The bridge to possible

Cisco Connected Grid Resilient Mesh WPAN Module for the Cisco 1000 Series Connected Grid Router

Contents

The Cisco® Wireless Personal Area Network (WPAN) Connected Grid Module is an IEEE 802.15.4g/e/v Radio-Frequency (RF) connection for Cisco 1000 Series Connected Grid Routers (CGR 1000). It delivers 900 MHz RF mesh connectivity to a diverse set of endpoints and support Orthogonal Frequency Division Multiplexing (OFDW).

The WPAN module allows utilities to converge multiple applications supported by the CGR 1000 across a single RF mesh network. Among these applications are Advanced Metering Infrastructure (AMI), Distribution Automation (DA), integration of Distributed Energy Resources (DER), and remote workforce automation.

Together, the ruggedized WPAN module and the CGR 1000 routers provide a versatile platform for diverse Field Area Network (FAN) and Internet-of-Things (IoT) communications deployments aligned with Wi-SUN Alliance objectives for smart utility grids.

Product overview

The Cisco IEEE 802.15.4g/e/v-compliant WPAN Connected Grid Module for CGR 1000 routers gives utilities highly secure, IPv6-based, over-the-air network connectivity. These modules are ideal for high-scale deployments to smart meters, distribution sensors, distribution automation devices, gateways such as the Cisco 500 Series WPAN Industrial Routers (IR500), and other endpoints. They are also suited for use in multi-hop mesh networks and long- reach solutions. Figure 1 displays a Cisco Connected Grid WPAN Module.

Figure 1.
Cisco Connected Grid WPAN Module

Table 1 provides a product SKU and description information about the Cisco Connected Grid WPAN Module.

Table 1.   Cisco Connected Grid WPAN Module product SKU and description

SKU	Description
CGM-WPAN-OFDM-FCC	Connected Grid Module - IEEE 802.15.4e/g/v WPAN 900 MHz
CGM-WPAN-OFDM-BRZ	IR530 with single antenna and battery, 915MHz-WPAN. For North and South America except Brazil.
CGM-WPAN-OFDM-ANZ	IR530 with single antenna and battery, 915MHz-WPAN. For Australia and New Zealand.

Utilities looking to deploy standards-based communications to millions of endpoints should consider the Cisco CGR 1000 Series with the WPAN module. The module provides dynamic, automated network discovery and self- healing. And its multi-hop mesh networking delivers a high endpoint-to-collector ratio of up to 5000 endpoints per CGR 1000.

Connected Grid WPAN Modules are tightly integrated with the network services of CGR 1000 routers. For example, the CGR 1000 provides Internet Engineering Task Force (IETF) Route Policy Language (RPL)-based routing for high availability and network reliability to endpoints connected to the wireless mesh. RPL is the standard for IPv6 Routing Protocol for Low-Power and Lossy Networks (RPL).

The WPAN module, along with CGR 1000 software, also provides robust security features for access control, device identity, key management, and encryption. It offers four levels of Quality of Service (QoS). Together, the WPAN module and CGR 1000 routers provide comprehensive network statistics that help network operators quickly identify and troubleshoot connectivity issues.

The Connected Grid WPAN Modules and CGR 1000 routers can be deployed in numerous utility environments worldwide. As such, the product comes with an array of antenna and cabling options to match each utility's environment. Refer to the antenna specifications (Table 4), cable specifications (Table 5), and accessories specifications (Table 6) for more details.

Cisco Connected Grid WPAN module specifications

Table 2 shows the hardware specifications for the Cisco Connected Grid WPAN Module, plus a partial listing of regulatory compliance and safety data.[1]

Table 2. Hardware specifications

Feature	CGM-WPAN-OFDM-FCC
Form factor	• Single Connected Grid Module
Dimensions (H x W x D)	• 1.50 in. x 4.24 in. x 5.25 in. • 3.81 cm x 10.77 cm x 13.34 cm
Weight	• 0.5 lb.
Worldwide frequency support	902-928 MHz (and subset of it to comply with country's regulations) • North America- ISM: 902-928 MHz • Australia: 915-928 MHz • Brazil: 902-907.5, 915-928 MHz
Radio access method	• IEEE802.15.4 g/e/v

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[1] For more information, consult the Cisco Product Approval Database or your local Cisco representative (Cisco.com login required).

Feature	CGM-WPAN-OFDM-FCC
Frequency hopping spread spectrum	Frequency hopping • Orthogonal Frequency Division Multiplexing (OFDM): 31 channels, 800 kHz channel spacing • 2FSK: 64 channels, 400 kHz channel spacing
Antenna interfaces	• 1 antenna port – QMA connector
Output conducted transmit power (average)	• OFDM: up to 28 dBm • FSK: 30 dBm
Link budget	• OFDM: Up to 143 dB, depending upon antenna gain and data rate • FSK: up to 154 dB, depending upon antenna gain and data rate
Receiver sensitivity	• OFDM: down to -105 dBm • FSK: down to -114 dBm • FSK & OQPSK: down to -114dBm
Antenna gain	Up to 5 dBi depending upon the antenna selection
Radiated transmit power, EIRP	• OFDM: up to 33 dBm • FSK: up to 35 dBm
Operating temperature	–40º F to 158º F (–40 to +70º C) continuous operating temperature range, with IEEE 1613 test, +85 C for 16 hours
Shock and vibration	• 30G at 6 ms, Class Cm • IEEE 1613 Class VS3 • IEC 870-2-2 Class Cm
Operating seismic earthquake	IEC 61850-3, Class S3
Altitude	10,000 ft (3,048 m) maximum operating temperature is derated with increasing altitude per IEEE1613a-2008
Relative humidity	5 to 95 percent, noncondensing
Non-operating temperature	Storage temperature: –40º C to +85º C
Non-operating relative humidity	5 to 95 percent noncondensing
Altitude	10,000 ft (3000 m); maximum operating temperature is derated with increasing altitude per IEEE 1613a-2008
Non-operating free-fall drop	4 in. (100 mm) per ENG-339611
Non-operating shock and vibration	• 50-60 G (3.76 m/s minimum) • 3-500 Hz at 1.12 GRMS (BP at 10 and 100 Hz)

Feature	CGM-WPAN-OFDM-FCC
Immunity	• EN61000-6-2 • EN61000-4-2 (ESD) • EN61000-4-3 (RF) • EN61000-4-4 (EFT) • EN61000-4-5 (SURGE) • EN61000-4-6 (CRF) • EN61000-4-11 (VDI) • EN 55024, CISPR 24 • EN61000-6-1 • EN55035 • CISPR 35
Safety	• USA: UL 60950-1 • Canada: CAN/CSA C22.2 No. 60950-1 • CSA-certified to UL/CSA 60950-1, Second Ed. • CB report to IEC60950-1, Second Ed., covering all group differences and national deviations
Electromagnetic compliance	• 47 CFR, Part 15 • ICES-003 Class A • EN55022 Class A • CISPR22 Class A • AS/NZS 3548 Class A • VCCI V-3 • CNS 13438 • EN 300-386 • EN55032 • CISPR 32
Radio	• FCC Part 2, FCC Part 15.247, Part 90.210 • R22 247 Issue 2

Table 3 outlines the software specifications for the Cisco Connected Grid WPAN Module.

Table 3.   Software specifications

Feature	CGM-WPAN-OFDM-FCC
Software compatibility	Cisco IOS® Software Release 15.7M(03) and newer
PHY/MAC	• IEEE 802.15.4g/e/v • IEEE 6LOWPAN (RFC 6282)
Data traffic	• Native IPv6 traffic over IEEE 802.15.4g/e/v-6LoWPAN, including non-IP traffic transported over Raw Sockets TCP and IPv4 traffic when endpoints implement MAP-T
IPv6 routing	• IETF RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks (RFC 6550, 6551, 6553, 6554, 6719, 6207) • Support for endpoints implementing multiple IPv6 addresses; for example, more than one IPv6 WPAN prefix or IPv6 MAP-T prefix

Feature	CGM-WPAN-OFDM-FCC
WPAN security	• Access control: IEEE 802.1x • Device identity: X.509 digital certificates (utility certificates) • Encryption: AES-128 • Key management: IEEE 802.11i
WPAN Quality of Service (QoS)	• 4 queues • Priority queuing
Network management and diagnostics	• Detailed WPAN diagnostics such as Tx power, Received Signal Strength Indication (RSSI), frequency (if connected) • IETF Constrained Application Protocol (CoAP) (draft-ietf-core-coap-18)
Management Information Bases (MIBs)	• WPAN MIB • ENTITY MIB • IF MIB
Data rate	• 1200 kbps, 800 kbps, 400 kbps, 200 kbps, 150 kbps, 50 kbps

For more information about Connected Grid Operating System (CGOS) software capability support, consult your local Cisco representative (Cisco.com login required).

Table 4 lists the antenna options for the Connected Grid WPAN Modules.

Table 4. Antenna options

Item	Specification
ANT-MP-INT-OUT-M	• Chassis-mounted integrated antenna • Outdoor • 0 dBi gain • Omni-directional
ANT-WPAN-OM-OUT-N	• Omni-directional antenna • Outdoor • 4 dBi gain • Mast mounted
ANT-WPAN-OM-OUT-N-5	• Omni-directional • Outdoor • 5 dBi gain • Mast mounted
ANT-WPAN-OD-OUT-N	• Omni-directional • Outdoor • 1.5 dBi gain • Direct attached to N connector on chassis

Find extensive descriptions of antenna options and deployment scenarios in our deployment guide.

Table 5 lists the RF cable options for the Connected Grid WPAN Module.

Table 5. RF cable options

Item	Specification
Indoor WPAN cable options for the Cisco 1120 Connected Grid Router (CGR 1120)	
CAB-L240-10-Q-N	10 ft (3 m) low-loss LMR 240 cable with QMA and N connectors
CAB-L240-15-Q-N	15 ft (4. 5 m) low-loss LMR 240 cable with QMA and N connectors
CAB-L240-20-Q-N	20 ft (6 m) low-loss LMR 240 cable with QMA and N connectors
Outdoor WPAN cable options for the Cisco CGR 1120 Router and 1240 Connected Grid Router (CGR1240)	
CAB-L400-5-N-N	5 ft (1.5 m) low-loss LMR 400 cable with N connectors (straight to right angle)
CAB-L400-5-N-NS	5 ft (1.5 m) low-loss LMR 600 cable with N connectors (straight to straight)
CAB-L400-20-N-N	20 ft (6 m) low-loss LMR 400 cable with N connectors
CAB-L600-30-N-N	30 ft (9.14 m) ultra-low-loss LMR 600 cable with N connectors

Table 6 lists additional accessories available for Connected Grid WPAN Modules.

Table 6. Additional accessories

Item	Specification
CGR-LA-NM-NF	Lightning arrestor for CGR 1240
CGR-N-CONN-WPAN	N connectors and internal coaxial cable for CGR 1240 for WPAN – ext. antennas
CGR-LA-NF-NF	Lightning arrestor for CGR 1120
ANT-ADPTR-Q-TNC	Connecting adapter for CGR antennas - QMA to TNC for CGR 1120

Find extensive descriptions of antenna and cable options and deployment scenarios in our deployment guide.

Ordering information

The Cisco Connected Grid WPAN Module and the Cisco 1000 Series Connected Grid Routers are available through any Cisco authorized partner. For more information, contact your Cisco representative.

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For more information

Find out more about the Cisco Connected Grid WPAN Module for the Cisco 1000 Series Connected Grid Routers.

Get more information on the Cisco CGR 1000.

Learn more about the Cisco Field Area Network (FAN) solution.

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