ConnectPort® X3 Family User's Guide

ConnectPort X3
ConnectPort X3 H
ConnectPort X3 R

90001190_E

Contents

Introduction

C H A P T E R 1

This guide describes and shows how to connect hardware, configure, manage, and develop programs for ConnectPort X3 Family products. It is intended for those responsible for setting up the products. It assumes some familiarity with networking concepts and protocols.

ConnectPort X3 Family gateways

ConnectPort X3 Family gateways deliver a powerful yet cost-effective asset management solution by combining a programmable gateway with an easy-to-use development environment and the iDigi® Device Cloud™ management platform. The ConnectPort X3 can be programmed using open source Python™ programming language or the iDigi Device Integration Application (iDigi® Dia). Digi also provides application developers with a familiar Eclipse-based Integrated Development Environment, Digi ESP™ for Python, for rapid application development.

An embedded XBee® module provides a low-power wireless connection to a small network of other ZigBee-enabled devices, for example, a collection of sensors. The optional analog I/O, digital I/O or RS-232 serial port provides a direct wired connectivity option. Onboard GPS is also available for applications that require location services.

The ConnectPort X3 Family offers a wide range of commercial enclosures, including rugged NEMA 4X/ IP66 and IP67. Various power options are also available including AC, DC, D-cell alkaline battery, and solar power.

Key features of ConnectPort X3 Family gateways include:

- Global cellular coverage with GSM/GPRS module
- Support for XBee/ZigBee device networks with support for up to five XBee nodes
- Gateway supports analog I/O, digital I/O, RS-232 serial and GPS options
- Programmable in Python and iDigi Device Integration Application (iDigi Dia); the latter reduces development time using familiar Eclipse-based development environment
- Hosted iDigi® management and monitoring platform provides secure, economical, scalable deployments
- iDigi Management Services for management and monitoring

Hardware

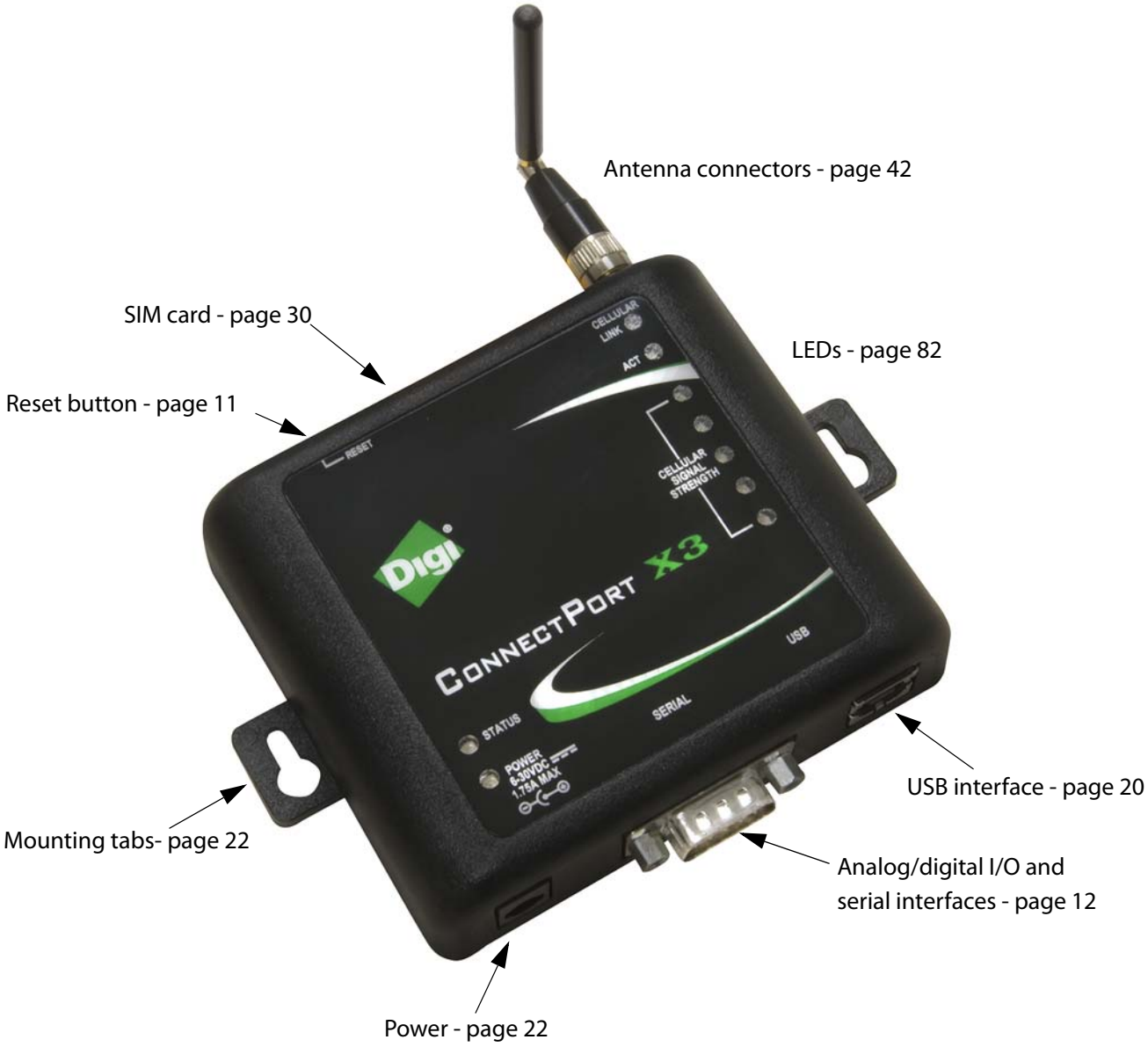
CHAPTER 2

This section details requirements and recommendations for ConnectPort X3 Family hardware. See also "Specifications and certifications" on page 69 and "System status LEDs" on page 82.

ConnectPort X3 and ConnectPort X3 H hardware

ConnectPort X3 hardware summary

ConnectPort X3 hardware is shown below. Product appearance may vary slightly based on configuration.



ConnectPort X3 H hardware summary

ConnectPort X3 H hardware shown below identifies the NEMA-enclosure hardware features for the product only. Please refer to "ConnectPort X3 and ConnectPort X3 H hardware" on page 9 for the ConnectPort X3 hardware within the NEMA enclosure. Product appearance may vary slightly based on configuration.

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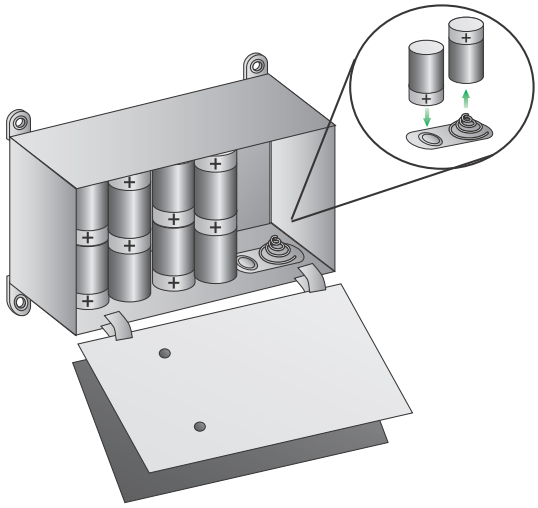

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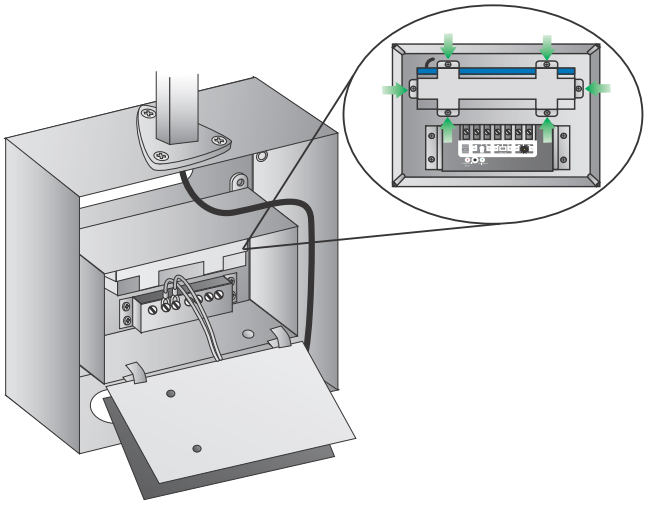
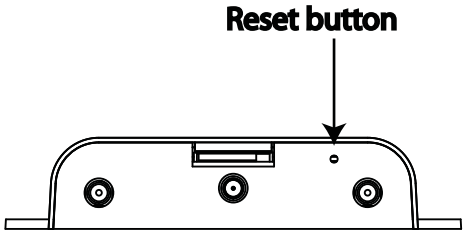


Battery replacement - Solar-powered models - page 26

Reset button/Reset line

The reset button for the ConnectPort X3 performs a simple reboot, or a soft reset, for the device and all peripheral devices on the unit, such as the GPS, XBee module, and WMP100 processor.



Interfaces

Following are requirements, pinouts, and specifications for the interfaces supported on ConnectPort X3 and ConnectPort X3 H products.

Analog/Digital I/O connection interfaces

This section describes pinout characteristics and DIP switches for ConnectPort X3 and ConnectPort X3 H products that have analog and digital I/O connectors.

Deployment decisions for analog connections:

Before using the analog connections in a solution, consider the following questions:

- What is the analog mode of the device or sensor you plan to attach to the ConnectPort X3 Family product?
- How do you want to retrieve measurement data from the ConnectPort X3 Family product?
- How will the ConnectPort X3 Family product be powered? Mains, battery, or solar?

Analog modes

ConnectPort X3 Family products have two modes in which it can measure analog input signals:

- 0-10 Volt mode: measures voltage on a scale of 0 to 10 Volts, and translates it into a 10-bit scale from 0 to 1023 as possible values.
- Current Loop (4 mA to 20 mA) mode: measures current on a scale of 4 to 20 mA, and translates it into a 10-bit scale from 0 to 1023 as possible values.

Measurement retrieval options

There are several ways to retrieve data collected by the X3:

- Through the iDigi Dia (Device Integration Application) framework. iDigi Dia software simplifies connecting devices (sensors, PLCs, etc.) to communication gateways. iDigi Dia includes a comprehensive library of plug-ins that work out-of-the-box with common device types and can also be extended to include new devices.
- By using existing Python modules provided by Digi.
- By using your own custom Python programs.

Connecting wires to the analog/digital I/O connector

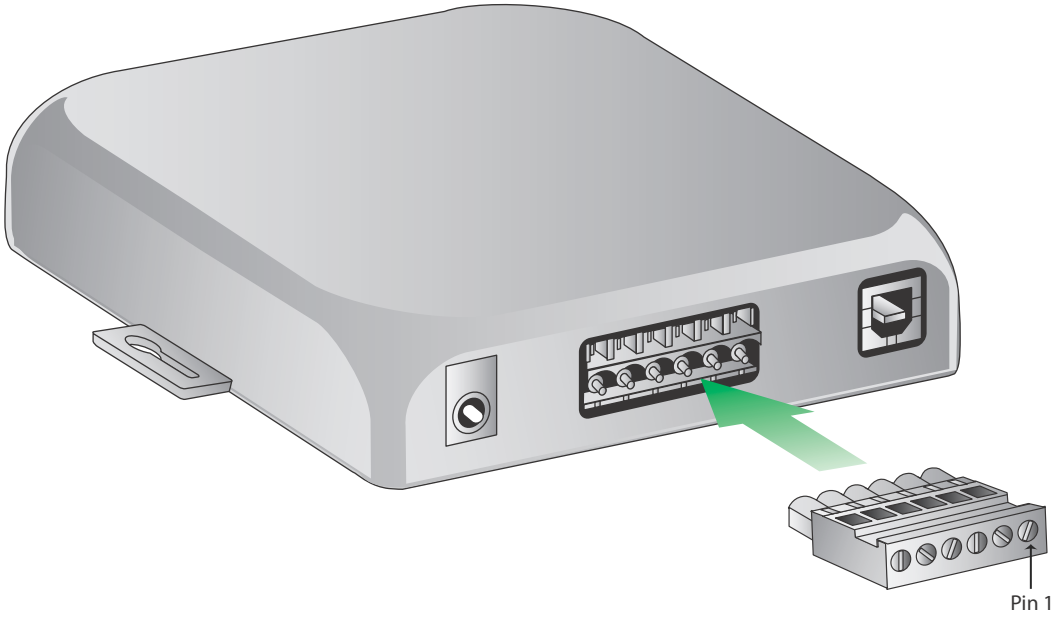
The connector for Analog and Digital I/O-equipped ConnectPort X3 models is a 6-position wire pluggable screw terminal block. The figure below shows Pin 1 of the connector when the ConnectPort X3 device is oriented with the mounting tabs facing downwards.

1 Connect the wires for the desired analog or digital device to the removable screw-lock connector. The connector accommodates wire gauges from 16AWG to 30AWG.

To insert wires, insert the wires into the screw-lock connector and tighten the screws associated with the wire slots.

To remove wires, loosen the screws associated with the wire slots and remove the wires.

2 Connect the two parts of the pluggable screw terminal block together as indicated in the figure.



Pinouts on the screw terminal block

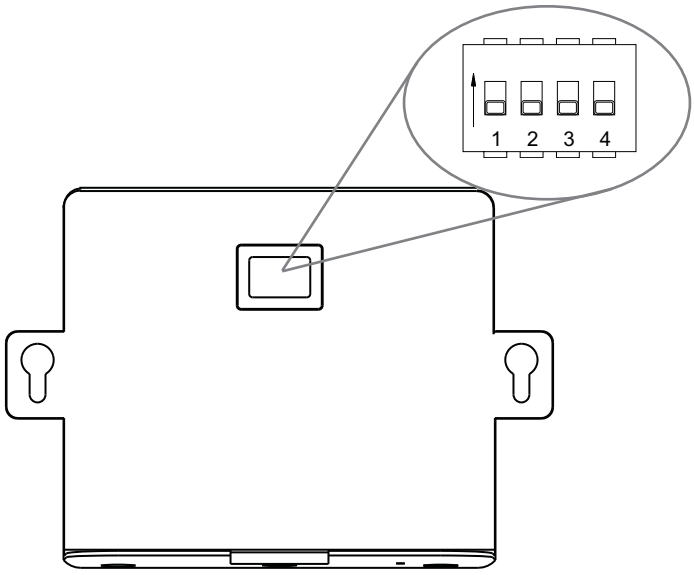
Using the orientation of the 6-position wire screw terminal block, pin 1 is the right-most pin and pin numbers increment from right to left. Pinouts for the connector are:

Pin	X3 I/O Type		
	2 Analog / 2 Digital	**4 Analog**	**4 Digital**
1	Channel 0 (Analog)	Channel 0 (Analog)	D0 (Digital)
2	Channel 1 (Analog)	Channel 1 (Analog)	D1 (Digital)
3	D2 (Digital)	Channel 2 (Analog)	D2 (Digital)
4	D3 (Digital)	Channel 3 (Analog)	D3 (Digital)
5	Ground	Ground	Ground
6	Power	Power	Power

	Function 1	**Function 2**
Analog Pins	0-10V input	4 – 20mA Current Loop
Digital Pins	Digital Input	Sinking Driver Output

DIP Switches

A 4-position DIP switch pack is used on the ConnectPort X3 Analog and Digital I/O models. This DIP switch pack is accessible from the bottom of the unit. The image shows the location of the DIP switch pack and the orientation of the unit for setting switches to the On position. The arrow on the DIP switch pack shows the direction in which to move switches to the On position.



To set the switches, use a small non-metallic pointed object. Switch settings are as follows:.

DIP Switch	Switch Settings
1	Enables and disables +4V voltage output On= +4V power Off = no output
2	Enables and disables +12V power out. On=+12V power out Off=no power out
3	D2 pullup 10k
4	D3 pullup 10k

Note: Switches 1 and 2 should not be on at the same time as increased parasitic battery drain will result.

Analog input/output specifications

Specifications for ConnectPort X3 2 Analog/2 Digital and 4 Analog models are as follows:

Analog Mode	Specification	Value
0-10 volt mode	Minimum input	0 VDC
	Maximum input	+10.25 VDC
	Minimum safe input	-0.5 VDC
	Maximum safe input	+11 VDC
	Input impedance	Differs by XBee RF protocol: XBee ZB: 28200 ohms XBee 802.15.4: 43600 ohms XBee 868, XBee DigiMesh 900: 43600 ohms
Current Loop (4 mA to 20 mA) mode	Minimum input	0 mA
	Maximum input	23.5 mA
	Minimum safe input	-.5 VDC
	Maximum safe input	40 mA
	Input impedance	Differs by XBee RF protocol: XBee ZB: 51.1 ohms XBee 802.15.4:, XBee 868, XBee DigiMesh 900: 120 ohms
All modes	Resolution	10 bits
	Accuracy	Differs by XBee RF protocol: XBee ZB, XBee 802.15.4: 0.2% XBee 868, XBee DigiMesh 900: 0.4%

Note: Exceeding the maximum or minimum safe values will result in damage to the unit.

Digital input/output specifications

2 Analog/2 Digital and Digital models have these specifications:

Digital mode	Specification	Value
Digital Input	Input type	Non-inverting Schmitt trigger gate
	Positive-going switching threshold	~1.6 VDC
	Negative-going switching threshold	~1.0 VDC
	Minimum input	0 VDC
	Maximum input:	+30 VDC
	Minimum safe input	-0.5 VDC
	Maximum safe input	+31 VDC
	Input impedance	1.5 Megaohms
	Default level when no input applied	Low
Digital Output	Output type	Open collector sinking driver
	Maximum sink current	1.8 ADC
	Minimum output voltage	0 VDC
	Maximum output voltage	+30 VDC
	Minimum safe output	0.5 VDC
	Maximum safe output	+31 VDC
	Resistor pullups	10K ohms pulled up to 3VDC; switch-selectable

Note: Exceeding the maximum or minimum safe input values will result in damage to the unit.

Power output specifications

External terminal 6 is a power-out pin. It can be set to either +4 VDC voltage out with DIP switch 1 = ON, or +12 VDC at 50 mA out with DIP switch 2 = ON. External terminal 5 is a system ground pin. This ground pin should be used for all external ground connections for both power and input connections.

When choosing +4 VDC (DIP switch 1) or +12 VDC (DIP switch2), **only one switch should be on at a time.** No damage will occur if both switches are set to on, but the output will default to the +12 VDC output and any battery-powered installations will result in increased parasitic battery drain.

With the DIP switch 1 set to on, the +4V voltage is on terminal 6 all the time, and is not controlled by any software command. Also, the +4 VDC is not gated with the sleep of the ConnectPort X3. Any current draw from terminal 6 will result in reduced battery life. This mode is primarily intended with switch closure applications using the digital inputs with an external switch in the customer equipment in the normally open position, so that no current results until the activating event happens.

When DIP switch 2 is on, the +12 VDC at 50 mA max is provided at terminal 6. This power is gated by both the sleep of the module and AT command P3. A P3 command issued to the XBee module in the ConnectPort X3 device controls the power out function. The ConnectPort X3 Family product must be in awake mode when the P3 command is issued. Set the P3 command to 5 to enable, and to 4 to disable.

Configuring digital inputs and outputs

As shown in the pinouts table, the digital interface for ConnectPort X3 Family products has four external terminals. The interface configuration chosen at order determines if that can be set as either a digital input or a sinking driver output (Digital options) or as a 0-10V or 4-20mA input (Analog options).

The digital input/output lines are used when performing operations through the XBee RF module on the ConnectPort X3 Family product, such as enabling disabling lines, receiving samples, enabling power output, and setting the output mode on the XBee RF module to HIGH or LOW.

The local digital lines on ConnectPort X3 products are configured using a Python library named **digihw**, or the iDigi Dia driver for the DIO interface.

The **digihw** Python library is built into ConnectPort X3 products, with a combination of XBee configuration commands. Digital line configuration can only be done through Python. Output is enabled though the **digihw** module Instead of through XBee AT commands,.

To configure the output of the digital input/output (DIO), use this Python call into the digihw module:

```
digihw.configure_channel(line, mode)
```

Where *line* is 0-3 (0 being the first terminal), and *mode* is 3 for output HIGH and 4 for output LOW.

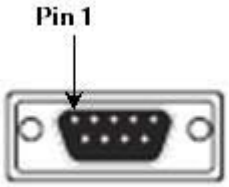
Serial interfaces

ConnectPort X3 RS-232 connector pinouts

The RS-232 connector for ConnectPort X3 products is an industry-standard DB9 male connector with a DTE configuration, similar to a PC serial port.

To connect a ConnectPort X3 product to another DTE device, use a DB9 crossover serial cable; for example, Digi part number 76000642. To connect a ConnectPort X3 Family product to a DCE device, use a DB9 straight-through cable; for example, Digi part number 63000066-01.

Pin 1 is in the leftmost pin on the upper row of pins; pin numbers increment from left to right, continuing left to right on the second row.



Pinouts are as follows:

Pin	Signal	Signal description	Data direction
1	CD	Carrier Detect	Input
2	RXD	Receive Data	Input
3	TXD	Transmit Data	Output
4	DTR	Data Terminal Ready	Output
5	GND	Ground	
6	DSR	Data Set Ready	Input
7	RTS	Request To Send	Output
8	CTS	Clear To Send	Input
9	RI	Ring Indicate	Input

USB interface

The USB connection is mainly for use with the Digi X3 Dashboard. and using that interface to commission a new SIM card installed in the ConnectPort X3 device for cellular service. See "Mobile settings" on page 50.

Cable fittings for ConnectPort X3 H

To route serial or sensor cables outside the enclosure, and maintain IP66 rating, the plugs can be replaced with cable glands, available in different diameters. These cable glands can be purchased separately from Digi.

To wire sensors through the cable grips:

1. Locate cord grip to attach sensor. Different diameter cord grips are available for different sensors, please contact Digi for purchase.
2. Wire sensor to the 6-pin connector plug according to "Pinouts on the screw terminal block" on page 14. Up to 4 sensors can be wired into the 6-pin connector.
3. Make sure that all cord grips are tightened and all empty holes are plugged before use to maintain environmental rating.

Powering considerations

When installed in the United States, the electrical wiring of this device must meet the requirements of National Electric Code and any applicable state or local codes. The electrical circuit must be installed by an electrical contractor and approved by a local building/electrical inspector.

Attention: See also the warnings under "The following models are suitable for use in Class I, Division 2, Groups A, B, C and D or Non-hazardous locations only" on page 77.

Power cable fitting

AC-powered Class 1, Division 2 units

Warning Do not plug in or apply power to the unit until all connections are made to the unit in the following steps.

For customers who have purchased an AC-Powered-Class 1, Division 2-approved unit with cable and conduit to wire into the main power supply:

1. Make sure that the mains power to the junction box where the cable is to be wired into is off.
2. Wire the exposed end of the cable into the junction box using approved Class 1, Division 2 wiring regulations per National Electrical Code Article 501 (if located in the United States) and other regulations applicable to the locality where it is installed. See the Power cable wiring table below for information on wiring this cable to the junction box. The mains voltage for this unit needs to be between 100VAC and 240VAC, 50Hz to 60 Hz, and be able to supply a minimum of 24 Watts.

Power cable wiring

Function	Cable Wire Color	Power Supply Phoenix Connector Pin Number
Frame Ground (FG)	Green	1
Neutral (N)	White	2
Line (L)	Black	3

On the ConnectPort X3, the Reset button can be used to disconnect/reconnect power for units that are hard-wired to power.

Non-Class 1, Division 2 units

For customers who have purchased a non-Class 1, Division 2-approved unit with a standard power cord with a plug on the end:

The unit can be plugged into a standard matching wall outlet that has an output between 100VAC to 240VAC, 50Hz to 60Hz, and capable of supplying at least 24 Watts.

There are three power-cord options available: U.S.A 120V, European 240V, and U.K. 240V.

Alkaline battery-powered models

Alkaline battery-powered models are powered by12 D-cell batteries. Currently, the only alkaline-battery-powered models are ConnectPort X3 H - Battery Power variants..

Warranty exception for batteries

The battery-powered ConnectPort X3 H does not ship with alkaline batteries. The batteries must be installed on first use and replaced by the user when discharged.

Alkaline batteries are not covered under the terms and conditions of the Digi warranty.

Alkaline battery disposal

Dispose of batteries according to the manufacturer's instructions.

Alkaline battery installation and replacement

Warnings

For Class 1, Division 2 installations:

- To prevent ignition of a hazardous atmosphere, batteries must only be changed in an area known to be non-hazardous. Opening the box to change batteries cannot be done in a Class 1, Division 2 area.

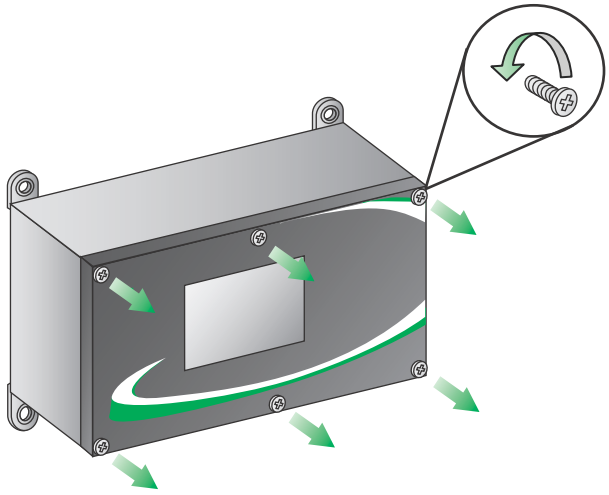
For all installations:

- Risk of explosion if battery is replaced by incorrect type.
- Dispose of used batteries according to instructions.
- Do not disconnect while circuit is alive unless area is known to be non-hazardous,

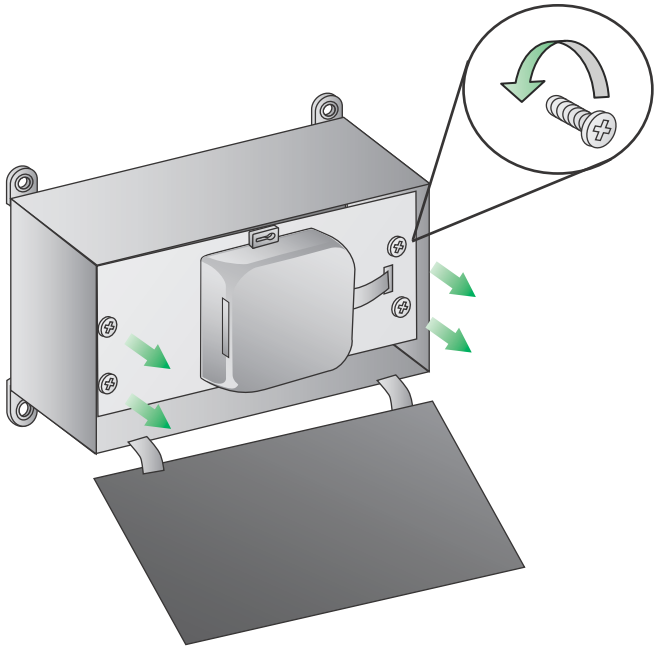
Battery replacement instructions

1. Remove the six screws securing the faceplate to the NEMA enclosure and carefully allow the faceplate to rest on its hinges.

   Note: The screws that secure the faceplate and mounting plate to the NEMA enclosure are captive screws that cannot be completely removed. Loosen them enough to allow the faceplate and mounting plate to open enough to rest on their hinges.

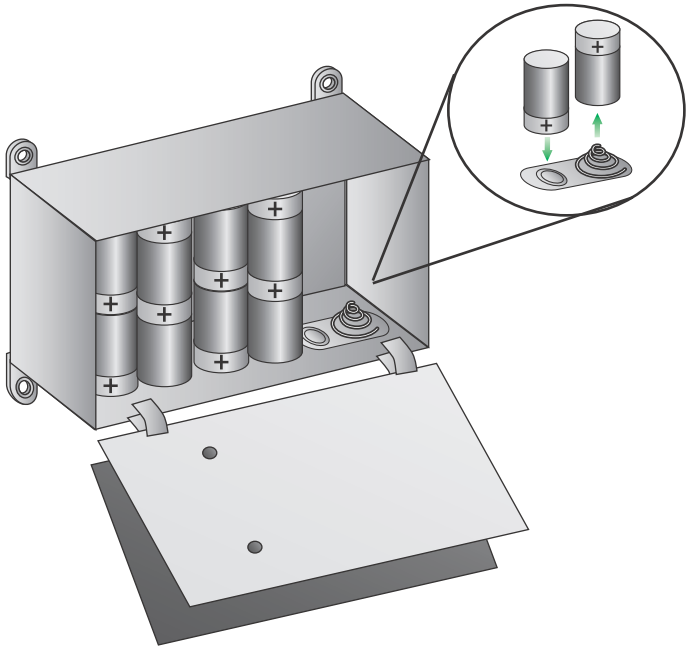


2. Inside the enclosure, remove the barrel connector from the power jack of the module mounted to the mounting plate.
3. Remove the four screws securing the mounting plate within the enclosure and carefully allow the mounting plate to rest on its hinges.



4 Remove the 12 D-Cell batteries from the battery compartment.

5 Carefully insert 12 D-Cell batteries into the battery compartment, following the polarity shown in the illustration.



6 Make sure the locking-barrel connector is securely connected to the power jack of the module on the mounting plate.

7 Carefully tighten all screws and reassemble the enclosure.

Solar-powered models

Lead-acid battery disposal

The battery in solar units contains lead and must be recycled after use. Please follow all applicable Federal, State, and regional laws dictating proper recycling methods.

Battery installation and replacement

Note: For EU units, separate purchase of a lead-acid battery may be required (Power-Sonic PS-1229),

Warnings

For Class 1, Division 2 installations:

To prevent ignition of a hazardous atmosphere, batteries must only be changed in an area known to be non-hazardous. Opening the box to change batteries cannot be done in Class 1, Division 2 area.

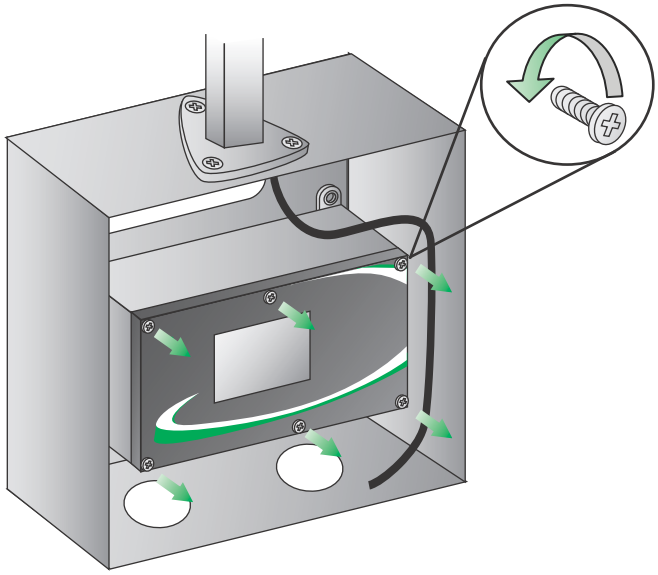
For all installations:

– Precautions are needed to avoid risk of electrostatic charge/discharge. Always practice proper grounding techniques prior to servicing the device.

– Do not disconnect while circuit is alive unless area is known to be non-hazardous.

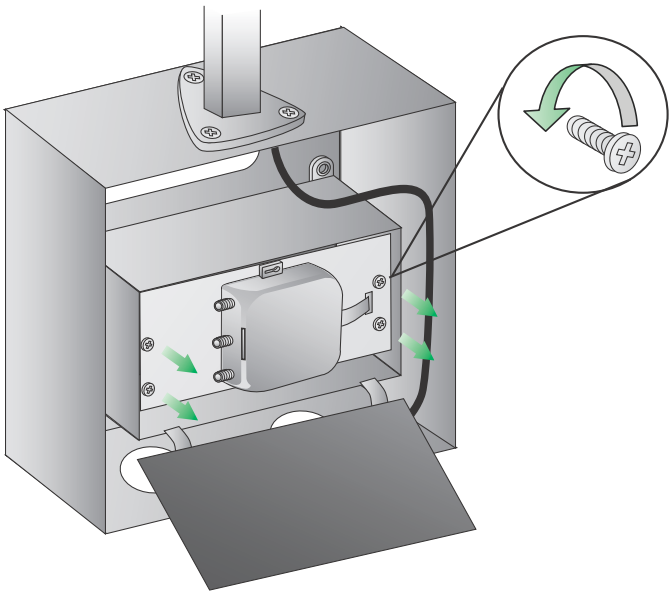
1 Remove the six screws securing the faceplate to the NEMA Enclosure and carefully allow the faceplate to rest on its hinges.

Note: The screws that secure the faceplate and the mounting plate to the NEMA Enclosure are captive screws and cannot be completely removed. Loosen them enough to allow the faceplate and mounting plate to open enough to rest on their hinges.

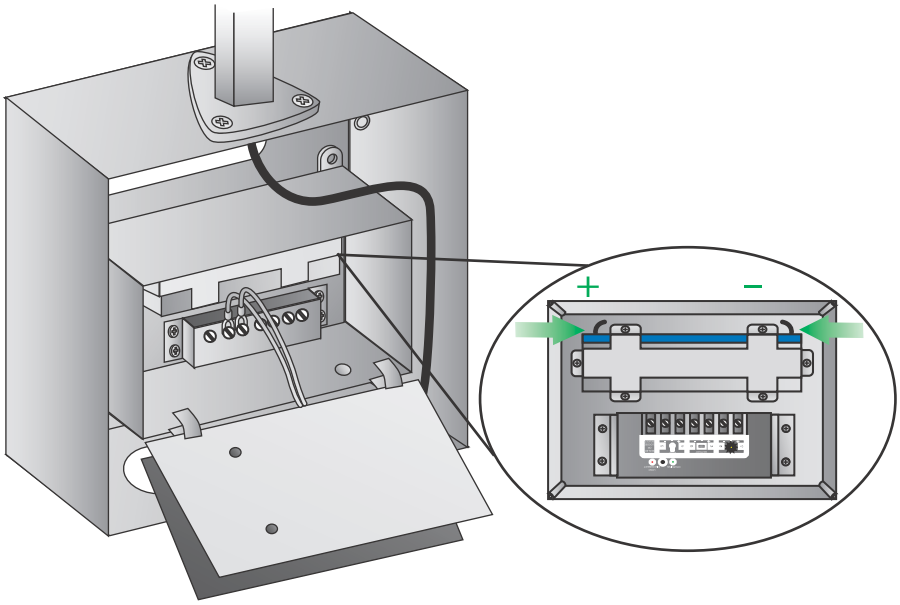


2 Inside the enclosure, remove the barrel connector from the power jack of the module mounted to the mounting plate.

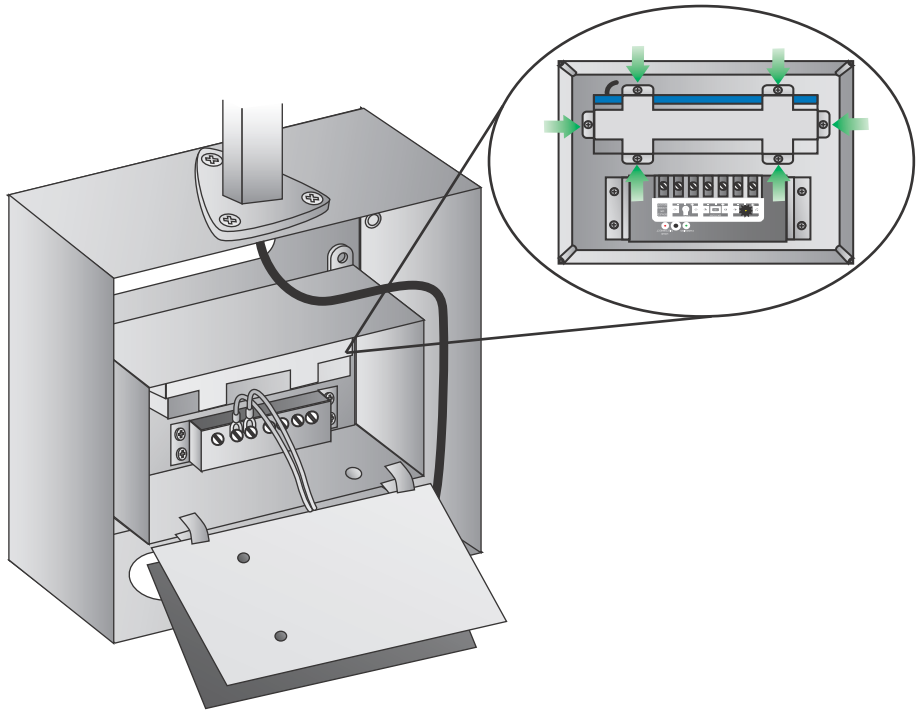
3 Remove the four screws securing the ConnectPort X3 unit within the enclosure and carefully allow the module to rest on its hinges.



4 Remove the black cable from the - terminal of the battery, and the red cable from the + terminal of the battery.



5 Unscrew the six screws securing the battery bracket to the NEMA enclosure.



6 Remove the battery.

7 Install the new battery.

8 Replace the six screws securing the battery bracket to the NEMA enclosure.

9 Attach the black cable to the - terminal, and the red cable to the + terminal.

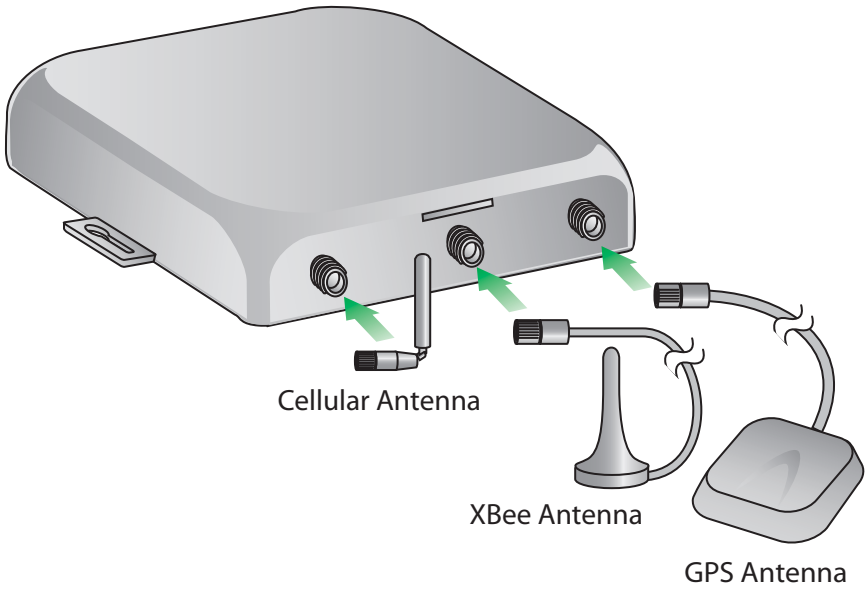
10 Make sure the locking-barrel connector is securely connected to the power jack of the module on the mounting plate.

11 Re-tighten all screws and reassemble enclosure.

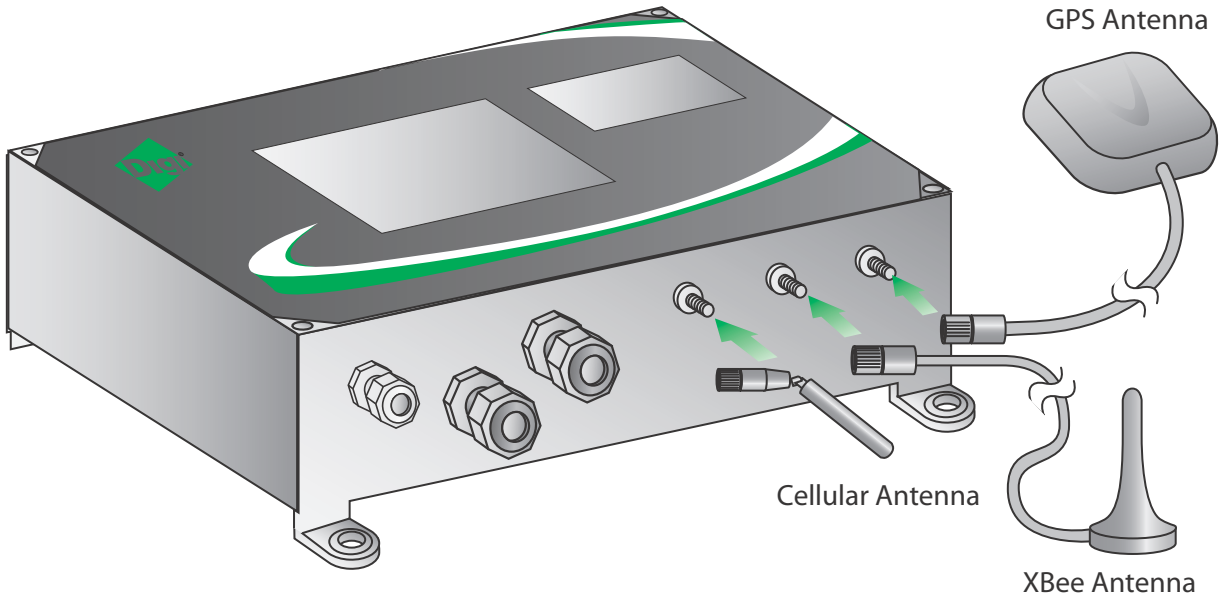
Antenna connections

Depending on model, ConnectPort X3 and ConnectPort X3 H products have three antenna options: Cellular, XBee, and GPS. The figures shows antenna connector locations and which antennas to connect to them.

ConnectPort X3



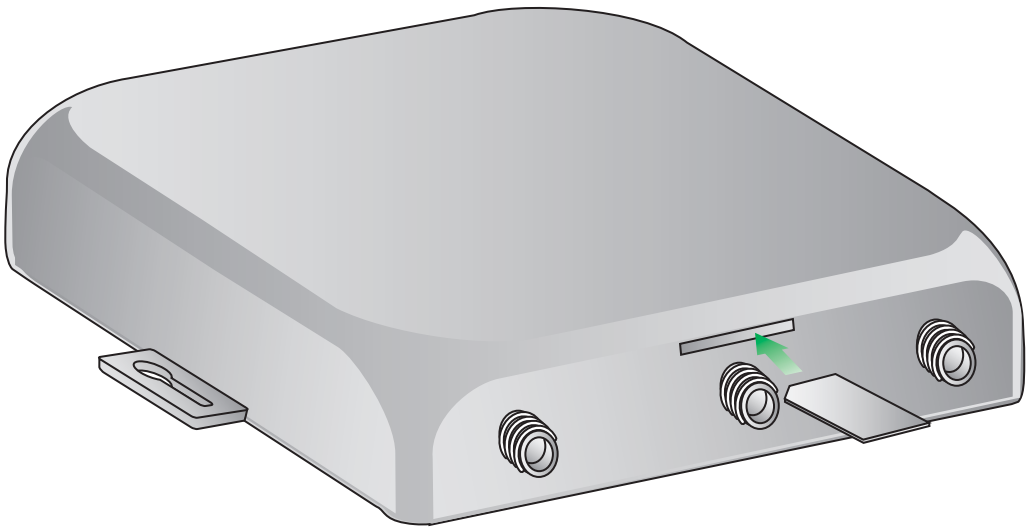
ConnectPort X3 H



SIM card installation

A SIM card must be supplied and activated by a Cellular Service Provider for device operation. There is a SIM card slot on the circuit board inside the enclosure. Insert the SIM card into the card slot as shown. When properly inserted, the SIM card will click into place.

ConnectPort X3 SIM card installation

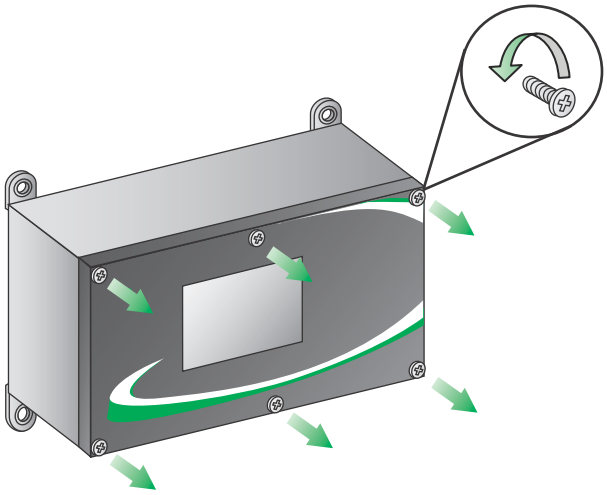


ConnectPort X3 H SIM card installation

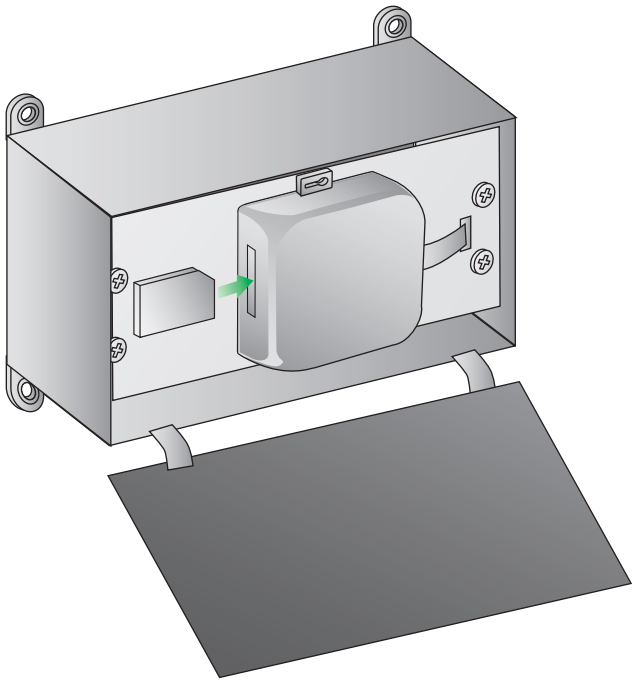
Warning: Do not disconnect while circuit is alive unless area is known to be non-hazardous.

1 Remove the six screws securing the faceplate to the NEMA enclosure and carefully allow the faceplate to rest on its hinges.

Note: The screws that secure the faceplate and the mounting plate to the NEMA enclosure are captive screws that cannot be completely removed. Loosen them enough to allow the faceplate and mounting plate to open enough to rest on their hinges.

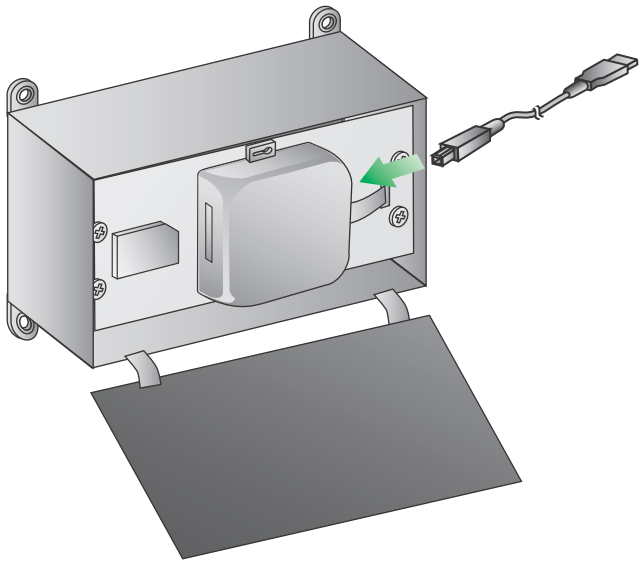


2 Insert SIM card as shown.



3 Connect the USB cable to the USB port of the ConnectPort X3 unit and the PC.

Note: The USB cable is for commissioning (activating the SIM for cellular service) only, and must be removed before the cover of the NEMA enclosure is closed and the screws are tightened.

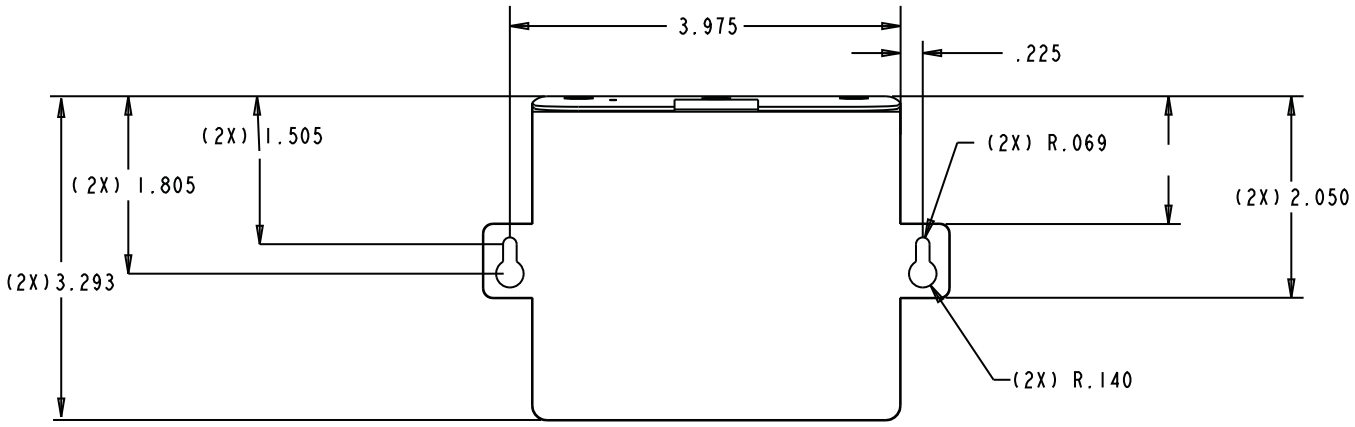


4 When commissioning is complete,.re-tighten all screws and reassemble enclosure.

Mounting hole locations and dimensions

ConnectPort X3

The ConnectPort X3 has two mounting flanges to allow installation in a variety of locations to many different surface materials. The illustration shows mounting hole locations and dimensions.



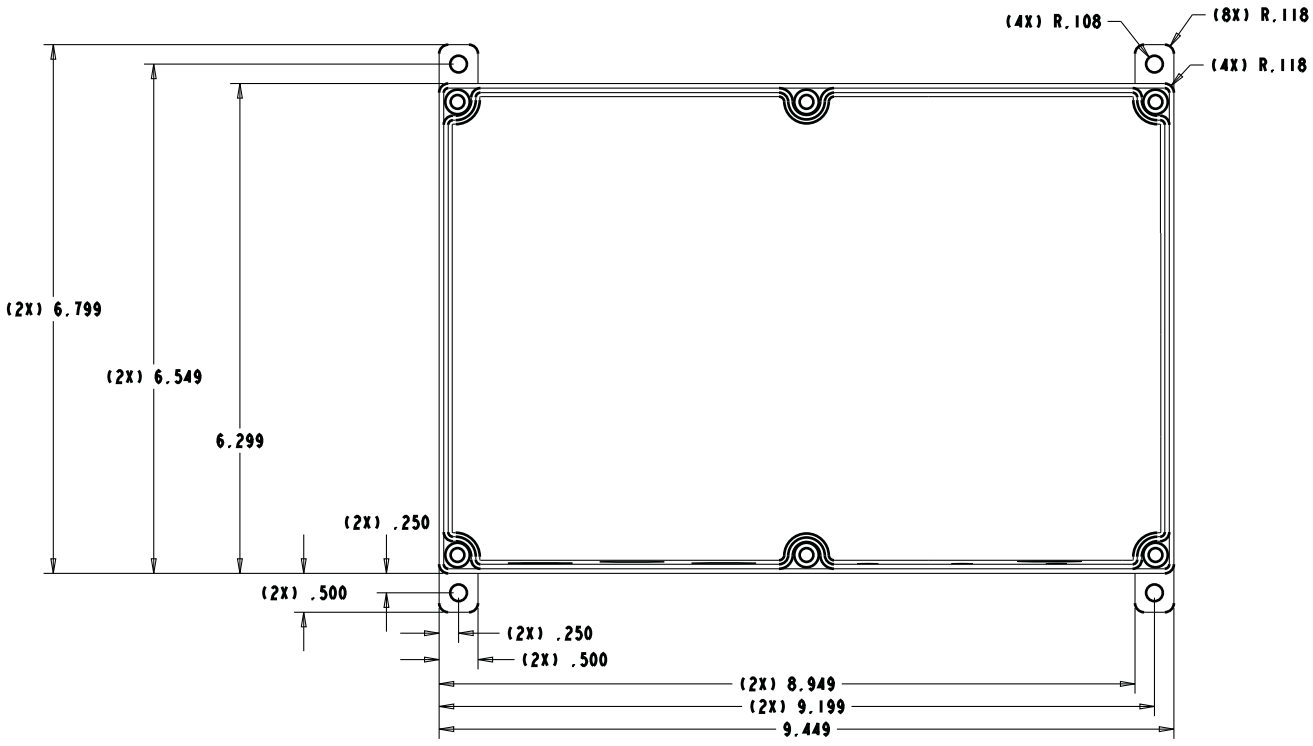
ConnectPort X3 H

The ConnectPort X3H has four mounting feet to allow installation in a variety of locations to many different surface materials. The illustration shows mounting hole locations and dimensions.

The ConnectPort X3 H enclosure is made of a polycarbonate.

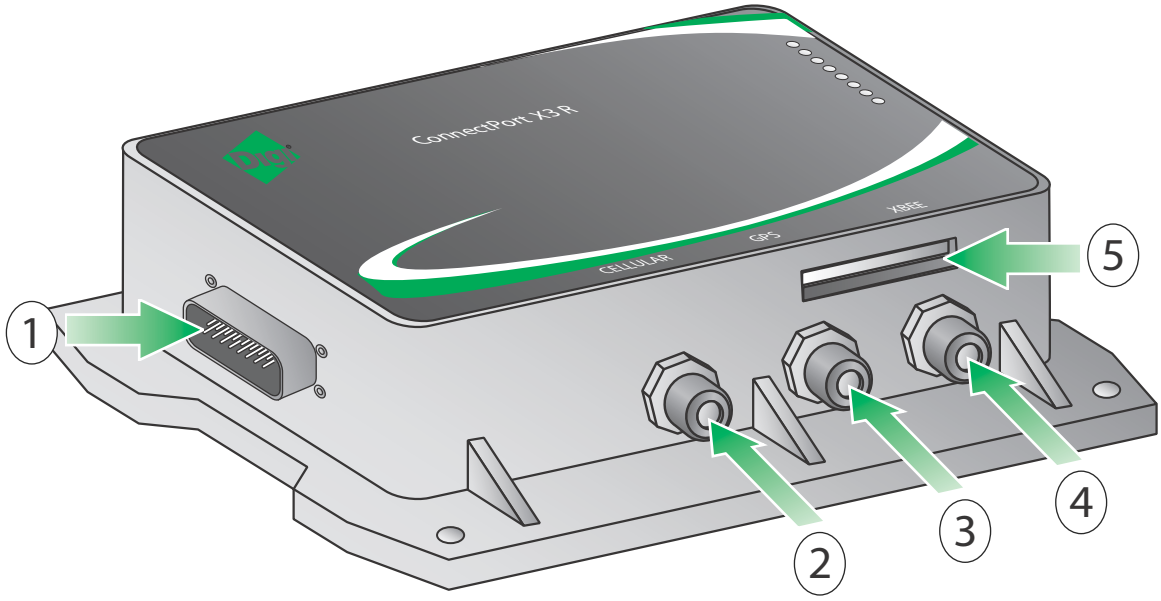
Use at least four (4) 10-32 screws to mount the ConnectPort X3 H unit. The ConnectPort X3 R unit is IP67 rated; allowing for it to be mounted inside or outside.

The ConnectPort X3 H grommets must be mated, plugs used, and SMA connectors must be mated to maintain IP67 rating.

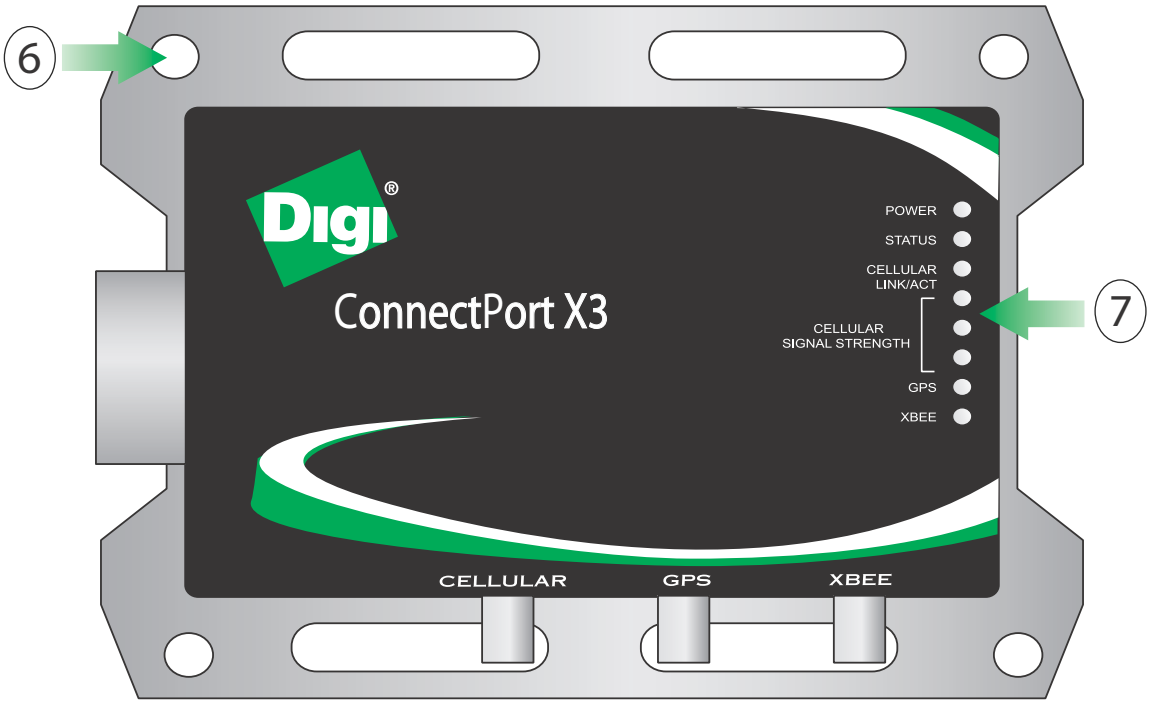


ConnectPort X3 R hardware

Side view



Top view



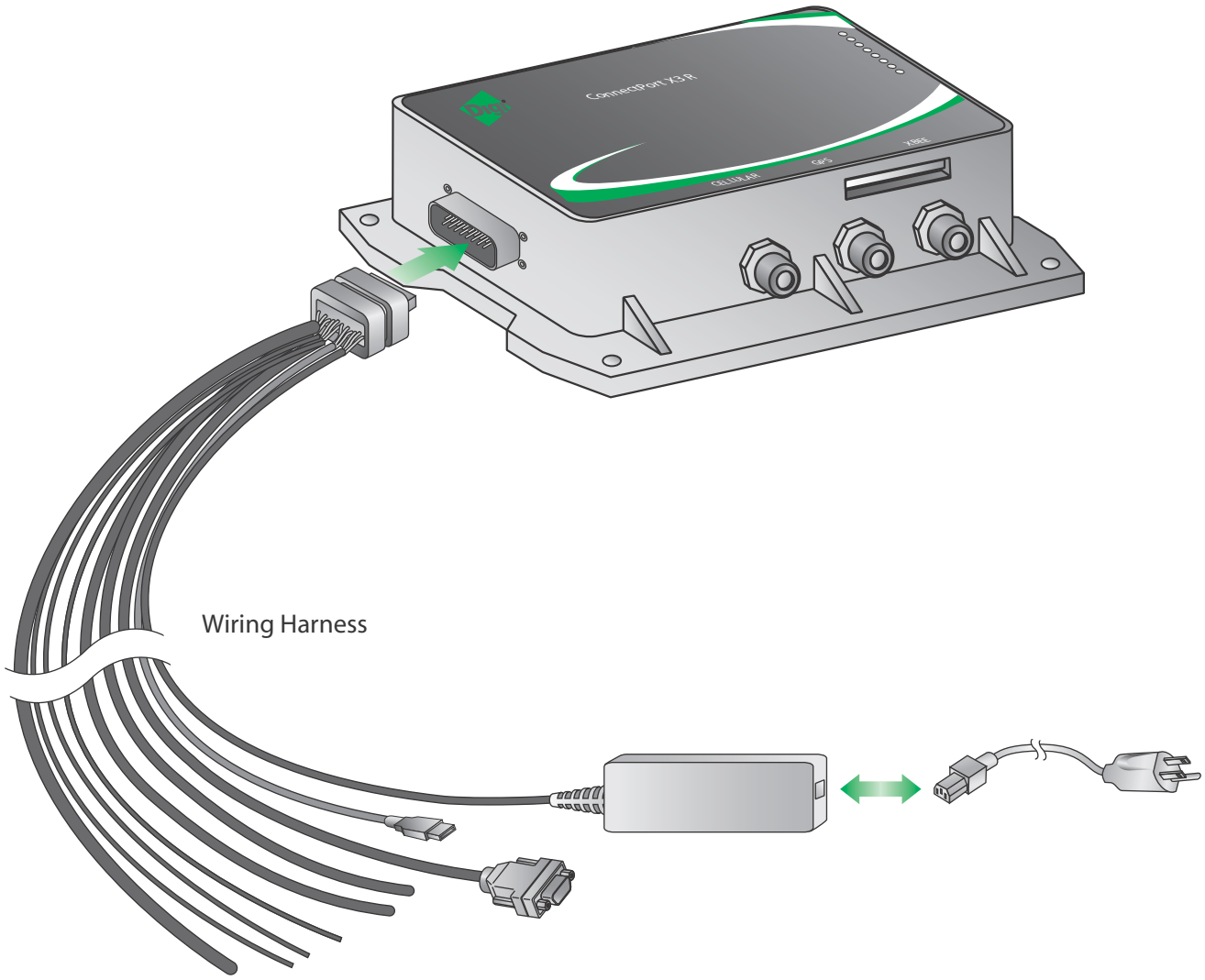
1 Wiring Harness Connector. See page 36.
2 Cellular antenna connector. See page 42.
3 GPS antenna connector, See page 42.
4 XBee antenna connector. See page 42.
5 SIM card slot. See page 44.
6 Mounting holes. See page 45.
7 LED status indicators. See page 84.

Interfaces and Wiring Harness guidelines

The ConnectPort X3 R does not come with a Wiring Harness. Instead you must design and create a Wiring Harness from the guidelines and pinouts provided in this section.

The ConnectPort X3 R Development Kit provides a Wiring Harness (it can also be purchased separately Digi part number 76000791).

Note Additional wires may be present on the Development Kit Wiring Harness. These additional wires are for features and interfaces that are not yet implemented.



ConnectPort X3 R Wiring Harness Connector

The Wiring Harness Connector on the ConnectPort X3 R is a 23-pin connector from Tyco. The Wiring Harness must use the mating plug and pins listed in the following table to connect to the ConnectPort X3 R.

ConnectPort X3 R 23-pin Wiring Harness part numbers

Part	Tyco Part Number
Wiring Harness Connector Header	1-776087-1
Wiring Harness Connector Housing	770680-1
Wiring Housing Connector Wire Relief	776464-1
Wiring Housing Connector Pins	770854-3
Wiring Housing Connector Plugs	770678-1
Wiring Housing Connector Crimper	58529-1

The connector pins accept 20-16AWG wire.

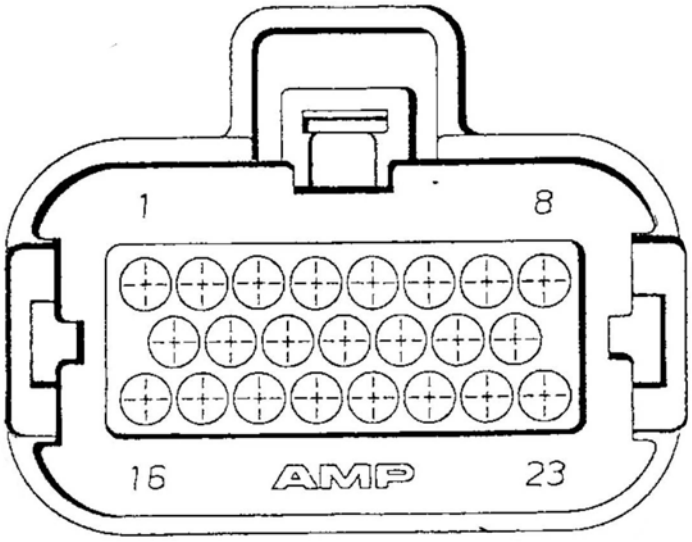
If the rubber seal of the Wiring Harness is accidently perforated in an unpopulated location during cable assembly, the hole can be filled with a plug if the connector needs to maintain a watertight rating.

The Wiring Harness should be restrained every 7-9” to prevent vibration-related damage.
The recommended minimum cable bend radius is five times the cable diameter.

Use dielectric grease on the Wiring Harness connector contacts when connecting your Wiring Harness to the ConnectPort X3 R to prevent fretting on the contacts.

ConnectPort X3 R Wiring Harness Connector pins

Pins for the ConnectPort X3 R Wiring Harness Connector are arranged as follows. Pin 1 is in the upper-left corner.



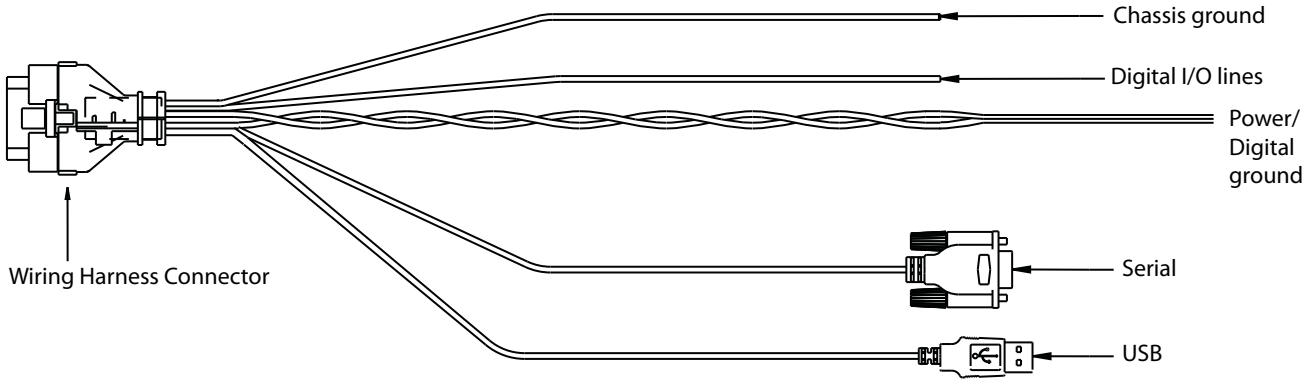
ConnectPort X3 R pinouts

Pinouts for the ConnectPort X3 R are as follows.

Pin #	Signal Name
1	Digital ground
2	Do not connect, for internal Digi use
3	Serial RXD
4	Serial RTS
5	Do not connect
6	Do not connect
7	Do not connect, for internal Digi use
8	USB_DN
9	Chassis ground
10	Serial TXD
11	Serial CTS
12	Do not connect
13	Do not connect
14	Do not connect, for internal Digi use
15	USB_DP
16	Vin
17	Do not connect
18	Do not connect
19	DIO0
20	DIO1
21	Do not connect
22	Do not connect
23	USB_5V

Available interfaces on the Wiring Harness

The figure shows the interfaces for the ConnectPort X3 R available on its Wiring Harness. Details about each interface follow.



Chassis ground

To provide chassis isolation, the metal enclosure and digital ground are not directly tied. The main reason for this is to avoid potentially large vehicle return currents from flowing through digital ground, if the product is mounted directly to a vehicle chassis. To prevent static charge build-up, the two grounds are connected through a high value resistance, to create a discharge path. The chassis ground should also be connected to the serial and USB drain wires.

Digital input/output lines

ConnectPort X3 R has two digital input/output lines. Note that the input and output functions are shared. The default state of the pins is input.

An external pull-up resistor (~10k) must be used when the sinking output drivers are enabled. The sinking outputs are protected against steady state over-current conditions by an in-line, self-resetting fuse.

The table lists specifications for these digital input/output lines.

Digital mode	Specification	Value
Digital Input	Input type	Non-inverting Schmitt trigger gate
	Positive-going switching threshold	~1.6 VDC
	Negative-going switching threshold	~1.0 VDC
	Maximum safe input	+30 VDC
	Minimum safe input	-.5 VDC
	Input impedance	1 Megaohm
	Default level when no input applied	Low
Digital Output	Output type	Open collector sinking driver
	Maximum sink current	0.5 ADC
	Maximum off voltage	+30 VDC
	Minimum safe input	-.5 VDC
	Resistor pull-ups	External pull-up required

Note: Exceeding the maximum or minimum safe input values will result in damage to the unit.

Power/Digital ground

Power and digital ground should be twisted pair and must be connected to a fused power supply. See hardware specs for required voltages and current draw.

Serial: RS-232 serial (RXD, TXD, CTS, RTS)

ConnectPort X3 R supports the following serial signals only: RXD, TXD, CTS and RTS. See the pinout on page 39 for the pins used for these signals. The serial drain wire should be connected to chassis ground.

USB

The USB cable must conform to USB cabling specifications.The USB drain wire should be connected to chassis ground.

Antenna connections

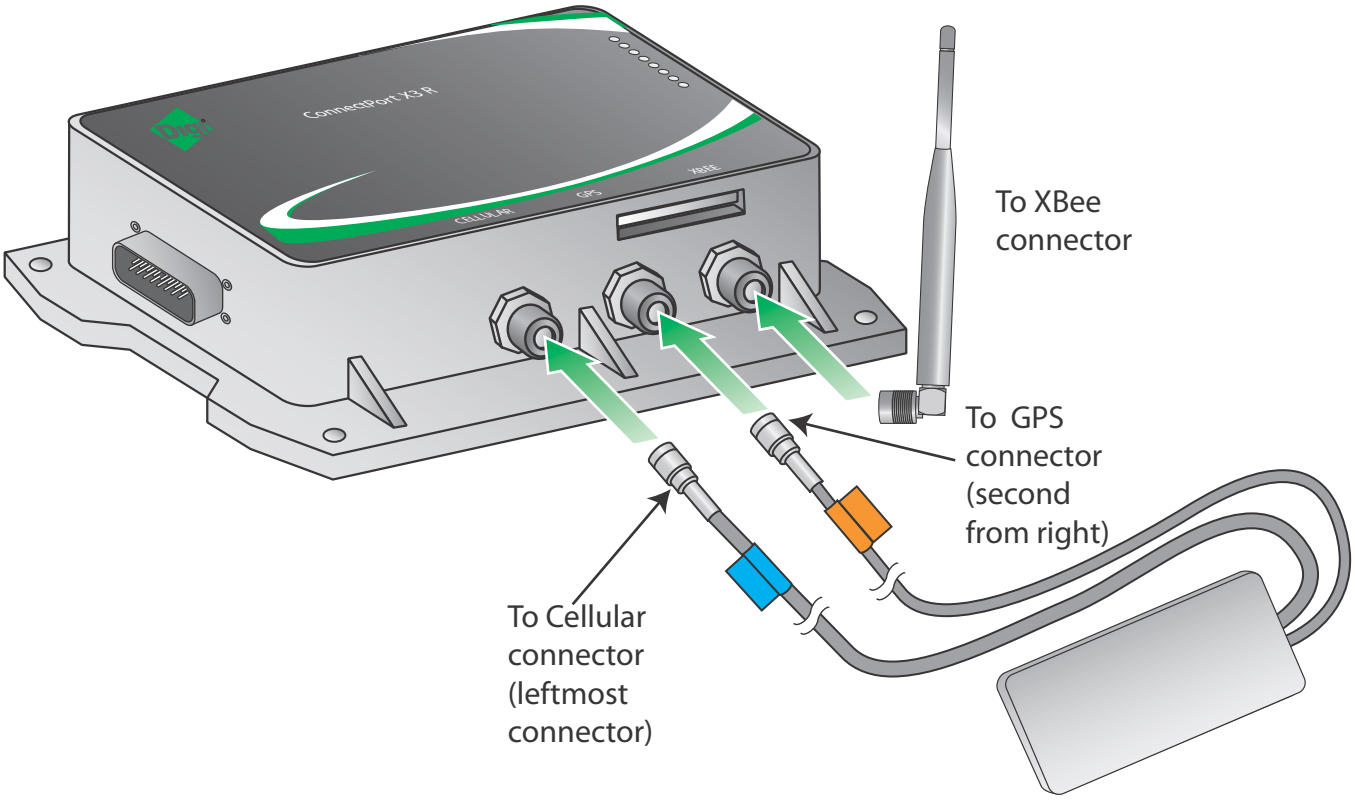
The ConnectPort X3 R does not ship with antennas (except when purchased as part of the ConnectPort X3 R Development Kit). The Cellular, GPS, and XBee antennas are connected as depicted in the diagram below.

Antenna installation requirements

The Cellular/GPS antenna must be mounted at least 8 inches (20 cm) away from the XBee antenna.

Keep Cellular/GPS antenna at least one foot (30.48 cm) away from metal objects.

Cellular/GPS antenna must be mounted on a plastic or glass surface.



Antenna specifications

Following are specifications for antennas shipped with the ConnectPort X3 R Development Kit. You must procure your own antennas for the ConnectPort X3 R product. If choosing to use antennas other than these, choose antennas that conform to these specifications.

Antenna	Manufacturer	Manufacturer part number	Digi part number	Specification	Value
Cellular / GPS	Taoglas http:// www.taoglas.com	MA.208.A3011 11.B30511	76000801	Frequency range	GSM: 880-960 MHz PCS: 1850-1990 MHz
				Gain	Cellular antenna: Average: -3.03dBi at 700 – 960MHz -4.34dBi at 1710 – 2170MHz Peak: 2.16dBi at 700 – 960MHz 0.42dBi at 1710 – 2170MHz GPS antenna: 3.5dBic typ @ Zenith
				Antenna size	Length: 7.9 in (20.05 cm) Width: 2.6 in (6.65 cm) Height: 0.35 in (0.9 cm)
				Mounting method	Adhesive mount
				Cable length	9.84 feet (3 meters)
				Connector type	Cellular: TNC (standard polarity TNC) GPS: RP-TNC (reverse polarity TNC)
XBee	Laird http:// www.lairdtech.com	RD2458-5-RA-TNC	76000784	Frequency range	2400 - 2483 MHz
				Gain	3 dBi
				Antenna size	6.8 in (17.27cm)
				Mounting method	Screws directly to TNC on product
				Connector type	RP-TNC
	Bobbintron	AN2400-19B01RART	76000784	Frequency range	2400-2500 MHz
				Gain	3 dBi
				Antenna size	6.8 in (17.27cm)
				Mounting method	Screws directly to TNC on product
				Connector type	RP-TNC

SIM card installation and activation

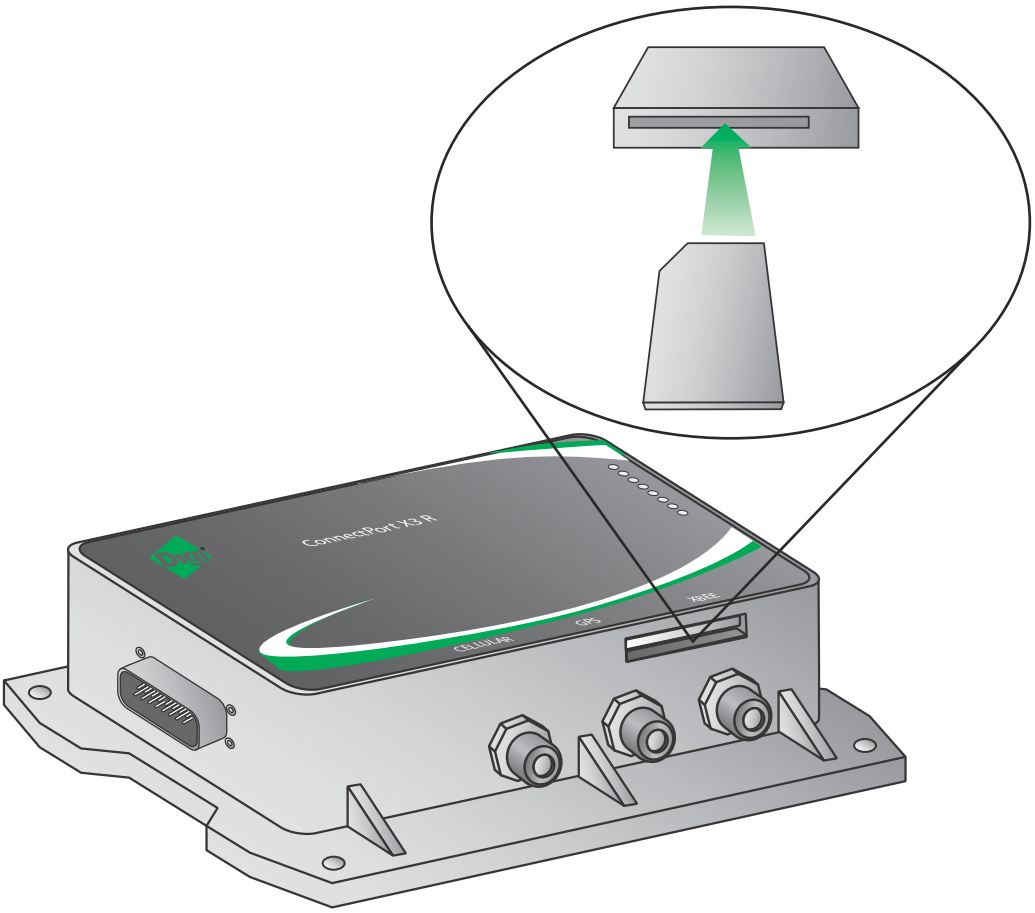
ConnectPort X3 R

The ConnectPort X3 R is sealed during manufacturing to retain its IP67 rating. Digi installs a customer-provided SIM card prior to shipping. This SIM card cannot be accessed in the field. High-temperature SIM cards are recommended to ensure cellular connectivity throughout the lifetime of the product.

ConnectPort X3 R Development Kit models

ConnectPort X3 R Development Kit models have a slot to allow product owners to install a SIM card. The slot and SIM card orientation are shown below.

The metal contacts on the SIM card should be facing down, and the chamfered edge should be inserted first.



SIM card activation

To activate the SIM for cellular service, see "Mobile settings" on page 50.

Mounting ConnectPort X3 R to a vehicle

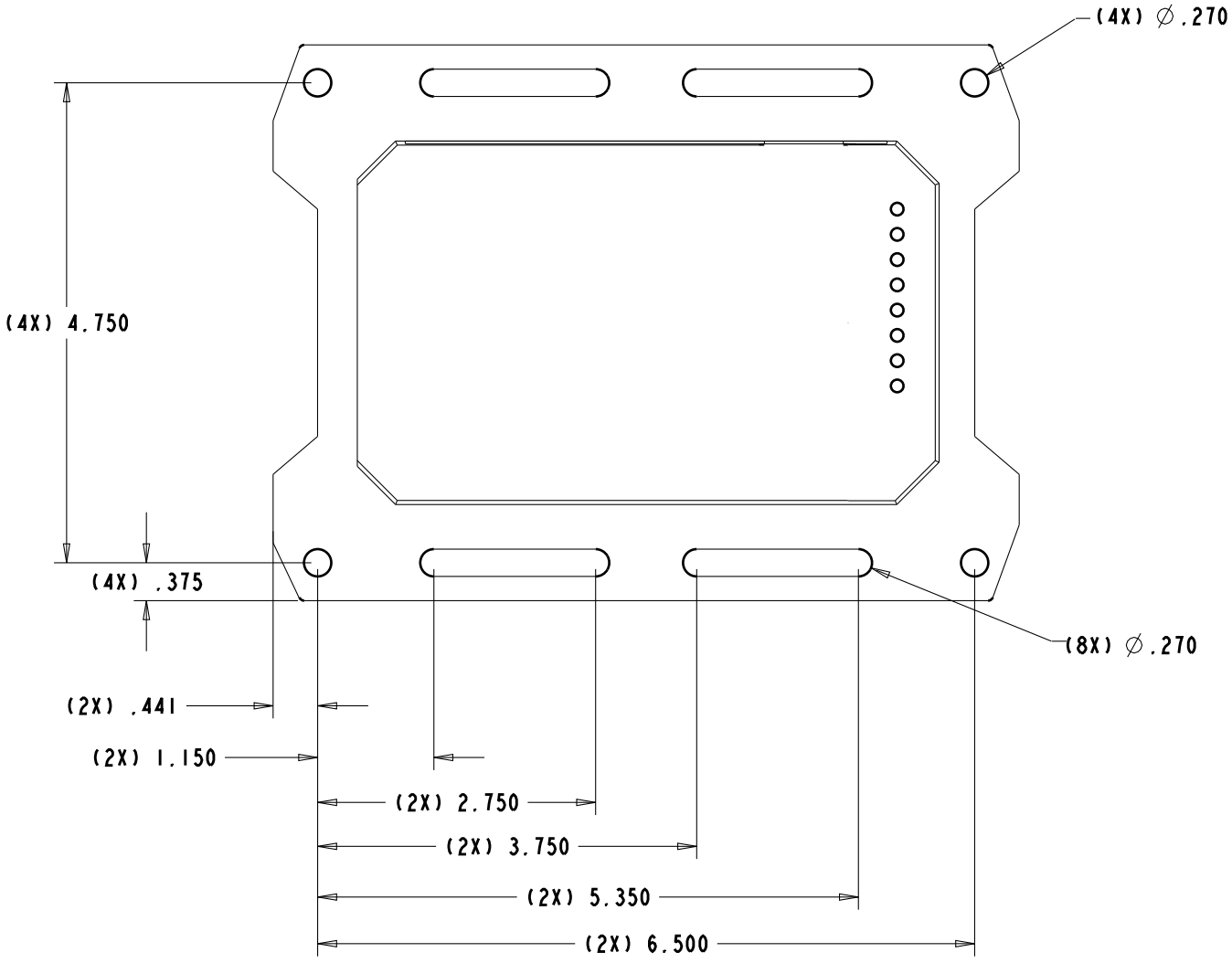
The ConnectPort X3 R has flexible mounting holes to allow installation in a variety of locations to many different surface materials.The illustration shows mounting hole locations and dimensions.

The ConnectPort X3 R enclosure is made of Cathode Electrodeposition Paint (CEP)-coated aluminum, and the TNC connectors and nuts are made of nickel-plated brass.

Use at least four (4) ¼" bolts to mount the ConnectPort X3 R unit. The ConnectPort X3 R unit is IP67 rated; allowing for it to be mounted inside or outside the vehicle.

The ConnectPort X3 R Wiring Harness Connector and TNC connectors must be mated to maintain IP 67 rating.

Do not mount the ConnectPort X3 R on a dashboard or on the lower chassis of a vehicle.



Configuration and management

CHAPTER 3

ConnectPort X3 Family products can be configured and managed from two interfaces:

- The Digi X3 Dashboard, a simple local user interface
- iDigi Manager Pro, Digi's remote management platform interface

Periodically, management and administration tasks need to be performed on ConnectPort X3 Family products, such as backing up and restoring device configurations, updating firmware, restoring the device configuration to factory defaults, and rebooting the device. As with configuration, these tasks can be performed either remotely from iDigi Manager Pro, which is recommended, or locally from the Digi X3 Dashboard.

Configuration and management through the Digi X3 Dashboard

The Digi X3 Dashboard is a simple Microsoft Windows application, providing a limited user interface for configuring basic settings for the ConnectPort X3 Family product and performing common management tasks such as updating firmware and uploading files to the device.

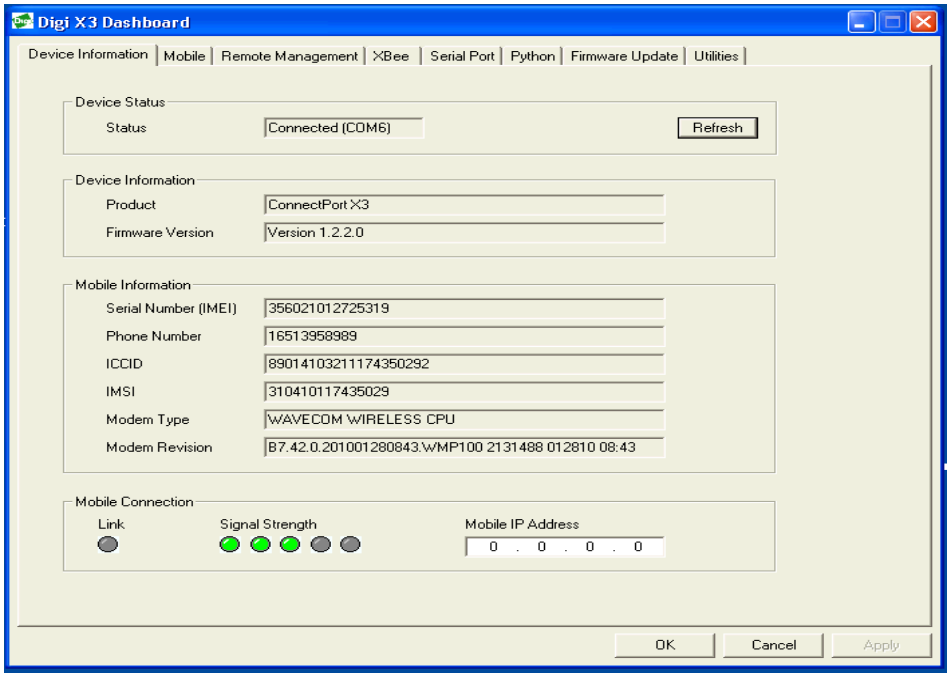
Open the Digi X3 Dashboard

The Digi X3 Dashboard is opened from the Windows Start menu:

Start > Programs > Digi > Digi X3 Dashboard > Digi X3 Dashboard

The Digi X3 Dashboard has several tabs of configuration settings, plus tabs for performing administrative tasks and running utilities.

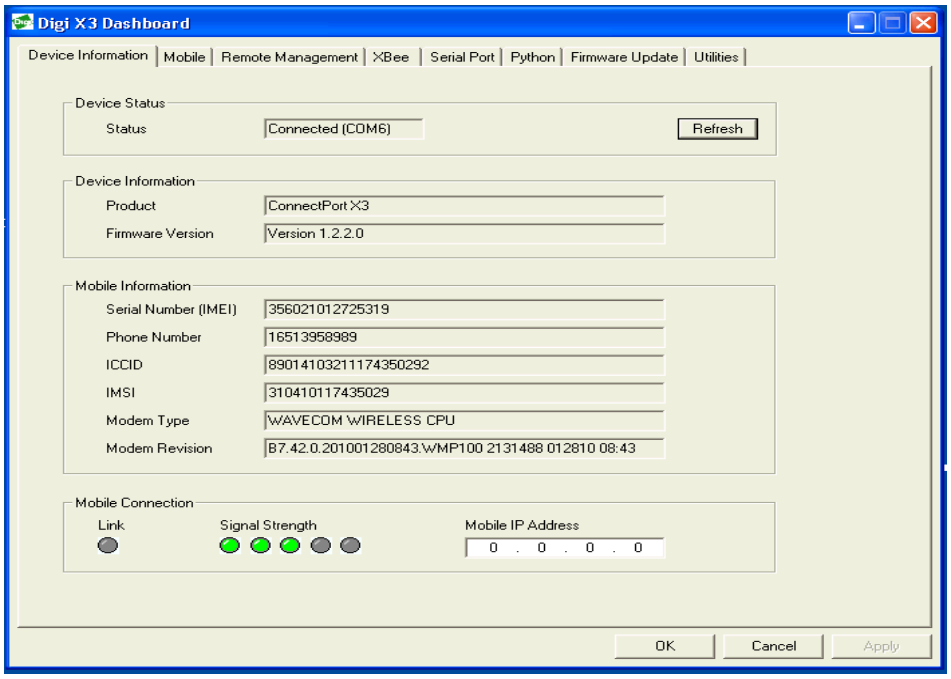
Note For ConnectPort X3 R, the information displayed on the X3 Dashboard is slightly different. In the Mobile Connection section of the Device Information tab, there are fewer Signal Strength indicators, as these models have three instead of five signal-strength LEDs.



Device Information

The Device Information tab is the default view for the Digi X3 Dashboard.

Note For ConnectPort X3 R and ConnectPort X3 R Development Kit, information displayed on the X3 Dashboard is slightly different. In the Mobile Connection section of the Device Information tab, there are fewer Signal Strength indicators, as these models have three instead of five signal-strength LEDs.

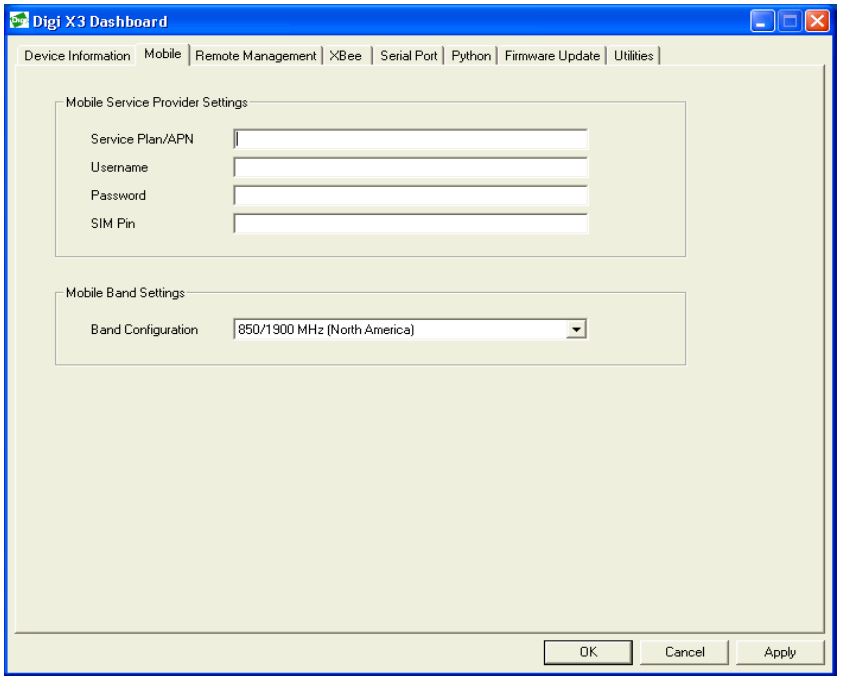


This tab displays the following information:

- **Device Status**
  - **Status:** The current connection status of the ConnectPort X3.
- **Device Information**
  - **Product**: Product name
  - **Firmware Version:** The firmware version running in the device. Compare this number to the latest firmware version on Digi's website to see if the device is running the latest version.
- **Mobile Information:** information about the cellular modem in the device
  - **Serial Number (IMEI):** This number is used as a device identifier. It is important to make a note of this number, as it is used when adding the device to iDigi.
  - **Phone Number, ICCID, and IMSI**: If these numbers are populated in this view, it means that the SIM card is properly inserted in the SIM slot of the device, and that the Mobile settings have been configured correctly.
  - **Modem Type** and **Modem Revision**: The manufacturer, model type, and revision level of the cellular modem.
- **Mobile Connection:** information about the cellular connection and signal strength for the device
  - **Link**: Whether the cellular link is up or down.
  - **Signal Strength**: Relative signal strength indicator (RSSI), shown as a number of illuminated green indicators.
  - **Mobile IP Address**: The IP address for the device, as assigned by the mobile service provider

Mobile settings

The Mobile settings tab is used to activate the SIM for cellular service, also known as commissioning, and select a mobile band for cellular communication.



- **Mobile Service Provider Settings**: in this section, enter the service plan or access point name (APN), username and password, and SIM PIN. This information should have been provided to you by your mobile service provider.

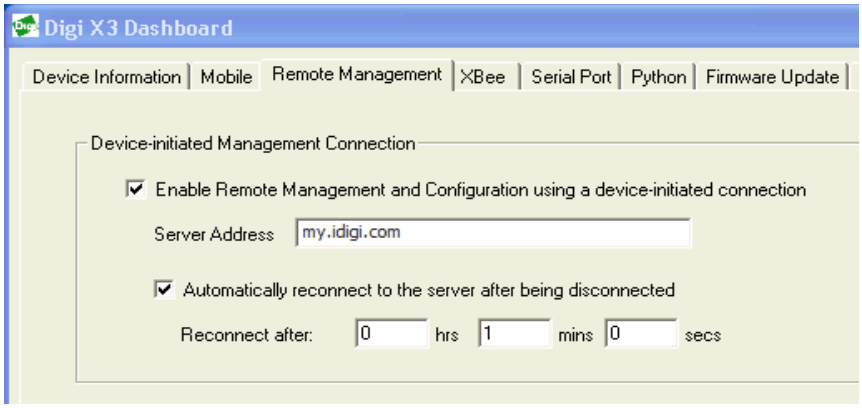
  Note If this mobile service provider information is missing, the ConnectPort X3 product will not be able to make a cellular connection. Your mobile service provider will inform you if additional information is required to access their services.

- **Mobile Band Settings**: For the **Band Configuration** setting, choose a mobile band selection that works best for you. Most users choose the band configuration by region. In some cases, you may want to set the device to a specific band. For example, you may choose a specific band to prevent the device from switching back-and-forth between bands in low-signal scenarios, or to avoid interference with other radios; for example, 900 MHz radios. In such a case, you could configure the X3 to 1800 MHz.

When all settings are entered, click **OK**. The device should now be able to make a cellular connection.

Remote Management settings

The Remote Management tab configures the connection to the iDigi Manager Pro™ remote management server so the ConnectPort X3 Family device knows how to connect to the server. iDigi Manager Pro allows devices to be configured and managed from remote locations. To use iDigi Manager Pro as a remote manager of a Digi device, see the information and iDigi documentation resources on page 59.



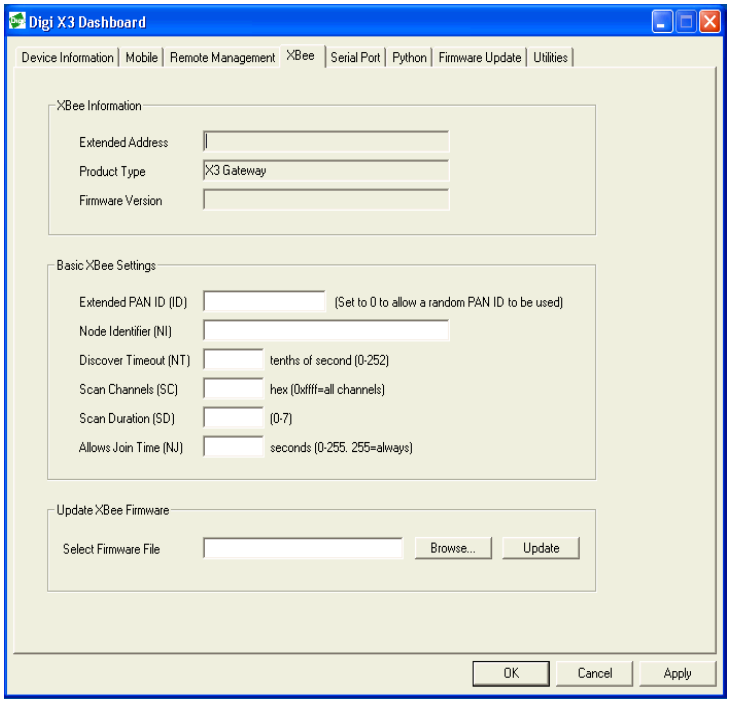
- **Device-initiated Management Connection:**
  - **Enable Remote Management and Configuration using a device-initiated connection**: Configures the connection to the iDigi server to be initiated by the ConnectPort X3 Family device.
  - **Server Address**: The IP address or hostname of the iDigi server.
  - **Automatically reconnect to the server after being disconnected/ Reconnect after:** Whether to automatically reconnect to the iDigi server after being disconnected and waiting for the specified amount of time.

XBee settings

ConnectPort X3 Family products provide a gateway between an Internet Protocol (IP) network and a network of various wireless devices, typically small sensors and controllers, known as an XBee network. The XBee network is formed through XBee RF modules integrated in the ConnectPort X3 Family product and the wireless devices.

The **XBee** tab configures basic settings for the XBee RF module on the ConnectPort X3 family product. All other settings and XBee network device management should be performed through iDigi Manager Pro. Reading and writing of data transmitted on the XBee network is handled through programming done through Digi ESP for Python and iDigi Dia.

For more detailed information on advanced XBee configuration and XBee network management, refer to the *iDigi User's Guide* and the product manual for the XBee RF module type installed in the ConnectPort X3 product.



How devices join an XBee network

On the XBee network, the ConnectPort X3 device serves as the **coordinator** node. As the coordinator, it is responsible for establishing the operation channel and PAN ID for the entire XBee network. Other XBee network devices programmed with this same PAN ID join the network.

As a coordinator, a ConnectPort X3 device can support up to five XBee nodes.

XBee Information

- **Extended Address**: The MAC address for the XBee module.
- **Product Type**: The model type of the ConnectPort X3 family product.
- **Firmware Version**: The current firmware level running on the XBee module.

Basic XBee Settings

The **Basic XBee Settings** control basic operation of the XBee module on the ConnectPort X3 Family product. The settings displayed may include some or all of the settings described below: For complete settings and their descriptions, see the Product Manual for the XBee module in your product.

To have access to complete XBee configuration parameters, to configure the XBee modules in the other devices in XBee network, and to best manage XBee networks, use the iDigi Manager Pro interface.

In most cases, these XBee settings can be left at their defaults. The letters in parentheses are the parameter names for the settings in XBee firmware.

- **Extended PAN ID (ID)**: the 64-bit Extended PAN ID, in hexadecimal. If set to 0, the coordinator will select a random extended PAN ID. The router or end device will join any extended PAN ID.
- **Node Identifier (NI)**: A printable string identifier of this node. This identifier is returned as part of Node Discover command.
- **Discover Timeout (NT)**: Sets the amount of time a node will spend discovering other nodes when a Node Join or Node Discover command is issued.
- **Scan Channels (SC)**: A bit field list of the channels to scan. The XBee module chooses of the channels when starting the network. In a router or end device, the bit field is a list of channels that will be scanned to find a coordinator/router to join.
- **Scan Duration (SD)**: Sets the scan duration exponent of the Active and Energy Scans (on each channel) that are used to determine an acceptable channel and PAN ID for startup of the coordinator.
- **Allows Join Time (NJ):** This value determines how long a coordinator or router will allow other devices to join it. If set to the default for all XBee modules except Smart Energy, 255, devices can join anytime. This setting is supported on coordinators and routers only.

Update XBee Firmware

XBee RF modules can be updated with new firmware over the XBee network. Firmware updates can be made both to the XBee RF module in the Digi device serving as a gateway to the XBee network, and to the XBee RF modules in other XBee network nodes.

Upload XBee firmware files to your PC

Firmware updates for the ConnectPort X gateway's XBee module are available through Digi Technical Support

Update XBee module with new firmware version

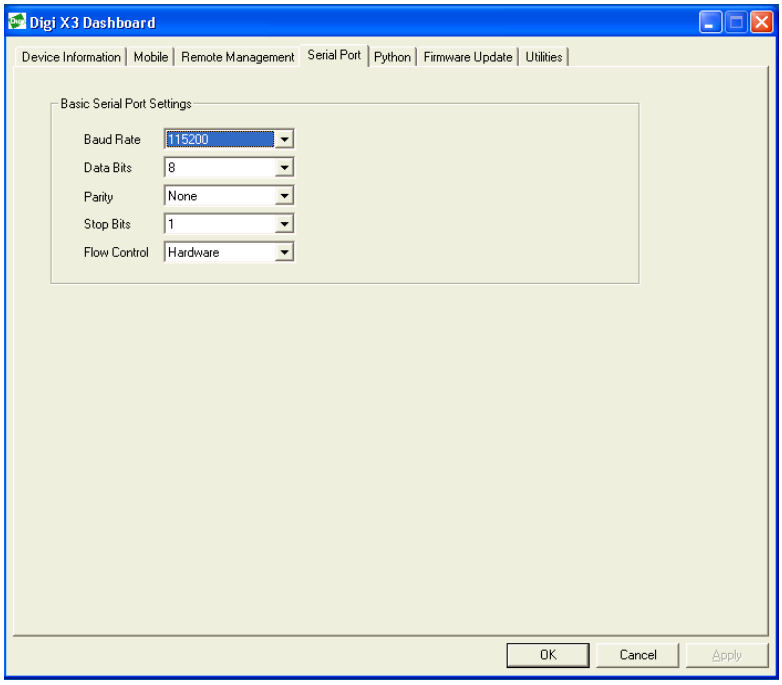
Once the XBee firmware file is loaded onto a PC, to update the XBee firmware:

1. Enter or browse to the file name containing the XBee firmware update for the XBee module. The only type of firmware file for ConnectPort X3 products is XBee ZB, which has firmware files with the filename extension **.ehx**.
2. Click the **Update** button.

   After the firmware is loaded successfully, the XBee module will be restarted.

Serial Port Settings

The **Basic Serial Settings** tab configures several aspects of the serial connection, including **Baud Rate**, **Data Bits**, **Parity**, **Stop Bits**, and **Flow Control**. These basic serial port settings must match the serial settings of the device on the other end of the serial connection.

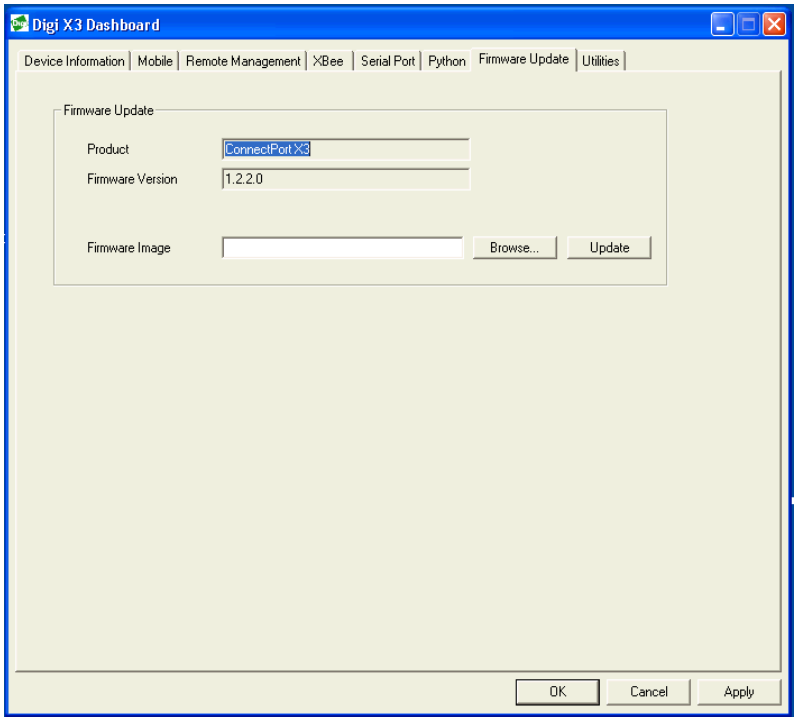


Python program file management

The **Python** tab is used to upload, manage, and run program authored in the Python programming language on the ConnectPort X3 device. For more information on this tab, see "Programming" on page 61.

Firmware Update

The **Firmware Update** tab is used to update the firmware on the main processor for the ConnectPort X3 Family product. The **Firmware Version** field displays the current firmware version in the ConnectPort X3 Family product.

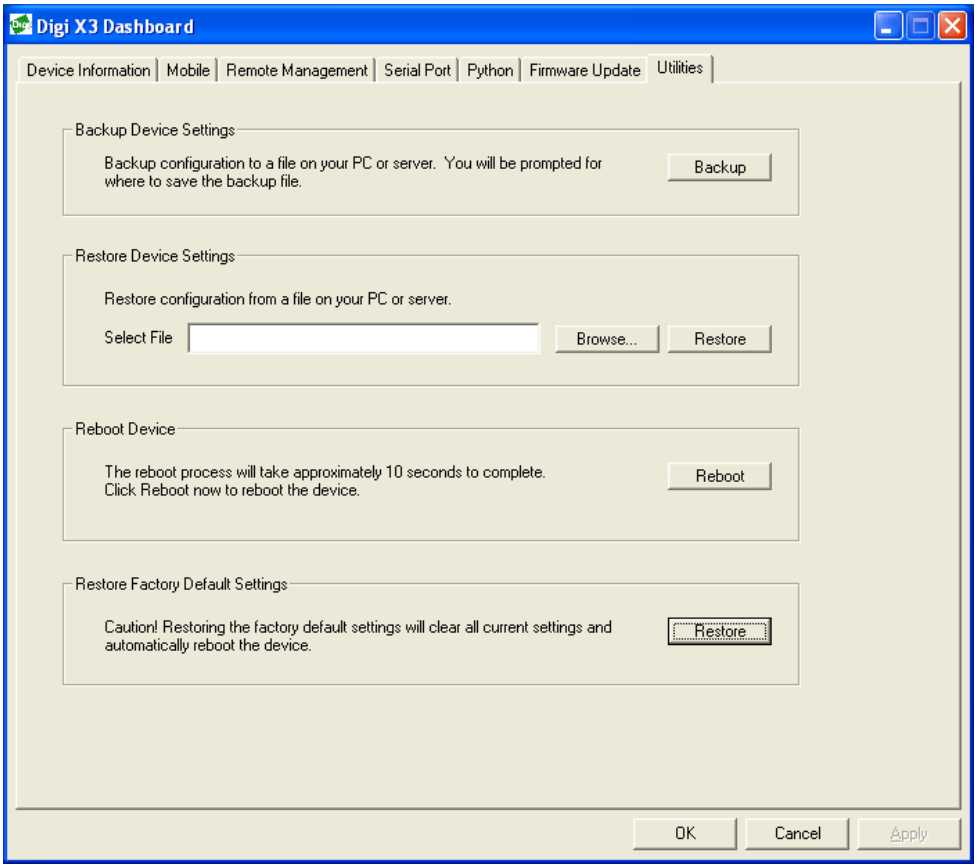


To upload firmware to a ConnectPort X3 Family product:

1. All firmware is available on Digi's Support site. Go to **www.digi.com/support**
2. On the Support site, search for your Digi X3 Family product.
3. On the product page, click the **Firmware Update** link to find the latest firmware version for your product.
4. Download the firmware file to your PC.
5. On the **Firmware Update** tab of the Digi X3 Dashboard, enter the path and filename or click **Browse...** and navigate to the firmware file you have downloaded in step 2.
6. Click **Update** and wait for the update is finished. Do not unplug the device. The firmware update will take about 5 to 10 minutes to complete.
7. When the update is complete, click **OK.**

Utilities tab

The **Utilities** tab is used to perform common administrative tasks for ConnectPort X3 Family products, including backing up and restoring device configuration settings, rebooting the device, and restoring configuration settings to factory defaults.



Back up Device Settings to a file

Once the ConnectPort X3 Family product is configured, backing up the configuration settings is recommended in case problems occur later, firmware is updated, or hardware is added.

If multiple devices need to be configured, the backup/restore feature can be used as a convenience, where the first device's configuration settings is backed up to a file, then the file is loaded onto the other devices.

Restore Device Settings from a file

The Restore Device Settings operation restores device settings from a file stored on a PC or a server. Enter the filename or browse to the file and click **Restore**.

Reboot the ConnectPort X3 Family device

Changes to some device settings require saving the changes and rebooting the Digi device. To reboot a Digi device, click the **Reboot** button. The reboot process takes approximately 10 seconds to complete.

Restore Factory Default Settings

Restoring a ConnectPort X3 Family product to its factory default settings clears all current configuration settings on the device, except any Python files that are loaded on the device, and reboots the device. This is the best way to reset the configuration, because the settings can also be backed up using the Backup and Restore Device Settings operations, which provide a means for restoring it after the configuration issues have been resolved.

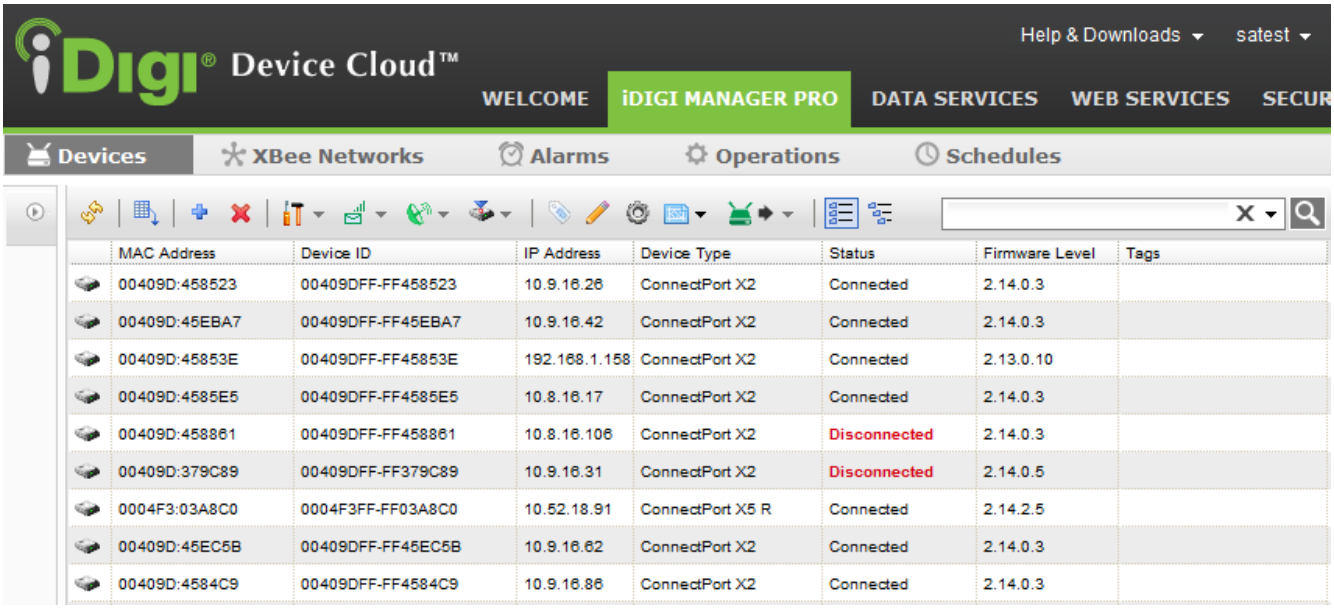
To restore factory default settings, click the **Restore** button.

Configuration and management through iDigi Manager Pro™

iDigi Manager Pro is a software-as-a-service, delivering capabilities that empower IT, network operations and customer support organizations to conquer the challenges of managing the vast array of equipment in their device networks. As a network grows, the complexity of effectively managing the network assets grows exponentially. Hosted on the iDigi® Device Cloud™, iDigi Manager Pro directly tackles and conquers the universal problems of a dynamic device network:

- Centralized control over large numbers of devices
- Reducing service complexity
- Maintaining high levels of security
- Provisioning and decommissioning of equipment
- Adding functionality to device networks

A feature of all Digi gateways, routers, device and components, iDigi Manager Pro provides a robust suite of network management tools with centralized control via the iDigi Manager Pro service module



MAC Address	Device ID	IP Address	Device Type	Status	Firmware Level	Tags
00409D:458523	00409DFF-FF458523	10.9.16.26	ConnectPort X2	Connected	2.14.0.3	
00409D:45EBA7	00409DFF-FF45EBA7	10.9.16.42	ConnectPort X2	Connected	2.14.0.3	
00409D:45853E	00409DFF-FF45853E	192.168.1.158	ConnectPort X2	Connected	2.13.0.10	
00409D:4585E5	00409DFF-FF4585E5	10.8.16.17	ConnectPort X2	Connected	2.14.0.3	
00409D:458861	00409DFF-FF458861	10.8.16.106	ConnectPort X2	Disconnected	2.14.0.3	
00409D:379C89	00409DFF-FF379C89	10.9.16.31	ConnectPort X2	Disconnected	2.14.0.5	
0004F3:03A8C0	0004F3FF-FF03A8C0	10.52.18.91	ConnectPort X5 R	Connected	2.14.2.5	
00409D:45EC5B	00409DFF-FF45EC5B	10.9.16.62	ConnectPort X2	Connected	2.14.0.3	
00409D:4584C9	00409DFF-FF4584C9	10.9.16.86	ConnectPort X2	Connected	2.14.0.3	

From the iDigi Manager Pro interface, you can configure devices, remotely update device firmware, upload and manage Python/iDigi Dia files, remotely reboot devices, reset devices to factory defaults, backup/restore device configuration properties, import or export the device configuration properties, track devices, monitor devices and connections.

With iDigi Manager Pro, management of large populations of devices is made easy. Devices can be tagged and grouped together enabling management tasks to groups of devices within a network simultaneously. Furthermore, the Scheduled Operations feature allows device management tasks to be automated and scheduled to run either on a one-time or a recurring basis, against a single device or multiple devices. The Alarms capability of iDigi Manager Pro facilitates monitoring the health of a device network. For instance, should a device disconnect or stay connected for longer than a specified period, an alarm fires and notification of the alarm can be sent via email in real-time.

Some things to note about using iDigi Manager Pro:

- Devices must be registered on iDigi Manager Pro before they can be accessed via the iDigi platform.
- To minimize network traffic, iDigi Manager Pro uses caching. As a result, device settings can be out-of-sync between the device and the settings viewed on the iDigi Manager Pro console.
- Device information can be refreshed on demand when the device is connected, and is refreshed automatically when a device connects.

For more information on iDigi Manager Pro as a remote device network management solution, see these resources:

- *iDigi User's Guide*
- *iDigi Web Services Programming Guide*
- iDigi tutorials and other documents available on www.iDigi.com

Programming

CHAPTER 4

ConnectPort X3 Family products offer a variety of interfaces that produce and/or consume data, including network sockets, and analog or digital data measured by attached sensors. ConnectPort X3 Family products can be customized through applications written in the Python programming language. Python is a dynamic object-oriented programming language that can be used for the development of many kinds of software. It offers strong support for integration with other languages and tools, comes with extensive standard libraries, and can be learned in a few days.

Applications can be created either by using open-source Python code or the iDigi Device Integration Application (iDigi Dia) in a development environment called Digi ESP for Python that is installed on your PC during ConnectPort X3-related software installation. Developing software programs for ConnectPort X3 products allows you to provide custom logic to control the flow of information to and from these varied interfaces.

This chapter introduces Digi's programming tools and resources and using Digi ESP for Python to create your first simple Python application and custom applications.

Programming tools and resources

Several tools and resources are available for developing software programs for ConnectPort X3 products.

Digi ESP for Python

When you install the software for ConnectPort X3 on your PC, a development environment called **Digi ESP for Python** is installed. This environment allows for easy development of applications in the Python programming language to be loaded, run, tested, and debugged on the device. It includes a wizard that guides you in creating your first simple Python or iDigi Dia applications, and extensive documentation.

Unlike proprietary embedded development platforms, the integration of the universal Python programming language allows for a truly open standard for complete control of connections to devices, the manipulation of data, and event-based actions.

When you install the software that accompanies your product on your PC, a development environment called Digi ESP™ for Python is also installed. This development environment includes extensive documentation, tutorials, and code samples to help you get started developing custom applications for your product. For example, applications can be created to:

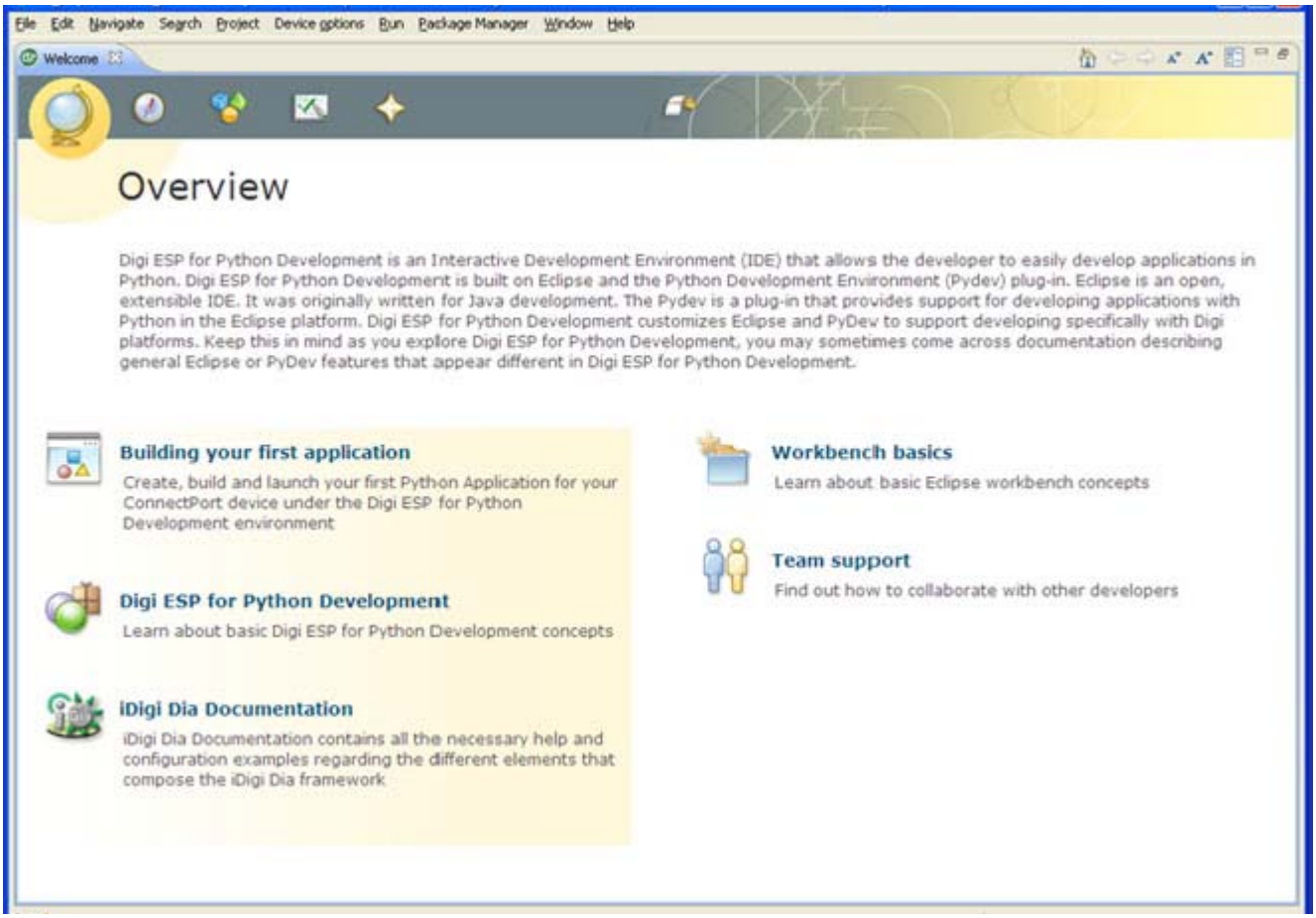
- Aggregate data on the device throughout the day, then upload to iDigi once a day.
- Develop a driver for a custom protocol to talk to a device connected to the X3.
- Translate data, for example, from raw serial into an XML format that can be consumed by other systems, such as iDigi.

Launch Digi ESP for Python Development and select a workspace

To launch the Digi ESP for Python Development environment:

1. From the Start menu:, go to **Start > Programs > Digi > iDigi > Digi ESP.** Or, on the desktop, click this icon:

2. A dialog is displayed for selecting a workspace, which is a folder Digi ESP for Python uses for storing projects. Select a location for the workspace and click **OK**.
3. In the interface, go to **Help > Welcome** to access the extensive help system, including tutorials on building your first application and other tasks, program samples, and detailed development documentation.

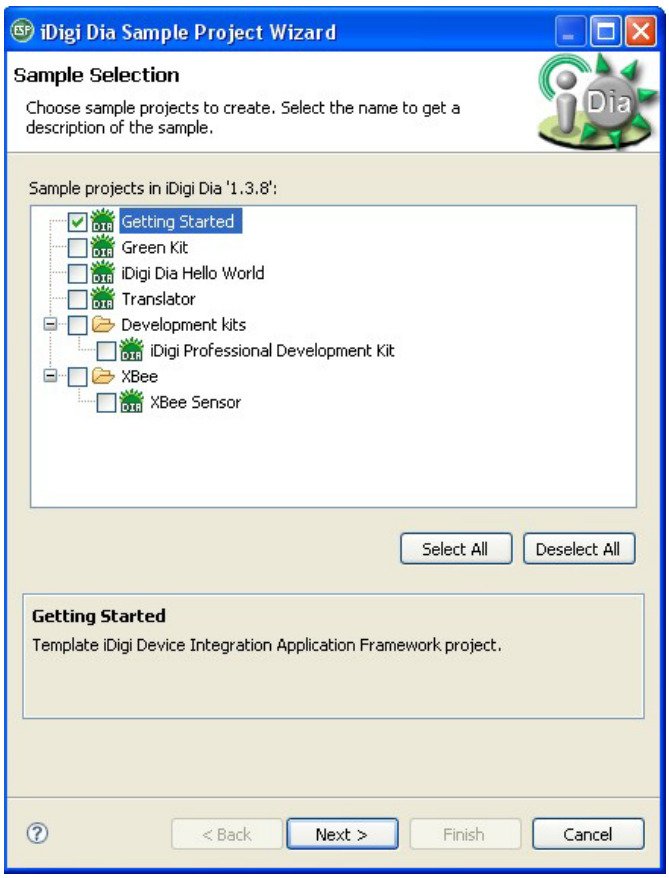


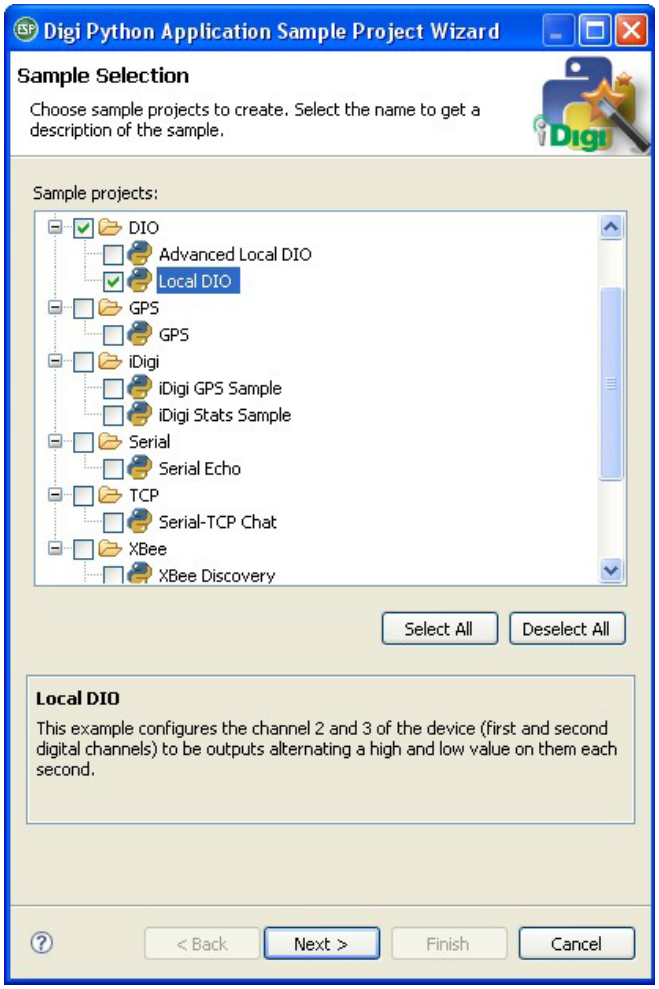
Build your first application

On the **Welcome** page, click **Building Your First Application**. Follow the instructions in Digi ESP for Python and its help to build and launch your first application. For ConnectPort X3 products, the first application you create will be an **iDigi Dia Project.**

Program samples

Digi ESP for Python provides many samples to use as a base for ConnectPort X3 programming including specific examples for exercising specific interfaces available on the ConnectPort X3, such as digital I/O and GPS functionality. For example, here are several types of sample projects available for selecting when building projects:





Digi Python Programming Guide

Digi incorporates a Python development environment into each ConnectPort X gateway. Unlike proprietary embedded development platforms, the integration of the universal Python programming language allows customers a truly open standard for complete control of connections to devices, the manipulation of data, and event based actions.

Python is a dynamic object-oriented programming language that can be used for the development of many kinds of software. It offers strong support for integration with other languages and tools, comes with extensive standard libraries, and can be learned in a few days.

The Digi Python Programming Guide introduces the Python programming language by showing how to create and run a simple Python program. It reviews Python modules, particularly modules with Digi-specific behavior. It describes how to load and run Python programs onto Digi devices, either through the command-line or web user interfaces, and how to run several sample Python programs. Find this guide at the Digi Python Wiki page--in the **Start Here** section, click the link titled **Digi Python Programmer's Guide**

http://www.digi.com/wiki/developer/index.php/Digi_Python_Programmer%27s_Guide

Digi Developer Community Wiki

The Digi Developer Community Wiki is a place to learn about developing solutions using Digi's communications portfolio, software and services, including Python, iDigi Device Cloud, iDigi Dia, and more.

Digi's Developer Wiki is where you'll learn about developing solutions using Digi's communications product, software and services. The Wiki includes how-to's, example code, and M2M information to speed application development. Digi encourages an active developer community and welcomes your contributions.

http://www.digi.com/wiki/developer/index.php/Main_Page

Python Support Forum on digi.com

Find answers to common questions and exchange ideas and examples with other members of the Digi Python development community at:

http://www.digi.com/support/forum/listforums?category=25

iDigi Dia

The iDigi Device Integration Application (iDigi Dia) is software that simplifies connecting devices (sensors, PLCs, etc.) to communication gateways. iDigi Dia includes a comprehensive library of plug-ins that work out-of-the-box with common device types and can also be extended to include new devices. Its unique architecture allows the user to add most devices in under a day.

iDigi Dia is a tested architecture that provides the core functions of remote device data acquisition, control and presentation between devices and information platforms. It collects data from any device that can communicate with a Digi gateway, and is supported over any gateway physical interface. iDigi Dia presents this data to upstream applications in fully customizable formats, significantly reducing a customer's time to market.

Written in the Python® programming language for use on Digi devices, iDigi Dia may also be executed on a PC for prototyping purposes when a suitable Python interpreter is installed.

iDigi Dia is targeted for applications that need to gather samples of data from a set of devices (ZigBee® sensors, wired industrial equipment, GPS devices, etc.). It is an integral component of the iDigi Device Cloud, which customers can deploy with iDigi Dia software to build flexible, robust solutions with unprecedented speed.

iDigi Manager Pro

iDigi Manager Pro allows for device management and access to device data within the iDigi platform. Designed as an on-demand solution, iDigi Manager Pro customers pay only for services consumed, conserving capital and requiring no infrastructure. iDigi Manager Pro includes:

- Device connector software that simplifies remote device connectivity and integration
- Management application (configure, upgrade, monitor, alarm, analyze) for Digi connectivity products including ZigBee nodes
- An application messaging engine with broadcast and receipt notification for application-to device interaction
- Cache and permanent storage options for generation-based storage and ad hoc access to historical device samples
- Application-focused bundles with ready-to-use illustrative applications

Power consumption and management

There are several power-related items and functions involved in developing programs to run on ConnectPort X3 Family products.

External power control device

In an effort to provide a programmatic means of reducing power consumption when there is limited work to be done, or when power is known to be budgeted, ConnectPort X3 Family products have a multi-tiered power management strategy. A single, intelligent, ultra-low power device remains powered whenever the device is connected to a power source. It is responsible for applying power to the rest of the system based on external stimulus.

The power control device is not responsible for determining when a device or its peripherals should be powered off. This intelligence is left to the applications running in the device. The following functions are supplied via the embedded Python module **digipowercontrol** so that applications can:

- Independently control the power of the cellular modem (a heavy current consumer)
- Determine the current state of the power sources managed by the power control module
- Turn off the system power
- Turn off the system power until a future time (scheduled wakeup)

Sleep mode and waking

Currently, ConnectPort X3 and ConnectPort X3 H have a sleep mode with wake-on-timeout and/or wake-on-movement. To use the lowest amount of power possible on the device, applications can be designed to turn off power to the device and turn it on again at a certain point. This is known as a timed wakeup or wake-on-timeout.

The intent of sleep mode and waking capability is to allow application writers to turn off the device when there is no work to be done, and turn it back on when there is more work to be done.

Programming limitations for ConnectPort X3 Family products

ConnectPort X3 Family products are subject to the following limitations in Python-authored applications run on them:

- All currently running applications cannot exceed the sum of 23 open sockets at one time.
- There is no way to view the used memory or CPU utilization on the ConnectPort X3 and ConnectPort X3 R.
- Secure connections are not supported.

Important note on handling of defective Python programs

ConnectPort X3 Family products have a handling method for a Python program containing defects; that is, a program that exits by unhandled programming exception. If you try to auto-start a defective Python program on a ConnectPort X3 device, or if a Python program fails to auto-start after three attempts while the device is booting, the ConnectPort X3 device disables auto-start of that Python program, then continues booting. This feature is meant to protect the ConnectPort X3 from defective Python programs, yet still allow user access to the device using iDigi Manager Pro in order to replace the defective Python program with a functioning one. You must re-check the Python “auto-start” checkbox once the defective Python program has been replaced.

Specifications and certifications

CHAPTER 5

This chapter provides hardware specifications, additional feature detail, and regulatory statements and certifications for Digi devices.

Hardware specifications

ConnectPort X3 specifications

Specification		Value
Environmental	Ambient temperature	-40F to +158F (-40C to +70C)
	Relative humidity	Relative humidity not to exceed 95% non-condensing over the temperature range of from 4C to 45C. Above 45C, constant absolute humidity shall be maintained.
	Storage and transport temperature	-40 to +185F (-40 to +85C)
	Altitude	6560 feet (2000 meters)
Power requirements	DC power input	■ Voltage input: - Low-voltage (LV) units: 3.5 - 7VDC - High-voltage (HV) units: 6-30VDC ■ Power consumption: - Idle: 1.2 W - Maximum: 8.5 W ■ Connector: 2.35mm x 5.7mm, locking barrel, center pin positive. ■ Sleep current: 20uA @ 12VDC
	AC power supply	■ Certifications: CE/UL /c-UL Listed ITE (LPS) or Class II power supply ■ Input voltage: 100 VAC to 240 VAC ■ Input frequency: 50-60 Hz ■ Output voltage: 12 VDC +/- 5% ■ Max output current: 2 A ■ Temperature range: -40 to +158F (-40 to +70C) ■ Connector: 2.1mm x 5.5mm, locking barrel, center pin positive.
Dimensions	Length	3.29 in (8.36 cm)
	Width	4.75 in (12.07 cm)
	Depth	0.95 in (2.41 cm)
	Weight	0.75 lb (0.34 kg)

ConnectPort X3 H specifications

Specification		Value
Environmental	Ambient temperature	-40F to +158F (-40C to +70C)
	Relative humidity	Relative humidity not to exceed 95% non-condensing over the temperature range of from 4C to 45C. Above 45C, constant absolute humidity shall be maintained.
	Storage and transport temperature	-40 to +185F (-40 to +85C)
	Altitude	6560 feet (2000 meters)
	Operational shock	40g, 11ms/axis
	Operational vibration	5.0g RMS 24-1000 Hz, 3-axis
Power requirements	DC power input	■ Voltage input: - Alkaline-battery-powered units: 3.5 - 7 VDC - Solar battery and AC-powered units: 6-30VDC ■ Power consumption: - Idle: 1.2 W - Maximum: 8.5 W ■ Connector: 2.35mm x 5.7mm, locking barrel, center pin positive. ■ Sleep current: 20uA @ 12VDC
	AC power supply	■ Certifications: CE/UL /c-UL Listed ITE (LPS) ■ Input voltage: 100 VAC to 240 VAC ■ Input frequency: 50-60 Hz ■ Output voltage: 24 VDC +/- 5% ■ Max output current: 1 A ■ Temperature range: -40 to +158F (-40 to +70C) ■ Connector: 2.1mm x 5.5mm, locking barrel, center pin positive.
Dimensions	Length	9.44 in (23.98 cm)
	Width	7.30 in (18.54 cm)
	Depth	3.59 in (9.12 cm)
	Weight	3.35 lb (1.52 kg)

ConnectPort X3 R specifications

Specification		Value
Environmental	Ambient temperature	-40 to +158F (-40C to +70C)
	Relative humidity	Relative humidity not to exceed 95% non-condensing over the temperature range of from 4C to 45C. Above 45C, constant absolute humidity shall be maintained.
	Storage and transport temperature	-40 to +185F (-40 to +85C)
	Altitude	16,000 feet (4876 meters) operating
	Operational shock	Meets SAE J1455 specification for shock.
	Operational vibration	Meets SAE J1455 specification for vibration.
	IP67	ConnectPort X3 R: All connectors must be mated to maintain IP67 rating. ConnectPort X3 R Kit does not have IP67 rating.
Power requirements	Power input	+12/24V vehicle battery
	Power consumption	Idle: 4W maximum Peak: 8W maximum
	Power Protection	ISO7637-2 vehicle transients (includes +200V load dump); Reverse voltage and cold-crank protection
Dimensions	Length	5.5 in (14.0 cm)
	Width	7.5 in (19.0 cm)
	Depth	1.8 in (4.6 cm)
	Weight	2.2 lb (1.0 kg)

Regulatory information and certifications

RF exposure statement

In order to comply with RF exposure limits established in the ANSI C95.1 standards, the distance between the antenna(s) and the user should not be less than 20 cm.

FCC certifications and regulatory information (USA only)

FCC Part 15 Class B

These devices comply with the standards cited in this section:

- ConnectPort X3

Radio Frequency Interface (RFI) (FCC 15.105)

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

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

Labeling Requirements (FCC 15.19)

This device complies with Part 15 of FCC 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.

If the FCC ID is not visible when installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module FCC ID.

Modifications (FCC 15.21)

Changes or modifications to this equipment not expressly approved by Digi may void the user's authority to operate this equipment.

Declaration of Conformity

(In accordance with FCC Dockets 96-208 and 95-19)

Manufacturer's Name:	Digi International
Corporate Headquarters:	11001 Bren Road East Minnetonka MN 55343
Manufacturing Headquarters:	10000 West 76th Street Eden Prairie MN 55344

Digi International declares, that the product:

Product Name	Model Number
ConnectPort X3	50001557-xx
ConnectPort X3 H	50001557-xx
ConnectPort X3 R	50001517-xx

to which this declaration relates, meets the requirements specified by the Federal Communications Commission as detailed in the following specifications:

- Part 15, Subpart B, for Class B equipment
- FCC Docket 96-208 as it applies to Class B personal computers and peripherals

The product listed above has been tested at an External Test Laboratory certified per FCC rules and has been found to meet the FCC, Part 15, Class B, Emission Limits. Documentation is on file and available from the Digi International Homologation Department.

Industry Canada (IC) certifications

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques de la class B prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

Important Safety Information

To avoid contact with electrical current:

- Never install electrical wiring during an electrical storm.
- Use caution when installing or modifying lines.
- Use a screwdriver and other tools with insulated handles.
- Wear safety glasses or goggles.
- Installation of inside wire may bring you close to electrical wire, conduit, terminals and other electrical facilities. Extreme caution must be used to avoid electrical shock from such facilities. Avoid contact with all such facilities.
- Protectors and grounding wire placed by the service provider must not be connected to, removed, or modified by the customer.
- External Wiring: Any *external* communications wiring installed needs to be constructed to all relevant electrical codes. In the United States this is the National Electrical Code Article 800. Contact a licensed electrician for details.

Safety statements

5.10 Ignition of Flammable Atmospheres

Warnings for Use of Wireless Devices

Observe all warning notices regarding use of wireless devices.

Potentially Hazardous Atmospheres

Observe restrictions on the use of radio devices in fuel depots, chemical plants, etc. and areas where the air contains chemicals or particles, such as grain, dust, or metal powders, and any other area where you would normally be advised to turn off your vehicle engine.

Safety in Aircraft

Switch off the wireless device when instructed to do so by airport or airline staff. If the device offers a ‘flight mode’ or similar feature, consult airline staff about its use in flight.

Safety in Hospitals

Wireless devices transmit radio frequency energy and may affect medical electrical equipment. Switch off wireless devices wherever requested to do so in hospitals, clinics, or healthcare facilities. These requests are designed to prevent possible interference with sensitive medical equipment.

Pacemakers

Pacemaker manufacturers recommended that a minimum of 15cm (6 inches) be maintained between a handheld wireless device and a pacemaker to avoid potential interference with the pacemaker. These recommendations are consistent with independent research and recommendations by Wireless Technology Research.

Persons with Pacemakers:

Should ALWAYS keep the device more than 15cm (6 inches) from their pacemaker when turned ON.

Should not carry the device in a breast pocket.

If you have any reason to suspect that the interference is taking place, turn OFF your device.

Class I Division 2, Groups A,B,C,D Hazardous Location

The following models are suitable for use in Class I, Division 2, Groups A, B, C and D or Non-hazardous locations only

- ConnectPort X3
- ConnectPort X3 H

Warning: Explosion Hazard - Substitution of components may impair suitability for Class I, Division 2.

Avertissement: Risque d'Exlposion - La substitution de composants peut rendre ce matérial inacceptable pour les emplacements de Classe I, Division 2.

Warning: Explosion Hazard - Do not replace power supply unless power has been switched off or the area is known to be non-hazardous.

Avertissement: Risque d'Exlposion - Ne remplace power supply pas d'alimentation eletrique á moins que le pouvoir n'ait été éteint ou on connu que la région soit non-hasardeuse.

Warning: Explosion Hazard - Do not disconnect equipment unless power has been switched off or the area is know to be non-hazardous.

Avertissement: Risque d'Exlposion - Avant de déconnecter l'equipment, couper le courant ou s'assurer que l'emplacement est désigné non dangereux.

Warning: To prevent ignition of a hazardous atmosphere, batteries must only be changed in an area known to be non-hazardous.

Avertissement: Afin de prévenir l'inflammations d'atmosphéres dangereuses, ne changer les batteries que dans emplacements désignés non dangereux.

International EMC (Electromagnetic Emissions/Immunity/Safety) standards

This device complies with the requirements of following International EMC (Electromagnetic Emissions/Immunity/Safety) standards.

Product	Emissions	Immunity	Safety
ConnectPort X3 ConnectPort X3 H	EN55022:(2006) +A1:2007 Class B FCC Part 15 Subpart B Class B ICES-003Iss. 4 (2004) AS/NZS CISPR 22:2006 VCCI V-3/2008.04	EN 301 489-17 V1.2.1:2002 EN61000-3-2:2006 EN61000-3-3:1995 + A1 (2001) A2 (2005)	IEC/EN 60950-1 UL/CUL 60950-1 UL1604, Class 1, Division 2 Haz Loc CSA C22.2 No. 213-M1987: Non-incendive Electrical Equipment for Use in Class I, Division 2
ConnectPort X3 R	Radiated/Conducted: CISPR25 EN 55022 FCC Part 15 B	Transients: ISO 7637-2, -3 Radiated: ISO 11452-2, -4 Conducted: SAE J1113-2 ESD: ISO 10605 Europe: EN 55024	General: IEC 60950-1 Outdoor: IEC 60950-22

There are no user-serviceable parts inside the product. Contact your Digi representative for repair information.

Environmental requirements for ConnectPort X3 R

ConnectPort X3 R products conform to these environmental tests:

Test Description	Specification and Section Number
Temperature Cycle Test	SAE J1455, Section 4.1.3.1
Thermal Shock	SAE J1455, Section 4.1.3.2
Thermal Stress	SAE J1455, Section 4.1.3.3
Humidity	SAE J1455, Section 4.2
Salt Spray Atmosphere	SAE J1455, Section 4.3.3.1
Immersion	SAE J1455, Section 4.3.3.2
Exposure to Chemicals and Oils	SAE J1455, Section 4.4
Steam Cleaning and Pressure Washing	SAE J1455, Section 4.5
Dust and Sand	SAE J1455, Section 4.7
Altitude	SAE J1455, Section 4.9
Mechanical Vibration	SAE J1455, Section 4.10
Mechanical Shock, Handling Drop	SAE J1455, Section 4.11.3.1
Mechanical Shock, Transit Drop	SAE J1455, Section 4.11.3.2
Operational Shock, Functional	SAE J1455, Section 4.11.3.4
Combined Test Profile	SAE J1455, Section 4.12
IP 67 rating on enclosure	60529 IP specification

Troubleshooting

CHAPTER 6

This chapter provides information on resources and processes available for troubleshooting your Digi device.

Troubleshooting resources

There are several resources available to you for support of your Digi product or resolving configuration difficulties at Digi's Support site, http://www.digi.com/support/ Try these troubleshooting steps to eliminate your problem. After working through these steps and your problem is not solved, try the resources listed below.

1. Visit Digi's Support knowledge base at http://www.digi.com/support/kbase to look for articles related to your situation.
2. Visit our Support Forums at http://www.digi.com/support/forum/ and search for possible posts from other users with similar situations.
3. If the knowledge base or support forums do not have the information you need, fill out an Online Support Request via http://www.digi.com/support/eservice/login.jsp?p=true You will need to create a user account if one is not already set up.

Where to find more information

Additional product information is available on the Digi website, **www.digi.com**, and Digi's support site at **www.digi.com/support**, which includes support forums, knowledge base, data sheets and product briefs, application/solution guides, and carrier-specific documents.

In addition to this guide, find additional product and feature information in the these documents:

- *iDigi User's Guide*
- *iDigi Web Services Programming Guide*
- Documentation, tutorials, and code samples available in Digi ESP for Python, and other programming tools and resources as outlined on page 62
- Quick Start Guide
- *ConnectPort X3 R Installation Guide*
- Cellular 101 Tutorial
- Release Notes
- Cabling Guides

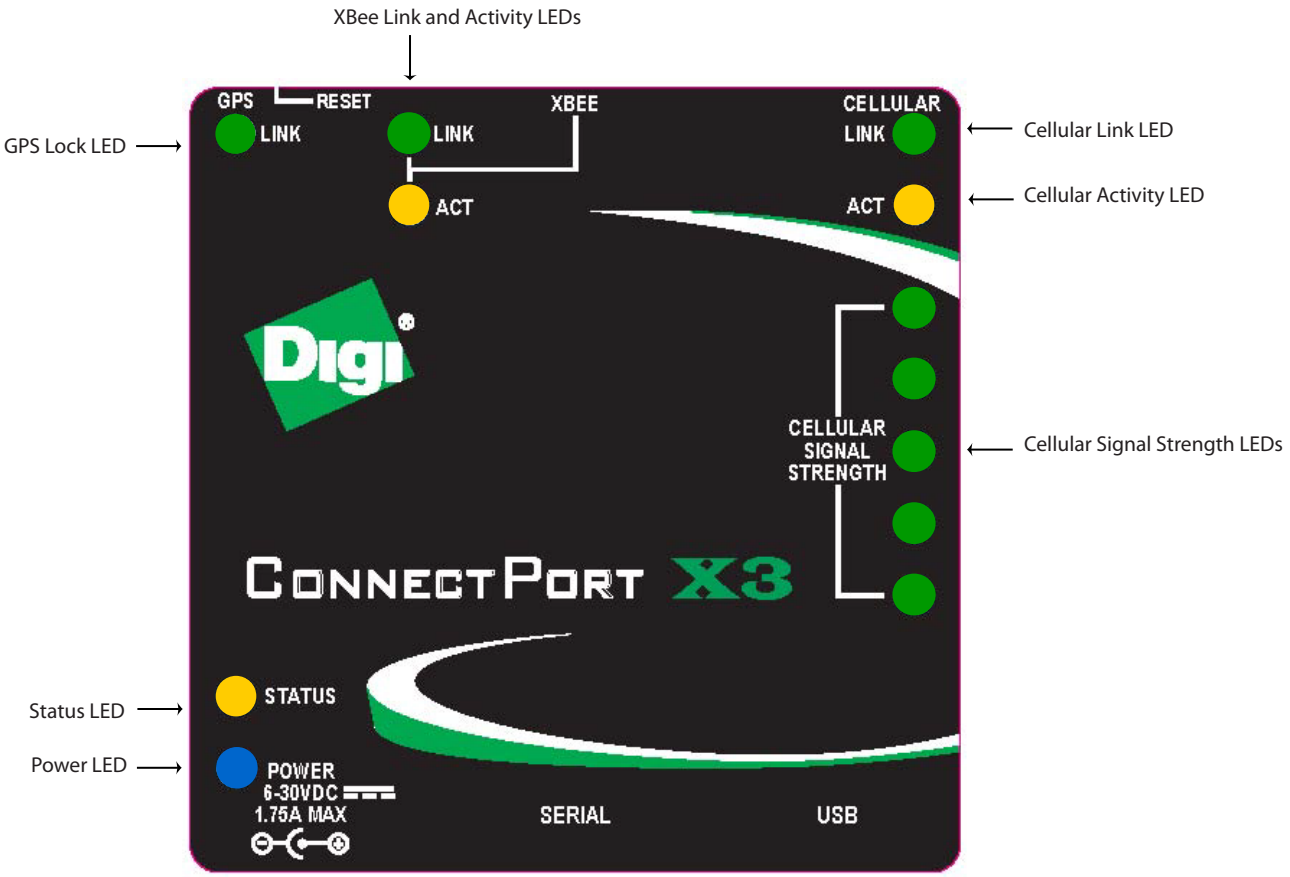
Digi contact information

For more information about Digi products, or for customer service and technical support, contact Digi International.

To Contact Digi International by:	Use:
Mail	Digi International 11001 Bren Road East Minnetonka, MN 55343 U.S.A.
World Wide Web:	http://www.digi.com/support/
email	http://www.digi.com/support/
Telephone (U.S.)	(952) 912-3444 or (877) 912-3444
Telephone (other locations)	+1 (952) 912-3444 or (877) 912-3444

System status LEDs

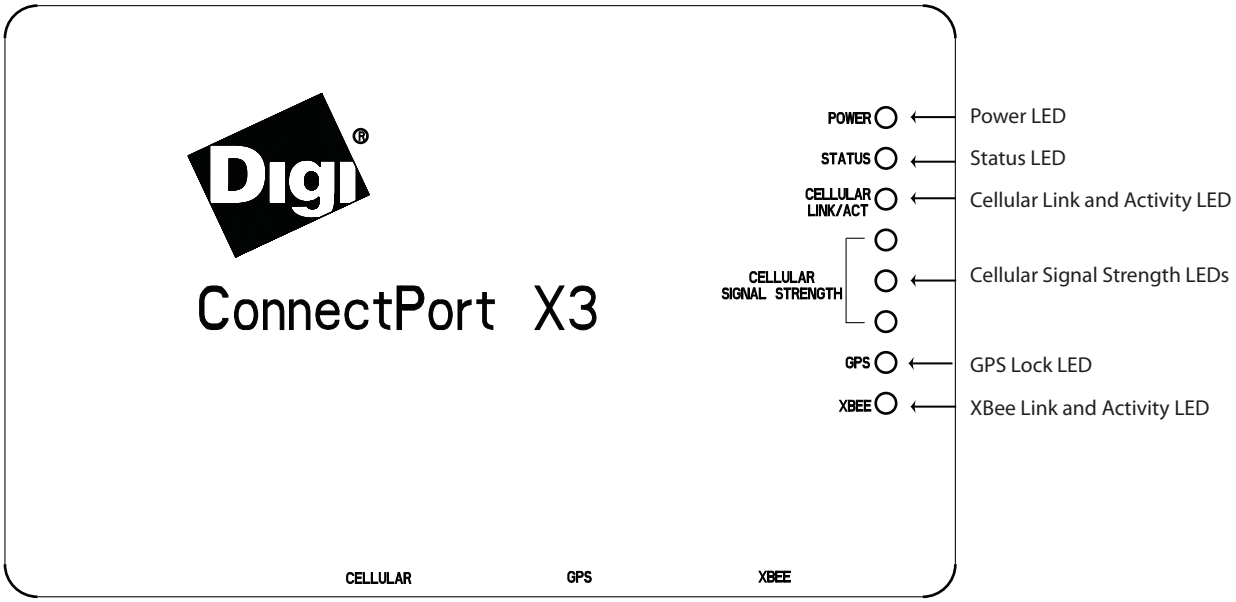
ConnectPort X3 and ConnectPort X3 H LEDs



ConnectPort X3 and ConnectPort X3 H LEDs

LED	Color and Light Pattern	Description
Power	Off	Device is off.
	Solid blue	Device is on.
Status	Blinking amber	Normal operation.
	Solid amber	Device is initializing.
Cellular Link	Solid green	Connected to the cellular network.
Cellular Activity	Blinking amber	Light blinks amber when there is cellular traffic/activity.
Cellular Signal Strength	Solid green	Relative signal strength indicator (RSSI), shown as a number of LEDs. ■ 0 LEDs: No signal. ■ 1-2 LEDs: Weak cellular signal. ■ 3-5 LEDs: Good cellular signal. Signal strength is also displayed on the **Device Information** tab of the X3 Dashboard under **Mobile Connection > Signal Strength**.
GPS	Off	No GPS satellites in range.
	Blinking green	GPS satellites detected, acquiring lock. **Note**: If the antenna is not connected to the ConnectPort X3 device, the GPS device can indicate “phantom” satellites. This will cause the device to behave as if many satellites are visible to it, though it will never establish a satellite lock. This behavior is visible as continuous, fast blinking.
	Solid green	GPS has a lock.
XBee Link	Solid green	XBee link is up.
XBee Activity	Blinking amber	XBee traffic/activity.

ConnectPort X3 R LEDs



ConnectPort X3 R LEDs

LED	Color and Light Pattern	Description
Power	Blue	Power is applied.
	Not illuminated	No power.
Status	Amber	The behavior of the Status LED is controlled by Python applications running on the unit. This LED is normally off.
Cellular Link and Activity	Solid green	The cellular link is up.
	Blinking green	Traffic is on the cellular link.
Cellular Signal Strengths	Green	Relative signal strength indicator (RSSI), shown as a number of LEDs. ■ 0: signal strength unknown or unacceptable ■ 1: signal strength low/weak ■ 3: signal strength high/excellent Signal strength is also displayed on the **Device Information** tab of the X3 Dashboard under **Mobile Connection > Signal Strength**.
GPS	Off	No satellites are visible.
	Blinking green	Satellites are visible, but a satellite lock has not yet been established. The rate of the blinking increases as the number of visible satellites increases. **Note**: If the antenna is not connected to the ConnectPort X3 R device, the GPS device can indicate “phantom” satellites. This will cause the device to behave as if many satellites are visible to it, though it will never establish a satellite lock. This behavior is visible as continuous, fast blinking.
	Solid green	A satellite lock has been acquired.
XBee Link and Activity	Solid green	The XBee network link is up. For more information on this indicator, see the description of the D5 (DIO5 Configuration) parameter in the product manual for the RF module.
	Blinking green	Activity is on the XBee network link.

Troubleshooting tips

If you cannot connect to the device

If you cannot connect to your device, follow these basic troubleshooting steps.

1. **Verify that the Power LED is on.** If it is not on, check that all cables are properly attached and that the unit is plugged into a power source.
2. **Verify that Cellular Signal Strength LEDs are on.** Ideally, three to five LEDs will be illuminated. If you have low signal strength as indicated by the LEDs, reposition the cellular antenna to adjust signal strength.
3. **Verify that the Cellular Link LED is on.** If it is off, verify that the SIM is inserted properly and that the Mobile Service Provider Settings have been configured properly in the Digi X3 Dashboard.

If loaded Python programs do not start

If any Python programs loaded onto the device and configured to start automatically after the device boots fail to start, the programs may be defective. See "Important note on handling of defective Python programs" on page 68.