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AirLink

AirLink XR60

Hardware User Guide

September 2025

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Warranty

Warranty information for AirLink products is available at www.sierrawireless.com/end-user-warranty.

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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 XR60 platform is classified to ANSI/ISA 12.12.01-2016 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:

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

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

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

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

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.*

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

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: sierrawireless.com/company/contact-us/ Global toll-free number: 1-877-687-7795 6:00 am to 5:00 pm PST
Corporate and product information	Web: sierrawireless.com

Revision History

Revision number	Release date	Changes
1	February 2024	Document created
2	May 2024	Updated Table 4-5, Host Interfaces, on page 53 (Serial Port RJ45 Connector Pinout pin names) Updated Safety and Table 4-1, Certifications, on page 50 (C1D2 statements) Updated Applicable standards (IECEx / ATEX) Updated non-Wi-Fi ambient temperature range
3	June 2024	Updated Important Information for Users in the European Union and the United Kingdom (EU DoC link)

Revision number	Release date	Changes
4	February 2025	Added Notice for Brazilian Users on page 76.
4.1	July 2025	Removed pending certification notes Updated Table 4-4, MNO Certifications Updated Table 4-8, GNSS Specifications (acquisition times; removed 'pending' footnote) Updated Table 4-15, EM9291 Conducted Maximum Tx Power Tolerances (updated B41 PC3 tolerance) Updated section macOS Releases (renamed from macOS Big Sur; updated tested version)
5	June 2025	Added Bluetooth comment for Brazil / Anatel
6	July 2025	Updated Explosive Environment certification references to T4 (replaced T5)
7	September 2025	Migrated rev4.1 changes to rev7

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1: Introduction to the AirLink XR60

Semtech® AirLink® XR60 5G routers are compact, intelligent and fully-featured communications platforms that provide real-time wireless capabilities for fixed and mobile applications. The XR60 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 XR60 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 up to 5 years of extended hardware warranty.

All XR60 routers support 5G NR Sub-6G, 4G LTE and HSPA+ cellular radio bands, Wi-Fi 6, dual-band GNSS, and include multiple SKU-dependent communication ports (Ethernet, USB, 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 XR60 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: XR60 Router Models

SKU	Model	Communication Ports				
		Cellular	Wi-Fi	Ethernet 1 Gbps	Ethernet 5 Gbps	Serial
1105099	**XR60 Dual Ethernet**	Y	–	Y	Y	–
1105159	**XR60 Dual Ethernet, Wi-Fi**	Y	Y	Y	Y	–
1105160	**XR60 Serial, Ethernet**	Y	–	Y	–	Y
1105161	**XR60 Serial, Ethernet, Wi-Fi**	Y	Y	Y	–	Y

Key Features

- Cellular support:
  - High-performance 4x4 5G NR Sub-6G and LTE-Advanced (Cat 20)
  - FirstNet support (Band 14) with Carrier Aggregation
  - Dual SIM support for nano-SIM (4FF) cards

    Note: The XR60 is the first Semtech router designed to use nano-SIM cards.

  - Fully automatic network operator switching on SIM card insertion
- Wi-Fi support:
  - 2x2 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, Serial, and USB-C connectors
  - Gigabit Ethernet support:
    - 1 Gbps — 10/100/1000
    - 5 Gbps (SKU-specific) — 100/1000/2500/5000
  - SKU-specific serial port support — 1 x 4-wire RS-232 serial port and 1 x 2-wire serial port (RS-232 or RS-485)
  - Gigabit USB support:
    - 5 Gbps Ethernet over USB-C network connectivity
  - Supports VPN tunnels for secure communications
- Router management-related features:
  - Remote configuration, software update, and monitoring with AirLink Management Service (ALMS). Your XR60 router purchase includes a one-year subscription to AirLink Complete, providing ALMS access, technical support, and up to 5 years of extended hardware warranty.
  - 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 Class 1 Div 2, IECEx/ATEX, MIL-STD-810H, IP64 ingress protection
  - E-Mark, ISO7637-2 and 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, switchable low side current sink, and 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) to prevent battery drain
  - Multiple power supply options — DC supply for vehicle and fixed installations, AC power adapter and 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 routers — Slightly taller and slightly deeper than RV-series routers, with identical mounting screw / bolt locations for easy upgrade / replacement of your existing RV-series router fleet. For dimensions, see Mechanical Specifications on page 68.
- microSD — (To be supported in a future AirLink OS release) Memory expansion slot to augment internal memory for Edge compute storage and containers. (Note — Edge compute feature is in Beta stage as of document revision date.)

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

Description

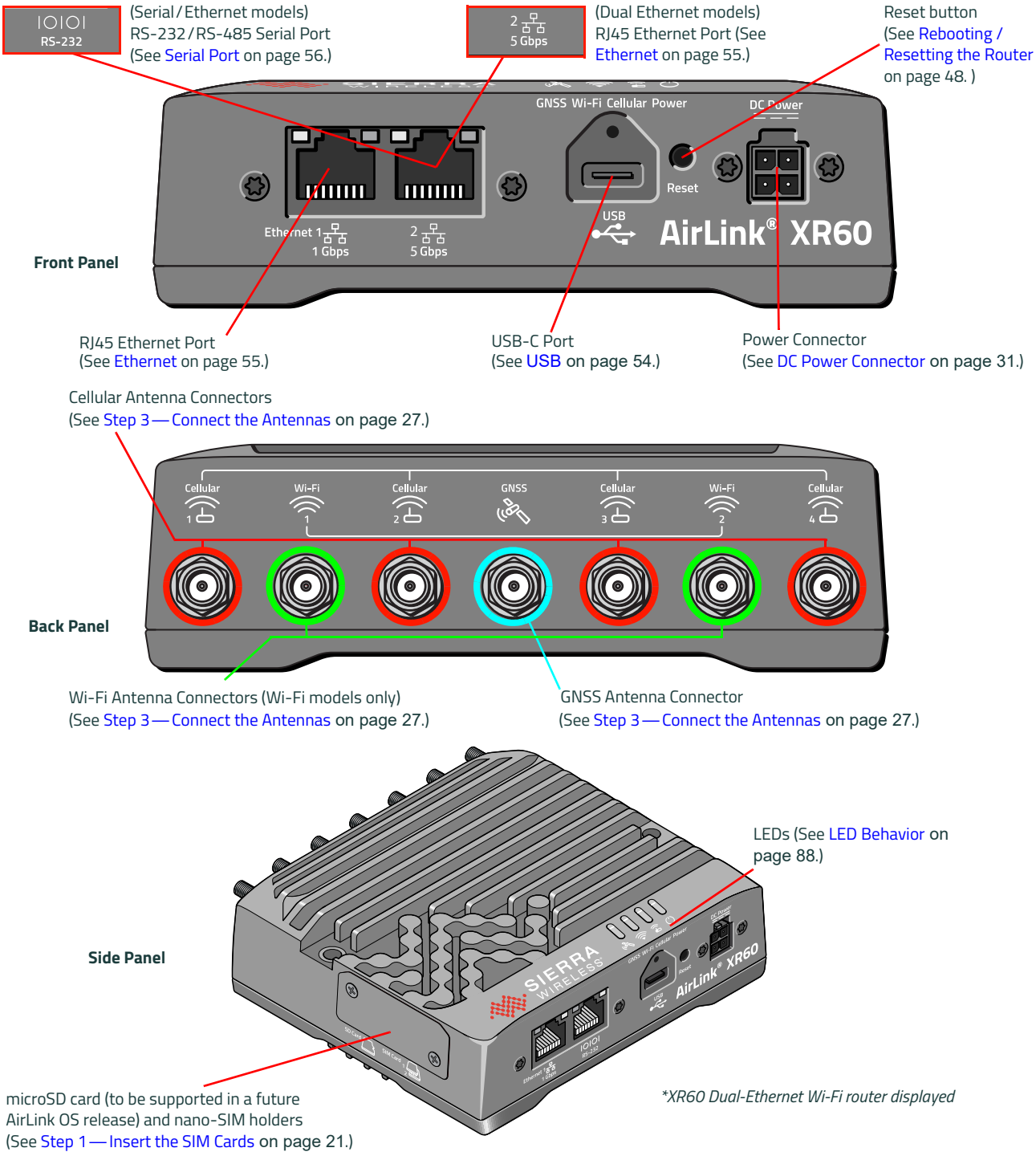


Figure 1-1: XR60 Router Connectors, LEDs and SIM Card Holders

Router Configuration and Management

You can configure and manage your XR60 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 XR60 router purchase includes a one-year subscription to AirLink Complete, including ALMS access.
  For more information, visit www.sierrawireless.com/ALMS or contact your Semtech distributor.

Power Modes & Consumption Scenarios

The AirLink XR60 router supports the following power modes / connection states:

- Standby
- Normal (Idle, Connected)

Table 1-2 describes several power consumption scenarios for the supported modes, and Table 1-3 on page 16 describes available power saving configurations.

Table 1-2: Power Consumption Scenarios

XR60 Model	Mode	Use Case	Interfaces[a] / Notes	Power Draw[b]		Current Draw
				Typ[c] (W)	Max (W)	Typ[c] @ 12 V (mA)
All	Standby	—	▪ CPU and radio are off ▪ Router enters Standby mode depending on the power source and related triggers: · DC Power connector (DC cable): · Low voltage disconnect · GPIO · Timers · DC Power connector (AC power adapter): · Low voltage disconnect · Timers · USB-C power adapter: · Timers ▪ Router returns to normal mode when woken by a GPIO input, or at a configured time, or (for a DC supply) when the voltage reaches the configured 'Resume Voltage' (see *[2] AirLink OS User Guide*).	55 mW	–	4.6
All	Normal	Max power draw	Max power draw (averaged over 100 ms). For typical Normal mode power / current draw use cases, refer to the table entries below.	—	18.5 W[d]	

Table 1-2: Power Consumption Scenarios (Continued)

XR60 Model	Mode	Use Case	Interfaces[a] / Notes	Power Draw[b]		Current Draw
				Typ[c] (W)	Max (W)	Typ[c] @ 12 V (mA)
Serial, Ethernet	Normal	Low	▪ RS-232 enabled with no traffic ▪ Cellular idle attached	3.5	—	292
		Fast Ethernet (Low)	▪ Ethernet set to 10-BaseT with no traffic ▪ Cellular idle attached	3.6	—	300
		Mid	▪ One interface enabled (either RS-232 or 10-BaseT Ethernet) with full traffic ▪ Cellular LTE[e] connected at 0 dBm	6.6	—	550
		High	▪ One interface enabled (either RS-232 or 1000-BaseT Ethernet) with full traffic ▪ Cellular LTE[e] connected at 23 dBm	7.2	—	600
Serial, Ethernet, Wi-Fi	Normal	Idle (Low)	▪ Wi-Fi Radio A set to AP mode and idle ▪ Wi-Fi Radio B disabled ▪ Cellular idle attached ▪ Ethernet port 2 set to 1000-BaseT enabled but idle	4.3	—	358
		All interfaces (High)	▪ Wi-Fi Radio A set to AP mode on the 5GHz band using data width of 80 MHz and Max throughput ▪ Wi-Fi Radio B set to STA mode on the 2.4GHz band using data width of 20 MHz ▪ RS-232 enabled with traffic ▪ Ethernet set to 1000-BaseT with full traffic ▪ USB enabled with full traffic ▪ GNSS enabled using an active antenna ▪ Cellular LTE[e] connected at 23 dBm	10.8	—	900

Table 1-2: Power Consumption Scenarios (Continued)

XR60 Model	Mode	Use Case	Interfaces[a] / Notes	Power Draw[b]		Current Draw
				Typ[c] (W)	Max (W)	Typ[c] @ 12 V (mA)
Dual Ethernet, Wi-Fi	Normal	Idle (Low)	▪ Wi-Fi Radio A set to AP mode on the 5GHz band enabled but idle ▪ Wi-Fi Radio B disabled ▪ Ethernet port 1 set to 5000-BaseT enabled but idle ▪ Ethernet port 2 set to 1000-BaseT enabled but idle ▪ USB enabled but idle ▪ GNSS enabled using an active antenna ▪ Cellular LTE[e] idle attached	4.5	—	375
		All interfaces (Mid)	▪ Wi-Fi Radio A set to AP mode on the 5GHz band using data width of 80 MHz and 500 Mbps throughput ▪ Wi-Fi Radio B set to STA mode on the 2.4GHz using data width of 20 MHz ▪ Ethernet port 1 set to 5000-BaseT with 500 Mbps traffic ▪ Ethernet port 2 set to 1000-BaseT with 500 Mbps traffic ▪ USB enabled with no traffic ▪ GNSS enabled using an active antenna ▪ Cellular LTE[e] connected at 0 dBm	8.6	—	717
		All interfaces (High)	▪ Wi-Fi Radio A set to AP mode on the 5GHz band using data width of 80 MHz and Max throughput ▪ Wi-Fi Radio B set to STA mode on the 2.4GHz using data width of 20 MHz ▪ Ethernet port 1 set to 5000-BaseT with full traffic ▪ Ethernet port 2 set to 1000-BaseT with full traffic ▪ USB enabled with full traffic ▪ GNSS enabled using an active antenna ▪ Cellular LTE[e] connected at 23 dBm	12	—	1000

a. Listed interfaces are all enabled as described. Interfaces that are not listed are all off or disabled.
b. Power draw measurements do not include cellular UL data. Cellular UL data may increase the indicated power consumption by 0.3–0.7 W.
c. Typical power/current draw measurements are expected to be within ± 10% of stated values at 25°C.
d. For normal mode Max power draw, if USB-PD (power delivery) sourcing up to 7.5 W (max) is used, then this additional power must be provisioned for the power supply. (i.e., Max power draw = 18.5 + 7.5 = 26 W).
e. Cellular LTE+Sub-6 will draw ~560 mW (0 dBm) or ~1000 mW (23 dBm) more power than the cellular radio in LTE mode only.

Power Saving Features

Table 1-3 on page 16 provides a quick reference to power saving feature configurations available for the XR60. These configurations may be used to optimize idle 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: Power Saving Features

Feature	Where to configure in AirLink OS	Power Saving Configuration Details
Hardware Interface configurations		
Cellular Interface[a]	Hardware Interfaces > Cellular Interfaces > Configuration	Disable the cellular interface.
Wi-Fi Interfaces[a]	Hardware Interfaces > Wi-Fi Interfaces > Configuration	Disable any combination of the Wi-Fi Client and Access Point interfaces.
Ethernet Interfaces[a]	Hardware Interfaces > Ethernet Interfaces > Configuration	Disable any unused Ethernet ports. (i.e., Ethernet 1, Ethernet 2)
		Select specific Ethernet data rates for enabled Ethernet ports. Ethernet data rates can be set as follows: • Auto • 5000 baseT/Full (Ethernet 2 only) • 2500 baseT/Full (Ethernet 2 only) • 1000 baseT/Full • 100 baseT/Full • 100 baseT/Half • 10 baseT/Full (Ethernet 1 only) • 10 baseT/Half (Ethernet 1 only) Slower rates may result in some power savings. For Dual-Ethernet devices that require only Ethernet 1 (i.e., the 1000 baseT), disable Ethernet 2 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.
USB Interface[a]	Hardware Interfaces > USB Interfaces > Configuration	Disable the USB port's data path. *Note: This does not disable the USB power feature.*
Serial Interfaces[a]	Hardware Interfaces > Serial Interfaces > Configuration	Disable unused serial ports by setting the MODE to Disabled.
Location Services configuration		
GNSS[a]	Services > Location > General	GNSS is disabled by default.
Power / Voltage configuration		
Low Voltage Disconnect	System > MCU > Voltage Threshold	The XR60 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.
Ignition Shutdown Delay	System > MCU > Power Management	Enable / disable / configure the shutdown delay. If the XR60 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.
Standby (Timer-based)	System > MCU > Power Management	The XR60 router is in standby mode and automatically wakes up periodically, for example hourly or daily.
Standby (I/O-based)	System > MCU > Power Management	The XR60 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 XR60 router has two SIM card 4FF (nano-SIM) 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.

Network Operator Switching

The Network Operator Switching feature, which is intended for North American routers, makes it possible to use a single XR60 hardware variant on multiple operator networks.

The AirLink XR60 comes preloaded with multiple network operator-specific radio module firmware (RMFW) versions.

When the router is powered on:

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 XR60 or are available for purchase from Semtech resellers.

Table 1-4: XR60 Accessories[a]

Part	Part Number	Description
Included with XR60 router purchase		
Locking DC Power Cable (Red Connector)	6001502	Length — 3 m (10 ft) ***Important:*** *This cable (red connector housing) meets the power requirements of the XR60. Do not reuse older-model cables (black connector with black housing).*
Quick Start Guide	5307421	Basic router installation instructions
AirLink Complete leaflet	5307263	AirLink Complete subscription service description and registration details
Available for separate purchase from Semtech resellers		
Semtech antennas	For XR60 antennas, visit www.sierrawireless.com/router-solutions/antennas/	5G Sub-6G, 2.4 GHz and 5 GHz Wi-Fi antennas for various XR60 configurations For best practice guidelines in selection, capabilities and use of cellular, Wi-Fi, BT, and GNSS antennas, refer to *[5] AirLink XR Series Router Antenna FAQ*. *Note: All antenna connectors are SMA (Cellular, GNSS) or RP-SMA (Wi-Fi).*
Universal AC Power Adapter (Red Connector)	6001503	Universal AC voltage power supply with three regional mains connectors ***Important:*** *This cable (red connector housing) meets the power requirements of the XR60. Do not reuse older-model cables (black connector with black housing).*
Serial Port Adapter Cable — Single	6001410	RJ45 to single DB9 (RS-232) female serial cable
Serial Port Adapter Cable — Dual	6001409	RJ45 to dual DB9 (RS-232/RS-485) 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 Screw Specifications on page 69.

a. Subject to change.

Warranty

XR60 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 *[6] End-User Warranty for Sierra Wireless AirLink products*.

2: Installation and Startup

This chapter shows how to connect, install and start the Semtech XR60 router. It also describes the front panel LEDs, and I/O functionality.

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.

Note: Do not reuse DC power cables or AC adapters from other AirLink routers (typically cables with black or blue connectors and black housings). The XR60 requires the higher-power DC Power Cable (Red Connector) or DC Power Cable (Red Connector).

Note: The XR60 router installation must be done by a qualified technician.

Out of Box — Quick Start

Included in your XR60 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 XR60 router (or XR router fleet).

Refer to *[3] AirLink XR60 Quick Start Guide* (included in the box) for instructions on registering and preconfiguring your XR60 router.

Tools and Materials Required

- Power supply — One of the following:
  - DC — Power cable included with the XR60 (DC Power Cable (Red Connector) on page 80)
  - AC — Optional AC adapter available from Semtech (AC Power Adapter (Red Connector) on page 81)
  - USB-C — Optional customer-supplied power adapter (USB PD 2.0/3.0 compliant, 45 W minimum) (not available from Semtech)

Important: *For DC or AC power supplies, make sure to use the specified parts, which meet the power requirements of the XR60 — DC Power Cable (Red Connector) or DC Power Cable (Red Connector).*
Do not reuse older-model cables (black or blue connectors with black housing).

- One or two nano-SIM cards (4FF) (provided by your mobile network operator)
- #1 Phillips screwdriver (to open/close the SIM card panel)
- A computer to make a LAN connection to the XR60:
  - 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) — 4x4 (All four must be connected when using cellular.)
  - Wi-Fi (Reverse Polarity SMA (RP-SMA)) — 2x2
  - GNSS (SMA) — 1
- Optional Serial cable (see Table 1-4 on page 18):
  - RJ45 to single RS-232 DB9
    or
  - RJ45 to dual connection RS-232 and RS-232/RS-485 DB9
- Optional DIN Rail Mounting Bracket kit (see Table 1-4 on page 18)

  or

  Optional mounting screws (if not mounting on a DIN rail). (For details (including recommended screw lengths, see Screw Specifications on page 69.)

Caution: *The router has a hardened case for use in industrial and extreme environments. 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.*

Installation Overview

The steps for a typical installation are:

Step 1 — Insert the SIM Cards

Step 2 — Mount and Ground the XR60 Router

> *Note: Depending on where you are installing the XR60 router, you may want to mount it after connecting the antenna, cables and power, and confirming correct operation.*

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 XR60 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.

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.)

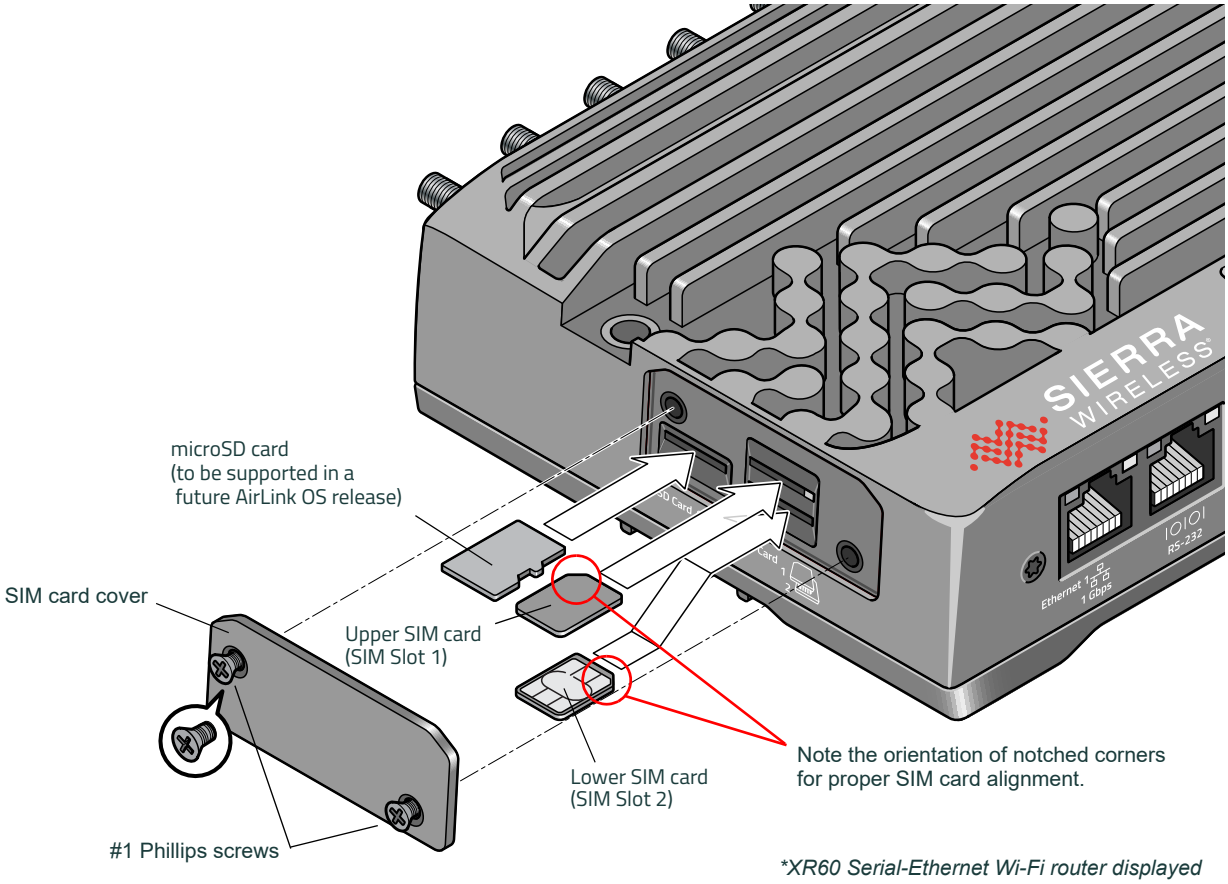


Figure 2-1: Installing the SIM Card

4. Replace the SIM card cover.

   Important: *Do not over-tighten the screws (see Screw Specifications on page 69). This could strip the threads inside the router, which will prevent the cover from re-attaching.*

5. Continue to Step 2 — Mount and Ground the XR60 Router.

Step 2 — Mount and Ground the XR60 Router

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 XR60 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 24.

Note: See the Mechanical Specifications on page 68 for the XR60 router's dimensions, including mounting hole positions.

To mount the XR60:

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 XR60 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 26 for more details.
   - Front 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 XR60 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 XR60 using one of the supported Mounting Methods (flat mount, or DIN rail mount).
4. If the XR60 will be a DC-powered installation with a fixed "system" ground reference, you must ground the XR60 chassis to this system ground reference — see Grounding the XR60 Router Chassis on page 26.
5. Continue to Step 3 — Connect the Antennas.

Mounting Methods

The XR60 router has 2 mounting holes, as shown in Figure 2-2. For mounting screw specifications (including recommended screw lengths), see Screw Specifications on page 69.

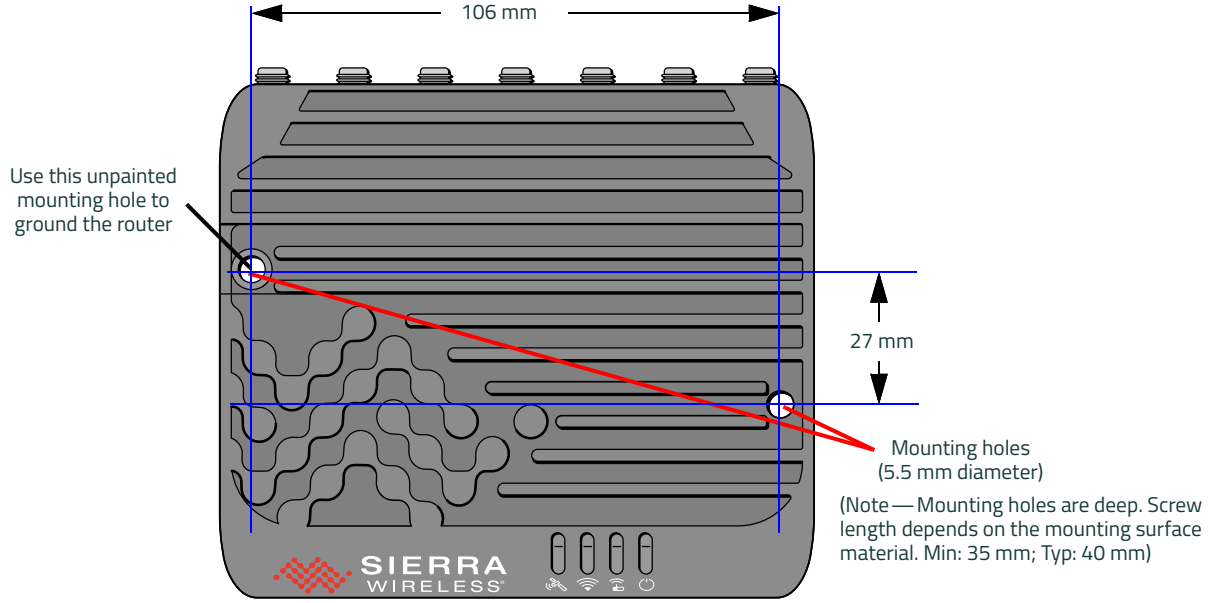


Figure 2-2: XR60 Router Mounting Holes

Note: When mounting the XR60 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.

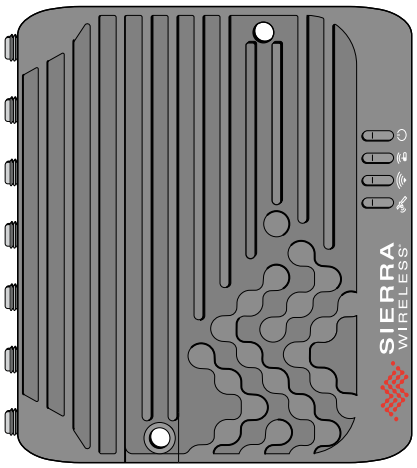


Figure 2-3: Recommended Orientation for Inclined/Vertical Mounting

Flat Surface Mount

To mount the XR60 router on a flat surface, use M5 pan head screws with split washers. For details (including recommended screw lengths), see Screw Specifications on page 69.

DIN Rail Mount

If you are mounting the XR60 router on a DIN rail, order a DIN rail mounting bracket kit from Semtech (see Table 1-4 on page 18). 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 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 XR60 routers.)
- Internal #8 lock washers for mounting screws — Qty 2

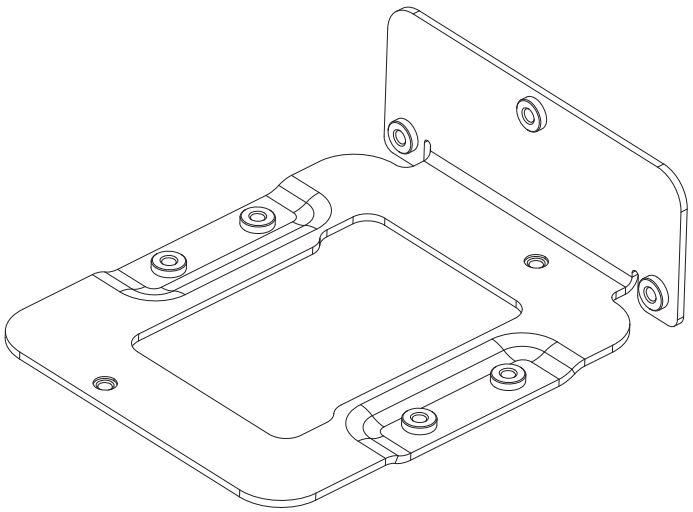


Figure 2-4: DIN Rail Mounting Bracket

To attach the XR60 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 21.)
2. Test the network connectivity.

   Connect the XR60 router. Power it up and ensure that you have network connectivity. (See Step 5 — Choose a Power Supply Type on page 30.)
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 XR60 mounting screws provided to attach the router to the bracket. Torque the screws to a maximum of 1.1 N-m (10 in-lb.).
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 XR60 Router Chassis

For DC installations (with a fixed "system" ground reference), you must ground the XR60 chassis to this system ground reference.

To ensure a good grounding reference, either:

- Attach the XR60 to a grounded metallic surface using a conductive metal screw, to ensure there is a reliable electrical connection from the XR60'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 XR60 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 XR60 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:

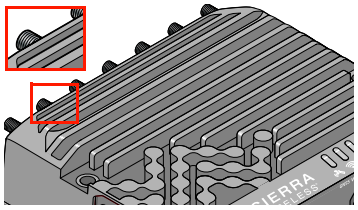
- Label all cables that attach to the XR60 router. For example: "GNSS", "Wi-Fi 1", "Ethernet to Device X", etc.
- Protect the cables using a proper cable conduit.
- Secure each cable connected to the XR60 router via a permanent fixture.

Step 3 — Connect the Antennas

Warning: *The XR60 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 XR60 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 × 4 SMA (outside thread, center hole)
- Wi-Fi × 2 RP-SMA (outside thread, center pin)
- GNSS x 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 70.*
- *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 26 for additional recommendations.*

To install the antennas:

1. For vehicle installations, mount the antenna unit(s) (which are typically multi-element units) on the vehicle.

   Note: If single-element antennas are installed, see Table A-1 on page 78 for recommended antenna separation.

   Mounting recommendations:
   - Follow the recommended installation instructions for the antenna unit(s).
   - Use appropriate cable strain relief. (See Cable Management on page 26.)
   - When mounting antenna unit(s) that contain WAN/WLAN cellular antennas, make sure there is at least 20 cm between the antenna(s) and the user or bystanders during normal operation.
   - If an antenna unit includes a GNSS antenna, make sure it 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 (approximately 0.6 – 0.8 Nm/5 – 7 in-lb.) is sufficient and the max torque should not go beyond 1.1 Nm (10 in-lb.).

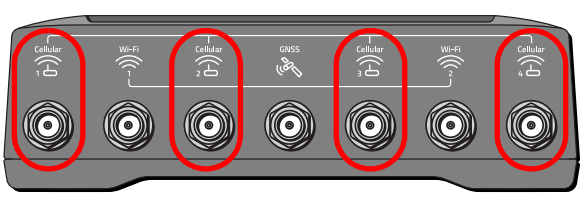
   - Connect cellular antennas to each cellular antenna SMA connector (Cellular 1, Cellular 2, Cellular 3, Cellular 4).

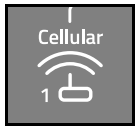
     Important: *The XR60 must be connected to four 5G cellular antennas that support the full expected frequency range. For details, refer to [5] AirLink XR Series Router Antenna FAQ.*

     Note that each cellular band uses specific transmitting antenna combinations. If an antenna is not connected for the required band, the connection will fail.

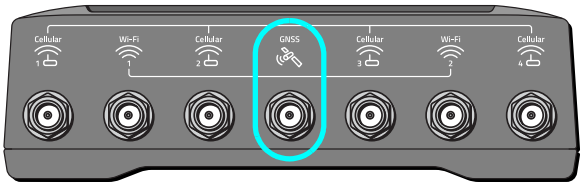
Semtech antennas are designed to meet strict regulatory and performance requirements. Semtech will not support antennas that do not meet the strict performance specifications.

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





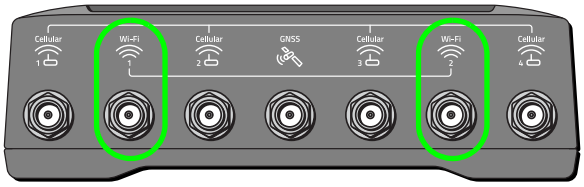
- If used, connect a GNSS antenna to the GNSS SMA antenna connector.



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 antennas to the RP-SMA Wi-Fi connectors.



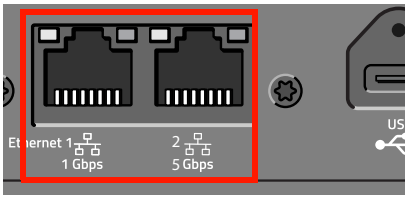
3. Continue to Step 4 — Connect the Data Cables.

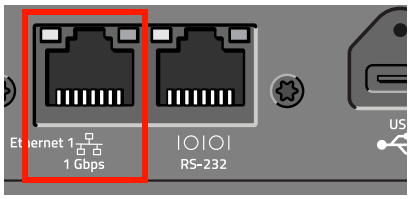
Step 4 — Connect the Data Cables

At least one computer must be connected via a data cable to the XR60 router to enable access to the router's AirLink OS. Additional computers and/or other appropriate devices can also be connected.

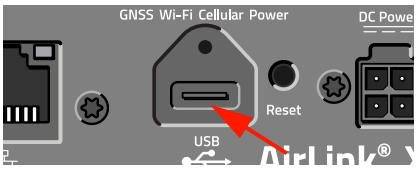
To connect data cables to the XR60 router:

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 front panel (Ethernet 1, Ethernet 2 (SKU-dependent). (By default, Ethernet ports are enabled for LAN connection.)
     See Ethernet on page 55 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 85.

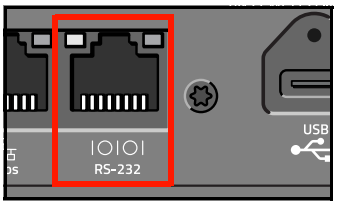
(Note — If the port is not used as an Ethernet port, it can be used to connect a USB power adapter to power the router.)

See USB on page 54 for cable requirements.

Note: After the XR60 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 18) or other vendors), and then connect appropriate device(s) to the port.

   The port supports a 4-wire and 2-wire serial interface. See Serial Port on page 56 for cable requirements.



3. Continue to Step 5 — Choose a Power Supply Type.

Step 5 — Choose a Power Supply Type

The AirLink XR60 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 18.

Important: *For DC or AC power supplies, make sure to use the specified parts, which meet the XR60's power requirements: DC Power Cable (Red Connector) on page 80 or AC Power Adapter (Red Connector) on page 81.*

Do not reuse older-model cables (black or blue connector with black housing).

- USB connector:
  - USB power — A customer-supplied USB-C (USB PD 2.0/3.0 compliant, 45W) power adapter can be used.

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 58.

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

To connect power to the router:

1. Review the topics in this section to familiarize yourself with the XR60's power requirements, wiring options, etc.:
   - Operating Voltage on page 30
   - Fusing on page 31
   - DC Power Connector on page 31
   - Vehicle Installation on page 32
   - I/O Configuration on page 38
2. Choose the power supply source to use for the XR60:
   - DC power cable — Connect the cable to the router using an appropriate Vehicle Installation or Fixed Installation method.
   - AC power adapter
   - USB-C power adapter (USB PD 2.0/3.0 compliant, 45 W minimum)
3. Go to Step 6 — Supply Power to the Router on page 44.

Operating Voltage

The XR60 router's operating voltage range is 7–36 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 10 A fast blow fuse, recommended to have no more than ±10% derating over the operating temperature.

DC Power Connector

Power can be supplied to the router through the DC power connector located on the front 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.

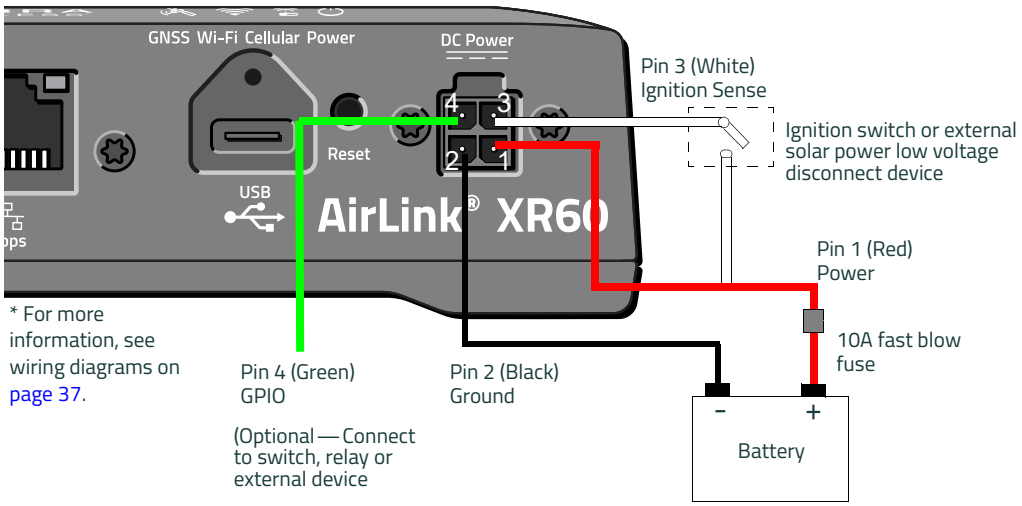


Figure 2-5: DC Power Cable Connections (Colors indicate DC cable wire colors.)

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

DC Power Connector Pin	Name	DC Cable Wire Color	Description	Type
1	Power	Red	Main power supply for router *Note: 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.* *Note: When the router switches to Standby mode based on a Low Voltage trigger, the voltage is monitored on Pin 1*	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	Enables control of the router power state. This wire must be connected in one of the following ways: • Connected to the vehicle ignition (for vehicle installations). **Recommendation:** Semtech recommends always connecting this pin to the vehicle ignition. However, if the router must not shut down when the ignition is turned off, disable the "Ignition" power source in AirLink OS (System > MCU > Power Management). • 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. • 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.) *Important: This wire must not be left unconnected, and the router should not be turned off by disconnecting the power.* Router power state — The XR60 router is: • On, when this pin is connected to the vehicle ignition or a low voltage disconnect device, or is tied to Pin 1 (power) • Off or in standby, when the pin is either open-circuit or grounded	I
4	GPIO	Green	General purpose input/output Typical GPIO uses include: • User configurable digital input/output — Connect to a switch, relay, or external device. • Analog input to detect analog signals (e.g., low voltage). For more information, see I/O Configuration on page 38.	I/O

Vehicle Installation

For vehicle installations, the XR60 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 on page 30 and Fusing on page 31.

DC Voltage Transients

The XR60 router has built-in protection against vehicle transients including engine cranking (down to 5.0 V) and load dump (up to 200 V), so there is no need for external power conditioning circuits. For details, see Industry Certification for Vehicles on page 50.

Connect the XR60 Router to a Vehicle's Electrical System

For vehicle installations, to connect the XR60 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 XR60 router is grounded. (See Step 2 — Mount and Ground the XR60 Router.)
7. Use a 10 A fast blow fuse, recommended to have no more than ±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 XR60 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
Vehicle Installation — Recommended Basic Method on page 34	The XR60 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.
Vehicle Installation — Timer-Driven Activation	The XR60 router wakes periodically for a configured duration, then returns to standby mode.
Vehicle Installation — Shore Power	The XR60 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.

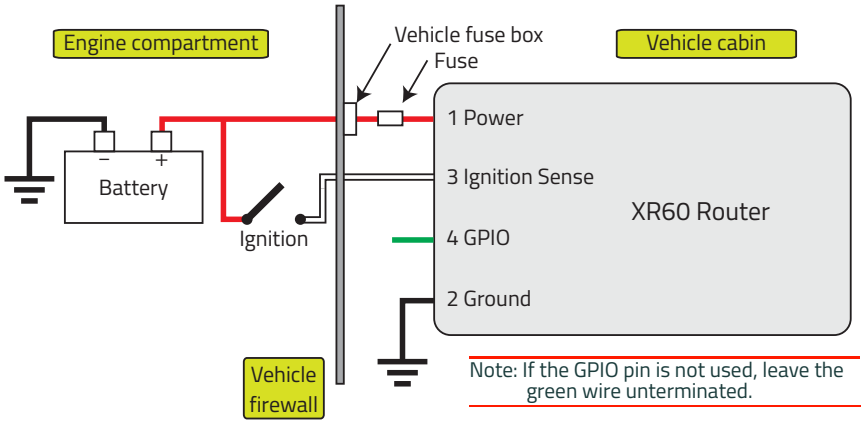


Figure 2-6: Vehicle Installation Wiring Diagram — Recommended Basic Method

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

- When the vehicle ignition is off, the XR60 router is in standby mode.
- Optionally, a delayed shutdown can be configured to keep the XR60 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 10 A, fast blow fuse, recommended to have no more than ±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 XR60 Router on page 23.
- White (Pin 3 — Ignition Sense) — Semtech recommends connecting the white wire to the vehicle ignition to turn on the XR60 router (or wake from standby mode), or to turn off the XR60 router (or enter standby mode).

  Important: *To protect the XR60 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 38.

Vehicle Installation — Timer-Driven Activation

This method can be used in vehicle installations where the XR60 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 XR60 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*.

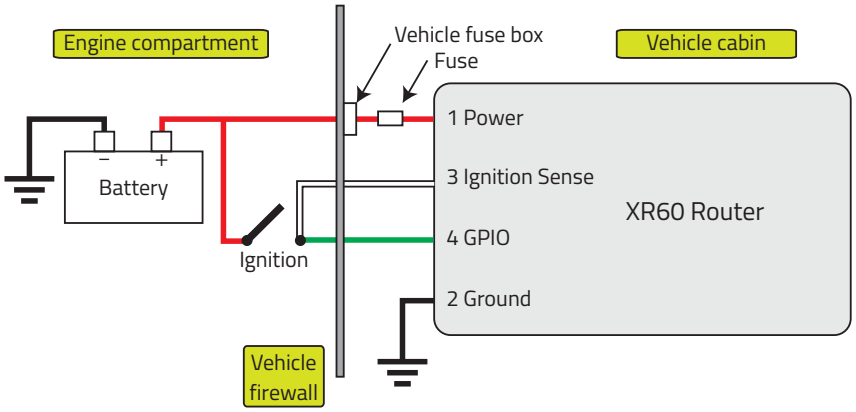


Figure 2-7: Vehicle Installation Wiring Diagram — Timer-driven Activation

Connect the DC cable's wires as follows:

- Red (Pin 1 — Power) — Connect to the power source. Include a 10 A, fast blow fuse, recommended to have no more than ±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 XR60 Router on page 23.
- White (Pin 3 — Ignition Sense) — Connect to the vehicle ignition to enable accurate ALMS Advanced Mobility Reporting (AMR) (e.g., trip reports) and improve the reliability of the GPS anti-jitter feature,

  and

  Disable ignition in the AirLink OS (System > MCU > Power Management) so the XR60 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 XR60 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.

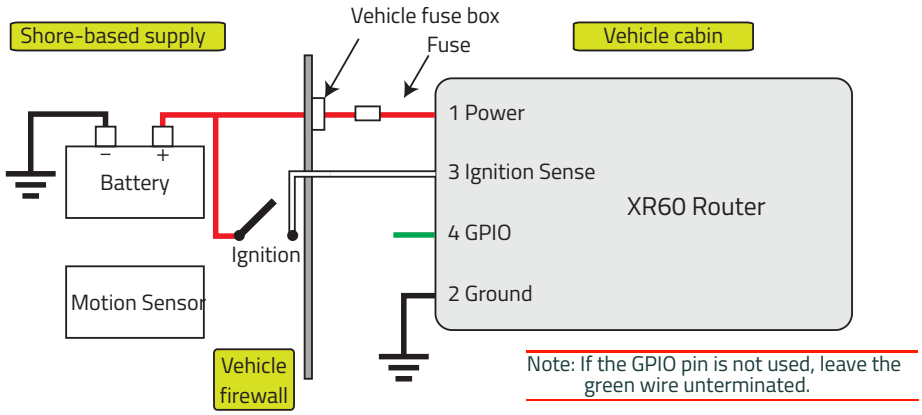


Figure 2-8: Vehicle Installation Wiring Diagram — Shore Power

Connect the DC cable's wires as follows:

- Red (Pin 1 — Power) — Connect to the power source. Include a 10 A, fast blow fuse, recommended to have no more than ±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 XR60 Router on page 23.
- 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) and improve reliability of the GPS anti-jitter feature,
  - Disable ignition in the AirLink OS (System > MCU > Power Management) so the XR60 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 38.

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 on page 30 and Fusing on page 31.

Table 2-3: Fixed Installation Wiring Methods Summary

Installation Method	Description
Fixed Installation — Recommended Basic Method on page 37	Fixed installation without I/O
Fixed Installation — I/O Input-Triggered Activation	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.

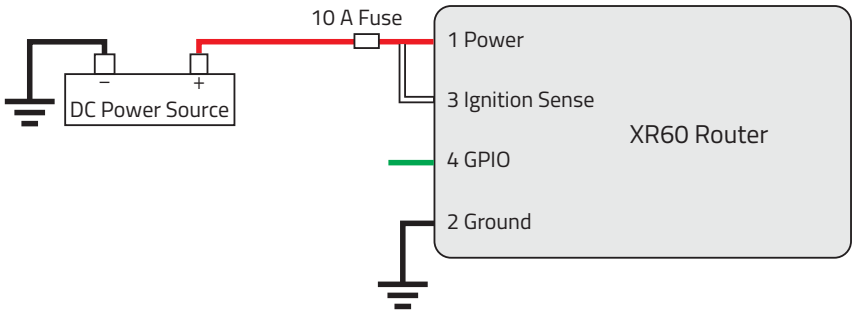


Figure 2-9: Fixed Installation Wiring Diagram — Basic Method (no I/O)

Connect the DC cable's wires as follows:

- Red (Pin 1 — Power) — Connect to the power source. Include a 10 A, fast blow fuse, recommended to have no more than ±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 XR60 Router Chassis on page 26.
- White (Pin 3 — Ignition Sense) — Tie to the red wire (Power) before the fuse (i.e., on the XR60 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 38.

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 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.

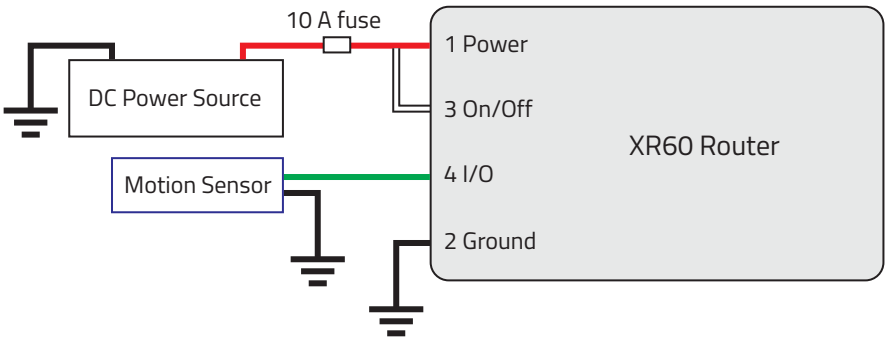


Figure 2-10: Fixed Installation with I/O

- Red (Pin 1 — Power) — Connect to the power source. Include a 10 A, fast blow fuse, recommended to have no more than ±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 XR60 Router Chassis on page 26.
- White (Pin 3 — Ignition Sense) — Tie to the red wire (Power) before the fuse (i.e., on the XR60 router side of the fuse).
- Green (Pin 4 — GPIO) — Connect this wire for I/O configurations. See I/O Configuration on page 38.

I/O Configuration

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

- Digital Input on page 39
- High Side Pull-up / Dry Contact Switch Input on page 40
- Analog Input on page 40
- Low Side Current Sink Output on page 42
- Digital Output/Open Drain on page 42

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 XR60 router for a configured length of time.

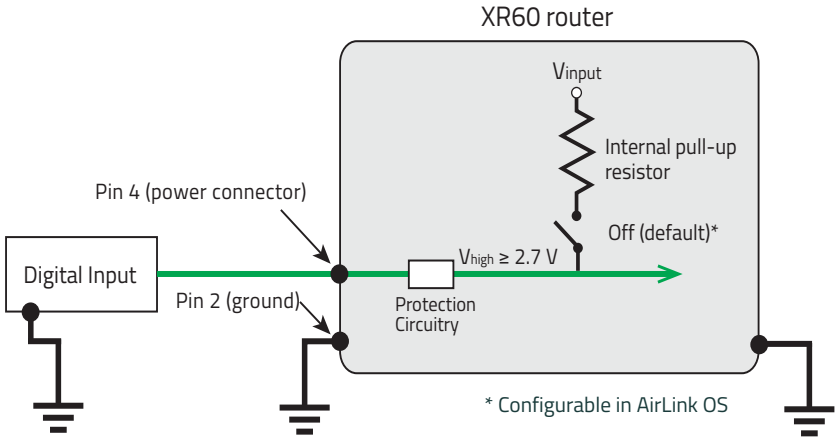


Figure 2-11: Digital Input

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.

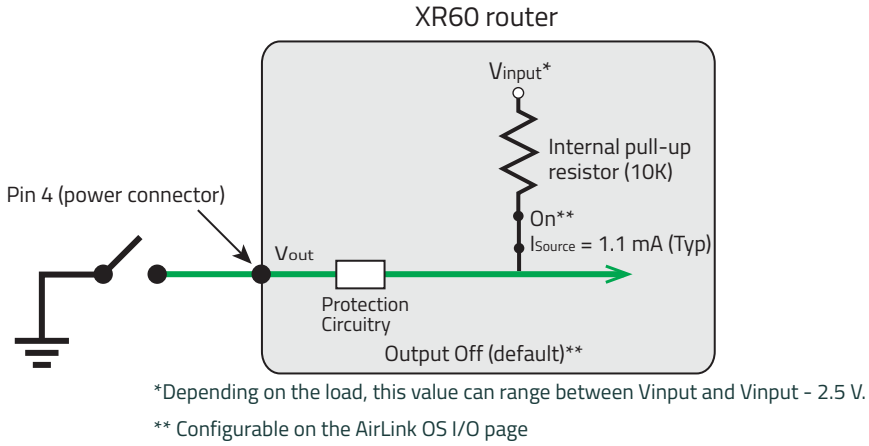


Figure 2-12: High Side Pull-up / Dry Contact Switch Input

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

	Minimum	Typical	Maximum	Units	Comments
Source Current	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})
V_{out}	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).

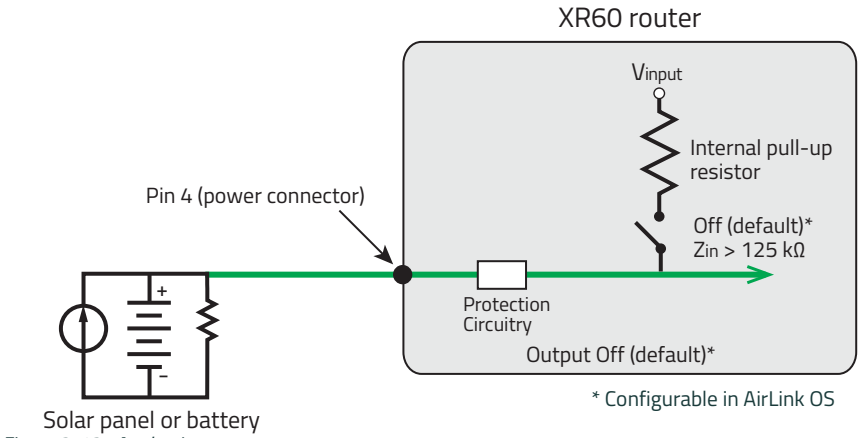


Figure 2-13: Analog Input

Table 2-6: Analog Input Specifications

Pull-up	Specification	Min	Typ	Max	Units	Comments
Off	Input range	0	—	5 or 10 (configurable)	V	Input voltage will cap at the maximum (i.e., over-voltage will be limited to the maximum) The input range is configured in AirLink OS (System > I/O > Analog Inputs).
	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.

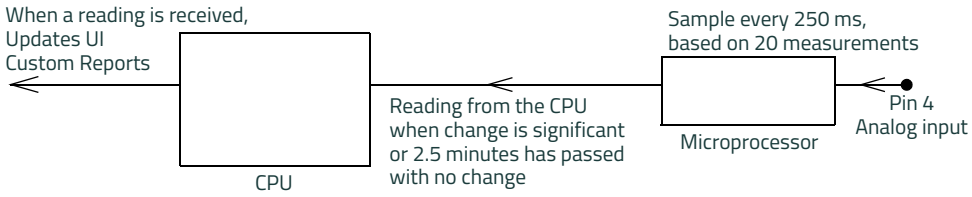
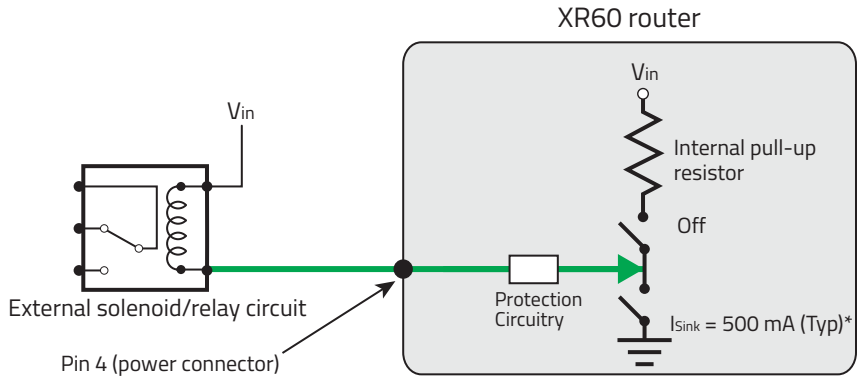


Figure 2-14: Analog Input Sampling and Reading

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 42 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	▪ Sink Current (I_{Sink}) ▪ The internal pull-up resistor is Off when the switch is in the On state.

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

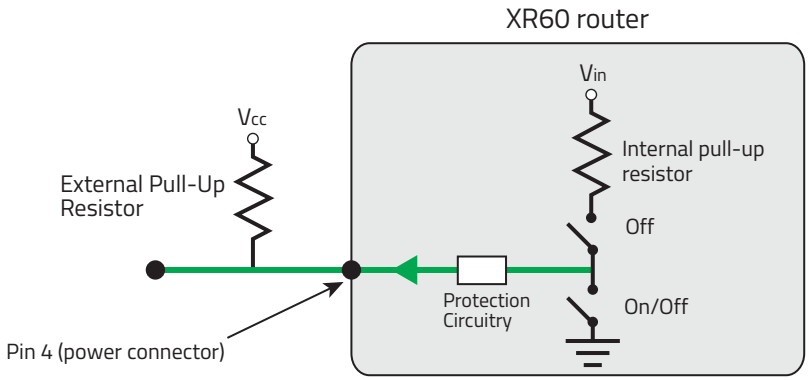


Figure 2-16: Digital Output / Open Drain

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 XR60 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 front panel DC power connector and plug the adapter into the power source (e.g., wall outlet).
   - Connect a USB-C power adapter (USB PD 2.0/3.0 compliant, 45 W minimum) to the front panel USB connector, and plug the adapter into the power source (e.g., electrical outlet).

   The router powers up in approximately 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 88.

   Note: The first time the XR60 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 XR60 Quick Start Guide.

2. If the router does not start automatically:
   a. Make sure:
      - The power source (DC cable, AC adapter, or USB-C power adapter) is plugged in and supplying sufficient voltage.
        (The XR60 router will boot in standby mode if the voltage is too low — see Operating Voltage on page 30 for details.)
      - Ignition Sense (Pin 3) is connected to the battery or power source (see Step 5 — Choose a Power Supply Type on page 30 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 49.)

3. Connect a test device (for example, a computer) to the LAN via:
   - Ethernet — Use any Ethernet port (Ethernet 1, 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 85.
4. Continue to Step 7 — Startup and Software Configuration on page 45.

Step 7 — Startup and Software Configuration

You can configure the AirLink OS software on the XR60 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 XR60 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 XR60 local interface takes between 1 and 2 minutes to respond after power has been applied.

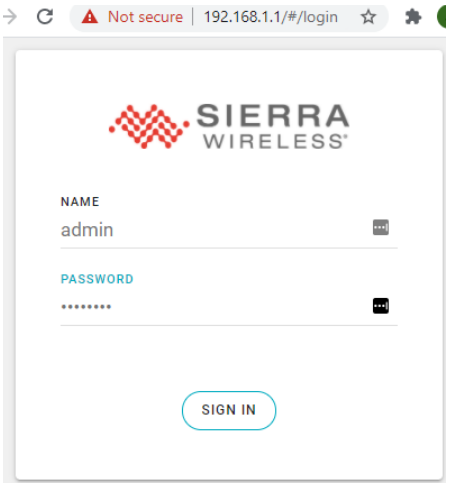


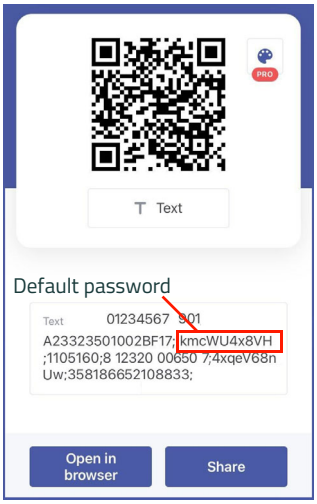
Figure 2-17: AirLink OS login window

3. Enter the default administrator NAME and PASSWORD and click SIGN IN.
   - NAME: *admin*
   - PASSWORD: *[printed on the XR60 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 XR60 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 precon-figuring your XR60 router.

To configure the XR60:

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 XR60 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 XR60 router the next time it connects to ALMS.

For help with ALMS, view the user guide at source.sierrawireless.com/airvantage/almsc/.

3: Router Reboot / Reset

Rebooting / Resetting the Router

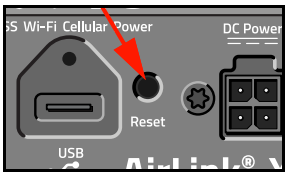
The XR60 router can be rebooted or reset using the following hardware and software methods:

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

Hard Reboot

To reboot the XR60 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 49.)

- 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 88.

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	Start of acquisition	< 25 seconds
	Tracking fix (cold start from power off)	< 60 seconds

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

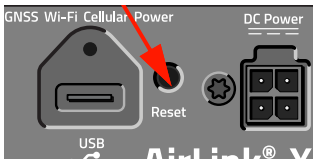
To define the Reset functionality:

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 XR60 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 XR60 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.
- XR60 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 XR60 router will do a normal hard reboot and no configurations will change.*

4: Specifications at a Glance

This chapter describes XR60 router specifications, RF band and Tx power specifications, Wi-Fi support, and mechanical specifications.

Certification and Interoperability

Table 4-1 lists certifications achieved for the XR60 router. For details, refer to source.sierrawireless.com/resources/airlink/certification_and_type_approval/xr_series_approvals/

Table 4-1: Certifications

Category	Certification
Emissions / Immunity	▪ FCC — For specific compliance details, see Important Information for Users in the United States on page 70. ▪ ISED Canada (IC) — For specific compliance details, see Important Information for Users in Canada on page 72. ▪ CE (Including EMC Test case for vehicle installation EN 301489) — For specific compliance details, see Important Information for Users in the European Union and the United Kingdom on page 75. ▪ RCM
Safety	▪ UL 62368-1 and CB Scheme ▪ UN ECE R118 Rev 2/03 ▪ CSA E60079-15 (CAN) ▪ IECEx — For specific compliance details, see IECEx Compliance on page 76. ▪ C1D2 (Class 1, Division 2, Groups A–D, and Class I, Zone 2, Groups IIC AEx ec IIC T4 Gc)
Industry Certification for Vehicles	▪ E-Mark (UN ECE Regulation 10.05), ISO7637-2, ISO16750 ▪ SAEJ1113-11 Level 4 (Shock & Vibration) ▪ MIL-STD-810H — For specific test details, see Environmental Testing on page 51.
Environmental Compliance	▪ RoHS 2011/65/EU (RoHS 2) ▪ WEEE — For specific compliance details, see WEEE Notice on page 77. ▪ REACH ▪ Prop 65 ▪ Halogen-free PCB
GSM / UMTS Certifications	▪ PTCRB ▪ GCF ▪ RED
Rail Usage	▪ EN 50155 / EN 45545-2 (Rolling Stock)

Reliability Specifications

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

SKU	Model	Hours (Years)	Notes
1105099	**XR60 Dual Ethernet**	264010 hours (30.13 years)	▪ Ground Benign, 25°C ▪ MTBF calculations performed per Telcordia "Reliability Prediction Procedure for Electronic Equipment" document number SR-332, Method I, Issue 3
1105159	**XR60 Dual Ethernet, Wi-Fi**	245227 hours (27.99 years)	
1105160	**XR60 Serial, Ethernet**	283666 hours (32.38 years)	
1105161	**XR60 Serial, Ethernet, Wi-Fi**	262094 hours (29.91 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: 10 Hz–150 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, 10 times per axis) Operating mode: Powered on
MIL-STD-810H, Test methods 501.7, 502.7	Temperature	Rugged category: · Wi-Fi routers: -30°C to 70°C · Non-Wi-Fi routers: -40°C to 70°C 2-hour soak each temp high/low 3 cycles ramp <= 3°C/minute Operating mode: Powered on
MIL-STD-810H, Test methods 501.7, 502.7	Temperature	Rugged category: -40°C to 85°C 2-hour soak each temp high/low 50 cycles ramp <= 3°C/minute Operating mode: Unpowered
MIL-STD-810H, Test method 507.6	Humidity	10 × 48-hour cycles: · 4-hour ramp to 60°C (95% humidity), hold 8 hours · 4-hour ramp down to 30°C (85% to 95% relative humidity), hold 21 hours · 1-hour ramp down to 20°C, hold 4 hours · 1-hour ramp up to 30°C, hold 5 hours Operating mode: Powered on

Table 4-3: Environmental Testing Methods (Continued)

Test Method	Category	Description
IEC 60529	Ingress Protection (IP64 testing)	Dust Resistance — Subject to circulating and suspended talcum powder in negative pressure environment for 2 hours. Water Resistance — Subject to spraying water. Water sprayed at an angle up to 60° on either side of the vertical for 10 minutes. Operating mode: Unpowered
IEC 61000-4-2	Electrostatic Discharge	+/-8 kV (Contact), +/-15 kV (Air) Operating mode: Powered on
IEC 60068-2-32	Free Fall Test	1 m drop height 6 drops onto concrete, 2 per axis: X, Y, Z Operating mode: Unpowered
IEC 60068-2-70 Part 2, Test Xb	Marking	The markings are rubbed with water for 10 cycles, then with lubricating oil for 10 cycles. Operating mode: Unpowered
ISTA 2A 2001, test categories 1, 4, 5, & 6	Package	In shipping packaging. Cargo vibration and drop test.

Mobile Network Operator Certification

Note: Certifications listed below are achieved or pending.

Table 4-4: MNO Certifications

Carrier / MNO	Certification
AT&T	Completed
Bell	Pending
FirstNet 4G Capable	Completed
FirstNet Trusted with 5G Support	Completed
Rogers	Pending
Telstra	Pending
Telus	Pending
T-Mobile	Completed
T-Mobile T-Priority	Completed
Verizon	Completed
Verizon Frontline Network Slice	Completed
Verizon Frontline Verified	Completed

Host Interfaces

Table 4-5: Host Interfaces

Antennas

Antenna connectors

SKU	XR60 Variant	Cellular	Wi-Fi	GNSS
1105099	**XR60 Dual Ethernet**	4 SMA		1 SMA
1105159	**XR60 Dual Ethernet, Wi-Fi**		2 RP-SMA	
1105160	**XR60 Serial, Ethernet**			
1105161	**XR60 Serial, Ethernet, Wi-Fi**		2 RP-SMA	

- Torque specification: Finger tight (5 – 7 in-lb) is sufficient. Max torque should not exceed 1.1 N-m (10 in-lb).

Antenna cabling

- Avoid tight bends
- VSWR < 2.5 and 50 Ω for all frequencies listed below:

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	
		5150–5835	Not supported in Canada: ▪ 5150–5350 MHz ▪ 5600–5650 MHz
GNSS	CS29 FR	1164–1189	
		1559–1610	

Antenna gain

- See Important Information for Users in the United States on page 70 and Important Information for Users in Canada on page 72.

Table 4-5: Host Interfaces (Continued)

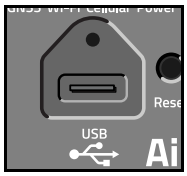
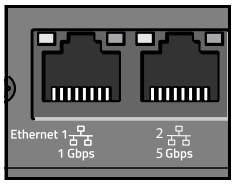
USB 	*Note: Do not use the USB ports in a potentially explosive environment.* ▪ USB 3.1 Type C (female) port, complies with USB Version 3.1 specification. A USB 3.1-compliant Type C cable must be used to ensure correct operation. ▪ Supported USB-C connector types: Regular; Locking (i.e., with integrated thumbscrew) *Figure 4-1: USB Type C Connectors (Locking and Regular)* ▪ The USB port may be used for one of the following purposes (not both simultaneously): · Connection for USB-C power supply: · Power input — 15 V/20 V (Note — The router will not operate with 5 V/9 V power input.) · Power supply must be USB PD 2.0/3.0 compliant, 45 W minimum. · Client or Host connection, software-selectable (Default: Client mode): · Client mode — USB virtual Ethernet connection (LAN only). The XR60 behaves as if the computer were connected to an Ethernet port, allowing access to the Internet and the XR60'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. · Host mode (Future) Power output (Host mode) — 7.5 W (5 V @ 1.5 A) **Note —** USB-C adapters are not supported on the router interface due to driver requirements. **Note —** The USB host does not support firmware updates over USB, or connection to Bluetooth or modem. · For information about setting the USB mode and configuring a USB connection, refer to *[2] AirLink OS User Guide*. ▪ On Windows computers, a driver must be loaded to use the network connection — see Windows on page 85.

Table 4-5: Host Interfaces (Continued)

Ethernet



- RJ45 Ethernet ports

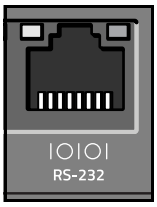
XR60 Variant	Ethernet 1	Ethernet 2
XR60 Dual Ethernet	1 Gbps[a] (10/100/1000 Base-T)	5 Gbps[a] (100/1000/2500/5GBASE-T)
XR60 Dual Ethernet, Wi-Fi		
XR60 Serial, Ethernet		—
XR60 Serial, Ethernet, Wi-Fi		

a. IEEE 802.3 Ethernet specification

- Cable requirements:
  - Maximum cable length for any port and cable type: 100 m
  - Cable lengths:
    - Ethernet 1 (1 Gbps)
      - < 100 m (unshielded Cat 5e)
    - Ethernet 2 (5 Gbps):
      - Bundled cables — < 20 m (Cat 5e); 20–100 m (Cat 6A)
      - Unbundled cables — < 75 m (Cat 5e); 75–100 m (Cat 6)
- Auto-crossover support
- Configurable link speeds and duplex settings through AirLink OS.
- Auto-negotiation detects the speed of the connecting device
- Unused ports can be individually turned ON/OFF to reduce power consumption.

Table 4-5: Host Interfaces (Continued)

Serial Port

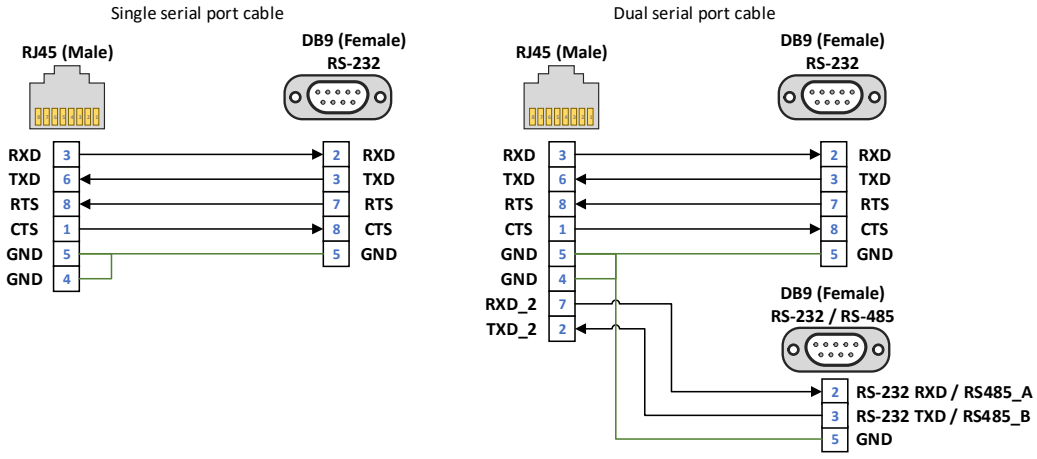


RJ45 (8-pin) connector provides 1×4-wire RS-232 serial port and 1×2-wire serial port (RS-232 or RS-485)

RJ45 Connector Pinout (DCE)

Name	Pin	Description	Type
CTS	1	Clear To Send (4-wire port)	OUT
TXD_2	2	(RS-232) Transmit Data 2 (2-wire port) / (RS-485) RS485_B	IN
RXD	3	Receive Data (4-wire port)	OUT
GND	4	Main GND. Connected internally to BOARD GND.	—
GND	5	Main GND. Connected internally to BOARD GND.	—
TXD	6	Transmit Data (4-wire port)	IN
RXD_2	7	(RS-232) Receive Data 2 (2-wire port) / (RS-485) RS485_A	OUT
RTS	8	Ready To Send (4-wire port)	IN

- 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 or RS-485) via dual serial cable (PN 6001409, RJ45 to dual DB9 female)



- Complies with the EIA RS-232D specification for DCE equipment
- Communication port settings (configurable through AirLink OS):

Setting	RS-232 (4-wire / 2-wire)	RS-485[a] (2-wire)
Enable / disable support	Always enabled	Configurable
Baud rate	4800-230400 bps	4800-230400 bps *or* 256 kbps
Parity	None / Odd / Even	
Data bits	7 / 8	
Stop bits	1 / 2	
Flow control	None / HW / SW	—
Termination resistor	—	Disable / Enable

a. RS485_A (non-inverting), RS485_B (inverting)

SIM Card Interface

The XR60 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 XR60 provides one configurable GPIO on the DC Power connector (Pin 4)

For details, including suggested uses, see I/O Configuration on page 38.

LEDs

The XR60 router includes four status LEDs:
- GNSS
- Wi-Fi
- Cellular
- Power

For details, see LEDs on page 88.

Reset

The XR60 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 48.

Power Supplies

Power Adapter

The XR60 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

Note: When connecting the router to a DC or AC supply, do not reuse DC power cables or AC adapters from other AirLink routers (typically cables with black or blue connectors and black housings). The XR60 requires the higher-power DC Power Cable (Red Connector) or DC Power Cable (Red Connector).

Power Supply Options

The XR60 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 (Red Connector))
  - AC adapter (see AC Power Adapter (Red Connector))
- USB-C power adapter (USB PD 2.0/3.0 compliant, 45 W minimum)

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 ($V_{input} < 4$ V), the router will not boot with DC power. 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 ($V_{standby} \leq V_{input} < 36$ V) — The router boots into normal operating mode.
  - If ($V_{input} > 36$ V) — The router turns off.

- If a 4-pin AC adapter (V_{input}) is present, the router boots with V_{input} as the supply.
- If only a USB-C adapter (V_{USB}) is present, the router boots with V_{USB} as the supply.

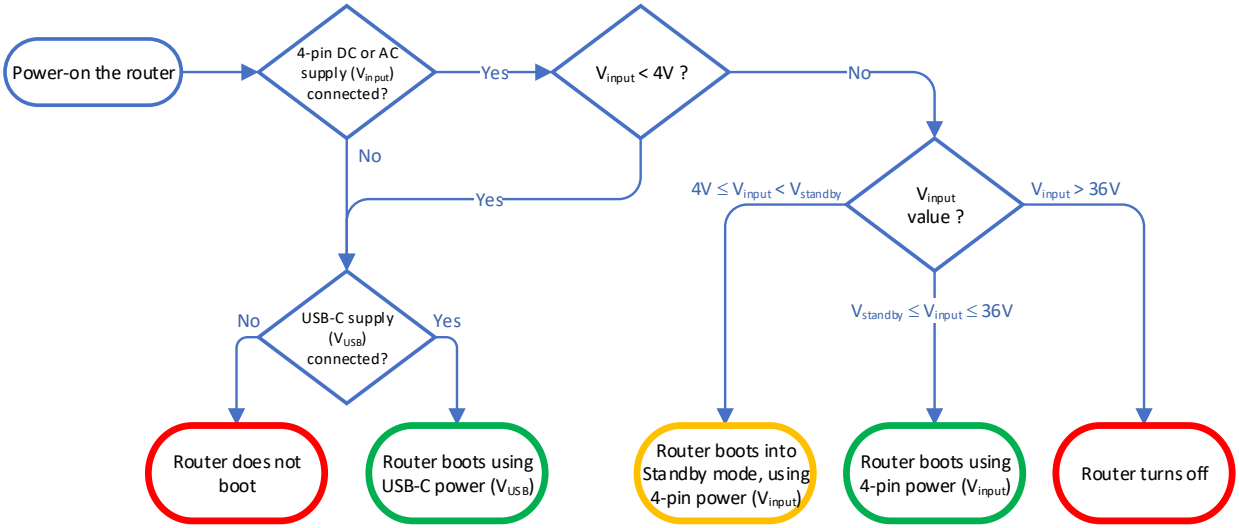


Figure 4-2: Power Source Determination and Router Behavior at Power-up

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 60):

- 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.

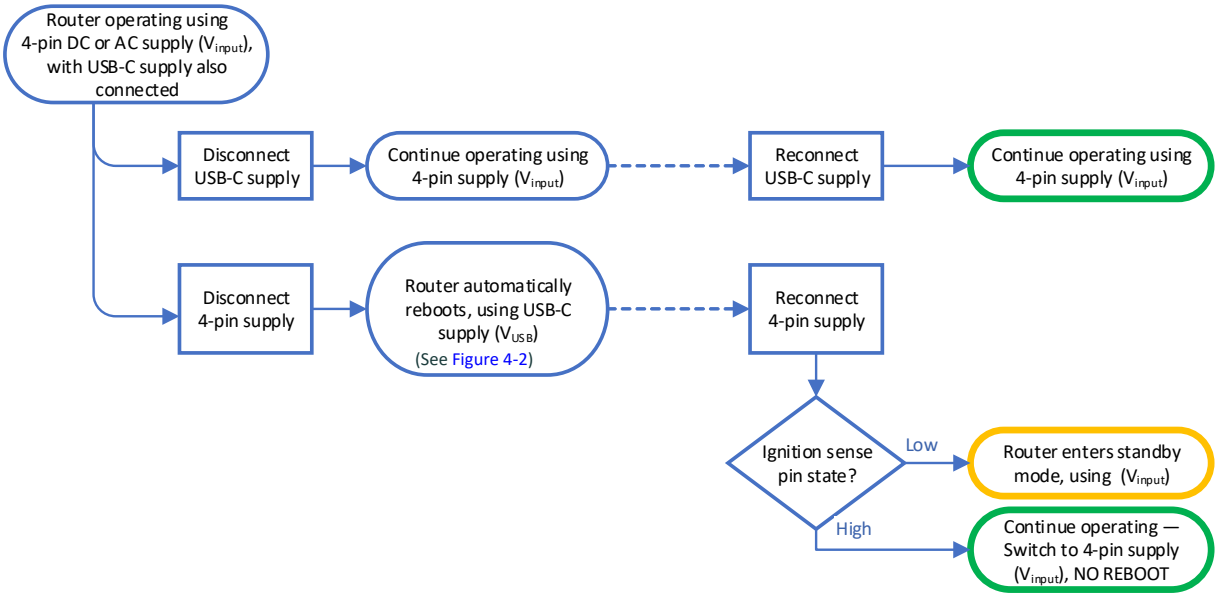


Figure 4-3: Router Behavior on Power Supply Disconnect/Reconnect

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: Scenario 2 (Class A, pulse not applicable to V_{input} pin)
    - Test Pulse 1: Scenario 3 (Class C)

  - Harness transient specifications:
    - Test Pulse 2a: Class A
    - Test Pulse 2b: Scenario 2 (Class A, pulse not applicable to V_{input} pin)
    - Test Pulse 2b: Scenario 3 (Class C)
    - Test Pulse 3a+b: Class A
- 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 5): Class C
  - Reverse voltage — Paragraph 4.7: Class C
- Tolerates +200 V/-600 V spikes
- Uninterrupted operation during brownouts down to 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) 40 channel GNSS Active antenna support
Constellations	GNSS constellations: ▪ GPS (L1C/A & L5C) ▪ GLONASS (L1OF) ▪ BeiDou (B1I & B2a) ▪ Galileo (E1 & E5a) ▪ QZSS (Quasi-Zenith Satellite System) ▪ IRNSS-ready (with dedicated firmware) Augmentation systems: ▪ DGPS (Differential GPS) via SBAS (Satellite Based Augmentation System)
Protocols	Streamable NMEA 0183 V4.11 and TAIP output
Acquisition time[a] (Time to first fix)	Hot start: <3.5 seconds Warm start: <27.0 seconds Cold start: <44.0 seconds
Sensitivity	Tracking[b]: -162 dBm Acquisition[c] (Cold start): -148 dBm
Accuracy	Horizontal position accuracy (CEP50%, 24h static, antenna mounted above roof): <0.8 m
Operational ITAR limits	Altitude <18000 m (59,055 ft), or Velocity <515 m/s (1001 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 = -130 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
	Note: Bias voltage on the GNSS port is nominally 3.15 V and current is limited to 300 mA.			

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)
  - 5 Gbps Ethernet on RJ45 (Ethernet 2 port)
  - Serial RS-232 on RJ45 (2 ports)
  - USB 3.1 on USB-C port (female)
- Compatibility
  - Supports Wi-Fi certified devices
  - Supports major operating systems

Security

The XR60 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 is off by default. Enable/disable and configure the XR60 Wi-Fi interfaces in AirLink OS (Hardware Interfaces > Wi-Fi Interfaces > Configuration).

Note: An issue exists where the XR60 Wi-Fi client cannot connect to a hidden SSID. Ensure that any SSIDs to which you want the router to connect are visible to the router.

- Security and authentication support:

Protocol	Access Point	Client
WPA2 Personal	Y	Y
WPA3 Personal	Y	Y
WPA2/3 Transitional	Y	Y
WPA2 Enterprise	Y	Y

- Wi-Fi 6 configurations:
  - Configurable as AP only, client only, or AP and Wi-Fi client concurrently
  - Simultaneous 2x2 MIMO (2.4 GHz) + 2x2 MIMO (5 GHz)
- Access points:
  - 3 SSIDs 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	Y	Y
Wi-Fi AP 2.4GHz	Y	—
Wi-Fi AP 5GHz	–	Y

  - Client connections — Number of supported simultaneous client connections depends on the number of enabled SSIDs:

Number of Enabled SSIDs	Max clients across all enabled SSIDs
1	32
2–3	29[a]

a.When 2 or 3 SSIDs are enabled, the total number of clients connected across the 2–3 SSIDs is 29. (e.g., 29 on SSID1 and 0 on SSID2; 16 on SSID1. 2 on SSID2 and 11 on SSID3, etc.)

- Wi-Fi channel support:
  - Supported bands: 2.4 GHz, 5 GHz
  - The XR60 supports the 2.4 GHz / 5 GHz Wi-Fi channels listed in Table 4-10.

Important: *Note that 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 XR60 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)

- Client and AP modes both enabled — Not supported

Table 4-10: 2.4 GHz / 5 GHz Wi-Fi Channel Support[a] for non-Geolocated and Geolocated[b] Routers

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

a. Wi-Fi channels available for use in AirLink OS 4.0.17
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. 5 GHz Wi-Fi is supported only when geolocated.
d. 40 MHz is available if both 20 MHz channels are available; 80 MHz is available if both 40 MHz channels are available.
e. 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.
f. Wi-Fi channel 116 width is limited to 20MHz in Australia.

Table 4-11: Geolocation Support[a]

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

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. 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[a]

Technology	Band	MIMO	Channel Width		
			20 MHz	40 MHz	80 MHz
Wi-Fi 6	2.4GHz	2 × 2	300 Mbps	600 Mbps	—
	5 GHz	2 × 2	300 Mbps	600 Mbps	1200 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) 2Tx
2.4 GHz	802.11ax	20 MHz	MCS0	21
5 GHz	802.11ax	20 MHz	MCS0	19
Receiver				
Band	**Technology**	**Bandwidth**	**Modulation**	**TIS (dBm / chain) Typical**
2.4 GHz	802.11ax	20 MHz	MCS0	-93
5 GHz	802.11ax	20 MHz	MCS0	-90

Cellular

Network Technology / Radio Frequency Bands

The XR60 supports 5G Sub-6G, LTE, and HSPA+.

Use the following tables as a guide to the radio frequencies and transmit power supported by the XR60 radio module.

Table 4-14: EM9291 Supported Frequency Bands

Band #	5G	4G LTE	3G
1	n1	B1	B1
2	n2	B2	B2
3	n3	B3	—
4	—	B4	B4
5	n5	B5	B5
7	n7	B7	—
8	n8	B8	B8
12	n12	B12	—
13	n13	B13	—
14	n14	B14	—
17	—	B17	—
18	n18	B18	—
19	—	B19	B19
20	n20	B20	—
25	n25	B25	—
26	n26	B26	—
28	n28	B28	—
29	n29[a]	B29[b]	—
30	n30	B30[b]	—
32	—	B32[b]	—
34	—	B34	—
38	n38	B38	—
39	—	B39	—
40	n40	B40	—
41	n41	B41	—
42	—	B42	—
43	—	B43	—
46	—	B46[b]	—
48	n48	B48	—
66	n66	B66	—
70	n70	—	—
71	n71	B71	—
75	n75[a]	—	—
76	n76[a]	—	—
77	n77	—	—
78	n78	—	—
79	n79	—	—

a. SA downlink only
b. Downlink only

Table 4-15: EM9291 Conducted Maximum Tx Power Tolerances[a]

Bands	Conducted Tx Power[b,c]	Notes
5G		
n1, n2, n3, n5, n7, n8, n12, n13, n14, n18, n20, n25, n26, n28, n30, n38, n40, n48, n66, n70, n71	+24 dBm +1.5/-2.0 dB	Power Class 3
n41, n77, n78, n79	+24 dBm +1.5/-2.0 dB	Power Class 3 operation only on Japanese carriers and some private networks (MC440, MC441, MCC999)
	+26 dBm +1.5/-2.0 dB	Power Class 2 (HPUE) operation, excluding Japanese carriers and some private networks (MCC440, MCC441, MCC999)
LTE		
B41 HPUE (B41C, B41D) B42 HPUE B43 HPUE	+25 dBm ± 1.0 dB	▪ Power Class 2 (HPUE) in LTE-only mode *Note: For B41 ULCA combinations, only B41C and B41D support power class 2. All other B41 ULCA combinations are power class 3.* ▪ Power Class 3 in NSA mode (i.e, when the band is part of an ENDC combination)
B41	+23 dBm ± 1.0 dB	Power Class 3 *Note: B41C and B41D ULCA combinations are power class 2 (see the row above). All other B41 ULCA combinations are power class 3.*
B2, B4, B5, B13, B66	+23.5 dBm ± 1.0 dB	Power Class 3 Max Power provides additional margin for Verizon Lab Conformance testing.
All other LTE bands	+23 dBm ± 1.0 dB	Power Class 3
UMTS		
All UMTS bands (12.2 kbps)	+23.5 dBm ± 1 dB	Power Class 3

a. Source: *[1] EM92XX Product Technical Specification (rev 1)*, Table 4-10
b. 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.
c. For EN-DC and 5G NR UL CA, the maximum power is the maximum of the component carriers (i.e., CC1 and CC2). For example, if CC1 is power class 3 and CC2 is power class 2, the maximum will be power class 2.

Carrier Aggregation

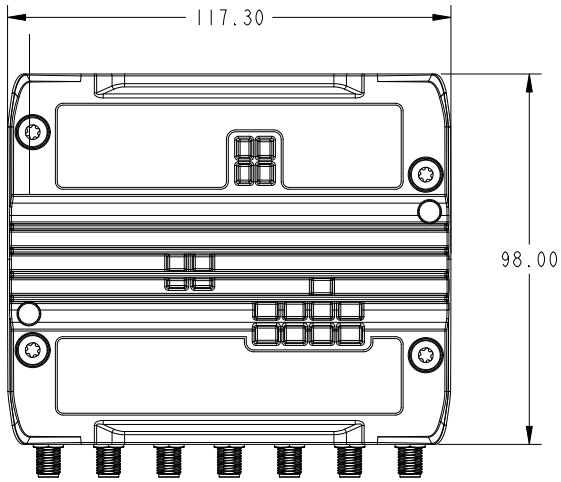
The XR60 router's radio module (EM9291) supports the following carrier aggregation types:

- LTE Advanced:
  - DLCA (downlink carrier aggregation) — Up to 5CC intra-band and inter-band CA components
  - ULCA (uplink carrier aggregation) — 2CC intra-band contiguous/non-contiguous CA, and inter-band CA (low band and mid-high band combinations)
- 5G NR Sub-6G DLCA (downlink carrier aggregation)

For comprehensive details, refer to *[1] EM92XX Product Technical Specification and [7] EM9 Carrier Aggregations and EN-DC (Doc# 2174317)*.

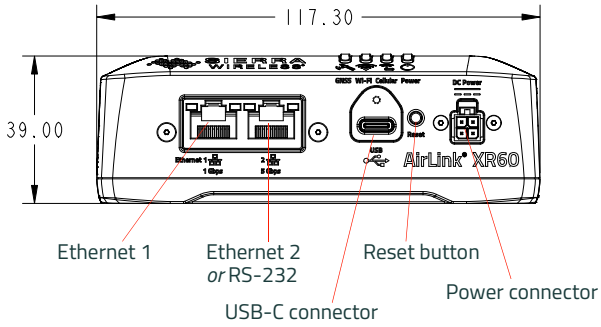
Mechanical Specifications

- Housing — The XR60 router is made of ruggedized powder-coated aluminum and is recyclable where facilities exist.
- RoHS — The XR60 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.

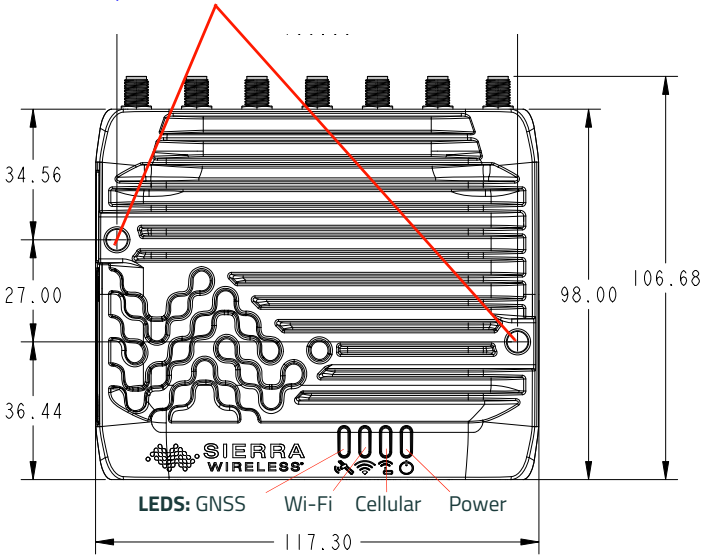


Bottom view

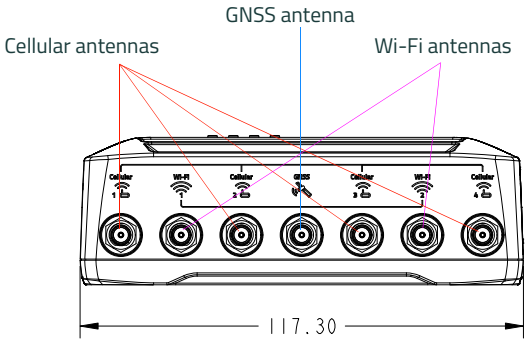
Mounting holes (∅ 5.5 mm; M5 screws recommended) are deep.
Screw length (Min: 35 mm; Typ: 40 mm) depends on the mounting surface material.
See Screw Specifications for details.



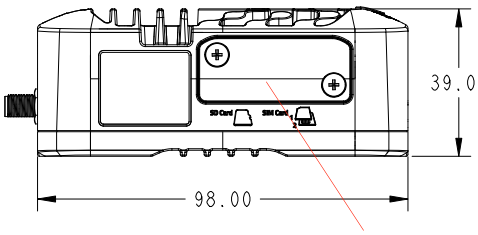
Front view



Top view



Back view



Side view

*** Wi-Fi model shown**

Figure 4-4: XR60 Router Mechanical Specifications

Temperature Specifications

Ambient operating temperature:

- Wi-Fi XR60 routers: -30°C to 70°C
- Non-Wi-Fi XR60 routers: -40°C to 75°C

Screw Specifications

- SIM cover captive screws (M3X6; Phillips head ⊕) — 6±0.75 kgf/cm (5.2±0.65 in lbf; 0.59±0.07 Nm)
- DIN rail mount screws: 1.1 Nm (9.74 in-lb; 11.22 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 (~17.4 in-lb; 1.96 Nm)

5: Regulatory Information

This chapter describes required details for specific certifications. For a general list of certifications, see Table 4-1 on page 50.

Important Information for Users in the United States

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Antennas listed at www.sierrawireless.com/router-solutions/antennas/ have been designed for use with the XR60 platform. Antennas of the same types within the defined gain limits may be used with the XR60.

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)
WCDMA Band 2	1850–1910	24.50	7.50	32.00
WCDMA Band 4	1710–1755	24.50	4.50	29.00
WCDMA Band 5	824–849	24.50	8.00	32.50
LTE B2	1850–1910	24.50	7.50	32.00
LTE B4	1710–1755	24.50	4.50	29.00
LTE B5	824–849	24.50	8.00	32.50
LTE B7	2500–2570	24.00	5.50	29.50
LTE B12	699–716	24.00	7.50	31.50
LTE B13	777–787	24.50	8.00	32.50
LTE B14	788–798	24.00	8.00	32.00
LTE B17	704–716	24.00	8.00	32.00

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 B25	1850–1915	24.00	7.50	31.50
LTE B26	814–849	24.00	8.00	32.00
LTE B41_PC3	2496–2690	24.00	5.50	29.50
LTE B41_PC2	2496–2690	26.00	5.50	31.50
LTE B42_PC3	3450–3550	24.00	4.00	28.00
LTE B42_PC2	3450–3550	26.00	4.00	30.00
LTE B48	3550–3700	24.00	-2.50	21.50
LTE B66	1710–1780	24.50	4.50	29.00
LTE B71	663–698	24.00	7.50	31.50
5G NR n2	1850–1910	25.50	7.50	33.00
5G NR n5	824–849	25.50	7.50	33.00
5G NR n7	2500–2570	25.50	5.50	31.00
5G NR n12	699–716	25.50	7.50	33.00
5G NR n13	777–787	25.50	8.00	33.50
5G NR n14	788–798	25.50	8.00	33.50
5G NR n25	1850–1915	25.50	7.50	33.00
5G NR n26	814–849	25.50	8.00	33.50
5G NR n30	2305–2315	25.50	-1.50	24.00
5G NR n41_PC3	2496–2690	25.50	5.50	31.00
5G NR n41_PC2	2496–2690	27.50	5.50	33.00
5G NR n48	3550–3700	25.50	-2.50	23.00
5G NR n66	1710–1780	25.50	4.50	30.00
5G NR n70	1695–1710	25.50	4.50	30.00
5G NR n71	663–698	25.50	7.50	33.00
5G NR n77_PC3	3450–3550	25.50	2.50	28.00
5G NR n77_PC2	3450–3550	27.50	2.50	30.00
5G NR n78_PC3	3450–3550	25.50	2.50	28.00
5G NR n78_PC2	3450–3550	27.50	2.50	30.00
WLAN 2.4 GHz	2400–2500	20.00	5.0	25.00
WLAN 5 GHz	5150–5850	20.00	5.0	25.00

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 6 GHz	5925–7125	20.00	5.0	25.00
Bluetooth[a]	2400–2500	15.00	5.0	20.00

a. Bluetooth is not available for Brazil / Anatel.

Important Information for Users in Canada

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/ have been designed for use with the XR60 platform. Antennas of the same types within the defined gain limits may be used with the XR60.

To ensure that the XR60 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)
WCDMA Band 2	1850–1910	24.5	7.00	31.50
WCDMA Band 4	1710–1755	24.5	4.50	29.00
WCDMA Band 5	824–849	24.5	4.50	29.00
LTE B2	1850–1910	24.00	7.00	31.00
LTE B4	1710–1755	24.00	4.50	28.50
LTE B5	824–849	24.00	4.50	28.50
LTE B7	2500–2570	24.0	5.50	29.50
LTE B12	699–716	24.0	4.00	28.00
LTE B13	777–787	24.0	4.50	28.50
LTE B14	788–798	24.0	4.50	28.50
LTE B17	704–716	24.0	5.00	29.00
LTE B25	1850–1915	24.0	7.00	31.00
LTE B26	814–849	24.0	4.50	28.50
LTE B41_PC3	2500–2690	24.0	5.50	29.50
LTE B41_PC2	2500–2690	26.0	5.50	31.50
LTE B42_PC3	3450–3600	24.0	4.00	28.00
LTE B42_PC2	3450–3600	26.0	4.00	30.00
LTE B43_PC3	3600–3800	24.0	4.00	28.00
LTE B43_PC2	3600–3800	26.0	4.00	30.00
LTE B48	3550–3700	24.0	4.50	28.50
LTE B66	1710–1780	24.0	4.50	28.50
LTE B71	663–698	24.0	4.00	28.00
5G NR n2	1850–1910	25.5	7.00	32.50
5G NR n5	824–849	25.5	4.00	29.50
5G NR n7	2500–2570	25.5	5.50	31.00
5G NR n12	699–716	25.5	4.00	29.5
5G NR n13	777–787	25.5	4.50	30.00
5G NR n14	788–798	25.5	4.50	30.00
5G NR n25	1850–1915	25.5	7.00	32.50

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 n26	814–849	25.5	4.50	30.00
5G NR n30	2305–2315	25.5	-1.50	24.0
5G NR n41_PC3	2500–2690	25.5	5.50	31.00
5G NR n41_PC2	2500–2690	27.5	5.50	33.00
5G NR n48	3550–3700	25.5	4.50	30.00
5G NR n66	1710–1780	25.5	4.50	30.00
5G NR n71	663–698	25.5	4.00	29.50
5G NR n77_PC3	3450–3980	25.5	2.50	28.00
5G NR n77_PC2	3450–3980	27.5	2.50	30.00
5G NR n78_PC3	3450–3800	25.5	2.50	28.00
5G NR n78_PC2	3450–3800	27.5	2.50	30.00
WLAN 2.4 GHz	2400–2500	20.00	5.0	25.00
WLAN 5 GHz	5150–5850	20.00	5.0	25.00
WLAN 6 GHz	5925–7125	20.00	5.0	25.00
Bluetooth[a]	2400–2500	15.00	5.0	20.00

a. Bluetooth is not available for Brazil / Anatel.

Wi-Fi Antenna Gain

The AirLink XR60 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[a]
	Min	Max	
2.4 GHz	0 dBi	3.5 dBi	PIFA
5 GHz	0 dBi	5.1 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 XR60 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 XR60 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/xr_series_ce_declaration_of_conformity/

The router displays the CE mark.

CE

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 XR60 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.*

Notice for Brazilian Users

Warning: *CISPR 22: This is a class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.*

Aviso: *CISPR 22: Este produto não é apropriado para uso em ambientes domésticos, pois poderá causar interferências eletromagnéticas que obrigam o usuário a tomar medidas necessárias para minimizar estas interferências.*

Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados

Para maiores informações, consulte o site da Anatel: www.gov.br/anatel/pt-br

IECEx Compliance

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.

This certification applies to the following Product SKUs:

- 1105099 Global Dual Ethernet
- 1105159 Global Dual Ethernet, Wi-Fi
- 1105160 Global Serial, Ethernet
- 1105161 Global Serial, Ethernet, Wi-Fi

XR60 SKUs contain FCC ID: N7NEM92

XR60 SKUs with Wi-Fi contain FCC ID: N6C-PCEAX

Applicable standards

- EN IEC 60079-0:2017, Edition 7.0
- IEC 60079-7:2017, Edition 5.1
- EN 60079-0:2018
- EN 60079-7:2015 +A1:2018
- Class 1 Zone 2: CSA E60079-15 (CAN)

- IECEx ETL 24.0009X
- ETL24ATEX0374X
- ETL24CA105592822X
- Ex ec IIC T4 Gc

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

Warning: *Do not separate when energized.*

WEEE Notice

If you purchased your AirLink XR60 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 XR60, 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 (λ) (mm)	Antenna Separation	
			Best (= 1/2 λ) (mm)	Good (= 1/4 λ) (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

Service	Frequency (MHz)	Wavelength (λ) (mm)	Antenna Separation	
			Best (= 1/2 λ) (mm)	Good (= 1/4 λ) (mm)
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 (λ) (mm)	Antenna Separation	
			Best (= 1/2 λ) (mm)	Good (= 1/4 λ) (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
WCDMA	850	353	176	88
	900	333	167	83
	1700	176	88	44
	1800	167	83	42
	1900	158	79	39
	2100	143	71	36

Service	Frequency (MHz)	Wavelength (λ) (mm)	Antenna Separation	
			Best (= 1/2 λ) (mm)	Good (= 1/4 λ) (mm)
LTE	2200	136	68	34
	2300	130	65	32
	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[a]	2.4GHz	125	63	32
	5.2GHz	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 (Red Connector)

Important: *When using DC power for the AirLink XR60 router, make sure to use the power cable specified below, which meets the power requirements of the XR60.*

Do not reuse older-model cables (black connector with black housing).

Table B-1: DC Power Cable

	Description
Part Number	6001502
Power connector housing	Black connector with red housing

Table B-2: DC Power Cable — Components

Component	Description
❶	1 UL2464 (18 AWG×2C + 22 AWG×2)+PVC (Outside mist) jacked cable
❷	1 Molex male 2×2P Ph: 3.0 mm housing, PA66 black, UL94V-0 (part number 43025-0408)
❸	Molex female crimp terminals, phosphor bronze tin plated ▪ 2x AWG 20-24, 250 V, 8.5 A Max (part number 43030-0001) ▪ 2x AWG 18, 250 V, 10.5 A Max (part number 203951-0001)

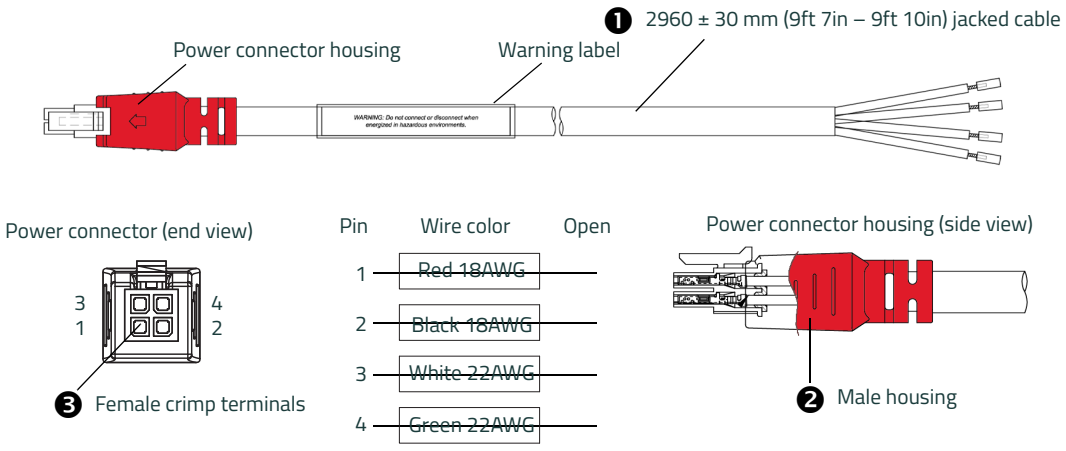


Figure B-1: DC Cable Specifications

AC Power Adapter (Red Connector)

Important: *When using an AC power adapter for the AirLink XR60 router, make sure to use the adapter cable specified below, which meets the power requirements of the XR60.*
Do not reuse *older-model cables (black connector with black housing).*

Table B-3: AC Power Adapter

	Description
Part Number	6001503
Power connector housing	Black connector with red housing

Table B-4: AC Power Adapter — Input Specifications

	Minimum	Typical	Maximum
Input Voltage	90 VAC	100–240 VAC	264 VAC
Input Frequency	47 Hz	50/60 Hz	63 Hz

Note: Input voltage range is 90 VAC to 264 VAC.
Maximum input current is 1.0 A at 100–240 VAC.
Inrush current will not exceed 100 A at 100–240 VAC input and maximum load from a cold start at 25 °C.
Standby input power should be less than 0.10 W with no-load.

Table B-5: AC Power Adapter — Output Specifications

	Minimum	Typical	Maximum	Test conditions
Output Voltage	23.8 VDC	24.0 VDC	26.4 VDC	0 A ~ 1.67 A loading

Table B-6: AC Power Adapter — Environmental Specifications

Specification	Description
Operating	
Operating Temperature	0 °C ~ 40 °C (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
Relative Humidity	10% ~ 90%
Altitude	Sea level to 2,000 meters
Vibration and Shock	MIL-STD-810D, method 514

Table B-7: AC Power Adapter — Reliability and Quality Control

	Description
MTBF	When the power supply is operating within the limits of this specification, the MTBF is at least 200,000 hours at 25°C (MIL-HDBK-217F). *Note: For router MTBF, see Reliability Specifications on page 51.*

Table B-8: AC Power Adapter — Safety Standards Certifications[a]

Regulatory Agency	Country or Region	Certified	Standard
UL	USA	Approved	UL62368
CUL	Canada	Approved	CSA C22.2 NO.62368
CE	Europe	Approved	EN 62368
SAA	Australia	Approved	AS/NZS 62368
UKCA	UK	Approved	BS EN 62368

a. The AC power adapter is certified with all listed international regulatory standards.

Table B-9: AC Power Adapter — EMC Standards

Standard	Description
EN 55032, FCC Part 15B Class B, BS EN 55032	The power supply meets the radiated and conducted emission requirements for EN 55032, FCC Part 15B Class B, BS EN 55032.

Table B-10: AC Power Adapter — Hazardous Substances Standards

Standard	Description
EU Directive 2011/65/EU "RoHS"	
EU Directive 2012/19/EU "WEEE"	
REACH	

Table B-11: AC Adapter — Energy Efficiency Compliance

Supplied Input	No-load power consumption	Average active mode efficiency	Complies with International Efficiency Level
115 VAC, 60 Hz	Less than 0.10 W	Greater than 87.59%	VI
230 VAC, 50 Hz	Less than 0.10 W	Greater than 87.59%	VI
Efficiency at 10% of rated output current: 78.60%			

Serial Port Adapter Cable — Single

Table B-12: Serial Port Adapter Cable — Single

	Description
Part Number	6001410
	RS-232 serial cable Connectors: RJ45 to single DB9 female

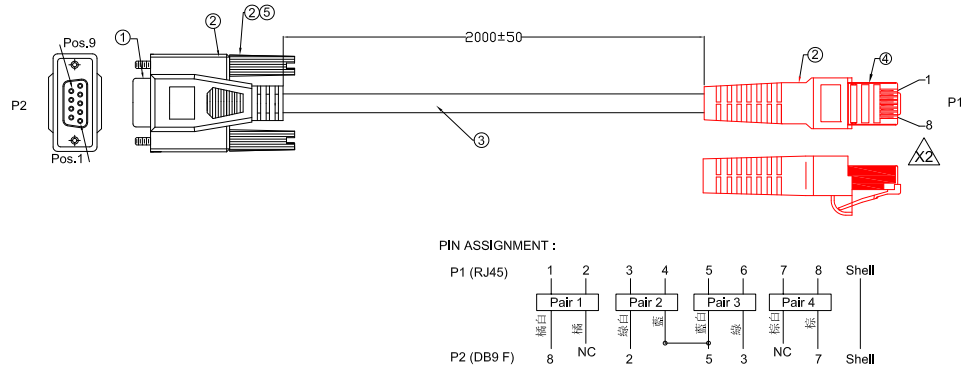


Figure B-2: Serial Port Adapter Cable — Single

Serial Port Adapter Cable — Dual

Table B-13: Serial Port Adapter Cable — Dual

	Description
Part Number	6001409
	RS-232/RS-485 serial cable Connectors: RJ45 to dual DB9 female (RS-232; RS-485)

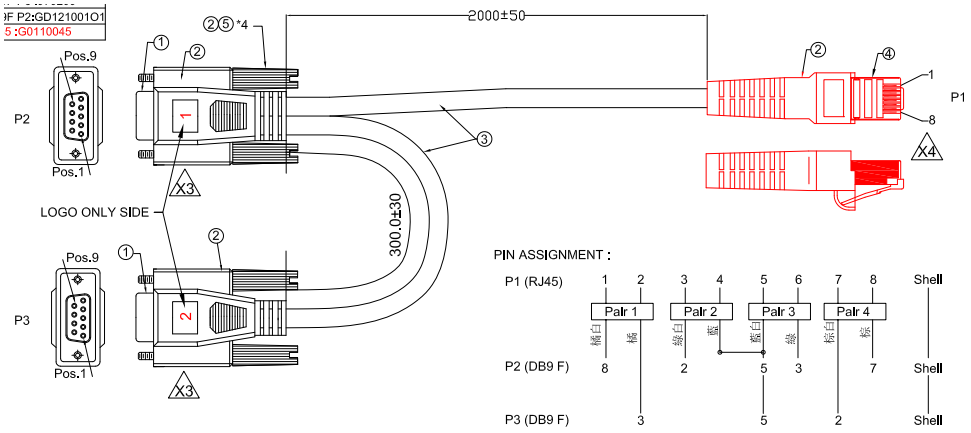


Figure B-3: Serial Port Adapter Cable — Dual

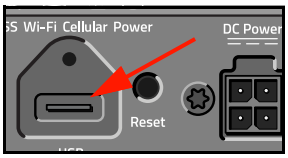
C: Thermal Protection

The XR60's maximum ambient operating temperature is 75°C.

If the ambient temperature rises above 75 °C, 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 XR60 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.

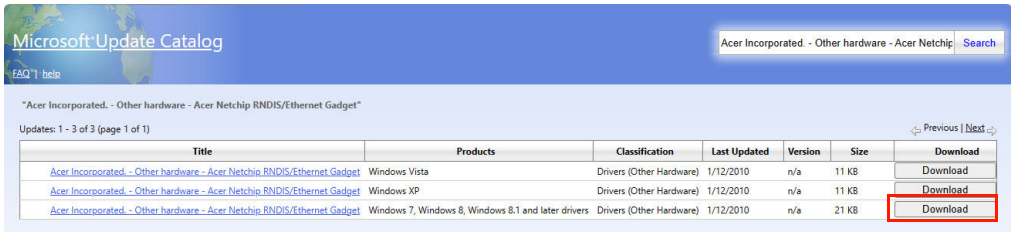


Note: In the examples below, the router is configured with the default LAN address 192.168.80.0/24 and IPv6 is enabled.

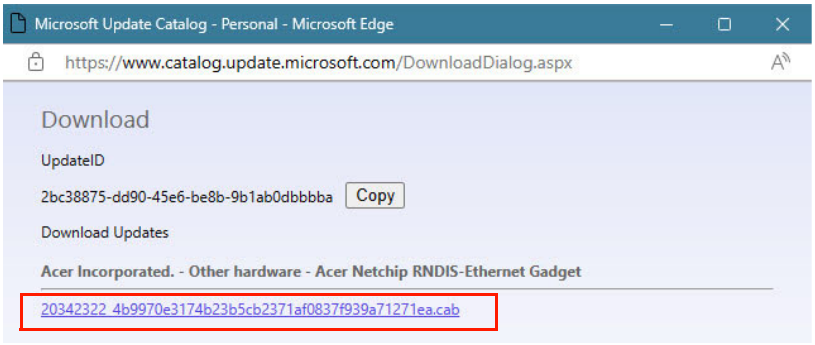
Windows

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/ and click Download for the Windows 8.1 and later package.



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.

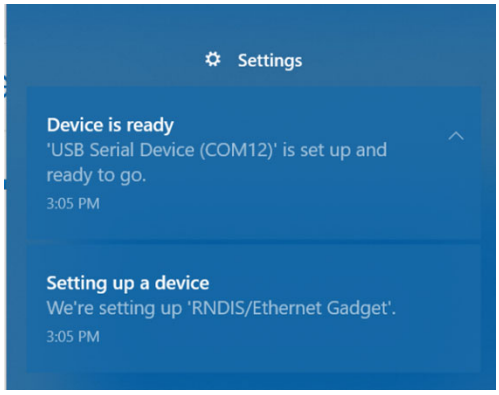


Figure D-1: USB-C Installation — Windows Setup Notifications (Windows 10 shown)

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.)

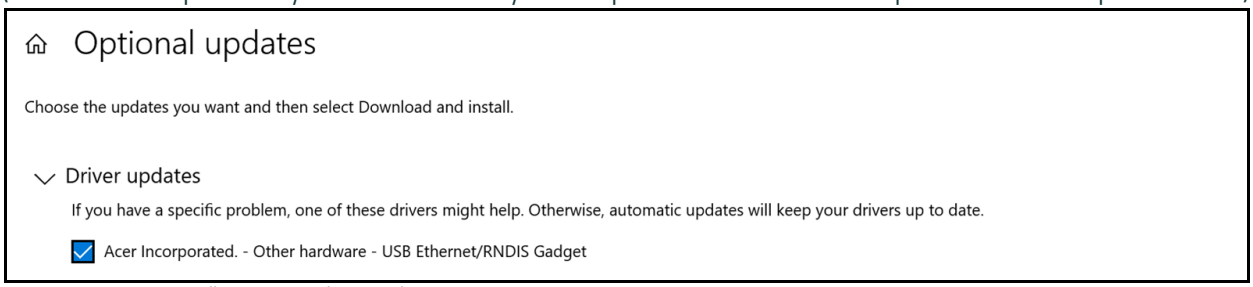


Figure D-2: USB-C Installation — Windows Update

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

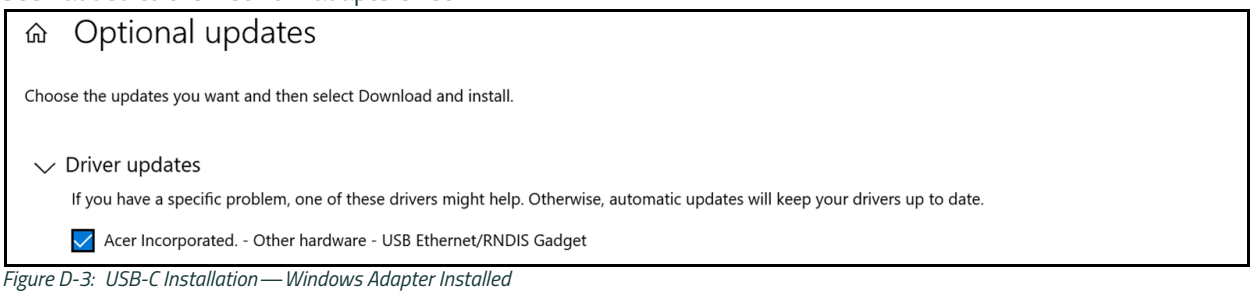


Figure D-3: USB-C Installation — Windows Adapter Installed

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

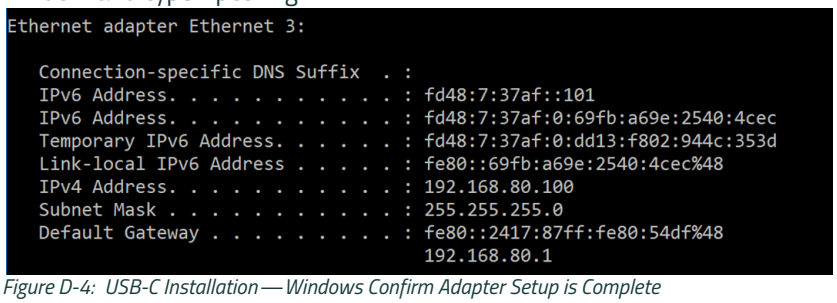


Figure D-4: USB-C Installation — Windows Confirm Adapter Setup is Complete

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.*

1. Make sure the macOS 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. In System Preferences, open the Network center and confirm the RNDIS/Ethernet Gadget appears and is connected.

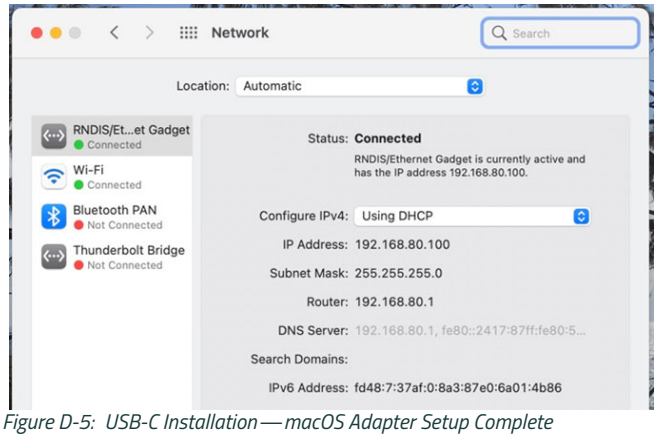


Figure D-5: USB-C Installation — macOS Adapter Setup Complete

E: LEDs

LED Behavior

Figure E-1: XR60 LEDs

LED Patterns

The XR60'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:

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

Table E-1: LED Behavior (Continued)

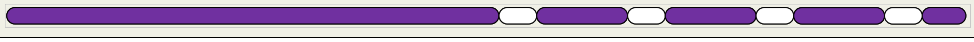
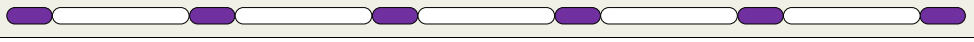
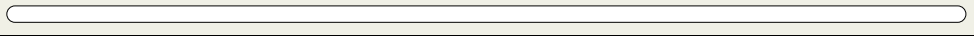
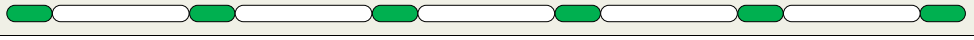
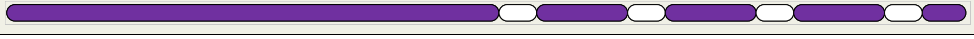
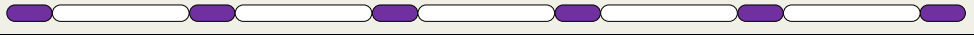
Wi-Fi	
Solid Green (pulse off with activity)	
Connected in Client mode (good signal) with traffic *Note: If access point and client are configured and have traffic at same time, LED displays the client status (i.e., displaying a connected Depot is the priority).*	
Slow Flashing Green	
Wi-Fi client enabled but not connected, and no AP is enabled	
Solid Yellow (pulse off with activity)	
Connected in client mode (fair signal) with traffic *Note: If access point and client are configured and have traffic at same time, LED displays the client status (i.e., displaying a connected Depot is the priority).*	
Solid Red (pulse off with activity)	
Connected in client mode (poor signal) with traffic *Note: If access point and client are configured and have traffic at same time, LED displays the client status (i.e., displaying a connected Depot is the priority).*	
Solid Purple (pulse off with activity)	
Access point with traffic, and Wi-Fi client enabled but no connection ***or*** Access point with traffic, and Wi-Fi client disabled *Note: If access point and client are configured and have traffic at same time, LED displays the client status (i.e., displaying a connected Depot is the priority).*	
Slow Flashing Purple	
Wi-Fi client is enabled but not connected, and AP is enabled without traffic	
Off	
No Wi-Fi enabled (no AP, no Wi-Fi client), or not available on this XR60 model	
Cellular	
Solid Green (pulse off with activity)	
Connected to a 4G/3G network with a good connection (equivalent to 4–5 bars); pulsing off for activity	
Slow Flashing Green	
Connecting to a 4G/3G network	
Solid Purple (pulse off with activity)	
Connected to a 5G network with a good connection (equivalent to 4–5 bars); pulsing off for activity	
Slow Flashing Purple	
Connecting to a 5G network	
Solid Yellow (colored pulse with activity)	
Connected to a network with a fair connection (equivalent to 2–3 bars) During activity, RAT (5G or 3G/4G) is indicated by a pulse color: ▪ Green pulse — 4G/3G ▪ Purple pulse — 5G	

Table E-1: LED Behavior (Continued)

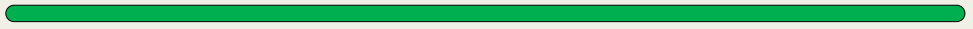
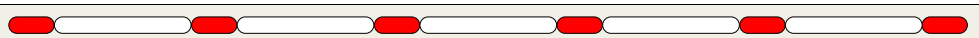
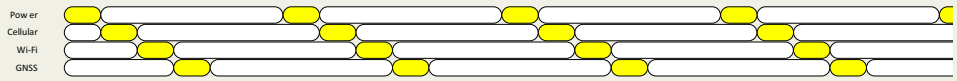
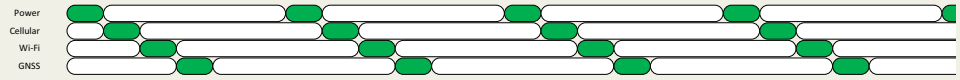
Solid Red (colored pulse with activity)	
Connected to a network with a poor connection (equivalent to 1 bar) During activity, RAT (5G or 3G/4G) is indicated by a pulse color: ▪ Green pulse — 4G/3G ▪ Purple pulse — 5G	
Slow Flashing Red	
No network connection	
Slow Alternating Flashing Red / Yellow	
Network Operator Switching is enabled, but the required radio module firmware is not currently available on the router	
Off	
Cellular radio disabled	
Power	
Solid Green	
Router operating normally with ignition on	
Fast Flashing Green	
Router is rebooting after Reset button pressed for <5 seconds. *Note: This pattern does not display when reset is initiated from AirLink OS.*	
Solid Yellow	
▪ Router is booting or ▪ 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 Thermal Protection on page 84.	
Fast Flashing Yellow	
Router is rebooting and being reset to factory defaults, after Reset button is pressed for 20–40 seconds	
Solid Red	
Power is present, but router is not running (e.g., ignition is off, router is in standby mode, etc.) *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 > MCU > Power Management), otherwise the LED will be Off. (By default, the setting is enabled.)*	
Fast Flashing Red	
Router is rebooting and being reset to the default template, after Reset button pressed for 5–20 seconds	
Slow Flashing Red	
Router is not operating because operating temperature range is exceeded (i.e., thermal shutdown) (For additional details, see Thermal Protection on page 84.)	
Fast Alternating Flashing Yellow / Red	
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.)	

Table E-1: LED Behavior (Continued)

Off	
▪ No power or ▪ Router is in standby mode and the AirLink OS Standby LED setting is disabled (System > MCU > Power Management)	
All LEDs	
Yellow LED chase	
Router firmware update in progress ***Important:*** *Do not turn off the power while the update is in progress.*	
Green LED chase	
Radio module firmware update in progress ***Important:*** *Do not turn off the power while the update is in progress.*	

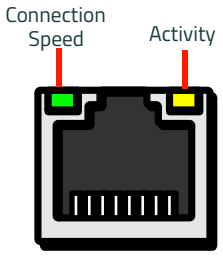
Ethernet LEDs

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

Note: On XR60 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
    - Solid Green—1000 Mbps (Gigabit)
    - Off—10/100 Mbps
  - Ethernet 2:
    - Solid Green—1–5 Gbps (i.e., Gigabit or greater)
    - Off—100 Mbps



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] EM92XX Product Technical Specification
Reference #41114313

[2] AirLink OS User Guide
Reference page: source.sierrawireless.com/airlinkos

[3] AirLink XR60 Quick Start Guide
Reference #5307421

[4] AirLink Complete leaflet
Reference #5307263

[5] AirLink XR Series Router Antenna FAQ
Reference #41114374

[6] End-User Warranty for Sierra Wireless AirLink products
Reference page: www.sierrawireless.com/legal/terms

Semtech Documents Requiring NDA

The following documents are available under NDA — contact your Semtech representative:

[7] EM9 Carrier Aggregations and EN-DC (Doc# 2174317)

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: sierrawireless.com/company/contact-us/ 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 sierrawireless.com/sso/signup
Security bulletins	Sign up for Sierra Wireless security bulletins at sierrawireless.com/company/iot-device-security/security-bulletins
Corporate and product information	Web: sierrawireless.com

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
MTBF	Mean Time Between Failure
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
ULCA	Uplink Carrier Aggregation
USB-PD	USB Power Delivery