AirLink GX Series

Hardware User Guide

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Consult our website for up-to-date product descriptions, documentation, application notes, firmware upgrades, troubleshooting tips, and press releases:

www.sierrawireless.com

Contents

1: Introduction to the AirLink GX Series

This chapter describes the Sierra Wireless AirLink GX Series device, including a description of ALEOS^{TM} embedded software and the AirVantage Management Service (AVMS) device management platform.

Introduction

The AirLink GX Series device is a compact, intelligent and fully-featured cellular gateway that provides real-time wireless capabilities for fixed and mobile applications such as:

* Public safety vehicle deployments
* Public transit systems
* Energy and utilities
* Remote asset monitoring
* Backup broadband connectivity

The AirLink GX Series device has multiple communication ports including serial, Ethernet, and USB ports. The power connector has one digital I/O pin for remote monitoring and control and one ignition sense pin to turn the device on and off and trigger the low power mode.

The AirLink GX Series device is available in the following variants:

* 4G LTE (GX440)
* 3G (GX400)

The AirLink GX Series device has several expansion options to add more capability. The following options are available:

* Wi-Fi (802.11 b/g/n)
* Input/Output (I/O) 15-pin connector which adds:
    · One additional RS-232 port
    · Four additional digital I/O pins
    · Four analog voltage sensing pins

The AirLink GX Series device, when coupled with the rich embedded intelligence provided by the embedded ALEOS software, is the perfect choice for a broad set of machine to machine solutions.

Description

Front Panel

The front panel has the following indicators and controls:

Figure 1-1: GX Series Front Panel

- **LEDs** – These show the device's operating status. Each LED can be red, green, yellow or off. The LEDs are described in detail in LED Operation on page 31. They are:
  - **Network** – When green the device is connected to a cellular network with an IP address assigned and a channel acquired
  - **Signal** – When green it is receiving a cellular signal
  - **Activity** – When green, the radio link is active
  - **Power** – When green, the device is connected to power
- **Reset Button** – Press and release to reboots the device. If you want to reset the device to factory default settings, hold the button down for 7 to 10 seconds.

Rear Panel

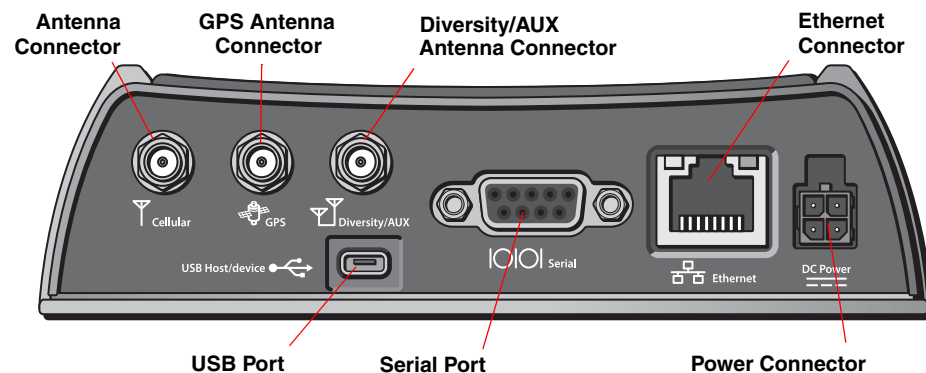The rear panel has the following connectors and controls:

Figure 1-2: GX Series Rear Panel

- **Antenna Connector** – This is the radio's receive and transmit port. The device works with most cellular antennas with an SMA connector.

Note: For more information on antenna connection and use, see Antenna Installation on page 26.

- **GPS Antenna Connector** – This connects an optional GPS antenna to the device. It works with most antennas that have an SMA connector.

Note: The GPS antenna connector has a bias output and Sierra Wireless recommends that you use an active antenna for better sensitivity.

- **Diversity/AUX Antenna Connector –** This connects an optional auxiliary antenna to the device for backup reception capability. It works with most antennas that have an SMA connector.

Note: The Diversity/AUX connector is receive only, it does not transmit.

- **Ethernet Connector** – This RJ-45 connector connects a standard Ethernet cable to the device. This is used to connect a PC to the device for configuration and diagnostic purposes or attaching Ethernet equipment to the device.
- **Power Connector** – This connects power to the device and provides additional inputs and outputs for the control and monitoring of external devices as well as triggering the low power mode. More information on its operation and how to use it is given in Power Connector Description on page 33.

  There are two types of optional power cables available from Sierra Wireless:
  - Cables with an AC adapter that are usually used for indoor, fixed applications where the device runs off line power
  - DC cables that are usually used in vehicles or other installations where the device runs off battery power

  The device automatically starts when it senses qualified power on the power connector as described in Starting the GX Series Device on page 30.
- **Serial Port** – This 9-pin connector provides standard RS-232 communication with a standard straight-though serial cable. It is used to communicate with industrial machines like motors, computers or controllers or for connection to a computer to configure the device with AT commands. It also supports features like TCP PAD and UDP PAD.
- **USB Port** – This Micro AB connector accepts Micro A and Micro B plugs. You can connect a Windows PC to it to monitor and configure the device.

  When connected to a PC, it becomes either a:
  - Virtual serial port
  - Virtual Ethernet port

Note: By default it is a virtual Ethernet port.

Windows drivers for this port are available at Sierra Wireless's download web site www.sierrawireless.com/en/Support/Downloads.aspx.

X-Cards

The AirLink GX Series device has several optional, factory-installed, expansion cards (X-Cards) available to add more functions to the basic device. They are configurable with the ALEOS ACEmanager software and more information is available in the ALEOS Software Configuration User Guide.

The options are:

- **Wi-Fi**—Adds Wi-Fi capability to the device using the 802.11b/g/n standard
- **I/O**—Has a 15-pin connector which adds to the device:
  - One 4-wire RS-232 port
  - Four analog inputs
  - Four high-voltage/high-power digital I/Os with analog readout
- **Dual Ethernet**—Adds two 10/100 baseT Ethernet ports

For a more complete description of each option, see X-Cards on page 38.

ALEOS Software

Note: For detailed information on all of the features in ALEOS, refer to the ALEOS Software Configuration User Guide. It is available for downloading from the Sierra Wireless web site.

ALEOS, the embedded core technology of the AirLink product line provides:

- Simplified installation, operation and maintenance of any wireless solution
- An always-on, always-aware, intelligent two-way connection for mission-critical applications

ALEOS enables:

- Persistent Network Connectivity
- Over-The-Air (OTA) Upgrades
- Wireless Optimized TCP/IP
- Real-Time Notification
- Real-Time GPS Reporting
- GPS Store and Forward
- Packet Level Diagnostics
- Device Management & Control

Sierra Wireless has three tools for monitoring and configuring AirLink devices. They are:

- **ACEmanager** – A web-based configuration tool for configuring a single AirLink device
- **ACEview** – A Windows application for monitoring the wireless connection status when the PC is connected via Ethernet to the AirLink device
- **AirVantage Management Service (AVMS)** – A cloud based device management service for monitoring and configuring fleets of AirLink devices

Contact your dealer or Sierra Wireless representative for more information.
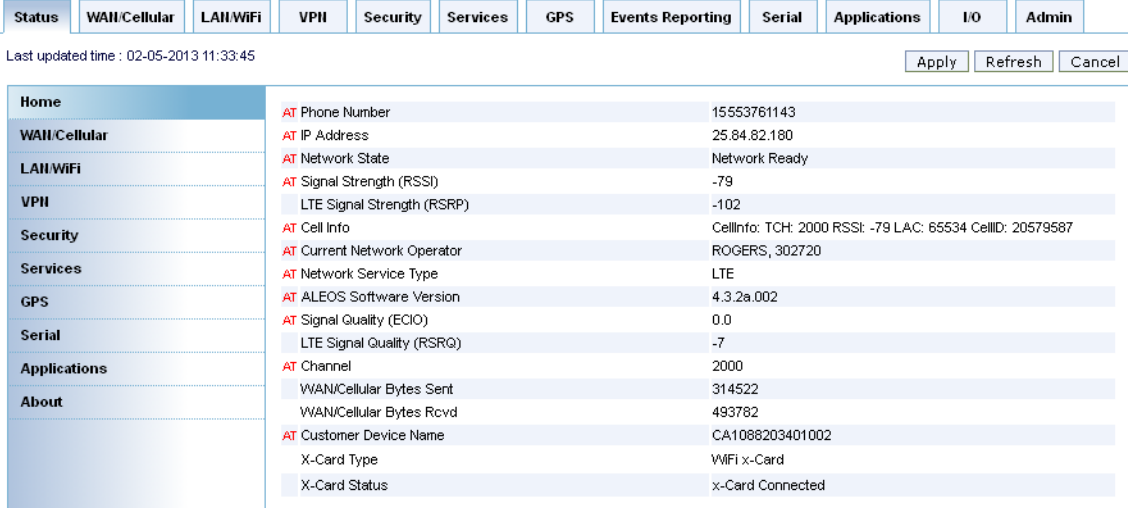
Download the applications and user guides from the Sierra Wireless AirLink Solutions web site at www.sierrawireless.com/support.

ACEmanager

ACEmanager:

- Simplifies deployment
- Provides extensive monitoring, control and management capabilities
- Configures your device to meet your needs
- Monitors and controls your AirLink device remotely and in real-time
- Is accessed through a web browser connected to the device

See Configuring with ACEmanager on page 45 to learn how to access ACEmanager.

Figure 1-3: ACEmanager Home Page

ACEview

ACEview is a Windows-based monitoring application for the PC with an easy to read interface.

Figure 1-4: ACEview Screen

Note: ACEview requires the Microsoft .NET Framework v.2.0 and Microsoft Windows XP or later. Obtain the Microsoft .NET Framework from Microsoft at: http://www.microsoft.com.

AirVantage Management Service

AirLink devices can be managed with the AirVantage Management Service (AVMS) available from Sierra Wireless. AVMS is a cloud-based application, accessed from your web browser, that provides remote monitoring and configuration for any number of AirLink ALEOS devices from a single computer.

AVMS features include:

- Device management with no software or hardware to buy and no ongoing maintenance required
- Advanced monitoring dashboards and alert notifications ensuring you always know the status of your AirLink devices
- Detailed configuration of all ALEOS parameters, including templates providing batch updates of pre-set configurations across multiple devices
- Over-the-air (OTA) firmware upgrades for all of your AirLink devices with a single operation

To connect with AVMS, see Configuring with AirVantage Management Service on page 46.

For more information on AVMS, call your AirLink reseller or visit: www.sierrawireless.com/productsandservices/AirVantage_M2M_Cloud.aspx

2: Installation and Startup

This chapter shows you how to connect, install and start the Sierra Wireless AirLink GX Series device. It also describes the front panel LEDs. Also described are the optional X-Cards available from Sierra Wireless that add more functions to the basic device.

Tools and Materials Required

*   If needed, a SIM card for your device as provided by your mobile network operator

    If you are installing a SIM card, see Installing the SIM Card on page 14 for a list of required tools.
*   Laptop computer with Ethernet cable
*   Wireless antenna
*   If used, a GPS antenna
*   If used, a second wireless antenna
*   If used, a straight-through 9-pin connection cable for the RS-232 port
*   Power cable, either the DC cable or AC cable ordered from Sierra Wireless or your own custom-made cable

Note: Custom-made cables must incorporate strain relief and use the correct type of power connector to prevent intermittent connection to the device.

Note: The device 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 environment to avoid cable failure.

Installing the SIM Card

All GX Series devices except the GX400 for Sprint and Verizon networks require a SIM card. If the SIM card has not already been installed by your Mobile Network Operator, install the SIM card before installing or connecting any external equipment or power to the AirLink device.

To install a SIM card, you need:
- SIM card for your account (provided by your Mobile Network Operator)
- 2 mm Allen (hex) wrench or a Phillips #1 screwdriver, depending on the screw type used on the black decorative cover
- If your GX Series device has a Serial I/O X-Card installed:
  · Small adjustable torque wrench
  · 4 mm nut driver or socket that works with the torque wrench
- If your GX Series device has a Wi-Fi X-Card installed:
  · Small adjustable torque wrench
  · 8 mm socket—long enough to fit over the SMA antenna connector

The procedure for installing a SIM card varies depending on whether or not the GX Series device has an X-Card installed, and if so, the type of X-Card present. Follow the appropriate instructions for your device:

Installing the SIM Card—No X-Card present
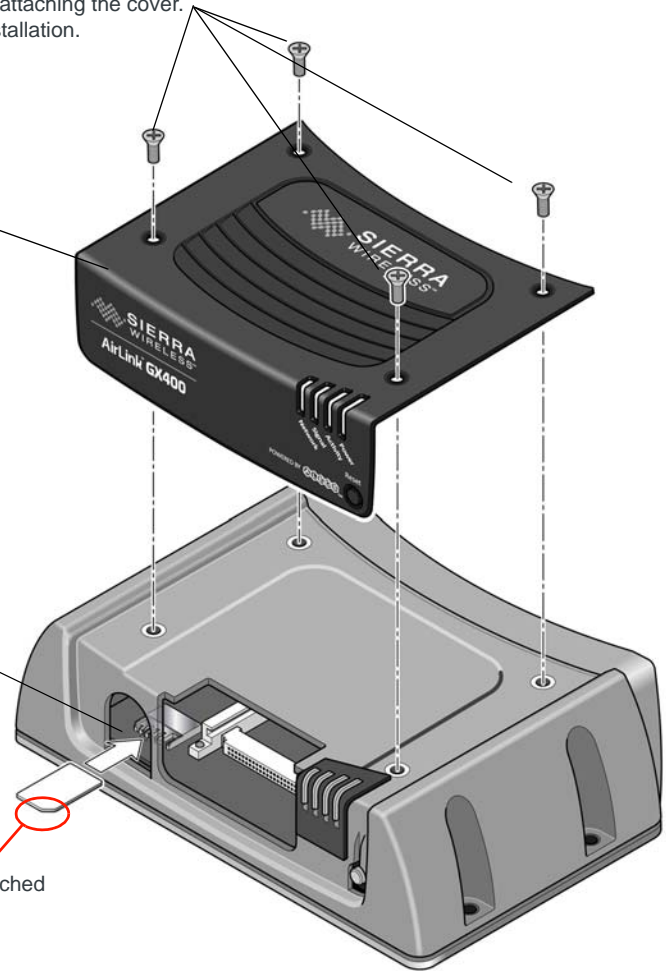
1) Remove the four screws attaching the cover.
Save the screws for reinstallation.

2) Remove the cover.

3) Slide the SIM card
into the SIM card holder.

Note the direction of notched
corner of SIM card for
proper alignment.

4) Use the screws you saved in step 1 to reattach the cover. Torque the screws to 5 in-lb. (0.6 N-m).

Figure 2-1: SIM Card Installation, with no X-Card present

Installing the SIM Card—Wi-Fi X-Card present

Important: *Failure to follow these instructions carefully may damage the X-Card and void the warranty agreement.*

To install a SIM card in a GX Series device with a Wi-Fi X-Card installed:

1. Unscrew the 8 mm hexagonal nut on the Wi-Fi SMA antenna connector at the front of the device, using the socket and wrench. Then slide off the nut and lock washer. Save the nut and washer. These are used again.

2. Remove the four screws used to secure the black decorative cover. Use a 2 mm Allen (hex) wrench or a Phillips #1 screwdriver, depending on the screw type used on the black decorative cover. Save the screws for reinstallation.
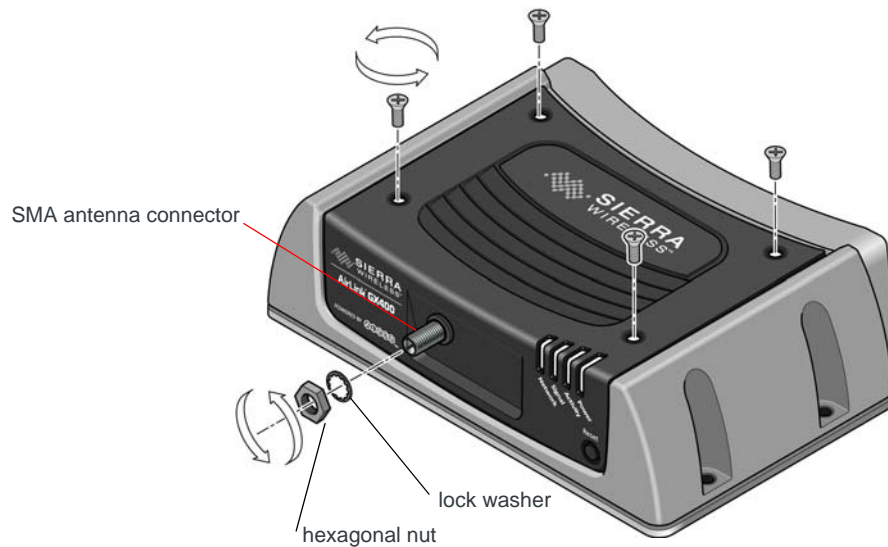

Figure 2-2: Removing the screws, nut and washer (Wi-Fi X-Card installed)

3. Gently tilt up the back of the decorative black cover and then move the cover forward so that it slides over the Wi-Fi SMA antenna connector.

Wi-Fi SMA antenna

Figure 2-3: Tilting the cover (Wi-Fi X-Card installed)
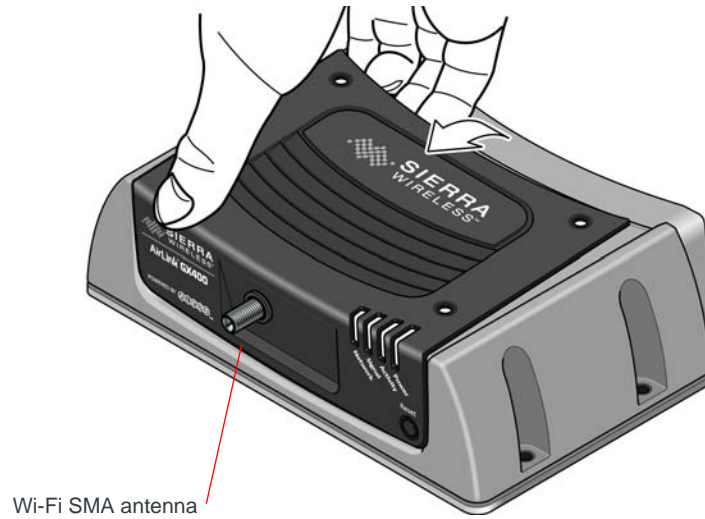
4. Continue to slide the cover horizontally until it clears the SMA antenna connector.
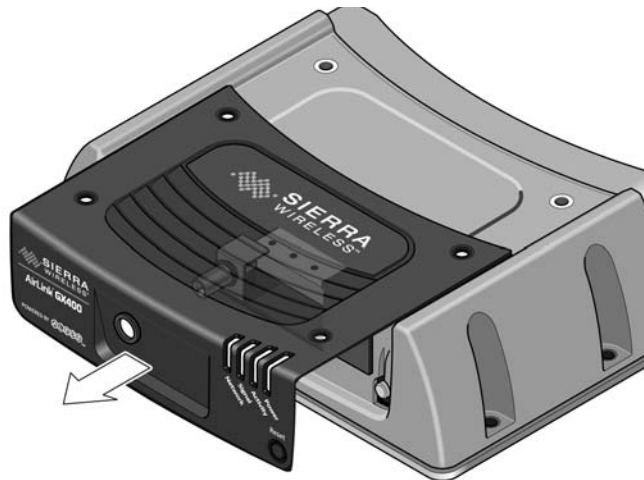

Figure 2-4: Removing the cover (Wi-Fi X-Card installed)

5. Lift the cover to remove it completely. Save the cover. It is used later.

6. Insert the SIM card, with the gold contacts facing down and the notch on the right side, as shown in the following illustration.

Note the direction of notched corner of SIM card for proper alignment.
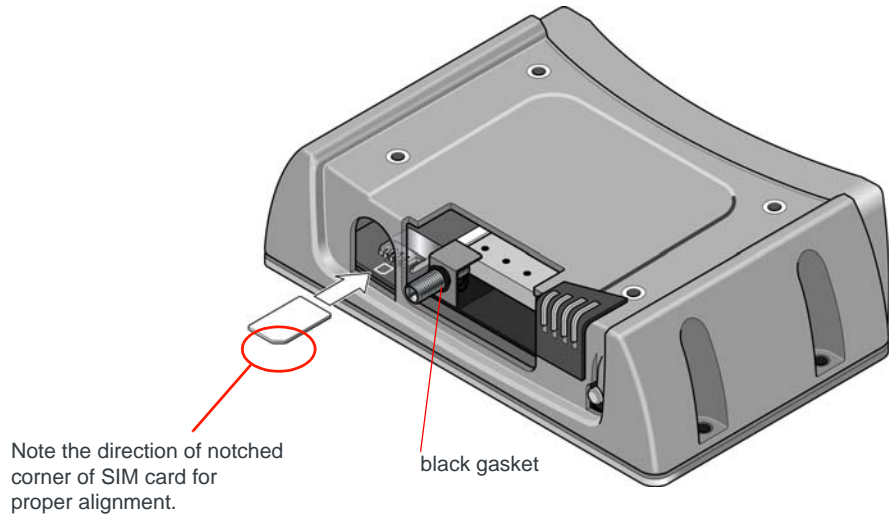
black gasket

Figure 2-5: Inserting the SIM card (Wi-Fi X-Card installed)

7. Ensure the black gasket is in place at the base of the SMA antenna connector.

8. Re-install the decorative black cover:

    a. Line up the SMA antenna connector with the hole in the cover.

    b. Tilt the rear of the cover slightly to make sure the front bottom of the cover seats in the front ridge. Slide the cover into place, and then push the top of the cover down.

        It may require some force to make sure the 4 holes in the cover line up with the threaded holes on the top of the device. You may need to push from the front as well to ensure that the holes line up properly.

9. Use the 4 screws saved in step 2 to re-attach the decorative black cover. Torque the screws to 5 in-lb. (0.6 N-m). Ensure that the screws are tight so that the seal underneath the decorative black cover is tight against the device.
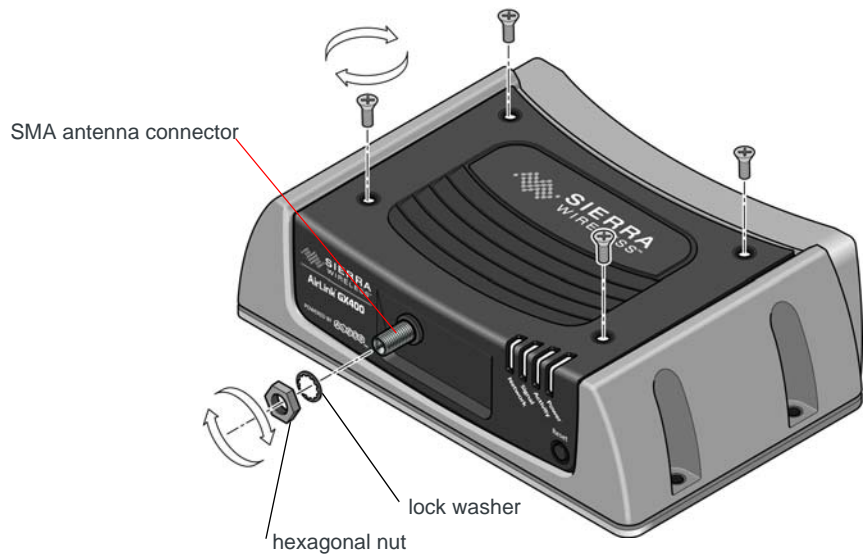
Figure 2-6: Replacing the screws, nut, and washer (Wi-Fi X-Card installed)

10. Place the lock washer onto the SMA antenna connector and move it to the back of the connector, so it is touching the decorative black cover.

11. Install, then tighten the nut with a 5/16" or 8 mm socket torque wrench to a torque spec of 8in-lbs.

Installing the SIM Card—I/O X-Card present

Important: *Failure to follow these instructions carefully may damage the X-Card and void the warranty agreement.*

To install a SIM card in a GX Series device with a I/O X-Card installed:

1. Unscrew the two 4-40 male to female hexagonal threaded standoffs (jack screws) on either side of the serial port at the front of the device, using the socket and wrench. Keep the hexagonal threaded standoffs for reinstallation.

2. Remove the four screws used to secure the black decorative cover. Use a 2 mm Allen (hex) wrench or a Phillips #1 screwdriver, depending on the screw type used on the decorative black cover. Save the screws for reinstallation.

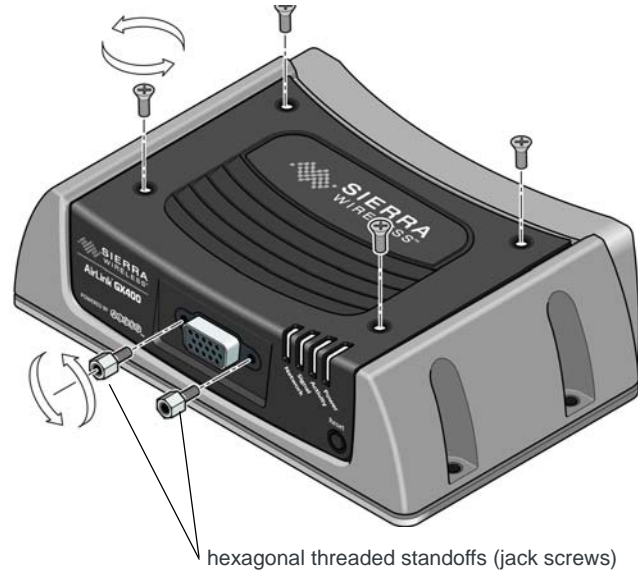hexagonal threaded standoffs (jack screws)

Figure 2-7: Removing the screws and threaded standoffs (I/O X-Card installed)

3. Gently tilt up the back of the decorative black cover and then move the cover forward so that it slides over the serial port.

Figure 2-8: Tilting the cover (I/O X-Card installed)

4. Continue to slide the cover horizontally until it clears the serial port.
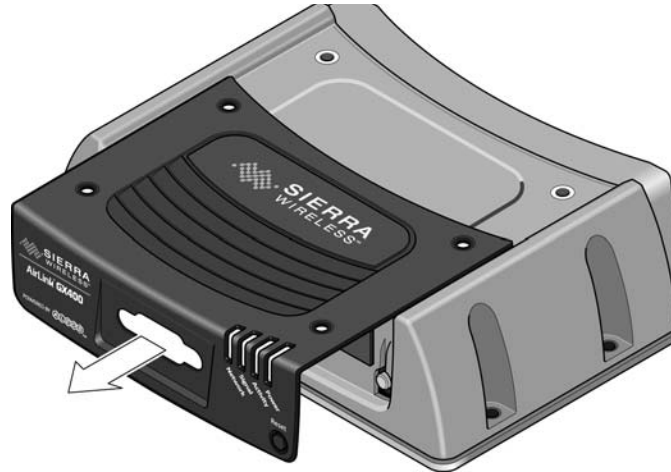
Figure 2-9: Removing the cover (I/O X-Card installed)

5. Lift the cover to remove it completely. Save the cover. It is used again.

6. Insert the SIM card, with the gold contacts facing down and the notch on the right side, as shown in the following illustration.

Note the direction of notched corner of SIM card for proper alignment.
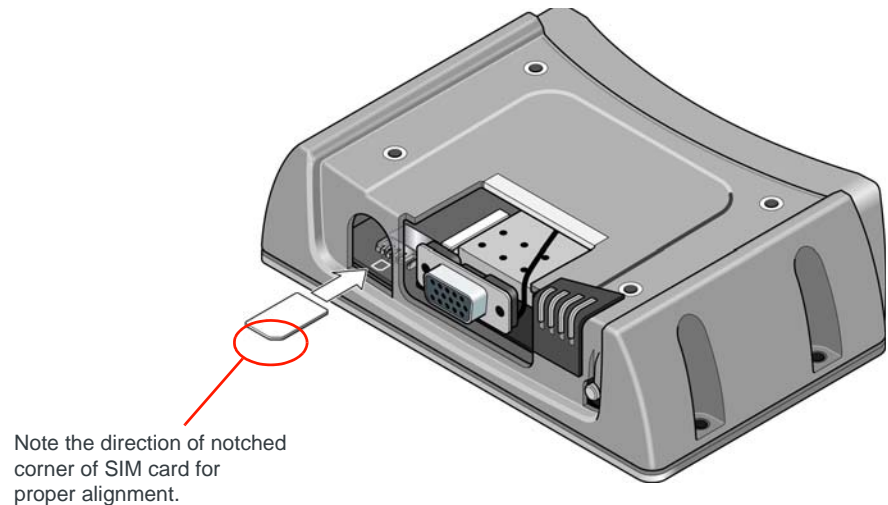
Figure 2-10: Inserting the SIM card (I/O X-Card installed)

7. Install the decorative black cover:

    a. Line up the serial port with the hole in the cover.

    b. Tilt the rear of the cover slightly to make sure the front bottom of the cover seats in the front ridge. Slide the cover into place, and then push the top of the cover down.

       It may require some force to make sure the 4 holes in the cover line up with the threaded holes on the top of the unit. You may need to push from the front as well to ensure that the holes line up properly.

8. Use the four screws you saved in step 2 to re-attach the decorative black cover. Torque the screws to 5 in-lb. (0.6 N-m). Ensure that the screws are

tight so that the seal underneath the decorative black cover is tight against the device.

9. Re-install the screw nuts you saved in step 1 to either side of the serial port. (Finger tight is sufficient.)

Note: The screw nuts must be re-installed to maintain the IP rating for the AirLink device.
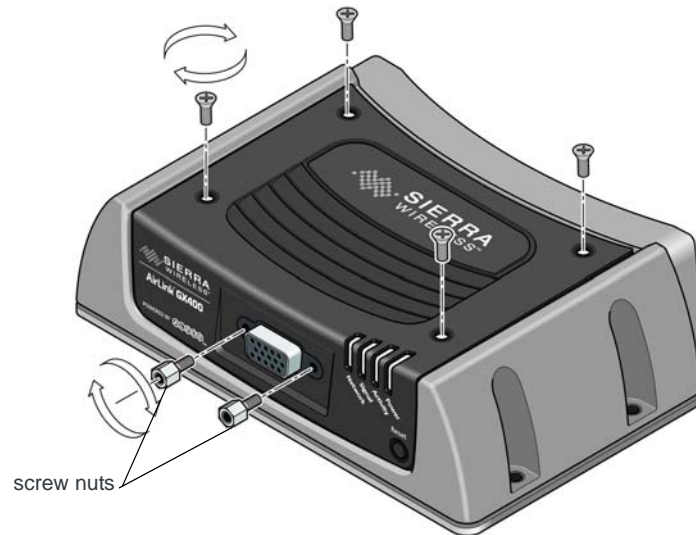
Figure 2-11: Replacing the screws and nuts (I/O X-Card installed)

Installing the SIM Card—Dual Ethernet X-Card present

Important: *Failure to follow these instructions carefully may damage the X-Card and void the warranty agreement.*

To install a SIM card in a GX Series device with a Dual Ethernet X-Card installed:

1. Remove the four screws used to secure the black decorative cover. Use a 2 mm Allen (hex) wrench or a Phillips #1 screwdriver, depending on the screw type used on the black decorative cover. Save the screws for reinstallation.

Figure 2-12: Removing the screws (Dual Ethernet X-Card installed)

2. Gently tilt up the back of the decorative black cover and then move the cover forward so that it slides over the Ethernet ports, being careful not to damage the rubber gasket.

Figure 2-13: Tilting the cover (Dual Ethernet X-Card installed)

3. Continue to slide the cover horizontally until it clears the Ethernet ports.
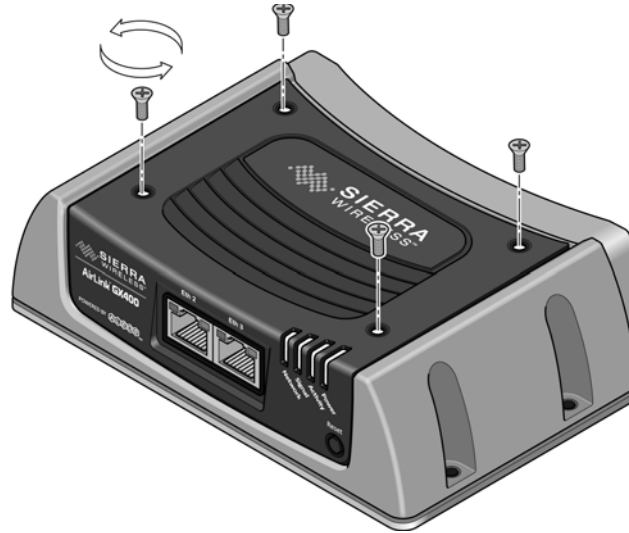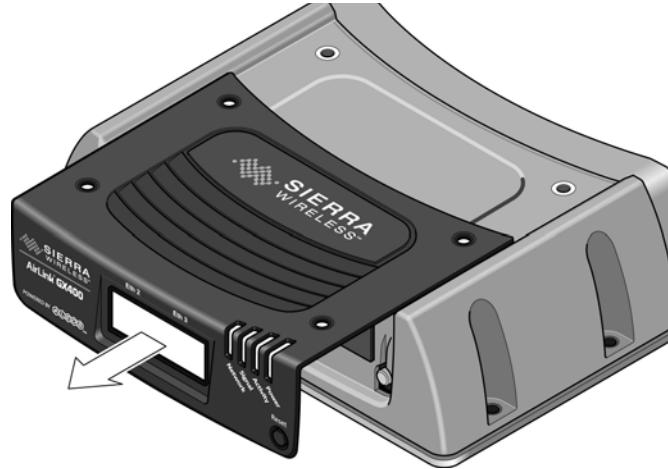
Figure 2-14: Removing the cover (Dual Ethernet X-Card installed)

4. Lift the cover to remove it completely. Save the cover. It is used again.

5. Insert the SIM card, with the gold contacts facing down and the notch on the right side, as shown in the following illustration.

Note the direction of notched corner of SIM card for proper alignment.
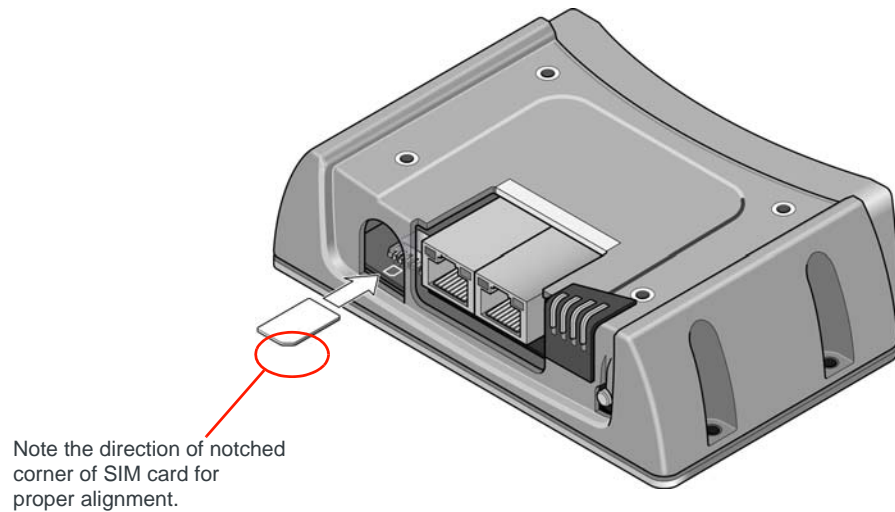
Figure 2-15: Inserting the SIM card (Dual Ethernet X-Card installed)

6. Install the decorative black cover:

    a. Line up the Ethernet ports with the hole in the cover.

    b. Tilt the rear of the cover slightly to make sure the front bottom of the cover seats in the front ridge. Slide the cover into place, and then push the top of the cover down. Ensure that the black gasket around the Ethernet ports is snug, with no gaps and the gasket is not folded in on itself.

        It may require some force to make sure the 4 holes in the cover line up with the threaded holes on the top of the unit. You may need to push from the front as well to ensure that the holes line up properly.

7. Use the 4 screws saved in step 1 to re-attach the decorative black cover. Torque the screws to 5 in-lb. (0.6 N-m). Ensure that the screws are tight so that the seal underneath the decorative black cover is tight against the device.

black gasket around the Ethernet ports
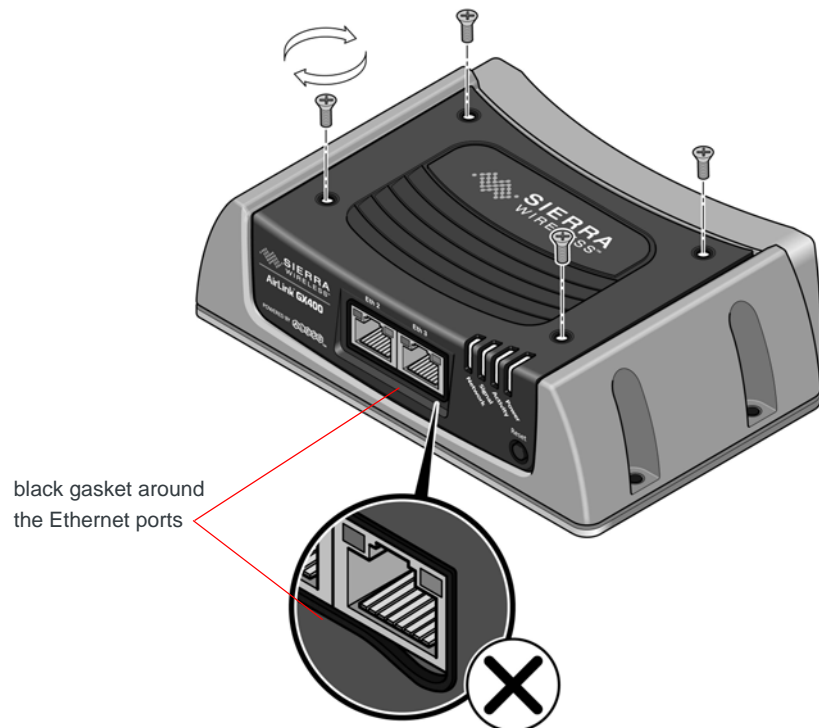
Figure 2-16: Replacing the screws (Dual Ethernet X-Card installed)

Mounting the GX Series

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

Note: The device 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 environment to avoid cable failure.

Mount the device where:

- There is easy access to the cables
- Cables are not bent, constricted, close to high amperages or exposed to extreme temperatures
- Cables are secured to ensure reliable connections
- The front panel LEDs are easily visible
- There is adequate airflow
- It is kept free from direct exposure to the elements, such as sun, rain, dust, etc.

Note: Sierra Wireless recommends that the device's case or the mounting bracket be connected to ground, which can be the battery or power source negative terminal. This provides protection from electrostatic discharges. Do this by connecting a grounding strap under one of the mounting screws.

In addition to the four mounting holes on the side of the device's body, there are four holes on the bottom plate to attach the device to a mounting surface.
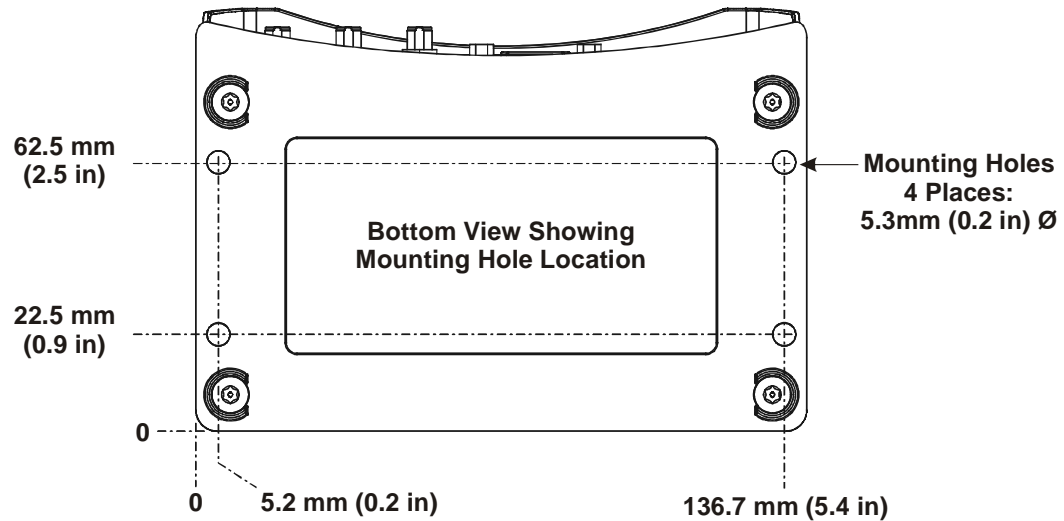
Figure 2-17: GX Series Bottom Plate and Mounting Holes

Vehicle Mounting

When installing the device in a vehicle:
*   Keep it out of direct exposure to the weather (sun, rain, etc.). The best locations are in places like a car trunk or in a container behind the seats.
*   Place it where it will not be bumped or come into contact with people, cargo, tools, equipment, etc.

Antenna Installation

Inadequate antenna separation between the transmit and diversity antennas creates unwanted interactions. This can cause reductions in:
*   Antenna efficiency
*   Transmit power
*   Receiver sensitivity
*   Data throughput
*   Radio front-end life span

Antenna Separation Recommendations

• The antennas should be separated so that there is at least 10dB isolation over the entire operating frequency range.

• The separation should be at least 1/4 wavelength (λ), but preferably 1/2 wavelength or greater of the lowest operating frequency. See Table 2-1 for specific recommendations, based on your network service type and frequency.

Note: The values in the table are approximate antenna separation values for monopole or dipole type antennas.

Table 2-1: Recommended Antenna Separation

Service	Frequency (MHz)	Wavelength (λ) (mm)	Best Antenna Separation (mm) (1/2 λ)	Good Antenna Separation (mm) (1/4 λ)
LTE	700	428	214	107
LTE	800	375	187	94
LTE	900	333	167	83
LTE	1800	167	83	42
LTE	2100	143	71	36
LTE	2600	115	58	29
WCDMA	850	353	176	88
WCDMA	900	333	167	83
WCDMA	1900	158	79	39
WCDMA	2100	143	71	36
CDMA/EV-DO	800	375	187	94
CDMA/EV-DO	1900	158	79	39
GSM/GPRS/ EDGE	850	353	176	88
GSM/GPRS/ EDGE	900	333	167	83
GSM/GPRS/ EDGE	1800	167	83	42
GSM/GPRS/ EDGE	1900	158	79	39

Table 2-2: Separation Examples for Specific Mobile Network Operator Bands

Service	Band	Mobile Network Operator	Country	Min Frequency (MHz)	Wavelength (λ) (mm)	Best Antenna Separation (mm) (1/2 λ)	Good Antenna Separation (mm) (1/4 λ)
LTE	13	Verizon	US	746	401.8665657	201	100
LTE	17	AT&T	US	704	425.8415597	213	106
LTE	4	Bell/Rogers/Telus	Canada	1710	175.3172269	88	44

Antenna Recommendations

Note: Do not remove the diversity antenna. The diversity antenna helps the device achieve the maximum network coverage. The device works without one installed, but with reduced network coverage.

Note: If the antennas are located far away from the device, keep the cables as short as possible to prevent the loss of antenna gain.

Warning: *The antenna should not exceed the maximum gain specified in Maximum Antenna Gain (Gain D'antenne Maximal) on page 61. In more complex installations (such as those requiring long lengths of cable and/or multiple connections), you must follow the maximum dBi gain guidelines specified by the radio communications regulations of the Federal Communications Commission (FCC) or Industry Canada or your country's regulatory body (if used outside the US). Also see Important Information for North American Users on Radiation Exposure on page 60 for more information.*

Mounting the GPS Antenna

Mount the antenna where it has a good view of the sky such as on the roof, the dashboard or the rear panel. It should see at least 90$^{\mathrm{o}}$ of the sky.
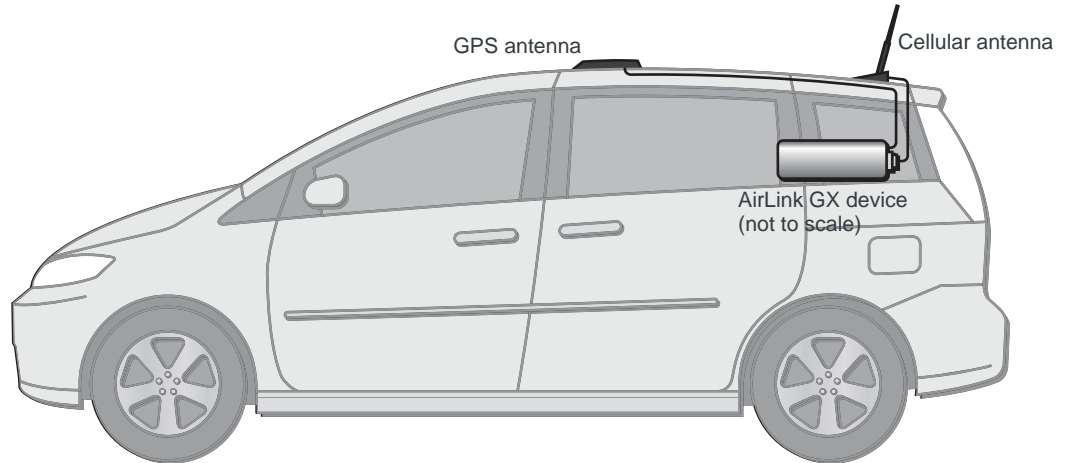

Figure 2-18: Mounting the GPS Antenna

Connecting the GX Series

Note: Route cables so that they are protected from damage and will not be snagged or pulled on. There should be no binding or sharp corners in the cable routing. Excess cabling should be bundled and tied off. Make sure that the cables are secured so that their weight will not loosen the connector from the device over time.

1. Connect the RF antenna to the antenna connector.
2. If used, connect the GPS antenna to the GPS antenna connector.
3. If used, connect an RF antenna to the Diversity/AUX antenna connector.
4. Attach a laptop to the device with the Ethernet cable.
5. If used, attach a device or computer to the RS-232 port and/or the USB port.

Note: Before proceeding, turn off the power going to the device.

6. Connect the power cable to the device, and if used, to the external devices to be controlled/monitored.

Note: For details about the power connector, see Power Connector Description on page 33. The battery connector cable should be no longer than 10 feet (3 meters).

7. Turn on the power.

   The device starts automatically as soon as it receives power as described in Starting the GX Series Device on page 30.

Starting the GX Series Device

Upon receiving power, the device automatically starts as indicated by the flashing LEDs. If it does not turn on, see that the:

• Power connector is plugged in

• Power cable is connected to power (line or battery power)

• Power is turned on or that the battery is fully charged

• Ignition Sense (pin 3) is connected to the battery or power source (see Power Connector Description on page 33 for details)

After the initial power up, to see if the device is properly connected and operating correctly:

1. In the laptop connected to the device, open a web browser.

2. In the browser's address bar, enter the IP address: **http://192.168.13.31:9191**.

Note: It may take a minute or two for the device to respond after the first power up.

The ACEmanager login screen appears.

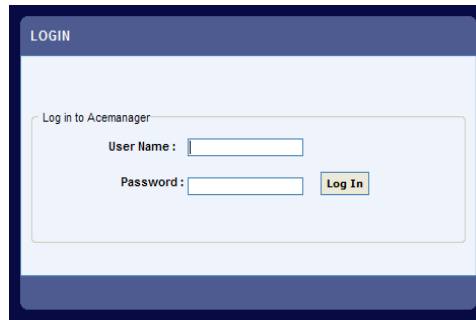3. Enter your user name and password. The administrator user name is **user** and password is **12345**.

Figure 2-19: ACEmanager Login Screen

The ACEmanager homepage appears.

Figure 2-20: ACEmanager Homepage

4. Check the Network State field. If you see "No SIM or Unexpected SIM Status" the SIM card may be missing or installed incorrectly. For information on other network states, refer to the ALEOS Software Configuration User Guide.

LED Operation

Power-up and Reboot

On power-up or reboot, all LEDs turn red, then yellow, then green. They then go through a blinking sequence that ends with the Power LED green and all the other LEDs off. Once the other LEDs resume their normal operating behavior, the reboot is complete.

To reboot the device:

• In ACEmanager, click the Reboot button at the top right of the screen.

• Press and release the Reset button on the device (see Front Panel on page 8). Do not hold the button down for more than a few seconds. (If you hold it for 7−10 seconds, the device resets to factory default settings.)

LED Behavior

Table 2-3: LED Behavior

LED	Color/Pattern	Description
Power	Off	No power or input voltage ≥ 36VDC or ≤ 9VDC
	Solid Green	Device is connected to nominal power and is operating normally.
	Flashing Yellow/Green	Device has a GPS fix
	Solid Yellow	Device is entering low power mode or system low level boot.
	Solid Red	Device is not operational (failure or in low power mode).
Signal	Solid Green	Good signal (RSSI ≥ -85 dBm)
	Solid Yellow	Marginal signal (-100 dBm < RSSI < -85 dBm)
	Solid Red	Poor signal (-110 dBm < RSSI < -100 dBm)
	Flashing Red	No signal (RSSI < -110 dBm)
Network	Solid Green	Network Ready — (LTE service available for GX440)
	Flashing Yellow/Green	Network Ready — (No LTE service available for GX440)
	Flashing Green (3 sec. on/1 sec. off)	Network Ready—WAN over Wi-Fi (device in Wi-Fi client mode)
	Flashing Green (1.0 sec. on/0.5 sec. off)	Network Ready—Roaming (LTE service available for GX440)
	Flashing Yellow/Green/Off	Network Ready—Roaming (No LTE service for GX440)
	Flashing Yellow	No Service
	Solid Yellow	Connecting to the network
	Flashing Red	Authentication/Negotiation failed (EV-DO only)
	Solid Red	Link Down No cellular network is present, no network coverage at current location, or the device is in radio passthru mode
The way in which the Activity LED functions depends on the version of ALEOS software on the device.		
Activity (ALEOS 4.3.6 or earlier)	Off	Normal operation
	Flashing Green	Traffic is being transmitted or received over the WAN interface.

Table 2-3: LED Behavior

LED	Color/Pattern	Description
Activity (ALEOS 4.4.0 or later)	Off	Normal operation
	Flashing Green	Traffic is being transmitted or received over the WAN interface.
	Flashing Red	Traffic is being transmitted or received over the serial port. (This behavior only appears if the AirLink GX device is configured to display it. Refer to the ALEOS Software Configuration Guide for details.)
	Flashing Yellow	Traffic is being transmitted or received over both the WAN interface and the serial port. (This behavior only appears if the AirLink GX device is configured to display it. Refer to the ALEOS Software Configuration Guide for details.)

Ethernet LEDs

The Ethernet connector has two LEDs that indicate speed and activity. When looking into the connector:

- Activity— The right LED is solid yellow when a link is detected (the cable is plugged in) and blinks when there is activity.
- Connection Speed—The left LED is green to indicate a 100 Mbps connection and orange to indicate a 10 Mbps connection. It is off when no cable is connected.

Reset to factory default settings

To reset the device to the factory default settings:

1. Press and hold the Reset button until all the LEDs turn yellowish-green (about 7–10 seconds). See Front Panel on page 8.

   The device reboots. Once the reboot is complete and the LEDs resume their normal operating behavior, the reset is complete.

Power Connector Description

The GX Series device's power connector is a four pin connector that has:

- Two pins connecting DC voltage to the device
- Two pins providing additional monitoring and control functions

This section has information to help you plan your device's connection and configuration.

The connector's pin diagram is shown below. It also shows the colors of the wires used on the DC power cable you can order from Sierra Wireless.
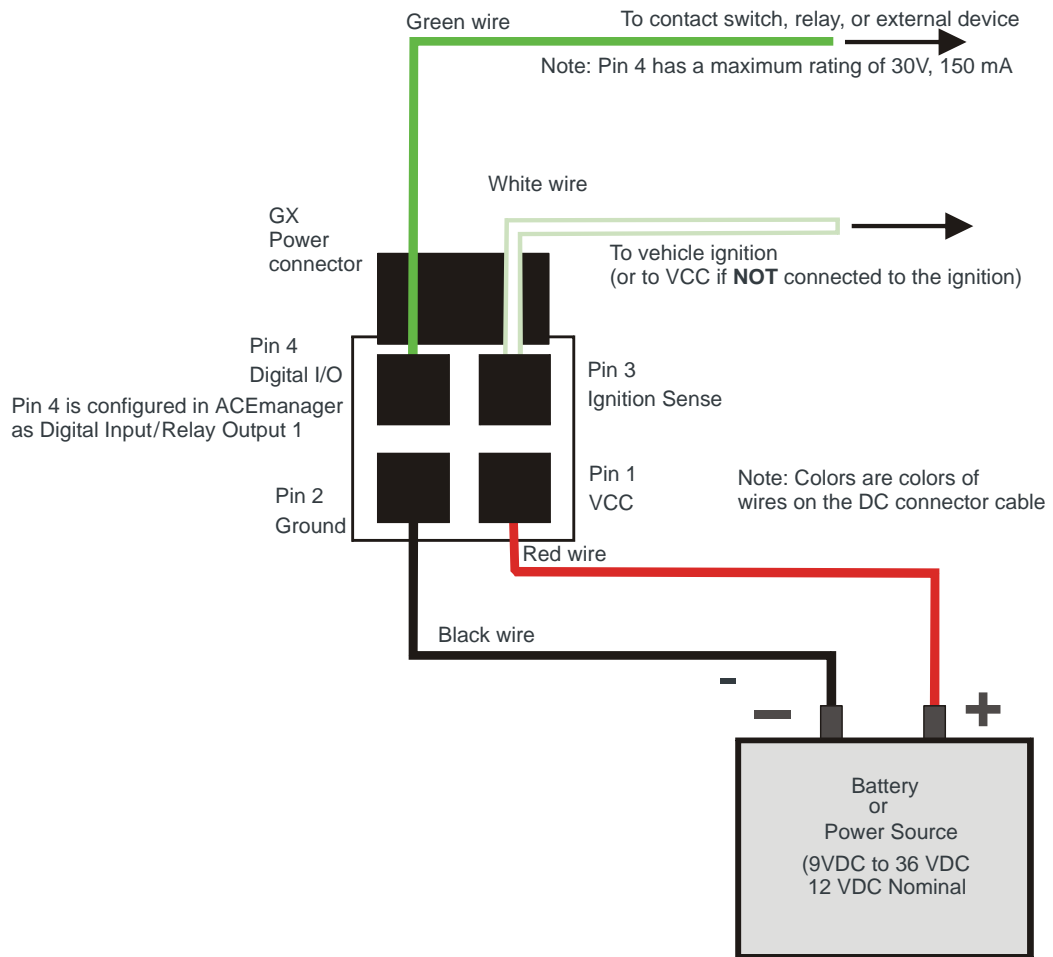
Figure 2-21: GX Series device Power Connector Pin Diagram

Pins 1 and 2

- Pin 1—VCC; Connect to +12VDC (nominal) (red wire on DC cable)
- Pin 2—Ground; Connect to ground (black wire on DC cable)

Pin 3

This pin is the ignition sense pin (white wire on DC cable). The voltage level present on this pin turns the device on and off.

*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 device looks for a qualified voltage on this pin as part of the power up sequence (9–36VDC). If one is not present, the device will not turn on. If you are using a Sierra Wireless AC cable, the connection is inside the cable.*

There are several typical connection options for this pin:

Option 1—If you want the device turned on and off when the engine is turned on and off:

- Connect pin 3 to the ignition
- In ACEmanager, disable the Low Power Mode (Default setting is disabled)

Option 2—If you power the device from the engine's battery and you do not want the device to drain it when the engine is turned off:

- Connect pin 3 to the ignition
- In ACEmanager, enable the Low Power Mode and set a time delay

When the ignition is turned off, the device operates at full power for the pro-grammed time delay. When it expires, the device switches to Low Power Mode (consumes 35mA or less). The device resumes normal operation when the ignition is turned on.

Option 3—If you want the device to switch into low power mode when the engine battery voltage drops below a certain value:

- Connect pin 3 to pin 1
- In ACEmanager, configure the Low Power Mode with a voltage level threshold

The device operates normally until the battery voltage drops below the thresh-old value, triggering the Low Power Mode. The device resumes normal opera-tion when the battery voltage rises above the threshold value.

Option 4—If you use a separate battery other than the engine's for device power, (such as in an ambulance or other application that has a stand-alone battery power system) but it isn't connected to an ignition or an on/off switch, and you do not want the battery drained:

- Connect pin 3 to pin 1
- In ACEmanager, configure the Low Power Mode with a voltage level threshold

The device operates normally until the battery voltage drops below the thresh-old value, triggering the Low Power Mode. The device resumes normal opera-tion when the battery voltage rises above the threshold value.

Option 5—If you have an installation where the device uses line power such as in a store or a remote site where power saving isn't needed:

- Use the Sierra Wireless AC adapter or connect pin 3 to pin 1
- In ACEmanager, disable the Low Power Mode. (Default setting is disabled)

The device is on for as long as the power is on.

Note: For details on how to use ACEmanager, refer to the ALEOS Software Configuration User Guide. It is available for downloading from the Sierra Wireless support web site.

Pin 4

This pin is a digital input/output (green wire on DC cable).

Pin 4 either:

- Monitors digital inputs and outputs
- Drives a relay

It has a maximum rating of 30V and 50mA sink current. The pin is user programmed. For information on configuring Pin 4 (Digital Input/Relay Output 1 in ACEmanager) refer to the ALEOS Software Configuration User Guide.

One way to use pin 4 is with events reporting. In ACEmanager you:

1. Create an Event.

    This triggers the device to act when it sees a specific input. For example, you can tell the device to do something when the Pin 4 state (Digital Input/Relay Output 1 in ACEmanager) changes. This could be when a door is opened, activating a switch attached to it.

2. Specify an Action.

    These are instructions the device performs when it sees an event. For example, an email could be sent to security, saying the door is open, giving the time, location and other information.

There are several typical uses for Pin 4:

*   As a digital input, it monitors a switch, using its opening or closing to record events or monitoring external voltages of up to 30VDC. For example, you could use it to measure the voltage on a 24VDC light bulb and have the device react when it turns on.

    When the switch, or input voltage is:

    *   Open (2.2VDC to 30VDC) – It is read as a digital input=1
    *   Closed (0 to 1.2VDC) – It is read as a digital input=0
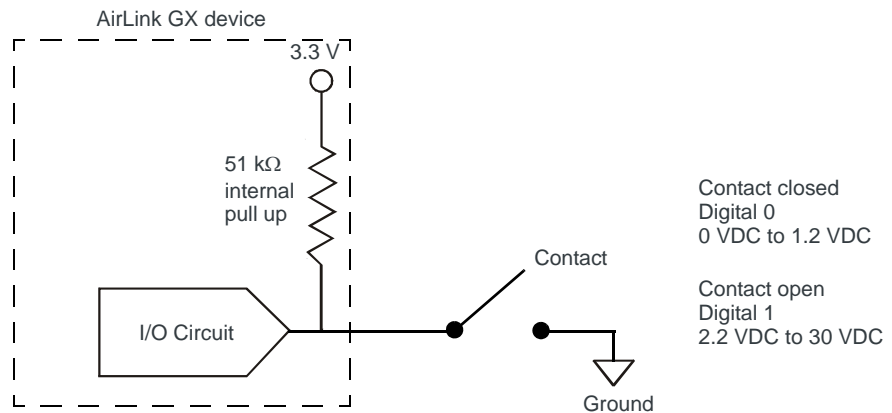
Examples: Door opening/closing, valve opening/closing, ignition on/off, tow bar up/down, empty/full container.

Figure 2-22: Digital Input Operation

*   As a digital output, it can trigger an alarm, siren, door lock or opens a valve or a switch. Pin 4 is an open collector transistor output normally at 3.3VDC. When triggered, it is pulled to low.
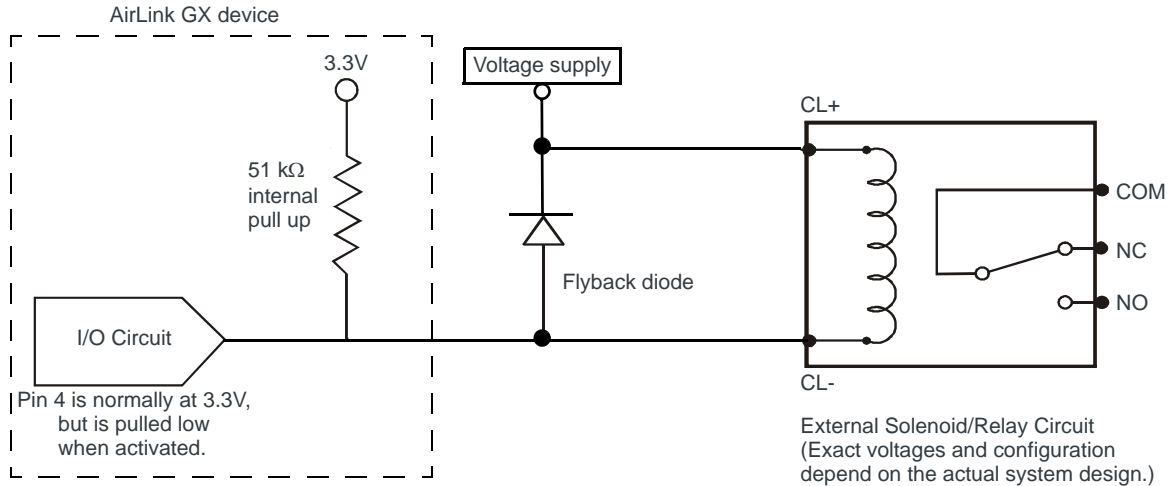
AirLink GX device

Figure 2-23: Digital Output Operation

Note: Some solenoids/relays include a flyback diode built into the unit. For those that do not, Sierra Wireless recommends a flyback diode with a voltage rating at least double the relay voltage and a current rating at least double the relay ON current to avoid damage to the GX input. A common 1N4007 will work for most applications. See Table 2-6 on page 41.

The initial state of the digital output when the device is rebooted is configurable in ACEmanager.

Serial Port

You can connect the GX Series device's 9-pin serial connector directly to most computers or other devices with a standard straight-through cable. This connector is used for device configuration and debugging.

This connector complies with the EIA RS-232D specification for DCE equipment. The output driver levels swing from -7VDC to +7VDC with normal loading.

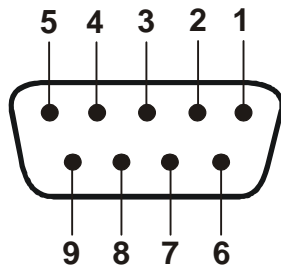*Note: If you have a DCE device, you need to use a null modem cable.*

Figure 2-24: 9-Pin Serial Connector Diagram

Table 2-4: Serial Connector Pin-out

Name	Pin	Description	Type
DCD	1	Data Carrier Detect	OUT
TXD	2	Transmit Data	OUT
RXD	3	Receive Data	IN
DTR	4	Data Terminal Ready	IN
GND	5	Main GND. Connected internally to BOARD_GND	GND
DSR	6	Data Set Ready	OUT
RTS	7	Ready To Send	IN
CTS	8	Clear To Send	OUT
RI	9	Ring Indicator	OUT

X-Cards

The AirLink GX Series has several optional, factory-installed, expansion cards (X-Cards) available to add more functions to the basic device. They are configurable with ACEmanager and more information is available in the ALEOS Software Configuration User Guide, which is available for downloading from the Sierra Wireless web site.

The available X-Cards are:

• Wi-Fi
• I/O
• Dual Ethernet

If you have an X-Card card installed on your device, its type and status is shown on the ACEmanager home page (Status > Home).

Wi-Fi X-Card

This card adds Wi-Fi capacity to the device using the 802.11b/g/n standard. It has the following modes:

• Client Mode where a GX device uses a Wi-Fi client connection to connect to an access point, rather than acting as an access point (AP)
• Access Point Mode where the device acts as an AP
• Both (AP + Client Mode) where the device can act as an AP and also use a Wi-Fi Client connection to connect to an AP

    The GX Series device connects as a client to a configured AP whenever the AP is available. When the AP is not available, it connects to 3G, all the while the device acts as a AP to W-Fi clients connected to the GX.

See the ALEOS Software Configuration User Guide for details on Wi-Fi set up and use.

I/O X-Card

This card uses a 15-pin connector to add to the basic device:

- One additional RS-232 communication port
- Four additional digital I/O pins
- Four analog voltage sensing pins
- Optional 2 meter I/O X-Card breakout cable (To order, contact your distributor.)

Maximum data rate for the RS-232 interface on the I/O X-Card is 115.2 kbps.

See the ALEOS Software Configuration User Guide for details on I/O set up and use.

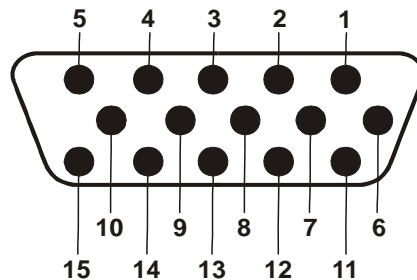## I/O X-Card 15-Pin Connector Description

Figure 2-25: I/O X-Card 15-pin Connector Pin Diagram

Note: For better performance, signal pins on the I/O X-Card should be referenced to the ground pin on the I/O X-Card (pin 10).

An optional 2-meter 15-pin I/O breakout cable (pn 2000424) for use with the I/O X-card is available from distributors.

Table 2-5: I/O 15-Pin Connector Pin Description

Pin	Name	Description	Wire color (on optional I/O X-Card breakout cable)
1	TXD	Transmit Data	White/black
2	CTS	Clear to Send	Red/black
3	DIO[2]	Digital I/O 2	Green/black
4	DIO[4]	Digital I/O 4	Orange/black
5	RXD	Receive Data	Blue/black
6	RTS	Request to Send	Blue

Table 2-5: I/O 15-Pin Connector Pin Description

Pin	Name	Description	Wire color (on optional I/O X-Card breakout cable)
7	AIN[2]	Analog Input 2	Green
8	AIN[4]	Analog Input 4	Red
9	Reserved for future use		Black
10	GND	Ground	White
11	DIO[3]	Digital I/O 3	Orange
12	DIO[5]	Digital I/O 5	Blue/White
13	Reserved for future use		Green/White
14	AIN[1]	Analog Input 1	Red/White
15	AIN[3]	Analog Input 3	Black/White
Shield	Cable Shield		
This is not a VGA connector			
Note: Digital Input 1 in ACEmanager is reserved for Pin 4 on the power connector.			

To check the current digital input values, in ACEmanager:
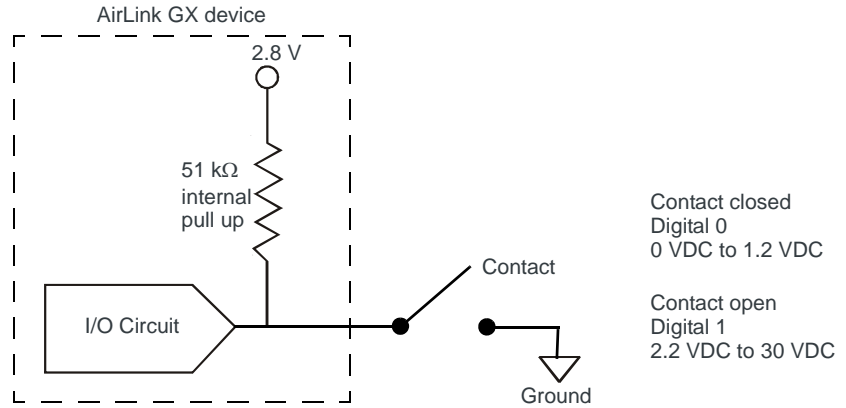
1. Go to I/O > Current State.

Digital I/O Interface

There are four digital I/O pins on the high density DB15 connector. Typical applications are:

• Input—source is a dry switch contact to ground
• Output—to drive a relay coil to ground
• Analog—to detect voltage levels in input or output mode

Pins include a 51K ohm pull up to 2.8VDC.

Examples: Door opening/closing, valve opening/closing, ignition on/off, tow bar up/down, empty/full container.
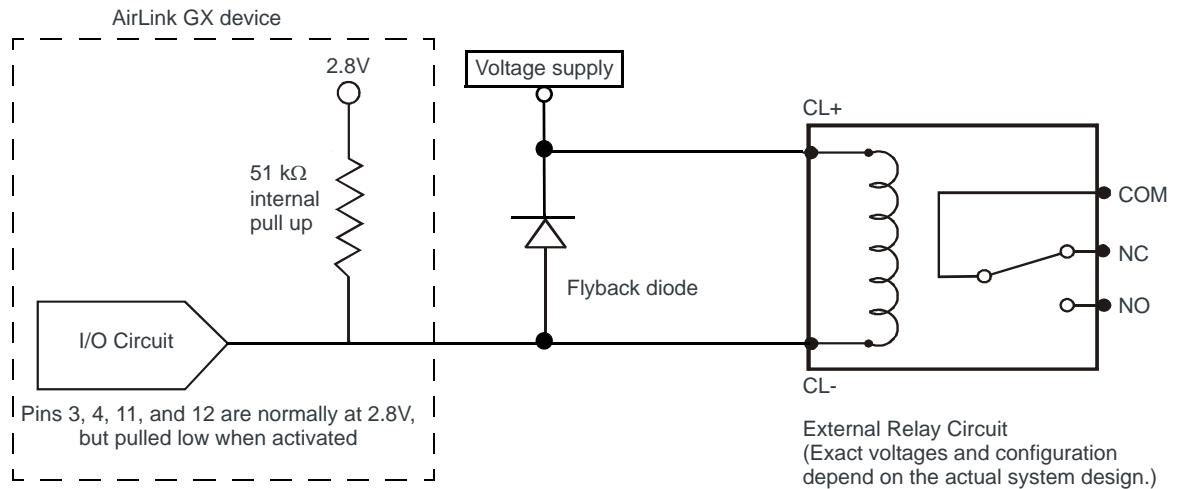
Figure 2-26: Digital Input Operation

Figure 2-27: Digital Output Operation

Table 2-6: Digital I/O

Pins	Name	Specification	Min	Typical	Max	Units
3 4 11 12	DIO[2...5] (as input)	Input low state voltage (At or below this voltage, relay reads as low)	—	—	1.2	V
		Input high state voltage range (At or above this voltage, relay reads as high)	2.2	—	—	V
		Input leakage current at 5 V	—	0.05	—	mA
		Input leakage current at 12 V	—	1.8	—	mA
		Input leakage current at 24 V	—	5.5	—	mA
	DIO[2...5] (as output)	Open drain drive to ground	—	100	—	mA
		Maximum open circuit voltage applied	—	—	30	V

I/O X-Card Digital I/O Input Pins

Pins 3, 4, 11 and 12 are programmed in ACEmanager to monitor inputs, respond to certain types of events or trigger a digital output. They behave exactly like the Digital I/O (pin 4) on the power connector as described in Power Connector Description on page 33.

Note: Digital Input 1 in ACEmanager is reserved for Pin 4 on the power connector.

Pins 3, 4, 11 and 12 (Digital inputs 2 to 5) have a voltage of 3.3VDC when it is set to high in ACEmanager. A voltage on the pins of:

• 2.2VDC to 30VDC=logic 1
• 0VDC to 1.3VDC=logic 0

I/O X-Card Analog Voltage Input Pins

Pins 7, 8, 14 and 15 are the analog voltage sensing pins configured in ACEmanager. Analog inputs monitor voltage changes in small increments. This allows you to monitor equipment that reports status as an analog voltage. You can use volts as the units reported or you can use the ACEmanager I/O Configuration screen to convert voltage to the desired units of measurement. You can also use the Event Reporting feature in ACEmanager to configure reports to be sent when an analog threshold is crossed. For more information, refer to the ALEOS Software Configuration User Guide.

The pins have a maximum rating of 30V, 200uA.

Table 2-7: I/O X-Card Analog Voltage Input Pins

Pins	Name	Specification	Parameter	Min	Typical	Max	Units
7 8 14 15	AIN[1...4]	Voltage range	VADC	0	—	30	V
		Input leakage current		—	—	200	µA
		Input capacitance	CIN	—	30	—	pF
		Error		0	2.5	5	%

These pins detect inputs of 0–30VDC across the pins to ground. When used with a sensor to transform values into voltages, the pins can monitor measurements like temperatures, pressures or the volume of liquid in a container. ACEmanager can transform these voltages into meaningful values. In ACEmanager, events reporting tells the device to perform an action when a specified voltage is detected.
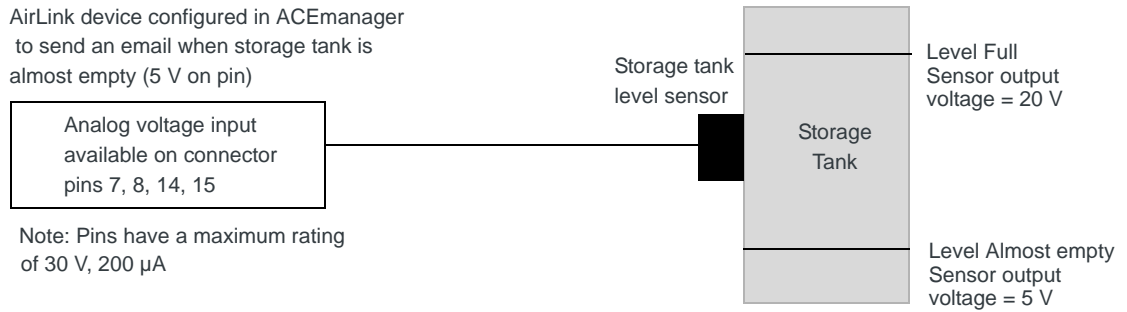
AirLink device configured in ACEmanager
to send an email when storage tank is
almost empty (5 V on pin)

Analog voltage input
available on connector
pins 7, 8, 14, 15

Note: Pins have a maximum rating
of 30 V, 200 μA

Storage tank
level sensor

Storage
Tank

Level Full
Sensor output
voltage = 20 V

Level Almost empty
Sensor output
voltage = 5 V

Figure 2-28: I/O X-Card Analog Voltage Input Operation

I/O X-Card RS-232 Port

Four pins on the high density DB15 support a 4-wire RS-232 interface. The
interface also supports features like AT, TCP PAD and UDP PAD.

Table 2-8: I/O X-Card RS-232 Port

Pins	Name	Specification	Parameter	Min	Typical	Max	Units
1 2	TXD CTS	Output low state voltage range	VOL	-5.0	-7.0	—	V
		Output high state voltage range	VOH	+5.0	+7.0	—	V
		Short circuit current	1 short	—	±35	±70	mA
		Leakage current	1 leak	—	±0.1	±10	μA
5 6	RXD RTS	Input low state voltage range	VIL	-5.0	—	-20	V
		Input high state voltage range	VIH	+5.0	—	+20	V
		Input resistance	R in	3	5	7	kΩ

*Note: There is no connection for RI, DCD, DTR or DSR. These are available on the DB-9
serial port. See Serial Port on page 37.*

Dual Ethernet X-Card

This card adds two RJ-45 Ethernet ports to the device for a total of three. The two
Ethernet ports on the X-Card are bridged with the device's main Ethernet port,
automatically becoming part of the same subnet.

The main Ethernet port on the rear panel is a high performance Ethernet port with
data rates up to 100 Mbps.

The Dual Ethernet X-Card provides additional Ethernet ports for applications
requiring lower throughput (in the range of 8–9 Mbps, or less if both ports are
being used).

For example, the Ethernet ports on the Dual Ethernet X-Card are ideal for applications that run on IP or other protocols that run on top of IP such as TCP and UDP.

Other suggested applications include:

- Modbus applications
- Low Resolution MMS (MultiMediaStreaming using mms://) applications
- Message Queuing Telemetry Transport (MQTT) applications
- Low Resolution Video surveillance applications

Configuring Dual Ethernet X-Card Ports

When your GX Series device has a Dual Ethernet X-Card installed, you can configure the additional Ethernet ports as Ethernet 2 and Ethernet 3 on the ACEmanager LAN > Ethernet screen. Information about the Ethernet ports appears on the Status > LAN and the Status > About screens. The LAN IP packets sent and received fields on the Status > LAN screen show the cumulative totals for all LAN interfaces.

3: Configuring AirLink GX Series devices   **3**

This chapter shows you how to communicate with and configure the Sierra Wireless AirLink GX Series device.

Connection Ports

You can connect to the device's:
- USB port (Micro AB)
- Ethernet port (RJ-45)
- Serial port (9-pin RS-232)

USB Port

The USB port can be either a:
- Virtual Ethernet port
- Virtual serial port

Drivers must be installed on the PC for it to work in either mode. They are available for download at http://www.sierrawireless.com/en/Support/Downloads.aspx.

We recommend you:
- Use a USB 2.0 cable
- Connect directly to your computer for best throughput

Configuring with ACEmanager

Note: For all of the configurable features available in ALEOS, refer to the ALEOS Software Configuration User Guide. It is available for downloading from the Sierra Wireless support web site.

AirLink devices are highly configurable when using the embedded ALEOS software. ACEmanager is a free utility included with every AirLink device. To access it:

1. Connect a laptop to the device with an Ethernet cable.
2. Start a web browser.
3. In the browser's address bar, enter the IP address: **http://192.168.13.31:9191**.
4. The login screen appears. Enter your name and password.

*Note: The administrator user name is **user** and the password is **12345**.*

The ACEmanager home page appears. From it you can access all of ALEOS's configurable features.

Figure 3-1: ACEmanager Example Home Page

Configuring with AirVantage Management Service

AirLink devices can be configured with the AirVantage Management Service (AVMS) from Sierra Wireless. AVMS is a cloud-based application, available from your web browser, that provides remote monitoring and configuration for any number of your AirLink ALEOS devices.

For more information on AVMS, go to: www.sierrawireless.com/productsandservices/AirVantage_M2M_Cloud.aspx

To access AirVantage:

1. Connect a laptop to the device with an Ethernet cable.

2. Start a web browser.

3. In the browser's address bar, enter the IP address:
   - **http://na.airvantage.net/start** (for North American customers)
   - **http://airvantage.net** (for European customers)

   The AirVantage login screen appears.

4. Enter your email address and AirVantage password and click **Log In.**

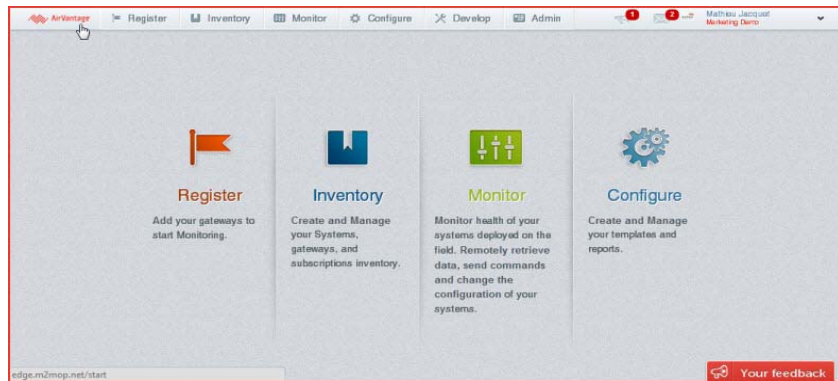The AirVantage start page appears. You can now manage your device through AirVantage.

Figure 3-2: AirVantage Start Page

Configuring with AT Commands

The device can be commanded and configured with AT commands. All the commands are listed in the ALEOS Software Configuration User Guide.

In ACEmanager, mouse over a red AT to the left of a listing to see a popup showing the AT command for that item.
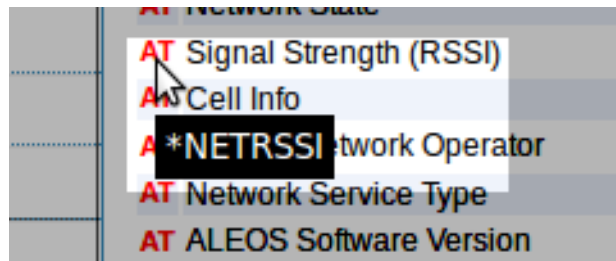

Figure 3-3: Mouse over for AT command (Signal Strength Shown)

- Most AT commands are prefaced with AT. Exceptions are noted in the ALEOS Software Configuration User Guide.
- The acceptable format and parameters are listed with each command in the ALEOS Software Configuration User Guide.
- If you enter a recognized AT command, the device responds with "OK." If the command is wrong, the device responds with "ERROR" or "Unsupported."

Simultaneous Wi-Fi AP and Client Mode with Automatic Switchover to Mobile Broadband

This configuration uses two ALEOS features:
- Wi-Fi Client Mode with automatic switchover from mobile broadband to Wi-Fi when a configured Wi-Fi Access Point (AP) is available
- Simultaneous Wi-Fi AP and Client modes

Note: This configuration uses an AirLink GX Series device with a Wi-Fi X-Card installed.

In Wi-Fi Client mode with automatic switchover, the GX device uses Wi-Fi whenever it is in range of a configured AP. When the GX device is out of range of a configured AP, it switches to using the Mobile Network Operator's (MNO's) mobile broadband network.

This is useful if you have the GX device installed in a transit or emergency vehicle. When the vehicle is near its home base (for example, a hospital, fire station, or bus depot) the GX connects to the AP at the home base to save on Mobile Network data plans. When the vehicle leaves its home base and is out of range of the AP, it switches automatically to the mobile broadband network.

When Wi-Fi mode on the GX device is set to Both (AP + Client), the GX device can connect to APs as a client and simultaneously act as an AP for a laptop, medical equipment, or other device co-located on the vehicle. The co-located device experiences a virtually seamless network connection, regardless of whether the connection from the GX device to the network is via Wi-Fi or the mobile broadband network.
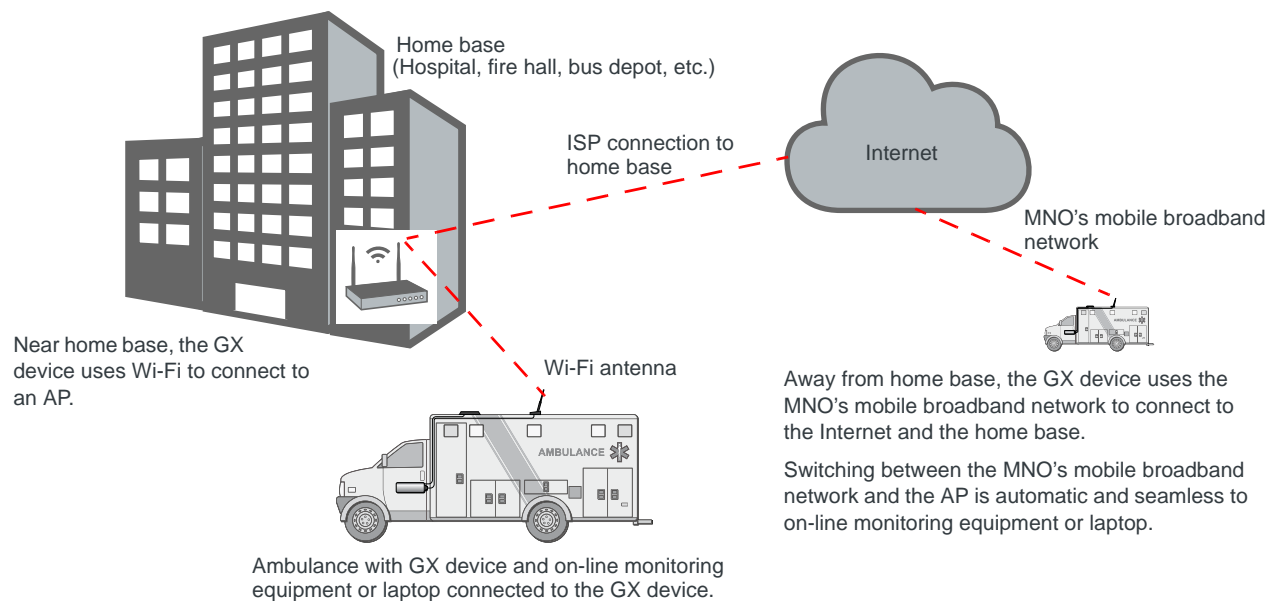

Figure 3-4: GX device AP + Client Wi-Fi application with automatic switch-over

You can configure these features in ACEmanager on the LAN/Wi-Fi tab > Wi-Fi page. The key configuration points are:

• Set the Wi-Fi mode to Both (AP + Client).

• Set the Wi-Fi Client Mode to Automatic.

• Configure the APs you want the GX device to scan for. The GX scans for the APs in the order they are configured in the ACEmanager window, so configure the most commonly used AP first. You can configure up to 10 APs.

The GX device scans for an AP every 5 seconds and when it finds an available configured AP, it automatically switches the connection from the mobile

broadband network to the AP. If more than one configured AP is available, the GX device connects to the AP with the strongest signal.

If the AP has a landing page that requires entering credentials, the GX device may not be able to transmit or receive traffic via the AP, as the GX device is not able to pass credentials to the landing page.

- Configure the access point parameters for the GX device, such as the SSID, channel, security authentication type, etc.

  The GX device supports WPA/WPA2 Personal authentication, but not WPA/WPA2 Enterprise authentication.

  If any of the configured APs that the GX device connects to have authentication configured, the authentication on GX device must be set to Open.

For details on configuring the GX device for simultaneous Client and AP mode, refer to the ALEOS Software Configuration User Guide.

4G LTE Models (GX 440)

- LTE/EV-DO (Verizon Wireless)
  LTE Band 13 with fallback to EV-DO Rev A 800/1900 MHz
- LTE/HSPA+ (AT&T, Canada)
  LTE Band 17/AWS with fallback to HSPA+ 850/1900/2100 MHz

3G Models (GX 400)

- EV-DO Rev A 800/1900 MHz
- HSPA+ 850/900/1900/2100 MHz

GPS Technology

- Protocols: NMEA 0183 V3.0, TAIP, RAP
- 4G LTE Models:
  - Acquisition time: 2 sec hot start
  - Accuracy: < 2 m (50%), < 5 m (90%)
  - Tracking sensitivity: -161 dBm
- 3G Models:
  - Acquisition time: 9 sec hot start
  - Accuracy: < 3 m (50%), < 8 m (90%)
  - Tracking sensitivity: -152 dBm

Protocols

- Network: TCP/IP, UDP/IP, DNS
- Routing: NAT, Host Port Routing, DHCP, PPPoE, VLAN, VRRP
- Application: SMS, Telnet/SSH, SMTP, SNMP, SNTP
- Serial: TCP/UDP PAD Mode, Modbus (ASCII, RTU, Variable), PPP

Events Reporting

- Event Types:
  - Digital input
  - GPS/AVL
  - Network parameters
  - Data usage
  - Timer
  - Power
  - Device temperature
- Report/Action Types:
  - SMS

· Email
· SNMP trap
· Relay output
· GPS RAP report
· Events protocol message to server

VPN/Security

• IPsec, SSL, and GRE VPN client

• Up to 5 VPN tunnels

• IKE encryption

• Port forwarding and DMZ

• Port filtering

• Trusted IP

• MAC address filtering

Device Management

• AirVantage™ Management Service cloud-based device management application

• ACEManager™ device configuration utility

ALEOS Application Framework

• Lua language coding platform

• Remote application management

• Eclipse-based IDE

• Integrated real-time debugging

Input/Output

• Configurable I/O on power connector

• Input ON voltage: 3.3VDC to 30VDC

• Input OFF voltage: 0VDC to 1.2VDC

• Output maximum switching capability 200mA @ 30VDC

Power Consumption

Table 4-1: GX Series device power consumption (without X-Card)

AirLink GX400/440 (no X-Card installed)	
Maximum current draw at 12V	1 A
Typical current draw at 12V	0.45 A
Low Power Mode current draw at 12V	50 mA

Additional Power Consumption with X-Cards Installed

Table 4-2 outlines the increase in power consumption if you have an X-Card installed in the GX Series device.

Table 4-2: Additional power consumption with X-Card installed[a]

	Dual Ethernet X-Card	Wi-Fi X-Card	Serial I/O X-Card
Change Typical	148 mA	110 mA	19 mA
Change Maximum	200 mA	155 mA	30 mA

a. Values are averaged over 2 minutes at +12 V at room temperature.

Environmental Specifications

- Operating temperature: -30°C to +70°C (-22°F to +158°F)[1]
- Storage temperature: -40°C to +85°C (-40°F to +185°F)
- Humidity: Maximum 90% RH @ 60°C (140°F)
- Military Spec MIL-STD-810F conformance to thermal, mechanical shock and humidity

Host Interfaces

- 10/100 Base-T RJ-45 Ethernet
- RS-232 Serial port
- USB V2.0 Micro-AB connector
- 3 SMA antenna connectors (RF, GPS, Rx Diversity)
- Support for active antenna

Wi-Fi X-Card

- IEEE 802.11b/g/n
- Both access point and client capability
- When used as an access point, up to 8 clients can connect simultaneously

1. The AC adapter has a narrower range of operating temperatures. See AC Adapter AC Power Adapter Environmental Specifications on page 57.

- When used as a client, can connect to one of up to 10 configured access points.
- Security:
  - WEP 64-bit and 128-bit encryption with H/W TKIP processing
  - WPA/WPA2 (Wi-Fi Protected Access)
  - AES-CCMP hardware implementation as part of 802.11i security
- SMA antenna connector
- Frequency range: 2.4 GHz

Number of channels

- 802.11b:
  - USA, Canada, and Taiwan—11
  - Most European countries—13
  - France—4
  - Japan—14
- 802.11g:
  - USA, Canada, and Taiwan—11
  - Most European countries—13
  - Japan—13
- 802.11n:
  - HT20: Channel 1~14 (2412~2484)
  - HT40: Channel 1~7 (2422~2472)
- Output power—WAN:
  - 802.11b: typical 16 dBm ± 1.5 dBm
  - 802.11g: typical 14 dBm ± 1.5 dBm
  - 802.11n (HT20 and HT40): typical 13 dBm ± 1.5 dBm
- Receive sensitivity (WAN):
  - 802.11b: typical -86dBm at 11 Mbps
  - 802.11g: typical -70 dBm at 54 Mbps
  - 802.11n: typical -69 dBm at HT20 MCS7
  - 802.11n: typical -66 dBm at HT40 MCS7
- Data Rates
  - 802.11b: 1, 2, 5.5, 11 Mbps
  - 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps
  - 802.11n: up to 150 Mbps
- Maximum Operating Range
  - Open space: ~100–125 m
  - Indoors: ~50 m

I/O X-Card

- 4 configurable digital I/O
- 4 analog inputs
  - Range of 0 to 30V
  - 10-bit resolution
- RS-232 Serial port

Dual Ethernet X-Card

- 2 configurable RJ-45 Ethernet ports
- LEDs
  - Link: 100Base-T=green / 10Base-T= off.
  - Activity: yellow
- Physical Layer Support: 10Base-T 100Base-T
- Auto Negotiation: 10Base-T, 100Base-T, Half and Full duplex
- Standards: IEEE 802.3 / 802.3u
- Auto Crossover: HP Auto MDI-X

Certifications

- PTCRB, R&TTE
- FCC, Industry Canada, CE, E-Mark
- RoHS Compliant, Class 1 Div 2

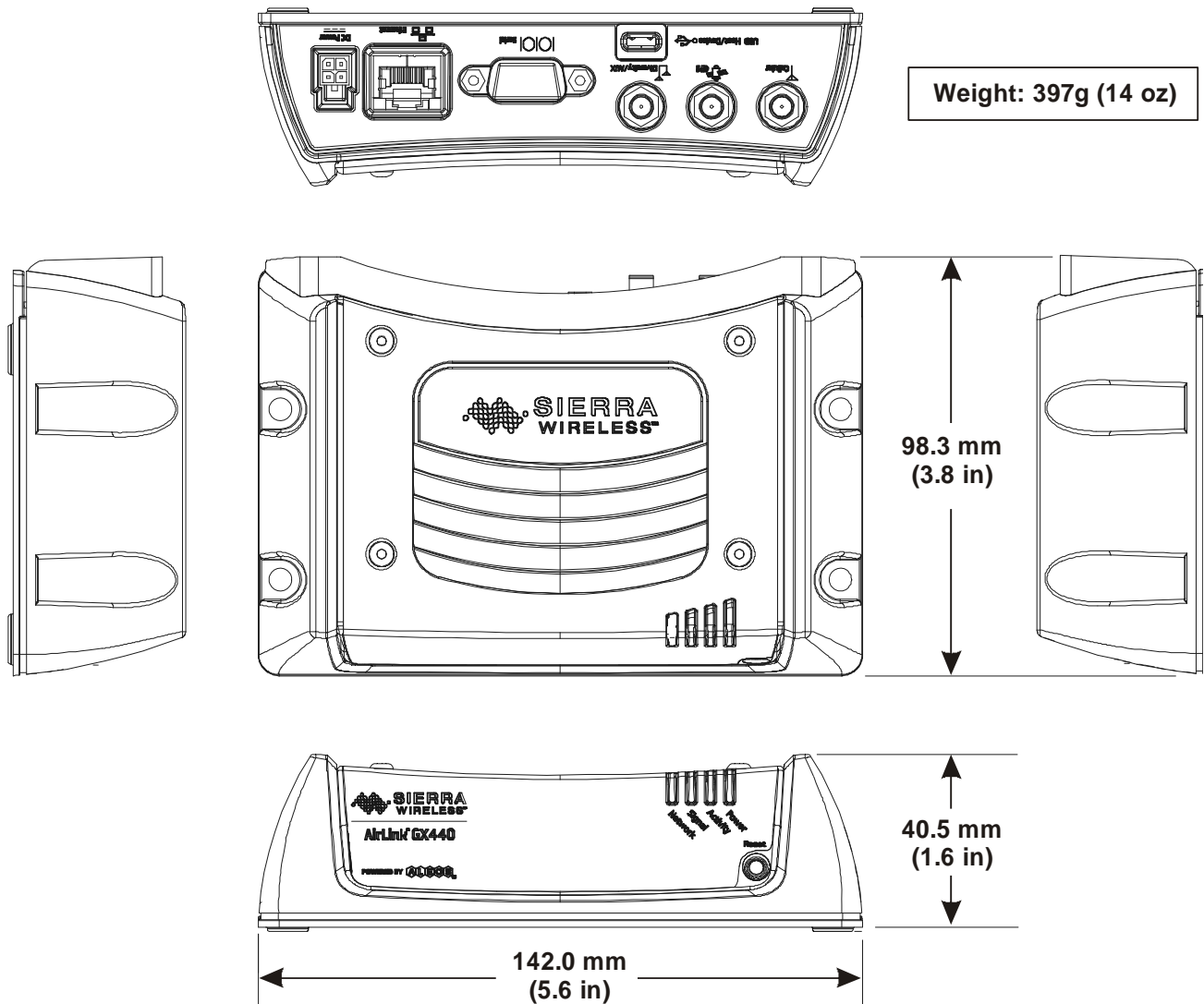## Power

- Voltage range: 9–36 VDC

Mechanical Specifications

Weight: 397g (14 oz)

98.3 mm (3.8 in)

40.5 mm (1.6 in)

142.0 mm (5.6 in)

Figure 4-1: AirLink GX Series Mechanical Specifications (Standard Device Shown)

The locking power connector housing and the internal wire connector that fits it are:

• Tyco micro Mate-N-Lok double row connector housing receptor p/n 794617-4

• Tyco female 3 mm Centerline, 250 V, 5 A max. crimp terminal p/n 794606-1

AC Power Adapter Specifications

This section describes the specifications for the AC power adapter that comes with the GX Series devices.

AC Power Adapter Input

The input voltage range is 90 VAC to 264 VAC.

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

The maximum input current is 500 mA at 100−240 VAC.

The inrush current will not exceed 70 A at 100−240 VAC input and maximum load from a cold start at 25°C.

AC Power Adapter Output

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

AC Power Adapter Environmental Specifications

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%
Vibration and Shock	MIL-STD-810D, method 514

Reliability and Quality Control

MTBF

When the power supply is operating within the limits of this specification, the MTBF is at least 50,000 hours at 25°C (MIL-HDBK-217F).

Safety Standards

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

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

EMC Standards

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

Hazardous Substances

- EU Directive 2002/95/EC "RoHS"
- EU Directive 2002/96/EC "WEEE"
- REACH

Energy Efficiency

- No-load power consumption is less than 0.3 W at input 115/230 VAC 60/50 Hz.
- Average active mode efficiency is greater than 80.4% at input 115/230 VAC 60/50 Hz.
- International Efficiency Level V
- Energy Star Energy Efficiency requirements for external power supplies (EPS Version 2)
- Canada's Energy Efficiency Regulations for external power supplies

5: Regulatory Information

Federal Communications Commission Notice (FCC United States)

Electronic devices, including computers and wireless devices, generate RF energy incidental to their intended function and are therefore subject to FCC rule and regulations. This equipment has been tested to, and found to be within the acceptable limits for a Class A digital device, pursuant to part 15 of the FCC Rules.

This equipment generates radio frequency energy and is designed for use in accordance with the manufacturer's user manual. However, there is no guarantee that interference will not occur in any particular installation.

If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by one or more of the following measures:

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

This device complies with Part 15 of the Federal Communications Commission (FCC) Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference.

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

Notice for Canadian Users

This Class A digital apparatus complies with ICES-003.

Industry Canada Notice

This Class A device complies with ICES-003 and RSS-210 of the Industry Canada rules. Operation is subject to the following two conditions:

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

Avis d'Industrie Canada

Cet appareillage numérique de la Classe A est conforme aux normes ICES-003 et RSS-210 du Canada. L'utilisation de ce dispositif est autorisée seulement aux conditions suivantes :

1. Il ne doit pas produire de brouillage et
2. Il doit accepter tout brouillage radioélectrique reçu, même si ce brouillage est susceptible de compromettre le fonctionnement du dispositif.

Important Information for North American Users on Radiation Exposure

This equipment complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and the user's body.

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

To comply with FCC/IC regulations limited both maximum RF output power and human exposure to RF radiation, maximum antenna gain must not exceed the values given in the tables in Maximum Antenna Gain (Gain D'antenne Maximal) on page 61.

Warning: *A minimum separation distance of 20 cm must be maintained between the antenna(s) used for this transmitter and all personnel.*

Informations Importantes Pour les Utilisateurs Nord-Américains sur L'exposition aux Radiations

Ce matériel est conforme aux limites établies par FCC/IC en matière d'exposition aux radiofréquences dans un environment non contrôlé. Ce matériel doit être installé et utilisé à une distance d'au moins 20 cm entrel'antenne et le corps de l'utilisateur.

Avertissement : *Ce produit est uniquement être installé par du personnel qualifié.*

Pour se conformer aux normes FCC/IC réglementation limitée à la fois la puissance maximale de sortie RF et l'exposition humaine aux rayonnements RF, gain d'antenne maximal ne doit pas dépasser les valeurs indiquées dans les tableaux de la section de gain d'antenne maximal.

Avertissement : *Une distance minimale de 20 cm doit être maintenue entre l'antenne (s) utilisées pour cet émetteur et l'ensemble du personnel.*

Maximum Antenna Gain (Gain D'antenne Maximal)

The Wi-Fi X-Card may transmit simultaneously with other co-located radio transmitters within a host device, as permitted by FCC/IC multi-transmitter product procedures.The antenna gain must not exceed the limits and configurations shown in the following tables:

Device	Frequency Band	FCC ID/IC Number			
		N7NMC8705/ 2417C-MC8705		N7N-MC5728/ 2417C-MC5728	
		Standalone	Collocated	Standalone	Collocated
GX400	Cellular Band	7.5 dBi	6 dBi	4.55 dBi	3 dBi
	PCS Band	3 dBi	3 dBi	2.85 dBi	2.5 dBi
Collocated Transmitter (Wi-Fi X-Card Option)	WLAN (2.4 GHz)	N/A	2 dBi	N/A	2 dBi

Device	Frequency Band	FCC ID/IC Number			
		N7NMC7700/ 2417C-MC7700		N7NMC7750/ 2417C-MC7750	
		Standalone	Collocated	Standalone	Collocated
GX440	Cellular Band	7.5 dBi	5 dBi	7.5 dBi	5.5 dBi
	PCS Band	3 dBi	3 dBi	3 dBi	3 dBi
	LTE Band 4	5.5 dBi	5.5 dBi	N/A	
	LTE Band 13	N/A		10.17 dBi	6.4 dBi
	LTE Band 17	9 dBi	6 dBi	N/A	
Collocated Transmitter (Wi-Fi X-Card Option)	WLAN (2.4 GHz)	N/A	2 dBi	N/A	2 dBi

EU (AirLink GX400 Only)

Sierra Wireless hereby declares the AirLink GX400 conforms to all the essential requirements of Directive 1999/5/EC.

Products are marked with a CE and notified body number and can be used throughout the European community. The alert symbol indicates that usage restrictions apply.

$C\epsilon$

The AirLink GX400 is compliant with the RF exposure requirements at 20 cm separation distance specified in EN 62311:2008 and 1999/519/EC for mobile exposure conditions, provided the maximum antenna gain does not exceed the limits given in the table below.

Model	Frequency (MHz)	Maximum Antenna Gain (dBi)
GX400 (MC8705 module)	880−915	3.00
	1710−1785	9.00
	1920−1980	12.00
Optional Wi-Fi Card	2400−2483.5	2.00

Note: This Wi-Fi card only works in the 2.4 GHz band.

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

Warning: A minimum separation distance of 20 cm must be maintained between the antenna(s) used for this transmitter and all personnel.

Declaration of Conformity

The Declaration of Conformity made under Directive 1999/5/EC is available for viewing at the following location in the EU community.

Sierra Wireless (UK) Limited

Suite 5, The Hub Fowler Avenue

Farnborough Business Park

Farnborough, United Kingdom GU14 7JP

WEEE Notice

If you purchased your AirLink GX series 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.

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