)

# 6. Using the System Graphical User Interface (GUI)

This section describes the system GUI options.

## 6.1 Main GUI Options

The main menu options are described below.

### 6.1.1 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. These coding icons are detailed in Table 12 below.

When choosing **Devices** from the main menu, the following screen appears (the displayed system tree is updated according to system topology):

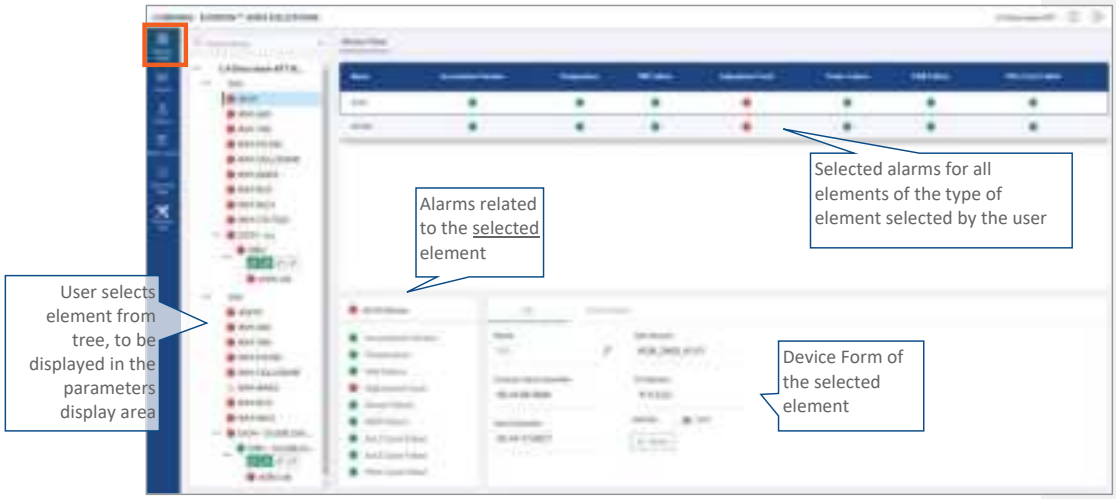



*Figure 16: Devices Screen*

*Note: The same DRU may appear in the system tree multiple times if it is connected to different DCMs. For details see section 6.1.1.9 DRU to DCM Connection.*

### 6.1.1.1 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 coloured circle to its left, according to the symbols shown in the table that follows.

*Table 12: Alarm Icons*

| Icon Unmasked | Masked | Indicates that… |
|---|---|---|
|  Red circle |  | There is a major alarm related to the element |
|  Green circle |  | No alarm is related to the element |
|  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 6.1.2).

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.

### 6.1.1.2 Lists of alarms per system element

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

*Table 13: 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 14: 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:<br>•For ACM installed in an HEU chassis - Ext1/Ext2 Clock Failed are relevant.<br>•For ACM installed in an IHU chassis - only Ext1 Clock Failed alarm is relevant. |
| 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 15*: 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 16: 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 17: 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 18: dLRU/dMRU/dHRU Alarms Descriptions*

| Alarm Name | Description |
|---|---|
| HW_ALRM | Indicates **un-recoverable** HW failure. Applicable for module or sub-module. |
| TEMP_ALRM_Minor_X | Over temperature indication. X is sensor number. |
| TEMP_ALRM_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. |

| Alarm Name | Description |
|---|---|
| SELF_PROTECTION | Self-protection alarm |
| 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 6.1.1.6 - 6.1.1.8 below).

*Table 19: 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. |

### 6.1.1.3 HCM Device Form

The device form of an HCM has a single tab: **Info**. The Info tab includes general information about the system element:


*Table 20: 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. |

### 6.1.1.4 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:


*Table 21: 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 6.1.1.2, under ACM Alarms Descriptions. In the example below there are no alarms related to any of the power supplies.


### 6.1.1.5 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:

*Table 22: 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:

*Table 23: 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 24: 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**

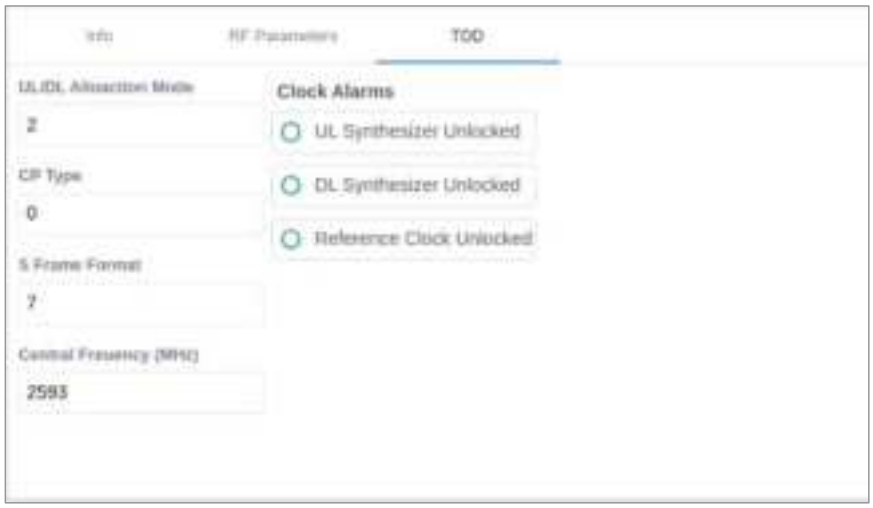



*Table 25: RIM TDD device form fields*

| 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) |

### 6.1.1.6 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.


*Table 26: 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 colour 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.


### 6.1.1.7 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:

*Table 27: 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:

### 6.1.1.8 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:

*Table 28: 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). |

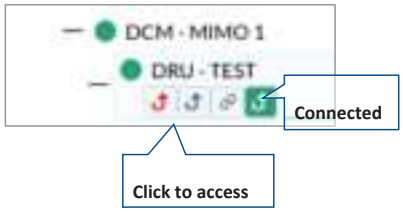
The **Supported Bands** tab lists all the bands supported by the dL/M/HRU. Clicking on a band shows the band information. In the example below information about the AWS band is displayed:


The **Optical Links** tab has information about the optical links of the dL/M/HRU. Each optical link indicates the colour 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:

### 6.1.1.9 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.

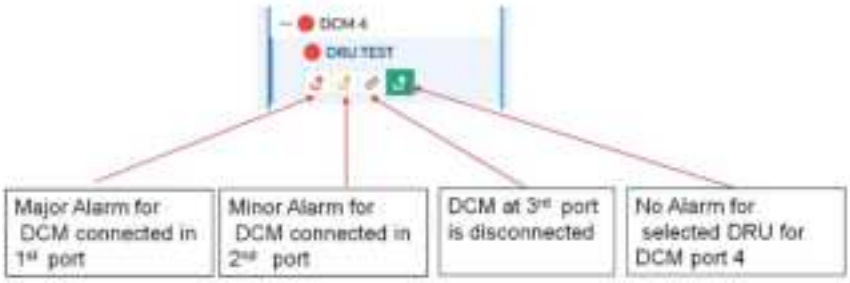



*Figure 17: Example – alarms for connected DCMs*

### 6.1.2 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.

When choosing Events from the main menu the following screen appears:

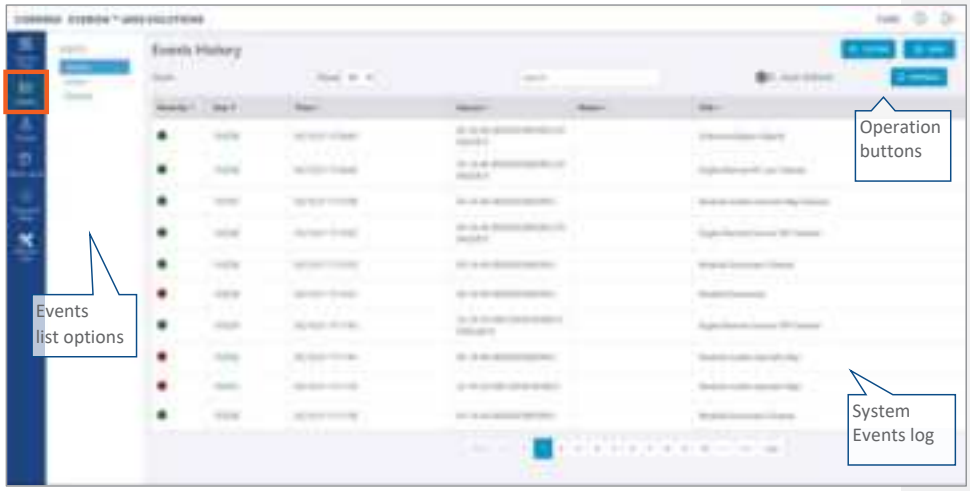



*Figure 18 Events Screen*

*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. |  |
| Masked | View events which are masked by user. |  |

| Tab | Information | Screen Example ( |
|---|---|---|
|  | Set filters for displayed events | |
|  | Save to file | |
|  | Refresh screen view | |

### 6.1.3 Admin Screen

The admin screen allows the user to define administrators, update credentials, upgrade firmware, generate reports and other admin options as detailed in the table below. When choosing **Admin** from the main menu the following screen appears:

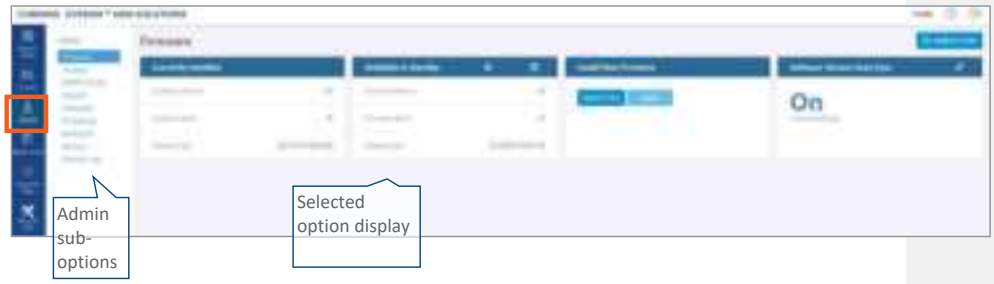



*Table 20: Admin Screen Sub Options*

| Tab | Enables user to… |
|---|---|
| Firmware | Update HCM FW and enable FW auto synchronization.<br>Lists which FW version is currently installed and what versions are available. |
| Security | Create and manage multi-user account operators and monitor user activities. |
| SNMP Config | Use any SNMP manager. |
| 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. |
| Scheduler | Schedule specified system operations and administrative procedures. |
| IP Settings | Change IP addresses that were auto assigned by DHCP, ping a manually typed IP address, etc. |
| Backup | Choose the stacks to be backed-up or re-stored to/from a backup file or SD card(s). |
| Activity Log | View activities such as configuration changes, according to a range of criteria such as User, Date, Device or Activity type. |
| License | View a list of available licenses and their expiration time, load new license obtained from Corning. |

### 6.1.3.1 Firmware

The **Firmware** tab allows the user to upgrade the firmware 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 **Firmware** 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.

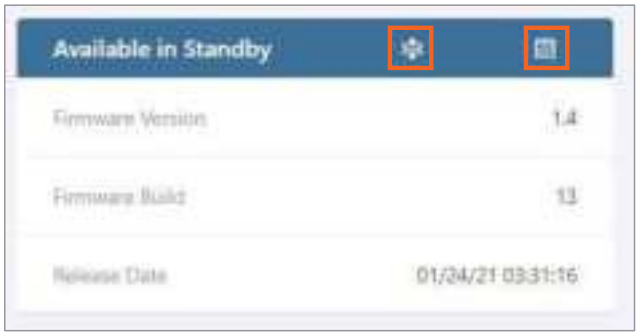
➢ **To upgrade the firmware version**

1. In the main menu bar, click  → 
2. **Download the new image file**: In the "Install New Firmware" 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".

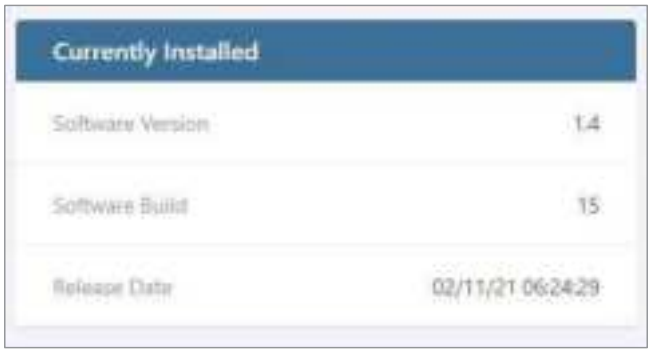

*Note: Do not attempt to refresh the browser or perform any operation before download procedure is complete.*

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



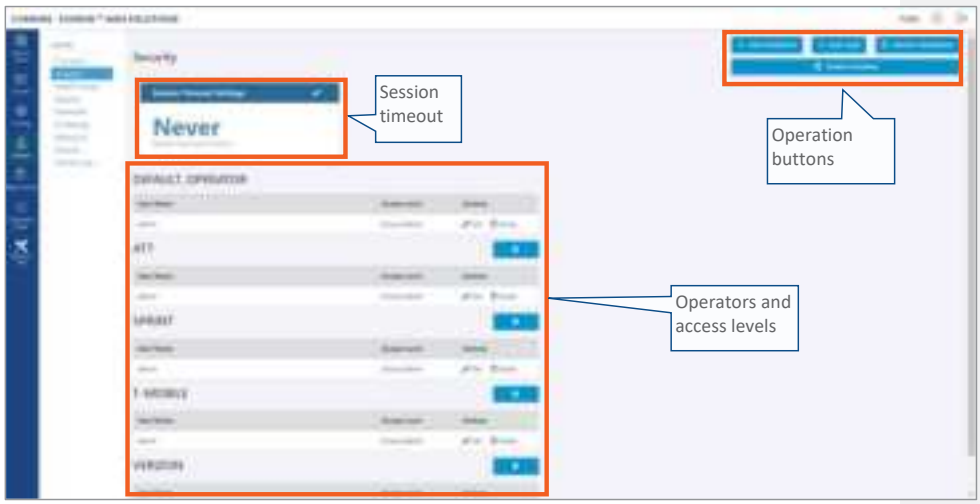

**Activate the new firmware** – either immediately by using the icon or at a scheduled (user defined) time by using the icon.

4. After the new firmware is activated, and the controller automatically restarts: **Log in to the system**.
   The new firmware version should appear in the "Currently Installed" area:



### 6.1.3.2 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 a 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 29: 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 *free text parameters* to allow the definition of location and identification information. |
| RF Tech | Access to the Devices, Config, Events and Channels screens:<br>• Write access to all *RF* parameters.<br>• R/O to all other parameters. |
| IT Tech | Access to the Devices and Admin screens:<br>• Write access to all non-*RF* parameters.<br>• Access to activity logs of all users and operators. |

| Level | Description |
|---|---|
| | • HCM firmware upgrade.<br>• R/O to all other parameters. |
| 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 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 29: 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.


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**

1. In the main menu bar, click  → 

.

2. Click the 

button. The following form appears:


3. 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**.

### 6.1.3.3 SNMP Config

The SNMP config allows configuring and using any SNMP manager.

### 6.1.3.4 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 30: 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 | 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**

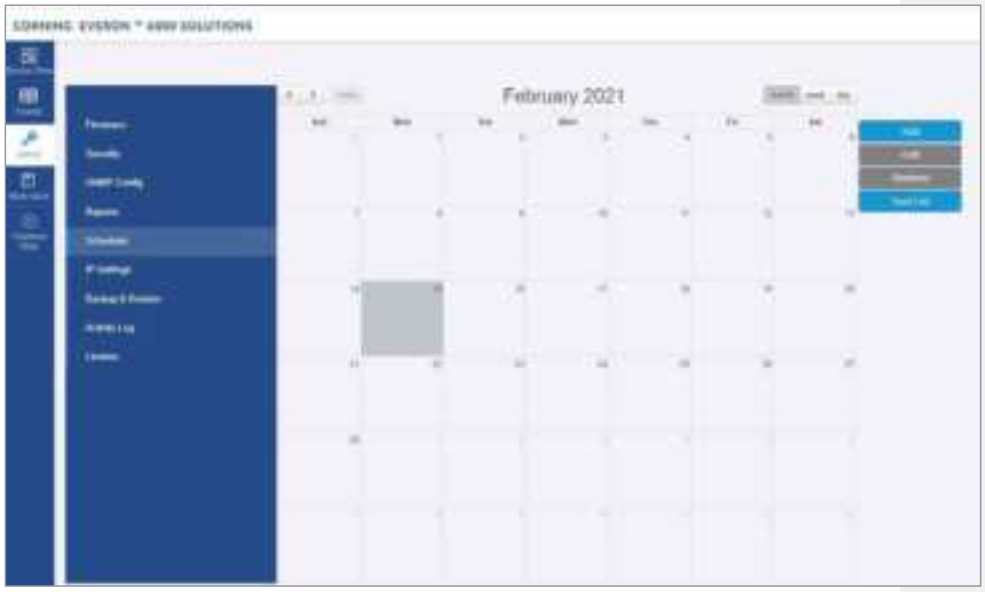
**Inventory reports** provide detailed information in the selected format of "All Devices" or a specific system element. The information includes location, installed versions, IP Address, and more.

- **Device Logs**

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

### 6.1.3.5 Scheduler

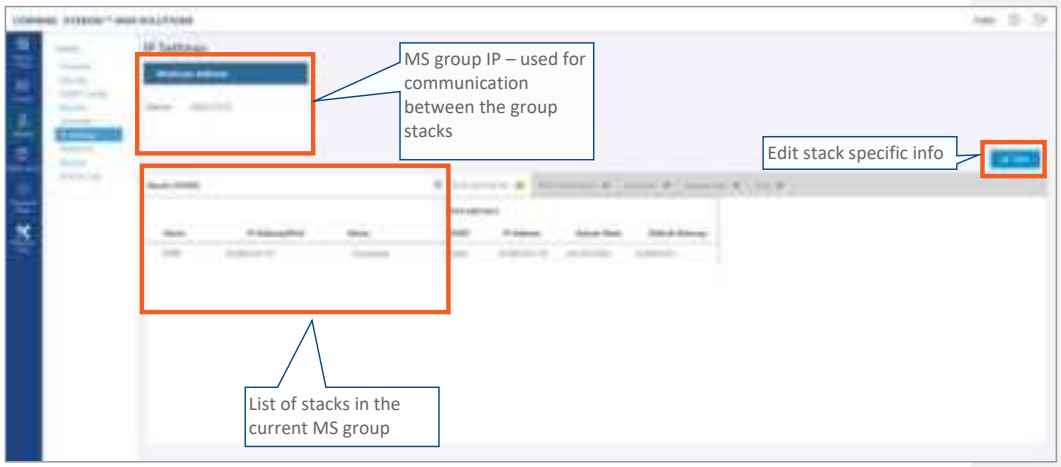
The task scheduler enabling schedule- specified system operations and administrative procedure scheduler. For example: Inventory reports can be scheduled by clicking on the **Schedule** button. In the displayed screen, under **Inventory Reports**, click on **Schedule Reports** and configure the schedule according to instructions provided in Task Scheduler




December 3,
2099

### 6.1.3.6 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.




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.

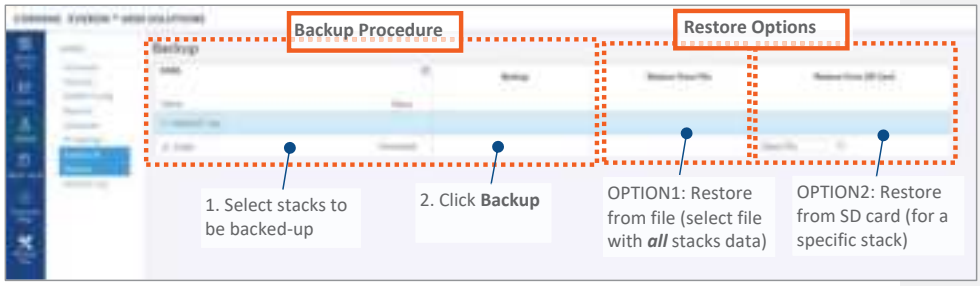
A Ping Tool option is provided in the IP Settings pane. Use this tool to verify access to IP hosts (rather than opening another application).

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.


### 6.1.3.7 Backup

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 (see section * for SD card slot location). It is recommended to perform backup after each configuration change.




➢ **To backup and restore configurations**

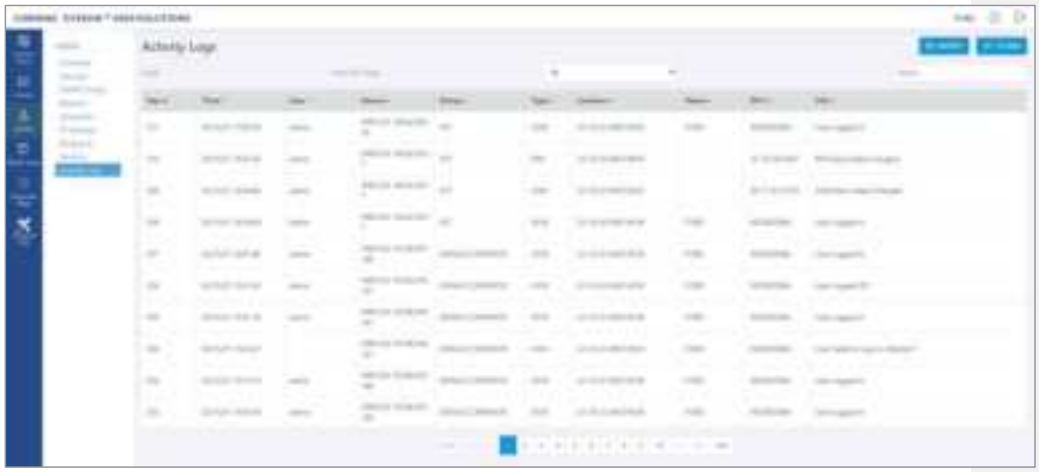
1. In the main menu bar, click  → 
2. Select the stacks to be backed up by checking their boxes.
3. Click **Backup**. A backup file will be created, and the configurations will be saved in the HCM SD card as well.
4. To restore configurations from a file: click the **Select File** button in the **Restore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

### 6.1.3.8 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:




The activity log display can be changed in the following ways:

- **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, and date.

### 6.1.4 Multi-Stack Screen

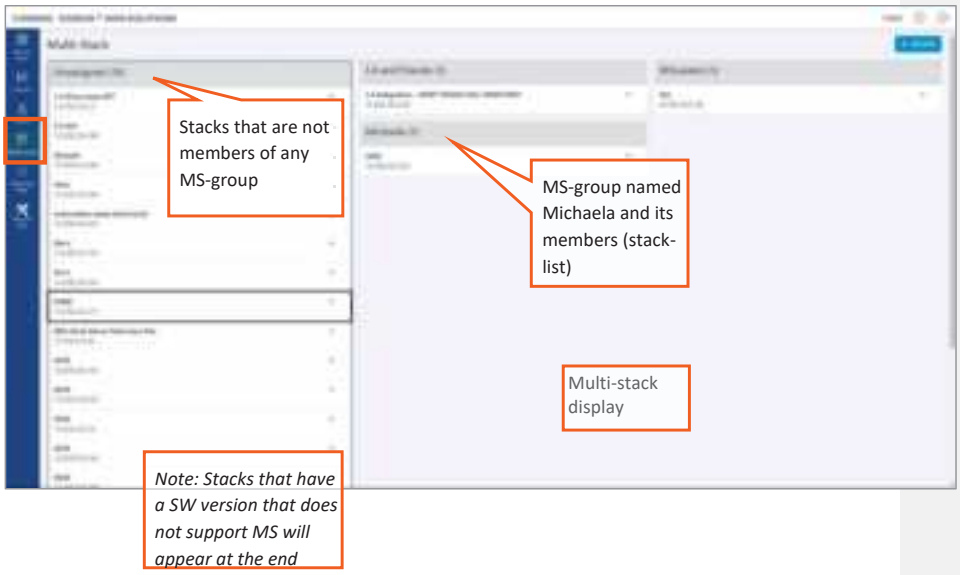
**MS management** allows centralized network management of sites with multiple stacks deployment, sharing common configuration, where user-defined operators of stacks are automatically and immediately updated with common data.

**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).

When choosing **Multi-Stack** from the main menu the following screen appears:




The user can view the information of the different stacks of the system.

### 6.1.5 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 a 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.

When choosing **Channels** from the main menu the following screen appears:

When configuring 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.

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

*Table 31: 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 32: Map Status*

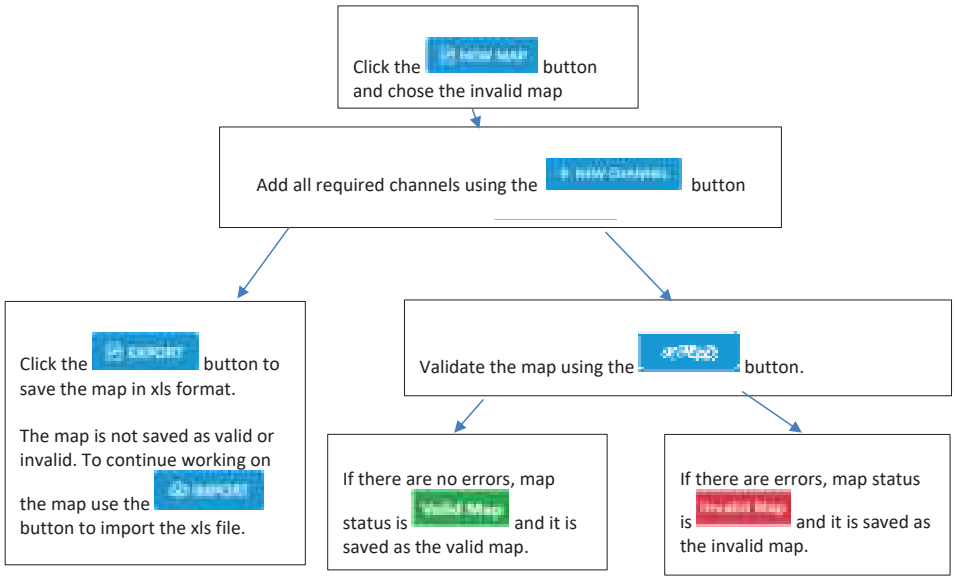
| Map status | Enables user to… |
|---|---|
|  | The map was submitted, but errors were found during activation. |
|  | The map was submitted, no errors were found during activation. |
|  | Map was not submitted yet. |

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

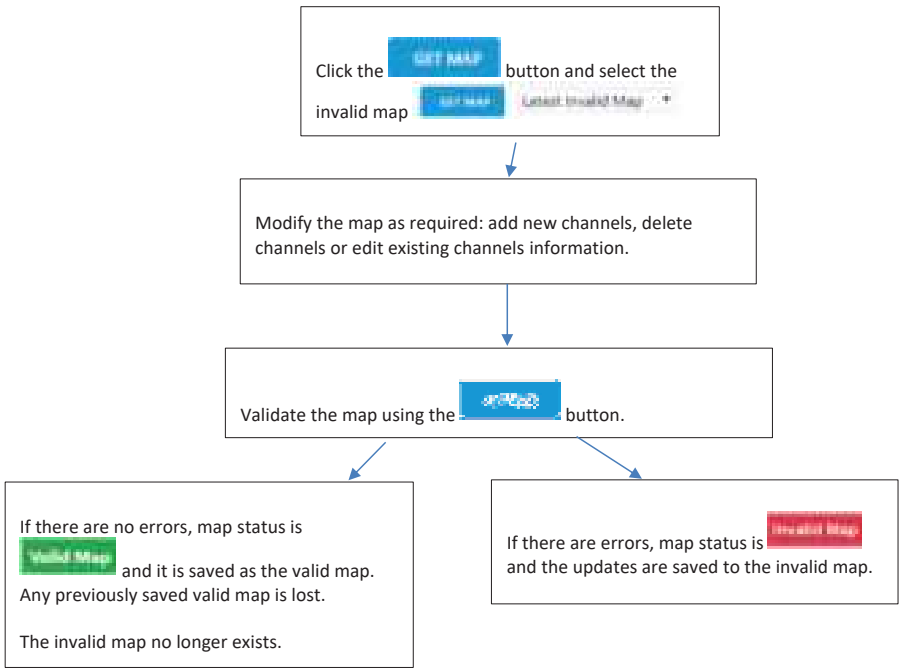
### 6.1.5.1 Map Management Flows

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:**



### 6.1.5.2 Add a New Channel

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

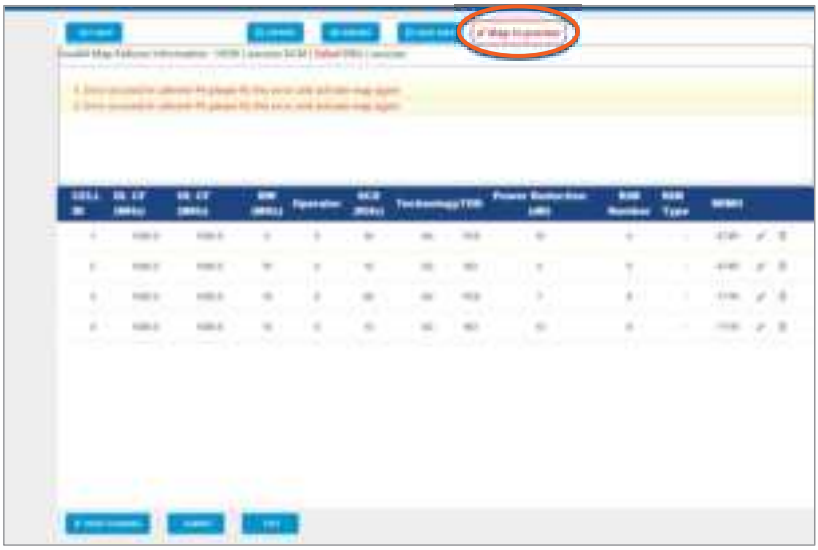

*Table 33: Add Channel Form*

| 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. |

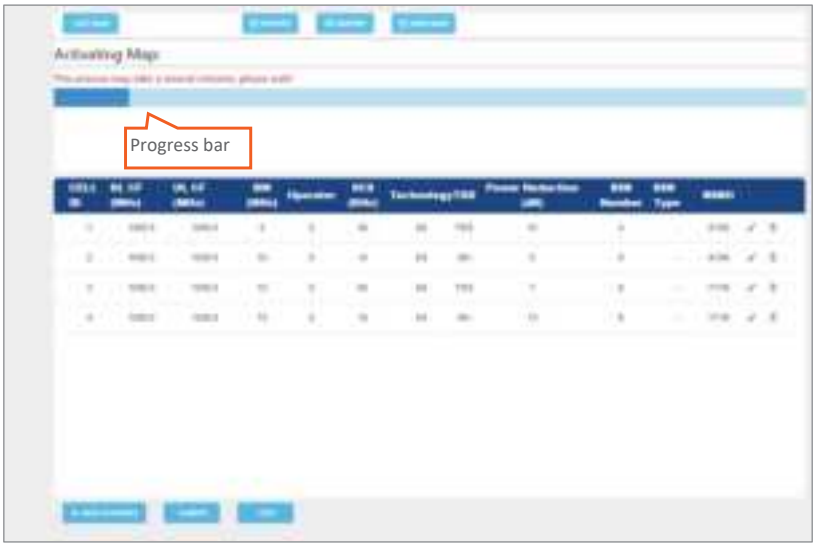
*Note: Up to 32 channels can be added (16 channels per DCM).*

### 6.1.5.3 Submitting a map

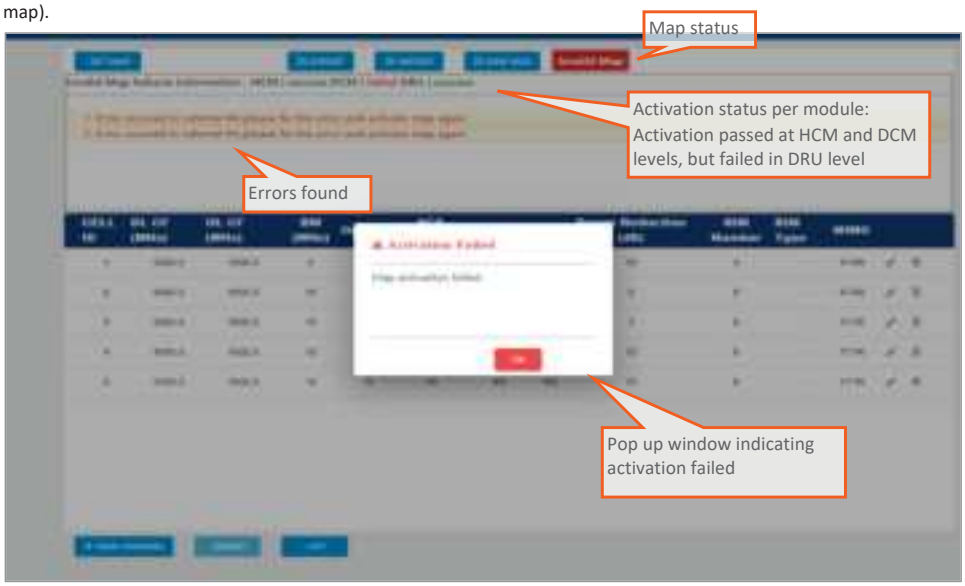
1. When changes are made to any map the status of the map is **map in process** until the changes are submitted:



2. 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.



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).




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.

# 7. 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 0), 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.

- **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.
- **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 7.2
3. Start monitoring the system

*Notes:*

** The supported traps are listed in section 7.3*

** The information each trap includes is listed in section **Error! Reference source not found.**.*

## 7.1 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 7.1.1
2. Through Everon GUI: Set traps monitoring destination addresses, see 7.1.2
3. Through your 3rd party SNMP monitoring tool: Load the MIB files, see 7.1.3

### 7.1.1 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:


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:

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


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**.

### 7.1.2 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.

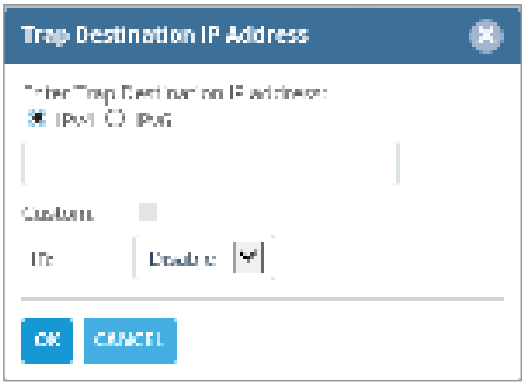
*Note: The defined HB interval must be the same for all devices in the system. This option is disabled by default.*

➢ **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:




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*.

### 7.1.3 SNMP 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 3rd 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.

## 7.2 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.

## 6.3 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 "trapDeviceTpe", 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 34:Binding Table*

| No. | Binding | Description |
|---|---|---|
| 1. | trapSequenceID | Trap sequence ID to be sent with the trap. This is a trapSequenceID varbind that is attached to the trap message in order to allow the manager to track missing traps. |
| 2. | trapTimeStamp | Time and date the current event occurred; Format H:M:S D/M/Y |
| 3. | 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)<br>fmm = (9)<br>frm = (10)<br>site = (11) |

| No. | Binding | Description |
|---|---|---|
| | | mru = (12)<br>lau = (21)<br>och = (24)<br>gx = (25)<br>mxu = (26) |
| 4. | trapDeviceSerial | Additional data sent with the trap. This is the serial number of the device that generated the trap (up to remote unit level). |
| 5. | trapChassisSN | Chassis serial number of the module |
| 6. | trapChassisIndex | Additional data sent with the trap. This is the base controller index that generates the trap (chassis index). |
| 7. | trapSlotIndex | Additional data sent with the trap. This is the base controller's port index that generates the trap (the slot inside the chassis). |
| 8. | 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). |
| 9. | trapRemoteIndex | Additional data sent with the trap. This is the internal index within the generating device (e.g., RxU index). |
| 10. | trapCtrlSerialNum | Serial number of the controller generating the event; Internal parameter. |
| 11. | trapCtrlName | Name of controller |
| 12. | trapModuleName | Name of module |
| 13. | trapSeverity | The alarm severity: (1) Notify<br>(2) Minor<br>(3) Major |
| 14. | trapChannel | Trap channel for remote unit band number for OIM optic port. |
| 15. | trapChannelDescription | Trap channel for remote unit band name for the OIM optical port. |

## 7.3 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 35: 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 |

| Trap name | Description | OID |
|---|---|---|
| acmExt2ClockDownClear | ACM Ext2 Clock down Clear | 117 |
| acmPilotClockDownSet | ACM Pilot Clock Down | 118 |
| acmPilotClockDownClear | ACM Pilot Clock Down Clear | 119 |
| 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 |
| rimUlSynthesizerUnlockedSet | RIM UL Synthesizer Unlocked | 250 |
| rimUlSynthesizerUnlockedClear | RIM UL Synthesizer Unlocked Clear | 251 |
| rimDlSynthesizerUnlockedSet | RIM DL Synthesizer Unlocked | 252 |
| rimDlSynthesizerUnlockedClear | 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 |

| Trap name | Description | OID |
|---|---|---|
| dcmOverTemprature Clear | 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<br><br>(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) | 2302 |
| ruCpriLinkClear | Remote CPRI link X status clear | 2303 |
| ruOverTempratureSet | Remote Unit Over temperature - sensor X | 2304 |
| ruOverTempratureClear | Remote Unit Over temperature clear | 2305 |
| ruServiceOffSet | Remote Unit service off - band X (600/700L/700H/FN/800/850/PCS/AWS/ WCS/TDD 2.5) | 2306 |
| ruServiceOffClear | Remote Unit service off clear | 2307 |
| ruUlLimiterSet | Remote Unit UL Limiter - band X | 2310 |
| ruUlLimiterClear | Remote Unit UL Limiter clear | 2311 |
| ruDlRfLowSet | Remote Unit DL RF Low | 2312 |
| ruDlRfLowClear | Remote Unit DL RF Low clear | 2313 |
| ruConnectionErrorSet | Remote Unit connection error | 2316 |
| ruConnectionErrorClear | Remote Unit connection error clear | 2317 |
| ruOverflowSet | Remote Unit Overflow - per channel X | 2320 |
| ruOverflowClear | Remote Unit Overflow clear | 2321 |
| ruVswrSet | Remote Unit VSWR Alarm in band X | 2322 |
| ruVswrClear | Remote Unit VSWR Alarm clear | 2323 |
| ruPaSelfProtectionSet | Remote Unit PA Self Protection Alarm - band X | 2324 |
| ruPaSelfProtectionClear | Remote Unit PA Self Protection Alarm clear | 2325 |
| ruTddOutOfSyncSet | Remote Unit TDD out of sync - band X | 2326 |
| ruTddOutOfSyncClear | Remote Unit TDD out of sync clear | 2327 |

# 8. 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 | 1930-1995 MHz |
| EAWS-band 66 | 1710-1780 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 | Single band module<br>(see bands table)<br>Interfaces: UL, DL and duplexed interface ports, QMA RF connectors<br>Weight: 1.9 lbs (0.9 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) |
| 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) |
| 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 | 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

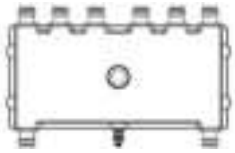
- **Medium Band LRU- Low power Remote Unit**
- **End to End System Performance**
- **Headend to Digital Low power Remote Unit**

| RF | | | | | | |
|---|---|---|---|---|---|---|
| Frequency Range Name | | | **1900** | **EAWS** | **WCS** | **2500** |
| Frequency Range | Uplink | MHz | 1850-1915 | 1710-1780 | 2305-2315 | 2496-2690 |
| | Downlink | | 1930-1995 | 2110-2180 | 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 | | | 5/10/15/20 for 4G<br><br>40 or 60 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 CBRS 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 | 1710-1780 | 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 | 1710-1780 | 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<br>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<br>The medium band combiner is designed to combine the following services: 1900, EAWS, WCS and 2.5GHz.<br>If a single module is required a single input (2500) is used.<br>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

# 9. 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 |
|---|---|
| **Stand Alone Modules** | |
| 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 |
| **Assemblies** | |
| dLRU-67817192325 | LRU set including: LRU low band, LRU mid band, mounting brackets, combiner plate, jumper cables, termination load, combiner |
| **Wall Mount bracket** | |
| BR-dLRU | LRU bracket for wall or celling mount installation |

- **MRU Part Numbers**

| Part Number | Description |
|---|---|
| **Stand Alone Modules** | |
| 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 |
| **Assemblies** | |
| 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 |
| **Wall Mount Bracket** | |
| BR-dMRU-W | MRU Wall Mounting Bracket |
| **General Information** | |

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 |
|---|---|
| **Stand Alone Modules** | |
| 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 |
| **Assemblies** | |
| 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 |