

CloudGate



CloudGate User Guide

CloudGate LTE WW Rev 4
(CG0124)

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CloudGate LTE WW Rev 4

Model: CG0124

The CloudGate LTE WW Rev 4 is a 4G multiband M2M gateway providing internet connectivity at LTE Cat 3 data rates.

Customs code (used for shipping) for CloudGate LTE WW Rev 4 is 8517620090.

The base unit is designed around a main board and a WWAN module. It's main features are listed in the table below:

Feature	Description
WWAN LTE	<ul style="list-style-type: none">• LTE FDD: B1, B2, B3, B4, B5, B7, B8, B12, B13, B18, B19, B20, B26, B28• TDD: 38• Maximum connectivity speed: LTE DL 150 Mbps, UL50 Mbps
WWAN 3G/2G	<ul style="list-style-type: none">• UMTS/HSDPA/HSUPA/HSPA+: 800-850/900/AWS (1700/2100)/1800/1900/2100 MHz (B1, B2, B4, B5, B6, B8, B19)• Maximum connectivity speed: DC-HSPA+ DL 42 Mbps, UL 5,76 Mbps• RX diversity: Simultaneous Equalization and Rx Diversity on all bands
GPS	<ul style="list-style-type: none">• Standalone GPS• Wideband GPS processing (20MHz) for improved measurement accuracy• Passive/active GPS antenna support
Antenna connectors	<ul style="list-style-type: none">• 1 x SMA: WWAN Main• 1 x SMA: WWAN Div/GPS
Ethernet (IEEE 802.3)	<ul style="list-style-type: none">• 2x 10/100Mb/s RJ45 Connector
Visual indicators	<ul style="list-style-type: none">• Three 3 color LEDs showing system status and signal strength
SIM	<ul style="list-style-type: none">• Micro SIM• USIM/SIM connection – Class B and Class C

Feature	Description
MicroSD card reader	<ul style="list-style-type: none"> • For additional storage (FAT32). Located underneath the Cellular modem PCB inside the CloudGate.
Power input	<ul style="list-style-type: none"> • DC input voltage: 9-33 V DC • Connector type: Micro-Fit 3.0™, Dual row, 4 position
RTC	<ul style="list-style-type: none"> • 5 days
timed wakeup	<ul style="list-style-type: none"> • yes
Last Gasp	<ul style="list-style-type: none"> • Optional
Expansion Card Slots	<ul style="list-style-type: none"> • front and back
Metal case	<ul style="list-style-type: none"> • Aluminum housing • Dimensions: 115 x 105 x 45 mm (excluding antenna connectors) • Weight: 285g • Mounting: bulkhead - 6 x M4 mounting holes or DIN rail with adapter
Environmentals	<ul style="list-style-type: none"> • Operating temperature: -30°C to 70°C (*) • Storage temperature: -40°C to 85°C • Humidity operational: 5% - 95% non condensing
Certification	<ul style="list-style-type: none"> • CE, FCC, IC, PTCRB
Standard compliance	<ul style="list-style-type: none"> • ROHS, Reach, WEEE
CloudGate Universe	<ul style="list-style-type: none"> • Device can be configured OTA using CloudGate Universe

(*) See [Safety Warning](#) in the Environmental Specifications section

A more detailed hardware description can be found in the corresponding subsections.

A datasheet of the CloudGate LTE WW Rev 4 can be found [here](#).

The CloudGate LTE WW Rev 4 has two expansion card slots that allow to insert a variety of expansion cards.

1.1.1. Main Board

The CloudGate LTE WW Rev 4 is designed around a main board and a 4G WWAN module. The processor on the main board controls all the interfaces. The WWAN module provides the wireless connectivity to to the internet.

The block diagram shows the overview.

Main Board Block Diagram (PDF)

Power Input

- V_PWR: min 9V DC, max 33V DC

Internal Power Supply

- Power input: V_PWR, min 9V DC, max 33V DC
- Stable 3.4V power rail
- Reverse polarity protection
- Over-voltage protection up to 60V
- Current limiter at 1.2A
- One-time fuse of 2A

Main Board Processor

- Freescale i.MX280 @ 450 MHz
 - 128 MB RAM
 - 512 MB Flash memory
 - 30MB Application partition
 - 270MB free data partition

Connector

- 2x RJ45 Ethernet interface (WAN / LAN)
- 1x SMA WWAN Main
- 1x SMA WWAN Div / GPS

WWAN module

The WWAN module in the LTE WW Rev 4 is the Quectel EG25-G.

1.2. Front and Back View

The CloudGate Base Unit is assembled in the top half of the device. The bottom half is available to insert expansion cards.

The front and back side of the CloudGate housing are closed by means of metal panels that are secured with Torx T10 screws.

The top panels are designed by Option and cannot be changed, since they provide the interfaces of the base unit. The bottom panels can be customized to match the external interfaces of the expansion card.

Front View



1	WWAN Diversity and GPS antenna connector	SMA-female
2	2x Ethernet port	10/100 Mbps RJ-45
3	WWAN Main antenna connector	SMA-female
4	Torx T10 screws	-

Back View



1	Power connector	<ul style="list-style-type: none"> • 9-33 VDC • Micro-Fit 3.0, dual row, 4 circuits
2	Reset button	<ul style="list-style-type: none"> • The explanation on how to use the reset button is written down here
	Expansion Card Slot	<ul style="list-style-type: none"> • Back Card

Behind the top back panel there is a socket for insertion of a SIM card.

Please also refer to the section about the [SIM Card Interface](#) for more details.

1.2.3. LED Indicators

CloudGate LTE Rev 4 has three LED indicators:

LED	Description
System State	<p>Indicates successful power on and device readiness</p> <p>Off: no power Orange: booting Red: error Green: on Green flashing: n/a</p>
WWAN State	<p>Indicates 3G/4G interface availability and use</p> <p>Off: no power or not connected Orange: on, not connected Red: WWAN error Green: on, connected Green flashing: data traffic</p>
WWAN Signal Strength	<p>Indicates 3G/4G interface signal strength</p> <p>Off: no power or not connected Red: bad signal strength</p> <ul style="list-style-type: none"> • < -111dbm when connected to 4G • < -104dBm when connected to 3G <p>Orange: moderate signal strength</p> <ul style="list-style-type: none"> • >= -111dbm & < -94dbm when connected to 4G • >= -104dbm & < -94dbm when connected to 3G <p>Green: good signal strength (>= -94dbm)</p>

Special LED functions:

During a software download from CloudGate Universe

When the CloudGate is downloading new firmware from the CloudGate Universe the

LED behaviour is different compared to normal behaviour. In this situation the LEDs are moving fast from left to right and back. The colors of the LEDs indicate the next:

- Orange: A new firmware is being downloaded
- Green: The download was successful. (This will be followed by a reset of the CloudGate)
- Red: The download was not successful.

During the bootup process

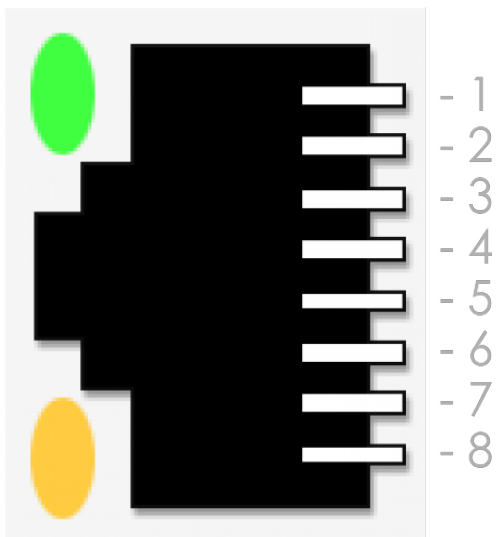
When the CloudGate is booting up, the System State LED behaviour is different compared to normal behaviour. In this situation the System State LED flashes red and orange. This process is expected behavior and can take up to a minute.

CloudGate CG0124 has two ethernet ports located on the front side. When looking at the device, the left port is WAN (DHCP) and the right port is LAN. Following specs are for both ports.

Ethernet Interface

- RJ-45 receptacle tab on top
- 10/100 Mbps
- 100BASE-TX
- Auto-MDIX

Pinout



Yellow LED:

- Active when operating speed is 100 Mbps
- Inactive when operating speed is 10 Mbps or when not connected

Green LED:

- Active when valid links are detected
- Blinks when activity is detected
- Inactive when not connected

Pin #	Function
1	TX/RX+
2	TX/RX-
3	RX/TX+
4	Not used

Pin #	Function
5	Not used
6	RX/TX-
7	Not used
8	Not used

IMPORTANT: The auto-MDIX feature is always activated on the CloudGate. This feature automatically detects the required cable connection type (straight or crossed), and configures the connection appropriately, removing the need for crossover cables. In order for auto-MDIX to work correctly, auto-negotiation (auto speed and auto duplex) must be enabled on both sides of the link. Note that auto negotiation is always active on the CloudGate.

1.2.5. Power Requirements

Base Unit Power Supply

The symbol on the label at the bottom side of the CloudGate shows the power requirements:

9-33V  **1.2A**

- Input voltage must be between 9V - 33V DC
- Internal electronic fuse limits the input current to 1.2A

For the power cable between the external power supply unit and the CloudGate Option recommends to use a power cable that has a wire thickness of 22 AWG!

SAFETY WARNING

This CloudGate operates on DC power provided by a DC power supply or by an AC power adapter. Only use power supplies in the range 9-33V DC and make sure the product is installed near a power outlet that is easily accessible.
When using the KNX card, only use a 24Vdc power supply.

SAFETY WARNING

When using an AC adapter make sure that the ambient temperature doesn't exceed the specified temperature limits of the AC adapter.

SAFETY WARNING

The CloudGate is regarded a Class III equipment: this means that the protection against electrical shock is provided by means of power supplied by an SELV (Safety Extra Low Voltage) circuit and that the CloudGate does not generate hazardous voltages within itself.

When using an AC power adapter make sure it provides protection against electrical shock, class II, and that it is certified for the country where it will be used.

As a reference, the power supply available from Option has the following parameters:

- Output voltage 12V DC
- Max output current 1A

In case you would like to use an industrial power supply Option recommends the next:

<http://www.us.tdk-lambda.com/ftp/Specs/dspa.pdf>

It can be sourced through Farnel, Mouser, Digikey, ...

Power Connector

The power connector is a Micro-Fit connector from Molex (MX-43025-0400)

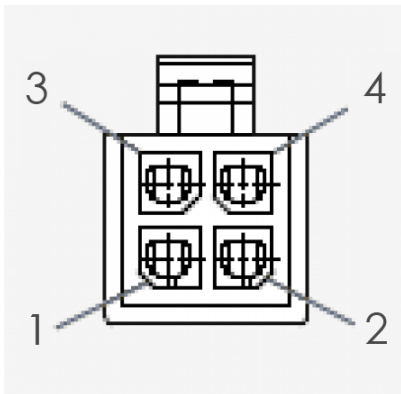


[Power Connector Drawing \(PDF\)](#)

[Power Connector Datasheet \(PDF\)](#)

Pinout

The following drawing shows the pinout of the power connector, seen from the terminal side.



Pin #	Function
1	Input voltage
2	GND
3	Ignition sense input
4	Not connected

Ignition sense

The input range for the Ignition Sense pin is 0-33V

Signal levels:

$V_{ILmax} = 2.7V$

$V_{IHmin} = 4.1V$

In words: the input signal will be read as a '0' when the level is lower than 2.7V and will

be read as a '1' when the level is higher than 4.1V.
Levels in between are undefined/unpredictable.

The explanation about the ignition sense feature and how to use it can be found in the Software Developer Kit, under the title "How to use the ignition sense".

Power Consumption

You can find here a document describing all the different power consumption numbers

Preventing Fuse Overload

SAFETY WARNING

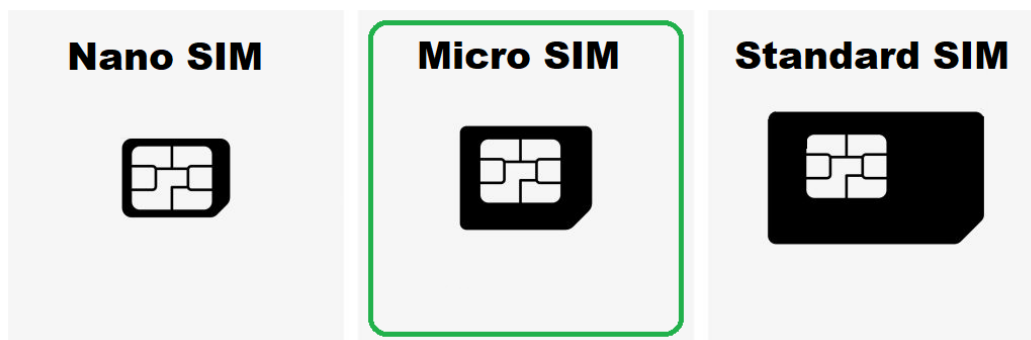
On old CloudGate models, a huge inrush current caused by capacitors inside the CloudGate may cause an internal fuse to break. When using an external power supply with an output voltage higher than 15V, Option recommends using a special cable which will reduce the amplitude of these charge currents. This cable can be obtained at your CloudGate distributor.

If the fifth digit of the serial number of the CloudGate is a "C", the CloudGate is an older model and susceptible to this remark. If the fifth digit is not a "C", the fuse of your CloudGate will not get broken due to these charge currents.

SIM Card Requirements

The CloudGate LTE Rev 4 has an integrated (U)SIM interface compatible with the ISO7816 IC card standard. The 3GPP standard defines three operational voltages for the supply voltage of the SIM card: 1.8V, 3V and 5V. The CloudGate supports two voltages: 1.8V and 3V. The 5V-only SIM cards are rarely used and are not supported by the CloudGate.

General requirements:



- CloudGate micro uses a 'micro' SIM formfactor.
- Changing of SIM cards while in operating mode, the so called "SIM card hot-swapping", is not supported.
- Detection of the SIM card removal can take up to 30 seconds.
- The CloudGate will not be able to communicate with the SIM card after re-insertion. As a result, the CloudGate needs to be reset after re-insertion of the SIM.

Please find more information in our Installation Guide to Learn how to install a SIM card.

Environmental Specifications

- Operating temperature: -30°C to 70° (*) see Safety Warning below
- Storage temperature: -40°C to 85°C
- Humidity operational: 5% - 95% non condensing
- Operating altitude: up to 2000m

Operating temperature with Li-Ion battery: -20°C to +60°C (discharging) and 0°C to +45°C (charging)

Safety Warning

When the device is installed in a location where the environmental temperature can rise above 60°C, the temperature of the surface might reach high values and therefore under these conditions the user needs to be warned in order to prevent accidental contact. For this purpose the device has to be installed in a restricted access location and a warning sticker, in accordance with IEC 60417-5041 (DB:2002-10), must be applied on a visible part of the unit.



Certification information for CloudGate 4.0 LTE WW

Model: CG0124

This page offers an overview of the country certifications and operator approvals obtained per region. This CloudGate model is approved for use in the countries listed below. For use in other countries, please consult your sales contact.

- European Economics Area (EEA): Austria, Belgium, Bulgaria, Croatia, Republic of Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the UK.
- Canada
- United States

Before installing your CloudGate device, read the Safety Guidelines section in the CloudGate Installation Guide carefully. Not following these guidelines can cause harm to the CloudGate, yourself or other persons.

EU Declaration of Conformity



The CloudGate 4.0 LTE WW complies with the essential requirements of the RED directive (2014/53/EU) issued by the Commission of the European Union and carries the CE mark. The product can be used in the following countries of the European Economic Area: Austria, Belgium, Bulgaria, Croatia, Republic of Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the UK.

[Click here to download the RED EU Declaration of Conformity.](#)

EU Regulatory Compliance Information

The CloudGate is constructed in such a way that it can be operated in the Member States of the EU without infringing applicable requirements on the use of the radio spectrum.

There are neither restrictions on putting into service nor requirements for authorization of use related to this product. In these circumstances, there is no information related to this matter to be included on the packaging.

Switzerland



The CloudGate 4.0 LTE WW carries the CE mark and can be used in Switzerland.

Canada



The CloudGate 4.0 LTE WW (CG0124) can be used in Canada and complies with the applicable Industry Canada regulations.

The product completed PTCRB certification.

The CloudGate 4.0 LTE WW (CG0124) CANNOT be used in Class I Div 2 Hazardous Locations.

INNOVATION, SCIENCE and ECONOMIC DEVELOPMENT CANADA (ISED) REGULATIONS

This digital apparatus complies with Canadian CAN ICES-003 (Issue 6).

Operation is subject to the following two conditions:

This device may not cause harmful interference.

This device must accept any interference received, including interference that may cause undesired operation of the device.

External antennas

Under ISED regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by ISED. To reduce potential radio interference to other users, the antenna type and its gain should be chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter, IC 10224A-201903EG25G, has been approved by Industry ISED to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

To comply with Industry Canada regulations limiting both maximum RF output power and human exposure to RF radiation, maximum antenna gain must not exceed:

GSM:

- 7.44 dBi in band 850 MHz
- 10.19 dBi in band 1900 MHz

CDMA:

- 8 dBi in band 2
- 5 dBi in band 4
- 8.26 dBi in band 5

LTE:

- 8 dBi in band 2, 7, 38
- 5 dBi in band 4
- 8.25 dBi in band 5
- 7.76 dBi in band 12
- 8.09 dBi in band 13
- 8.25 dBi in band 26 (824-849 MHz)

In addition, the product shall be installed in a way that a distance of at least 20 cm is maintained between the antennas and the user's body.

REGULATIONS INNOVATION, SCIENCE and ECONOMIC DEVELOPMENT CANADA

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement Economique Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes:

l'appareil ne doit pas produire de brouillage.

l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

Antennas externs

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son

gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio, IC 10224A-201903EG25G, a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

GSM:

- 7.44 dBi in band 850 MHz
- 10.19 dBi in band 1900 MHz

CDMA:

- 8 dBi in band 2
- 5 dBi in band 4
- 8.26 dBi in band 5

LTE:

- 8 dBi in band 2, 7, 38
- 5 dBi in band 4
- 8.25 dBi in band 5
- 7.76 dBi in band 12
- 8.09 dBi in band 13
- 8.25 dBi in band 26 (824-849 MHz)

En plus, le produit doit être installé de manière à assurer une distance de séparation de 20 cm minimum entre le corps de l'utilisateur et les antennes.

United States



The CloudGate 4.0 LTE WW (CG0124) can be used in the USA and complies with the applicable FCC rule parts.

The product completed PTCRB certification and will be approved by the following network operators:

- Verizon Wireless (for Cat 4 devices, Verizon Wireless requirement is to use minimum of 2 antennas)

- AT&T
- USCellular

The CloudGate 4.0 LTE WW (CG0124) CANNOT be used in Class I Div 2 Hazardous Locations.

[Click here](#) to download the FCC Declaration of Conformity.

FCC REGULATIONS

This device complies with Part 15 of the FCC rules.

Operation is subject to the following two conditions:

(1) This device may not cause harmful interference

(2) this device must accept any interference received, including interference that may cause undesired operation

Federal communications commission notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radiofrequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Exposure Information to Radio Frequency Energy

Users concerned with the risk of Radio Frequency exposure may wish to limit the duration of their calls and to position the antenna as far away from the body as is practical.

Modifications

Any changes or modifications made to this device that are not expressly approved by Option could void the user's authority to operate the equipment.

External antennas

To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, maximum antenna gain must not exceed:

GSM:

- 8.6 dBi in band 850 MHz
- 10.19 dBi in band 1900 MHz

CDMA:

- 8 dBi in band 2
- 5 dBi in band 4
- 9.42 dBi in band 5

LTE:

- 8 dBi in band 2, 7, 38
- 5 dBi in band 4
- 9.41 dBi in band 5
- 8.7 dBi in band 12
- 9.16 dBi in band 13
- 9.36 dBi in band 26 (814-824 MHz)
- 9.41 dBi in band 26 (824-849 MHz)

In addition, the product shall be installed in a way that a distance of at least 20 cm is maintained between the antennas and the user's body.

Last Gasp Battery

CloudGate LTE 4.0 supports the possibility to add a so called "last gasp" battery. This battery does not provide power to all interfaces and is only meant to track power loss and to shut down in a clean way.

Battery Details

- 3.7V
- 950 mAh
- ~3.5W

Power consumption CloudGate: 12V 0.2A = 2,4W

Interfaces like IO or expansion cards might not work anymore when running on the last gasp.

Forcing the power off when battery powered is done by removing the power and then pushing the reset button for 10 seconds

The following is an incomplete list of expansion cards and is subject to change. Contact Option to know for certain which features will work.

Front slot expansion cards:

Part	Description	Compatilby	Notes
CG1101-11919	Standard serial Card	yes	
CG1102-11920	Industrial serial Card	yes	
CG1104-11936	Ethernet Card (4 port)	no	
CG1103-11935	Ethernet Card with PoE (4 port)	no	
CG5106-11984	Telematics Card: IO and CAN	partial	only serial, digital output, analog input
CG5106-12039	Telematics Card: IO and CAN - 4p CL	partial	only serial, digital out, analog input
CG1119-12096	Option BLE Card	partial	USB will power down
CM1123	CloudGate mini	partial	only serial and can

Back slot expansion cards:

Part	Description	Compability	Notes
CG2101-11921	WLAN I expansion	yes	

Part	Description	Compability	Notes
	Card		
CG2102-11994	WLAN II expansion Card	yes	
CG2111	Monnit	yes	applies to all Monit/Alta cards
CG2123	LoRaWAN	yes	applies to all Lora cards



OPTION

WIRELESS TECHNOLOGY