Edge Gateway 5000/5100
Technical Guidebook

Contents

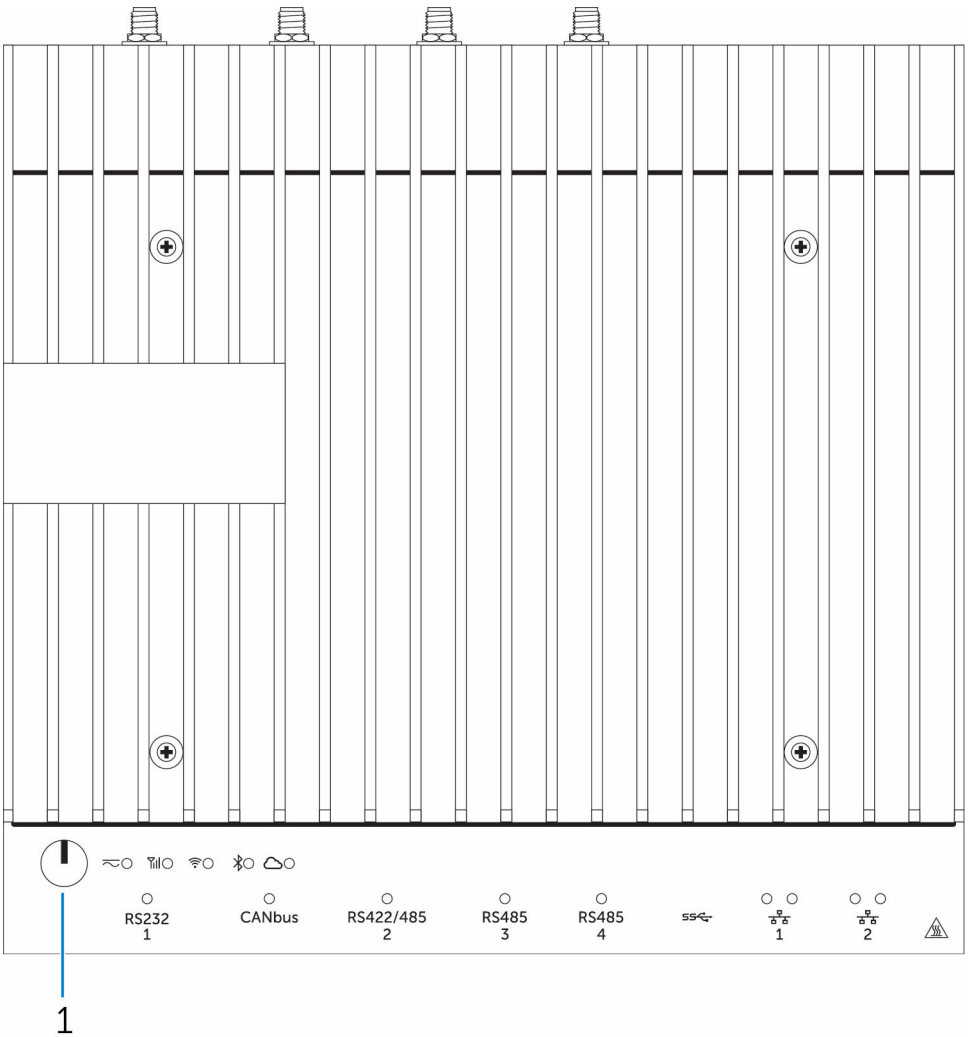
1

Overview

This chapter provides an overview of the Edge Gateway system as well as optional modules.

System views

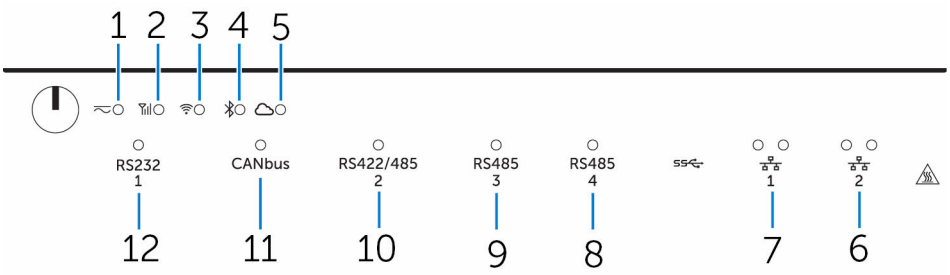
System—Front



Features		
1	Power button	Press and hold for 2 seconds to turn on the system if it is turned off.

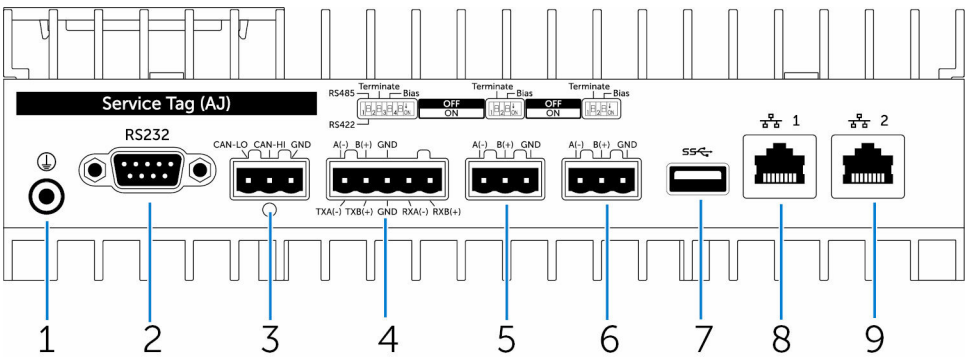
NOTE: For more details about the LED indicators on the front of the system, see LED indicators.

System—Front (LED indicators)



Features		
1	Power status LED	Indicates the power-state of the system.
2	Mobile broadband status LED	Indicates the mobile broadband status and network activity.
3	Wireless status LED	Indicates the wireless connectivity status and network activity.
4	Bluetooth status LED	Indicates the Bluetooth status and activity.
5	Cloud connection status LED	Indicates the cloud connection status.
6	Network status LED	Indicates the connectivity status and network activity.
7	Network status LED	Indicates the connectivity status and network activity.
8	RS485 port status LED	Provides the status of the RS485 port connections.
9	RS485 port status LED	Provides the status of the RS485 port connections.
10	RS422/485 port status LED	Provides the status of the RS422/485 port connections.
11	CANbus port status LED	Provides the status of the CANbus port connection.
12	Serial port status LED	Provides the status of the serial port connection.

System—Bottom

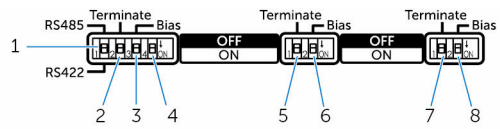


Features		
1	Earth ground	Connect the grounding cable to the system.
2	Serial port	Connect to a serial port enabled device such as a printer.
3	CANbus port	Connect to a CANbus port enabled device or dongle.
4	RS422/485 port	Connect a RS422/485 device.

Features		
5	RS485 port	Connect a RS485 device.
6	RS485 port	Connect a RS485 device.
7	USB 3.0 port	Connect a USB 3.0 device.
8	Network port	Connect an Ethernet (RJ45) cable from a router or a broadband modem for network or internet access.
9	Network port	Connect an Ethernet (RJ45) cable from a router or a broadband modem for network or internet access.

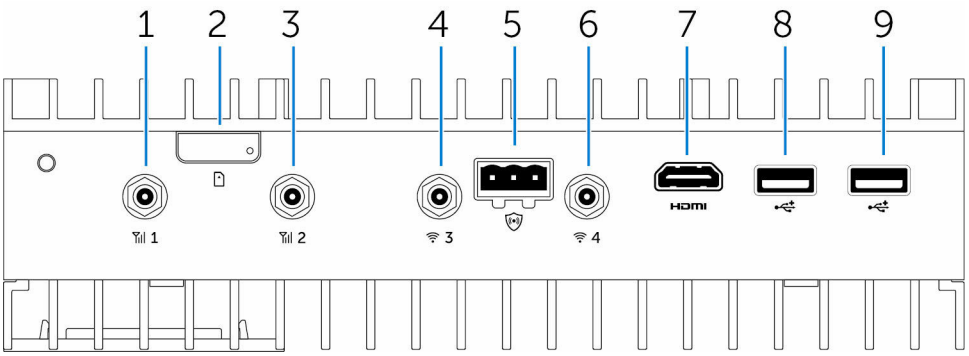
NOTE: For more details about the DIP switches on the bottom of the system, see DIP switches.

System—Bottom (DIP switches)



Feature		
1	RS422/RS485 port toggle switch	Toggle between RS422 or RS485 standard.
2	RS422/RS485 port resistor switch	Enable/disable the differential termination resistor.
3	RS422/RS485 port bias resistor switch	Enable/disable the bias resistor for the RS422/RS485 port.
4	ePSA diagnostic switch	When the position of the switch changes, the system starts in ePSA (Enhanced Preboot System Assessment) mode on the next start.
5	RS485 port resistor switch	Enable/disable the differential termination resistor for RS485.
6	RS485 port bias resistor switch	Enable/disable the bias resistor for the RS485 port.
7	RS485 port resistor switch	Enable/disable the differential termination resistor for RS485.
8	RS485 port bias resistor switch	Enable/disable the bias resistor for the RS485 port.

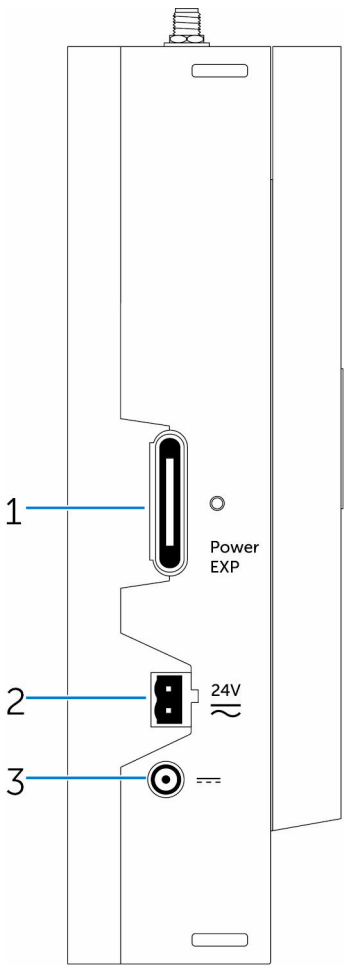
System—Top



Features		
1	Mobile broadband antenna port (port one)	Connect an antenna to increase the range and strength of the mobile broadband signals.
2	Micro-SIM card slot	Insert a micro-SIM card to connect to a mobile broadband network.

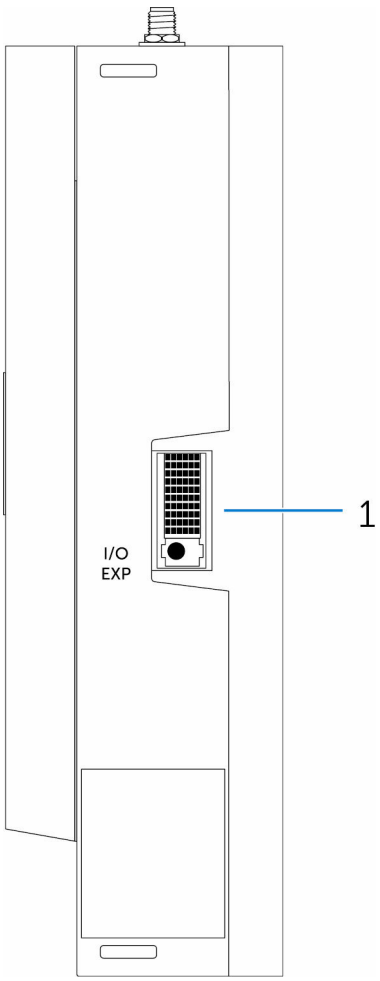
Features		
3	Mobile broadband antenna port (port two)	Connect an antenna to increase the range and strength of the mobile broadband signals.
4	Wi-Fi antenna port (port three)	Connect an antenna to increase the range and strength of Wi-Fi signals.
5	Intrusion detection connector	Connect an intrusion detection switch to detect any intrusion into the system.
6	Wi-Fi antenna port (port four)	Connect an antenna to increase the range and strength of Wi-Fi signals.
7	HDMI port	Connect a monitor or other HDMI device. Provides video and audio output. Hot-plugging is supported on Windows 10 and Ubuntu only.
8	USB 2.0 port	Connect a USB 2.0 device.
9	USB 2.0 port	Connect a USB 2.0 device.

System—Left



Features		
1	Power module expansion port	Connect an external power module for increased power options.
2	24 V AC/DC power Phoenix connector	Connect an 24 V AC/DC power connector to provide power to your system.
3	19.5 V DC power adapter port	Connect a 19.5 V DC power adapter connector to provide power to your system.

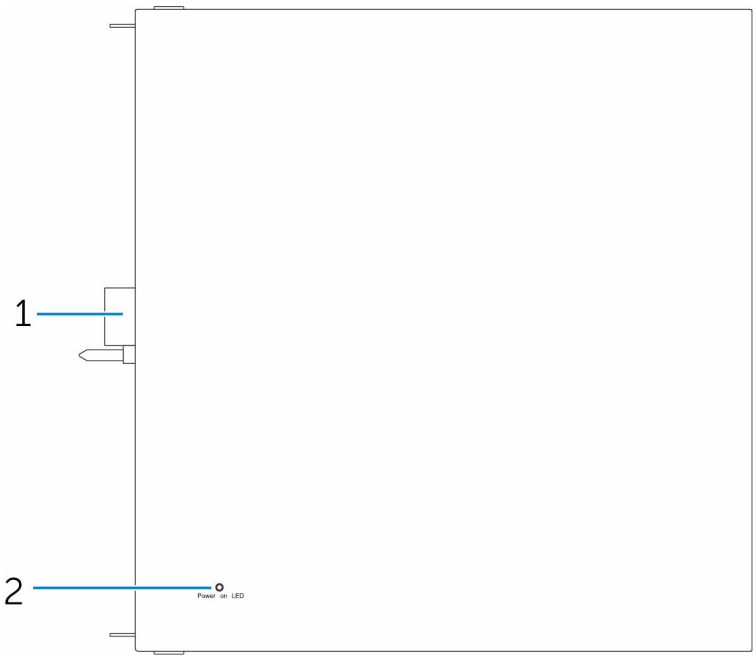
System—Right



Features		
1	IO expansion port	Connect an external expansion module for additional IO ports.

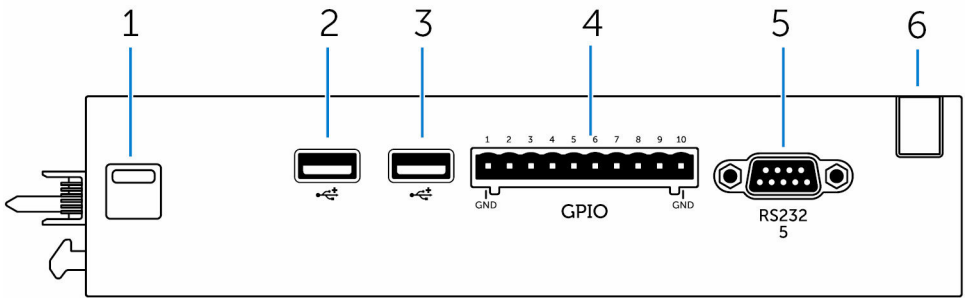
IO module (optional) views

IO module—Front



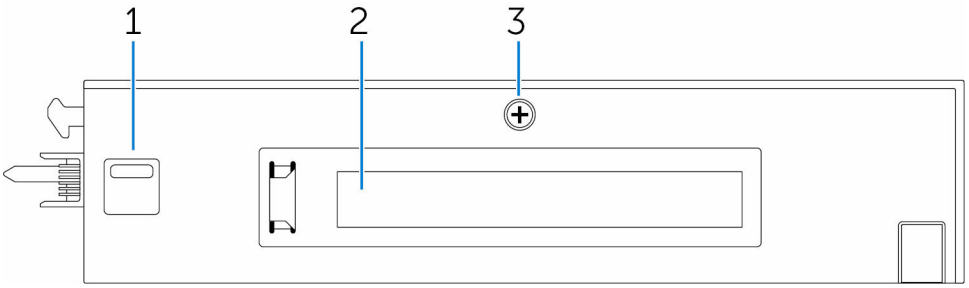
Features		
1	IO module expansion connector and guide pin	Connect the IO module to the Edge Gateway.
2	Power status light	Indicates the power state of the IO module and the Edge Gateway.

IO module—Top



Features		
1	Top release latch	Push both the top and bottom release latches to disconnect the power module from the Edge Gateway.
2	USB 2.0 port	For USB 2.0 devices.
3	USB 2.0 port	For USB 2.0 devices.
4	GPIO port	Connect a GPIO 8–pin cable.
5	RS232 port	Connect an RS232 cable.
6	Cable routing slot	Route any cable(s) that has to be connected to the PCI card installed in the IO module.

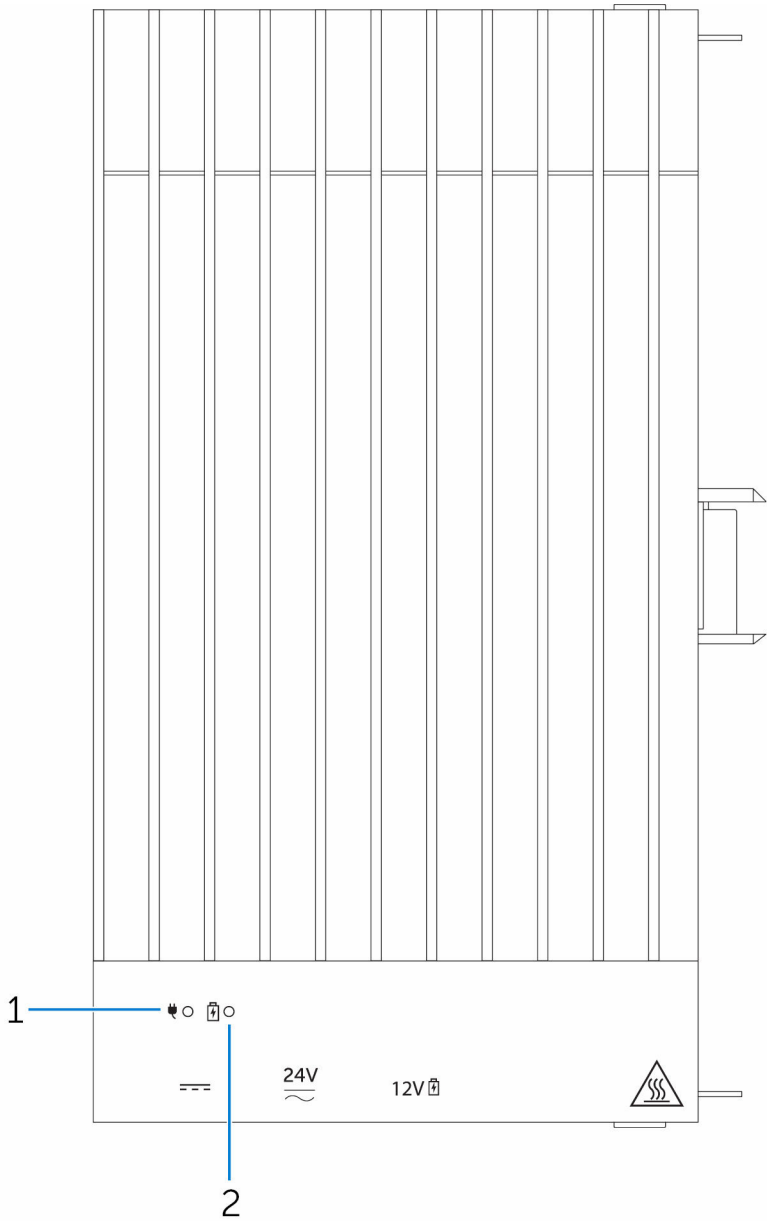
IO module—Bottom



Features		
1	Bottom release latch	Push both the top and bottom release latches to disconnect the power module from the Edge Gateway.
2	PCIe x1 card slot	Install PCIe x1 card on the IO module.
3	IO module cover removal screw	Remove the screw to open the box and install the PCIe card.

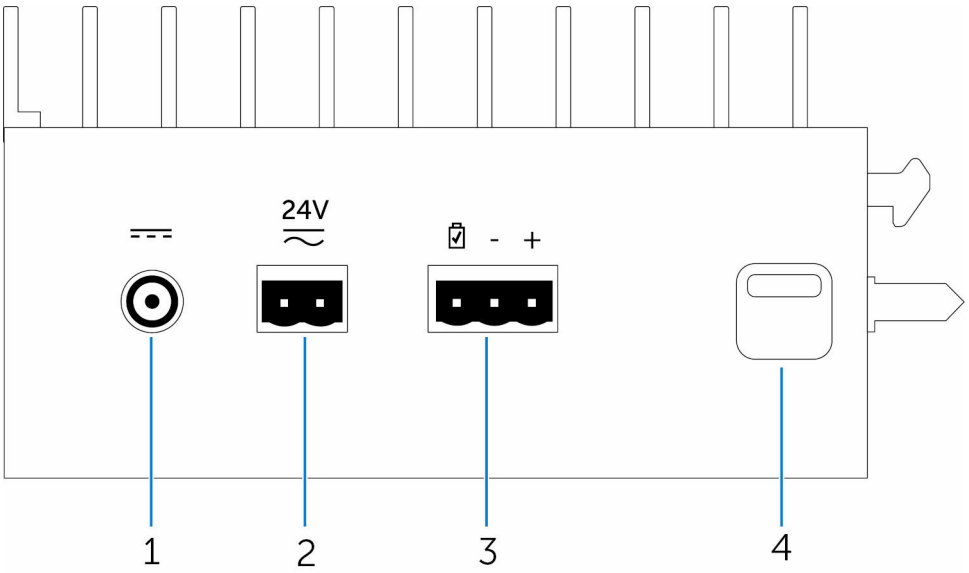
Power module (optional) views

Power module—Front



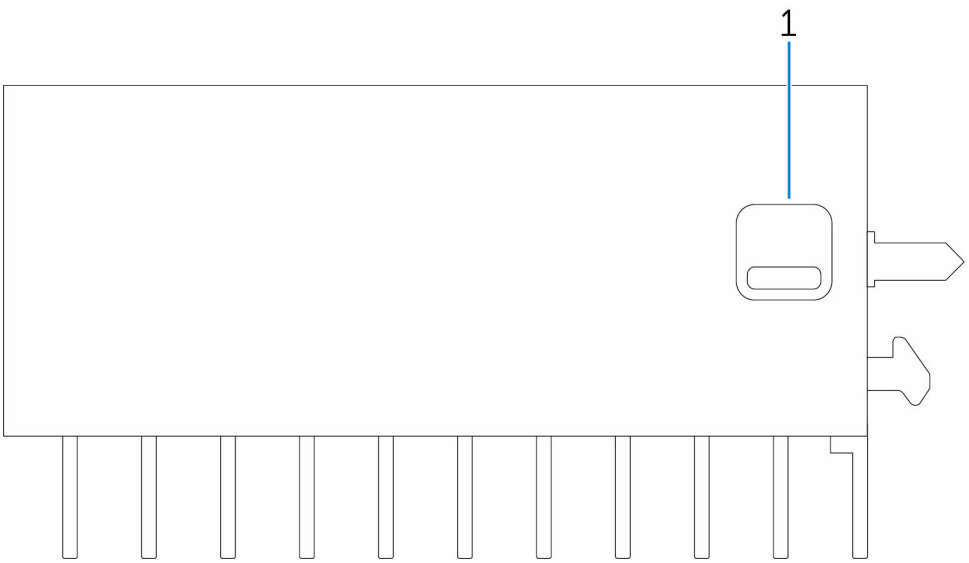
Features		
1	Power status LED	Indicates the power-state of the power module and the Edge Gateway.
2	Battery status LED	Indicates the power-state of the attached battery.

Power module—Bottom



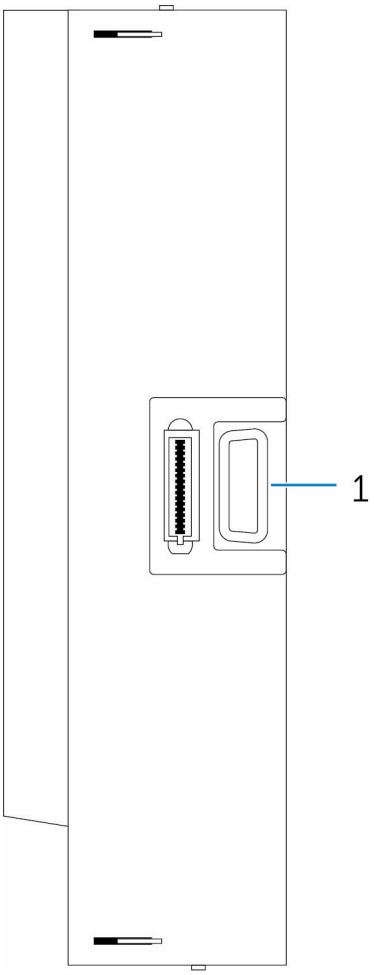
Features		
1	19.5 V DC power adapter port	Connect a 19.5 V DC power adapter to provide power to your Edge Gateway.
2	24 V AC/DC power port	Connect a 24 V AC/DC power source to power your Edge Gateway.
3	Sealed lead-acid battery port	Connect an external battery to the power module to provide back-up power in case of power interruption.
4	Bottom release-latch	Push both the top and bottom release-latches to disconnect the power module from the Edge Gateway.

Power module—Top



Features		
1	Top release latch	Push both the top and bottom release latches to disconnect the power module from the Edge Gateway.

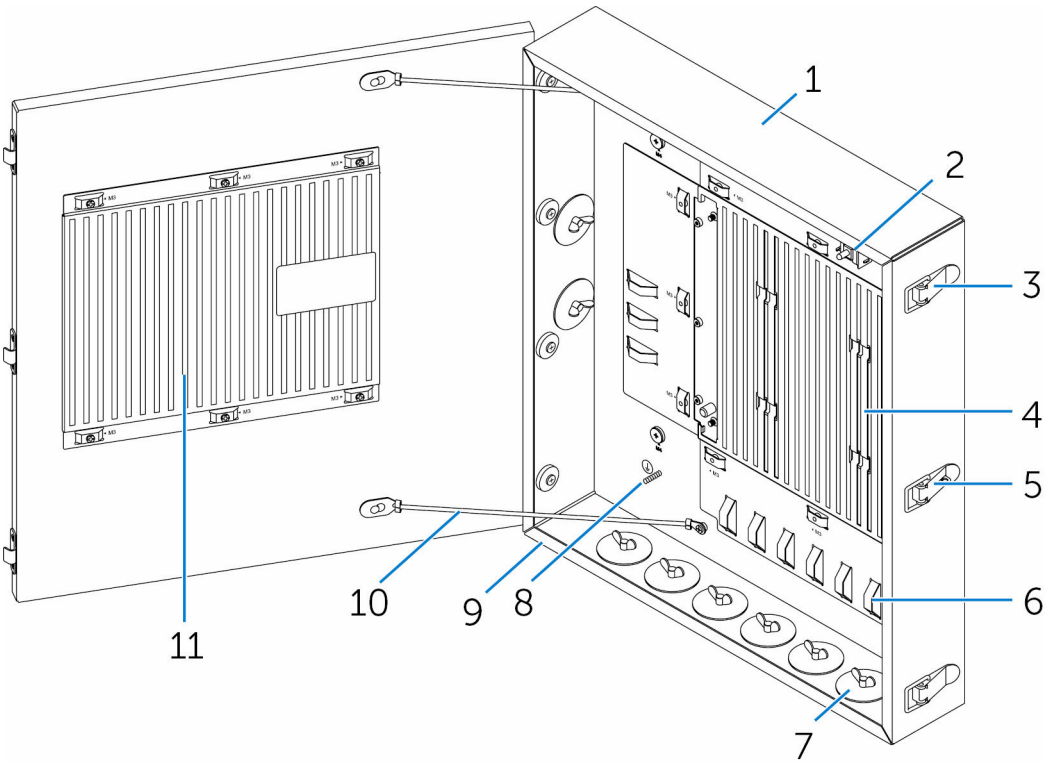
Power module—Right



Features		
1	Edge Gateway expansion port	Connect the power module to the Edge Gateway for increased power options and to power the IO expansion module.

Enclosure (optional) view

Enclosure - Side



Features		
1	Rugged enclosure	Install the Edge Gateway in the rugged enclosure when using in harsh environments condition.
2	Intrusion detection switch	Detects unauthorized system access.
3	Door securing latch (3)	Secure the enclosure.
4	Thermal ribs	Dissipates the heat generated by the system.
5	Latch lock-out	Secure the system with a padlock.
6	Cable tie-off (17)	To prevent accidental cable disconnection, tie all cables to the cable tie-off guides.
7	Cable conduit openings (8)	Route the cables through the conduits (1 inch and 0.75 inch diameter).
8	Primary ground (internal)	Connect the grounding cable to the system.
9	Primary ground (external)	Connect the grounding cable to the system.
10	Door-stop cables (2)	Restricts the door from opening.
11	Door thermal ribs	Dissipates the heat generated by the system.

2

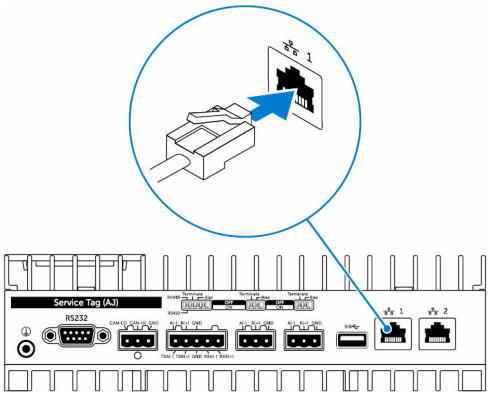
Installation and configuration

NOTE: The information in this chapter provides an overview of the installation and configuration requirements of the Edge Gateway. The Edge Gateway is designed for specific applications and needs to be installed by qualified personnel with RF and regulatory-related knowledge. For full installation instructions, see the *Edge Gateway Installation and Operation Manual* that ships with the product.

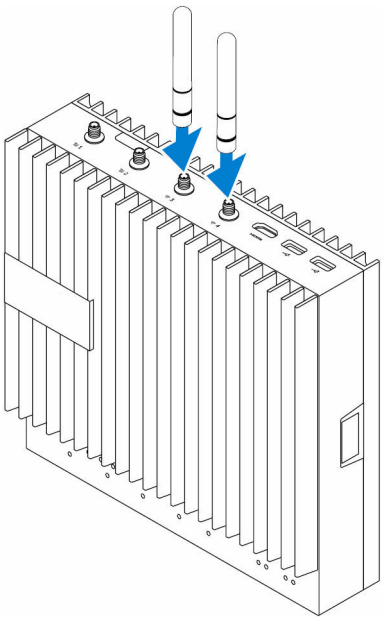
Setting up the Edge Gateway

Powering on the Edge Gateway

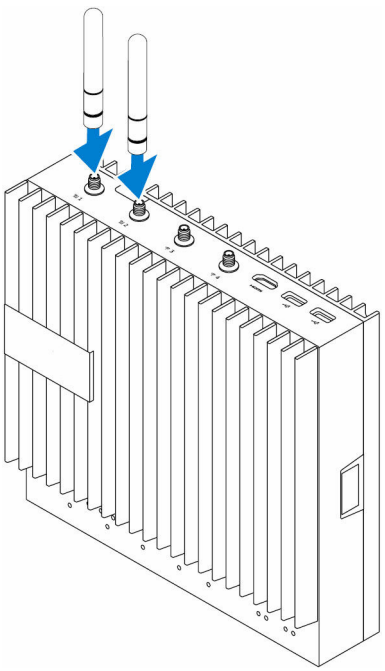
1. Install the Edge Gateway on the wall mount using a wall mounting kit.
   or
   Install the Edge Gateway on the rack infrastructure using DIN-rail mounting brackets.
2. Connect a network cable—optional.



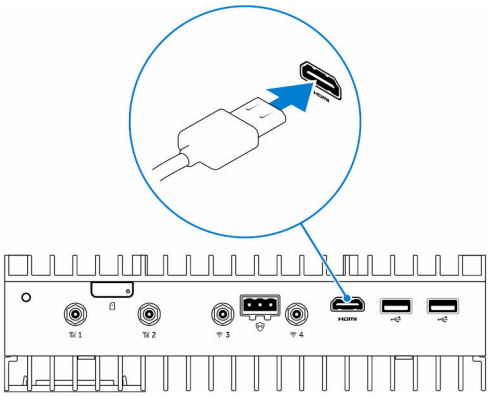
3. Install the WLAN antenna to enable the wireless connections—optional.



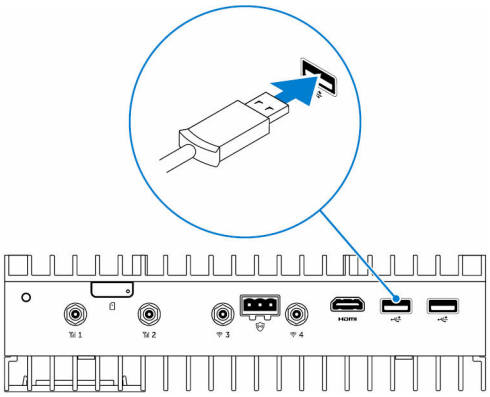
4. Install the WWAN antenna to enable the wireless connections—optional.



5. Connect a display to the Edge Gateway (if necessary).

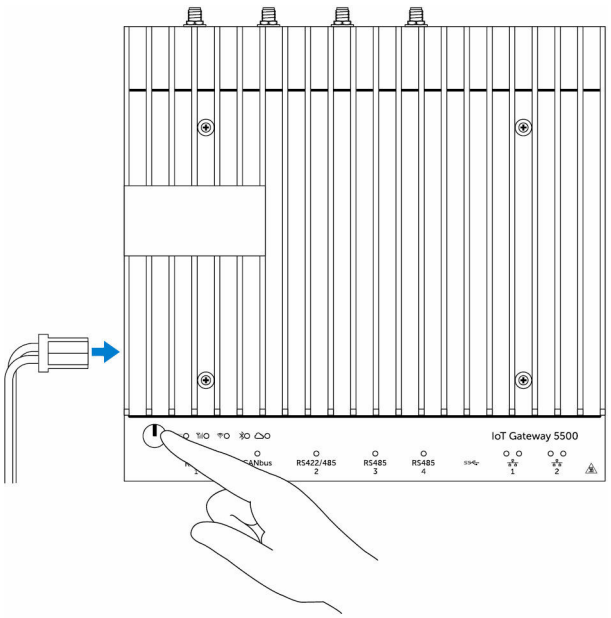


6. Connect a keyboard and mouse if accessing the Edge Gateway directly.



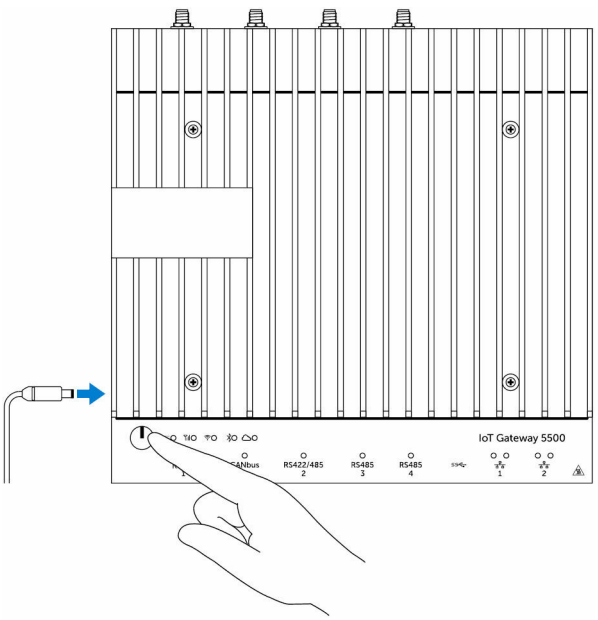
7. Connect a grounding cable to the Gateway (if necessary).
8. Connect a SELV/limited energy circuit power source to the Edge Gateway and press the power button to turn it on.

24 V AC/DC



or

19.5 V DC



9. If setting up the Edge Gateway for the first time, complete the operating system setup.

   NOTE: The Edge Gateway is shipped with either Windows 10 Enterprise, Ubuntu Snappy, or Wind River Linux operating systems.

   NOTE: On Windows 10 OS, select *Do this later* when prompted to enter the product key.

   NOTE: The default username and password for Ubuntu-Snappy-Core is *ubuntu*.

   NOTE: The default username and password for Wind River is *root*.

10. Connect and configure devices using the RS422/RS485 ports.

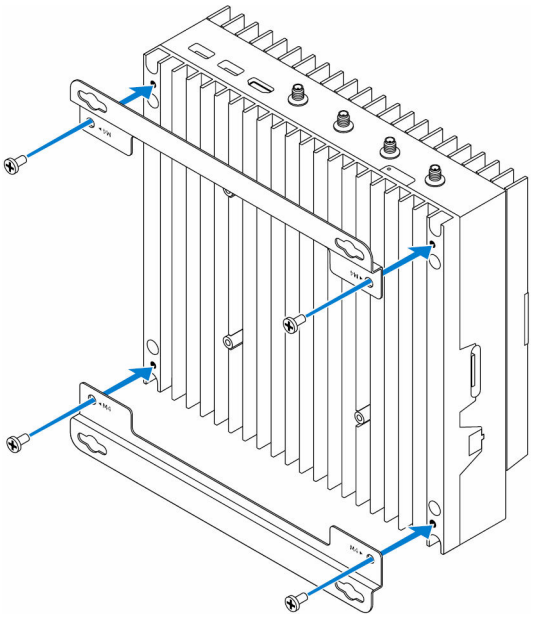
    NOTE: Turn on the corresponding dip switches to enable the RS422/R485 ports.

    NOTE: After the Edge Gateway setup is complete, reinstall the dust covers on any unused ports.

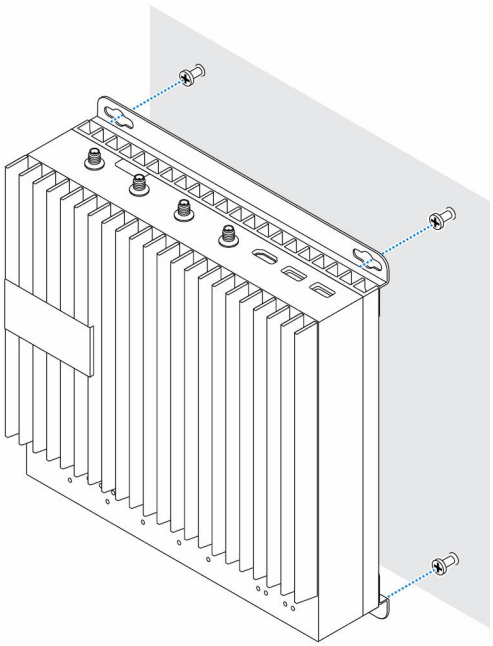
Mounting the Edge Gateway on the wall

You can mount the Edge Gateway on a wall by using mounting brackets.

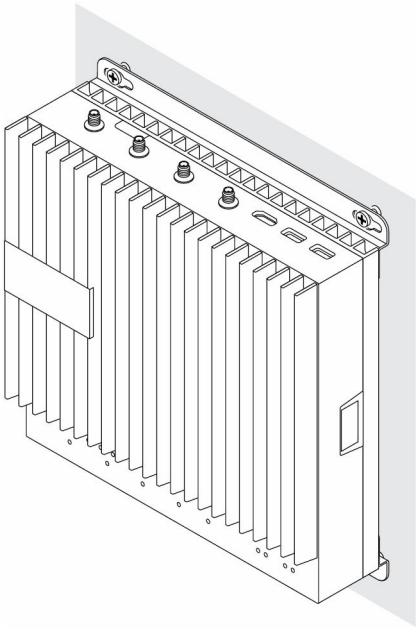
1. Secure the two mounting brackets to the back of the Edge Gateway by using four screws.



2. Drill four holes in the wall that correspond to the holes in the mounting bracket, then place the Edge Gateway against the wall and align the holes in the mounting brackets with the holes in the wall.



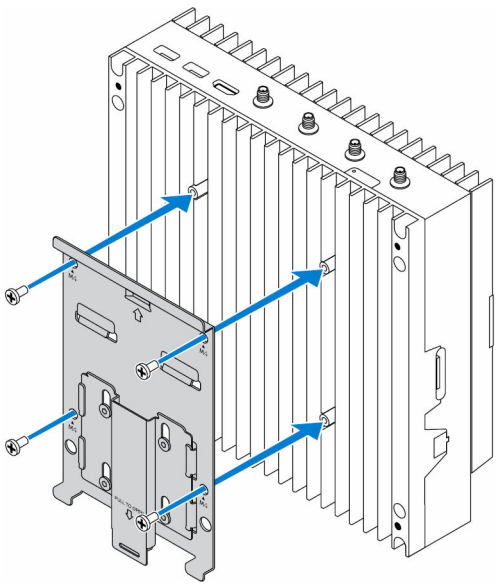
3. Tighten the screws to secure the Edge Gateway to the wall.



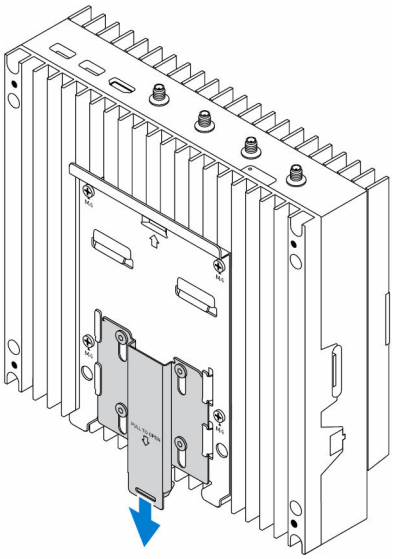
Mounting the Edge Gateway on a DIN rail

The Edge Gateway can be mounted on a DIN rail. The DIN rail bracket mounts to the back of the Edge Gateway.

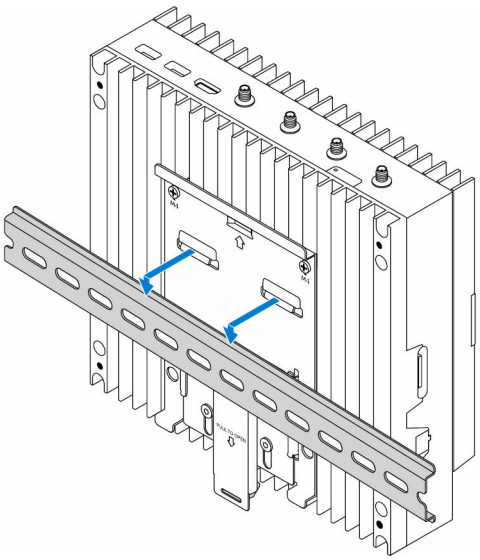
1. Align the screw holes on the DIN rail mount to the back of the Edge Gateway, place the screws on the DIN rail mount and secure it to the Edge Gateway.



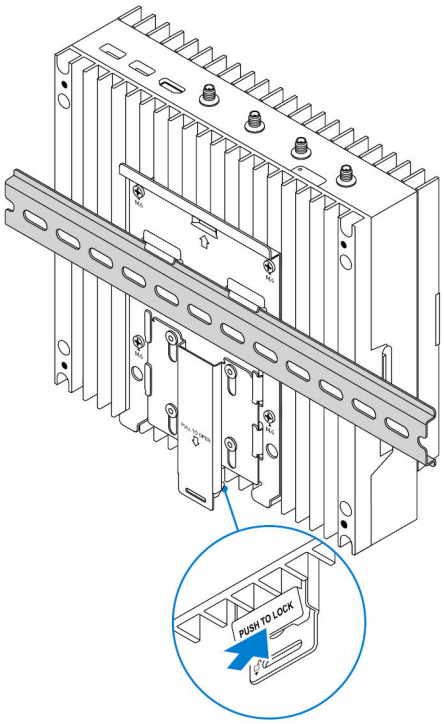
2. Pull down on the tab to release the latch on the DIN rail mount.



3. Mount the Edge Gateway on a DIN rail.



4. Secure the Edge Gateway to the DIN rail by pressing the latch.

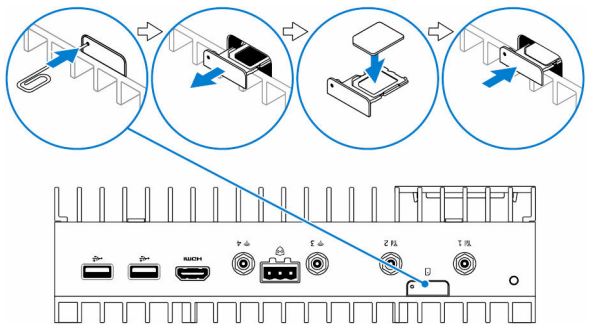


Inserting a micro-SIM card and activating your mobile broadband

CAUTION: We recommend that you insert the micro-SIM card before powering on the Edge Gateway.

1. Shut down your Edge Gateway.
2. Locate the micro-SIM card slot.
3. Use a paper clip or SIM eject tool to eject the micro-SIM card tray.
4. Place the micro-SIM card on the tray.

   CAUTION: Ensure that the micro-SIM card is aligned as shown in the image.
5. Close the micro-SIM card tray.



6. Turn on your Edge Gateway.
7. Connect to a mobile network.

   Windows operating system

   If the Edge Gateway is shipped with HSPA+ (DW5580) WWAN card:

   a. Launch the **Telit Mobile Broadband Manager**.

   b. Click the play  button to connect to your HSPA+ network.

NOTE: Click the information  button to view the International Mobile Equipment Identity (IMEI) and Integrated Circuit Card Identifier (ICCID) information.

Click the stop  to disconnect from your HSPA+ network.

If the Edge Gateway is shipped with LTE Verizon (DW5812) WWAN or LTE AT&T (DW5813) card:

a. Select the network icon from the taskbar and then click **Cellular**.
b. Select your **Mobile Broadband Carrier → Advanced Options**.
c. Make a note of the International Mobile Equipment Identity (IMEI) and the Integrated Circuit Card Identifier (ICCID).

Ubuntu operating system

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

```
#nmcli con add type gsm ifname ttyACM3 con-name <connection name> apn <apn> user
<user name> password <password>
```

d. Connect to the mobile network: `#nmcli con up` *connection name*

NOTE: To view the IMEI and ICCID number use the `mmcli -m 0 --command=+CIMI` command.

To disconnect from the mobile network: `#nmcli con down` *connection name*.

Wind River operating system

If the Edge Gateway is shipped with HSPA+ (DW5580) WWAN card:

a. Open the **Terminal** window.
b. Configure the Mobile Broadband APN profile:

```
#uci set network.wwan.apn="<apn>"
#uci commit network
```

c. Connect to the mobile network: `#ifup wwan`

NOTE: To view the IMEI and ICCID number use the `AT+IMEISV` command.

To disconnect from the mobile network: `#ifdown wwan`.

If the Edge Gateway is shipped with LTE Verizon (DW5812) WWAN card:

Open the **Terminal** window.

a. In the terminal type `AT+IMEISV` to open the Minicom terminal.

   The Minicom terminal opens with the following text:

```
Welcome to minicom 2.7
OPTIONS: I18n
Compiled on Dec 17 2015, 16:20:45.
Port /dev/ttyACM0, 21:33:05
Press CTRL-A Z for help on special keys
```

b. Type the AT+cgdcont command with *PDP Context Identifier*, "*Packet Data Protocol type*", and "*Access Point Name*" parameters and press Enter.

   Example: `at+cgdcont=3,"IPV4V6","vzwinternet"`.

   NOTE: If the command runs successfully, the message `OK` appears.

c. Configure the Network Control Mode with the `at#ncm` command.

   Example: `at#ncm=1,3`.

d. Activate the Packet Data Protocol with the `at+cgact` command.

   Example: `at+cgact=1,3`.

e. To view the PDP Context Read Dynamic Parameters, that is, *bearer_id*, *apn*, *ip_addr*, *subnet_mask*, *gw_addr*, *DNS_prim_addr*, *DNS_sec_addr*, *P-CSCF_prim_addr*, and *P-CSCF_sec_addr* parameters, run the `at+cgcontrdp` command.

Example: `at+cgcontrdp=3`

```
+CGCONTRDP: 3,7,"vzwinternet.mnc480.mcc311.gprs","100.106.47.7.255.0.0.0","100.1
06.47.8","198.224.157.135","0.0.0.0","0.0.0.0","0.0.00"
```

f. Exit the Minicom module.

g. In the Linux terminal configure the connection with the following commands

```
root@WR-IntelligentDevice:~# ifconfig wwan0 ip_addr netmask subnet_mask up
root@WR-IntelligentDevice:~# route add default gw gw_addr wwan0
root@WR-IntelligentDevice:~# echo nameserver DNS_prim_addr >>/etc/resolv.conf
```

Example:

```
root@WR-IntelligentDevice:~# ifconfig wwan0 100.106.47.7 netmask 255.0.0.0 up
root@WR-IntelligentDevice:~# route add default gw 100.106.47.8 wwan0
root@WR-IntelligentDevice:~# echo nameserver 198.224.157.135 >>/etc/resolv.conf
```

h. Log in to the Minicom module using the `minicom -D /dev/ttyACM0` command.

i. Connect to the mobile network using the `at+cgdata` command.

Example:`at+cgdata="M-RAW_IP",3`

NOTE: To view the IMEI and ICCID number use the `AT+IMEISV` command.

To disconnect from the mobile network

a. Open the Minicom terminal.

b. Enter the `at+cgdata="M-RAW_IP",3` command.

c. Close the Minicom terminal.

d. Enter the `root@WR-IntelligentDevice:~# ifconfig wwan0 down` command.

If the Edge Gateway is shipped with LTE AT&T (DW5813) WWAN card:

a. Open the **Terminal** window.

b. In the terminal type `minicom -D /dev/ttyACM0` to open the Minicom terminal.

The Minicom terminal opens with the following text:

```
Welcome to minicom 2.7
OPTIONS: I18n
Compiled on Dec 17 2015, 16:20:45.
Port /dev/ttyACM0, 21:33:05
Press CTRL-A Z for help on special keys
```

c. Type the AT+cgdcont command with *PDP Context Identifier*, "*Packet Data Protocol type*", and "*Access Point Name*" parameters and press Enter.

Example: `at+cgdcont=3,"IPV4V6","broadband".`

NOTE: If the command runs successfully, the message `OK` appears.

d. Configure the Network Control Mode with the `at#ncm` command.

Example: `at#ncm=1,3`.

e. Activate the Packet Data Protocol with the `at+cgact` command.

Example: `at+cgact=1,3`.

f. To view the PDP Context Read Dynamic Parameters, that is, *bearer_id*, *apn*, *ip_addr*, *subnet_mask*, *gw_addr*, *DNS_prim_addr*, *DNS_sec_addr*, *P-CSCF_prim_addr*, and *P-CSCF_sec_addr* parameters, run the `at+cgcontrdp` command.

Example: `at+cgcontrdp=3`

```
+CGCONTRDP: 3,7,"broadband.mnc480.mcc311.gprs","100.106.47.7.255.0.0.0","100.1
06.47.8","198.224.157.135","0.0.0.0","0.0.0.0","0.0.00"
```

g. Exit the Minicom module.

h. In the Linux terminal configure the connection with the following commands

```
root@WR-IntelligentDevice:~# ifconfig wwan0 ip_addr netmask subnet_mask up
root@WR-IntelligentDevice:~# route add default gw gw_addr wwan0
root@WR-IntelligentDevice:~# echo nameserver DNS_prim_addr >>/etc/resolv.conf
```

Example:

```
root@WR-IntelligentDevice:~# ifconfig wwan0 100.106.47.7 netmask 255.0.0.0 up
root@WR-IntelligentDevice:~# route add default gw 100.106.47.8 wwan0
root@WR-IntelligentDevice:~# echo nameserver 198.224.157.135 >>/etc/resolv.conf
```

i. Log in to the Minicom module using the `minicom -D /dev/ttyACM0` command.

j. Connect to the mobile network using the `at+cgdata` command.

Example:`at+cgdata="M-RAW_IP",3`

To disconnect from the mobile network

a. Open the Minicom terminal.

b. Enter the `at+cgdata="M-RAW_IP",3` command.

c. Close the Minicom terminal.

d. Enter the `root@WR-IntelligentDevice:~# ifconfig wwan0 down` command.

Replacing the micro-SIM card

CAUTION: Removing the micro-SIM card while it is in use may cause data loss or result in application errors.

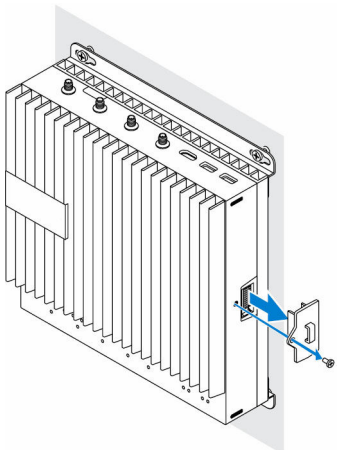
1. Using a paper clip or SIM eject tool, eject the micro-SIM card tray.
2. Remove the micro-SIM card from the micro-SIM card tray.
3. Replace the micro-SIM card tray into the Gateway.

Setting up the IO module

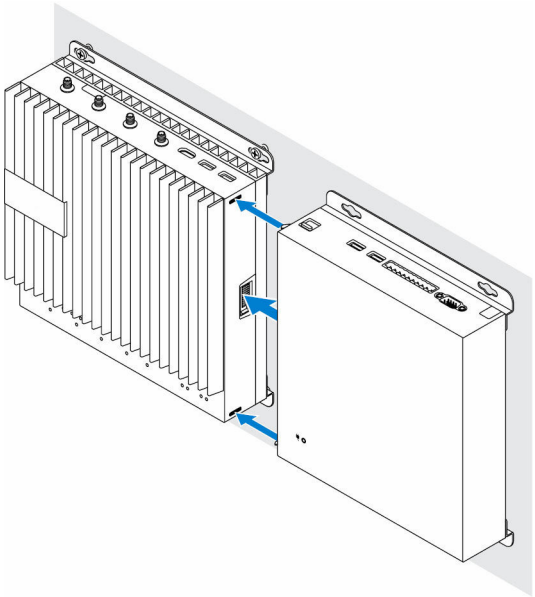
CAUTION: Before touching anything inside the system, ground yourself by touching an unpainted metal surface. While you work, periodically touch an unpainted metal surface to dissipate static electricity, which could harm internal components.

NOTE: Install the PCIe expansion card in the IO expansion module before mounting it on wall mount or DIN rail.

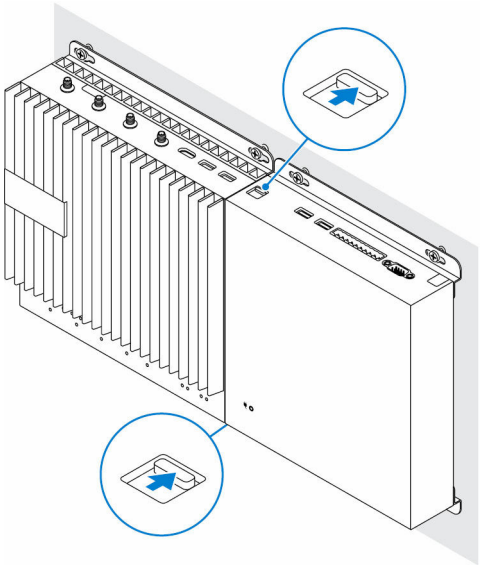
1. Install the PCIe expansion card in the IO expansion module—optional.
   For more information, see Installing the PCIe card into the IO module.
2. Attach either wall-mount brackets or a DIN rail mount to the power module as needed.
3. Remove the screw and the dust cap covering the power module expansion port on the Edge Gateway connector.



4. Align the power module guide pins to the power module port on the Edge Gateway and slide the power module toward the Edge Gateway until fully seated.

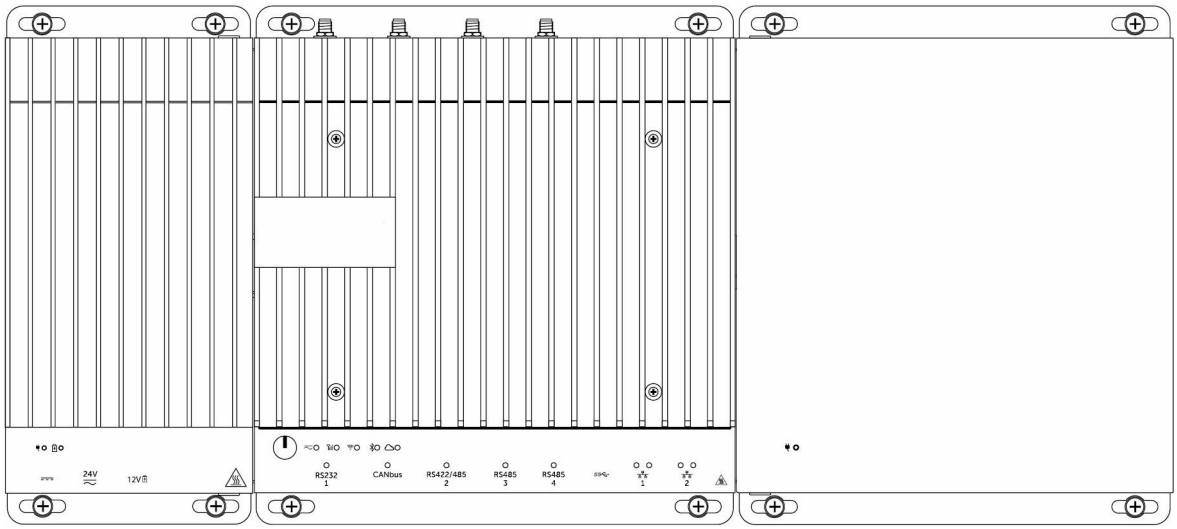


5. Ensure the top and bottom latches are locked to secure the module to the Edge Gateway.

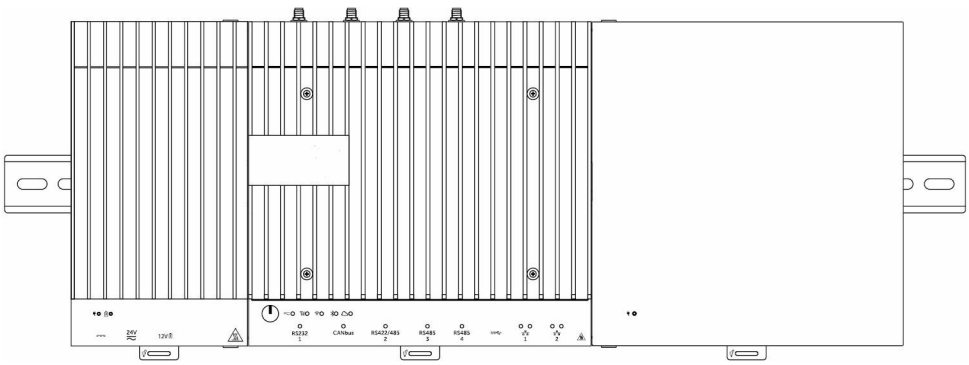


6. Install the Edge Gateway and the IO module along with the power module at a desired location using a wall-mount bracket or the DIN rail mount.

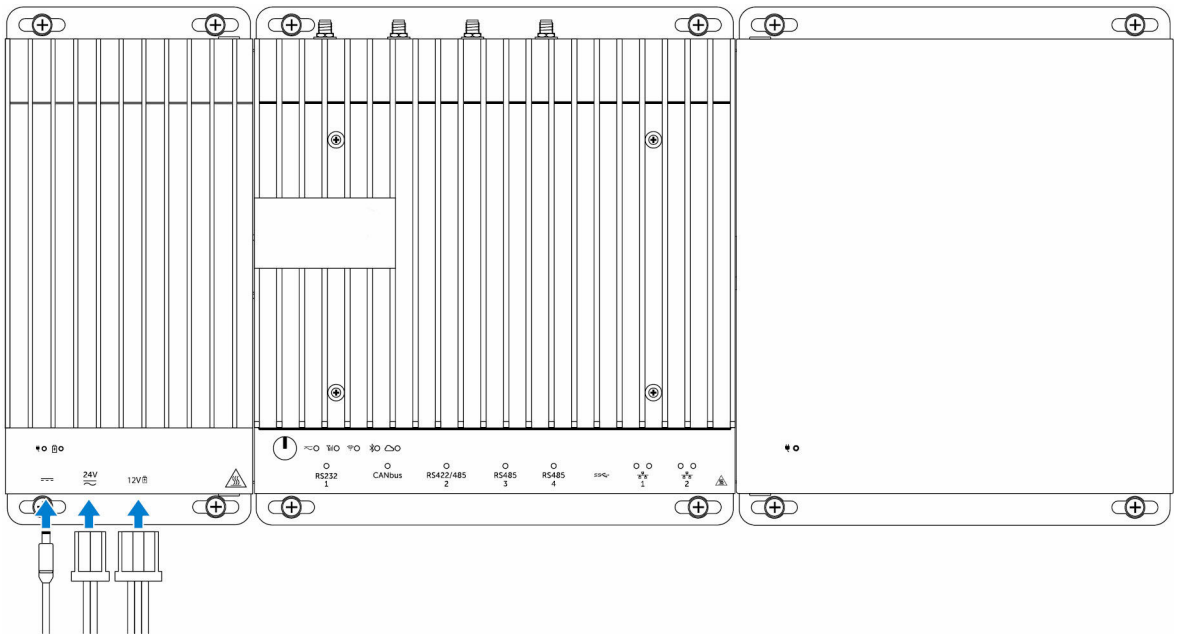
Wall mount bracket



DIN rail mount



7. Connect to a power source, and press the power button.



NOTE: Connect a power cable to the 24 V AC/DC or 19.5 V DC power adapter port on the power module.

NOTE: The power adapter and sealed lead-acid battery is sold separately.

NOTE: To enable and use the IO expansion module, you must also install the power module.

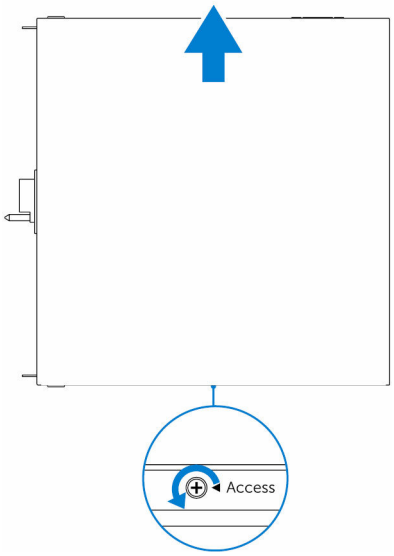
Installing the PCIe card into the IO module

CAUTION: Electrical and electronic devices are sensitive to electrostatic discharge (ESD). Exposure to ESD can harm your device and potentially cause it not to function properly. Ensure that you are properly grounded before handling the mobile broadband card.

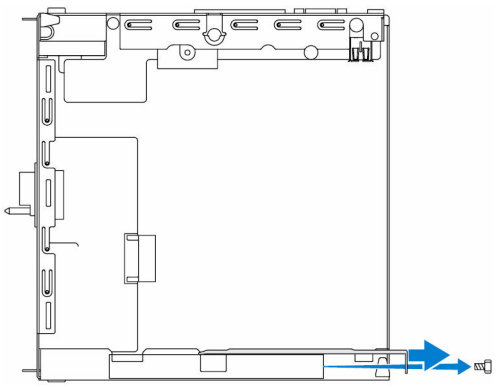
NOTE: Install the PCIe expansion card in the IO expansion module before mounting it on a wall mount or DIN rail.

1. Open the IO module.
   a. Remove the dust caps and loosen the access cover screw that secures the IO expansion module to the cover.
   b. Slide the module in the direction shown, and then carefully lift the top cover from the module.

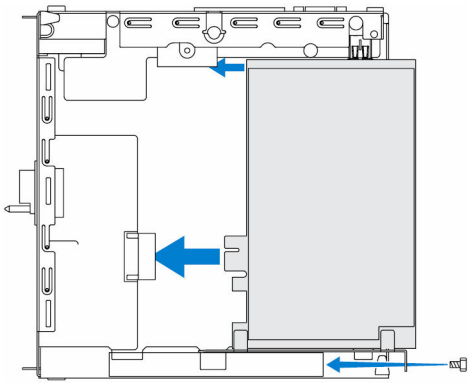
   CAUTION: Remove the cover carefully to avoid damaging the LED light cable, which is mounted on the bottom of the cover.



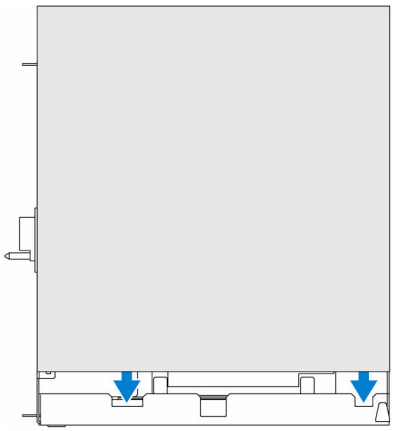
2. Remove the PCIe expansion card-slot cover.



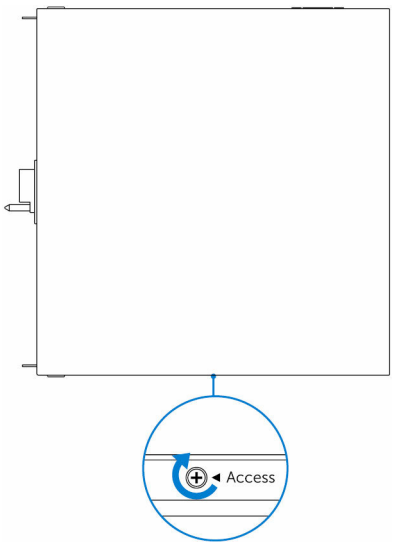
3. Install the PCIe card into the PCIe expansion card slot on the IO expansion module and secure with a screw.



4. Replace the cover on the IO expansion module.



5. Tighten the screw that secures the cover to the IO expansion module.



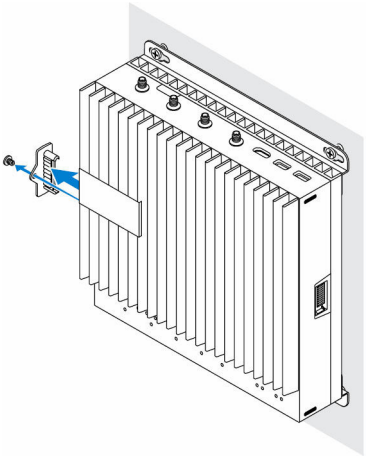
NOTE: Replace the dust caps on any unused ports and connectors.

Setting up the power module

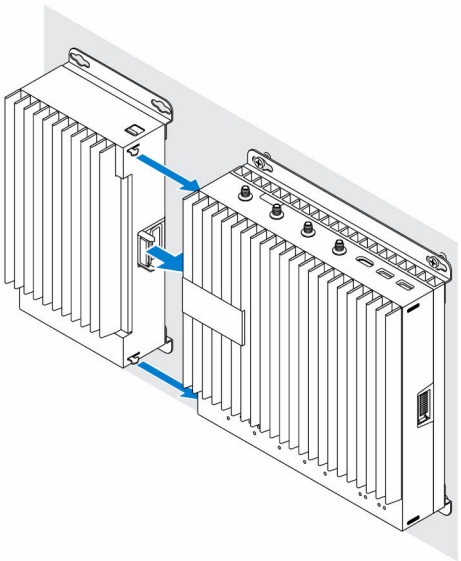
WARNING: Before installing the power module, shut down the Edge Gateway and disconnect the power cable.

NOTE: To enable and use the IO expansion module, you must also install the power module.

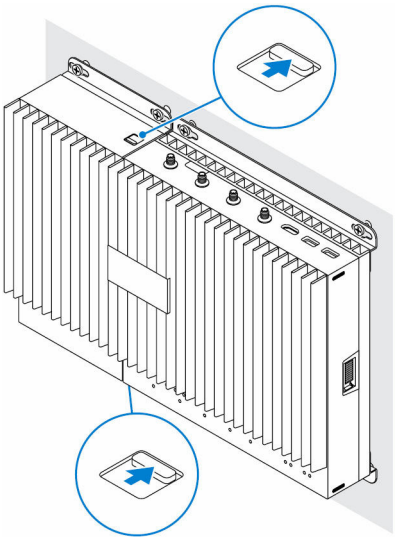
1. Attach either wall-mount brackets or a DIN rail mounts to the power module as needed.
2. Remove the screw and the dust-cap covering the power module expansion port on the Edge Gateway connector.



3. Align the power module guide pins to the power module port on the Edge Gateway and slide the power module until fully seated.

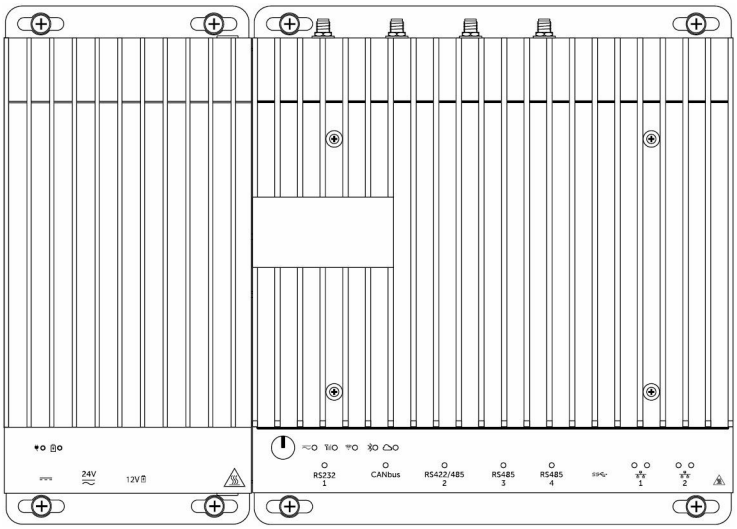


4. Ensure the top and bottom latches are locked to secure the module to the Edge Gateway.

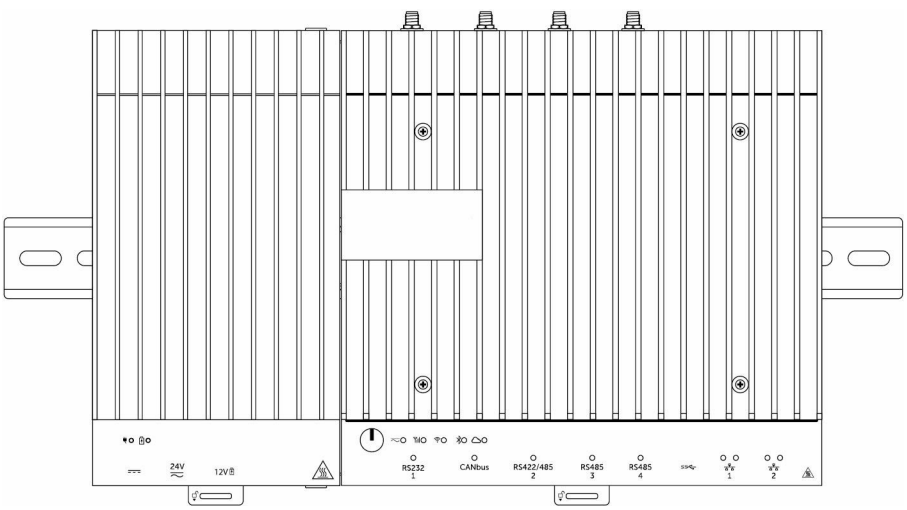


5. Secure the power module to the wall or to the DIN rail.

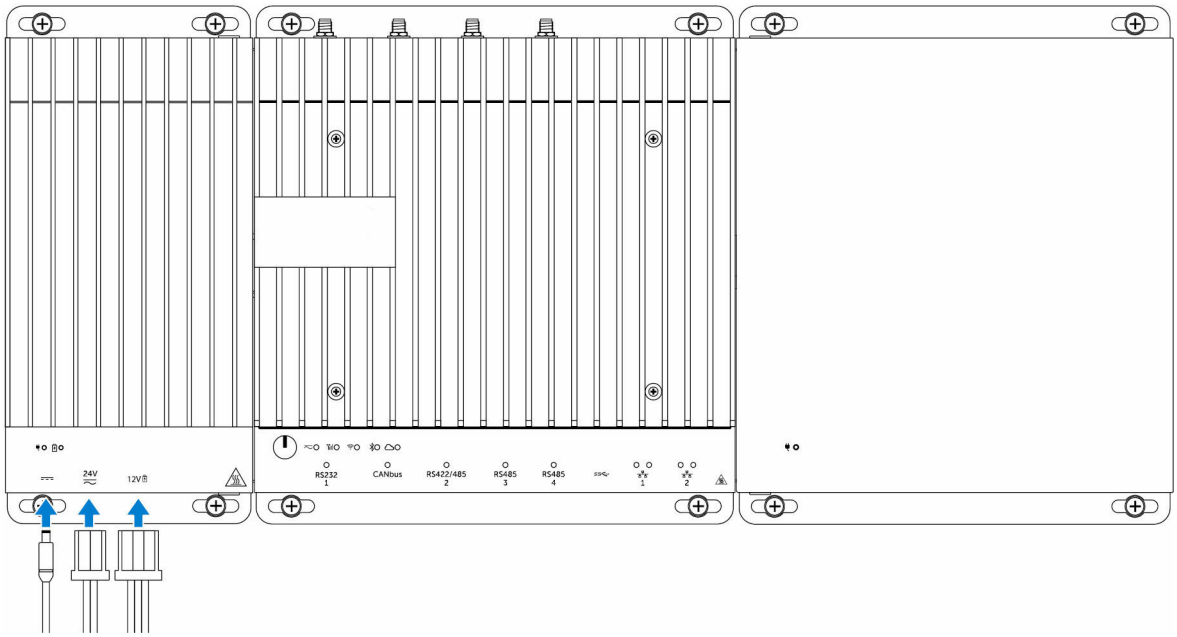
Wall mount bracket



DIN rail



6. Connect the power sources and press the power button on the Edge Gateway.



NOTE: You can connect the power cable to the 24V AC/DC, 19 VDC, and a battery simultaneously.

NOTE: The power adapter and sealed lead-acid battery are sold separately.

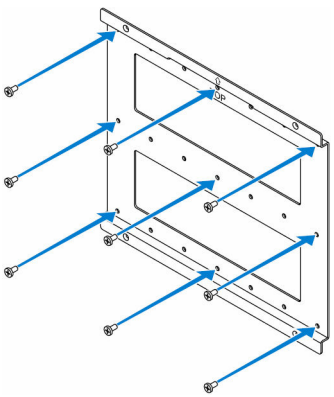
NOTE: Installing the battery is optional. We recommend that you connect a sealed 12V lead-acid battery to the power module.

Setting up the enclosure

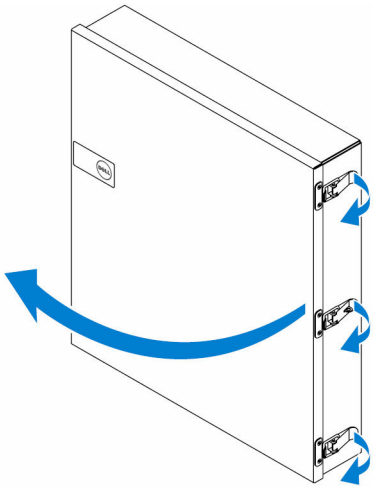
1. Install the enclosure's wall-mount bracket at a desired location and secure it to the wall using the wall-mount screws.

   NOTE: Ensure that the notch on the bracket is on the top.

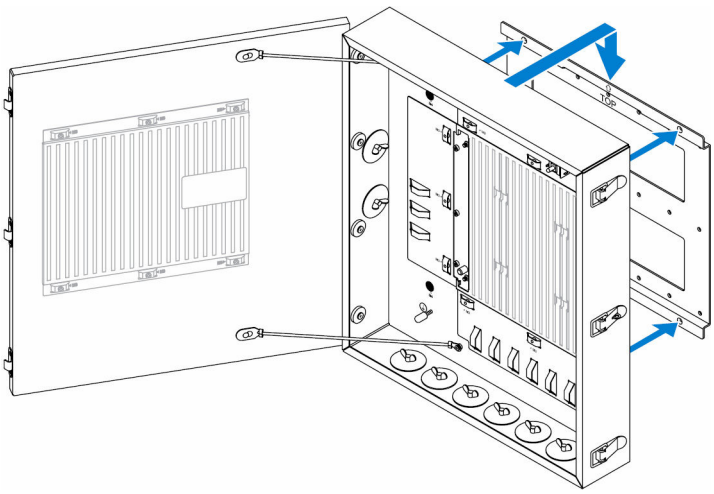
   NOTE: The wall-mount screws are not included with the enclosure.



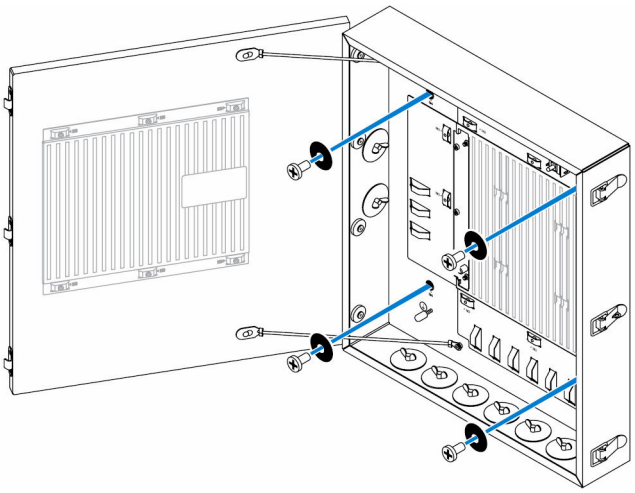
2. Open the enclosure.



3. Place the enclosure on the wall-mount bracket, and align the tab on the back of the enclosure so that it fits into the notch on the wall bracket.

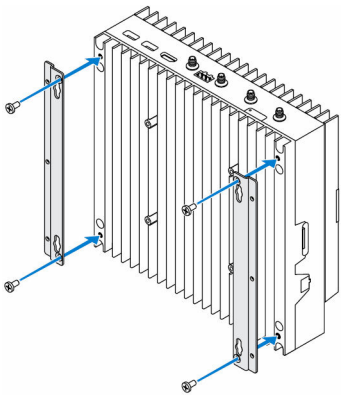


4. Secure the enclosure to the wall bracket by using the rubber washers and screws.

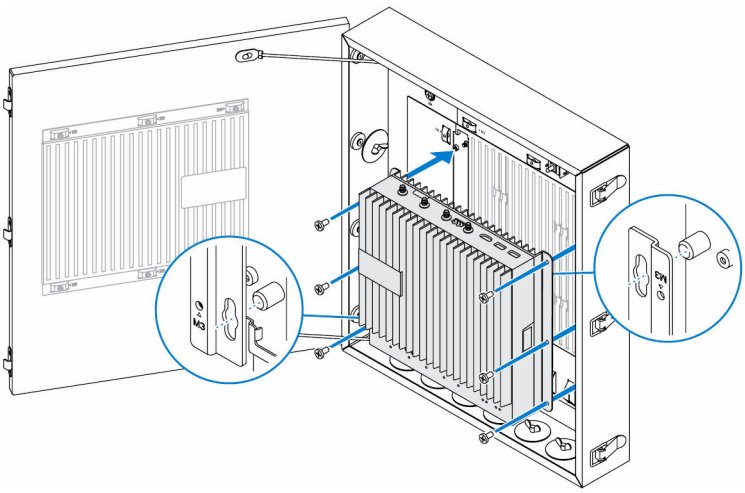


5. Secure the enclosure mounting brackets to the Edge Gateway by using the screws.

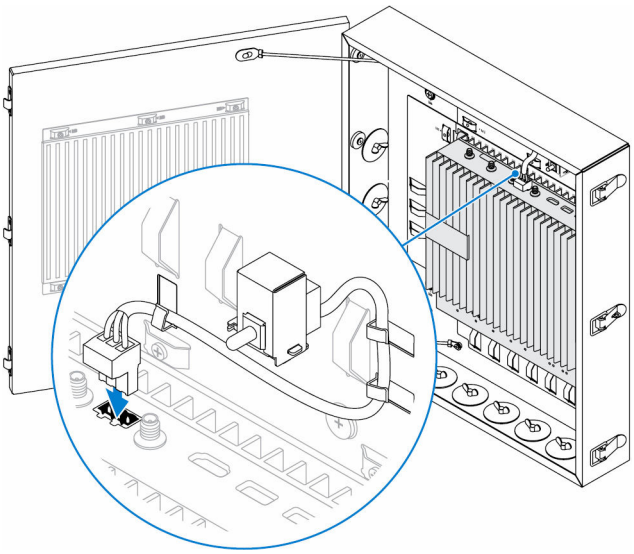
NOTE: Before attaching the brackets to the Edge Gateway, note the correct orientation of the brackets.



6. Position the Edge Gateway onto the enclosure's two locator pins, and then place and tighten the screws to secure the Edge Gateway to the enclosure.

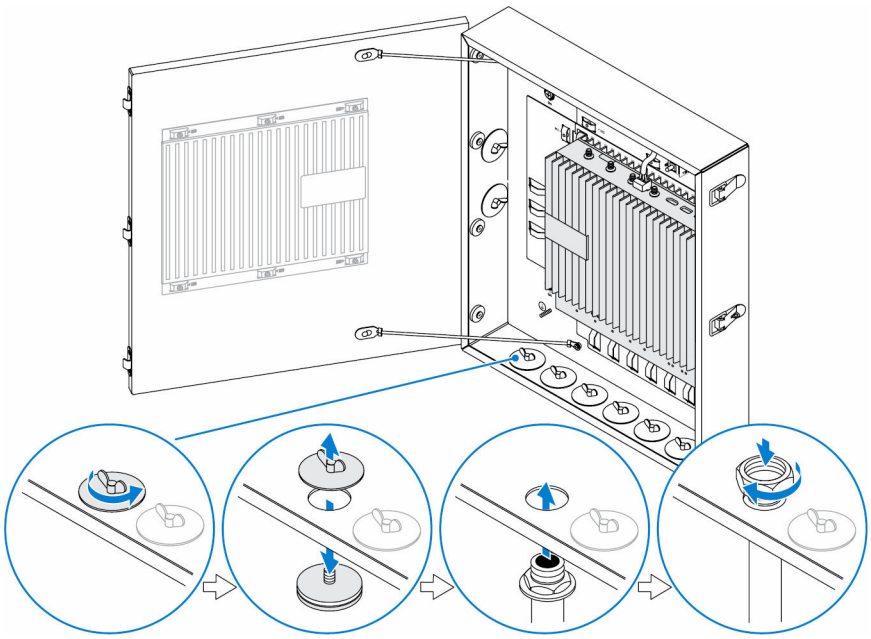


7. Connect the intrusion switch to the system.



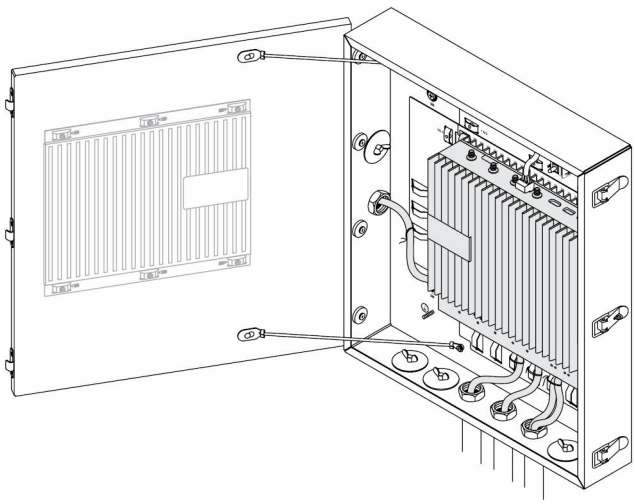
8. Remove the desired conduit plugs on the bottom or the left side of the enclosure and install the wiring conduits.

NOTE: To ensure that dust and water does not enter the enclosure, install a conduit rated as IP65.

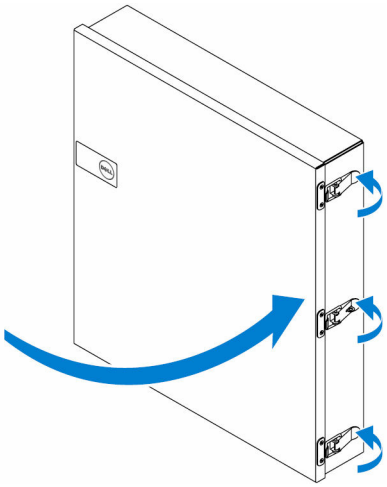


9. Route the cables through the conduits and connect the cables to the desired connectors.

NOTE: To reduce the risk of accidental cable disconnection, tie all cables to the cable tie-off guides.



10. Close and securely latch the enclosure door.

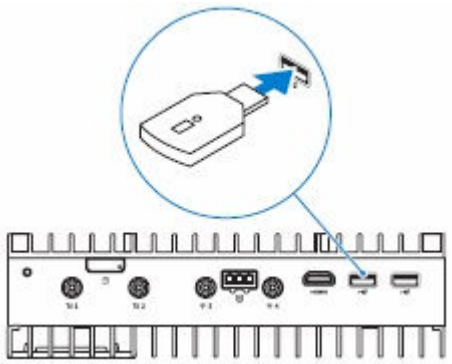


Setting up the ZigBee dongle

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

NOTE: Do not connect the ZigBee dongle to the internal USB port of the IO expansion module.

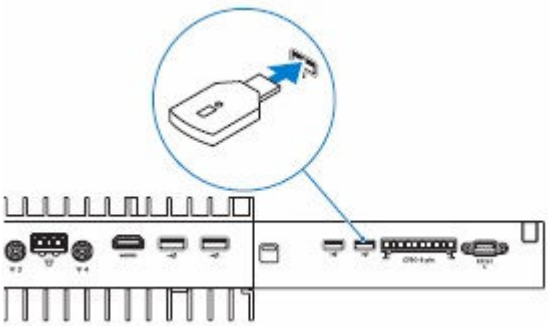
1. Shut down your Edge Gateway.
2. Connect the ZigBee dongle to any external USB port on your Edge Gateway.



or

Connect the ZigBee dongle to any external USB port on the IO module.

NOTE: Do not connect the ZigBee dongle to the internal USB port of the IO expansion module.



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

NOTE: For ZigBee development information, see www.silabs.com/.

3

Marketing system configurations

NOTE: Offerings may vary by country; not all configurations are available in all regions.

Component types

Component	5000	5100
PCB	Standard FR4	Isola 370HR
CPU	Intel E3B25/E3827	Intel E3B25/E3827
Memory	Dell-managed	Dell-managed
BIOS Flash	Dell-managed 128 MB SPI FLASH	Dell-managed 128 MB SPI FLASH
Super I/O	Fintek F81960D-I	Fintek F81960D-I
LAN on system-board	Realtek RTL81191-CG	Realtek RTL81191-CG
TPM	Nuvoton NPCT6SO series	Nuvoton NPCT6S4 series
SSD	60D3 LITEON	60D3 LITEON
WLAN	MURATA/ LBEE5ZZ1EN	MURATA/LBEE5ZZ1EN
WWAN	TELIT/HE910, TELIT/LE910-SV, TELIT/LE910	TELIT/HE910, TELIT/LE910-SV, TELIT/LE910
Coin-cell battery	CR2032	BR2032

Operating systems

Supported operating systems:

- Microsoft Windows 10 IoT Enterprise LTSB
- Ubuntu Snappy 15.04
- Wind River Linux IDP-XT 3.1

Processor

	5000/5100
Intel Atom E3825	X
Intel Atom E3827	X

Memory

	5000	5100
Type	DDR3L	DDR3L
Memory channel	Single/dual	Single/dual
Minimum memory	2 GB	2 GB
Maximum system memory	8 GB	4 GB

Drives and removable storage

	5000/5100
Supported number of mSATA hard drives (maximum)	1
32GB M.2 Solid State Drive	X
64GB M.2 Solid State Drive	X

NOTE: For hard drives, 'GB' means 1 billion bytes; actual capacity varies with pre-loaded material and operating environment and will be lower.

Graphics/video controller

5000/5100
Intel integrated graphics

External ports and connectors

NOTE: For locations of ports and connectors, see system views.

	5000/5100
RS-232	1
RS-485	2
RS-422/RS-485 combo (configurable via DIP switches)	1
Network connector (RJ-45) – Dual gigabit ethernet	2
HDMI Port 1.4	1
Line out for headphones or speakers	None
Universal audio jack	None
USB 3.0	1
CANBus (3–pin Phoenix connector)	1

Communications—Wireless LAN

Wireless LAN 802.11n internal mSATA card	Optional. For detailed engineering specifications, see Communications—Wireless LAN.

Communications—Wireless WAN

DW5813 (AT&T)	Optional. For detailed engineering specifications, see Communications—Wireless WAN.
DW5812 (Verizon)	Optional. For detailed engineering specifications, see Communications—Wireless WAN.
DW5580 (Rest of the World)	Optional. For detailed engineering specifications, see Communications—Wireless WAN.

Security

	5000/5100
Trusted Platform Module (TPM)	• TPM 1.2 • TPM 2.0 (for Windows 10 only)
Chassis Intrusion Switch	Available when system is installed in (optional) enclosure. When enclosure door is opened, a message appears in the BIOS during Power-On Self-Test (POST), indicating door is open. A log is also created.

NOTE: TPM is not available in all countries. Depending on your country regulations, TPM system boards may be unavailable.

Environmental

	5000/5100
BFR/PVC-free	No

Service and support

NOTE: For more details on Dell service plans, see Dell service plans

	5000/5100
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 next business day on-site service	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.

NOTE: Service may be provided by third-party. A technician will be dispatched if necessary following phone-based troubleshooting. Subject to parts availability, geographical restrictions and terms of service contract. Service timing dependent upon time of day call placed to Dell U.S.

4

Detailed engineering specifications

Dimensions and weight

NOTE: System weight and shipping weight are based on a typical configuration and may vary depending on PC configuration. A typical configuration includes: integrated graphics, one hard drive, and one optical drive.

Product dimensions and weight

	5000	5100	IO module	Power module	IP65 rugged enclosure
Volume (Liters)	3.167 L	3.675 L	2.14 L	1.634 L	13.62 L
Weight	3.0 kg (6.6 lb)	3.3 kg (7.3 lb)	1.2 kg (2.6 lb)	1.4 kg (3.1 lb)	6.3 kg (13.9 lb)
Height	228.4 mm (8.99 in)	228.4 mm (8.99 in)	207.60 mm (8.17 in)	117.80 mm (4.64 in)	388 mm (15.28 in)
Width	216 mm (8.50 in)	216 mm (8.50 in)	216 mm (8.50 in)	216 mm (8.50 in)	440 mm (17.46 in)
Depth	64.20 mm (2.52 in)	74.50 mm (2.93 in)	47.70 mm (1.88 in)	64.20 mm (2.53 in)	79.80 mm (3.14 in)

NOTE: The dimensions for the enclosure do not include the latches and wall bracket on the back of the enclosure. The wall bracket adds 5 mm (0.04 inches) to the depth.

Packaging dimensions and weight

	5000	5100	IO Module	Power module	IP65 rugged enclosure
Height	34.4 cm (13.56 in)	34.4 cm (13.56 in)	25.4 cm (10 in)	25.4 cm (10 in)	52.7 cm (20.75 in)
Width	29.5 cm (11.63 in)	29.5 cm (11.63 in)	13.2 cm (5.2 in)	11.4 cm (4.49 in)	15.9 cm (6.26 in)
Depth	15.6 cm (6.13 in)	15.6 cm (6.13 in)	18.1 cm (7.12 in)	18.1 cm (7.12 in)	52 cm (20.47 in)
Shipping weight (includes packaging materials)	3.8 kg (8.38 lb)	3.8 kg (8.38 lb)	1.48 kg (3.26 lb)	1.63 kg (3.59 lb)	7.79 kg (17.17 lb)

Mounting dimensions

	5000	5100	IO module	Power module	IP65 rugged enclosure
Height	246 mm (9.69 in)	246 mm (9.69 in)	246 mm (9.69 in)	246 mm (9.69 in)	458.2 mm (18.04 in)
Width	228.4 mm (8.99 in)	228.4 mm (8.99 in)	228.2 mm (8.98 in)	130.8 mm (5.15 in)	405.6 mm (15.97 in)
Depth	72.7 mm (2.86 in)	83 mm (3.27 in)	56.2 mm (2.21 in)	72.7 mm (2.86 in)	91.8 mm (3.61 in)

Environmental and operating conditions

Environmental conditions—System

Ingress protection rating	IP50
Temperature range:	
Operating (with a maximum temperature gradation of 15°C per hour)	**Edge Gateway 5000** • 0°C to 50°C (32°F to 122°F) when connected to a 24 V AC/DC power source. • 0°C to 40°C (32°F to 104°F) when connected to a power adapter. **Edge Gateway 5100** • -30°C to 70°C (-22°F to 158°F) when connected to a 24 V AC/DC power source. • 0°C to 40°C (32°F to 104°F) when connected to a power adapter. **NOTE:** The maximum operating temperature is derated 1°C/305 m (1000 ft) above sea level altitude.
Non-operating (with a maximum temperature gradation of 15°C per hour)	-40°C to 70°C (-40°F to 158 °F)
Relative humidity (maximum):	
Operating (with maximum humidity gradation of 10% per hour)	10% to 90% (non-condensing)
Non-operating (with maximum humidity gradation of 10% per hour)	5% to 95% (non-condensing)
Altitude (maximum, unpressurized):	
Operating	-15.20 m to 5000 m (-50 ft to 16,404 ft) **NOTE:** The maximum operating temperature is derated 1°C/305 m (1000 ft) above sea level altitude.
Storage	-15.20 m to 10,668 m (-50 ft to 35,000 ft)

Environmental conditions—IO module

Environmental requirements	
Ingress protection rating	IP50 **NOTE:** Enclosure meets IP50 with the pre-installed PCIe blank bracket. System IP rating depends on the PCIe card IP rating.
Temperature range:	
Operating (with a maximum temperature gradation of 15°C per hour)	-30°C to 70°C (-22°F to 158°F) **NOTE:** The maximum operating temperature is derated 1°C/305 m(1000 ft) above sea level altitude.

Environmental requirements	
	NOTE: The enclosure meets this specification without a PCIe card. Operating temperature may change if a PCIe card is installed. **NOTE:** Any component to be installed in the IO module shall have a still air temperature rating that is equal to or higher than the PCIe card temperature rating. For IO modules without PCIe cards, use a system ambient temperature of +3°C (+37.4°F) to determine the inside air temperature.
Non-operating	-40°C to 70°C (-40°F to 158°F)
Relative humidity (maximum):	
Operating (with maximum humidity gradation of 10% per hour)	10% to 90% (non-condensing)
Non-operating ((with maximum humidity gradation of 10% per hour)	5% to 95% (non-condensing)
Altitude (maximum, unpressurized):	
Operating	-15.2 m to 5000 m (-50 ft to 16,404 ft) **NOTE:** The maximum operating temperature is derated 1°C/305 m (1000 ft) above sea level altitude.
Storage	-15.20 m to 10,668 m (-50 ft to 35,000 ft)

Supported PCIe card power—PCIe card temperatures and power ratings must meet following requirements:

System ambient after altitude derating (°C)	Maximum supported power dissipation (W) for 85°C or above still air rated PCIe cards	Maximum supported power dissipation (W) for 70°C still air rated PCIe cards	Maximum supported power dissipation (W) for 55°C still air rated PCIe cards
20	15	12	8
25	14	10	6
30	13	9	5
35	12	8	4
40	10	6	3
45	9	5	2
50	8	4	1
55	6	3	Not supported
60	5	2	Not supported
65	4	1	Not supported
70	3	Not supported	Not supported

NOTE: PCIe cards must support still air environment and must not require active cooling.

NOTE: PCIe cards rated above 25 W are not supported regardless of temperature rating.

NOTE: If a PCIe card is rated at a temperature that is not shown in the table, use interpolation to calculate the maximum supported power.

System ambient after altitude derating (°C)	Maximum supported power dissipation (W) for 85°C or above still air rated PCIe cards	Maximum supported power dissipation (W) for 70°C still air rated PCIe cards	Maximum supported power dissipation (W) for 55°C still air rated PCIe cards
20	15	12	8
25	14	10	6
30	13	9	5
35	12	8	4
40	10	6	3
45	9	5	2
50	8	4	1
55	6	3	Not supported
60	5	2	Not supported
65	4	1	Not supported
70	3	Not supported	Not supported

NOTE: PCIe cards must support still air environment and must not require active cooling.

NOTE: PCIe cards rated above 25 W are not supported regardless of temperature rating.

NOTE: If a PCIe card is rated at a temperature greater than 85°C, it shall be treated as an 85°C rated card in determining the supported power.

Environmental conditions - Power module

Environmental requirements	
Ingress protection rating	IP50
Temperature range:	
Operating (with a maximum temperature gradation of 15°C per hour)	• -30°C to 70°C (-22°F to 158°F) when connected to a 24V AC/DC power source. • 0°C to 40°C (-22°F to 104°F) when connected to a power adapter or battery. **NOTE:** The maximum operating temperature is derated 1°C/ 305m(1000ft) above sea level altitude.
Non-operating	-40°C to 70 °C (-40°F to 158°F)
Relative humidity (maximum):	
Operating (with maximum humidity gradation of 10% per hour)	10% to 90% (non-condensing)
Non-operating ((with maximum humidity gradation of 10% per hour)	5% to 95% (non-condensing)
Altitude (maximum, unpressurized):	
Operating	-15.2m to 5000m (-50ft to 16,404ft) **NOTE:** The maximum operating temperature is derated 1°C/ 305m (1000ft) above sea level altitude.
Storage	-15.20 m to 10,668 m (-50 ft to 35,000 ft)

Environmental conditions - Enclosure

Ingress protection rating	IP65 **NOTE:** Require IP65 or above conduit connection.
Temperature range:	
Operating (with a maximum temperature gradation of 15°C per hour)	• Edge Gateway 5000: 0°C to 45°C (32°F to 113°F) • Edge Gateway 5100: -30°C to 70°C (-22°F to 158°F) **NOTE:** The maximum operating temperature is derated 1°C/305 m (1000 ft) above sea level altitude. **NOTE:** The maximum operating temperature is derated 18°C (32.4°F) under direct solar thermal load.
Non-operating (with a maximum temperature gradation of 15°C per hour)	-40°C to 70°C (-40°F to 158 °F)
Relative humidity (maximum):	
Operating (with maximum humidity gradation of 10% per hour)	10% to 90% (non-condensing)
Non-operating (with maximum humidity gradation of 10% per hour)	5% to 95% (non-condensing)
Altitude (maximum, unpressurized):	
Operating	-15.2 m to 5000 m (-50 ft to 16,404 ft) **NOTE:** The maximum operating temperature is derated 1°C/305 m (1000 ft) above sea level altitude.
Storage	-15.2 m to 10,668 m (-50 ft to 35,000 ft)

Operating conditions

Maximum vibration

	5000	5100
Operational	1.54 Grms, 15 min/side	1.54 Grms, 60 min/side

Maximum shock

	5000	5100
Operational	40G, 2ms	40G, 2ms
Non-operational	160g, 2ms Half Sine Shock	160g, 2ms Half Sine Shock

Maximum altitude

	5000	5100
Operational	-15.20 m to 5000 m (-50 ft to 16,404 ft)	-15.20 m to 5000 m (-50 ft to 16,404 ft)
Non-operational	–15.2 to 10,668 m (–50 to 35,000 ft)	–15.2 to 10,668 m (–50 to 35,000 ft)

Power

Power adaptor (optional)

General parameters	
Power supply	EPS Level V
Wattage	65 W
AC input voltage range	90-264 Vac
AC input current (low AC range/high AC range)	1.7 A/1.0 A
AC input frequency	47 Hz/63 Hz
Average efficiency (ESTAR 5.2 compliant)	87%

DC parameters	
+19.5 v output	19.5 V/ 3.34 A
Total power (maximum)	65 W
BTUs/h (based on PSU max wattage)	222 BTU

Power-input tolerances	
24V AC/DC	+10% to -25% (26.4 V to 18 V)
Power module—Battery connector	• Charging—Charging shuts down when the battery voltage reaches 14 V. • Powering the system—System will shutdown is the voltage from the battery is below 10 V.

3.0 V CMOS coin-cell battery

Brand	Type	Voltage	Composition
JHIH HONG	CR2032 (for Edge Gateway 5000)	3 V	Lithium
PANASONIC	CR2032 (for Edge Gateway 5000)	3 V	Lithium
MITSUBISHI	CR2032 (for Edge Gateway 5000)	3 V	Lithium
SHUNWO & KTS	CR2032 (for Edge Gateway 5000)	3 V	Lithium
PANASONIC	BR2032 (for Edge Gateway 5100)	3 V	Lithium

NOTE: We recommend checking or replacing the coin-cell battery prior to operation if the system has been disconnected from a power source for more than two years.

Communications—Ethernet

General specifications	
Ethernet type	Ethernet LAN 10/100/1000
External connector type	RJ45
Data rates supported	10/100/1000 Mbps

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)	542 mW (maximum)
Power consumption (standby operation)	169 mW (maximum)
IEEE standards compliance	802.3
Hardware certifications	n/a
Boot ROM support	EEPROM (located in SPI)

Network transfer mode	
Network transfer rate	10 Mb (full/half-duplex) 100 Mb (full/half-duplex) 1000 Mb (full-duplex)

Environmental	
Operating temperature	0°C to 85°C (32°F to 185°F)
Operating humidity	20% to 80% (non-condensing)
Operating system driver support	Windows 10, Ubuntu, Wind River
Manageability	WOL, PXE 2.1
Management capabilities alerting	Intel standard

Communications—Wireless WAN

Wireless WAN DW5812/DW5813 specifications

General specifications

- DW5813 supported frequencies:
  - LTE: 700 (B17/B12/B13)/850 (B5)/AWS1700 (B4)/1900 (B2)
  - UMTS/HSPA: 850, 1900 MHz
- DW5812 supported frequencies
  - LTE: 700 (B13)/AWS1700 (B4)/1900 (B2)
- LTE FDD Cat.4, 3GPP release 9 compliant
- Rx diversity and MIMO DL 2x2
- SIM application Tool Kit 3GPP TS 51.014

General specifications

- Serial port multiplexer 3GPP TS27.010
- SMS over IMS
- Built-in UDP/TCP/FTP/SMTP stack
- Control through AT commands according to 3GPP TS 27.005, 27.007 and Telit Custom AT commands

Data specifications

- LTE Cat.4
- Uplink up to 50 Mbps
- Downlink up to 150 Mbps DC-HSPA+ 42 Mbps (supported on the variants with 3G fallback)

Electrical specifications

- Output power: Class 3 (0.2 W, 23 dBm) at LTE
- Supply voltage: 3.3 VDC +/– 9%

DW5580 specifications

General specifications

- Supported frequencies:
  - GSM/GPRS/EDGE: 850, 900, 1800, 1900
  - UMTS/HSPA: 800/850[1], 900, AWS 1700, 1900, 2100 MHz
- Rx diversity
- 3GPP release 7 compliant
- SIM application Tool Kits 3GPP TS 51.014
- Built-in UDP/TCP/FTP/SMTP stack
- IP stack with TCP and UDP protocol
- Standard and extended AT command set
- Available variants: Data-only

[1] Bands B6 and B19 (800 MHz) are a subset of B5 (850 MHz) and supported as well.

Data specifications

- HSPA category 6 in uplink and up to category 14 in downlink:
  - Uplink up to 5.76 Mbps
  - Downlink up to 21.0 Mbps

Electrical specifications

- Output power:
  - Class 4 (2 W, 33 dBm) at GSM 850/900
  - Class 1 (1 W, 30 dBm) at GSM 1800/1900
  - Class 3 (0.25 W, 24 dBm) at UMTS
  - Class E2 (0.5 W, 27 dBm) at EDGE 850/900
  - Class E2 (0.4 W, 26 dBm) at EDGE 1800/1900
- Supply voltage: 3.3 VDC +/– 9%

Electrical specifications

- Sensitivity:
  - 108 dBm at UMTS
  - 107 dBm at GSM 850/900 MHz
  - 106 dBm at DCS1800/PCS1900 MHz

Communications—WWAN antenna

General specifications									
Antenna type	PCB dipole								
Number of ports	2								
Frequency (MHz)	698-803	791-862	824-894	880-960	1710-1880	1850-1990	1710-2155	1920-2170	2500-2690
VSWR	2:1								
Isolation (dB)	> 15								
Peak gain	< 5.0 dBi	< 5.0 dBi	< 5.0 dBi	< 3.7 dBi	< 5.0 dBi	< 3.3 dBi	< 3.3 dBi	< 5.0 dBi	< 5.0 dBi
Average gain on sphere (3D)	> –3 dBi								
Polarization	Linear								
Efficiency	> 40%								

Mechanical and environmental specifications	
Height	254 mm (10 in)
Diameter	41 mm (1.61 in)
Weight	820 g (with mounting holder)
IPX class	IP65
Mounting	Wall mounted
Connector type	SMA male
Antenna color	White
Cable type	Plenum rated low loss RG58
Cable color	White
Mounting bracket	Swivel type (plastic)
Mounting bracket length (approximate)	175 mm (6.89 in)
Mounting bracket color	Black
Pig tail length	500 mm (19.69 in)

Coaxial cable specification	
Impedance	50 ± 2.0 ohms
Structural return loss	–16 dB or better from 100-2500 MHz un-terminated sample (direct bridge method)
Nominal RTL reference	–16 dB or better to 6.0 GHz

Coaxial cable specification	
Dielectric	Foam FEP
Dielectric (outer diameter)	2.79 mm ± 0.076 mm (0.110 in ± 0.003 in)
Velocity of propagation	80%
Center conductor	Solid copper, 0.94 mm ± 0.025 mm (0.037 in ± 0.001 in)
Shield #1	Foil, aluminium/poly tape, adhered to dielectric
Diameter over foil	3.02 mm ± 0.07 mm (0.119 in ± 0.003 in)
Shield #2	Braid, 90% 36-AWG tin/copper
Outer jacket	Plenum PVDF, off-white, lead-free, and UV stable
Outer diameter	4.52 mm ± 0.15 mm (0.178 in ± 0.006 in)
Outer Jacket	Plenum PVDF, Off-white, lead free, and UV stable
Outer Diameter	4.52 mm ± 0.15 mm (0.178 in ± 0.006 in)
PLENUM rating	CMP(ETL)C(ETL)
Attenuation dB/100 feet (nominal reference values)	• 8.0 dB at 450 MHz • 12.5 dB at 900 MHz • 19.6 dB at l.8 GHz • 23.6 dB at 2.5 GHz • 23.0 dB at 3.0 GHz • 27.5 dB at 4.0 GHz • 31.0 dB at 5.0 GHz • 35.0 dB at 6.0 GHz
Installation temperature	–20°C (–4°F) to +65°C (149°F)
Operating temperature	–30°C (–22°F) to +65°C (149°F)
CC pullout	6 pound-force minimum, 16 pound-force maximum
Jacket pullout	4.5 pound-force minimum on 76.2 mm (3 in) section at 12.7 mm (0.5 in) per minute
Minimum bend radius	12.7 mm (0.5 in) static bend
Leakage	–90 dB

Measured antenna peak gain (antenna only)				
	Main antenna		Auxiliary antenna	
Frequency (MHz)	Horizontal (dBi)	Vertical (dBi)	Horizontal (dBi)	Vertical (dBi)
698	0.09	0.63	1.19	1.12
704	–0.11	0.66	0.89	0.91
710	–0.27	0.60	0.51	0.78
716	–0.08	0.55	0.42	0.86
734	0.17	0.57	0.68	0.97
740	0.35	0.60	0.86	0.99
746	0.38	0.92	1.00	1.03
734	0.49	1.12	1.16	1.10

Measured antenna peak gain (antenna only)				
740	0.67	1.42	1.39	1.11
746	0.95	1.56	1.51	1.20
756	1.48	2.10	1.63	1.53
765	1.81	2.42	1.64	1.63
772	1.93	2.47	1.40	1.57
777	2.00	2.50	1.33	1.60
782	1.85	2.36	1.02	1.48
787	1.67	2.25	0.73	1.43
791	1.62	2.21	0.90	1.37
806	1.69	2.34	1.68	1.61
821	1.70	2.02	1.97	1.91
824	1.63	1.93	1.91	1.91
836	1.65	1.65	1.80	1.71
849	1.63	1.46	1.79	1.40
862	1.65	1.34	2.01	1.19
869	1.60	1.26	2.07	1.04
880	1.72	1.24	2.16	1.09
894	1.69	1.06	2.15	0.96
900	1.71	1.00	2.13	0.94
915	1.65	1.03	1.87	0.82
925	1.57	1.16	1.61	0.74
940	1.30	1.36	1.24	0.60
960	1.43	1.31	0.98	0.69
1710	2.19	2.18	1.83	2.39
1730	2.25	2.29	1.66	2.36
1750	1.90	2.15	1.39	2.29
1770	1.33	1.91	0.97	1.83
1785	0.88	1.76	0.66	1.50
1805	0.40	1.59	0.34	1.26
1840	–0.12	1.49	–0.01	1.18
1850	–0.06	1.58	0.04	1.18
1880	0.36	1.65	0.51	1.49
1910	0.72	1.76	0.90	1.81
1920	0.86	1.85	0.91	1.99
1930	1.01	1.89	0.95	2.15
1950	1.29	2.16	0.99	2.28
1960	1.23	2.32	0.91	2.29
1980	0.98	2.43	0.95	2.19
1995	0.35	2.22	0.74	1.80
2110	0.72	1.06	1.37	1.28

Measured antenna peak gain (antenna only)				
2140	0.82	1.08	1.58	1.31
2170	1.15	1.22	1.85	1.18
2300	2.23	2.40	2.97	1.63
2325	1.76	2.18	2.48	1.74
2350	1.44	1.74	2.08	1.66
2375	1.26	1.59	1.84	1.46
2400	1.29	1.91	1.85	1.63
2500	3.17	2.75	2.94	2.47
2515	3.11	2.62	2.78	2.47
2535	2.88	2.42	2.55	2.48
2555	2.51	2.09	2.18	2.46
2570	2.21	1.91	1.92	2.46
2570	2.21	1.91	1.92	2.46
2595	1.89	1.65	1.56	2.45
2620	1.69	1.68	1.44	2.35
2620	1.69	1.68	1.44	2.35
2630	1.80	1.76	1.43	2.41
2655	1.78	1.82	1.63	2.60
2680	1.98	2.20	2.02	2.59
2690	2.07	2.38	2.17	2.55

Communications—Wireless LAN

General specifications	
Wireless LAN type:	
Ubuntu Desktop	Murata LBEE5ZZ1EN (802.11a/b/g/n/ac)
Windows 7/Windows 10	Rivet DW1910 (802.11a/b/g/n)
Connector type	Standard u.FL connectors (Main + Aux)
Encryption	• LBEE5ZZ1EN: WEP 64-bit and 128-bit, TKIP, AES-CCMP 128-bit • DW1910: WEP, TKIP, and AES hardware encryption
Bluetooth standards supported	• LBEE5ZZ1EN: Bluetooth 4.1LE • DW1910: Bluetooth 4.0LE
Operating temperature	• LBEE5ZZ1EN: –30°C to 85°C (–22°F to 185°F) • DW1910: 0°C to 70°C (32°F to 158°F)
Operating system driver support	LBEE5ZZ1EN supports Ubuntu Desktop 16.04. DW1910 supports the following operating systems: • Ubuntu Desktop 16.04 • Windows 7 Embedded (64-bit) • Windows 7 Professional (64-bit) • Windows 10 Professional (64-bit)

General specifications	
	• Windows 10 IoT Enterprise 2015 LTSB (64-bit)

Controller specifications	
Controller Bus architecture	Electrically compatible with the PCI express base specification v1.1 (x1 lane) and following PCIe interfaces: • LBEE5ZZ1EN: PCIe v3.0 Gen 1 rate (2.5Gbps) interface • DW1901: PCIe v1.1 interface
WLAN standards supported	• LBEE5ZZ1EN: 802.11a, 802.11b, 802.11g, 802.11n, 802.11ac • DW1901: 802.11a, 802.11b, 802.11g, 802.11n
802.11a data rates supported	6, 9, 12, 18, 24, 36, 48, and 54 Mbps
802.11b data rates supported	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	The MIMO maximum data rates (GI 400 ns) supported by LBEE5ZZ1EN are as follows: • 192.6 Mbps (20 MHz) • 400 Mbps (40 MHz) • 866.7 Mbps (80 MHz) DW1901 does not support 802.11ac. DW1901 is limited to maximum 802.11a/n HT40 (40 MHz) 300 Mbps.
802.11ac data rates supported (GI 800 ns)	The MIMO maximum data rates (GI 400 ns) supported by LBEE5ZZ1EN are as follows: • 192.6 Mbps (20 MHz) • 400 Mbps (40 MHz) • 866.7 Mbps (80 MHz)
Encryption	WEP (64-bit and 128-bit), TKIP, AES-CCMP (128-bit)
Bluetooth standards supported	Bluetooth 4.1LE
Operating temperature	–30°C to 80°C (–22°F to 176°F)
Operating system driver support	Windows 7 32/64-bits, Windows 10 64-bits

Communications—WLAN antenna

General specifications		
Antenna type	PCB Dipole	
Number of ports	2	
Frequency (GHz)	2.4 to 2.5	4.9 to 5.9
Voltage Standing Wave Ratio (VSWR)	2:1	2:1
Isolation (dB)	> 20	> 20
Peak gain	3.5 dBi	5.0 dBi
Average gain on sphere (3D)	> –4 dBi	> –5 dBi
Polarization	Linear	

General specifications		
Efficiency	> 55%	> 55%

Mechanical and environmental specifications	
Height	105.60 mm (4.16 in)
Diameter	36.20 mm (1.43 in)
IPX class	IP65
Mounting	Wall mounted
Connector type	SMA male
Antenna color	White
Cable type	Plenum rated low loss RG58
Cable color	White
Mounting bracket	Swivel type (plastic)
Mounting bracket length (approximate)	175 mm (6.89 in)
Mounting bracket color	Black
Pig tail length	500 mm ± 10 mm (19.69 in ± 0.39 in)

Coaxial cable specification	
Impedance	50 ± 2.00 ohms
Structural return loss	–16 dB or better from 100-2500 MHz un-terminated sample (direct bridge method)
Nominal RTL reference	–16 dB or better to 6.0 GHz
Dielectric	Foam FEP
Dielectric (outer diameter)	2.79 mm ± 0.076 mm (0.110 in ± 0.003 in)
Velocity of propagation	80%
Center conductor	Solid copper, 0.94 mm ± 0.025 mm (0.037 in ± 0.001 in)
Shield #1	Foil, aluminium/poly tape, adhered to dielectric
Diameter over foil	3.02 mm ± 0.07 mm (0.119 in ± 0.003 in)
Shield #2	Braid, 90% 36-AWG tin/copper
Outer jacket	Plenum PVDF, off-white, lead-free, and UV stable
Outer diameter	4.52 mm ± 0.15 mm (0.178 in ± 0.006 in)
PLENUM rating	CMP(ETL)C(ETL)
Attenuation dB/100 feet (nominal reference values)	• 8.0 dB at 450 MHz • 12.5 dB at 900 MHz • 19.6 dB at l.8 GHz • 23.6 dB at 2.5 GHz • 23.0 dB at 3.0 GHz • 27.5 dB at 4.0 GHz • 31.0 dB at 5.0 GHz • 35.0 dB at 6.0 GHz
Installation temperature	–20°C (–4°F) to +65°C (149°F)

Coaxial cable specification	
Operating temperature	–30°C (–22°F) to +65°C (149°F)
CC pullout	6 pound-force minimum, 16 pound-force maximum
Jacket pullout	4.5 pound-force minimum on 76.2 mm (3 in) section at 12.7 mm (0.5 in) per minute
Minimum bend radius	12.7 mm (0.5 in) static bend
Leakage	–90 dB

Communications—Antenna 4-in-1

General specifications	
Antenna type	Pantheon antenna 4-in-1
Connector type	3m CFD-200 standard, fully customizable
Cable type	SMA male straight, fully customizable

WLAN specifications			
Frequency (GHz)	2.4~2.5		5.15~5.85
		MIMO 1	
Peak gain (dBi)*	2.82		4.11
Average gain (dBi)*	-3.43		-4.92
Efficiency (percent)*	45.56		32.26
Return loss (dB)*	<-10		
		MIMO 2	
Peak gain (dBi)*	2.79		4.51
Average gain (dBi)*	-3.64		-4.93
Efficiency (percent)*	43.39		32.25
Return loss (dB)*	<-10		
Polarization	Linear		
Impedance	50Ω		

* All measurements were conducted with 3-meter cable length.

WWAN specifications								
Band	LTE 700	GSM 850	GSM 900	DCS	PCS	UMTS1	LTE 2600	LTE 3500
Frequency (MHz)	698~824	824~894	880~960	1710~1880	1850~1990	1920~2170	2500~2690	2900~3500
				MIMO 1				
Peak gain (dBi)*	5.04	2.91	2.00	2.55	2.55	2.36	4.21	1.84
Average gain (dBi)*	-1.75	-2.71	-2.87	-2.28	-2.14	-2.47	-3.28	-4.98
Efficiency (percent)*	67.37	53.84	51.81	59.25	61.21	56.83	47.04	32.09
Return loss (dB)*	<-6							
				MIMO 2				

WWAN specifications								
Peak gain (dBi)*	3.7	2.44	2.5	2.14	2.28	2.69	2.43	1.05
Average gain (dBi)*	-2.39	-2.36	-2.52	-2.3	-2.27	-2.51	-3.38	-5.2
Efficiency (percent)*	57.84	58.25	56.05	58.86	59.34	56.16	46.00	30.49
Return loss (dB)*	<-6							
Polarization	Linear							
Impedance	50Ω							

All measurements were conducted with 3-meter cable length.

Mechanical and environmental specifications	
Height	84.50 mm (3.33 in)
Diameter	143.20 mm (5.64 in)
Weight	1.16 kg (2.56 lbs)
Casing	Wonderloy PC-540 PC
Waterproof	IP67
Recommended torque for mounting	49N--m
Max torque for mounting	58.8N--m
Operation temperature	-40°C (-40°F) to 85°C (185°F)
Storage temperature	-40°C (-40°F) to 90°C (194°F)
Humidity	Non-condensing 65°C (149°F) 95 percent RH

Communications—Serial ports

NOTE: For details on how to access serial ports, see Appendix: Access serial ports.

General specifications	
Serial port RS	232/422/485
Connector type	RS-232
Data rates supported	50 bps ~115.2 Kbps

Graphics—Onboard

Bus type	Integrated
GPU core clock	Depends on CPU type (Intel HD Graphics 530/510@1150 Mhz/950 Mhz
Frame buffer memory (onboard and shared) size and speed	Depends on available system memory (Up to 1.7 GB with 4 GB system memory)
Overlay planes	Yes
Maximum color depth	24–bits
Maximum vertical refresh rate	85 Hz
Operating system graphics/API support	• Direct3D* 2015, Direct3D 11.2, Direct3D 11.1, Direct3D 9, Direct3D 10, Direct2D

	• OpenGL* 5.0 • OpenCL* 2.1, OpenCL 2.0, OpenCL 1.2
Supported resolutions and max refresh rates (Hz) **NOTE:** Analog and/or digital.	Up to: • 4096x2160 @ 24 Hz, 24bpp (HDMI 1.4)
External connector	HDMI 1.4

Graphics—Video port and resolution

Port type	HDMI 1.4
Supported platforms	7040, 5040, 3040, 7440 AIO, 3240 AIO
Single display (maximum resolution)	2560 x 1600; 4096 x 2304 @ 24Hz

NOTE: All resolutions shown at 24 bpp, and unless specifically-stated are @ 60Hz refresh.

Hard drives - M.2 SATA 32GB SSD

General specifications	
Capacity (bytes)	32 Gb
Dimensions inches (W x D x H)	3.94 x 2.75 x 0.374
Interface type and maximum speed	Up to 6 Gb/s (SATA 3.0)
MTBF	1.5 M hours
Logical blocks	250,069,680
Power source	
Power consumption (reference only)	Idle 0.5 W, Active 2.5 W
Spin-up current (reference only)	5 V (1000 mA)
Environmental operating conditions (non-condensing)	
Temperature range	5°C to 60°C
Relative humidity range	10% to 90% non-condensing
Maximum dew point temperature	Operating: 26°C Non-operating: 33°C
Altitude range	-1000 ft to 10000 ft
Environmental non-operating conditions (non-condensing)	
Temperature range	-40°C to 65°C
Relative humidity range	5% to 95% non-condensing
Maximum wet bulb temperature	33°C
Altitude range	-1000 ft to 40000 ft

Hard drives - M.2 SATA 64GB SSD

General specifications	
Capacity (bytes)	64 Gb
Dimensions inches (W x D x H)	3.94 x 2.75 x 0.374
Interface type and maximum speed	Up to 6 Gb/s (SATA 3.0)
MTBF	800,000 hours
Logical blocks	500,118,192

Power source	
Power consumption (reference only)	Idle 0.5 W, Active 2.5 W
Spin-up current (reference only)	5 V (1000 mA)

Environmental operating conditions (non-condensing)	
Temperature range	5°C to 60°C
Relative humidity range	10% to 90% non-condensing
Maximum dew point temperature	Operating: 26°C Non-Operating: 33° C
Altitude range	-1000 ft to 10000 ft

Environmental non-operating conditions (non-condensing)	
Temperature range	-40°C to 65°C
Relative humidity range	5% to 95% non-condensing
Maximum wet bulb temperature	33°C
Altitude range	-1000 ft to 40000 ft

CANBus port

General specifications	
Type	3-pin phoenix contact BCP-500
Processor	Microchip PIC32MX530F128H
Transceiver	TI ISO 1050 (3 V nominal, 2 V to 5.5 V)
CAN signals	Electrically-isolated
CAN activity	Indicated by green LED
CAN board detect in BIOS	Required (BIOS-readable)
Driver	Standard USB HID device

NOTE: For details about CANBus programming, see Appendix: Program the CANBus.

BIOS defaults

System configuration

	5000	5100
Integrated NIC	Enable w/PXE	Enable w/PXE
Serial port	Disable	Disable
SATA operation	AHCI	AHCI
Drives	Enable (SSD-1)	Enable (SSD-1)
SMART reporting	Disable	Disable
USB configuration	Enable (boot support, front USB ports, rear USB ports)	Enable (boot support, front USB ports, rear USB ports)

Performance

	5000	5100
Multiple core support	All	All
Intel SpeedStep	Enable	Enable
C states control	Enable	Enable
Limit CPUID value	Disable	Disable
Intel TurboBoost	Enable	Enable
Rapid Start Technology	Enable	Enable
HyperThread control	Enable	Enable

Security

	5000	5100
Internal HDD password	Not set	Not set
Strong password	Disable	Disable
Password configuration	4~32	4~32
Password bypass	Disable	Disable
Password changes	Enable	Enable
TPM security	Enabled	Enabled
Computrace®	Deactivate	Deactivate
Chassis intrusion	On (Silent)	On (Silent)
CPU XD support	Enable	Enable
Admin setup lockout	Disable	Disable
OROM keyboard access	Enable	Enable
HDD protection support	Disable	Disable

Power management

	5000	5100
AC recovery	Power off	Power off
Auto on time	Disable	Disable
Fan control override	Disable	Disable
USB wake support	Enable USB wake support From power off (S5) state	Enable USB wake support from power off (S5) state
Wake on LAN/WLAN	Disable: Turns the system on from hibernation (S4) and power off (S5) state	Disable: Turns the system on from hibernation (S4) and power off (S5) state
Block sleep	Disable	Disable
Intel ready mode	Disable	Disable

NOTE: With USB wake support from power off (S5), a wired keyboard or mouse is able to wake the system if connected to the designated USB port (marked with the Smart Power On icon). For wireless keyboard and mice, if both devices share the same USB dongle and the dongle is inserted into the designated USB port, both keyboard and mouse can wake the system. For wireless keyboard only or mouse only, either can wake the system as long as the dongle is inserted into the designated USB port.

Maintenance

	5000	5100
Service tag	Set by the factory	Set by the factory
Asset tag	Optional user entry	Optional user entry
SERR message	Enable	Enable

POST behavior

	5000	5100
Numlock LED	Enable	Enable
Keyboard errors	Enable	Enable
Adaptor warning	N/A	Enable

Cloud desktop

	5000	5100
Server lookup method	DNS	DNS
Server name	CDServer	CDServer
Server IP address	255.255.255.255	255.255.255.255
Server port	06910	06910
Client address method	DHCP	DHCP
Client IP address	255.255.255.255	255.255.255.255
Client subnet mask	255.255.255.255	255.255.255.255
Client gateway	255.255.255.255	255.255.255.255
DNS IP address	255.255.255.255	255.255.255.255
Advanced	Disable	Disable

Wireless

	5000	5100
Wireless device enable	Enable (WLAN/WWAN/Bluetooth)	Enable (WLAN/WWAN/Bluetooth)

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Appendix

Access serial ports

NOTE: The maximum baud rate is 115.2 Kbps.

Setup

- Gateway 5000
- Ubuntu (Snappy or 14.04)

Port mapping

/dev/ttyS6	RS232	1
/dev/ttyS4	RS422/RS485	2
/dev/ttyS5	RS485	3
/dev/ttyS2	RS485	4

To confirm port mapping devices:

```
user@stlouis:~$ dmesg | grep ttyS
[    1.065001] 00:03: ttyS4 at I/O 0x3e0 (irq = 10, base_baud = 115200) is a 16550A
[    1.085907] 00:04: ttyS5 at I/O 0x2e0 (irq = 11, base_baud = 115200) is a 16550A
[    1.106791] 00:05: ttyS2 at I/O 0x3e8 (irq = 10, base_baud = 115200) is a 16550A
[    1.127682] 00:06: ttyS6 at I/O 0x2d0 (irq = 7, base_baud = 115200) is a 16550A
```

Suggested interface for testing

- minicom
- gtkterm (gnome based)

To test basic port operation

1. Boot the system and log in: ubuntu / ubuntu.
2. Inspect the current speed w/stty:
   ```
   stty –F /dev/ttyS2 speed
   ```
3. Set the speeds to a variety of baud rates including 115200, 1200:
   ```
   stty –F /dev/ttyS2 38400
   ```
4. Use a simple echo command to test the port:
   ```
   sudo sh –c 'echo –n a > /dev/ttyS2'
   ```

Program the CANBus

The CANBus appears as a CDC (Common Device Class)/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.