



nanoLTE

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nanoLTE E61 AP Hardware Installation

NANO_INST_43325 205_0.6

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Table of Contents

1	Introduction.....	1
1.1	Overview	1
1.2	Warnings and Regulatory Information	1
1.3	Related Information.....	1
1.4	Licenses and Copyright Notices	1
1.5	Terminology	1
2	Installation Overview and Requirements	2
2.1	Installation Tasks	2
2.1.1	Pre-Provisioning	2
2.1.2	Commissioning.....	2
2.1.3	Site Installation	2
2.2	Mounting Options.....	3
2.3	nanoLTE E61 AP Site Requirements.....	3
2.3.1	General Site Installation Requirements.....	3
2.3.2	AP Cooling	4
2.3.3	Port Usage	4
2.3.4	nanoLTE E61 AP Power Requirements	7
2.3.5	E61 AP Physical Requirements	9
2.3.6	Thermal Protection	10
2.3.7	Backhaul (IP) Bandwidth Requirements.....	10
2.3.8	E61 AP Installation Tool Requirements for Wall Mounting.....	10
3	nanoLTE E61 AP Commissioning	11
3.1	Requirements for Commissioning with the Web Page.....	12
3.1.1	Information Required for Commissioning	12
3.1.2	Other Items for Commissioning	13
3.2	Redirector First Contact and NTP Synchronisation for Software Update	14
3.3	Configure a Commissioning Terminal.....	15
3.4	Access the Commissioning Web Page for the LTE AP	16
3.5	Optional - Software Download	17
3.6	Configure the Connection to the NOS Server.....	19
3.6.1	Static IP Configuration.....	19
3.6.2	Configure IPsec.....	19
3.6.3	Configure the TR-069 Management Connection.....	20
3.6.4	Complete the LTE AP Commissioning	20
3.7	Commissioning Complete	21
3.7.1	Completed On Site Commissioning	21
3.7.2	Completed Commissioning in Advance.....	21
4	nanoLTE E61 AP Hardware Installation.....	22
4.1	Unpack the E61 AP	22
4.2	Cable Connections.....	23

4.2.1	PSU and LAN	23
4.2.2	Optional PoE+ Injectors	24
4.2.3	PoE+ Switch	24
4.2.4	GPS Source	24
4.3	Mount the E61 AP on a Wall or Ceiling.....	25
5	Troubleshooting	27
5.1	E61 AP Does Not Power Up	27
5.2	E61 AP LEDs	27
5.3	Factory Reset.....	30
5.3.1	E61 AP Factory Reset.....	30
6	AP and PSU Regulatory Information	31
6.1	Warnings and Cautions - nanoLTE E61 AP.....	31
6.2	Warnings and Cautions - Optional Power Supply Unit	33
6.3	Regulatory Statements for the E61 AP	34
6.3.1	US FCC Compliance	34
6.3.2	Safety Standards.....	34
6.3.3	Environmental Standards.....	34
6.3.4	RF Exposure Statement.....	35
6.4	Regulatory Statements for PSU	36
6.4.1	Output Specification	37

1 Introduction

The nanoLTE E61 AP from ip.access is a compact Small Cell that provides LTE TDD capability. The E61 AP is targeted at indoor enterprise applications.

This manual provides important information on installing the E61 AP hardware.

1.1 Overview

This manual is organised as follows:

- This introduction
- An overview of E61 AP installation, including site requirements
- E61 AP hardware installation
- Troubleshooting
- Regulatory warnings and safety information

1.2 Warnings and Regulatory Information

For all warnings and regulatory information, see section 6.

1.3 Related Information

[INST_13400]	AP Pre-Provisioning and Configuration (NANO_INST_13400)
[REF_11105]	System Glossary (NANO_REF_11105)
[REF_43005]	nanoLTE AP Open Source Software (NANO_REF_43005)
[TRB_13005]	AP Troubleshooting (NANO_TRB_13005)
[21.905]	Vocabulary for 3GPP Specifications (3GPP TR 21.905)

1.4 Licenses and Copyright Notices

Portions of the AP software are constructed from third-party software and open source code and ip.access Ltd gratefully acknowledges the contributions that these libraries, technologies and components have made to the product. Each of these is supplied under the terms of a license agreement and these are either reproduced or referenced in [REF_43005], in line with the stipulations of their authors.

1.5 Terminology

Common System terminology is defined in [REF_11105].

For additional terminology, see [21.905].

2 *Installation Overview and Requirements*

The topics in this section are:

- *2.1 Installation Tasks*
- *2.2 Mounting Options*
- *2.3 nanoLTE E61 AP Site Requirements*

2.1 Installation Tasks

The tasks that must be completed to install a nanoLTE E61 AP and make it ready to provide service are:

- Pre-Provisioning in the NOS
- Commissioning
- Site installation

These tasks can be completed in any order. In most cases, however, the most practical approach is to pre-provision an E61 AP before commissioning and site installation.

2.1.1 Pre-Provisioning

The pre-provisioning process prepares an AP to enter service.

For information about AP pre-provisioning, see the AP Pre-Provisioning and Configuration manual [INST_13400]. The LTE AP runs LTE AP2.5 software.

This manual has no further information on AP configuration.

2.1.2 Commissioning

The commissioning procedure prepares the E61 AP so that it is ready to connect to its serving NOS, usually via a serving IPsec GW.

The commissioning procedure is in section 3.

2.1.3 Site Installation

Physical installation of an E61 AP at its operating site, including providing the AP with power and a suitable network connection. The network connection provides the backhaul path to the NOS Server and LTE Gateway, usually via an IPsec GW.

The network connection must also provide Internet access so that the E61 AP can contact the services it needs at boot time, including NTP, the Redirector and the public CRL mirror.

If an E61 AP has been enabled for service prior to the site visit, the installation engineer can make test calls immediately.

2.2 Mounting Options

The E61 is designed for wall or ceiling mounting on the supplied mounting bracket.
The hardware installation procedure in section 4 is applicable to both options.

2.3 nanoLTE E61 AP Site Requirements

The basic requirements are:

- A mounting location for the E61 AP.
- Power supplied via the supplied mains adaptor unit, which requires a suitable mains power supply point near the AP that is within reach of the adaptor's cabling, or via PoE+ to each Ethernet socket.
- An Ethernet cable connections to the Internet, or equivalent backhaul network.

Optionally also provide:

- A GPS source for frequency discipline.

2.3.1 General Site Installation Requirements

The more general requirements for installation are:

- A permanent means to provide power to the AP
- An Ethernet connection to the backhaul via CAT5 Ethernet cabling
- Access to a DHCP service on the backhaul to allow dynamic IP address configuration
- Access to a DNS service on the backhaul to resolve symbolic addresses
- Access to NTP services on the backhaul to set the correct time and date each time the AP starts up
- Internet access so that the LTE AP can connect to the Redirector
- If IPsec will be used to secure the interface across the backhaul, access to the relevant IPsec Gateway that terminates the IPsec tunnel
- If a firewall is in place on the network an AP will use for backhaul, this must be configured to allow traffic to and from the AP - see the port usage information in section 2.3.3

Note: If possible, the engineer should stay on site until the AP is brought into service, ready to make test calls to verify the AP has been configured correctly from the NOS.

2.3.2 AP Cooling

Special attention **must** be given to ensure a AP will meet its air cooling requirements in its installed location.

Take the following points into consideration for the physical location of an AP:

- The AP **must** be installed where there will be proper air will flow through the body of the AP to provide cooling.
- The AP **MUST NOT** be installed in an enclosed space where air flow is restricted. This includes, but is not necessarily limited to:
 - Roof or ceiling spaces
 - Small cabinets
 - Tightly enclosed shelf spaces

2.3.3 Port Usage

This information is provided in case it is needed for configuring local on-premises equipment, especially any hardware firewalls between the AP and the rest of the backhaul network.

All connections are outgoing. That is, they are initiated from the AP. Port usage has some dependency on whether or not the AP is using IPsec.

Port Usage Before IPsec

The AP can use any of the following ports before the IPsec tunnel is established:

Protocol	Destination Port	Use
udp	67	DHCP
udp	68	DHCP
udp	53	DNS
udp	123	NTP
tcp	443	HTTPS for connecting to the Redirector (LTE only)
tcp	80	HTTP for first CRL download for a new AP or after Factory Reset

The AP may continue to use some of these ports outside the IPsec tunnel. For example, for contacting NTP servers.

AP in Commissioning Mode

When the AP is in commissioning mode after a factory reset, this is the only time that the AP allows an inbound connection. The LTE AP takes the fixed IP address 192.168.0.10. The AP then listens for an incoming connection to the commissioning web page:

Protocol	Destination Port	Use
tcp	8089	Commissioning web page

Note: The commissioning web page is only available if the LTE AP's DOCP (obtained from the Redirector) indicates that the LTE AP should enable the web page.

Port Usage With IPsec

With IPsec, the standard two ports are used:

Protocol	Destination Port	Use
udp	500	IPSec initial connection
udp	4500	IPSec operations

The AP will need to continue using these ports:

Protocol	Destination Port	Use
udp	53	DNS
udp	123	NTP

If the NOS is configured for HTTPS access to the Certificate Validation Service for CRL Mirror server functionality, the AP will also need to use this port outside of the IPsec tunnel:

Protocol	Destination Port	Use
tcp	443	HTTPS for CRL download from the NOS

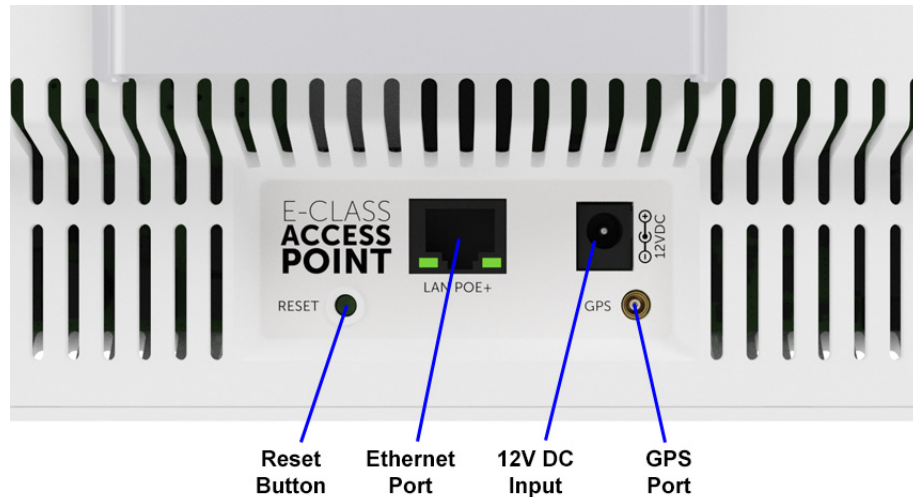
Port Usage Without IPsec

Without IPsec, the following ports are used:

Protocol	Destination Port	Use
sctp	36412	SCTP connection
udp	2152	GTP to/from AP
tcp	8080 or 7547	TR-069 to the NOS (the NOS listens for TR-069 connections on both ports)
tcp	80	PM upload, software download, CRL download, AP diag upload

This assumes the AP is on a secure network that does not need IPsec. For example, a self-contained test network.

2.3.4 nanoLTE E61 AP Power Requirements



Maximum expected power consumption:

- Approx 16W (Rated +12V on the DC input)

The E61 AP uses power from a suitable DC source (+12V, 1.8A rated centre positive 2.1mm jack). Use the supplied mains adaptor only.

Alternatively, provide PoE+ via the Ethernet connection. The mains power adaptor is not required in this case.

PSU

The following 12V PSU, rated up to 30W, is included in the box with the E61 AP:



There must be a suitable mains power supply point for plugging in the power adapter. The lead on the PSU is 1.5m long, hence the power supply point must be within 1.5m of the AP.

Note: This PSU has a maximum ambient operating temperature rating of 40°C. An alternative PSU, part number PSAA30R-050(MOT), is available for deployments where the ambient temperature is above 40°C. If there is a requirement to obtain the alternative PSU, contact an ip.access representative.

Optional PoE+ Injector

If required, this must be ordered separately.



The PoE+ injector has two Ethernet connections, one for connection to the main LAN, the other for connection to the AP. The PoE+ injector can be located anywhere on the cable run between the network switch and the AP, including locally at the AP or remotely at the network switch.

The PoE+ injector is a pass-through connector for the LAN. Its function is to add PoE+ to provide power to the AP. Therefore, the maximum cable run from the network switch to the AP is 100m, regardless of the placement of the PoE+ injector.

The PoE+ injector supplied by ip.access complies with LPS requirements in accordance with IEC/EN 60950-1.

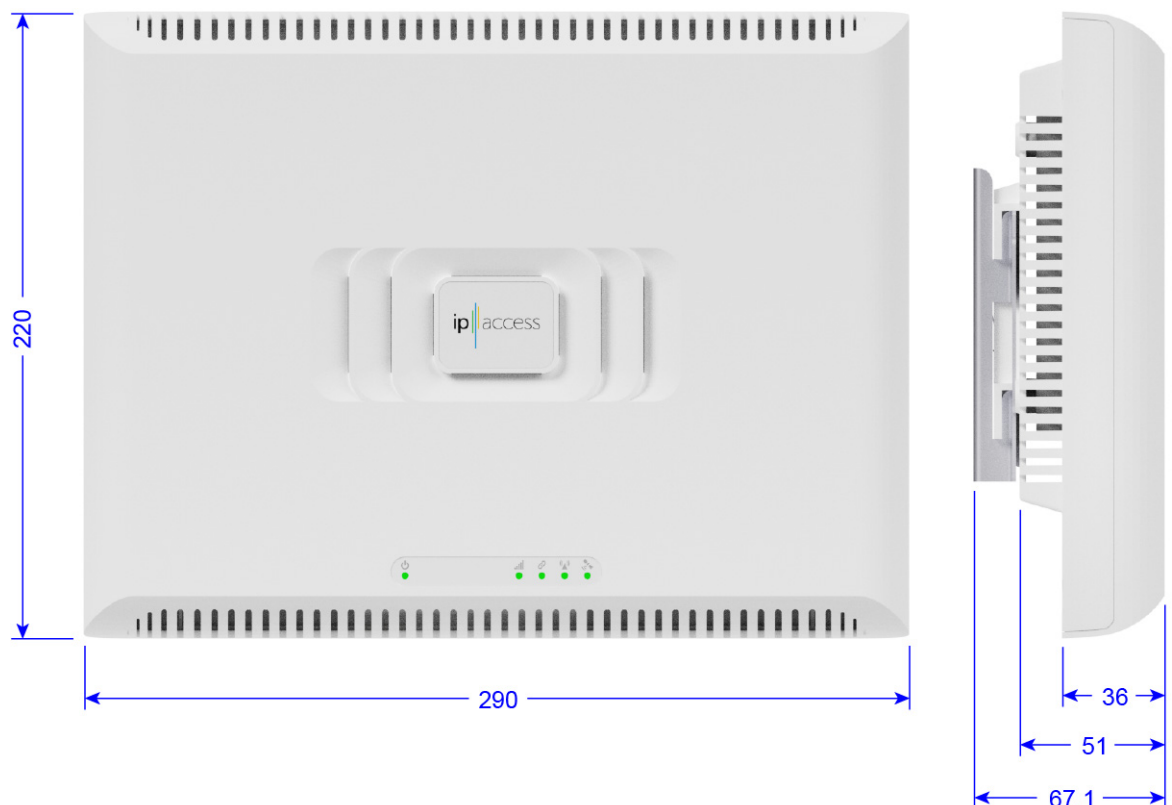
2.3.5 E61 AP Physical Requirements

An E61 AP is installed by attaching its mounting bracket to a wall or ceiling, then fitting the AP onto the mounting bracket.

Pay attention to ensure that air can circulate freely around the unit.

It is recommended to install the AP with its front surface facing the area requiring cellular coverage, unobstructed by walls or partitions that may cause significant RF attenuation.

Dimensions and weight with mounting bracket	Height	220mm
	Width	290mm
	Depth	67.1mm
	Approximate Weight	1.6kg
Environmental	Cooling	Vents on all sides must be kept clear of obstructions
	Operating Temperature	0°C to +45°C - wall mounted 0°C to +35°C - ceiling mounted
	Operating Humidity	10 to 70% non-condensing



2.3.6 Thermal Protection

The E61 AP may become warm during normal operation.

Ensure the AP is in a location where it will be at least 20cm away from personnel and any items that may be heat sensitive.

2.3.7 Backhaul (IP) Bandwidth Requirements

At maximum capacity and with IPsec in use, the E61 AP requires:

- Downlink: 110Mbps
- Uplink: 10Mbps

This will provide bandwidth for 32 users.

2.3.8 E61 AP Installation Tool Requirements for Wall Mounting

To mount the bracket onto the wall:

- 4 pan head screws, size No. 6 (approx 3.5mm (0.14in) in diameter), for the AP bracket.
- Wall plugs if required.
- Suitable drills and screwdriver.

Note: A set of 4 standard screws and 4 standard wall plugs are included with the E61 AP. The screws and wall plugs are suitable for solid walls. It may be necessary to source alternative fixings if they are not suitable for the type of wall material on site.

3 *nanoLTE E61 AP Commissioning*

Use the procedures in this section to configure the E61 AP with the settings it needs to establish a connection with its serving NOS Server. Once commissioning is complete, use the NOS Client for any remaining configuration and to bring the AP into service.

There are two LTE AP commissioning methods:

- **Redirector Only Commissioning**
The Redirector supplies the NOS connection parameters in the DOCP. In this case, all the LTE AP requires is a connection to the Internet so that it can connect to the Redirector. No other commissioning activities are possible. This is the easiest way to commission an nanoLTE E61 AP. In this case, proceed to the hardware installation procedure in section 4.

or

- **Redirector Enables the Commissioning Web Page**
The Redirector supplies the AP with a DOCP that enables the built-in commissioning web page. The AP is not provided with any of the parameters that it needs to connect to its serving NOS (or equivalent TR-069 ACS). The parameters must be provided via the built-in commissioning web page. In this case, follow the procedures in the rest of this section.

The rest of this section is only applicable to commissioning with the built-in web page. If this is not enabled, proceed to the hardware installation procedure in section 4.

When using the commissioning web page, the nanoLTE E61 AP can be commissioned either in advance of the site visit via a commissioning computer or on site via a commissioning laptop. The web page based procedure is identical in both cases. To allow for both of these scenarios, the term *commissioning terminal* is used to refer to any laptop or computer used for commissioning.

The topics in this section are:

- *3.1 Requirements for Commissioning with the Web Page*
- *3.2 Redirector First Contact and NTP Synchronisation for Software Update*
- *3.3 Configure a Commissioning Terminal*
- *3.4 Access the Commissioning Web Page for the LTE AP*
- *3.5 Optional - Software Download*
- *3.6 Configure the Connection to the NOS Server*
- *3.7 Commissioning Complete*

3.1 Requirements for Commissioning with the Web Page

The following items are required for commissioning:

- A commissioning terminal, which can be either a desktop computer or a laptop, with:
 - OS: Windows® 7 or later
 - Web browser: Microsoft Internet Explorer 7 or later
 - JavaScript enabled in the web browser
- A spare connection to allow the AP to connect to the Internet - this is so that the AP can connect to the Redirector briefly after a Factory Reset before switching the AP over to the commissioning terminal
- A short Ethernet cable for connecting the commissioning terminal to the LTE AP
- A temporary means to provide power to the AP while it is connected to the commissioning terminal - typically use the supplied power adaptor
- Optionally, if a software update is required, a copy of the required LTE AP software file on the commissioning terminal - this should only be used if the LTE AP will not be managed by the NOS, as there are additional requirements that must be met when downloading software from an attached commissioning terminal

3.1.1 Information Required for Commissioning

Use this information to commission an LTE AP from the commissioning terminal, so that the LTE AP can subsequently connect to its serving NOS Server.

It is possible to commission an AP before taking it on site.

For connecting to the LTE AP from the commissioning terminal:

- User name and password for the LTE AP's web server - if necessary, contact customer support at ip.access for the current user name and password

For commissioning the LTE AP:

- IP Address or FQDN of the serving NOS Server
- IP Address or FQDN of an NTP server
- DHCP or static IP
- If static IP is required:
 - IP address for the LTE AP
 - Netmask
 - IP Address or FQDN of the default gateway
 - IP Address or FQDN of the Primary DNS
- IPSec configuration (usually required, but see note below):
 - IP Address or FQDN of the IPsec Gateway
 - IP Address or FQDN of a CRL server

- Optionally, Traffic Selector information (IP address and subnet mask)
A traffic selector defines a range of IP addresses that are sent through the IPsec tunnel. This allows an extra degree of control over the traffic that is passed down the IPsec tunnel. Normally, the IPsec Gateway controls this range and no other configuration is needed.
- NTP server address
This is the address of an NTP server from which the LTE AP can obtain its clock time on startup. The correct clock time is required for security certificate validation. Hence, the LTE AP must be able to access this NTP server before establishing an IPsec tunnel and/or connecting to its serving NOS. Although APs have an ip.access NTP server configured by default, operators are recommended to configure APs with the address of their own first-contact NTP server.

Note: IPsec configuration is required in all cases where an AP will traverse any public or insecure network. This is assumed to be the case in most deployments. IPsec is not necessary only when an LTE AP can establish an end-to-end connection to the NOS and its nanoLTE GW and/or EPC via fully secure trusted networks.

3.1.2 Other Items for Commissioning

The items in this section can only be used if the commissioning terminal is running a web server that provides a path to any ip.access AP software download packages. That is, the required .sdp files must be present on the commissioning terminal.

Setting up a web server for this purpose on the commissioning terminal is outside the scope of this manual.

Software Image

If there is a requirement to update the LTE AP's software during commissioning, the relevant *_signed.sdp file must be present on the commissioning terminal.

In addition, the LTE AP must be able to update its clock time with NTP prior to downloading the software. This is to ensure the LTE AP does not reject the software due to having a clock time set that is in the past compared to the time/date stamp in the LTE AP software load.

3.2 Redirector First Contact and NTP Synchronisation for Software Update

The LTE AP must be connected to the Internet at least once so that it can obtain its unique OLM Package from the Redirector. If the LTE AP has not yet downloaded its OLM package, it will not be possible to use the commissioning web page.

NTP synchronisation is necessary when there is also a requirement to update the LTE software using the commissioning web page. This applies regardless of the current software load on the LTE AP.

Note: This is not necessary when using the NOS to update the LTE AP's software, as the LTE AP has to use NTP to update its clock time before it connects to the NOS. For more information about when the LTE AP uses NTP in its startup sequence, see [TRB_13005].

The LTE AP software is always code signed. The LTE AP must have an up to date clock time so that it can verify that the time stamp in the signed software is valid. The LTE AP has a "last known time" that it updates hourly, and the last known time is also preserved across a reboot or factory reset. If the last known time is in the past in comparison to the time stamp in the LTE AP software package, the AP will reject the software load.

Hence, when using the LTE AP's commissioning web page to update the software, it is recommended to ensure the LTE AP uses NTP to obtain the current time, so that the last known time is up to date before starting the commissioning web page. To do this:

- 1) Connect the LTE AP to the Internet and reboot it. The LTE AP will automatically update its clock time with NTP.

If the LTE AP has not yet contacted the Redirector, it will also connect to the Redirector and obtain its unique OLM package. This enables the built-in commissioning web page the next time that a Factory Reset is performed on the LTE AP.

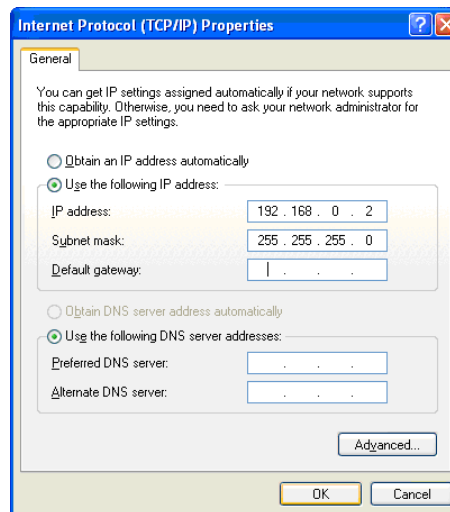
- 2) If updating the software from the commissioning web page, also leave the AP switched on for at least an hour to ensure it updates its "last known time".

The AP is now ready for commissioning and will accept code signed software downloads via the commissioning web page.

3.3 Configure a Commissioning Terminal

Use this procedure to configure a Windows® computer used as a commissioning terminal so that it has an IP address in the same address space as the LTE AP.

- 1) Open the Windows Control Panel on the commissioning terminal.
- 2) Go to **Network Connections**.
- 3) Right-click the relevant **Local Area Connection** and select **Properties**.
- 4) In the list of items on the General tab, select **Internet Protocol (TCP/IP)** and then click **Properties**. A dialogue similar to the following appears (this varies according to the version of Windows):



- 5) If it is not possible to leave this network connection permanently configured for AP commissioning, make a note of the current settings.
- 6) Click the **Use the following IP address** radio button.
- 7) Set the IP Address to **192.168.0.2**.
- 8) Set the Subnet Mask to **255.255.255.0**.
- 9) There is no default gateway, so ensure the default gateway address is cleared.
- 10) Click **OK** to close and save the changes in each of the two dialogues. Also close the Control Panel.

3.4 Access the Commissioning Web Page for the LTE AP

The commissioning web page is only accessible after performing a factory reset. The login prompt for this web page is available for 10 minutes, after which the LTE AP will attempt to boot normally.

- 1) Plug an Ethernet cable into the AP that is connected to a network that allows the AP to connect to the Internet.
- 2) Plug in the power supply unit that is in the box with the AP to a mains outlet and the AP. The AP will start up.
- 3) Perform a factory reset on the LTE AP:
 - Press and hold the LTE AP reset button for at least 5 seconds, then release the reset button.
 - The LTE power LED will briefly turn red as the AP reboots, and will then return to green.

Note: See section 5.3 for more information about factory reset.

- 4) Make a note of the time that the factory reset was started. The login prompt for the web commissioning page will start to be available after the AP has contacted the Redirector and re-downloaded its OLM Package. From this point, the login prompt will be available for 10 minutes.
- 5) During this interval, start a web browser on the commissioning terminal.
- 6) After 10 minutes from starting the factory reset, swap the AP to the Ethernet cable that connects it directly to the commissioning terminal.
- 7) In the address bar of the web browser on the commissioning terminal, type in the pre-defined static IP address and port number for the web server on the AP and press <Enter>:

`http://192.168.0.10:8089`

- 8) A login screen should appear in the browser. If the login screen does not appear immediately, refresh the browser screen once every 20 seconds until it appears.

- 9) Enter the commissioning user name and the password (supplied separately for security reasons). After entering the correct user name and password, the LTE AP Commissioning page appears:

LTE AP Commissioning

LTE AP Serial Number: 000295-0200000000 Sw Version: 440K238.0_signed

LTE AP IP Configuration:

Address type: DHCP
IP Address: Assigned by DHCP Subnet Mask: Assigned by DHCP
Default gateway: Assigned by DHCP DNS Server Address: Assigned by DHCP

IP Sec Configuration

IP Sec Enabled: No
Security Gateway Address:
Traffic Selectors:
Traffic Selector 1: Subnet Mask 1:
Traffic Selector 2: Subnet Mask 2:
Traffic Selector 3: Subnet Mask 3:

ACS Address:
CRL Base Server URL:
NTP Server Addresses: 0.ipaccess.pool.ntp.org,1.ipa

3.5 Optional - Software Download

If it is necessary to download a software package to the AP, this **must** be done before configuring the connection to the NOS Server.

This can only be done if the commissioning terminal is running a web server that provides a path to any ip.access AP software download packages. That is, the required .sdp files must be present on the commissioning terminal.

Setting up a web server for this purpose on the commissioning terminal is outside the scope of this manual.

Use the SW Download page to:

- Inspect the current version of software that the LTE AP is running.
 - Download a new version of AP software to the LTE AP from the commissioning terminal to the standby memory bank. The LTE AP reboots to the new version of software when the download is complete and verified.
- 1) If it has not already been done (as in section 3.2), ensure the LTE AP has updated its clock time with NTP and also updated its "last known time". This must be done before downloading any new software to the LTE AP. To do this, connect the LTE AP to the Internet and reboot it. The LTE AP must be left in this state for an hour to ensure it updates its "last known time", which is preserved when the LTE AP is restarted again to reenter the commissioning web page. Then reconnect the LTE AP to the commissioning terminal and restart the web page.

- 2) Near the top of the main page, click the **Update** button next to the current software version. The web page for downloading software will be shown. This also provides full details about the current software installed on the LTE AP. For example:

LTE AP Software Download

Active Sw Version: 440K238.0_signed

Standby Sw Version: 440K238.0_signed

Default Sw Version: 440K238.0_signed

SW Download Status: Not Started

SDP File URL:

- 3) In the SDP File URL text box, enter the URL for the SDP file stored on the commissioning terminal. For example:
- `http://192.168.0.2/webservername/440K007_<ver>_signed.sdp`
- Where <ver> is the actual build version of the required software package.

- 4) Click **Begin Download**.
- 5) Wait about a minute for the download to take place.
- 6) To restart the LTE AP from the new software just downloaded, briefly press the corresponding reset button on the back of the AP.
- 7) Once the LTE AP has started, repeat the procedure in section 3.4 to perform a factory reset and access the login prompt to login again with the commissioning user name and password.
- 8) Click the **SW Download** link on the left.
- 9) Inspect the software version information to verify that the LTE AP has booted from the downloaded software.
- 10) To ensure the standby bank also has the latest software version, repeat the software download, but do not restart the LTE AP. It is not necessary to restart the LTE AP once it is already running the updated software.

This ensures the LTE AP does not have old software on the standby bank. Hence, if the LTE AP is commanded to switch banks, it will run up-to-date software.

3.6 Configure the Connection to the NOS Server

3.6.1 Static IP Configuration

Obtaining an IP address with DHCP is recommended for the E61 AP, and this is selected by default. Only execute this section if static IP configuration is needed. Do this first.

- 11) If static IP is required, click the **Change** button next to the Address Type box.

LTE AP Commissioning

LTE AP Serial Number: 000295-0200000000 Sw Version: 440K238.0_signed

LTE AP IP Configuration:

Address type: DHCP

IP Address: Assigned by DHCP Subnet Mask: Assigned by DHCP

Default gateway: Assigned by DHCP DNS Server Address: Assigned by DHCP

IP Sec Configuration

IP Sec Enabled: No

Security Gateway Address:

Traffic Selectors:

Traffic Selector 1: Subnet Mask 1:

Traffic Selector 2: Subnet Mask 2:

Traffic Selector 3: Subnet Mask 3:

ACS Address:

CRL Base Server URL:

NTP Server Addresses: 0.ipaccess.pool.ntp.org,1.ipa

- 12) Edit the **IP Address**, **Subnet Mask**, **Default Gateway** and **DNS Server Address** parameters as needed.

3.6.2 Configure IPsec

When commissioning an LTE AP with the web page, IPsec is disabled by default.

Note: If IPsec is not required, also ensure that the LTE AP is pre-provisioned in the NOS with IPsec turned off in the AP configuration stored in the NOS.

If IPsec is required, update the configuration as follows:

- 1) Click the **Change** button next to the IPsec Enabled box. The IPsec parameters become available.
- 2) Enter the address for the **IPSec Gateway** and the **Traffic Selector** addresses and subnet masks.

ALERT: If the IPsec connection is towards an ACME SeGW the Traffic Selector IP Addresses and Subnet Masks must all be left as 0.0.0.0.

3.6.3 Configure the TR-069 Management Connection

- 3) Enter addresses for the NOS Server (or equivalent TR-069 ACS) in the **ACS Address** field.
- 4) In the **CRL Base Server URL**, enter the URL for contacting a CRL mirror server.
Note: This is the "base URL" as the AP constructs a full URL of the CRL update file to obtain on contacting the server.
- 5) In the **NTP Server Addresses** box, enter a comma separated list of the four valid NTP server addresses that will be accessible to the AP via its backhaul network. If the backhaul will use the Internet, these can be NTP servers on the public Internet.
Note: The NTP and CRL servers must be accessible to the AP on start up, before it has established an IPsec tunnel to the IPsec Gateway.
Note: If the AP can connect to the Internet, the default "0.ipaccess.pool.ntp.org" may only be used as an initial value. The final configuration of an operational AP (as supplied from the NOS or other TR-069 ACS) must not use the ip.access pool.
Note: To provide AP crystal discipline, the final configuration of the NTP servers must comprise four stratum 1 time servers.
- 6) To save the configuration, click the **Save** button.
The settings applied on this page are retained permanently as the *default set* of these parameters in the TR-196 data model, and can only be subsequently changed on this web page from a commissioning terminal or from the Redirector by assigning the AP to a different set of DOCP parameters.
Note: At this point it may be useful to make a note of the parameter values entered in this screen. Alternatively, save a screenshot of the web page (information about how to take a screenshot is outside the scope of this manual).

3.6.4 Complete the LTE AP Commissioning

- 7) To start the LTE AP in normal operation mode, click **Complete Commissioning**.
- 8) Acknowledge the warning about changes in the IP configuration and click **OK**.
- 9) When the initial configuration is complete, power off the AP and disconnect it from the commissioning terminal.
At this point, the commissioning web page is no longer accessible. If there are configuration errors that prevent the AP connecting to its serving NOS Server, the commissioning web page must be started again after resetting the AP with a factory reset. See section 5.3 for factory reset instructions.

3.7 Commissioning Complete

Commissioning the LTE AP is now finished.

From this point on, the LTE AP must be managed from the NOS Client, via the NOS Server. If the LTE AP has not been pre-provisioned in the NOS Server, it must be pre-provisioned and configured before it can enter service.

For information about LTE AP pre-provisioning, see [INST_13400].

3.7.1 Completed On Site Commissioning

If commissioning has been done on site, continue to the on-site hardware installation procedure (section 4).

Note: The on-site network connection to the LTE AP must also allow a path to the Redirector.

3.7.2 Completed Commissioning in Advance

If commissioning has been done in advance of sending the AP on site, it is advisable to ensure that the LTE AP will connect to its serving NOS Server prior to sending the AP on site. To do this:

- 1) Verify that the LTE AP has been pre-provisioned in the serving NOS.
- 2) Provide the LTE AP with an appropriate network connection. If the LTE AP has been commissioned to use IPsec, this means a network connection that will go via the IPsec Gateway, which is likely to require connection of the LTE AP to an external network.
Note: The network connection to the LTE AP must also allow a path to the Redirector.
- 3) Power up the AP.
- 4) Use the NOS Client to verify that the LTE AP has connected to its serving NOS. When the blue delta symbol against the AP object disappears this means that the LTE AP has connected to the NOS and has also updated its configuration.
- 5) After verifying this, re-pack the AP so that it is ready for delivery to its intended site.

4 *nanoLTE E61 AP Hardware Installation*

The topics in this section are:

- *4.1 Unpack the E61 AP*
- *4.2 Cable Connections*
- *4.3 Mount the E61 AP on a Wall or Ceiling*

4.1 Unpack the E61 AP

- 1) Unpack the AP and its accessories.

Box contents may vary, but typically the box should contain the following:

- E61 AP unit with mounting bracket attached
- Extraction tool for removing the AP from its mounting bracket
- Mains power adaptor unit
- Set of 4 screws and wall plugs for the mounting bracket

Note: The screws and wall plugs are suitable for solid walls. It may be necessary to source alternative fixings if they are not suitable for the type of wall material on site.

- 2) Check that the serial numbers on the AP unit match the label on the box.
- 3) Check that the items have not been damaged in transit.

For any damaged units, contact the supplier immediately for returns advice.

4.2 Cable Connections

The AP requires power and an Ethernet connection. These can be provided discretely from a power adaptor (as supplied) and a standard CAT5 Ethernet cable or with a single Ethernet cable carrying PoE+.

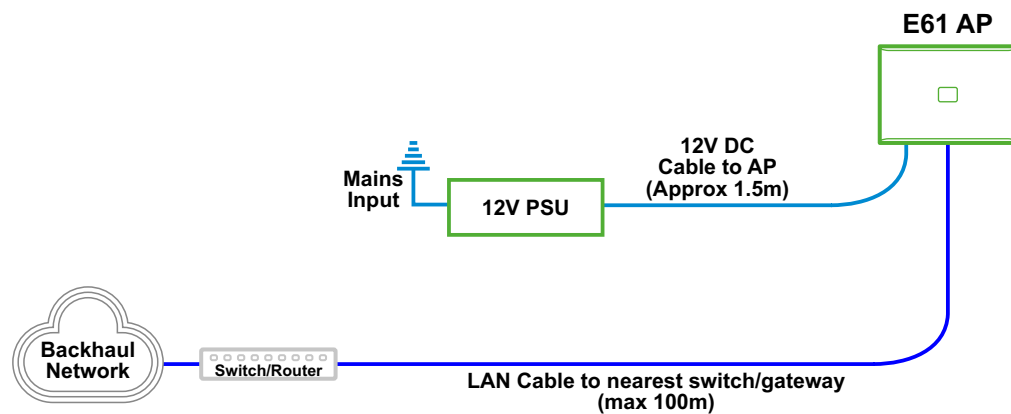
Two power supply modules are available from ip.access, designed for use with the ip.access E61 AP, that are compliant with the IEEE 802.3at standard:

- Direct power from the supplied mains power adapter
- Optionally, a PoE+ injector, commonly used for single site installations, which must be ordered separately

Alternatively, power the E61 AP from a PoE+ switch.

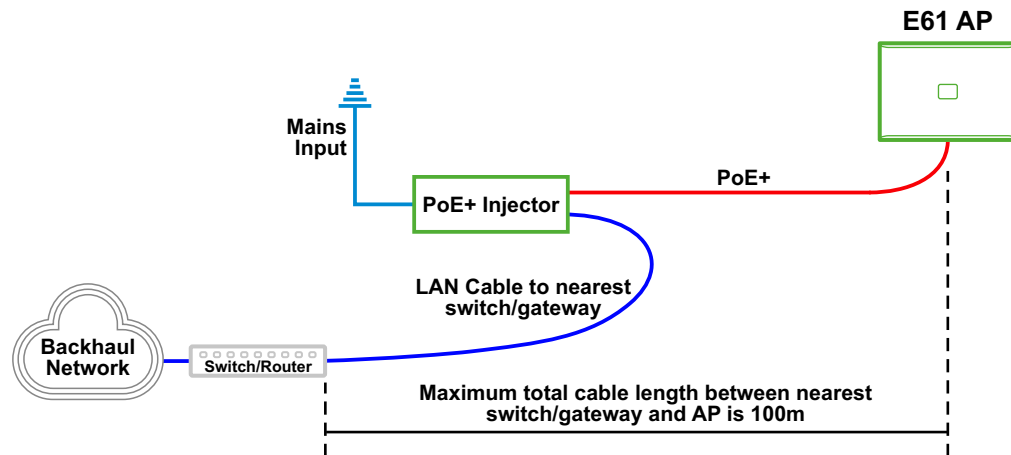
4.2.1 PSU and LAN

When a suitable PSU is used to power the AP the PoE+ injector unit is not needed. However, this means that a mains socket providing power to the AP must be within reach of the cabling included with the PSU. This is typically about 1.5m. The PSU for the E61 AP is supplied as standard.



4.2.2 Optional PoE+ Injectors

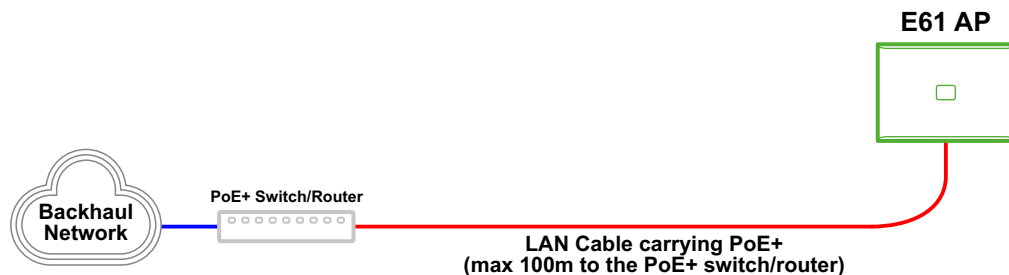
The AP can be up to 100m from the switch/gateway to the backhaul, but allow approximately 0.1m for routing through the injectors. The injectors can be positioned anywhere on this cable run. Hence the injectors can be at the most convenient point for providing power, without restricting the location of the AP.



The injectors take a direct mains input using the supplied mains cable. Use a CAT5 Ethernet cable that is capable of carrying PoE+ from each injector to the AP.

4.2.3 PoE+ Switch

In this case, the PoE+ switch is a third-party item. The cable run from the switch to the AP can be a full 100m.



A PoE+ switch is typically used if there are multiple APs on site and/or there is other equipment that can take advantage of PoE+.

4.2.4 GPS Source

The E61 AP includes an MCX connector for optionally using a GPS source for frequency discipline.

The E61 AP does not have an internal GPS antenna. Hence, to use GPS for frequency discipline, an external source must be provided, which can be a dedicated GPS antenna or an equivalent source such as a distributed GPS system.

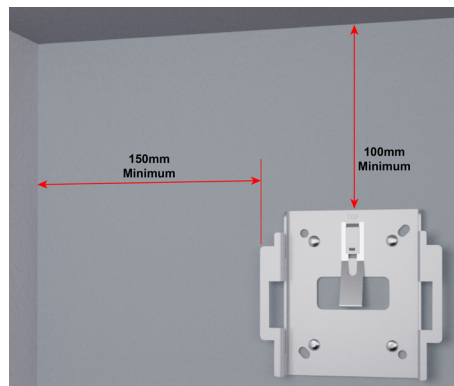
4.3 Mount the E61 AP on a Wall or Ceiling

Note: The E61 AP should be installed in a position so that it is at least 2m away from the area where handsets are normally used.

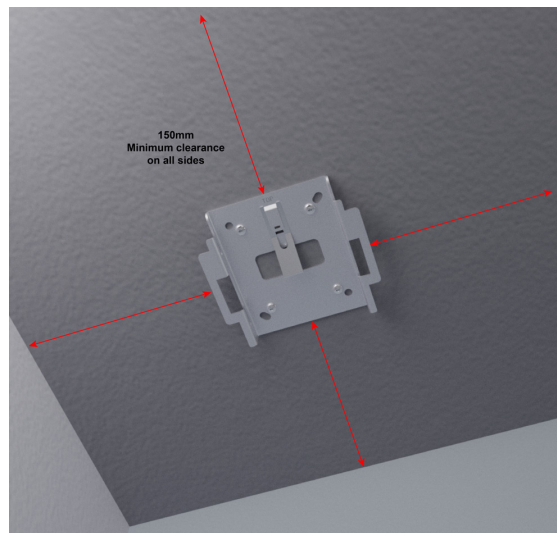
The location of each E61 AP should be shown on an installation floor plan produced at the network planning stage. For example, it must take into account that all APs must be at least 2m from any mobile equipment. The network wiring must be complete before the E61 AP can be installed. The E61 AP should be placed on a wall or ceiling at or above head height, at a minimum height of 1.8m.

- 1) Remove the mounting bracket from the E61 AP. Lay the AP on a flat surface with the mounting bracket upwards. Slide the removal tool over the central guide groove over the fin between the bracket and the body of the unit to disengage the locking spring, then slide the bracket to separate it from the AP. The removal tool may be inserted from the top or bottom of the AP.
- 2) Position the bracket on the wall or ceiling with its flat side against the wall or ceiling. For wall mounting, orient the clip part towards the top. Ensure the bracket is level and sufficient clearance is maintained to allow the AP to be fitted to the bracket.

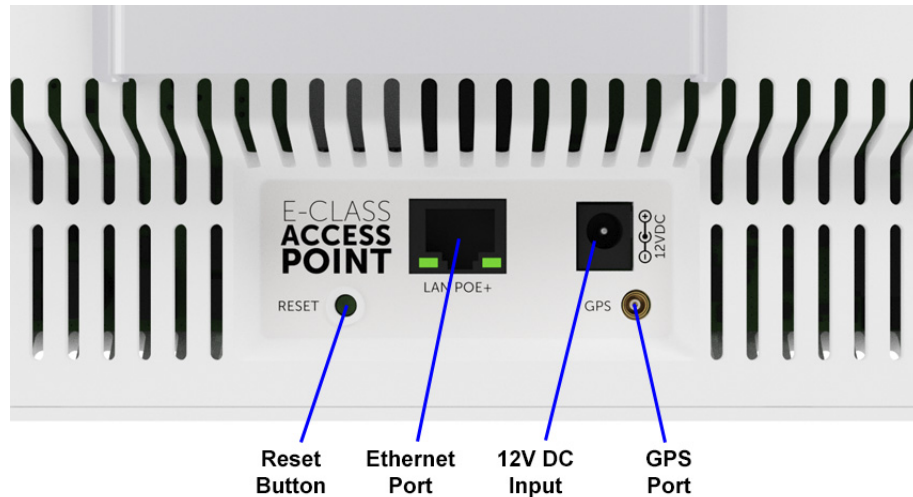
For wall mounting, allow at least 100mm from the bracket to the top of wall, and 150mm from the side of the bracket to any side walls, as illustrated:



For ceiling mounted APs, allow 150mm clearance on all sides:



- 3) Mark the position of the four screw holes.
- 4) Drill the four holes in the positions marked previously and insert wall plugs (if required) and fix the mounting bracket securely to the wall or ceiling.
- 5) Before fitting the AP onto the bracket, plug in the required cables. Plug the Ethernet cables from a switch/gateway into the RJ45 sockets. If the Ethernet cables do not carry PoE+, also plug the power supply into the +12V DC input. Also, if required, connect a GPS source to the GPS port.



- 6) Position the E61 so that the rear lugs line up to the gaps on the side rails of the bracket, then push the S62 AP onto the bracket and slide the AP until the retaining spring engages the indent at the rear of the unit.



5 Troubleshooting

This section covers the following topics that may be useful for troubleshooting an E61 AP during installation:

- *5.1 E61 AP Does Not Power Up*
- *5.2 E61 AP LEDs*
- *5.3 Factory Reset*

5.1 E61 AP Does Not Power Up

Check the following:

- Verify the correct power supply is in use and that mains power is available.

or

- Ensure that the Ethernet socket has PoE+ (PoE Plus, not PoE) to power the AP.





5.2 E61 AP LEDs


The front of the E61 has status LEDs:



Note: The Ethernet port on the back of the E61 AP has a link activity LED that flashes when there is activity on the network connection. The LED is always off when the network cable is unplugged.

The nanoLTE E61 AP has the following LEDs:

LED	Colour	Description
 Power	Off	The S2D is not switched on.
	Green	The LED may be Red or Green during the first 2 seconds after powering up, while the E61 AP is initializing. After this, Green indicates that the AP is powered up normally.
	Red	The LED should only be Red briefly once the 2 second initialization period is complete. If the LED continues to stay Red after this, this means there is a fault with the AP. After the 2 second initialization period, if the LED turns Red after previously turning Green, this means that there is a hardware power fault with the AP.
 Service	Off	The LTE AP is not provisioned, it has no IP address. This may be a temporary condition when the LTE AP is switched on for the first time, or after factory reset.
	Red	Service not available because the LTE AP is administratively locked (from the NOS).
	Red flashing	There is an error condition. Usually this means that the cell is also down.
	Flashing green (1800ms on, 200ms off), Red off	Cell down, service not available.
	Green flashing (500ms on, 500ms off), Red off	Cell locked, service not available.
	Green flashing(50ms on, 50ms off), Red off	Normal reboot, when reset button pressed for less than 5 seconds.
	Green flashing(50ms on, 200ms off), Red off	Factory reset, when reset button pressed for more than 5 seconds.
 Connection	Off	The LTE AP does not yet have an IP address. This should change shortly after the AP is switched on.
	Red	If this LED has previously been Green, Red means that there is an error, such as the LTE AP losing its IPsec connection with the IPsec Gateway.
	Green	Flashing Green indicates the LTE AP is acquiring NTP or connecting to its IPsec Gateway. Steady Green indicates the LTE AP is connected to its serving IPsec Gateway.
 Mode	Green	This LED will always be Green to indicate that the LTE AP is operating in LTE TDD mode. This LED may be off or amber temporarily during startup.

LED	Colour	Description
 GPS	Off	<p>The LED is Off if the AP has not yet achieved GPS lock or if the AP has lost GPS lock.</p> <p>Note: If the AP is configured to use GPS synchronisation, it will not start transmitting if it cannot obtain GPS lock and similarly will stop transmitting if it loses GPS lock.</p>
	Green	<p>This LED is Green when the AP has achieved GPS lock. The E61 AP has a GPS connector on the back panel for an external GPS antenna.</p>

5.3 Factory Reset

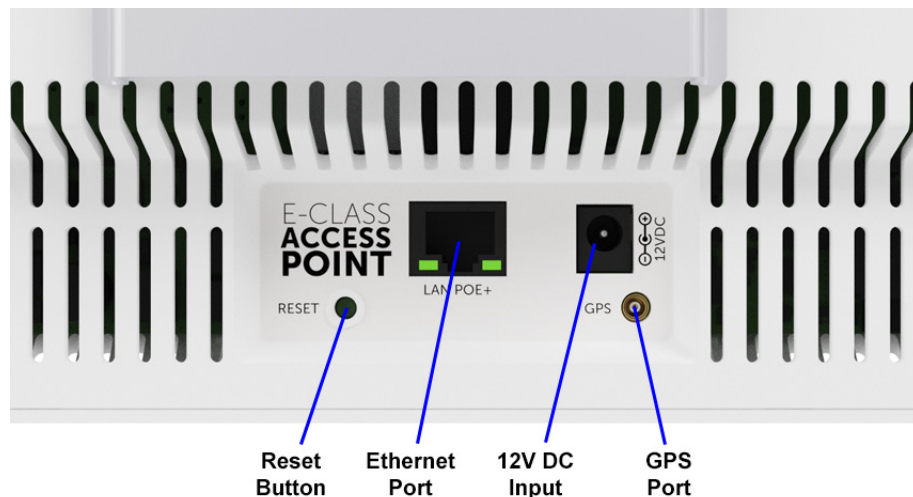
First ensure that all other possibilities have been explored and eliminated before trying to Factory Reset the AP.

A factory reset will clear the AP's configuration, for example as supplied to the AP by the NOS (or TR-069 ACS if the NOS is not used). Hence the AP will be reset to the following configuration after a factory reset:

- Factory configuration data that cannot be removed, which includes:
 - The AP's Equipment ID (EID)
 - The FQDN for the ip.access NTP services hosted by ntp.org
 - The FQDN of the primary ip.access CRL mirror server

5.3.1 E61 AP Factory Reset

- 1) Press and hold the Reset switch.



Ensure that any implement used to press the button will not cause a static discharge that may damage components on the board.









- 2) Hold the Reset button for at least 5 seconds, then release the button and the AP will perform its Factory Reset.
If the Reset Switch is pressed for less than 5 seconds, this will only reboot the AP.
- 3) The Service LED blinks fast (50ms on, 50ms off) until the factory reset commences, then it blinks slowly (50ms on, 200ms off). When the factory restore process is complete, the LED extinguishes and the AP automatically reboots.

This chapter provides the customer with safety and regulatory warnings, cautions and information for the ip.access Ltd range of products.


- 6.1 Warnings and Cautions - nanoLTE E61 AP
- 6.2 Warnings and Cautions - Optional Power Supply Unit
- 6.3 Regulatory Statements for the E61 AP
- 6.4 Regulatory Statements for PSU



6.1 Warnings and Cautions - nanoLTE E61 AP

Electrical Safety





	CAUTION The AP is intended for dry indoor applications only. If evidence of condensation is present do not apply power to the AP.
	CAUTION The AP is designed to be operated as a fixed system device and must be located away from the user. It must be mounted in a manner to ensure that all users and bystanders are kept a minimum of 20cm away from the connected antennas at all times.
	WARNING Do not immerse any part of the AP in water or any other liquid. Do not install or use the AP near open water. Do not spill liquids of any type on the AP.
	WARNING Do not use liquid, solvent or aerosol cleaning agents on or near the AP.
	CAUTION To avoid the risk of fire and/or electrical shock, do not push objects through openings into the AP. The only exception is the recess for the Reset switch.
	CAUTION Do not disassemble the AP.
	CAUTION Before connecting a power supply the AP, verify that the power supply meets the power requirements of the AP.
	CAUTION To avoid the risk of fire and/or electrical shock, do not overload power outlets or extension cables.

Interference with Electronic Devices

	CAUTION If using a pacemaker, ensure you are using the device in accordance with its safety requirements with respect to RF devices. Consult your doctor if you have questions about RF signals and your pacemaker.
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	CAUTION If using a hearing aid, RF devices may cause interference.
	CAUTION Unshielded electronic devices should not be used near the AP. Conversely, the AP should not be installed adjacent to unshielded electrical or electronic devices (such as unshielded speakers).









Other Warnings and Cautions

	WARNING Do not install the AP in a position where any connected cables may cause a tripping or choking hazard.
	WARNING Do not install the AP on an unstable surface. All caution must be observed to prevent the device from falling and causing injury to a person and/or damage to the device.
	WARNING The AP should not be disposed of in household waste bins. Please follow local regulations for disposal of electronic devices.
	CAUTION Do not install the AP in a position where any connected cables may be damaged by walking on the cables.





6.2 Warnings and Cautions - Optional Power Supply Unit

This section is only applicable when the optional power supply unit (PSU) is supplied with the E61 AP.

Electrical Safety

	WARNING Do not immerse any part of the power supply in water or any other liquid. Do not install or use the power supply near open water. Do not spill liquids of any type on the power supply.
	WARNING Do not use liquid, solvent or aerosol cleaning agents on or near the power supply.
	CAUTION To avoid the risk of fire and/or electrical shock, do not push objects through openings into the power supply.
	CAUTION Do not disassemble the power supply.
	CAUTION Before using the power supply, verify that the mains voltage is within the range specified by the voltage printed on the power supply.
	CAUTION When supplied, the PSU supplied with the AP must not be used for powering any other equipment.
	CAUTION To avoid the risk of fire and/or electrical shock, do not overload power outlets or extension cables.
	CAUTION When disconnecting the power supply from the mains, pull the plug. Pulling the cable may result in damage to the cable.

Other Warnings and Cautions

	WARNING Do not install the power supply in a position where the cable may cause a tripping or choking hazard.
	WARNING Do not install the power supply on an unstable surface. All caution must be observed to prevent the device from falling and causing injury to a person and/or damage to the device.
	WARNING The power supply should not be disposed of in household waste bins. Please follow local regulations for disposal of electronic devices.
	CAUTION Do not install the power supply in a position where the cable may be damaged by walking on the cable.


6.3 Regulatory Statements for the E61 AP

6.3.1 US FCC Compliance

- FCC CFR47 Parts 15B, 2, 96

Note: Changes or modifications not expressly approved by the party responsible for compliance may void the user's authority to operate this equipment.

Model	LTE Band	FCC ID
nanoLTE E61 AP Model 495X	48 (CBRS)	QGGIPA495X

	WARNING This is a class B product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.
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Note: 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.

6.3.2 Safety Standards

The E61 unit has passed safety testing in accordance with IEC/UL 62368-1.

6.3.3 Environmental Standards

- Type: Indoor
 - Storage: Weather Protected, Partly Temperature controlled Class 1.1 - ETSI 300-019-1-1
 - Transport: Public Transport Class 2.3 - ETSI 300-019-1-2
 - Operation: Partly Temperature controlled locations Class 3.2 - ETSI 300-019-1-3

6.3.4 RF Exposure Statement

This equipment complies with radiation exposure limits set forth for an uncontrolled environment and meets radio frequency (RF) Exposure Guidelines for base stations. This equipment should be installed and operated keeping the product 20cm or more away from a person's body.

6.4 Regulatory Statements for PSU

Safety Approvals	cUL/UL SAA CE C-Tick
Mechanical Characteristics	Length: 82.7mm (3.26in) Width: 55mm (2.17in) Height: 39.1mm (1.54in) Weight: 150g (5.29oz)
PSAA30R Characteristics	
AC Input Voltage Rating	100 to 240V AC
Emissions	FCC Class B
	EN55022 Class B
AC Input Voltage Range	90 to 264V AC
Immunity	IEC61000-4-2 Level 4 IEC61000-4-3 Level 2 IEC61000-4-4 Level 2 IEC61000-4-5 Level 2 IEC61000-4-6 Level 2 IEC61000-4-8 Level 1 IEC61000-4-11 ENC61000-3-2
AC Input Frequency	47 to 63Hz
Input Current	0.8A (RMS) maximum at 120V AC 0.5A (RMS) maximum at 240V AC
Leakage Current	0.25mA maximum
Over-Voltage protection	Auto restart
Inrush Current	<60A for 100V AC at maximum load <100A for 240V AC at maximum load (Cold start at ambient 25C)
Over-Current Protection	Auto-restart without damage
Short-Circuit Protection	Output can be shorted without damage
Input Power Saving	0.3W maximum at no load
Dielectric Withstand (Hi-pot) Test	Input to Output: 3000V AC for 1 min., 10mA
Output Efficiency	>83.5% average efficiency
Insulation Resistance	Input to output: 7M ohm, 500V DC
Environmental Temperature	Operation 0°C to +40°C Non-operation -25 to +75C Humidity 20 to 90%
DC Output Connector (Barrel Type)	2.1 x 5.5 x 9.5mm Center Positive Standard

AC Input Clips	RPA: US RPB: Brazil RPC: China RPE: Europe RPH: Korea RPI: India RPK: UK RPN: Argentina RPS: Australia RPX: IEC320 C8
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6.4.1 Output Specification

Model	DC Output Voltage	Load Min Max		Ripple P-P (max)	Regulation Line / Load	Efficiency Level
PSAA30R-120	12V	0A	2.50A	120mV	+5%	V