AEM networks

PoE Load Testing

Application Note – load testing installed PoE links with the NSA and PoE Load Box

Application Note | AEM Networks | Network Service Assistant | October 2026

1 Why load test a PoE link?

Power over Ethernet has moved well beyond IP phones. Access points, PTZ cameras, LED lighting, digital signage and building-automation controllers now draw up to 90 W per port over the same twisted-pair cabling that carries their data, and IEEE 802.3bt pushes current through all four pairs at once.

A link that passes a conventional wiremap or even a full certification test can still fail in service once a powered device starts drawing real current. Three things change under load:

- **Voltage drop.** – every metre of cable and every termination adds resistance; at 802.3bt currents the voltage at the outlet can drop below what the device needs, even though the switch is delivering its full class power.
- **PSE power budget.** – a port may negotiate a high PD class but current-limit or shut down when that power is actually drawn, particularly on fully populated switches with a shared power budget.
- **Data performance.** – DC current flowing through the pairs raises cable temperature and can degrade signal-to-noise ratio, so a link that supports 10 Gbps unloaded may not do so with 90 W flowing through it.

The only way to know how a link behaves is to load it. The Network Service Assistant (NSA) can do this in two ways: a short internal load from its AD-NSA adapter for a quick check of PoE function, and a sustained external load through the AEM PoE Load Box when PoE performance has to be proven over an extended period. This application note describes both, and walks through the extended test on an installed link – a wall outlet patched back to a PoE switch.



Network Service Assistant with AD-NSA adapter



PoE Load Box CPGB-01-MAIN with POE90U-1BT-X injector

2 The test solution

2.1 Network Service Assistant (NSA)

The Network Service Assistant is AEM Networks' handheld network qualification tester for IT departments and cable contractors. With the AD-NSA adapter attached, its Multi-Gig / PoE port connects directly to the link under test and the NSA acts as the powered device (PD) at the end of that link.

During a PoE test the NSA reports:

- PSE detected, voltage, PSE type (1-2, 2, 3-4, 4) and PD class (0 to 8)
- the cable pairs carrying power, the power allocated by the switch and the real power delivered
- voltage, current and real power under internal or external load
- link speed and signal-to-noise ratio (SNR) on every pair while the load is applied

Test results are saved on the unit with a label and can be transferred to TestDataPro, AEM's test management software, to produce PDF reports.

2.2 PoE Load Box (POE-LOAD-SRC-K90W)

The NSA supports two ways of loading a PoE link. The AD-NSA adapter contains its own load and can draw power from the switch for a short period – ideal for a quick functional check that the switch detects a PD, negotiates the class and delivers power. Because of the heat dissipation limits of the adapter's small form factor, this internal load is applied only briefly. When PoE performance has to be proven over an extended period, the external PoE Load Box takes over: connected to the NSA's red and black banana sockets, it draws a constant, selectable load through the link for as long as the test requires while the NSA keeps measuring what arrives at the outlet.

	Internal load (AD-NSA adapter)	External load (PoE Load Box)
Purpose	Quick functional check of PoE on each outlet	Sustained load test of the link and the switch port
Duration	Short – limited by heat dissipation in the adapter	Extended – minutes to hours, as the test requires
Load level	Fixed by the NSA	Selectable: six 15 W steps to 90 W, ±2 W fine-tune
Extra equipment	None	POE-LOAD-SRC-K90W and 4 mm banana leads

The rest of this note describes the extended external-load test. The PoE Load Box kit contains two parts; the injector is used only when the switch at the far end does not supply PoE – for example when load testing cabling before the PoE switches are installed. On a live PoE switch the link is tested exactly as installed.

Item	Model	Key specifications

PoE load box	CPGB-01-MAIN	Input 30–58 V DC · six switchable 15 W steps, 90 W total · fine-tune ±2 W · minimum load 3 W · 300 × 165 × 55 mm, 4 kg
PoE injector (optional use)	POE90U-1BT-X	IEEE 802.3bt, 4-pair powering · 56 V DC, 1.6 A max · 10 Gbps data pass-through · OCP / OVP protection · UL / IEC safety approvals

3 Test setup

Power flows from the switch, through the installed link, into the NSA and on to the load box. The NSA sits at the outlet end of the link and measures everything that arrives there.

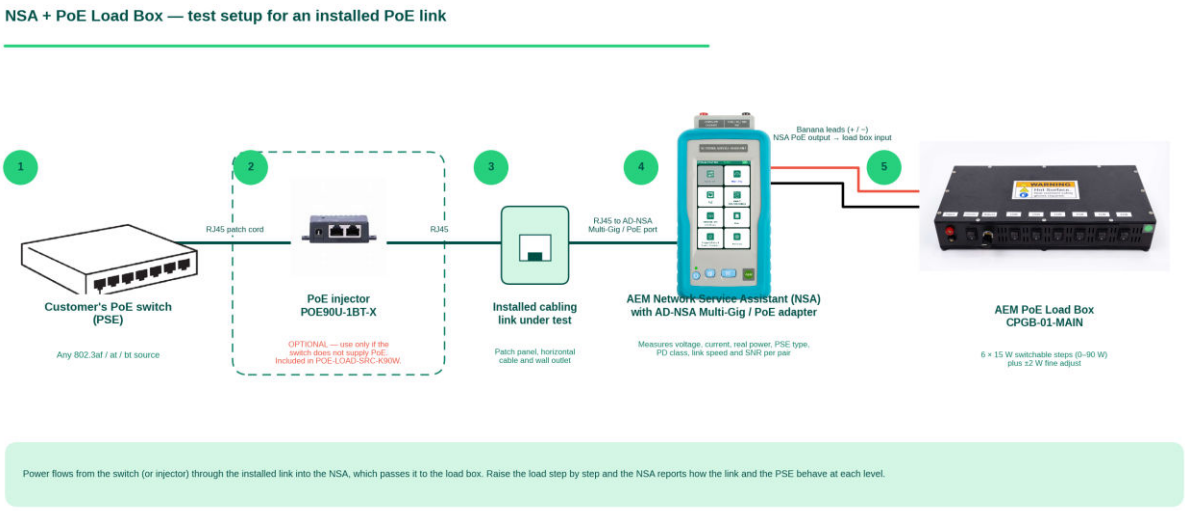

Figure 1 – PoE load test setup for an installed link

#	Equipment	Role in the test
1	PoE switch (PSE)	The power source under evaluation, connected exactly as in service
2	PoE injector POE90U-1BT-X (optional)	Inserted between the switch and the link only if the switch has no PoE; mains-powered
3	Installed cabling link	Patch panel, horizontal cable and wall outlet – the link being load tested
4	NSA with AD-NSA adapter	Acts as the powered device; measures voltage, current, power, PSE type, PD class, link speed and SNR
5	PoE Load Box CPGB-01-MAIN	Draws the selected load (15 W steps to 90 W) through the NSA's banana sockets

3.1 Connecting the equipment

1. Attach the AD-NSA adapter to the NSA and switch the NSA on.
2. Patch the outlet end of the link to the Multi-Gig / PoE port of the AD-NSA adapter with an RJ45 patch cord.
3. At the equipment room, make sure the far end of the link is patched to a PoE-enabled switch port. If the switch does not supply PoE, connect the POE90U-1BT-X injector between the switch port and the link and plug the injector into mains.
4. Connect the red (+) and black (–) banana sockets on the NSA to the input terminals of the PoE Load Box with 4 mm banana test leads. Keep the polarity correct and never short the two sockets together.
5. Set all six 15 W switches on the load box to OFF and switch the load box ON.

4 Test procedure

1. On the NSA home screen select [PoE] and choose the PoE standard you expect from the switch (802.3af, at or bt). The NSA negotiates with the switch and shows the PSE type, PD class, allocated power, powered pairs and voltage.
2. Select [PoE Load Test]. For a quick check, run it with the internal load first: the NSA applies its own load briefly and confirms the switch delivers power. For the extended test, select the external load option with the load box connected. The NSA now shows live voltage, current and real power at the outlet, plus SNR and received power per pair.
3. Switch in the first 15 W step on the load box and note the readings. Add further 15 W steps one at a time, using the Adjust knob (±2 W) to fine-tune the load, until you reach the level you want to prove – up to 90 W.
4. Run a [Multi-Gig] Autotest while the load is applied to confirm the link still supports 2.5, 5 or 10 Gbps with healthy SNR on all four pairs.
5. Select [Save] and choose a label for the outlet. Repeat for the next outlet.

4.1 Interpreting the results

Record the voltage, current and real power at each load step and compare them with the class the switch negotiated. Three patterns are worth looking for:

- **Excessive voltage drop** – voltage falls steadily as current rises. Compare the drop with the link length; a drop that is large for the length points at a high-resistance termination or an undersized conductor.
- **Port cut-off below class power** – the switch negotiates a high class but current-limits or drops the port before the load reaches it. The port, or the switch's total power budget, cannot deliver what it advertises.
- **Data degradation under load** – the link passes the PoE test but SNR on one or more pairs falls, or the Multi-Gig Autotest no longer reaches the expected speed, once the load is applied. Suspect marginal terminations or cable heating.

A result at every step

A link that holds its voltage, delivers its full class power and keeps its SNR to 90 W is proven for any powered device you will connect to it. A step where the voltage sags or the port drops out is equally useful: it tells you the safe operating limit of that link before a device is deployed on it.

4.2 Safety and practical notes

- The load box dissipates up to 90 W as heat. Its top surface becomes hot – wear heat-resistant gloves and keep it clear of other equipment, as marked on the unit.
- Stay within the class the switch port is rated for. The load box lets you go to 90 W; a Type 1 or Type 2 port will cut off well before that, which is itself a valid result.
- The NSA's banana sockets must never be short-circuited directly; always connect through the load box.
- Allow a few seconds after each load change for the readings to settle before recording them.

4.3 Results and reporting

Each saved test records the PoE readings together with the link speed and per-pair SNR. Results are stored on the NSA by project and label and can be exported to a USB drive or uploaded to TestDataPro for PDF reports – one per outlet, or a combined report for the whole installation.

5 Equipment required

Part number	Description	Qty
NSA-K30E	Network Service Assistant kit including the AD-NSA Multi-Gig / PoE test adapter	1
POE-LOAD-SRC-K90W	PoE Load Box CPGB-01-MAIN with POE90U-1BT-X 90 W IEEE 802.3bt PoE injector	1

Standard 4 mm banana test leads are used to connect the NSA to the load box.

6 Find out more

The same NSA and load box combination also tests PoE injectors, midspans and powered fibre links, and the NSA qualifies the link for 2.5, 5 and 10 Gbps data in the same visit.

To arrange a demonstration or request a quotation, contact your local AEM Networks partner or write to us:

AEM Networks
customercare@aemnetworks.com · www.aemnetworks.com