

Dell Edge Gateway 3000 Series Technical Guidebook

Regulatory Model: N03G
Regulatory Type: N03G001



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2017 - 05

Rev. A00

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Overview

The Edge Gateway 3000 Series is an Internet-of-Things (IoT) device. It is mounted at the edge of a network, enabling you to collect, secure, analyze, and act on data from multiple devices and sensors. It enables you to connect with devices used in transportation, building automation, manufacturing, and other applications. The Edge Gateway has a low-power architecture, which is capable of supporting industrial automation workloads while remaining fanless to satisfy environmental and reliability requirements. It supports Windows 10 IoT Enterprise LTSC 2016 and Ubuntu Core 16 operating systems.

System views

Top view

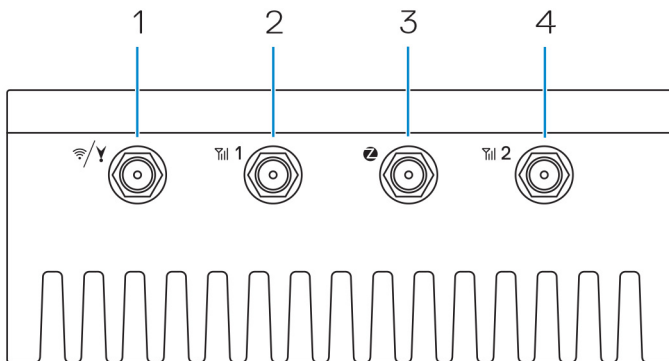


Table 1. Top view

Features		
1	WLAN, Bluetooth, or GPS connector	Connect the antenna to increase the range and strength of wireless, Bluetooth, or satellite signals.
2	Mobile broadband antenna-connector one (3G/LTE)	Connect the mobile broadband antenna to increase the range and strength of mobile broadband signals.
3	ZigBee antenna connector	Connect the ZigBee antenna for intermittent data transmissions from a ZigBee-compliant sensor or input device.
4	Mobile broadband antenna-connector two (LTE Auxiliary only)	Connect the mobile broadband antenna to increase the range and strength of mobile broadband signals.

NOTE: Depending on the configuration ordered, some of the antenna connectors may not be present or may be capped. For more information about connecting antennas to the Edge Gateway, see the documentation that is shipped with the antenna.

Bottom view

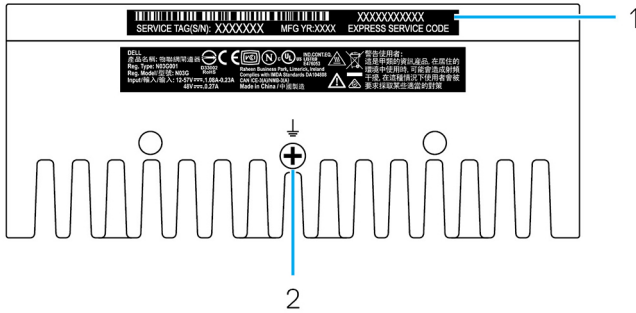


Table 2. Bottom view

Features		
1	Service Tag label	The Service Tag is a unique alphanumeric identifier that enables the Dell service technicians to identify the hardware components in your Edge Gateway and access warranty information.
2	Earth ground	A large conductor attached to one side of the power supply, which serves as the common return path for current from many different components in the circuit.

Left view

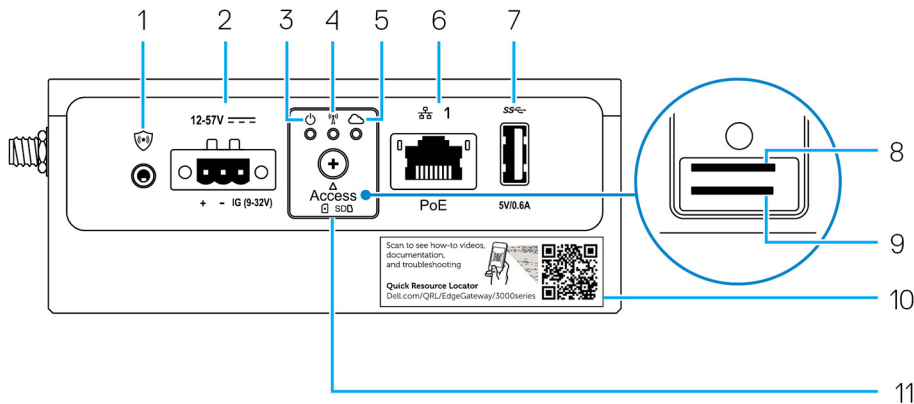







Table 3. Left view

Features		
1	Intrusion switch	An intrusion event is triggered when the enclosure (in which the Edge Gateway is installed) is opened.
<p> NOTE: External enclosure is sold separately.</p>		

Features

		<p> NOTE: An intrusion event is triggered by a third-party enclosure to the Edge Gateway through a sensor. The sensor should have a cable that is compatible with the intrusion switch connector on the Edge Gateway.</p>
2	Power or ignition port	Connect a 12-57 VDC (1.08-0.23 A) power cable to supply power to the Edge Gateway.
		<p> NOTE: Power cable is sold separately.</p>
3	Power and System status light	Indicates the power status and system status.
4	WLAN or Bluetooth status light	Indicates if WLAN or Bluetooth is ON or OFF.
5	Cloud-connection status light	Indicates the cloud connection status.
6	Ethernet port one (with Power over Ethernet support)	Connect an Ethernet (RJ45) cable to gain network access. Provides data transfer speeds up to 10/100 Mbps and supports Power over Ethernet.
		<p> NOTE: The Edge Gateway is an IEEE 802.3af compliant Powered Device (PD).</p>
7	USB 3.0 port ¹	Connect a USB enabled device. Provides data transfer speeds up to 5 Gbps.
8	SIM card slot (optional)	Insert a micro-SIM card into the slot.
9	SD card slot (optional)	Insert a micro-SD card into the slot.
		<p> NOTE: Remove the SD card slot filler before inserting a micro-SD card.</p>
10	Quick Resource Locator label	Scan with a QR reader to access documentation and other system information.
11	micro-SIM or micro-SD card access door	Open the access door to access the micro-SIM or micro-SD card.

¹ USB power is limited to 0.6 A/3 W to ensure that the Edge Gateway power consumption remains within the allowed 13 W PoE Class 0 range.

Table 4. Status-light indicators

Function	Indicator	Color	Control	Status
System	Power status and System status	Green or Amber	BIOS	Off: System off
				On (Solid Green): System on or Boot successful
				On (Solid Amber): Power up or boot fail
				Blinking Amber: Fault or error
	WLAN or Bluetooth	Green	Hardware	Off: WLAN or Bluetooth module is off

Function	Indicator	Color	Control	Status
				On: WLAN or Bluetooth module is on
	Cloud	Green	Software	Off: No connection to the cloud device or service On: Edge Gateway connected to a cloud device or service Blinking Green: Activity to a cloud device or service
LAN (RJ-45)	Link	Green/Amber	Driver (LAN)	Off: No network link or cable is not connected On (Green): High-speed connection (100 Mbps) On (Amber): Low-speed connection (10 Mbps)
	Activity	Green	Driver (LAN)	Off: No activity on link Blinking Green: LAN activity. The blink rate is related to packet density.

NOTE: The power and system status light may operate differently during different boot-up scenarios, for example, when a USB script file is run during boot-up.

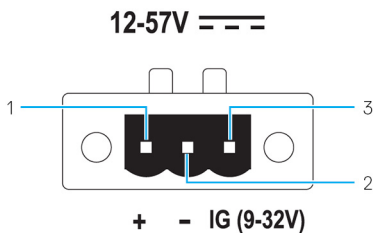


Table 5. Power connector pin definition details

Pin	Signal	Function
1	DC+	12–57 VDC power
2	DC–	Ground
3	IG	9–32 VDC ignition

NOTE: Pin 3 (IG) is connected to the vehicle's ignition status indicator (optional) or a wake pin. A voltage of more than 9 V on the signal indicates that the vehicle's engine is running. The ignition or Wake pin is used to prevent the draining of the vehicle battery when the vehicle is turned off for an extended amount of time.

NOTE: The IG signal can be used to gracefully shutdown or enter low-power state when the vehicle is turned off (battery powered). It can also be used for turning on the Edge Gateway when the vehicle starts.

Right view

Right view—3001

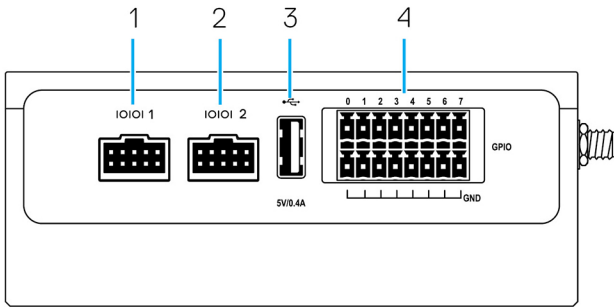


Table 6. Right view—3001

Features

Port Number	Port Description	Features
1	RS-232/RS-422/RS-485 port one	Connect a RS-232/RS-422/RS-485 cable to the Edge Gateway. Provides data transfer speeds up to 1 Mbps in RS-232 mode and 12 Mbps in RS-422/RS-485 mode. The serial port mode is configurable in the BIOS.
2	RS-232/RS-422/RS-485 port two	Connect a RS-232/RS-422/RS-485 cable to the Edge Gateway. Provides data transfer speeds up to 1 Mbps in RS-232 mode and 12 Mbps in RS-422/RS-485 mode. The serial port mode is configurable in the BIOS.
3	USB 2.0 port ¹	Connect a USB enabled device. Provides data transfer speeds up to 480 Mbps.
4	GPIO port	Connect a GPIO enabled device or dongles.

¹ USB power is limited to 0.4 A/2 W to ensure that the Edge Gateway power consumption remains within the allowed 13 W PoE Class 0 range.

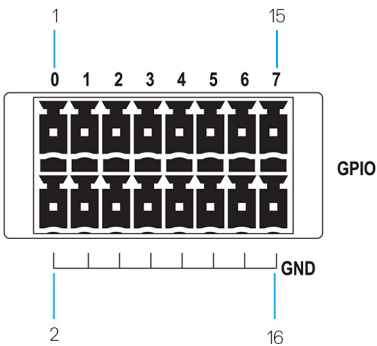


Table 7. GPIO-port pin definition details

Pin	1	3	5	7	9	11	13	15
Signal	GPIO0	GPIO1	GPIO2	GPIO3	GPIO4	GPIO5	GPIO6	GPIO7
Pin	2	4	6	8	10	12	14	16



Signal GND GND GND GND GND GND GND GND

 **NOTE:** GPIO0 to the GPIO7 pins are 0-5 V input/output and digital/analog configurable pins.

 **NOTE:** The GPIO port is powered by analog devices' AD5593R.

 **NOTE:** Each pin has a 1K series resistor between the connector and the AD5593R.

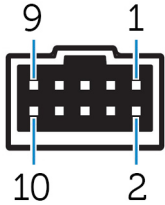


Table 8. RS-232 pin definition details

Pin	Signal	Characteristics
1	DCD	Data Carrier Detect
2	RXD	Received Data
3	TXD	Transmitted Data
4	DTR	Data Terminal Ready
5	GND	Ground
6	DSR	Data Set Ready
7	RTS	Request To Send
8	CTS	Clear To Send
9	RI	Ring Indicator
10	GND	Ground

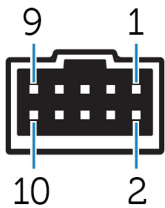


Table 9. RS-485/RS-422 full duplex pin definition details

Pin	Signal	Characteristics
1	TXD-	Transmit Data A
2	TXD+	Transmit Data B
3	RXD+	Receive Data B
4	RXD-	Receive Data A
5	GND	Ground
6	Not applicable	Not applicable
7	Not applicable	Not applicable
8	Not applicable	Not applicable

Pin	Signal	Characteristics
9	Not applicable	Not applicable
10	GND	Ground

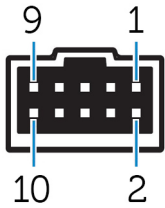


Table 10. RS-485 half-duplex pin definition details

Pin	Signal	Characteristics
1	Data-	(-) TX/RX data
2	Data+	(+) TX/RX data
3	Not applicable	Not applicable
4	Not applicable	Not applicable
5	GND	Ground
6	Not applicable	Not applicable
7	Not applicable	Not applicable
8	Not applicable	Not applicable
9	Not applicable	Not applicable
10	GND	Ground

Right view—3002

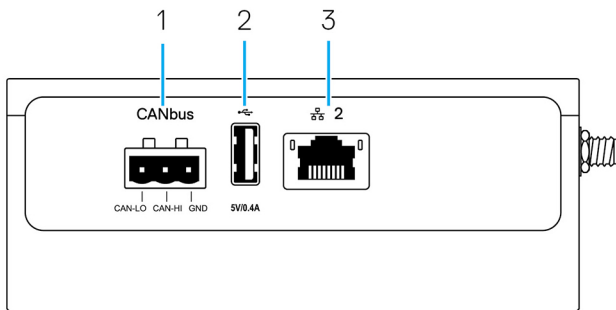


Table 11. Right view—3002

Features		
1	CANbus port	Enables the CANbus connection.
2	USB 2.0 port ¹	Connect a USB enabled device. Provides data transfer speeds up to 480 Mbps.
3	Ethernet port two (Non-PoE)	Connect an Ethernet (RJ45) cable for network access. Provides data transfer speeds up to 10/100 Mbps.

¹ USB power is limited to 0.4 A/2 W to ensure that the Edge Gateway power consumption remains within the allowed 13 W PoE Class 0 range.



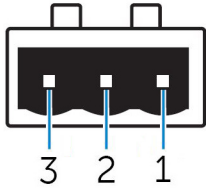


Table 12. CANbus-port pin definition details

Features		
1	GND	Ground
2	CAN-H	High-level CANbus line
3	CAN-L	Low-level CANbus line

Right view—3003

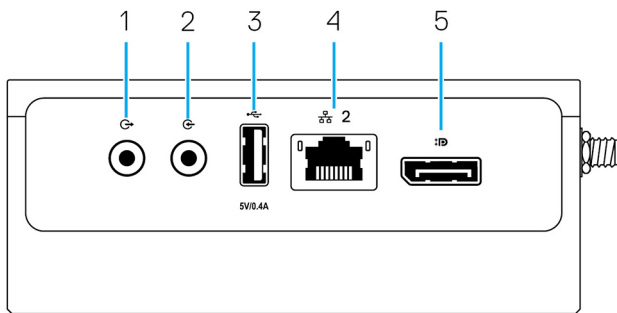


Table 13. Right view—3003

Features		
1	Audio line-out (GREEN)	Connect audio-output devices such as speakers and amplifiers.
2	Audio line-in (BLUE)	Connect recording or playback devices.
3	USB 2.0 port ¹	Connect a USB enabled device. Provides data transfer speeds up to 480 Mbps.
4	Ethernet port two (Non-PoE)	Connect an Ethernet (RJ45) cable for network access. Provides data transfer speeds up to 10/100 Mbps.
5	DisplayPort connector	Connect a monitor or another DisplayPort-enabled device. Provides video and audio output.

¹ USB power is limited to 0.4 A/2 W to ensure that the Edge Gateway power consumption remains within the allowed 13 W PoE Class 0 range.

Installing your Edge Gateway

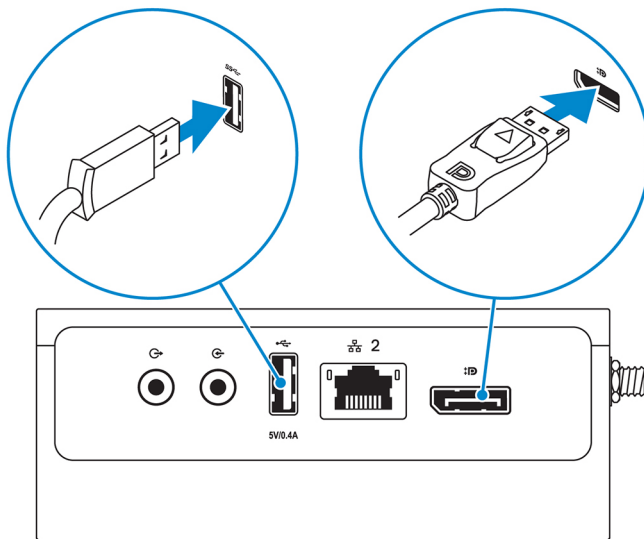
WARNING: Before you begin any of the procedures in this section, read the [safety and regulatory information](#) that is shipped with your system. For additional best practices information, go to www.dell.com/regulatory_compliance.

Setting up your Edge Gateway

NOTE: Edge Gateway mounting options are sold separately.

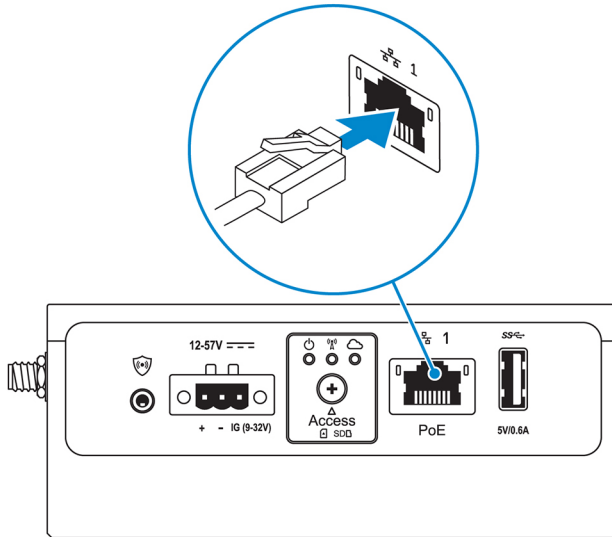
NOTE: Mounting can be done before or after configuring your Edge Gateway. For more information about mounting your Edge Gateway, see [Mounting your Edge Gateway](#).

1. Use USB cables to connect a display, keyboard, and mouse.



NOTE: USB power is limited to 0.6 A/3 W for USB 3.0 port and 0.4 A/2 W for USB 2.0 port to ensure that the Edge Gateway is within the allowed 13 W PoE Class 0 range.


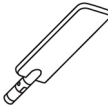






2. Connect an Ethernet cable to Ethernet port one.



3. Connect the antennas depending on the configuration ordered (optional).

NOTE: The antennas supported in the Edge Gateway vary depending on the configuration ordered.

Table 14. Antennas supported in Edge Gateway 3000 Series

Antennas supported				
Signals				
3000	Yes	Not applicable	Yes	Not applicable
3001	Yes	Yes	Yes	Not applicable
3002	Yes	Yes	Yes	Yes
3003	Yes	Yes	Yes	Not applicable

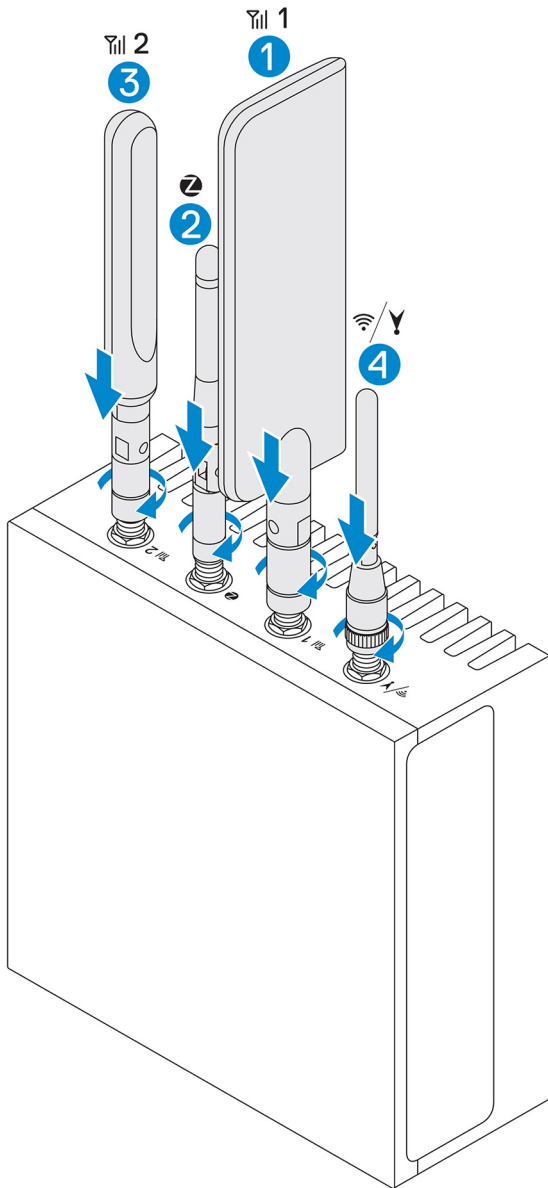
NOTE: Use only the supplied antennas or third-party antennas that meet the [minimum specifications](#).

NOTE: Depending on the configuration ordered, some of the antenna connectors may not be present or may be capped.

NOTE: Mobile broadband antenna connector two is for LTE Auxiliary only; it does not support 3G.

4. Insert the antenna into the connector.

NOTE: If you are installing multiple antennas, follow the sequence indicated in the following image.



5. Secure the antenna by tightening the rotating head of the connector until it firmly holds the antenna in the preferred position (upright or straight).

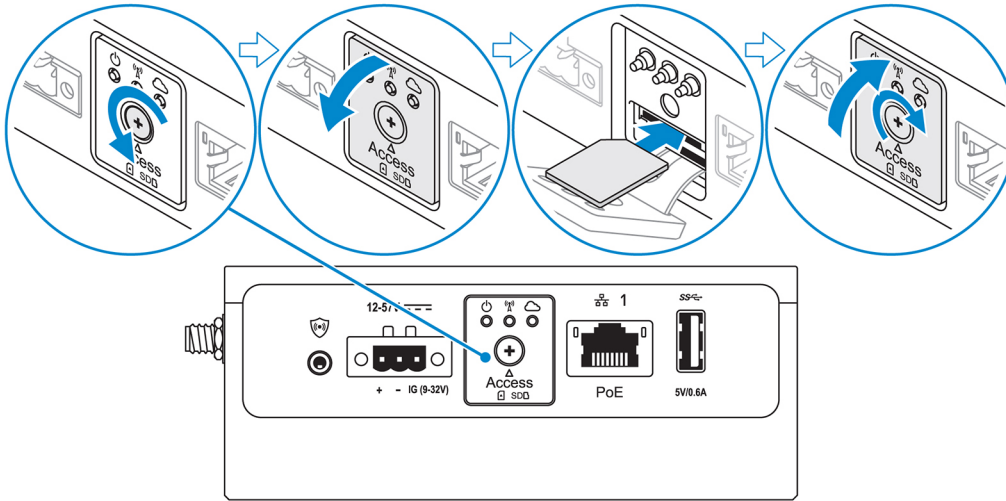
 **NOTE: Antenna images are for illustrative purposes only. Actual appearance may differ from the images provided.**

6. Connect all desired cables to the appropriate I/O ports on the Edge Gateway.
7. Open the micro-SIM or micro-SD card access door.
8. Insert a micro-SIM card into the top micro-SIM card slot and [activate your mobile broadband service](#).

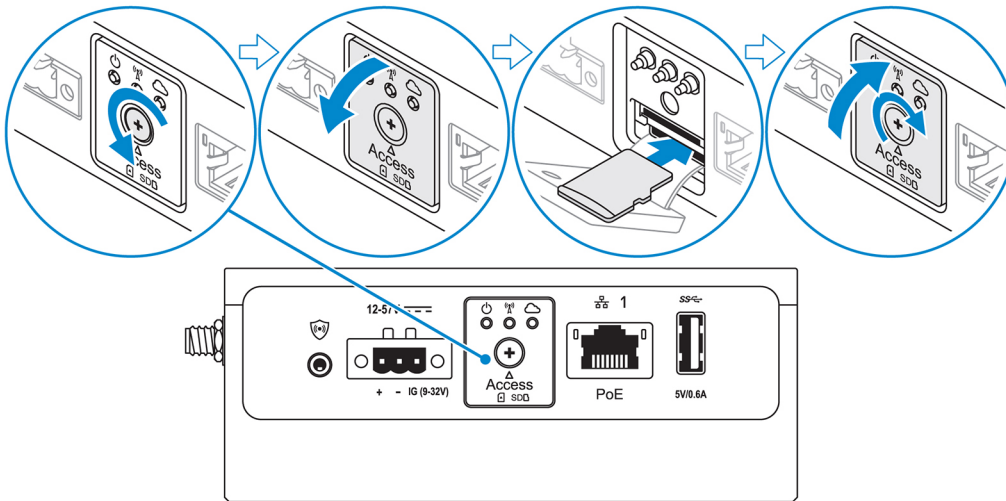
 **CAUTION: Dell recommends that you insert the micro-SIM card before turning on the Edge Gateway.**

 **NOTE: Ensure that you firmly screw back the access door after closing.**

 **NOTE: Contact your service provider to activate your micro-SIM card.**



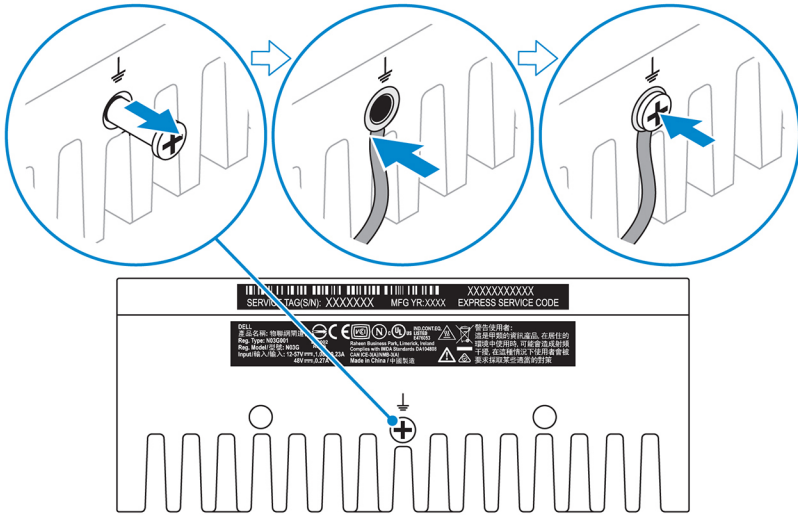
9. Insert a micro-SD card into the bottom micro-SD card slot.



NOTE: Remove the SD card slot filler before inserting a micro-SD card.

NOTE: Ensure that you firmly screw back the access door after closing.

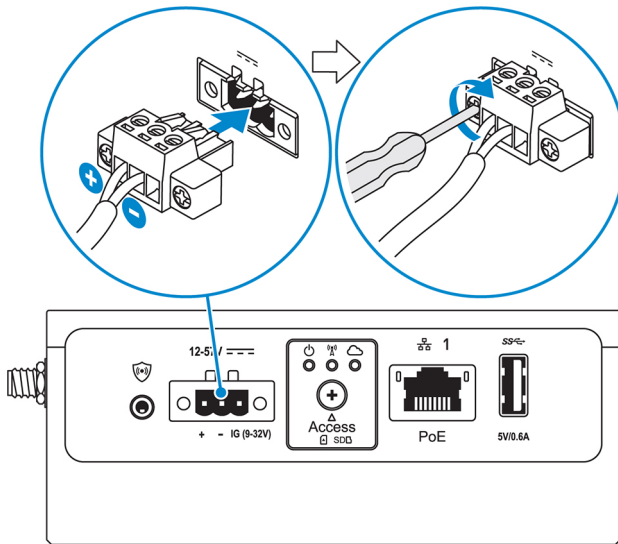
10. Connect a grounding cable between the Edge Gateway and the secondary enclosure.



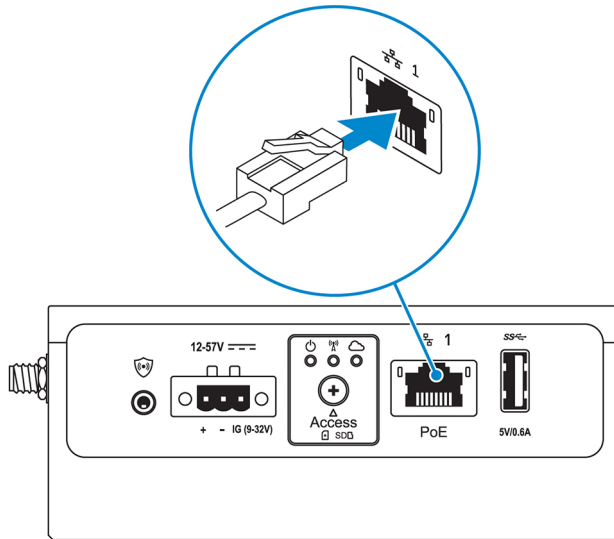
NOTE: Secondary enclosures are sold separately.

11. Connect the Edge Gateway to one of the following power sources:

- DC-IN



- PoE



NOTE: Shut down your system before you change the power sources.

12. Replace the dust caps on any unused ports.
13. When setting up the Edge Gateway for the first time, complete the operating system setup.
For more information, see [Setting up your operating system](#).

NOTE: MAC addresses and the IMEI number are available on the label at the front of the Edge Gateway. Remove the label at install.

NOTE: The Edge Gateway is shipped with either Windows 10 IoT Enterprise LTSC 2016 or Ubuntu Core 16 operating system.

NOTE: The default user name and password for Windows 10 IoT Enterprise LTSC 2016 is *admin*.

NOTE: The default user name and password for Ubuntu Core 16 is *admin*.

14. On Edge Gateway 3003, access the BIOS by pressing F2 to enter the BIOS setup or F12 to enter the BIOS boot menu. On Edge Gateway 3001 and 3002, access the BIOS by connecting remotely with the Dell Command | Configure application.

Windows 10 IOT Enterprise LTSC 2016

Click **Start** → **All Programs** → **Dell** → **Command Configure** → **Dell Command | Configure Wizard**.

Ubuntu Core 16

Use the `dcc.cctk` command to access the Dell Command | Configure application.

NOTE: For more information about using the Dell Command | Configure application, see the Dell Command | Configure *Installation Guide* and *User's Guide* at www.dell.com/dellclientcommandsuite/manuals.

NOTE: For more information about BIOS settings on the Edge Gateway, see [Default BIOS settings](#).

15. Install the Edge Gateway using one of the following mounting options:

NOTE: An open space of 63.50 mm (2.50 in) is recommended around the Edge Gateway for optimal air circulation.

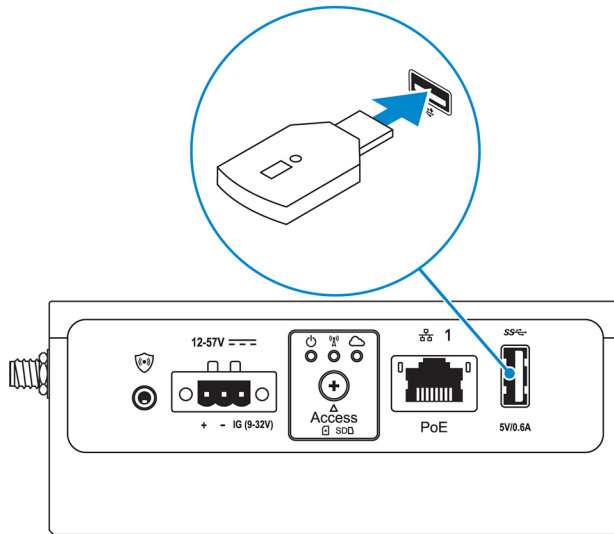
- [Standard mount](#)
- [DIN rail mount](#)
- [Quick mount](#)
- [Perpendicular mount](#)

- [Cable control bar](#)
- [VESA mount](#)

Setting up the ZigBee dongle

⚠ CAUTION: Do not connect the ZigBee dongle if the Edge Gateway is installed inside the enclosure.

1. Turn off your Edge Gateway.
2. Connect the ZigBee dongle to any external USB port on your Edge Gateway.



3. Turn on your Edge Gateway, and complete the setup.

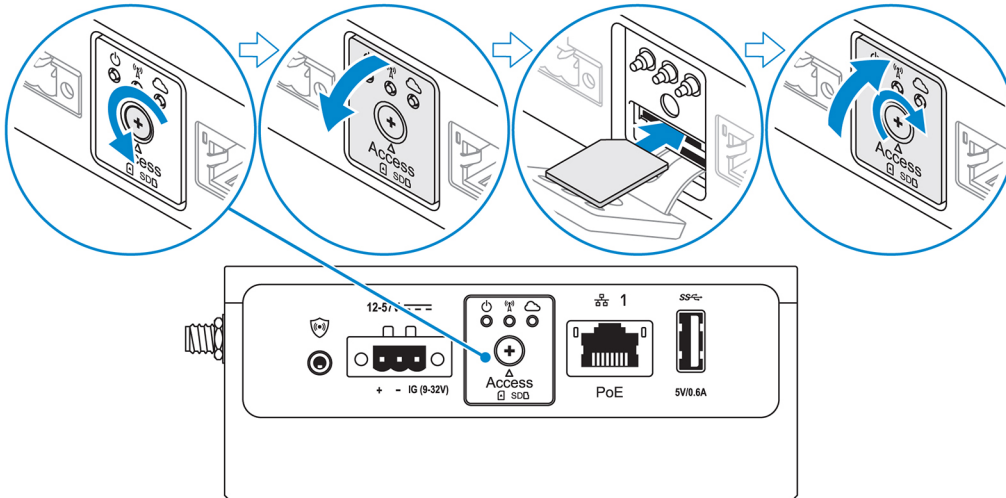
✍ NOTE: For more information about the ZigBee development, see www.silabs.com.

Activating your mobile broadband service

⚠ CAUTION: Before turning on the Edge Gateway, insert a micro-SIM card.

✍ NOTE: Ensure that the service provider has already activated the micro-SIM card before using it in the Edge Gateway.

1. Remove the screw to open the micro-SIM card access door.
2. Insert a micro-SIM card into the top micro-SIM card slot.



3. Replace the screw, and close the micro-SIM card access door.
4. Turn on the Edge Gateway.
5. Connect to a mobile network.

Windows operating system

- a. Click the network icon from the taskbar, and then click **Cellular**.
- b. Select **Mobile Broadband Carrier** → **Advanced Options**.
- c. Make a note of the **International Mobile Equipment Identity (IMEI)** and **Integrated Circuit Card Identifier (ICCID)**.
- d. Enter your APN number and any other credentials that your service provider requires.

Ubuntu operating system

- a. Open the **Terminal** window.
- b. Enter `$sudo su -` to access super user mode.
- c. Configure the Mobile Broadband connection profile:

Command line:

```
network-manager.nmcli con add type <type> ifname <ifname> con-name <connection-name>
apn <apn>
```

Example (Verizon):

```
network-manager.nmcli con add type gsm ifname cdc-wdm0 con-name VZ_GSMDEMO apn
vzwinternet
```

Example (AT&T):

```
network-manager.nmcli con add type gsm ifname cdc-wdm0 con-name ATT_GSMDEMO apn
broadband
```

Example (3G):

```
network-manager.nmcli con add type gsm ifname cdc-wdm0 con-name 3G_GSMDEMO apn
internet
```

- d. Connect to the mobile network:

Command line:

```
network-manager.nmcli con up <connection-name>
```

Example (Verizon):

```
network-manager.nmcli con up VZ_GSMDEMO
```

Example (AT&T):

```
network-manager.nmcli con up ATT_GSMDEMO
```

Example (3G):

```
network-manager.nmcli con up 3G_GSMDEMO
```

To disconnect from the mobile network:

Command line: `network-manager.nmcli con down <connection-name>`

Example (Verizon):

```
network-manager.nmcli con down VZ_GSMDEMO
```

Example (AT&T):

```
network-manager.nmcli con down ATT_GSMDEMO
```

Example (3G):

```
network-manager.nmcli con down 3G_GSMDEMO
```

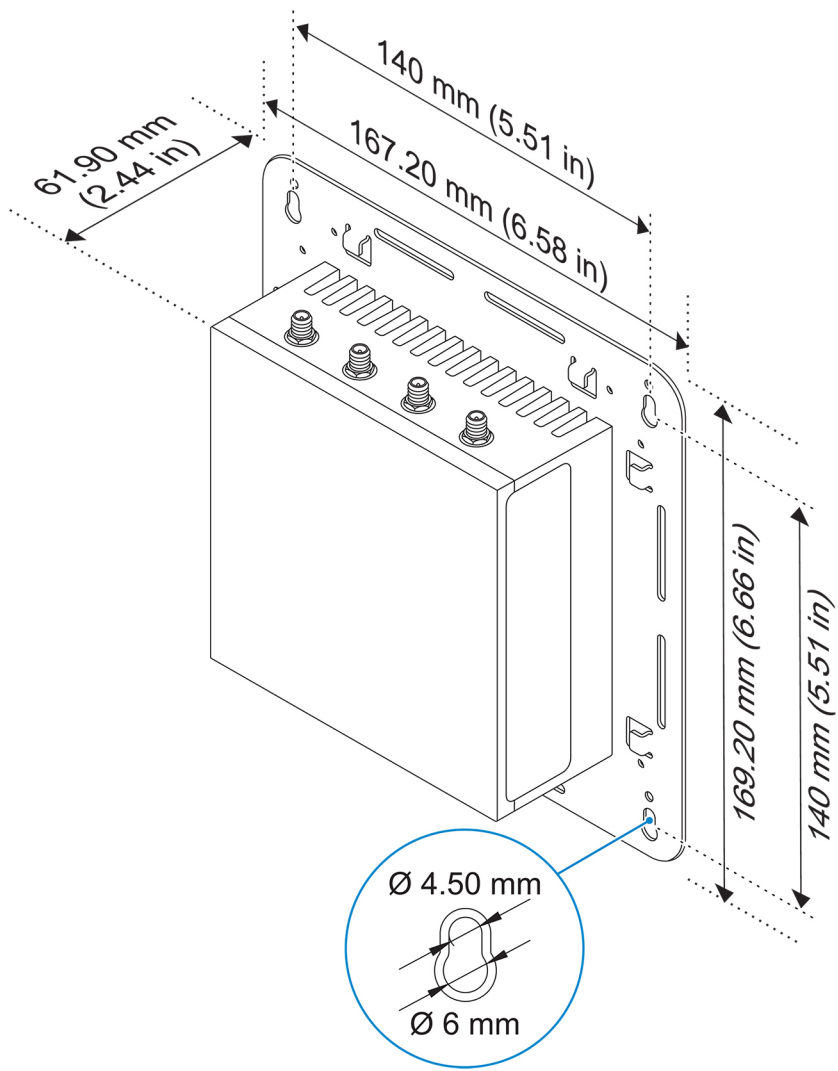
Mounting your Edge Gateway

 **NOTE: Mounting can be completed before or after configuring your Edge Gateway.**

 **NOTE: Mounting options are sold separately. Mounting instructions are available in the documentation shipped with the mounting device.**

Mounting the Edge Gateway using the standard-mount bracket

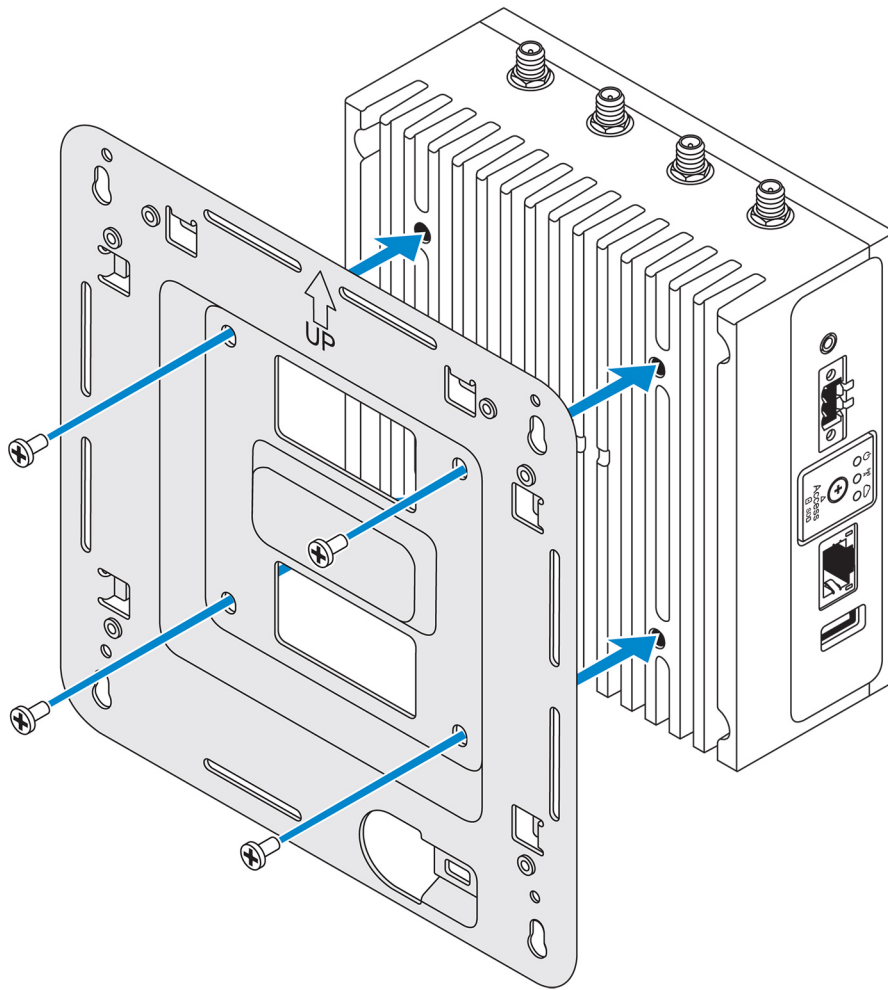
Mounting dimensions



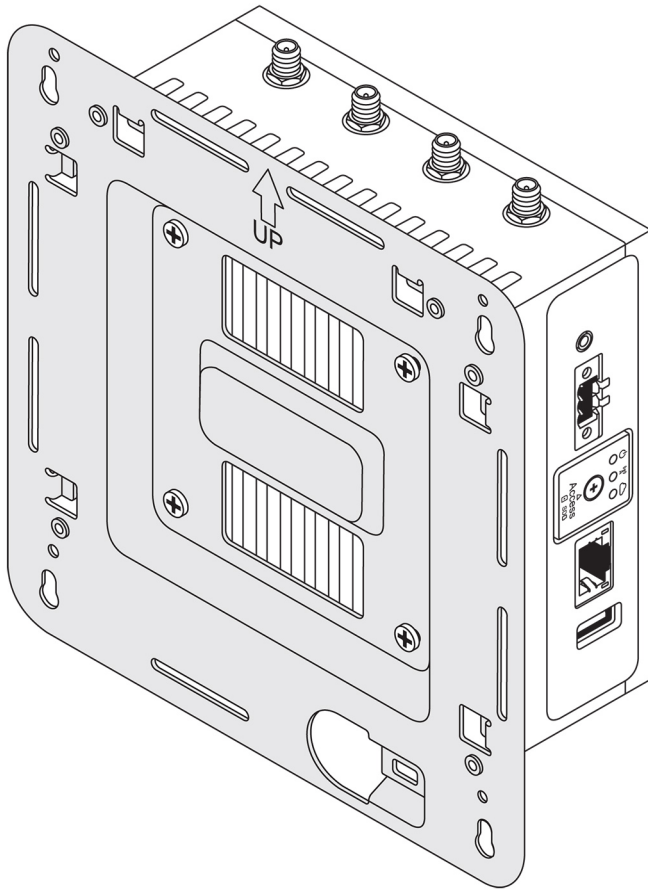
NOTE: The mounting brackets are shipped with only those screws that are required for securing the mounting brackets to the Edge Gateway.

1. Secure the standard-mount bracket to the back of the Edge Gateway using the four M4x4.5 screws.

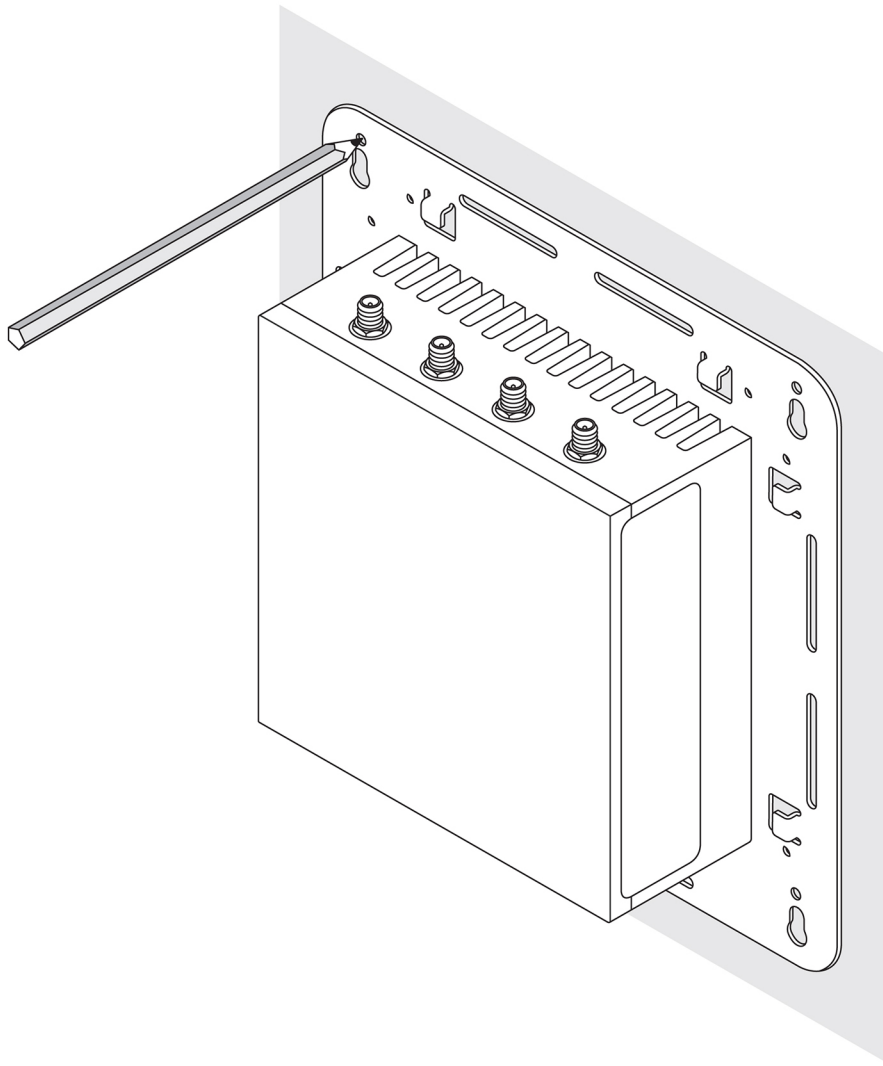
NOTE: Torque the screws at 8 ± 0.5 kilograms-centimeter (17.64 ± 1.1 pounds-inch).



2. Place the Edge Gateway against the wall, and align the holes in the standard-mount bracket with the holes on the wall. Screw holes on the bracket have a diameter of 3 mm (0.12 in).

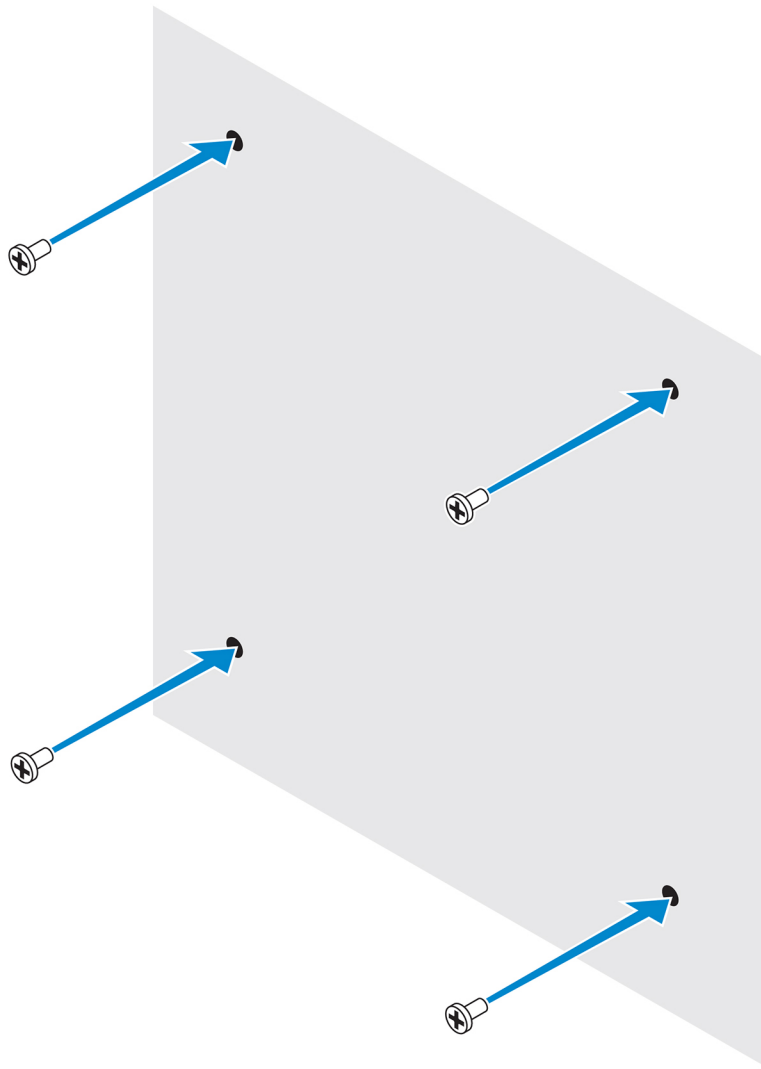


3. Place the standard-mount bracket on the wall, and using the holes above the screw holes on the bracket, mark the positions to drill the four holes.

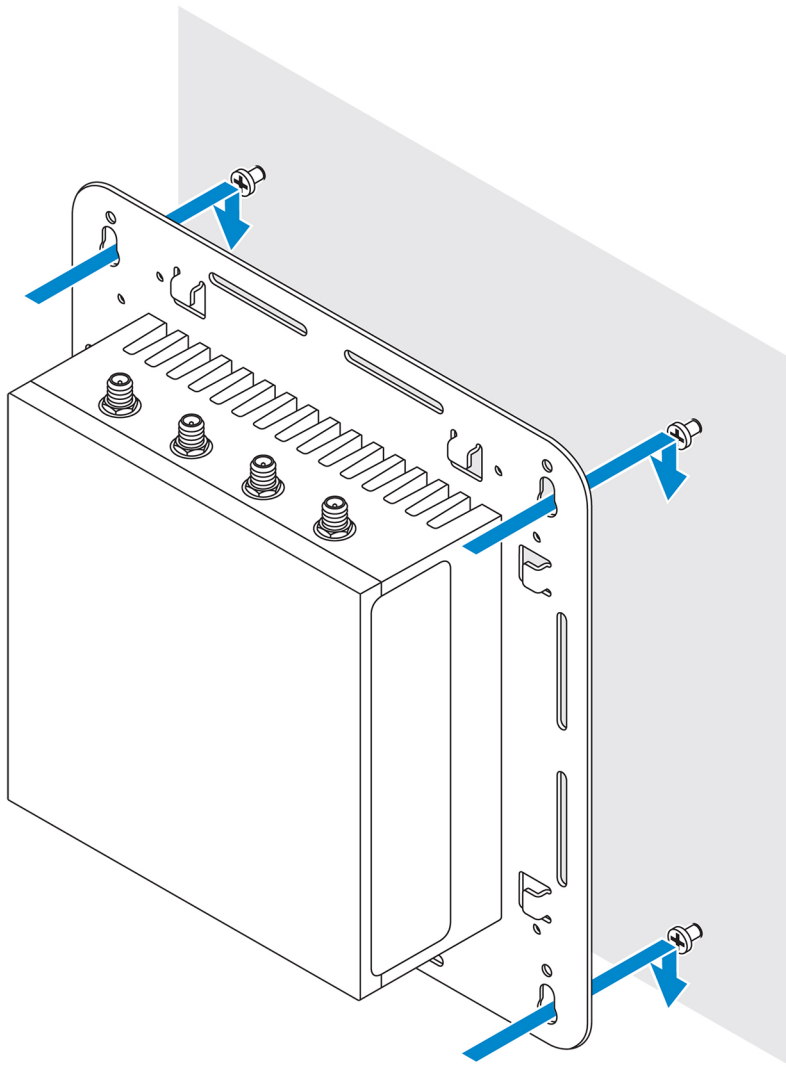


4. Drill four holes in the wall as marked.
5. Insert and tighten four screws (not supplied) to the wall.

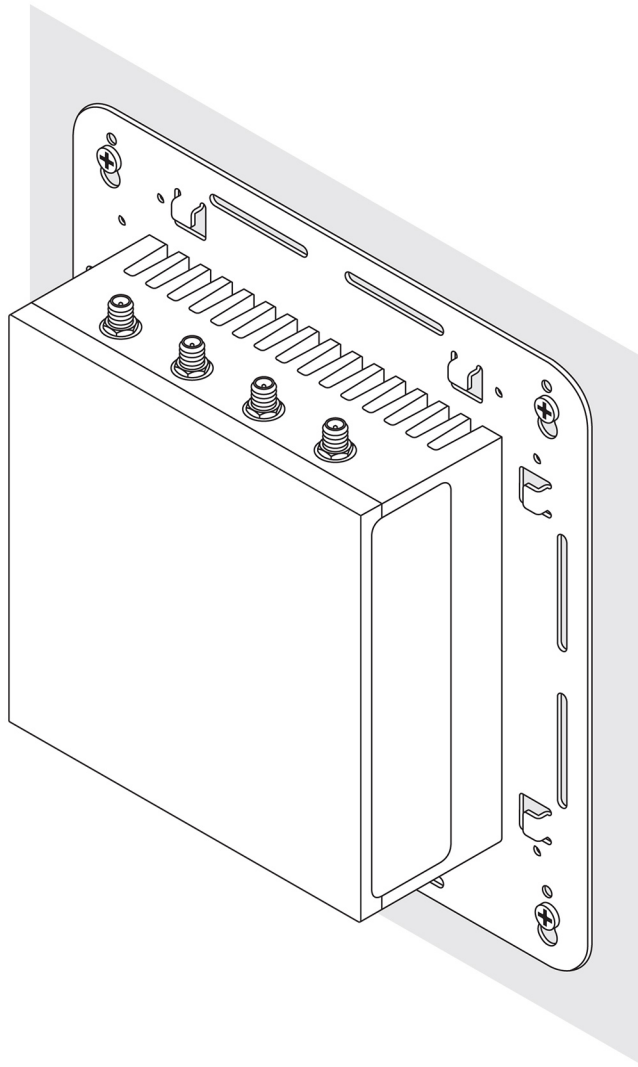
 **NOTE: Purchase screws that fit the diameter of the screw holes.**



6. Align the screw holes on the standard-mount bracket with the screws and place the Edge Gateway onto the wall.



7. Tighten the screws to secure the assembly to the wall.

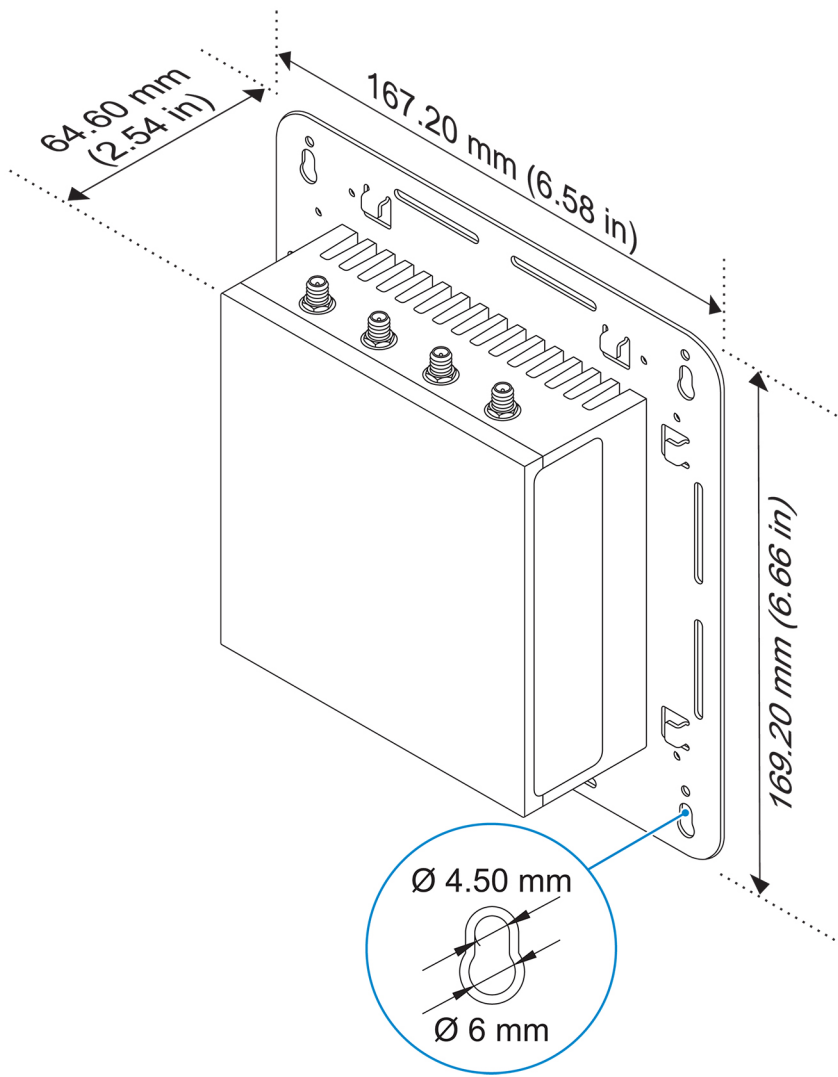


Mounting the Edge Gateway using quick-mount bracket

The quick-mount bracket is a combination of the standard-mount bracket and the DIN-rail bracket. It enables you to easily mount and demount the Edge Gateway.

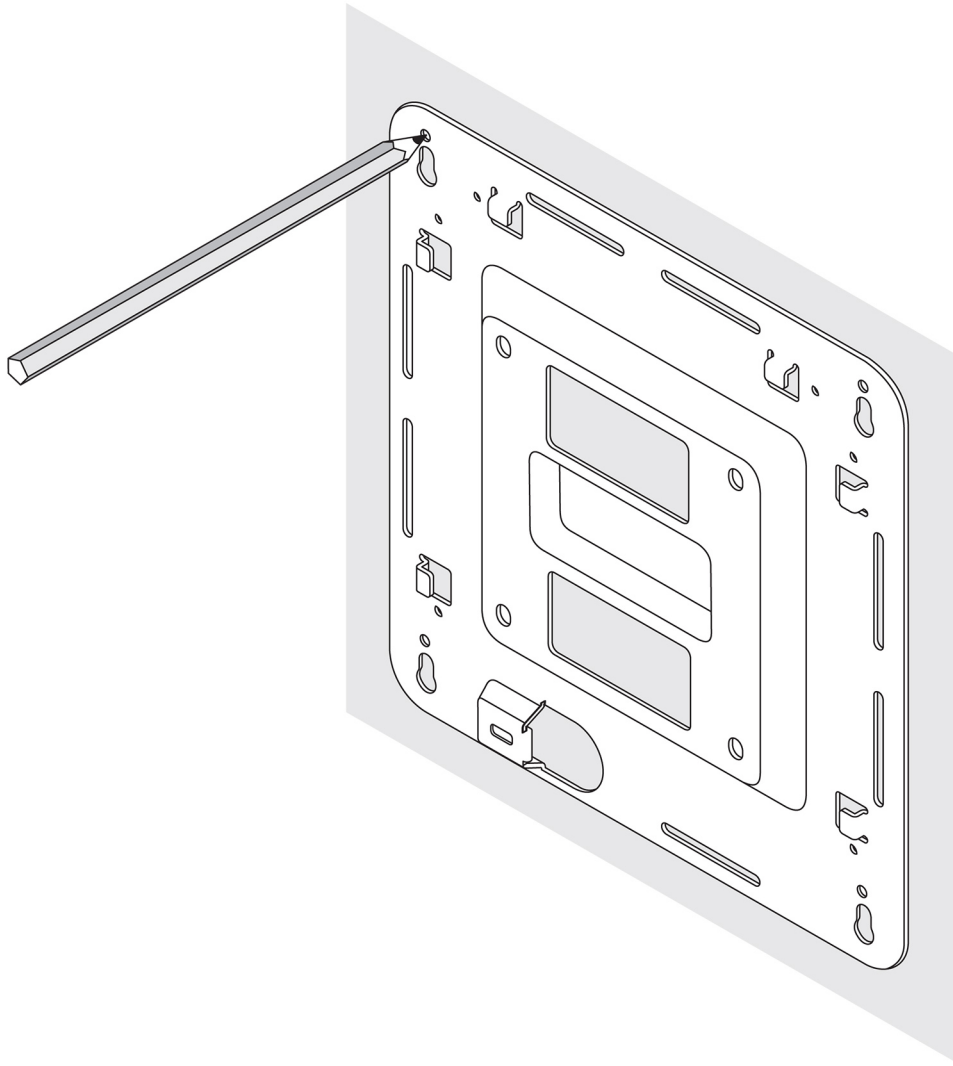
 **NOTE:** The mounting brackets are shipped with only those screws required for securing the mounting brackets to the Edge Gateway.

Mounting dimensions



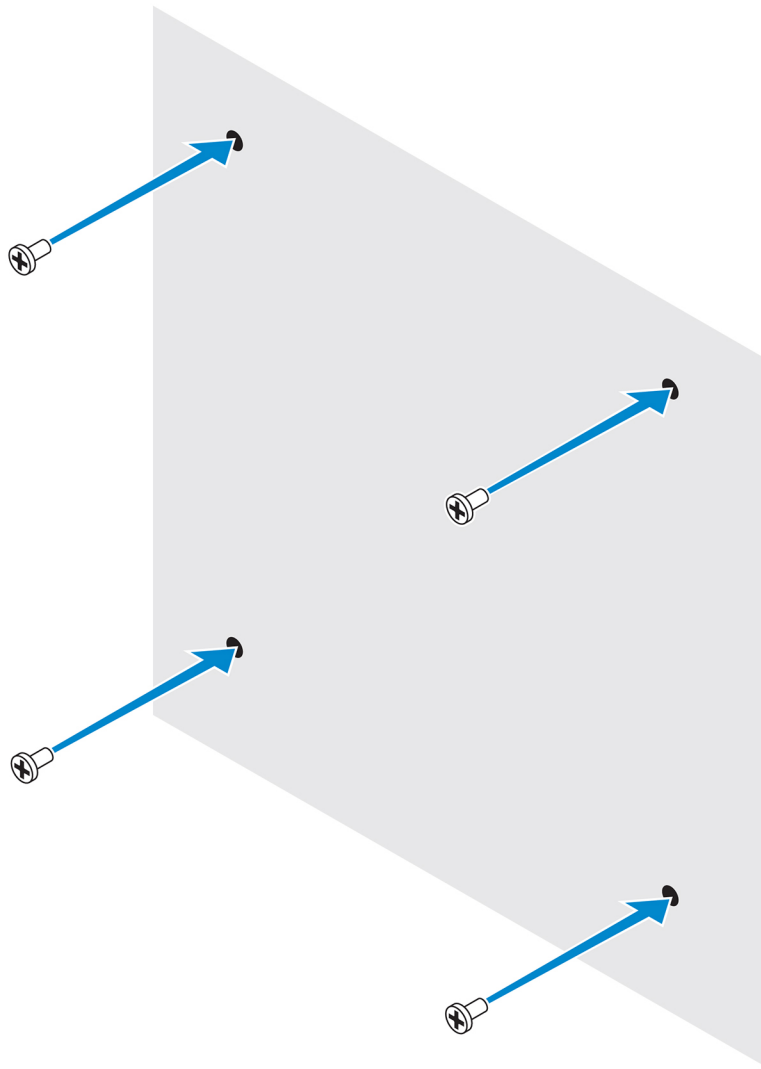
Mounting instructions

1. Place the standard-mount bracket on the wall, and using the holes above the screw holes on the bracket, mark the positions to drill the four holes.

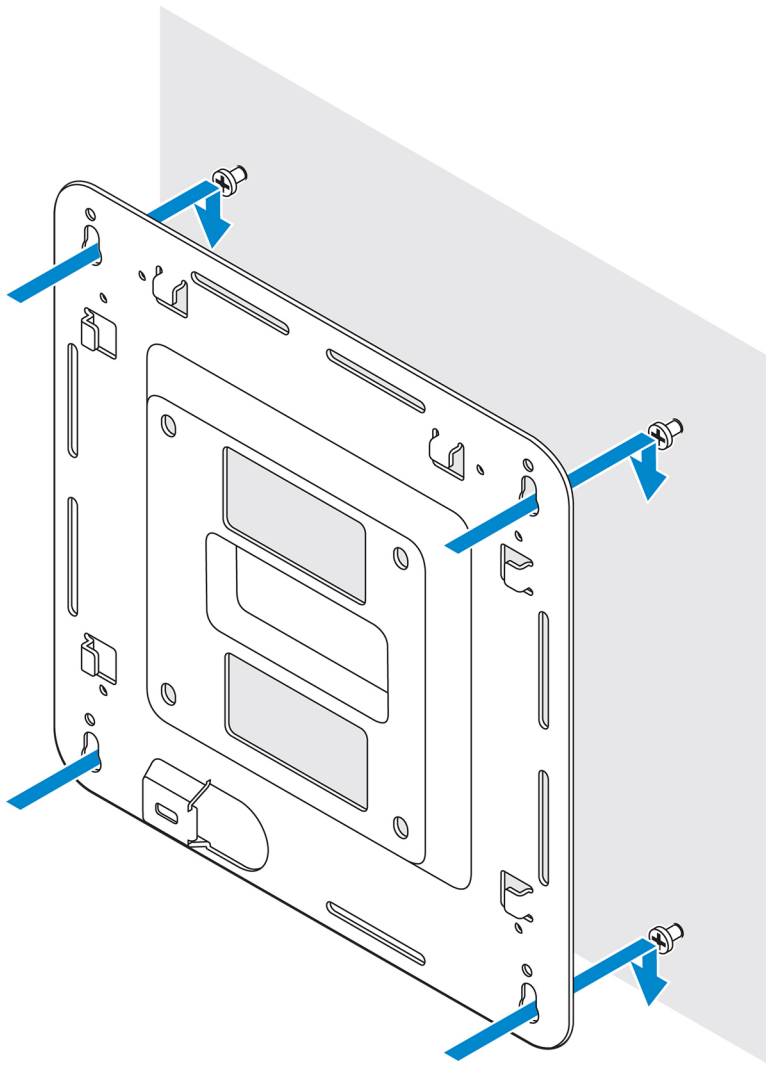


2. Drill four holes in the wall as marked.
3. Insert and tighten four screws (not supplied) to the wall.

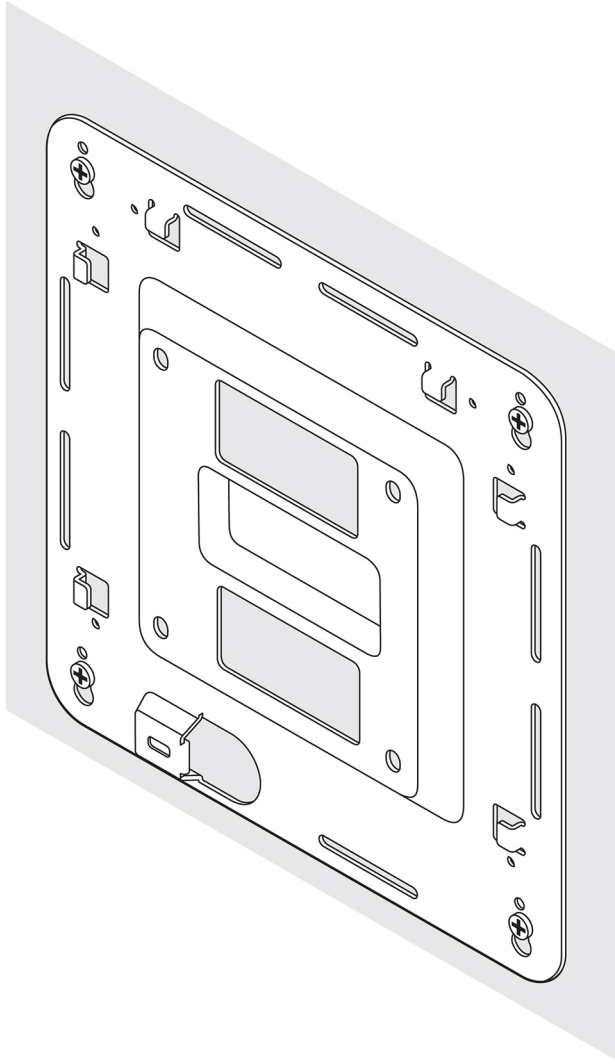
 **NOTE: Purchase screws that fit the diameter of the screw holes.**



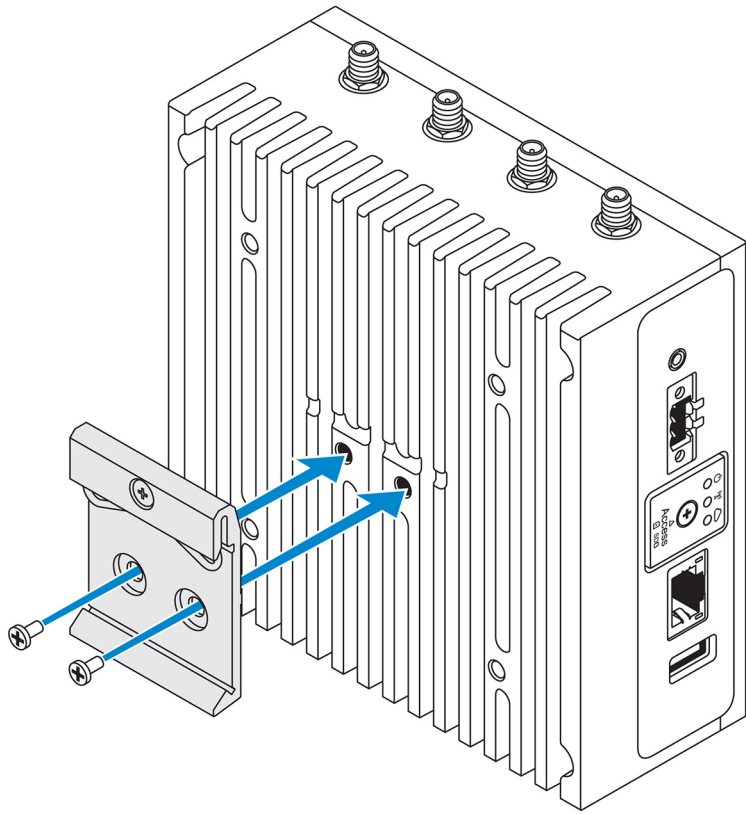
4. Align the screw holes on the standard-mount bracket with the screws on the wall, letting the bracket hang on the screws.



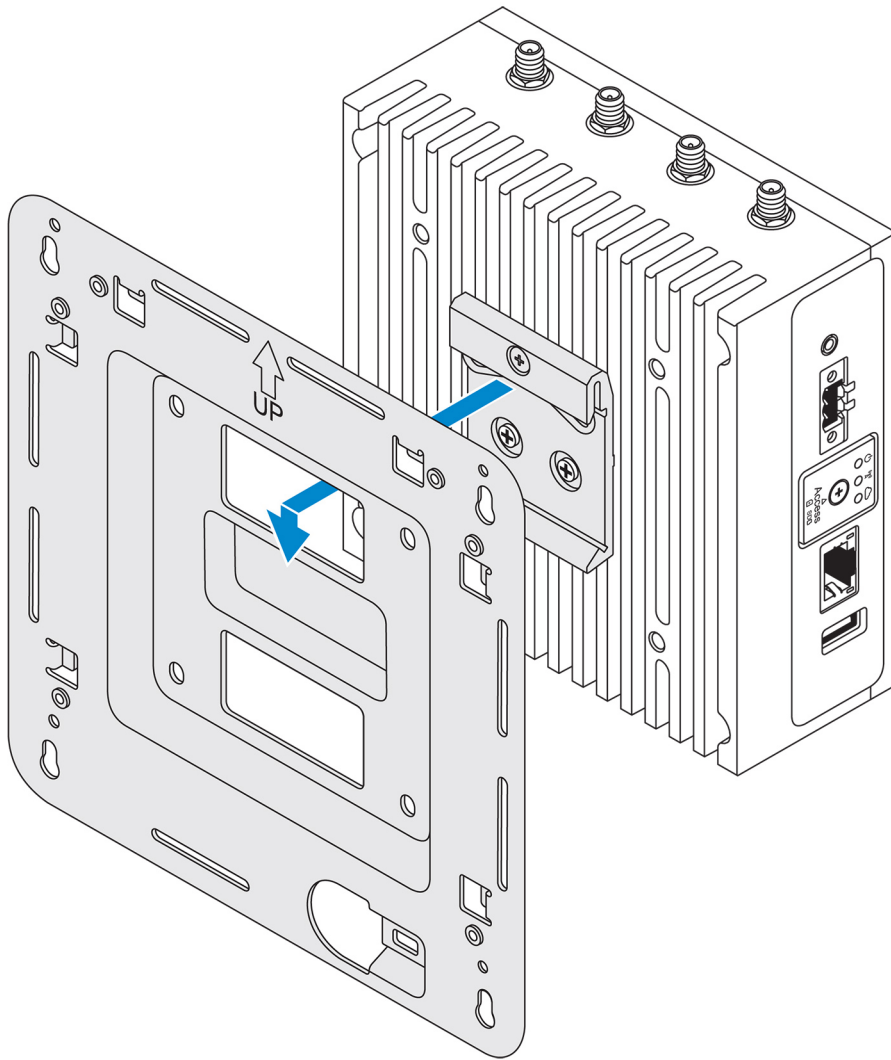
5. Tighten the screws to secure the assembly to the wall.



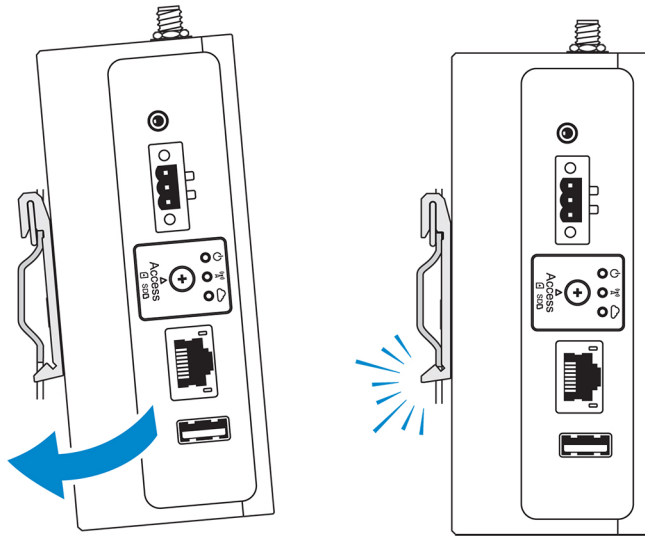
6. Align the screw holes on the DIN-rail bracket with the screw holes at the back of the Edge Gateway.
7. Place the two M4x7 screws on the DIN-rail bracket and secure it to the Edge Gateway.



8. Place the Edge Gateway on the standard mount at an angle, and then pull the Edge Gateway down to compress the springs at the top of the DIN-rail bracket.



9. Push the Edge Gateway towards the DIN-rail to secure it on the standard-mount bracket.

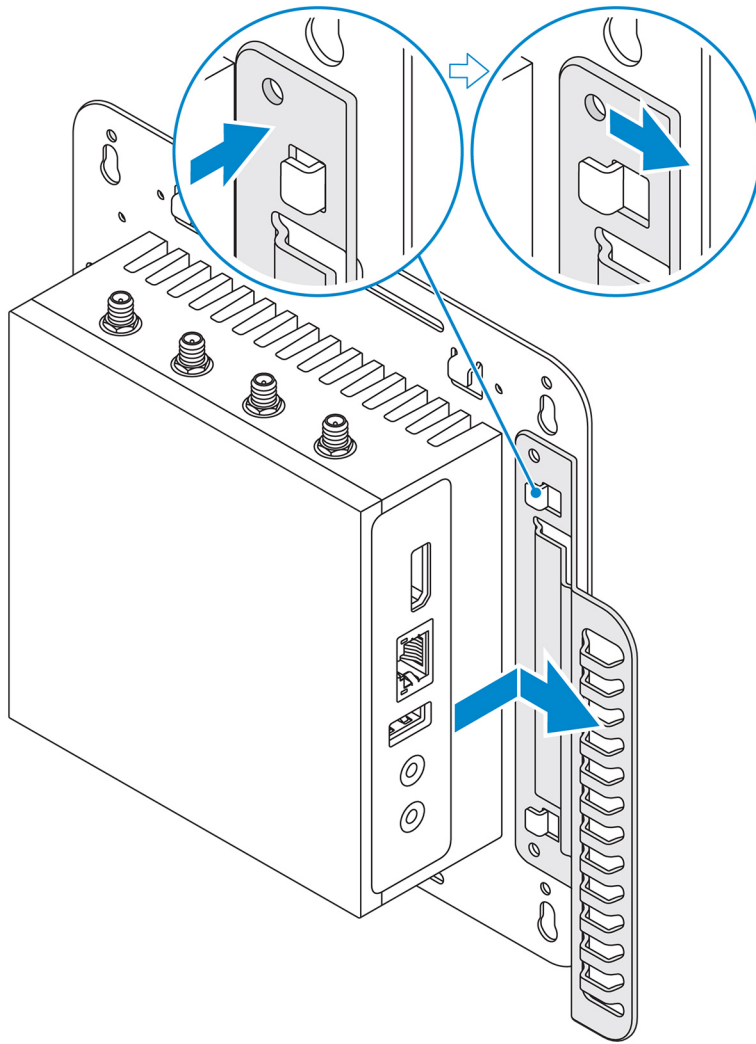


 **NOTE:** For more information about demounting the DIN-rail, see [Demounting DIN rail](#).

Attaching the cable control bars to the standard-mount bracket

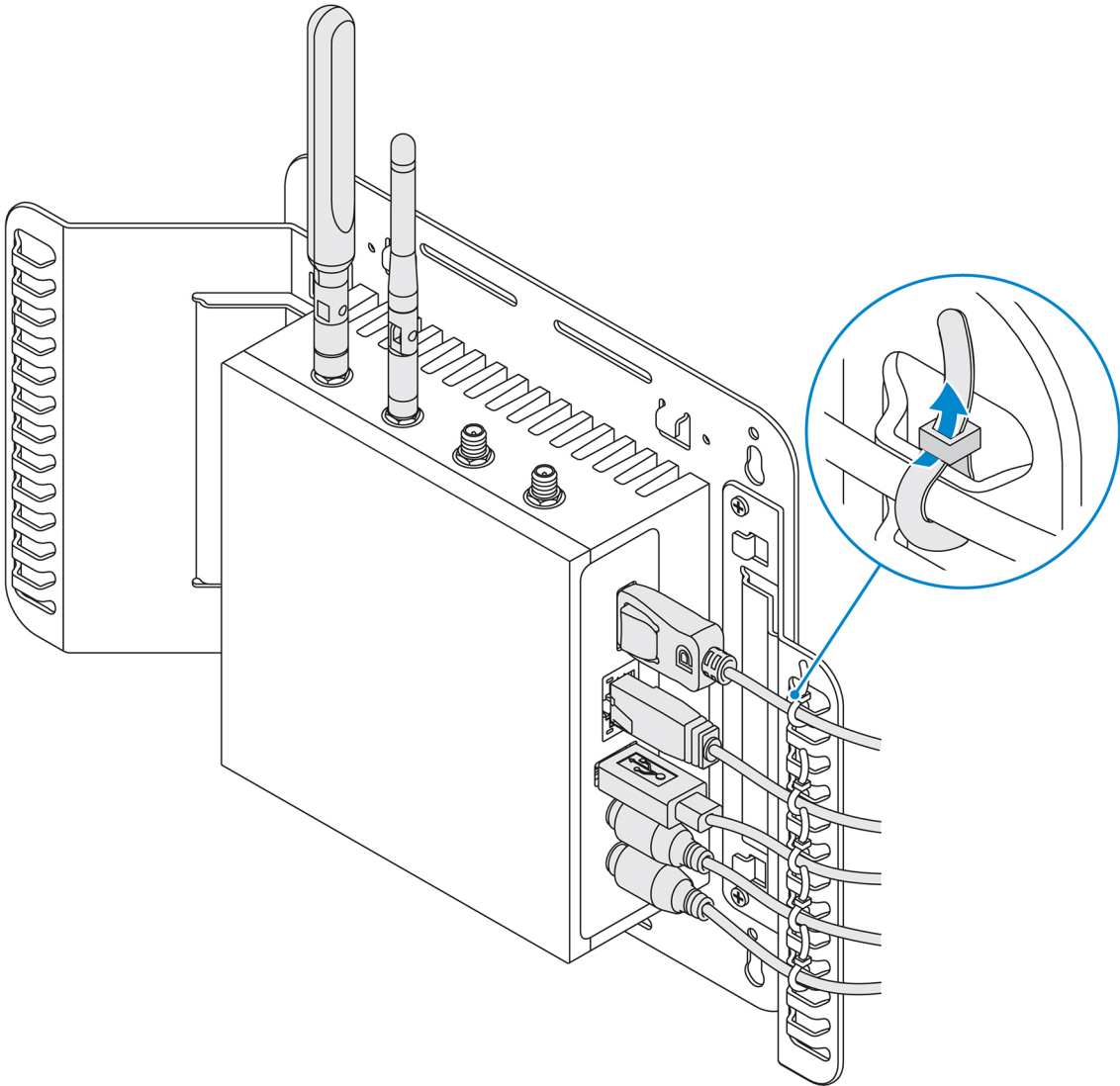
1. Mount the Edge Gateway on the wall using the [standard-mount bracket](#) or [quick-mount bracket](#).
2. Place the cable control bar on the mounting bracket and secure it to the notch.

 **CAUTION:** Use the top cable control bar only with coaxial cable connections. Do not use with antennas.

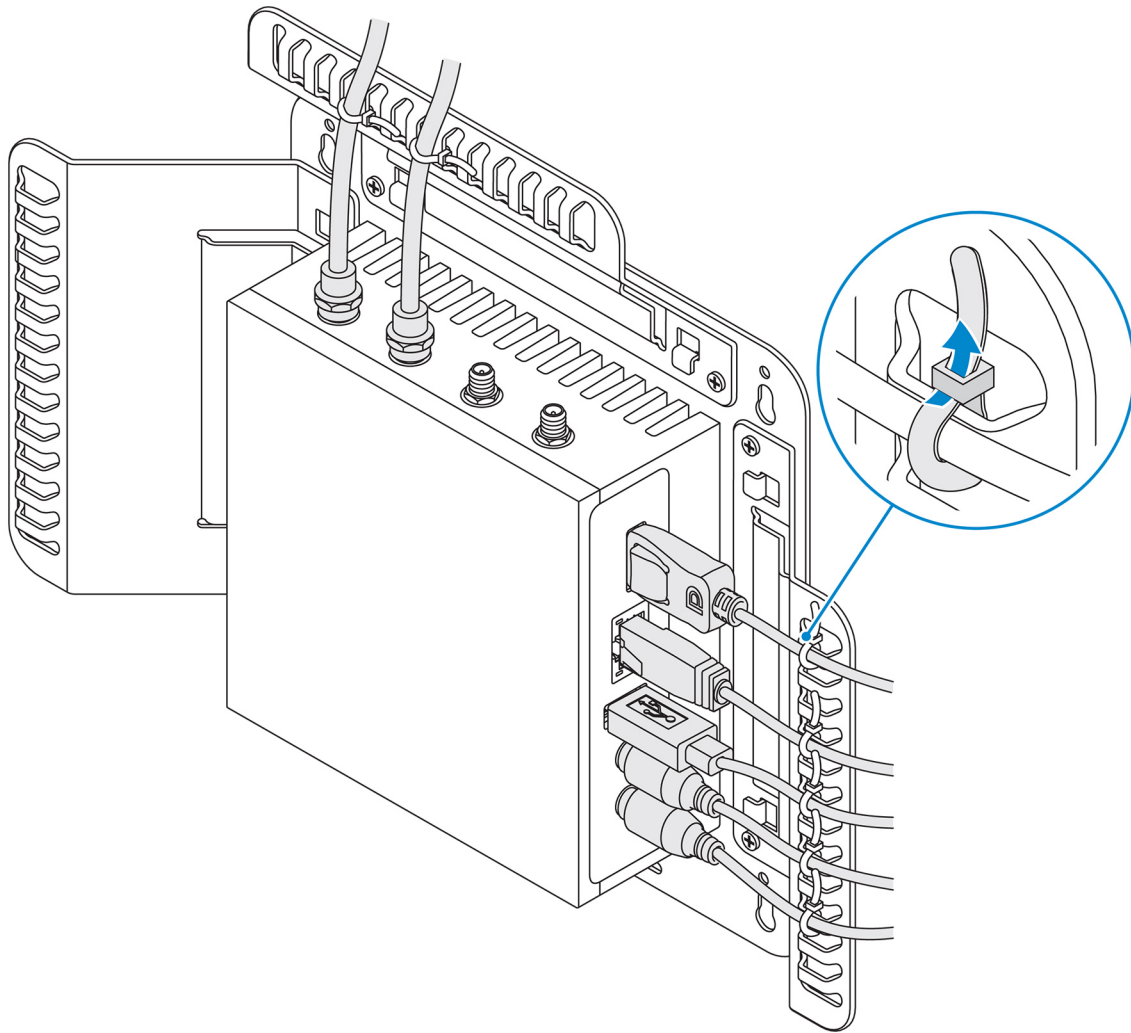


3. Align the screw holes on the cable control bar with the screw holes on the mounting bracket.
4. Tighten the six M3 x 3.5 mm screws that secure the cable control bar to the mounting bracket.

 **NOTE: Torque the screws at 5±0.5 kilograms-centimeter (11.02±1.1 pounds-inch).**



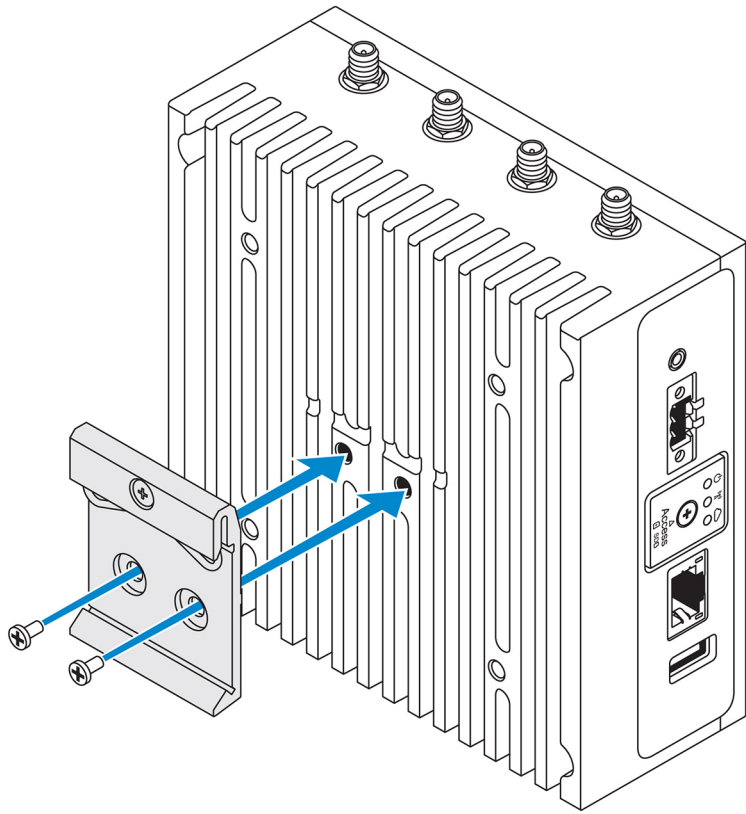
5. Connect the cables to the Edge Gateway.
6. Loop the cable lock (not supplied) to secure each cable to the cable control bar.



Mounting the Edge Gateway on a DIN rail using the DIN-rail bracket

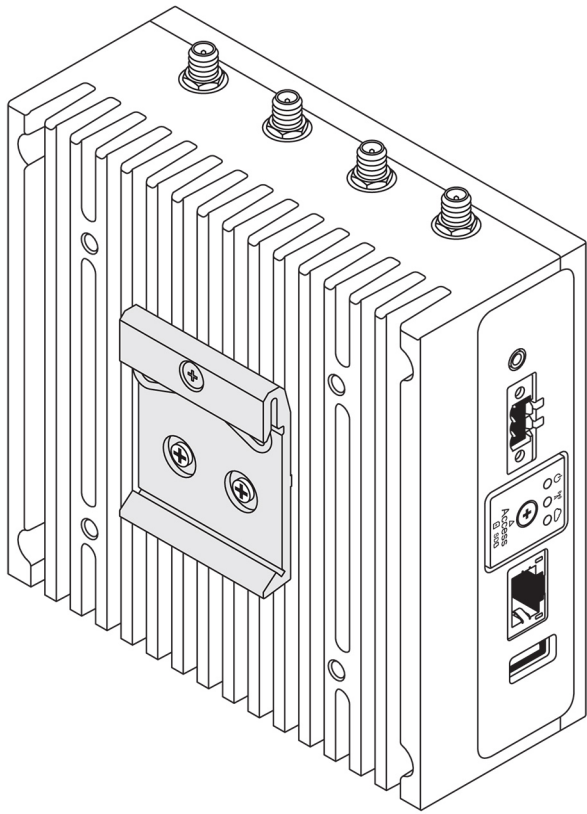
 **NOTE:** The DIN-rail bracket includes the screws that are required for securing the bracket to the Edge Gateway.

1. Align the screw holes on the DIN-rail bracket with the screw holes at back of the Edge Gateway.
2. Place the two M4x7 screws on the DIN-rail bracket and secure it to the Edge Gateway.

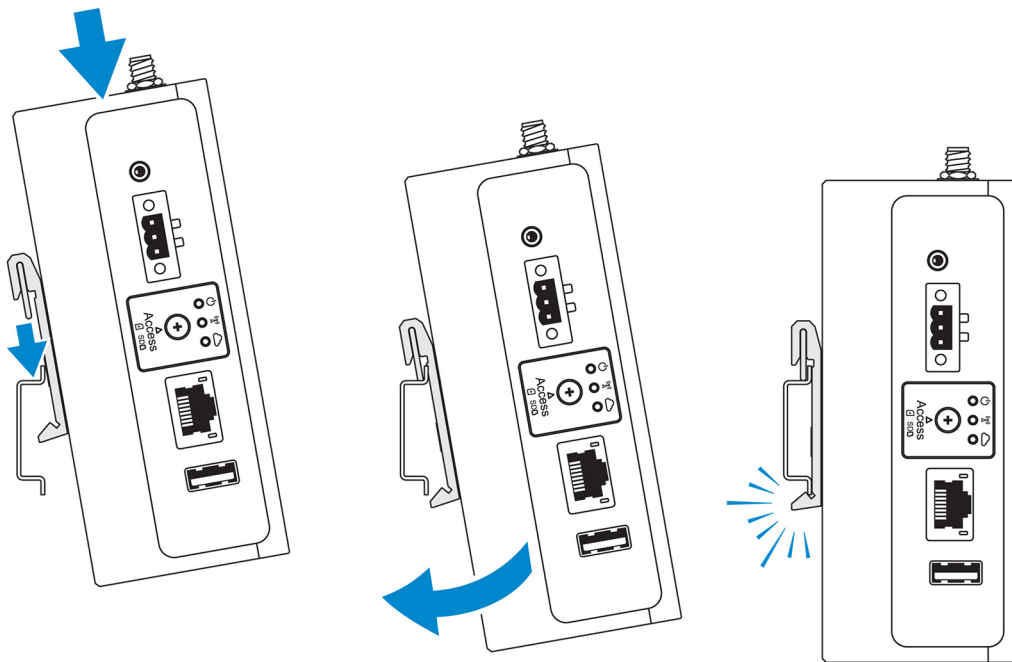


3. Secure the DIN-rail mounting bracket to the Edge Gateway using the two M4x7 screws provided.

 **NOTE: Torque the screws at 8 ± 0.5 kilograms-centimeter (17.64 ± 1.1 pounds-inch) on the DIN-rail mounting bracket.**





4. Place the Edge Gateway on the DIN rail at an angle, and then pull the Edge Gateway down to compress the springs at the top of the DIN-rail mounting bracket.
5. Push the Edge Gateway towards the DIN-rail to secure the lower clip of the bracket onto the DIN rail.



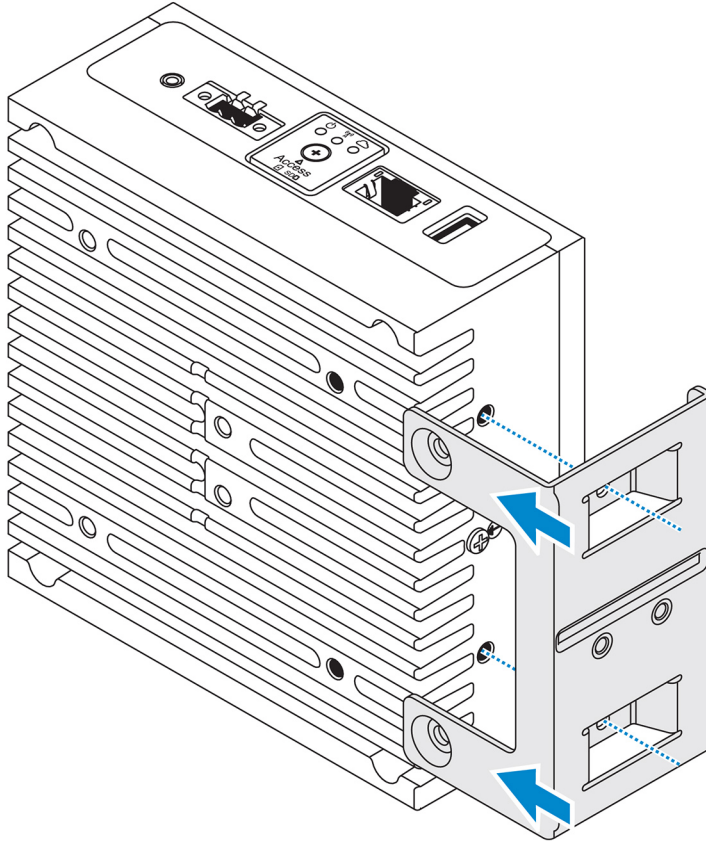
 **NOTE:** For more information about demounting the DIN-rail, see [Demounting DIN rail](#).

Mounting the Edge Gateway using the perpendicular mount

 **NOTE:** The perpendicular mount is designed for mounting in a DIN-rail only.

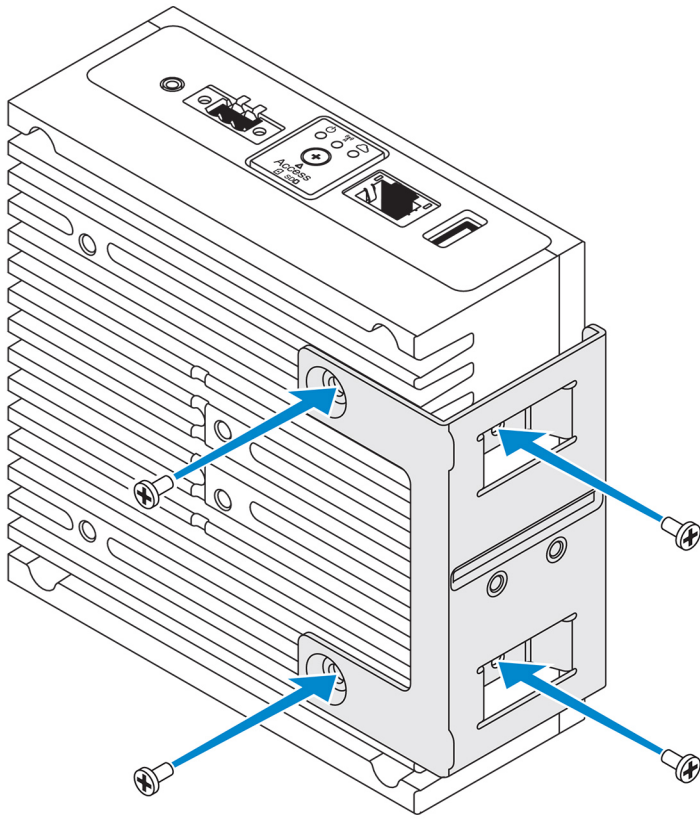
 **NOTE:** An open space of 63.50 mm (2.50 in) around the Edge Gateway is recommended for optimal air circulation. Ensure that the environmental temperature in which the Edge Gateway is installed does not exceed the operating temperature of the Edge Gateway. For more information about the operating temperature of the Edge Gateway, see the *Edge Gateway Specifications*.

1. Align the screw holes on the perpendicular-mount bracket with the screw holes on the Edge Gateway.



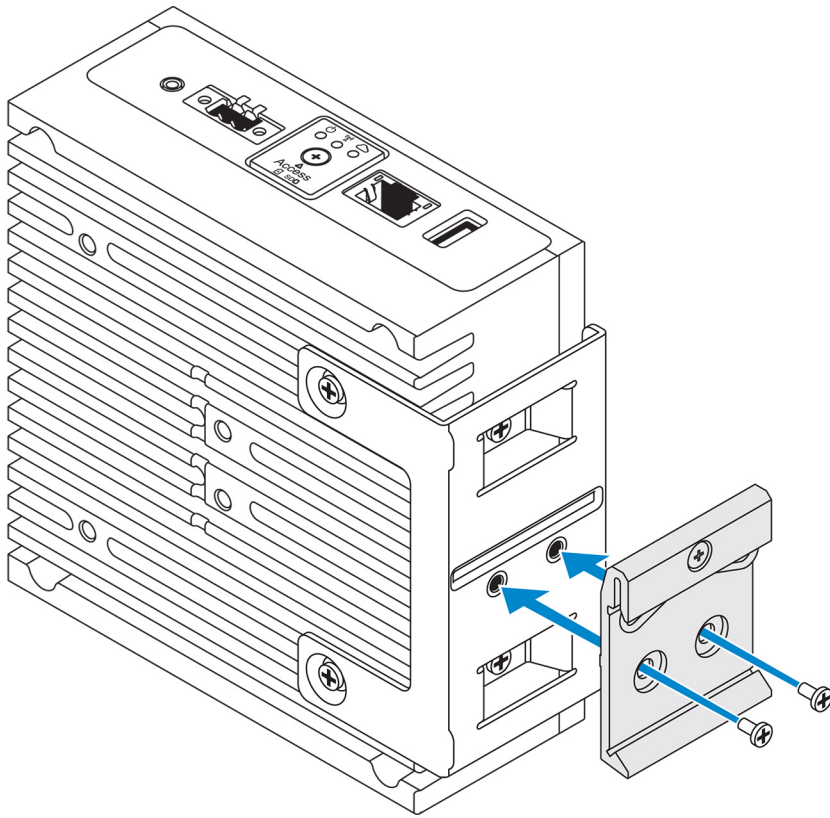
2. Tighten the four M4x7 screws to secure the Edge Gateway to the perpendicular-mount bracket.

 **NOTE:** Torque the screws at 8 ± 0.5 kilograms-centimeter (17.64 ± 1.1 pounds-inch).

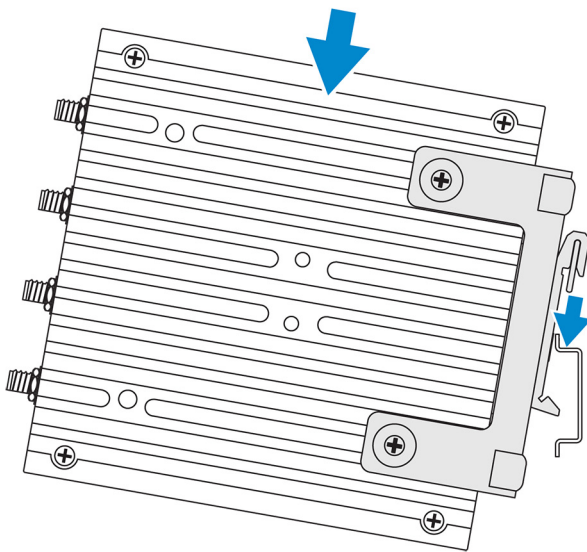


3. Align the screw holes on the DIN-rail mount bracket with the screw holes on the perpendicular-mount bracket, and tighten the two screws.

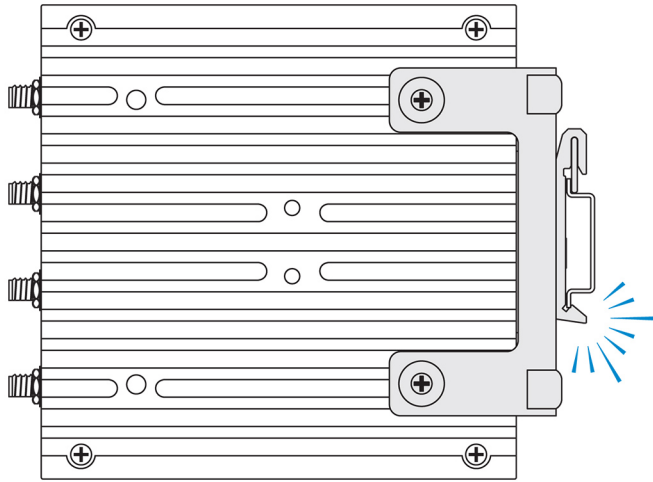
NOTE: Torque the screws at 8 ± 0.5 kilograms-centimeter (17.64 ± 1.1 pounds-inch).



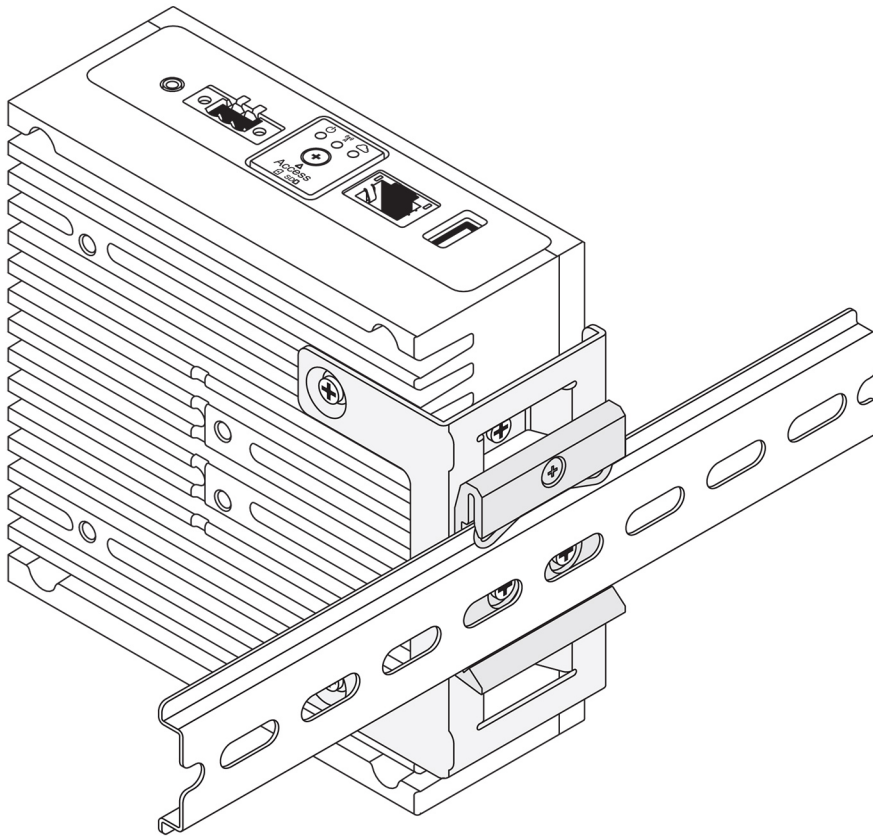
4. Place the Edge Gateway on the DIN rail at an angle and push the Edge Gateway down to compress the springs on the DIN-rail mount brackets.



5. Push the Edge Gateway towards the DIN-rail to secure the lower clip of the bracket onto the DIN rail.



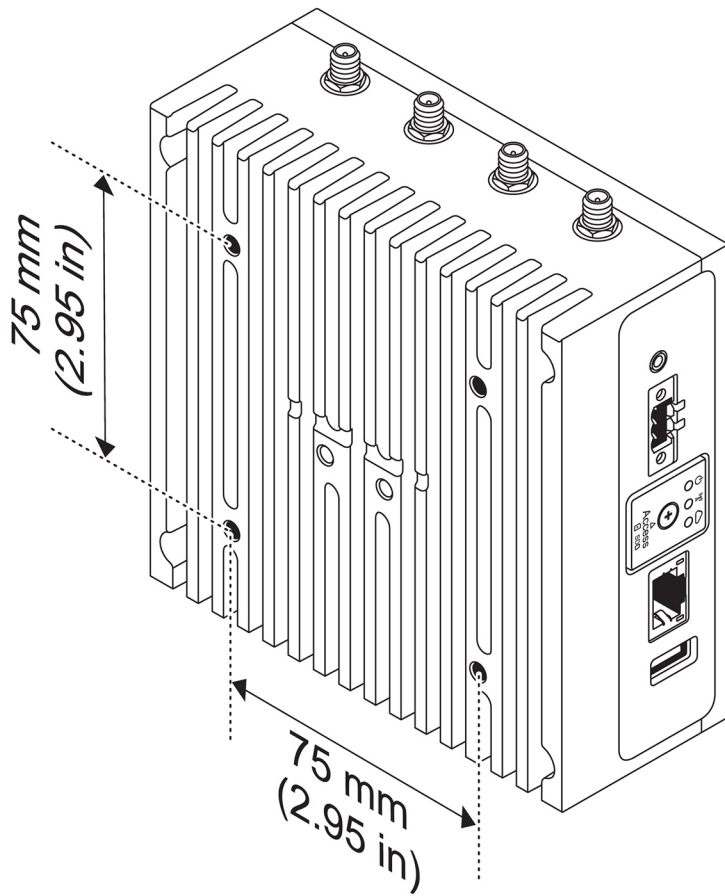
6. Secure the Edge Gateway on the DIN rail.



Mounting the Edge Gateway using a VESA mount

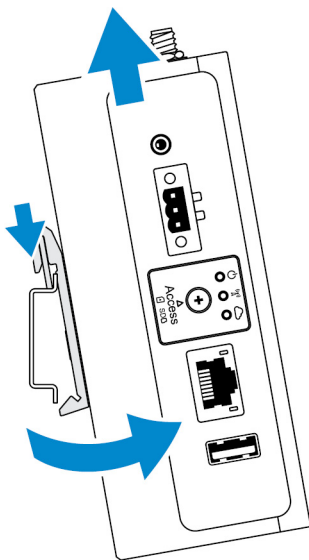
The Edge Gateway can be mounted on a standard VESA mount (75 mm x 75 mm).

NOTE: The VESA mount option is sold separately. For VESA mounting instructions, see the documentation that is shipped with the VESA mount.



De-mounting from DIN-rail bracket

1. Pull the Edge Gateway down to release from DIN-rail bracket.
2. Lift the Edge Gateway bracket off the DIN rail.



Setting up the operating system

 **CAUTION:** To prevent operating system corruption from sudden power loss, use the operating system to gracefully shut down the Edge Gateway.

The Edge Gateway is shipped with one of the following operating systems:

- Windows 10 IoT Enterprise LTSC 2016
- Ubuntu Core 16

 **NOTE:** For more information about Windows 10 operating system, see msdn.microsoft.com.

 **NOTE:** For more information about the Ubuntu Core 16 operating system, see www.ubuntu.com/desktop/snappy.

Windows 10 IoT Enterprise LTSC 2016

Overview

The Edge Gateway is shipped with Windows 10 IoT Enterprise LTSC 2016. For more information about Windows 10 operating system, see msdn.microsoft.com.

Boot up and login—Direct system configuration (Edge Gateway 3003 only)

 **NOTE:** Ensure that you have connected a display, keyboard, and mouse to the Edge Gateway before you login.

At first boot, you are not prompted for log-in credentials. Subsequent boots require you to log in. The default user name and password is `admin` (in lowercase).

 **NOTE:** The Edge Gateway 3003 can also be configured remotely.

Boot up and login—Remote system configuration (Edge Gateway 3001 and 3002)

 **NOTE:** Your computer must be on the same subnet as the Edge Gateway.

1. Connect a network cable from the Ethernet port one on the Edge Gateway to a DHCP-enabled network or router that provides IP addresses.

 **NOTE:** The first-time boot to Windows takes about five minutes for system configuration. Subsequent boots take approximately 50 seconds.

2. Using the MAC address provided on the front cover of the Edge Gateway, obtain the IP address through your network's DHCP server or through a network analyzer.
3. On the Windows computer, search for **Remote Desktop Connection** and launch the application.
4. Log in using the IP address or with the following details:
 - Computer name: `D+<Service Tag>`
 - User name: `admin`
 - Password: `admin`



 **NOTE:** Ignore any certification errors when connecting to your Edge Gateway.

Boot up and login—Static IP system configuration (Edge Gateway 3002 and 3003 only)

 **NOTE:** To help setup the Edge Gateway remotely, the static IP address of Ethernet port two on the Edge Gateway is set to the following values at the factory:

- IP address: 192.168.2.1
- Subnet mask: 255.255.255.0
- DHCP server: Not applicable

This allows you to connect your Edge Gateway either directly through a Windows computer (ad hoc), or a router or switch, which must have an IP of 192.168.2.x and subnet mask of 255.255.255.0.

1. On the Windows computer, search for **View network connections** in Control Panel.
2. In the list of network devices that appears, right-click the Ethernet adaptor that you want to connect to the Edge Gateway, then click **Properties**.
3. On the **Networking** tab, click **Internet Protocol Version 4 (TCP/IPv4)** → **Properties**.
4. Select **Use the following IP address**, then enter 192.168.2.x as the IP address (where x represents the last digit of the IP address, for example, 192.168.2.2).
5. Enter 255.255.255.0 as the subnet mask, then click **OK**.
6. Secure a network cable between Ethernet port two on the Edge Gateway and the configured Ethernet port on the computer. You can also connect through a router or switch, if on the same subnet.
7. On the Windows computer, launch **Remote Desktop Connection**.
8. Connect to the Edge Gateway using the IP address 192.168.2.1, and the username `admin` and password `admin`.

Restoring Windows 10 IoT Enterprise LTSC 2016

 **CAUTION:** These steps will delete all the data on your system.

When the operating system is restored to the factory image, all data on the system is deleted.

You can restore Windows 10 IoT Enterprise LTSC 2016 on the Edge Gateway using the recovery USB image. You can download and save the ISO recovery image file from www.dell.com/support. The recovery USB image resets the run-time image back to the factory image. For more information about creating the USB recovery image, see [Creating the USB flash drive](#).

1. Insert the USB flash drive into the USB port on the Edge Gateway.
2. Turn on the Edge Gateway.
The Edge Gateway boots to the USB flash drive automatically and installs Windows. The system turns off after the installation is complete.

 **NOTE:** The installation takes approximately 25 minutes to complete.

3. Remove the USB flash drive after the Edge Gateway turns off.

 **NOTE:** For setting up Remote Desktop Protocol (RDP), see [Remote System Configuration](#).

Restoring Windows 10 IoT Enterprise LTSC 2016 (Edge Gateway 3003)

 **CAUTION:** These steps will delete all the data on your system.

When the operating system is restored to the factory image, all data on the system is deleted.

You can restore Windows 10 IoT Enterprise LTSB 2016 on the Edge Gateway using the recovery USB image. You can download and save the ISO recovery image file from www.dell.com/support. The recovery USB image resets the run-time image back to the factory image. For more information about creating the USB recovery image, see [Creating the USB flash drive](#).

1. Connect a keyboard, mouse, and monitor to the Edge Gateway.
2. Insert the USB flash drive into the USB port on the Edge Gateway.
3. Turn on the Edge Gateway.

The Edge Gateway boots to the USB flash drive automatically and installs Windows. The system turns off after the installation is complete.

 **NOTE: The installation takes approximately 25 minutes to complete.**

4. Remove the USB flash drive after the Edge Gateway turns off. The operating system reinstallation is complete.

 **NOTE: For setting up Remote Desktop Protocol (RDP), see [Remote System Configuration](#).**

Creating the recovery USB flash drive

Prerequisites:

- A working computer on which you have administrator user rights and at least 8 GB of available data storage to download the Dell ISO recovery image.
- A blank USB flash drive with at least 8 GB of storage space.
- .NET Framework 4.5.2 or higher

1. Download and save the Dell ISO recovery image file from www.dell.com/support.
2. Download and install the Dell OS Recovery Tool on your computer.
3. Launch the **Dell OS Recovery Tool**.
4. Click **Yes** in the **User Account Control** prompt.
5. Connect the USB flash drive to the computer.
6. Click **Browse** and browse to the location where the Dell ISO recovery image file is saved.
7. Select the Dell ISO recovery image file and click **Open**.
8. Click **Start** to begin creating the bootable USB recovery media.

A message appears indicating that all the data on the USB flash drive will be lost. Ensure that you backup any existing data on the USB flash drive.

9. Click **Yes** to continue.
10. Click **OK** to complete.

Windows 10 IOT Enterprise LTSB 2016 basic functions

BIOS update

Download BIOS updates for the Edge Gateway from www.dell.com/support. The download includes an executable file that may be run from the local machine. For more information about updating the BIOS, see [Flashing the BIOS](#).

Watchdog Timer

The Watchdog Timer for Windows 10 IoT Enterprise LTSB 2016 is controlled through the BIOS setting. Enter the BIOS during boot by pressing F2.

The Watchdog Timer is enabled and disabled under the BIOS setting **Watchdog Timer**.

 **NOTE: For more information about BIOS settings on the Edge Gateway, see [Default BIOS settings](#).**

Cloud LED

 **NOTE: To utilize the Cloud LED, download the necessary tools and drivers from www.dell.com/support.**



One unique feature of the Edge Gateway 3000 Series is the *Cloud LED*. Cloud LED enables you to visually inspect the operational status of the Edge Gateway by looking at the display light on the left panel of the Edge Gateway.

To enable this feature, you must expose and program a GPIO register on the Edge Gateway.

Follow these steps to control the Cloud LED on the Edge Gateway:

1. Download the Cloud LED utility from www.dell.com/support.
2. Extract the following files:
 - a. DCSTL64.dll
 - b. DCSTL64.sys
 - c. DCSTL64.inf
 - d. DCSTL64.cat
 - e. CloudLED.exe

 **NOTE: These files must be in the same directory.**

3. Run the **CloudLED.exe** from Command Prompt or PowerShell with administrative rights. Run the following commands:
 - CloudLED.exe ON
 - CloudLED.exe OFF

TPM support

Windows 10 IoT Enterprise LTSC 2016 supports TPM 2.0. For more information about TPM resources, see technet.microsoft.com/en-us/library/cc749022.

System shutdown and restart

Click **Start** → **Power**, and then click **Restart** or **Shutdown** to restart or shutdown the Edge Gateway, respectively.

LAN and WLAN network configuration

In the **Search** box, type *Settings* and open the **Settings** window. Select **Network & Internet** to configure the network.

Bluetooth configuration

In the **Search** box, type *Settings* and open the **Settings** window. Select **Devices**, and then select **Bluetooth** from the menu on the left panel to configure the network.

WWAN (5815) network configuration

 **NOTE: Ensure that the micro-SIM card is already activated by your service provider before using it in the Edge Gateway. For more information, see [activate your mobile broadband service](#).**

Follow these steps after installing the micro-SIM card:

1. In the **Search** box, type *Settings* and open the **Settings** window.
2. Select **Network & Internet**.
3. Locate the WWAN connection in the Wi-Fi section and select the entry to connect and disconnect from the WWAN adapter.

Ubuntu Core 16

Overview

Ubuntu Core 16 is a Linux OS distribution that is an entirely new mechanism for managing IOT systems and its applications. For more information about Ubuntu Core 16 OS, see

- www.ubuntu.com/cloud/snappy

- www.ubuntu.com/internet-of-things

Prerequisites for setting up Ubuntu Core 16

Infrastructure

An active connection to the internet is needed to update the Ubuntu Core 16 operating system as well as applications (snaps).

Prior knowledge

- Prior knowledge of the following is necessary to setup the Ubuntu Core 16 operating system:
 - Unix/Linux commands
 - Serial communication protocol
 - SSH terminal emulators (for example, PuTTY)
 - Network settings (for example, proxy URL)

Boot up and log in (Direct system configuration—Edge Gateway 3003 only)

NOTE:

Turn on the Edge Gateway. The system sets up the operating system automatically and restarts multiple times to apply all the configurations. The system takes approximately one minute to boot to the operating system.

When prompted, log in using the default credentials. The default user name and password is `admin` (both lowercase), and the default computer name is the service tag.

For example;

```
Ubuntu Core 16 on 127.0.0.1 (tty1)
localhost login: admin
Password:
```

Boot up and log in (Remote system configuration—Edge Gateway 3001 and 3002)

1. Connect a network cable from Ethernet port one on the Edge Gateway to a DHCP-enabled network or router that provides IP addresses.
2. In your network's DHCP server, use the command `dhcp-lease-list` to obtain the IP address associated with the Edge Gateway's MAC address.
3. Setup an SSH session using an SSH terminal emulator (for example, native command-line `ssh` client on Linux or PuTTY on Windows).

NOTE: The SSH service is enabled by default on Ubuntu Core 16.

4. Enter the command `ssh admin@<IP address>`, followed by the default user name and password (`admin`, both lowercase).

For example;

```
lo@lo-Latitude-E7470:~$ ssh admin@10.101.46.209
admin@10.101.46.209's password:
```

Boot up and log in—Static IP system configuration (Edge Gateway 3002 and 3003 only)

This allows you to connect your Edge Gateway through a host computer, which must be on the same subnet.



 **NOTE: The static IP address of Ethernet port two on the Edge Gateway is set to the following values at the factory:**

- IP address: 192.168.2.1
- Subnet mask: 255.255.255.0
- DHCP server: Not applicable

1. On the host computer, configure the Ethernet adaptor that is connected to the Edge Gateway with a static IPv4 address under the same subnet. For example, set the IPv4 address to 192.168.2.x (where x represents the last digit of the IP address, for example, 192.168.2.2).

 **NOTE: Do not set the IPv4 address to the same IP address as the Edge Gateway. Use an IP address from 192.168.2.2 to 192.168.2.254.**

2. Set the subnet mask to 255.255.255.0.

Updating operating system and applications

After enabling the network connections and connecting to the internet, Dell recommends to have the latest OS components and applications installed. To update Ubuntu Core 16, run the `admin@localhost:~$ sudo snap refresh` command.

Viewing operating system and application versions

Running command,

```
admin@localhost:~$ sudo uname -a
```

returns

```
Linux ubuntu.localdomain 4.4.30-xenial_generic #1 SMP Mon Nov 14 14:02:48 UTC 2016 x86_64  
x86_64 x86_64 GNU/Linux
```

Running command,

```
admin@localhost:~$ sudo snap list
```

returns

Table 15. Operating system and application versions

Name	Date	Version	Developer
ubuntu-core	2015-10-13	7	ubuntu
bluez	2015-10-20	5.34-2	canonical
network-manager	2015-10-20	0.2	canonical
plano-uefi-fw-tools	2015-10-20	0.5	canonical
webdm	2015-10-20	0.9.2	canonical
plano-webdm	2015-10-20	1.7	canonical

 **NOTE: Check if a newer version of the software is available. For more information on checking for updates, see [Updating operating system and applications](#).**

Useful commands

To access the built-in help, run the `admin@localhost:~$ sudo snap --help` command.

To see a list of all the snaps that are currently installed, run the `admin@localhost:~$ sudo snap list` command.

Updating the system name

Run the following command:

```
admin@localhost:~$ network-manager.nmcli general hostname <NAME>
```

Changing the time zone

When the system arrives from the factory, the OS is usually set to the **UTC** time zone. To change the time zone to your location, run the command:

```
admin@localhost:~$ sudo timedatectl --help
* the help file above will tell you commands you need to know.
```

System reboot

Run the following command:

```
admin@localhost:~$ sudo reboot
```

Returns:

```
System reboot successfully
```

Root user credential

Run the following command:

```
admin@localhost:~$ sudo su -
```

Returns:

```
$ admin@localhost:~# sudo su -
$ root@localhost:~#
```

UEFI capsule update capability

 **NOTE:** For more information about fwupd commands, see www.fwupd.org/users.

This `fwupgmgr` tool or commands are used to update the UEFI BIOS on the system. The UEFI BIOS for this platform is released through online Linux Vendor File System (LVFS) based methods.

Dell recommends that you enable the UEFI Capsule update by default so that it is running in the background to keep the system BIOS up to date.

Updating BIOS without an internet connection on the Edge Gateway

Follow these steps to update the BIOS without an internet connection on the Edge Gateway:

1. Download the latest cab file from secure-lvfs.rhcloud.com/lvfs/devicelist.
2. Check the current BIOS details.

```
$ sudo uefi-fw-tools.fwupdmgr get-devices
```
3. Copy the firmware.cab file to `/root/snap/uefi-fw-tools/common/` folder.

```
$ sudo cp firmware.cab /root/snap/uefi-fw-tools/common/
```
4. Check the details of the BIOS from the .cab file.

```
$ sudo uefi-fw-tools.fwupdmgr get-details [Full path of firmware.cab]
```
5. Apply the update.

```
$ sudo uefi-fw-tools.fwupdmgr install [Full path of firmware.cab] -v --allow-older --allow-reinstall
```
6. Check the EFI boot details.

```
$ sudo efibootmgr -v
```
7. Restart the system.

```
$ sudo reboot
```



Updating BIOS with an internet connection on the Edge Gateway

Follow these steps to update the BIOS with an internet connection on the Edge Gateway:

1. Check the current BIOS details.
`$sudo uefi-fw-tools.fwupdmgr get-devices`
2. Check if the update is available from LVFS service.
`$sudo uefi-fw-tools.fwupdmgr refresh`
3. Download the BIOS from the [Dell.com/support](https://www.dell.com/support).
`$sudo uefi-fw-tools.fwupdmgr get-updates`
4. Apply the update.
`$sudo uefi-fw-tools.fwupdmgr update -v --allow-older --allow-reinstall`
5. Check the EFI boot details.
`$ sudo efibootmgr -v`
6. Restart the system.
`$ sudo reboot`

System Service Tag identity

Run the following command:

```
admin@localhost:~$ cat /sys/class/dmi/id/product_serial
```

The system tag is printed.

System identity

Run the following commands:

```
admin@localhost:~$ cat /sys/class/dmi/id/board_vendor
```

Returns:

```
Dell Inc.
```

System PowerOff

Run the following command:

```
admin@localhost:~$ sudo poweroff
```

The system shuts down successfully.

Network communication interfaces

The Edge Gateway 3000 series comes with an Ethernet connection, 802.11b/g/n wireless network connection, and Bluetooth network connection.

Ethernet (Port 1, eth0)

Assuming that you have an internet-enabled Ethernet cable plugged into Port1, your screen should be similar to the one below after running the `ifconfig` command. If the WLAN and Bluetooth are not configured, they are not displayed in the network device list.

```
admin@localhost:~$ ifconfig
```

After running the `ifconfig` command:u

```
eth0      Link encap:Ethernet HWaddr 74:e6:e2:e3:0f:12
          inet addr:192.168.28.216 Bcast:192.168.28.255    Mask:255.255.255.0
          inet6 addr: fe80::76e6:e2ff:fee3:f12/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
          RX packets:11 errors:0 dropped:0 overruns:0 frame:0
          TX packets:19 errors:0 dropped:0 overruns:0 carrier:0
          Collisions:0 txqueuelen:1000
```



```

lo          RX bytes:1740 (1.7 KB) TX bytes:2004 (3.0 KB)
           Link encap:Local Loopback
           inet addr:127.0.0.1 Mask:255.0.0.0
           inet6 addr: ::1/128 Scope:Host
           UP LOOPBACK RUNNING MTU:65536 Metric:1
           RX packets:160 errors:0 dropped:0 overruns:0 frame:0
           TX packets:160 errors:0 dropped:0 overruns:0 carrier:0
           Collisions:0 txqueuelen:1000
           RX bytes:13920 (13.9 KB) TX bytes:13920 (13.9 KB)

```

```
admin@localhost:~$
```

WLAN (wlan0)

Use these identifiers in the following examples:

- `<ssidname>` = `iotisvlab`, where `ssid` is the name of the access point.
- `<name>` = `testwifi`, where `name` is the connection name, which is basically a connection identifier.
- `<keytype>` = `wpa-psk`, where `keytype` is the WLAN key management security type being used.
- `<passco>` = `happy`, where `passco` is the WLAN passcode or password for the access point.

Enter the following at the command prompt to view the network interfaces.

```
$ network-manager.nmcli d
```

Enter the following at the command prompt to find a list of available access points.

```
$ network-manager.nmcli d wifi
```

Run the following commands and replace `$$SSID`, `$$PSK`, and `$$WIFI_INTERFACE` of your environment.

- Connect `$ sudo network-manager.nmcli dev wifi connect $$SSID password $$PSK ifname $WIFI_INTERFACE`
- OR
- `$ sudo network-manager.nmcli dev wifi connect $$SSID password $$PSK`
- Disconnect `$ sudo network-manager.nmcli dev disconnect $WIFI_INTERFACE`

Enter the following at the command prompt to add a connection to the system.

```
$>: network-manager.nmcli con add con-name <name> ifname wlan0 type wifi ssid <ssidname>
```

For example:

```
$>: network-manager.nmcli con add con-name testwifi ifname wlan0 type wifi ssid iotisvlab
```

Enter the following at the command prompt to provide the system with the passkey that is used on the access point.

```
$>: network-manager.nmcli con modify <name> wifi-sec.key-mgmt <keytype>
```

For example:

```
$>: network-manager.nmcli con modify testwifi wifi-sec.key-mgmt wpa-psk
```

Enter the following at the command prompt to provide the system with the passcode for the access point.

```
$>: network-manager.nmcli con modify <name> wifi-sec.psk <passco>
```

For example:

```
$>: network-manager.nmcli con modify testwifi wifi-sec.psk happy
```

Enter the following at the command prompt to bring up the connection (allows the system to connect to the access point and get an IP address).



```
$>: network-manager.nmcli con up id <name>
```

For example:

```
$>: network-manager.nmcli con up id testwifi
```

Bluetooth

Run the following commands to pair Bluetooth devices such as a Bluetooth keyboard:

1. Start the bluetoothctl console.

```
#bluez.bluetoothctl -a
```
2. Turn on the device.

```
$ power on
```
3. Register the agent for keyboard.

```
$ agent KeyboardOnly  
$ default-agent
```
4. Put the controller in pairable mode.

```
$ pairable on
```
5. Scan for nearby Bluetooth devices.

```
$ scan on
```
6. Stop scanning after the Bluetooth keyboard is found.

```
$ scan off
```
7. Pair Bluetooth devices.

```
$ pair <MAC address of Bluetooth keyboard>
```
8. Enter PIN code on the Bluetooth keyboard, if required.
9. Trust the Bluetooth keyboard.

```
$ trust <MAC address of Bluetooth keyboard>
```
10. Connect to the Bluetooth keyboard.

```
$ connect <MAC address of Bluetooth keyboard>
```
11. Close the bluetoothctl console.

```
$ quit
```

You can start using the Bluetooth keyboard.

Software enabled Access Point (SoftAP)

The Software enabled Access Point (SoftAP) feature depends on the Wi-Fi card and associated driver support to act as a wireless access point.

Run the following commands:

1. Check the access point status.

```
$ wifi-ap.status
```
2. By default, SoftAP is disabled. Turn on SoftAP.

```
$ wifi-ap.config set disabled=false
```
3. To secure the Wi-Fi access point with WPA2 personal, change two configuration items.

```
$ wifi-ap.config set wifi.security=wpa2 wifi.security-passphrase=Test1234
```

This enables WPA2 security with the passphrase set to Test1234.



NOTE: If the passphrase contains any special characters or space, ensure that it is added correctly. For example 'My WiFi', 'Pa\$\$word', or 'Alan's AP'.

Additional communication interfaces

Serial

The RS-232 and RS-422\485 LEDs default state is **OFF**, and is only **ON** when data is being transmitted. The device nodes are ordered by port position starting with the leftmost port being RS-232.

Table 16. Serial ports

Number	Port Type	Connector	Device Node
1	RS-232/RS-422/RS-485	Molex 90130-3210	COM3
2	RS-232/RS-422/RS-485	Molex 90130-3210	COM3

RS-232

Ready-to-use software to control or manipulate devices are not available from Dell.

Run the following commands to configure the RS-232 port:

1. Set to RS-232 from BIOS, which are in the BIOS script.

```
#Platcfg64E.efi 0x046F:0x0001
#Platcfg64E.efi 0x046F:0x0001
```

Alternatively, use the Dell Command | Configure (DCC) application to switch the BIOS configuration.

```
$ dcc.cctk -h --serial1
$ dcc.cctk --serial1
$ dcc.cctk --serial1=rs232
```

2. Set serial port mode.

```
$ sudo stty -F /dev/ttyXRUSB0 ispeed 115200 ospeed 115200 -echo -onlcr -ixon -ixoff
$ sudo stty -F /dev/ttyXRUSB1 ispeed 115200 ospeed 115200 -echo -onlcr -ixon -ixoff
```

3. Transfer or receive data between two ports (wired RS-232 between two serial ports on the device).

```
$ sudo su
$ echo abcdefg > /dev/ttyXRUSB0
```

Repeat the command to send data.

4. Receive data from another terminal by ssh from your computer.

```
$ ssh admin@<IP addr of caracalla>
(passwd: admin)
$ sudo su
$ cat /dev/ttyXRUSB1
```

Verify that the string is received correctly.

RS-422FD\RS-485FD

Ready-to-use software to control or manipulate the device is not available from Dell.

Run the following commands to configure the RS-422\RS-485 port:

1. Set to RS-422\RS-485 FD from BIOS, which are in the BIOS script.

```
#Platcfg64E.efi 0x0470:0x0003
#Platcfg64E.efi 0x0473:0x0003
```

Alternatively, use the Dell Command | Configure (DCC) application to switch the BIOS configuration

```
dcc.cctk -h --serial1
dcc.cctk --serial1
dcc.cctk --serial1=rs422
```



- Set serial port mode.


```
$ sudo stty -F /dev/ttyXRUSB0 ispeed 115200 ospeed 115200 -echo -onlcr -ixon -ixoff
$ sudo stty -F /dev/ttyXRUSB1 ispeed 115200 ospeed 115200 -echo -onlcr -ixon -ixoff
```
- Transfer or receive data between two ports (Wired RS422/485 FD between two serial ports on the device).


```
$ sudo su
$ echo abcdefg > /dev/ttyXRUSB0
```

Repeat the command to send data.
- Receive data from another terminal by ssh from your computer.


```
$ ssh admin@<IP addr of caracalla>
(passwd: admin)
$ sudo su
$ cat /dev/ttyXRUSB1
```

Verify that the string is received correctly.

RS-485HD

Run the following commands to configure the RS-485HD port:

- Set to RS-485 HD from BIOS, which are in the BIOS script.


```
Platcfg64E.efi 0x0471:0x0002
Platcfg64E.efi 0x0474:0x0002
```

Alternatively, use the Dell Command | Configure (DCC) application to switch the BIOS configuration

```
dcc.cctk -h --serial1
dcc.cctk --serial1
dcc.cctk --serial1=rs485
```
- Set serial port mode.


```
$ sudo stty -F /dev/ttyXRUSB0 ispeed 115200 ospeed 115200 -echo -onlcr -ixon -ixoff
$ sudo stty -F /dev/ttyXRUSB1 ispeed 115200 ospeed 115200 -echo -onlcr -ixon -ixoff
```
- Transfer or receive data between two ports (Wired RS485 HD between two serial ports on the device).


```
$ sudo su
$ echo abcdefg > /dev/ttyXRUSB0
```

Repeat the command to send data.
- Receive data from another terminal by ssh from your computer.


```
$ ssh admin@<IP addr of caracalla>
(passwd: admin)
$ sudo su
$ cat /dev/ttyXRUSB1
```

Verify that the string is received correctly.

ZigBee

The Silicon Labs ETRX3587HR-D1 module is used in the Edge Gateway. This feature is only supported if hardware module is present, and the operating system provides the capability of mutual communication between user space application and physical module. If there is a specific ZigBee programming requirement of user mode application, contact the hardware provider of that module for the API documentation.

Security

Trusted Platform Module (TPM)

 **NOTE:** For more information about the Trusted Platform Module, see <https://developer.ubuntu.com/en/snappy/guides/security-whitepaper/>.

TPM is supported only on devices that have TPM hardware, and for those products which offer Snappy enhanced security support. The TPM on/off setting is configurable in the BIOS and manageable in the operating system.

Running command:

```
admin@localhost:~$ ls /dev/tpm0
```

If TPM is turned off, the device node (/dev/tpm0) does not exist.

```
(plano)ubuntu@localhost:~$ ls /dev/tpm0
ls: cannot access /dev/tpm0: No such file or directory
```

If TPM is turned on, the device node (/dev/tpm0) exists.

```
(plano)ubuntu@localhost:~$ ls /dev/tpm0
/dev/tpm0
```

Watchdog Timer (WDT)

 **NOTE:** For more information about Watchdog Timer (WDT) commands, see www.sat.dundee.ac.uk/~psc/watchdog/Linux-Watchdog.html.

Dell recommends that you enable the WDT by default to activate the fail-safe circuitry. Snappy, a WDT-compatible operating system provides the capability to detect and recover the system from malfunctions or unexpected crashes.

Running command:

```
admin@localhost:~$ systemctl show | grep -i watchdog
```

Returns:

```
RuntimeWatchdogUsec=10s
ShutdownWatchdogUsec=10min
```

 **NOTE:** The default value is 10. The actual value should be greater than 0.

Recovery partition

You can restore Ubuntu Core 16 on the Edge Gateway using the recovery operating system image on the recovery partition.

Recovery partition in core operating system

Perform the following steps to trigger the recovery partition:

1. Connect the Edge Gateway remotely or through a KVM session.
2. Login to the operating system.
3. Run the following command to trigger native eMMC recovery partition.

```
$ sudo efibootmgr -n $(efibootmgr | grep "factory_restore" | sed 's/Boot//g' | sed 's/[^0-9A-B]*/g') ; reboot
```

 **CAUTION:** Performing this step deletes all the data on your system.

Recovery partition during BIOS POST

Perform the following steps to trigger operating system recovery:

1. Connect the keyboard to the Edge Gateway.
2. Turn on the system.
3. Press Ctrl+F to trigger the operating system recovery.
4. When the Cloud LED starts to blink, press “Y” and then “Enter”.

 **CAUTION:** Performing this step deletes all the data on your system.

The system will restart if there is no input provided in 30 seconds.



System will restart after the operating system restoration is complete. This takes approximately 2 minutes.

Recovery partition in boot menu (Edge Gateway 3003 only)

Perform the following steps to trigger the recovery partition in boot menu:

1. Connect a keyboard to the Edge Gateway.
2. Turn on the system.
3. Press F12 when the Dell logo is displayed on the screen to enter the boot menu.
4. Select `Factory Restore` from the boot menu.
5. When prompted `Factory Restore will delete all user data, are you sure? [Y/N]`, press `Y`.

 **CAUTION: Performing this step deletes all the data on your system.**

Flashing a new OS image

Prerequisites

- USB flash drive with a minimum capacity of 4 GB
- Ubuntu Desktop ISO

 **NOTE: You can download the latest version of the Ubuntu Desktop ISO file from <http://releases.ubuntu.com>.**

- A released Ubuntu Core 16 image from Dell.com/support: `<unique name-date> img.xz`
- LCD monitor
- USB keyboard
- USB mouse
- DisplayPort cable
- Ubuntu workstation with Ubuntu Desktop 14.04 or higher

Flashing new Ubuntu OS image

1. Insert a USB flash drive into the Ubuntu Desktop workstation.
2. Copy `<unique name-date>img.xz` to `~/Downloads/` directory.
3. Flash the installation image to USB flash drive.
 - a. Start the **Terminal** application. It can be found by typing `Terminal` in the Unity Dash.

 **CAUTION: The `dd` command erases the content of the drive it writes to.**

- b. Type the following command and press Enter.

```
xzcat /cdrom/<unique name-date> img.xz | sudo dd  
of=/dev/sdb bs=32M ; sync
```

 **NOTE: The `sdb` may have to be replaced with the actual name of the drive on the system.**

4. Unmount and remove the USB flash drive.
5. Connect the power, keyboard, monitor, and Ethernet cable to your Edge Gateway.
6. Insert the USB flash drive into your Edge Gateway.
7. Turn on and boot up the Edge Gateway from the USB flash drive.

The installation USB flash drive flashes the Ubuntu Core 16 installation image into storage automatically. After the installation is complete, the system shuts down.
8. Remove the USB flash drive.
9. Restart the system.

Ubuntu Core 16 is installed on your Edge Gateway.

Edge Gateway CAN module functionality—Edge Gateway 3002 only

An Atmel CAN module is integrated on the Edge Gateway. The CAN module is enumerated to the operating system as a USB CDC Class device. Currently, there is no software natively installed on the Edge Gateway that communicates with the CAN module.

For information about using the CAN module, see the documentation available at www.atmel.com.



BIOS and UEFI

BIOS overview

The BIOS enables enterprise class security and manageability. You can use Dell Command | Configure (DCC) and Edge Device Manager (EDM) to configure the BIOS settings on the Edge Gateway.

DCC is a factory-installed application in the Edge Gateway that helps to configure the BIOS settings. It consists of a Command Line Interface (CLI) to configure various BIOS features.

EDM enables you to perform remote management and system configuration. By using the EDM cloud console, you can view and configure the BIOS settings. For more information about the EDM, see www.dell.com/support/home/us/en/19/product-support/product/wyse-cloud-client-manager/research.

Accessing BIOS

1. Connect to the Edge Gateway remotely on a Windows computer.
For more information about connecting to the Edge Gateway, see [Remote system configuration](#) for Edge Gateway 3001 and 3002, and [Direct system configuration](#) for Edge Gateway 3003.
2. Access Dell Command | Configure.
 - On Windows: Click **Start** → **All Programs** → **Command Configure** → **Dell Command | Configure Wizard**.
 - On Ubuntu Core 16: On the connected computer running Ubuntu Core, access Dell Command | Configure using the command `dcc.cctk`.

For more information on how to use the Dell Command | Configure application, see the Dell Command | Configure *Installation Guide* and *User's Guide* at www.dell.com/dellclientcommandsuite/manuals.

For more information about BIOS settings on the Edge Gateway, see [Default BIOS settings](#).

Flashing BIOS

The procedure to update the BIOS varies depending on the operating system installed.

Windows 10 IoT Enterprise LTSC 2016

Update the BIOS using the following methods:

- USB flash drive
- USB Invocation Script
- Dell Command | Configure (DCC)
- Edge Device Manager (EDM)

USB flash drive

Prerequisites

- BIOS file. Download the file from www.dell.com/support.
- USB 2.0 or USB 3.0 flash drive with minimum capacity of 4 GB.

Follow these steps to update the BIOS:

1. Turn off the Edge Gateway.
2. On a separate computer, extract the BIOS update file that you downloaded from www.dell.com/support.
3. Open the extracted file folder **Edge_Gateway3000_1.x.x**, where **x . x** is the BIOS version.
4. Copy the BIOS update file, **Edge_Gateway3000_1.x.x.exe**, to a USB flash drive.
5. Insert the USB flash drive in one of the available USB ports on the Edge Gateway.
6. Turn on the Edge Gateway.
7. Press F12 when the system is starting up to enter the one-time boot screen.
8. On the one-time boot screen, choose **Flash the BIOS** .
9. In the next screen, select the BIOS file (**Edge_Gateway3000_1.x.x.exe**) on the USB key.
10. Start the flash process.

USB invocation script

The Edge Gateway 3000 Series come in headless configurations—that is, configurations without any video output. Certain basic system administration tasks traditionally accomplished by the BIOS Setup program are not possible without video. Hence, to perform these system administration tasks, Edge Gateways contain a facility for running an invocation script of BIOS commands from a USB flash drive.

For more information about USB invocation script, see *Edge Gateway USB script utility User's Guide* at www.dell.com/support/manuals.

Dell Command | Configure (DCC)

Use DCC to update and configure the BIOS settings.

For more information on how to use DCC, see the *DCC Installation Guide* and *User's Guide* at www.dell.com/dellclientcommandssuite/manuals.

For more information about BIOS settings on the Edge Gateway, see [Default BIOS settings](#).

Edge Device Manager (EDM)

BIOS can be updated remotely through the EDM console connected to a remote system.

For more information about EDM, see www.dell.com/support/home/us/en/19/product-support/product/wyse-cloud-client-manager/research.

Ubuntu Core 16

Update the BIOS using the following methods:

- UEFI capsule update
- Dell Command | Configure (DCC)
- Edge Device Manager (EDM)

UEFI capsule update

The fwupgmr tool or commands are used to update UEFI BIOS firmware on the system.

For more information about UEFI capsule update methods, see [UEFI capsule update capability](#).

Dell Command | Configure (DCC)

Use DCC to update and configure the BIOS settings.

For more information on how to use DCC, see the *DCC Installation Guide* and *User's Guide* at www.dell.com/dellclientcommandssuite/manuals.



For more information about BIOS settings on the Edge Gateway, see [Default BIOS settings](#).

Edge Device Manager (EDM)

BIOS can be updated remotely through the EDM console connected to a remote system.

For more information about EDM, see www.dell.com/support/home/us/en/19/product-support/product/wyse-cloud-client-manager/research.

System configurations and specifications

Dimensions and weight

Product

Table 17. Product

Height	125 mm (4.92 in)
Width	125 mm (4.92 in)
Depth	51 mm (2 in)
Weight	1 kg (2.20 lb)
Volume	0.80 L

Packaging

 **NOTE: The packaging weight includes the total weight of the Edge Gateway and four antennas.**

Table 18. Packaging

Height	262 mm (10.32 in)
Width	139 mm (5.47 in)
Depth	241 mm (9.49 in)
Shipping weight (includes packaging materials)	1.71 kg (3.77 lb)

Mounting dimensions

 **NOTE: Mounting dimensions includes the dimensions of the Edge Gateway and various mounting options.**

 **NOTE: Each mounting option is sold separately.**

Table 19. Mounting dimensions

	Standard mount	Quick mount	Quick mount and cable control bars	DIN mount	Perpendicular mount	Standard mount and cable control bars
Weight	1.23 kg (2.71 lb)	1.26 kg (2.78 lb)	1.55 kg (3.42 lb)	1.02 kg (2.25 lb)	1.10 kg (2.42 lb)	1.53 kg (3.37 lb)
Height	169.20 mm (6.66 in)	169.20 mm (6.66 in)	222.30 mm (8.75 in)	125 mm (4.92 in)	125 mm (4.92 in)	222.30 mm (8.75 in)
Width	167.20 mm (6.58 in)	167.20 mm (6.58 in)	273.30 mm (10.76 in)	125 mm (4.92 in)	143.50 mm (5.65 in)	273.30 mm (10.76 in)



	Standard mount	Quick mount	Quick mount and cable control bars	DIN mount	Perpendicular mount	Standard mount and cable control bars
Depth	61.90 mm (2.44 in)	64.60 mm (2.54 in)	64.60 mm (2.54 in)	59.20 mm (2.33 in)	55.50 mm (2.18 in)	61.90 mm (2.44 in)

VESA mounting dimensions

The Edge Gateway can be mounted on a standard VESA mount.

Table 20. VESA mounting dimensions

Height	75 mm (2.95 in)
Width	75 mm (2.95 in)

Environmental and operating conditions

Environmental conditions

Table 21. Environmental conditions

Ingress protection rating	IP50
---------------------------	------

 **CAUTION:** Install the Edge Gateway in an area that is not exposed to direct sunlight.


 **NOTE:** For outdoors and rugged environments, install the Edge Gateway in an external enclosure (sold separately).


Operating conditions

Table 22. Operating conditions

Maximum vibration

Operational	<ul style="list-style-type: none"> • 5 Hz with 0.002 G²/Hz • 350 Hz with 0.002 G²/Hz
-------------	--

 **NOTE:** Operational values are based on the 0.26 Grms profile. These values are tested for all operational orientations and are retrieved from two minutes per test orientation with IO meter.

 **NOTE:** All screws on the Edge Gateway are embedded with a Nylock seal to resist vibration and loosening.


Maximum shock

Operational	<p>Half sine shock</p> <p>All operational orientations; 40 G ± 5% with pulse duration of 2 msec ± 10% (equivalent to 20 in/sec [51 cm/sec])</p>
Non-operational	<p>Half sine shock</p> <p>Tested on all six sides; 160 G ± 5% with pulse duration of 2 msec ± 10% (equivalent to 50 in/sec [127 cm/sec])</p>

Maximum altitude

Operational (maximum, unpressurized)

-15.20 m to 5,000 m (-50 ft to 16,404 ft)

 **NOTE: The maximum temperature is derated 1°C/305 m (1000 ft) above sea level altitude.**


Non-operational (maximum, unpressurized)


-15.20 m to 10,668 m (-50 ft to 35,000 ft)

Operating environment






Temperature range (system)

- Operating:
 - With 0.7 m/s airflow: -30°C to 75°C (-22°F to 167°F)
 - Without airflow: -30°C to 70°C (-22°F to 158°F)
- Operating:
 - With 0.7 m/s airflow: -30°C to 70°C (-22°F to 158°F)
 - Without airflow: -30°C to 60°C (-22°F to 140°F)
- Non-operating (with a maximum temperature gradation of 15°C per hour):
 - With 0.7 m/s airflow: -40°C to 85°C (-40°F to 185°F)
 - Without airflow: -40°C to 85°C (-40°F to 185°F)

 **WARNING: The maximum operating temperature of the Edge Gateway 3001 and 3002 is 70°C (158°F). Do not exceed this maximum temperature while operating the Edge Gateway inside an enclosure. Internal heating of the Edge Gateway electronics, other electronics, and the lack of ventilation inside an enclosure can cause the operating temperature of the Edge Gateway to be greater than the outside ambient temperature. Continuous operation of the Edge Gateway at temperatures greater than 70°C (158°F) may result in an increased failure rate and a reduction of the product life. Ensure that the maximum operating temperature of the Edge Gateway when placed inside an enclosure is 70°C (158°F) or less.**

 **WARNING: The maximum operating temperature of the Edge Gateway 3003 is 60°C (140°F). Do not exceed this maximum temperature while operating the Edge Gateway inside an enclosure. Internal heating of the Edge Gateway electronics, other electronics, and the lack of ventilation inside an enclosure can cause the operating temperature of the Edge Gateway to be greater than the outside ambient temperature. Continuous operation of the Edge Gateway at temperatures greater than 60°C (140°F) may result in an increased failure rate and a reduction of the product life. Ensure that the maximum operating temperature of the Edge Gateway when placed inside an enclosure is 60°C (140°F) or less.**

Temperature range (with components)	<ul style="list-style-type: none"> Operating (SD card): –40°C to 85°C (–40°F to 185°F) Operating (eMMC): –40°C to 85°C (–40°F to 185°F)
Maximum relative humidity (with maximum humidity gradation of 10% per hour)	<ul style="list-style-type: none"> Operating: 10% to 95% (non-condensing) Non-operating: 5% to 95% (non-condensing)
Pollution degree	2

-  **NOTE: The ambient temperature is based on the free-air environment, system mounting, and certain workload assumptions.**
-  **NOTE: An open space of 63.50 mm (2.50 in) is recommended around the Edge Gateway for optimal air circulation.**
-  **NOTE: The maximum operating temperature may vary, depending on factors such as air flow, system mounting, software applications, and so on.**
-  **NOTE: The temperature at the center of the exposed base surface must not exceed 82°C (179.6°F).**
-  **NOTE: For optimal thermal distribution when mounted, ensure that Edge Gateway is installed as instructed in the supplied documentation.**

Power

Power source

The Edge Gateway supports the following power sources, which are isolated to 2.5 kV:

- DC-IN
- Power over Ethernet (PoE)

 **CAUTION: Turn off the Edge Gateway before you change the power source.**

 **NOTE: You can connect either DC-IN and/or PoE.**



 **NOTE: USB power is limited to 0.6 A/3 W for USB 3.0 port and 0.4 A/2 W for USB 2.0 port. Ensure that the Edge Gateway is within the allowed 13 W PoE Class 0 range.**

Table 23. DC parameters

DC parameters	
Supported input voltage	12/24 V vehicle power system (12 V ~ 57 V wide DC input, ISO 7637-2 & SAE J1113 compliant).
	 NOTE: Supports vehicle cold-crank down to 6 V.
Maximum input current	1.08 A at 12 V/0.23 A at 57 V
Minimum DC supply power requirement	13 W
Power management	System power on, standby, and hibernate management through optional ignition input.
Supported wake up events	<ul style="list-style-type: none"> • Alarm (real-time clock) • WLAN and LAN (Windows OS only) • USB • Ignition and Direct Ignition (DI)
Power protection	System power protection. For example, vehicle battery protection through optional ignition input.

DC parameters








	 NOTE: Ignition input provides an option to turn off the device or put it into a low-power mode (depending on the OS), whenever the vehicle ignition is turned off to protect from vehicle battery draining.
System idle	4.2 W
	 NOTE: Operating system is active but no applications are running.
Processor full load	8.1 W
	 NOTE: Operating system active with 100% processor utilization and 2D/3D load.
System full load	12.9 W
	 NOTE: Operating system active with 100% processor utilization and simultaneous access to I/O devices.
Recommended power supply	17 W (20% derating)
	 NOTE: With consideration of voltage derating under high environmental temperature.

Table 24. PoE parameters

PoE parameters

Compatibility	IEEE 802.3, IEEE 802.3u, IEEE802.3ab, IEEE802.3x, IEEE802.3af  NOTE: Full-controller compliance with IEEE 802.3.af standard for maximum 15.4 W, with power up to 48 V over existing Ethernet infrastructure, with no modifications required.  NOTE: Standard IEEE 802.3 Ethernet interface provided for 10BASE-TX and 10BASE-T applications (802.3, 802.3u, 802.3ab, and 802.3x) 9014-bytes jumbo frame support.
Number of ports	One Fast Ethernet Media Access Control (MAC) port and one physical layer (PHY) port
Speed	10/100 Mbps (supports Wake on LAN and WLAN)
Connector	8-pin RJ45
Protection	Built-in 2.25 KV isolation protection on LAN ports and ESD IEC61000-4-2 ±30 KV
Power input	15.4 W maximum according to IEEE 802.3af-2003 (standard)
Supported input voltage	48 V DC
Supported input current	0.27 A

Ignition

Table 25. Ignition parameters

Parameter	Minimum voltage	Maximum voltage	Default
High-level input voltage (V_{IH})	9 V	32 V	12 V
Low-level input voltage (V_{IL})	0 V	1.2 V	0 V

3 V CMOS coin-cell battery

Table 26. Coin-cell battery

RTC coin-cell battery (lithium-ion)	
Type	BR-2032
Manufacturer	Panasonic Corporation
Nominal voltage	3 V
Nominal capacity	200 mAh

 **NOTE:** Dell recommends that you check or replace the coin-cell battery before operation. Also, check or replace the coin-cell battery if the system has been disconnected from a power source for more than two years.

Operating systems

The Edge Gateway supports the following operating systems:

- Windows 10 IoT Enterprise LTSC 2016
- Ubuntu Core 16

 **NOTE:** Windows 10 IoT Enterprise LTSC 2016 is supported only on Edge Gateway models with 32 GB eMMC.

Processor

Table 27. Processor

Configuration	Processor
Edge Gateway 3001	Intel Atom Processor E3805 (1 MB L2 cache)
Edge Gateway 3002	Intel Atom Processor E3805 (1 MB L2 cache)
Edge Gateway 3003	Intel Atom Processor E3815 (512 KB L2 cache)

Memory

Table 28. Memory type

Type	DDR3L
Memory channel	Single
Minimum memory	2 GB
Maximum system memory	2 GB

Storage

Table 29. Storage specifications

Storage type	Capacity supported
micro-SD	<ul style="list-style-type: none">8 GB32 GB64 GB128 GB
eMMC (Edge Gateway 3001, 3002, and 3003)	<ul style="list-style-type: none">8 GB32 GB

 **NOTE: Windows 10 IoT Enterprise LTSC 2016 is supported only on Edge Gateway models with 32 GB eMMC.**

Audio and video

Audio

Table 30. Audio specifications

Controller	Realtek ALC3277
Line-out	3.5 mm jack - Green
Line-in	3.5 mm jack - Blue

DisplayPort 1.1

DisplayPort 1.1 supports a maximum resolution of 2560 x 1440. It provides connection to VGA, DVI, HDMI monitor through DisplayPort to VGA adapter cable, to DVI adapter cable, and to HDMI adapter cable. It does not support daisy chain connection configurations.

Graphics and video controller

Table 31. Graphics and video controller specifications

Controller	7 th generation Intel HD Graphics
Speed	400 MHz

 **NOTE: The graphics and video controller is supported only on Edge Gateway 3003.**

External ports and connectors

 **NOTE: For more information about ports and connectors locations, see the [System views](#).**

Table 32. Ports and connectors on Edge Gateway

Ports	Edge Gateway 3001	Edge Gateway 3002	Edge Gateway 3003
RS-232/RS-485/RS-422 ports	2	0	0
Audio line-out	0	0	1



Ports	Edge Gateway 3001	Edge Gateway 3002	Edge Gateway 3003
Audio line-in	0	0	1
Ethernet port one (with PoE)	1	1	1
Ethernet port two (without PoE)	0	1	1
WLAN or Bluetooth antenna connector	1	1	1
GPS antenna connector	1	1	1
Mobile broadband antenna connector (3G)	1	1	1
Mobile broadband antenna connector (4G LTE)	1	1	1
ZigBee antenna connector	0	1	0
Intrusion switch (optional)	1	1	1
DisplayPort	0	0	1
GPIO	1	0	0
USB 3.0	1	1	1
USB 2.0	1	1	1
CANbus	0	1	0



NOTE: The connector for wireless antenna () and GPS antenna () is the same.

Communications

Wireless LAN

Table 33. Wireless LAN specifications

WLAN standards supported	802.11b, 802.11g, 802.11n
802.11b data rates supported	1, 2, 5.5, and 11 Mbps
802.11g data rates supported	6, 9, 12, 18, 24, 36, 48, and 54 Mbps
802.11n data rates supported	MCS0 to MCS7 with and without Short GI. Maximum data rate 150 Mbps.
Encryption	WEP 64-bit and 128-bit, TKIP, AES, and WPS

Wireless WAN

Table 34. Wireless WAN specifications

Card	Region
DW5815 (4G LTE)	AT&T and Verizon (North America)
DW5515 (3G)	Rest of the world

DW5815 specifications

Table 35. DW5815 card specifications

Network	LTE/HSPA+
Frequency bands	<ul style="list-style-type: none">• LTE band: 2, 4, 5, 13, 17• HSPA+/WCDMA band: 2, 5
Speed (Downlink)	< 150 Mbps
Speed (Uplink)	< 50 Mbps
Fallback network	HSPA+/WCDMA
Fallback speed	<ul style="list-style-type: none">• Downlink: < 42 Mbps• Uplink: < 5.76 Mbps
SIM	AT&T and Verizon

DW5515 specifications

Table 36. DW5515 card specifications


Network	HSPA+/WCDMA
Frequency bands	<ul style="list-style-type: none">• HSPA+/WCDMA band: 1, 2, 5, 6, 8, 19• EDGE/GPRS frequency: 850, 900, 1800, 1900 MHz
Speed (Downlink)	< 21 Mbps
Speed (Uplink)	< 5.76 Mbps
Fallback network	EDGE/GPRS
Fallback speed	<ul style="list-style-type: none">• Downlink: < 236.8 Kbps• Uplink: < 118.4 Kbps
SIM	All

Antenna specifications

The Edge Gateway is a professionally installed equipment. The Radio Frequency output power does not exceed the maximum limit allowed in the country of operation.

 **CAUTION: Unauthorized antennas, modifications, or attachments may damage the device and potentially violate international regulations.**

 **NOTE: Use only the supplied or an approved replacement antenna.**

 **NOTE: Modifications to the device or use of unauthorized antennas not expressly approved by Dell is the sole responsibility of the user or configurator or operator to reassess the equipment in accordance to all applicable international Safety, EMC, and RF standards.**

The Dell authorized antenna specifications are as follows:

- Mobile Broadband
 - Main: Dipole
 - LTE Auxiliary: PIFA
- GPS/WiFi/Zigbee: Monopole



The following tables provide the gain specifications for different antenna positions.

Table 37. Mobile broadband main antenna maximum gain (dBi)

Frequency (MHz)	Antenna position—Bent		Antenna position—Straight	
	3G (dBi)	4G (dBi)	3G (dBi)	4G (dBi)
704~806	Not applicable	2	Not applicable	1.7
824~894	1	1.4	2.1	2.1
880~960	0.5	1.4	1.4	1.5
1710~1880	3.2	4.2	1.9	3
1850~1990	3.9	4.3	3.2	3.4
1920~2170	4	4.4	3.2	3.4

Table 38. Mobile broadband main antenna maximum gain (dBi)

Frequency (MHz)	Antenna position—Bent		Antenna position—Straight	
	3G (dBi)	4G (dBi)	3G (dBi)	4G (dBi)
704~806	Not applicable	2.6	Not applicable	2.9
824~894	1.2	1.6	2.8	2.6
880~960	0.9	1.6	2.0	1.9
1710~1880	2.4	3.8	1.7	3.0
1850~1990	3.1	3.8	3.3	3.2
1920~2170	3.4	3.9	3.3	3.2

Table 39. Mobile broadband auxiliary antenna maximum gain (dBi)

Frequency (MHz)	Antenna position—Bent	Antenna position—Straight
	4G (dBi)	4G (dBi)
704~806	0.6	1.9
824~894	-0.3	-0.1
880~960	-1.9	-2.5
1710~1880	2.3	2.0
1850~1990	3.6	3.2
1920~2170	3.6	3.2

Table 40. Mobile broadband auxiliary antenna maximum gain (dBi)

Frequency (MHz)	Antenna position—Bent	Antenna position—Straight
	4G (dBi)	4G (dBi)
704~806	0.2	1.9
824~894	-0.8	-0.1
880~960	-0.6	-2.5
1710~1880	4.2	2.0
1850~1990	5.4	3.2
1920~2170	5.4	3.2

Table 41. WiFi/GPS antenna maximum gain (dBi)

Frequency (MHz)	Antenna position—Bent		Antenna position—Straight	
	GPS (dBi)	WLAN (dBi)	GPS (dBi)	WLAN (dBi)
1561~1602	2.6	Not applicable	2.4	Not applicable
2400~2500	Not applicable	3.4	Not applicable	1.6

Table 42. WiFi/GPS antenna maximum gain (dBi)

Frequency (MHz)	Antenna position—Bent		Antenna position—Straight	
	GPS (dBi)	WLAN (dBi)	GPS (dBi)	WLAN (dBi)
1561~1602	3.9	Not applicable	3.4	Not applicable
2400~2500	Not applicable	2.7	Not applicable	1.3

Table 43. ZigBee antenna maximum gain (dBi)

Frequency (MHz)	Antenna position—Bent	Antenna position—Straight
	ZigBee (dBi)	ZigBee (dBi)
2400~2500	0.4	1.7

Bluetooth

Table 44. Bluetooth specifications

Bluetooth standard supported	Dual-mode Bluetooth 4.0 BLE
Bluetooth Classic	Version 2.1+EDR
Bluetooth data rates supported	Up to 3 Mbps
Bluetooth Low Energy	Yes
Encryption	128-bit



COM ports

Table 45. COM ports specifications

Connector type	2x5 terminal block
Data rate	Up to 1 Mbps in RS-232/12 Mbps in RS-422/RS-485

RS-232/RS-422/RS-485

Table 46. RS-232/RS-422/RS-485 specifications

General

Bus type	USB 2.0
Connectors	2 x 2x5 terminal blocks (JVE/ 23N6963-10D00B-15G-2.9)
Power consumption	20 mA at +3.3 V

Communications

Communication controller	XR21V1412 (controller), SP339E (transceiver)
Data bits	7, 8, 9
Data signals	<ul style="list-style-type: none"> • RS-232: DCD, RXD TXD, DTR, GND, DSR, RTS, CTS, RI • RS-422: TXD+, TXD-, RXD+, RXD-, GND • RS-485: Data+, Data-, GND
FIFO	<ul style="list-style-type: none"> • 128 bytes (TX) • 384 bytes (RX)
Flow control	Hardware (RTS/CTS or DTR/DSR), Software (Xon/Xoff)
Parity	None, Odd, Even, Mark, and Space
Speed/Baudrate	Up to 1 Mbps (RS-232), 12 Mbps (RS422/RS485)
Stop bits	1, 2

Protection

Isolation protection	Not applicable
ESD protection	Transceiver 6100-4-2 ± 15 KV (Air), ±8 KV (Contact)
EFT protection	Not applicable
Surge protection	Not applicable

GPIO

Table 47. GPI configuration

GPI configuration

Logic high	3.5 V to 5 V
Logic low	0 V to 1.5 V
Input resistance	1 k between connector and controller

GPI configuration	
Interrupt source	Not applicable
Isolation voltage	1 KV DC, controller to rest of system

Table 48. GPO configuration

GPO configuration	
Output	Open-drain or push-pull 1.6 mA per channel
Supply voltage	5 VDC
Isolation voltage	1 KV DC, controller to rest of system No Vdd pin on connector

Table 49. GPIO specifications

Name	Default setting	Default internal Pull-up and Pull-down
GPIO~7	85 K pull-down	Not applicable
GPO0~7	85 K pull-down	Not applicable Open-drain or push-pull output pin

Table 50. GPIO electrical specifications

Voltage/Current	Minimum	Maximum
Input low voltage (V_{il})		1.5 V
Input high voltage (V_{ih})	3.5 V	
Output low voltage (V_{ol})		0.4 V
Output high voltage (V_{oh})	4.8 V	
Output sink/source current		1.6 mA

CANbus

Table 51. CANbus specifications

General	Bus type/Card interface	USB
	Connector	3-pin terminal block Molex 39532–6503
	Power consumption	162 mA at 3.3 V (controller), 70 mA at 5 V, and 5.6 mA at 3.3 V (transceiver)
Communications	CAN controller	Atmel ATSAME70N19A-CNT
	CAN transceiver	NXP TJA1052i
	Protocol	CAN2.0 A/B/FD
	Speed	Up to 1 Mbps (CAN 2.0), 2 Mbps (CAN-FD)
	Signal support	CAN_H, CAN_L, GND



Protection	Galvanic Isolation	2.5 KV
	ESD	Transceiver IEC-61000-4-2 ± 8KV

Security

Table 52. Security specifications

Trusted Platform Module (TPM)	TPM 2.0
External enclosure chassis intrusion switch	When the chassis is opened, the external enclosure chassis intrusion switch raises an intruder electrical signal to the gateway, triggering an external enclosure chassis intrusion event.

 **NOTE: Depending on your country's regulations, TPM system boards may be unavailable.**

Environmental compliance

Table 53. Environmental compliance

BFR/PVC-free	No
--------------	----

Software

The following software is supported in the Edge Gateway 3000 Series:

- Dell Command | Configure (DCC)
- Dell Command | Monitor (DCM)
- Dell Command | Powershell (DCPP)—For Windows only
- Edge Device Management (EDM)
- Support Assist (includes Dell Data Vault (DDV))

Service and support

Table 54. Service and support

One year base hardware warranty, with mail-in service.	Included
Basic extensions up to five years, with mail-in service.	Available
ProSupport extensions up to five years, with advanced exchange.	Available

 **NOTE: For a copy of our guarantees or limited warranties, write to 'Dell USA L.P., Attn: Warranties, One Dell Way, Round Rock, TX 78682'. For more information, visit www.dell.com/warranty.**

Detailed engineering specifications

Component types

Table 55. Edge Gateway components

Component	Edge Gateway (3001)	Edge Gateway (3002)	Edge Gateway (3003)
CPU	Intel Baytrail I 3805	Intel Baytrail I 3805	Intel Baytrail I 3815 (with GPU)
DDR3L 2 GB	Yes	Yes	Yes
eMMC	8 GB or 32 GB	8 GB or 32 GB	8 GB or 32 GB
WLAN	Yes	Yes	Yes
BTLE	Yes	Yes	Yes
Discrete GPS	Yes	Yes	Yes
ZigBee (SMT)	No	Yes	No
CAN Bus (SMT)	No	Yes	No
TPM	2	2	2
micro-SD card slot	Yes	Yes	Yes
micro-SD (supported capacities)	8 GB, 16 GB, 32 GB or 64 GB	8 GB, 16 GB, 32 GB or 64 GB	8 GB, 16 GB, 32 GB or 64 GB
micro-SIM card slot	Optional	Yes	Optional
WWAN connector	Optional	Yes	Optional
DP connector	No	No	Yes
Audio codec I/C	No	No	Yes
Audio in/out connector	No	No	Yes
GPIO connector	Yes	No	No
Serial connector	Yes	No	No
RJ45 connector	1	2	2
USB connector	1 x USB 2.0 1 x USB 3.0	1 x USB 2.0 1 x USB 3.0	1 x USB 2.0 1 x USB 3.0



Component	Edge Gateway (3001)	Edge Gateway (3002)	Edge Gateway (3003)
Intrusion switch input	Yes	Yes	Yes
PCB	PCB Type 3	PCB Type 3	PCB Type 3
3-Pin Phoenix-type connector	Yes	Yes	Yes

Communications—Ethernet

Table 56. Ethernet general specifications

General specifications	
Ethernet type	Ethernet LAN 10/100
External connector type	RJ45
Data rates supported	10/100 Mbps

Table 57. Ethernet controller details

Controller details	
Controller bus architecture	PCI express base specification (revision 1.1)
Integrated memory	Yes
Data transfer mode (example: Bus-master DMA)	Yes
Power consumption (full operation per data rate connection speed)	224 mW (maximum)
Power consumption (standby operation)	135 mW (maximum)
IEEE standards compliance	802.3
Hardware certifications	n/a
Boot ROM support	EEPROM (located in SPI)

Table 58. Ethernet network transfer mode

Network transfer mode	
Network transfer rate	10 Mb (full/half-duplex) 100 Mb (full/half-duplex)

Table 59. Ethernet Environmental

Environmental	
Operating temperature	0°C to 85°C (32°F to 185°F)
Operating humidity	20% to 80% (non-condensing)
Operating system driver support	<ul style="list-style-type: none"> Windows 10 IoT Enterprise LTSC 2016 Ubuntu Core 16

Environmental

Manageability	WOL, PXE 2.1
Management capabilities alerting	Intel standard

Communications—Wireless WAN

Table 60. Wireless WAN specifications

Card	Region
DW5815 (4G LTE)	AT&T and Verizon (North America)
DW5515 (3G)	Rest of the world

DW5815 specifications

Table 61. DW5815 card specifications

Model	Sierra MC-HL 7588
Chipset	Intel XMM7160
Firmware	AT&T, Verizon
Network	LTE/HSPA+
Frequency bands	<ul style="list-style-type: none">• LTE band: 2, 4, 5, 13, 17• HSPA+/WCDMA band: 2, 5
Speed (Downlink)	< 150 Mbps
Speed (Uplink)	< 50 Mbps
Fallback network	HSPA+/WCDMA
Fallback speed	<ul style="list-style-type: none">• Downlink: < 42 Mbps• Uplink: < 5.76 Mbps
SIM	AT&T and Verizon
Antenna	Main (Tx/Rx) + Aux (Rx)
Operating system support	Ubuntu, Windows 10
Host Interface	USB 2.0

DW5515 specifications

Table 62. DW5515 card specifications

Model	Sierra MC-HL 8548
Chipset	Intel XMM6265
Firmware	Generic GCF
Network	HSPA+/WCDMA
Frequency bands	<ul style="list-style-type: none">• HSPA+/WCDMA band: 1, 2, 5, 6, 8, 19• EDGE/GPRS frequency: 850, 900, 1800, 1900 MHz



Speed (Downlink)	< 21 Mbps
Speed (Uplink)	< 5.76 Mbps
Fallback network	EDGE/GPRS
Fallback speed	<ul style="list-style-type: none"> Downlink: < 236.8 Kbps Uplink: < 118.4 Kbps
SIM	All
Antenna	Main (Tx/Rx) + Aux (Rx)
Operating system support	Ubuntu, Windows 10
Host Interface	USB 2.0

Communications—Wireless LAN

Table 63. Wireless LAN general specifications

General specifications	
Wireless WAN type	Intel Wireless 8260AC (802.11ac)
Connector type	Custom WLAN antenna connector (2x2)

Table 64. Wireless LAN controller specifications

Controller specifications	
Controller Bus architecture	Electrically compatible with the PCI express base specification v1.1 (x1 lane) and PCIe v2.1
WLAN standards supported	802.11a, 802.11b, 802.11g, 802.11n, or 802.11ac
802.11a data rates supported	11, 5.5, 2, and 1 Mbps
802.11b data rates supported	54, 48, 36, 24, 18, 12, 9, and 6 Mbps
802.11g data rates supported	54, 48, 36, 24, 18, 12, 11, 9, 6, 5.5, 2, and 1 Mbps
802.11n data rates supported	270, 240, 180, 135, 130, 121.5, 120, 117, 108, 104, 90, 81, 78, 65, 60, 58.5, 54, 52, 40.5, 39, 30, 27, 26, 19.5, 13.5, 13, and 6.5 Mbps
802.11ac data rates supported (GI 800ns)	13, 26, 39, 52, 58.5, 104, 117, 130, 156, 175.5, 234, 351, 468, 526.5, 585, 702, and 780 Mbps
Encryption	WEP 64-bit and 128-bit, TKIP, AES-CCMP 128-bit
Bluetooth standards supported	Bluetooth 4.0
Operating temperature	-30°C to 80°C
Operating system driver support	Windows 7 32/64 bits, Windows 8.1 64 bits, Windows 10 64 bits

Communications—ZigBee

Embedded ZigBee Module Support (Silicon Labs ETRX3587HR)

The Edge Gateway 3002 includes a Silicon Labs ETRX3587HR ZigBee module within the platform.

The module supports the ZigBee protocol stack architecture from Silicon Labs, also known as NCP (Network Co-Processor) mode.

In NCP mode, the application layer of the protocol stack executes at the Operating System (OS) layer. The application layer interfaces with other layers of the ZigBee protocol stack, which are supported at the firmware-level on the ETRX3587HR module.

The Edge Gateway OS image does not include this application layer software; the ZigBee module includes the firmware component, which supports other layers of the NCP architecture.

 **NOTE: Users developing the ZigBee application layer stack can obtain the SDK (Software Development Kit) and supporting reference documentation from [Silicon Labs](#).**

 **NOTE: Detailed specifications for ZigBee antennas are available in [Communications-Antennas](#).**

International regulatory compliance regulations for ZigBee antennas

To comply with international regulatory compliance regulations, both the maximum RF output power and the maximum antenna gain, including cable loss for this radio device, must not exceed the specified limits provided in Table 1 below.

Table 65. Maximum limits for ZigBee antennas

Channels		18-11	19-24	25	26
Dipole antenna type	Max. gain (dBi)	0.1	0.1	0.1	0.1
	Max. gain (EIRP)	0.1	0.1	0.1	0.1
Max. transmit output power (dBm)	Boost mode	7	7	7	0
	Normal mode	0	0	0	0

Failure to abide by these specified parameters will result in unauthorized use. In the event that these parameters are changed for any reason, the operator will be fully responsible to pursue a reassessment of the device according to international regulatory compliance requirements.

Communications—Antennas

Table 66. Antenna supplier: Taoglas

Antenna model number	Connected to
Taoglas TS.07	Wireless LAN/Bluetooth/GPS port
Taoglas TG.30	Mobile broadband antenna port one (3G/LTE)
Taoglas GW.15	ZigBee antenna port (Edge Gateway 3002 only)
Taoglas TG.10	Mobile broadband antenna port two (LTE only)

Table 67. Antenna supplier: Hongbo

Antenna type	Connected to
Hongbo E46WD	Wireless LAN/Bluetooth/GPS port
Hongbo JYDK0	Mobile broadband antenna port one (3G/LTE)
Hongbo G9HPD	ZigBee antenna port (Edge Gateway 3002 only)
Hongbo M9RV9	Mobile broadband antenna port two (LTE only)



Antennas—Taoglas TS.07

General specifications

Table 68. Taoglas TS.07 General specifications

Electrical	
Impedance	50 Ω
Polarization	Linear
Radiation pattern	Omni-directional
Input power	10 W

Table 69. Mechanical specifications

Mechanical	
Antenna length	72 mm
Antenna diameter	10 mm
Casing	POM
Connector	SMA (M)
Weight	6 grams

Table 70. Environmental specifications

Environmental	
Temperature range	-40°C to 85°C
Humidity	Non-condensing 65°C 95% RH

Taoglas TS.07 specifications for Edge Gateway 3001 and 3003 (Bent position)

Table 71. Taoglas TS.07 specifications for Edge Gateway 3001 and 3003 (Bent position)

	GPS	WLAN
Frequency (MHz)	1561 ~ 1602	2400 ~ 2500
Efficiency (%)¹		
WLAN	71.1	53.6
WWAN 3G	64.1	60.3
WWAN LTE	51.8	59.4
Average gain (dBi)¹		
WLAN	-1.5	-2.7
WWAN 3G	-1.9	-2.2
WWAN LTE	-2.9	-2.3

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Taoglas TS.07 specifications for Edge Gateway 3001 and 3003 (Straight position)

Table 72. Taoglas TS.07 specifications for Edge Gateway 3001 and 3003 (Straight position)

	GPS	WLAN
Frequency (MHz)	1561 ~ 1602	2400 ~ 2500
Efficiency (%)¹		
WLAN	71	56.9
WWAN 3G	52.9	51.3
WWAN LTE	43.7	52.1
Average gain (dBi)¹		
WLAN	-1.5	-2.5
WWAN 3G	-2.8	-3.0
WWAN LTE	-3.6	-2.9

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Taoglas TS.07 specifications for Edge Gateway 3002 (Bent position)

Table 73. Taoglas TS.07 specifications for Edge Gateway 3002 (Bent position)

	GPS	WLAN
Frequency (MHz)	1561 ~ 1602	2400 ~ 2500
Efficiency (%)¹		
WLAN	69.4	49.6
WWAN 3G	64.6	48.2
WWAN LTE	65.3	48.0
Average gain (dBi)¹		
WLAN	-1.6	-3.0
WWAN 3G	-1.9	-3.2
WWAN LTE	-1.9	-3.2

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Taoglas TS.07 specifications for Edge Gateway 3002 (Straight position)

Table 74. Taoglas TS.07 specifications for Edge Gateway 3002 (Straight position)

	GPS	WLAN
Frequency (MHz)	1561 ~ 1602	2400 ~ 2500
Efficiency (%)¹		
WLAN	70.5	53.9
WWAN 3G	62.1	52.2
WWAN LTE	62.6	52.2
Average gain (dBi)¹		



	GPS	WLAN
WLAN	-1.5	-2.7
WWAN 3G	-2.1	-2.8
WWAN LTE	-2.0	-2.8

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Antennas—Taoglas TG.30

General specifications

Table 75. Taoglas TS.30 General specifications

Electrical	
Impedance	50 Ω
Polarization	Linear
Radiation pattern	Omni-directional
Input power	5 W

Table 76. Mechanical specifications

Mechanical	
Casing	UV-resistant PC/ABS
Connector	SMA male-hinged 90°

Table 77. Environmental specifications

Environmental	
Temperature range	-40°C to 85°C
Humidity	Non-condensing 65°C 95% RH

Taoglas TG.30 specifications for Edge Gateway 3001 and 3003 (Bent position)

Table 78. Taoglas TG.30 specifications for Edge Gateway 3001 and 3003 (Bent position)

	LTE700	GSM850	GSM900	DCS	PCS	UMTS
Frequency (MHz)	704 ~ 806	824 ~ 894	880 ~ 960	1710 ~ 1880	1850 ~ 1990	1920 ~ 2170
Efficiency (%)¹						
WWAN 3G	67.5	67.0	55.1	57.5	52.2	49.5
WWAN LTE	67.2	66.0	52.9	51.2	47.94	46
Average gain (dBi)¹						
WWAN 3G	-1.7	-1.75	-2.61	-2.41	-2.85	-3.08
WWAN LTE	-1.73	-1.8	-2.8	-2.9	-3.2	-3.4

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Taoglas TG.30 specifications for Edge Gateway 3001 and 3003 (Straight position)

Table 79. Taoglas TG.30 specifications for Edge Gateway 3001 and 3003 (Straight position)

	LTE700	GSM850	GSM900	DCS	PCS	UMTS
Frequency (MHz)	704 ~ 806	824 ~ 894	880 ~ 960	1710 ~ 1880	1850 ~ 1990	1920 ~ 2170
Efficiency (%)¹						
WWAN 3G	71.2	65.5	47.7	64.2	59.5	55.8
WWAN LTE	71.1	62.1	45.8	61.3	58.2	54.5
Average gain (dBi)¹						
WWAN 3G	-1.6	-1.9	-3.3	-1.9	-2.3	-2.6
WWAN LTE	-1.5	-2.1	-3.4	-2.1	-2.4	-2.7

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Taoglas TG.30 specifications for Edge Gateway 3002 (Bent position)

Table 80. Taoglas TS.30 specifications for Edge Gateway 3002 (Bent position)

	LTE700	GSM850	GSM900	DCS	PCS	UMTS
Frequency (MHz)	704 ~ 806	824 ~ 894	880 ~ 960	1710 ~ 1880	1850 ~ 1990	1920 ~ 2170
Efficiency (%)¹						
WWAN 3G	67.0	66.7	55.3	58.3	52.2	48.93
WWAN LTE	70.1	54.2	48.3	60.4	72.3	74.0
Average gain (dBi)¹						
WWAN 3G	-1.8	-1.8	-2.6	-2.3	-2.9	-3.1
WWAN LTE	-1.6	-2.7	-3.2	-2.2	-1.4	-1.3

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Taoglas TG.30 specifications for Edge Gateway 3002 (Straight position)

Table 81. Taoglas TS.30 specifications for Edge Gateway 3002 (Straight position)

	LTE700	GSM850	GSM900	DCS	PCS	UMTS
Frequency (MHz)	704 ~ 806	824 ~ 894	880 ~ 960	1710 ~ 1880	1850 ~ 1990	1920 ~ 2170
Efficiency (%)¹						
WWAN 3G	69.3	65.2	49.7	66.8	58.3	53.0
WWAN LTE	66.7	57.7	45.8	57.1	70.6	71.7
Average gain (dBi)¹						
WWAN 3G	-1.6	-1.8	-3.0	-1.7	-2.4	-2.8
WWAN LTE	-1.8	-2.4	-3.4	-2.4	-1.5	-1.4

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.



Antennas—Taoglas GW.15

General specifications

Table 82. Taoglas GW.15 General specifications

Electrical	
Impedance	50 Ω
Polarization	Linear
Radiation pattern	Omni-directional
Input power	10 W

Table 83. Mechanical specifications

Mechanical	
Antenna length	72 mm
Antenna diameter	10 mm
Casing	POM
Connector	SMA (M)
Weight	6 grams

Table 84. Environmental specifications

Environmental	
Temperature range	-40°C to 85°C
Humidity	Non-condensing 65°C 95% RH

Taoglas GW.15 specifications for Edge Gateway 3002 (Bent position)

Table 85. Taoglas GW.15 specifications for Edge Gateway 3002 (Bent position)

	ZigBee
Frequency (MHz)	2400 ~ 2500
Efficiency (%)¹	
WLAN	37.1
WWAN 3G	45.0
WWAN LTE	41.7
Average gain (dBi)¹	
WLAN	-4.4
WWAN 3G	-3.5
WWAN LTE	-3.8

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Taoglas GW.15 specifications for Edge Gateway 3002 (Straight position)

Table 86. Taoglas GW.15 specifications for Edge Gateway 3002 (Straight position)

	ZigBee
Frequency (MHz)	2400 ~ 2500
Efficiency (%)¹	
WLAN	35.1
WWAN 3G	42.4
WWAN LTE	38.0
Average gain (dBi)¹	
WLAN	-4.7
WWAN 3G	-3.8
WWAN LTE	-4.3

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Antennas—Taoglas TG.10

General specifications

Table 87. Taoglas TG.10 General specifications

Electrical	
Impedance	50 Ω
Polarization	Linear
Radiation pattern	Omni-directional
Input power	5 W

Table 88. Mechanical specifications

Mechanical	
Casing	PC/ABS
Connector	Hinged SMA male
Weight	24 grams
Recommended torque for mounting	0.9 Nm
Maximum torque for mounting	1.176 Nm

Table 89. Environmental specifications

Environmental	
Temperature range	-40°C to 85°C
Humidity	Non-condensing 65°C 95% RH



Taoglas TG.10 specifications for Edge Gateway 3001 and 3003 (Bent position)

Table 90. Taoglas TG.10 specifications for Edge Gateway 3001 and 3003 (Bent position)

	LTE700	GSM850	GSM900	DCS	PCS	UMTS
Frequency (MHz)	704 ~ 806	824 ~ 894	880 ~ 960	1710 ~ 1880	1850 ~ 1990	1920 ~ 2170
Efficiency (%)¹						
WWAN LTE	39.09	33.94	26.34	42.08	55.42	61.33
Average gain (dBi)¹						
WWAN LTE	-4.12	-4.74	-5.80	-3.82	-2.58	-2.13
Peak gain (dBi)¹						
WWAN LTE	0.64	-0.3	-1.91	2.28	3.60	3.60

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Taoglas TG.10 specifications for Edge Gateway 3001 and 3003 (Straight position)

Table 91. Taoglas TG.10 specifications for Edge Gateway 3001 and 3003 (Straight position)

	LTE700	GSM850	GSM900	DCS	PCS	UMTS
Frequency (MHz)	704 ~ 806	824 ~ 894	880 ~ 960	1710 ~ 1880	1850 ~ 1990	1920 ~ 2170
Efficiency (%)¹						
WWAN LTE	45.82	27.20	23.55	47.48	65.85	63.50
Average gain (dBi)¹						
WWAN LTE	-3.40	-5.67	-6.28	-3.28	-1.83	-2.01
Peak gain (dBi)¹						
WWAN LTE	1.93	-0.05	-2.50	1.95	3.24	3.24

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Taoglas TG.10 specifications for Edge Gateway 3002 (Bent position)

Table 92. Taoglas TG.10 specifications for Edge Gateway 3002 (Bent position)

	LTE700	GSM850	GSM900	DCS	PCS	UMTS
Frequency (MHz)	704 ~ 806	824 ~ 894	880 ~ 960	1710 ~ 1880	1850 ~ 1990	1920 ~ 2170
Efficiency (%)¹						
WWAN LTE	33.65	26.99	25.04	51.24	71.32	68.94
Average gain (dBi)¹						
WWAN LTE	-4.74	-5.70	-6.01	-2.93	-1.48	-1.64
Peak gain (dBi)¹						
WWAN LTE	0.17	-0.79	-0.56	4.24	5.41	5.41

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Taoglas TG.10 specifications for Edge Gateway 3002 (Straight position)

Table 93. Taoglas TG.10 specifications for Edge Gateway 3002 (Straight position)

	LTE700	GSM850	GSM900	DCS	PCS	UMTS
Frequency (MHz)	704 ~ 806	824 ~ 894	880 ~ 960	1710 ~ 1880	1850 ~ 1990	1920 ~ 2170
Efficiency (%)¹						
WWAN LTE	45.82	27.20	23.55	47.48	65.85	63.50
Average gain (dBi)¹						
WWAN LTE	-3.40	-5.67	-6.28	-3.28	-1.83	-2.01
Peak gain (dBi)¹						
WWAN LTE	1.93	-0.05	-2.50	1.95	3.24	3.24

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Antennas—Hongbo E46WD

General specifications

Table 94. Hongbo E46WD General specifications

Electrical	
Impedance	50 Ω
Polarization	Linear
Radiation pattern	Omni-directional
Input power	10 W

Table 95. Mechanical specifications

Mechanical	
Antenna length	72 mm
Antenna diameter	10 mm
Casing	POM
Connector	SMA (M)
Weight	8.2 grams

Table 96. Environmental specifications

Environmental	
Temperature range	-40°C to 85°C
Humidity	Non-condensing 65°C 95% RH



Hongbo E46WD specifications for Edge Gateway 3001 and 3003 (Bent position)

Table 97. Hongbo E46WD specifications for Edge Gateway 3001 and 3003 (Bent position)

	GPS	WLAN
Efficiency (%)¹		
WLAN	58.2	65.8
WWAN 3G	55.5	58.3
WWAN LTE	54.6	54.1
Average gain (dBi)¹		
WLAN	-2.4	-1.8
WWAN 3G	-2.6	-2.3
WWAN LTE	-2.6	-2.7

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Hongbo E46WD specifications for Edge Gateway 3001 and 3003 (Straight position)

Table 98. Hongbo E46WD specifications for Edge Gateway 3001 and 3003 (Straight position)

	GPS	WLAN
Efficiency (%)¹		
WLAN	65.0	62.5
WWAN 3G	63.5	54.0
WWAN LTE	61.9	52.1
Average gain (dBi)¹		
WLAN	-1.9	-2.0
WWAN 3G	-2.0	-2.7
WWAN LTE	-2.1	-2.8

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Hongbo E46WD specifications for Edge Gateway 3002 (Bent position)

Table 99. Hongbo E46WD specifications for Edge Gateway 3002 (Bent position)

	GPS	WLAN
Efficiency (%)¹		
WLAN	58.7	65.9
WWAN 3G	56.8	56.0
WWAN LTE	54.8	55.7
Average gain (dBi)¹		
WLAN	-2.3	-1.8
WWAN 3G	-2.5	-2.5
WWAN LTE	-2.6	-2.5

1 Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Hongbo E46WD specifications for Edge Gateway 3002 (Straight position)

Table 100. Hongbo E46WD specifications for Edge Gateway 3002 (Straight position)

	GPS	WLAN
Efficiency (%)¹		
WLAN	65.5	61.9
WWAN 3G	64.1	53.6
WWAN LTE	61.9	53.2
Average gain (dBi)¹		
WLAN	-1.8	-2.1
WWAN 3G	-1.9	-2.7
WWAN LTE	-2.1	-2.7

1 Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Antennas—Hongbo JYDKO

General specifications

Table 101. Hongbo JYDKO General specifications

Electrical	
Impedance	50 Ω
Polarization	Linear
Radiation pattern	Omni-directional
Input power	10 W

Table 102. Mechanical specifications

Mechanical	
Antenna length	209.17 mm
Antenna diameter	42 mm
Casing	PC
Connector	SMA (M)
Weight	40 grams

Table 103. Environmental specifications

Environmental	
Temperature range	-40°C to 85°C
Humidity	Non-condensing 65°C 95% RH



Hongbo JYDKO specifications for Edge Gateway 3001 and 3003 (Bent position)

Table 104. Hongbo JYDKO specifications for Edge Gateway 3001 and 3003 (Bent position)

	LTE700	GSM850	GSM900	DCS	PCS	UMTS
Efficiency (%)¹						
WWAN 3G	92.7	61.2	52.6	72.6	71.1	74.0
WWAN LTE	87.1	56.8	50.7	66.9	65.2	66.4
Average gain (dBi)¹						
WWAN 3G	-0.3	-2.1	-2.8	-1.4	-1.5	-1.3
WWAN LTE	-0.6	-2.5	-2.9	-1.7	-1.9	-1.8

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Hongbo JYDKO specifications for Edge Gateway 3001 and 3003 (Straight position)

Table 105. Hongbo JYDKO specifications for Edge Gateway 3001 and 3003 (Straight position)

	LTE700	GSM850	GSM900	DCS	PCS	UMTS
Efficiency (%)¹						
WWAN 3G	73.3	57.1	50.9	56.2	55.1	56.7
WWAN LTE	69.0	54.0	48.0	57.5	56.0	55.8
Average gain (dBi)¹						
WWAN 3G	-1.3	-2.4	-2.9	-2.5	-2.6	-2.5
WWAN LTE	-1.6	-2.7	-3.2	-2.4	-2.5	-2.5

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Hongbo JYDKO specifications for Edge Gateway 3002 (Bent position)

Table 106. Hongbo JYDKO specifications for Edge Gateway 3002 (Bent position)

	LTE700	GSM850	GSM900	DCS	PCS	UMTS
Efficiency (%)¹						
WWAN 3G	93.0	62.4	53.6	70.2	68.1	71.0
WWAN LTE	88.9	57.9	51.4	66.8	63.8	65.7
Average gain (dBi)¹						
WWAN 3G	-0.3	-2.0	-2.7	-1.5	-1.7	-1.5
WWAN LTE	-0.5	-2.4	-2.9	-1.8	-2.0	-1.8

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Hongbo JYDKO specifications for Edge Gateway 3002 (Straight position)

Table 107. Hongbo JYDKO specifications for Edge Gateway 3002 (Straight position)

	LTE700	GSM850	GSM900	DCS	PCS	UMTS
Efficiency (%)¹						
WWAN 3G	73.3	57.0	50.6	55.7	54.6	56.5
WWAN LTE	69.1	55.2	47.9	57.0	55.3	55.3
Average gain (dBi)¹						
WWAN 3G	-1.3	-2.4	-3.0	-2.5	-2.6	-2.5
WWAN LTE	-1.6	-2.6	-3.2	-2.4	-2.6	-2.6

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Antennas—Hongbo G9HPD

General specifications

Table 108. Hongbo G9HPD General specifications

Electrical	
Impedance	50 Ω
Polarization	Linear
Radiation pattern	Omni-directional
Input power	10 W

Table 109. Mechanical specifications

Mechanical	
Antenna length	109 mm
Antenna diameter	10 mm
Casing	PC
Connector	SMA (M)
Weight	7 grams

Table 110. Environmental specifications

Environmental	
Temperature range	-40°C to 85°C
Humidity	Non-condensing 65°C 95% RH

Hongbo G9HPD specifications for Edge Gateway 3002 (Bent position)

Table 111. Hongbo G9HPD specifications for Edge Gateway 3002 (Bent position)

ZigBee	
Efficiency (%)¹	
WLAN	40.2



	ZigBee
WWAN 3G	50.5
WWAN LTE	46.2
Average gain (dBi)¹	
WLAN	-4.0
WWAN 3G	-3.0
WWAN LTE	-3.4

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Hongbo G9HPD specifications for Edge Gateway 3002 (Straight position)

Table 112. Hongbo G9HPD specifications for Edge Gateway 3002 (Straight position)

	ZigBee
Efficiency (%)¹	
WLAN	40.5
WWAN 3G	43.9
WWAN LTE	43.2
Average gain (dBi)¹	
WLAN	-3.9
WWAN 3G	-3.6
WWAN LTE	-3.7

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Antennas—Hongbo M9RV9

General specifications

Table 113. Hongbo M9RV9 General specifications

Electrical	
Impedance	50 Ω
Polarization	Linear
Radiation pattern	Omni-directional
Input power	10 W

Table 114. Mechanical specifications

Mechanical	
Antenna length	207 mm
Antenna diameter	20.5 mm
Casing	ABS
Connector	SMA (M)

Mechanical	
Weight	25 grams

Table 115. Environmental specifications

Environmental	
Temperature range	-40°C to 85°C
Humidity	Non-condensing 65°C 95% RH

Hongbo M9RV9 specifications for Edge Gateway 3001 and 3003 (Bent position)

Table 116. Hongbo M9RV9 specifications for Edge Gateway 3001 and 3003 (Bent position)

	LTE700	GSM850	GSM900	DCS	PCS	UMTS
Efficiency (%)¹						
WWAN LTE	63.2	42.9	38.0	68.0	78.2	73.1
Average gain (dBi)¹						
WWAN LTE	-2.0	-3.7	-4.2	-1.7	-1.1	-1.4
Peak gain (dBi)¹						
WWAN LTE	-0.1	-0.3	-1.2	3.0	2.9	2.7

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Hongbo M9RV9 specifications for Edge Gateway 3001 and 3003 (Straight position)

Table 117. Hongbo M9RV9 specifications for Edge Gateway 3001 and 3003 (Straight position)

	LTE700	GSM850	GSM900	DCS	PCS	UMTS
Efficiency (%)¹						
WWAN LTE	63.0	35.1	33.7	54.3	55.5	52.6
Average gain (dBi)¹						
WWAN LTE	-2.0	-4.5	-4.7	-2.7	-2.6	-2.8
Peak gain (dBi)¹						
WWAN LTE	0.0	-4.7	-4.5	0.7	1.8	1.8

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Hongbo M9RV9 specifications for Edge Gateway 3002 (Bent position)

Table 118. Hongbo M9RV9 specifications for Edge Gateway 3002 (Bent position)

	LTE700	GSM850	GSM900	DCS	PCS	UMTS
Efficiency (%)¹						
WWAN LTE	62.9	43.6	39.6	69.1	76.4	70.3
Average gain (dBi)¹						
WWAN LTE	-2.0	-3.6	-4.0	-1.6	-1.2	-1.5
Peak gain (dBi)¹						



	LTE700	GSM850	GSM900	DCS	PCS	UMTS
WWAN LTE	0.8	-1.1	-4.5	-0.9	-2.5	-0.6

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Hongbo M9RV9 specifications for Edge Gateway 3002 (Straight position)

Table 119. Hongbo M9RV9 specifications for Edge Gateway 3002 (Straight position)

	LTE700	GSM850	GSM900	DCS	PCS	UMTS
Efficiency (%)¹						
WWAN LTE	63.3	34.8	33.4	53.6	54.7	51.7
Average gain (dBi)¹						
WWAN LTE	-2.0	-4.6	-4.8	-2.7	-2.6	-2.9
Peak gain (dBi)¹						
WWAN LTE	0.1	-4.4	-4.4	1.2	2.1	2.1

¹ Efficiency and average gain is the average number of each frequency band. Peak gain is the maximum number of each frequency band.

Communications—CANbus port

 **NOTE:** The CANbus port is available on Edge Gateway 3002 only.

Table 120. CANbus port general specifications

General specifications	
Type	3-pin terminal block Molex 39532-6503
Processor	Atmel ATSAME70N19A-CNT
Transceiver	NXP TJA1052i
CAN signals	Electrically isolated
CAN board detect in BIOS	Required (BIOS-readable)
Driver	Standard USB HID device

 **NOTE:** For details about the CANbus programming, see [Appendix-Program the CANbus](#).

Communications—GPIO port

 **NOTE:** The GPIO port is available on Edge Gateway 3001 only.

Table 121. GPIO port—General specifications

General specifications	
Number of channels	8
Resolution	12-bit
Configuration	Any combination of: <ul style="list-style-type: none"> • 8 x 12-bit DAC channels • 8 x 12-bit ADC channels

General specifications

	• 8 x general-purpose I/O pins
Device	Analog Devices AD5593R
Host interface	I2C
GPIO signals	Electrically-isolated
Operating power supply input (Vdd)	5 V
Reference input/output voltage (Vref)	2.5 V
ADC input range	0 V to Vref; or, 0 V to 2 x Vref, selectable
DAC output range	0 V to Vref; or, 0 V to 2 x Vref, selectable
Series resistance	100K-ohm (between connector pin and device pin)
Type	2 x 8 terminal block

 **NOTE:** For details about GPIO programming, see [Appendix: Programming the GPIO](#).

Communications—Serial ports

 **NOTE:** Serial ports are available on Edge Gateway 3001 only.

Table 122. Communications—Serial ports

General specifications

Serial port RS	232/422/485
Connector type	2 x 2 x 5 terminal blocks
Data rates supported	Up to 12 Mbps (422/485), 1 Mbps (232)
USB-to-UART bridge	Exar XR21V1412
Transceiver	2 x Exar SP339E

Recommended specifications for serial port connectors

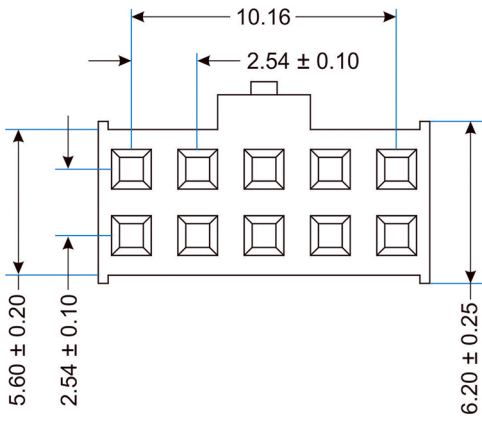
Table 123. General specifications

Voltage rating	250 V AC/DC
Current rating	3A AC/DC
Wire range	22-30 AWG
Temperature range	-25°C to 85°C (-13°F to 185°F)
Contact resistance (maximum)	20 mΩ
Insulation resistance (minimum)	1000 mΩ
Withstanding voltage	1500 V AC/minute

Recommended serial port connector dimensions—Front

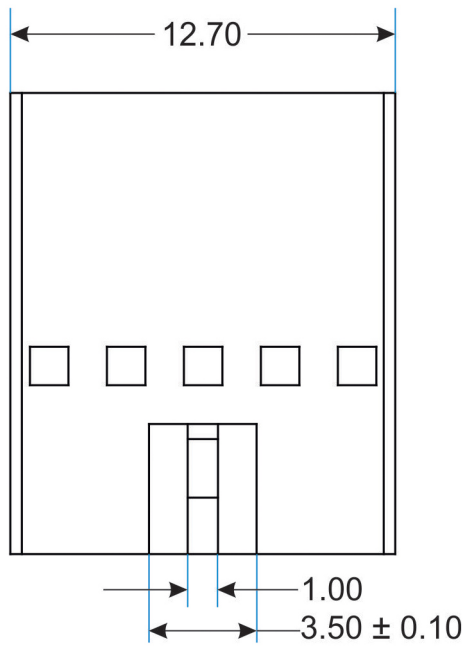
 **NOTE:** All values in the illustration are in millimeters.





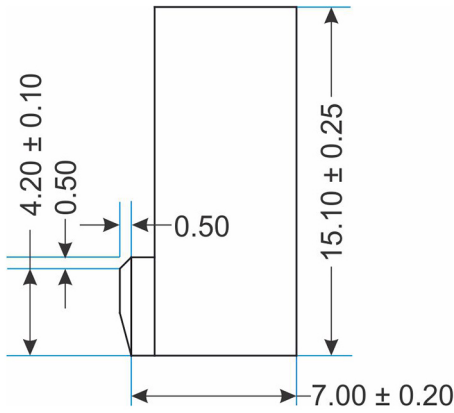
Recommended serial port connector dimensions—Top

 **NOTE:** All values in the illustration are in millimeters.



Recommended serial port connector dimensions—Side

 **NOTE:** All values in the illustration are in millimeters.



micro-SD

Model: Apacer Industrial Micro Secure Digital 3.0

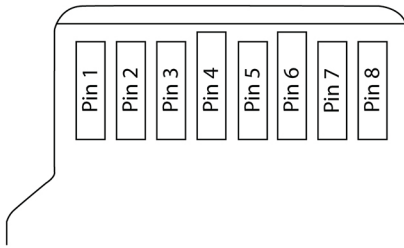


Table 124. PIN assignments

PIN	Name	SD mode		SPI mode	
		Name	Description	Name	Description
1	DAT2		Data line (bit 2)	Reserved	N/A
2	CD/DAT3		Card detected/Data line (bit 3)	CS	Chip select
3	CMD		Command/Response	DI	Data-in
4	VDD		Supply voltage	VDD	Supply voltage
5	CLK		Clock	SCLK	Clock
6	VSS		Supply voltage ground	VSS	Supply voltage ground
7	DAT0		Data line (bit 0)	DO	Data-out
8	DAT1		Data line (bit 1)	Reserved	N/A

Table 125. Capacity

Capacity (GB)	Total bytes
8	7,960,756,224
16	16,013,819,904
32	32,098,975,744



Table 126. Performance

Modes	Capacity			
	8 GB	16 GB	32 GB	64 GB
Read (MB/s)	43	43	43	44
Write (MB/s)	26	36	34	22

Table 127. Electrical—Operating voltages

Symbol	Parameter	Minimum	Maximum	Unit
V _{DD}	Power supply voltage	2.7	3.6	V

Table 128. Electrical—Power consumption

Modes	Capacity			
	8 GB	16 GB	32 GB	64 GB
Operating (mA)	75	100	130	135
Standby (μA)	200	210	240	250

eMMC

Table 129. eMMC—General specifications

General specifications	
Capacity	<ul style="list-style-type: none"> 8 GB Kingston EMMC32G-W525-X01U¹ 32 GB Kingston EMMC08G-W525-X01U <p>¹ Windows 10 IoT Enterprise LTSB 2016 is not supported on the Edge Gateway models with 8 GB or less of the eMMC storage space.</p>
Interface	Compliant with eMMC 5.0 JEDEC Standard Number JESD84-B50
Compatibility	Backward-compatible with all prior eMMCTM specification revisions
Technology	NAND flash memory with eMMCTM 5.0 interface
Protocol	High-speed eMMCTM protocol
Power consumption (reference only)	Idle 0.5 mW, Active 0.4 W
Transfer rate (reference only)	<ul style="list-style-type: none"> 8 GB: 255 MB/s (read); 28 MB/s (write) 32 GB: 277 MB/s (read); 47 MB/s (write)

Regulatory and environmental compliance

Product-related conformity assessment and regulatory authorizations including Product Safety, Electromagnetic Compatibility (EMC), Ergonomics, and Communication Devices relevant to this product, as well as the Data Sheet for this product, are available at dell.com/regulatory_compliance.

Details of Dell's environmental stewardship program to conserve product energy consumption, reduce or eliminate materials for disposal, prolong product life span and provide effective and convenient equipment recovery solutions may be viewed at www.dell.com/environment. Product-related environmental information relevant to this product may be viewed by clicking the Design for Environment link on the webpage.



Appendix

Program the CANbus

The CANbus appears as a Common Device Class (CDC)/USB device in supported operating systems.

For CANbus programming of user mode applications, see the API documentation available at www.microchip.com/design-centers/can/xref.

Programming the GPIO

Program the GPIO port using a hardware programming utility.

1. Enter the **Extended Function Mode** of your utility by writing 87h twice to IO port **2Eh**.
2. Configure pin **GPO0** to **GPO7**.
 - a. Select **Logical Device 8**.
 - Write 07h at IO port **2Eh**.
 - Write 08h at IO port **2Fh**.
 - b. Configure Register CR E1.
 - Write E1h at IO port **2Eh**.
 - Write NNh at IO port **2Fh**.

Table 130. Programming the GPIO

GPO7	GPO6	GPO5	GPO4	GPO3	GPO2	GPO1	GPO0
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Example: If you want to set GPO0 to High and GPO1 to 7 to Low, you need to set **NN** to **01h**.



NOTE: The default values are all low.

3. Configure pin **GPI0** to **GPI7**.
 - a. Select **Logical Device 7**.
 - Write 07h at IO port **2Eh**.
 - Write 07h at IO port **2Fh**.
 - b. Configure Register CR F5.
 - Write F5h at IO port **2Eh**.
 - Read NNh at IO port **2Fh**.

Table 131. Programming the GPIO

GPI7	GPI6	GPI5	GPI4	GPI3	GPI2	GPI1	GPI0
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

- Exit the **Extended Function Mode** by writing 0xAAh at IO port **2Eh**.

Sample code—Controlling GPO registers

The following example is written in Intel 8086 assembly language.

- Enter the **Extended Function Mode**:

```
MOV DX, 2EH
MOV AL, 87H
OUT DX, AL
OUT DX, AL
```

- Configure the GPO register:

```
MOV DX, 2EH
MOV AL, 07H
OUT DX, AL
MOV DX, 2FH
MOV AL, 08H
OUT DX, AL (select Logical Device 8 for GPO)
MOV DX, 2EH
MOV AL, E1H
OUT DX, AL (select CRE1)
MOV DX, 2FH
MOV AL, 01H (update GPO register with value 01H (GPO0 = HIGH, GPO1 to GPO7 = LOW))
OUT DX, AL
```

- Exit the **Extended Function Mode** by:

```
MOV DX, 2EH
MOV AL, AAH
OUT DX, AL
```

Sample code—Read GPI status

The following example is written in Intel 8086 assembly language.

- Enter the **Extended Function Mode**:

```
MOV DX, 2EH
MOV AL, 87H
OUT DX, AL
OUT DX, AL
```

- Configure GPO register:

```
MOV DX, 2EH
MOV AL, 07H
OUT DX, AL
MOV DX, 2FH
MOV AL, 07H
OUT DX, AL (select Logical Device 7 for GPI)
MOV DX, 2EH
MOV AL, F5H
OUT DX, AL (select CRF5)
MOV DX, 2FH
IN AL, DX ; (Get value of GPI0 to GPI7)
```

- Exit the **Extended Function Mode**:

```
MOV DX, 2EH
MOV AL, AAH
OUT DX, AL
```



Default BIOS settings

General (BIOS level 1)

Table 132. General (BIOS level 1)

BIOS level 2	BIOS level 3	Item	Default value	
System Information	System Information	BIOS Version	Not applicable	
		Service Tag	Not applicable	
		Asset Tag	Not applicable	
		Ownership Tag	Not applicable	
		Manufacturing Date	Not applicable	
		Ownership Date	Not applicable	
		Express Service Code	Not applicable	
	Memory Information	Memory Installed	Not applicable	
		Memory Available	Not applicable	
		Memory Speed	Not applicable	
		Memory Channel Mode	Not applicable	
		Memory Technology	Not applicable	
		Processor Information	Processor Type	Not applicable
			Core Count	Not applicable
	Processor ID		Not applicable	
	Current Clock Speed		Not applicable	
	Minimum Clock Speed		Not applicable	
	Maximum Clock Speed		Not applicable	
	Processor L2 Cache		Not applicable	
	Device Information	Processor L3 Cache	Not applicable	
		HT Capable	Not applicable	
		64-Bit Technology	Not applicable	
		eMMC Drive	Not applicable	
			LOM MAC Address	Not applicable

BIOS level 2	BIOS level 3	Item	Default value
		LOM2 MAC Address	Not applicable
		Video Controller	Not applicable
		Video BIOS Version	Not applicable
		Wi-Fi Device	Not applicable
		Celluar Device	Not applicable
		Bluetooth Device	Not applicable
Boot Sequence	Boot Sequence	Boot Sequence - Depends on installed boot devices	Depends on installed boot devices
		Boot List option [Legacy/UEFI]	UEFI
Advanced Boot Options	Advanced Boot Options	Enable Legacy Option ROMs [Enable/Disable]	Enabled
Date/Time	Date/Time	Date [MM/DD/YY]	Not applicable
		Time [HH:MM:SS A/P]	Not applicable

System configuration (BIOS level 1)

Table 133. System configuration (BIOS level 1)

BIOS level 2	BIOS level 3	Item	Default value
Integrated NIC	Integrated NIC	Enable UEFI Network Stack [Enable/Disable]	Enabled
		[Disabled, Enabled, Enabled w/PXE]	Enabled w/PXE
	Integrated NIC 2	[Disabled, Enabled]	Enabled
	Serial Port1	[Disable, RS232, RS-485 HALF DUPLEX, RS-485/422 FULL DUPLEX]	RS232
	Serial Port2	[Disable, RS232, RS-485 HALF DUPLEX, RS-485/422 FULL DUPLEX]	RS232
USB Configuration	USB Configuration	Enable Boot Support [Enable/Disable]	Enabled
		Enable USB 3.0 Controller [Enable/Disable]	Enabled
		Enable USB Port1 [Enable/Disable]	Enabled



BIOS level 2	BIOS level 3	Item	Default value
		Enable USB Port2 [Enable/Disable]	Enabled
	Audio	Enable Audio [Enable/Disable]	Enabled
	Miscellaneous Devices	Enable WWAN [Enable/Disable]	Enabled
		Enable WLAN/Bluetooth [Enable/Disable]	Enabled
		Enable CANBus [Enable/Disable]	Enabled
		Enable ZigBee [Enable/Disable]	Enabled
		Enable Dedicated GPS Radio [Enable/Disable]	Enabled
		Enable MEMs Sensor [Enable/Disable]	Enabled
Watchdog Timer Support	Watchdog Timer Support	Enable Watchdog Timer [Enable/Disable]	Disabled

Security (BIOS level 1)

Table 134. Security (BIOS level 1)

BIOS level 2	BIOS level 3	Item	Default value
Admin Password	Admin Password	Enter the old password	Not Set
		Enter the new password	Not applicable
		Confirm new password	Not applicable
System Password	System Password	Enter the old password	Not Set
		Enter the new password	Not applicable
		Confirm new password	Not applicable
Strong Password	Strong Password	Enable Strong Password [Enable/Disable]	Disabled
Password Configuration	Password Configuration	Admin Password Min	4
		Admin Password Max	32
		System Password Min	4
		System Password Max	32
Password Bypass	Password Bypass	[Disabled/Reboot Bypass]	Disabled

BIOS level 2	BIOS level 3	Item	Default value
Password Change	Password Change	Allow Non-Admin Password Changes [Enable/Disable]	Enabled
UEFI Capsule Firmware Updates	UEFI Capsule Firmware Updates	Enable UEFI Capsule Firmware Updates [Enable/Disable]	Enabled
TPM 2.0 Security	TPM 2.0 Security	TPM 2.0 Security [Enable/Disable]	Enabled
		TPM On [Enable/Disable]	Enabled
		PPI Bypass for Enable Commands [Enable/Disable]	Disabled
		PPI Bypass for Disable Commands [Enable/Disable]	Disabled
		Attestation Enable [Enable/Disable]	Enabled
		Key Storage Enable [Enable/Disable]	Enabled
		SHA-256 [Enable/Disable]	Enabled
		Clear [Enable/Disable]	Disabled
Computrace(R)	Computrace(R)	Deactivate/Disable/Activate	Deactivate
Chassis Intrusion	Chassis Intrusion	[Disable/Enable/On-Silent]	Disable
CPU XD Support	CPU XD Support	Enable CPU XD Support [Enable/Disable]	Enabled
Admin Setup Lockout	Admin Setup Lockout	Enable Admin Setup Lockout [Enable/Disable]	Disabled

Secure boot (BIOS level 1)

Table 135. Secure boot (BIOS level 1)

BIOS level 2	BIOS level 3	Item	Default value
Secure Boot Enable	Secure Boot Enable	[Enable/Disable]	Disabled
Expert Key Management	Expert Key Management	Enable Custom Mode [Enable/Disable]	Disabled
		Custom Mode Key Management {PK/KEK/db/dbx}	PK



Performance (BIOS level 1)

Table 136. Performance (BIOS level 1)

BIOS level 2	BIOS level 3	Item	Default value
C-States Control	Inter SpeedStep	Enable Intel SpeedStep [Enable/Disable]	Enabled
C-States Control	C-States Control	C-states [Enable/Disable]	Enabled
Limit CPUID Value	Limit CPUID Value	Enable CPUID Limit [Enable/Disable]	Disabled

Power management (BIOS level 1)

Table 137. Power management (BIOS level 1)

BIOS level 2	BIOS level 3	Item	Default value
Auto On Time	Auto On Time	Time Selection: [HH:MM A/P] Auto On Time (if Wake Period =0)	12:00AM
		Value Selection: [0-254] Auto-Wake Period (0-254 minutes)	000
		Day Selection: [Disabled/Every Day/Weekdays/Select Days]	Disabled
		Under [Select Days] when enabled [Sunday/Monday.../Saturday]	Not applicable
Wake on LAN/WLAN	Wake on LAN/WLAN	[Disabled/LAN Only/WLAN only/LAN or WLAN]	Disabled

POST behavior (BIOS level 1)

Table 138. POST behavior (BIOS level 1)

BIOS level 2	BIOS level 3	Item	Default value
Keyboard Errors	Numlock LED	Enable Numlock LED [Enable/Disable]	Enabled
Keyboard Errors	Keyboard Errors	Enable Keyboard Error Detection [Enable/Disable]	Enabled
Fastboot	Fastboot	[Minimal/Thorough/Auto]	Thorough
Extend BIOS POST Time	Extend BIOS POST Time	[0 seconds/5 seconds/10 seconds]	0 seconds
Full Screen Logo	Full Screen Logo	Enable Full Screen Logo [Enable/Disable]	Disabled

BIOS level 2	BIOS level 3	Item	Default value
Warnings and Errors	Warnings and Errors	[Prompt on Warnings and Errors/Continue on Warnings/Continue on Warnings and Errors]	Prompt on Warnings and Errors

Virtualization support (BIOS level 1)

Table 139. Virtualization support (BIOS level 1)

BIOS level 2	BIOS level 3	Item	Default value
Virtualization	Virtualization	Enable Intel Virtualization Technology [Enable/Disable]	Enabled

Maintenance (BIOS level 1)

Table 140. Maintenance (BIOS level 1)

BIOS level 2	BIOS level 3	Item	Default value
Service Tag	Service Tag	<System Service Tag>, text entry capability when blank	Not applicable
Asset Tag	Asset Tag	<System Asset Tag>, text entry capability	Not applicable
SERR Messages	SERR Messages	Enable SERR Messages [Enable/Disable]	Enabled
BIOS Downgrade	BIOS Downgrade	Allow BIOS Downgrade [Enable/Disable]	Enabled
Data Wipe	Data Wipe	Wipe on Next Boot [Enable/Disable]	Disabled
BIOS Recovery	BIOS Recovery	BIOS Recovery from Hard Drive [Enable/Disable]	Enabled

System logs (BIOS level 1)

Table 141. System logs (BIOS level 1)

BIOS level 2	BIOS level 3	Item	Default value
BIOS Events	BIOS Events	List of BIOS events with "Clear Log" button to clear the log	Not applicable



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