Siretta

Enabling Industrial IoT

QUARTZ-LITE

3G & 4G Industrial Router Range

Hardware Reference Manual

Rev 1.1

Siretta
Enabling Industrial IoT

QUARTZ-LITE
Hardware Manual

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VAT Registration No. GB163 04 0349

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Introduction

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

The QUARTZ-LITE is a range of UMTS / LTE routers enabling mobile broadband and machine to machine (M2M) industrial communication.

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

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About Siretta

Siretta, located in Reading, United Kingdom have been manufacturing antennas, cable assemblies and cellular modems for over 10 years. We supply our products globally to many of the world's leading organisations.

Whether you require an off the shelf or custom solution, Siretta has a wide portfolio of antenna, RF cable assemblies and modems to fit your application.

Our extensive knowledge and experience in the wireless market allows us to support a wide range of customer applications, focusing on frequencies typically within the 75MHz - 5.8GHz range. These encompass the HF, VHF, ISM, GSM/GPRS/3G/4G and GPS frequencies as well as industrial WLAN and VHF/UHF antenna/Wi-Fi antenna solutions.

With a heavy emphasis on design, we have a team of dedicated Application Engineers and Product Managers, backed up by Field Sales Engineers, who specialise in wireless applications.

We have made significant investments in R&D facilities which boast GPS hardware development equipment and a GSM Pico Cell on site, as well as development software and a comprehensive suite of Industrial, Scientific and Medical band, and non ISM band frequency products. We have many technology partners enabling us to keep at the forefront of the communications industry and offer class leading wireless solutions.

General Description

The Siretta QUARTZ-LITE router is a range of high speed industrial cellular routers in a compact enclosure. The QUARTZ-LITE is offered in 3G / UMTS and 4G / LTE forms giving reliable, secure and high speed wireless connectivity.

The QUARTZ-LITE is a quality range designed for use in industrial environments needing high performance and a robust hard enclosure as standard.

The QUARTZ-LITE has been designed for remote management, telemetry, condition monitoring, CCTV, ATMs, vending machine and other M2M applications.

The QUARTZ-LITE is an ideal wireless data transfer device for high speed data applications transferring large amounts of data.

The QUARTZ-LITE, using the UMTS / 3G and 4G LTE networks, gives fast transfer speeds reaching up to 21Mbps download and up to 5.76Mbps upload for 3G and 50Mbps upload and 100Mbps download for 4G. The QUARTZ-LITE has dual port Ethernet capability and a single SIM as standard, with 150Mbs data rate Wifi and GPS engine as optional versions.

This makes the compact QUARTZ-LITE ideal for fleet tracking and device access management. In addition, the QUARTZ-LITE is available with industrial grade VPN as an option, enabling a virtual private network service through the 3G / 4G connection and directly access the industrial server environment.

QUARTZ-LITE
Hardware Manual

Features

- European 3G / UMTS Bands with 2G Fallback
- European 4G / LTE Bands with 3G Fallback
- High speed data via UMTS & LTE networks
- Strong resistance to electromagnetic interference
- Built-in watch dog, multi-link detection
- Compact industrial design
- Good heat and radiation endurance
- Supports DHCP server
- Supports DNS proxy and Dynamic DNS (DNSS)
- Supports timing operation
- Supports LED status indication
- Supports APN and VDPN wireless private network access
- Supports 802.11b/g/n WiFi, 150Mbps data rate
- Local and remote management
- SNMP network management, NTP support
- WAN supports PPOE, Static IP DHCP Client (with 1 x WAN and 1 x LAN option)

Specifications

Table 1. Specifications of QUARTZ-LITE routers

	QUARTZ-LITE UMTS (EU)	QUARTZ-LITE LTE (EU)
3G frequency band:	B8 (900MHz), B1 (2100MHz)	B5 (850MHz), B8 (900MHz), B1 (2100MHz)
4G frequency band:		B20 (800MHz), B5 (850MHz), B8 (900MHz), B3 (1800MHz), B1 (2100MHz), B7 (2600MHz)
Dimensions:	103mm x 73.5mm x 23.5mm	103mm x 73.5mm x 23.5mm
Weight:	300g	300g
Supply voltage:	7.5 - 32VDC	7.5 - 32VDC
Operating temperature range:	-30 to 70°C	-30 to 70°C
Antenna interface:	SMA Female	2 x SMA Female

QUARTZ-LITE Interface

Standard Router Features

Hardware

The QUARTZ-LITE routers come with the following interfaces:

» 2 x 10/100Mb Ethernet LAN
» 1 x standard SIM/R-UIM interface
» 1 x standard DC power interface
» 1 x 3G SMA Female antenna interface (3G / UMTS model)
» 2 x 4G SMA Female antenna interface (4G / LTE model)

Optional Router Features

Optional Interfaces

The QUARTZ-LITE routers have the following optional interfaces available:

» 1 x 10/100Mb Ethernet LAN, 1 x 10/100Mb Ethernet WAN instead of 2 x LAN

Ordering Information

QUARTZ-LITE X X X XXXX

Range Identifier
QUARTZ-LITE = Industrial Router Range

Optional Antenna Interfaces*
G = GPS
W = WiFi

Number of Ethernet Ports
1 = 1 x Ethernet LAN Port, 1 x Ethernet WAN Port
2 = 2 x Ethernet LAN Ports

Number of SIM Ports
1 = 1 x SIM Port

Technology
UMTS = 3G EU Frequencies
LTE = 4G EU Frequencies

Part Numbering Examples

» QUARTZ-LITE-W21-UMTS(EU) = European 3G / UMTS Industrial Router with Wifi, 2 x Ethernet LAN, and 1 x SIM Port Interfaces

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

*WiFi and GPS are not available on a QUARTZ-LITE simultaneously. If you do not require an additional antenna interface, leave this blank.

Dimensions

All dimensions are shown in mm.

Figure 1. QUARTZ-LITE front - dimensions

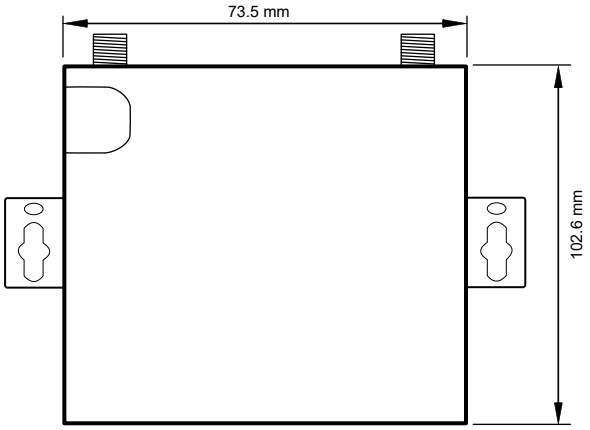
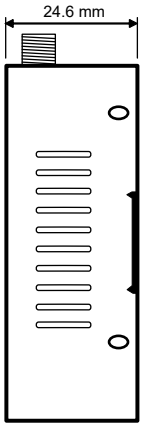


Figure 2. QUARTZ-LITE side - dimensions



QUARTZ-LITE Images

Figure 3. 3D view of the QUARTZ-LITE Router

Figure 4. Front view of QUARTZ-LITE Router

Figure 5. LAN, WAN/CON, Reset and Power Interfaces

Figure 6. Antenna and LEDs

QUARTZ-LITE LED Indicators

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

Figure 7. QUARTZ-LITE LEDs

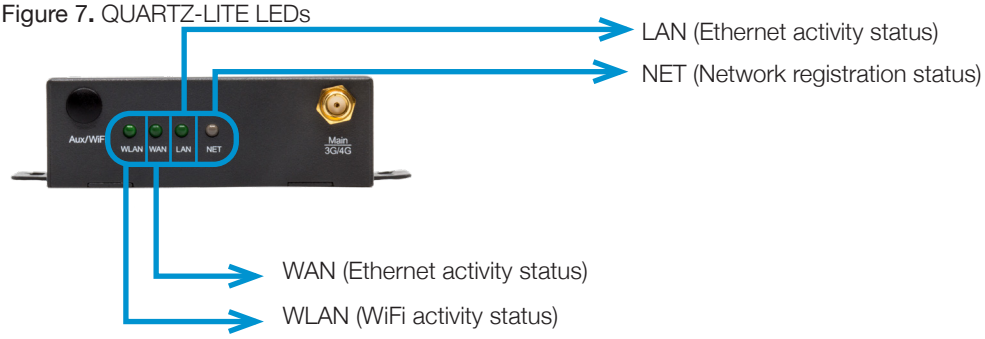


Table 2. Device status LED

Silk screen	Color	Status	Indication
NET	Green	Blink	Strong signal
	Orange	Blink	Normal signal
	Red	Blink	Weak signal
		Blinking slowly (2s)	Logged in to network. LED color is matched with signal identification. (e.g. Green blink = strong online signal)
		Blinking slowly (0.5s)	Dialling
WLAN	Green	Solid light	WLAN port open but no data sending
	Green	Blinking quickly	Data is transmitting
	Green	Dark	WLAN port isn't opened
LAN(WAN)	Green	Solid light	Connection OK
	Green	Blinking	Data sending
	Green	Dark	LAN(WAN) not connected

Interfaces

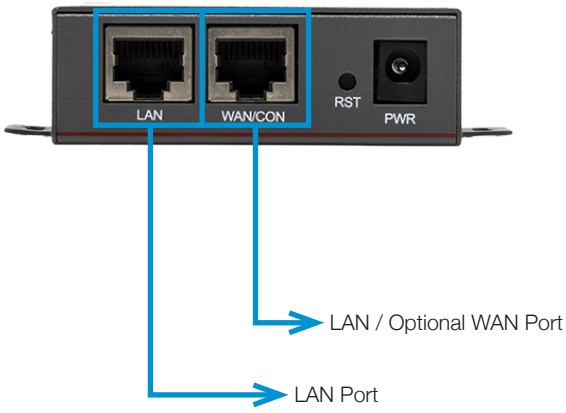
LAN / WAN Port

As standard, the QUARTZ-LITE is supplied with 2 x 10/100Mb LAN connections.

Optionally, the QUARTZ-LITE router can be supplied with 1 x 10/100Mb LAN and 1 x WAN/CON connections. (Speak to your Siretta representative)

These connections can be used to connect the router directly to a computer, to transmit wireless data or for debug testing.

Figure 8. QUARTZ-LITE LAN / WAN Connection



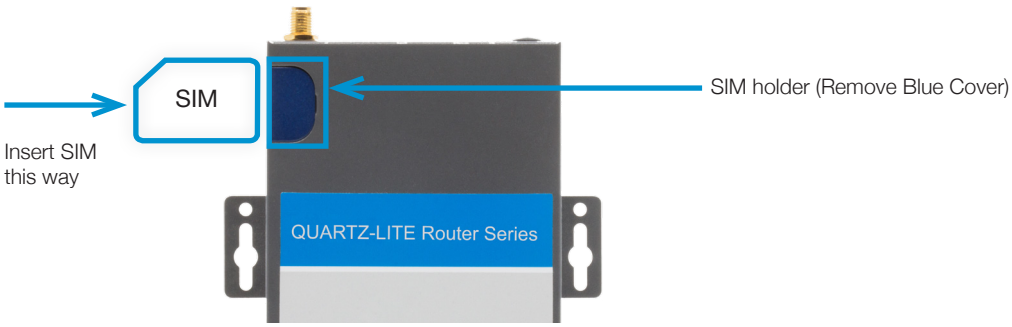
SIM Socket

The QUARTZ-LITE supports fixed SIMs locked to a network and roaming SIMs which can operate on more than one network within the home country. This allows for least cost routing for roaming mobile data and machine to machine applications where signal strength is variable in any given area and network selection is required.

The QUARTZ-LITE also supports global roaming SIMs which will work with any network it can detect, at home or abroad and can be chosen for best performance.

The QUARTZ-LITE routers are single SIM, supporting 1.8/3/5V with automatic SIM detection.*

Figure 9. SIM holder



SIM Requirements

SIM services available for the QUARTZ-LITE routers include:

- SMS
- For the 3G / UMTS Model: Frequency Coverage is 900/2100MHz
- For the 4G / LTE Model: Frequency Coverage is 800/850/900/1800/2100/2600MHz

*To insert SIM card, remove blue protective shield and insert. Replace shield once SIM is inserted.

Antenna Connectors

Figure 10. Antenna connectors

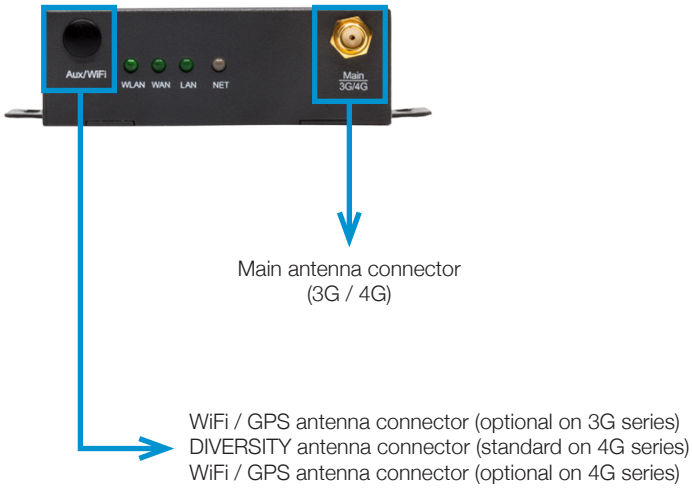


Figure 11. QUARTZ-LITE Antennas

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.

*Antennas only supplied when QUARTZ-LITE is purchased with accessories.

Main Antenna

A female SMA connector is provided to allow connection of 3G(UMTS) / 4G(LTE) antennas. For optimum performance the antenna assembly connected to this router is required to have the following characteristics:

» For 3G / UMTS: Operation in the following bands: UMTS 900/2100MHz
» For 4G / LTE: Operation in the following bands:
LTE 800/850/900/1800/2100/2600MHz
» The characteristic impedance of any antenna, or cable assembly, attached to this router, should be 50 Ohms
» The antenna must be capable of handling a minimum of 2W output power
» The VSWR should be less than 3:1 to avoid damage to the router

GPS Antenna (where fitted)

A female SMA connector is provided to allow connection of an optional passive GPS antenna. For optimum performance the antenna assembly connected to this router is required to have the following characteristics:

» For GPS: Operation in the following bands: 1575.42 MHz
» The characteristic impedance of any antenna, or cable assembly, attached to this router, should be 50 Ohms
» The antenna must be capable of handling a minimum of 2W output power
» The VSWR should be less than 3:1 to avoid damage to the router
» The antenna must be passive and not have a built in LNA

WiFi Antenna (where fitted)

A female SMA connector is provided to allow connection of an optional WiFi antenna. For optimum performance the antenna assembly connected to this router is required to have the following characteristics:

» For WiFI: Operation in the following bands: 2.4 GHz
» The characteristic impedance of any antenna, or cable assembly, attached to this router, should be 50 Ohms
» The antenna must be capable of handling a minimum of 2W output power
» The VSWR should be less than 3:1 to avoid damage to the router

GPS

GPS Performance (QUARTZ-LITE GPS Variants)

» Advanced real time hardware correlation engine for enhanced sensitivity (better than -165dBm for A-GPS)

» Fast Acquisition giving rapid Time-To-First-Fix (TTFF)

» Capability to monitor up to 28 channels

» Stand Alone and Assisted mode

» Integrated LNA

WiFi

WiFi Performance (QUARTZ-LITE WiFi Variants)

» Standard: IEEE 802.11b/g/n

» WEP, WPA and WPA2 encryption

» Standard 150Mbps

Power

Power Supply Requirements

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

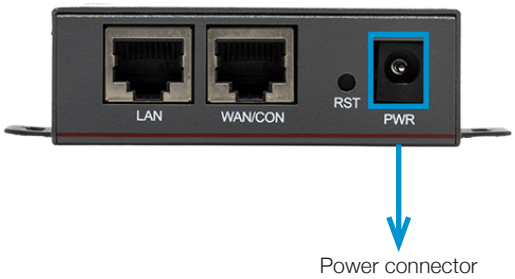
Table 3. Characteristics of power input

	QUARTZ-LITE
Idle:	80mA @ +12VDC
Communicating:	320mA : +12VDC
Power supply:	7 - 32VDC
DC power supply polarity:	Centre +ve

Power Connector

This connector is used for supplying DC power to the router.

Figure 12. Power connector



Switching the Router ON/OFF

Power on the QUARTZ-LITE

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

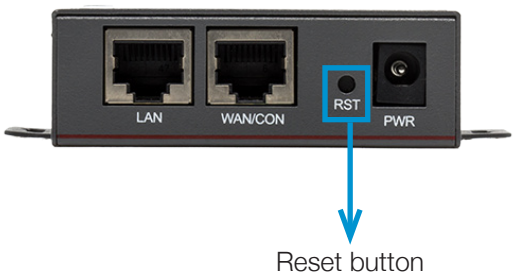
Power off the QUARTZ-LITE

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

Restart the QUARTZ-LITE

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

Figure 13. Reset button



Installation

Considerations for Installations Incorporating the QUARTZ-LITE

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-LITE 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 2A.

» When the router is powered from a battery or a high current supply, connect a fast 1.25A 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 19 'Installation' before you begin your system integration.

General Precautions

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

» All cables connected to the QUARTZ-LITE 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 1.25A fuse in line with the positive supply.

» Do not connect any incompatible component or product to the QUARTZ-LITE 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-LITE 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-LITE 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 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 crewmember 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 crew 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.

Approvals

» **CE** - European Conformity

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

» **CCC** - China Compulsory Certificate

Disclaimer

The information contained in this document is proprietary to Siretta. Siretta has made every effort to ensure that the accuracy of the information contained within this document is accurate. Siretta does not make any warranty as to the information contained within this document and does not accept any liability for any injury, loss or damage of any kind incurred by the use of this information.

Siretta does not take responsibility for any application developed using the router characterized in this document and notes that any application of this router must comply with the safety standards of the applicable country and comply with the relevant wiring rules. Siretta reserves the right to make modifications, additions and deletions to this document due to typographical errors, inaccurate information, or improvements to equipment at any time and without notice. Such changes will be incorporated into new editions of this document.

Definitions

Term	Definition
3G	3rd Generation Mobile Telecommunications
4G	4th Generation Mobile Telecommunications
APN	Access Point Name
CSD	Circuit Switched Data
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
GPS	Global Positioning System
IP	Internet Protocol
LAN	Local Area Network
LED	Light Emitting Diode
LNA	Low Noise Amplifier
LTE	Long-Term Evolution
M2M	Machine to Machine Communication
NTP	Network Time Protocol
PPoE	Point-to-Point Protocol over Ethernet
RF	Radio Frequency
R-UIM	Removable User Identity Module
SIM	Subscriber Identity Module
SMA	Subminiature Version A
SNMP	Simple Network Management Protocol
UMTS	Universal Mobile Telecommunications System
VPN	Virtual Private Network
VSWR	Voltage Standing Wave Ratio
WAN	Wide Area Network
WCDMA	Wideband Code Division Multiple Access
WLAN	Wireless Local Area Network
WPA	WiFi Protected Access

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Rev 1.1 - March 2020