



nanoLTE

High speed coverage
where it's needed most

nanoLTE S60 AP Hardware Installation

NANO_INST_43315 200_0.5

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Revision History

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1 Introduction

The ip.access nanoLTE S60 AP is an indoor Access Point for SOHO and enterprise small cell applications.

This manual provides all the necessary information required for hardware installation of a nanoLTE S60 AP.

1.1 Overview

This manual is organised as follows:

- This introduction
- An overview of nanoLTE S60 AP installation, including site requirements
- nanoLTE S60 AP hardware installation
- Troubleshooting
- Regulatory warnings and safety information

1.2 Warnings and Regulatory Information

For all warnings and regulatory information, see section 5.

1.3 Related Information

[GST_41050]	nanoLTE System Planning (NANO_GST_41050)
[INST_43370]	nanoLTE AP Pre-Provisioning and Configuration (NANO_INST_43370)
[OPM_43005]	nanoLTE AP Operations (NANO_OPM_43005)
[REF_11105]	System Glossary (NANO_REF_11105)
[REF_43005]	nanoLTE AP Open Source Software (NANO_REF_43005)
[TRB_43005]	nanoLTE AP Troubleshooting (NANO_TRB_43005)
[21.905]	Vocabulary for 3GPP Specifications (3GPP TR 21.905)

1.4 Licenses and Copyright Notices

Portions of the AP 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**

2.1 **Installation Tasks**

The tasks that must be completed to install a nanoLTE S60 AP and make it ready to provide service are:

- Pre-Provisioning
- Site installation

These tasks can be completed in any order. In most cases, however, the most practical approach is to pre-provision an S60 AP before site installation.

2.1.1 **Pre-Provisioning**

For information about nanoLTE AP pre-provisioning, see the nanoLTE AP Configuration manual [INST_43370].

This manual has no further information on AP configuration.

2.1.2 **Site Installation**

Physical installation of a nanoLTE S60 AP at its operating site, including providing the AP with power and a suitable network connection. The network connection provides a backhaul path to the NOS Server and EPC or S1 Gateway.

The network connection must also provide Internet access so that the S60 AP can the services it needs at boot time, including NTP, the Redirector and the public CRL mirror.

If a nanoLTE S60 AP has been enabled for service prior to the site visit, the installation engineer can make test calls immediately.

2.2 **Mounting Options**

The mounting options for the nanoLTE S60 AP are:

- Wall mounted, by using the wall mounting holes on the back of the unit (suitable pan-head screws must be sourced separately)
- Free standing, on the supplied stand, which must be placed on a stable flat surface

The hardware installation instructions in section 3 cover both options.

2.3 nanoLTE S60 AP Site Requirements

The basic requirements are:

- A mounting location for the S60 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.
- An Ethernet cable connection to the Internet, or equivalent backhaul network

2.3.1 General Site Installation Requirements

All nanoLTE APs have the following general requirements for installation:

- 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 AP can connect to the Redirector
- If IPsec will be used to secure the interface across the backhaul, access to the relevant Security 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 nanoLTE AP Cooling

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

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

- All AP models **must** be installed so that they are upright, to ensure proper air will flow through the body of the AP to provide cooling.
- All AP models **must not** be installed in enclosed spaces 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
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.

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

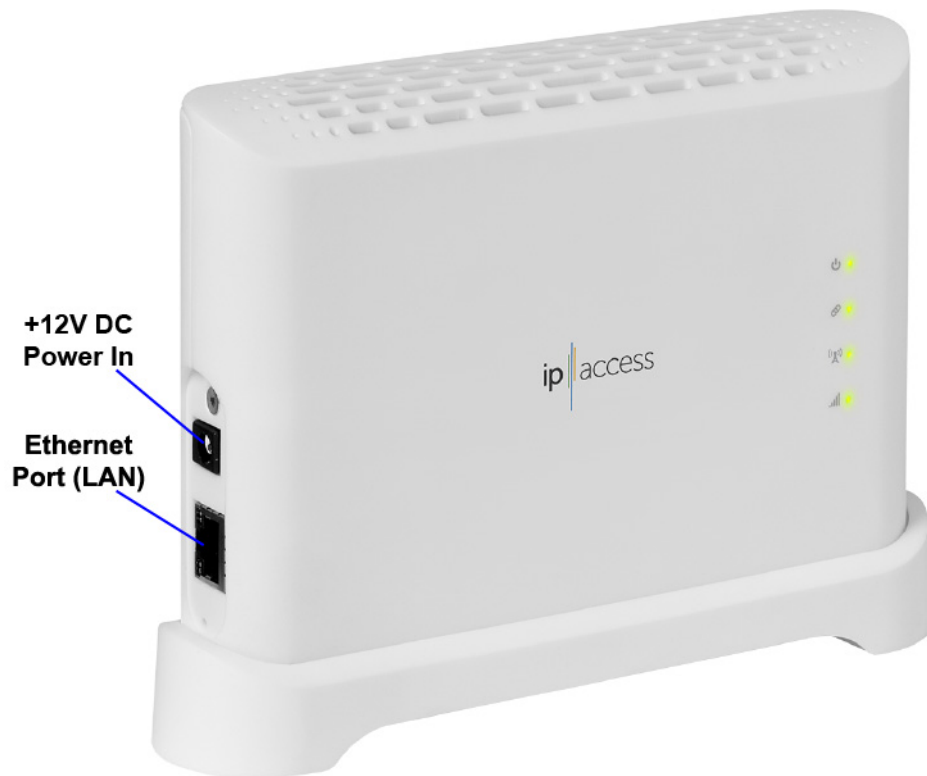
Port Usage Without IPsec

Without IPsec, the following ports are used:

Protocol	Destination Port	Use
sctp	36412	SCTP connection
udp	2152	PS GTP from AP
udp	2152	PS GTP to 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 S60 AP Power Requirements



Maximum expected power consumption:

- 15 Watts (Rated +12V on the DC input)

The S60 AP only uses power from a suitable DC source (+12V, 1.67A rated centre positive 2.1mm jack). Use the supplied mains adaptor only.

PSU

The following 12V PSU, rated up to 20W, is included in the box with the S60 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.

The S60 AP does not use PoE or PoE+. The S60 AP can use an Ethernet connection carrying PoE or PoE+, but will not power up from the cable.

2.3.5 S60 AP Physical Requirements

An S60 AP is installed by mounting it on a wall or partition on screws or by sitting it on the supplied stand.

Pay attention to ensure that air can circulate freely around the unit. The unit must be vertical.

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 without stand	Height	130mm
	Width	176mm
	Depth	34mm
	Approximate Weight	360g
Dimensions and weight with stand	Height	137mm
	Width	188mm
	Depth	46mm
	Approximate Weight	385g
Environmental	Cooling	Vents on the top and bottom
	Operating Temperature	0°C to +45°C
	Operating Humidity	10 to 70% non-condensing

2.3.6 Thermal Protection

The nanoLTE S60 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 S60 AP Backhaul (IP) Bandwidth Requirements

At maximum capacity and with IPsec in use, a nanoLTE S60 AP will require:

- Downlink: 150Mbps
- Uplink: 50Mbps

This will provide bandwidth for 32 users.

2.3.8 S60 AP Installation Tool Requirements for Wall Mounting

To mount the S60 on a wall:

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

None of these items are included in the box with the S60 AP.

3 nanoLTE S60 AP Hardware Installation

3.1 Unpack the S60 AP

- 1) Unpack the AP and its accessories.

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

- S60 AP unit with wall bracket attached
- Tabletop stand
- Mains power supply unit with plug adaptors
- Ethernet cable (approx 2m)

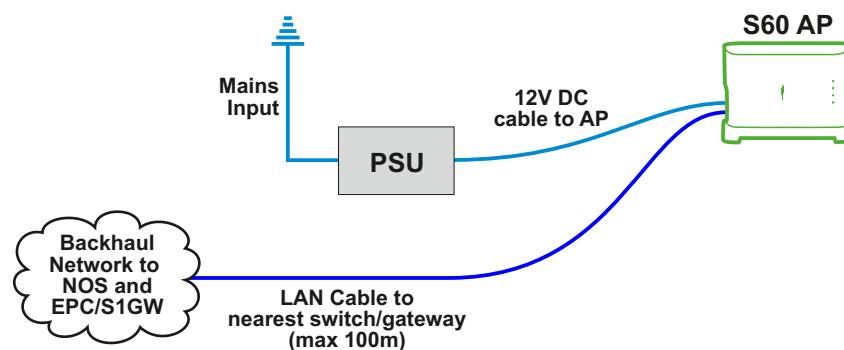
- 2) Check that the serial number on the AP unit matches the label on the box.

- 3) Check that the items have not been damaged in transit.

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

3.2 Cable Connections

The nanoLTE S60 AP requires an Ethernet cable connection to the backhaul and power from the mains via the supplied power adapter:

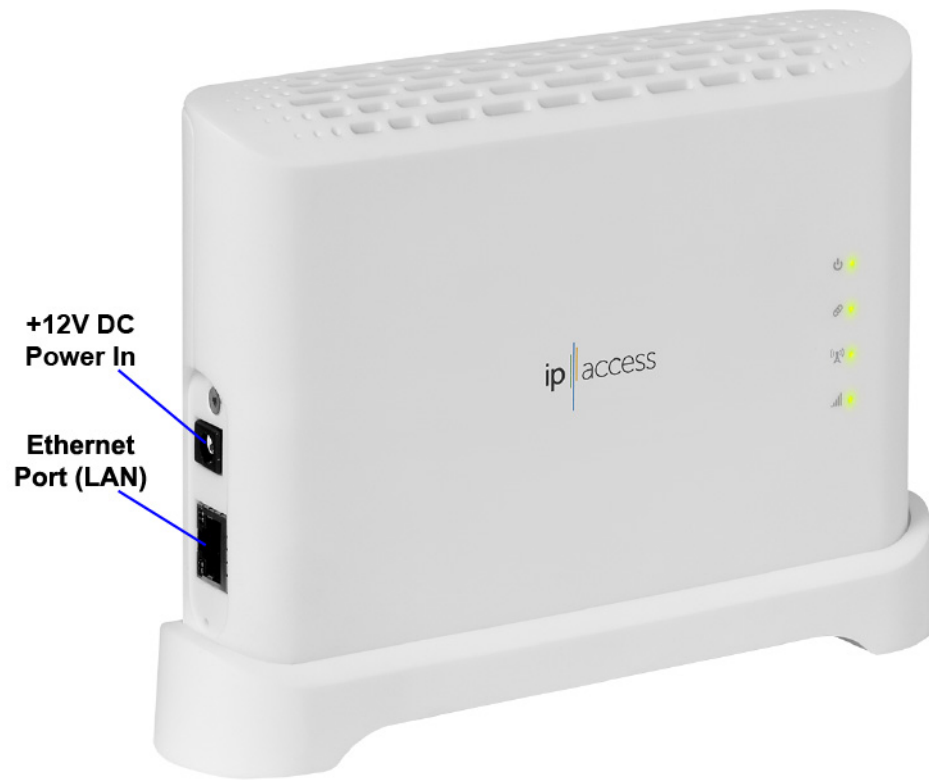


A mains socket providing power to the AP must be within reach of the cabling included with the PSU. This is typically less than 1.5m. Use the PSU supplied for use with the S60 AP.

Note: The nanoLTE S60 AP cannot be powered with PoE or PoE+. The presence of power on the Ethernet connection has no effect on the S60 AP.

3.3 Mount the nanoLTE S60 AP on its Stand

- 1) Fit the S60 AP onto its stand. It should click into place when the unit is oriented correctly on the stand.
- 2) Position the S60 AP in a suitable location, within reach of a power supply point and an Ethernet connection. When it is on its stand, the AP must be on a stable flat surface.
- 3) Plug in the required cables. Plug an Ethernet cable from a switch/gateway into LAN and the included power supply into the +12V DC input:



Route the cables safely. Do not create a tripping hazard with the cables.

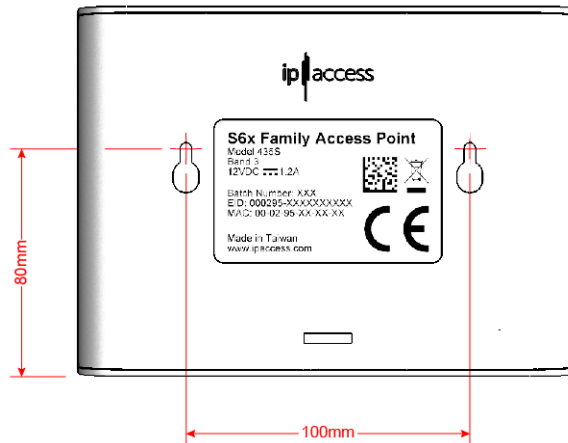
3.4 Mount the S60 AP on a Wall

Note: The S60 AP should be installed in a position so that it is at least 2m away from the area where handsets are normally used.

The S60 AP must be mounted vertically to ensure air circulation around the unit.

The location of each S60 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. Any additional network wiring must be complete before the S60 AP can be installed. When it is wall mounted, position the S60 AP at or above head height.

- 1) Mark the position of the two screw holes on a flat area of wall, 100mm apart horizontally to match the mounting holes on the back of the unit:



To ensure adequate ventilation, allow at least 200mm around the holes to the nearest obstructions, typically to a corner in the walls and the ceiling.

- 2) Drill the two holes in the positions marked previously and insert wall plugs (if required) and fix the screws in place, leaving enough of each screw protruding from the wall so it is easy to hang the S60 on the screws.
- 3) Slide the S60 AP onto the two screws.
- 4) Plug in the required cables. Plug an Ethernet cable from a switch/gateway into LAN and the power supply into the +12V DC input:



Note: Route the cables safely.

4 Troubleshooting

This section covers the following topics that may be useful for troubleshooting a nanoLTE S60 AP during installation:

- 4.1 nanoLTE S60 AP Does Not Power Up
- 4.2 nanoLTE S60 AP LEDs
- 4.3 Factory Reset

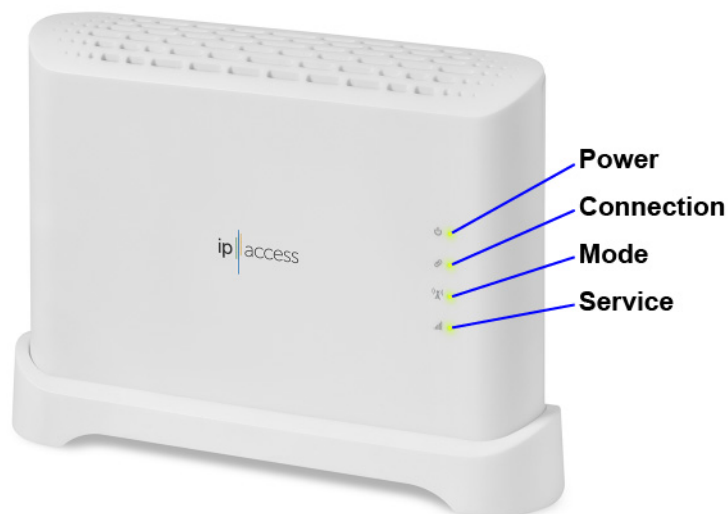
For more information on AP troubleshooting, see [TRB_43005].

4.1 nanoLTE S60 AP Does Not Power Up


Check the following:




- Verify the correct power supply is in use and that mains power is available.
- Ensure that PoE or PoE+ is not being used to attempt to power the AP. The presence of power on the Ethernet connection has no effect on the S60 AP.

4.2 nanoLTE S60 AP LEDs



The following table shows the meaning of the status indicators under normal and fault conditions.

LED	Colour	Description
 Power	Off	The nanoLTE AP is not switched on.
	Green	The nanoLTE AP is powered up normally.
	Red	The LED should only be Red for a short time when the nanoLTE AP is starting up. If the LED stays Red, this means there is a fault with the AP. If the LED turns Red after previously turning Green, this means that there is a hardware power fault with the nanoLTE AP.

LED	Colour	Description
 Connection	Off	The 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 AP losing its IPsec connection with the security gateway.
	Green	Flashing Green indicates the AP is acquiring NTP or connecting to its IPsec Security Gateway. Steady Green indicates the AP is connected to its serving IPsec security gateway.
 Mode	Green	This LED will always be green for the nanoLTE S60 AP, to indicate that it is operating in LTE mode. This LED may be off temporarily during startup.
 Service	Off	The nanoLTE AP is not provisioned, it has no IP address. This may be a temporary condition when the AP is switched on for the first time, or after factory reset.
	Red	Service not available because the 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.

Note: The Ethernet port has standard indicator LEDs, showing when the network connection is up and flashing for network activity.

4.3 Factory Reset

Only use a factory reset when there is no other way to repair the AP connection to either the IPsec SecGW and/or the NOS Server. First ensure that all other possibilities have been explored and eliminated.

A factory reset will clear the configuration supplied to the AP by the NOS (or TR-069 ACS if the NOS is not used). Hence the AP will retain the following information after a factory reset:

- Factory configuration data that cannot be changed, which includes:
 - The AP's Equipment ID (EID)
 - The FQDN for the ip.access NTP services hosted by ntp.org
 - The FQDN of the Field Redirector
 - The FQDN of the primary ip.access CRL mirror server
- If the AP has already successfully obtained its unique OLM Package, it will also have:
 - The DOCP, containing the parameters the AP needs to connect to its serving NOS (see below)
 - Certificates

The DOCP parameters are permanently stored by the AP, and will be used if the AP performs a factory reset. However, they are overridden with the configuration that the AP obtains from the NOS server when it connects for the first time. If this downloaded configuration is incorrect, this may subsequently prevent the AP from successfully re-connecting to the Security Gateway and/or the correct NOS.

In the NOS Client, check these parameters, which are the parameters supplied to the AP in the DOCP, as downloaded from the Field Redirector in its unique OLM Package:

Select in Navigation Pane	Parameter	Notes
Device.ManagementServer	X_000295_DefaultMgmtServerURL	The NOS the AP will attempt to connect to.
Device.Time	X_000295_DefaultNTPServer	If this is incorrectly configured, the AP will be unable to set its clock time. Hence it will be unable to validate any certificates and establish an IPsec tunnel. In this case, the "Default" values are likely to be null.
Device.Security	X_000295_DefaultCRLServerBaseUrl	If this is incorrectly configured, the AP will be unable to validate any certificates and establish an IPsec tunnel. In this case, the "Default" values are likely to be null.
Device.IPsec	X_000295_DefaultIPsecEnable	If it is expected that the AP will use IPsec, this will only be unchecked if the AP has not yet been able to connect to the NOS.
Device.IPsec	X_000295_DefaultRemoteTrafficSelectors	A list of remote Traffic Selectors supplied to the AP.

Select in Navigation Pane	Parameter	Notes
FAPService.{i}.FAPControl.UMTS.Gateway	X_000295_DefaultSecGWServer	The serving IPsec gateway address.

If all these Default values are null, this means that the AP has never connected to the NOS, so it has been unable to inform the NOS with these values. In this case, check the AP's ability to connect to the Field Redirector and the IPsec SecGW. For example, ensure any on-site firewall is allowing the AP to connect to the Internet and also allows IPsec to pass through.

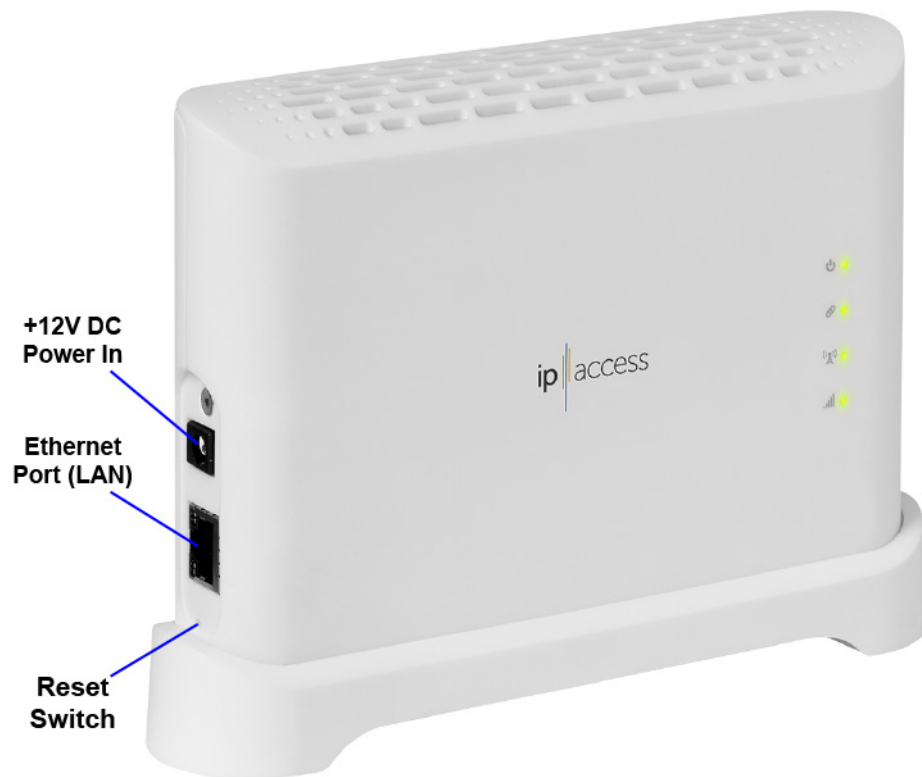
If the default values are populated, this shows means the AP has been able to connect at least once. Hence, in this case, check the AP configuration provisioned from the NOS. That is, ensure these parameters are set correctly:

Select in Navigation Pane	Parameter	Notes
Device.ManagementServer	URL	The configured NOS address. In most cases, this should be the same NOS as provided in the DOCP and shown in X_000295_DefaultMgmtServerURL.
Device.Time	NTPServer1, NTPServer2, NTPServer3 and NTPServer4	The operator's NTP server addresses. All four parameters should have an NTP server address. If all of them are incorrectly configured, the AP will be unable to set its clock time. Hence it will be unable to validate any certificates and establish an IPsec tunnel.
Device.Security	X_000295_CRLServerBaseUrl	If this is incorrectly configured, the AP will be unable to validate any certificates and establish an IPsec tunnel.
Device.IPsec	Enable	If the AP should use IPsec, this must be checked (enabled). If this is unchecked (disabled) then the AP will not attempt to establish an IPsec tunnel, which means it will be unable to reconnect to the NOS.
Device.IPsec	X_000295_ConfiguredRemoteTrafficSelectors	The list of configured remote end Traffic Selectors for the AP. When using an ACME SecGW, leave these at the default values. In this scenario, if they are configured, the AP may be able to establish an IPsec tunnel, but may then be unable to reconnect to the NOS.
FAPService.{i}.FAPControl.UMTS.Gateway	SecGWServer1	The configured IPsec gateway. If this is incorrect, the AP will be unable to find the SecGW, and hence will be unable to reconnect to the NOS.

To resolve any incorrect provisioned values, correct them in the NOS then perform a factory reset. The AP will reconnect to the NOS using the default factory configuration and then obtain the updated configuration.

4.3.1 S60 Factory Reset

- 1) Use a thin rod to press and hold the reset button, which is accessed through a small hole under the Ethernet port.



- 2) Keep the reset button pressed until the Service LED changes from blinking fast (50ms on, 50ms off) to blinking slowly (50ms on, 200ms off).

The 4G 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. The AP will then attempt to re-contact the Redirector via the Internet, in case there is an updated OLM Package available (for example, if the DOCP for the AP has been modified and/or there are new certificates for the AP). The AP will then attempt to reconnect to the specified IPsec Security Gateway and NOS. If the AP is unable to reconnect to the Redirector, it will use the existing DOCP parameters.

- 3) See the nanoLTE AP Troubleshooting manual [TRB_43005] for the full AP restart sequence following a factory reset.











5 nanoLTE AP and PSU Regulatory Information


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

- 5.1 Warnings and Cautions
- 5.2 Regulatory Statements for nanoLTE S60 AP
- 5.3 Regulatory Statements for PSAA20R-120L6 PSU




5.1 Warnings and Cautions

Electrical Safety






	<p>CAUTION</p> <p>The nanoLTE AP is intended for dry indoor applications only. If evidence of condensation is present do not apply power to the nanoLTE AP.</p>
	<p>CAUTION</p> <p>The nanoLTE 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 integral antennas at all times.</p>
	<p>WARNING</p> <p>Do not immerse any part of the nanoLTE AP or its power supply in water or any other liquid. Do not install or use the nanoLTE AP or its power supply near open water. Do not spill liquids of any type on the nanoLTE AP or its power supply.</p>
	<p>WARNING</p> <p>Do not use liquid, solvent or aerosol cleaning agents on or near the nanoLTE AP or its power supply.</p>
	<p>CAUTION</p> <p>To avoid the risk of fire and/or electrical shock, do not push objects through openings into the nanoLTE AP or its power supply. The only exception is the recess for the Reset switch, which is recessed to prevent accidental operation.</p>
	<p>CAUTION</p> <p>Do not disassemble the nanoLTE AP or its power supply.</p>
	<p>CAUTION</p> <p>The nanoLTE AP must only be powered using the ip.access power supply provided for use with the nanoLTE AP.</p>
	<p>CAUTION</p> <p>Before using the power supply, verify that the mains voltage is within the range specified by the voltage printed on the power supply.</p>
	<p>CAUTION</p> <p>The PSU supplied with the nanoLTE AP must not be used for powering any other equipment.</p>
	<p>CAUTION</p> <p>To avoid the risk of fire and/or electrical shock, do not overload power outlets or extension cables.</p>

	<p>CAUTION When disconnecting the power supply from the mains, pull the plug. Pulling the cable may result in damage to the cable.</p>
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Interference with Electronic Devices

	<p>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.</p>
	<p>CAUTION If using a hearing aid, RF devices may cause interference.</p>
	<p>CAUTION Unshielded electronic devices should not be used near the nanoLTE AP. Conversely, the nanoLTE AP should not be installed adjacent to unshielded electrical or electronic devices (such as unshielded speakers).</p>

Other Warnings and Cautions

	<p>WARNING Do not install the nanoLTE AP in a position where the power supply cable or network cable may cause a tripping or choking hazard.</p>
	<p>WARNING Do not install the nanoLTE AP or 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.</p>
	<p>WARNING The nanoLTE AP should not be disposed of in household waste bins. Please follow local regulations for disposal of electronic devices.</p>
	<p>CAUTION Do not install the nanoLTE AP in a position where the power supply cable or network cable may be damaged by walking on the cables.</p>
	<p>CAUTION Do not attempt to fit an external antenna or antenna cabling to the nanoLTE AP.</p>


5.2 Regulatory Statements for nanoLTE S60 AP

5.2.1 US FCC Compliance

- FCC CFR47 Parts 15B, 24

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 S60 435R	2	QGGIPA435R

	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.

5.2.2 EU Regulatory Compliance

The nanoLTE AP model 435S (Band 3) conforms to the following regulatory standards:

Health (Art 3.1(a)):	EN50385: 2002
Safety (Art 3.1(a)):	EN 62368-1:2014
EMC (Art 3.1(b)):	Draft EN 301 489-1 V2.1.0, Draft EN 301 489-50 V2.1.0
Spectrum (Art 3.2):	EN 301 908-14 V11.1.1

This product is intended for use in all Member States of the European Union.
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"Hereby, ip.access Ltd, declares that the nanoLTE 435S is in compliance with the essential requirements and other relevant provisions the Radio Equipment Directive 2014/53/EU."

A copy of regulatory compliance documentation may be obtained in writing from "IP Access Ltd, Building 2020, Cambourne Business Park, Cambourne, Cambridge, CB23 6DW, UK".

5.2.3 Safety Standards

- EN 62368-1:2014

5.2.4 Environmental Standards

- ETSI 300 019-2-3
- ETSI 300 019-2-2

5.2.5 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.

5.3 Regulatory Statements for PSAA20R-120L6 PSU

Safety Approvals	UL/cUL 60950-1 CB CE SAA+C-TICK+MEPS
Mechanical Characteristics	L x W x H: 71.7mm x 50.0mm x 39.1mm (2.82" x 1.97" x 1.54") Weight: 180.8g (6.38oz)
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
AC Input Frequency	47 to 63Hz
Input Current	0.8A (RMS) maximum at 120V AC and max load 0.5A (RMS) maximum at 240V AC and max load
Leakage Current	0.25mA maximum
Inrush Current	<60A for 100V AC at maximum load <100A for 240V AC at maximum load (Cold start at ambient 25°C)
Over-Current Protection	Short circuit: Auto restart
Short-Circuit Protection	Output can be shorted permanently without damage
Input Power Saving	0.1W maximum at no load
Dielectric Withstand (Hi-pot) Test	Primary to Secondary: 3000VAC or 4242VDC, 10mA 1min. 3600VAC or 5090VDC, 10mA 3s.
Output Efficiency	DOE Level VI
Insulation	Class II Double Insulated
Environmental	Operation: 0 to +40C Non-operation: -20 to +75C Humidity: 20 to 90%
DC Output Connector	5.5mm O.D., 2.1mm I.D., 9.5mm length. Centre conductor positive.

5.3.1 Output Specification

Model	DC Output	Load		Ripple P-P (max)	Regulation Line /Load	Efficiency Level
		Min	Max			
PSAA20R-120L6	12V / 20W	0A	1.67A	120mV	±5%	VI