

PA-50R Series Hardware Reference

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Before You Begin

Read the following topics before you install or service the PA-50R Series firewall.

- [Compliance](#)
- [Parts List and Required Tools](#)

Compliance

Read the Safety Warnings prior to installing the PA-50R Series firewall hardware. This section also lists certifications that apply to the firewall.

- [Safety Warnings](#)
- [Safety Warnings \(French\)](#)
- [Certifications](#)
- [Tamper Proof Statement](#)
- [Third-Party Component Support](#)

Safety Warnings

To avoid personal injury or death for yourself and others and to avoid damage to your Palo Alto Networks hardware, be sure you understand and prepare for the following warnings before you install or service the hardware. You will also see warning messages throughout the hardware reference where potential hazards exist.

 *All Palo Alto Networks products with laser-based optical interfaces comply with 21 CFR 1040.10 and 1040.11.*

- When installing or servicing a Palo Alto Networks firewall or appliance hardware component that has exposed circuits, ensure that you wear an electrostatic discharge (ESD) strap. Before handling the component, make sure the metal contact on the wrist strap is touching your skin and that the other end of the strap is connected to earth ground.
- Use grounded and shielded Ethernet cables (when applicable) to ensure agency compliance with electromagnetic compliance (EMC) regulations.
- Fiber SFP transceivers emit invisible infrared lasers that can cause significant retinal damage if they make contact with your eyes. As a best practice, power off the device when installing or replacing an SFP module. If handling an SFP module while the device is operating, apply dust caps to the end of the transceiver or make sure to keep it pointed away from your eyes.
- Do not connect a supply voltage that exceeds the input range of the firewall or appliance. For details on the electrical range, refer to electrical specifications in the hardware reference for your firewall or appliance.

	Caution: Shock hazard Disconnect all power cords (AC or DC) from the power inputs to fully de-energize the hardware.
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- Do not connect or disconnect energized DC wires to the power supply.
- The DC supply source must be located within the same premises as the firewall.
- The firewall must be in the same immediate area (such as adjacent cabinets) as any other equipment that has a connection between the earthing conductor of the DC supply circuit and the earthing of the DC system.

- Install all firewalls that use DC power in restricted access areas only. A restricted access area is where access is granted only to craft (service) personnel using a special tool, lock and key, or other means of security, and that is controlled by the authority responsible for the location.
- Install the firewall DC ground cable only as described in the power connection procedure for the firewall that you are installing. You must use the American wire gauge (AWG) cable specified and torque all nuts to the torque value specified in the installation procedure for your firewall.

Radio Antenna Safety Warnings

- **Radio Frequency (RF) Radiation Exposure Warning:** Hazardous Radiation Exposure Warning —Adjustments or procedures other than those specified may result in hazardous RF radiation exposure. A minimum distance of 20cm (7.87in) must be maintained between the operating radio antennas and personnel.
- **Antenna Installation Warning:** To avoid hazardous RF radiation exposure, ensure the device is switched off when installing or changing antennas.
- **Cellular Devices:** The USB 2.0 port on the cellular device is used for maintenance only.

Safety Warnings (French)

- **French Translation:** Lorsque vous installez ou que vous intervenez sur un composant matériel de pare-feu ou de dispositif Palo Alto Networks qui présente des circuits exposés, veuillez à porter un bracelet antistatique. Avant de manipuler le composant, vérifiez que le contact métallique du bracelet antistatique est en contact avec votre peau et que l'autre extrémité du bracelet est raccordée à la terre.
- **French Translation:** Des câbles Ethernet blindés reliés à la terre doivent être utilisés pour garantir la conformité de l'organisme aux émissions électromagnétiques (CEM).
- **French Translation:** Veillez à ce que la tension d'alimentation ne dépasse pas la plage d'entrée du pare-feu ou du dispositif. Pour plus d'informations sur la mesure électrique, consulter la rubrique des caractéristiques électriques dans la documentation de votre matériel de pare-feu ou votre dispositif.

• 	French Translation: (Tous les appareils Palo Alto Networks avec au moins deux sources d'alimentation) Débranchez tous les cordons d'alimentation (c.a. ou c.c.) des entrées d'alimentation et mettez le matériel hors tension.
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- Ne raccordez ni débranchez de câbles c.c. sous tension à la source d'alimentation.
- La source d'alimentation c.c. doit se trouver dans les mêmes locaux que ce pare-feu.
- Le pare-feu doit se trouver dans la même zone immédiate (des armoires adjacentes par exemple) que tout autre équipement doté d'un raccordement entre le conducteur de mise à la terre du même circuit d'alimentation c.c. et la mise à la terre du système c.c.
- Tous les pare-feux utilisant une alimentation c.c. sont conçus pour être installés dans des zones à accès limité uniquement. Une zone à accès limité correspond à une zone dans laquelle l'accès n'est autorisé au personnel (de service) qu'à l'aide d'un outil spécial, cadenas ou clé, ou autre dispositif de sécurité, et qui est contrôlée par l'autorité responsable du site.

- Installez le câble de mise à la terre c.c. du pare-feu comme indiqué dans la procédure de raccordement à l'alimentation pour le pare-feu que vous installez. Utilisez le câble American wire gauge (AWG) indiqué et serrez les écrous au couple indiqué dans la procédure d'installation de votre pare-feu.

Certifications

The following table provides an overview of PA-50R Series firewall hardware certifications.

Category	Certification	Standard / Description
Electrical & Physical Safety	NRTL	UL 62368-1 / CSA C22.2 No. 62368-1:25, Fourth Edition
	CB Scheme	IEC/EN 62368-1, IEC/EN 60950-1 (international electrical safety)
	CE Low Voltage Directive	LVD 2014/35/EU (European Union electrical equipment safety)
	Laser Safety	21 CFR 1040.10, 1040.11; IEC 60825-1 (Class 1 laser, optical transceivers and SFP/SFP+ ports)
Materials & Environmental Sustainability	EU RoHS	Directive 2011/65/EU and Amendment 2015/863
	China RoHS	Management Methods for Controlling Pollution Caused by Electronic Information Products
	EU REACH	EC 1907/2006 (Substances of Very High Concern)
	WEEE Directive	2012/19/EU (end-of-life recycling requirements)
	California Proposition 65	Chemical safety and exposure limit compliance disclosures
	Taiwan Declaration of Restricted Substances	Taiwan presence condition marking for restricted hazardous substances in electronic products
Electromagnetic Compatibility (EMC) & Radio / Regulatory	FCC Part 15 (47 CFR Part 15)	Class A for enterprise rack-mounted hardware
	FCC Parts 22, 24, 27 & Part 1.1310	Licensing and RF exposure limits for cellular/5G-enabled firewalls

Category	Certification	Standard / Description
	CE EMC Directive	2014/30/EU (European Union electromagnetic compatibility)
	CE Radio Equipment Directive (RED)	2014/53/EU (required for cellular/5G-equipped hardware)
	ISED / ICES-003 Class A	Canadian Innovation, Science and Economic Development EMC standard
	VCCI Class A / Class B	Japan Voluntary Control Council for Interference by Information Technology Equipment
	BSMI	Taiwan Bureau of Standards, Metrology and Inspection for product safety requirements and regulations
	NCC	Taiwan National Communications Commission for telecommunications, radio frequency (RF), and wireless communication equipment.
	KC / KCC Class A	South Korea National Radio Research Agency EMC certification
	RCM / ACMA	Australian Communications and Media Authority (EMC and telecommunications)
	MIC (Ministry of Internal Affairs and Communications, Japan)	Japan radio licensing and type certification for wireless communications equipment
	UKCA (UK Conformity Assessed)	UK post-Brexit conformity mark covering electrical equipment safety (UK S.I. 2016/1101) and electromagnetic compatibility (UK S.I. 2016/1091)
Shock, Vibration, Humidity & Environmental Tolerance	IEC 60068 Series	• IEC 60068-2-1: Cold temperature operational/storage testing (-40°C) • IEC 60068-2-2: Dry heat operational/storage testing (+70°C to +75°C) • IEC 60068-2-6: Sinusoidal vibration endurance • IEC 60068-2-14: Change of temperature operational testing (-40°C to +70°C) • IEC 60068-2-27: Mechanical physical shock

Category	Certification	Standard / Description
		- IEC 60068-2-30: Damp heat cyclic humidity (up to 95% non-condensing) - IEC 60068-2-78: Damp heat steady state operational testing
	MIL-STD-810G / MIL-STD-810H	US Military Standard for vibration and shock
	IP Rating (Ingress Protection)	Dust-tight and liquid enclosure ratings (such as IP30 or IP40 for fanless metal enclosures)
Hazardous Locations & Utility / Industrial Substation Standards	IEC 61850-3	Communications networking for electric power utility substations (thermal stability, shock/vibration, EMC emission/immunity)
	IEEE 1613	Environmental and EMC immunity testing requirements for communications firewalls in electric power substations
	NEBS Level 3 (GR-63-CORE & GR-1089-CORE)	Telecom carrier certification for fire resistance, seismic stability, acoustic noise, and DC power surge immunity
	Class I, Division 2 / ATEX / IECEx	Compliance for hardware in locations where flammable gases, vapors, or liquids may be present under abnormal conditions
Security, Cryptographic & Government Hardware Assurance	FIPS 140-3 (NIST CMVP)	Cryptographic module validation for physical and logical security of PAN-OS hardware
	Common Criteria (CCRA / ISO/IEC 15408)	NIAP certification under the Network Device Protection Profile (NDPP) and Stateful Traffic Filter Extended Package
	USGv6	NIST IPv6 profile certification for federal agency network infrastructure
	Physical Tamper Protection	Tamper-evident seals and tamper-proof enclosure designs

Tamper Proof Statement

To ensure that products purchased from Palo Alto Networks were not tampered with during shipping, verify the following upon receipt of each product:

- The tracking number provided to you electronically when ordering the product matches the tracking number that is physically labeled on the box or crate.
- The integrity of the tamper-proof tape used to seal the box or crate is not compromised.

- The integrity of the warranty label on the firewall or appliance is not compromised.

Third-Party Component Support

Before you consider installing third-party hardware, read the [Palo Alto Networks Third-Party Component Support](#) statement.

Parts List and Required Tools

The following table lists the items that are shipped with the PA-50R Series firewall.

Table 1: Parts List – PA-52R-5G

Quantity	Item
1	Torx head screw (T10) – M3 × 5mm, zinc-plated steel, nylon patch
3	2-pin terminal block – 3.5mmC, 8A, 160V, upright, screw flange, 11.25mmH
1	Grounding lug
2	Desiccant
1	SIM card tweezer

Table 2: Parts List – PA-54R-POE and PA-54R-POE-D-5G

Quantity	Item
2	Phillips head screw – M4 × 14mm
6	Torx head screw (T25) – 10-32, 1/4"
1	Grounding lug
2	2-pin terminal block – 5mmC, 18A, 300V, free-hanging, 15.00mmH
1	2-pin terminal block – 3.5mmC, 8A, 160V, upright, screw flange, 11.25mmH
1	8-pin terminal block – 3.5mmC, 8A, 300V, free-hanging, 11.50mmH
2	Desiccant
1	DIN rail
2	Port protection covers
1	SIM card tweezer (PA-54R-POE-D-5G only)

Table 3: Parts List – PA-56R-POE-5G

Quantity	Item
1	Grounding lug

Quantity	Item
2	2-pin terminal block – 5mmC, 18A, 300V, free-hanging, 15.00mmH
1	8-pin terminal block – 3.5mmC, 8A, 300V, free-hanging, 11.50mmH
1	Desiccant

The following tools are either required or recommended when installing the PA-50R Series firewall hardware.

- ESD wrist strap
- Equipment rack screws
- #1 Phillips-head screwdriver
- (PA-52R-5G only) Torx screwdriver

PA-50R Series Firewall Overview

The PA-50R Series next-generation firewalls are made up of the following models:

- PA-52R-5G
- PA-54R-POE
- PA-54R-POE-D-5G
- PA-56R-POE-5G

The PA-50R Series firewalls are ruggedized appliances designed for industrial facilities, transportation infrastructure, and mobile deployments. These IP40-rated devices are engineered to operate in environments that exceed the specifications of standard networking equipment, providing reliable security in conditions characterized by temperature extremes, dust, moisture, and constant vibration. By extending security controls to these environments, the PA-50R Series firewalls protect critical industrial control systems and manufacturing networks that lack the climate-controlled infrastructure of a traditional data center.

The PA-50R Series firewalls offer varied port densities and integrated cellular capabilities, including 5G modem support with GPS functionality. These platforms also support flexible power configurations, accepting a wide range of DC voltage inputs suitable for both stationary and vehicle-based installations. To maintain reliability under thermal stress, the appliances feature dynamic power management that adjusts Power over Ethernet (PoE) allocation based on internal temperature sensors.

First Supported PAN-OS release: PAN-OS 12.2.2

Refer to [PA-50R Series Firewall Panel Components](#) to view descriptions of the front and back panel interfaces, power inputs, and other components of your firewall.

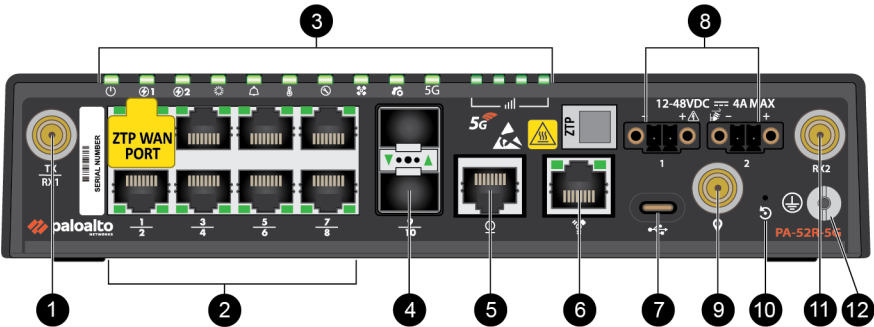
PA-50R Series Firewall Panel Components

Refer to the following sections to view the front and back panel components of the PA-50R Series firewalls.

- [PA-52R-5G](#)
- [PA-54R-POE](#)
- [PA-54R-POE-D-5G](#)
- [PA-56R-POE-5G](#)

PA-52R-5G

The following image shows the front panel of the PA-52R-5G. The table lists and describes each labeled component.

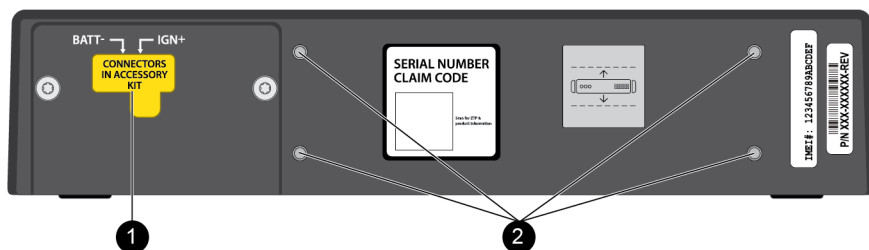


Item	Component	Description
1	Antenna Connector	A connector for the primary TX/RX1 antenna. See the antenna specifications for more information about the antenna.
2	Copper RJ-45 Ports	Eight RJ-45 ports for 10 Mbps/100 Mbps/1000 Mbps network traffic. You can set the link speed and duplex mode or choose autonegotiate.  You must use Shielded RJ-45 Ethernet cables in order to meet compliance requirements.
3	LED Status Indicators	Ten LEDs that indicate the status of the firewall hardware components and four LEDs to indicate cellular status.

Item	Component	Description
		Refer to the LED definitions to view the color and behavior of each LED.
4	Fiber SFP Ports	Two SFP ports for 1000 Mbps network traffic.
5	Console Port	One RJ-45 port used to connect a management computer to the firewall using a RJ-45 to USB cable and terminal emulation software. The console connection provides access to firewall boot messages, the Maintenance Recovery Tool (MRT), and the command line interface (CLI). Use the following settings to configure your terminal emulation software to connect to the console port: • Data rate: 115,200 • Data bits: 8 • Parity: none • Stop bits: 1 • Flow control: None
6	Management Port	One RJ-45 10Mbps/100Mbps/1000Mbps port that is used to access the management web interface and perform administrative tasks. The firewall also uses this port for management services, such as retrieving licenses and updating threat and application signatures.
7	USB Type-C Port	One USB-C port used for debugging and administration only. Use it to bootstrap the firewall or perform self-service enhanced factory reset (EFR). Bootstrapping enables you to provision the firewall with a specific PAN-OS configuration and then license it and make it operational on your network. EFR provides remediation of a compromised or potentially

Item	Component	Description
		compromised firewall to initiate a complete cleanup of the device.
8	Power Inputs	Two DC power inputs used to connect power to the firewall. A second power input can be used for redundancy.
9	GNSS Port	One Global Navigation Satellite System (GNSS) port that can be used for active GPS/GNSS antenna support if required.
10	Reset Button	A button that reboots the appliance.
11	Antenna Connector	A connector for the RX2 antenna. See the antenna specifications for more information about the antenna.
12	Ground Stud	A single post ground stud used to connect the firewall to earth ground.

The following image shows the back panel of the PA-52R-5G. The table lists and describes each labeled component.

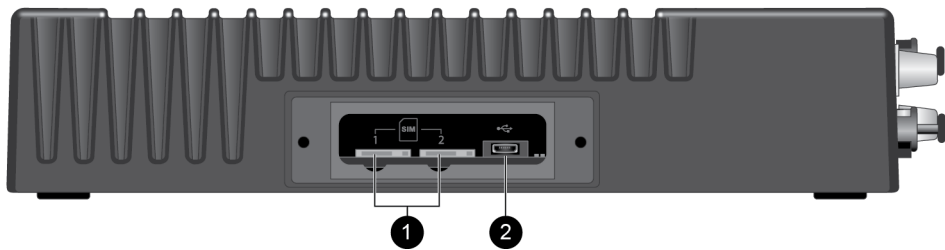


Item	Component	Description
1	BATT- and IGN+ Input	A connector used to enable Vehicle Ignition Monitoring System (VIMS) when you connect a cable between this input and a vehicle's ignition circuitry.
2	DIN Mount Screw Locations	Use these screw holes to Install the PA-50R Series Firewall on a DIN Rail .

Item	Component	Description
		 You can attach a DIN clip to either the back or bottom panel of the device.

The following image shows the side panel of the PA-52R-5G with the SIM cover open. The table lists and describes each labeled component.

 The SIM access cover must remain on while the firewall is in operation.



Item	Component	Description
1	SIM Cards	Two SIM cards that enable mobile network connectivity.
2	Micro USB-C Port	This port is reserved for internal use and is not available for configuration.

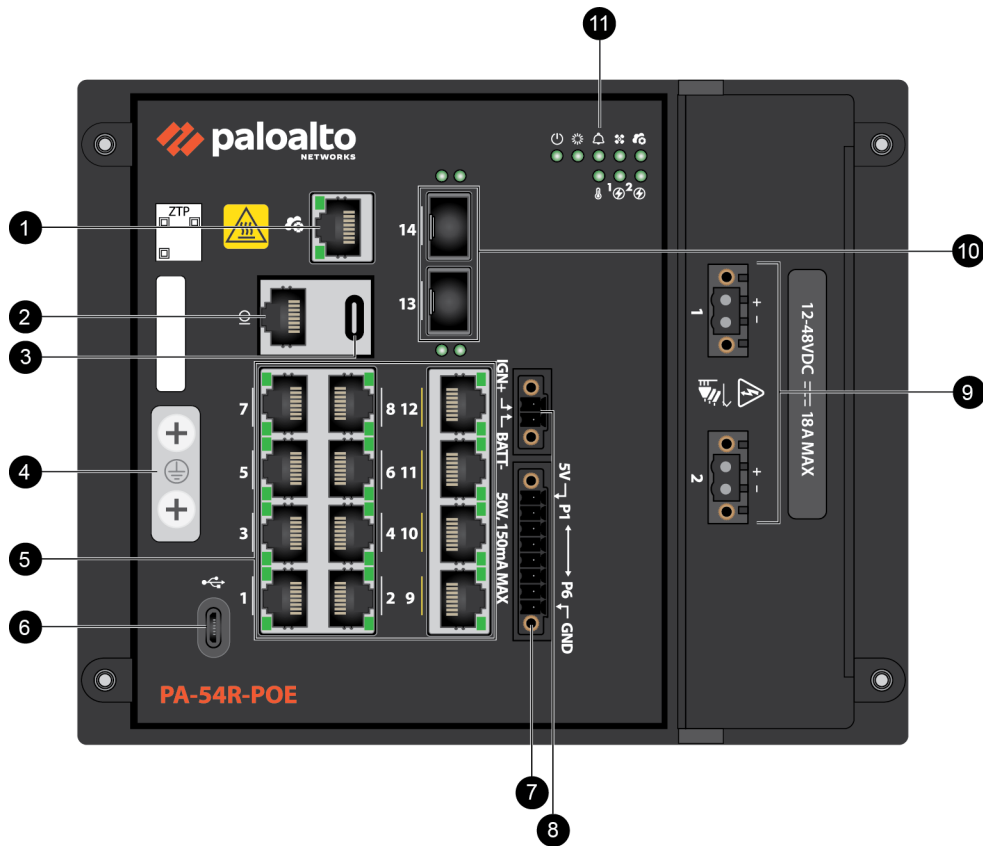
The following image shows the bottom panel of the PA-52R-5G. The table lists and describes each labeled component.



Item	Component	Description
1	Mounting Screw Locations	Four screw holes used to install a wall mount bracket or seat the firewall in a rack mount tray .
2	DIN Mount Screw Locations	Use these screw holes to Install the PA-50R Series Firewall on a DIN Rail .  You can attach a DIN clip to either the back or bottom panel of the device.

PA-54R-POE

The following image shows the front panel of the PA-54R-POE. The table lists and describes each labeled component.

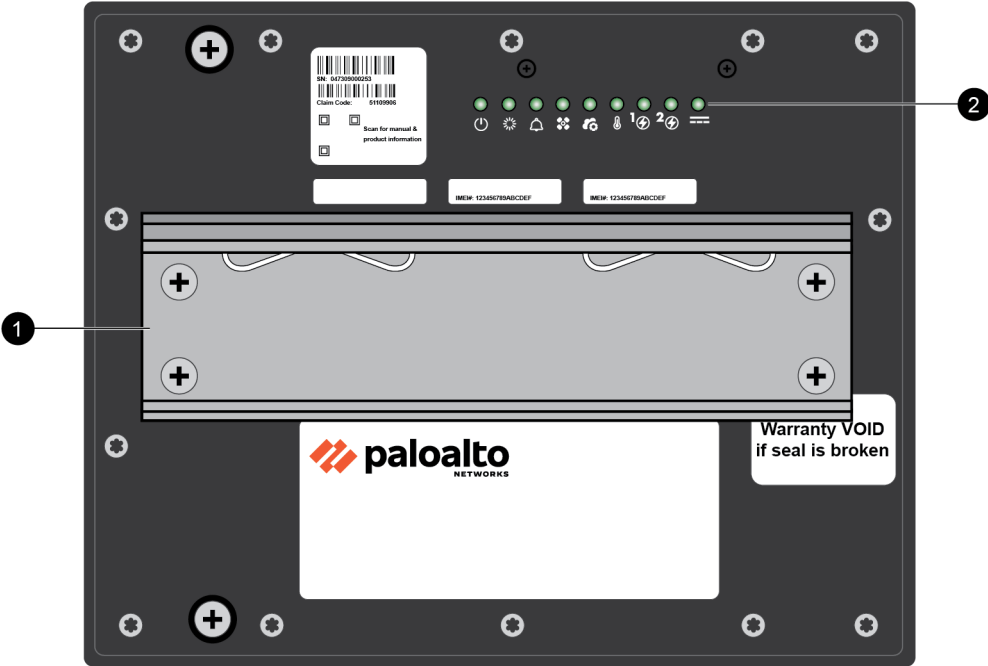


Item	Component	Description
1	Management Port	One RJ-45 10 Mbps/100 Mbps/1000 Mbps port that is used to access the management web interface and perform administrative tasks. The firewall also uses this port for management services, such as retrieving licenses and updating threat and application signatures.
2	Console Port (RJ-45)	One RJ-45 port used to connect a management computer to the firewall using a RJ-45 to USB cable and terminal emulation software. The console connection provides access to firewall boot messages, the Maintenance Recovery Tool (MRT), and the command line interface (CLI). Use the following settings to configure your terminal emulation software to connect to the console port: • Data rate: 115,200

Item	Component	Description
		• Data bits: 8 • Parity: none • Stop bits: 1 • Flow control: None
3	Console Port (USB-C)	One USB-C port used to connect a management computer to the firewall using a standard USB-C cable. The console connection provides access to firewall boot messages, the Maintenance Recovery Tool (MRT), and the command line interface (CLI). Use the following settings to configure your terminal emulation software to connect to the console port: • Data rate: 115,200 • Data bits: 8 • Parity: none • Stop bits: 1 • Flow control: None
4	Ground Studs	Dual screw ground lugs used to connect the firewall to earth ground.
5	Copper RJ-45 Ports	Twelve RJ-45 ports for 10 Mbps/100 Mbps/1000 Mbps network traffic. You can set the link speed and duplex mode or choose autonegotiate. Ports 9, 10, 11, and 12 are Power over Ethernet (PoE) ports that can each transfer up to 90W of power to a connected device. The maximum PoE budget is 90W. Refer to the electrical specifications for more PoE information.  <i>You must use Shielded RJ-45 Ethernet cables in order to meet compliance requirements.</i>
6	USB-C Port	One USB-C port used for debugging and administration only. Use it to

Item	Component	Description
		bootstrap the firewall or perform self-service enhanced factory reset (EFR). Bootstrapping enables you to provision the firewall with a specific PAN-OS configuration and then license it and make it operational on your network. EFR provides remediation of a compromised or potentially compromised firewall to initiate a complete cleanup of the device.
7	Digital I/O	An accessible digital I/O with eight LEDs used for interfacing with external sensors, relays, or controllers.
8	BATT- and IGN+ Input	A connector used to enable Vehicle Ignition Monitoring System (VIMS) when you connect a cable between this input and a vehicle's ignition circuitry.  <i>This port is only active when it detects an AMPSU (Automotive Power Supply Unit).</i>
9	Power Inputs	Two DC power inputs used to connect power to the firewall. A second power input can be used for redundancy.
10	Fiber SFP Ports	Two SFP ports for 100Mbps/1000 Mbps network traffic.
11	LED Status Indicators	Eight LEDs that indicate the status of the firewall hardware components. Refer to the LED definitions to view the color and behavior of each LED.

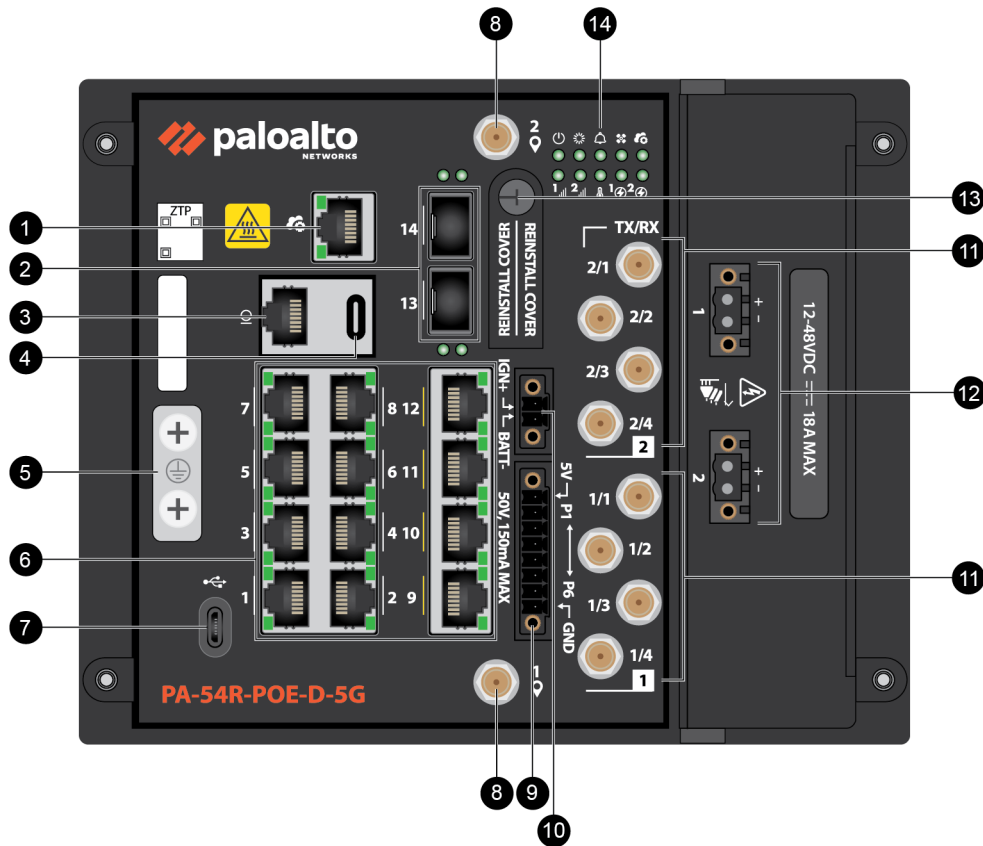
The following image shows the back panel of the PA-54R-POE. The table lists and describes each labeled component.



Item	Component	Description
1	DIN rail mounting clip	Use this mounting clip to Install the PA-50R Series Firewall on a DIN Rail .
2	LED Status Indicators	Nine LEDs that indicate the status of the firewall hardware components. Refer to the LED definitions to view the color and behavior of each LED.

PA-54R-POE-D-5G

The following image shows the front panel of the PA-54R-POE-D-5G. The table lists and describes each labeled component.



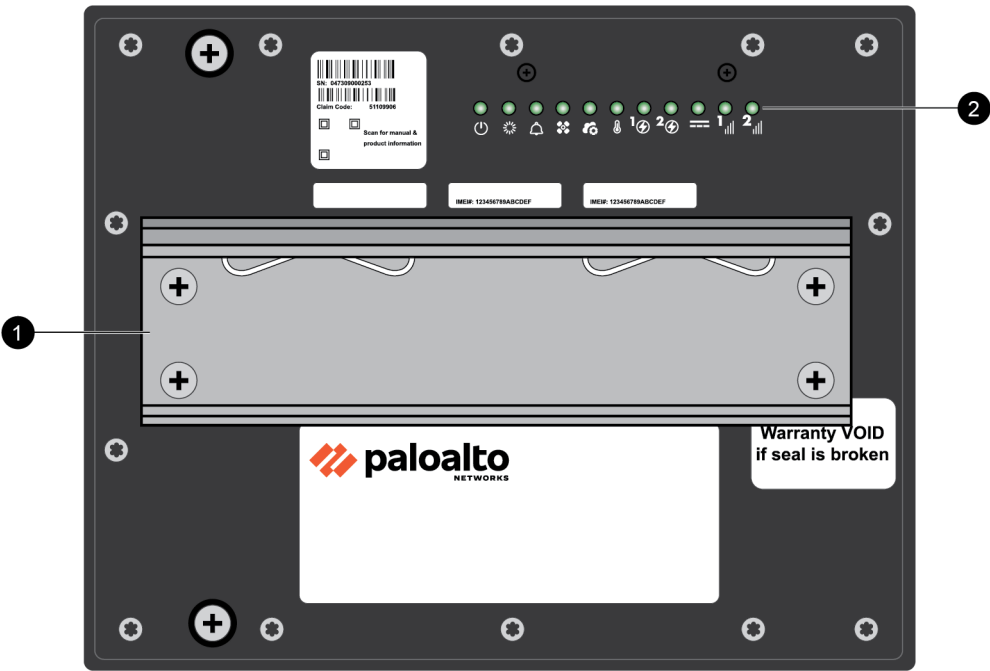
Item	Component	Description
1	Management Port	One RJ-45 10 Mbps/100 Mbps/1000 Mbps port that is used to access the management web interface and perform administrative tasks. The firewall also uses this port for management services, such as retrieving licenses and updating threat and application signatures.
2	Fiber SFP Ports	Two SFP ports for 100Mbps/1000Mbps network traffic.
3	Console Port (RJ-45)	One RJ-45 port used to connect a management computer to the firewall using a RJ-45 to USB cable and terminal emulation software. The console connection provides access to firewall boot messages, the Maintenance Recovery Tool (MRT), and the command line interface (CLI).

Item	Component	Description
		Use the following settings to configure your terminal emulation software to connect to the console port: • Data rate: 115,200 • Data bits: 8 • Parity: none • Stop bits: 1 • Flow control: None
4	Console Port (USB-C)	One USB-C port used to connect a management computer to the firewall using a standard USB-C cable. The console connection provides access to firewall boot messages, the Maintenance Recovery Tool (MRT), and the command line interface (CLI). Use the following settings to configure your terminal emulation software to connect to the console port: • Data rate: 115,200 • Data bits: 8 • Parity: none • Stop bits: 1 • Flow control: None
5	Ground Studs	Dual screw ground lugs used to connect the firewall to earth ground.
6	Copper RJ-45 Ports	Twelve RJ-45 ports for 10 Mbps/100 Mbps/1000 Mbps network traffic. You can set the link speed and duplex mode or choose autonegotiate. Ports 9, 10, 11, and 12 are Power over Ethernet (PoE) ports that can each transfer up to 90W of power to a connected device. The maximum PoE budget is 90W. Refer to the electrical specifications for more PoE information.

Item	Component	Description
		 You must use <i>Shielded RJ-45 Ethernet cables</i> in order to meet compliance requirements.
7	USB-C Port	One USB-C port used for debugging and administration only. Use it to bootstrap the firewall or perform self-service enhanced factory reset (EFR). Bootstrapping enables you to provision the firewall with a specific PAN-OS configuration and then license it and make it operational on your network. EFR provides remediation of a compromised or potentially compromised firewall to initiate a complete cleanup of the device.
8	GNSS Ports	Two Global Navigation Satellite System (GNSS) ports that can be used for active GPS/GNSS antenna support if required.
9	Digital I/O	An accessible digital I/O with eight LEDs used for interfacing with external sensors, relays, or controllers.
10	BATT- and IGN+ Input	A connector used to enable Vehicle Ignition Monitoring System (VIMS) when you connect a cable between this input and a vehicle's ignition circuitry.  This port is only active when it detects an <i>AMPSU (Automotive Power Supply Unit)</i>.
11	Antenna Connectors	Four SMA-F connectors used to install 4x4 MIMO antennas that provide 5G connectivity to the device.
12	Power Inputs	Two DC power inputs used to connect power to the firewall. A second power input can be used for redundancy.

Item	Component	Description
13	SIM Access Cover	Once the cover is removed, there are two slots in which you can install 4FF nano SIM cards to enable mobile network connectivity.  It is recommended that the 4FF nano SIMs you use are within industrial temperature range.  The SIM access cover must remain on while the firewall is in operation.
14	LED Status Indicators	Ten LEDs that indicate the status of the firewall hardware components. Refer to the LED definitions to view the color and behavior of each LED.

The following image shows the back panel of the PA-54R-POE-D-5G. The table lists and describes each labeled component.

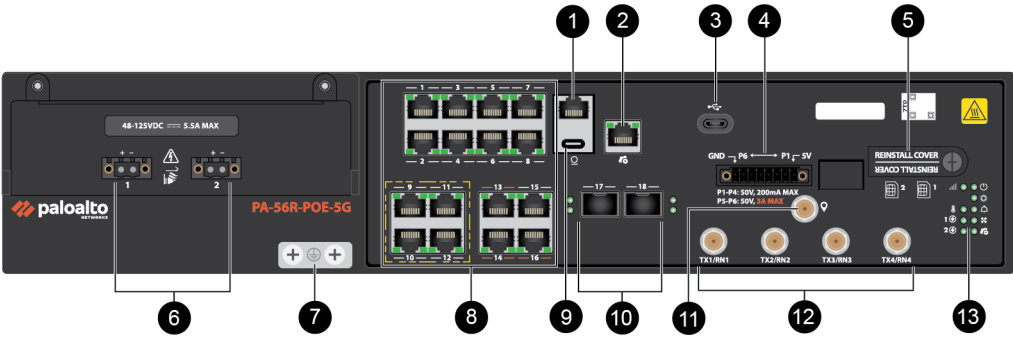


Item	Component	Description
1	DIN rail mounting clip	Use this mounting clip to Install the PA-50R Series Firewall on a DIN Rail .

Item	Component	Description
2	LED Status Indicators	Eleven LEDs that indicate the status of the firewall hardware components. Refer to the LED definitions to view the color and behavior of each LED.

PA-56R-POE-5G

The following image shows the front panel of the PA-56R-POE-5G. The table lists and describes each labeled component.

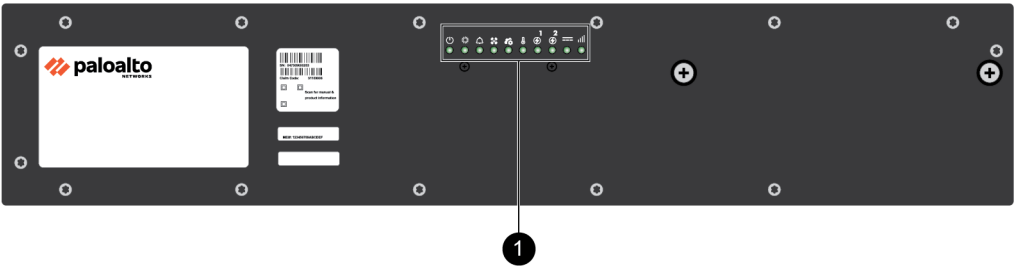


Item	Component	Description
1	Console Port (RJ-45)	One RJ-45 port used to connect a management computer to the firewall using a RJ-45 to USB cable and terminal emulation software. The console connection provides access to firewall boot messages, the Maintenance Recovery Tool (MRT), and the command line interface (CLI). Use the following settings to configure your terminal emulation software to connect to the console port: • Data rate: 115,200 • Data bits: 8 • Parity: none • Stop bits: 1 • Flow control: None
2	Management Port	One RJ-45 10 Mbps/100 Mbps/1000 Mbps port that is used to access the management web interface and perform administrative tasks. The firewall also uses this port

Item	Component	Description
		for management services, such as retrieving licenses and updating threat and application signatures.
3	USB-C Port	One USB-C port used for debugging and administration only. Use it to bootstrap the firewall or perform self-service enhanced factory reset (EFR). Bootstrapping enables you to provision the firewall with a specific PAN-OS configuration and then license it and make it operational on your network. EFR provides remediation of a compromised or potentially compromised firewall to initiate a complete cleanup of the device.
4	Digital I/O	An accessible digital I/O for interfacing with external sensors, relays, or controllers.
5	SIM Access Cover	Once the cover is removed, there are two slots in which you can install 4FF nano SIM cards to enable mobile network connectivity.  <i>It is recommended that the 4FF nano SIMs you use are within industrial temperature range.</i>  <i>The SIM access cover must remain on while the firewall is in operation.</i>
6	Power Inputs	Two DC power inputs used to connect power to the firewall. A second power input can be used for redundancy.
7	Ground Studs	Dual screw ground lugs used to connect the firewall to earth ground.
8	Copper RJ-45 Ports	Sixteen RJ-45 ports for 10 Mbps/100 Mbps/1000 Mbps network traffic. You can set the link speed and duplex mode or choose autonegotiate.

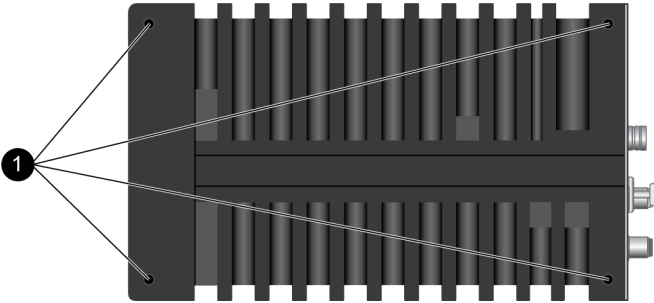
Item	Component	Description
		Ports 9, 10, 11, and 12 are Power over Ethernet (PoE) ports that can each transfer up to 90W of power to a connected device. The maximum PoE budget is 150W. Refer to the electrical specifications for more PoE information.  <i>You must use Shielded RJ-45 Ethernet cables in order to meet compliance requirements.</i>
9	Console Port (USB-C)	One USB-C port used to connect a management computer to the firewall using a standard USB-C cable. The console connection provides access to firewall boot messages, the Maintenance Recovery Tool (MRT), and the command line interface (CLI).
10	Fiber SFP Ports	Two SFP ports for 1000 Mbps network traffic.
11	GNSS Port	One Global Navigation Satellite System (GNSS) port that can be used for active GPS/GNSS antenna support if required.
12	Antenna Connectors	Four SMA-F connectors used to install 4x4 MIMO antennas that provide 5G connectivity to the device.
13	LED Status Indicators	Nine LEDs that indicate the status of the firewall hardware components. Refer to the LED definitions to view the color and behavior of each LED.

The following image shows the back panel of the PA-56R-POE-5G. The table lists and describes each labeled component.



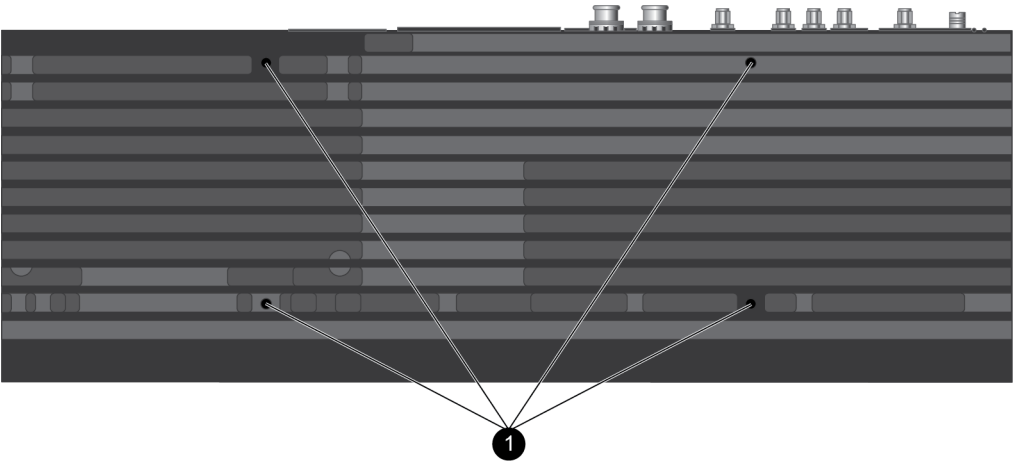
Item	Component	Description
1	LED Status Indicators	Nine LEDs that indicate the status of the firewall hardware components. Refer to the LED definitions to view the color and behavior of each LED.

The following image shows the side panel of the PA-56R-POE-5G. The table lists and describes each labeled component.



Item	Component	Description
1	Rack Mounting Holes	Four holes on each side of the firewall that are used to Install the PA-50R Series Firewall in an Equipment Rack .

The following image shows the bottom panel of the PA-56R-POE-5G. The table lists and describes each labeled component.



Item	Component	Description
1	Wall Mounting Holes	Four holes that are used to Install the PA-50R Series Firewall on a Wall .

PA-50R Series Firewall Installation

The PA-50R Series Firewall can be installed on a wall, equipment rack, or DIN rail.

Use the following topics to install, power on, and set up your PA-50R Series firewall.

- [Install the PA-50R Series Firewall on a Wall](#)
- [Install the PA-50R Series Firewall in an Equipment Rack](#)
- [Install the PA-50R Series Firewall on a DIN Rail](#)
- [Install Antennas on the PA-50R Series 5G Firewall](#)
- [Insert a SIM Card into a PA-50R Series 5G Firewall](#)
- [Connect Power to the PA-50R Series Firewall](#)
- [Set Up 5G Connectivity on the PA-50R Series Firewall](#)
- [Set Up a Connection to the Firewall](#)
- [Set Up VIMS](#)

Install the PA-50R Series Firewall on a Wall

The PA-52R-5G, PA-54R-POE, and PA-54R-POE-D-5G, and PA-56R-POE-5G can be installed on a wall. The following procedure describes how to attach the wall mount bracket to the device and install it on a wall.



The wall mount bracket is required for this installation and must be purchased separately.

- **PA-52R-5G**—PAN-PA-52R-WALL-MOUNT
- **PA-54R-POE and PA-54R-POE-D-5G**— PAN-PA-54R-WALL-MNT
- **PA-56R-POE-5G**—PAN-PA-56R-WALL-MNT



After installing, make sure to keep the device clean and clear of dust to ensure optimal heat dissipation and maintain proper hardware operation.

- [PA-52R-5G](#)
- [PA-54R-POE and PA-54R-POE-D-5G](#)
- [PA-56R-POE-5G](#)

PA-52R-5G

The following table lists the items included in the PAN-PA-52R-WALL-MOUNT kit.

Table 4: Parts List – PAN-PA-52R-WALL-MOUNT

Quantity	Item
1	Wall mount bracket
4	Phillips pan head screw — M4 × 8mm, stainless steel
4	Torx head screw (T10) — M3 × 5mm, zinc-plated steel, nylon patch
2	Desiccant

STEP 1 | Mark the locations on the wall that line up with the four wall mount holes on the bottom of the wall mount bracket.

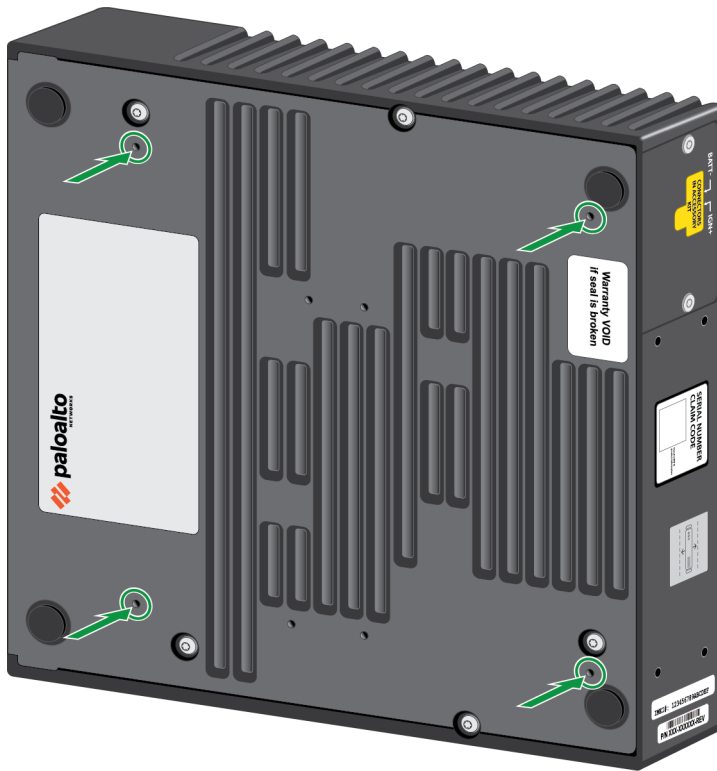


Ensure there are no building services (water, gas, or wiring) behind the wall where you intend to install the firewall.

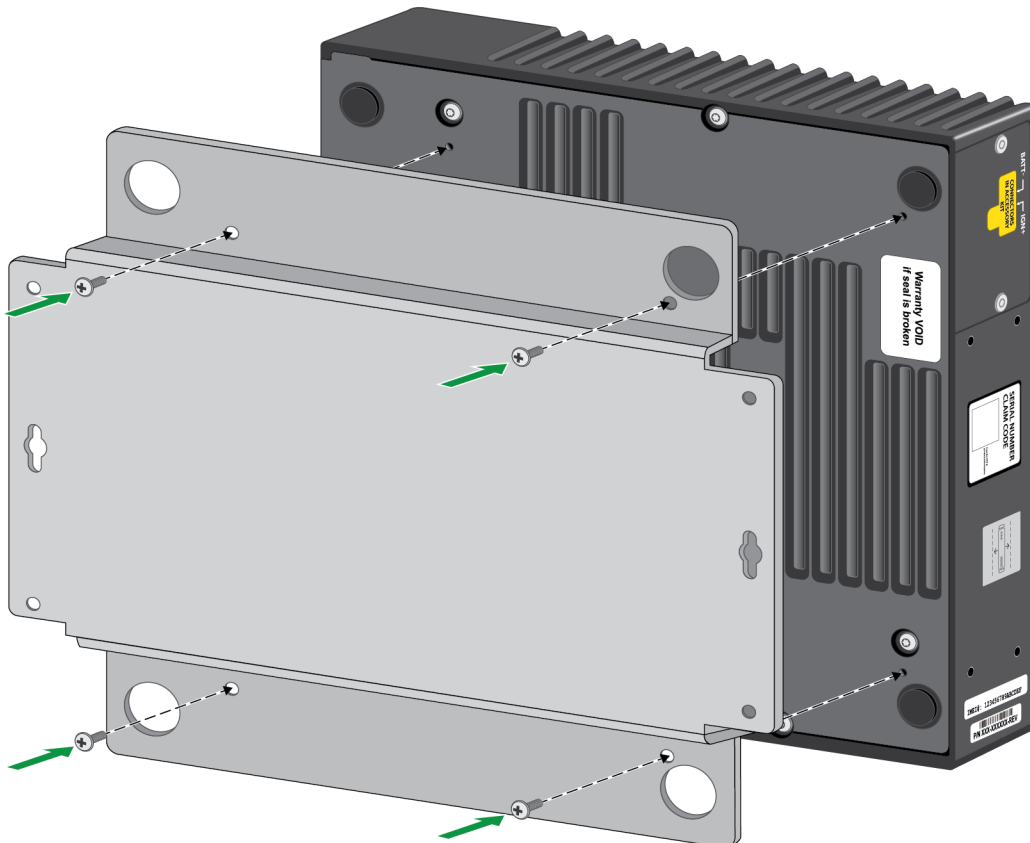
STEP 2 | Drill holes into the four marked locations on the wall. Make sure to remove any loose debris around the holes.

STEP 3 | Attach the firewall to the wall mount.

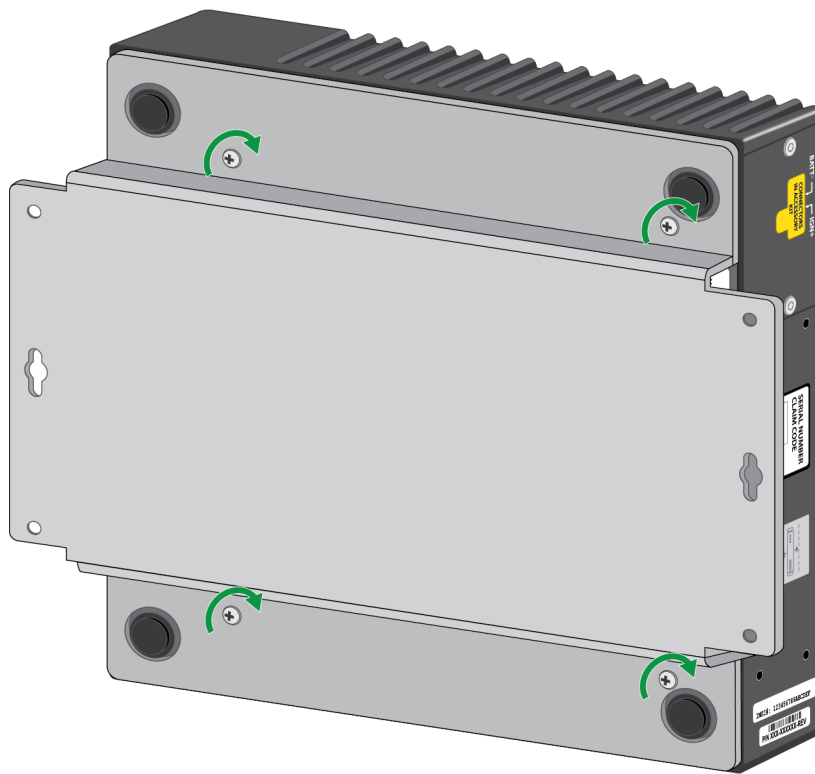
1. Identify the four screw holes on the bottom panel of the PA-52R-5G.



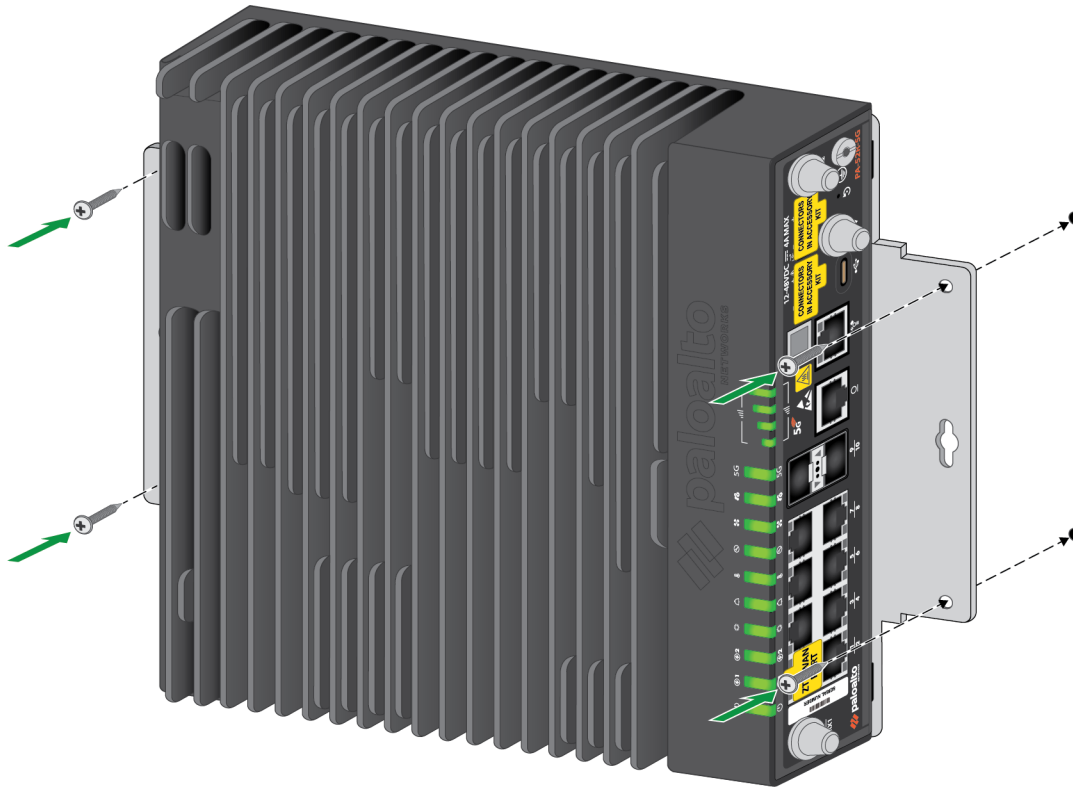
2. Align the wall mount bracket with the four screw holes.



3. Secure the wall mount bracket to the firewall using the four provided T10 Torx M3 x 0.5 screws.



STEP 4 | Using four M4 Pan head screws (two for each side), install the wall mount bracket to the previously drilled holes in the wall.



 Ensure that the firewall is oriented in such a way that its front and side panel components are accessible.

PA-54R-POE and PA-54R-POE-D-5G

The following table lists the items included in the PAN-PA-54R-WALL-MNT kit.

Table 5: Parts List – PAN-PA-54R-WALL-MNT

Quantity	Item
1	Wall mount bracket
4	Phillips pan head screw with plastic anchor – #6-20 Type AB, 1.25" L, zinc-plated steel
2	Desiccant

STEP 1 | Mark the locations on the wall that line up with the four wall mount holes on the bottom of the wall mount bracket.

 Ensure there are no building services (water, gas, or wiring) behind the wall where you intend to install the firewall.

- STEP 2 |** Drill holes into the four marked locations on the wall. Make sure to remove any loose debris around the holes.
- STEP 3 |** Install the four provided wall anchors into the four holes.
- STEP 4 |** Remove the DIN clip from the back panel of the firewall by unscrewing the four Flathead screws.
- STEP 5 |** Attach the wall mount bracket onto the back panel by using four M4 screws.
- STEP 6 |** Secure the wall mount bracket using four additional M4 screws in the corner holes.
- STEP 7 |** Using four #6-20 screws, install the wall mount bracket to the anchors in the wall.

PA-56R-POE-5G

The following table lists the items included in the PAN-PA-56R-WALL-MNT kit.

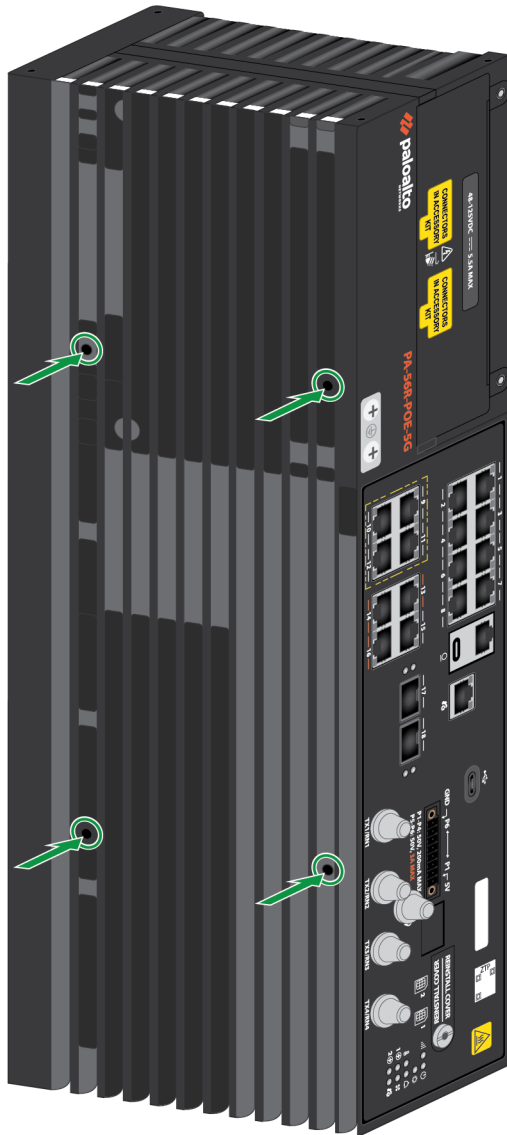
Table 6: Parts List – PAN-PA-56R-WALL-MNT

Quantity	Item
1	Wall mount bracket
4	Phillips pan head screw – M4 × 8mm, stainless steel
4	Phillips pan head screw with plastic anchor – #6-20, 1.25"L, zinc-plated steel
2	Desiccant

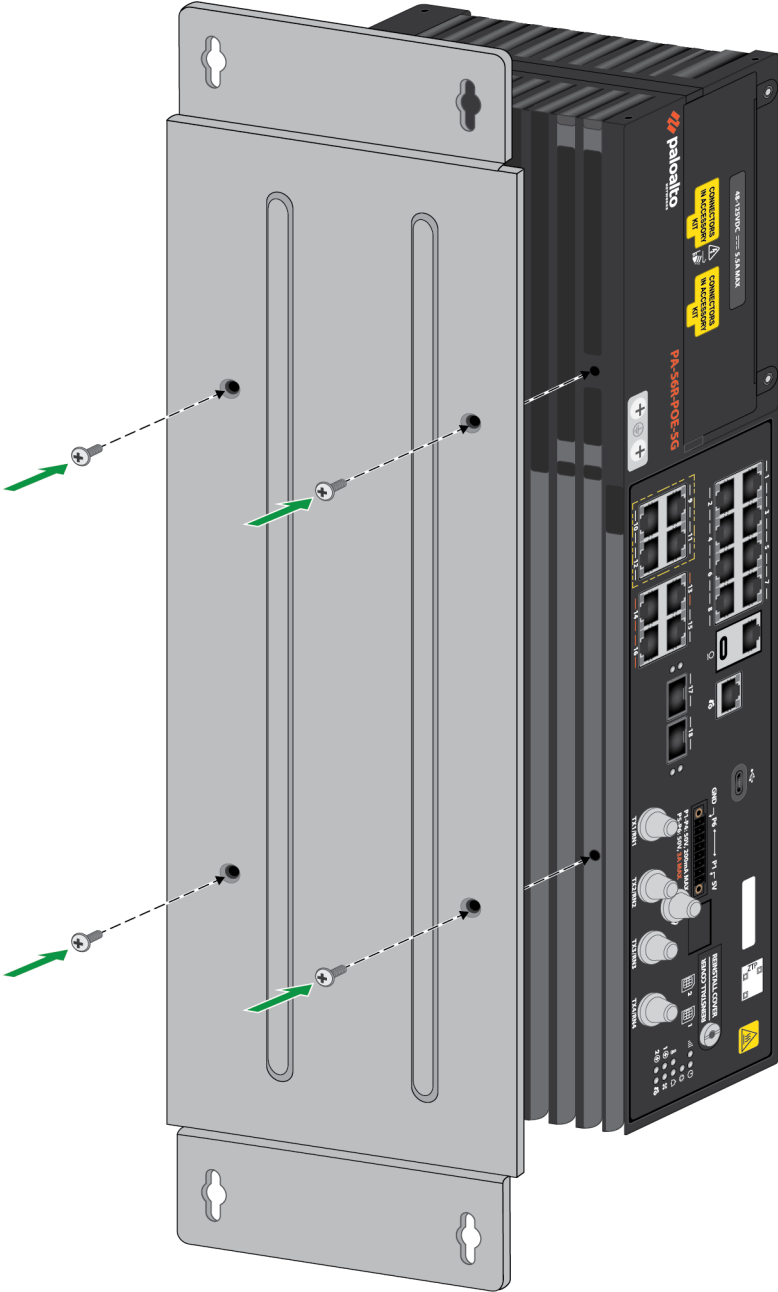
- STEP 1 |** Mark the locations on the wall that line up with the four wall mount holes on the bottom of the wall mount bracket.
-  *Ensure there are no building services (water, gas, or wiring) behind the wall where you intend to install the firewall.*
- STEP 2 |** Drill holes into the four marked locations on the wall. Make sure to remove any loose debris around the holes.
- STEP 3 |** Install the two provided wall anchors into the upper two holes.

STEP 4 | Attach the firewall to the wall mount.

1. Identify the four screw holes on the bottom panel of the PA-56R-POE-5G.



2. Align the wall mount bracket with the four screw holes.
3. Secure the wall mount bracket to the firewall using the four provided M4 Pan head screws.



STEP 5 | Using four #6-20 screws, install the wall mount bracket to the anchors in the wall.



Install the PA-50R Series Firewall in an Equipment Rack

The PA-50R Series firewalls are designed to operate efficiently using passive cooling. The hardware requires 1RU (rack unit) of spacing above and below it to ensure adequate airflow. Before installing the firewall, make sure that your equipment rack has enough space and that the ambient temperature of the environment is within the recommended range. Avoid installing the firewall close to heat sources or direct sunlight.



Position the unit centrally within the allocated rack space to avoid blocking airflow vents.

- [PA-52R-5G](#)
- [PA-54R-POE and PA-54R-POE-D-5G](#)
- [PA-56R-POE-5G](#)

PA-52R-5G

The PA-52R-5G firewall can be mounted in a 2-post or 4-post rack. Make sure that you have purchased the correct mounting tray for your type of equipment rack.

- PAN-PA-52R-2-POST-RACK-MOUNT – 2-post mounting tray
- PAN-PA-52R-4-POST-RACK-MOUNT – 4-post mounting tray

Table 7: Parts List – PAN-PA-52R-2-POST-RACK-MOUNT

Quantity	Item
1	2-post rack mount tray • 6x M3x5MM screws • 1x Base panel • 1x Front cover • x1 Stiffener
8	Phillips pan head screw – M4 × 8mm
8	Torx flat head screw (T10) – M3 × 5mm
12	Locking cable tie
2	Power cord retainer
4	Velcro strap
3	RF cable assembly – R/A SMA to N-type, 450mm L
1	Dual LTE/5G cable mount bracket

Quantity	Item
1	Single LTE/5G cable mount bracket

Table 8: Parts List – PAN-PA-52R-4-POST-RACK-MOUNT

Quantity	Item
1	4-post rack mount tray
2	Fixed rail
2	Adjustable rail
2	Phillips pan head screw – M4 × 8mm
22	Torx flat head screw (T10) – M3 × 5mm
6	Adhesive cable tie mount
15	Locking cable tie
4	Power cord retainer
8	Velcro strap
3	RF cable assembly – R/A SMA to N-type, 697mm L
6	RF cable assembly – ST SMA to N-type, IP67, 93mm L
2	Dual LTE/5G antenna cable bracket
2	Single LTE/5G antenna cable bracket
1	Power cord routing cover, right
1	Power cord routing cover, left

STEP 1 | Verify that the equipment rack has enough space to accommodate the firewall and has 1RU of space both above and below it.

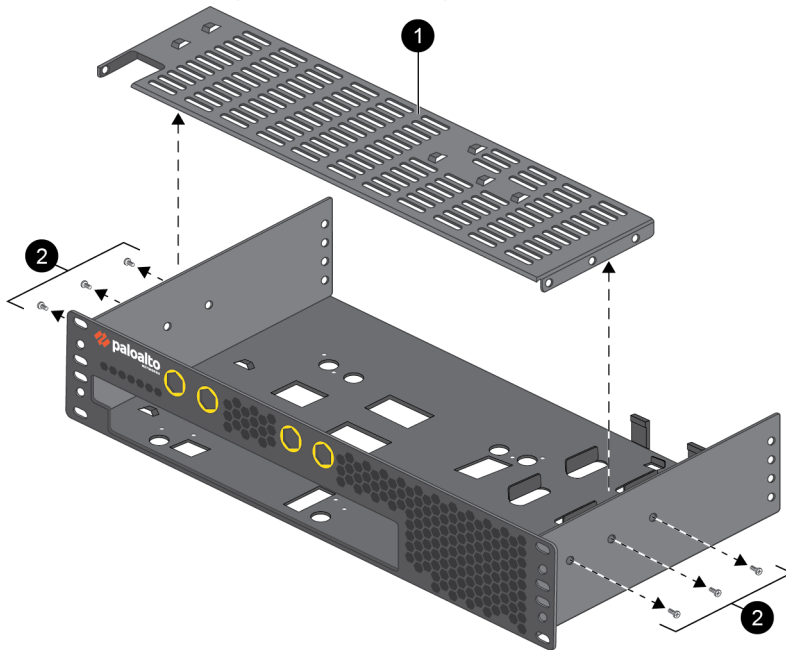
STEP 2 | Install the necessary equipment depending on whether you are using the [2-Post](#) or [4-Post](#) rack mount.

2-Post Rack Mount

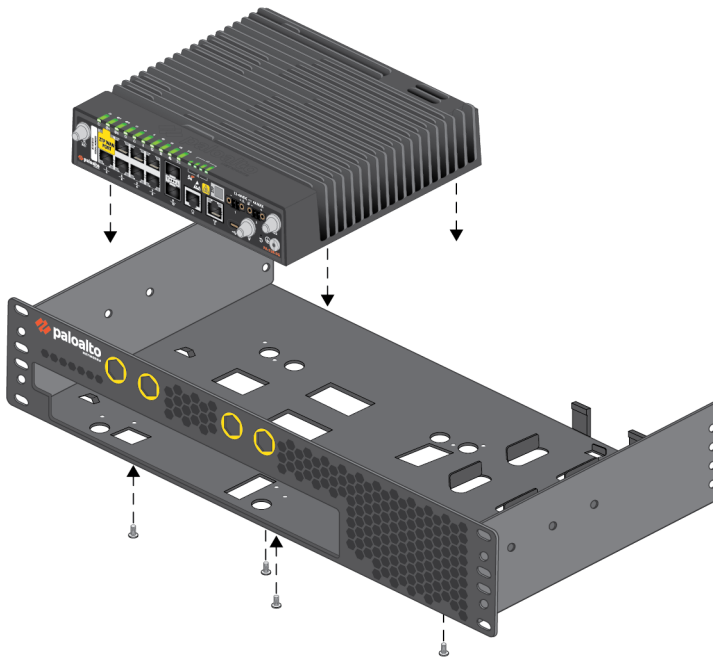


Using this mount, you can deploy the antenna on either the front or back side of the device.

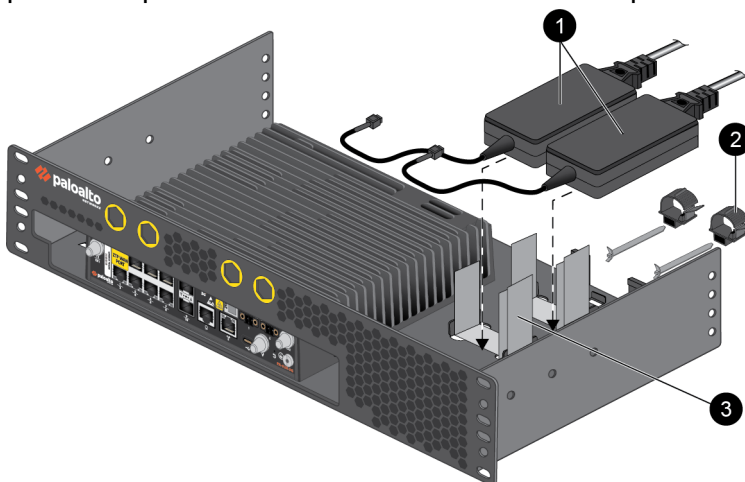
1. Using a Flathead screwdriver, remove the six screws (three on each side) securing the metal stiffener to the top of the rack tray.



2. Align the four holes on the bottom of the device with the 4 screw holes in the mounting tray.
3. Seat the firewall in the designated position and use four M3 Flat head screws to secure it in place.



4. Place up to two power adapters in the designated location beside the firewall. Loop the provided Velcro straps through the cutouts in the mounting tray, using two straps per power adapter. Use cord retainers to secure the power cables in place.

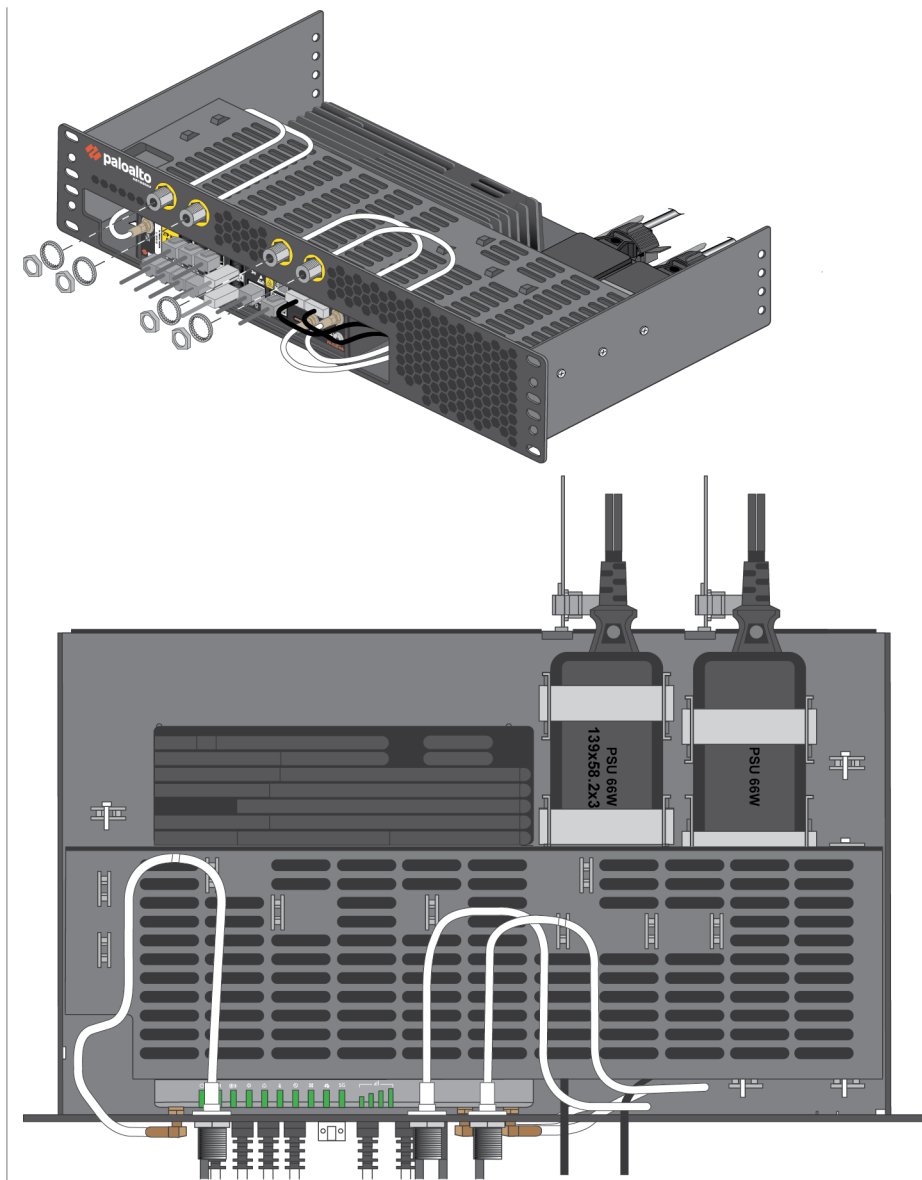


5. Connect your cables and antenna connectors to the device and route them through the mounting tray in order to minimize slack.

The antenna cables can be routed to the front or back side of the rack tray depending on where your antennas are installed.

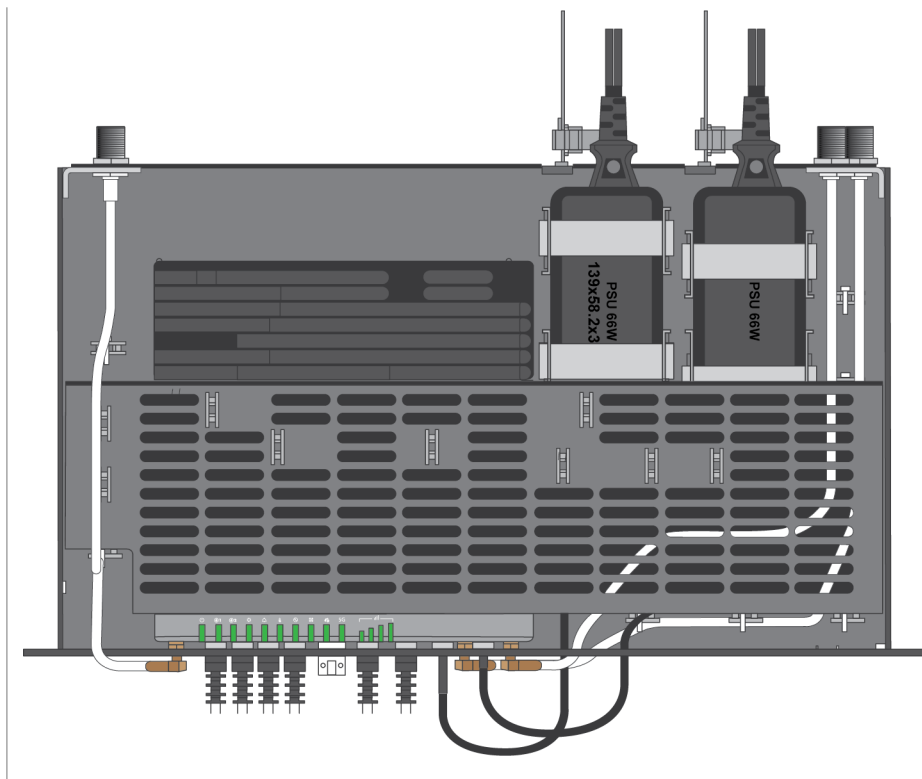
Front

Guide the antenna cables out of the openings in the front of the rack tray, then secure each cable in place using the included lock washer and nut.

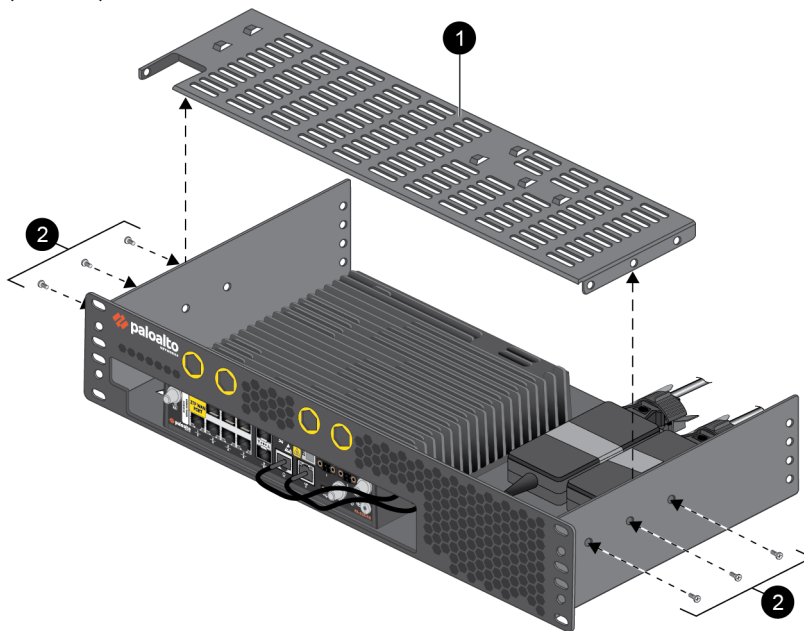


Back

Install the provided antenna cable brackets to the back side of the rack tray using two M3 screws each (four total). After guiding the antenna cables through the brackets, secure each cable in place using the included lock washer and nut.



6. Wrap cable ties through the small cutouts in the tray to secure the cables in place.
7. Install the stiffener back over the device and secure it using three M3 screws on each side (6 total).



8. Proceed to [Step 3](#).
- 4-Post Rack Mount**



There are three possible configurations when using the PAN-PA-52R-4-POST-RACK-MOUNT:

- Two firewalls with antenna connectors on the front of the tray
- One firewall with antenna connectors on the front of the tray (either left or right side)
- One firewall with antenna connectors on the back of the tray (either left or right side)

1. Align the four holes on the bottom of the device with one of the designated locations in the mounting tray.

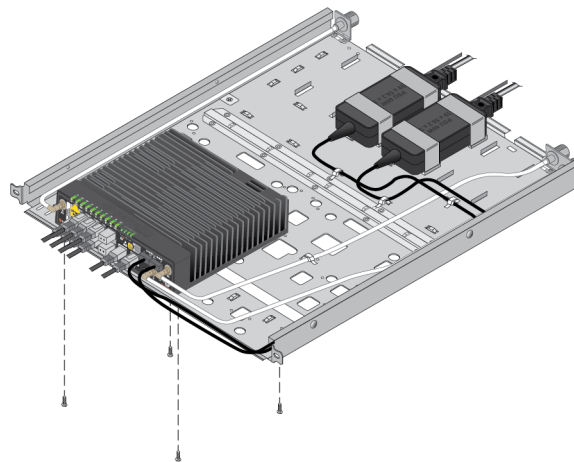


If installing a single PA-52R-5G, you can choose between the left or right side of the tray. If installing two PA-52R-5G firewalls, the two devices must be mounted side by side.

2. Seat the firewall(s) and use four M3 Flat head screws to secure each one in place.

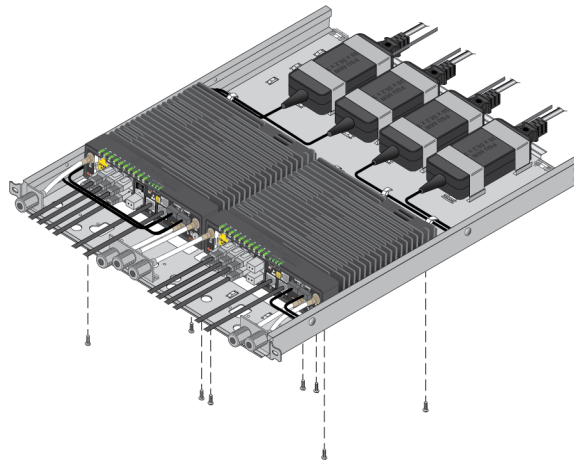
One firewall

Four M3 Flat head screws



Two firewalls

Eight M3 Flat head screws



3. Place up to four power adapters (two for each firewall) in the designated locations behind the device. Loop the provided Velcro straps through the cutouts in the mounting tray, using two straps per power adapter.
4. Connect your cables and antenna connectors to the device and route them through the mounting tray in order to minimize slack.

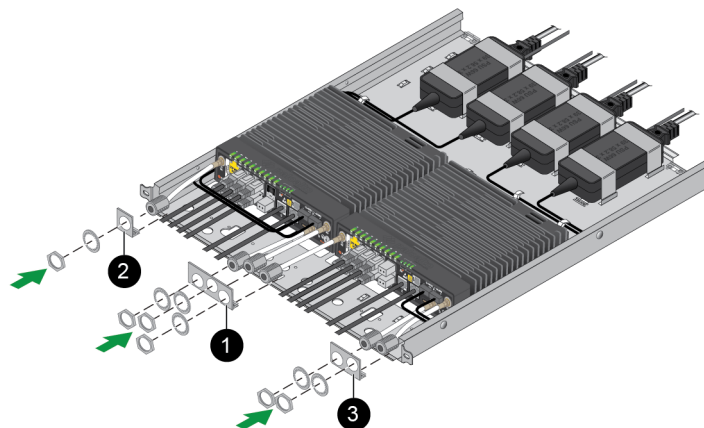
The antenna cables can be routed differently based on your configuration. Make sure to install the provided antenna cable brackets accordingly.



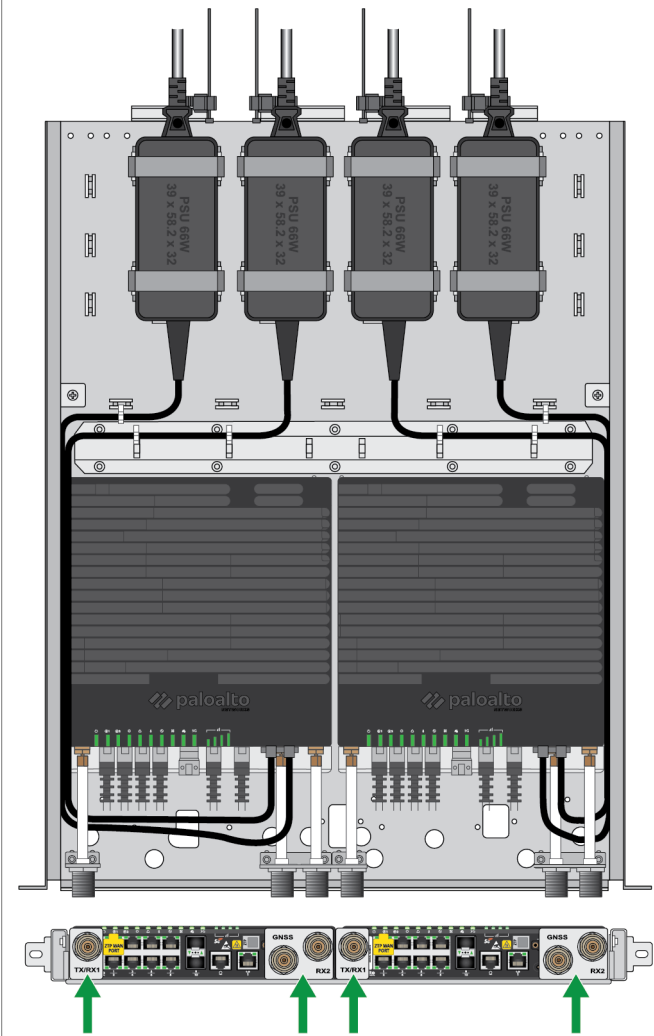
A total of four antenna cable brackets are included – two single cable brackets and two double cable brackets. When looking at the front panel of the device, the single cable bracket is used for the left (TX/RX1) connector and the double cable bracket is used for the right (GNSS and RX2) connectors.

Install each bracket using two M3 screws through the holes in the mounting tray. The location of the brackets will vary depending on how you have chosen to orient your antenna connectors.

After guiding the antenna cables through the brackets, secure each cable in place using the included lock washer and nut.

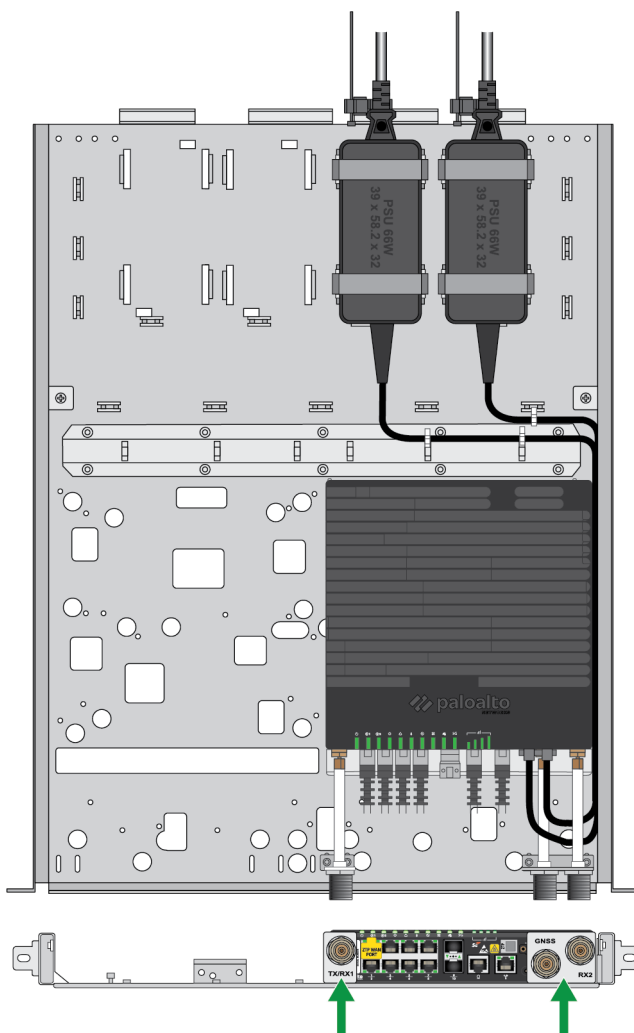


Two firewalls
with antenna
connectors on the
front of the tray



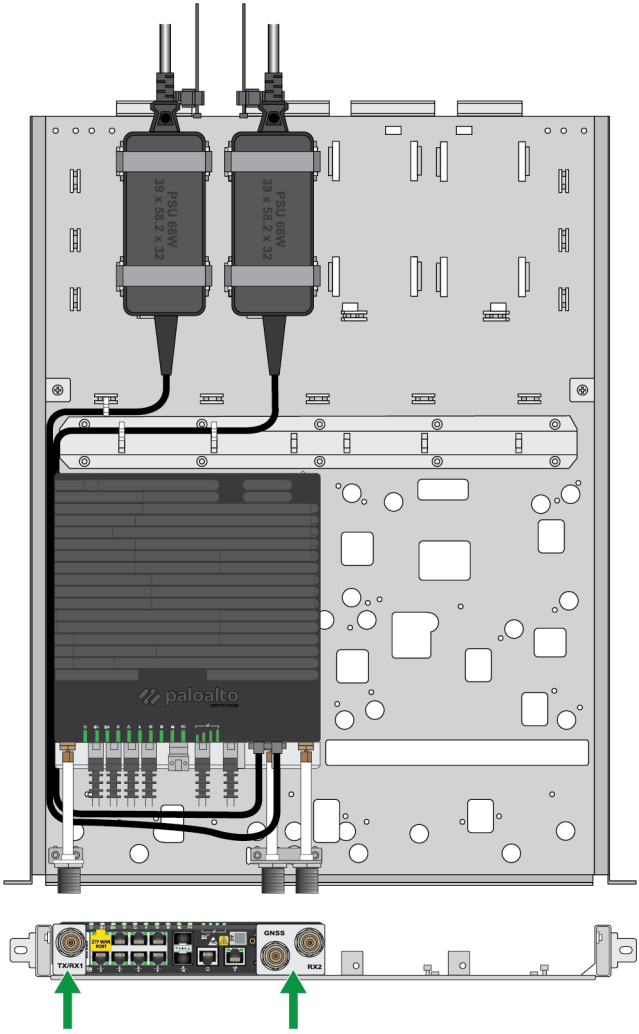
Install the four antenna cable brackets at the front of the rack tray.

One firewall
with antenna
connectors on
the front of
the tray (right)



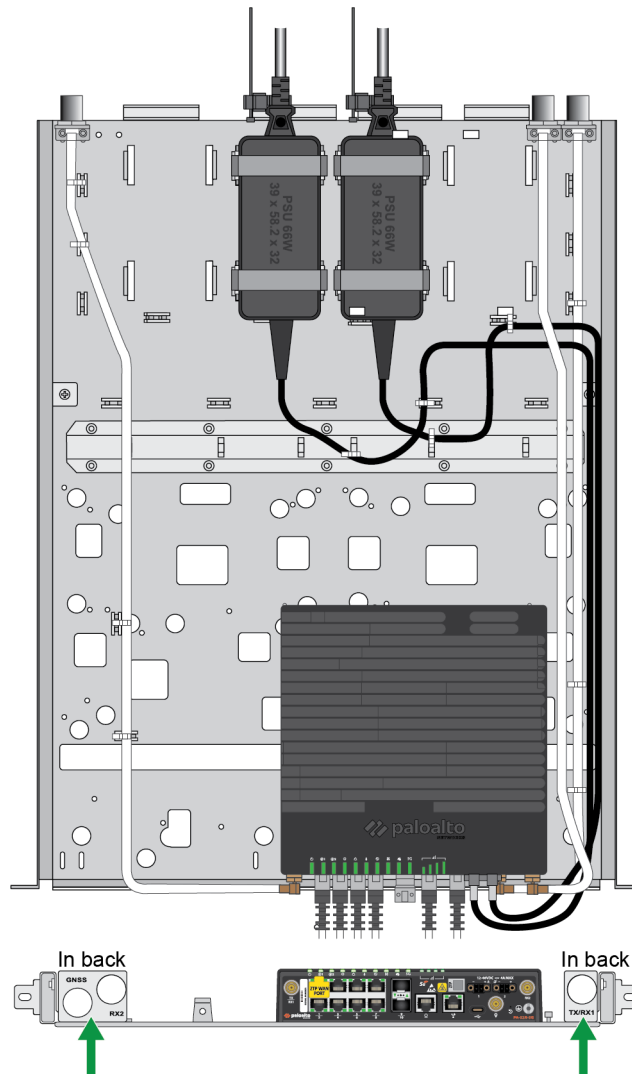
Install two antenna cable brackets at the front of the rack tray.

One firewall
with antenna
connectors on
the front of
the tray (left)



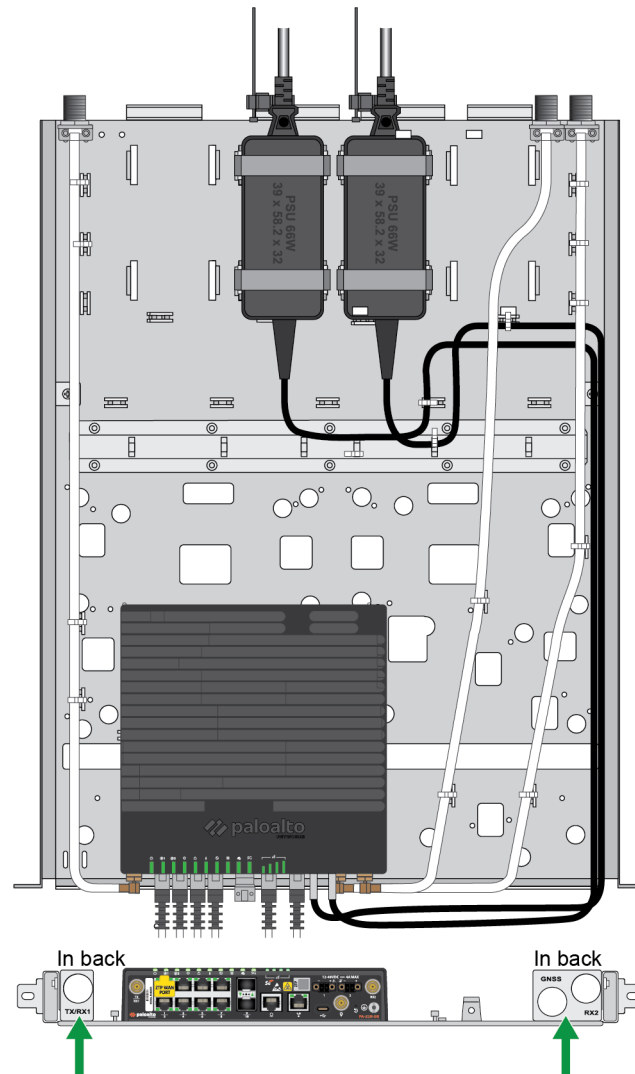
Install two antenna cable brackets at the front of the rack tray.

One firewall
with antenna
connectors on
the back of
the tray (right)



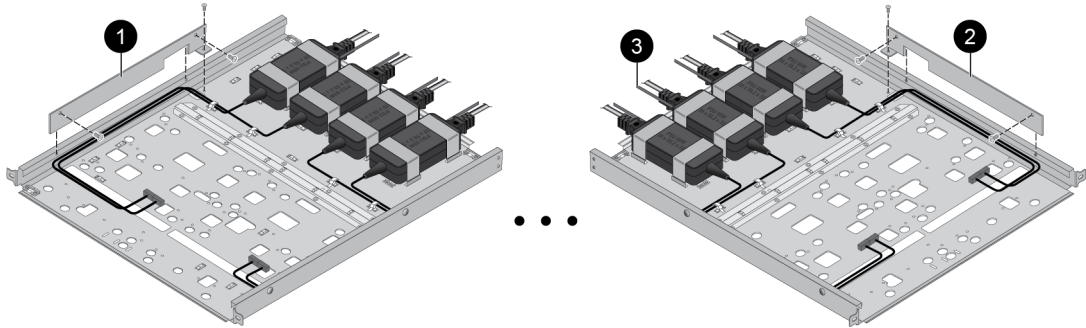
Install two antenna cable brackets at the back of the rack tray, ensuring that the single and double cable brackets remain on the same sides as their connectors on the device.

One firewall with antenna connectors on the back of the tray (left)



Install two antenna cable brackets at the back of the rack tray, ensuring that the single and double cable brackets remain on the same sides as their connectors on the device.

- 5. Wrap cable ties through the small cutouts in the tray to secure the cables in place.
- 6. Install the two provided power cord routing brackets on the right and left sides of the tray. Use two M3 screws for each side (four total).



- 7. Apply cable retention clamps over the power cords by slotting them into the tray.
- 8. Proceed to [Step 3](#).

STEP 3 | Slide the firewall (seated securely in the mounting tray) into the equipment rack.

 *Make sure that you do not block any of the airflow vents on the firewall.*

STEP 4 | Secure the mounting tray to the equipment rack using compatible screws.

 *After installation, you should inspect the hardware on a regular basis in order to account for dust, debris, and any other obstructions that may affect the firewall's airflow.*

 *Do not place any items or obstructions directly above or below the firewall within the 1RU of free space.*

PA-54R-POE and PA-54R-POE-D-5G

The PA-54R-POE and PA-54R-POE-D-5G firewalls can be mounted using the PAN-PA-54R-2-POST-RACK-MOUNT.

Table 9: Parts List – PAN-PA-54R-2-POST-RACK-MOUNT

Quantity	Item
1	3RU DIN rail rack mount kit
8	Phillips truss head screw – 10-32 UNF, 3/4"L
8	Phillips truss head screw – 12-24 UNC, 1/2"L

Quantity	Item
8	Cage nut – 10-32
4	Desiccant

- STEP 1 |** Verify that the equipment rack has enough space to accommodate the firewall and have 1RU of space both above and below it.
- STEP 2 |** The mounting plate is already assembled with a DIN rail and two side brackets. Using slight downward pressure, attach the firewall onto the DIN rail so that the two metal clips lock into place.
- STEP 3 |** (If mounting a second firewall) Repeat the previous step using the DIN rail that is already installed in the mounting plate.
- STEP 4 |** (If mounting an antenna cable bracket) You must have purchased PAN-PA-54R-CBL-MNT. Clip the cable mount onto a separate DIN rail depending on where your mobile antenna is located.
- STEP 5 |** Align the ears of the side brackets with the screw holes in your equipment rack. Secure the side brackets to the equipment rack using four screws on each side (eight total) that are suitable for your equipment rack. Install cage nuts on each screw.



After installation, you should inspect the hardware on a regular basis in order to account for dust, debris, and any other obstructions that may affect the firewall's airflow.

PA-56R-POE-5G

The PA-56R-POE-5G can be mounted using the PAN-PA-56R-2-POST-RACK-MOUNT.

Table 10: Parts List – PAN-PA-56R-2-POST-RACK-MOUNT

Quantity	Item
2	2-post rack mount bracket
8	Phillips pan head screw – M4 × 8mm
4	Phillips truss head screw – 10-32 UNF, 3/4"L
4	Phillips truss head screw – 12-24 UNC, 1/2"L
4	Cage nut – 10-32
2	Desiccant

- STEP 1 |** Verify that the equipment rack has enough space to accommodate the firewall and have 1RU of space both above and below it.

STEP 2 | Install the two mount brackets to the [sides of the device](#) using four M4 screws each (8 total). You can choose to position the ears of the bracket towards the front or back of the device.

STEP 3 | Secure the firewall to the equipment rack using two screws and cage nuts for each ear of the mounting brackets (4 total).

-  *Make sure that you do not block any of the airflow vents on the firewall.*
-  *Do not place any items or obstructions directly above or below the firewall within the 1RU of free space.*
-  *After installation, you should inspect the hardware on a regular basis in order to account for dust, debris, and any other obstructions that may affect the firewall's airflow.*

Install the PA-50R Series Firewall on a DIN Rail

Only the PA-52R-5G, PA-54R-POE and PA-54R-POE-D-5G firewalls can be installed on a DIN rail.

- [PA-52R-5G](#)
- [PA-54R-POE and PA-54R-POE-D-5G](#)

PA-52R-5G

You must attach the DIN rail bracket (PAN-PA-52R-DIN-CLIP) before installing the PA-52R-5G on a DIN rail. You can either attach the bracket to the [bottom](#) or [back](#) panel of the firewall depending on your desired deployment orientation.

Install the DIN Rail Bracket on the Bottom Panel

1. Align the four holes in the DIN rail bracket with the four holes on the bottom panel of the firewall.
2. Secure the DIN rail bracket to the device by tightening the four captive M3 screws.
3. Bring the device to the DIN rail and push the rail down into the two "hooks" in the bracket. Ensure that the lever (opposite the hooks) locks into place securely.
4. Attach two stoppers on the DIN rail at both ends of the firewall, making sure that they are flush with the device.

Install the DIN Rail Bracket on the Back Panel

1. Align the four holes in the DIN rail bracket with the four holes on the back panel of the firewall.
2. Secure the DIN rail bracket to the device by tightening the four captive M3 screws.
3. Bring the device to the DIN rail and push the rail sideways into the two "hooks" in the bracket. Ensure that the lever (opposite the hooks) locks into place securely.
4. Attach two stoppers on the DIN rail at both ends of the firewall, making sure that they are flush with the device.

Uninstall the DIN Rail Bracket

1. Pull the lever on the DIN rail bracket upwards so that it releases the rail.
2. Remove the stoppers, then carefully pull the device off of the DIN rail.
3. Unscrew the four M3 screws in the DIN rail bracket to detach it from the device.

PA-54R-POE and PA-54R-POE-D-5G

The PA-54R-POE and PA-54R-POE-D-5G firewalls ship with an attached DIN clip and a 35mm x 7.5mm x 406mm (W x H x L) DIN rail.

STEP 1 | Using slight downward pressure, attach the firewall onto the DIN rail.



Keep the device clean and clear of dust to ensure optimal heat dissipation and maintain proper hardware operation.

STEP 2 | Ensure that the metal clips are locked securely into place.

Install Antennas on the PA-50R Series 5G Firewall

The PA-52R-5G, PA-54R-POE-D-5G, and PA-56R-POE-5G support remote MIMO, FWA (Fixed Wireless Access) and vehicular antennas. The PA-52R-5G has two SMA (F) connectors, while the PA-54R-D-5G and PA-56R-5G have 4x4 MIMO connectors. Refer to the [antenna specifications](#) for more information.



Before installing the firewall, it is recommended that you conduct a cellular location assessment of the installation site to receive the best signal strength before installing the device.

STEP 1 | Attach the antennas.

- **PA-52R-5G**—Connect a 2x2 MIMO antenna with SMA (M) connectors.
- **PA-54R-POE-D-5G** and **PA-56R-POE-5G**—Connect a 4x4 MIMO antenna with SMA (M) connectors.



You can optionally connect a GNSS antenna to the device's GNSS port(s).

STEP 2 | Adjust the remote antenna location and orientation to receive the best possible signal strength.

Check the signal strength of the firewall by viewing the [LEDs](#) or by checking the Firewall Web Interface.



If the signal quality is poor, it is recommended that you consider another location to place the antenna.

Insert a SIM Card into a PA-50R Series 5G Firewall

Only the PA-52R-5G, PA-54R-POE-D-5G, and PA-56R-POE-5G firewalls use field replaceable SIM cards to enable mobile connectivity. The following procedure describes how to install or replace a SIM card.

STEP 1 | Locate the SIM access cover.

- On the [PA-52R-5G](#), the cover is located on the side panel.
- On the [PA-54R-POE-D-5G](#), the cover is located on the front panel.
- On the [PA-56R-POE-5G](#), the cover is located on the front panel.

STEP 2 | Remove the SIM access cover.

- **PA-54R-POE-D-5G and PA-56R-POE-5G**—Use a Philips head screwdriver.
- **PA-52R-5G**—Use a Torx screwdriver.

STEP 3 | With the chamfered corner (sloping edge) of the SIM facing towards the slot, gently push the SIM into the SIM 1 or SIM 2 slot until the SIM clicks into position.



The SIM may get damaged if you attempt to insert it into the slot by the wrong end.



Tweezers may be required to install the SIM cards. If using tweezers, use only the ones provided.



SIM 1 is the primary (active) SIM slot by default. If you intend to use only one SIM, it is recommended to use SIM 1 as the primary slot. A SIM installed in SIM 2 enables redundancy.

STEP 4 | After inserting the SIM, place the SIM cover back onto the device and refasten the screw(s).

STEP 5 | **(To remove a SIM card)** Gently push the SIM inward using your fingertip. Release your fingertip and pull out the SIM. It is recommended that you use tweezers to extract the SIM.

Connect Power to the PA-50R Series Firewall

Before you begin connecting DC power to the firewall, ensure that you have the following items:

Item	Description
AWG cable, 8 AWG	Use this cable for the ground cable.
AWG cable, minimum 16 AWG  A 14 AWG cable is recommended for the PA-54R-POE, PA-54R-POE-D-5G, and PA-56R-POE-5G.	Use this cable for the DC power cables.
Ground lug(s)	Use lugs suited for your firewall (one-hole or two-hole) to connect a ground cable to the screw-on ground point on the firewall. Refer to PA-50R Series Firewall Panel Components to verify the location of the ground point.
Cable/wire strippers	Use this tool to strip the cable shielding off the ends of the DC power and ground cables.
Screwdrivers	PA-54R-POE, PA-54R-POE-D-5G, and PA-56R-POE-5G —use a Phillips-head screwdriver for the screw-on ground point and a small flat-head screwdriver to secure the cables to the DC terminal block inputs. PA-52R-5G —use a Torx screwdriver to assemble the earth lug screw and a small flat-head screwdriver to secure the cables to the DC terminal block inputs.

 To avoid injury to yourself or damage to your Palo Alto Networks® hardware or the data that resides on the hardware, read the [Safety Warnings](#).

 Power off the DC power sources that you will connect to the power supplies before you continue.

STEP 1 | Learn how to [Set Up a Connection to the Firewall](#) based on your desired boot mode prior to powering on the firewall for the first time.

STEP 2 | Establish a connection between the firewall and earth ground.

1. Crimp one end of a ground cable (minimum 16 AWG) to the ground lug. Connect the other end of the cable to earth ground.
2. Remove the ground screw(s) from the ground point on the firewall. Hold the ground lug (that you previously attached to the ground cable) over the screw hole, and then re-attach the screw(s) to secure the cable to the firewall. Do not torque the screw(s) to more than 6 in-lbs.

STEP 3 | Strip the positive and negative DC cable ends and insert them into the terminal block.



Ensure that you insert the positive and negative cable ends into the correct slots of the terminal block.

Facing the appliance:

- **PA-54R-POE, PA-54R-POE-D-5G, and PA-56R-POE-5G**—the positive end is on the left and the negative end is on the right.
- **PA-52R-5G**—the negative end is on the left and the positive end is on the right.



For a HVPSU (High Voltage Power Supply Unit), it is recommended that you twist and insert the crimped wires into a ferrule before proceeding.

STEP 4 | Secure each cable using the appropriate screwdriver. Turn the terminal screws clockwise until tight. Torque to no more than 2-in lbs.

STEP 5 | Plug the cabled DC terminal block into the DC inputs on the firewall, making sure that the cables align with the polarity marked on the front of the device. Secure the terminal block by turning the two screws on each side of the block clockwise. Torque to no more than 3 in-lbs.

STEP 6 | (**Optional**) Repeat Steps 3 through 5 to connect a second DC cable to provide power redundancy to the firewall.

STEP 7 | Power on the DC power source to power on the firewall. The power **LED** turns green.

Set Up 5G Connectivity on the PA-50R Series Firewall

You can establish 5G connectivity on the PA-52R-5G, PA-54R-POE-D-5G, and PA-56R-POE-5G firewalls by configuring a cellular interface. The cellular interface enables you to provide a primary internet connection or configure a secondary connection for redundancy in case the primary connection is unavailable.

The following procedure describes how to set up, configure, and monitor your cellular interface.

- STEP 1 |** Make sure that you have [installed antennas](#), [inserted the SIM card](#), and [powered on the firewall](#).
- STEP 2 |** Log in to the firewall's [Web Interface](#) and select **Network > Interfaces > Cellular**. Then select an interface.
- STEP 3 |** The cellular interface is disabled by default. Under **Radio Settings**, switch **Radio** to **On**. Enabling **GPS** is optional.
- STEP 4 |** Select the **Primary SIM Slot** based on which of the two slots you installed the SIM into in [Step 1](#).
- STEP 5 |** (**Optional**) Depending on your deployment, you may also need to configure one or more of the following:
- In the **Advanced** tab, configure the **SIM Settings** and **APN Profile** if you have applied APN settings to your SIM card.
 *Alternatively, if your deployment supports this option, you can create or modify an APN profile by navigating to **Network > Network Profiles > APN/DNN Profile**.*
 - In the **Other Info** tab, select a **Management Profile**.
- STEP 6 |** Select **OK**, then **Commit** your changes.
- STEP 7 |** After the commit has completed, verify that the **Link State** of the interface is green. You can select **IP Runtime Info** to view the status, IP address, Gateway, and other information about the interface.
- STEP 8 |** Upgrade the cellular firmware using either the Web Interface or the Customer Support Portal (CSP).
-  *The firmware version is separate from the PAN-OS version. As a result, upgrading PAN-OS does not automatically upgrade the cellular firmware.*
- **Web Interface**—Select **Device > Cellular Firmware**, then select **Check Now**. Select the latest firmware version that is associated with your SIM carrier, then **Download** and **Install** it.
 - **CSP**—Log in to the [CSP](#) and select **Updates > Cellular Updates**. Filter by **Product** and, optionally, **Carrier**. Download your desired firmware, then return to the Web Interface. Select **Device > Cellular Firmware**, then **Upload** the firmware file.

STEP 9 | To identify signal and firmware issues, select **Monitor > Logs > System** and look for logs pertaining to your cellular interface. If your signal strength is low, you may need to adjust your antenna location.

Set Up a Connection to the Firewall

On first startup, the PA-50R Series firewall boots into Zero Touch Provisioning (ZTP) mode by default. ZTP mode allows you to automate the provisioning process of a new firewall that is added to a Panorama™ management server. To learn more about ZTP, see [ZTP Overview](#). You can also bring the PA-50R Series firewall online in standard mode. See the instructions below to learn how to boot in ZTP or standard mode.



If you have already booted up the firewall and selected the wrong mode, you must perform a factory reset or private-data-reset before continuing.

- [Reset the Firewall to Factory Default Settings](#) describes how to do a factory reset.
- To use the private-data-reset command, you must access the firewall CLI and enter the command **request system private-data-reset**. This command will remove all logs and restore the default configuration.



Before you can successfully add a ZTP firewall to Panorama, you must ensure that a Dynamic Host Configuration Protocol (DHCP) server is deployed on the network. A DHCP server is required to successfully onboard a ZTP firewall to Panorama. The ZTP firewall is unable to connect to the Palo Alto Networks ZTP service to facilitate onboarding without a DHCP server.



ZTP mode is disabled if FIPS-CC mode is enabled. If the firewall boots with FIPS-CC mode enabled, the firewall will automatically boot in standard mode.

STEP 1 | Use an RJ-45 Ethernet cable to connect the device to the correct port. The port(s) connected will depend on which mode you intend the firewall to run in.

- **(Standard mode)** Connect the Ethernet cable from the MGT port on the firewall to the RJ-45 port of your network switch.
- **(ZTP mode)** Connect the Ethernet cable from the ZTP port (Ethernet port 1) on the firewall to your network switch.

STEP 2 | Confirm that the connection to the MGT port or Ethernet port 1 has an active network switch.



An active switch allows the firewall to trigger a “link up” state on the port you connected to for your desired boot mode.

STEP 3 | **(Standard mode only)** If you intend to boot the firewall in standard mode, you will need access to the firewall CLI to respond to a prompt during bootup. Connect a console cable from the firewall console port to your computer. Once the firewall is powered on, use a terminal emulator such as PuTTY to access the CLI. See [Access the CLI](#) for more information.

STEP 4 | Power on the firewall.

- (Standard mode) Using your terminal emulator, watch for the following CLI prompt as the firewall boots:

```
Do you want to exit ZTP mode and configure your firewall in
standard mode (yes/no)[no]?
```

Enter **yes**. The system will then ask you to confirm. Enter **yes** again to boot in standard mode.

```
SSH Public key fingerprints:
Generating SSH2 RSA host key of length 2048: [ OK ]
2048 MD5:28:5a:a8:4e:3d:69:99:a8:b0:4a:77:9c:12:f6:62:ce no comment (RSA)
Starting sshd: [ OK ]
Starting PAN Software: ERROR: Module us[ 73.058994] intel_qat: module verification failed: signature and/or required key missing - tainting kernel
dm_drv does not exist in /proc/modules
ERROR: Module qat_c3xxx does not exist in /proc/modules
ERROR: Module intel_qat does not exist in /proc/modules
FATAL: Module qat_c3xxx not found.
Restarting all devices.
Processing /etc/c3xxx_dev0.conf
Checking status of all devices.
There is 1 QAT acceleration device(s) in the system:
qat_dev0 - type: c3xxx, inst_id: 0, node_id: 0, bsf: 0000:01:00.0, #accel: 3 #engines: 6 state: up
CPLD RSU not supported for ver 0x0
* * * * FIPS-CC Plugin Self-Tests Stage-2 begins * * * *
* * * * FIPS-CC Plugin Self-Tests Stage-2 passed * * * *
Zero touch provisioning (ZTP) of the firewall is in progress.
Do you want to exit ZTP mode and configure your firewall in standard mode (yes/no)[no]?y\y/no
[ OK ]
```



If you miss the above CLI prompt, you can also change your boot mode using the web interface. Go to the firewall login screen at any point before or during the startup process. A prompt will ask if you wish to continue booting in ZTP mode or if you would like to switch to standard mode. Select **Standard Mode** and the firewall will begin rebooting in standard mode.

- (ZTP mode) Stand by as the firewall boots up.

STEP 5 | Set up the firewall manually if using standard mode. If using ZTP mode, the device group and template configuration defined on the Panorama management server are automatically pushed to the firewall by the ZTP service.

- (Standard mode) Change the IP address on your computer to an address in the 192.168.1.0/24 network, such as 192.168.1.2. From a web browser, go to <https://192.168.1.1>. When prompted, log in to the web interface using the default username and password (admin/admin).
- (ZTP mode) Follow the instructions provided by your Panorama administrator to register your ZTP firewall. You will have to enter the serial number (12-digit number identified as S/N) and claim key (8-digit number). The claim key is required to [add a ZTP firewall to the Panorama management server](#). These numbers are stickers attached to the back of the device.

Set Up VIMS

You can enable, configure, and monitor VIMS (Vehicle Ignition Monitoring System) on the PA-52R-5G, PA-54R-POE, and PA-54R-POE-D-5G firewalls. VIMS uses IGN+ and BATT+ inputs to detect instances of vehicle ignition and draw electrical current to power the connected appliance. By installing the firewall in this way, you can effectively establish a mobile network perimeter, track vehicle data, and secure sensitive data in remote locations.

The PA-54R-POE and PA-54R-POE-D-5G firewalls have BATT- and IGN+ inputs that must be connected to the vehicle's primary power source through an AMPSU (Automotive Power Supply Unit). You can only enable VIMS configuration once the connection between the firewall and the vehicle is established. The interface between the AMPSU and the firewall offers input/output pins that can be configured to monitor and report on different conditions of the VIMS deployment based on voltage signals.

The following procedure describes how to enable and monitor VIMS.

STEP 1 | Connect the vehicle's BATT- and BATT+ cables to the firewall's power input.

STEP 2 | Connect the BATT- and IGN+ inputs to the vehicle's primary power source.



You must use an AMPSU (Automotive Power Supply Unit) with the PA-54R-POE and PA-54R-POE-D-5G firewalls.

STEP 3 | Power on the firewall if it is not already powered on.

STEP 4 | Log in to the firewall Web Interface, then navigate to **Device > Setup > Smart Control AI**.

STEP 5 | Select **Enable VIMS Configuration** to turn on VIMs.

STEP 6 | Configure the power off timeout settings:

- **PoE Power Off Timeout (In minutes)** – Enter a value between 1 and 60 to determine the time (in minutes) PoE remains active after the vehicle ignition is powered off.
- **System Power Off Timeout (In Minutes)** – Enter a value between 1 and 60 to determine the time (in minutes) the device continues running after the vehicle ignition is powered off.

STEP 7 | On the **Dashboard**, select the **VIMS Status** widget to display the battery voltage and shutdown counts on the firewall.

PA-50R Series Firewall Maintenance

Use the following topics to service the PA-50R Series firewall hardware.

- [PA-50R Series Firewall LEDs](#)

PA-50R Series Firewall LEDs

The following table describes how to interpret the status LEDs on the PA-50R Series firewalls. Not all PA-50R Series firewalls have all of the LED indicators.

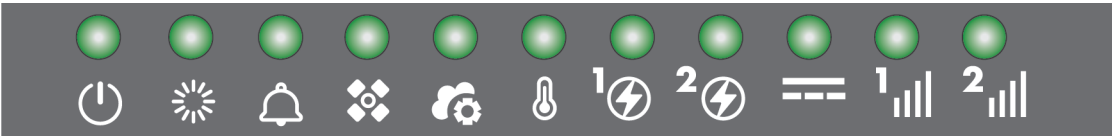
PA-52R-5G



PA-54R-POE-D-5G – Front (The PA-54R-POE and PA-56R-POE-5G LEDs are similar)



PA-54R-POE-D-5G – Back (The PA-54R-POE and PA-56R-POE-5G LEDs are similar)



LED	Description
System LEDs	
	Power - Green—The firewall is powered on. - Red—One or more power rails have encountered an issue. - Off—The firewall is not powered on or an error has occurred with the internal power system (for example, power is not within tolerance levels).
	Status - Green—The firewall is operating normally. - Yellow—Auto commit is in progress or the firewall is booting.
	Alarm Red—A hardware component failed, such as a power adapter failure, a firewall failure that caused an HA failover, a drive failure, or

LED	Description
	hardware is overheating and the temperature is above the high temperature threshold. Off—The firewall is operating normally.
	High Availability (HA) - Green—The firewall is the active peer in an active/passive configuration. - Yellow—The firewall is the passive peer in an active/passive configuration. - Off—High availability (HA) is not operational on this firewall.  <i>In an active/active configuration, the HA LED only indicates HA status for the local firewall and has two possible states (green or off); it does not indicate HA connectivity of the peer. Green indicates that the firewall is either active-primary or active-secondary and off indicates that the firewall is in any other state (for example, non-functional or suspended).</i>
	Controller  <i>This LED is reserved for a future release.</i>
	Temperature - Green—The firewall temperature is within normal levels. - Yellow—The firewall temperature is outside tolerance levels.
	Power Supplies 1 and 2 - Green—The PSU is powered with the correct voltage. - Yellow—The PSU is powered with the incorrect voltage. - Off—The PSU is not present.
	DC Power - Green—The firewall is powered using VIMS. - Off—The firewall is not powered using VIMS or the vehicle battery has encountered an issue.
 or 	Cellular  <i>Only the PA-52R-5G has bars.</i>

LED	Description
5G	- Green—4G or 5G connectivity. - One bar—Poor signal strength. - Two bars—Fair signal strength. - Three bars—Good signal strength. - Four bars—Maximum signal strength. - Red—The cellular interface is down. - Off—The cellular connection is not configured.
Port LEDs	
RJ-45 Ports	Link LED - Off—There is no link. - Yellow—10 Mbps/100 Mbps. - Green—1 Gbps. Activity LED Blinking—The link is up and there is network activity. Off—There is no network activity.
SFP Ports	Link LED - Off—There is no link. - Green—1 Gbps. Activity LED Blinking—The link is up and there is network activity. Off—There is no network activity.

PA-50R Series Firewall Specifications

Use the following links to review the specifications of the PA-50R Series firewall hardware:

- [PA-50R Series Firewall Physical Specifications](#)
- [PA-50R Series Firewall Electrical Specifications](#)
- [PA-50R Series Firewall Environmental Specifications](#)
- [PA-50R Series Firewall Antenna Specifications](#)
- [PA-50R Series Firewall Miscellaneous Specifications](#)

PA-50R Series Firewall Physical Specifications

The following table describes PA-50R Series firewall physical specifications.

Specification	Value
Rack units and dimensions	PA-52R-5G - Height x Width x Depth— 1.67 inch x 7.96 inch x 7.99 inch (42.5 mm x 202.2 mm x 203 mm) - Rack units—1RU PA-54R-POE and PA-54R-POE-D-5G - Height x Width x Depth— 5.79 inch x 7.24 inch x 5.59 inch (147 mm x 184 mm x 142 mm) - Rack units—4RU PA-56R-POE-5G - Height x Width x Depth— 3.37 inch x 16.46 inch x 5.71 inch (85.5 mm x 418 mm x 145 mm) - Rack units—2RU
Weight	PA-52R-5G - Firewall weight—5.5 lbs (2.5 kg) - Shipping weight—7 lbs (3.63 kg) PA-54R-POE and PA-54R-POE-D-5G - Firewall weight—7.5 lbs (3.4 kg) - Shipping weight—10.3 lbs (4.67 kg) PA-56R-POE-5G - Firewall weight—9.77 lbs (4.43 kg) - Shipping weight—TBD

PA-50R Series Firewall Electrical Specifications

The following table describes PA-50R Series firewall electrical specifications.

Specification	Value
Input voltage (DC)	PA-52R-5G - Nominal—12V-48V - Absolute Maximum—9.6V-52.8V PA-54R-POE, PA-54R-POE-D-5G, and PA-56R-POE-5G Automotive Power Supply (AMPSU) - Nominal— 12V-48V - Absolute Maximum—8V-54V - Startup— 8.5V Low Voltage Power Supply - Nominal— 12V-48V - Absolute Maximum—9.6V-54V High Voltage Power Supply - Nominal— 48V-125V - Absolute Maximum—38.5V-137.5V
Maximum power consumption	PA-52R-5G—40 W PA-54R-POE—225.1 W PA-54R-POE-D-5G—225.1 W PA-56R-POE-5G—225.1 W
Maximum current consumption	PA-52R-5G—TBD PA-54R-POE—15.0A@12VDC PA-54R-POE-D-5G—15.0A@12VDC PA-56R-POE-5G—15.0A@12VDC
Power over Ethernet (PoE)	PA-54R-POE, PA-54R-POE-D-5G, and PA-56R-POE-5G - Supported on ports 9, 10, 11, and 12 - Maximum power reserved per port—90W - Total PoE budget allowed (across all ports) —150W

Specification	Value
	 150W is the maximum PoE budget when the ambient temperature is 60°C or less. <i>If the ambient temperature exceeds 60°C, then PoE shuts down in order to avoid safety risks.</i> Thermal and voltage derating – TBD
Digital Input/Output Pins	PA-54R-POE, PA-54R-POE-D-5G, and PA-56R-POE-5G • Nominal—5V-50V • Absolute Maximum— -0.6V to 60V • Source Current—15mA (all pins) • Sink Current • Pins 1 through 4 — -200mA • Pins 5 through 6 — -3A

PA-50R Series Firewall Environmental Specifications

The following table describes PA-50R Series firewall environmental specifications.

Specification	Value
Operating temperature range	PA-52R-5G -40°F to 140°F (-40°C to 60°C)  <i>The PA-52R-5G can operate at up to 158°F (70°C) only if there is 240 LFM (linear feet per minute) of external airflow.</i> PA-54R-POE, PA-54R-POE-D-5G, PA-56R-POE-5G -40°F to 158°F (-40°C to 70°C)
Humidity tolerance	10% to 90% non-condensing
Airflow	The PA-50R Series firewalls use passive cooling and do not contain fans.
Maximum BTUs/hour	PA-52R-5G—136.5 BTUs/hour PA-54R-POE—767.7 BTUs/hour PA-54R-POE-D-5G—767.7 BTUs/hour PA-56R-POE-5G—767.7 BTUs/hour
Acoustic noise	Emits no sound.
Maximum operating altitude	10,000 ft (3048m)

PA-50R Series Firewall Antenna Specifications

The following table describes PA-50R Series firewall antenna specifications and requirements.



For separately purchased antennas, refer to the manufacturer's datasheet for specifications and other information.

Specification	Description
Antennas	PA-52R-5G —2x2 MIMO antenna PA-54R-POE-D-5G —4x4 MIMO antenna PA-56R-POE-5G —4x4 MIMO antenna
Frequency range	615-960MHz / 1500-1600MHz / 1710-2690MHz / 3300-5000MHz

Refer to the following sections to view third-party antenna recommendations for each firewall.

- [PA-52R-5G](#)
- [PA-54R-POE-D-5G](#)
- [PA-56R-POE-5G](#)

PA-52R-5G

PAN-PA-5G-ANT-2X2-5M-SMAM

The PAN-PA-5G-ANT-2X2-5M-SMAM is a high-performance 2x2 omni-directional MIMO antenna suitable for wall and pole mount applications with 5 meter (16.4 ft) cables. All measurements are for the 4G/5G antenna elements (Elements 1 and 2) measured in free space with 0.5 meter (1.5 ft) of CS32 cable.

Table 11: Cellular Bands and Frequency Performance

Frequency Range (MHz)	Operational Cellular Bands	Element	Peak Realised Gain (dBi)	Nominal Radiated Efficiency	Typical VSWR
617-960	Low Bands: B5, B8, B12, B13, B14, B17, B19, B20, B26, B27, B28, B71, n105, B106	Elements 1 and 2	3	> 60%	< 2.5:1
1427-2700	Mid Bands / Supplemental Downlink:	Elements 1 and 2	6	> 60%	< 2.5:1

Frequency Range (MHz)	Operational Cellular Bands	Element	Peak Realised Gain (dBi)	Nominal Radiated Efficiency	Typical VSWR
	B1, B2, B3, B4, B7, B9, B11, B21, B23, B25, B30, B35, B38, B39, B40, B41, B66, B74, B75, B76				
3400–4200	C-Band / Mid-Band 5G: B22, B42, B43, B48 (CBRS), n77, n78	Elements 1 and 2	5	> 60%	< 2.5:1
4900–6000	High-Band 5G / Unlicensed: n79	Elements 1 and 2	5	> 60%	< 2.5:1

Third-Party Antenna Requirements

If you purchase a third-party antenna, refer to this list of WWAN and GNSS recommendations to ensure compatibility and performance with the PA-52R-5G.

Table 12: Recommended WWAN Antenna Requirements

Parameter	Requirement Specifications	Details
Antenna system	External multi-band 2×2 MIMO antenna system (Ant1/Ant2)	- Ant1: Main RF (Rx/Tx) - Ant2: Auxiliary RF (Diversity/ MIMO)
Operating bands	- Antenna 1: All supporting Tx and Rx frequency bands - Antenna 2: All supporting Rx frequency bands	Full coverage required across supported cellular spectrums.
VSWR	- Recommended: < 2:1 - Worst case: < 3:1	Evaluated across all bands including band edges. Measured at the RF connector including mismatch/antenna losses, but excluding cable loss.
Total radiated efficiency	> 50% on all bands	Primary evaluation parameter. Peak gain alone is not an accurate indicator of performance when integrated into a host device.

Parameter	Requirement Specifications	Details
Radiation pattern	Nominally omni-directional radiation pattern in azimuth plane	Provides balanced horizontal coverage.
Envelope correlation coefficient (ECC)	- Rx bands < 960 MHz: < 0.5 - Rx bands > 1.4 GHz: < 0.2	Measured between Ant1 and Ant2.
Mean effective gain (MEG)	3 dBi	Specified for MEG1 (Ant1) and MEG2 (Ant2).
MEG imbalance	- MIMO operation: < 2 dB - Diversity operation: < 6 dB	Measured between Ant1 and Ant2.
Maximum antenna gain	Must not exceed regulatory antenna gain limits	
Isolation (S21)	> 10 dB between Ant1 and Ant2	
Max input power	10 dBm	Maximum allowable RF input power at the antenna port.
Power handling	> 1 W	Tested using a 1 W CW signal over 4 hours at the middle of each supported Tx band.

Table 13: Recommended GNSS Antenna Requirements (EM8695)

Parameter	Requirement Specifications	Comments
Frequency range	- GPS/QZSS L1: 1575.42 MHz - GPS/QZSS L5: 1176.45 MHz - Galileo E1: 1559–1591 MHz - Galileo E5a: 1164–1189 MHz - BeiDou B1C: 1559–1591 MHz - BeiDou B11: 1559–1563 MHz - BeiDou B2a: 1166–1186 MHz - GLONASS G1: 1597.5–1605.9 MHz	Covers GNSS L1 (1563–1587 MHz) and L5 (1164–1189 MHz) frequency bands with buffer zones.
Field of view (FOV)	Azimuth: Omni-directional	Ensures broad sky coverage.

Parameter	Requirement Specifications	Comments
	Elevation: -45 to +90 degrees	
Polarization (average Gv/Gh)	> 0 dB	Vertical linear polarization is sufficient. Any polarization other than LHCP is acceptable.
Free space average gain	> -6 dBi (preferably > -3 dBi) over FOV	Gv and Gh averaged over -45 to +90 degrees elevation and ±180 degrees azimuth.
Gain orientation	Maximum gain and uniform coverage at high elevation angles and zenith	High gain in the azimuth plane is not desired.
Average 3D gain	> -5 dBi	Total 3D gain metric.
Isolation	> 15 dB between GNSS and Ant1	Evaluated across all uplink bands and GNSS Rx bands.
Typical VSWR	< 2.5:1	Antenna port return loss specification.

PA-54R-POE-D-5G

Third-Party Antenna Requirements

If you purchase a third-party antenna, it must meet the following WWAN requirements to ensure compatibility and performance with the PA-54R-POE-D-5G.

Table 14: Recommended WWAN Antenna Requirements

Parameter	Requirement Specifications	Details
Antenna system	- NR/LTE: External multi-band 4x4 DL MIMO antenna system (ANT1, ANT2, ANT3, ANT4) 3G: External multi-band antenna system with diversity (ANT1, ANT3)	If an antenna includes GNSS, it must also satisfy dedicated GNSS antenna requirements.
Frequency ranges	- ANT1: 617–5925 MHz - ANT2: 1164–5000 MHz - ANT3: 617–5000 MHz - ANT4: 1427–5925 MHz	Specified across supported cellular and GNSS bands.

Parameter	Requirement Specifications	Details
VSWR	- Recommended: < 2:1 - Worst case: < 3:1	Measured at the RF receptacle across all bands including band edges.
Total radiated efficiency	> 50% on all bands	Primary parameter for evaluating the antenna system (measured at RF receptacle excluding cable loss).
Radiation pattern	Nominally omni-directional radiation pattern in the azimuth plane	Provides uniform horizontal coverage.
Envelope correlation coefficient (ECC)	- Rx bands < 960 MHz: < 0.5 - Rx bands > 1.4 GHz: < 0.2	Measured between receiving antennas.
Mean effective gain (MEG)	Receiving antennas: -2 to -3 dBi	Specified for receiving antenna elements.
MEG imbalance	- MIMO operation: < 2 dB - Diversity operation: < 6 dB	Measured between any two antenna elements.
Isolation	- Band B41 / UL MIMO: > 20 dB between transmitting antennas - All other bands/scenarios: > 10 dB across all antennas	Prevents potential ACLR and EVM performance issues during transmission.
Max input power	ANT1, ANT2, ANT3, ANT4, GNSS: 10 dBm	Critical: In-band GPS signal on ANT2 must be < 0 dBm to avoid damaging the internal LNA.
Power handling	> 1 W	Endurance measured over 4 hours using a 1 W continuous wave (CW) signal at mid-band frequencies.
Impedance	50 Ω (nominal)	All SMA ports.
Connector	SMA (M)	WWAN and GNSS.
GNSS active bias	3.15 Vdc (50 mA max)	



Consult a professional for best device location and antenna siting. Any installation should comply with all national and local regulations.

PA-56R-POE-5G

Third-Party Antenna Requirements

If you purchase a third-party antenna, it must meet the following WWAN requirements to ensure compatibility and performance with the PA-56R-POE-5G. Two antennas are required for dual SIM dual active (DSDA) operation.

Table 15: Recommended WWAN Antenna Requirements

Parameter	Requirement Specifications	Details
Antenna system	- NR/LTE: External multi-band 4x4 DL MIMO antenna system (ANT1, ANT2, ANT3, ANT4) 3G: External multi-band antenna system with diversity (ANT1, ANT3)	If an antenna includes GNSS, it must also satisfy dedicated GNSS antenna requirements.
Frequency ranges	- ANT1: 617–5925 MHz - ANT2: 1164–5000 MHz - ANT3: 617–5000 MHz - ANT4: 1427–5925 MHz	Specified across supported cellular and GNSS bands.
VSWR	- Recommended: < 2:1 - Worst case: < 3:1	Measured at the RF receptacle across all bands including band edges.
Total radiated efficiency	> 50% on all bands	Primary parameter for evaluating the antenna system (measured at RF receptacle excluding cable loss).
Radiation pattern	Nominally omni-directional radiation pattern in the azimuth plane	Provides uniform horizontal coverage.
Envelope correlation coefficient (ECC)	- Rx bands < 960 MHz: < 0.5 - Rx bands > 1.4 GHz: < 0.2	Measured between receiving antennas.
Mean effective gain (MEG)	Receiving antennas: –2 to –3 dBi	Specified for receiving antenna elements.
MEG imbalance	- MIMO operation: < 2 dB - Diversity operation: < 6 dB	Measured between any two antenna elements.

Parameter	Requirement Specifications	Details
Isolation	- Band B41 / UL MIMO: > 20 dB between transmitting antennas - All other bands/scenarios: > 10 dB across all antennas	Prevents potential ACLR and EVM performance issues during transmission.
Max input power	ANT1, ANT2, ANT3, ANT4, GNSS: 10 dBm	Critical: In-band GPS signal on ANT2 must be < 0 dBm to avoid damaging the internal LNA.
Power handling	> 1 W	Endurance measured over 4 hours using a 1 W continuous wave (CW) signal at mid-band frequencies.
Impedance	50 Ω (nominal)	All SMA ports.
Connector	SMA (M)	WWAN and GNSS.
GNSS active bias	3.15 Vdc (50 mA max)	



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PA-50R Series Firewall Miscellaneous Specifications

The following table describes PA-50R Series firewall miscellaneous specifications.

Specification	Value
Storage capacity	PA-52R-5G—One 120GB SSD PA-54R-POE, PA-54R-POE-D-5G, and PA-56R-POE-5G—One 128GB SSD
Mean time between failures (MTBF)	PA-54R-POE—300,000 hours at 25°C PA-54R-POE-D-5G—300,000 hours at 25°C PA-56R-POE-5G—300,000 hours at 25°C

