



Installing the P-LPWA-XXX Pluggable Module

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Cisco LoRaWAN Pluggable Module Overview

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LoRa®

LoRa® is a low power wide area network (LPWAN) RF physical layer modulation technology that offers long-distance wireless connectivity, excellent power efficiency, very high receiver sensitivity, and robust spectrum spreading. It operates on unlicensed Industrial, Scientific, and Medical (ISM) frequencies, for which 863 - 870 MHz spectrum and spectrum subsets are available for Europe, the Middle East, Africa, and India, and 902 - 928 MHz spectrum and spectrum subsets can be utilized in the Americas and in Asia-Pacific countries.

LoRa Alliance®

Wide Area networks for the Internet of Things. Launched at Mobile World Congress in 2015, the LoRa Alliance® is an open, non-profit association of Members that are developing and deploying Internet of Things (IoT) solutions now.

LoRaWAN®

LoRaWAN® is a MAC (Media Access Control) protocol specification defined by the [LoRa Alliance](#) that complements the LoRa® physical layer. It is supported by an established ecosystem of LoRaWAN compliant

devices that are available from multiple vendors, and which can be certified for interoperability by the LoRa Alliance.

The Cisco LoRaWAN Pluggable Interface Module

The Cisco LoRaWAN Pluggable Interface Module supports eight channels of LoRa connectivity.

There are two different P-LPWA modules:

- The P-LPWA-900 is designed for RF regional profile US915, AS923 and AU915 as defined by the [LoRa Alliance RF regional profile specifications](#).
- The P-LPWA-800 is designed for the EU868, IND865 and RU864 RF regional profile as defined by the [LoRa Alliance RF regional profile specifications](#).

The Cisco LoRaWAN pluggable modules can be managed by command line interface (CLI), or the Cisco IOS XE Web User Interface (WebUI).

The following figure shows the P-LPWA-900.

Figure 1: P-LPWA-900 LoRaWAN Pluggable Interface Module



The following figure provides details for the Cisco LoRaWAN pluggable module:

Figure 2: Module Details

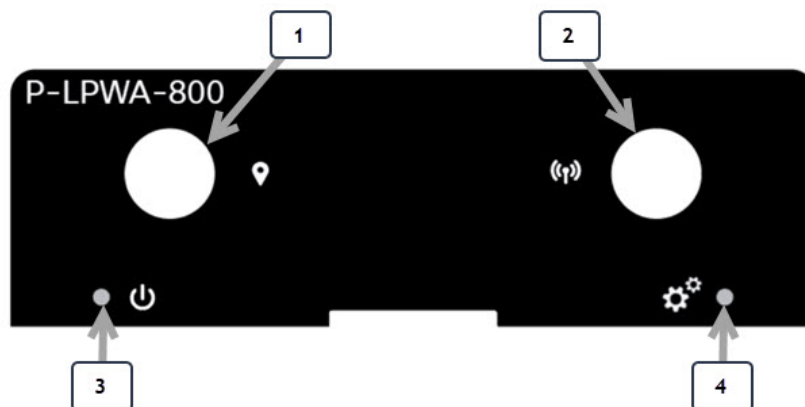


Table 1: Module Details

Item	Description
1	GNSS Connector SMA(f)
2	LoRa RF Connector SMA(f)
3	LoRa Power LED
4	LoRa Status LED

The module dimensions are 2.50" x 0.85" x 3.30" (6.35cm x 2.16cm x 8.38cm). The module weighs 0.4 lbs (181.4 grams).



Note Additional information can be found in the [Cisco LoRa WAN Deployment Guide](#).

Guidelines and Limitations

The Cisco LoRaWAN pluggable modules have the following guidelines and limitations:

- Support is available with IOS-XE release 17.10.1 and later
- Physical OIR is not supported
- GPS Coordinates locking is mandatory for the latest Common Packet Forwarder (CPF) application to work on the PIM module

The following guidelines and limitations apply to the IR1101:

- The Cisco LoRaWAN module can be installed in the Base module or Expansion module
- The Cisco LoRaWAN module is supported in both the IRM-1100-SP and IRM-1100-SPMI expansion modules
- Only one Cisco LoRaWAN module is supported. Any combination of two or more Cisco LoRaWAN modules is not supported



Important The Cisco LoRaWAN module can not be used on the IR1101 when running on the npe IOS XE software image.

GPS Channel Plans

GPS check for verification of channel plans is included.



Note This table is derived from the LoRaWAN Regional Parameters document, version RP2-1.0.2.



Note The CPF feature is intended to operate only when a GPS fix is actively available or has been stored from an earlier fix. The location derived from the GPS fix must be in one of the countries listed in the table below. If not, the radio will not turn on. This does not apply to Actility LRR since the channel plan is configured on the network server.

Countries supported by GPS check include:

Code	Name	Channel plan
AL	Albania	EU868
AD	Andorra	EU868
AM	Armenia	EU868
AR	Argentina	AU915-928
AT	Austria	EU868
AU	Australia	AU915 (default) AS923
AZ	Azerbaijan	EU868
BY	Belarus	EU868
BE	Belgium	EU868
BA	Bosnia	EU868
BN	Brunei	EU868
BG	Bulgaria	EU868
KH	Cambodia	EU868
CA	Canada	US915 (default) AU915
CN	China	AS923
HR	Croatia	EU868
CY	Cyprus	EU868
CZ	Czech Republic	EU868
DK	Denmark	EU868
EE	Estonia	EU868

Code	Name	Channel plan
FI	Finland	EU868
FR	France	EU868
DE	Germany	EU868
GR	Greece	EU868
HK	Hongkong	EU868
HU	Hungary	EU868
IS	Iceland	EU868
IE	Ireland	EU868
IN	India	IN865
IT	Italy	EU868
JP	Japan	AS923
LA	Laos	EU868
LV	Latvia	EU868
LI	Liechtenstein	EU868
LT	Lithuania	EU868
LU	Luxembourg	EU868
MK	Macedonia	EU868
MY	Malaysia	EU868
MX	Mexico	US915
MD	Moldova	EU868
ME	Montenegro	EU868
NL	Netherlands	EU868
NZ	New Zealand	AS923 AU915
NO	Norway	EU868
PL	Poland	EU868
PT	Portugal	EU868
PR	Puerto Rico	US915
RO	Romania	EU868

Code	Name	Channel plan
RS	Serbia	EU868
SG	Singapore	EU868
SK	Slovakia	EU868
SI	Slovenia	EU868
ZA	South Africa	EU868
ES	Spain	EU868
SE	Sweden	EU868
CH	Switzerland	EU868
TH	Thailand	EU868
TR	Turkey	EU868
GB	United Kingdom	EU868
UA	Ukraine	EU868
US	United States	US915 (default) AU915
VA	Vatican City	EU868
VN	Vietnam	EU868



Note Refer to the [LoRa Alliance Technical Specifications](#) for more information.

Installing the P-LPWA-XXX Pluggable Module

The router may have a blank plate covering the Pluggable Module slot. This will need to be removed prior to installing the P-LPWA-XXX module.

Procedure

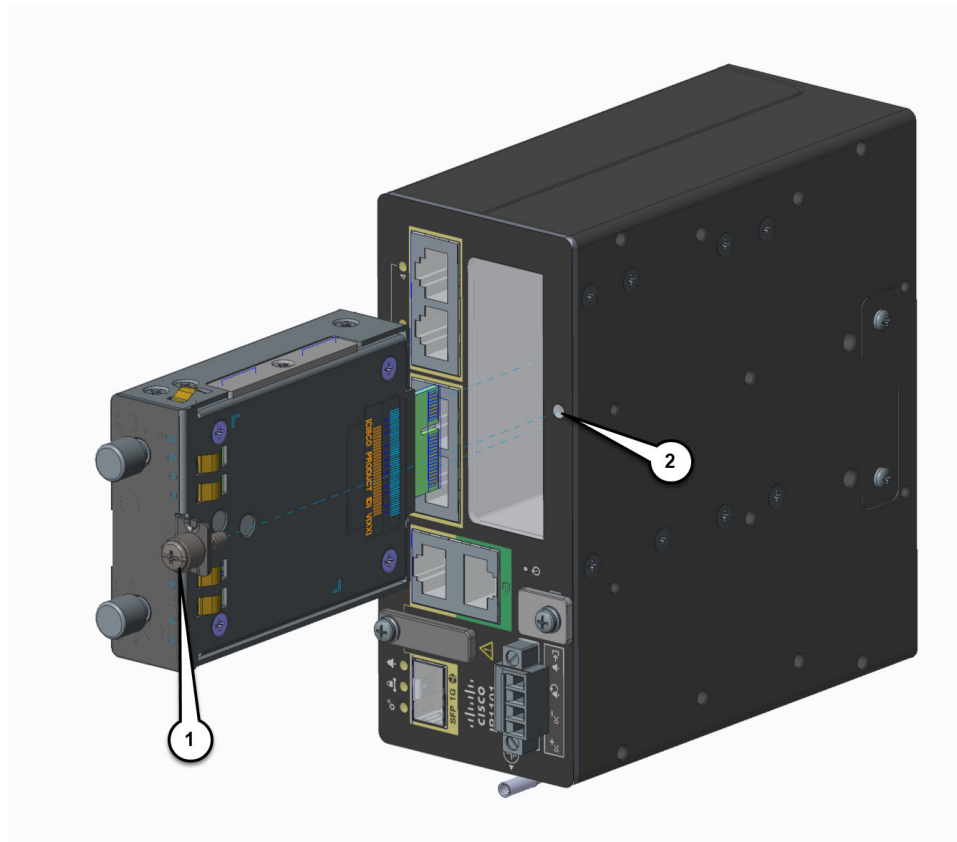
Step 1 Remove the blank plate by unscrewing the latch lock screw (1) that holds the plate secure. Refer to the following figure.

Figure 3: Latch Lock Screw



Step 2 Slide the blank plate out of the device.

Step 3 Slide the Pluggable Module into the device as shown in the following figure. The latch lock screw (1) aligns with the screw hole (2) on the front of the device. Push the Pluggable Module all the way into the device until you feel it seat, and then torque the latch lock screw 8-10 inch-pound (0.9 to 1.1 newton meter).

Figure 4: Pluggable Module Insert

- Step 4** Attach your antennas to the ports on the pluggable module. There are different instructions for each antenna type, be sure to consult the [Cisco Industrial Routers and Industrial Wireless Access Points Antenna Guide](#).
- Step 5** If no antennas are being installed on a port, make sure the antenna caps are installed on the connector.

Deployment Scenarios on the IR1101

The IR1101 has two sides that an expansion module can mount to. The top is called the Expansion side, and the bottom is called the Compute side. If the expansion module is connected to the top, then it is referred to as the EM side. If the expansion module is connected on the bottom, then it is referred to as the CM side.



Note The CM side support will be added in a future release.

Functionality differs depending on which side the expansion module is attached to, how many, and types of expansion modules are in use.

Additional information can be found in the [Cisco Catalyst IR1101 Rugged Series Router Software Configuration Guide](#).

Scenario One

In this scenario, the Cisco LoRaWAN module is installed in the IR1101 Base unit. See the following figure:



In this configuration the Cisco LoRaWAN module has full functionality. The interface numbering in this scenario is LORAWAN 0/1/0.

Scenario Two

In this scenario, the Cisco LoRaWAN module is mounted on the Expansion side, or the top. See the following figure:



In this configuration the LoRaWAN module has full functionality. The interface numbering in this scenario is LORAWAN 0/3/0.

Inventory Details Based on Deployment

The output of the different **show** commands will show different details based upon which side of the IR1101 base unit it is attached to.

Router# **show inventory**

```

+++++
INFO: Please use "show license UDI" to get serial number for licensing.
+++++

NAME: "Chassis", DESCR: "IR1101 Base Chassis"
PID: IR1101-K9          , VID: V03  , SN: FCW2424P05J

NAME: "Module 0 - Mother Board", DESCR: "Cisco IR1101 motherboard"
PID: IR1101-K9          , VID: V03  , SN: FOC24233KEB

NAME: "module subslot 0/0", DESCR: "IR1101-ES-6S"
PID: IR1101-ES-6S      , VID: V01  , SN:

NAME: "module subslot 0/1", DESCR: "P-LTEA-EA Module"
PID: P-LTEA-EA         , VID: V02  , SN: FOC23044M0J

NAME: "Modem on Cellular0/1/0", DESCR: "Sierra Wireless EM7455"
PID: EM7455            , VID: 1.0  , SN: 356129070601460

NAME: "module subslot 0/3", DESCR: "P-LPWA-900 Module"

```

PID: P-LPWA-900 , VID: V00 , SN: FOC25520G96

NAME: "Module 4 - Expansion Module", DESCR: "IR1100 expansion module with Pluggable slot and SFP"

PID: IRM-1100-SP , VID: V02 , SN: FCW2544Z0M3

Router#

Router#show platform

Chassis type: IR1101-K9

Slot	Type	State	Insert time (ago)
0	IR1101-K9	ok	21:18:40
0/0	IR1101-ES-6S	ok	21:17:20
0/1	P-LTEA-EA	ok	21:17:20
0/3	P-LPWA-900	ok	21:17:20
R0	IR1101-K9	ok, active	21:18:40
F0	IR1101-K9	ok, active	21:18:40
P0	PWR-12V	ok	21:18:05

Router#

Router#show ip int brief

Interface	IP-Address	OK?	Method	Status	Protocol
GigabitEthernet0/0/0	172.27.127.211	YES	NVRAM	up	up
FastEthernet0/0/1	unassigned	YES	unset	down	down
FastEthernet0/0/2	unassigned	YES	unset	down	down
FastEthernet0/0/3	unassigned	YES	unset	down	down
FastEthernet0/0/4	unassigned	YES	unset	down	down
GigabitEthernet0/0/5	unassigned	YES	unset	down	down
Cellular0/1/0	unassigned	YES	NVRAM	up	up
Cellular0/1/1	unassigned	YES	NVRAM	down	down
LORAWAN0/3/0	unassigned	YES	NVRAM	up	up
Async0/2/0	unassigned	YES	unset	up	down
Tunnel1	unassigned	YES	unset	up	down
Tunnel11	31.31.31.1	YES	NVRAM	up	up
Tunnel12	30.30.30.1	YES	NVRAM	up	up
VirtualPortGroup0	192.168.2.1	YES	NVRAM	up	up
Vlan1	unassigned	YES	unset	up	down

Router#

Cisco LoRaWAN Pluggable Interface Module LEDs

There are two LEDs on the front the PIM module. The LED on the left is the Power LED, and the LED on the right is the Status LED.

Figure 5: P-LPWA-xxx LEDs



The following tables describe the LEDs:

LoRa Power LED	Description
Green	Operational with the radio on.
Amber	Module is powering up.
Off	No power.

LoRa Status LED	Description
Green	PIM fully configured. LoRa Interface Operational.
Red	PIM interface error encountered, or a problem occurred during configuration.
Off	PIM not fully configured.

The LED status is also available through the CLI.

```
Router#show led
SYSTEM LED : Green

Custom LED : Off

VPN LED : Off

ALARM LED : Off

GigabitEthernet0/0/0 LED : On
FastEthernet0/0/1 LED : Off
FastEthernet0/0/2 LED : Off
FastEthernet0/0/3 LED : Off
FastEthernet0/0/4 LED : Off

LORAWAN0/1/0
Lorawan Module Power LED : GREEN
Lorawan Module Status LED : GREEN
Router#
```

Supported Antenna and RF Accessories

This section shows details for the supported antennas, cables, and lightning arrestors used in a deployment with the P-LPWA-XXX Pluggable Module.

Table 2: LoRaWAN Antennas

Cisco PID	Connector	Frequency	Peak Gain	Polarization	Radiation Pattern
ANT-LPWA-SMA-D	SMA(m)	863 – 928 MHz	1.0 dBi	Linear, Vertical	Omnidirectional
ANT-LPWA-DB-O-N-5	N(f)	863 – 928 MHz	5.6 dBi	Linear, Vertical	Omnidirectional
ANT-WPAN-OD-OUT-N	N(m)	863 – 928 MHz	1.5 dBi	Linear, Vertical	Omnidirectional

Table 3: GNSS Antennas

Cisco PID	Connector	Frequency	Peak Gain	Polarization	Radiation Pattern
GPS-ACT-ANTM-SMA	SMA(m) with 17 ft. integrated cable.	1575.42 ± 1 MHz	4 dBic	RHCP	Hemispheric

Table 4: Coaxial Cables

Cisco PID	Description
CAB-L240-10-SM-NM	10 ft. LMR-240-DB/FR/CMR, SMA(m)-STR to N(m)-STR
CAB-L400-5-N-N	5 ft. LMR-400-DB, N(m)-STR to N(m)-R/A
CAB-L400-5-N-NS	5 ft. LMR-400-DB, N(m)-STR to N(m)-STR
AIR-CAB010LL-N	10 ft. LMR-400-DB, N(m)-STR to N(m)-STR
CAB-L400-20-N-N	20 ft. LMR-400-DB, N(m)-STR to N(m)-RA
AIR-CAB025HZ-N	25 ft. LMR-400-DB/FR/CMR, N(m)-STR to N(m)-RA
CAB-L600-30-N-N	30 ft. LMR-600-DB, N(m)-STR to N(m)-RA

Table 5: Lightning Arrestors

Cisco PID	Connectors	Description
CGR-LA-NM-NF	N(m)-STR to N(f)-STR	DC to 7 GHz, GDT type, bidirectional
CGR-LA-NF-NF	N(f)-STR to N(f)-STR	DC to 7 GHz, GDT type, bidirectional

For installation instructions and detailed information on any of these antennas, refer to the antenna data sheet on Cisco.com, or see the [Cisco Industrial Routers and Industrial Wireless Access Points Antenna Guide](#).

