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Wave Electronics WEH37-TM24B 25G SFP+ 1port L2 Ethernet Encapsulation



USER MANUAL

MODEL: WEH37-TM24B

Revision History

Who	Version	Date	Comment
Minhyeok Kwon	0.1	25-11-2024	Initial version

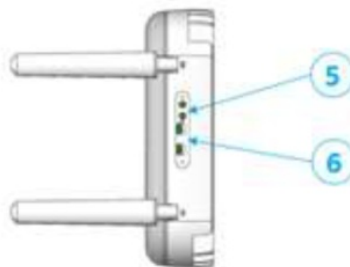
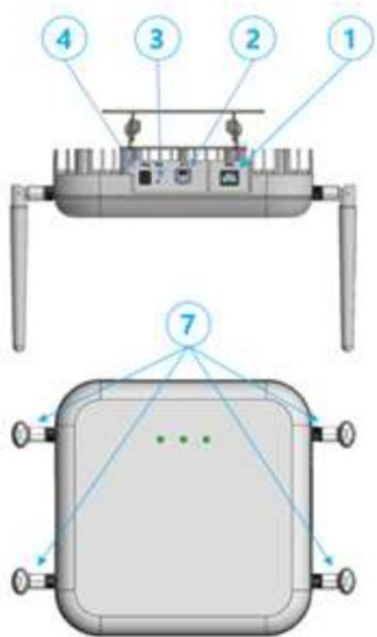
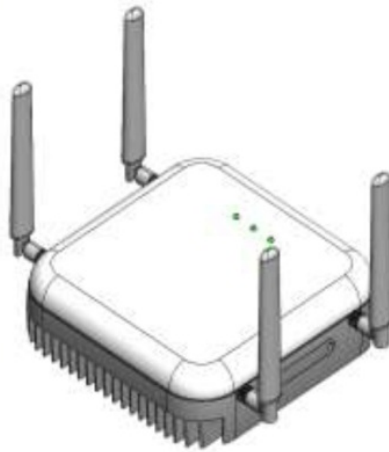
I. Overview of O-RU

A. Introduction of O-RU

This product is the indoor small-output O-RU device that supports 4T4R in n48

Bandwidth, operated while linked to O-RAN DU and 10Gbps O-RAN eCPRI interface.

B. Outward Appearance



No.	Item	Description	Count	Remarks
1	10G SFP+	10Gbps Optical Port	1	
2	1G Ethernet RJ-45	Management Port	1	Not Use in Operation
3	Reset Button	Reset	1	
4	DC Jack	+12V DC Input	1	Use Adapter
5	MMCX	1PPS Out / 10MHz Out	2	Not Use in Operation
6	USB2.0 Micro B type	Console Port / Factory Use	2	Not Use in Operation
7	Antenna	RF Transmission/Reception	4	

C. Technical Specification

Category		Specification
Product purpose		n48(CBRS) O-RU
Power	Rated Voltage	DC 12V
I/O Port	User Port	A0, A1, A2, A3: Antenna Port 0~3 Opt: SFP+ 10G Pwr: DC IN
	Unused/Administrator's port	Console: USB (micro-B) Factory USB (micro-B) Eth: RJ45 Management 1pps: MMCX-Female 10MHz: MMCX-Female
Functionality	Product Functionality	
	Wireless Functionality	Transmission: 3550 MHz ~ 3700 MHz Reception: 3550 MHz ~ 3700 MHz
Supplies		O-RU Board Adaptor Antenna

D. Environmental Specification

Item	Specification	Remarks
Operating Temperature.	-5 ~ 45°C	
Power Consumption	< 40W	
Cooling	Natural Convection Cooling	
Humidity	Storage 5 ~ 95%	
IP level	IP30	

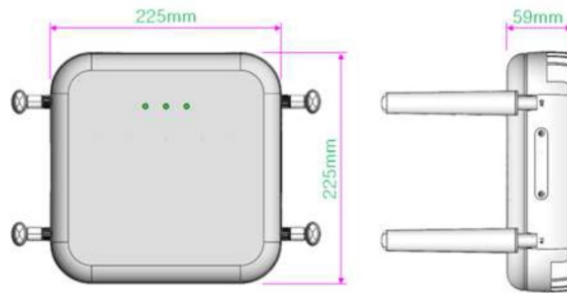
E. RF Specification

Item	Specification	Remarks
Frequency Range	n48	
Service Frequency	3550~3700 MHz	
Number of TRX	4T4R	
Output Power	20dBm@BW 40MHz	@port
	17dBm@BW 20MHz	
	14dBm@BW 10MHz	
ACLR	< - 45dBc	
Frequency Error	±0.1ppm	
Spurious Emission	Category B	
EVM	< 17.5%@QPSK	
	< 12.5%@16QAM	
	< 8%@64QAM	
	<3.5%@256QAM	
Sub Carrier Spacing	30 kHz ($\mu = 1$)	

Antenna Gain	5.8dBi	Due to Peak
--------------	--------	-------------

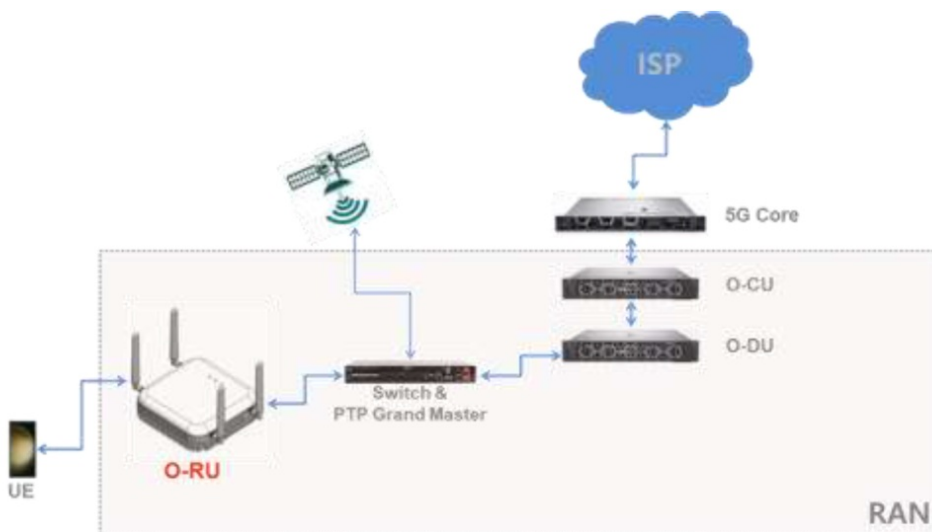
F. Mechanical Specification

Item	Specification	Remarks
Dimension	225(W) x 225(H) x 59(D)mm	Without bracket
Volume	< 3 Liter	
Weight	< 2Kg	with antenna
Installation	Wall, Ceiling	

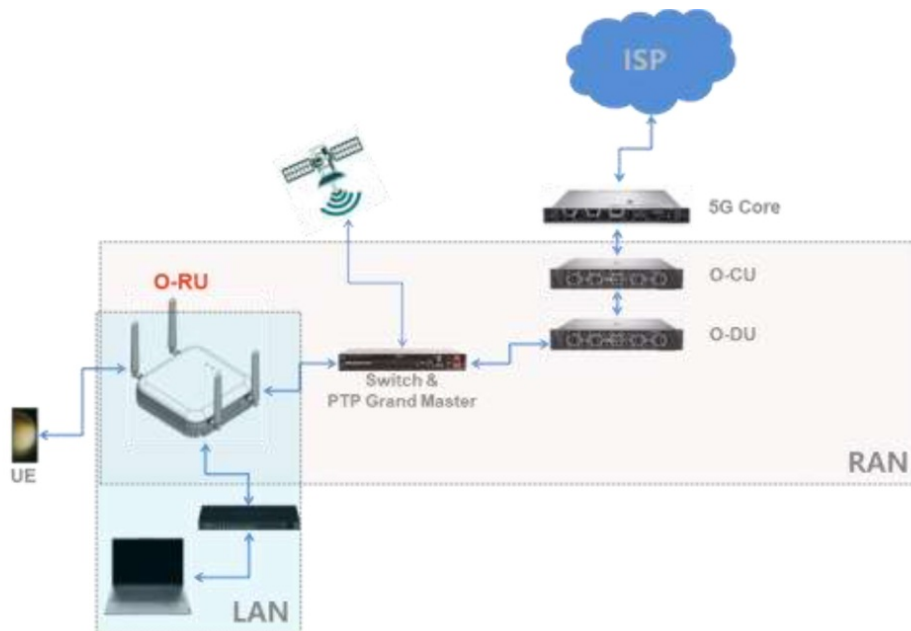


II. Network configuration

A. O-RU network connection with O-DU/O-CU/5G Core Network



B. O-RU LAN configuration for remote control/debugging



III. Cable connection

10G SFP+ port

RJ45 ethernet port

Management port is used for 1000 Base-T Ethernet connection purposes.

DHCP client allocates IP for default configuration. In case DHCP server doesn't exist, fall back address is configured as 172.16.16.123.

Supplies ssh, http connection to monitor device status, configuration and to debug.

Console port: The port to debug the issue in Linux shell, PC connection is available via Micro USB port.

It is available to monitor IP addresses, running processes, and log message for simple debugging purposes.

Application programs such as 'putty' and 'tera term' need to be set as Serial/115200/8 and without flow control.

ID and Password are initialized as admin/admin.

IV. WEB GUI Introduction

A. Access

Check the IP address of eth0 in the console port.

In case of IP allocation via DHCP, look up the IP allocation list of DHCP server and check the ORU MAC

address to inspect the ORU IP address.

Wave Electronics MAC addresses are initialized as 00:1A:60:XX:XX:XX.


Log in page is displayed after entering ORU IP address in the PC web browser connected to ORU. Ex.)

<http://172.16.16.123>

B. Login

ID/PW: admin/admin


ID/PW: admin/admin



The screenshot shows the login interface for WaveElectronics ORU. At the top, there is a dark header bar with the WaveElectronics logo on the left, the text "WaveElectronics ORU" in the center, and a "Refresh" button on the right. Below the header, there is a light gray box containing the login form. The form has two input fields: "ID" and "Password", each with a small icon to its left. To the right of the "Password" field is a dark gray "Login" button. Below the login form, there is a light gray footer bar. On the left side of the footer, it says "A/S Request :". In the center, it says "Copyright © 2023. Wave Electronics Co., Ltd. All rights reserved."

C. Dashboard

After the log-in process, the system information page is displayed below.


WaveElectronics ORU

▶ **Status Information**

- **System Information**
- System Log
- ORU OAM Status
- ORU Performance Management
- RF

▶ **Configuration**

System information

Model Name/Manufacturer	WCH17/Wave Electronics Co.Ltd
Version	V2.3.1(ORU-OSF)
Date, Time	Thu, 01 Jan 1970 09:38:45 +0900
System Up Time	38 minutes, 40 seconds
Memory Usage	40%
ORU Usage	100.0%
Temperature	Front: 49.4 °C / Fan: -95~99, -95~99 / NPU: 44.0 °C / BQ3PWR: 56.0 °C
Serial Number	10T012249800014

Image information

ORU-OSF	ORU-OSF
ImageVersion : 2.3.1	ImageVersion : 2.3.1
ImageBuildTime : 2024/Nov/08 16:38:39	ImageBuildTime : 2024/Nov/08 16:38:39

Test Mode Configuration

Test Mode Status(Normal, 1 Test Mode)	1
Test mode option(version)	v5.1.0

Management port IP Configuration

Protocol Type	DHCP
IP Address	172.16.16.523

uCPRI port IP Configuration

Protocol Type	
IP Address	

V. Status Information Menu

This menu monitors the system status information. It consists of the following sub menu.

A. System information sub menu

WaveElectronics ORU																																			
<div> <div> <div>WE</div> <div>WaveElectronics</div> </div> <div> <div>System Information</div> <div> <ul style="list-style-type: none"> System Information System Log ORU GAM Status ORU Performance Management RF </div> </div> <div> <div>Configuration</div> </div> </div>	<div> <div>System information</div> <table> <tr> <td>Model Name/Manufacturer</td><td>WEH37/Wave Electronics Co.,Ltd</td></tr> <tr> <td>Version</td><td>V2.1.1(ORU-OS1)</td></tr> <tr> <td>Date, Time</td><td>Thu, 01 Jan 1970 00:38:40 +0900</td></tr> <tr> <td>System Up Time</td><td>38 minutes, 40 seconds</td></tr> <tr> <td>Memory Usage</td><td>40%</td></tr> <tr> <td>CPU Usage</td><td>100.0%</td></tr> <tr> <td>Temperature</td><td>Proc: 45.4 °C / Fw: -95.00 ~95.00 / NPU: 44.0 °C / B03PWR: 56.0 °C</td></tr> <tr> <td>Serial Number</td><td>107012289400014</td></tr> </table> <div>Image information</div> <table> <tr> <th>ORU-OS1</th><th>ORU-OS2</th></tr> <tr> <td>ImageVersion : 2.3.1</td><td>ImageVersion : 2.3.1</td></tr> <tr> <td>ImageBuildTime : 2024/Nov/08 16:38:29</td><td>ImageBuildTime : 2024/Nov/08 16:38:29</td></tr> </table> <div>Test Mode Configuration</div> <table> <tr> <td>Test Mode Status(Normal, 1 Test Mode)</td><td>1</td></tr> <tr> <td>Test mode cy(temperature)</td><td>v5.1.0</td></tr> </table> <div>Management port IP Configuration</div> <table> <tr> <td>Protocol Type</td><td>DHCP</td></tr> <tr> <td>IP Address</td><td>172.16.16.123</td></tr> </table> <div>eCPRI port IP Configuration</div> <table> <tr> <td>Protocol Type</td><td></td></tr> <tr> <td>IP Address</td><td></td></tr> </table> </div>	Model Name/Manufacturer	WEH37/Wave Electronics Co.,Ltd	Version	V2.1.1(ORU-OS1)	Date, Time	Thu, 01 Jan 1970 00:38:40 +0900	System Up Time	38 minutes, 40 seconds	Memory Usage	40%	CPU Usage	100.0%	Temperature	Proc: 45.4 °C / Fw: -95.00 ~95.00 / NPU: 44.0 °C / B03PWR: 56.0 °C	Serial Number	107012289400014	ORU-OS1	ORU-OS2	ImageVersion : 2.3.1	ImageVersion : 2.3.1	ImageBuildTime : 2024/Nov/08 16:38:29	ImageBuildTime : 2024/Nov/08 16:38:29	Test Mode Status(Normal, 1 Test Mode)	1	Test mode cy(temperature)	v5.1.0	Protocol Type	DHCP	IP Address	172.16.16.123	Protocol Type		IP Address	
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Test mode cy(temperature)	v5.1.0																																		
Protocol Type	DHCP																																		
IP Address	172.16.16.123																																		
Protocol Type																																			
IP Address																																			

The following information is displayed on this page.

System information

Model Name/ Manufacturer: Displayed as WEH37/Wave Electronics Co.,Ltd.

Version: Display the current version of ORU OS(ROS1/ROS2).

Date, Time: Current Date/Time in the system.

System Up Time: Display the time passed after the booting.

Memory Usage: Display the memory usage.

CPU Usage: Display the CPU usage.

Temperature: Display the current temperature of NPU, NoC (PC802R).

System uptime, CPU/memory usage, temperature are updated in 5 seconds.

NoC: Network on Chip

Image Information

Display the information of ORU-OS saved in the flash memory.

The SW of WEH37 ORU is operated by active/standby method.

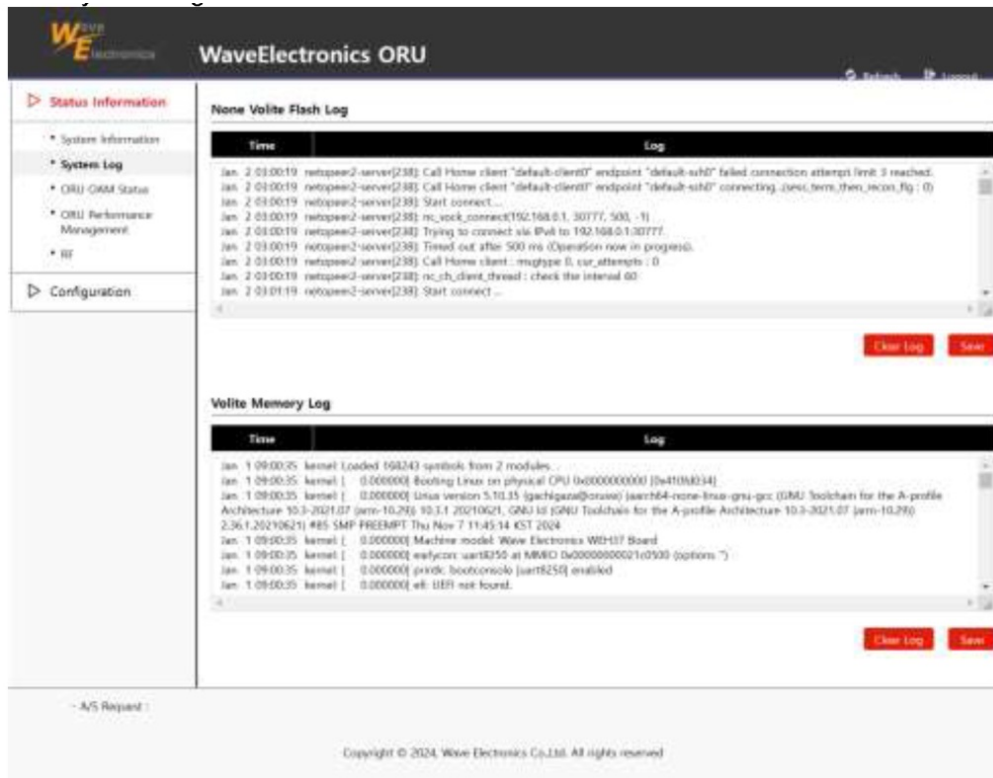
Ex) ORU-OS2 is operated after the SW upgrade if the current ORU-OS is operated with ORU-OS1.

Management port IP Configuration/eCPRI port IP Configuration

Display the address of Management port and eCPRI port.

The default setting value is configured as DHCP, and it displays the fallback address if DHCP fails.

B. System Log sub menu



WaveElectronics ORU

Status Information

- System Information
- System Log**
- ORU GMM Status
- ORU Performance Management
- RF

Configuration

None Volite Flash Log

Time	Log
Jan 2 03:00:19	netopee2-server[238]: Call Home client "default-client0" endpoint "default-sid0" failed connection attempt limit 3 reached.
Jan 2 03:00:19	netopee2-server[238]: Call Home client "default-client0" endpoint "default-sid0" connecting (desc,term,then_recon_flg: 0)
Jan 2 03:00:19	netopee2-server[238]: Start connect...
Jan 2 03:00:19	netopee2-server[238]: nc_sock_connect(192.168.0.1, 30777, 500, -1)
Jan 2 03:00:19	netopee2-server[238]: Trying to connect via IPv6 to 192.168.0.1:30777
Jan 2 03:00:19	netopee2-server[238]: Timed out after 500 ms (Operation now in progress).
Jan 2 03:00:19	netopee2-server[238]: Call Home client : nc_type 0, cur_attempts : 0
Jan 2 03:00:19	netopee2-server[238]: nc_sock_thread : check the internal 00
Jan 2 03:01:19	netopee2-server[238]: Start connect...

Volite Memory Log

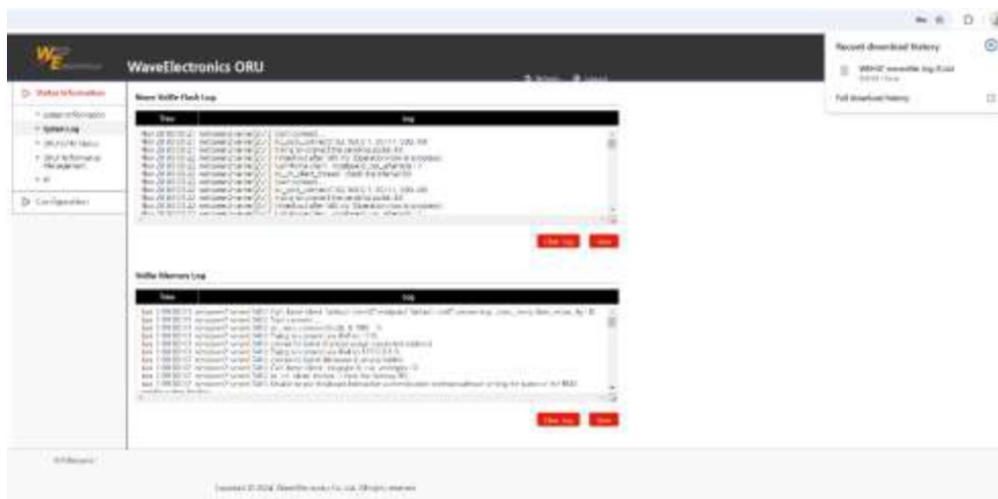
Time	Log
Jan 1 09:00:35	kernel: Loaded 168243 symbols from 2 modules.
Jan 1 09:00:35	kernel: [0.000000] booting Linux on physical CPU (0x0000000000 [0x4108034])
Jan 1 09:00:35	kernel: [0.000000] Linux version 5.10.15 (gachipaza@orau) (aarch64-linux-gnu-gcc (GNU Toolchain for the A-profile Architecture 10.3-2021.07 (arm-10.20) 10.20) 10.3-2021.07) (arm-10.20) 10.3-2021.07) #65 SMP PREEMPT Thu Nov 7 11:45:14 KST 2024
Jan 1 09:00:35	kernel: [0.000000] Machine model: Wave Electronics WEH37 Board
Jan 1 09:00:35	kernel: [0.000000] earlycon: uart8250 at MMIO 0x00000000021e0500 (options="")
Jan 1 09:00:35	kernel: [0.000000] printk: bootconsole [uart8250] enabled
Jan 1 09:00:35	kernel: [0.000000] efi: UEFI not found.

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WEH37 ORU supports monitoring system log in non volite/volite areas via syslog.

Two red buttons below each log area functions 'clear' or 'save' the log.

In case of downloading the log to the PC via "save" button



WaveElectronics ORU

Status Information

- System Information
- System Log**
- ORU GMM Status
- ORU Performance Management
- RF

Configuration

None Volite Flash Log

Time	Log
Jan 2 03:00:19	netopee2-server[238]: Call Home client "default-client0" endpoint "default-sid0" failed connection attempt limit 3 reached.
Jan 2 03:00:19	netopee2-server[238]: Call Home client "default-client0" endpoint "default-sid0" connecting (desc,term,then_recon_flg: 0)
Jan 2 03:00:19	netopee2-server[238]: Start connect...
Jan 2 03:00:19	netopee2-server[238]: nc_sock_connect(192.168.0.1, 30777, 500, -1)
Jan 2 03:00:19	netopee2-server[238]: Trying to connect via IPv6 to 192.168.0.1:30777
Jan 2 03:00:19	netopee2-server[238]: Timed out after 500 ms (Operation now in progress).
Jan 2 03:00:19	netopee2-server[238]: Call Home client : nc_type 0, cur_attempts : 0
Jan 2 03:00:19	netopee2-server[238]: nc_sock_thread : check the internal 00
Jan 2 03:01:19	netopee2-server[238]: Start connect...

Volite Memory Log

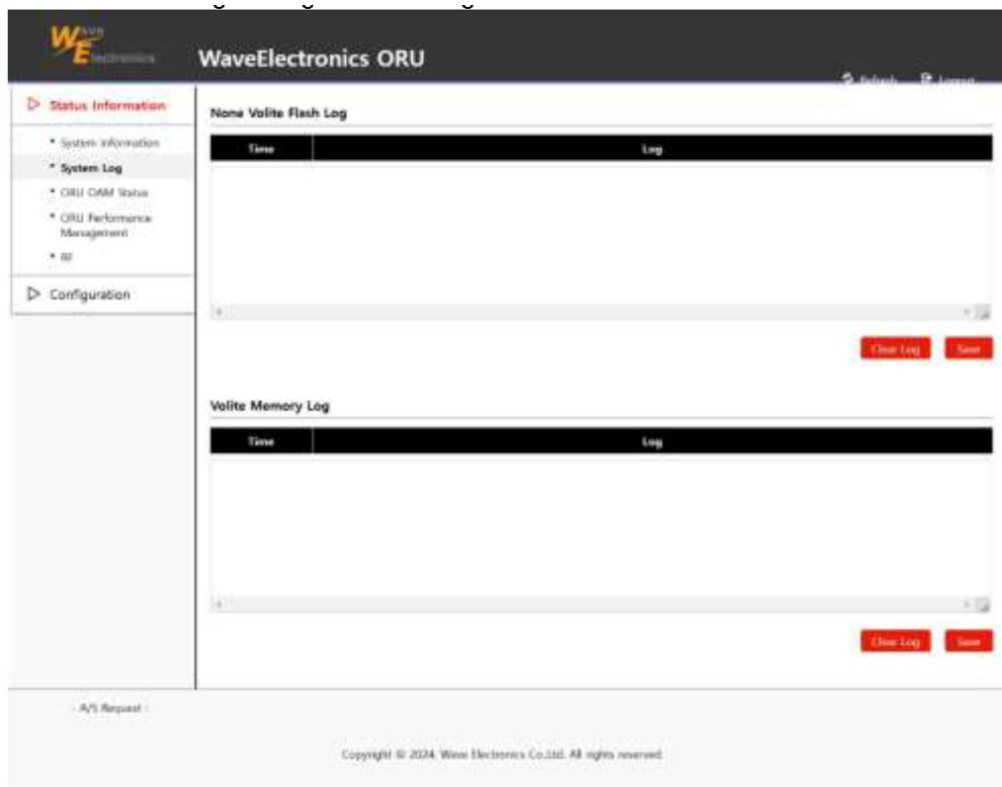
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Jan 1 09:00:35	kernel: Loaded 168243 symbols from 2 modules.
Jan 1 09:00:35	kernel: [0.000000] booting Linux on physical CPU (0x0000000000 [0x4108034])
Jan 1 09:00:35	kernel: [0.000000] Linux version 5.10.15 (gachipaza@orau) (aarch64-linux-gnu-gcc (GNU Toolchain for the A-profile Architecture 10.3-2021.07 (arm-10.20) 10.20) 10.3-2021.07) (arm-10.20) 10.3-2021.07) #65 SMP PREEMPT Thu Nov 7 11:45:14 KST 2024
Jan 1 09:00:35	kernel: [0.000000] Machine model: Wave Electronics WEH37 Board
Jan 1 09:00:35	kernel: [0.000000] earlycon: uart8250 at MMIO 0x00000000021e0500 (options="")
Jan 1 09:00:35	kernel: [0.000000] printk: bootconsole [uart8250] enabled
Jan 1 09:00:35	kernel: [0.000000] efi: UEFI not found.

Recent download history

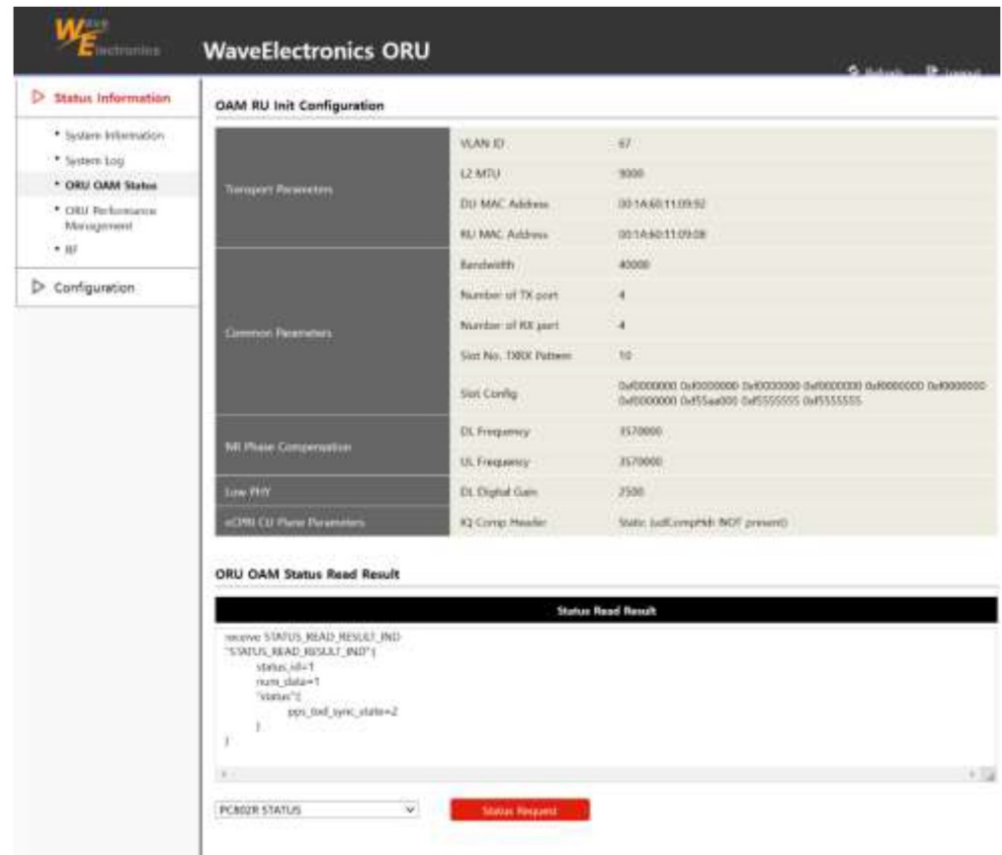
- WEH37-NoneVolite-Log-Flash
- WEH37-Volite-Memory-Log

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In case of deleting the log via “clear log” button



C. O-RU OAM status sub menu



OAM RF Init Configuration

The following OAM configuration information is displayed.

Transport Parameters: Displays VLAN ID, L2 MTU size, DU/RU MAC address.

Common Parameters: Displays Bandwidth, Number of TX/RX antenna port, Slot number of DL/UL transmission periodicity, Slot configuration.

NR Phase Compensation: Displays DL/UL Frequency.

Low PHY: Displays DL Amplitude Scale for time domain signal amplitude adjustment.

eCPRI CU Plane Parameters: Displays whether IQ Compression Header is Dynamic (udCompHdr present) or Static (udCompHdr NOT present).

ORU OAM Status Read Result

Available to monitor the following OAM Status information.

PC802R_STATUS: 0:IDLE, 1:CONFIGURED, 2:RUNNING

Normal operation status displays oam_agent_state as 2.

ORU OAM Status Read Result

Status Read Result

```
status_id=0
num_data=1
"status":{
  oam_agent_state=2
}
```

PC802R STATUS

Status Request

PPS_TOD_SYNC_STATUS: Monitoring PPS TOD Sync status. 0:UNLOCKED, 1:LOCKED
Normal operation status displays pps_tod_sync_state as 1.

ORU OAM Status Read Result

Status Read Result

```
status_id=1
num_data=1
"status":{
  pps_tod_sync_state=1
}
```

PPS TOD SYNC STATUS

Status Request

ECPRI_LINK_STATUS: Monitoring the connection status to DU. 1:LINKED/0:UNLINKED
Normal ECPRI service status displays ecpri_link_state as 1.

ORU OAM Status Read Result

Status Read Result

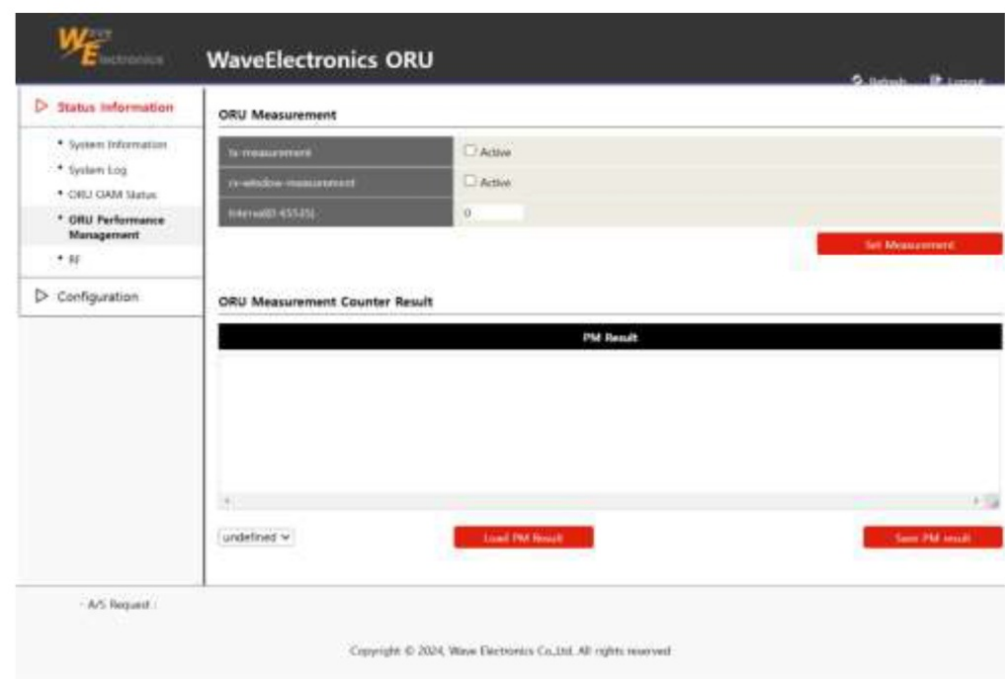
```
status_id=2
num_data=1
"status":{
  ecpri_link_state=1
}
```

PVT_STATUS: Monitoring the internal temperature of the PC802R.

ECPRI_PACKET_PROCESSOR_STATUS: Monitoring packet counts of ecpri_tx_pkt,
non_ecpri_rx_pkt,
ecpri_rx_pkt per 4 pvt and non_ecpri_tx_pkt.

ORU_SW_VERSION_INFO: Monitoring hash ID of ORU related SW.
ECPRI_RS_FEC_STATUS

D. ORU Performance Management sub menu



ORU Measurement

Available to configure whether to enable performance management per Tx/Rx or not. Select Active checkbox of each Tx/Rx measurement and configure interval (unit: seconds), then press the ‘Set Measurement’ button to apply the changed configuration.

ORU Measurement Counter Result

WaveElectronics ORU

[Refresh](#)
[Logout](#)

▶ **Status Information**

- System Information
- System Log
- ORU OAM Status
- ORU Performance Management**
- RF

▶ **Configuration**

ORU Measurement

Is measurement?

Is active measurement?

Interval: 65536

Active

Active

[Get Measurement](#)

ORU Measurement Counter Result

PM Result

PM Result	BU	BU	BU
RA_SPPH1_2	2024-09-27T13:46:10+09:00	2024-09-27T13:46:15+09:00	BU
RX_LATENCY	2024-09-27T13:46:10+09:00	2024-09-27T13:46:15+09:00	BU
RX_CORRUPT	2024-09-27T13:46:10+09:00	2024-09-27T13:46:15+09:00	BU
RX_BB_DROP	2024-09-27T13:46:10+09:00	2024-09-27T13:46:15+09:00	BU
TX_TOTAL	2024-09-27T13:46:15+09:00	2024-09-27T13:46:20+09:00	BU
TX_TOTAL_C	2024-09-27T13:46:15+09:00	2024-09-27T13:46:20+09:00	BU
RX_TOTAL	2024-09-27T13:46:15+09:00	2024-09-27T13:46:20+09:00	BU
RX_ON_TIME	2024-09-27T13:46:15+09:00	2024-09-27T13:46:20+09:00	BU
RX_ERROR	2024-09-27T13:46:15+09:00	2024-09-27T13:46:20+09:00	BU
BU Latency	2024-09-27T13:46:15+09:00	2024-09-27T13:46:20+09:00	BU

C20240927134615+0900_RU.csv

Load PM Result

Save PM result

- A/S Request

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Monitoring the results of ORU Measurement Counter.

Select the csv file from the list and press the ‘Load PM Result’ button to monitor the result. It is also available to save csv file with the ‘Save PM result’ button.

E. RF sub menu

a. RF Initial Configuration

WaveElectronics ORU

[Refresh](#)
[Logout](#)

▶ **Status Information**

- System Information
- System Log
- ORU OAM Status
- ORU Performance Management
- RF**

▶ **Configuration**

RF Status

- RF Initial Configuration**
- RU To Power

RF Initial Configuration

Frequency	UL Frequency(MHz) : -	3570
	DL Frequency(MHz) : -	3570
Antennas	UL Antennas(2 or 4)	4
	DL Antennas(2 or 4)	4
Line Rate	UL Line Rate(4: 4.9G 9: 9.8G)	9
	DL Line Rate(4: 4.9G 9: 9.8G)	9
DL Attenuation	TX0 Attenuation(mdB) : -	8000
	TX1 Attenuation(mdB) : -	8000
	TX2 Attenuation(mdB) : -	7100
	TX3 Attenuation(mdB) : -	7100

- A/S Request

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RF Initial Configuration

The following RF Initial Configuration information is displayed.

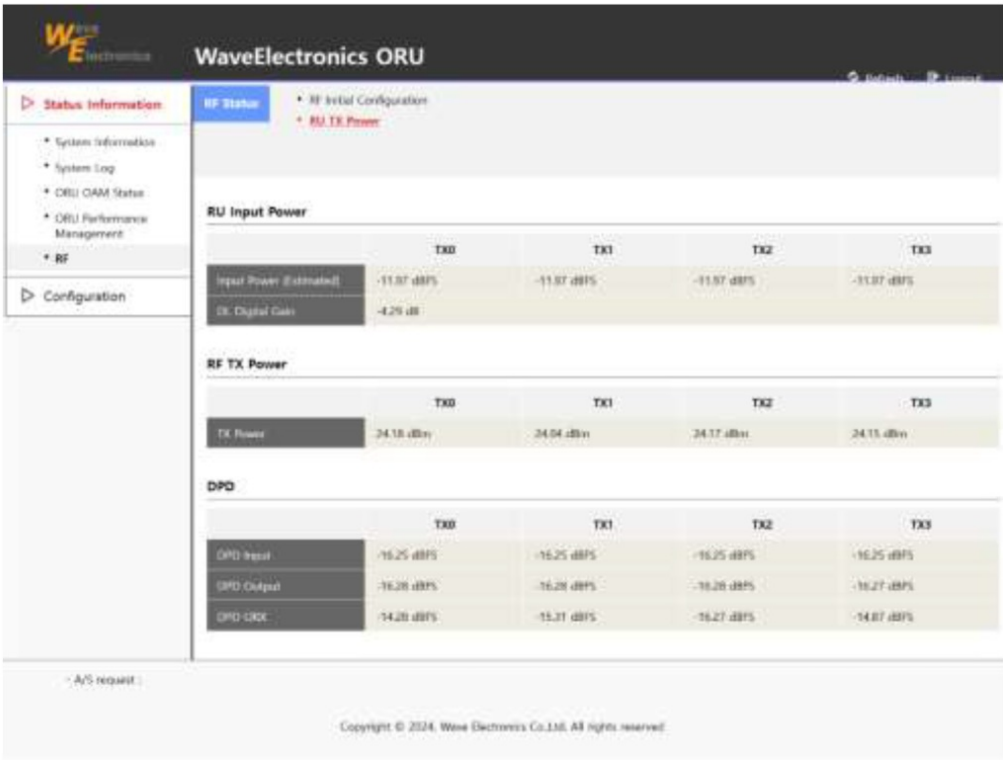
Frequency: Displays UL/DL Frequency (Unit: MHz)

Antennas: Displays the number of UL/DL Antennas

Line Rate: Displays whether the UL/DL Lane rates are 4.9G or 9.8G

DL Attenuation: Displays Tx Attenuation values per each Tx path (TX0~TX3)

b. RU Tx Power sub menu



RU Input Power

Monitoring the following Power information.

Input Power (Estimated): Displays the estimated ORU Input Power

DL Digital Gain: Displays the DL Digital Gain value per Tx path.

RF TX Power

Monitoring the following Power information.

TX Power: Displays the RF Tx Power per Tx path.

DPD

Monitoring the following Power information.

DPD Input: Displays the DPD Input Power per Tx path.

DPD Output: Displays the DPD Output Power per Tx path.
DPD ORX: Displays the DPD ORX Power per Tx Path.

VI. Configuration Menu

Supports configuration functionalities.

A. RF sub menu

Configuration

RF

RJ-CAM

Network

System Management

RF Configuration

Bandwidth & Carrier Frequency

Bandwidth40 MHz

Carrier Frequency3570000 kHz

Attenuation

TX06100 mdB6100 mdB

TX16300 mdB6300 mdB

TX27100 mdB7100 mdB

TX37100 mdB7100 mdB

RX Gain Index

RX000dB0dB

RX100dB0dB

RX200dB0dB

RX300dB0dB

ORX0-240-240

ORX1-240-240

ORX2-240-240

ORX3-240-240

TX Enable status

TX Enable

TX0☒TX1☒TX2☒TX3☒

TX path RSSI

RX056250 mdBFS

RX10 mdBFS

RX20 mdBFS

RX356250 mdBFS

DPD ORX Power

TX0Saved : -14.46 dBFS

TX1Saved : -15.35 dBFS

TX2Saved : -16.44 dBFS

TX3Saved : -15.02 dBFS

Set to Save DPD ORX Power

Save Rx Attenu & ORX Gain

RF Configuration

Support RF configuration functionalities for the following parameters.

Bandwidth & Carrier Frequency: Displays current Bandwidth (Unit: MHz) and Carrier Frequency (Unit: kHz)

Attenuation: Displays operating Tx Attenuation value per Tx path (Unit: mdB) and saved Tx Attenuation value per Tx path according to operating Carrier Frequency. Available to modify the Tx Attenuation value on the input element and press the ‘Set’ button to apply the change.

RX Gain Index: Displays operating Rx Gain value and ORX Gain value per each path

(Unit: dB). Available to modify the Rx Gain and ORX Gain value on the input element and press the 'Set' button to apply the change.

TX Enable status: Displays which Tx path is running. Available to change the TX status whether to enable or not. Modify with the checkbox per each Tx path and press the 'Set' button to apply the change.

RX path RSSI: Displays current Rx path RSSI (Unit: mdBFs)

DPD ORX Power: Displays the saved DPD ORX reference power per each Tx path. When the DPD starts running, press the 'Get DPD ORX Power' button to load current DPD ORX reference power per each Tx path. The following picture describes how this page changes when the 'Get DPD ORX Power' is pressed.

The screenshot shows the 'RF Configuration' interface. On the left is a sidebar with a 'Configuration' header and a menu containing 'RF', 'EU OAM', 'Network', and 'System Management'. The main area is titled 'RF Configuration' and contains several sections:

- Bandwidth & Carrier Frequency:** Shows 'Bandwidth' as 40 MHz and 'Carrier Frequency' as 357000 kHz.
- Antenna:** A table with columns for TX path (TX0, TX1, TX2, TX3) and their corresponding values (e.g., 4.900 mdB, 6.100 mdB). A 'Set' button is on the right.
- RX Gain Index:** A table with columns for RX path (RX0, RX1, RX2, RX3) and their corresponding values (e.g., 0 dB, 0 dB). A 'Set' button is on the right.
- TX Enable status:** A table with columns for TX path (TX0, TX1, TX2, TX3) and their corresponding status (checked/unchecked). A 'Set' button is on the right.
- RX path RSSI:** A table with columns for RX path (RX0, RX1, RX2, RX3) and their corresponding values (e.g., 36250 mdBfs, 0 mdBfs).
- DPD ORX Power:** A table with columns for TX path (TX0, TX1, TX2, TX3) and their corresponding 'Saved' and 'Current' values (e.g., Saved: -14.46 dBFS, Current: -14.25 dBFS). A 'Get DPD ORX Power' button is on the right.

At the bottom, there are two red buttons: 'Set & Save DPD ORX Pwr' and 'Save Tx Atten & ORX Gain'.

The page displays the current DPD ORX reference power per Tx path.

To save the modified parameters to the flash memory, press the 'Save Tx Atten & ORx Gain' button to save Tx Atten & ORx Gain values. And press the 'Set & Save DPD ORX Pwr' button to save DPD ORX reference power per Tx path.

WaveElectronics ORU

RU OAM

- RU OAM Configuration
- OAM Initial Configuration

OAM RU Init Configuration

Transport Parameters	VLAN ID	67
	L2 MTU	9000
	DU MAC Address	001A:60:11:05:92
	RU MAC Address	001A:60:11:05:08
Common Parameters	Bandwidth	40 MHz
	Number of TX port	4
	Number of RX port	4
	Slot No. TXRX Pattern	10
	Slot Config	0x00000000 0x00000000 0x00000000 0x00000000 0x00000000 0x00000000
DL&UL Frequency	Carrier Frequency	3570 MHz
Low PHY	DL Digital Gain	2500
IQ Compression Header	C-Plane	<input type="checkbox"/> Dynamic (sdCompetition present) <input checked="" type="checkbox"/> Static (sdCompetition NCS present)

Update (non-volatile memory)

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OAM RU Init Configuration

Transport Parameters: Displays current VLAN ID, L2 MTU, DU MAC Address, RU MAC Address and available to change these parameters.

Common Parameters: Displays current Bandwidth (Unit: MHz), Number of TX Port, Number of RX Port, Slot No. TXRX Pattern, Slot Config and available to change these parameters.

DL&UL Frequency: Displays current Carrier Frequency and available to choose the value. (Unit: MHz)

Low PHY: Displays current DL Digital Gain and available to change the value.

IQ Compression Header: Choose between Dynamic and Static compression method for CPlane.

Press the 'Update (non-volatile memory)' to save the modified configuration.

Advice: These parameters are applied after rebooting process.

Slot-config value:

Ex) Slot number 5 / DDSU / S 10:2:2

- Symbol Sequence: 14 13 12 11 10 9 8 7 6 5 4 3 2 1
- 2 bits per symbol

14	13	12	11	10	9	8	7	6	5	4	3	2	1
00	00	00	00	00	00	00	00	00	00	00	00	00	00

- Value per symbol Value → D symbol: 00, U symbol: 01, F Symbol: 10

0xf0000000 0xf0000000 0xf0000000 0xf5a00000 0xf5555555

D Slot: 0xf0000000 → 0'b1111 0000 0000 0000 0000 0000 0000 (D: 1 ~ 14 symbol)

U Slot: 0xf5555555 → 0'b1111 0101 0101 0101 0101 0101 0101 0101 U: (U: 1 ~ 14 symbol)

b. OAM Initial Configuration

Initial Configuration

OAM Log Level: Choose the OAM Log Level (Debug, Info, Warn, Error).

Execute Log Forwarder: Choose the checkbox whether to execute log forwarder or not.

Pico DM Log Level: Choose the Pico DM Log Level (Debug, Info, Warn, Error).

Timeout Seconds: Configure the timeout seconds to wait for TOD sync after carrier activation message is sent via OAM Manager. (Default: 50 seconds)

Operation Mode: Choose the Operation Mode between NETCONF and Standalone without NETCONF mode.

C. Network sub menu

a. IP Configuration

WaveElectronics ORU

Network Management

- IP Configuration
- PTP VLAN Configuration

Management port IP Address

Protocol Type: ☒ DHCP ☐ Static

IP Address: 192.168.1.1

Subnet Mask: 255.255.255.0

Set

eCPRI port IP Address

Protocol Type: ☒ DHCP ☐ Static

IP Address:

Subnet Mask:

Set

Save Configuration

Save Config

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Set IP address for Management port and eCPRI port.

DHCP is selected for default value. In case of setting as static, input IP address and subnet

mask then press the 'Set' button.

Advice: Web connection will be disconnected after changing the IP address of Management

port. Access with the modified IP address. It is necessary to press 'Save Config' button after

applying changes with pressing 'Set' button to maintain changes after reboot process.

b. PTP VLAN Configuration

The screenshot shows the 'WaveElectronics ORU' web interface. The left sidebar has a 'Configuration' menu with sub-items: RF, RU OAM, Interface IP, and System Management. The main content area is titled 'Network Management' and contains a sub-menu with 'IP Configuration' and 'PTP VLAN Configuration'. The 'PTP VLAN Configuration' section has a form with a 'PTP VLAN ID' input field and an 'Apply' button. Below this is a 'Save Configuration' section with a 'Save Config' button. The footer includes a copyright notice: 'Copyright © 2024 Wave Electronics Co., Ltd. All rights reserved.'

Configure PTP VLAN ID and press the 'Apply' button to apply the change.
After pressing the 'Save Config' button, the PTP VLAN ID will be saved in the SQL DB.

D. System Management sub menu

a. Time Configuration

TBD (Under development)

b. Log Configuration

The screenshot shows the 'WaveElectronics ORU' web interface. The left sidebar has a 'System Management' menu with sub-items: RF, RU OAM, Network, and System Management. The main content area is titled 'System Management' and contains a sub-menu with 'Time Configuration', 'Accounts', 'Configuration File', and 'Log Configuration'. The 'Log Configuration' section has a form with three rows: 'Local Memory' (Active/Inactive), 'Local Disk' (Active/Inactive), and 'Remote Log' (Active/Inactive). Below this is a 'NoC(eCPR) Log Configuration' section with a form for 'NoC(eCPR) Log forward' (Active/Inactive), 'DM IP address' (127.0.0.1), and 'DM port' (8888). The footer includes a copyright notice: 'Copyright © 2024 Wave Electronics Co., Ltd. All rights reserved.'

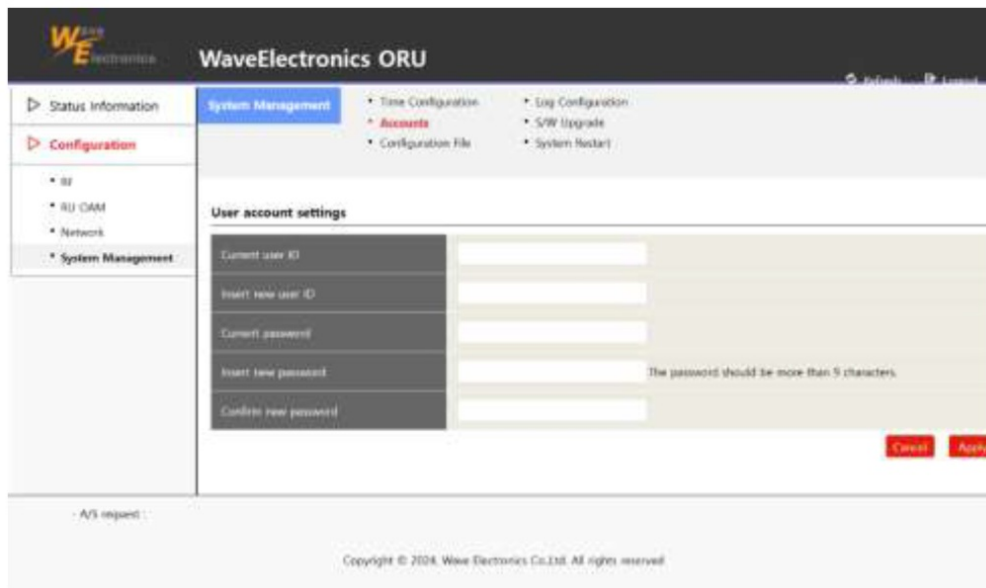
Log Configuration

Configure whether to save syslog or not.

NoC(eCPRI) Log Configuration

DM program log gathering configuration. Install the DM program on the remote PC, then input the correct IP/Port information. Press the 'Set' button to apply the change.

c. Accounts



The screenshot displays the WaveElectronics ORU web interface. The top header includes the WaveElectronics logo and the title 'WaveElectronics ORU'. A navigation menu on the left lists 'Status Information', 'Configuration', and 'System Management'. The 'Configuration' section is expanded, showing sub-menus like 'Time Configuration', 'Log Configuration', 'Accounts', 'Configuration File', 'S/W Upgrade', and 'System Restart'. The 'Accounts' sub-menu is selected, leading to the 'User account settings' page. This page contains input fields for 'Current user ID', 'Insert new user ID', 'Current password', 'Insert new password', and 'Confirm new password'. A note states 'The password should be more than 5 characters'. 'Cancel' and 'Apply' buttons are at the bottom right. The footer shows 'Copyright © 2018, Wave Electronics Co., Ltd. All rights reserved'.

Available to configure following materials about WEB UI user account.

Change password.

Add another account.

d. S/W Upgrade

The functionality to upgrade ORU S/W, support the following methods

The screenshot displays the WaveElectronics ORU web interface. The top navigation bar includes 'Status Information', 'System Management' (selected), and 'Configuration'. Under 'System Management', there are links for 'Time Configuration', 'Accounts', 'Configuration File', 'Log Configuration', 'S/W Upgrade' (highlighted in red), and 'System Restart'. The left sidebar lists 'RT', 'RU GMM', 'Network', and 'System Management' (selected). The main content area is titled 'S/W Upgrade' and contains three sections: 'TFTP Upgrade', 'FTP Upgrade', and 'PC File Upload'. Each section has input fields for 'Server address' and 'File name'. The 'FTP Upgrade' section also includes fields for 'ID' and 'Password'. Red 'Upgrade' buttons are present for each section. The 'PC File Upload' section has a blue 'Search' button and a red 'Upgrade' button. At the bottom, there is a footer with 'A/S request' and 'Copyright © 2024, Wave Electronics Co., Ltd. All rights reserved'.

TFTP upgrade: Constitute the TFTP server, download and upgrade the saved ORU SW from the server directory. Input the Server IP address and certain ORU SW file name.

FTP upgrade: Constitute the FTP server, download and upgrade the saved ORU SW from the server directory. Input the Server IP address, FTP access ID/Password and certain ORU SW file name.

PC file upload: Do not need to constitute the server, search the ORU S/W file and upgrade the system.

This method is much simpler than others. (Recommended to use) Advice:

Input the following command in console if it fails to upgrade tftp method in WEB UI.

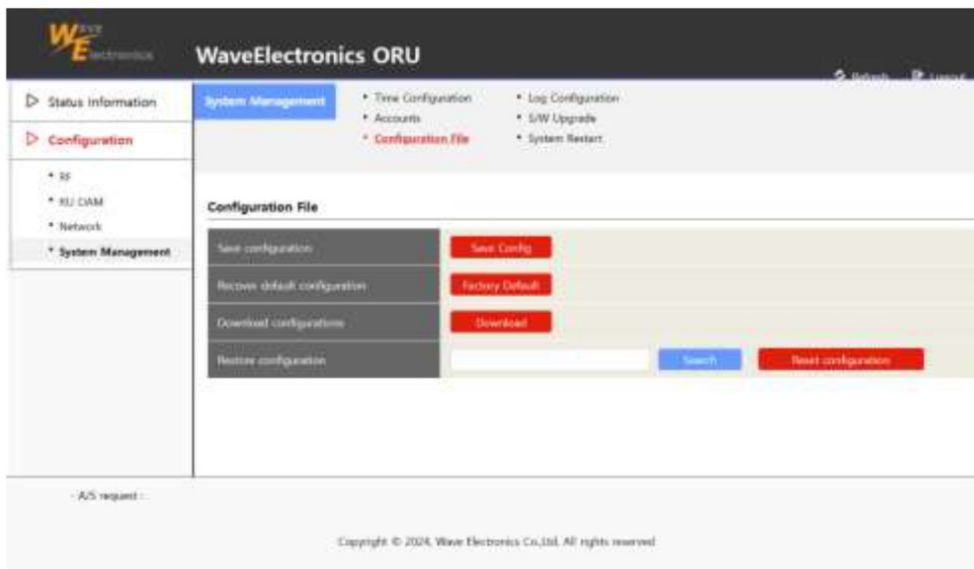
```
update-image.sh web -f /tmp/upload.bin -aq
```

Upload the ORU S/W file via sftp and input the following command in console.

(Upload the file in the /tmp directory)

```
update-image.sh web -f /tmp/ORUOS_weh37_v2.3.1.bin -aq
```

e. Configuration



Supports the following functionalities.

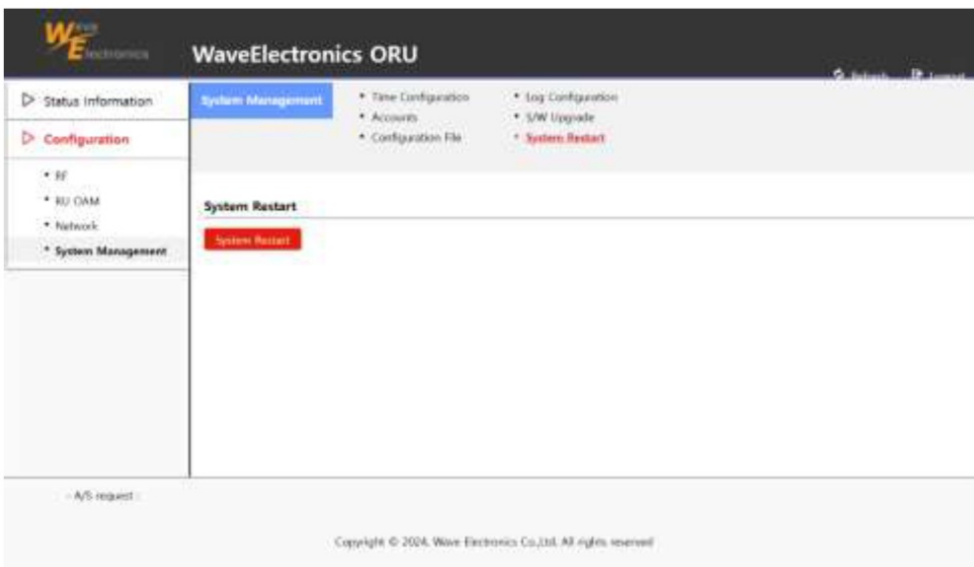
Save configuration: Save current configurations.

Recover default configuration: Initialize the configurations as default, reboot the system.

Backup configuration: TBD (Under development)

Restore configuration: TBD (Under development)

f. System Restart



Reboot the system.

g. Test Mode

Two running modes of device exist (Normal mode/Test Mode), and it could be changed in WEB UI.

The configuration address is hidden.

Input the address directly at the web browser for connection.

Ex) http://172.16.16.117/device/test_mode.asp

The screenshot shows the WaveElectronics ORU web interface. The left sidebar contains navigation links: Status Information, Configuration, RF, RU OAM, Network, and System Management. The main content area is titled 'System Management' and includes links for Time Configuration, Accounts, Configuration File, Test Mode Configuration (highlighted), Log Configuration, S/W Upgrade, and System Restart. Below these links, the 'Test Mode Configuration' section has a 'Test Mode' toggle set to 'Active' (with 'Inactive' as an option) and a version field showing 'v5.1.0'. An 'Apply' button is present. The 'CFR/DPD Mode Configuration' section has a 'CFR Enable' toggle set to 'Active' (with 'Inactive' as an option) and an 'option' field. Another 'Apply' button is present. At the bottom, there is a 'Save Configuration' section with a 'Save Config' button. The footer indicates 'Copyright © 2024, Wave Electronics Co., Ltd. All rights reserved.'

Choose between Active and Inactive (Active: Test Mode, Inactive: Normal Mode)

Press the 'Apply' button to apply the change.

Press the 'Save Config' button to save in the flash memory.

The running mode will be changed after the reboot process.

The same version of the test tool should be in the /etc/test_mode_tool/ directory.

Available to run the test tool in the console.

```
[admin@WEH37 ~]# cd /etc/test_mode_tool/test_tool/
[admin@WEH37 test_tool]# ll
total 52
drwxr-xr-x  3 admin  root    0 Oct 12 2024 .
drwxr-xr-x  4 admin  root    0 Nov 11 2024 ..
drwxr-xr-x 27 admin  root    0 Oct 12 2024 TM_DATA
-rwxr-xr-x  1 admin  root 51176 Oct 12 2024 test_tool
[admin@WEH37 test_tool]# ls TM_DATA/
TM1.1_100M  TM1.1_20M  TM1.1_25M  TM1.1_50M  TM1.1_80M  TM2a      TM3.1a_30k_20MHz  TM3.3
TM1.1_15M  TM1.1_30M  TM1.1_40M  TM1.1_60M  TM1.1_90M  TM3.1     TM3.1a_30k_40MHz  TM3.1a_30k_50MHz
TM1.1_15M  TM1.1_40M  TM1.1_70M  TM2        TM3.1a_30k_10MHz  TM3.2
```

FCC Regulatory Statement

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This device must not be co-located or operating in conjunction with any other antenna or transmitter.

The antenna(s) must be installed such that a minimum separation distance of at least 20 cm is maintained between the radiator (antenna) and all persons at all times.

This equipment has been tested and found to comply with the limits for a Class B digital

device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Supplier's Declaration of Conformity

47 CFR § 2.1077 Compliance Information

Unique Identifier: (e.g., Trade Name, Model Number)

Responsible Party – U.S. Contact Information

Specifications:

- Product Purpose: n48(CBRS) O-RU
- Power: DC 12V
- Rated Voltage: A0, A1, A2, A3: Antenna Port 0~3 Opt: SFP+ 10G Pwr: DC IN
- I/O Port: Console: USB (micro-B) Factory USB (micro-B) Eth: RJ45 Management 1pps: MMCX-Female 10MHz: MMCX-Female
- Transmission Frequency: 3550 MHz ~ 3700 MHz
- Reception Frequency: 3550 MHz ~ 3700 MHz
- Number of TRX: 4T4R
- Output Power: 20dBm@BW 40MHz, 17dBm@BW 20MHz, 14dBm@BW 10MHz

- Operating Temperature: -5°C to 45°C
- Power Consumption: Less than 40W
- Cooling: Natural Convection Cooling
- Humidity: Storage 5% to 95%
- IP Level: IP30

Wave Electronics

3F, 152, Gwanggyo-ro, Yeongtong-gu
Suwon-si, Gyeonggi-do
16506
Telephone number or internet contact information

www.wavetc.com

FAQ:


Q: What is the purpose of the O-RU device?

A: The O-RU device is designed to support n48 Bandwidth with 4T4R functionality.

Q: What is the operating temperature range for the device?

A: The operating temperature range is -5°C to 45°C.

Documents / Resources

	<p>Wave Electronics WEH37-TM24B 25G SFP+ 1port L2 Ethernet Encapsulation [pdf] User Manual</p> <p>2BKZBWEH37-TM24B, 2BKZBWEH37TM24B, WEH37-TM24B 25G SFP 1port L2 Ethernet Encapsulation, WEH37-TM24B, 25G SFP 1port L2 Ethernet Encapsulation, L2 Ethernet Encapsulation, Encapsulation</p>
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References

- [User Manual](#)

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