Aricent

LTTH CPE

User Manual

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1

Introduction

1.1 Purpose

This document serves as a user manual for LTTH CPE (IDU) during installation and troubleshooting.

Note: The terms "LTTH CPE" and IDU are interchangeably used in the rest of this document. Also, following terms can be used interchangeably

LTTH -> FastMile

NTE -> Outdoor Modem

CPE -> Home Router

1.2 Scope

The scope of this document is limited to providing information on

- CPE physical installation
- General management using Mobile Application and
- Troubleshooting during the piloting phase of IDU

1.3 Who Should Read this Manual

This document is intended for:

- Integration and Verification Team
- System integrators
- Operators

1.4 How this manual is organized

#	Chapter	Contents
1	Introduction	Introduces LTTH CPE (IDU); defines the purpose, scope, and intended audience of this document; explains how information is organized in this document.
2	LTTH CPE Overview	This chapter presents brief overview of LTTH CPE.
3	Installation Procedure	This chapter presents detailed installation steps and startup procedure for LTTH CPE
4	Troubleshooting	This chapter lists down common problems faced during various phases. It also contains their resolutions.

1.5 Acronyms

The acronyms expanded in **Error! Reference source not found.** are fundamental to the information provided in this guide.

ACS	Auto Configuration Server
CPE	Customer Premises Equipment
IDU	Indoor Unit of CPE
NTE	Network Termination Equipment (same as ODU)
ODU	Outdoor Unit of CPE (same as NTE)
PoS	Point of sales
PoSApp	Point of sales Application
PoE	Power over Ethernet
GBE	Gigabit Ethernet
DBDC	Dual band dual concurrent
LTTH	LTE to the home
LED	Light Emitting Diode
RGB	Red Green Blue
LAN	Local Area Network
WAN	Wide Area Network
MIMO	Multiple Input Multiple Output
USB	Universal Serial Bus
LTE	Long Term Evolution
PSE	Power Sourcing Equipment

Chapter
2

LTTH CPE Overview

This chapter provides an overview of LTTH CPE.

2.1 Product Overview

LTTH (LTE-to-the-Home) is a Customer Premises Equipment (CPE), the purpose of which is to provide the last mile broadband connection to the home using LTE technology. It Consists of an Indoor Unit (IDU) and Outdoor Unit (ODU).

Indoor and outdoor units are connected together with a wired interface that provides power from the indoor unit to the outdoor unit as well as the high speed data connection using Power-over-Ethernet (PoE+).

IDU provides support for

- 2 GBE LAN ports and 1 GBE WAN Port (PoE+)

- 2x2 DBDC MIMO WiFi interface - 802.11b/g/n at 2.4 GHz & 802.11 a/n/ac at 5 GHz

- USB 3.0 interface via Type C connector

- One Tri-color RGB LED for status indication

- +54VDC External regulated power connection (Adapter)

Figure 2-1 IDU Module

2.2 Deployment Overview

Wireless access modules IDU and ODU module are interfaced by means of PoE+ interface. The outdoor module has LTE communication through which it sends or receives information to the service provider. The received data is then transmitted to the Indoor Unit for LAN and/or Wi-Fi Communication.

Figure 2-2 Deployment Overview

2.3 Key Characteristics

2.3.1 WIFI

802.11b/g/n at 2.4 GHz & 802.11a/n/ac at 5 GHz
2x2 DBDC MIMO Internal Antenna configuration
5G frequency range (5.15GHz to 5.25GHz)
Bandwidth: 802.11n with max 40 MHz and 802.11ac with max 80MHz
Transmit power: Max 23dBm branch/chain
Modulation: 2G with 64QAM and 5G with 256QAMTransmit power control (TPC) and Dynamic Frequency Selection (DFS)

2.3.2 Ethernet

Supports 2 numbers of LAN and 1 number of WAN
Supports IEEE802.3 10BASE-Te, 100BASE-TX and 1000BASE-T
Supports CAT5/5E/6 unshielded twisted pair cable for max 1000Mbps
Supports IEEE802.3az Energy efficient Ethernet

2.3.3 PoE+

WAN Port supports PoE+ PSE as per IEEE802.3 at type-2
Maximum power delivery with 30W (25.4W for PoE+ PD)

2.3.4 USB

Supports Type-C reversible connector
Supports USB3.0 with 5Gbps
Supports legacy USB2.0 devices
Supports 5V@1.5A power outputs

2.3.1 TR-069

Supports device management using TR-069 standard
Supports communication between AP and client
Supports configuration management, diagnostics and monitoring

2.4 Interface/Ports

IDU module has some of User interfaces and indications as shown in below fig.
IDU module has

- 2 Nos of GbE LAN port
- 1 No of GbE WAN port with POE+ PSE
- 1 No of Super speed USB 3.0
- Reset switch
- +54V DC power input
- Multi-color LED indication

- WiFi interface (antenna is present internal to the IDU module)
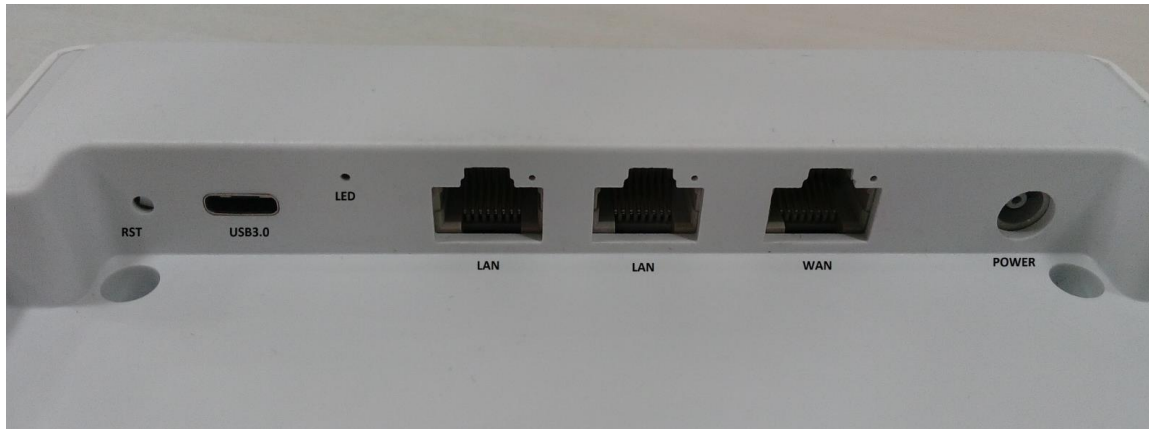
Figure 2-3 Interface Ports of IDU module

2.5 Status LED

IDU has one Multi-color status indication as shown in above fig. LED uses different colors to indicate the user about different status conditions. The LED is present under the IDU module which will not provide light pollution until it is purposefully seen.

COLOR INDICATION	FUNCTION
ORANGE	Indicates that CPE is starting up.
ORANGE Blink	Indicates that the CPE has encountered a problem condition
GREEN	Indicates that the CPE is working fine
GREEN Blink	Indicates that a new Firmware Update is available on CPE

2.6 Power Supply

Separate power supply adapter is used to power the IDU module. The Power supply adapter is connected to the Main AC power supply which powers the IDU module.

Figure 2-4 Power Supply adapter

Specifications:
- Input: 100V-200V AC 50/60Hz
- Output: +54V DC output 1.11A

2.7 Performance

2.7.1 Throughput

2.7.1.1   WIFI

IEEE802.11n MIMO with max 300Mbps
TCP Throughput: 231Mbps
UDP Throughput: 257.53Mbps

IEEE802.11ac MIMO with max 866Mbps
TCP Throughput: 648.2Mbps
UDP Throughput: 728.42Mbps

Notes:
- All throughput results are taken under wired and shielded environment.
- Attenuation used is 20dBm
- TCP throughput is taken using Iperf, Window Size 256k, No. of client streams:8
- UDP throughput is taken using Ixia IxNetwork, Packet Length used is 1450 in case of UDP
- All the data rates are in Mbps.

2.7.1.2   Ethernet

IEEE802.3ab; 1000BASE-T with max 1000Mbps (986.5Mbps as per EVM test result)

2.7.1.3   USB

USB3.0 with max 26MBps write and 80MBps read (as per EVM test result)

2.7.2 Power Consumption

Power consumption at idle state: 6.9Watts
Power consumption at all interfaces being exercised: 7.6Watts
Power consumption at full throughput: 10.2Watts

2.8 Compliance statements

FCCID: 2AL7J-FMHRN0002

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including
Interference that may cause undesired operation
FCC Caution!!!
• Any changes or modifications not expressly approved by the party

Responsible for compliance could void the user's authority to operate this Equipment
• This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

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.

Chapter

3

Installation Procedure

This chapter describes the pre-requisite for LTTH CPE Installation and its step by step installation procedure and respective dependencies.

3.1 Safety information

- Only experienced installation professionals who has complete knowledge on safety codes and, where applicable, are licensed by the appropriate government regulatory authorities should install CPE
- Use only the allotted power adapter for powering the IDU
- Do not **POWER ON** before assembling the entire setup.
- Do not block the air flow from the air vents in the IDU box

3.2 Warning

- Do not live insert the adapter to the AC mains when the Main supply is ON
- It is recommended to avoid hot plug of the PoE+ WAN connector to the ODU module.

3.3 Package content

Sl. No	Item	Qty
1.	IDU Unit	1
2.	Power Adapter	1
3.	Wall Mounting holster	1
4.	Screws	2

3.4 LTTH CPE Installation Prerequisite

Mechanical Tools are required for Wall mounting the IDU Unit.

3.5 LTTH CPE installation

IDU can be used as Wall mount or Table top depending on the user convenient

3.5.1 Wall mount option

Wall mount option needs mechanical arrangements to be done,

- Choose the wall where the IDU is to be mounted. The walls should not have ventilation close to the IDU module to avoid contact with rain water.
- Avoid mounting close to side wall which blocks the air vent
- The wall should have the sufficient space for connecting the cables required for IDU module

Steps to be followed for using wall mount option.
- First the holster should be mounted on the wall as shown below

Figure 3-1 Holster and screws

WALL MOUNT ARRANGEMENT

Figure 3-2 Mechanical arrangement for Wall mount option

1	Holster
2	Screws

- Then insert the cables to the IDU module and route the cables as shown blow for proper arrangement
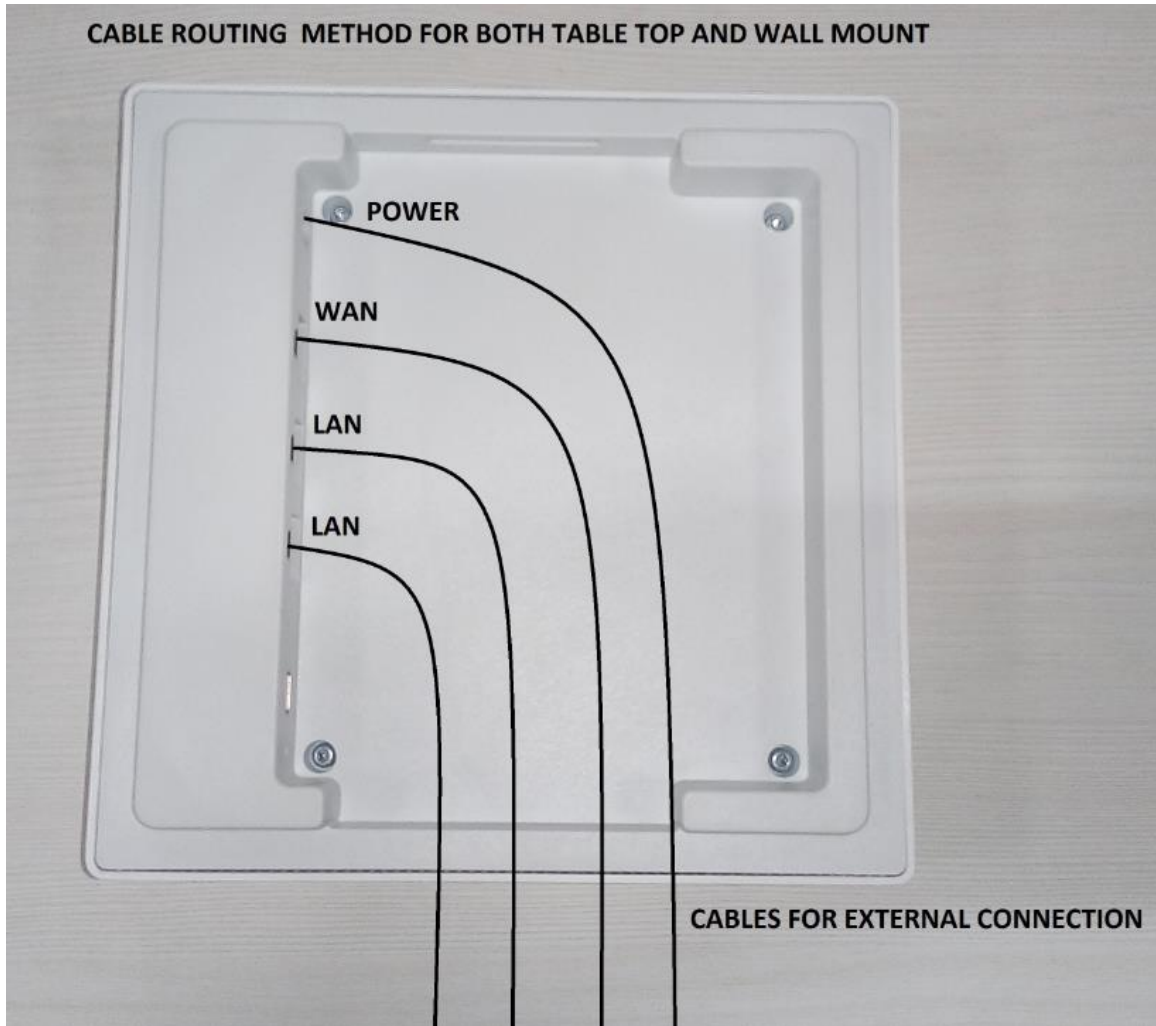
Figure 3-3 Recommended Cable routing (Bottom of IDU module)

- The bottom of the IDU module is having sufficient space to route the cables

AIR VENT HOLES

SPACE FOR ROUTING CABLES TO IDU
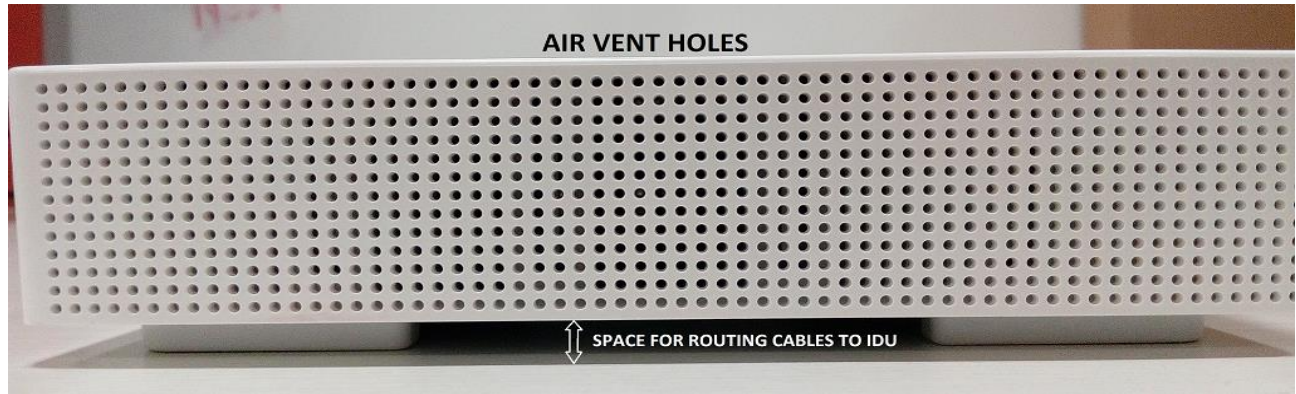
Figure 3-4 Space for connecting cables

- After connecting the cables to the IDU module, the module can be mounted on the holster by inserting the holster bend in the groove of IDU box as shown below

WALL MOUNT OPTION
HOLSTER INSERTION
POINT
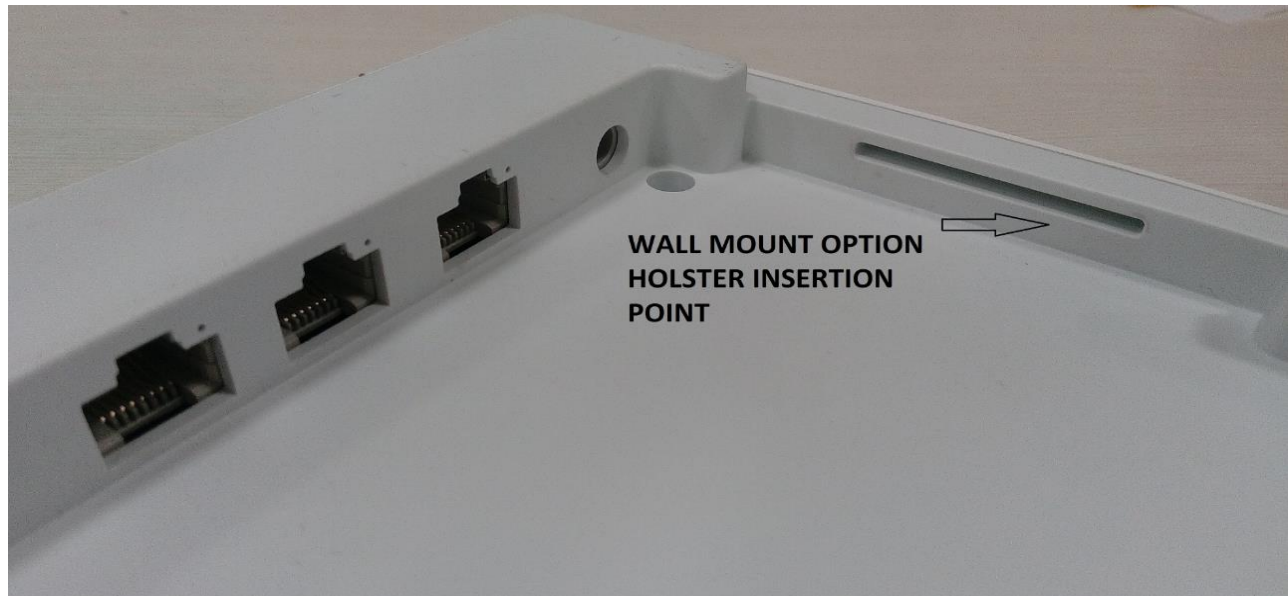
Figure 3-5 Groove for inserting Holster

Figure 3-6 Inserting Holster in the IDU module

3.5.2 Table top option

For table top option follow the following steps.

- First insert the required cables at the back of the IDU module
- Route the cables properly as shown in previous diagrams
- Place the IDU module on the table for user access.

Figure 3-7 IDU Table top option

3.5.3 Managing CPE using Mobile Management Application

The end user is provided with a Mobile Management Application which can be installed on Android and iOS mobile devices. The user can perform the following operations on IDU using this application.

- Firmware upgrade of the IDU
- Change the following Wi-Fi parameters on IDU
  - o Change SSID/Wi-Fi Name
  - o Change Security mode
  - o Change Wi-Fi password
  - o Change Wi-Fi channel
  - o Enable/disable 5Ghz Wi-Fi band

These actions are elaborated more in the following sections.

Note: Details of installation of this application on Android and other devices is out of scope of this document.

3.5.3.1   CPE Firmware Upgrade

- Whenever a new firmware is downloaded to CPE and is available for upgrade, the Management Application automatically starts showing the below notification.

Figure 3-8 Firmware Update Available Notification

- The end user click on the "Update available" button to go to the "Software Update" screen where an update can be started by clicking on "Restart CPE and Update"

button. This will update the CPE with the latest downloaded software and restart the CPE.

Figure 3-9 Option - Restart CPE and Update

- In case the user does not update Firmware on CPE by clicking "Restart CPE and Update", it is be upgraded automatically on next reboot.

3.5.3.2   Wi-Fi Parameters update

Many Wi-Fi parameters for CPE can be updated using the mobile applications.

3.5.3.2.1   Change SSID/Wi-Fi Name

Wi-Fi name (or SSID) can be changed from the "Network Settings" page where the name next to "Wi-Fi Name" can be changed to the user's liking. Any combination of alphanumeric characters (uppercase and lowercase) up to a maximum length of 32 can be set. It should also be noted that user can only change the 2.4 GHz band Name. The name for 5 GHz band is automatically derived this this name. E.g. If 2.4 GHz Name is set to TEST then the 5 GHz Name is automatically set to TEST-5GHz.
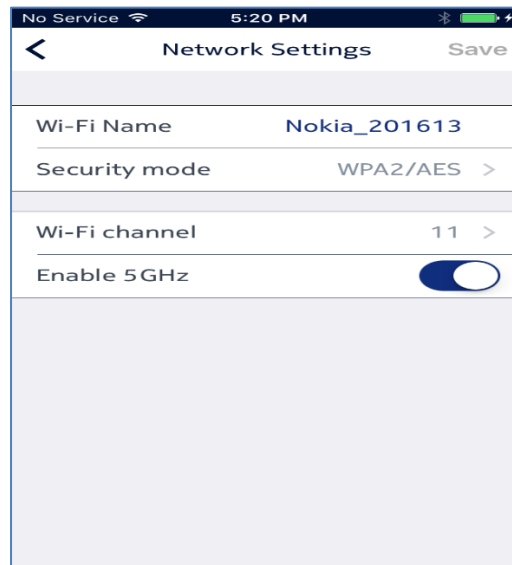
Figure 3-10 Network Settings - Wi-Fi Name and control 5GHz band

3.5.3.2.2 Change Security mode

Security mode can be changed to either WPA2/AES or None. User should be careful while changing the mode to "None" as this would mean that the Wi-Fi would work unprotected and any W-Fi password set will not have any effect.
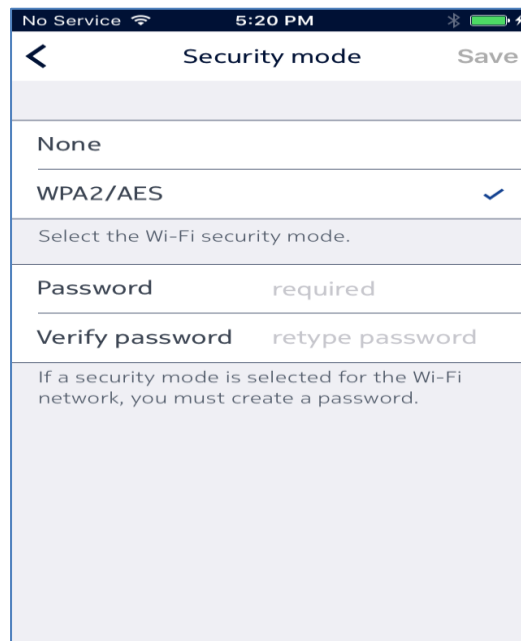
Figure 3-11 Security mode & Wi-Fi Password Change

3.5.3.2.3   Change Wi-Fi password

Wi-Fi password can be changed to the user's liking from the "Security mode" page. Any combination of alphanumeric characters (min. 8 characters, max. 64 characters) can be set. It should also be noted that user can only change the 2.4 GHz band password. The password for 5 GHz band is automatically set to the same password.

3.5.3.2.4   Change Wi-Fi channel

Wi-Fi channel can be changed to any of the possible values in the "Network Channel" page. Please note that changing may lead to enhanced or degraded performance of Wi-Fi and hence should only be changed by expert/advanced users.

Figure 3-12 Wi-Fi Channel Change

Note: Channel for 5GHz band is auto-selected.

3.5.3.2.5   Enable/disable 5 GHz Wi-Fi band

User can also enable or disable the high performance 5GHz Wi-Fi band from the "Network Settings" page. This band is enabled by default.

Chapter

4

Troubleshooting

This chapter contains the possible issues a user might face while installing/familiarizing with LTTH CPE. It also contains resolution for the same.

4.1 Common Problems during LTTH CPE Installation and startup Phase

4.1.1 During start-up phase, CPE is rebooting repeatedly

<u>Root causes</u>

 I. The running.config.cfg file is corrupted.

 II. UDID is not configured.

<u>Indication to user</u>

CPE LED will be stable orange.

<u>How to resolve/fix</u>

 I. Delete the running.config.cfg file via CPE console from path /opt/Nokia/var/command/data and perform CPE reboot. An alternative option is to Perform CPE Factory Reset via Reset button.

 II. Check CPE UDID via CPE console from INVENT_TEST utility and select option (1) and READ UDID. If UDID is not written then Write UDID and perform a CPE Reboot.

4.1.2 CPE stuck in repeated uBOOT

Root causes

Any key is pressed by mistake in CPE console before it reaches to Auto Boot mode.

Indication to user

CPE LED will be stable orange.

How to resolve/fix

Execute 'sf bflagwr' command via CPE console and followed by 'RESET' command.

4.1.3 CPE registration fails at LTTH-C

Root causes

Wrong HW version or Product Class is mentioned while Registering Product Category at LTTH-C.

Indication to user

CPE is not present under 'Find CPE' tab at LTTH-C.

How to resolve/fix

Rectify HW version or Product Class value while Registering Product Category at LTTH-C and Perform CPE Reboot or Factory Reset.

4.1.4 OTA CPE firmware upgrade is not initiated via LTTH-C

Root causes

Wrong HW version or Product Class is mentioned while Registering Product Category at LTTH-C.

Indication to user

No, CPE LED will be stable green.

How to resolve/fix

Rectify HW version or Product Class value while Registering Product Category at LTTH-C and re-initiate CPE firmware upgrade by performing 'Reconciliation' operation by LTTH-C.

4.1.5 CPE firmware upgrade fails using 'img_upgrade' test tool

Root causes

The 'img_upgrade' test tool perform the firmware upgrade in passive partition and firmware upgrade fails if passive partition is faulty.

Indication to user

CPE will be operational with old firmware build.

How to resolve/fix

Perform CPE firmware upgrade via TFTP server.

4.1.6 CPE firmware activation fails

Root causes

CPE reboot is performed before SW flashing is completed.

Indication to user

CPE will be operational with old firmware build.

How to resolve/fix

Perform CPE reboot only when CPE LED turns to blinking green indicating that SW flashing is completed and new firmware is ready to be activated. An alternative option is to perform software activation through Management App when 'SW update available' option is appeared on screen.

4.2 Common Problems during Execution Phase

4.2.1 Ethernet station is not able to communicate to CPE on LAN-1/LAN-2 interface

Root causes

Ethernet station IP address is incorrect.

Indication to user

Ping to CPE (192.168.254.2) will not work.

How to resolve/fix

Go to Network interface settings on Ethernet station and select automatic DHCP option. If static IP is configured then ensure static IP are in range 192.168.1.101-254 for LAN1 and 192.168.2.101-254.

4.2.2 5GHz SSID is not broadcasted by CPE

Root causes

5 GHz radio switch is off or client does not support 5GHz band hence will not detect 5Ghz SSID.

Indication to user

Unable to see 5GHz SSID.

How to resolve/fix

Enable 5 GHz radio via CPE console by executing command "*./cpe_ctrl setwlanstatus –s 1*" from path /usr/local/bin. Alternatively 5 GHz radio can be enabled via Management app.

4.2.3 WiFi user not able to connect to CPE due to wrong password provided

Root causes

User has forgotten the password or password is not known to user.

Indication to user

Not able to connect to CPE

How to resolve/fix

Change password via CPE console by executing command "*./cpe_ctrl setwlansmode -m 2*

-pwd mypassword" from path /usr/local/bin/. Alternatively perform factory reset and try connecting using default password.

4.2.4 WiFi/Ethernet client not able to access internet and CPE LED is blinking orange

Root causes

CPE has lost connectivity with NTE/LTE network.

Indication to user

LED blinking orange and internet is not accessible.

How to resolve/fix

Check PoE cable is properly connected between CPE and NTE. If this is fine then problem to be looked at operator side.

4.2.5 WiFi/Ethernet client not able to access internet and CPE LED is stable Green

Root causes

Manual network proxy is set at client side.

Indication to user

Internet is not accessible.

How to resolve/fix

Configure network proxy setting to 'Automatic' and try to access the internet.

Chapter

5

Appendix A Factory Settings

You can return the router to its factory settings. Use the end of a paper clip or a similar object to press and hold the Reset button on the back of the router for at least <mark>five</mark> seconds.
The router resets and returns to the factory configuration settings shown in the following table,

FEATURE	Default Behavior
Router Login	
User login URL	
User name (case-sensitive)	
Login password (case-sensitive)	
Local Network (LAN)	
LAN IP	192.168.1.1
Subnet mask	255.255.255.0
DHCP server	Enabled
DHCP range	192.168.1.2 to 192.168.1.254
DHCP starting IP address	192.168.1.2
DHCP ending IP address	192.168.1.254
Wireless Wi-Fi	
Wireless communication	Enabled
SSID name	See router label
Password	See router label
Security	WPA2-PSK (AES)
Broadcast SSID	Enabled
Transmission speed	Auto
Operating mode	Up to 300 Mbps at 2.4 GHz, 867 Mbps at 5 GHz

Chapter
6

Appendix B Specifications

FEATURE	DESCRIPTION
Altitude	≤ 2000m
Dimension	165mm x 165mm x 41.5mm
Weight	600 grams
Operating temperature	0 to 40 deg C
Storage temperature	-40 to 85 deg C
Operating humidity	0% to 93% non-condensing

Revision History

Rev	Date of Issue	Author	Approver	Description
0.1		Aricent		Initial draft version
0.2		Aricent		Review comment from Nokia incorporated
0.3		Aricent		TUV inputs added