Siretta

Enabling Industrial IoT

QUARTZ-GOLD

Gigabit Ethernet Industrial Router Range

Hardware Reference Manual

Rev 1.4

Siretta
Enabling Industrial IoT

QUARTZ-GOLD
Hardware Manual

Table of Contents

Registered in England No. 08405712
VAT Registration No. GB163 04 0349

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Introduction

This document is a guide for adding a QUARTZ-GOLD router to your system.

The QUARTZ-GOLD is a range of industrial LTE routers that can be used as the gateway router to a WAN or the 4G LTE cellular network, with the option of automatic fallback between the two.

This document is aimed at engineers and describes the electrical characteristics and hardware operation of the QUARTZ-GOLD router.

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About Siretta

Siretta is a wireless communications company located in Reading, United Kingdom manufacturing & supplying industrial IoT products since the early 2000s.

Siretta's product portfolio is made up of:

» Antennas, plus their associated Cable Assemblies & Adapters,

» Cellular Network Analysers

» Industrial Modems

» Industrial Routers

» Associated Cloud Management

Siretta supplies products directly and via a worldwide network of distributors, into numerous markets and applications across the globe.

Siretta's distribution partners range from industrial IoT specialists through to global catalogue organisations.

Whether "off the shelf" or custom solutions are required, Siretta has a wide portfolio of products to fit many types of application.

Siretta's extensive knowledge and experience in the wireless market allows support of a wide range of customer applications, focusing on frequencies between 150 MHz to 6 GHz. These encompass modems, routers and antennas for:

» Cellular technologies: GSM/GPRS/3G/UMTS/4G/LTE & 5G NR, plus LTE CAT 1, LTE CAT M & LTE CAT NBIoT

» Global positioning: GPS/GNSS

» WLAN/Wi-Fi

Whilst providing the above products for the industrial cellular market, Siretta also has a number of antennas to cover applications for:

» Bluetooth, Zigbee, ISM band, LoRa and Sigfox

With a heavy emphasis on design, Siretta has a team of dedicated Engineers and Product Managers, who specialise in wireless applications.

Siretta continually makes significant investment in R&D endeavouring to provide customers with market leading, future-proofed, wireless solutions. Siretta works closely with many technology partners to stay at the forefront of industrial IOT.

General Description

The QUARTZ-GOLD is powered with a Broadcom 900 MHz ARM Cortex A7 processor with 128 MB flash and 1 GB of DDR3 RAM. This processor runs a proprietary Operating System based on Linux.

As well as offering two Gigabit Ethernet interfaces, the QUARTZ-GOLD also offers an RS232 interface that may be used to create a network serial port with products such as door access control panels and alarm panels.

IEEE 802.11 b/n/ac WiFi comes as standard, and the QUARTZ-GOLD also optionally supports GNSS for asset tracking applications.

Three modes of networking operation are possible:

1. LTE cellular router where the WAN connection of the router is the LTE cellular interface. In this mode both Ethernet interfaces are for LAN use. Internet connectivity comes from the internal cellular interface.
2. WAN router where one of the Ethernet ports of the router is used as the WAN connection. The WAN port in this case would normally be connected to a cable or ADSL modem to obtain Internet connectivity.
3. Backup router which combines the two above modes. The router can switch between the cellular and WAN connections automatically to maintain Internet connectivity in the event that one path fails. The preferred route can be set to cellular or WAN.

Features

- European 4G / LTE bands
- High speed data via LTE Cat 4 network
- 2.4 GHz & 5 GHz dual WiFi support
- Strong resistance to electromagnetic interference
- Built-in watch dog, multi-link detection
- Compact industrial design
- Excellent temperature endurance
- VPN: OpenVPN, PPTP, L2TP, GRE, IPSec
- GPS Receiver (order option)
- 2 x GbE Local LAN
  (Cellular Router Mode)
- 1 x GbE Local LAN & 1 x GbE Remote WAN
  (WAN Router and Backup Router Mode)

Specifications

Table 1. Specifications of QUARTZ-GOLD routers

	QUARTZ-GOLD
2G frequency band:	B8 (900 MHz), B3 (1800 MHz)
3G frequency band:	B8 (900 MHz), B1 (2100 MHz)
4G frequency band:	TDD Bands: B41 (2500 MHz), B40 (2300 MHz), B38 (2600 MHz) FDD Bands: B28A (700 MHz), B20 (800 MHz), B8 (900 MHz), B7 (2600 MHz), B3 (1800 MHz), B1 (2100 MHz)
Dimensions:	103 mm x 73.5 mm x 25.5 mm (excluding protruding connectors)
Weight:	320 g (excluding antennas, SIM card and packaging)
Supply voltage:	7.5 - 32 VDC
Operating temperature range:	-30 to +75 °C
Storage temperature range:	-40 to +85 °C
Humidity range:	0 to 95 % RH non-condensing
IP rating:	30

QUARTZ-GOLD Interface

Physical Features

» 2 x Gigabit Ethernet Interfaces
» 1 x SIM Slot
» 1 x DC Power Interface (reverse polarity protected)
» 1 x RS232
» 2 x Cellular Antenna Interface (1 x Cellular, 1 x GNSS on models supporting GNSS)
» 2 x WiFi Interface

WiFi Features

» IEEE 802.11n/ac radio supporting IEEE 802.11a/b/g/n/ac wireless standards
» Concurrently operates in 2.4 and 5 GHz bands
» Standard Reverse Polarity SMA antenna interface
» Access point, Client and Ethernet bridge modes of operation

LAN/WAN Features

» 1 x Gigabit LAN & 1 x Gigabit LAN/WAN (User configurable)
» Power saving green technology
» Auto-MDI/MDIX

RS232 Features

» 2 Wire RS232 interface
» Supports up to 115200 Kbps
» Configurable baud rate/data length/parity/stop bits
» Client & server options
» Data caching option

LTE Features

» Supports Cat4 FDD and TDD modes
» Supports 1.4/3/5/10/15/20 MHz RF bandwidth
» Supports MIMO in download direction using diversity*
» LTE-FDD: Max 150 Mbps (Download)/Max 50 Mbps (Upload)*
» LTE-TDD: Max 130 Mbps (Download)/Max 30 Mbps (Upload)*

UMTS Features

» Supports 3GPP Release 8 features DC-HSDPA, HSPA+, HSDPA, HSUPA and WCDMA
» Supports QPSK, 16-QAM and 64-QAM modulation
» DC-HSDPA: Max 42 Mbps (Download)*
» HSUPA: Max 5.76 Mbps (Upload)
» WCDMA: Max 384 Kbps (Download)/Max 384 Kbps (Upload)

GSM Features

GPRS

» Support GPRS multi-slot class 33 by default
» Coding scheme: CS-1, CS-2, CS-3 and CS-4
» Max 107 Kbps (Download)/Max 85.6 Kbps (Upload)

EDGE

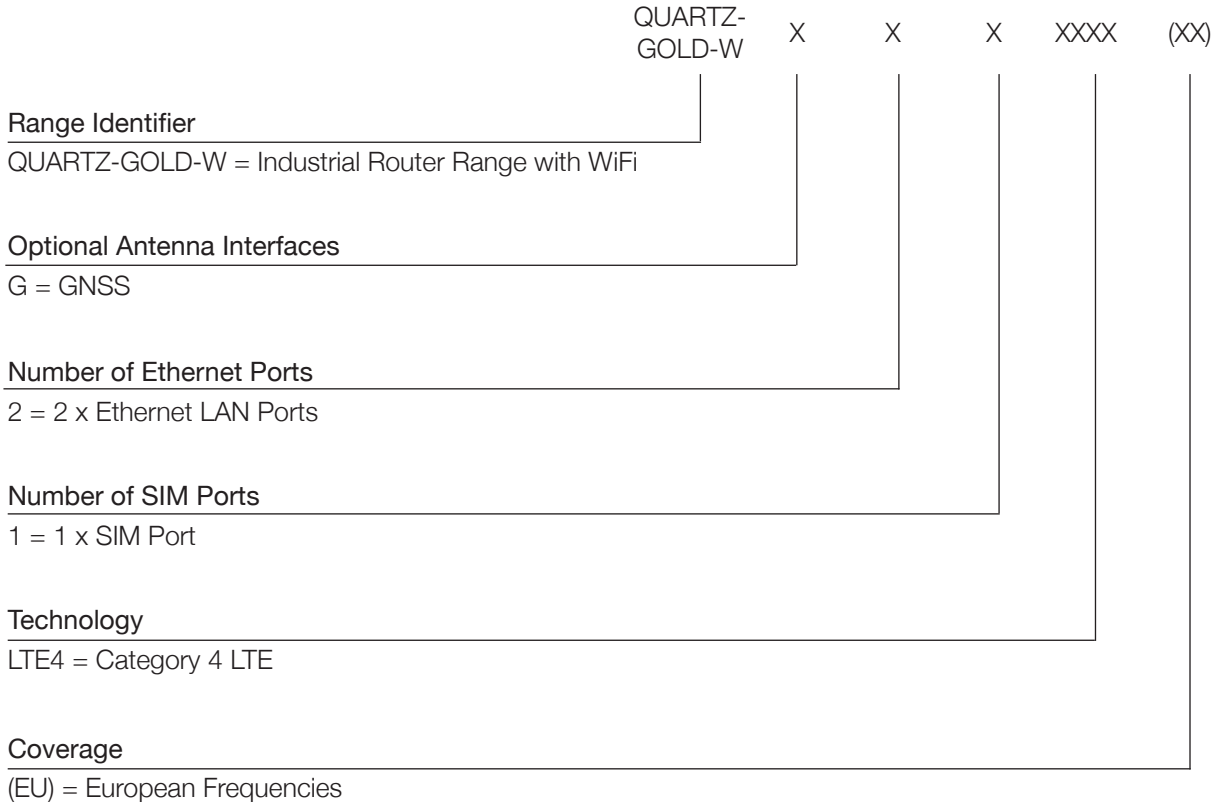
» Support EDGE multi-slot class 33 by default
» Support GMSK and 8-PSK for different MCS (Modulation and Coding Scheme)
» Downlink coding schemes: CS 1-4 and MCS 1-9
» Uplink coding schemes: CS 1-4 and MCS 1-9
» Max 296 Kbps (Download)/Max 236.8 Kbps (Upload)

GNSS Features

» Supports GPS
» 1Hz update rate
» NMEA 0183 & proprietary format supported
» Cold start time to first fix typically 18 seconds
» Active and passive antenna support

*Non-GNSS models only. Data download rates on GNSS models are halved as they are unable to support diversity.

Ordering Information



Part Numbering Examples

» QUARTZ-GOLD-W21-LTE4 (EU) = European 4G / LTE Industrial Router with Wi-Fi, 2 x Ethernet LAN, and 1 x SIM Port Interfaces

» QUARTZ-GOLD-GW21-LTE4 (EU) = European 4G / LTE Industrial Router with WiFi, GNSS, 2 x Ethernet LAN and 1 x SIM Port Interfaces

Radio Characteristics

WiFi

The QUARTZ-GOLD supports WiFi using a Broadcom radio that is IEEE802.11n/ac compliant. There are two WiFi channels that may be configured and used independently or aggregated.

A channel configured for 2.4 GHz operation can be used as 802.11b only, 802.11g only, 802.11b/g mixed and 802.11n only, as well as the default 802.11b/g/n mixed mode.

A channel configured for 5 GHz operation can be used as 802.11a only and 802.11n only, as well as the default 802.11ac.

2.4 GHz Band

Table 2. Supported 2.4 GHz band channels

Band	Frequency
B1	2412 MHz
B2	2417 MHz
B3	2422 MHz
B4	2427 MHz
B5	2432 MHz
B6	2437 MHz
B7	2442 MHz
B8	2447 MHz
B9	2452 MHz
B10	2457 MHz
B11	2462 MHz
B12	2467 MHz
B13	2472 MHz
B14	2482 MHz

NOTE: While the QUARTZ-GOLD can support all 2.4 GHz WiFi channels, the regional settings in the WiFi configuration page will limit the available channels to meet the regulatory requirements of the country in which it is being used. Siretta always recommends that the region setting be correctly configured for the country in which the router is being used.

5 GHz Band

Table 3. Supported 5 GHz band channels

Band	Frequency		
36	5.18 GHz	120	5.60 GHz
40	5.20 GHz	124	5.62 GHz
44	5.22 GHz	128	5.64 GHz
48	5.24 GHz	132	5.66 GHz
52	5.26 GHz	136	5.68 GHz
56	5.28 GHz	140	5.70 GHz
60	5.30 GHz	144	5.72 GHz
64	5.32 GHz	149	5.745 GHz
100	5.50 GHz	153	5.765 GHz
104	5.52 GHz	157	5.785 GHz
108	5.54 GHz	161	5.805 GHz
112	5.56 GHz	165	5.825 GHz
116	5.58 GHz		

NOTE: Bands 50 – 144 support DFS as required in Europe

WiFi Speed

Table 4. WiFi speed

Mode	Speed
2.4G Only	150 Mbps + 150 Mbps
5G Only	433 Mbps + 433 Mbps
2.4G + 5G	150 Mbps + 433 Mbps

Cellular

The QUARTZ-GOLD supports the 3GPP specifications for cellular communications by using the MDM9207 LTE Cat 4 cellular radio from Qualcomm.

GSM Band

Table 5. Supported GSM frequency bands

Band	Frequency
B3	1800 MHz (DCS)
B8	900 MHz (Extended GSM)

UMTS Band

Table 6. Supported UMTS frequency bands

Band	Frequency
B1	2100 MHz (IMT)
B8	900 MHz (Extended GSM)

LTE Band

Table 7. Supported LTE frequency bands

Band	Frequency
B1	2100 MHz FDD (IMT)
B3	1800 MHz FDD (DCS)
B7	2600 MHz FDD (IMT-E)
B8	900 MHz FDD (Extended GSM)
B20	800 MHz FDD (Digital Dividend)
B28A*	700 MHz FDD (APT)
B38	2600 MHz TDD (IMT-E)
B40	2300 MHz TDD (S-Band)
B41	2500 MHz TDD (BRS)

*B28A is a subset of B28 using the lower duplexer frequencies (Tx : 703-733 MHz / Rx : 758-788 MHz)

FDD = Frequency Division Duplexing, TDD = Time Division Duplexing

Transmit Power

Table 8. Transmit power rates

Technology	Minimum Power	Maximum Power
LTE-TDD bands	< -39 dBm	23 dBm ± 2 dB
LTE-FDD bands	< -39 dBm	23 dBm ± 2 dB
WCDMA bands	< -49 dBm	24 dBm + 1/-3 dB
DCS1800 8-PSK	0 dBm ± 5 dB	26 dBm ± 3 dB
EGSM900 8-PSK	5 dBm ± 5 dB	27 dBm ± 3 dB
DCS1800	0 dBm ± 5 dB	30 dBm ± 2 dB
EGSM900	5 dBm ± 5 dB	33 dBm ± 2 dB

Data Transmission

Table 9. Data transmission rates

Cellular Connection	Maximum Download	Maximum Upload
4G / LTE-FDD	150 Mbps*	50 Mbps
4G / LTE-TDD	130 Mbps*	30 Mbps
3G / UMTS DC-HSPA+	42 Mbps*	5.76 Mbps
3G / UMTS WCDMA	384 Kbps	384 Kbps
2G / GSM EDGE	296 Kbps	236.8 Kbps
2G / GSM GPRS	107 Kbps	85.6 Kbps

*QUARTZ-GOLD with the GNSS option only supports one cellular antenna, so the maximum data download rate for LTE and DC-HSPA+ is halved on these models as they are unable to support diversity.

NOTE: All upload and download speeds are those supported by the QUARTZ-GOLD. Actual speeds achieved will be dependent on the capabilities of the network cell connected to, any network congestion, and the radio link quality.

NOTE: The cellular connection type obtained by the router is shown on the Status > Overview page of the routers web interface.

GNSS

NOTE: This section is only applicable to models with the GPS option.

The GNSS receiver uses the GPS constellation to provide GNSS positioning. ensuring that the QUARTZ-GOLD provides excellent positioning availability and accuracy.

Table 10. GNSS Characteristics

Parameter	Description	Typical Value
Sensitivity	Cold start	-146 dBm
	Reacquisition	-157 dBm
	Tracking	-157 dBm
Time to first fix	Cold start with open sky	18 s
	Warm start with open sky	2.2 s
	Hot start with open sky	1.8 s
Accuracy (CEP-50)	Autonomous with open sky	<2.5 m

Dimensions

All dimensions are shown in mm.

Figure 1. QUARTZ-GOLD front

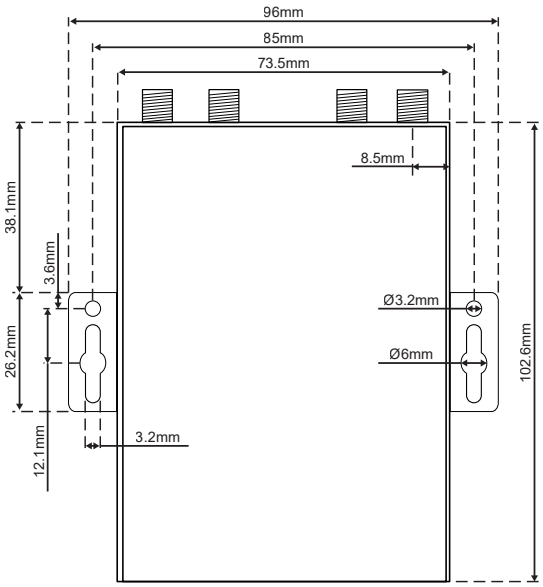


Figure 2. Earth point

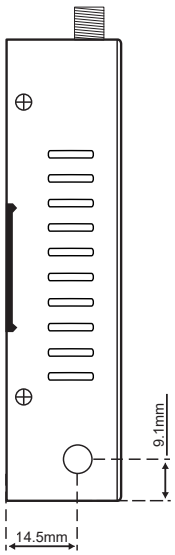


Figure 3. Antenna, LEDs and SIM Slot

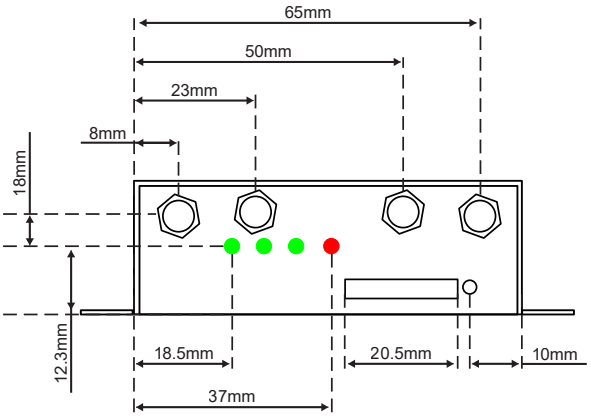
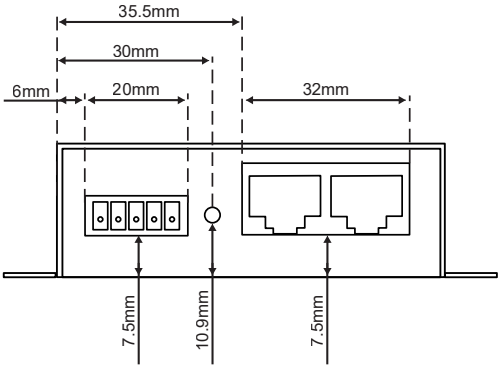


Figure 4. Power, reset and LAN/WAN interfaces



QUARTZ-GOLD Images

Figure 5. 3D view of the QUARTZ-GOLD Router

Figure 6. Front view of the QUARTZ-GOLD Router

Figure 7. Power, Reset and LAN / WAN Interfaces

Figure 8. Antenna, LEDs and SIM Slot

QUARTZ-GOLD LED Indicators

The status of the QUARTZ-GOLD Router is indicated by the LEDs, as shown in table 2 below.

Figure 9. QUARTZ-GOLD LEDs

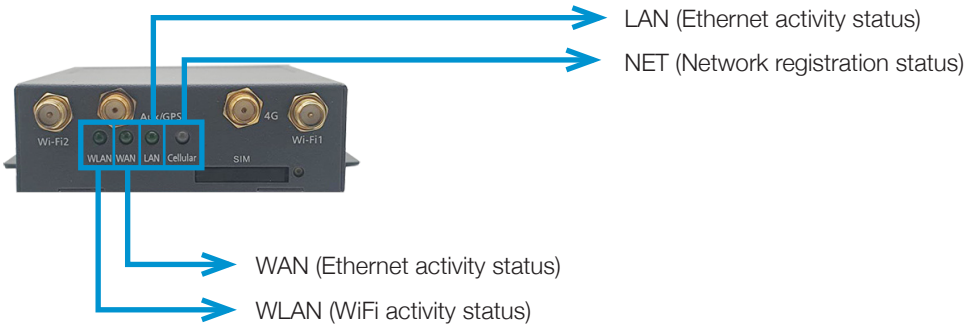


Table 11. Device status LED

Label	Color	Status	Indication
Cellular	Red	Fast blink (0.5s)	Cellular offline
	Red	Slow blink (1.0s)	3G / UMTS connection online, poor cellular signal
	Red	Solid	4G / LTE connection online, poor cellular signal
	Green	Slow blink (1.0s)	3G / UMTS connection online, good cellular signal
	Green	Solid	4G / LTE connection online, good cellular signal
WLAN	Green	Off	WLAN not enabled
	Green	Fast blink	Data transfer
	Green	Solid	Enabled, no data flow
LAN / WAN	Green	Off	Not connected
	Green	Blinking	Data transfer
	Green	Solid	Connected, no data flow

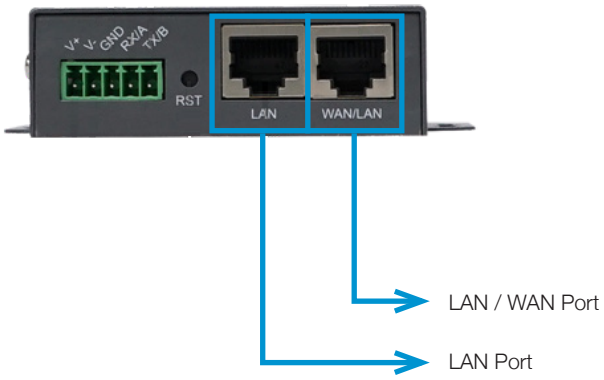
Interfaces

LAN / WAN Port

For initial setup, it is recommended to connect the LAN port to the PC that will be used to configure the router. There are two RJ45 interfaces. Please take care not to use the interface marked WAN/LAN until the router has been configured. WiFi may be enabled as part of the configuration process, and when enabled further configuration may be done over a WiFi connection to the router.

Once the router is configured, the WAN (if used) may be connected. The WAN port, if used, is the port to which a wired Internet connection is available. This is usually a cable/xDSL/Fibre modem.

Figure 10. QUARTZ-GOLD LAN / WAN Connection



LAN Characteristics

2x 10/100/1000 Mbps Ethernet RJ45 Ports supporting IEEE 802.3az specification for Energy Efficient Ethernet (EEE). Individual ports automatically detect short cable lengths and scale power accordingly.

One port is for LAN only. The second port may be software configured as a LAN or a WAN port.

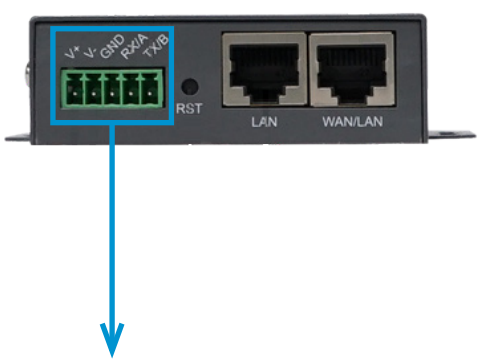
Support for full and half duplex in 10 Mbps and 100 Mbps modes, and full duplex for 1000 Mbps. IEEE 802.3x frame-based flow control is supported in full duplex mode.

RS232 Interface

The RS232 interface shares the green connector with the power supply. Its use is optional.

For use, the user must wire the connector to their RS232 port. Note that TXD and RXD get swapped in the wiring harness.

Figure 11. RS232 / power supply interface



Connector to be used for RS232 interface

Figure 12. RS232 wiring diagram

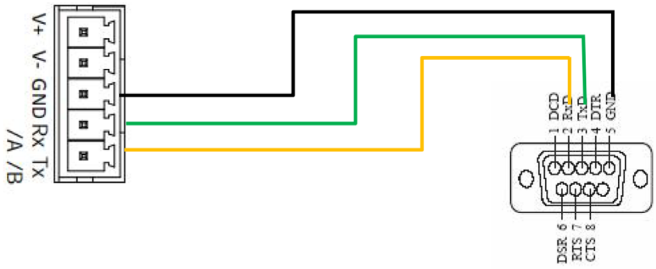


Table 12. RS232 pin functions

Pin	Label	Description
1	V+	Power positive
2	V-	Power negative
3	GND	RS232 ground
4	RXD/A	RS232 RXD
5	TXD/B	RS232 TXD

RS232 Characteristics

The RS232 port is 2 wire (no flow control). The RS232 port may be used in either client or server mode (server mode requires either a fixed IP address SIM or a VPN to be configured). Caching of serial data is supported for areas where Internet access is intermittent.

Allowed configuration settings of the serial port are shown in the table below.

Table 13. Compatible configuration settings

Setting	Allowed Values
Baud Rate	300, 600, 1200, 2400, 9600, 19200, 38400, 57600, 115200
Data bits	5, 6, 7, 8
Parity	None, Odd, Even
Stop bits	1, 2

NOTE: Baud rates settings are valid with a with a load of 3kΩ, 1000pF.

Table 14. Transmitter Characteristics

Transmitter Parameter	Conditions	Min	Typ	Max	Units
Output voltage swing	3 kΩ load to ground	±5.0	±5.4		Volts
Output short circuit current	V-		±35	±60	mA

Table 15. Receiver Characteristics

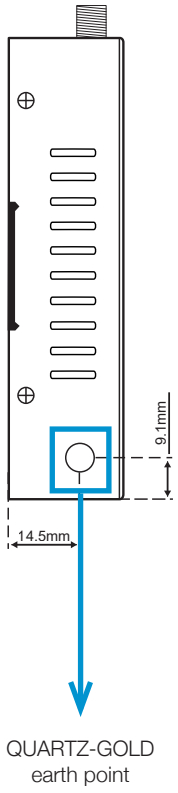
Transmitter Parameter	Min	Typ	Max	Units
Voltage range	-15		15	Volts
Threshold low	0.6	1.3		Volts
Threshold high		1.7	2.4	Volts
Hysterisis		0.3		Volts
Resistance	3	5	7	kΩ

Minimum and maximum values are over the operating temperature range of -30 to +75 °C, typical values are at +25 °C.

Earth Point

There is an earth point on the side of the QUARTZ-GOLD that can be used to earth the router. When the antennas are placed outside of a building it is recommended that the router be earthed as there is always a possibility that they could be struck by lightning. Earthing your router is unlikely to prevent it from receiving catastrophic damage if an antenna receives a lightning strike but should prevent the surge continuing down wiring connected to the router. This reduces both the shock and the fire hazard.

Figure 13. QUARTZ-GOLD earth point



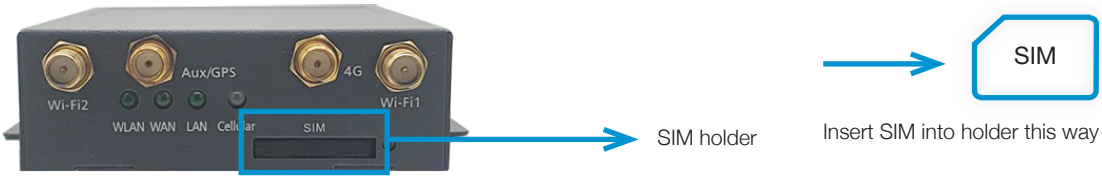
SIM Socket

The QUARTZ-GOLD will accept any **data enabled** SIM card. These may be Pay as You Go (PAYG) or Contract, fixed IP address or normal consumer SIM cards. It is recommended that a contract SIM card be used. These are normally shipped ready for use. PAYG SIM cards often need to be activated first in a normal phone before being used in a router.

The SIM card holder is designed to accept a single mini-SIM (2FF) (measuring 25 mm x 15 mm). The SIM card voltages supported are 1.8V and 3.3V, meaning that the interface will be compatible with any SIM card manufactured after 1998.

Use a small screwdriver or paperclip to press the recessed button to the right of the SIM card holder to release the tray that holds the SIM card and pull out the SIM tray.

Figure 14. SIM holder



SIM Card Reader

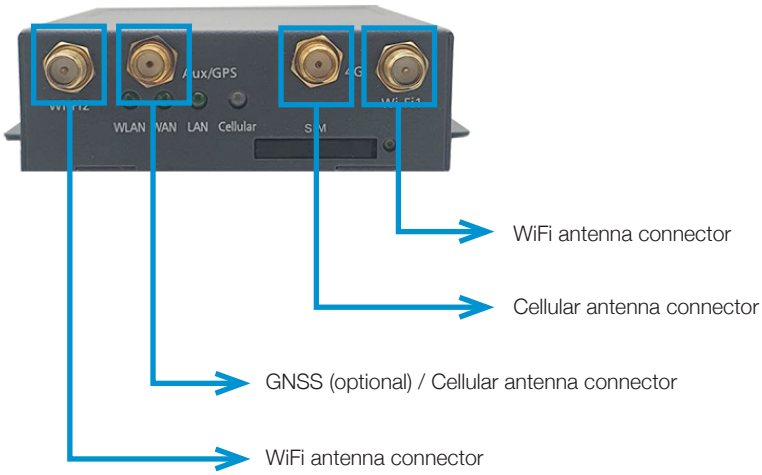
SIM card reader for mini-SIM (2FF) meeting ISO/IEC 7810:2019, ID-000 (25mm x 15mm).

Table 16. SIM card reader characteristics

Parameter	Value
SIM card reader type:	Draw type with card detection switch
SIM card voltage support	1.8 V and 3 V
Durability:	5000 cycles maximum

Antenna Connectors

Figure 15. Antenna connectors



Antenna Placement

The recommended minimum distance between adjacent antennas, is at least 50cm. Depending on the number of active antennas on the router you may need to use antenna extension cables.

Antenna Connection Cable

If a cable is used to connect the antenna to the router it is highly recommended that this cable be a high quality low loss cable. The cable and any connectors used should have 50 Ohms impedance.

Cellular Antenna Connector

The QUARTZ-GOLD is designed for use with 50 Ohm SMA male antennas.

When selecting an antenna, choose an antenna with a frequency band support that matches the frequencies supported by the QUARTZ-GOLD and the chosen network operator. Note that different countries and different network operators support different frequency bands. If in any doubt, do a cellular site survey with one of Siretta's cellular network analysers to find which network operators are present and on which frequency bands they operate. (https://www.siretta.com/cellular-network-analysers/)

For optimum performance the antenna assembly connected to this router is required to have the following characteristics:

Table 17. Cellular antenna requirements

Parameter	Value
VSWR:	≤2
Efficiency:	>30%
Maximum input power:	50 W
Input impedance:	50 Ω
Cable insertion loss (B8 / B20 / B28):	<1 dB
Cable insertion loss (B1 / B3):	<1.5 dB
Cable insertion loss (B7 / B38 / B40 / B41):	<2 dB

The antennas supplied as part of the accessory kit will meet these requirements.

Connect one antenna to the input marked '4G'. If the QUARTZ-GOLD does not support GNSS, connect the second (diversity) antenna to the input marked 'AUX / GPS'. A router supporting GNSS only uses one cellular antenna.

GNSS Antenna Connector

If the QUARTZ-GOLD has the GNSS option, then a GNSS antenna is required for this option to work.

For optimum performance the antenna assembly connected to this router is required to have the following characteristics:

Table 18. GNSS antenna requirements

Parameter	Value
VSWR:	≤2
Efficiency:	>30%
Frequency range:	1575.42 ± 1.023 MHz*
Polarization:	RHCP or linear
Active antenna noise figure:	<1.5 dB
Active antenna gain:	>0 dBi
Active antenna embedded LNA gain:	<17 dB

The magnetic mount active GNSS antenna supplied as part of the accessory kit will work with the GPS constellation. Connect it to the input marked 'Aux/GPS'.

If an active antenna is used, the maximum allowed load current of the antenna allowed is 25 mA. With a 25 mA load, the supply voltage to the active antenna is 2.5 V and with no load 2.85 V. The output voltage scales linearly with the load.

The GNSS antenna should be placed where it has the best possible view of the sky. The greater the view of the sky, the greater the number of satellites that the GNSS receiver will be able to see. More satellites in view means faster time to first fix and greater position accuracy.

WiFi Antenna Connector

If the QUARTZ-GOLD has the WiFi option, then a WiFi antenna is required for this option to work.

For optimum performance the antenna assembly connected to this router is required to have the following characteristics:

Table 19. WiFi antenna requirements

Parameter	Value
VSWR:	≤1.5
Minimum input power:	1 W
Frequency range (2.4 GHz):	2.4 to 2.5 GHz
Frequency range (5 GHz):	5.15 to 5.85 GHz
Polarization:	Vertical
Gain (2.4 GHz):	3 dBi maximum*
Gain (5 GHz):	3 dBi maximum*

*Note that connecting an antenna exceeding this gain will invalidate this routers compliance with EN 300328 and is not under any circumstances allowed. Siretta takes no responsibility should higher gain antennas be used with this router. The antennas supplied with the optional accessory kit have a gain of 3 dBi and a uniform radiation pattern in the XY plane.

Power

Power is supplied via a green 5-way 3.50 mm pitch terminal block which also carries the RS232 connections. The mating connector for the terminal block is Phoenix Contact part number 1840395 or equivalent. All QUARTZ-GOLD models are supplied with an adapter cable consisting of the 5-way connector with power cable fitted (15 cm in length) and a socket so that a power supply with a 2.1 mm Barrel Plug (2.1 x 5.5) can be used to power the QUARTZ-GOLD. A QUARTZ-GOLD purchased with accessories will include a 12V, 1.5 A power supply. If you use your own power supply, this should at least match that supplied in the accessory kit. You can also directly wire the power supply to the connector rather than use the supplied adapter for a DC jack power supply.

NOTE: The power connector is shared with that of the RS232 interface. Power should be connected to V+ and V-. GND is the ground reference for the RS232 connection and should not be used for the power supply connection.

Figure 16. QUARTZ-GOLD power terminal block

Power terminal block

Power Supply Requirements

A DC power supply must be connected to the power input.

Table 20. Characteristics of power input

Parameter	Value
Input power supply voltage:	7.5 – 32 V
Minimum current output:	1.5 A @ 12 V

Power Consumption

All measurements with LTE Cellular enabled are after the router has obtained an IP address from the cellular network. Supply voltage = 12 V, LAN always connected.

Table 21. Router power consumption

Features Enabled				Average Current	
LTE	WiFi	WAN	GNSS	QUARTZ-GOLD-W21-LTE4 (EU)	QUARTZ-GOLD-GW21-LTE4 (EU)
✓	✓	✓		590 mA	570 mA
✓	✓			550 mA	530 mA
	✓	✓		515 mA	515 mA
		✓		490mA	490 mA
				435 mA	435 mA
✓	✓	✓	✓	N/A	585 mA

NOTE: Measurements are average current. When the cellular connection is active there will be short current pulses significantly greater than the average values. It is important that the 12 V supply used to power the router can deliver at least 1.5 A to prevent network disconnections caused by these current pulses.

Switching the Router ON/OFF

Power on the QUARTZ-GOLD

The QUARTZ-GOLD router is automatically powered on when power is supplied.

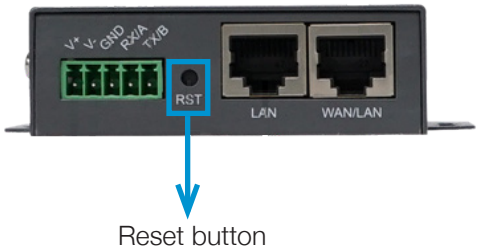
Power off the QUARTZ-GOLD

The QUARTZ-GOLD router is automatically powered off when power is removed.

Restart the QUARTZ-GOLD

Press and hold the reset button for at least 5 seconds.

Figure 17. Reset button



Reset button

Installation

Considerations for Installations Incorporating the QUARTZ-GOLD

There are several conditions which need to be taken into consideration when designing your application as they might affect the router and its functionality. These are:

Environmental conditions: The router must be installed so that the environmental conditions stated, such as temperature, humidity and vibration are satisfied. Additionally, the electrical specifications must not be exceeded.

Signal strength: The router/antenna has to be placed in a position that ensures sufficient signal strength. To improve signal strength, the antenna can be moved to a more elevated position. Signal strength usually depends on how close the router is to the base station. You must ensure that the location at which you intend to use the router is within the network coverage area. Degradation in signal strength can be the result of a disturbance from another source, for example an electronic device in the immediate vicinity.

When considering the location for the router and antenna placement, you must consider signal strength as well as cable length as long cable runs can attenuate the signal strength.

Connections of components to a QUARTZ-GOLD router: The system integrator is responsible for the final system solution. If external components are incorrectly designed or installed it may cause radiation limits to be exceeded. For instance, improper cable connections or incorrectly installed antennas can disturb the network and lead to router malfunction.

Network and subscription: Before your application is used, you must ensure that your chosen network provides the necessary telecommunication services. Contact your service provider to obtain the necessary information.

» If you intend to use SMS in the application, ensure this is included in your subscription.

Power Supply Installations

» Use a high-quality power supply with short leads. This ensures that the voltages at the connector pins are within the specified range, especially during the maximum peak current of approximately 2 A.

» When the router is powered from a battery or a high current supply, connect a fast 2 A fuse in line with the positive supply. This protects the power cabling and router from damage.

Securing the Router

Before securing the router please take into account the amount of additional space required for the mating connectors and cables that will be used with the router in the application.

» Where access is restricted, it may be easier to connect all the cables to the router prior to placing it in the application.

Safety and Product Care

Please read the information on this page and page 32 ‘Installations’ before you begin your system integration.

General Precautions

» The QUARTZ-GOLD routers are a standalone item designed for indoor use only. For use outside it must be installed in a weatherproof enclosure.

» Do not exceed the environmental and electrical limits as specified.

» Avoid exposing the router to lit cigarettes, naked flames or to extreme hot or cold temperatures.

» Never try to dismantle the router. There are no components inside the router that can be serviced by the user. If you attempt to dismantle the router, you will invalidate the warranty.

» The QUARTZ-GOLD router must not be installed or located where the surface temperature of the enclosure may exceed 85 °C.

» All cables connected to the QUARTZ-GOLD router must be secured or clamped, immediately adjacent to the routers connectors, to provide strain relief and to avoid transmitting excessive vibration to the router in the installation.

» To protect the power supply and to meet the fire safety requirements when the router is powered from a battery or a high current supply, connect a fast 1.25 A fuse in line with the positive supply.

» Do not connect any incompatible component or product to the QUARTZ-GOLD router.

SIM Card Precautions

Before handling the SIM card in your application, ensure that you have discharged any static electricity. Use standard precautions to avoid electrostatic discharges.

» When designing a QUARTZ-GOLD router into your application, the accessibility of the SIM card should be taken into account so that it can be removed or changed.

» We always recommend that you have the SIM card protected by a PIN code. This will ensure that the SIM card cannot be used by an unauthorized person.

Antenna Precautions

If the antenna is to be mounted outside, always consider the risk of a lightning strike. Follow the instructions provided by the antenna manufacturer. In addition please observe the following:

» Never connect more than one router to a single antenna. The router can be damaged by radio frequency energy from the transmitter of another router.

» As with all cellular radio equipment, the antenna of the router emits radio frequency energy. To avoid EMI (electromagnetic interference) you must determine if the application or equipment in the application's proximity, needs further protection against radio emission and the disturbances it might cause. Protection is secured either by shielding the surrounding electronics or by moving the antenna away from the electronics and external signal cables.

» The router and antenna may be damaged if either come into contact with ground potentials other than the ground potential used in your application. Beware, ground potentials can vary significantly between hardware platforms.

Exposure to RF Energy

There has been some public concern about possible health effects of using GSM equipment in close proximity to a person or body. Although research on health effects from RF energy has focused for many years on the current RF technology, research has begun on new radio technologies, such as GSM and UMTS. After existing research had been reviewed, and after compliance to all applicable safety standards has been tested, it has been concluded that the QUARTZ-GOLD series router is fit for use.

If you are concerned about exposure to RF energy, there are a number of things you can do to minimize exposure. Limiting the duration of time near a device will reduce your exposure to RF energy. In addition, you can reduce RF exposure by operating your router efficiently by adhering to the following guidelines:

Electronic devices: Most electronic equipment, for example in hospitals and motor vehicles is shielded from RF energy. However, RF energy may affect some malfunctioning or improperly shielded electronic equipment.

Vehicle electronic equipment: Check with your vehicle manufacturer's representative to determine if any on board electronic equipment is adequately shielded from external RF energy.

Medical electronic equipment: Consult the manufacturer of any personal medical devices (such as pacemakers, hearing aids, etc.) to determine if they are adequately shielded from external RF energy.

Turn your router OFF in health care facilities when any regulations posted in the area instruct you to do so. Hospitals or health care facilities may be using RF monitoring equipment.

Aircraft: Turn your router OFF before boarding any aircraft. To prevent possible interference with aircraft systems, Federal Aviation Administration (FAA) regulations require you to have permission from a crew member to use your router equipment whilst the plane is on the ground. To prevent interference with cellular systems, local RF regulations prohibit using your router whilst in the air.

Blasting areas: To avoid interfering with blasting operations, turn your router OFF when in a “blasting area” or in areas posted: “turn off two-way radio“. Construction crews often uses remote control RF devices to set off explosives.

Potentially explosive atmospheres: Turn your router OFF when in any area with a potentially explosive atmosphere. It is rare, but your routers or their accessories could generate sparks. Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death.

Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include fuelling areas such as petrol stations, below deck on boats, fuel or chemical transfer or storage facilities and areas where the air contains chemicals or particles, such as grain, dust or metal powders. Do not transport or store flammable gas, liquid or explosives, in the compartment of your vehicle, which contains your router or accessories. Before using your router in a vehicle powered by liquefied petroleum gas (such as propane or butane) ensure that the vehicle complies with the relevant fire and safety regulations of the country in which the vehicle is to be used.

Safety Recommendations

PLEASE READ CAREFULLY

Be sure the use of this product is allowed in the country intended and the environment required. The use of this product may be dangerous and has to be used with caution in the following areas:

- Where it can interfere with other electronic devices in environments such as hospitals, airports, aircrafts, etc
- Where there is risk of explosion such as gasoline stations, oil refineries, gas works etc

Do not disassemble the product. Any evidence of tampering will void the warranty..

We recommend following the instructions of this hardware user guide for the correct wiring of the product. The product has to be supplied with a stabilized voltage source and the wiring has to conform to the security and fire prevention regulations.

The product has to be handled with care, avoid any direct contact with the pins because electrostatic discharge may damage the product. The same precautions have to be observed for the SIM card installation.

The system integrator is responsible for the complete functionality of the final product. Therefore, care has to be taken with the external components used with the module, as well as any installation issue.

Should there be any doubt, please refer to the technical documentation and the regulations in force. Every module has to be equipped with a suitable antenna with characteristics which match the product requirements.

The antenna has to be installed with care in order to avoid any interference with other electronic devices and has to guarantee a minimum distance from a human (20 cm). In case this requirement cannot be satisfied, the system integrator has to assess the final product against the SAR regulation EN 50360.

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Approvals

» **CE** - European Conformity

» **RoHS** - Restriction of the Use of Certain Hazardous Substances Compliant

» **CCC** - China Compulsory Certificate

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Definitions

Term	Definition
2G	2nd Generation Mobile Telecommunications
3G	3rd Generation Mobile Telecommunications
4G	4th Generation Mobile Telecommunications
ADSL	Asymmetric Digital Subscriber Line
DC	Direct Current
DHCP	Dynamic Host Configuration Protocol
EDGE	Enhanced Data rates for Global Evolution
FDD	Frequency Division Duplex
GbE	Gigabit Ethernet
GNSS	Global Navigation Satellite System
GPRS	General Packet Radio Service
GPS	Global Positioning System
IP	Internet Protocol
LAN	Local Area Network
LED	Light Emitting Diode
LTE	Long-Term Evolution
MDI	Medium Dependent Interface
MIMO	Multiple-input and Multiple-output
RHCP	Right-handed Circular Polarization
RXD	Receive Data
SIM	Subscriber Identity Module
SMS	Short Message Service
TDD	Time Division Duplex
TXD	Transmit Data
UMTS	Universal Mobile Telecommunications System
VPN	Virtual Private Network
VSWR	Voltage Standing Wave Ratio
WAN	Wide Area Network
WLAN	Wireless Local Area Network

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