HXG3000

Indoor LoRaWAN Gateway

User Guide

Revision history—90002468

Revision	Date	Description
A	July 2021	Initial Digi release.

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- Product name and model
- Product serial number (s)
- Firmware version
- Operating system/browser (if applicable)
- Logs (from time of reported issue)
- Trace (if possible)
- Description of issue
- Steps to reproduce

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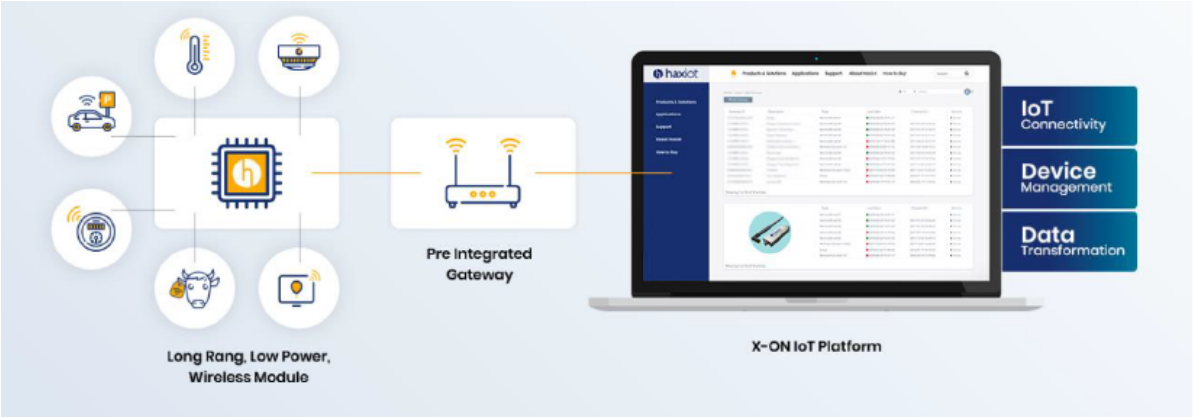
About the HXG3000 Indoor IoT Gateway

This guide provides installation instructions for the HXG3000 Indoor IoT Gateway. The HXG3000 Indoor IoT Gateway provides secure LoRaWAN connectivity to the Haxiot X-ON cloud service.

The Haxiot HXG1000 Gateway is a multi-channel high performance LoRa transceiver designed to receive multiple LoRaWAN packets simultaneously with remote management from the Haxiot X-ON cloud platform. The HXG3000 Indoor IoT Gateway supports multiple operating systems and host processor chipsets. The Haxiot X-ON cloud platform provides centralized configuration and management for all the Haxiot gateway capabilities.



Note To provision and connect the HXG3000 Indoor IoT Gateway a current subscription to the Haxiot X-ON platform is required. See Gateway provisioning for details on how to scan and provision your gateway in X-ON.

Overview

The HXG3000 Indoor IoT Gateway is optimized for indoor IoT coverage applications. The gateway supports eight receive channels of additional coverage and capacity. Ideal for smaller campus or building deployments, the HXG3000 Indoor IoT Gateway is a great solution to provide IoT coverage in areas not serviced by outdoor products. They can be deployed with dedicated Ethernet to provide access to cloud services.

Features

- LoRaWAN 8-channel indoor gateway
- Haxiot Gateway Manager Linux
- ARM A7 528MHz CPU with 512MB RAM and 4GB NAND
- Edge IoT / analytics
- Automatic gateway profile configuration
- Embedded Linux
- Regional support for 470-510 & 902-928Mhz
- Remote firmware upgrade
- EUI-64 LoRaWAN gateway auto-address
- Remote radio reset
- Cloud based shell access
- AES-256 secure NS connectivity

Part numbers

MPN	Description
HXG3000	Haxiot Indoor LoRaWAN Gateway
HXGW470	Haxiot LoRaWAN Gateway Concentrator Module 470 Mhz
HXGW900	Haxiot LoRaWAN Gateway Concentrator Module 900 Mhz
ANT-916-CW-HWR-SMA	900 Mhz LoRa Antenna

All HXG3000 Indoor IoT Gateway devices are designed in the USA and manufactured in China under ISO9001.

Packing list and supply options

Packing list

- The HXG3000 base unit
- HXGW470 or HXGW900 concentrator—depending on regional frequency plan
- LoRa Antenna—900 MHz—or LoRa antenna—470 MHz—depending on regional frequency plan

Supply options

- 5V @ 2 Amp DC Adapter—supplied with the kit.
- Power over Ethernet (PoE) Splitter—not supplied with kit. Customers can buy separately.

Requirements

Haxiot Cloud account

To provision and connect the HXG3000 Indoor IoT Gateway you must have a current subscription to the Haxiot X-ON platform. See Gateway provisioning for details on how to scan and provision your gateway in X-ON.

Network and firewall requirements

The HXG3000 Indoor IoT Gateway requires an Internet connection to the X-ON cloud platform. Power over Ethernet(PoE) Splitter—if used—requires an available ethernet port. IP address allocation is by DHCP from the Local Area Network.

By default, the gateway initiates an outbound connection to the us1.haxiot.com XON cloud server using TLS connectivity.

IP network ports

Haxiot HXG Series gateways use TLS over TCP port 443 for network connections to the XON Cloud, the same protocol used for HTTPS. The gateway initiates all connection requests to the XON Cloud. The use of Network Address Translation on Internet gateways is fully supported by the HXG series.

- TCP outbound - port 443 (TLS)
- UDP outbound - port 53 (DNS)

Installation

Warnings

WARNING! Read all instructions before installing the HXG3000 gateways.

WARNING! The HXG3000 Indoor IoT Gateway must always be operated with a LoRa antenna connected or the radio module could be damaged.

Site survey

Customers should select a site with as few obstructions as possible between the HXG3000 Indoor IoT Gateway and the expected locations of LoRaWAN IoT devices. Elevation increases range.

Backhaul accessibility

The gateway location must have access to a network connection—Ethernet RJ-45—and power—120/240V—for the supplied DC power adapter. Shielded, indoor grade Category 5E cabling or higher is recommended.

The antenna should be mounted vertically and will generate a vertically polarized omni-directional LoRa signal. There is minimal coverage directly above and directly below the antenna with a standard design omnidirectional antenna. Maximum coverage will extend outwards in all directions horizontally.

Operation

The HXG3000 Indoor IoT Gateway uses a fixed Gateway EUI to authenticate with the Haxiot Cloud server. The Gateway needs to be provisioned using the QR Code on your customer account before it can be remotely managed.

The gateway can be locally accessed via SSH protocol on port 22 using the credentials below. By default, the gateway is configured for DHCP IP address allocation, so you need to look up the IP address on the DHCP server or scan the Local Area Network for a host MAC starting with **00:0C**.

Default username and password for the HXG3000 Indoor IoT Gateway

Username: loragw

Password: pass1234

The HXG3000 comes pre-configured to auto connect with the Haxiot Cloud server US1.HAXIOT.com after bootup.

Gateway provisioning

1. Insert an Ethernet Cable to your HXG3000 Indoor IoT Gateway.
2. Make sure that you have an antenna attached to the gateway.
3. Power on the gateway with the 5V Adapter.
4. Scan the Gateway QR code using https://scan.haxiot.com. Use X-ON user credentials to login under your Account.
5. Type or edit the name for your Gateway.
6. Select **Provision**.

Specifications

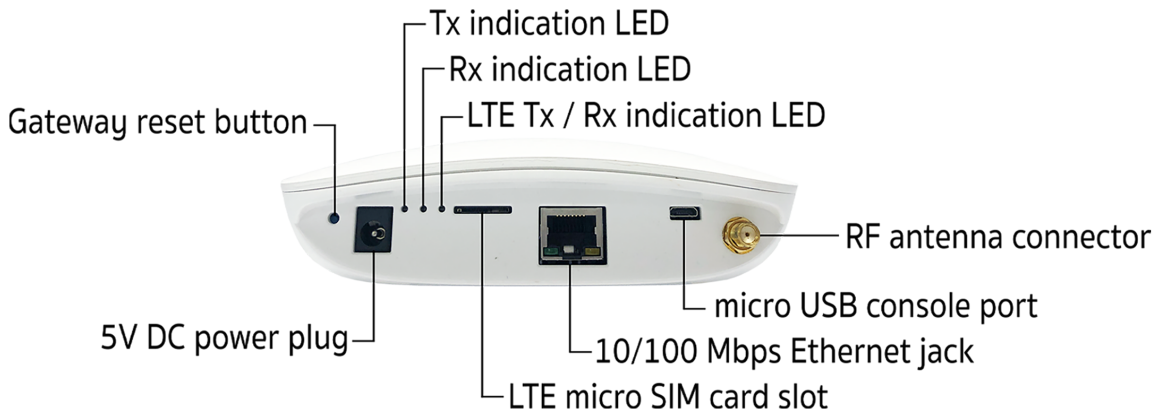
The HXG3000 Indoor IoT Gateway's outer shell is made with ABS thermoplastic.

Dimensions

HXG3000 Indoor IoT Gateway overall dimensions:

- Length 150 mm
- Width 150 mm
- T hickness 44 mm

Rear view



Item	Description	Type
Reset	Gateway Reset Button	Button
DC Power	DC Power Plug	5V@ 2A Plug
LED 1	Tx Indication LED	LED
LED 2	RX Indication LED	LED
LED 3	LTE Tx/Rx Indication LED	LED
SIM Slot	LTE micro SIM Card Slot	micro SIM
ETH	10/100 Mbps Ethernet Jack	RJ45
USB	micro USB Programming Port	microUSB
RF Port	RF Antenna Connector	SMA female

Operating conditions: absolute maximum ratings

Parameter	Min	Typ	Max	Unit
Storage Temperature	-40	+25	+90	°C
Supply Voltage	+0.5	+3.3	+5.0	V
Input RF Level			-10	dBm
Output RF Level	+7	-	+27	dBm
Transmit Duty Cycle			100	%

Normal operating conditions

Parameter	Min	Typ	Max	Unit
Operating Temperature	-25	+25	+85	°C
Supply Voltage	+4.5	+5.0	+5.1	V
Output RF Level	+7	-	+27	dBm
Transmit Duty Cycle	0	-	5	%
Receive Duty Cycle	-	-	100	%

Electrical characteristics

The LoRa radio front end of the Haxiot Mini PCI Express cards is half duplex and supports either receive (Rx) or transmit (Tx) in TDD mode. System power consumption changes between idle, receive and transmit. In typical operation, the Haxiot LoRaWAN Gateway is in the receive state. Idle is used only when the host-based LoRaWAN software is not operational. Transmit mode is used only during packet send operations.

Parameter	Min	Typ	Max	Unit
Idle		8		mA
Rx Mode (4/8 channels)	300		560	mA
Rx + Tx Mode (4/8 channels)		TBD		mA
Module startup (<1500ms)	0	TBD	TBD	mA

Note The transmitter should always be operated at or under a 5% transmit duty cycle in normal operation to manage thermal output. The transmitter MUST also be operated at or under the Duty Cycle mandated for each regulatory region where the product is used.

Radio information

The HXG3000 Indoor IoT Gateway contains one of several factory-installed radio modules in the LoRaWAN radio slot. Each radio LoRaWAN regions with two hardware variants with Software Defined Radio (SDR).

Radio features

The radio features of the HXG3000 Indoor IoT Gateway have the following characteristics:

- Half-duplex mode for independent transmit / receive.
- Simultaneously receive 8 LoRa channels multi-data rates (SF7 ~ SF12 / 125 kHz) + 2 mono-data rate (LoRa 250 / 500 kHz and FSK 50 kbps).
- USA/Australia 915 MHz ISM band [902 MHz - 928 MHz].
- Multiple LoRaWAN regional channel plans supported.
- Industrial temperature rated components -40 to +85 °C.
- Shock and vibration resistant oscillators for industrial use.
- Maximum transmit output power = +27 dBm.
- Typical sensitivity level:

  -139 dBm at SF12 BW 125 kHz

  -125 dBm at SF7 BW 125 kHz

- Ability to work in hostile RF environments such as close to cellular mobile phones, Wi-Fi routers, Bluetooth devices.

Operating frequencies

Model	Tx	Rx	units
HXGW900	902-928	902-928	MHz
HXGW470	470-510	470-490	MHz

US915 regional channel

Channel number	Channel frequency
0	902.3
1	902.5
2	902.7
3	902.9
4	903.1

Channel number	Channel frequency
5	903.3
6	903.5
7	903.7

Receiver specifications (HXGW900)

Parameter	Radio configuration	Min	Typ	Max	Unit
Supply Current Rx	SF7, BW=125k		TBD	625	mA
	SF12 BW=125k		TBD	625	mA
RF Sensitivity	SF7, BW=125k		-125	-126	dBm
	SF12 BW=125k		-140	-142.5	dBm
Receive Frequency		902		928	MHz
Frequency Synthesis		-2		+2	kHz

Transmitter specifications (HXGW900)

Parameter	Radio configuration	Min	Typ	Max	Unit
Supply Current Tx	SF7, BW=500k		TBD	~550	mA
	SF12 BW=500k		TBD	550~	mA
Tx Conducted Power	SF7, BW=500k	+7		+27	dBm
	SF12 BW=500k	+7		+27	dBm
Receive Frequency		902		928	MHz

The HXG3000 Indoor IoT Gateway should only be used with a +3dBi or less antenna gain when configured for maximum transmit power.

Receiver specifications (HXGW470)

Parameter	Radio configuration	Min	Typ	Max	Unit
Supply Current Rx	SF7, BW=125k		TBD		mA
	SF12 BW=125k		TBD		mA
RF Sensitivity	SF7, BW=125k			-127	dBm

Parameter	Radio configuration	Min	Typ	Max	Unit
	SF12 BW=125k			-143.5	dBm
Receive Frequency		470		490	MHz

Transmitter specifications (HXGW470)

Parameter	Radio configuration	Min	Typ	Max	Unit
Supply Current Tx	SF7, BW=500k		TBD		mA
	SF12 BW=500k		TBD		mA
Tx Conducted Power	SF7, BW=500k	+17		+21	dBm
	SF12 BW=500k	+17		+21	dBm
Transmit Frequency		470		510	MHz

Note The HXGW470 should only be used with a +0-3dBi or less antenna gain to be compliant with Chinese radio frequency regulations.

Antenna specifications for 900MHz

The Haxiot HXGW LoRaWAN Gateway cards are modular adapter radio frequency transceivers. As part of modular certification, each model is tested and certified with specific antennas. OEMs that utilize the module are recommended to use the same make and model of antennas to take advantage of the modular certification.

The HXG3000 indoor gateway module is tested and certified with the Linx ANT-916-CW-HWR-SMA (proposed) which is supplied with the HXG3000.

Regulatory

Haxiot notice

The Haxiot HXGW900 LoRaWAN gateway module has been certified for US and Canada with the Federal Communications Commission (FCC) & Industry Canada (IC).

FCC ID: ANQY-HXGW900

IC ID: 23185-HXGW900

FCC notice

FCC NOTICE: This product is designed to allow:

(1) Product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and

(2) Software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

(3) Sales of this device are limited to product developers, software developers, and system integrators

For evaluation only; not FCC approved for resale; and this evaluation kit is designed to comply with all applicable FCC technical rules, including frequency use, spurious and out-of-band emission limits, and maximum power or field strength ratings applicable to a final FCC approval product that would employ the components or circuitry to be evaluated.

RoHS compliance

This module is compliant with the requirements of RoHS.