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# Sierra Wireless FX30

## Hardware User Guide



**SIERRA**  
WIRELESS®

41110030  
Rev 1

## Important Notice

Due to the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. Although significant delays or losses of data are rare when wireless devices such as the Sierra Wireless modem are used in a normal manner with a well-constructed network, the Sierra Wireless modem should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. Sierra Wireless accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the Sierra Wireless modem, or for failure of the Sierra Wireless modem to transmit or receive such data.

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# 1: Introduction to the FX30

1

The Sierra Wireless® FX30, a small, rugged, programmable Internet of Things (IoT) gateway, runs the secure Legato® Application Framework, and a long-term support Linux® operating system. You can use the FX30 as a simple USB modem, but its full potential is realized when you use it as an embedded cellular platform for IoT applications. With Ethernet, USB, I/O interfaces, and IoT Expansion cards, the FX30 can connect to many machines and infrastructures. The Linux-based Legato framework enables you to use efficient low-level C programming to write IoT applications for any connected machine.

## Key Features

- Penta-band HSPA+
- Ethernet 10/100 Mbps
- USB 2.0
- mini-SIM slot
- Three configurable I/Os
- Internet of Things (IoT) slot
- GNSS (GPS/Galileo/GLONASS)
- Legato support
- Ultra low power mode

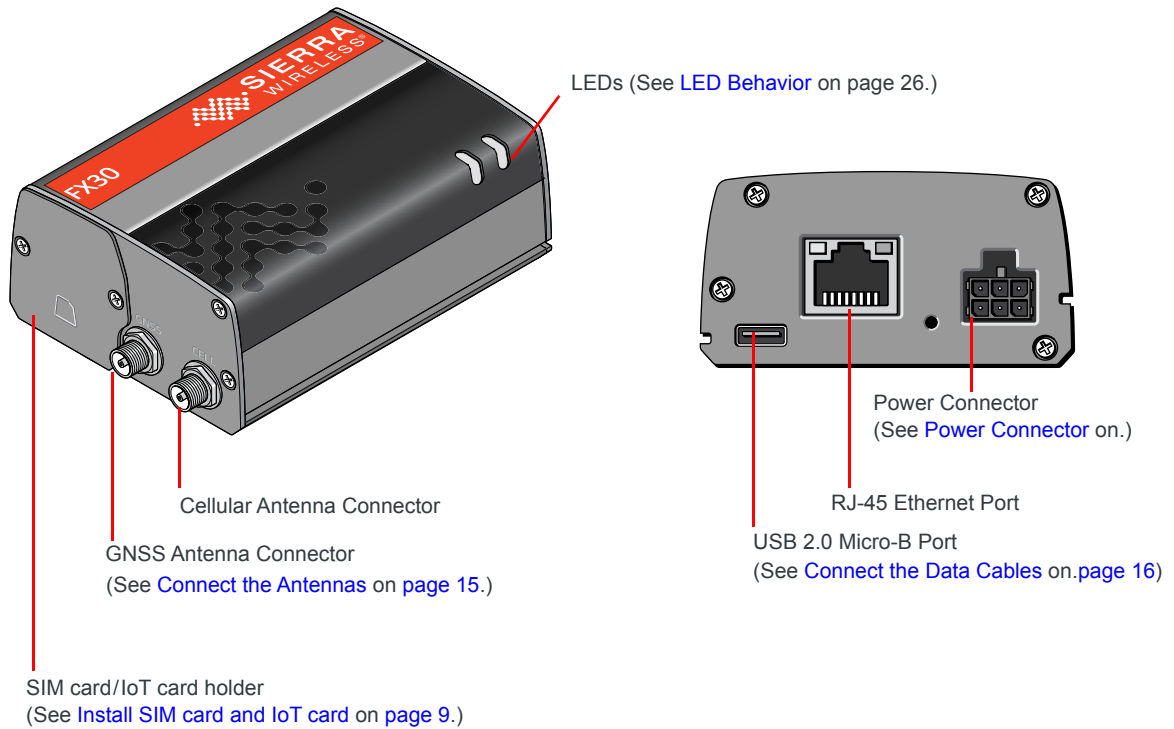


Figure 1-1: FX30 Connectors, LEDs and SIM Card Holder

## Accessories

The following items come with the FX30 gateway:

- DC power cable
- Mounting bracket

You can order the following items separately from Sierra Wireless:

- Universal AC power adapter
  - Voltage input: 100– 240 VAC
  - Current output: 1.5 A
- Compatibility bar (useful if you are replacing a Fastrack Supreme or a Fastrack Xtend)
- Range of GNSS and cellular antennas

Commonly available standard accessories you may want:

- 35 mm DIN rail clips

## Warranty

The FX30 comes with a 3-year warranty.



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## Reference Documents

Document Number	Title	Location
4116440	WP75xx/WP8548 Product Technical Specification	<a href="http://source.sierrawireless.com">source.sierrawireless.com</a>
4118047	WPx5xx AT Command Reference	<a href="http://source.sierrawireless.com">source.sierrawireless.com</a>
4117166	IoT Expansion Card Design Specification	<a href="http://mangoh.io/documentation/iot_expansion_card-design_specifications.html">http://mangoh.io/documentation/iot_expansion_card-design_specifications.html</a>
n/a	Legato information	<a href="http://legato.io">legato.io</a>

## 2: Installation and Startup

This chapter shows how to connect, install and start the Sierra Wireless FX30. It also describes the front panel LEDs, and I/O functionality.

---

*Note: The FX30 must be installed by a qualified technician.*

---

### Tools and Materials Required

- mini-SIM card (provided by your mobile network operator)
- #1 Phillips screwdriver
- Laptop computer
- AC adapter or DC power cable
- micro-B USB cable
- Cellular antenna
- Optional:
  - GNSS antenna

### Installation Overview

The steps for a typical installation are:

1. [Insert the SIM card and optional IoT Expansion card.](#)
2. [Mount and ground the FX30.](#)
3. [Connect the antennas.](#)
4. [Connect the data cables.](#)
5. [Connect the power and I/O.](#)
6. [Check the FX30 operation.](#)
7. [Using the FX30.](#)

The following sections describe these steps in detail. Read these sections carefully before performing the installation.

### Step 1—Insert the SIM Card and Optional IoT Card

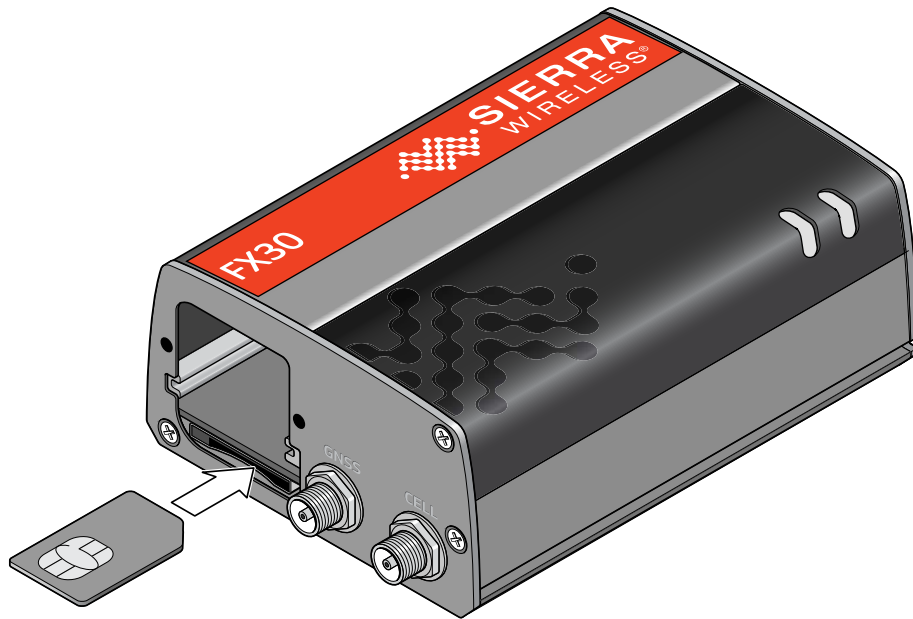
The Sierra Wireless FX30 has one mini-SIM (2FF) card slot.

If the SIM card has not already been installed, insert the SIM card into the gateway before connecting any external equipment or power to the FX30.

To install the SIM card:

1. Use a Phillips screwdriver to remove the cover.
2. Orient the SIM card, as shown in [Figure 2-1](#). The gold contacts on the SIM card face up.
3. Gently slide the SIM card into the slot until it clicks into place.

To remove a SIM card, press the SIM card in, and release it. Gently grip the SIM card and pull it out.



*Figure 2-1: Installing the SIM Card*

4. Replace the cover.

The FX30 has a slot for an Internet of Things (IoT) Expansion Card that provides a standard hardware interface for sensors, network adapters and other IoT technologies. Using Legato, you can design host applications for the IoT Expansion Card. For more information, see [Internet of Things \(IoT\) Expansion Card](#) on page 39.

To install an IoT Expansion card:

1. Use a Phillips screwdriver to remove the SIM card cover.
2. Orient the IoT Expansion card as shown in [Figure 2-2](#) and slide the card into the IoT slot.
3. Replace the cover.

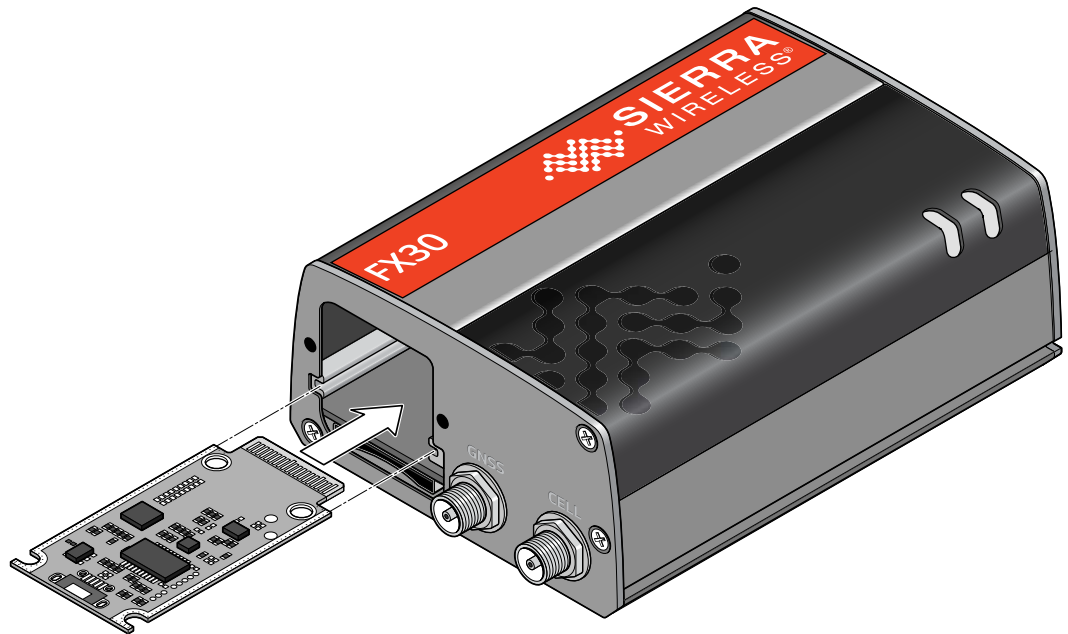


Figure 2-2: Installing the IoT Expansion Card

## Step 2—Mount and Ground the FX30 Chassis

The FX30 can be flat mounted, or mounted on a DIN rail. There is also a compatibility bar that allows you to use the same mounting holes if you are replacing a Fastrack Supreme or a Fastrack Xtend programmable gateway. See [Replacing existing Fastrack Supreme or Fastrack Xtend Device](#) on page 13.

Mount the FX30 where:

- There is easy access for attaching the cables.
- Cables will not be constricted, close to high amperages or exposed to extreme temperatures.
- The front panel LEDs are easily visible.
- There is adequate airflow.
- It is away from direct exposure to the elements, such as sun, rain, dust, etc.

You can mount the FX30:

- On a flat surface ([page 11](#))
- On a DIN Rail ([page 12](#))

To flat mount the FX30:

1. Attach the bracket to the mounting surface, using the attachment points shown in [Figure 2-3](#).

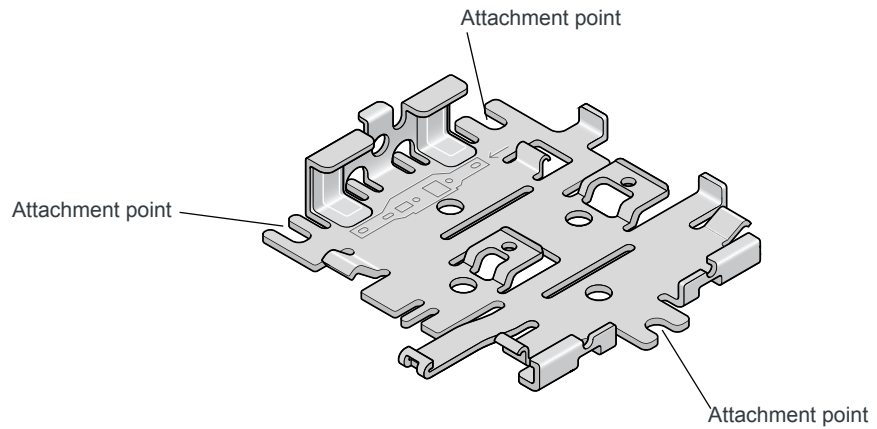


Figure 2-3: Mounting Bracket, showing attachment points

2. Slide or snap the FX30 into the bracket.

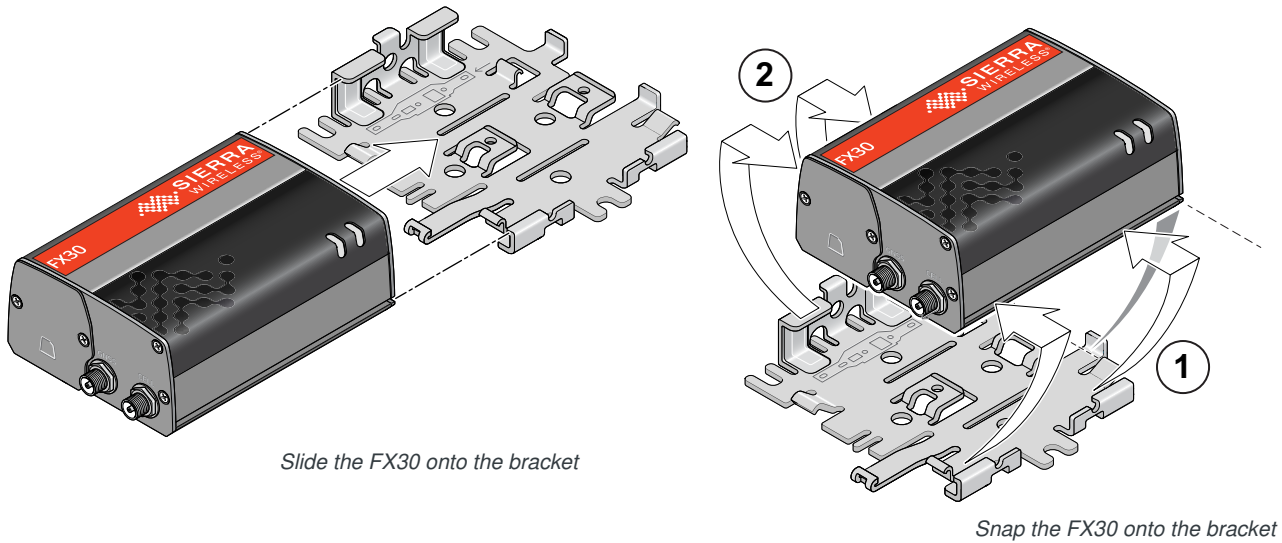
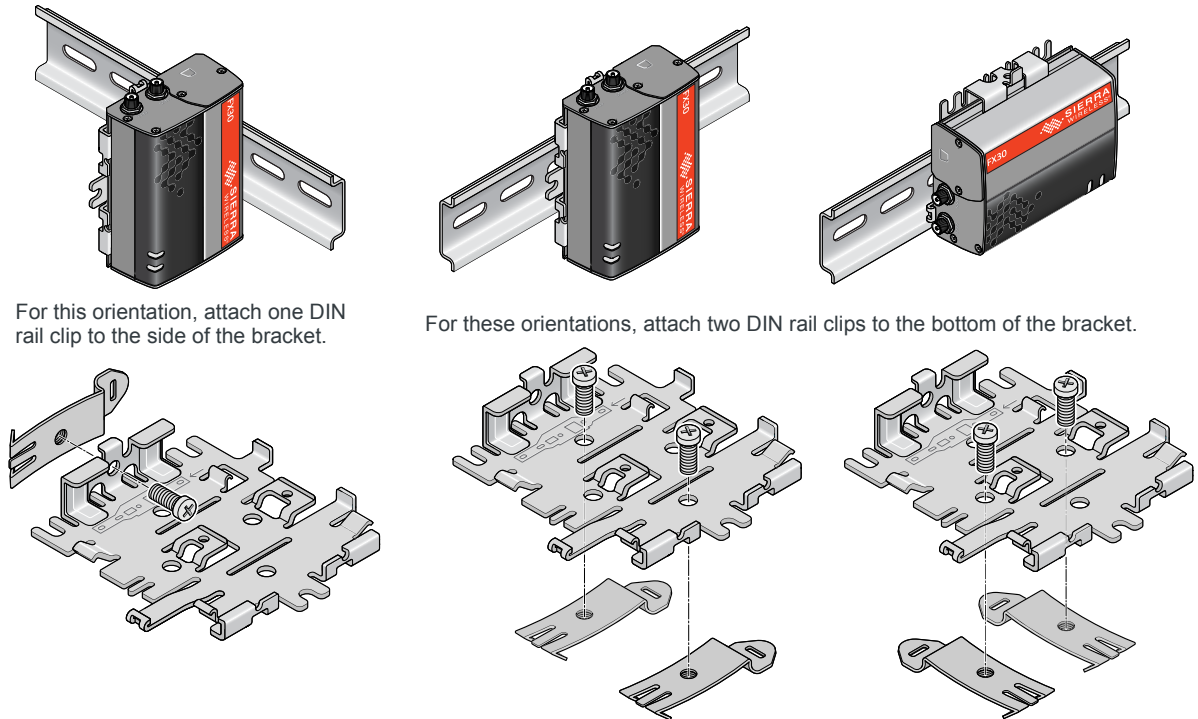


Figure 2-4: Attaching the FX30 to the bracket

To mount the FX30 in a DIN rail:

1. Attach the DIN rail clips to the bracket as shown in [Figure 2-5](#).  
If you are mounting the FX30 on its edge, attach one DIN rail clip to the side of the bracket.  
If you are mounting the FX30 horizontally or vertically, attach two DIN rail clips to the bottom of the bracket.



For this orientation, attach one DIN rail clip to the side of the bracket.

For these orientations, attach two DIN rail clips to the bottom of the bracket.

Figure 2-5: Attaching the DIN rail clips

2. Slide or snap the FX30 onto the bracket, as shown in [Figure 2-4](#).
3. Attach the FX30 to the DIN Rail. See [Figure 2-5](#).

## Replacing existing Fastrack Supreme or Fastrack Xtend Device

If you are going to be mounting the FX30 in a location where you previously had a Fastrack Supreme or a Fastrack Xtend mounted, attach the compatibility bar to the bracket. The compatibility bar is available from Sierra Wireless.

---

*Note: Adding the compatibility bar does not change the height of the gateway + mounting bracket. See [Figure 3-2](#) on page 36.*

---

To attach the compatibility bar to the bracket:

1. Note the large and small raised tabs on the bracket. Each tab has a small hole in the center of the raised portion. Also note the large and small rectangular openings in the compatibility bar. See [Figure 2-6](#).

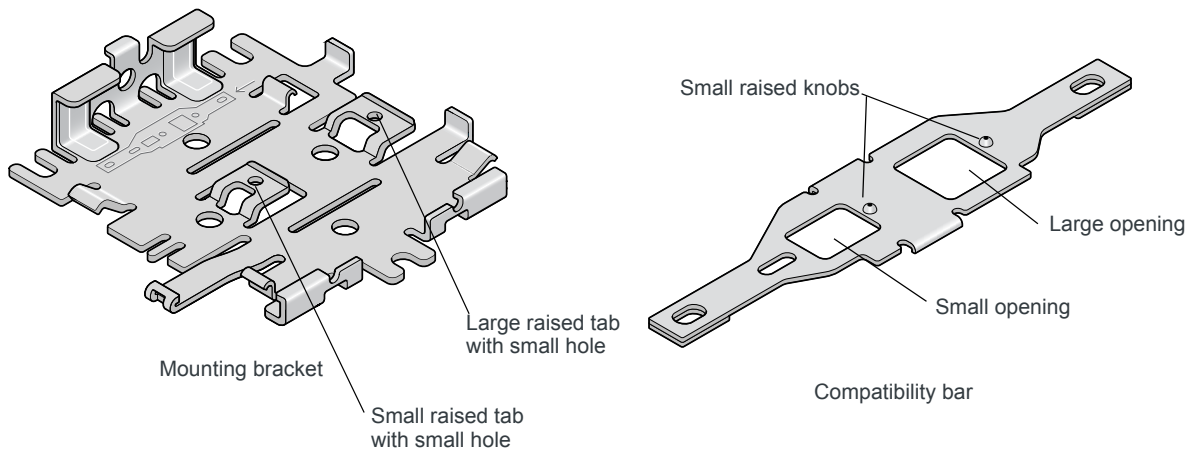


Figure 2-6: Mounting bracket and compatibility bar

2. Orient the mounting bracket and the compatibility bar as shown in [Figure 2-7](#).

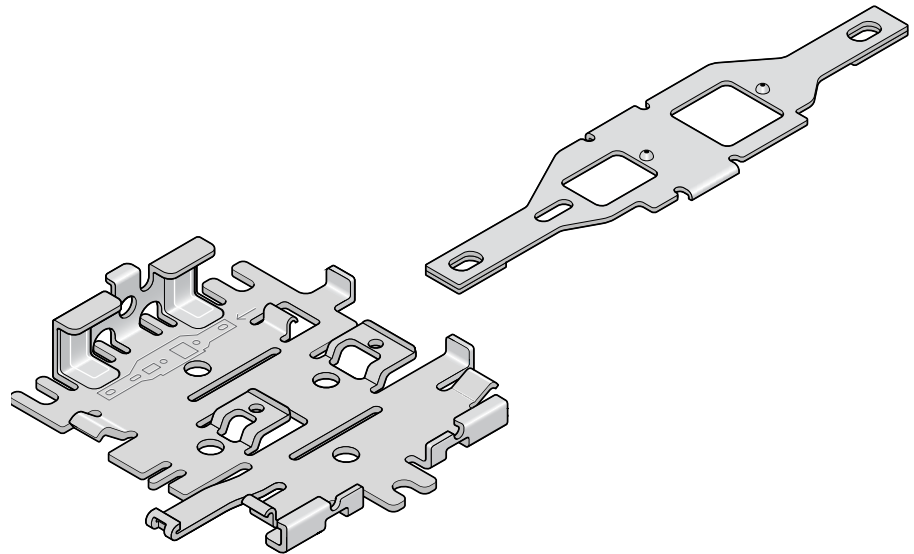


Figure 2-7: Mounting bracket and compatibility bar orientation

3. Place the compatibility bar on top of the bracket, so that the tabs on the bracket are inside the openings in the bar, and slide the bar into place. When fully secure, the knobs on the bar should be inside the small holes on the tabs.

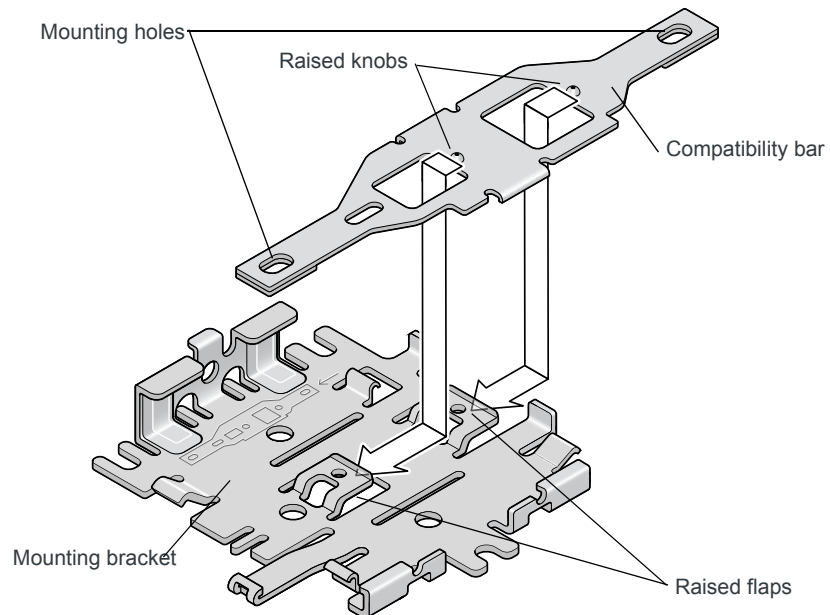


Figure 2-8: Attaching the compatibility bar

4. The mounting holes in the adapter bar match the existing mounting holes for the Fastrack Supreme or Fastrack Xtend.

For DC installations (with a fixed “system” ground reference), Sierra Wireless recommends always grounding the FX30 chassis to this system ground reference.

To ensure a good grounding reference, attach the FX30 to a grounded metallic surface.

## Step 3—Connect the Antennas

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

---

The FX30 has two SMA female antenna connectors:

- Cellular antenna connector
- GNSS antenna connector
  - GNSS bias supports 3.15 V antennas

For regulatory requirements concerning antennas, see [Maximum Antenna Gain](#) on page 40.



---

*Note: The antenna should not exceed the maximum gain specified in [RF Exposure](#) on page 40. 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), Industry Canada, or your country's regulatory body.*

---

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*Note: Take extra care when attaching the antennas to the SMA connectors. 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.).*

---

To install the antennas:

1. Connect the cellular antenna to the SMA cellular antenna connector.  
Mount this antenna so there is at least 20 cm between the antenna and the user or bystander.
2. If used, connect a GNSS antenna to the SMA GNSS antenna connector.  
Mount the GNSS antenna where it has a good view of the sky (at least 90°).

---

*Note: If the antennas are located away from the gateway, keep the cables as short as possible to prevent the loss of antenna gain. Route the 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 the cables are secured so their weight will not loosen the connectors from the gateway over time.*

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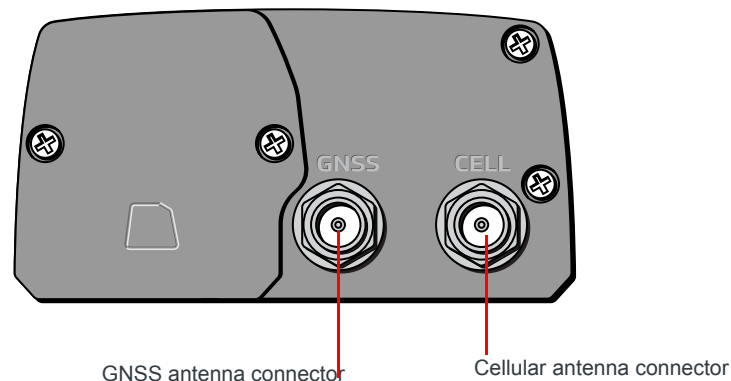


Figure 2-9: Antenna Connectors

## Step 4—Connect the Data Cables

The FX30 has two ports for connecting data cables:

- [USB](#) (Micro-B)
- [Ethernet](#) (RJ-45) —Use a Cat5 or greater Ethernet cable

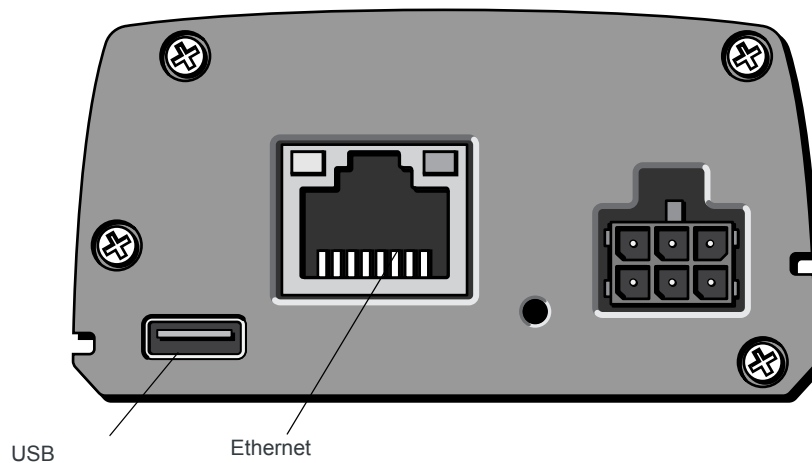


Figure 2-10: Connectors for data cables

## Cabling Concerns

Separate the antenna, data, and power cables from other wiring and route away from sharp edges.

## Cable Strain Relief

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

Place the cable strain relief within 200 mm (8") of the FX30 to reduce the mass of cable supported by the power connector under vibration. Ideally, the strain relief mounting for the DC cable should be attached to the same object as the gateway, so both the gateway and cable vibrate together. The strain relief should be mounted such that it does not apply additional stress on the power connector, i.e. the cable should not be taut and should not pull the power connector at an angle.

## Step 5—Connect the Power and I/O

The Sierra Wireless FX30 comes with a 1.5 meter (about 5 ft.) DC power cable. You can also purchase an optional AC adapter.

---

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

---

The FX30 supports an operating voltage of 4.75 V–32 V.

## Fusing

The Sierra Wireless DC power cable has a 3 A fuse installed in the cable. If that cable is used, no additional fusing is required.

## Power Connector on the FX30

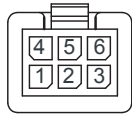


Figure 2-11: DC Power Cable Connections

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

Pin	Function	Associated DC Cable Wire Color	Description
1	Power	Red	(20 AWG + Fuse) Main power supply for device Fuse: Slow-blow 3 A 250 V (5 x 20)  <i>Note: If you want to turn the FX30 on/off using a control line, Sierra Wireless strongly recommends that you connect the on/off line to Pin 3 and apply continuous power on Pin 1.</i>
2	Ground	Black	(20 AWG) Main device ground
3	On/Off	Yellow	(28 AWG) On/Off: Control line to turn the gateway on and off. Pin 3 must be connected: either to the input power source or to an on/off switch. The FX30 is off when this pin is either open-circuit or grounded, and on when this pin is connected to power.
4	IO 1	Brown	Digital input Wake from active low power mode or ultra low power mode
5	IO 2	Green	Digital input Wake from active low power mode or ultra low power mode Analog input
6	IO 3	Orange	Digital input Digital output

## Power Modes

The FX30 has three power modes:

- Off—Gateway is turned off. No power to the gateway.
- Ultra Low Power—The gateway is in its lowest power state. Ports are powered down, but the gateway monitors GPIO1 and GPIO2 and wakes up if the I/O state changes. This is useful if the gateway only needs to be active

very infrequently (for example, in a remote monitoring station that must transmit data once a day)

- Active Low Power—The gateway is fully powered and operating in a low energy state. The gateway monitors GPIO1 and GPIO2 and wakes up if the I/O state changes.
- On—Gateway is fully powered.

## Wiring Diagrams

### Always On Installation

For an Always On application, connect the wires as shown in [Figure 2-12](#).

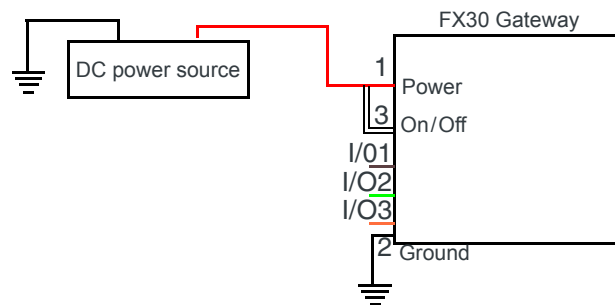


Figure 2-12: Always on installation

- Pin 1 (Power)—Use the red wire in the DC cable to connect Pin 1 to the power source.
- Pin 2 (Ground)—Use the black wire in the DC cable to connect Pin 2 to ground. See also [Step 2—Mount and Ground the FX30 Chassis](#) on page 11.
- Pin 3 (On/Off)—Connected to power
- Optional—I/O1, I/O2, and I/O3

### On/Off Installation

For an On/Off application, connect the wires as shown in [Figure 2-13](#).

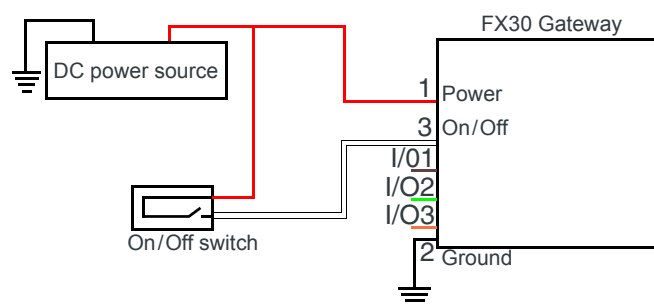


Figure 2-13: On/Off Installation

- Pin 1 (Power)—Use the red wire in the DC cable to connect Pin 1 to the power source.

- Pin 2 (Ground)—Use the black wire in the DC cable to connect Pin 2 to ground. See also [Step 2—Mount and Ground the FX30 Chassis](#) on page 11.
- Pin 3 (On/Off)—Connected to an on/off switch  
Pin 3 must be connected.
- Optional—I/O1, I/O2, and I/O3

## Installation with I/O Input Triggered by Standby Mode

If you have an installation where you want to use the I/O to monitor an external device such as a motion detector or gate sensor, refer to [Figure 2-14](#). If desired, you can use Legato to program the I/O line to wake the gateway from ultra low power mode for a specific length of time.

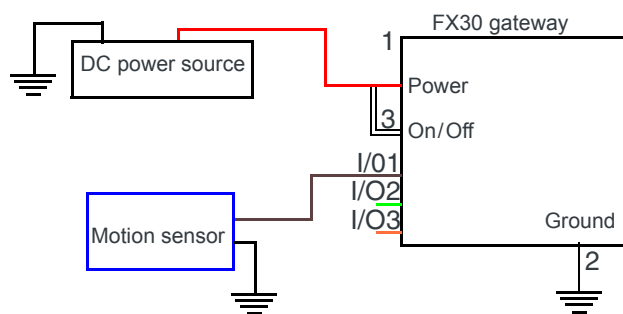


Figure 2-14: Fixed Installation with I/O

- Pin 1 (Power)—Use the red wire in the DC cable to connect Pin 1 to the power source.
- Pin 2 (Ground)—Use the black wire in the DC cable to connect Pin 2 to ground. See also [Step 2—Mount and Ground the FX30 Chassis](#) on page 11.
- Pin 3 (On/Off)—Connected to power  
Pin 3 must be connected.
- Optional—I/O1, I/O2, and I/O3  
See [I/O Configuration](#) on page 20.

## I/O Configuration

The Sierra Wireless FX30 power connector has three pins you can use for I/O configuration:

- I/O1—Digital input only; allows wakeup from ultra low power mode
- I/O2—Digital and analog input; allows wakeup from ultra low power mode
- I/O3—Digital input and digital output

---

*Note: The IoT Expansion Card has four GPIO pins that you can program using Legato. For details, refer to the [IoT Expansion Card Design Specification](#).*

---

## I/O Pins

You can use the I/O pins as:

- Digital inputs  
(See [Table 2-2](#) on page 22 and [Figure 2-15](#) on page 21.)
- High side pull-ups/dry contact switch inputs  
(See [Figure 2-16](#) on page 22.)
- Analog inputs  
(See [Table 2-3](#) on page 23 and [Figure 2-17](#) on page 23.)
- Low side current sinks  
(See [Figure 2-18](#) on page 24.)
- Digital outputs/open drains  
(See [Table 2-4](#) on page 25 and [Figure 2-19](#) on page 24.)

---

*Note: The I/O pin functionality is programmable in Legato applications.*

---

## Digital Input

Digital input is available on I/O1, I/O2, and I/O3 on the power connector.

---

*Note: To use I/O3 as a digital Input, GPIO56 (that drives I/O3 when used as a digital output) must be low.*

---

You can connect any of these pins to a digital input to detect the state of a digital sensor or pulse counter.

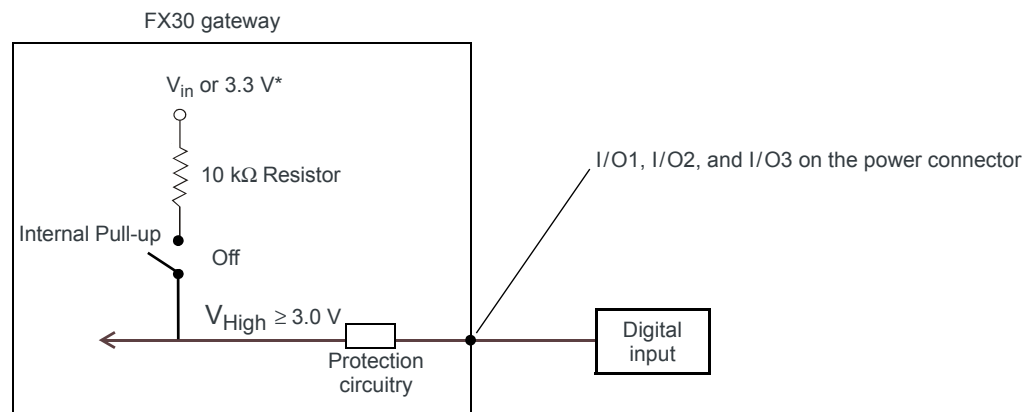


Figure 2-15: Digital Input

---

*Note: When using a digital input, the pull-up should be Off.*

---

**Table 2-2: Digital Input**

Pull-up	State	Minimum	Typical	Maximum	Units
Off	Low	—	—	1.0	V
	High	3.0	—	V <sub>in</sub>	V

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

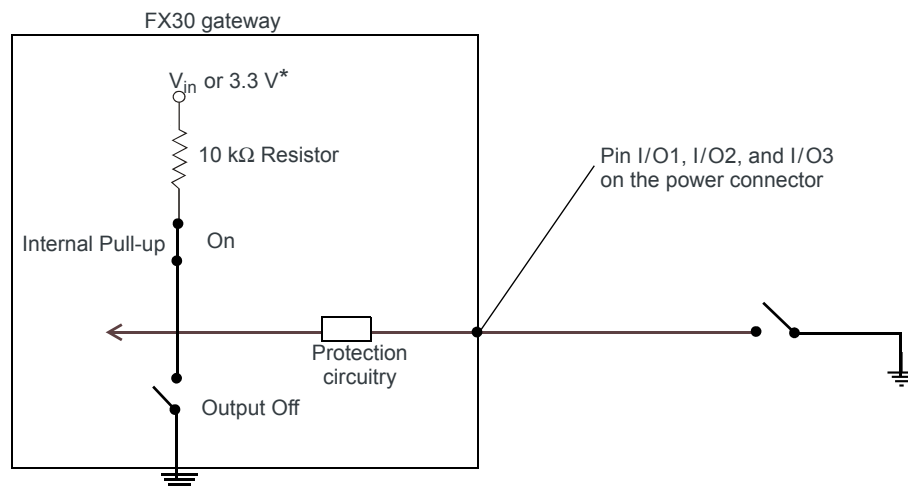
High side pull-up/dry contact switch input is available on I/O1, I/O2, and I/O3 on the power connector.

---

*Note: To use I/O3 as an high side pull-up/dry contacts switch input, GPIO56 (that drives I/O3 when used as a digital output) must be low.*

---

You can connect any of these pins to a dry contact switch.



\*I/O 1 and I/O 2 are pulled to 3.3 V through a 10 kΩ resistor.  
I/O 3 can be pulled to V<sub>in</sub> through a 10 kΩ resistor.

Figure 2-16: High Side Pull-up / Dry Contact Switch Input

---

*Note: For this use case, the pull-up must be enabled.*

---

## Analog Input

Analog input is available on I/O2 on the power connector and on the IoT interface.

You can connect any of these pins to an analog gauge. As an analog input (voltage sensing pin), the gateway monitors voltage changes in small increments. This allows you to monitor equipment that reports status as an analog voltage.

The pin detects inputs of 0V–10 V (or 0V–5 V when the lower ADC range is selected). When used with a sensor to transform values into voltages, the pin can monitor measurements like temperatures, pressures or the volume of liquid in a container.

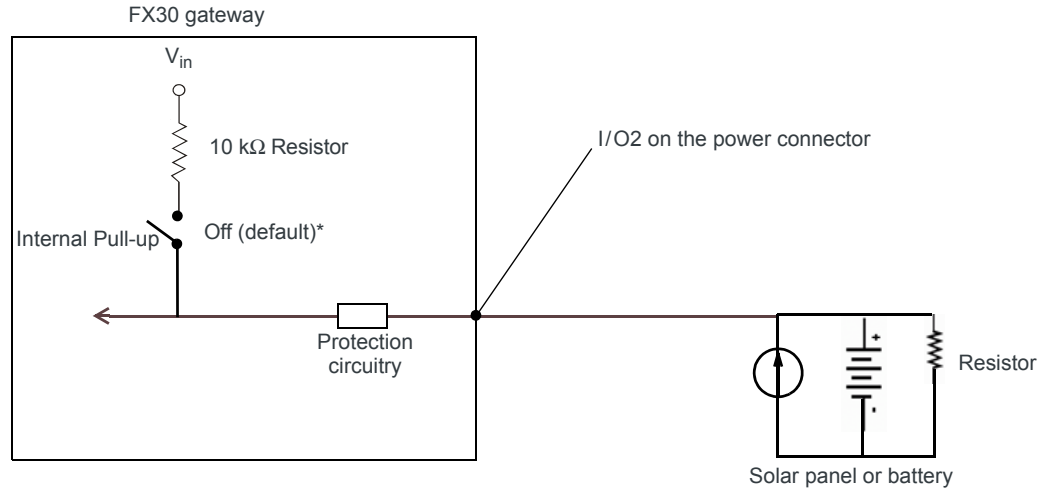


Figure 2-17: Analog Input

*Note: When using a analog input, the pull-up should be Off.*

**Table 2-3: Analog Input**

Pull-up		Minimum	Typical	Maximum	Units
Off	Analog Input Range	0	—	5 or 10 <sup>a</sup>	V
	Analog Input Precision	—	< 10 for 0–10 V ADC range 5 for 0–5 V ADC range	25	mV

a. Depending on the ADC range selected.



## Low Side Current Sink Output

Low side current sink output, for example to drive a relay, is only available using I/O3 on the power connector.

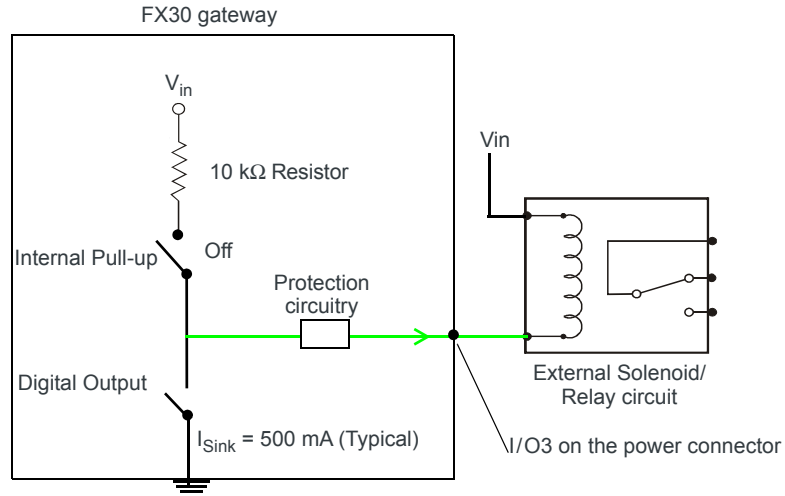


Figure 2-18: Low Side Current Sink

*Note: When using low side current sink output, the pull-up should be Off.*

The I/O can typically sink 400 mA, but this can vary depending on factors such as temperature.

## Digital Output/Open Drain

Digital output/open drain is only available using I/O3 on the power connector.

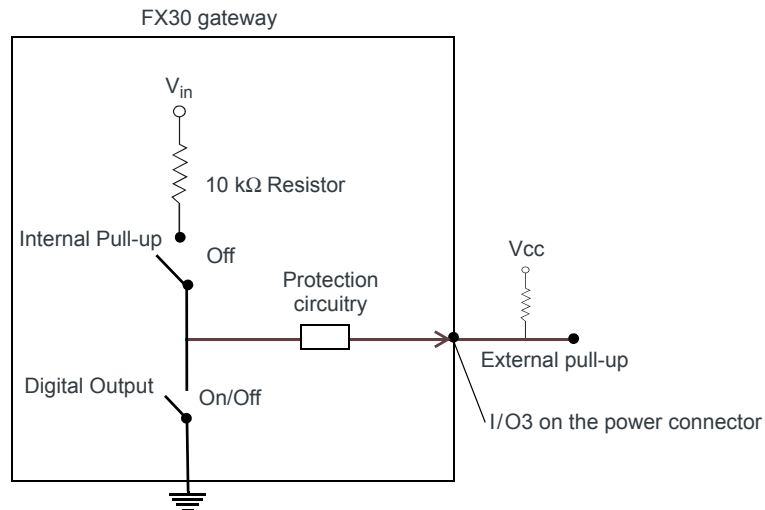


Figure 2-19: Digital Output/Open Drain

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*Note: To provide voltage on the digital output, either use the internal pull-up or add an external pull-up.*

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**Table 2-4: 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—Check the FX30 operation

1. On initial power up, the Power LED is red. When the processor boots up, the LED turns amber (by default). The Power LED can be controlled by Legato applications.

If the Power LED does not turn on, ensure that the:

- Power connector is plugged in and supplying voltage of 4.75 V or greater.
- On/Off (pin 3) is connected to the battery or power source. (See [Step 5—Connect the Power and I/O](#) on page 17 for details.)