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

The Cisco® Wireless Personal Area Network (WPAN) Connected Grid Module is an IEEE 802.15.4g/e radio-frequency (RF) connection for Cisco 1000 Series Connected Grid Routers (CGR 1000 Series). It delivers 900 MHz RF mesh connectivity to a diverse set of endpoints.

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 SKUs and description information about the Cisco Connected Grid WPAN Module.

Table 1. Cisco Connected Grid WPAN Module for CGR 1000 Series

SKU	Description
CGM-WPAN-FSK-NA	Connected Grid Module - IEEE 802.15.4e/g WPAN 900 MHz
CGM-WPAN-OFDM-FCC	Connected Grid Module - IEEE 802.15.4e/g/v WPAN 900 MHz

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.

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. The product thus comes with an array of antenna and cabling options to match the utility's own 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-FSK-NA	CGM-WPAN-OFDM-FCC
Form Factor	• Single Connected Grid Module	• Single Connected Grid Module
Dimensions (H x W x D)	• 1.50" x 4.24" x 5.25" • 3.81 cm x 10.77 cm x 13.34 cm	• 1.50" x 4.24" x 5.25" • 3.81 cm x 10.77 cm x 13.34 cm
Weight	• .5 pounds	• .5 pounds
Radio Capabilities		
Worldwide Frequency Support	• North America- ISM: 902-928 MHz • Australia: 915-928 MHz • Brazil: 902-907.5, 915-928 MHz • Hong Kong: 920-924 MHz • China: 920- 925 MHz	• North America- ISM: 902-928 MHz
Radio Access Method	• IEEE802.15.4 g/e	• IEEE802.15.4 g/e/v
Frequency Hopping Spread Spectrum	• 64 channels (depending on regulatory domain), 400 KHz per channel	• 31 channels , 800 KHz Channel spacing for OFDM Modes
Antenna Interfaces	• 1 antenna port - QMA connector	• 1 antenna port - QMA connector
Output Transmit Power (Average Power)	• 30 dBm	• 25 – 30 dBm (36dBm EIRP), vary on datarate
Link Budget	• Over 136 dB (up to 148 dB depending on antenna gain)	• Over 136 dB (up to 148 dB depending on antenna gain)
Receiver Sensitivity	• −106 dBm	• −101 dBm

Feature	CGM-WPAN-FSK-NA	CGM-WPAN-OFDM-FCC
Operating Conditions		
Operating Temperature	−40º F to 158º F (−40 to +70º C) continuous operating temperature range with IEEE 1613 type, for up to +85 C for 16 hours	−40º F to 158º F (−40 to +70º C) continuous operating temperature range with IEEE 1613 type, for up to +85 C for 16 hours
Shock and Vibration	• 30G at 6 ms, Class Cm • IEEE 1613 Class VS3 • IEC 870-2-2 Class Cm	• 30G at 6 ms, Class Cm • IEEE 1613 Class VS3 • IEC 870-2-2 Class Cm
Operating Seismic Earthquake	IEC 61850-3, Class S3	IEC 61850-3, Class S3
Altitude	10,000 ft (3,048 m) maximum operating temperature is derated with increasing altitude per IEEE1613a-2008	10,000 ft (3,048 m) maximum operating temperature is derated with increasing altitude per IEEE1613a-2008
Relative Humidity	5 to 95 percent noncondensing	5 to 95 percent noncondensing
Non-Operating Conditions		
Temperature	−40º to +185º F (−25º C to +85º C)	−40º to +185º F (−25º C to +85º C)
Non-Operating Relative Humidity	5 to 95 percent noncondensing	5 to 95 percent noncondensing
Altitude	10,000 ft (3000 m); maximum operating temperature is derated with increasing altitude per IEEE 1613a-2008	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	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)	• 50-60 G (3.76 m/s minimum) • 3-500 Hz at 1.12 GRMS (BP at 10 and 100 Hz)
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 • EN50082-1	• 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 • EN 55035, CISPR 35 • EN61000-6-1
Safety	• USA: UL 60950-1 • Canada: CAN/CSA C22.2 No. 60950-1 • Europe: EN 60950-1 • China: GB 60950-1 • Australia/New Zealand: AS/NZS 60950-1 • Rest of world: IEC 60950-1 • CSA-certified to UL/CSA 60950-1, 2nd Ed. • CB report to IEC60950-1, 2nd Ed., covering all group differences and national deviations	• USA: UL 60950-1 • Canada: CAN/CSA C22.2 No. 60950-1 • CSA-certified to UL/CSA 60950-1, 2nd Ed. • CB report to IEC60950-1, 2nd Ed., covering all group differences and national deviations
Emissions	• 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	• 47 CFR, Part 15 • EN61000-3-3 • EN61000-3-4 • ICES-003 Class A • EN55032 Class A • CISPR32 Class A • AS/NZS 3548 Class A • VCCI V-3 • CNS 13438 • EN 300-386

Radio	• FCC Part 2, FCC Part 15.247, Part 90.210 • Brazil: ANATEL Resolution No. 506 • Australia: AS/NZS 4268:2008 • China: 1049 Issue 1	• FCC Part 2, FCC Part 15.247, Part 90.210 • RSS-247

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

Table 3. Software Specifications

Feature	CGM-WPAN-FSK-NA	CGM-WPAN-OFDM-FCC
Software Compatibility	• 15.4(1)CG and above • IOS 15.5M(03) and above	IOS 15.7M(03) and above
PHY/MAC	• IEEE 802.15.4g/e • IETF 6LOWPAN (RFC 6282)	• IEEE 802.15.4g/e/v • IEEE 6LOWPAN (RFC 6282)
Data Traffic	• Native IPv6 traffic over IEEE 802.15.4g/e-6LoWPAN, including non-IP traffic transported over RawSockets TCP and IPv4 traffic when endpoints implement MAP-T	• Native IPv6 traffic over IEEE 802.15.4g/e/v-6LoWPAN, including non-IP traffic transported over RawSockets 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	• 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
WPAN Security	• Access control: IEEE 802.1x • Device identity: X.509 digital certificates (utility certificates) • Encryption: AES-128 • Key management: IEEE 802.11i	• 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	• 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)	• 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	• WPAN MIB • ENTITY MIB • IF MIB
Data Rate	• 150 Kbps (75 Kbps with FEC enabled)	• 800 kbps, 400kbps, 200kbps, 150 kbps, 50 kbps

For more information about 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	• Multipurpose integrated antenna • Outdoor
ANT-WPAN-OM-OUT-N	• Omni antenna for 900 MHz WPAN • Outdoor
ANT-LPWA-DB-O-N-5	• Omni antenna for 900 MHz WPAN • Outdoor

For an extensive description of antenna options and the potential deployment scenarios, see the following deployment guide: http://www.cisco.com/en/US/docs/routers/connectedgrid/antennas/installing/cg_antenna_install_guide.html.

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 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. 5m) 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

Item	Specification
Outdoor WPAN Cable Options for Cisco CGR 1120 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 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

For an extensive description of antenna and cable options and deployment scenarios, see the deployment guide: http://www.cisco.com/en/US/docs/routers/connectedgrid/antennas/installing/cg_antenna_install_guide.html.

Ordering Information

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

Cisco and Partner Services

Services from Cisco and certified partners can help you transform your network and innovate faster across the grid and enterprise. We have the deep, broad expertise to create a clear, replicable, and optimized field network across many technologies.

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For More Information

To find out more about the Cisco Connected Grid WPAN Module for the Cisco 1000 Series Connected Grid Routers, visit http://www.cisco.com/en/US/products/ps12280/index.html.

For more information on the Cisco CGR 1000, visit http://www.cisco.com/go/cgr1000.

For more information on the Cisco Field Area Network (FAN) solution, visit http://www.cisco.com/go/fan.

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