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# AirLink RX400 / EX400

## Hardware User Guide

## Important Notice

Information relating to this product and the application or design described herein is believed to be reliable, however such information is provided as a guide only and Semtech assumes no liability for any errors in this document, or for the application or design described herein.

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## Wireless Communications

Due to the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. The Semtech product should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. Semtech accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the Semtech product, or for failure of the Semtech product to transmit or receive such data.

## Warranty

Warranty information for AirLink products is available at [www.sierrawireless.com/end-user-warranty](http://www.sierrawireless.com/end-user-warranty).

## Safety

Do not operate the Semtech product in areas where blasting is in progress, where explosive atmospheres may be present, near medical equipment, near life support equipment, or near any equipment which may be susceptible to any form of radio interference. In such areas, the Semtech product should be powered off.

The RX400 platform is classified to UL 121201 and CSA C22.2#213 and is suitable for use in Class 1, Division 2, Groups A–D, and Class I, Zone 2, Groups IIC AEx ec IIC T4 Gc classified Hazardous Locations.

The following warnings and instructions apply:

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**Warning:** *EXPLOSION HAZARD—SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.*

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**Warning:** *EXPLOSION HAZARD—DO NOT DISCONNECT WHILE CIRCUIT IS LIVE UNLESS THE AREA IS KNOWN TO BE NON-HAZARDOUS.*

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**Warning:** *DO NOT USE THE USB CONNECTOR IN A HAZARDOUS AREA.*

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**Avertissement:** *RISQUE D'EXPLOSION—LA SUBSTITUTION DE COMPOSANTS PEUT RENDRE CE MATERIEL INACCEPTABLE POUR LES EMPLACEMENTS DE CLASSE I, DIVISION 2.*

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**Avertissement:** *RISQUE D'EXPLOSION—NE PAS DEBRANCHER TANT QUE LE CIRCUIT EST SOUS TENSION, A MOINS QU'IL NE S'AGISSE D'UN EMPLACEMENT NON DANGEREUX.*

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**Avertissement:** *NE PAS UTILISER DE CONNECTEUR USB DANS LES ENVIRONNEMENTS DANGEREUX.*

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## Sierra Wireless

Semtech Corporation purchased Sierra Wireless in January 2023. The Sierra Wireless brand is gradually being phased out. During the phase-out period, references to both “Semtech” and “Sierra Wireless” may appear in product documentation.

## Contact Information

Sales information and technical support, including warranty and returns	Web: <a href="http://sierrawireless.com/company/contact-us/">sierrawireless.com/company/contact-us/</a> Global toll-free number: 1-877-687-7795 6:00 am to 5:00 pm PST
Corporate and product information	Web: <a href="http://sierrawireless.com">sierrawireless.com</a>

## Revision History

Revision number	Release date	Changes
1	January 2026	Document created
2	March 2026	Updated fast blow fuse rating to 4 A (Fusing on p.29; Figure 2-5; Connect the RX400/EX400 Router to a Vehicle's Electrical System on p.31; Vehicle Installation — Recommended Basic Method on p. 32; Vehicle Installation — Timer-Driven Activation on p.33; Vehicle Installation — Shore Power on p.34; Fixed Installation — Recommended Basic Method on p.35; Figure 2-9; Fixed Installation — I/O Input-Triggered Activation on p.35; Figure 2-10)

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# 1: Introduction to the AirLink RX400 / EX400

Semtech® AirLink® RX400/EX400 5G routers are compact, intelligent and fully-featured communications platforms that provide real-time wireless capabilities for fixed and mobile applications.

The RX400/EX400 is intended for use in fixed, industrial and mobile settings such as:

- Remotely monitoring and controlling infrastructure and surveillance equipment on reclosers, cap bank controllers, pumps and valves in any energy, utility, or industrial application
- Tracking the location of heavy equipment and assets in the field
- Providing reliable Internet access to a mobile workforce

Each RX400/EX400 includes a one-year subscription to AirLink Complete — a subscription service combining comprehensive network management services (remote configuration, software update, and monitoring) with AirLink Management Service (ALMS), 24/7/365 technical support, and hardware warranty (extendable up to 5 years with subscription).



All RX400/EX400 routers support 5G NR Sub-6G (Redcap NR) and 4G LTE cellular radio bands, Wi-Fi 6, dual-band GNSS, and include multiple SKU-dependent communication ports (Ethernet, USB, (RX400 only) Serial).

The router's power connector provides additional functionality with a GPIO pin for remote monitoring and control, and an ignition sense pin to turn the router on and off.

The RX400/EX400 router, with its rich feature set, configurable with the included AirLink OS software, is the perfect choice for a broad set of IoT solutions.

**Table 1-1: RX400 / EX400 Router Models**

SKU	Model	Communication Ports				AirLink Complete
		Cellular	Wi-Fi	Ethernet (1 Gbps)	Serial	
1105302	EX400 Dual Ethernet	Y	–	Y	–	Y
1105303	EX400 Dual Ethernet, Wi-Fi	Y	Y	Y	–	Y
1105304	RX400 Serial, Ethernet	Y	–	Y	Y	Y
1105305	RX400 Serial, Ethernet, Wi-Fi	Y	Y	Y	Y	Y

## Key Features

- Cellular support:
  - High-performance 2x2 5G NR Sub-6G (RedCap) and LTE (Cat 4)
  - FirstNet support (Band 14) (Certification in progress/pending)
  - Dual SIM support — nano-SIM cards (4FF)
  - Fully automatic network operator switching on SIM card insertion
- Wi-Fi support:
  - 1x1 Wi-Fi 802.11ax 2.4/5 GHz
- GNSS support:
  - Dual-band active GNSS (L1,L5) with several advantages compared to single-band GNSS (L1) routers, including:
    - Faster and more accurate router location fixes for position reporting and remote equipment tracking
    - Less susceptible to interference caused by dense vegetation, urban canyons (streets bordered by tall buildings), etc.

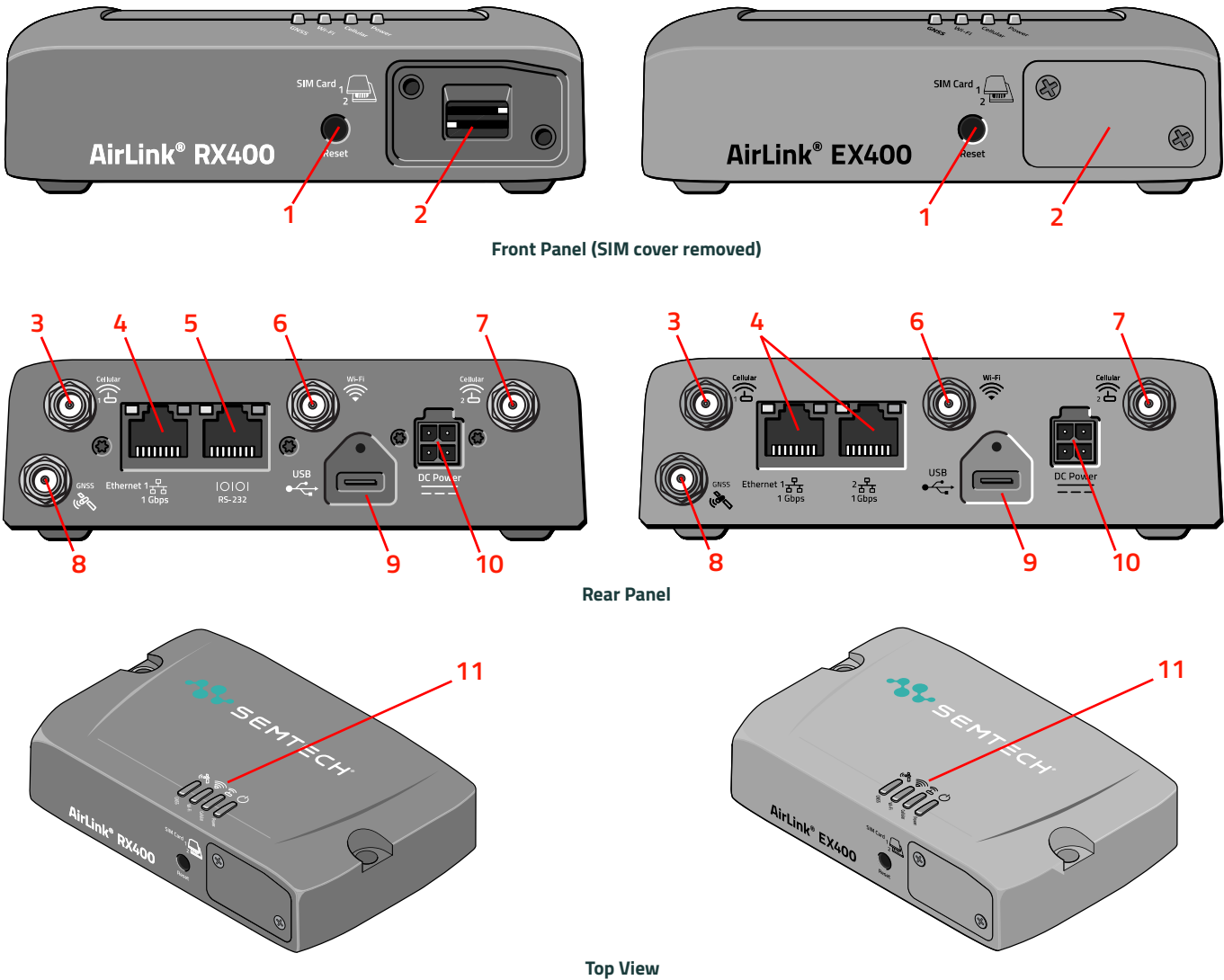
- Network support:
  - Provides network connectivity via Ethernet, USB-C, and (RX400 only) Serial connectors
    - Gigabit Ethernet support: 1 Gbps — 10/100/1000
    - USB 2.0 support with 480 Mbps Ethernet over USB-C network connectivity
    - (RX400 only) Serial port support: One connector used for 1 x 4-wire RS-232 serial port, or 1 x 4-wire and 1 x 2-wire RS-232 serial ports
  - Supports VPN tunnels for secure communications
- Router management-related features:
  - Remote configuration, software update, and monitoring with AirLink Management Service (ALMS). Your RX400/EX400 router purchase includes a one-year subscription to AirLink Complete, providing ALMS access, technical support, and hardware warranty (extendable up to 5 years with subscription).
  - Location data, communication link status and traffic statistics (Cellular, Wi-Fi, Ethernet, etc.), and ignition status reporting to ALMS and third party server platforms
  - REST API (Note — Feature is in Beta stage as of document revision date.)
- Certifications/Standards compliance:
  - Meets industrial-grade certifications including:
    - (RX400 only) Class 1 Div 2, IECEx/ATEX
    - MIL-STD-810H
    - (RX400 only) IP64 / (EX400) IP30 ingress protection
  - E-Mark, ISO7637-2 and (RX400 only) SAEJ1113-11 Level 4 for shock, vibration, electrical
- Security via Remote Authentication (RADIUS, TACACS+, LDAP) to centrally manage router access
- Multi-function digital input, analog input, (RX400 only) digital output switchable low side current sink, and digital input/output high side configurable pull-up
- Power-related features:
  - Built-in, class-leading voltage transient protection provides superior reliability
  - Preprogrammed configurable low voltage disconnect (9 V default) to prevent battery drain
  - Multiple external power supply options — DC supply for vehicle and fixed installations, AC power adapter and (RX400 only) USB-C power adapter for fixed installations
  - [Power Saving Features](#), including:
    - Standby mode
    - Power saving strategies such as turning off unused interfaces (USB, Serial, Ethernet), turning off GNSS, and adjusting the Ethernet data rate
- Mounting hole compatibility with RV-series and XR60 routers — Identical mounting screw / bolt locations for easy upgrade / replacement of your existing RV-series and / or XR60 router fleet. For RX400/EX400 dimensions, see [Mechanical Specifications](#) on page 64. For RV-series and XR60 dimensions, see the “Mechanical Specifications” sections in *[6] AirLink RV55 Hardware User Guide* and *[7] AirLink XR60 Hardware User Guide*.

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*Note: All antenna connectors are SMA (Cellular, GNSS) or RP-SMA (Wi-Fi).*

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## Description



- |                                                                                                                                                                          |                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| 1 — Reset Button (See <a href="#">Rebooting / Resetting the Router</a> on page 46. )                                                                                     | 6 — (Wi-Fi models only) Wi-Fi Antenna Connector (See <a href="#">Step 3 — Connect the Antennas</a> on page 25.) |
| 2 — Nano-SIM holders (See <a href="#">Step 1 — Insert the SIM Cards</a> on page 19.)                                                                                     | 7 — Cellular Antenna Connector #2 (See <a href="#">Step 3 — Connect the Antennas</a> on page 25.)               |
| 3 — Cellular Antenna Connector #1 (See <a href="#">Step 3 — Connect the Antennas</a> on page 25.)                                                                        | 8 — GNSS Antenna Connector #2 (See <a href="#">Step 3 — Connect the Antennas</a> on page 25.)                   |
| 4 — RJ45 Ethernet Port(s)<br>(EX400 only) RJ45 Ethernet Port #1 and Ethernet Port #2<br>(RX400 only) RJ45 Ethernet Port #1<br>(See <a href="#">Ethernet</a> on page 52.) | 9 — USB-C Port (See <a href="#">USB</a> on page 52.)                                                            |
| 5 — (RX400 only) RS-232 Serial Port (See <a href="#">(RX400 only) Serial Port</a> on page 53.)                                                                           | 10 — Power Connector (See <a href="#">DC Power Connector</a> on page 29.)                                       |
|                                                                                                                                                                          | 11 — LEDs (See <a href="#">LED Behavior</a> on page 85)                                                         |

Figure 1-1: RX400/EX400 Router Connectors, LEDs and SIM Card Holders

## Router Configuration and Management

You can configure and manage your RX400/EX400 router using:

- **AirLink OS** — Browser-based router management application. Refer to [2] *AirLink OS User Guide*.
- **AirLink Management Service (ALMS)** — Cloud-based router management service provided by Semtech. Your RX400/EX400 router purchase includes a one-year subscription to AirLink Complete, including ALMS access.  
For more information, visit [www.sierrawireless.com/ALMS](http://www.sierrawireless.com/ALMS) or contact your Semtech distributor.

The AirLink RX400/EX400 router supports the following power modes/connection states:

- Standby
- Normal (Connected)

Table 1-2 describes several power consumption scenarios for the supported modes, and Table 1-3 on page 14 describes available power saving configurations.

**Table 1-2: Power Consumption Scenarios**

RX400 / EX400 Model	Mode	Use Case	Interfaces <sup>a</sup> / Notes	Power Draw		Current Draw
				Typ <sup>b</sup> (W)	Max (W)	Typ <sup>b</sup> @ 12 V (mA)
All	Standby	—	<ul style="list-style-type: none"> <li>▪ CPU and radio are off</li> <li>▪ Router enters Standby mode depending on the power source and related triggers mentioned in <a href="#">Low Voltage Standby Mode</a> on page 55.</li> </ul>	0.055 <sup>c</sup> (55 mW)	—	4.6
All	Normal	High	<ul style="list-style-type: none"> <li>▪ All interfaces up, max power draw</li> </ul>	—	< 15	1100
RX400 Serial, Ethernet	Normal	Low	<ul style="list-style-type: none"> <li>▪ RS-232 enabled with no traffic</li> <li>▪ Cellular idle attached</li> </ul>	0.924	—	77
		Low	<ul style="list-style-type: none"> <li>▪ RS-232 enabled with no traffic</li> <li>▪ Cellular idle attached</li> <li>▪ Ethernet set to 10-BaseT with no traffic</li> <li>▪ USB enabled and Idle</li> </ul>	1.14	—	95
		Mid	<ul style="list-style-type: none"> <li>▪ One interface enabled (either RS-232 or 10-BaseT Ethernet) with full traffic</li> <li>▪ Cellular LTE connected at 0 dBm</li> </ul>	1.656	—	138
		High	<ul style="list-style-type: none"> <li>▪ One interface enabled (either RS-232 or 1000-BaseT Ethernet) with full traffic</li> <li>▪ Cellular LTE connected at 23 dBm</li> </ul>	3.96	—	330

Table 1-2: Power Consumption Scenarios (Continued)

RX400 / EX400 Model	Mode	Use Case	Interfaces <sup>a</sup> / Notes	Power Draw		Current Draw
				Typ <sup>b</sup> (W)	Max (W)	Typ <sup>b</sup> @ 12 V (mA)
RX400 Serial, Ethernet, Wi-Fi	Normal	Low	<ul style="list-style-type: none"> <li>▪ Wi-Fi Radio set to AP 2.4 GHz mode and idle</li> <li>▪ Cellular idle attached</li> <li>▪ Ethernet port set to 10-BaseT enabled and idle</li> <li>▪ USB enabled and idle</li> <li>▪ RS-232 enabled with no traffic</li> <li>▪ GNSS enabled</li> </ul>	1.5	—	125
		High	<ul style="list-style-type: none"> <li>▪ Wi-Fi Radio set to AP mode on the 5GHz band using data width of 80 MHz and Max throughput or Wi-Fi Radio set to STA mode on the 2.4GHz band using data width of 20 MHz</li> <li>▪ RS-232 enabled with traffic</li> <li>▪ Ethernet set to 1000-BaseT with full traffic</li> <li>▪ USB enabled with full traffic</li> <li>▪ GNSS enabled using an active antenna</li> <li>▪ Cellular LTE connected at 23 dBm</li> </ul>	5.1851	—	432.09
EX400 Dual Ethernet	Normal	Low	<ul style="list-style-type: none"> <li>▪ Ethernet port set to 10-BaseT enabled and idle</li> <li>▪ Cellular idle attached</li> </ul>	0.8846	—	73.72
		Mid	<ul style="list-style-type: none"> <li>▪ One interface enabled 10-BaseT Ethernet with full traffic</li> <li>▪ Cellular idle connected at 0 dBm</li> </ul>	1.599	—	133.25
		High	<ul style="list-style-type: none"> <li>▪ One interface enabled 1000-BaseT Ethernet with full traffic</li> <li>▪ Cellular idle connected at 23 dBm</li> </ul>	4.3523	—	362.69
EX400 Dual Ethernet, Wi-Fi	Normal	Idle (Low)	<ul style="list-style-type: none"> <li>▪ Wi-Fi Radio set to AP mode on the 5GHz band and idle</li> <li>▪ Cellular idle attached</li> <li>▪ Ethernet port set to 10-BaseT enabled and idle</li> <li>▪ USB enabled and idle</li> <li>▪ GNSS enabled</li> </ul>	1.87	—	156
		All interfaces (High)	<ul style="list-style-type: none"> <li>▪ Wi-Fi Radio set to AP mode on the 5GHz band using data width of 80 MHz and Max throughput or Wi-Fi Radio set to STA mode on the 2.4GHz band using data width of 20 MHz</li> <li>▪ Ethernet port 1 set to 1000-BaseT with full traffic</li> <li>▪ Ethernet port 2 set to 1000-BaseT with full traffic</li> <li>▪ USB enabled with full traffic</li> <li>▪ GNSS enabled using an active antenna</li> <li>▪ Cellular LTE connected at 23 dBm</li> </ul>	5.4642	—	455.35

- a. Listed interfaces are all enabled as described. Interfaces that are not listed are all off or disabled.
- b. Typical power / current draw measurements are expected to be within ± 10% of stated values at 25°C.
- c. When powered by only USB-C, the standby power consumption is expected to increase by an additional ~30 mW.

## Power Saving Features

Table 1-3 on page 14 provides a quick reference to available RX400/EX400 power saving feature configurations. These configurations may be used to optimize power consumption, and are recommended for customers who require the best power consumption efficiency—for example, in battery or solar powered applications. Using these features saves energy by reducing performance where possible.

**Table 1-3: Configurable Power Saving Features**

Feature	Where to configure in AirLink OS	Power Saving Configuration Details
<b>Hardware Interface configurations</b>		
<b>Cellular Interface<sup>a</sup></b>	Hardware Interfaces > Cellular Interfaces > Configuration	Disable the cellular interface.
<b>Wi-Fi Interfaces<sup>a</sup></b>	Hardware Interfaces > Wi-Fi Interfaces > Configuration	Disable any combination of the Wi-Fi Client and Access Point interfaces.
<b>Ethernet Interfaces<sup>a</sup></b>	Hardware Interfaces > Ethernet Interfaces > Configuration	Disable any unused Ethernet ports. (i.e., Ethernet 1, (EX400 only) Ethernet 2)
		Select specific Ethernet data rates for enabled Ethernet ports. Ethernet data rates can be set as follows: <ul style="list-style-type: none"> <li>• Auto (Default)</li> <li>• 1000 baseT/Full</li> <li>• 100 baseT/Full</li> <li>• 100 baseT/Half</li> <li>• 10 baseT/Full</li> <li>• 10 baseT/Half</li> </ul> Slower rates may result in some power savings. For Dual-Ethernet devices that require only one Ethernet connection, disable the second Ethernet connection to obtain power savings. When set to 10 or 100 Mbits, both sides of the link must be set to the same fixed speed and duplex settings. If you are unable to ensure that both sides of the link have exactly the same fixed settings, it is best to use Auto.
<b>USB Interface<sup>a</sup></b>	Hardware Interfaces > USB Interfaces > Configuration	Disable the USB port's data path.  <i>Note: This does not disable the USB power feature.</i>
<b>Serial Interfaces<sup>a</sup></b>	Hardware Interfaces > Serial Interfaces > Configuration	Disable unused serial ports by setting the MODE to Disabled.
<b>Location Services configuration</b>		
<b>GNSS<sup>a</sup></b>	Services > Location > General	GNSS is disabled by default.
<b>Power / Voltage configuration</b>		
<b>Low Voltage Disconnect</b>	System > MCU > Power Management	The RX400/EX400 router enters standby mode 30 seconds (configurable) after the voltage drops below a user-defined threshold (9 V default), to prevent excessive battery drain in battery-operated systems. The router will return to normal mode when the voltage rises to the user-configurable resume voltage (10.5 V (default)).  <i>Note: This does not apply when power is supplied via USB-C.</i>

Table 1-3: Configurable Power Saving Features (Continued)

Feature	Where to configure in AirLink OS	Power Saving Configuration Details
<b>Ignition Shutdown Delay</b>	System > MCU > Power Management	Enable/disable/configure the shutdown delay. If the RX400/EX400 is installed in a vehicle, connect the ignition sense pin (Pin 3) on the DC power cable to the vehicle ignition and configure the router to shut down after a configured delay once the ignition is turned off.
<b>Standby (Timer-based)</b>	System > MCU > Power Management	The RX400/EX400 router is in standby mode and automatically wakes up periodically, for example hourly or daily.
<b>Standby (I/O-based)</b>	System > MCU > Power Management	The RX400/EX400 router is in standby mode and automatically wakes up on configured I/O input.

- a. If a template is used to re-enable peripherals (i.e., hardware interfaces, location services), a reboot is required after the template is applied.

## Dual SIM

The AirLink RX400/EX400 router has two nano-SIM (4FF) card slots.

By default, the upper SIM slot is for the Primary SIM card and the lower slot is for the Secondary SIM card, but these assignments can be reconfigured in AirLink OS.

To configure the Primary and Secondary SIM card slots:

- Go to Hardware Interfaces > Cellular Interfaces > Configuration and configure the SIM SLOT MANAGEMENT settings.

When the router is powered on or reboots, it automatically connects to the cellular network associated with:

- the Primary SIM card, if one is present  
*or, if there is no Primary SIM card*
- the Secondary SIM card, if one is present

SIM PIN configuration is also available for both SIM cards. This feature allows you to install SIM cards for two different network operators, use one SIM card initially and later change network operators by configuring the new SIM card to be the Primary SIM card.

To configure SIM PINs:

- Go to Hardware Interfaces > Cellular Interfaces > SIM Database and configure the KNOWN SIM table entries.

Data usage is tracked independently for each SIM card.

---

*Note: AirLink OS also supports dual SIM fail-over (automatic SIM switching).*

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## Network Operator Switching

The Network Operator Switching feature, which is intended for North American routers, makes it possible to use a single RX400/EX400 hardware variant on multiple operator networks.

The AirLink RX400/EX400 comes preloaded with multiple network operator-specific radio module firmware (RMFW) versions.

When the router powers on (i.e., when it begins to boot):

1. The router determines which SIM to use. The Primary SIM will be used if a card is detected in the Primary SIM slot, otherwise the router will use the SIM card in the Secondary SIM slot.
2. The router determines whether the loaded RMFW matches the SIM card.  
If the RMFW does not match, then the router checks the stored RMFW for a match and automatically loads it onto the radio module. If a match is not found (e.g., because an unrecognized SIM is inserted), Generic RMFW is loaded.  
While the new RMFW is loading (i.e., Network Operator Switching is in progress), the router display a green LED 'chase' (the LEDs sequentially flash green).

## Accessories

Table 1-4 lists accessories that are included with the RX400/EX400 or are available for purchase from Semtech resellers.

**Table 1-4: RX400 / EX400 Accessories<sup>a</sup>**

Part	Part Number	Description
Included with RX400/EX400 router purchase		
Locking DC Power Cable (Black Connector)	2000522	Length — 3 m (10 ft)
Quick Start Guide	5308364	Basic router installation instructions
AirLink Complete leaflet	5308164	AirLink Complete subscription service description and registration details
Available for separate purchase from Semtech resellers		
Semtech antennas	For RX400/EX400 antennas, visit <a href="http://www.sierrawireless.com/router-solutions/antennas/">www.sierrawireless.com/router-solutions/antennas/</a>	5G Sub-6G cellular antennas, and 2.4 GHz and 5 GHz Wi-Fi antennas, for various RX400/EX400 configurations <i>Note: All antenna connectors are SMA (Cellular, GNSS) or RP-SMA (Wi-Fi).</i>
Universal AC Power Adapter (Black Connector)	2000579	Universal AC voltage power supply with three regional mains connectors
(RX400 only) Serial Port Adapter Cable — Single (4-wire Serial)	6001410	RJ45 to single DB9 (RS-232) female 4-wire serial cable
(RX400 only) Serial Port Adapter Cable — Dual	6001409	RJ45 to dual DB9 (RS-232) female serial cable
DIN rail mounting bracket	6001529	Mounting bracket for horizontal or vertical installation on a DIN rail
Optional customer-supplied items		
Mounting screws	2	M5, pan head, used with split washers (e.g., Bossard BN 762) For details (including recommended screw lengths), see <a href="#">Screw Specifications</a> on page 66.

a. Subject to change.

## Warranty

RX400/EX400 routers include a 1-year standard hardware warranty that can be extended to 5 years maximum with an active AirLink Complete or AirLink Premium subscription. For complete warranty details, refer to *[5] End-User Warranty for Sierra Wireless AirLink products*.

## 2: Installation and Startup

This chapter shows how to connect, install and start the Semtech RX400/EX400 router. It also describes the top panel LEDs, and I/O functionality.

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*Note: Field wiring and connections in hazardous locations must be connected as per the wiring methods requirement for Class 2 circuits mentioned in the National Electric Code and the Canadian Electric Code.*

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*Note: The RX400/EX400 router installation must be done by a qualified technician.*

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### Out of Box — Quick Start

Included in your RX400/EX400 router purchase is a one-year subscription to AirLink Complete, which provides ALMS access, technical support, and up to 5 years of extended warranty.

Use ALMS to remotely register, configure, manage and monitor your RX400/EX400 router (or XR router fleet).

Refer to [3] *AirLink RX400/EX400 Quick Start Guide* (included in the box) for instructions on registering and preconfiguring your RX400/EX400 router.

### Tools and Materials Required

- Power supply — One of the following:
  - DC — Power cable included with the RX400/EX400 ([DC Power Cable \(Black Connector\)](#) on page 76)
  - AC — Optional AC adapter available from Semtech ([AC Power Adapter \(Black Connector\)](#) on page 77)
  - (RX400 only) USB-C — Optional customer-supplied USB-C 5V, 3A (15 W) power adapter (not available from Semtech; [USB-C Power Adapter](#) on page 80)

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**Important:** For DC or AC power supplies, make sure to use the specified parts, which meet the power requirements of the RX400/EX400—[DC Power Cable \(Black Connector\)](#) or [AC Power Adapter \(Black Connector\)](#).

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- One or two nano-SIM cards (4FF) (provided by your mobile network operator)
- #1 Phillips screwdriver (to open/close the SIM card cover)
- A computer to make a LAN connection to the RX400/EX400:
  - Computer (any OS) with an Ethernet connection
  - or
  - Windows computer with a USB-C cable (Note — The power supply must be either DC or AC.)
- Antennas for any communication ports that will be used:
  - Cellular (SMA) — 2x2 (Both should be connected when using cellular.)
  - Wi-Fi (Reverse Polarity SMA (RP-SMA)) — 1x1
  - GNSS (SMA) — 1

- (RX400 only) Optional Serial cable (see [Table 1-4](#) on page 16):
  - RJ45 to single RS-232 4-wire DB9, *or*
  - RJ45 to dual connection RS-232 4-wire + 2-wire DB9
- Optional DIN Rail Mounting Bracket kit (see [Table 1-4](#) on page 16)  
*or*  
Optional mounting screws (if not mounting on a DIN rail). (For details (including recommended screw lengths, see [Screw Specifications](#) on page 66.)

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**Caution:** *RX400/EX400 routers have hardened cases for use in industrial and extreme environments (RX400 is ruggedized; EX400 is semi-ruggedized). If you are installing it in these types of environments, use cables designed and specified for use in these types of environments to avoid cable failure.*

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## Installation Overview

The steps for a typical installation are:

[Step 1 — Insert the SIM Cards](#)

[Step 2 — Mount and Ground the RX400/EX400 Router](#)

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*Note: Depending on where you are installing the RX400/EX400 router, you may want to mount it after connecting the antenna, cables and power, and confirming correct operation.*

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[Step 3 — Connect the Antennas](#)

[Step 4 — Connect the Data Cables](#)

[Step 5 — Choose a Power Supply Type](#)

[Step 6 — Supply Power to the Router](#)

[Step 7 — Startup and Software Configuration](#)

## Step 1 — Insert the SIM Cards

The AirLink RX400/EX400 router has two nano-SIM (4FF) card slots:

- Slot 1 (upper slot — SIM1)
- Slot 2 (lower slot — SIM2)

AirLink OS references these slot numbers, and by default, the SIM card in Slot 1 is the Primary SIM card. If you are using only one SIM card, Semtech recommends that you install it in Slot 1.

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*Note: SIM slot assignments are software-configurable in AirLink OS (Hardware Interfaces > Cellular Interfaces > Configuration > SIM SLOT MANAGEMENT).*

---

If the SIM card (or SIM cards) are not already installed, insert the SIM cards into the router before connecting any external equipment or power to the router.

To install the SIM cards:

1. Use a #1 Phillips screwdriver to remove the SIM card cover.

---

*Note: The cover uses captive screws.*

---

2. Orient the SIM card(s), as shown in [Figure 2-1](#). Note— If you are using only one SIM card, insert it in the upper SIM slot (Slot 1).
  - Upper SIM card— The gold contacts face down.
  - Lower SIM card— The gold contacts face up.
3. Gently slide the SIM cards into the slots until they click into place.

Note— To remove a SIM card:

- i. Press the SIM card in to release it.
- ii. Gently grip the SIM card and pull it out. (Do not try to pull it out before releasing it in step i.)

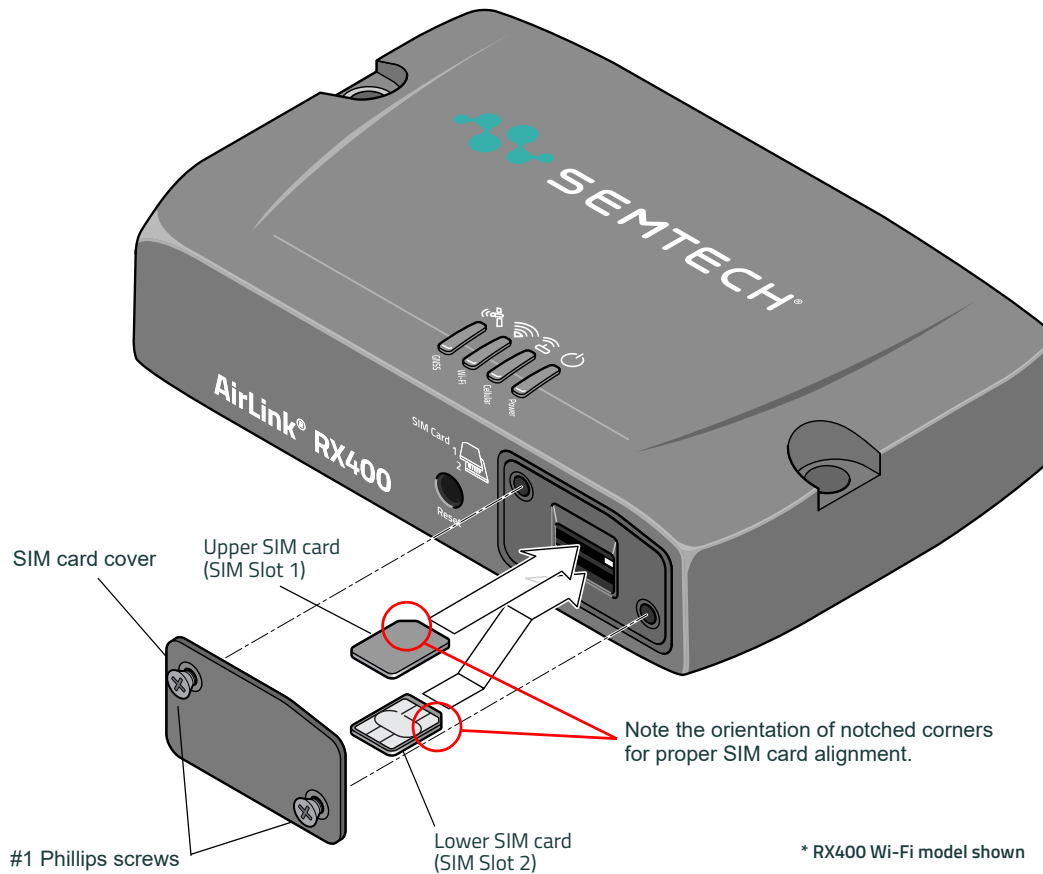


Figure 2-1: Installing the SIM Card

4. Replace the SIM card cover.

---

**Important:** Do not over-tighten the screws (see [Screw Specifications](#) on page 66). This could strip the threads inside the router, which will prevent the cover from re-attaching.

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5. Continue to [Step 2— Mount and Ground the RX400/EX400 Router](#).

---

## Step 2 — Mount and Ground the RX400/EX400 Router

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**Warning:** This router is not intended for use close to the human body. Antennas should be at least 8 inches (20 cm) away from the operator.

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The RX400/EX400 router can be mounted directly onto a flat surface, or attached to a mounting bracket to allow easy mounting/dismounting on flat or vertical surfaces.

Semtech strongly recommends always grounding the router using the unpainted mounting hole (grounding point) shown in [Figure 2-2](#) on page 22.

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*Note:* See the [Mechanical Specifications](#) on page 64 for the RX400/EX400 router's dimensions, including mounting hole positions.

---

To mount the RX400/EX400:

1. Make sure the power source is OFF (e.g., vehicle battery is disconnected, power cord is disconnected, vehicle ignition is off, etc.) before beginning to mount the RX400/EX400 router.
  2. Determine where to mount the router — Key considerations when choosing a location include:
    - Cabling:
      - Easy access to the cables — Make sure to leave sufficient space in front of, behind, and above the router.
      - Make sure cables are not bent, constricted, close to high amperages or exposed to extreme temperatures.
      - See [Cabling—Best Practices](#) on page 24 for more details.
    - Top panel LEDs should be easily visible.
    - There must be adequate airflow to dissipate heat.
    - The router must be away from direct exposure to the elements, such as sun, rain, dust, etc.
    - Typical vehicle installation locations include under the deck lid or on the floorboard of the vehicle's equipment storage.
    - The router will not be hit or come into contact with people, cargo, tools, equipment, etc.
- 

*Note:* For vehicle mounting, make sure the RX400/EX400 is not in the driver's area of the vehicle or any other area where it can distract the driver. Mount the router in accordance with accepted after-market practices and materials.

---

3. Mount the RX400/EX400 using one of the supported [Mounting Methods](#) (flat mount, or DIN rail mount).
4. If the RX400/EX400 will be a DC-powered installation with a fixed "system" ground reference, you must ground the chassis to this system ground reference — see [Grounding the RX400/EX400 Router Chassis](#) on page 24.
5. Continue to [Step 3 — Connect the Antennas](#).

## Mounting Methods

The RX400/EX400 router has 2 mounting holes, as shown in [Figure 2-2](#). For mounting screw specifications (including recommended screw lengths), see [Screw Specifications](#) on page 66.

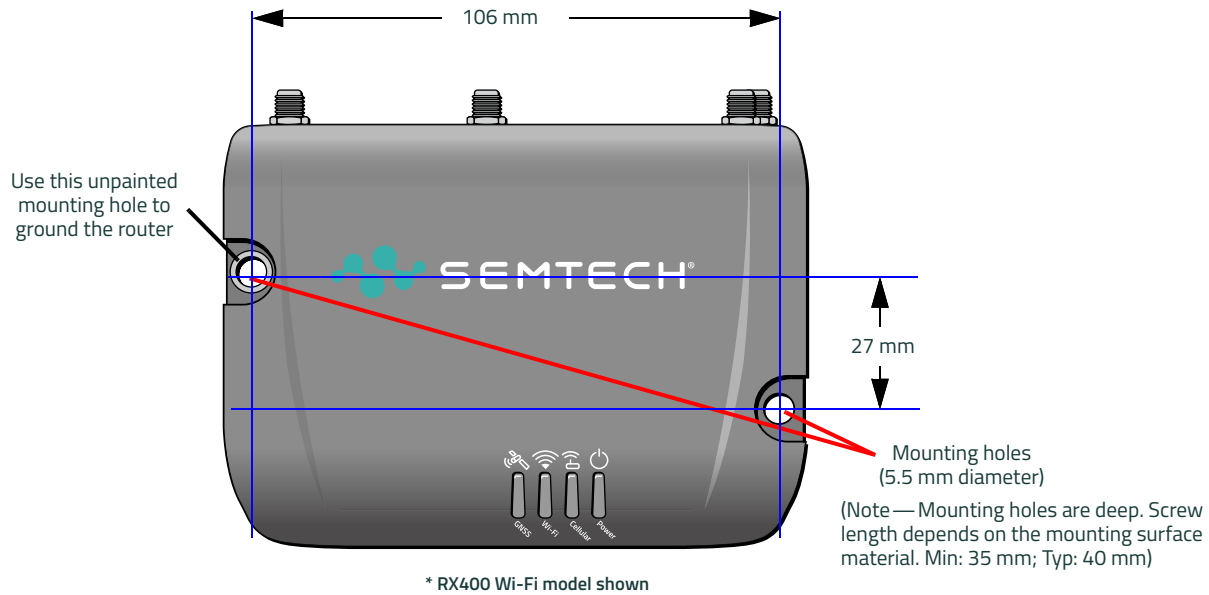


Figure 2-2: RX400/EX400 Router Mounting Holes

*Note: When mounting the RX400/EX400 router in a location that could be exposed to rain (e.g., in a vehicle door panel, which would expose the router when the door is opened), mount the router with the SIM card cover facing down, as shown in [Figure 2-3](#).*

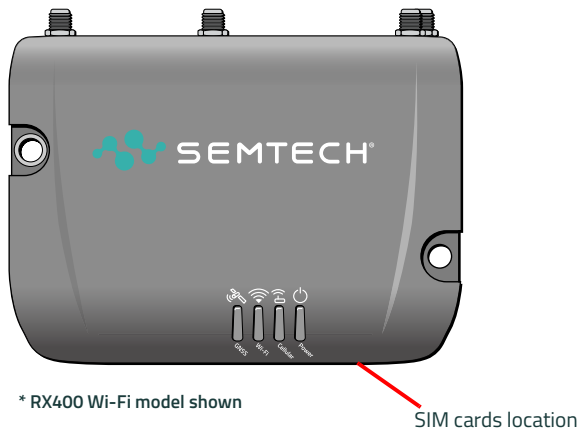


Figure 2-3: Recommended Orientation for Inclined/Vertical Mounting

## Flat Surface Mount

To mount the RX400/EX400 router on a flat surface, use M5 pan head screws with split washers. For details (including recommended screw lengths), see [Screw Specifications](#) on page 66.

## DIN Rail Mount

If you are mounting the RX400/EX400 router on a DIN rail, order a DIN rail mounting bracket kit (part #6001529) from Semtech (see [Table 1-4](#) on page 16). The kit contains:

- L-shaped DIN Rail Mounting Bracket — Qty 1
- DIN Rail Clip (35 mm EN 50022) — Qty 1
- Screws:
  - DIN rail clip screws: Flathead Phillips, M4 x 12 mm — Qty 4
  - XR60/RX400/EX400 mounting screws: Panhead Phillips, M4 x 35 mm — Qty 2
  - RX55 mounting screws: Panhead Phillips, M4 x 12 mm — Qty 2  
(Note — [Not for use with RX400/EX400 routers.](#))
- Internal #8 lock washers for mounting screws — Qty 2

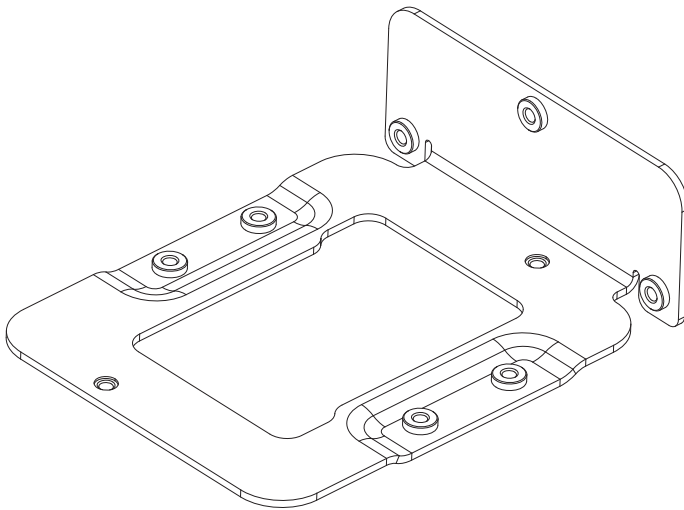


Figure 2-4: DIN Rail Mounting Bracket

To attach the RX400/EX400 router to a horizontally mounted DIN rail, in a variety of orientations:

1. Install the SIM card. (See [Step 1 — Insert the SIM Cards](#) on page 19.)
2. Test the network connectivity.  
Connect the RX400/EX400 router. Power it up and ensure that you have network connectivity. (See [Step 5 — Choose a Power Supply Type](#) on page 28.)
3. Place the router on the DIN rail mounting bracket, lining up the mounting holes on the underside of the router with the holes on the DIN rail mounting bracket.
4. Use the RX400/EX400 mounting screws provided to attach the router to the bracket. Torque the screws to a maximum of 1.1 N.m (9.74 lbf.in; 11.2 kgf.cm).
5. Use the DIN rail clip screws provided to attach the DIN rail clip to the bracket.
6. Attach the DIN rail clip to a horizontal DIN rail, with the spring clip at the bottom.

---

*Note: The DIN rail mounting bracket and clip in the kit should only be used on a horizontally-mounted DIN rail.*

---

## Grounding the RX400 / EX400 Router Chassis

For DC installations (with a fixed “system” ground reference), you must ground the RX400 / EX400 chassis to this system ground reference.

To ensure a good grounding reference, either:

- Attach the RX400 / EX400 to a grounded metallic surface using a conductive metal screw, to ensure there is a reliable electrical connection from the RX400 / EX400’s unpainted upper left mounting hole to the metal surface, *or*
- Connect one end of a short 18 AWG or larger gauge wire to the unpainted upper left mounting hole (see [Figure 2-2](#)) and connect the other end to the system ground reference or (if mounted in a vehicle) the vehicle chassis.

## Cabling—Best Practices

### Cable Routing for Vehicle Installations

Semtech recommends separating the RX400 / EX400 router’s antenna, data and power cables from other wiring in the vehicle, and routing the cables so they are protected from damage by sharp edges or other hazards, and will not be snagged or pulled on.

There should be no binding or sharp corners in the cable routing, and excess cabling should be bundled and tied off.

Make sure the cables are secured so their weight will not loosen the connectors from the router over time.

### Cable Strain Relief for High-Vibration Installations

Semtech recommends using cable strain relief for installations in high-vibration environments.

Place the cable strain relief within 200 mm (8”) of the RX400 / EX400 router to reduce the mass of cable supported by the router’s connectors (power, antenna, etc.) under vibration. Ideally, the strain relief mounting for the cables should be attached to the same object as the router, so both the router and cables vibrate together. Strain relief should be mounted such that it does not apply additional stress on the connectors (i.e., the cables should not be taut and should not pull the connectors at an angle).

## Cable Management

Proper cable management eliminates unnecessary installation complications, allows for ease of maintenance, and prolongs cable longevity.

The following practices are recommended for cable installation:

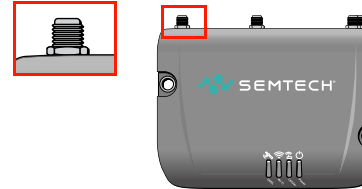
- Label all cables that attach to the RX400 / EX400 router. For example: “GNSS”, “Wi-Fi”, “Ethernet to Device X”, etc.
- Protect the cables using a proper cable conduit.
- Secure each cable connected to the RX400 / EX400 router via a permanent fixture.

## Step 3 — Connect the Antennas

**Warning:** This router is not intended for use close to the human body. Antennas should be at least 8 inches (20 cm) away from the operator.

The RX400/EX400 router uses SMA and RP-SMA antenna connector jacks (i.e., outside threads) for all RF connections. The number of connectors depends on the product variant:

- Cellular × 2 SMA (outside thread, center hole)
- (Wi-Fi routers) Wi-Fi × 1 RP-SMA (outside thread, center pin)
- GNSS × 1 SMA (outside thread, center hole)



Cellular and GNSS antenna cables must have SMA plugs (inside thread, center pin), and Wi-Fi antenna cables must have RP-SMA plugs (inside thread, center hole).

- Note:**
- The cellular and Wi-Fi antennas should not exceed the maximum gains specified in [Regulatory Information](#) on page 67.
  - In more complex installations (such as those requiring multiple connections and/or long lengths of cable where antennas are located away from the router), you must follow the maximum dBi gain guidelines specified by the radio communications regulations of the Federal Communications Commission (FCC), Innovation, Science and Economic Development Canada (ISED), or your country's regulatory body.
  - Keep the cables as short as possible to prevent the loss of antenna gain, and see [Cable Routing for Vehicle Installations](#) on page 24 for additional recommendations.

To install the antennas:

1. Consider the following recommendations for mounting antenna units:
  - For all installations (i.e., fixed or vehicle installations):
    - Follow the recommended installation instructions for the antenna unit(s).
    - Use appropriate cable strain relief. (See [Cable Management](#) on page 24.)
  - For single-element antennas:
    - See [Table A-1](#) on page 74 for recommended antenna separation distances.
  - For multi-element antennas:
    - When mounting antenna unit(s) that contain WAN/WLAN cellular antennas, make sure there is at least 20 cm (8 inches) between the antenna(s) and the user or bystanders during normal operation.
  - For any installation that includes a GNSS antenna that will be connected to the router (e.g., dedicated single-element (e.g., paddle) antenna, multi-element panel/dome/SharkFin/etc.), make sure the GNSS antenna has a good view of the sky (at least 90°).
2. Connect cellular, Wi-Fi and GNSS antennas as described below:

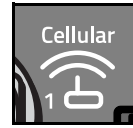
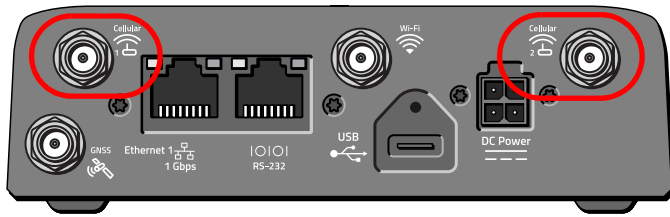
**Note:** Take extra care when attaching the antenna SMA plugs to the router's SMA connector jacks. Finger tight is sufficient (0.7±0.1 N.m; 6.2±0.88 lbf.in; 7.15±1.0 kgf.cm) and the max torque should not go beyond 1.1 N.m (9.74 lbf.in; 11.2 kgf.cm).

- Connect cellular antennas to each cellular antenna SMA connector (Cellular 1, Cellular 2).

**Important:** The RX400/EX400 should be connected to two 5G cellular antennas that support the full expected frequency range.

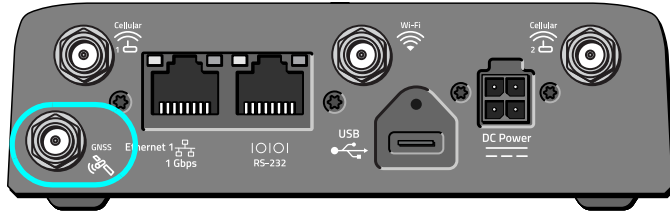
Semtech antennas are designed to meet strict regulatory and performance requirements. Semtech will not support antennas that do not meet the strict performance specifications.

Mount each cellular antenna so there is at least 20 cm between the antenna and the user or bystander.



\* RX400 Wi-Fi model shown

- If used, connect a GNSS antenna to the GNSS SMA antenna connector.

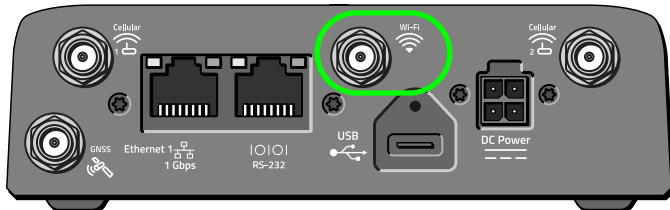


\* RX400 Wi-Fi model shown

Mount the GNSS antenna where it has a good view of the sky (at least 90°).

*Note: AirLink OS is configured by default for an active GNSS antenna. If you are using a passive antenna, after the router is installed, log in to AirLink OS, go to Services > Location > General and set the GNSS Antenna Bias to Off.*

- For Wi-Fi-capable routers, connect the Wi-Fi antenna to the RP-SMA Wi-Fi connector.



\* RX400 Wi-Fi model shown

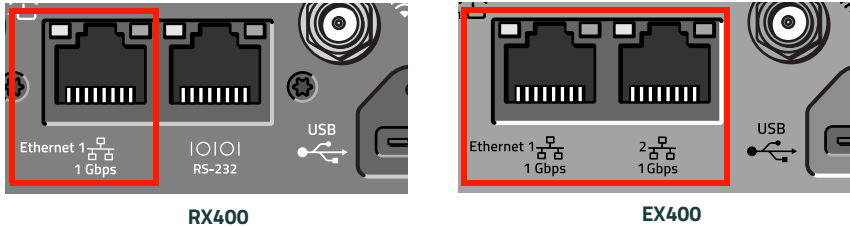
3. Continue to [Step 4 — Connect the Data Cables.](#)

## Step 4 — Connect the Data Cables

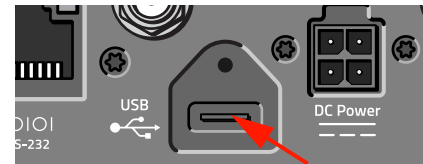
At least one computer must be connected via a data cable to the RX400/EX400 router to enable access to the router's AirLink OS. Additional computers and/or other appropriate devices can also be connected.

To connect data cables to the RX400/EX400 router:

1. Connect at least one computer (to enable access to the router's AirLink OS), using either of the following methods:
  - Ethernet— Use an Ethernet cable to connect the computer to an Ethernet port on the rear panel (Ethernet 1, Ethernet 2 (SKU-dependent)). (By default, Ethernet ports are enabled for LAN connection.) See [Ethernet](#) on page 52 for cable requirements.



- USB— Use a data-capable USB-C cable to connect the computer to the USB type-C locking port. Plug the cable into the USB port and then, if using a USB locking cable, tighten the jack screw finger-tight. (Make sure the cable is data-capable; some USB-C cables are power only.)



**Warning:** Do not use the USB port in a potentially explosive environment.

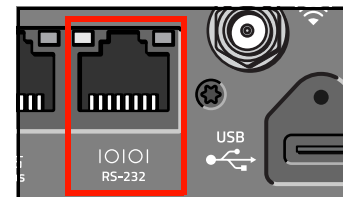
When the router is first powered on, the router will enumerate a virtual Ethernet port as described in [USB-C Network Connection](#) on page 82.

*Note: (RX400 only) If the USB-C port is not used as a virtual Ethernet port, it can be used to connect a USB-C power adapter to power the router—see [Step 5—Choose a Power Supply Type](#) on page 28.)*

See [USB](#) on page 52 for cable requirements.

*Note: After the RX400/EX400 router is set up, specific Ethernet ports can be reconfigured in the AirLink OS for WAN use (Network > General > Mode).*

2. Optionally, in the RS-232 serial port (SKU-dependent), insert a supported RJ45 to DB9 female cable (available from Semtech (see [Table 1-4](#) on page 16) or other vendors), and then connect appropriate device(s) to the port. The port supports a 4-wire serial interface, or a 4-wire + 2-wire dual serial interface. See [\(RX400 only\) Serial Port](#) on page 53 for cable requirements.
3. Continue to [Step 5—Choose a Power Supply Type](#).



## Step 5 — Choose a Power Supply Type

The AirLink RX400/EX400 router can be powered via any of the following supplies:

- DC power connector:
  - DC power — The router comes with a 3 meter (10 ft.) DC power cable.
  - AC power — An optional AC adapter is available from Semtech — see [Accessories](#) on page 16.

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**Important:** For DC or AC power supplies, make sure to use the specified parts, which meet the RX400/EX400's power requirements: [DC Power Cable \(Black Connector\)](#) on page 76 or [AC Power Adapter \(Black Connector\)](#) on page 77.

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- (RX400 only) USB connector:
  - USB power — A customer-supplied USB-C 5V, 3A (15 W) power adapter can be used ([USB-C Power Adapter](#) on page 80).

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*Note:* If both the DC power connector and USB connector have power supplies attached, the DC power connector will be used if sufficient voltage is supplied, otherwise the USB power will be used. For details, see [Power Supply Options](#) on page 55.

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*Note:* Electrical installations are potentially dangerous and should be performed by personnel thoroughly trained in safe electrical wiring procedures.

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To connect power to the router:

1. Review the topics in this section to familiarize yourself with the RX400/EX400's power requirements, wiring options, etc.:
  - [Operating Voltage \(DC power supply\)](#) on page 28
  - [Fusing](#) on page 29
  - [DC Power Connector](#) on page 29
  - [Vehicle Installation](#) on page 30
  - [I/O Configuration](#) on page 36
2. Choose the power supply source to use for the RX400/EX400:
  - DC power cable — Connect the cable to the router using an appropriate [Vehicle Installation](#) or [Fixed Installation](#) method.
  - AC power adapter
  - (RX400 only) USB-C 5V, 3A (15 W) power adapter
3. Go to [Step 6 — Supply Power to the Router](#) on page 42.

## Operating Voltage (DC power supply)

The RX400/EX400 router's operating voltage range when power is supplied via a DC power supply is (RX400) 7–36 V/(EX400) 9–30 V.

By default, the router is factory-configured with low voltage standby mode enabled and the standby voltage set to 9 V. Therefore, you must supply greater than 9 V at startup (i.e., the startup voltage must be greater than the standby voltage), otherwise the router will boot and enter standby mode.

If you want to operate the router at a lower voltage, change the low voltage settings once the router is up and running. For more information, refer to [2] *AirLink OS User Guide*.

To disable/enable low voltage standby mode or to operate the router at a lower voltage, change the low voltage settings in AirLink OS (System > MCU > Voltage Threshold) once the router is up and running. For more information, refer to [2] *AirLink OS User Guide*.

*Note: Low voltage standby mode does not apply when the router is powered by USB-C or by an AC adapter.*

## Fusing

For DC installations, Semtech recommends fusing the power input using a 4.0 A fast-acting fuse, recommended to have no more than  $\pm 10\%$  derating over the operating temperature.

## DC Power Connector

Power can be supplied to the router through the DC power connector located on the rear of the router, using either the DC power cable or the optional AC power adapter.

Figure 2-5 shows the DC power connector plus a basic wiring diagram for the DC power cable.

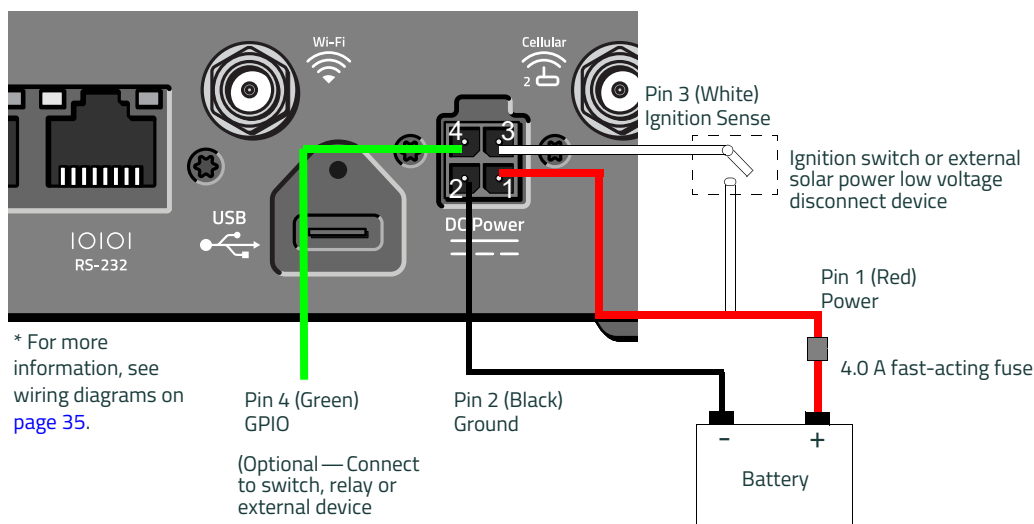


Figure 2-5: DC Power Cable Connections (Colors indicate DC cable wire colors.)

Table 2-1: Power Connector Pin and DC Cable Wires

DC Power Connector Pin	Name	DC Cable Wire Color	Description	Type
1	Power	Red	<p>Main power supply for router</p> <p><i>Note:</i> To use a control line (such as a vehicle ignition line) to turn the router on/off, Semtech strongly recommends that you connect the control/ignition line to Pin 3 (Ignition Sense) and apply continuous power on Pin 1.</p> <p><i>Note:</i> When the router switches to Standby mode based on a Low Voltage trigger, the voltage is monitored on Pin 1.</p>	PWR
2	Ground	Black	Main router ground	PWR

Table 2-1: Power Connector Pin and DC Cable Wires

DC Power Connector Pin	Name	DC Cable Wire Color	Description	Type
3	Ignition Sense	White	<p>Enables control of the router power state.</p> <p>This wire <u>must</u> be connected in one of the following ways:</p> <ul style="list-style-type: none"> <li>Connected to the vehicle ignition (for vehicle installations). <b>Recommendation:</b> Semtech recommends always connecting this pin to the vehicle ignition. However, if the router <u>must not</u> shut down when the ignition is turned off, disable the "Ignition" power source in AirLink OS (System &gt; Power Management &gt; Standby Mode).</li> <li>Connected to a low voltage disconnect device (for fixed installations). For example, in solar applications, if the router should turn off when the voltage drops below a defined level, connect this wire to an external low voltage disconnect.</li> <li>Tied to Pin 1 (Power) (for vehicle or fixed installations). Connect to the positive terminal of your power supply or battery. (For example, in the optional AC adapter cable, Pin 3 is tied to Pin 1 inside the cable.)</li> </ul> <p><i>Important:</i> This wire <u>must not</u> be left unconnected, and the router should not be turned off by disconnecting the power.</p> <p>RX400/EX400 router power state:</p> <ul style="list-style-type: none"> <li>On, when this pin is connected to the vehicle ignition or a low voltage disconnect device, or is tied to Pin 1 (power)</li> <li>Off/Standby, when the pin is either open-circuit or grounded</li> <li>(RX400 only) When the router is powered only by USB-C, the Ignition Sense pin is ignored ("masked").</li> </ul>	I
4	GPIO	Green	<p>General purpose input/output</p> <p>Typical GPIO uses include:</p> <ul style="list-style-type: none"> <li>User configurable digital input/output — Connect to a switch, relay, or external device.</li> <li>Analog input to detect analog signals (e.g., low voltage).</li> </ul> <p>For more information, see <a href="#">I/O Configuration</a> on page 36.</p>	I/O

## Vehicle Installation

For vehicle installations, the RX400/EX400 router's power supply cable must be connected to the vehicle's fuse box, and installed along the vehicle wall, always inside the vehicle cabin and must not cross the vehicle's firewall protection. Always follow the vehicle manufacturer's recommendations for electrical accessories connections. All components used in the electrical connection to the vehicle should be UL Listed or equivalent.

For operating voltage details (including software configuration) and fusing recommendations, see [Operating Voltage \(DC power supply\)](#) on page 28 and [Fusing](#) on page 29.

## DC Voltage Transients

The RX400/EX400 router has built-in protection against vehicle transients including engine cranking (down to 5.0 V) and load dump ((RX400) 24 V suppressed load dump of 65 V; (EX400) 12 V suppressed load dump), so there is no need for external power conditioning circuits. For details, see [Industry Certification for Vehicles](#) on page 48.

## Connect the RX400/EX400 Router to a Vehicle's Electrical System

For vehicle installations, to connect the RX400/EX400 router to the vehicle's electrical system:

1. Decide which wiring method will be used (see [Vehicle Installation Wiring methods](#) for suggestions).
2. Make sure the vehicle is turned off.
3. Remove the key from the ignition.
4. Disconnect the vehicle's battery:
  - a. Disconnect the negative terminal first.
  - b. Disconnect the positive terminal.
5. Connect the black (Ground) wire on the DC power cable to the vehicle chassis.
6. Make sure the RX400/EX400 router is grounded. (See [Step 2 — Mount and Ground the RX400/EX400 Router.](#))
7. Use a 4.0 A fast-acting fuse, recommended to have no more than  $\pm 10\%$  derating over the operating temperature range, to connect the red (Power) wire on the DC power cable to the vehicle's fuse box. (e.g., [Figure 2-6.](#))
8. Connect the white wire (Ignition Sense) on the DC power cable to the ignition signal from the vehicle.
9. Connect the green wire (GPIO) as required by your selected wiring method.
10. Connect the DC power cable to the RX400/EX400 router.
11. Reconnect the vehicle's battery:
  - a. Connect the positive terminal first.
  - b. Connect the negative terminal.

## Vehicle Installation Wiring methods

[Table 2-2](#) summarizes typical vehicle installation wiring methods. Refer to the methods for wiring diagrams and details for connecting the supplied DC cable to your power supply.

**Table 2-2: Vehicle Installation Wiring Methods Summary**

Installation Method	Description
<a href="#">Vehicle Installation — Recommended Basic Method</a> on page 32	The RX400/EX400 router operates while engine is running. Optional delayed shutdown can be used to maintain network connection for short periods while the engine is shut off.
<a href="#">Vehicle Installation — Timer-Driven Activation</a>	The RX400/EX400 router wakes periodically for a configured duration, then returns to standby mode.
<a href="#">Vehicle Installation — Shore Power</a>	The RX400/EX400 router continues operating when engine is shut off, via shore power supply, such as in a maintenance bay.

## Vehicle Installation — Recommended Basic Method

For most vehicle installations, Semtech recommends connecting the white Ignition Sense wire to the vehicle's ignition switch, as shown in [Figure 2-6](#).

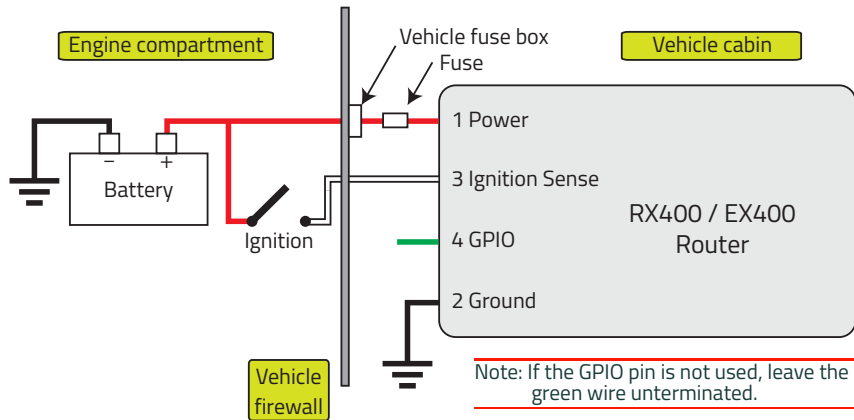


Figure 2-6: Vehicle Installation Wiring Diagram — Recommended Basic Method

This installation method allows the router to operate with the vehicle:

- When the vehicle ignition is off, the RX400/EX400 router is in standby mode.
- Optionally, a delayed shutdown can be configured to keep the RX400/EX400 router on for a specified time after the vehicle's ignition shuts off.

For example, a delayed shutdown is especially useful for maintaining a network connection while the vehicle's engine is shut off for short periods, such as in a delivery vehicle. For more information, refer to [2] *AirLink OS User Guide*.

Connect the DC cable's wires as follows:

- Red (Pin 1 — Power) — Connect to the power source. Include a 4.0 A fast-acting fuse, recommended to have no more than  $\pm 10\%$  derating over the operating temperature range, in the input power line. Semtech recommends using a continuous (unswitched) DC power source. Connect the power through the vehicle's fuse box.
- Black (Pin 2 — Ground) — Connect to the vehicle battery's negative terminal, or ground. For details, see [Step 2 — Mount and Ground the RX400/EX400 Router](#) on page 21.
- White (Pin 3 — Ignition Sense) — Semtech recommends connecting the white wire to the vehicle ignition to turn on the RX400/EX400 router (or wake from standby mode), or to turn off the RX400/EX400 router (or enter standby mode).

---

**Important:** To protect the RX400/EX400 router, do not remove the power source (e.g., do not disconnect the power cable) while the router is on. Uncontrolled shutdowns may result in unexpected operations/behavior when power is reapplied. For example, location data could be lost, which will adversely impact ALMS Advanced Mobility Reporting (AMR) reports.

---

- Green (Pin 4 — GPIO) — Leave the green wire (GPIO) unconnected if GPIO functionality is not required. Otherwise, connect the GPIO as described in [I/O Configuration](#) on page 36.

## Vehicle Installation — Timer-Driven Activation

This method can be used in vehicle installations where the RX400/EX400 router must be active at specific time intervals (e.g., to report vehicle status), and is powered via a DC cable connected to a DC power source (e.g., the vehicle's battery).

*Note: This method does not apply to routers powered by an AC adapter or USB power adapter.*

Using this method:

- The vehicle ignition must be connected to the router's I/O pin (see [Figure 2-7](#)).
- The AirLink OS MCU Power Management timer must be enabled and configured to turn the RX400/EX400 router on at the required interval for a specific duration (e.g., turn on for 20 minutes, once every 24 hours when the ignition is off).

When the timer activates, the router wakes from standby mode and remains in operational mode until the duration expires, which returns the router to standby mode. For more information, refer to [2] *AirLink OS User Guide*.

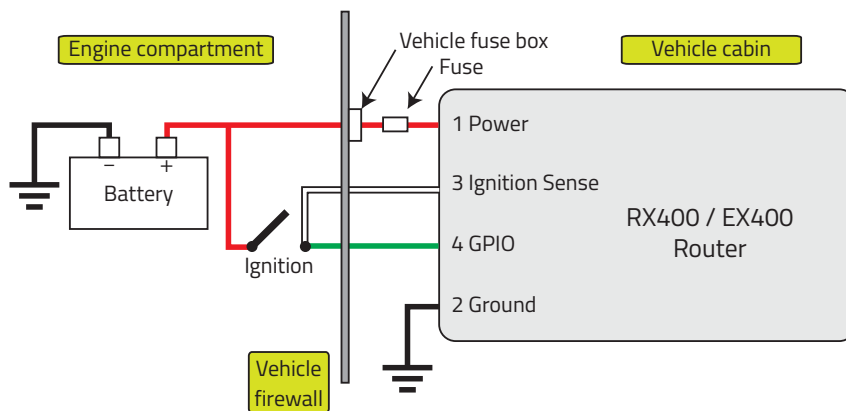


Figure 2-7: Vehicle Installation Wiring Diagram — Timer-driven Activation

Connect the DC cable's wires as follows:

- Red (Pin 1 — Power) — Connect to the power source. Include a 4.0 A fast-acting fuse, recommended to have no more than  $\pm 10\%$  derating over the operating temperature range, in the input power line. Semtech recommends using a continuous (unswitched) DC power source. Connect the power through the vehicle's fuse box.
- Black (Pin 2 — Ground) — Connect to the vehicle battery's negative terminal, or ground. For details, see [Step 2 — Mount and Ground the RX400/EX400 Router](#) on page 21.
- White (Pin 3 — Ignition Sense) — Connect to the vehicle ignition to enable accurate ALMS Advanced Mobility Reporting (AMR) (e.g., trip reports). When connected, this wire is also used for the AirLink OS Ignition Park Mode Filter (Services > Location > General).

and

Disable ignition in the AirLink OS (System > MCU > Power Management) so the RX400/EX400 router does not shut down (or enter standby mode) when the vehicle ignition is turned off.

- Green (Pin 4 — GPIO) — Connect to the vehicle's ignition.

## Vehicle Installation — Shore Power

A shore power supply can be used to operate the RX400/EX400 router while the vehicle ignition is off and the vehicle is in a facility with a shore power supply (e.g., parked in a maintenance bay), as shown in [Figure 2-8](#).

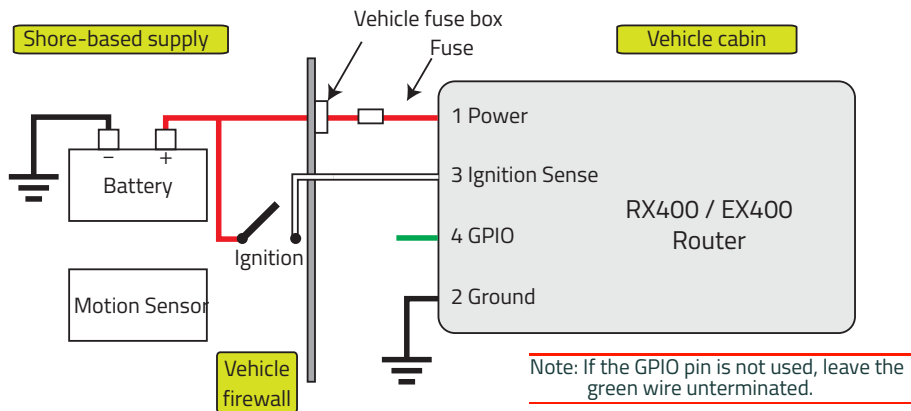


Figure 2-8: Vehicle Installation Wiring Diagram—Shore Power

Connect the DC cable's wires as follows:

- Red (Pin 1 — Power) — Connect to the power source. Include a 4.0 A fast-acting fuse, recommended to have no more than  $\pm 10\%$  derating over the operating temperature range, in the input power line. Semtech recommends using a continuous (unswitched) DC power source. Connect the power through the vehicle's fuse box.
- Black (Pin 2 — Ground) — Connect to the vehicle chassis ground. For details, see [Step 2 — Mount and Ground the RX400/EX400 Router](#) on page 21.
- White (Pin 3 — Ignition Sense) — Make sure to:
  - Connect to the vehicle ignition to enable accurate ALMS Advanced Mobility Reporting (AMR) reporting (e.g., trip reports). When connected, this wire is also used for the AirLink OS Ignition Park Mode Filter (Services > Location > General).
  - Disable ignition in the AirLink OS (System > MCU > Power Management) so the RX400/EX400 router does not shut down (or enter standby mode) when the vehicle ignition is turned off.
  - Configure AirLink OS to indicate the ignition wire is connected to the vehicle ignition (Services > Telemetry > Vehicle > VEHICLE IGNITION WIRING).
- Green (Pin 4 — GPIO) — Leave unconnected if GPIO functionality is not required. Otherwise, connect the GPIO as described in [I/O Configuration](#) on page 36.

## Fixed Installation

### Fixed Installation Wiring Methods

Table 2-3 summarizes typical fixed installation wiring methods. Refer to the methods for wiring diagrams and details for connecting the supplied DC cable to your power supply.

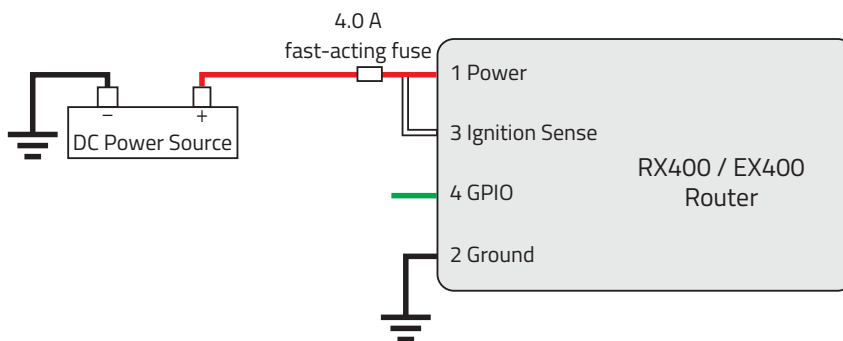
For operating voltage details (including software configuration) and fusing recommendations, see [Operating Voltage \(DC power supply\)](#) on page 28 and [Fusing](#) on page 29.

**Table 2-3: Fixed Installation Wiring Methods Summary**

Installation Method	Description
<a href="#">Fixed Installation — Recommended Basic Method</a> on page 35	Fixed installation without I/O
<a href="#">Fixed Installation — I/O Input-Triggered Activation</a>	Fixed installation with the I/O connected to an external device such as a motion detector, remote solar panel, remote camera, etc.

### Fixed Installation — Recommended Basic Method

For fixed installations without I/O, connect the wires as shown in [Figure 2-9](#).



*Figure 2-9: Fixed Installation Wiring Diagram — Basic Method (no I/O)*

Connect the DC cable's wires as follows:

- Red (Pin 1 — Power) — Connect to the power source. Include a 4.0 A fast-acting fuse, recommended to have no more than  $\pm 10\%$  derating over the operating temperature range, in the input power line. Semtech recommends using a continuous (unswitched) DC power source.
- Black (Pin 2 — Ground) — Connect to ground. For details, see [Grounding the RX400/EX400 Router Chassis](#) on page 24.
- White (Pin 3 — Ignition Sense) — Tie to the red wire (Power) before the fuse (i.e., on the RX400/EX400 router side of the fuse).
- Green (Pin 4 — GPIO) — Leave unconnected if GPIO functionality is not required. Otherwise, connect the GPIO as described in [I/O Configuration](#) on page 36.

### Fixed Installation — I/O Input-Triggered Activation

If you have a fixed installation where you want to use the DC power cable's I/O pin to monitor an external device such as a motion detector, remote solar panel, or a remote camera, connect the wires as shown in [Figure 2-10](#). You can configure the I/O line to wake the router up for a configured length of time, and use Low voltage disconnect to put the router in Standby mode if the voltage falls below a configured value.

---

*Note: The I/O power source must have a common ground with the router power source.*

---

This method can be used in installations where the router is powered via a DC cable connected to a DC power source, or powered by a USB-C power adapter.

---

*Note: This method does not apply to routers powered by an AC adapter.*

---

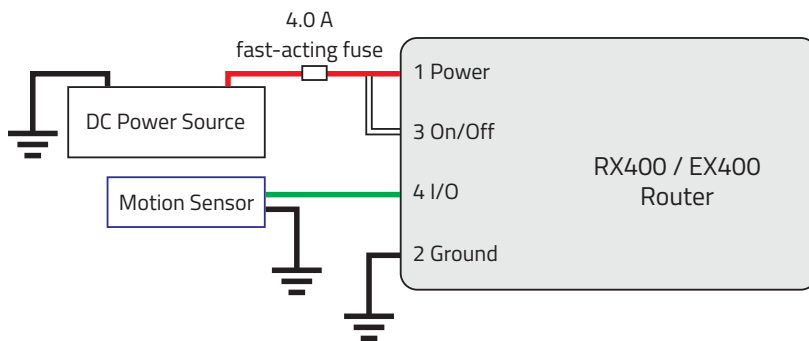


Figure 2-10: Fixed Installation with I/O

- Red (Pin 1 — Power) — Connect to the power source. Include a 4.0 A fast-acting fuse, recommended to have no more than  $\pm 10\%$  derating over the operating temperature range, in the input power line. Semtech recommends using a continuous (unswitched) DC power source.
- Black (Pin 2 — Ground) — Connect to ground. For details, see [Grounding the RX400/EX400 Router Chassis](#) on page 24.
- White (Pin 3 — Ignition Sense) — Tie to the red wire (Power) before the fuse (i.e., on the RX400/EX400 router side of the fuse).
- Green (Pin 4 — GPIO) — Connect this wire for I/O configurations. See [I/O Configuration](#) on page 36.

## I/O Configuration

You can use the DC cable's Pin 4 (GPIO) green wire as:

- [Digital Input](#) on page 37
- [High Side Pull-up / Dry Contact Switch Input](#) on page 38
- [Analog Input](#) on page 38
- [Low Side Current Sink Output](#) on page 40
- [Digital Output/Open Drain](#) on page 40

For more information, refer to [2] *AirLink OS User Guide*.

---

*Note: You can configure Pin 4 (GPIO) in AirLink OS or ALMS for one of the following, but not both:*

- *Trigger standby mode,*

*or*

- *Sink current or pull up the voltage*
-

*Note: During bootup, the I/O settings remain in their default state: the internal pull-up resistor is disabled, and the output current sink switch is open. After bootup, any custom I/O settings are applied—this may take approximately 30 seconds after the router is restarted or powered on.*

You can use AirLink OS Custom Reports (Services > Telemetry > Custom Reports) to monitor the state of Pin 4 and send a report when the state changes (e.g., when a switch is opened or closed, at fixed interfaces, when specific states are true, etc.). For more information, refer to [2] *AirLink OS User Guide*.

## Digital Input

You can use the green wire to connect Pin 4 to a digital input to:

- Detect the state of a switch, such as a vehicle ignition (on/off), door/latch position (open/closed), container fill state (full/empty), fuel level in vehicle (if connected to an on/off sensor), vehicle trunk position (open/closed), etc.
- Monitor an external device, such as a motion detector, remote solar panel, or remote camera.
- Work with the standby timer. While in Standby mode, the digital input will act as a wakeup function to wake the RX400/EX400 router for a configured length of time.

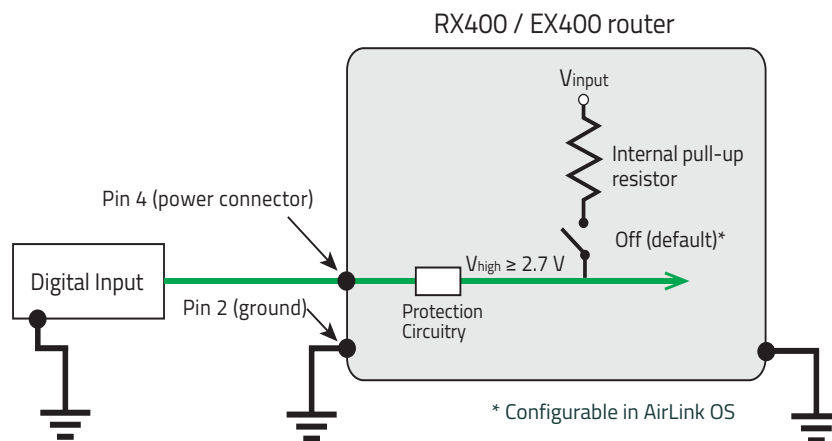


Figure 2-11: Digital Input

*Note: The digital input source should be referenced to the same ground as the router.*

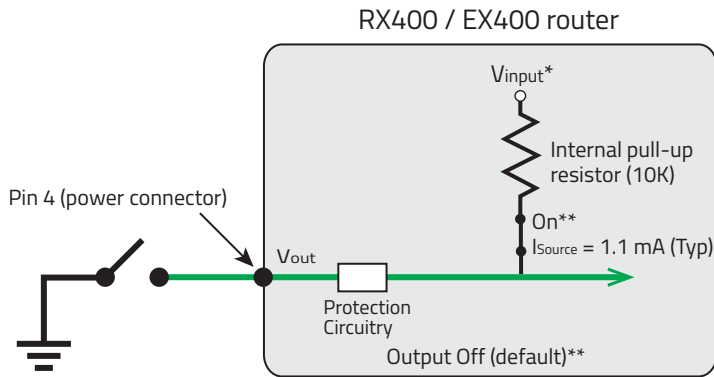
Table 2-4: Digital Input

Pull-up	State	Minimum	Typical	Maximum	Units
Off	Low	—	—	1.0	V
	High	2.7	—	—	V

## High Side Pull-up / Dry Contact Switch Input

You can use the green wire to connect Pin 4 to a dry contact switch.

*Note: In Standby mode, the internal pull-up resistor is in the Off state. Therefore the dry contact switch is not available in Standby mode.*



\*Depending on the load, this value can range between  $V_{input}$  and  $V_{input} - 2.5 V$ .

\*\* Configurable on the AirLink OS I/O page

Figure 2-12: High Side Pull-up / Dry Contact Switch Input

Table 2-5: High Side Pull-up / Dry Contact Switch Input

	Minimum	Typical	Maximum	Units	Comments
<b>Source Current</b>	0.6 $V_{input} = 7 V$	1.1 $V_{input} = 12 V$	3.5 $V_{input} = 36 V$	mA	Maximum current the voltage output can provide (depends on $V_{input}$ )
<b>V<sub>out</sub></b>	$V_{input} - 2.5$	—	$V_{input}$	V	The voltage on Pin 4 when the high side pull-up is enabled (depends on $V_{input}$ and power consumption)

## Analog Input

You can use the green wire to connect Pin 4 to an analog sensor. As an analog input (voltage sensing pin), the router monitors voltage changes in small increments. This enables monitoring of equipment that reports status as an analog voltage.

Pin 4 detects inputs of 0–5 V or 0–10 V (selectable in AirLink OS) referenced to ground. When used with a sensor to transform values into voltages, the pin can monitor measurements such as temperatures, sensors, or input voltage.

*Note: The lowest guaranteed detectable voltage for each analog input is 0.5 V (voltages from 0–0.5 V are not detected accurately).*

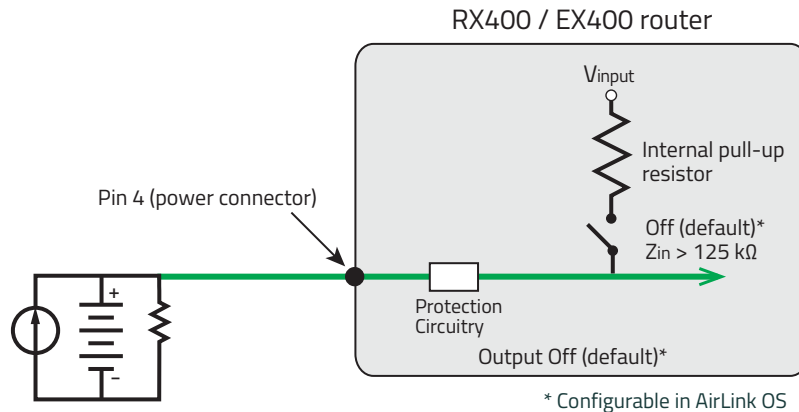


Figure 2-13: Analog Input

Table 2-6: Analog Input Specifications

Pull-up	Specification	Min	Typ	Max	Units	Comments
Off	Input range	0	—	10	V	Input voltage will cap at the maximum (i.e., over-voltage will be limited to the maximum)
	Voltage offset error	+50 mV to -50 mV			—	

Data sampling is handled by a dedicated microprocessor. In order to filter noisy signals, twenty measurements are taken over a 250 ms interval and they are averaged to generate a sample. If the change since the last sample is significant, a notification is sent to the CPU for updating the current value displayed in the user interface and for use by AirLink OS Custom Reports.

Changes are considered significant if the change is 150 mV or more. If there has not been a significant change to the parameter being monitored, the CPU reads a sample every 2.5 minutes, which detects small changes.

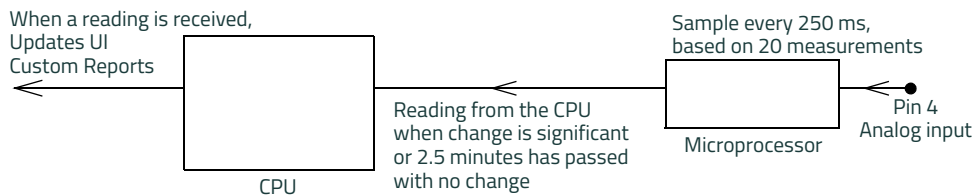
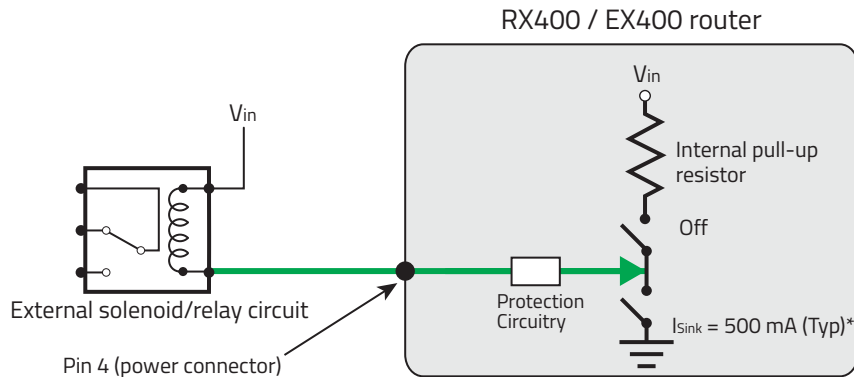


Figure 2-14: Analog Input Sampling and Reading

Note: The same method is used to sample the input voltage and the internal board temperature for AirLink OS Custom Reports. The significant changes are 300 mV for the input voltage and 1 °C for the board temperature.

## Low Side Current Sink Output

The power cable GPIO pin (Pin 4) can be connected to a low-side current sink output, for example to drive a relay.



\* See Table 2-7 on page 40 for more details.

Figure 2-15: Low Side Current Sink

Table 2-7: Low Side Switch Operational Ranges (Recommended)

State	Minimal	Typical	Maximum	Units	Comments
On	250 (@ 70°C)	500 (@ 25°C)	900 (@ -40°C)	mA	<ul style="list-style-type: none"> <li>Sink Current (<math>I_{Sink}</math>)</li> <li>The internal pull-up resistor is Off when the switch is in the On state.</li> </ul>

Note: The router protection circuitry has a high-impedance (~200 kΩ) path to ground. If Pin 4 is connected to 12 V, there will be a small current flow (~100 μA) into Pin 4 during bootup. This flow is countered when the internal pull-up resistor (10 kΩ) becomes active after bootup. Depending on your application, you may need to install an external pull-up resistor (10 kΩ) to nullify the small input current flow for the first 30 seconds during bootup.

Note: If the GPIO (Pin 4) stops working, the overcurrent protection circuitry may have been triggered, which disables the GPIO. To re-enable the GPIO, remove the cause of the overcurrent.

## Digital Output / Open Drain

You can connect the power cable GPIO (Pin 4) to a digital output / open drain, for example to drive an external digital input.

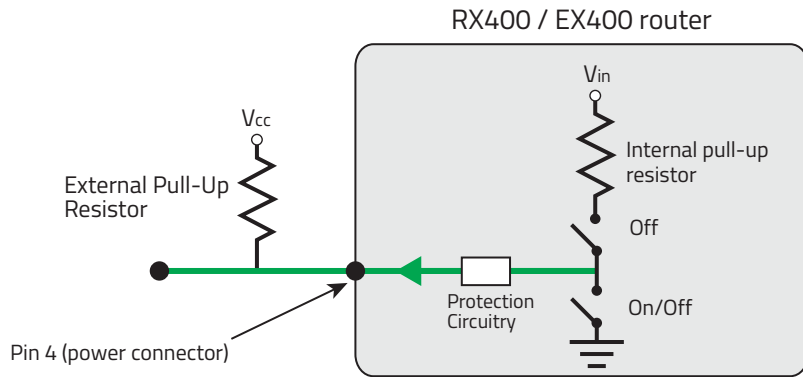


Figure 2-16: Digital Output / Open Drain

Table 2-8: Digital Output / Open Drain

Pull-up	State	Minimum	Typical	Maximum	Units	Comments
Off	Off	Open Circuit	—	—	—	—
	Active Low	—	—	0.5	V	5 mA, ≤ 5 V

## Step 6 — Supply Power to the Router

The RX400/EX400 router's factory default configuration enables it to establish a WAN connection if an appropriate SIM card is installed and the APN is configured correctly.

---

*Note: Additional configuration is always recommended.*

---

1. Apply power to the system using one of the following methods:
  - DC power cable — Turn on the ignition (if wired to vehicle's electrical system) or turn on the power supply.
  - AC power adapter — Connect the optional AC power adapter to the rear panel DC power connector and plug the adapter into the power source (e.g., wall outlet).
  - (RX400 only) Connect a USB-C 5V, 3A (15 W) power adapter to the rear panel USB connector, and plug the adapter into the power source (e.g., electrical outlet).

The router's time to power up is < 45 seconds.

- If the LEDs begin flashing in sequence, a router update is in progress. **DO NOT REMOVE POWER.**
- As the router is turning on, the Power LED color changes from dim solid red to solid red, solid yellow, and finally solid green when powered up, and other LEDs begin to display their regular behavior. For more information on the LED patterns see [LED Behavior](#) on page 85.

---

*Note: The first time the RX400/EX400 router is powered on (i.e., a new router being used for the first time), it uses an available Internet connection to connect to ALMS, complete its registration, and apply any preconfigurations done when the router was registered with ALMS (for details, refer to [3] AirLink RX400/EX400 Quick Start Guide.*

---

2. If the router does not start automatically:
  - a. Make sure:
    - The power source (DC cable, AC adapter, or (RX400 only) USB-C power adapter) is plugged in and supplying sufficient voltage. (The RX400/EX400 router will boot in standby mode if the voltage is too low — see [Operating Voltage \(DC power supply\)](#) on page 28 for details.)
    - Ignition Sense (Pin 3) is connected to the battery or power source (see [Step 5 — Choose a Power Supply Type](#) on page 28 for details).
  - b. Press (< 5 seconds) and release the Reset button on the front panel.

---

**Important:** *If you hold Reset for > 5 seconds but do not want to reset the router configuration, continue holding Reset for > 40 seconds and then release. (The router will do a normal reboot and no configurations will change.)*

*If you release Reset after only 5–40 seconds, the router resets to a custom template or to factory defaults. (For details, see [Configuration Reset](#) on page 47.)*

---

3. Connect a test device (for example, a computer) to the LAN via:
  - Ethernet — Use any Ethernet port (Ethernet 1, (EX400 only) Ethernet 2) on the router. (All ports are factory configured for LAN access.)

or

  - USB-C (if the router is powered via the DC power connector) — The router will enumerate a virtual Ethernet port as described in [USB-C Network Connection](#) on page 82.
4. Continue to [Step 7 — Startup and Software Configuration](#) on page 43.

## Step 7 — Startup and Software Configuration

You can configure the AirLink OS software on the RX400/EX400 router in the following ways:

- [Configure locally with AirLink OS](#) (Web-based UI)
- [Configure and Monitor Remotely with AirLink Management Service](#) (cloud-based management service)

### Configure locally with AirLink OS

To access AirLink OS and configure the router locally:

1. Connect to the RX400/EX400 through a LAN connection (e.g., a configured Ethernet port, Wi-Fi connection, or USB-C connection).
2. Open a browser window and enter 192.168.1.1, and bypass any certificate notifications in your browser.

*Note: The RX400/EX400 local interface takes between 1 and 2 minutes to respond after power has been applied.*

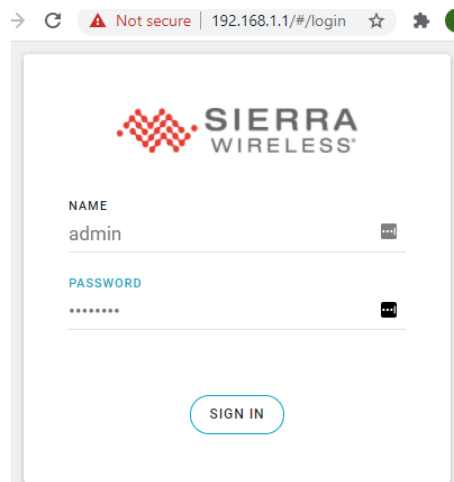


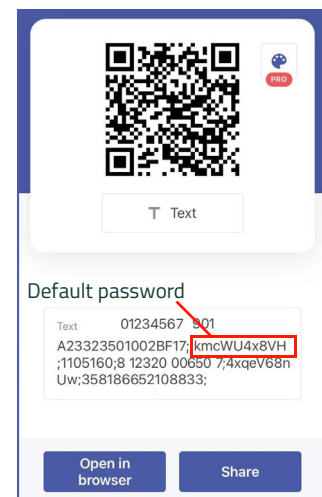
Figure 2-17: AirLink OS login window

3. Enter the default administrator NAME and PASSWORD and click SIGN IN.
  - NAME: *admin*
  - PASSWORD: *[printed on the RX400/EX400 bottom label, and encoded in QR codes on the bottom and side labels. Read with a QR code reader (as shown in this example) to avoid any confusion between similar characters such as uppercase 'I', lowercase 'l', and the number '1']*

QR code format:

```
<serial#>;<password>;<SKU>;<UPC>;<regCode>;<IMEI>;
```

*Note: For system security, ensure that you change the default password as soon as possible.*



QR code example



Figure 2-18: QR Code Locations

4. Configure the RX400/EX400 as required.  
For configuration / usage instructions, refer to [2] *AirLink OS User Guide*.

Recommendation(s):

- For vehicle installations with power supplied via the DC cable connected to the vehicle battery, make sure to set voltage levels, appropriate to your operational requirements, for entering standby mode and for resuming normal operation.

Voltage level	Standby Voltage	Resume Voltage	Notes
Default	9 V	10.5 V	
Suggested	11.5 V	12.5 V	Higher standby/resume voltage values are suggested to support engine restarting in a normal 12 V vehicle.

## Configure and Monitor Remotely with AirLink Management Service

AirLink Management Service (ALMS) allows remote management of all your AirLink routers from one user interface (a “single pane of glass”).

ALMS features include:

- Centralized, remote monitoring for all your AirLink routers
- Continuous status monitoring of important health data such as cellular signal strength
- Location monitoring, including world map views
- Individual router configuration, and template-based multiple (batch) router configuration
- Single-click over-the-air firmware updates to all your routers
- Compatibility with all carriers or mobile network operators

*Note: To create a free ALMS account, refer to [4] AirLink Complete leaflet (included in the box) for instructions on registering and preconfiguring your RX400/EX400 router.*

To configure the RX400/EX400:

1. Open a browser window and log in to ALMS (at the ALMS URL for your account), using your login credentials (email address and password) for your previously-created ALMS account. Your ALMS account Dashboard is displayed.

2. Select Monitor > Systems to display your registered routers.
3. Locate your RX400/EX400 router in the list (you can use the Filters box to narrow your search), then click the router name to display the system details.
4. Click the Configuration button to display the router configuration interface.
5. Make and save any required configuration changes. These changes will be applied to the RX400/EX400 router the next time it connects to ALMS.

For help with ALMS, view the user guide at [source.sierrawireless.com/airvantage/alms/](https://source.sierrawireless.com/airvantage/alms/).

## 3: Router Reboot / Reset

### Rebooting / Resetting the Router

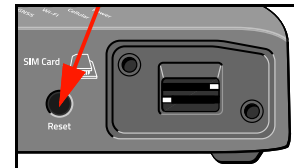
The RX400/EX400 router can be rebooted or reset using the following hardware and software methods:

- Hard reboot via the Reset button (< 5-second press and release, or > 40-second press and release) or AirLink OS. The configuration is not reset.
- Reset configuration to custom template or factory defaults via the Reset button (5 to 20-second press and release) or AirLink OS. The reset type is configured in AirLink OS.
- Reset configuration to factory defaults via the Reset button (20 to 40-second press and release) or AirLink OS.

### Hard Reboot

To reboot the RX400/EX400 without resetting the router configuration, use either of the following methods:

- Hardware — On the front of the router, press and hold the Reset button for < 5 seconds and release.



**Important:** If you hold Reset for > 5 seconds but do not want to reset the router configuration, continue holding Reset for > 40 seconds and then release. (The router will do a normal reboot and no configurations will change.)

If you release Reset after only 5–40 seconds, the router resets to a custom template or to factory defaults. (For details, see [Configuration Reset](#) on page 47.)

- AirLink OS — Go to System > Admin > Reboot and click REBOOT NOW.

As the router begins to reboot, the Power LED color changes from dim solid red to solid red, solid yellow, and finally solid green when powered up, and other LEDs begin to display their regular behavior. For more information on the LED patterns see [LED Behavior](#) on page 85.

**Table 3-1: Router Boot Timing**

Cold Boot		Time
Time until AirLink OS is available		< 45 seconds
Time until cellular traffic (WAN) is available	No carrier switch	< 120 seconds
	Carrier switch (SIM has been changed)	< 6 minutes
Time until Wi-Fi Access Point is available		< 120 seconds
Time until Wi-Fi Client is available		< 120 seconds
Time until GNSS is available	Acquisition time (cold start)	< 32 seconds
	Tracking fix (cold start from power off) <sup>a</sup>	< 147 seconds

a. Tracking fix value includes time for the cellular radio module to boot.

## Configuration Reset

The router's configuration can be reset to a custom (user-defined) template or to factory defaults. The reset functionality (type and activation method) are configured through AirLink OS.

### Set Configuration Reset Functionality

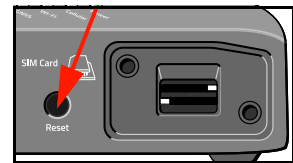
To define the Reset functionality:

1. In AirLink OS, go to System > Admin > Reset Settings.
2. Select the RESET CONFIGURATION TYPE to use when a configuration reset is performed:
  - Use Factory Defaults — The router will be reset to the standard factory configuration, and all user customizations will be lost.
  - Use Custom Template — The router will be reset to the customized configuration in the CURRENT TEMPLATE (e.g., a template containing fleet-standardized settings). To use a different template, click SET TEMPLATE and load a different file.
3. Select the reset activation method:
  - Reset allowed via AirLink OS and the RX400/EX400 router's Reset button — Select (enable) RESET BUTTON.
  - Reset allowed via AirLink OS only — Deselect (disable) RESET BUTTON.
4. Click Save.

### Reset to Factory Default or Custom Template Settings

To reset the RX400/EX400 router to the configured RESET CONFIGURATION TYPE using:

- AirLink OS:
  - a. Go to System > Admin > Reset Settings.
  - b. Select the RESET CONFIGURATION TYPE.
  - c. Click RESET SETTINGS.
  - d. Click RESET SETTINGS to confirm.
- RX400/EX400 router Reset button (if enabled)
  - Reset to template — Press the Reset button and release after 5–20 seconds.
  - Reset to factory defaults — Press the Reset button and release after 20–40 seconds.



**Important:** If Reset is pressed > 5 seconds and you do not want to reset to a template or to factory defaults, continue holding the Reset button for > 40 seconds and then release. The RX400/EX400 router will do a normal hard reboot and no configurations will change.

## 4: Specifications at a Glance

This chapter describes RX400/EX400 router specifications, RF band and Tx power specifications, Wi-Fi support, and mechanical specifications.

### Certification and Interoperability

Table 4-1 lists certifications achieved or pending for the RX400/EX400 router. For details, refer to [source.sierrawireless.com/resources/airlink/certification\\_and\\_type\\_approval/rx\\_ex\\_series\\_approvals/](http://source.sierrawireless.com/resources/airlink/certification_and_type_approval/rx_ex_series_approvals/)

Table 4-1: Certifications

Category	Certification	RX400		EX400	
		Wi-Fi	non-Wi-Fi	Wi-Fi	non-Wi-Fi
Regulatory	FCC — For specific compliance details, see <a href="#">Important Information for Users in the United States</a> on page 67.	Y		Y	
	ISED Canada (IC) — For specific compliance details, see <a href="#">Important Information for Users in Canada</a> on page 69.	Y		Y	
	CE (Including EMC Test case for vehicle installation EN 301489) — For specific compliance details, see <a href="#">Important Information for Users in the European Union and the United Kingdom</a> on page 72.	Y <sup>a</sup>		Y <sup>a</sup>	
	RCM	Y <sup>a</sup>		Y <sup>a</sup>	
Safety	EN/UL/CSA 62368-1 and CB Scheme	Y <sup>a</sup>		Y <sup>a</sup>	
	UN ECE R118 Rev 2/03	Y <sup>a</sup>		n/a	
	IECEX/ATEX — For specific compliance details, see <a href="#">IECEX Compliance (RX400 only)</a> on page 73.	Y <sup>a</sup>		n/a	
	C1D2 (Class 1, Division 2, Groups A–D, and Class I, Zone 2, Groups IIC AEx ec IIC T4 Gc)	Y <sup>a</sup>		n/a	
Industry Certification for Vehicles	E-Mark (UN ECE Regulation 10), ISO7637-2, ISO16750	Y <sup>a</sup>		n/a	
	SAEJ1113-11 Level 4 (Shock & Vibration)	Y		Y	
	MIL-STD-810H — For specific test details, see <a href="#">Environmental Testing</a> on page 49.	Y <sup>a</sup>		Y <sup>a</sup>	
Environmental Compliance	RoHS 2011/65/EU (RoHS 2)	Y		Y	
	WEEE — For specific compliance details, see <a href="#">WEEE Notice</a> on page 73.	Y		Y	
	REACH	Y		Y	
	Prop 65	Y		Y	
Mobile Network Interoperability	PTCRB	Y		Y	
	GCF	Y		Y	
Rail Usage	EN 50155 (Rolling Stock)/EN 45545-2 (Fire Protection)	Y <sup>a</sup>		n/a	

a. Pending certification

## Reliability Specifications

Table 4-2: Mean Time Between Failure (MTBF)

SKU	Model	Hours (Years)	Notes
1105302	EX400 Dual Ethernet	840216.642 hours (96 years)	<ul style="list-style-type: none"> <li>Ground Benign, 25°C</li> <li>MTBF calculations performed per Telcordia "Reliability Prediction Procedure for Electronic Equipment" document number SR-332, Method I, Issue 3</li> </ul>
1105303	EX400 Dual Ethernet, Wi-Fi	809031.5302 hours (92 years)	
1105304	RX400 Serial, Ethernet	849172.967 hours (97 years)	
1105305	RX400 Serial, Ethernet, Wi-Fi	817294.5422 hours (93 years)	

## Environmental Testing

Table 4-3: Environmental Testing Methods

Test Method	Category	Description
MIL-STD-810H, Test method 514.8 IEC 60068-2-64	Vibration	Frequency range: 5 Hz–500 Hz Spectrum level: 2.24G on all axes for 8 hours/axis Operating mode: Powered on
MIL-STD-810H, Test method 516.8-I	Functional Shock	Half-sine 40G, 15–23 ms, (+/-X, +/-Y, +/-Z directions, 6 times per axis) Operating mode: Powered on
MIL-STD-810H, Test methods 501.7, 502.7	Temperature	Rugged category: <ul style="list-style-type: none"> <li>Wi-Fi and non-Wi-Fi routers: -30°C to +65°C (-22°F to +149°F) (Note: Preliminary; additional operational tests are ongoing at -40°C (-40°F))</li> </ul> 2-hour soak each temp high/low 3 cycles ramp <= 3°C/minute (5.4°F/minute) Operating mode: Powered on
MIL-STD-810H, Test methods 501.7, 502.7	Temperature	Rugged category: -40°C to 85°C (-40°F to +185°F) 2-hour soak each temp high/low 50 cycles ramp <= 3°C/minute (5.4°F/minute) Operating mode: Unpowered
MIL-STD-810H, Test method 507.6	Humidity	13 × 24-hour cycles: <ul style="list-style-type: none"> <li>2-hour ramp to 60°C (140°F) (95% humidity), hold 6 hours</li> <li>8-hour ramp down to 30°C (86°F) (85% to 95% relative humidity), hold 8 hours</li> </ul> Operating mode: Powered on

Table 4-3: Environmental Testing Methods (Continued)

Test Method	Category	Description
<b>IEC 60529</b>	(RX400 only) Ingress Protection (IP64 testing)	Dust Resistance — Subject to circulating and suspended talcum powder in negative pressure environment for 2 hours. Water Resistance — Oscillate through an angle of almost 360°, 180° on either side of the vertical, the time for one complete oscillation (2 x 360°) being approximately 12 s, for a total of 10 minutes. Operating mode: Unpowered
	(EX400 only) Ingress Protection (IP30 testing)	Dust Resistance — Protects against solid objects larger than 2.5 mm, preventing accidental contact with internal parts. Water Resistance — Zero protection against water or moisture. Operating mode: Unpowered
<b>IEC 61000-4-2</b>		+/-8 kV (Contact), +/- 15 kV (Air) Operating mode: Powered on
<b>IEC 60068-2-32</b>	Free Fall Test	1 m drop height 6 drops onto concrete, 2 per axis: X, Y, Z Operating mode: Unpowered
<b>IEC 60068-2-70 Part 2, Test Xb</b>	Marking	The markings are rubbed with water for 10 cycles, then with lubricating oil for 10 cycles. Operating mode: Unpowered
<b>ISTA 2A 2001, test categories 1, 4, 5, &amp; 6</b>	Package	In shipping packaging. Cargo vibration and drop test.

## Mobile Network Operator Certification




*Note: Certifications listed below are achieved, in progress, or pending.*

Table 4-4: MNO Certifications

Carrier / MNO	Certification
<b>AT&amp;T</b>	Complete
<b>Anterix</b>	Complete
<b>Bell</b>	Pending
<b>FirstNet Capable</b>	Complete
<b>FirstNet Trusted with 5G Support</b>	Pending
<b>Rogers</b>	Pending
<b>Telstra</b>	Pending
<b>Telus</b>	Pending
<b>T-Mobile</b>	Pending
<b>Verizon</b>	Complete

## Host Interfaces

Table 4-5: Host Interfaces

Antennas		Antenna connectors																								
  		<table border="1"> <thead> <tr> <th>SKU</th> <th>RX400 / EX400 Variant</th> <th>Cellular</th> <th>Wi-Fi</th> <th>GNSS</th> </tr> </thead> <tbody> <tr> <td>1105302</td> <td>EX400 Dual Ethernet</td> <td rowspan="4">2 SMA</td> <td>—</td> <td rowspan="4">1 SMA</td> </tr> <tr> <td>1105303</td> <td>EX400 Dual Ethernet, Wi-Fi</td> <td>1 RP-SMA</td> </tr> <tr> <td>1105304</td> <td>RX400 Serial, Ethernet</td> <td>—</td> </tr> <tr> <td>1105305</td> <td>RX400 Serial, Ethernet, Wi-Fi</td> <td>1 RP-SMA</td> </tr> </tbody> </table>	SKU	RX400 / EX400 Variant	Cellular	Wi-Fi	GNSS	1105302	EX400 Dual Ethernet	2 SMA	—	1 SMA	1105303	EX400 Dual Ethernet, Wi-Fi	1 RP-SMA	1105304	RX400 Serial, Ethernet	—	1105305	RX400 Serial, Ethernet, Wi-Fi	1 RP-SMA					
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		<ul style="list-style-type: none"> <li>Torque specification: Finger tight is sufficient (0.7±0.1 N.m; 6.2±0.88 lbf.in; 7.15±1.0 kgf.cm). Max torque should not exceed 1.1 N.m (9.7lbf.in; 11.2 kgf.cm).</li> </ul>																								
		Antenna cabling																								
		<ul style="list-style-type: none"> <li>Avoid tight bends</li> <li>VSWR &lt; 2.5 and 50 Ω for all frequencies listed below:</li> </ul>																								
		<table border="1"> <thead> <tr> <th>Antenna Elements</th> <th>External Cable Type</th> <th>Supported Frequencies (MHz)</th> <th>Notes</th> </tr> </thead> <tbody> <tr> <td rowspan="4">4G/5G (All ports)</td> <td rowspan="4">CS32</td> <td>617–802</td> <td rowspan="4">External cable type CS32 (or equivalent) is required to meet required gains.</td> </tr> <tr> <td>824–960</td> </tr> <tr> <td>1710–2690</td> </tr> <tr> <td>3300–5925</td> </tr> <tr> <td rowspan="2">Wi-Fi (All ports)</td> <td rowspan="2">CS32</td> <td>2400–2483</td> <td rowspan="2">Not supported in Canada:           <ul style="list-style-type: none"> <li>5150–5350 MHz</li> <li>5600–5650 MHz</li> </ul> </td> </tr> <tr> <td>5150–5835</td> </tr> <tr> <td rowspan="2">GNSS</td> <td rowspan="2">CS29 FR</td> <td>1164–1189</td> <td></td> </tr> <tr> <td>1559–1610</td> <td></td> </tr> </tbody> </table>	Antenna Elements	External Cable Type	Supported Frequencies (MHz)	Notes	4G/5G (All ports)	CS32	617–802	External cable type CS32 (or equivalent) is required to meet required gains.	824–960	1710–2690	3300–5925	Wi-Fi (All ports)	CS32	2400–2483	Not supported in Canada: <ul style="list-style-type: none"> <li>5150–5350 MHz</li> <li>5600–5650 MHz</li> </ul>	5150–5835	GNSS	CS29 FR	1164–1189		1559–1610			
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		<ul style="list-style-type: none"> <li>See <a href="#">Important Information for Users in the United States</a> on page 67 and <a href="#">Important Information for Users in Canada</a> on page 69.</li> </ul>																								

**Table 4-5: Host Interfaces (Continued)**

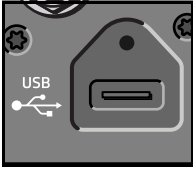

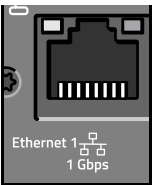
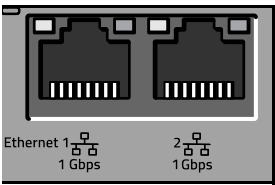
<p style="text-align: center;"><b>USB</b></p> 	<p><i>Note: Do not use the USB ports in a potentially explosive environment.</i></p> <ul style="list-style-type: none"> <li>USB 2.0 Type C (female) port, complies with USB Version 2.0 specification. A USB 2.0-compliant Type C cable must be used to ensure correct operation.</li> <li>Supported USB-C connector types: Regular; Locking (i.e., with integrated thumbscrew)</li> </ul>  <p style="text-align: center;"><i>Figure 4-1: USB Type C Connectors (Locking and Regular)</i></p> <ul style="list-style-type: none"> <li>The USB port may be used for one of the following purposes (not both simultaneously):             <ul style="list-style-type: none"> <li>(RX400 only) Connection for USB-C power supply:                 <ul style="list-style-type: none"> <li>Power supply must be USB-C 5V, 3A (15 W).</li> </ul> </li> <li>Client mode connection — USB virtual Ethernet connection (LAN only)                      The RX400/EX400 behaves as if the computer were connected to an Ethernet port, allowing access to the Internet and the RX400/EX400’s internal web server. This is the default setting. Semtech recommends connecting directly to your computer for best throughput, instead of through a USB hub.</li> <li>For information about setting the USB mode and configuring a USB connection, refer to [2] <i>AirLink OS User Guide</i>.</li> </ul> </li> <li>On Windows computers, a driver must be loaded to use the network connection — see <a href="#">Windows</a> on page 82.</li> </ul>																			
<p style="text-align: center;"><b>Ethernet</b></p>  <p style="text-align: center;"><b>RX400</b></p>  <p style="text-align: center;"><b>EX400</b></p>	<ul style="list-style-type: none"> <li>RJ45 Ethernet ports</li> </ul> <table border="1"> <thead> <tr> <th>SKU</th> <th>RX400 / EX400 Variant</th> <th>Ethernet 1</th> <th>Ethernet 2</th> </tr> </thead> <tbody> <tr> <td>1105302</td> <td>EX400 Dual Ethernet</td> <td rowspan="2" style="text-align: center;">1 Gbps<sup>a</sup> (10/ 100/ 1000 Base-T)</td> <td style="text-align: center;">1 Gbps<sup>a</sup> (10/ 100/ 1000 Base-T)</td> </tr> <tr> <td>1105303</td> <td>EX400 Dual Ethernet, Wi-Fi</td> <td></td> </tr> <tr> <td>1105304</td> <td>RX400 Serial, Ethernet</td> <td></td> <td style="text-align: center;">—</td> </tr> <tr> <td>1105305</td> <td>RX400 Serial, Ethernet, Wi-Fi</td> <td></td> <td></td> </tr> </tbody> </table> <p style="margin-left: 20px;">a. IEEE 802.3 Ethernet specification</p> <ul style="list-style-type: none"> <li>Cable requirements:             <ul style="list-style-type: none"> <li>Maximum cable length for any port and cable type: 100 m</li> <li>Ethernet cable length: &lt; 100 m (unshielded Cat 5e)</li> </ul> </li> <li>Auto-crossover support</li> <li>Configurable link speeds and duplex settings through AirLink OS.</li> <li>Auto-negotiation detects the speed of the connecting device</li> <li>Unused ports can be individually turned ON/OFF to reduce power consumption.</li> </ul>	SKU	RX400 / EX400 Variant	Ethernet 1	Ethernet 2	1105302	EX400 Dual Ethernet	1 Gbps <sup>a</sup> (10/ 100/ 1000 Base-T)	1 Gbps <sup>a</sup> (10/ 100/ 1000 Base-T)	1105303	EX400 Dual Ethernet, Wi-Fi		1105304	RX400 Serial, Ethernet		—	1105305	RX400 Serial, Ethernet, Wi-Fi		
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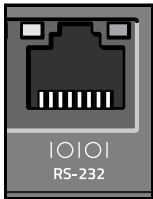
Table 4-5: Host Interfaces (Continued)

RJ45 (8-pin) connector supports 1×4-wire RS-232 serial port, or dual RS-232 serial port connections (1×4-wire + 1×2-wire)

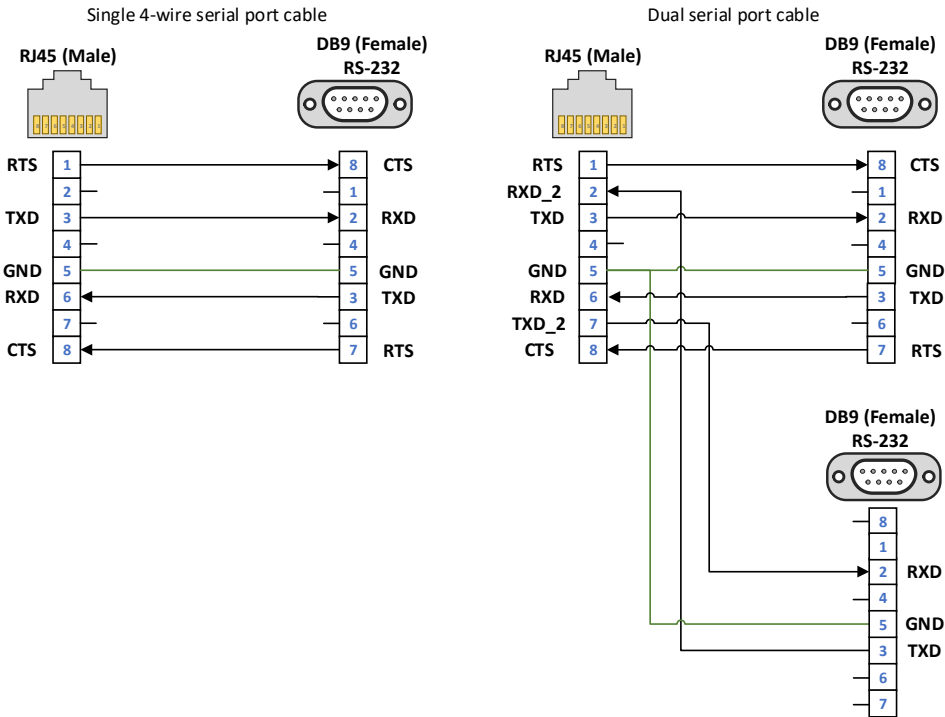
**RJ45 Connector Pinout (DTE)**

Pin	Name	Description	Type
1	RTS	Ready To Send (4-wire port)	Output
2	RXD_2	Receive Data 2 (2-wire port)	Input
3	TXD	Transmit Data (4-wire port)	Output
4	—	Reserved for future use	—
5	GND	Main GND. Connected internally to BOARD GND.	—
6	RXD	Receive Data (4-wire port)	Input
7	TXD_2	Transmit Data 2 (2-wire port)	Output
8	CTS	Clear To Send (4-wire port)	Input

(RX400 only)  
Serial Port



- 1×4-wire RS-232 serial port via RS-232 serial cable (PN 6001410, RJ45 to single DB9 female), or 1×4-wire RS-232 serial port and 1 × 2-wire serial port (RS-232) via dual serial cable (PN 6001409, RJ45 to dual DB9 female)



**Table 4-5: Host Interfaces (Continued)**

	<ul style="list-style-type: none"> <li>Complies with the EIA RS-232D specification for DCE equipment</li> <li>Communication port settings (configurable through AirLink OS):</li> </ul>																
	<table border="1"> <thead> <tr> <th>Setting</th> <th>RS-232 (4-wire / 2-wire)</th> </tr> </thead> <tbody> <tr> <td>Enable/disable support</td> <td>Always enabled</td> </tr> <tr> <td>Baud rate</td> <td>4800-230400 bps</td> </tr> <tr> <td>Parity</td> <td>None/Odd/Even</td> </tr> <tr> <td>Data bits</td> <td>7/8</td> </tr> <tr> <td>Stop bits</td> <td>1/2</td> </tr> <tr> <td>Flow control</td> <td>None/HW/SW</td> </tr> <tr> <td>Termination resistor</td> <td>—</td> </tr> </tbody> </table>	Setting	RS-232 (4-wire / 2-wire)	Enable/disable support	Always enabled	Baud rate	4800-230400 bps	Parity	None/Odd/Even	Data bits	7/8	Stop bits	1/2	Flow control	None/HW/SW	Termination resistor	—
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	Data bits	7/8															
	Stop bits	1/2															
	Flow control	None/HW/SW															
Termination resistor	—																

## SIM Card Interface

The RX400/EX400 provides a SIM card interface with the following characteristics:

- Dual SIM support (2× nano-SIM (4FF) slots)
- Supports 1.8 V and 3.3 V nano-SIMs
- Interface is compliant with the applicable 3GPP USIM standards.

## General Purpose Input / Output

The RX400/EX400 provides one configurable GPIO on the DC Power connector (Pin 4)

For details, including suggested uses, see [I/O Configuration](#) on page 36.

## LEDs

The RX400/EX400 router includes four status LEDs:

- GNSS
- Wi-Fi
- Cellular
- Power

For details, see [LEDs](#) on page 85.

## Reset

The RX400/EX400 router can be reset or rebooted via hardware (manual reset button on front panel) or software (via the AirLink OS). For details, see [Rebooting / Resetting the Router](#) on page 46.

## Power Supplies

### Power Adapter

The RX400/EX400 router uses a 4-pin power adapter connection:

- Pin 1 — Power
- Pin 2 — Ground
- Pin 3 — Configurable ignition sense
- Pin 4 — Configurable GPIO (digital I/O, analog input, current sinking), with a pull-up enable

### Power Supply Options

The RX400/EX400 router's operating voltage range is 7–36 V, and power can be supplied via the following sources:

- 4-pin power supplies:
  - DC power supply (see [DC Power Cable \(Black Connector\)](#) on page 76)
  - AC adapter (see [AC Power Adapter \(Black Connector\)](#) on page 77)
- (RX400 only) USB-C 5V, 3A (15 W) power adapter (see [USB-C Power Adapter](#) on page 80)

---

*Note: For DC or AC power supplies, make sure to use the specified parts, which meet the power requirements of the RX400/EX400—DC Power Cable (Black Connector) or AC Power Adapter (Black Connector).*

---

Note:

- The maximum ripple voltage to guarantee analog input accuracy must be 100 mVpp.
- The DC power supply can drop to 5 V during engine cranking without resetting, per SAEJ1113.
- The DC power connector on the router has reverse polarity protection for  $V_{input}$ .

### Low Voltage Standby Mode

By default, the router is factory-configured with low voltage standby mode enabled—this feature applies when the router uses a DC power supply ( $V_{input}$ ). The default standby voltage ( $V_{standby}$ ) is 9 V. Therefore, the DC power supply must provide at least  $V_{input}$  at startup (i.e., the startup voltage must be greater than the standby voltage), otherwise the router will boot and enter standby mode.

---

*Note: Low voltage standby mode does not apply when the router is powered by USB-C.*

---

To disable/enable low voltage standby mode or to operate the router at a lower voltage, change the low voltage settings in AirLink OS (System > MCU > Voltage Threshold) once the router is up and running. For more information, refer to [2] *AirLink OS User Guide*.

### Power Supply Determination at Power-on

When the router is being powered on (as shown in [Figure 4-2](#)):

- If a 4-pin DC power supply ( $V_{input}$ ) is present, the router boot behavior is:
  - If ( $V_{input} < 4\text{ V}$ ), the router will not boot with DC power.  
(RX400 only) If a USB-C adapter ( $V_{USB}$ ) is also present, the router boots with  $V_{USB}$  as the supply.
  - If ( $4\text{ V} \leq V_{input} < V_{standby}$ )—The router boots in standby mode.
  - If ( $V_{standby} \leq V_{input} < 36\text{ V}$ )—The router boots into normal operating mode.
  - If ( $V_{input} > 36\text{ V}$ )—The router turns off.
- If a 4-pin AC adapter ( $V_{input}$ ) is present, the router boots with  $V_{input}$  as the supply.
- (RX400 only) If only a USB-C adapter ( $V_{USB}$ ) is present, the router boots with  $V_{USB}$  as the supply.

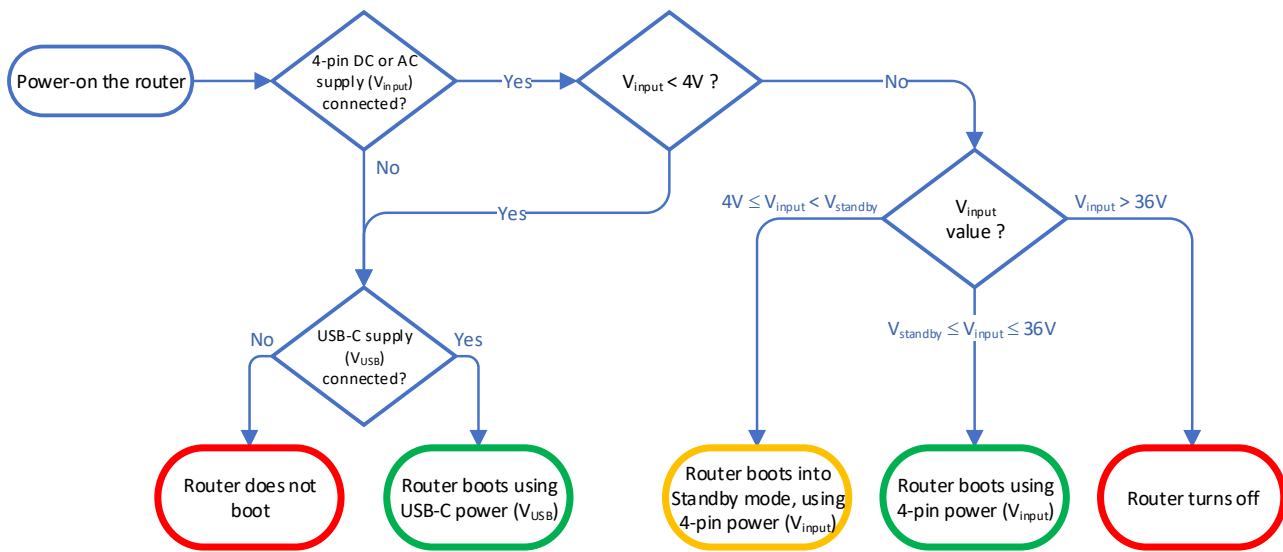


Figure 4-2: Power Source Determination and Router Behavior at Power-up

### Power Supply Determination at Supply Disconnect/Reconnect

While the router is operating with power provided by a 4-pin power supply, and a USB-C power adapter is also connected (as shown in [Figure 4-3](#) on page 57):

- If the USB-C power adapter is removed:
  - a. The router continues operating with power provided by the 4-pin power supply.
  - b. If the USB-C power adapter is plugged back in, no change occurs — power is still provided by the 4-pin power supply.
- If the 4-pin power supply is removed:
  - a. The router reboots with power supplied by the USB-C power adapter.
  - b. After the router boots, if the 4-pin power supply is plugged back in and the ignition sense pin is:
    - Low — The router enters standby mode.
    - High — The router switches to the 4-pin power supply without rebooting.

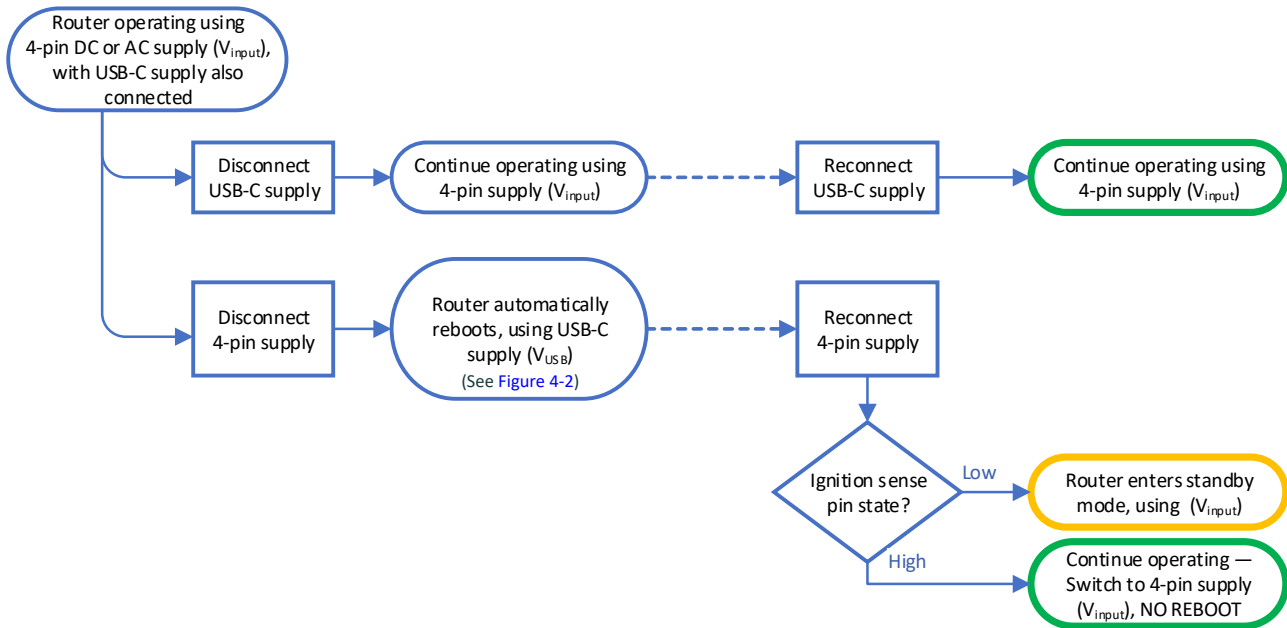


Figure 4-3: Router Behavior on Power Supply Disconnect/Reconnect

## Power Specifications

Table 4-6: Power Supply Specifications

Pin	Name	Specification	Parameter	Minimum	Maximum
1	Power	Voltage range	VCC	7 V	36 V

Table 4-7: Ignition Sense Specifications

Pin	Name	Input Impedance (Typ)	Specification	Parameter	Minimum	Maximum
3	Ignition Sense (Input only)	125 kΩ (minimum)	Input low state voltage (maximum)	$V_{IL}$	—	1.0 V
			Input high state voltage (minimum guaranteed)	$V_{IH}$	2.5 V	—

Note: If you do not connect this pin to the ignition, you **MUST** connect it to the positive terminal of your power supply or battery. The router looks for a qualified (i.e., stable) voltage on this pin as part of the power up sequence. If the router does not see the voltage, the router remains in standby or will not turn on. If you are using a Semtech AC power adapter, the cable internally connects Pin 1 (Power) to Pin 3 (Ignition Sense).

## Conducted Electrical Transients

- Compliant to ISO 7637-2:
  - Inductive load transient specifications:
    - Test Pulse 1 (12V/24V systems): Class C
  - Harness transient specifications:
    - Test Pulse 2a (12V/24V systems): Class A
    - Test Pulse 2b (12V/24V systems): Class C
    - Test Pulse 3a+b (12V/24V systems): Class A
    - Test Pulse 4 (12V/24V systems)
- Compliant to ISO 16750-2:
  - Cranking specification — Paragraph 4.6.3 (formerly Test Pulse 4): Class A, Level 2
  - Load dump specifications — Paragraph 4.6.4 (formerly Test Pulse 5b): Class A:
    - (RX400 only) 24 V suppressed load dump of 65 V
    - (EX400 only) 12 V suppressed load dump
  - Reverse voltage — Paragraph 4.7: Class C
- Tolerates +200 V/-600 V spikes
- Uninterrupted operation during brownouts down to 4.5 V

## GNSS Specifications

GNSS is disabled by default. It can be enabled/disabled and configured in AirLink OS (Services > Location).

**Table 4-8: GNSS Specifications**

Parameter/feature	Description
Satellite channels	Dual-band (L1, L5) 56 channel GNSS Active antenna support
Constellations	GNSS constellations: <ul style="list-style-type: none"> <li>▪ GPS (L1C/A &amp; L5C)</li> <li>▪ GLONASS (L1OF)</li> <li>▪ BeiDou (B1I &amp; B2a)</li> <li>▪ Galileo (E1 &amp; E5a)</li> </ul>
Protocols	Streamable NMEA 0183 V4.11 and TAIP output
Acquisition time <sup>a</sup> (Time to first fix)	Hot start: 1 second Warm start: 29 seconds Cold start: 32 seconds
Sensitivity	Tracking <sup>b</sup> : <ul style="list-style-type: none"> <li>• GNSS: -160 dBm</li> </ul> Acquisition <sup>c</sup> (cold start): <ul style="list-style-type: none"> <li>• GNSS: -154 dBm</li> </ul>
Accuracy	Horizontal: < 2 m (50%); < 2.8 m (90%) Altitude: < 3 m (50%); < 6 m (90%) Velocity: < 0.2 m/s

**Table 4-8: GNSS Specifications (Continued)**

Parameter/feature	Description
Operational ITAR limits	Altitude <6000 m (19,685 ft), or Velocity <100 m/s (194 knots) (Either limit may be exceeded, but not both.)
Forwarding	Local and remote forwarding via TCP or UDP

- a. Acquisition times are approximate, and measured with signal strength = -135 dBm
- b. Tracking sensitivity is the lowest GNSS signal level for which the router can still detect an in-view satellite 50% of the time when in sequential tracking mode.
- c. Acquisition sensitivity is the lowest GNSS signal level for which the router can still detect an in-view satellite 50% of the time.

**Table 4-9: GNSS DC Bias Voltage**

Signal	Description	Open Circuit	Valid Range	Short Circuit
GNSS	Active bias on GNSS port	<5 mA	5 mA < Bias < 50 mA	>50 mA
	<i>Note: Bias voltage on the GNSS port is nominally 3.15 V and current is limited to 300 mA.</i>			

## Protocols

For supported software protocols (network, routing, etc.), refer to [2] *AirLink OS User Guide*.

## Vehicle Area Networking (LAN)

- Support for all on-board devices (wired and wireless)
  - Wi-Fi
  - 1 Gbps Ethernet on RJ45 (Ethernet 1 port)
  - (EX400 only) 1 Gbps Ethernet on RJ45 (Ethernet 2 port)
  - (RX400 only) Serial RS-232 on RJ45 (1 port)
  - USB 2.0 on USB-C port (female)
- Compatibility
  - Supports Wi-Fi certified devices
  - Supports major operating systems

## Security

The RX400/EX400 can secure all data transmitted to and from the local environment without the need for VPN client software on connected devices.

- Wi-Fi Security and Authentication — See [Wi-Fi](#), below.
- Firewall and DMZ
- Encryption and VPN
  - IPSec including LAN to LAN, Host to LAN, IKEV2, MOBIKE
  - FIPS-140-2 option
- Authentication and Accounting
  - RADIUS/TACACS+/LDAP integration

## Wi-Fi

(Wi-Fi routers only)

Wi-Fi is off by default. Enable/disable and configure the RX400/EX400 Wi-Fi interfaces in AirLink OS (Hardware Interfaces > Wi-Fi Interfaces > Configuration).

*Note: If the router will operate in client mode (i.e., will be used to connect to an access point), ensure that any SSIDs (Wi-Fi networks) that you want the router to connect to are visible to the router.*

- Security and authentication support:

Protocol	Access Point	Client
Open	Y	Y
<i>Note: This protocol is <b>not</b> recommended.</i>		
WPA2 Personal	Y	Y
WPA2/3 Transitional	Y	Y
WPA3 Personal	Y	Y
WPA2-Enterprise	N	Y
WPA3-Enterprise	N	Y

- Wi-Fi 6 configurations:
  - Configurable as Access Point (AP) only or client only.

*Note: Concurrent AP and Client mode is not supported.*

- Dual-band (2.4 GHz + 5 GHz), non-concurrent SISO operation
- Access points:
  - 2 available SSIDs (non-simultaneous) with separately configurable security, bandwidth, and QOS. Band support (2.4 GHz, 5 GHz) is SSID-dependent:

SSID	2.4 GHz support	5 GHz support
Wi-Fi AP 2.4GHz	Y	—
Wi-Fi AP 5GHz	—	Y

*Note: Only one SSID is broadcast; simultaneous AP 2.4 GHz and AP 5 GHz is not supported.*

- Simultaneous client connections — 16 (maximum)

- Wi-Fi channel support:
  - Supported bands: 2.4 GHz, 5 GHz
  - The RX400/EX400 supports the 2.4 GHz/5 GHz Wi-Fi channels listed in [Table 4-10](#).

**Important:** *AirLink OS enables increased Wi-Fi channel support via router geolocation, which identifies the country in which the router is currently located. Geolocation fixes are obtained via a cellular network connection or a GNSS position fix.*

*If a geolocation fix indicates the RX400/EX400 is operating in a supported country ([Table 4-10](#)), the 5 GHz channels for that country can be used by the router. (5 GHz Wi-Fi is only supported when the router is geolocated.)*

*If a geolocation fix is not obtained (i.e., a fix cannot be obtained from either a cellular connection or a GNSS position fix), Wi-Fi channel support is limited to the most restrictive region (USA—FCC 2.4 GHz channels).*

- Auto Channel Selection— The best Wi-Fi channel is chosen from the set of available channels.
- Dynamic Frequency Selection (DFS) Support:
  - Client mode only enabled— Supported (Default: DFS On)
  - AP mode only enabled— Supported (Default: DFS Off)

**Table 4-10: 2.4 / 5 GHz Wi-Fi Channel Support<sup>a</sup> — Non-Geolocated / Geolocated<sup>b</sup> Routers**

	Wi-Fi Channel	US	Canada / Mexico	Australia / Europe	Rest of World	Channel Width			Notes
						20 MHz	40 MHz	80 MHz	
2.4 GHz	1	S	S	S	S	Y	–	n/a	
	2	S	S	S	S	Y	–		
	3	S	S	S	S	Y	Y		
	4	S	S	S	S	Y	Y		
	5	S	S	S	S	Y	Y		
	6	S	S	S	S	Y	Y		
	7	S	S	S	S	Y	Y		
	8	S	S	S	S	Y	Y		
	9	S	S	S	S	Y	Y		
	10	S	S	S	S	Y	Y <sup>c</sup>		
	11	S	S	S	S	Y	Y <sup>c</sup>		
	12	–	–	S	S	Y	–		
	13	–	–	S	S	Y	–		

**Table 4-10: 2.4 / 5 GHz Wi-Fi Channel Support<sup>a</sup> — Non-Geolocated / Geolocated<sup>b</sup> Routers (Continued)**

	Wi-Fi Channel	US	Canada / Mexico	Australia / Europe	Rest of World	Channel Width			Notes
						20 MHz	40 MHz	80 MHz	
5 GHz <sup>d</sup>	36	G	–	G	–	Y	γ <sup>e</sup>	γ <sup>e</sup>	Channels 52–144 are available only if DFS (Dynamic Frequency Selection) is enabled <sup>f</sup>
	40	G	–	G	–	Y			
	44	G	–	G	–	Y			
	48	G	–	G	–	Y			
	52	G	–	G	–	Y	γ <sup>e</sup>		
	56	G	–	G	–	Y			
	60	G	–	G	–	Y			
	64	G	–	G	–	Y	γ <sup>e</sup>		
	100	G	G	G	–	Y			
	104	G	G	G	–	Y	γ <sup>e</sup>		
	108	G	G	G	–	Y			
	112	G	G	G	–	Y			
	116	G	G	G	–	Y <sup>g</sup>	γ <sup>eg</sup>		
	120	G	–	G (Europe only)	–	Y			
	124	G	–	G (Europe only)	–	Y	γ <sup>e</sup>		
	128	G	–	G (Europe only)	–	Y			
	132	G	G	G	–	Y	γ <sup>e</sup>		
	136	G	G	G	–	Y			
	140	G	G	G	–	Y			
	144	G	G	–	–	Y	γ <sup>e</sup>		
149	G	G	–	–	Y				
153	G	G	–	–	Y	γ <sup>e</sup>			
157	G	G	–	–	Y				
161	G	G	–	–	Y				
165	G	G	–	–	Y	–	–		

- a. Wi-Fi channels available for use in AirLink OS 6.0.
- b. Geolocation is supported for specific countries. See [Table 4-11](#).  
S— Supported for non-geolocated and geolocated routers; G— Supported only when router is successfully geolocated to a country in [Table 4-11](#).
- c. 40 MHz channel width is supported on Channels 10 and 11, in Australia/Europe, UK, and Japan.
- d. 5 GHz Wi-Fi is supported only when geolocated.
- e. 40 MHz is available if both 20 MHz channels are available; 80 MHz is available if both 40 MHz channels are available.
- f. When DFS is enabled, the Channel Availability Check (CAC) process requires 1–10 minutes (region-dependent) to make sure the channel is clear (no radar or other traffic) before broadcasting is enabled on the channel.
- g. Wi-Fi channel 116 width is limited to 20MHz in Australia.
- h. When DFS is enabled, the Channel Availability Check (CAC) process requires 1–10 minutes (region-dependent) to make sure the channel is clear (no radar or other traffic) before broadcasting is enabled on the channel.

**Table 4-11: Geolocation Support<sup>a</sup>**

Albania [AL] <sup>b</sup>	Bulgaria [BG]	Finland [FI]	Italy [IT]	Monaco [MC] <sup>b</sup>	Portugal [PT]	Switzerland [CH] <sup>b</sup>
Andorra [AD] <sup>b</sup>	Canada [CA] <sup>c</sup>	France [FR]	Latvia [LV]	Montenegro [ME] <sup>b</sup>	Romania [RO]	United Kingdom [GB]
Australia [AU] <sup>c</sup>	Cyprus [CY]	Germany [DE]	Liechtenstein [LI] <sup>b</sup>	Netherlands [NL]	Slovakia [SK]	United States of America [US]
Austria [AT]	Czech Republic [CZ]	Greece [GR]	Lithuania [LT]	North Macedonia [MK] <sup>b</sup>	Slovenia [SI]	
Belgium [BE]	Denmark [DK]	Iceland [IS] <sup>b</sup>	Luxembourg [LU]	Norway [NO]	Spain [ES]	
Bosnia and Herzegovina [BA] <sup>b</sup>	Estonia [EE]	Ireland [IE]	Malta [MT]	Poland [PL]	Sweden [SE]	

- a. Geolocation is supported only for the listed countries. Countries are listed by name (e.g., United States) and ISO country code (e.g., US).
- b. Geolocation support pending: AL, AD, BA, IS, LI, MC, ME, MK, NO, CH.
- c. No additional Wi-Fi channels are used on routers that are geolocated to Australia or Canada.

- Performance specifications:

**Table 4-12: Wi-Fi Link Speed<sup>a</sup>**

Technology	Band	MIMO	Channel Width		
			20 MHz	40 MHz	80 MHz
Wi-Fi 6	2.4GHz	1 × 1	150 Mbps	300 Mbps	—
	5 GHz	1 × 1	150 Mbps	300 Mbps	600 Mbps

a. Actual data throughput may vary.

**Table 4-13: Wi-Fi Total Radiated Power (TRP) and Total Isotropic Sensitivity (TIS)**

Transmitter				
Band	Technology	Bandwidth	Modulation	TRP (dBm) 1Tx (1x1)
2.4 GHz	802.11ax	20 MHz	MCS0	16.5
5 GHz	802.11ax	20 MHz	MCS0	18
Receiver				
Band	Technology	Bandwidth	Modulation	TIS (dBm / chain) Typical
2.4 GHz	802.11ax	20 MHz	MCS0	-90
5 GHz	802.11ax	20 MHz	MCS0	-89

## Cellular

### Network Technology / Radio Frequency Bands

The RX400/EX400 supports 5G Sub-6G RedCap SA and 4G LTE.

Use the following tables as a guide to the radio frequencies and transmit power supported by the RX400/EX400 radio module.

**Table 4-14: EM8695 RF Bands Supported by RX400 / EX400<sup>a,b</sup>**

RAT	Bands																																
	1	2	3	4	5	7	8	12	13	14	17	18	19	20	25	26	28	30	34	38	39	40	41	42	43	48	66	70	71	77	78	79	106
5G	Y	Y	Y	—	Y	Y	Y	Y	Y	Y	—	Y	—	Y	Y	Y	Y	N	—	Y	—	Y	Y	—	—	Y	Y	Y	Y	Y	Y	Y	—
4G LTE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	—	—	—	Y

a. Source: [1] EM8695 Product Technical Specification (rev 6), Table 1-1.

b. EM8695 RF Bands that are not supported by RX400/EX400 are marked as 'N' in this table.

**Table 4-15: EM8695 Conducted Maximum Tx Power Tolerances for RF Bands supported by RX400 / EX400<sup>a,b</sup>**

Bands	Conducted Tx Power <sup>c</sup>	Notes
<b>5G</b>		
n1, n2, n3, n8, n18, n20, n25, n38, n40, n41	+24 dBm $\pm$ 1.0 dB	Power Class 3
n5, n12, n13, n14, n26, n28, n66, n70, n71, n77, n78, n79	+23.5 dBm $\pm$ 1.0 dB	
n7	+23 dBm $\pm$ 1.0 dB	
n48	+22 dBm $\pm$ 1.0 dB	
<b>LTE</b>		
B41 HPUE	+26 dBm $\pm$ 1.0 dB	Power Class 2 (HPUE)
B42 <sup>d</sup> HPUE	+25.5 dBm $\pm$ 1.0 dB	
B1, B3, B8, B18, B19, B20, B39, B40, B41, B106	+24 dBm $\pm$ 1.0 dB	Power Class 3
B2, B4, B5, B12, B13, B14, B17, B25, B26, B28, B34, B38, B42, B43, B66, B70, B71	+23.5 dBm $\pm$ 1.0 dB	
B7	+23 dBm $\pm$ 1.0 dB	
B48	+21.5 dBm $\pm$ 1.0 dB	

a. Source: [1] EM8695 Product Technical Specification (rev 6), Table 3-6

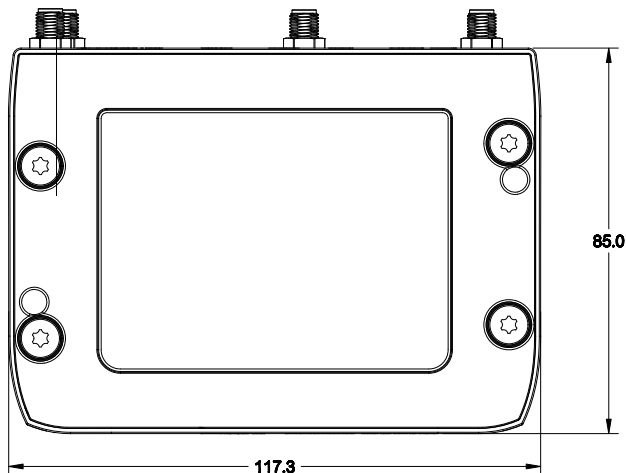
b. EM8695 RF Bands that are not supported by RX400/EX400 are not shown in this table.

c. Tx Power is based on no maximum power reduction (MPR) configuration as 3GPP defined. For configurations that require MPR or additional MPR, refer to 3GPP for the power reduction.

d. B42 HPUE is supported only during standalone operation. During non-standalone operation, PC3 is supported. ULCA is not supported.

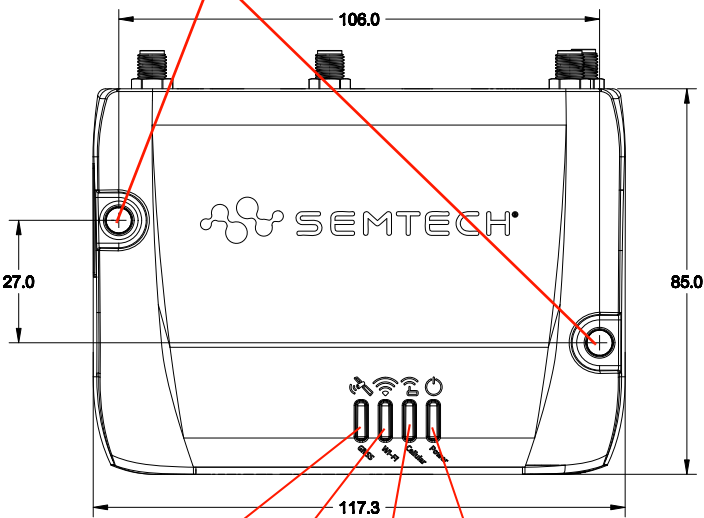
## Mechanical Specifications

- **Housing** — RX400 and EX400 router housings have a top enclosure made of ruggedized powder-coated aluminum. The RX400 bottom enclosure is also made of ruggedized powder-coated aluminum, and the EX400 bottom enclosure is made of stamped, anodized aluminum. These routers are recyclable where facilities exist.
- **RoHS** — The RX400/EX400 router complies with the Restriction of Hazardous Substances Directive (RoHS). This directive restricts the use of six hazardous materials in the manufacture of various types of electronic and electrical equipment.



Bottom view

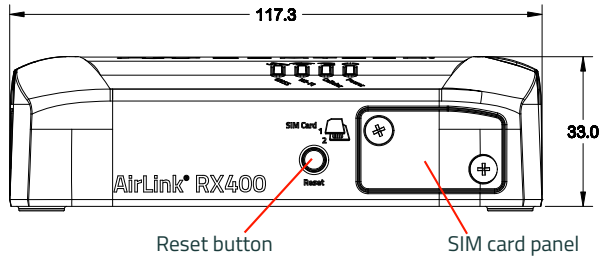
Mounting holes (Ø 5.5 mm; M5 screws recommended) are deep. Screw length (Min: 35 mm; Typ: 40 mm) depends on the mounting surface material. See [Screw Specifications](#) for details.



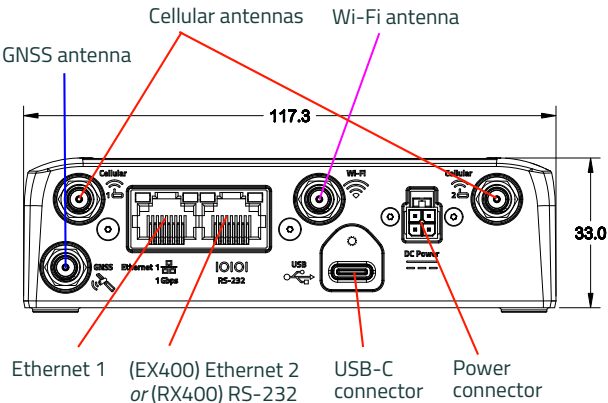
Top view



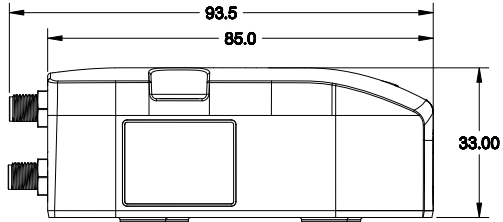
\* RX400 Wi-Fi model shown



Front view



Back view



Side view

Figure 4-4: RX400/EX400 Router Mechanical Specifications

## Temperature Specifications

**Table 4-16: Ambient Operating Temperature<sup>a</sup>**

Router variant	EX400 / RX400
Wi-Fi and Non-Wi-Fi routers	-30°C to +70°C (-22°F to 158°F)

a. Note: Preliminary; additional operational tests are ongoing at -40°C (-40°F)

## Screw Specifications

- SIM cover captive screws (M3X7; Phillips head  $\oplus$ )—0.34±0.04 N.m (3.04±0.35 lbf.in; 3.5±0.4 kgf.cm)
- DIN rail mount screws: 1.1 N.m (9.74 lbf.in; 11.2 kgf.cm)
- Router mounting screws, customer-supplied. Recommendation: M5, pan head, used with split washers (e.g., Bossard BN 762)
  - Screw length depends on mounting surface material (substrate):
    - Minimum: 35 mm; Typical: 40 mm
    - Example: For direct mounting against a wood surface, use an M5 pan head wood screw with sufficient length to penetrate the wood substrate (e.g., minimum 40 mm, but longer if necessary).
  - Torque specification will vary by screw head/plating/class. For a pan head, Phillips/Torx, Zn plated, class 4.5 screw, torque to ~20 kgf.cm (17.36 lbf.in; 1.96 N.m)

## 5: Regulatory Information

This chapter describes required details for specific certifications. For a general list of certifications, see [Table 4-1](#) on page 48.

### Important Information for Users in the United States

**Important:** *Compliance certification of radio equipment type RX400/EX400 with respect to part 15 of the FCC Rules is currently in progress. When complete, the following section will apply:*

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Antennas listed at [www.sierrawireless.com/router-solutions/antennas/](http://www.sierrawireless.com/router-solutions/antennas/) have been designed for use with the RX400/EX400 platform. Antennas of the same types within the defined gain limits may be used with the RX400/EX400.

Antennas must be installed such that the following separation distances are maintained:

- Minimum 20 cm between the antennas and the user

**Warning:** *This product is only to be installed by qualified personnel.*

**Warning:** *Changes or modifications to this device not expressly approved by Semtech could void the user's authority to operate the device.*

This device can operate in collocation with cellular radios not exceeding the specifications in the following table.

**Table 5-1: FCC Antenna Gain and Collocated Radio Transmitter Specifications**

Band	Tx Freq Range (MHz)	Max Time-Avg Cond Power (dBm)	Antenna Gain Limit (dBi)	Source-based Time-Avg Max EIRP (dBm)
LTE B2	1850–1910	24.5	6.0	30.5
LTE B4	1710–1755	24.5	5.0	29.5
LTE B5	824–849	24.5	4.0	28.5
LTE B7	2500–2570	24.0	6.9	30.9

**Table 5-1: FCC Antenna Gain and Collocated Radio Transmitter Specifications (Continued)**

Band	Tx Freq Range (MHz)	Max Time-Avg Cond Power (dBm)	Antenna Gain Limit (dBi)	Source-based Time-Avg Max EIRP (dBm)
LTE B12	699–716	24.5	3.5	28.0
LTE B13	777–787	24.5	4.0	28.5
LTE B14	788–798	24.5	4.0	28.5
LTE B25	1850–1915	24.5	6.0	30.5
LTE B26	814–849	24.5	4.0	28.5
LTE B41_PC3	2496–2690	25.0	6.9	31.9
LTE B41_PC2	2496–2690	27.0	4.9	31.9
LTE B42_PC3	3450–3550	24.5	5.5	30.0
LTE B42_PC2	3450–3550	26.5	3.5	30.0
LTE B48*	3550–3700	22.5	0.0	22.5
LTE B66	1710–1780	24.5	5.0	29.5
LTE B71	663–698	24.5	3.5	28.0
LTE B106	897.5–900.5	25.0	3.0	28.0
5G NR n2	1850–1910	25.0	6.0	31.0
5G NR n5	824–849	24.5	4.0	28.5
5G NR n7	2500–2570	24.0	6.9	30.9
5G NR n12	699–716	24.5	3.5	28.0
5G NR n13	777–787	24.5	4.0	28.5
5G NR n14	788–798	24.5	4.0	28.5
5G NR n25	1850–1915	25.0	6.0	31.0
5G NR n26	814–849	24.5	4.0	28.5
5G NR n41	2496–2690	25.0	6.9	31.9
5G NR n48*	3550–3700	23.0	0.0	23.0
5G NR n66	1710–1780	24.5	5.0	29.5
5G NR n70	1695–1710	24.5	5.2	29.7
5G NR n71	663–698	24.5	3.5	28.0
5G NR n77_PC3_270	3700–3980	24.5	5.5	30.0
5G NR n77_PC3_27Q	3450–3550	24.5	4.5	29.0
5G NR n78_PC3_270	3700–3800	24.5	5.5	30.0
5G NR n78_PC3_27Q	3450–3550	24.5	4.5	29.0

**Table 5-1: FCC Antenna Gain and Collocated Radio Transmitter Specifications (Continued)**

Band	Tx Freq Range (MHz)	Max Time-Avg Cond Power (dBm)	Antenna Gain Limit (dBi)	Source-based Time-Avg Max EIRP (dBm)
WLAN 2.4 GHz	2400–2500	20.0	3.2	23.2
WLAN 5 GHz	5150–5850	23.0	4.3	27.3

**\* Important:** Airborne operations in LTE Band 48/5G NR n48 are prohibited.

## Important Information for Users in Canada

**Important:** Compliance certification of radio equipment type RX400/EX400 with respect to Innovation, Science and Economic Development Canada's licence-exempt RSS(s) is currently in progress. When complete, the following section will apply:

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage ;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Antennas listed at [www.sierrawireless.com/router-solutions/antennas/](http://www.sierrawireless.com/router-solutions/antennas/) have been designed for use with the RX400/EX400 platform. Antennas of the same types within the defined gain limits may be used with the RX400/EX400.

To ensure that the RX400/EX400 meets Health Canada's Safety Code 6 requirements, a separation distance of at least 20 cm (8 inches) must be maintained between the router's antenna and the body of the user and any nearby persons at all times and in all applications and uses.

Antennas used must not exceed the maximum allowable gain specified in this hardware user guide.

**Warning:** This product is only to be installed by qualified personnel.

**Warning:** Changes or modifications to this device not expressly approved by Semtech could void the user's authority to operate the device.

This device can operate in collocation with cellular radios not exceeding the specifications in the following table.

**Table 5-2: ISED Antenna Gain and Collocated Radio Transmitter Specifications**

Band	Tx Freq Range (MHz)	Max Time-Avg Cond Power (dBm)	Antenna Gain Limit (dBi)	Source-based Time-Avg Max EIRP (dBm)
LTE B2	1850–1910	24.5	6.0	30.5
LTE B4	1710–1755	24.5	5.0	29.5
LTE B5	824–849	24.5	4.0	28.5
LTE B7	2500–2570	24.0	6.9	30.9
LTE B12	699–716	24.5	3.5	28.0
LTE B13	777–787	24.5	4.0	28.5
LTE B14	788–798	24.5	4.0	28.5
LTE B25	1850–1915	24.5	6.0	30.5
LTE B26	814–849	24.5	4.0	28.5
LTE B41_PC3	2500–2690	25.0	6.9	31.9
LTE B41_PC2	2500–2690	27.0	4.9	31.9
LTE B42_PC3	3450–3600	24.5	5.5	30.0
LTE B42_PC2	3450–3600	26.5	3.5	30.0
LTE B43	3600–3800	24.5	5.5	30.0
LTE B48	3550–3700	22.5	7.0	29.5
LTE B66	1710–1780	24.5	5.0	29.5
LTE B71	663–698	24.5	3.5	28.0
5G NR n2	1850–1910	25.0	6.0	31.0
5G NR n5	824–849	24.5	4.0	28.5
5G NR n7	2500–2570	24.0	6.9	30.9
5G NR n12	699–716	24.5	3.5	28.0
5G NR n13	777–787	24.5	4.0	28.5
5G NR n14	788–798	24.5	4.0	28.5
5G NR n25	1850–1915	25.0	6.0	31.0
5G NR n26	814–849	24.5	4.0	28.5
5G NR n41	2500–2690	25.0	6.9	31.9
5G NR n48	3550–3700	23.0	7.0	30.0
5G NR n66	1710–1780	24.5	5.0	29.5
5G NR n70	1695–1710	24.5	5.2	29.7

**Table 5-2: ISED Antenna Gain and Collocated Radio Transmitter Specifications (Continued)**

Band	Tx Freq Range (MHz)	Max Time-Avg Cond Power (dBm)	Antenna Gain Limit (dBi)	Source-based Time-Avg Max EIRP (dBm)
5G NR n71	663–698	24.5	3.5	28.0
5G NR n77_PC3_270	3450–3980	24.5	5.5	30.0
5G NR n77_PC3_27Q	3450–3980	24.5	4.5	29.0
5G NR n78_PC3_270	3450–3800	24.5	5.5	30.0
5G NR n78_PC3_27Q	3450–3800	24.5	4.5	29.0
RedCap NR n2	1850–1910	25.0	6.0	31.0
RedCap NR n5	824–849	24.5	4.0	28.5
RedCap NR n7	2500–2570	24.0	6.9	30.9
RedCap NR n12	699–716	24.5	3.5	28.0
RedCap NR n25	1850–1915	25.0	6.0	31.0
RedCap NR n41	2500–2690	25.0	6.9	31.9
RedCap NR n66	1710–1780	24.5	5.0	29.5
RedCap NR n71	663–698	24.5	3.5	28.0
RedCap NR n78_PC3_270	3450–3800	24.5	5.5	30.0
RedCap NR n78_PC3_27Q	3450–3800	24.5	4.5	29.0
WLAN 2.4 GHz	2400–2500	20.0	3.2	23.2
WLAN 5 GHz	5150–5850	23.0	4.3	27.3

## Wi-Fi Antenna Gain

**Important:** Compliance certification of radio equipment type RX400/EX400 with respect to EN IEC 62311:2020 and 1999/519/EC for mobile exposure conditions is currently in progress. When complete, the following declaration will apply:

The AirLink RX400/EX400 is compliant with the radio frequency (RF) exposure requirements at 20 cm separation distance specified in EN IEC 62311:2020 and 1999/519/EC for mobile exposure conditions, provided the maximum antenna gain does not exceed the limits given in the table below.

**Table 5-3: Maximum Wi-Fi Antenna Gain**

Band	Antenna Gain		Antenna Type <sup>a</sup>
	Min	Max	
2.4 GHz	0 dBi	3.2 dBi	PIFA
5 GHz	-2.0 dBi	4.3 dBi	

a. Semtech antennas have been tested to meet all requirements. Third-party antennas must meet the above specifications, or be tested to meet applicable regulatory compliance specifications.

## Important Information for Users in the European Union and the United Kingdom

Compliance certification of radio equipment type RX400/EX400 with respect to Directive 2014/53/EU and Directive 2011/65/EU is currently in progress. When complete, the following declaration will apply:

Hereby, Semtech Corporation declares that the radio equipment type RX400/EX400 is in compliance with Directive 2014/53/EU and Directive 2011/65/EU.

The full text of the EU declaration of conformity is available at the following internet address: [https://source.sierrawireless.com/resources/airlink/certification\\_and\\_type\\_approval/rx\\_ex\\_400\\_series\\_ce\\_declaration\\_of\\_conformity/](https://source.sierrawireless.com/resources/airlink/certification_and_type_approval/rx_ex_400_series_ce_declaration_of_conformity/)

The router displays the CE mark.



### Indoor Use Restrictions

	Countries with indoor-use restrictions on operation in 5150 to 5350 MHz:						
	AT	BE	BG	HR	CY	CZ	DK
	EE	FI	FR	DE	EL	HU	IE
	IT	LV	LT	LU	MT	NL	PL
	PT	RO	SK	SI	ES	SE	UK(NI)
IS	LI	NO	CH	TR			

	UK
--	----

Pursuant to Article 10(10) of Directive 2014/53/EU, the pictograms displayed above will be displayed on the packaging of Semtech RX400/EX400 products that are restricted (in the countries identified) to indoor use only when operating in the 5150–5350 MHz frequency range.

**Caution:** *To comply with EU regulations limiting human exposure to electromagnetic fields, a minimum separation distance of 20 cm between the antenna and the user's body must be maintained at all times.*

## IECEX Compliance (RX400 only)

Special condition of safe use:

- Equipment shall be installed in an Ex certified tool secured enclosure which provides a minimum ingress protection of IP54. It must be mounted with mounting screws on a flat surface, or optional DIN rail mounting bracket with the DIN rail clip to a horizontal DIN rail and the spring clip at the bottom.
- Equipment references the enclosure ground. The end user shall ensure that the installation adequately mitigates the risks of circulating earth currents and floating voltages.

---

**Important:** *IECEX Compliance certification of radio equipment type RX400/EX400 is currently in progress. When complete, the following section will apply:*

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This certification applies to the following Product SKUs:

- 1105304 RX400 Serial, Ethernet
- 1105305 RX400 Serial, Ethernet, Wi-Fi

RX400 SKUs contain FCC ID: N7NEM86T / ISED ID: 2417C-EM86T

RX400 SKUs with Wi-Fi also contain FCC ID: N6C-SDMAX / ISED ID: 4908A-SDMAX

## Applicable standards

- EN IEC 60079-0:2017, Edition 7.0 (Preliminary, subject to change)
- IEC 60079-7:2017, Edition 5.1 (Preliminary, subject to change)
- EN 60079-0:2018 (Preliminary, subject to change)
- EN 60079-7:2015 +A1:2018 (Preliminary, subject to change)
- Class 1 Zone 2: CSA E60079-15 (CAN) (Preliminary, subject to change)
- Ex ec IIC T4 Gc



II 3 G Ex ec IIC T4 Gc  
-30°C ≤ Tamb ≤ +60°C

---

**Warning:** *Do not separate when energized.*

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## WEEE Notice



If you purchased your AirLink RX400/EX400 device in Europe, please return it to your dealer or supplier at the end of its life. WEEE products may be recognized by their wheeled bin label on the product label.

# A: Antennas

## Antenna Separation

When installing single-element antenna units, refer to [Table A-1](#) for recommended antenna separation distances.

The recommended antenna separation is related to the band frequency/wavelength. To accommodate the lowest frequency/longest wavelength band supported by the RX400/EX400, Semtech recommends a minimum antenna separation of 250 mm for best results, and if necessary, a separation of 125 mm for acceptable results.

Recommended antenna separations are related to band frequency/wavelength.

**Table A-1: Recommended Antenna Separation**

Service	Frequency (MHz)	Wavelength ( $\lambda$ ) (mm)	Antenna Separation	
			Best (= $1/2 \lambda$ ) (mm)	Good (= $1/4 \lambda$ ) (mm)
5G Sub-6G	600	500	250	125
	650	462	231	115
	700	429	214	107
	750	400	200	100
	800	375	188	94
	850	353	176	88
	900	333	167	83
	950	316	158	79
	1500	200	100	50
	1700	176	88	44
	1800	167	83	42
	1900	158	79	39
	2000	150	75	38
	2100	143	71	36
	2200	136	68	34
	2300	130	65	33
2400	125	63	31	
2500	120	60	30	
5G Sub-6G	2600	115	58	29
	2700	111	56	28
	3300	91	45	23
	3400	88	44	22
	3500	86	43	21
	3600	83	42	21
	3700	81	41	20
	3800	79	39	20
	3900	77	38	19
	4000	75	38	19
	4100	73	37	18
	4200	71	36	18
	4400	68	34	17
	4600	65	33	16
4800	63	31	16	
5100	59	29	15	
5500	55	27	14	
5900	51	25	13	

**Table A-1: Recommended Antenna Separation (Continued)**

Service	Frequency (MHz)	Wavelength ( $\lambda$ ) (mm)	Antenna Separation	
			Best (= $1/2 \lambda$ ) (mm)	Good (= $1/4 \lambda$ ) (mm)
LTE	600	500	250	125
	650	462	231	115
	700	429	214	107
	750	400	200	100
	800	375	188	94
	850	353	176	88
	900	333	167	83
	950	316	158	79
	1450	207	103	52
	1500	200	100	50
	1700	176	88	44
	1800	167	83	42
	1900	158	79	39
	2000	150	75	38
	2100	143	71	36
	2200	136	68	34
	2300	130	65	32
LTE	2400	125	63	31
	2500	120	60	30
	2600	115	58	29
	2700	111	56	28
	3400	88	44	22
	3500	86	43	21
	3600	83	42	21
	3700	81	41	20
	3800	79	39	20
	5100	59	29	15
	5500	55	27	14
	5900	51	25	13
	WLAN <sup>a</sup>	2.4 GHz	125	63
5.2 GHz		57	29	15

a. Wi-Fi/Cellular separation distance should be whichever value (Wi-Fi or Cellular separation) is largest for the applicable band.

# B: Accessories

## DC Power Cable (Black Connector)

Table B-1: DC Power Cable

DC Power Cable	
Part Number	2000522
Product Release	2016

### Components:

- ❶ 1 UL2464 20 AWG × 4 core cable
- ❷ 4 Molex female crimp terminals /AWG 20-24, 250V, 4A Max, phosphor bronze tin-plated (part number 43030-0001)
- ❸ 1 Molex male 2×2P Ph: 3.0 mm housing, 250V, 5 A max, PA65 black UL94V-0 (part number 43025-0408)

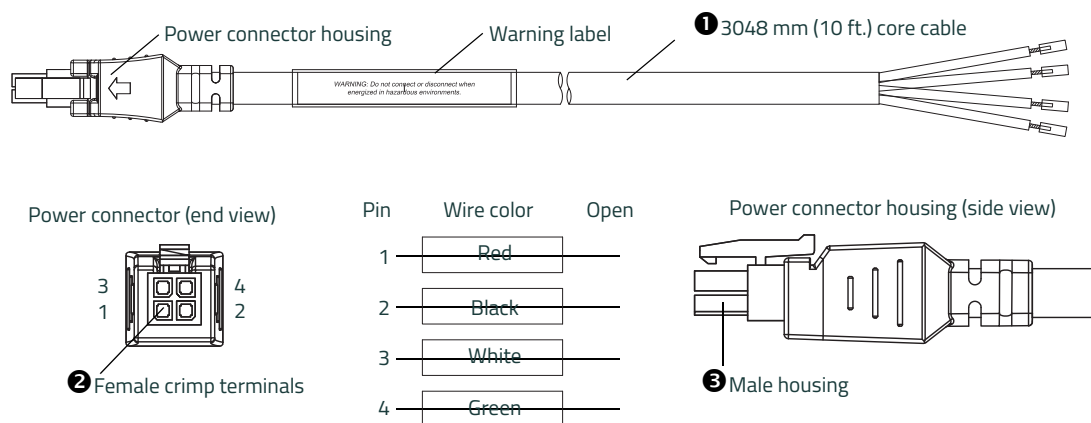


Figure B-1: DC Cable Specifications

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## AC Power Adapter (Black Connector)

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**Important:** When using an AC power adapter for the AirLink RX400/EX400 router, make sure to use the adapter cable specified below, which meets the power requirements of the RX400/EX400.

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**Table B-2: AC Power Adapter**

AC Power Adapter	
Part Number	2000579
Product Release	2016

## AC Power Adapter Input

**Table B-3: Input Specifications**

	Minimum	Typical	Maximum
<b>Input</b>			
Input Voltage	90 VAC	100–240 VAC	264 VAC
Input Frequency	47 Hz	50/60 Hz	63 Hz
<i>Note: Input voltage range is 90 VAC to 264 VAC. Maximum input current is 500 mA at 100–240 VAC. Inrush current will not exceed 75 A at 100–240 VAC input and maximum load from a cold start at 25°C (77°F).</i>			

## AC Power Adapter Output

**Table B-4: AC Power Adapter Output Specifications**

	Minimum	Typical	Maximum	Test conditions
Output Voltage	11.4 VDC	12.0 VDC	12.6 VDC	0 ~ 1.5 A loading

## AC Power Adapter Environmental Specifications

**Table B-5: AC Power Adapter Environmental Specifications**

Operating	
Operating Temperature	0°C ~ 40°C (32°F ~ 104°F) (operates normally)
Relative Humidity	10% ~ 90%
Altitude	Sea level to 2,000 meters
Vibration	1.0 mm, 10–55 Hz, 15 minutes per cycle for each axis (X, Y, Z)
Non-operating	
Storage Temperature	-30°C ~ 70°C (-22°F ~ 158°F)
Relative Humidity	10% ~ 90%
Vibration and Shock	MIL-STD-810D, method 514

## AC Power Adapter Reliability and Quality Control

### AC Power Adapter MTBF

When the power supply is operating within the limits of this specification, the MTBF is at least 200,000 hours at 25°C (77°F) (MIL-HDBK-217F).

*Note: For router MTBF, see [Reliability Specifications](#) on page 49.*

## AC Power Adapter Safety Standards

The power supply is certified with the following international regulatory standards:

**Table B-6: AC Power Adapter Safety standards**

Regulatory Agency	Country or Region	Certified	Standard
UL	USA	Approved	UL60950-1
GS	Europe	Approved	EN60950-1
CE	Europe	Approved	EN60950-1
SAA	Australia	Approved	AS/NZS 60950
CCC	China	Approved	GB4943
CUL	Canada	Approved	CSA C22.2 NO.60950-1

## AC Power Adapter EMC Standards

The power supply meets the radiated and conducted emission requirements for EN55022, FCC Part 15, Class B, GB9254.

## AC Power Adapter Hazardous Substances

- EU Directive 2011/65/EU “RoHS”
- EU Directive 2012/19/EU “WEEE”
- REACH

## AC Power Adapter Energy Efficiency

The AC adapter complies with International Efficiency Levels, as shown in [Table B-7](#).

Table B-7: AC Adapter Energy Efficiency

Supplied Input	No-load Power Consumption	Average Active Mode Efficiency	International Efficiency Level
115 VAC, 60 Hz	Less than 0.1 W	Greater than 85%	VI
230 VAC, 50 Hz	Less than 0.3 W	Greater than 80.4%	V

## Serial Port Adapter Cable — Single (4-wire Serial)

Table B-8: Serial Port Adapter Cable — Single (4-wire serial)

	Description
Part Number	6001410
	RS-232 serial cable (for 4-wire serial connection) Connectors: RJ45 to single DB9 female

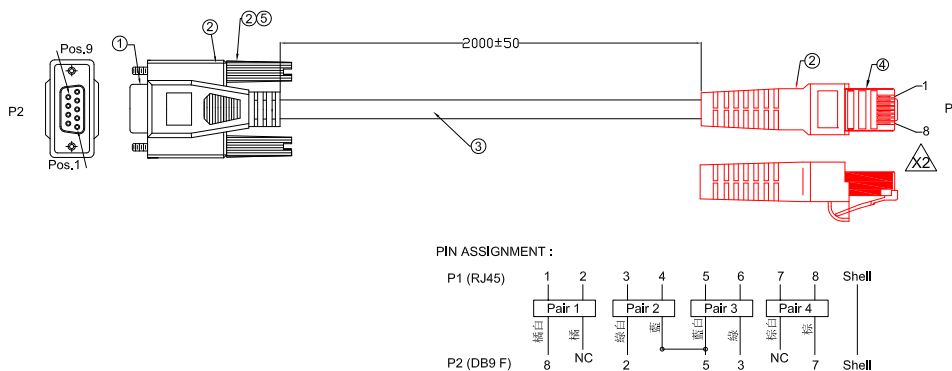


Figure B-2: Serial Port Adapter Cable — Single

## Serial Port Adapter Cable — Dual

Table B-9: Serial Port Adapter Cable — Dual

	Description
Part Number	6001409
	RS-232 serial cable Connectors: RJ45 to dual DB9 female (RS-232)

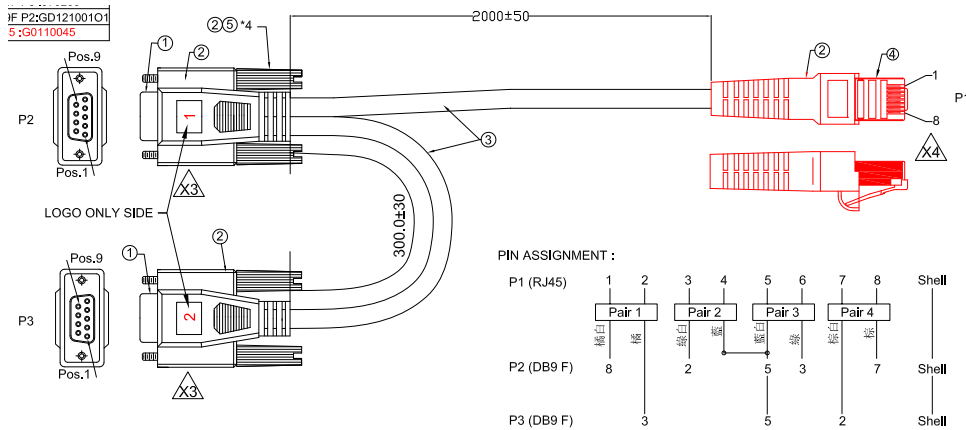


Figure B-3: Serial Port Adapter Cable — Dual

## Customer-supplied Accessory Specifications

### USB-C Power Adapter

If a USB-C power adapter (supplied by the customer, not available from Semtech) is used as the power source for the RX400/EX400, it must meet the following minimum requirements:

- USB PD 2.0/3.0
- Output — 5 V / 3A (15 W)
- Operational temperature range: The power supply cable must be rated for operation over the expected temperature range. Note: For the RX400/EX400 operational temperature range, see [Temperature Specifications](#) on page 66.

# C: Thermal Protection

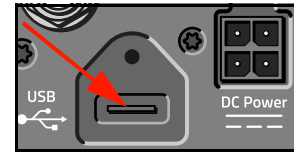
Table C-1: Maximum Ambient Operating Temperature

		<b>Max Ambient Operating Temperature</b>
EX400	Wi-Fi	+65°C (149°F)
	Non-Wi-Fi	+70°C (158°F)
RX400	Wi-Fi	+65°C (149°F)
	Non-Wi-Fi	+70°C (158°F)

If the ambient temperature rises above the router's maximum temperature ([Table C-1](#)), a thermal mitigation algorithm may throttle performance depending on the device's power utilization. When the temperature returns to the valid operating range, the router resumes normal operation.

# D: USB-C Network Connection

The RX400/EX400 router's USB-C port can be used as a virtual Ethernet port to connect a Windows 10 or later or macOS computer to the router.



*Note: In the examples below, the router is configured with the default LAN address 192.168.80.0/24 and IPv6 is enabled.*

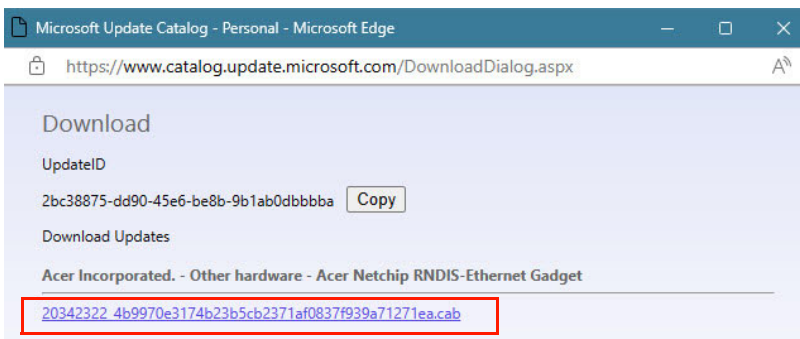
## Windows

### Windows 11

1. Make sure the Windows computer has an active internet connection.
2. Go to [www.catalog.update.microsoft.com/Search.aspx?q=Acer Incorporated. - Other hardware - Acer Netchip RNDIS/Ethernet Gadget/](http://www.catalog.update.microsoft.com/Search.aspx?q=Acer Incorporated. - Other hardware - Acer Netchip RNDIS/Ethernet Gadget/) and click Download for the Windows 8.1 and later package.

Title	Products	Classification	Last Updated	Version	Size	Download
Acer Incorporated. - Other hardware - Acer Netchip RNDIS/Ethernet Gadget	Windows Vista	Drivers (Other Hardware)	1/12/2010	n/a	11 KB	Download
Acer Incorporated. - Other hardware - Acer Netchip RNDIS/Ethernet Gadget	Windows XP	Drivers (Other Hardware)	1/12/2010	n/a	11 KB	Download
Acer Incorporated. - Other hardware - Acer Netchip RNDIS/Ethernet Gadget	Windows 7, Windows 8, Windows 8.1 and later drivers	Drivers (Other Hardware)	1/12/2010	n/a	21 KB	Download

3. In the Download window, click the link displayed for the .cab file (the download package).



4. Navigate to your downloads folder and extract the .cab file to a temporary folder. (Two files will be extracted (.cat and .inf files) — both are required for the driver to install.)
5. Open the Windows Device Manager — Click the Windows Start icon and type "Device Manager", then click **Open** when the application is shown.
6. Expand **Ports (COM & LPT)** and note the ports that are currently displayed.
7. Connect the computer to the router using a data-capable USB-C cable and, if using a locking cable, tighten the jack screw finger tight.
8. Check the Ports (COM & LPT) section — a new port should be listed for the router connection.
9. Right-click the new port and select **Update Driver**.
10. Click **Browse my computer for drivers**.

11. Click **Let me pick from a list of available drivers on my computer**.
12. Click **Have Disk ...**
13. Browse to the temporary folder where the .cab file was extracted in [step 4](#).
14. Select the RNDIS.INF file and click **Open**.
15. When the driver has installed, reboot the Windows computer to finalize the driver installation.

## Windows 10

1. Make sure the Windows computer has an active internet connection.
2. Connect the computer to the router using a data-capable USB-C cable and, if using a locking cable, tighten the jack screw finger tight.  
(Note that some USB-C cables are power-only and will not transmit/receive data.)
3. Wait for the automatic virtual COM port setup to complete — The computer displays a notice while setting up the port, and another notice when the installation is complete, as shown in [Figure D-1](#).

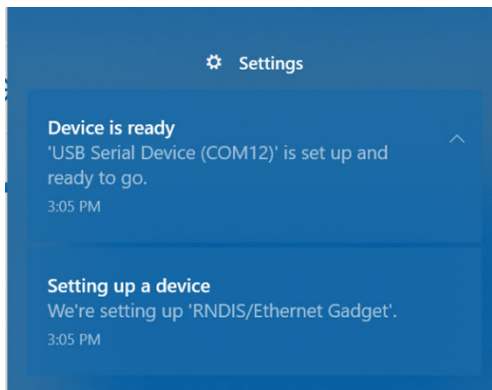


Figure D-1: USB-C Installation—Windows Setup Notifications (Windows 10 shown)

4. Go to Windows Update and check for Optional Updates, then select and install the “Acer Incorporated - Other Hardware - USB Ethernet/RNDIS Gadget”.  
(Note that this update may not be available if your computer uses an internal corporate Windows update server.)

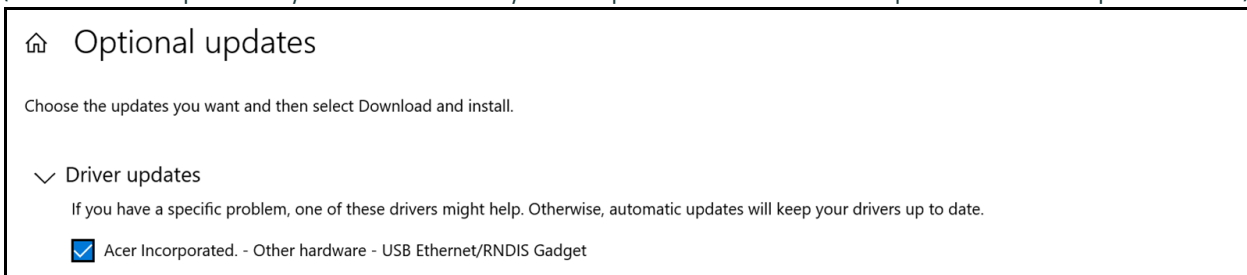


Figure D-2: USB-C Installation—Windows Update

- Confirm that the device has installed—Use Device Manager to verify the “USB Ethernet RNDIS Gadget” has been added to the Network adapters list.

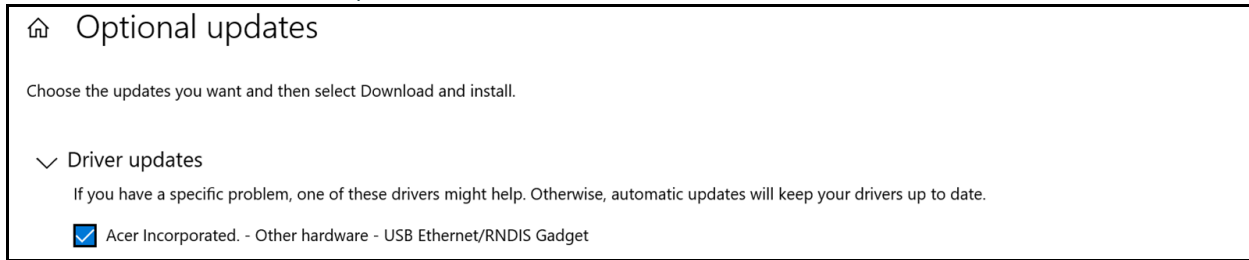


Figure D-3: USB-C Installation—Windows Adapter Installed

- Confirm the network is available and the adapter has been assigned IP address(es)—Open a Command prompt window and type "ipconfig".

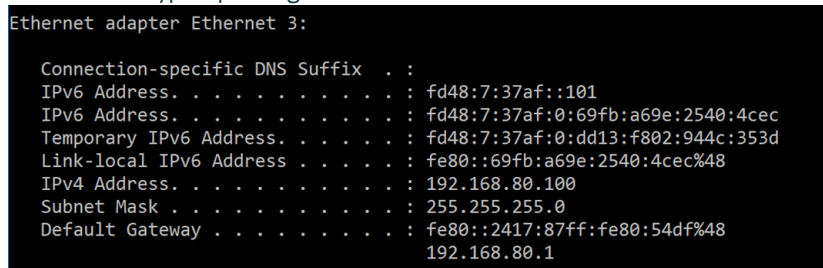


Figure D-4: USB-C Installation—Windows Confirm Adapter Setup is Complete

## macOS Releases

- Notes:
- This procedure was tested on macOS Sequoia (15.5).
  - USB-C network connections are not available on the iPad Pro due to limited functionality of the iPad OS.

- Make sure the macOS computer has an active internet connection.
- Connect the computer to the router using a data-capable USB-C cable and, if using a locking cable, tighten the jack screw finger tight.  
(Note that some USB-C cables are power-only and will not transmit/receive data.)
- In System Preferences, open the Network center and confirm the RNDIS/Ethernet Gadget appears and is connected.

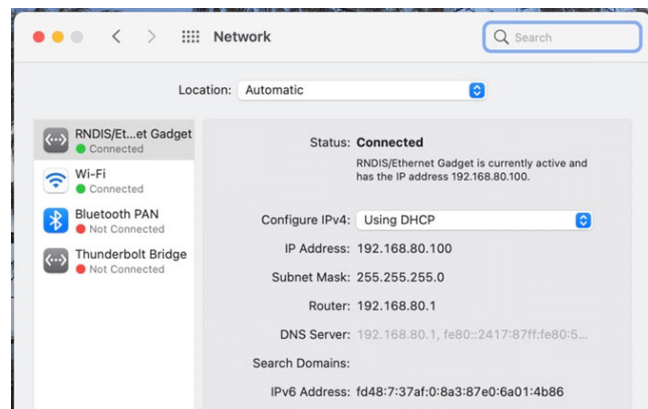


Figure D-5: USB-C Installation—macOS Adapter Setup Complete

# E: LEDs

## LED Behavior

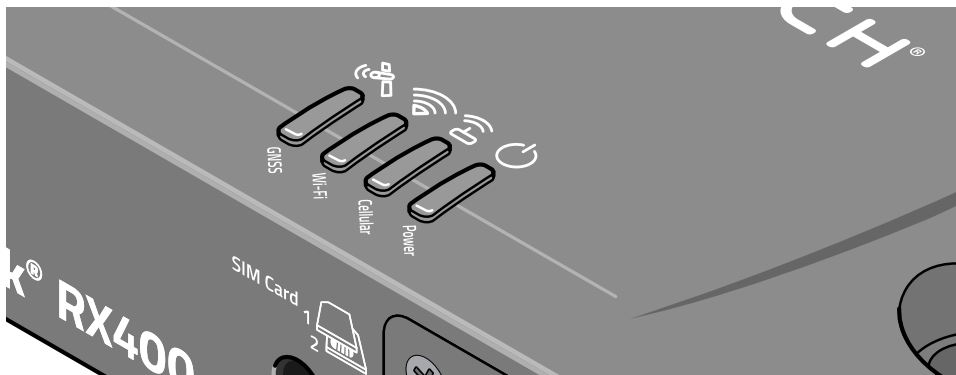


Figure E-1: RX400/EX400 LEDs

## LED Patterns

The RX400/EX400's LEDs display four router statuses (see [Table E-1](#))—GNSS, Wi-Fi, Cellular radio, and Power using a variety of pattern types and colors (Note: The Wi-Fi LED is non-functional for non-Wi-Fi router models.)

- Solid—Single color, always on
- Fast flashing—One color on for 0.2 s, then off or another color for 0.2 s
- Slow flashing—One color on for 0.25 s, then off or another color for 0.75 s
- Pulse—One color on for 0.5 s, then a 0.2 s pulse off or another color
- Chase—All LEDs on in sequence for 0.2 s each, from left to right, continuously

Table E-1: LED Behavior





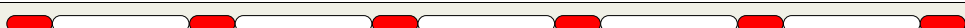

 GNSS	
<b>Solid Green</b>	
Satellite fix available	
<b>Solid Red</b>	
Searching for a satellite fix	
<b>Fast Flashing Red</b>	
GNSS antenna is shorted	
<i>Note: Antenna may appear to be connected, but the current draw is too high.</i>	
<b>Slow Flashing Red</b>	
GNSS antenna is disconnected	
<i>Note: Current draw is below predefined threshold.</i>	
<b>Off</b>	
GNSS is off/disabled	

Table E-1: LED Behavior (Continued)







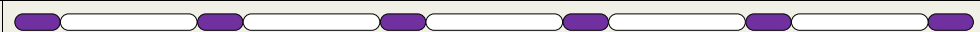










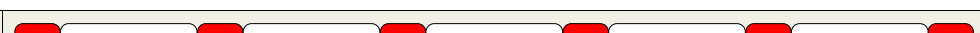
 <b>Wi-Fi</b>	
<b>Solid Green (pulse off with activity)</b>	
Connected in Client mode (good signal) with traffic	
<b>Slow Flashing Green</b>	
Wi-Fi client enabled but not connected	
<b>Solid Yellow (pulse off with activity)</b>	
Connected in client mode (fair signal) with traffic	
<b>Solid Red (pulse off with activity)</b>	
Connected in client mode (poor signal) with traffic	
<b>Solid Purple (pulse off with activity)</b>	
Access point with traffic	
<b>Slow Flashing Purple</b>	
Access point without traffic	
<b>Off</b>	
No Wi-Fi enabled (no AP, no Wi-Fi client), or not available on this RX400/EX400 model	
 <b>Cellular</b>	
<b>Solid Green (pulse off with activity)</b>	
Connected to a 4G network with a good connection (equivalent to 4–5 bars); pulsing off for activity	
<b>Slow Flashing Green</b>	
Connecting to a 4G network	
<b>Solid Purple (pulse off with activity)</b>	
Connected to a 5G network with a good connection (equivalent to 4–5 bars); pulsing off for activity	
<b>Slow Flashing Purple</b>	
Connecting to a 5G network	
<b>Solid Yellow (colored pulse with activity)</b>	 
Connected to a network with a fair connection (equivalent to 2–3 bars) During activity, RAT (5G or 4G) is indicated by a pulse color:	
<ul style="list-style-type: none"> <li>▪ Green pulse — 4G</li> <li>▪ Purple pulse — 5G</li> </ul>	
<b>Solid Red (colored pulse with activity)</b>	 
Connected to a network with a poor connection (equivalent to 1 bar) During activity, RAT (5G or 4G) is indicated by a pulse color:	
<ul style="list-style-type: none"> <li>▪ Green pulse — 4G</li> <li>▪ Purple pulse — 5G</li> </ul>	
<b>Slow Flashing Red</b>	
No network connection	

Table E-1: LED Behavior (Continued)




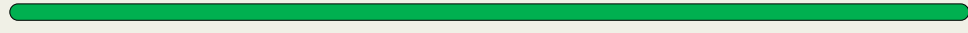










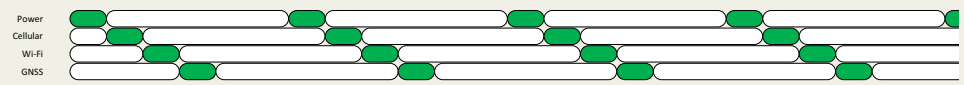
<b>Slow Alternating Flashing Red / Yellow</b>	
Network Operator Switching is enabled, but the required radio module firmware is not currently available on the router	
<b>Off</b>	
Cellular radio disabled	
 <b>Power</b>	
<b>Solid Green</b>	
Router operating normally with ignition on	
<b>Fast Flashing Green</b>	
Router is rebooting after Reset button pressed for < 5 seconds. <i>Note: This pattern does not display when reset is initiated from AirLink OS.</i>	
<b>Solid Yellow</b>	
<ul style="list-style-type: none"> <li>Router is booting or</li> <li>Router is thermally throttled—one or more of CPU, cellular radio, and Wi-Fi radio has exceeded threshold. When operating temperature returns to normal, LED returns to solid green. For details, see <a href="#">Thermal Protection</a> on page 81.</li> </ul>	
<b>Fast Flashing Yellow</b>	
Router is rebooting and being reset to factory defaults, after Reset button is pressed for 20–40 seconds	
<b>Solid Red</b>	
Power is present, but router is not running (e.g., ignition is off, router is in standby mode, etc.) <i>Note: If the router is in standby mode, the Power LED will be solid red only if the AirLink OS Standby LED setting is enabled (System &gt; MCU &gt; Power Management), otherwise the LED will be Off. (By default, the setting is enabled.)</i>	
<b>Fast Flashing Red</b>	
Router is rebooting and being reset to the default template, after Reset button pressed for 5–20 seconds	
<b>Slow Flashing Red</b>	
Router is not operating because operating temperature range is exceeded (i.e., thermal shutdown) (For additional details, see <a href="#">Thermal Protection</a> on page 81.)	
<b>Fast Alternating Flashing Yellow / Red</b>	
Reset button held > 40 seconds, canceling the reset action and rebooting normally when released (i.e., If pressing reset > 5 seconds and decide that the router should do a regular reboot (not a reset to default template or factory defaults), continue pressing Reset until LED alternates Yellow and Red flashes.)	
<b>Off</b>	
<ul style="list-style-type: none"> <li>No power or</li> <li>Router is in standby mode and the AirLink OS Standby LED setting is disabled (System &gt; MCU &gt; Power Management)</li> </ul>	

Table E-1: LED Behavior (Continued)

 All LEDs	
<b>Yellow LED chase</b> Router firmware update in progress <b>Important:</b> Do not turn off the power while the update is in progress.	
<b>Green LED chase</b> Radio module firmware update in progress <b>Important:</b> Do not turn off the power while the update is in progress.	

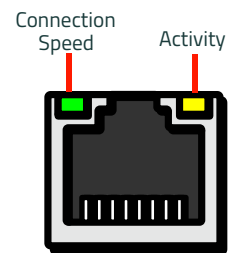
## Ethernet LEDs

Each RJ45 Ethernet connector (Ethernet 1, Ethernet 2) has two LEDs that indicate speed and activity.

*Note: On RX400 Serial-Ethernet routers, the right-hand RJ45 connector is a serial port connector. The LEDs on this connector are non-functional.*

When looking into the connector:

- Activity — The right LED indicates the link status:
  - Solid Amber — Link
  - Blinking Amber — Activity
  - Off — No link
- Connection Speed — The left LED indicates the Ethernet connection speed:
  - Ethernet 1 and (EX400 only) Ethernet 2:
    - Solid Green — 10/100/1000 Mbps (Gigabit)
    - Off — No link



# F: References

## Web Site Support

For the latest AirLink XR Series router documentation, go to <https://source.sierrawireless.com>. Click **sign up** to receive product updates and to download product documentation.

## Reference Materials

- [1] EM8695 Product Technical Specification  
Reference #41114813
- [2] AirLink OS User Guide  
Reference page: [source.sierrawireless.com/airlinkos](https://source.sierrawireless.com/airlinkos)
- [3] AirLink RX400/EX400 Quick Start Guide  
Reference #5308364
- [4] AirLink Complete leaflet  
Reference #5308164
- [5] End-User Warranty for Sierra Wireless AirLink products  
Reference page: [www.sierrawireless.com/legal/terms](http://www.sierrawireless.com/legal/terms)
- [6] AirLink RV55 Hardware User Guide  
Reference #41113042
- [7] AirLink XR60 Hardware User Guide  
Reference #41114699

For additional documents that may be used (under NDA) to assist with regulatory and certification submissions, contact your Semtech representative.

# G: Customer Support

## Contact Us

Sales information and technical support, including warranty and returns	Web: <a href="https://sierrawireless.com/company/contact-us/">sierrawireless.com/company/contact-us/</a> Global toll-free number: 1-877-687-7795 6:00 am to 5:00 pm PST
Product resources and product bulletins	Sign up to the Source for product resources and to subscribe to product bulletins at <a href="https://sierrawireless.com/sso/signup">sierrawireless.com/sso/signup</a>
Security bulletins	Sign up for Sierra Wireless security bulletins at <a href="https://sierrawireless.com/company/iot-device-security/security-bulletins">sierrawireless.com/company/iot-device-security/security-bulletins</a>
Corporate and product information	Web: <a href="https://sierrawireless.com">sierrawireless.com</a>

# H: Glossary

Table H-1: Glossary

Term	Definition
ALMS	AirLink Management Service
AMR	(ALMS) Advanced Mobility Reporting
AWG	American Wire Gauge
BeiDou	BeiDou Navigation Satellite System
CA	Carrier Aggregation
CEP	Circular Error Probability
Computer	Desktop, laptop, notebook, etc., computer
DCE	Data Communications Equipment
DGPS	Differential GPS
DLCA	Downlink Carrier Aggregation
EEE	Energy Efficient Ethernet
GLONASS	Global Orbiting Navigation System
GNSS	Global Navigation Satellite System
GPIO	General Purpose I/O
GPS	Global Positioning System
I/O	Input/Output
IECEX	International Electrotechnical Commission System for Certification to Standards Relating to Equipment for Use in Explosive Atmospheres
IRNSS	Indian Regional Navigation Satellite System
kgf.cm	Kilogram-Force-Centimeter (torque unit of measurement)
lbf.in	Pound-Force-Inch (torque unit of measurement)
MTBF	Mean Time Between Failure
N.m	Newton meters (torque unit of measurement)
NMEA	National Marine Electronics Association
QZSS	Quasi-Zenith Satellite System
RMFW	Radio Module Firmware
RP-SMA	Reverse Polarity SMA
SBAS	Satellite Based Augmentation System
Telemetry	Data measurements reporting

**Table H-1: Glossary (Continued)**

Term	Definition
ULCA	Uplink Carrier Aggregation
USB-PD	USB Power Delivery