

User manual

ReliaGATE 10-12-6x

IoT Edge Gateway TI AM335x, LTE Cat 1

Rev. 2-1 — 16 October 2020 — REGATE-10-12-6x_Man_ENG_2-1 — ENGLISH

Trademarks

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Intended audience of this document

This document is intended for system integrators: skilled persons with a thorough knowledge in linking together, physically or functionally, different computing systems and software applications to operate as a coordinated whole in compliance with the applicable regulations.

Revision history

Revision	Description	Date
1-0	First release	15 July 2019
2-0	Updated information about CAN termination resistors Added APAC variant Added new antennas sets Added information for versions: <ul style="list-style-type: none">• REGATE-10-12-65G• REGATE-10-12-66G• REGATE-10-12-67G	29 June 2020
2-1	Updated sections: <ul style="list-style-type: none">• 9.8 "USB 0, USB 1, USB 2"• 10 "The software"• 11.1 "Default credentials" Added section: <ul style="list-style-type: none">• "Canadian Representative contact information" in chapter 7.4	16 October 2020

HOW TO GET STARTED

To get started with the ReliaGATE 10-12, follow these steps:

1. Read carefully and understand the instructions and warnings contained in this manual.

To lower the risk of personal injury, electric shock, fire, or damage to equipment, observe the instructions and warnings contained in this manual.

For more information see: ["Safety instructions" on page 9](#).

Whenever in doubt regarding the correct understanding of this document, contact the Eurotech Technical Support.

For more information see: ["How to receive technical assistance" on page 17](#)

2. Know the ReliaGATE 10-12 and its interfaces.

For more information see:

- ["Product overview" on page 23](#)
- ["Technical specifications" on page 25](#)
- ["Interfaces overview" on page 39](#)
- ["Interfaces in detail" on page 45](#)

3. Understand how to login the Administration Console and how to manage the interfaces in Linux.

For more information see:

- ["How to login the Administration Console" on page 69](#)
- ["How to manage interfaces in Linux" on page 71](#)

4. Install the ReliaGATE 10-12.

For more information see:

- ["Mechanical specifications" on page 97](#)
- ["How to install the product" on page 99](#)

5. Supply power to the ReliaGATE 10-12 respecting all safety instructions.

For more information see: ["Power supply. How to turn ON/OFF and reset the product" on page 105](#)

6. Start developing your IoT applications.

The ReliaGATE 10-12 supports the Eurotech Everyware Software Framework (ESF). ESF is a smart application container that enables remote management of IoT gateways and provides a wide range of APIs allowing you to write and deploy your own IoT application.

For more information see:

- ["Eurotech Everyware IoT" on page 93](#)
- <http://esf.eurotech.com/docs>.

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1 SAFETY INSTRUCTIONS

IMPORTANT: Read carefully and understand the instructions and warnings contained in this document before installing / using the product. Keep this document for future reference.

To lower the risk of personal injury, electric shock, fire or damage to equipment, observe the instructions and warnings contained in this document.

Failure to comply with the instructions and warnings contained in this document, violates the standards of safety, design, manufacture, and intended use of the product.

Eurotech assume no liability for any damage caused by failure to observe the instructions and warnings contained in this document.

Whenever you have any doubt regarding the correct understanding of this document, contact the Eurotech Technical Support (for more information see ["How to receive technical assistance" on page 17](#)).


1.1 Warning messages

1.1.1 Warning messages for harm to persons


To indicate an imminently hazardous situation which, if not avoided, will result in death or serious injury, the following message is used:

 DANGER	
Sign (if necessary)	TEXT THAT EXPLAINS THE HAZARD AND THE CONSEQUENCES OF NOT AVOIDING IT. Text that explains how to avoid this hazard.

To indicate a potentially hazardous situation which, if not avoided, could result in death or serious injury, the following message is used:

 WARNING	
Sign (if necessary)	TEXT THAT EXPLAINS THE HAZARD AND THE CONSEQUENCES OF NOT AVOIDING IT. Text that explains how to avoid this hazard.

To indicate a potentially hazardous situation which, if not avoided, could result in minor or moderate injury, the following message is used:


 CAUTION	
Sign (if necessary)	TEXT THAT EXPLAINS THE HAZARD AND THE CONSEQUENCES OF NOT AVOIDING IT. Text that explains how to avoid this hazard.

1.1.2 **Warning messages for damage to property**


To indicate potential risks of damage to the supported product (or to other property), the following message is used:

NOTICE	
Sign (if necessary)	Text that explains how to avoid damaging the supported product (or other property)

1.2 **Warning: power supply safety**

 WARNING	
ELECTRIC SHOCK HAZARD	
Failure to supply power correctly or to follow all operating instructions correctly, may create an electric shock hazard, which could result in personal injury or loss of life, and / or damage the equipment or other property.	
To avoid injuries and safely supply power to the product, complete the following steps:	
<ol style="list-style-type: none"> 1. Observe all the instructions for safety, installation, and operation 2. Make sure your hands are dry 3. Make sure that all the cables to use: <ol style="list-style-type: none"> a. Are in good condition b. Meet the product requirements and comply with the relevant standards and regulations 4. Position cables with care. Do not position cables in places where they may be trampled or compressed 5. Make sure that the power-points and plugs are in good condition before using them 6. Do not overload the power-points and plugs 7. Make sure that the product maintains a proper grounding connection 8. Use a power supply that meets the product requirements and complies with the relevant standards and regulations. In case of uncertainties, contact the Eurotech Technical Support (for more information see "How to receive technical assistance" on page 17) 9. Connect power after the installation of the system has been completed 10. Never connect or disconnect the cables with the system or the external apparatus switched ON. 	

1.3 **Caution: wireless safety**

 CAUTION	
The antennas used with the product must be installed with care, avoiding any interference with other electronic devices and keeping a distance from persons greater than 20 cm. If these requirements cannot be satisfied, the system integrator has to assess the final product with respect to SAR regulations.	

1.4 Warning: battery safety



WARNING

SERIOUS HARM IF BATTERY IS USED INCORRECTLY

Before using the battery always refer to battery manufacturer's instructions for safety.



CAUTION

RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE

Use and replace only with correct size and type.

Dispose of used batteries according to battery manufacturer's instructions.

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2 CONSIGNES DE SECURITE

IMPORTANT: Lire attentivement et bien respecter les instructions et les avertissements contenus dans ce document avant d'installer / d'utiliser le produit. Conserver ce document pour s'y référer à l'avenir.

Pour éviter les risques de blessures, de choc électrique, d'incendie ou de détérioration du matériel, bien suivre les instructions et les avertissements contenus dans ce document.

Le non-respect des instructions et des avertissements contenus dans ce document constitue une violation des normes de sécurité, de conception, de fabrication et d'utilisation prévue du produit.

Eurotech rejette toute responsabilité pour les dommages causés en cas de non-respect des instructions et des avertissements contenus dans ce document.

En cas de doute sur la compréhension de ce document, contacter le Support Technique d' Eurotech (pour plus d'informations voir "[Comment obtenir une assistance technique](#)" page 19).

2.1 Messages d'avertissement

2.1.1 Messages d'avertissement relatifs au dommage aux personnes


Pour signaler une situation dangereuse imminente qui, si elle n'est pas évitée, entraînera la mort ou un préjudice grave le message suivant est utilisé:

 DANGER	
Signal (si besoin)	TEXTE EXPLIQUANT LE DANGER ET SES CONSÉQUENCES. Texte expliquant comment éviter ce danger.

Pour signaler une situation potentiellement dangereuse qui, si elle n'est pas évitée, pourrait entraîner la mort ou un préjudice grave le message suivant est utilisé:

 AVERTISSEMENT	
Signal (si besoin)	TEXTE EXPLIQUANT LE DANGER ET SES CONSÉQUENCES. Texte expliquant comment éviter ce danger.

Pour signaler une situation potentiellement dangereuse qui, si elle n'est pas évitée, pourrait entraîner un préjudice mineur ou modéré le message suivant est utilisé:


 ATTENTION	
Signal (si besoin)	TEXTE EXPLIQUANT LE DANGER ET SES CONSÉQUENCES. Texte expliquant comment éviter ce danger.

2.1.2 Messages d'avertissement relatifs aux dommages matériels


Pour signaler les risques potentiels de détérioration du produit (ou des produits annexes), le message suivant est utilisé:

AVIS	
Signal (si besoin)	Texte expliquant comment éviter d'endommager le produit (ou des produits annexes)

2.2 Avertissement: sécurité de l'alimentation électrique

 AVERTISSEMENT
<p>RISQUE DE CHOC ÉLECTRIQUE</p> <p>Une alimentation électrique incorrecte peut créer un risque de choc électrique, pouvant entraîner des blessures corporelles ou la perte de vies humaines, et / ou endommager le produit ou d'autres biens.</p> <p>Pour éviter les blessures et brancher l'appareil en toute sécurité, procéder comme suit:</p> <ol style="list-style-type: none"> 1. Respecter toutes les consignes de sécurité, d'installation et d'utilisation 2. S'assurer que les mains sont sèches 3. S'assurer que tous les câbles utilisés: <ol style="list-style-type: none"> a. Sont en bon état b. Répondent aux exigences du produit et soient conformes aux normes et réglementations en vigueur 4. Positionner les câbles avec soin. Ne pas les placer dans des endroits où ils risquent d'être piétinés ou comprimés 5. S'assurer que les prises de courant et les connecteurs d'alimentation sont en bon état avant de les utiliser 6. Ne pas surcharger les prises de courant et les connecteurs d'alimentation 7. S'assurer que le produit est correctement relié à la terre 8. Utiliser une alimentation électrique conforme aux exigences du produit et conforme aux normes et réglementations en vigueur. En cas d'incertitude, contacter l'équipe d'assistance technique d'Eurotech (pour plus d'informations, voir "Comment obtenir une assistance technique" page 19) 9. Ne Brancher l'alimentation électrique qu'une fois l'installation du système terminée 10. Ne jamais brancher ou débrancher les câbles lorsque le système ou un appareil périphérique sous tension.

2.3 Attention: sécurité sur la connectivité sans fil

 ATTENTION
<p>Les antennes utilisées avec le produit doivent être installées avec soin, en évitant toute interférence avec d'autres appareils électroniques et à au moins 20 cm des personnes. Si ces exigences ne peuvent être satisfaites, l'intégrateur du système doit évaluer le produit final par rapport à la réglementation SAR.</p>

2.4 Avertissement: Sécurité de la Batterie



AVERTISSEMENT

BLESSURES GRAVES SI LA BATTERIE EST UTILISÉE DE MANIÈRE INCORRECTE

Avant d'utiliser la batterie, reportez-vous toujours aux instructions du fabricant de la batterie pour plus de sécurité.



ATTENTION

RISQUE D'EXPLOSION SI LA BATTERIE DE REMPLACEMENT NE RESPECTE PAS LES CARACTÉRISTIQUES DE LA BATTERIE INITIALE.

N'utilisez que des batteries de dimensions et de caractéristiques préconisées.

Respectez les instructions du constructeur pour le recyclage de la batterie usagée.

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3 HOW TO RECEIVE TECHNICAL ASSISTANCE

3.1 How to ask for technical support

To ask for technical support, complete the following steps

1. Go to the Eurotech Global Support Centre: <https://support.eurotech.com/>
2. Submit a support request
3. Wait for the reply from the Eurotech Technical Support with the information you required

3.2 How to send a product for repair

Any product returned to Eurotech, that is found to be damaged due to inadequate packaging, will not be covered by the warranty.

To send a product for repair, complete the following steps:

1. Go to the Eurotech Global Support Centre: <https://support.eurotech.com/>
2. Submit an RMA request
3. Wait for the reply from the RMA Department. It will contain:
 - The RMA number
 - The shipping information
4. Pack the product adequately using anti-static material and place it in a sturdy box with enough packing material to protect it from shocks and vibrations
5. Ship the product to Eurotech following the information received from the RMA Department.

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4 COMMENT OBTENIR UNE ASSISTANCE TECHNIQUE

4.1 Comment contacter le support technique

Pour demander un support technique, procéder comme suit:

1. Se connecter au Support Eurotech sur: <https://support.eurotech.com/>
2. Envoyer une demande d'assistance
3. Attendre la réponse de l'équipe de support avec les informations requises

4.2 Comment retourner un produit en service après vente

Tout produit renvoyé à Eurotech, qui se trouve endommagé en raison d'un emballage inadéquat, ne sera pas couvert par la garantie.

Pour retourner un produit en Service Après Vente, procéder comme suit:

1. Se connecter au Support Eurotech sur: <https://support.eurotech.com/>
2. Faire une demande de RMA
3. Attendre la réponse du service RMA qui indiquera:
 - Le numéro de RMA
 - Les informations pour l'expédition
4. Emballer le produit de manière adéquate en utilisant des protections antistatiques et le placer dans un conditionnement solide contenant suffisamment de matériau d'emballage pour le protéger des chocs et des vibrations
5. Expédier le produit chez Eurotech selon les informations reçues par mail.

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5 CONVENTIONS USED

5.1 Conventions for signal names

Convention	Description
GND	Ground
#	Active low signal
+	Positive signal; Positive signal in differential pair
-	Negative signal; Negative signal in differential pair
3.3	3.3 V signal level
5	5 V signal level
NC	No Connection
Reserved	Use is reserved to Eurotech

5.2 Conventions for signal types

Convention	Description
I	Signal is an input to the system
O	Signal is an output from the system
IO	Signal may be input or output
P	Power and Ground
A	Analog signal
NC	No Connection
Reserved	Use is reserved to Eurotech

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6 PRODUCT OVERVIEW

6.1 Product description

The ReliaGATE 10-12 is a family of IoT Edge Gateways designed to deliver LTE connectivity with 2G/3G fallback to industrial and lightly rugged applications.

The ReliaGATE 10-12 is based on the TI AM335x Cortex-A8 (Sitara) processor family, with 1GB of RAM, 8GB of eMMC, and user-accessible MicroSD and dual MicroSIM card holders.

The ReliaGATE 10-12 features the following wired connections: 2x Fast Ethernet, 3x Host 2.0 USB, 2x CAN bus with 5V (100mA) Power Out, 2x Optoinsulated Digital Input and 2x Optoinsulated Digital Output; it also includes the following serial ports: 1x RS-422/485 (surge protected and insulated), 1x RS-232/485 (surge protected), and 1x TTL Serial Console.

The ReliaGATE 10-12 can also feature a wide range of wireless connections¹: it can integrate an internal LTE Cat 1 modem (2G/3G fallback) with dual SIM usage support, Wi-Fi, and Bluetooth Low Energy; an internal GNSS provides precise geolocation capabilities.

The Host USB connector available on the left side, allows adding the ReliaCELL 10-20, a family of external rugged cellular modules for global connectivity, certified by leading carriers.

The Expansion connector available on the right side, allows adding modules with extra features, such as: the ReliaLORA 10-12, a LoRa Gateway unit, or the ReliaIO 10-12, which provides analog inputs and digital I/Os.

The ReliaGATE 10-12 can come with Everyware Software Framework (ESF), a commercial, enterprise-ready edition of Eclipse Kura, the open source Java/OSGi middleware for IoT Edge Gateways.

Distributed and supported by Eurotech, ESF supports ready-to-use field protocols (including Modbus, OPC-UA, S7), MQTT connectivity, web-based visual data flow programming and deep configuration.

ESF is also integrated with Everyware Cloud (EC), Eurotech IoT Integration Platform (separately available), enabling advanced diagnostics, provisioning, and full remote device access and management.

Used stand-alone, or in conjunction with EC, the ReliaGATE 10-12 provides a fast go-to-market solution for IoT projects of any size.

For more information visit www.eurotech.com.

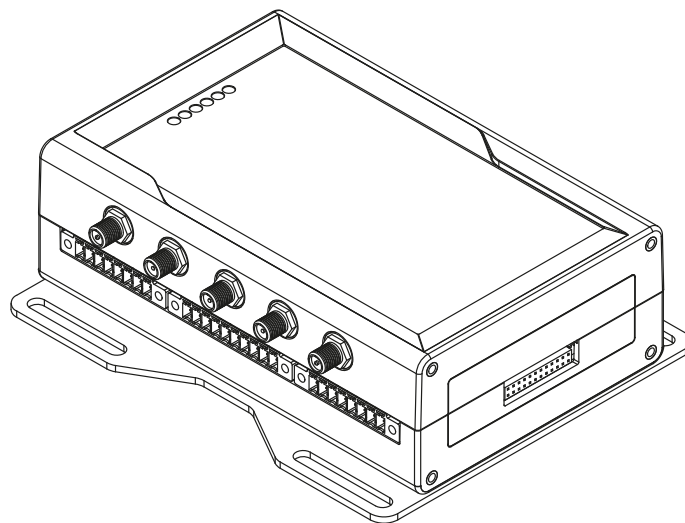


Figure 6.1 - The ReliaGATE 10-12

¹The features availability depends on the product versions

6.2 Intended use and not allowed uses of the product

The product is intended for professional use and must be installed by qualified personnel only.

The product must be installed in a secured location, accessible to authorized personnel only (for example in a cabinet / technical compartment).

6.2.1 *Intended use*

The ReliaGATE 10-12 is a family of IoT Edge Gateways designed to deliver LTE connectivity with 2G/3G fallback to industrial and lightly rugged applications.

The ReliaGATE 10-12 must:

- Be installed in a secured location, only accessible to authorized personnel (for example in a cabinet / technical compartment), and not exposed to atmospheric agents
- Be used indoors only
- Be used with appropriate interconnecting and power cables
- Be used with an external DC power supply source that:
 - Must meet the requirements stated on the identification label of the product
 - Must deliver a maximum current of 2 A
 - Must include an external 2 A fuse on the line coming from the negative terminal.

6.2.2 *Not allowed uses*

Do not use the ReliaGATE 10-12:

- In automotive applications
- In railway applications
- In defence applications
- Outdoors
- In safety-critical applications
- In environments with potentially explosive atmospheres
- If not installed according to the instructions and warnings contained in this document.

6.3 Technical specifications

The ReliaGATE 10-12 family is available in several -XY versions, for example: ReliaGATE 10-12-63 (where: X = 6, Y = 3).

The specifications are the following, according to the respective versions:

Specifications		Description according to -XY versions						
		-61	-62	-63	-64	-65/ -65G	-66/ -66G	-67/ -67G
Processor	CPU	TI AM3352, 1 GHz, 1 Core						
Memory	RAM	1 GB, DDR3						
Storage	Embedded	8 GB eMMC						
	Other	1x MicroSD holder (user accessible)						
Wired Interfaces	Ethernet	2x Fast Ethernet on RJ45 connectors						
	USB	3x Host USB 2.0 (noise and surge protected) on Type A connectors						
	Serial	1x RS-422/485: COM 0; Surge protected, Insulated, Full / Half Duplex (Default: RS-485 Full Duplex) 1x RS-232/485: COM 1; Surge protected, RS-485 termination and fail-safe resistors (Default: RS-232) 1x TTL Serial Console						
	CAN 2.0B	2x CAN bus with 5V (100mA) Power Out						
	Digital I/O	2x Digital Input: 36 V, 1 kV Optoinsulated 2x Digital Output: 40 V AC/DC, 1 kV Optoinsulated, 500 mA, 1 kHz Max Switching						
	Expansion	Yes, for Side Expansion Modules						
Wireless Interfaces	Internal Cellular Modem	No	LTE Cat 1 (NA) 3G Fallback	LTE Cat 1 (EU) 2G/3G Fallback	LTE Cat 1 (NA) 3G Fallback	LTE Cat 1 (EU) 2G/3G Fallback	LTE Cat 1 (JP)	
	External Cellular Modem	Optional Accessory: ReliaCELL 10-20 (3G/4G)						
	GNSS	Vers. -65G, -66G, -67G: Internal (72 channels GPS, Galileo, GLONASS, BeiDou) Optional Accessory: External ReliaCELL 10-20 3G						
	Wi-Fi/BT	No	802.11a,b,g,n/ BLE 4.2	No	802.11a,b,g,n/ BLE 4.2			
	Antenna Connectors	No	2x RP-SMA Wi-Fi/BT	2x SMA Cellular		2x SMA Cellular, 2x RP-SMA Wi-Fi/BT		
Other	RTC	Yes (user accessible backup battery)						
	Watchdog	Yes (system level)						
	TPM	TPM 2.0						
	Accel/Gyro	3D digital accelerometer and 3D digital gyroscope: Full-scale acceleration range: $\pm 2/\pm 4/\pm 8/\pm 16$ g Angular rate range: $\pm 125/\pm 250/\pm 500/\pm 1000/\pm 2000$ dps						
	Sensors	Temperature (inside the product)						
	LEDs	1x Power, 1x Cellular Connection, 4x Programmable						
	Pushbuttons	1x Hardware reset, 1x Programmable						
	SIM Card Holder	No	2x MicroSIM card holders (user accessible)					

Specifications		Description according to -XY versions						
		-61	-62	-63	-64	-65/ -65G	-66/ -66G	-67/ -67G
Power	Input	Nominal: 12 or 24 VDC; Range: 9 to 30 VDC with transient protection						
	Consumption	2 W idle; 15 W maximum						
Environment	Operating Temperature	-40 to +70°C ⁽¹⁾						
	Storage Temperature	-40 to +85 °C						
	Relative Humidity	5 to 95% (non-condensing) at +40°C						
Certifications	Regulatory	FCC, ISED, CE	FCC, ISED	CE	FCC, ISED	CE	JATE, TELEC	
	Safety	EN 62368, UL 60950 ⁽²⁾						
	Environmental	RoHS3; REACH						
	Wi-Fi/BT Radio	No	FCC, ISED, CE	FCC, ISED	CE	FCC, ISED	CE	JATE, TELEC
	Cellular Radio	No	No	FCC, ISED, PTCRB (AT&T, Verizon)	CE	FCC, ISED, PTCRB (AT&T, Verizon)	CE	JATE, TELEC
	Ingress	IP40						
	MTBF	> 375.000 h (prediction method: IEC 62380 @ 25°C GF)						
Mechanical	Dimensions	139 (L) x 115 (W) x 46 (H); mm - Antennas Connectors and Mounting Bracket included						
	Weight	210 g (without DIN Rail Mounting Clip/Bracket)						
	Enclosure	Material: ABS- Color: Aluminium						
Operating System		Yocto Linux** + ESF ** Factory Option: Secure Boot - Yocto Linux						

⁽¹⁾ Software ensures that the system doesn't exceed the maximum operating temperature (+70 °C)

⁽²⁾ Factory Option

6.4 Optional accessories



To simplify the development of applications, you can request the following optional accessories:

Accessory Order Code	Accessory Description
MEC-40200-00	DIN Rail Mounting Kit, composed of: <ul style="list-style-type: none"> • 1x DIN Rail Mounting Clip • 3x Phillips Countersunk Screws
E16-50-11-00	Power Supply 24W; IN: 100-240VAC; OUT: 24VDC, 1A (EU, US, UK Blades)
99ACC-70190-A0001	TTL-to-USB Cable
E29-10-11-00	2.4/5 GHz Wi-Fi/BT Telematic-mount Antenna: Linx Technologies ANT-DB1-RAF-RPS
99ACC-60750-C0007	2.4/5 GHz Wi-Fi/BT Magnetic/Adhesive-mount Antenna: 2J Antennas 2J6302MP
99ACC-60750-B0002	Cellular Adhesive-mount Antenna (LTE/DCS/EDGE/HSDPA/GPRS/GPS/GSM): Taoglas GSA.8827.A.101111
99ACC-60750-C0004	Cellular Telematic-mount Antenna (4G/LTE): 2J Antennas 2JW0124-C868B
99ACC-60750-C0005	Cellular Magnetic-mount Antenna(4G/LTE/AMPS/GSM/DCS/PCS/3G): 2J Antennas 2J3024M
99ACC-60750-C0006	Cellular Adhesive-mount Antenna (4G/LTE/3G/2G): 2J Antennas 2J5424P
99ACC-60750-C0001	GNSS Adhesive-mount Antenna (GPS/GLONASS/GALILEO): Taoglas AA.107.301111
99ACC-60750-C0008	GNSS Magnetic/Adhesive-mount Antenna (GPS/GLONASS/GALILEO): 2J Antennas 2J4301MPGF




Notes about the antennas

Depending to in-field applications, Eurotech recommends the following antennas:


- **Wi-Fi/BT**

Mounting type	Order Code	Example
Telematic-mount	E29-10-11-00	
Magnetic/Adhesive-mount	99ACC-60750-C0007	

- **Cellular:**

Mounting type	Order Code	Example
Telematic-mount	99ACC-60750-C0004	
Magnetic-mount	99ACC-60750-C0005	
Adhesive-mount	99ACC-60750-C0006	

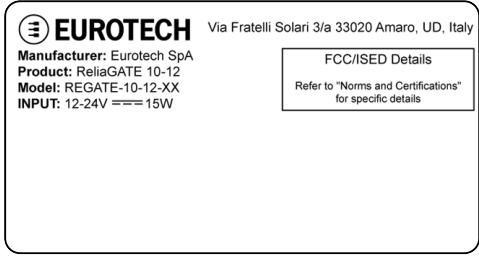
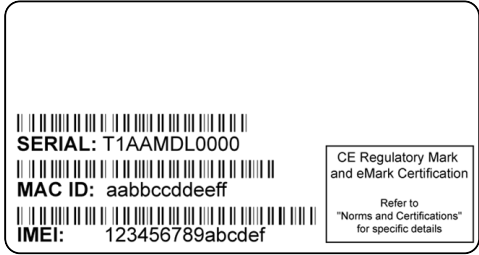

- **GNSS:**

Mounting type	Order Code	Example
Magnetic/Adhesive-mount	99ACC-60750-C0008	

For more information see: ["Antennas list" on page 37](#).

6.5 Product labels

The following labels are placed on the product:

Label example	Label type and content	Label position
 <p>The label contains the Eurotech logo, manufacturer name (Eurotech SpA), address (Via Fratelli Solari 3/a 33020 Amaro, UD, Italy), product name (ReliaGATE 10-12), model (REGATE-10-12-XX), and power supply specifications (INPUT: 12-24V === 15W). It also includes a box for FCC/ISED details with a reference to norms and certifications.</p>	<p>Part Number Label</p> <ul style="list-style-type: none"> • Eurotech logo • Manufacturer name • Manufacturer address (EU versions only) • Product number • Model number (xx = product version) • Power supply specifications* • FCC information (US versions only) • ISED information (NA versions only) 	<p>On the underside of the product</p>
 <p>The label features two barcode areas. The first contains the serial number (SERIAL: T1AAMDLO000) and MAC ID (MAC ID: aabbccddeeff). The second contains the IMEI (IMEI: 123456789abcdef). It also includes a box for CE Regulatory Mark and eMark Certification with a reference to norms and certifications.</p>	<p>Serial Number Label</p> <ul style="list-style-type: none"> • Serial number • MAC ID number • IMEI number • CE mark (EU versions only) • WEEE symbol (EU versions only) 	<p>On the underside of the product</p>
 <p>The label shows two warning symbols: a triangle with an exclamation mark and an open book with an exclamation mark.</p>	<p>Battery Label</p> <p>Warning: to avoid battery hazards, see: "Warning: battery safety" on page 11</p>	<p>On the internal side of the Service Panel cover</p>

* the symbol === stands for direct current

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7 REGULATORY INFORMATION

This section provides regulatory information for the ReliaGATE 10-12 (hereafter referred to as "this product").

Upon request, Eurotech can provide the product Declaration of Conformity.

For details and more information contact the Eurotech Technical Support (see ["How to receive technical assistance" on page 17](#)).

7.1 CE marking

Some versions of this product are CE marked (for more information see ["Technical specifications" on page 25](#)). They comply with the regulatory information reported in the following sections.

Eurotech is not responsible for the use of this product together with equipment (for example: power supplies, personal computers, etc.) that are not CE marked and not compliant with the requirements specified in this document.



7.1.1 Safety

This product is compliant with the standard EN 62368-1:2014 on the safety requirements in information and communication technology equipment.

7.1.2 Packaging and packaging waste

This product has been manufactured in compliance with the European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste.

7.1.3 Product disposal and recycling

This product, at the end of its life cycle, must be collected separately and managed in accordance with the provisions of the Directive 2012/19/EU on waste of electrical and electronic equipment.

For details and more information:

- See: ["WEEE compliance" below](#)
- Contact the Eurotech Technical Support (see ["How to receive technical assistance" on page 17](#)).

7.1.4 WEEE compliance

In compliance with the Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE), the symbol on the right, shown on the product or within its literature, indicates separate collection for electrical and electronic equipment (EEE) that has been placed on the market after 2005.

This product, at the end of its life cycle, must be collected separately and managed in accordance with the provisions of the current Directive on waste of electrical and electronic equipment.

Because of the substances present in the product, improper disposal can cause damage to human health and to the environment.

For collect and recycling information contact the Eurotech Technical Support (see ["How to receive technical assistance" on page 17](#)).



7.1.5 RoHS 3 compliance

This product has been manufactured in compliance with the following Directives:

- Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.
- Commission Delegated Directive (EU) 2015/863 of 31 March 2015 amending Annex II to Directive 2011/65/EU of the European Parliament and of the Council as regards the list of restricted substances

7.1.6 Directive RED 2014/53/EU

Some versions of this product meet the requirements of the Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonization of the laws of the Member States relating to the making available on the market of radio equipment.

For more information see "[Technical specifications](#)" on page 25.

Modification statement

Eurotech has not approved any changes or modifications to this product by the user. Any changes or modifications could void the user's authority to operate this product.

7.1.6.1 EU restrictions on 5 GHz Wi-Fi usage

Channel Number	Frequency (MHz)	Europe (ETSI)
36	5180	Indoor Usage Only
40	5200	Indoor Usage Only
44	5220	Indoor Usage Only
48	5240	Indoor Usage Only
52	5260	Not Supported
56	5280	Not Supported
60	5300	Not Supported
64	5320	Not Supported
100	5500	Not Supported
104	5520	Not Supported
108	5540	Not Supported
112	5560	Not Supported
116	5580	Not Supported
120	5600	Not Supported
124	5620	Not Supported
128	5640	Not Supported
132	5660	Not Supported
136	5680	Not Supported
140	5700	Not Supported
149	5745	Not Supported
153	5765	Not Supported
157	5785	Not Supported
161	5805	Not Supported
165	5825	Not Supported

7.1.6.2 Class II product

According to Commission Decision 2000/299/EC of 6 April 2000, establishing the initial classification of radio equipment and telecommunications terminal equipment and associated identifiers, the product falls within the scope of Class II.

Due to EU restrictions on 5 GHz Wi-Fi bands the product is limited to indoor operation and should only be operated in the frequency band 5150 MHz – 5250 MHz (U-NII-1) covering 20 MHz channels (36,40,44,48), 40 MHz channels (38,46), and 80 MHz channel (42).

Dynamic Frequency selection (DFS) as master or slave is not supported by the product.

	AT	BE	BG	CH	CY	CZ	DE
	DK	EE	EL	ES	FI	FR	HR
	HU	IE	IT	IS	LI	LT	LU
	LV	MT	NL	NO	PL	PT	RO
	SE	SI	SK	TR	UK		

7.2 Statement for class A equipment (vers.: -61)

Class A equipment (Broadcasting equipment for business) This equipment may cause radio interference when used in household environment certified for business use purpose.

A 급 기기(업무용 방송통신기자재)
 이 기기는 업무용환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용환경에서 용하는 경우 전파간섭의 우려가 있습니다.

7.3 Statement for KN 32/35 (vers.: -61)

This product may cause malfunction if it is used nearby wireless communication equipment such as a cell phone, a Wi-Fi or Bluetooth device or etc.

이 장치는 이동전화, **Wi-Fi** 또는 블루투스 장치 등 무선통신장치와 매우 근접한 장소에서 사용할 경우 오작동을 일으킬 가능성이 있습니다.

7.4 FCC/ISED Regulatory Notices

7.4.1 FCC marking

Some versions of this product are FCC marked (for more information see "[Technical specifications](#)" on page 25). They comply with the regulatory information reported in the following sections.

Eurotech is not responsible for the use of the product together with equipment (for example: power supplies, personal computers, etc.) that are not FCC marked and not compliant with the requirements specified in this document.



Certaines versions de ce produit sont certifiées FCC (pour plus d'informations, voir "[Technical specifications](#)" on page 25). Elles sont conformes à la réglementation présentée dans les sections suivantes.

Eurotech n'est pas responsable de l'utilisation du produit avec des équipements (par exemple : alimentations, ordinateurs personnels, etc.) non certifiés FCC et qui ne sont pas conformes aux exigences spécifiées dans ce document.

Modification statement

Eurotech has not approved any changes or modifications to the product by the user. Any changes or modifications could void the user's authority to operate the product.

Eurotech n'approuve aucune modification apportée à l'appareil par l'utilisateur, quelle qu'en soit la nature. Tout changement ou modification peuvent annuler le droit d'utilisation de l'appareil par l'utilisateur.

7.4.2 FCC Class B Digital Device Notice

This product complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this product may not cause harmful interference, and (2) this product must accept any interference received, including interference that may cause undesired operation.

Note: This product has been tested and found to comply with the limits for a Class B digital product, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This product generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this product does cause harmful interference to radio or television reception, which can be determined by turning the product OFF and ON, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the product and the receiver
- Connect the product into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

Cet appareil est conforme à la partie 15 des règlements de la FCC. L'utilisation est soumise aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Remarque: Cet équipement a été testé et déclaré conforme aux limites d'un appareil numérique de classe B, conformément à la partie 15 des règlements de la FCC. Ces limites sont conçues pour fournir une protection raisonnable contre les interférences nuisibles dans une installation résidentielle. Ce produit génère, utilise et peut émettre des ondes radio qui peuvent causer des interférences nuisibles s'il n'est pas installé et utilisé conformément aux instructions. Si néanmoins ce produit cause des interférences nuisibles à la réception de la radio ou de la télévision, ce qui peut être déterminé en éteignant et en rallumant l'appareil, l'utilisateur est encouragé à essayer de corriger l'interférence par une ou plusieurs des mesures suivantes:

- Réorienter ou déplacer l'antenne de réception
- Augmenter la distance entre le produit et le récepteur
- Brancher l'appareil sur une prise de courant différente de celle à laquelle le récepteur est raccordé
- Consulter le revendeur ou un technicien radio/TV expérimenté pour obtenir de l'aide.

7.4.3 FCC restrictions on 5 GHz Wi-Fi usage

Channel Number	Frequency (MHz)	North America (FCC)
36	5180	Indoor Usage Only
40	5200	Indoor Usage Only
44	5220	Indoor Usage Only
48	5240	Indoor Usage Only
52	5260	Not Supported
56	5280	Not Supported
60	5300	Not Supported
64	5320	Not Supported
100	5500	Not Supported
104	5520	Not Supported
108	5540	Not Supported
112	5560	Not Supported
116	5580	Not Supported
120	5600	Not Supported
124	5620	Not Supported
128	5640	Not Supported
132	5660	Not Supported
136	5680	Not Supported
140	5700	Not Supported
149	5745	Supported
153	5765	Supported
157	5785	Supported
161	5805	Supported
165	5825	Supported

7.4.4 **ISED Canada Regulatory Notices**

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This radio transmitter has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed in "[Antennas list](#)" on the facing page, with the maximum permissible gain indicated. Antenna types not included in that list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Le présent émetteur radio 21442-MRG1012 a été validé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés dans "[Antennas list](#)" sur la page d'en face, avec indication du gain maximum autorisé. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour fonctionner avec cet appareil.

7.4.5 **ISED Class B Digital Device Notice**

ICES-003 Class B Notice - Avis NMB-003, Classe B.

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

7.4.6 **Responsible parties: Canadian Representative contact information**

The Canadian Representative has the following contact information:

Company Name:	Canadian Certification Consulting, Inc.
Company Number¹:	10842A
Company Address:	2210 Horizon Drive, Suite 17
City:	West Kelowna
Province/State:	BC
Postal Code:	V1Z 3L4
Country:	Canada
Contact Name:	Jon Hughes
Title:	President
Phone Number:	1-250-575-1719
Email:	info@can-cert.com

¹Company Number is issued by Innovation, Science and Economic Development Canada (formerly Industry Canada)

7.4.7 RF Radiation Exposure Statement

This product complies with FCC and ISED radiation exposure limits set forth for an uncontrolled environment. The antenna should be installed and operated with minimum distance of 20 cm between the radiator and your body.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.

Cet appareil est conforme aux limites d'exposition aux rayonnements de l'ISED pour un environnement non contrôlé. L'antenne doit être installée de façon à garder une distance minimale de 20 centimètres entre la source de rayonnements et votre corps.

Cet appareil et son (ses) antenne(s) ne doivent pas être co-localisés ou utilisés en conjonction avec une autre antenne ou un autre émetteur, sauf en conformité avec les procédures du produit multi-émetteur de la FCC.

7.4.8 Labeling Information

The following information is stated on the product label(s):

Les informations suivantes sont indiquées sur l'étiquette (les étiquettes) du produit:

- Contains FCC ID: RI7LE910NAV2
- Contains FCC ID: UKMMRG1012
- Contains IC ID: 5131A-LE910NAV2
- Contains IC ID: 21442-MRG1012
- CAN ICES-3 (B)/NMB-3(B)

7.5 Antennas list

The ReliaGATE 10-12 has been certified with the following antennas:

Le ReliaGATE 10-12 a été certifié avec les antennes suivantes:

Types Types	Manufacturer and Model Fabricant et Modèle	Bands Bandes	Peak Gain (dBi) Max. Gain (dBi)	VSWR
Wi-Fi/BT	Linx Technologies ANT-DB1-RAF-RPS	2.40–2.483 MHz 5.15–5.825 GHz	2.5/ 4.6	<1.9
	2J Antennas 2J6302MP	2410-2490 MHz 4920-5925 MHz	1.7/ 2.3 (2m cable)	1.6/ 1.5
Cellular	Taoglas GSA.8827.A.101111	698-960 MHz 1710-2170 MHz 2500-2700 MHz	1.8/ 3/ 4.7	-
	2J Antennas 2JW0124-C868B	698-960 MHz 1710-2170 MHz 2500-2700 MHz	0.5 / 2.5 / 1.5	2.5 / 1.5 / 2.6
	2J Antennas 2J3024M	698-960 MHz 1710-2170 MHz 2500-2700 MHz	1.0 / 2.4 / 2.1 (2m cable)	1.9 / 1.5 / 1.3
	2J Antennas 2J5424P	698-960 MHz 1710-2170 MHz 2500-2700 MHz	1.8 / 2.4 / 2.1 (2m cable)	2.7 / 2.1 / 2.0
GNSS	Taoglas AA.107.301111	1574-1602 MHz	-	N.A.
	2J Antennas 2J4301MPGF	1575.42-1606 MHz	-	N.A.

NOTICE

**Within the EU, antennas have to be used in compliance with the RED requirements.
Within the US/Canada, antennas have to be used in compliance with the FCC/ISED requirements.**

***Au sein de l'UE, les antennes doivent être utilisées conformément aux exigences RED.
Aux États-Unis et au Canada, les antennes doivent être utilisées conformément aux exigences de la FCC/ISED.***

7.6 REACH compliance

This product has been assessed to be compliant with the regulation (EC) No. 1907/2006 (REACH) (with the exceptions allowed by the EU Technical Committee).

Eurotech has set in place a monitoring process to assess compliance to REACH regulation.

For details and more information contact the Eurotech Technical Support (see "[How to receive technical assistance](#)" on page 17).

8 INTERFACES OVERVIEW

8.1 Front Side Interfaces overview

The Front Side Interfaces are as follows:

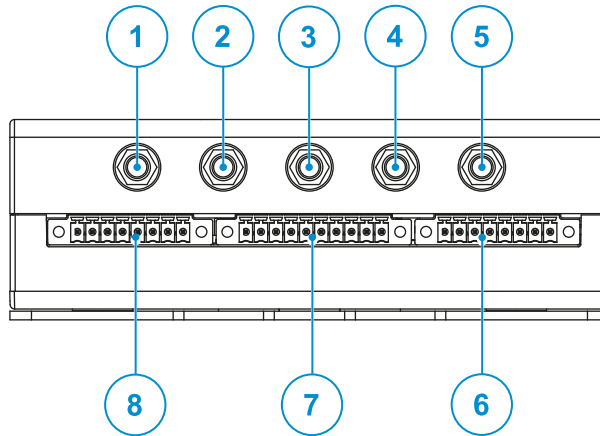


Figure 8.1 - Front Side Interfaces layout

Ref#	Description
1	Antenna connector for 2.4 GHz Wi-Fi / Bluetooth (all vers. except: -61, -63, -64)
2	Main antenna connector for Internal Cellular Modem: CELL MAIN (all vers. except: -61, -62)
3	Antenna Connector for Internal Global Navigation Satellite System (vers.: -65G, -66G, -67G)
4	Diversity antenna connector for Internal Cellular Modem: CELL DIV (all vers. except: -61, -62)
5	Antenna connector for 5 GHz Wi-Fi (all vers. except: -61, -63, -64)
6	CAN 0/1 connector
7	COM 0/1 connector
8	Digital I/Os connector

Table 8.1 - Front Side Interfaces description

8.2 Rear Side Interfaces overview

The Rear Side Interfaces are as follows:

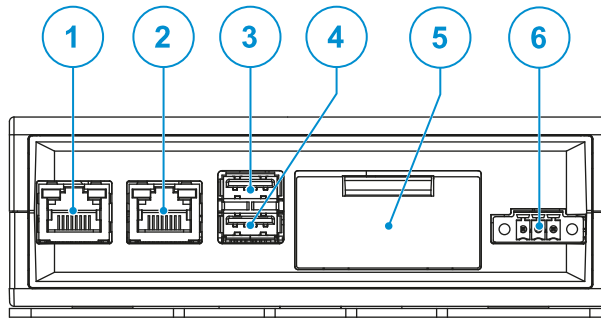


Figure 8.2 - Rear Side Interfaces layout

Ref#	Description
1	Ethernet ETH 1 connector
2	Ethernet ETH 0 connector
3	USB 0 connector
4	USB 1 connector
5	Service Panel
6	Power IN connector

Table 8.2 - Rear Side Interfaces description

8.2.1 Service Panel Interfaces

The Interfaces available in the Service Panel are as follows:

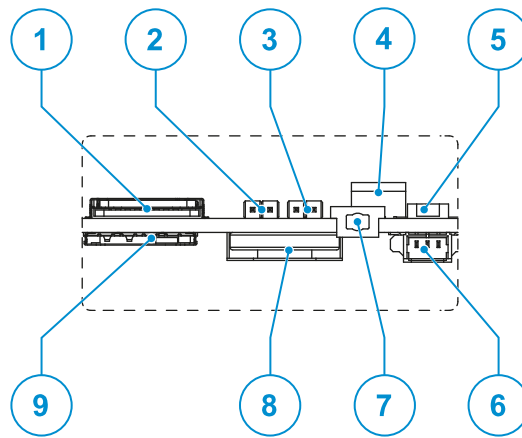


Figure 8.3 - Service Interfaces layout

Ref#	Description
1	Combo MicroSD (push-pull) + MicroSIM (pull-lever) cards holder
2	RTC battery connection jumper
3	Boot selection jumper
4	DIP-switch for serial ports configuration
5	Programmable pushbutton
6	TTL Serial Console
7	Hardware reset pushbutton
8	RTC user accessible backup battery
9	MicroSIM card holder (push-pull)

Table 8.3 - Service Interfaces description

8.3 Right Side Interface overview

The Right Side Interface is as follows:

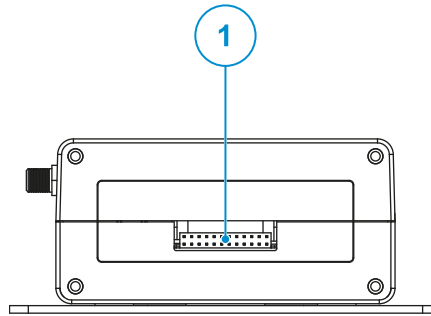


Figure 8.4 - Right Side Interfaces layout

Ref#	Description
1	Expansion connector

Table 8.4 - Right Side Interfaces description

For more information see:

- ["Expansion connector" on page 62](#)
- ["How to enable the 3.3V and 5V power supply on the Expansion connector" on page 86](#)
- ["Appendix 2: Expansion connector pin map with respect to device tree pin assignment" on page 115.](#)

8.4 Left Side Interface overview

The Left Side Interface is as follows:

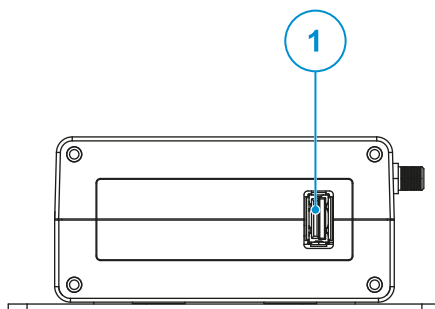


Figure 8.5 - Left Side Interface layout

Ref#	Description
1	2.0 Host USB connector (ready to interface optional USB accessories, e.g.: ReliaCELL 10-20)

Table 8.5 - Left Side Interface description

8.5 LED Indicators overview

The LED Indicators are as follows:

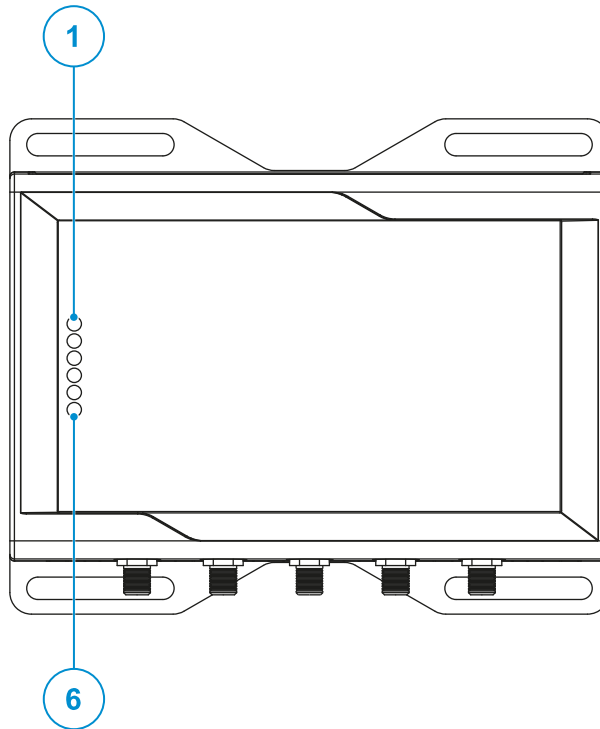


Figure 8.6 - LED Indicators layout

Ref#	Use	Color
1	USER1 (General Purpose)	Green
2	USER2 (General Purpose)	Green
3	USER3 (General Purpose)	Amber
4	USER4 (General Purpose)	Amber
5	CELLULAR (Internal Cellular Modem activity; all vers. except: -61, -62) <ul style="list-style-type: none"> LED ON: Modem ON LED blinking: Modem connected to cellular network 	Green
6	POWER: <ul style="list-style-type: none"> LED ON: Product powered by the external source LED OFF: Product not powered by the external source 	Blue

Table 8.6 - LED Indicators description

9 INTERFACES IN DETAIL

9.1 Wi-Fi and Bluetooth (all vers. except: -61, -63, -64)

The ReliaGATE 10-12 provides the following Wi-Fi / Bluetooth function:

- 2.4 GHz Wi-Fi 802.11a,b,g,n / BLE 4.2 BLE Bluetooth
- 5 GHz Wi-Fi 802.11a,b,g,n

The internal circuitry allows for 2.4 GHz Wi-Fi and Bluetooth coexistence.

The antennas connectors are placed on the front side.

For more information see: "[How to manage Wi-Fi and Bluetooth](#)" on page 72.

9.1.1 Wi-Fi specifications

- Integrated 2.4 & 5G GHz Power Amplifier (PA) for WLAN solution
- WLAN Baseband Processor and RF transceiver Supporting IEEE Std 802.11a/b/g/n
- WLAN 2.4/5 GHz SISO (20/40 MHz channels)
- Baseband Processor
 - IEEE Std 802.11a/b/g/n data rates and IEEE Std 802.11n data rates with 20 or 40 MHz SISO
- Fully calibrated system. Production calibration not required
- Medium Access Controller (MAC)
 - Embedded ARM™ Central Processing Unit (CPU)
 - Hardware Based Encryption/Decryption using 64, 128, and 256 Bit WEP, TKIP or AES Keys
 - Supports requirements for Wi-Fi Protected Access (WPA and WPA2.0) and IEEE Std 802.11i (includes hardware accelerated Advanced Encryption Standard (AES))
 - Designed to work with IEEE Std 802.1x
- IEEE Std 802.11d,e,h,i,k,r PICS compliant
- New advanced co-existence scheme with BT/BLE
- 2.4/5 GHz Radio
 - Internal LNA and PA
 - Supports: IEEE Std 802.11a, 802.11b, 802.11g and 802.11n
- Supports 4 bit SDIO host interface, including high speed (HS) and V3 modes.

9.1.1.1 2.4 GHZ TX output power

Maximum RMS output power measured at 1dB from IEEE spectral mask or EVM.

Parameter	Value
Operation frequency range	2412 to 2484 MHz
Output Power	17 dBm @ condition: 1 Mbps DSSS

9.1.1.2 5 GHZ TX output power

Maximum RMS output power measured at 1dB from IEEE spectral mask or EVM.

Parameter	Value
Operation frequency range	4910 to 5825MHz
Output Power	16.8 dBm @ condition: 6 Mbps OFDM

9.1.2 Bluetooth specifications

- Supports Bluetooth 4.2
- Includes concurrent operation and built -in coexisting and prioritization handling of Bluetooth, BLE, audio processing and WLAN
- Dedicated Audio processor supporting on chip SBC encoding + A2DP:
 - Assisted A2DP (A3DP) support - SBC encoding implemented internally
 - Assisted WB-Speech (AWBS) support - modified SBC codec implemented internally

9.1.3 BLE specifications

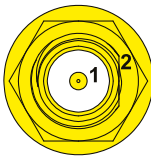
- Fully compliant with BT and BLE dual mode standard
- Support for all roles and role-combinations, mandatory as well as optional
- Supports up to 10 BLE connections
- Independent buffering for LE allows having large number of multiple connections without affecting BR/EDR performance

9.1.4 Antennas connectors specifications

Specifications are the same for both the following antennas connectors:

- 2.4 GHz Wi-Fi / Bluetooth
- 5 GHz Wi-Fi

Connector Layout:



Connector Pinout:

Pin #	Description
1	Male inner pin contact
2	Female connector body (outer thread)

Connector Specifications:

- RP-SMA connector
- Gender: Female

Mating Connector Specifications:

- RP-SMA connector
- Gender: Male

9.2 Internal Cellular Modem (all vers. except: -61, -62)

The ReliaGATE 10-12 supports the following Telit LE910 modem variants, according to product versions based on the geographic area of usage:

Product version	Modem variant	Technology
-63, -65, -65G	Telit LE910-NA1 - North America	LTE Cat 1 3G Fallback
-64, -66, -66G	Telit LE910C1-EU - Europe	LTE Cat 1 2G/3G Fallback
-67, -67G	Telit LE910C1-AP - Japan	LTE Cat 1

The antennas connectors are placed on the front side.

For more information see: ["How to manage the Internal Cellular Modem" on page 73.](#)

9.2.1 Internal Cellular Modem specifications (according to product versions)

9.2.1.1 Product features

- Rx Diversity and MIMO DL 2x2
- LTE FDD Cat.1, 3GPP compliant
- Built in UDP/TCP/FTP/SMTP stack

9.2.1.2 LTE data

- Uplink up to 5 Mbps
- Downlink up to 10 Mbps

9.2.1.3 Supported RF bands

TELIT LE910 variant	Technology	4G bands	3G bands	2G bands
LE910-NA1 - North America	LTE Cat 1 (NA) 3G Fallback	B2, B4, B5, B12/B13	B2, B5	-
LE910C1-EU - Europe	LTE Cat 1 2G/3G Fallback	B1, B3, B7, B8, B20, B28A	B1, B3, B8	B3, B8
LE910C1-AP - Japan	LTE Cat 1 (JP)	B1, B3, B5, B8, B28	B1, B5, B8	-

9.2.1.4 TX output power

Class 3 (0.2W, 23 dBm) @ LTE

9.2.2 LTE - single antenna operation notes

Single LTE antenna operation can be supported; however, typically, wireless carriers (Mobile Network Operators) impose restrictions. Please consult with your carrier before considering single LTE antenna usage.

For optimum performance of the cellular interface, Eurotech recommends the use of both CELL MAIN and CELL DIV antenna connectors.

If CELL DIV antenna is not used/connected, Eurotech recommends to disable the diversity function: see ["How to disable/enable the diversity \(CELL DIV\) function" on page 74.](#)

9.2.2.1 Main antenna requirements

Telit LE910-NA1 - North America version

Feature	Value
Frequency range	Depending by the frequency band(s) provided by the network operator
Bands	See "Supported RF bands" on the previous page
Impedance	50 Ohm
Input power	> 24dBm Average power
VSWR absolute max	$\leq 10:1$
VSWR recommended	$\leq 2:1$

Telit LE910C1-EU - Europe version

Feature	Value
Frequency range	Depending by the frequency band(s) provided by the network operator
Bands	See "Supported RF bands" on the previous page
Impedance	50 Ohm
Input power	> 33 dBm(2 W) peak power in GSM > 24 dBm average power in WCDMA & LTE
VSWR absolute max	$\leq 10:1$
VSWR recommended	$\leq 2:1$

Telit LE910C1-AP - APAC version

Feature	Value
Frequency range	Depending by the frequency band(s) provided by the network operator
Bandwidth	See "Supported RF bands" on the previous page
Impedance	50 Ohm
Input power	> 24dBm Average power
VSWR absolute max	$\leq 10:1$
VSWR recommended	$\leq 2:1$

9.2.2.2 Second antenna requirements (for antenna diversity)

Telit LE910-NA1 - North America version

Feature	Value
Frequency range	Depending by the frequency band(s) provided by the network operator
Impedance	50 Ohm
VSWR recommended	$\leq 2:1$

Telit LE910C1-EU - Europe version

Feature	Value
Frequency range	Depending by the frequency band(s) provided by the network operator
Impedance	50 Ohm
VSWR recommended	$\leq 2:1$

Telit LE910C1-AP - APAC version

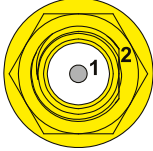
Feature	Value
Frequency range	Depending by the frequency band(s) provided by the network operator
Impedance	50 Ohm
VSWR recommended	$\leq 2:1$

9.2.3 Antennas connectors specifications

Specifications are the same for both the following connectors:

- Main Antenna Connector
- Diversity Antenna Connector

Connector Layout:



Connector Pinout:

Pin #	Description
1	Female inner pin contact
2	Female connector body (outer thread)

Connector Specifications:

- SMA connector
- Gender: Female

Mating Connector Specifications:

- SMA connector
- Gender: Male

9.2.4 The MicroSIM card holders

The ReliaGATE 10-12 includes the following MicroSIM card holders:

- 1st MicroSIM card holder:
 - Integrated in a Combo MicroSD (push-pull) + MicroSIM (pull-lever) cards holder
 - Placed **on the top side** of the circuit board in the Service Panel
- 2nd MicroSIM card holder:
 - Push-pull card holder
 - Placed **on the bottom side** of the circuit board in the Service Panel

If you use a single SIM card, use the 1st MicroSIM card holder.

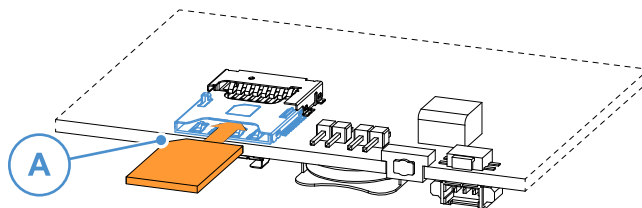
Turn OFF the SIM PIN before inserting the SIM card in the holder. The cellular connection will not work if the SIM PIN is ON.

9.2.4.1 How to insert / remove the MicroSIM card

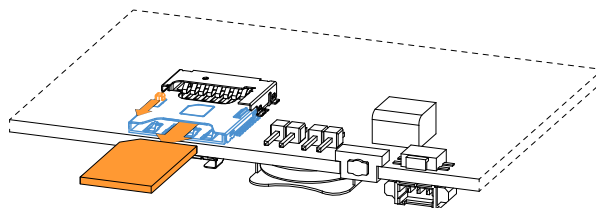
If you are using the holder on the top side of the circuit board

To insert the MicroSIM card, complete the following steps:

1. Orient the MicroSIM card with the contacts facing the circuit board and the cut corner - highlighted with the letter **A** - facing the holder
2. Push the MicroSIM card in the holder



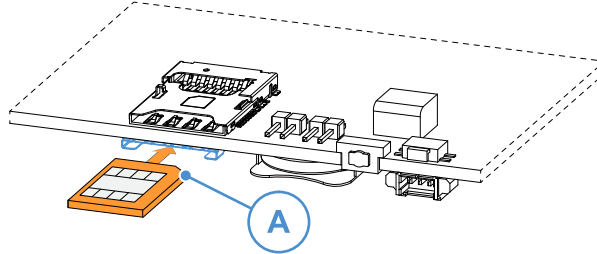
To remove the MicroSIM card, pull the eject lever: use a pen tip to simplify the operation:



If you are using the holder on the bottom side of the circuit board

To insert the MicroSIM card, complete the following steps:

1. Orient the MicroSIM card with the contacts facing the circuit board and the cut corner - highlighted with the letter **A** - facing the holder
2. Push the MicroSIM card in the holder



To remove the MicroSIM card, pull it out from the holder: use a pair of plastic tweezers to simplify the operation.

9.3 Internal GNSS (vers.: -65G, -66G, -67G)

The ReliaGATE 10-12 provides the following GNSS function: Internal Untethered Dead Reckoning; 72 channels GPS, Galileo, GLONASS, BeiDou.

The GNSS outputs NMEA data; this data can be read by applications directly.

The antenna connector is placed on the front side.

For more information see: ["How to manage the Internal GNSS" on page 75.](#)

9.3.1 Internal GNSS specifications

Receiver Type:

- 72-channel engine
- GPS/QZSS L1 C/A, GLONASS L10F, BeiDou B1
- SBAS L1 C/A: WAAS, EGNOS, MSAS
- Galileo-ready E1B/C

Nav. Update Rate:

- Single GNSS: up to 18 Hz
- Concurrent GNSS: up to 10 Hz

Position Accuracy:

- 2.0 m CEP

Acquisition:

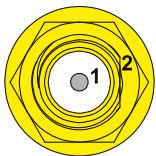
- Cold starts: 26 s
- Aided starts: 3 s
- Reacquisition: 1 s

Sensitivity:

- Tracking & Nav: -160 dBm
- Cold starts: -148 dBm
- Hot starts: -156 dBm

9.3.2 Antenna connector specifications

Connector Layout:



Connector Pinout:

Pin #	Description
1	Female inner pin contact
2	Female connector body (outer thread)

Connector Specifications:

- SMA connector
- Gender: Female

Mating Connector Specifications:

- SMA connector
- Gender: Male

9.4 Digital I/Os

The ReliaGATE 10-12 provides the following Digital I/Os:

- 2x Digital Input: 36 V, 1 kV Optoinsulated
- 2x Digital Output: 40 V AC/DC, 1 kV Optoinsulated, 500 mA, 1 kHz Max Switching

The Digital I/Os connector is available on the front side.

For more information see: ["How to manage the Digital I/Os" on page 85.](#)

9.4.1 Insulated Digital Inputs

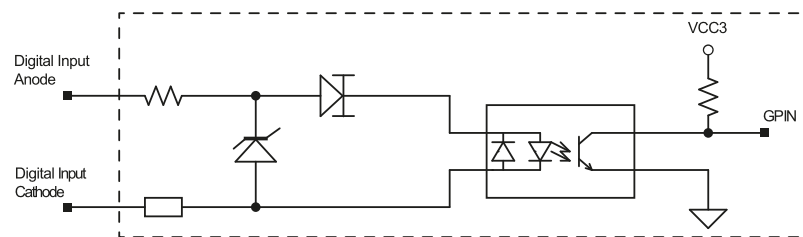
9.4.1.1 Electrical specifications

The table below shows the electrical specifications of the digital inputs:

Characteristic	Value
Logic Zero	$0\text{ V} \leq V_{IN_low} \leq 1\text{ V}$
Logic One	$2\text{ V} \leq V_{IN_high} \leq 36\text{ V}$
Input Current	< 3.5 mA

9.4.1.2 Electrical schematics

The illustration below shows the electrical schematics of one digital input:



9.4.2 Insulated Digital Outputs

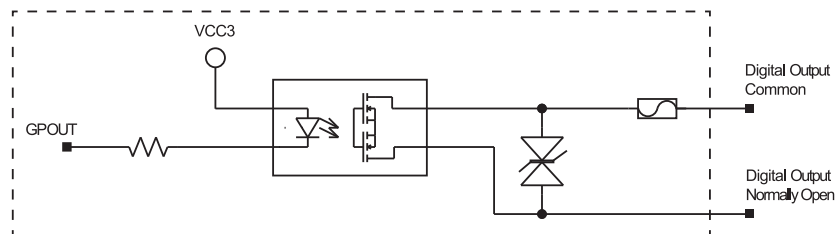
9.4.2.1 Electrical specifications

The table below shows the electrical specifications of the digital outputs:

Characteristic	Value
Maximum Voltage	40 V
Maximum Current	500 mA
Output ON Resistance	Typical: 0.83 Ohm Maximum: 2.50 Ohm
Maximum switching frequency	1 kHz

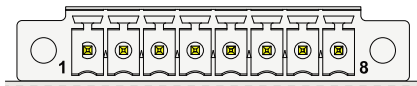
9.4.2.2 Electrical schematics

The illustration below shows the electrical schematics of one digital output:



9.4.3 Digital I/Os connector specifications

Connector Layout:



Connector Specifications:

- Base strip, Header
- Gender: Female
- Type: 8-pin, 3.5 mm pitch

Mating Connector Specifications:

- Pluggable screw terminal block;
- Gender: Male
- Type: 8-pin, 3.5 mm pitch
- Example:
Manufacturer: Phoenix Contact
Part Number: MC 1,5/ 8-STF-3,5 - 1847181
(or equivalent)

Connector Pinout:

Pin #	Signal	Type	Description
1	Digital OUT: 1COM	O	Digital Output 1 Common
2	Digital OUT: 1NO	O	Digital Output 1 Normally Open
3	Digital OUT: 2COM	O	Digital Output 2 Common
4	Digital OUT: 2NO	O	Digital Output 2 Normally Open
5	Digital IN: 1A	I	Digital Input 1 Anode
6	Digital IN: 1C	I	Digital Input 1 Cathode
7	Digital IN: 2A	I	Digital Input 2 Anode
8	Digital IN: 2C	I	Digital Input 2 Cathode

9.5 COM 0 and COM 1

The ReliaGATE 10-12 provides the following COM ports:

- 1x RS-422/485: COM 0; Surge protected, Insulated, Full Duplex/Half Duplex (Default: RS-485 Full Duplex)
- 1x RS-232/485: COM 1; Surge protected, RS-485 termination and fail-safe resistors (Default: RS-232)

COM ports specifications:

- The COM ports are surge protected
- Both COM ports are disabled when the ReliaGATE 10-12 is initially powered ON
- Maximum supported baud rates are:
 - For RS-232 mode: up to 450 kbps
 - For RS-485 mode: up to 1.75 Mbps

The COM connectors are available on the front side.

For more information see: ["How to manage the COM ports" on page 77](#).

9.5.1 **Note for termination resistors for COM 0 in RS-485 mode**

The termination resistors can be driven using the "gpio_utility".

For more information see: ["How to drive the GPIOs: the GPIO Utility" on page 71](#).

9.5.2 **Note for termination resistors for COM 1 in RS-485 mode**

COM 1 has 2 pairs of pins (each signal is doubled):

- If the ReliaGATE 10-12 is located at the beginning, or at the end, of a RS-485 chain, spare pair of pins can be used to connect permanently standard axial resistor 120 Ohm, if the application requires that
- If the ReliaGATE 10-12 is not at the beginning or at end of the RS-485 chain, two options are available:
 - Option 1: one pair of pins can remain not connected
 - Option 2: one pair of pins can be used to connect the previous device of the chain, and the other pair can be used to connect the following device of the chain

9.5.3 **Note for fail-safe resistors for COM 0 in RS-485 mode**

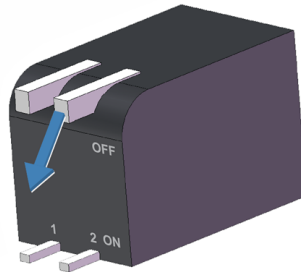
Fail-safe resistors (1.21 k Ω) are already inserted by default and cannot be removed by the user.

9.5.4 Note for fail-safe resistors for COM 1 in RS-485 mode

To insert the RS-485 fail-safe resistors, use the DIP switch available in the Service Panel.

9.5.4.1 Switches meaning

Default DIP switch configuration is OFF; this means no resistors inserted.



SW #	Signal	Description
1	RS232_RX/485_D+ Line	ON: 4.7 kΩ pull-up resistor inserted on COM 1
2	RS232_TX/485_D- Line	ON: 4.7 kΩ pull-down resistor inserted on COM 1

9.5.5 Note for RS-485 half duplex (only for COM 0 in RS-485 mode)

To set an RS-485 connection in Half Duplex, add the following external loop-back in the COM connector (see "[COM 0 and COM 1 connector specifications](#)" on the next page): connect pin 1 to pin 4, and pin 2 to pin 5.

Then: pins 1 and 4 are: D+ Line (A/Y); pins 2 and 5 are: D- Line (B/Z).

9.5.6 COM 0 and COM 1 connector specifications

Connector Layout:



Connector Specifications:

- Base strip, Header
- Gender: Male
- Type: 10-pin, 3.5 mm pitch

Mating Connector Specifications:

- Pluggable screw terminal block;
- Gender: Female
- Type: 10-pin, 3.5 mm pitch
- Example:
Manufacturer: Shenzhen Connection Electronics Co., Ltd.
Part Number: MC 1,5/10-STF-3,5 - 1847204
(or equivalent)

Connector Pinout:

Pin #	Signal	Type	Description
1	COM 0: Y/D+	O	COM port 0: • RS-422: TX+ (Y) • RS-485: A (D+ Line)
2	COM 0: Z/D-	O	COM port 0: • RS-422: TX- (Z) • RS-485: B (D- Line)
3	COM 0: IGND	P	Ground (isolated)
4	COM 0: A/D+	I	COM port 0: • RS-422: RX+ (A) • RS-485: A (D+ Line)
5	COM 0: B/D-	I	COM port 0: • RS-422: RX- (B) • RS-485: B (D- Line)
6	COM 1: TX/D-	O	COM port 1: • RS-232: TX • RS-485: B (D- Line)
7	COM 1: RX/D+	I	COM port 1: • RS-232: RX • RS-485: A (D+ Line)
8	COM 1: GND	P	Ground (not isolated)
9	COM 1: RX/D+	I	COM port 1: • RS-232: RX • RS-485: A (D+ Line)
10	COM 1: TX/D-	O	COM port 1: • RS-232: TX • RS-485: B (D- Line)

9.6 CAN 0 and CAN 1

The ReliaGATE 10-12 provides 2x CAN (Controller Area Network) ports compliant with the CAN Specification 2.0, Parts A and B:

- CAN 0
- CAN 1

The CAN connectors are available on the front side.

For more information see: ["How to manage the CAN ports" on page 76.](#)

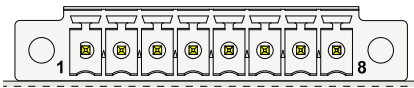
No CAN termination resistors are present internally. If required, they need to be added externally.

Notes about CAN power supply:

- The ReliaGATE 10-12 can supply power to the 2 CAN ports: 100mA @ 5V (each port)
- CAN power can be enabled / disabled by software
- The interfaces are surge protected.

9.6.1 CAN 0 and CAN 1 connector specifications

Connector Layout:



Connector Specifications:

- Base strip, Header
- Gender: Male
- Type: 8-pin, 3.5 mm pitch

Mating Connector Specifications:

- Pluggable screw terminal block;
- Gender: Female
- Type: 8-pin, 3.5 mm pitch
- Example:
Manufacturer: Phoenix Contact
Part Number: MC 1,5/ 8-STF-3,5 - 1847181
(or equivalent)

Connector Pinout:

Pin #	Signal	Type	Description
1	CAN 0: H	IO	CAN port 0 Positive Data
2	CAN 0: L	IO	CAN port 0 Negative Data
3	CAN 0: 5V	5	CAN node 0 5 V Output power supply
4	CAN 0: GND	P	Ground
5	CAN 1: H	IO	CAN port 1 Positive Data
6	CAN 1: L	IO	CAN port 1 Negative Data
7	CAN 1: 5V	5	CAN node 1 5 V Output power supply
8	CAN 1: GND	P	Ground

9.7 ETH 0 and ETH 1

The ReliaGATE 10-12 provides 2x 10/100 Mbps Ethernet ports:

- ETH 0
- ETH 1

The Ethernet connectors are available on the rear side.

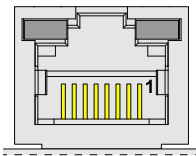
For more information see: ["How the Ethernet ports are exposed" on page 85.](#)

9.7.1 Ethernet specifications

Feature	Description
Network Standard	IEEE 802.3u 10/100-BaseTX. IEEE 802.3x full-duplex flow control.
Speeds	10/100-BaseTX interfaces with MAC
Notes	The interfaces are noise and surge protected. The RJ-45 connector has integrated magnetics.

9.7.2 ETH 0 and ETH 1 connectors specifications

Connector Layout:



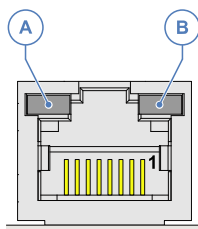
Connector Specifications:

- RJ-45 socket
- Gender: Female

Mating Connector Specifications:

- RJ-45 plug
- Gender: Male

LEDs Layout:



Connector Pinout (pins not listed are not connected):

Pin #	Signal	Type	Description
1	TX+	O	Transmit Data +
2	TX-	O	Transmit Data -
3	RX+	I	Receive Data +
6	RX-	I	Receive Data -

LEDs Meaning:

Ref #	LED Color	LED Meaning
A	Yellow	Activity
B	Green	Link

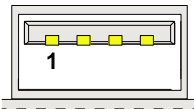
9.8 USB 0, USB 1, USB 2

The ReliaGATE 10-12 provides 3x Host 2.0 USB ports (Noise and Surge Protected) for general purpose applications:

- USB 0 on the rear side
- USB 1 on the rear side
- USB 2 on the left side (ready to interface optional USB accessories, e.g.: ReliaCELL 10-20).

9.8.1 USB 0 and USB 1 connectors specifications

Connector Layout:



Connector Specifications:

- USB Type-A socket
- Gender: Female

Mating Connector Specifications:

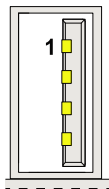
- USB Type-A plug
- Gender: Male

Connector Pinout:

Pin #	Signal	Type	Description
1	V+	P	+5V
2	D-	IO	Data-
3	D+	IO	Data+
4	GND	P	Ground

9.8.2 USB 2 connector specifications

Connector Layout:



Connector Specifications:

- USB Type-A socket
- Gender: Female

Mating Connector Specifications:

- USB Type-A plug
- Gender: Male

Connector Pinout:

Pin #	Signal	Type	Description
1	V+	P	+5V
2	D-	IO	Data-
3	D+	IO	Data+
4	GND	P	Ground

9.9 Expansion connector

The ReliaGATE 10-12 provides, on the right side, an expansion connector with the following interfaces:

- Additional USB OTG interface
- I²S Audio interface
- GPIO expansion interface
- I²C interface
- SPI interface

For more information see:

- ["Right Side Interface overview" on page 42](#)
- ["How to enable the 3.3V and 5V power supply on the Expansion connector" on page 86](#)
- ["Appendix 2: Expansion connector pin map with respect to device tree pin assignment" on page 115.](#)

9.9.1 Expansion connector specifications

Connector Layout:



Connector Specifications:

- 2mm dual row R/A header
- Gender: Female
- Type: 12*2-pin; 2.0 mm pitch

Mating Connector Specifications:

- 2mm dual row R/A header
- Gender: Male
- Type: 12*2-pin; 2.0 mm pitch
- Example:
Manufacturer: Pinrex
Part Number: 221-92-12GB51
(or equivalent)

Connector Pinout:

Pin #	Signal	Type	Description
1	VCC 3v3 EXT	P	3.3V/100mA max power supply
2	GND	P	Ground
3	VCC 5v_EXT	P	5V/1A max power supply
4	USB_EXP+	IO	USB data positive
5	USB_EXP-	IO	USB data negative
6	GND	P	Ground
7	MCASP0_FSX	IO	I2S audio or GPIO
8	MCASP0_AXR0	IO	I2S audio or GPIO
9	MCASP0_ACLKX	IO	I2S audio or GPIO
10	MCASP0_AXR1	IO	I2S audio or GPIO
11	GND	P	Ground
12	Reserved	-	Reserved
13	Reserved	-	Reserved
14	USB_EXP_EN	I	OTG detect or GPIO
15	GPIO_EXP_2	O	3.3V OUT enable (status)
16	GPIO_EXP_1	O	5V OUT enable (status)
17	GND	P	Ground
18	SPI1_D1	O/IO	SPI Data OUT or GPIO
19	SPI1_CS0	O/IO	SPI Chip select or GPIO
20	SPI1_D0	I/IO	SPI Data IN or GPIO
21	SPI1_SCLK	O/IO	SPI Clock or GPIO
22	GND	P	Ground
23	I2C1: SDA	IO	I2C Data
24	I2C1: SCL	O	I2C Clock

9.10 TTL Serial Console

The ReliaGATE 10-12 provides a 3.3 V TTL compatible Serial console in the Service Panel.

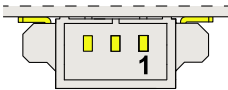
The voltage levels are as follows:

- Log 1 (Hi): 2.0 to 3.3 V
- Log 0 (Low): 0 to 0.8 V

For more information see: ["How the TTL Serial Console is exposed" on page 76.](#)

9.10.1 TTL Serial Console connector specifications

Connector Layout:



Connector Specifications:

- Shrouded header
- Gender: Male
- Type: Pitch 1.25 mm; 3-pin

Mating Connector Specifications:

- Connector Housing
- Gender: Female
- Type: Pitch 1.25 mm; 3-pin
- Example:
Manufacturer: Molex
Part Number: 51021-0300
(or equivalent)

Connector Pinout:

Pin #	Signal	Type	Description
1	GND	P	Ground
2	TX	O	Transmit Data
3	RX	I	Receive Data

9.11 MicroSD card holder

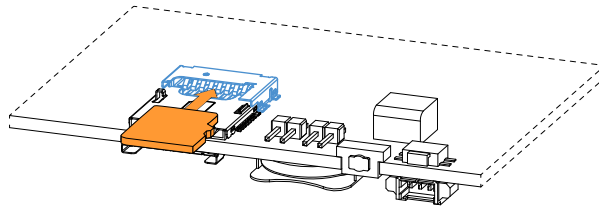
The MicroSD card holder is integrated in a Combo MicroSD (push-pull) + MicroSIM (pull-lever) cards holder, placed **on the top side** of the circuit board in the Service Panel.

The holder allows you to insert a MicroSD card (up to 32 GB) for additional data storage.

9.11.1 *How to insert / remove the MicroSD card in the holder*

To insert the MicroSD card, complete the following steps:

1. Orient the MicroSD card with the contacts facing the circuit board
2. Push the MicroSD card in the holder



To remove the Micro SD card, pull it out from the holder. Use your little finger or a pair of plastic tweezers to simplify the operation.

9.12 RTC (Real Time Clock)

The ReliaGATE 10-12 includes the following two RTC (Real Time Clocks) devices:

RTC device	Description	Use
/dev/rtc0	<ul style="list-style-type: none"> Internal (in the CPU SoC) 	Reserved
/dev/rtc1	<ul style="list-style-type: none"> External (I2C-based RTC device) Default RTC used by Linux Accuracy: 25 minutes per year (at 25 °C) 	User available

9.12.1 The RTC Device "/dev/rtc1"

The RTC device "/dev/rtc1" offers three timestamp registers.

For more information see: ["How the RTC is exposed" on page 87.](#)

9.12.2 The RTC backup battery


The ReliaGATE 10-12 includes a BR1225 lithium coin cell RTC battery in the Service Panel.

9.12.2.1 How to replace / install the battery

 **WARNING**

SERIOUS HARM IF BATTERY IS USED INCORRECTLY

Before using the battery always refer to battery manufacturer's instructions for safety.

 **CAUTION**

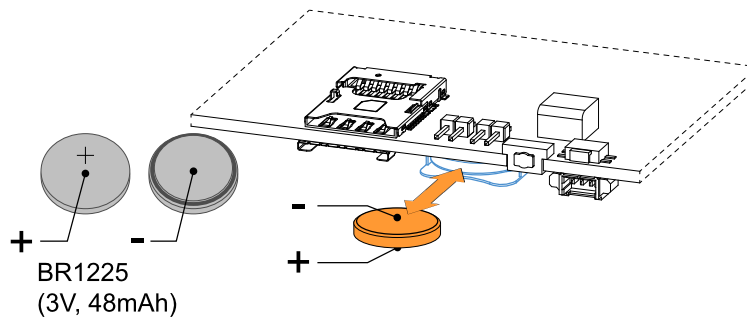
RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE

Use and replace only with correct size and type.

Dispose of used batteries according to battery manufacturer's instructions.

To replace/install a battery, complete the following steps:

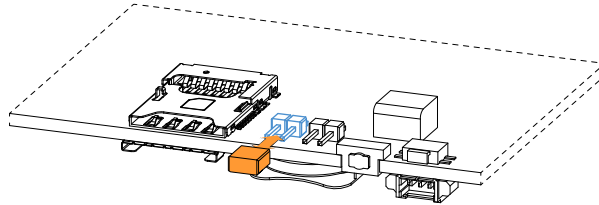
1. Disconnect the power cable from the product
2. Remove the old battery: use a pair of plastic tweezers to pull out the battery. Dispose of old battery properly
3. Insert a new battery with the minus "-" pole facing the circuit board.



9.12.2.2 How to enable/disable the battery

To enable/disable the battery, use the RTC battery jumper:

- Jumper inserted = Battery connected
- Jumper removed = Battery not connected



9.13 Watchdog

The ReliaGATE 10-12 includes a watchdog / supervisor IC, external to the CPU.

For more information see: ["How the Watchdog is exposed" on page 88.](#)

9.14 Accelerometer and Gyroscope

The ReliaGATE 10-12 includes a 3D digital accelerometer / 3D digital gyroscope that has the following characteristics:

- Full-scale acceleration range: $\pm 2/\pm 4/\pm 8/\pm 16$ g
- Angular rate range: $\pm 125/\pm 250/\pm 500/\pm 1000/\pm 2000$ dps.

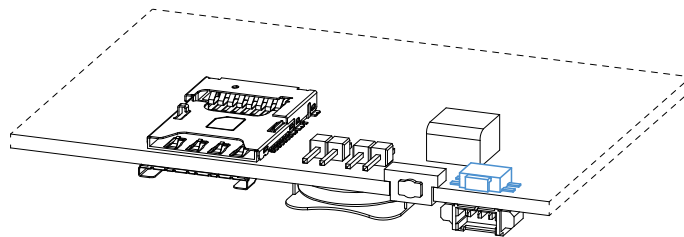
For more information see: ["How to output Accelerometer and Gyroscope values" on page 89.](#)

9.15 Programmable pushbutton

The ReliaGATE 10-12 provides a programmable pushbutton in the Service Panel.

The programmable pushbutton can be programmed to execute a shell script every time you push it.

For more information see: ["How to know the programmable pushbutton status" on page 90.](#)



10 THE SOFTWARE

10.1 The Linux OS distribution

Eurotech provides a Linux distribution based on a Yocto framework, www.yoctoproject.org, as well as an SDK for application development.

All the documentation for the developer is available from: www.yoctoproject.org/documentation.

10.2 The bootloader procedure

The ReliaGATE 10-12 boots from eMMC or SD card according to the status of the Boot selection jumper (JP2) available in the Service Panel:

JP2 status	Boot from	Note
Inserted	Micro-SD card. If the Micro-SD card is not found, the ReliaGATE 10-12 boots from eMMC.	This is the default configuration
Removed	eMMC	

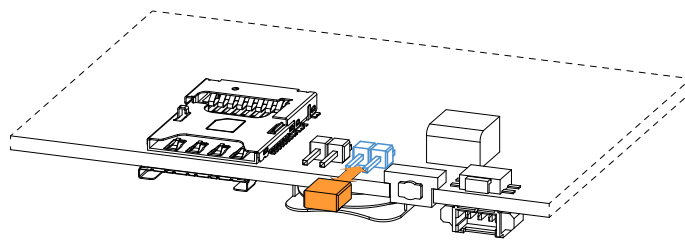


Figure 10.1 - Boot selection jumper (JP2) layout

For advanced boot options see "[Appendix 1: Advanced boot options](#)" on page 111.

10.3 How to create and use a bootable MicroSD card for a Linux release

To create a bootable micro SD card and use it to install the Linux release to the internal eMMC (flash) device, refer to the **README** file accompanying the Linux release.

10.4 Ensure power supply during installation and update

If the system only runs Linux: During installation and update, ensure a reliable source of power for the duration of the install process and for a period of 30 seconds after the first boot.

If the system runs ESF: During installation and update, ensure a reliable source of power for the duration of the install process and for a period of 3 minutes after the first boot.

NOTICE

If the power supply is interrupted prematurely, this may result in a file corruption. This failure will not be covered under warranty.

10.5 The TPM

The ReliaGATE 10-12 includes a TPM 2.0 hardware module: Infineon SLB9670. This is connected to the CPU via an SPI interface.

By default, the ReliaGATE 10-12 does not utilise the TPM device. It is therefore fully available for customer use. See ["The TPM and the tpm2-tools package" on page 90](#).

11 HOW TO LOGIN THE ADMINISTRATION CONSOLE

This section describes how to login the Administration Console to access the ReliaGATE 10-12 Linux Operating System.

To login the Administration Console, use one of the following methods:

- Direct login via Console Port
- Remote login via Secure Shell (SSH)

11.1 Default credentials

By default the system provides two users:

- guest
- root

The guest password is `Eurotech` and it provides non root privileges.

The root password is set by default to the serial number of the device

11.2 How to login using the Serial Console

To login using the Serial Console, complete the following steps:

1. Setup a Development PC (for example: a laptop) with a free USB port
2. Make sure that both the Development PC and the ReliaGATE 10-12 are turned OFF
3. Connect the TTL-to-USB Cable between the USB port (of the Development PC) and the TTL Serial Console (of the ReliaGATE 10-12)
4. Turn ON both the Development PC and the ReliaGATE 10-12
5. Use the Development PC to login the Administration Console:
 - a. Run a terminal emulator (example: Tera Term on Windows)
 - b. Configure the serial port connection with these parameters: 115200, 8 bits, 1 stop bit, no parity, no flow control
 - c. Enter the default case-sensitive credentials when the prompt appears (see "[Default credentials](#)" above).

You will obtain a video output like the following:

```
root
Password:
root@productname...:~#
```

11.3 How to Login Via Secure Shell (SSH)

The default (out-of-the-box) network configuration of the ReliaGATE 10-12 is as follows:

- **eth0**
 - Status: Enabled for LAN
 - Configure: Manually (Static IP)
 - IP Address: 172.16.0.1
 - Subnet Mask: 255.255.255.0
 - DHCP Server Enabled
- **eth1**
 - Status: Enabled for WAN
 - Configure: DHCP (DHCP client)
- **wlan0**
 - Status: Disabled

11.3.1 How to Login Via eth0

To login using eth0, complete the following steps:

1. Enter the command `ssh root@172.16.0.1`
2. At the prompt, enter the password (see ["Default credentials" on the previous page](#)).

11.3.2 How to Login via eth1

To login using eth1, you need to know its IP address. Use a zeroconf implementation to detect it.

By default, the ReliaGATE 10-12 runs a zeroconf implementation.

You can detect remotely the IP address of the ReliaGATE 10-12 by running the command: `avahi-discover`.

Example:

1. Run the command: `avahi-discover`. A dialog box pops-up reporting all the devices on your network that support this mechanism
2. In "eth1 IPv4" > "local" > "Workstation", you should see your product's hostname (example: `productname_serialnumber`). Select it to see its IP address
3. Login the ReliaGATE 10-12 using: `ssh root@productname_serialnumber.local`
4. At the prompt, enter the default password (see ["Default credentials" on the previous page](#)).

11.4 How to change the password

For security reasons, Eurotech recommends you to change the password of the "root" account after your initial setup.

To change the password, complete the following steps:

1. Login the Administration Console
2. Run the command `passwd`. You will be prompted to enter your old password for verification, and then a new password.

12 HOW TO MANAGE INTERFACES IN LINUX

Interfaces availability depends on product version.

If Everyware Software Framework (ESF) is installed, it will manage the network interfaces, cellular modem, Bluetooth adapter and GPIOs.

Any changes you make to the Linux configuration files may be overwritten if the related service is managed by ESF.

Refer to the ESF documentation for more information.

12.1 How to drive the GPIOs: the GPIO Utility

Several ReliaGATE 10-12 interfaces are controlled by their GPIOs.

To manage these interfaces, drive their GPIOs by using the GPIO Utility: `gpio_utility`.

`gpio_utility` allows you to:

- Read / Write a GPIO status
- Set a GPIO as input or output
- Unexport a GPIO.

The GPIOs are exported by default at startup.

To read the GPIO status (for example: the status of LED 1), enter the following command:

```
gpio_utility gpio117
```

The output is as follows:

- If LED 1 is ON, then `gpio117 = 1`
- If LED 1 is OFF, then `gpio117 = 0`

To set the GPIO status (for example: the status of LED 1), enter the following commands:

```
#turn led on
gpio_utility gpio117 1

#turn led off
gpio_utility gpio117 0
```

12.2 How to determine the version of Linux installed

To determine the version of Linux installed, enter the following command:

```
eurotech_versions
```

Example output:

```
eth_name_bsp: xxx  
eth_vers_bsp: Operating System version  
eth_partno_bsp: unknown  
eth_serial_number: xxx  
eth_model: xxx  
eth_partno_epr: unknown
```

12.3 How the storage memory is exposed

The ReliaGATE 10-12 exposes the storage memory as follows:

- Embedded Storage Memory: `/dev/mmcblk0`
- MicroSD Card Memory: `/dev/mmcblk1`

12.4 How to manage Wi-Fi and Bluetooth

The ReliaGATE 10-12 exposes the Wi-Fi and Bluetooth interfaces as follows:

- Wi-Fi interface: `wlan0`
- Bluetooth interface: `hci0`

The ReliaGATE 10-12 exposes the power supply of the Bluetooth as GPIO as follows:

- `/sys/class/gpio/gpio22/value`

To manage this GPIO, see ["How to drive the GPIOs: the GPIO Utility" on the previous page.](#)

NOTES:

- Turning the Bluetooth OFF and ON, does not automatically restart the daemon
- Wi-Fi power control is handled by the driver and is not user accessible.

12.5 How to manage the Internal Cellular Modem

The ReliaGATE 10-12 supports the following Telit LE910 modem variants, according to product versions based on the geographic area of usage:

Product version	Modem variant	Technology
-63, -65, -65G	Telit LE910-NA1 - North America	LTE Cat 1 3G Fallback
-64, -66, -66G	Telit LE910C1-EU - Europe	LTE Cat 1 2G/3G Fallback
-67, -67G	Telit LE910C1-AP - Japan	LTE Cat 1

Before using the modem:

1. Select the MicroSIM card holder to use
2. Refer to the Telit LE910 AT command reference guides for a full list of modem AT commands and example usage.

12.5.1 How to select the MicroSIM card holder to use

To select the top holder, use the following command:

```
telit-he910 chat 'AT#GPIO=2,1,1'
```

To select the bottom holder, use the following command:

```
telit-he910 chat 'AT#GPIO=2,0,1'
```

12.5.2 Note for LE910-NA1 Modem: AT&T / Verizon firmware support

The LE910-NA1 modem supports both AT&T and Verizon firmware.

The firmware used by the modem needs to be set the first time the modem is used. Once the modem firmware has been set, the same firmware will load on each modem reset.

A firmware switch between the two modem firmware versions can be performed during operation.

With dual SIM usage on the ReliaGATE 10-12 it is possible to load both an AT&T and a Verizon SIM into the MicroSIM card holders, and then switch between Verizon and AT&T firmware and their respective SIM cards to provided coverage on either network. Due to the firmware switch, simultaneous operation is not possible.

AT&T / Verizon firmware selection is performed using an AT command. This loads the respective AT&T / Verizon firmware, resets the modem, and then re-enumerates the device on the bus.

NOTE: Allow 20 seconds from the execution of the command before sending further AT commands to allow the device to be re-enumerates on the USB bus.

12.5.2.1 How to select the AT&T firmware

To select the AT&T firmware, use the following command:

```
telit-he910 chat `AT#FWSWITCH=0,1`
```

12.5.2.2 How to select the Verizon firmware

To select the Verizon firmware, use the following command:

```
telit-he910 chat `AT#FWSWITCH=1,1`
```

12.5.3 *How to disable/enable the diversity (CELL DIV) function*

To disable the diversity function, use the following command:

```
AT#RXDIV=0
```

The value set by the command is directly stored in the modem NVM, and it will be available at next power ON.

To enable the diversity function, use the following command:

```
AT#RXDIV=1
```

The value set by the command is directly stored in the modem NVM, and it will be available at next power ON.

12.6 How to manage the Internal GNSS

The ReliaGATE 10-12 exposes the GNSS as follows:

- /dev/ttyS5

You need to enable the GNSS before it will work.

To enable the GNSS, enter the following command:

```
gpio_utility gpio81 1
```

To prove that the positioning is working, dump the serial port output by entering the following commands:

```
stty -F /dev/ttyS5 raw speed 9600  
cat /dev/ttyS5
```

Example output:

```
$GNGSA,A,1,,,,,,,,,,,,,99.99,99.99,99.99*2E  
$GPGSV,1,1,00*79  
$GLGSV,1,1,00*65  
$GNGLL,,,,,V,N*7A  
$GNTXT,01,01,01,NMEA unknown msg*46  
$GNTXT,01,01,01,NMEA unknown msg*46  
$GNTXT,01,01,01,NMEA unknown msg*46
```

For more information on NMEA data, refer to <http://aprs.gids.nl/nmea/>.

12.7 How to manage the CAN ports

The ReliaGATE 10-12 exposes the CAN ports as follows:

- CAN 0 port: can0
- CAN 1 port: can1

CAN ports are added through the SocketCAN kernel extension.

For more information on SocketCAN refer to the Linux kernel documentation:

www.kernel.org/doc/Documentation/networking/can.txt

12.7.1 How to enable the CAN Bus 5V

To enable can0 5V, enter the following command:

```
gpio_utility gpio8 1
```

To enable can1 5V, enter the following command:

```
gpio_utility gpio9 1
```

12.7.2 How to setup a CAN port

To setup a CAN port, enter the following commands:

```
#Set CAN0 to work at 125 kbps
ip link set can0 type can bitrate 125000

#Open the connection
ip link set up can0
```

12.7.3 How to send/receive a message via a CAN port

Example: Sending / receiving a message via a CAN port (once the CAN port has been setup)

```
#Send a byte via CAN0
cansend can0 255

#Example of received message on can0
root@productname...:~# candump can0
interface = can0, family = 29, type = 3, proto = 1
<0x001> [1] 01
<0x001> [1] 02
<0x001> [1] 05
<0x001> [1] 00
<0x001> [1] ff
```

12.8 How the TTL Serial Console is exposed

The ReliaGATE 10-12 exposes the Console as follows:

- Console /dev/ttyS0 (available in the Service Panel)

12.9 How to manage the COM ports

The ReliaGATE 10-12 exposes the COM ports as follows:

- COM port 0 (RS-422/485): /dev/ttyO4 (available on the front side)
- COM port 1 (RS-232/485): /dev/ttyO3 (available on the front side)

You need to configure the serial ports mode before they will work.

12.9.1 How to set the termination resistors for COM 0 in RS-485 mode

The termination resistors are controlled with the "gpio_utility".

For more information see: "[How to drive the GPIOs: the GPIO Utility](#)" on page 71.

To enable the termination resistors, enter the following command:

```
gpio_utility GPIO2_3 1 &>/dev/null
```

To disable the termination resistors, enter the following command:

```
gpio_utility GPIO2_3 0 &>/dev/null
```

12.9.2 How to set the RS-422/485 modes for COM 0

You can configure the serial port mode in the following ways, A or B:

- A. Using the **ethsetserial** utility
- B. Implementing the **ioctl** in the source code

12.9.2.1 How to use the ethsetserial utility to configure the COM ports

To set COM port 0 to RS-422 mode, enter the following command:

```
ethsetserial -p ttyO4 -m422 -r1 -s1 -b0 -a0
```

To set COM port 0 to RS-485 mode, enter the following command:

```
ethsetserial -p ttyO4 -m485 -r0 -s1 -b100 -a100
```

To see all the available options, enter the following command:

```
ethsetserial -h
```

12.9.2.2 How to implement the ioctl in the source code to configure the COM ports

To implement the ioctl in the source code, enter the following commands:

```
/*Ioctl to read */
#define TIOCGRS485                0x542E

/*Ioctl to write */
#define TIOCERS485                0x542F
```

Definition of the flags bit

```
/*FLAGS */
//#define SER_RS485_ENABLED        (1 << 0)

/* Logical level for RTS pin when sending */
//#define SER_RS485_RTS_ON_SEND    (1 << 1)

/* Logical level for RTS pin after sent*/
//#define SER_RS485_RTS_AFTER_SEND (1 << 2)
//#define SER_RS485_RX_DURING_TX   (1 << 4)

/* Inverted logic level for RS485 gpio */
#define SER_RS485_INVERT           (1 << 5)

/* if enabled serial line drivers must be configured in HiZ*/
#define SER_HIZ_ENABLED            (1 << 31)
```

Linux kernel data structure

```
struct serial_rs485 {
    __u32  flags;                /* RS485 feature flags */
    __u32  delay_rts_before_send; /* Delay before send (milliseconds) */
    __u32  delay_rts_after_send;  /* Delay after send (milliseconds) */
    __u32  padding[5];           /* Memory is cheap, new structs
};
```

Example: Configuring COM 0 in RS-422 mode

ser_port_name has to be /dev/ttyO4

```

struct serial_rs485 rs485conf;
unsigned int rs_mode_mask=(SER_HIZ_ENABLED|SER_RS485_ENABLED|SER_RS485_
INVERT|SER_RS485_RTS_ON_SEND|SER_RS485_RTS_AFTER_SEND);

unsigned int set_flags=0;
unsigned int set_flags_mask=rs_mode_mask;

int fd;
fd=open(ser_port_name,O_RDWR);
if (fd==-1)
{
/* process the error */
...
}

/* get serial port configuration */
if (ioctl (fd, TIOCGRS485, & rs485conf) < 0)
{
/* process the error */
...
}

rs485conf.flags&=~ set_flags_mask;
set_flags&=set_flags_mask;
rs485conf.flags|= set_flags;

/*set delay but not used in rs232 mode */
rs485conf.delay_rts_after_send=<delay after send in ms>;
rs485conf.delay_rts_before_send=<delay before send in ms>;

/* apply changes */
if (ioctl (fd, TIOCSRS485, & rs485conf) < 0)
{
/* process the error */
...
}
close(fd);

```

Example: Configuring COM 0 in RS-485 mode

ser_port_name has to be /dev/ttyO4

```
struct serial_rs485 rs485conf;
unsigned int rs_mode_mask=(SER_HIZ_ENABLED|SER_RS485_ENABLED|SER_RS485_
INVERT|SER_RS485_RTS_ON_SEND|SER_RS485_RTS_AFTER_SEND);

unsigned int set_flags=(SER_RS485_INVERT|SER_RS485_ENABLED|SER_RS485_RTS_ON_
SEND);
unsigned int set_flags_mask=rs_mode_mask;

int fd;
fd=open(ser_port_name,O_RDWR);
if (fd==-1)
{
/* process the error */
...
}

/* get serial port configuration */
if (ioctl (fd, TIOCGRS485, & rs485conf) < 0)
{
/* process the error */
...
}

rs485conf.flags&=~ set_flags_mask;
set_flags&=set_flags_mask;
rs485conf.flags|= set_flags;

/*set delays */
rs485conf.delay_rts_after_send=<delay after send in ms>;
rs485conf.delay_rts_before_send=<delay before send in ms>;

/* apply changes */
if (ioctl (fd, TIOCSRS485, & rs485conf) < 0)
{
/* process the error */
...
}
close(fd);
```


12.9.3 **How to set the RS-232/485 modes for COM 1**

You can configure the serial port mode in the following ways, A or B:

- A. Using the **ethsetserial** utility
- B. Implementing the **ioctl** in the source code

12.9.3.1 **How to use the ethsetserial utility to configure the COM ports**

To set COM port 1 to RS-232 mode, enter the following command:

```
ethsetserial -p ttyO3 -m232
```

To set COM port 1 to RS-485 mode, enter the following command:

```
ethsetserial -p ttyO3 -m485 -r0 -s1 -b100 -a100
```

To see all the available options, enter the following command:

```
ethsetserial -h
```

12.9.3.2 How to implement the ioctl in the source code to configure the COM ports

To implement the ioctl in the source code, enter the following commands:

```
/*Ioctl to read */
#define TIOCGRS485                0x542E

/*Ioctl to write */
#define TIOCERS485                0x542F
```

Definition of the flags bit

```
/*FLAGS */
//#define SER_RS485_ENABLED        (1 << 0)

/* Logical level for RTS pin when sending */
//#define SER_RS485_RTS_ON_SEND    (1 << 1)

/* Logical level for RTS pin after sent*/
//#define SER_RS485_RTS_AFTER_SEND (1 << 2)
//#define SER_RS485_RX_DURING_TX   (1 << 4)

/* Inverted logic level for RS485 gpio */
#define SER_RS485_INVERT           (1 << 5)

/* if enabled serial line drivers must be configured in HiZ*/
#define SER_HIZ_ENABLED            (1 << 31)
```

Linux kernel data structure

```
struct serial_rs485 {
    __u32  flags;                /* RS485 feature flags */
    __u32  delay_rts_before_send; /* Delay before send (milliseconds) */
    __u32  delay_rts_after_send;  /* Delay after send (milliseconds) */
    __u32  padding[5];           /* Memory is cheap, new structs
};
```

Example: Configuring COM 1 in RS-232 mode

ser_port_name has to be /dev/ttyO3

```

struct serial_rs485 rs485conf;
unsigned int rs_mode_mask=(SER_HIZ_ENABLED|SER_RS485_ENABLED|SER_RS485_
INVERT|SER_RS485_RTS_ON_SEND|SER_RS485_RTS_AFTER_SEND);

unsigned int set_flags=0;
unsigned int set_flags_mask=rs_mode_mask;

int fd;
fd=open(ser_port_name,O_RDWR);
if (fd==-1)
{
/* process the error */
...
}

/* get serial port configuration */
if (ioctl (fd, TIOCGRS485, & rs485conf) < 0)
{
/* process the error */
...
}

rs485conf.flags&=~ set_flags_mask;
set_flags&=set_flags_mask;
rs485conf.flags|= set_flags;

/*set delay but not used in rs232 mode */
rs485conf.delay_rts_after_send=<delay after send in ms>;
rs485conf.delay_rts_before_send=<delay before send in ms>;

/* apply changes */
if (ioctl (fd, TIOCSRS485, & rs485conf) < 0)
{
/* process the error */
...
}
close(fd);

```

Example: Configuring COM 1 in RS-485 mode

ser_port_name has to be /dev/ttyO3

```

struct serial_rs485 rs485conf;
unsigned int rs_mode_mask=(SER_HIZ_ENABLED|SER_RS485_ENABLED|SER_RS485_
INVERT|SER_RS485_RTS_ON_SEND|SER_RS485_RTS_AFTER_SEND);

unsigned int set_flags=(SER_RS485_INVERT|SER_RS485_ENABLED|SER_RS485_RTS_ON_
SEND);
unsigned int set_flags_mask=rs_mode_mask;

int fd;
fd=open(ser_port_name,O_RDWR);
if (fd==-1)
{
/* process the error */
...
}

/* get serial port configuration */
if (ioctl( fd, TIOCGRS485, & rs485conf) < 0)
{
/* process the error */
...
}

rs485conf.flags&=~ set_flags_mask;
set_flags&=set_flags_mask;
rs485conf.flags|= set_flags;

/*set delays */
rs485conf.delay_rts_after_send=<delay after send in ms>;
rs485conf.delay_rts_before_send=<delay before send in ms>;

/* apply changes */
if (ioctl( fd, TIOCSRS485, & rs485conf) < 0)
{
/* process the error */
...
}
close(fd);

```

12.9.4 How to test a serial port

To test the serial port, use the microcom utility:

```

#connect ttyO3 with a baud rate of 9600
microcom /dev/ttyO3 -s 9600

```

The microcom utility:

- Allows you to transmit / receive data to / from the serial port
- Does not include a local echo (you cannot see the data sent).

12.10 How to manage the Digital I/Os

The ReliaGATE 10-12 exposes the Digital I/Os (GPIOs) as follows:

- Digital Input 1: `/sys/class/gpio/gpio26/value`
- Digital Input 2: `/sys/class/gpio/gpio27/value`
- Digital Output 1: `/sys/class/gpio/gpio87/value`
- Digital Output 2: `/sys/class/gpio/gpio89/value`

To manage these GPIOs, see ["How to drive the GPIOs: the GPIO Utility"](#) on page 71.

12.11 How to manage the LED Indicators

The ReliaGATE 10-12 exposes the LED Indicators as follows:

- LED 1 (green): `/sys/class/gpio/gpio117/value`
- LED 2 (green): `/sys/class/gpio/gpio114/value`
- LED 3 (amber): `/sys/class/gpio/gpio115/value`
- LED 4 (amber): `/sys/class/gpio/gpio116/value`
- LED 5 (green): Reserved
- LED 6 (blue): Reserved

To manage these GPIOs, see ["How to drive the GPIOs: the GPIO Utility"](#) on page 71.

12.12 How the Ethernet ports are exposed

The ReliaGATE 10-12 exposes the Ethernet ports as follows:

- Ethernet 0 port: `eth0`
- Ethernet 1 port: `eth1`.

12.13 How to enable the 3.3V and 5V power supply on the Expansion connector

3.3V and 5V are OFF by default and are controlled driving specific GPIO's.

To control the 3.3V, enter the following commands:

```
#turn on 3.3V
gpio_utility gpio71 1

#turn off 3.3V
gpio_utility gpio71 0
```

To control the 5V, enter the following commands:

```
#turn on 5V
gpio_utility gpio70 1

#turn off 5V
gpio_utility gpio70 0
```

While the default kernel DTB allows access to these power control pins, depending on the device tree used, control of these power supplies is handled by the kernel and therefore it may not be possible to control them from user space.

For more information see:

- ["Right Side Interface overview" on page 42](#)
- ["Expansion connector" on page 62](#)
- ["Appendix 2: Expansion connector pin map with respect to device tree pin assignment" on page 115.](#)

12.14 How the RTC is exposed

The ReliaGATE 10-12 exposes the RTC as follows:

- RTC: `/dev/rtc1`

`/dev/rtc1` offers three read-only timestamp registers:

Timestamp register	What it contains
<code>sys/class/rtc/rtc1/device/timestamp1</code>	Reserved data
<code>sys/class/rtc/rtc1/device/timestamp2</code>	The timestamp that the system last lost power (only if a successful initialization has been achieved)
<code>sys/class/rtc/rtc1/device/timestamp3</code>	The timestamp that the system last has been powered (only if a successful initialization has been achieved)

To read a timestamp (for example: `timestamp2`), enter the following command:

```
cat /sys/class/rtc/rtc1/device/timestamp2
```

12.15 How the Watchdog is exposed

The ReliaGATE 10-12 exposes the watchdog as follows:

- Watchdog: /dev/watchdog1

12.15.1 How to manage the Watchdog using the C programming language

To manage the watchdog using the C programming language enter the following commands:

```

Int interval;
Int bootstatus;
Long value;

/* display current watchdog value */
If (ioctl(fd,WDIOC_GETTIMEOUT,&interval)==0)
{
    // interval contains current timeout in seconds
}

/* Check if last boot is caused by watchdog */
If (ioctl(fd,WDIOC_GETBOOTSTATUS,&bootstatus)==0)
{
    //bootstatus <> 0 Watchdog
    //bootstatus = 0 Power-on reset
}

/* set the watchdog value (for example: 30 seconds) */
value=30;
If (ioctl(fd,WDIOC_SETTIMEOUT,&value)==0)
{
    //Watchdog has been set to value content
}

/* stop the watchdog */
write(fd,"V",1);

/* feed the watchdog */
ioctl(fd,WDIOC_KEEPAALIVE,0);

```

12.15.2 How to manage the Watchdog from the command line

To set the watchdog value (for example: 30 seconds), enter the following command:

```
wdt_setup -d /dev/watchdog1 -t 30
```

To start and feed the watchdog, enter the following command:

```
echo 1 > /dev/watchdog1
```

To stop the watchdog, enter the following command:

```
echo V > /dev/watchdog1
```

12.15.3 For more information

For more information on Linux support for watchdog, see:

www.kernel.org/doc/Documentation/watchdog/watchdog-api.txt

12.16 How to output Accelerometer and Gyroscope values

The ReliaGATE 10-12 includes a 3D digital accelerometer / 3D digital gyroscope:

- The accelerometer is exposed as `cat /sys/bus/iio/devices/iio\:device1`
- The gyroscope is exposed as `cat /sys/bus/iio/devices/iio\:device0`

To output the three-dimensional values for the accelerometer, use the following commands:

```
watch -n 1 cat /sys/bus/iio/devices/iio\:device1/in_anglvel_x_raw  
watch -n 1 cat /sys/bus/iio/devices/iio\:device1/in_anglvel_y_raw  
watch -n 1 cat /sys/bus/iio/devices/iio\:device1/in_anglvel_z_raw
```

To output the three-dimensional values for the gyroscope, use the following commands:

```
watch -n 1 cat /sys/bus/iio/devices/iio\:device0/in_accel_x_raw  
watch -n 1 cat /sys/bus/iio/devices/iio\:device0/in_accel_y_raw  
watch -n 1 cat /sys/bus/iio/devices/iio\:device0/in_accel_z_raw
```

12.17 How to read the Internal Temperature Sensor

The ReliaGATE 10-12 is provided with a sensor that measures the temperature inside the product.

To read the internal temperature, enter the following command:

```
cat /sys/class/hwmon/hwmon0/temp1_input
```

12.18 How to know the programmable pushbutton status

The programmable pushbutton can be programmed to execute a shell script every time the button is pushed. The script is located at `/usr/bin/switch_script.sh` and can be customized according to the needs of the user.

To know the programmable pushbutton status, enter the following command:

```
gpio_utility gpio74
```

The output is as follows:

- If the button is pushed, then `value = 0`
- If the button is not pushed, then `value = 1`.

12.19 The TPM and the tpm2-tools package

The TPM 2.0 device is fully supported by Linux via the `tpm2-tools` package that is pre-installed in the image.

The `tpm2-tools` package includes many commands used to setup and manage the TPM.

For more information refer to the following table:

Subject	Link
How to use tpm2-tools	https://github.com/tpm2-software/tpm2-tools/wiki/How-to-use-tpm2-tools
Information on the TPM hardware	https://www.infineon.com/cms/en/product/security-smart-card-solutions/optiga-embedded-security-solutions/optiga-tpm/slb-9670vq2.0/

12.20 Optional: How to manage the ReliaCELL power supply

If the ReliaCELL is installed, the ReliaGATE 10-12 exposes the ReliaCELL power supply as a GPIO as follows:

- `/sys/class/gpio/gpio73/value`

To manage this GPIO, see "[How to drive the GPIOs: the GPIO Utility](#)" on page 71.

13 HOW TO COMPILE CUSTOM SOFTWARE

13.1 How to setup the toolchain

To setup the toolchain, complete the following steps:

1. Make sure you're using the correct toolchain version corresponding to the Yocto image installed on your gateway.

The latest toolchain and Yocto image for your ReliaGATE 10-12 are available here:

<https://eurotech.github.io/linux-releases/>

2. Download the binary file (x86_64 version tested) on a Virtual/physical machine running Ubuntu (14.04 tested), execute it and select appropriate installation options
3. Once the installation is complete, switch to superuser (`sudo su`)
4. To setup the correct environment variables, run:

```
source /opt/poky/2.3.2/environment-setup-cortexa8hf-neon-poky-linux-gnueabi
cd /opt/poky/2.3.2/sysroots/cortexa8hf-neon-poky-linux-gnueabi/usr/kernel
make scripts
```

5. Exit superuser mode

13.2 How to use the toolchain to compile custom software

To use the toolchain to compile custom software, complete the following steps:

1. Setup the environment variables using:

```
source /opt/poky/2.3.2/environment-setup-cortexa8hf-neon-poky-linux-gnueabi
```

2. To directly compile a user-space C source file `hello_world.c`, use

```
$CC hello_world.c
```

3. To compile a kernel module `kernel_module.c`, configure your Makefile to point to the kernel directory and include the `.config` file in the kernel directory. Here's an example of Makefile:

```
KBLD := /opt/poky/2.3.2/sysroots/cortexa8hf-neon-poky-linux-gnueabi/usr/kernel -
include $(KBLD)/.config
obj-m :=kernel_module.o
all : modules
modules clean :
$(MAKE) -C $(KBLD) M=$(PWD) $@
```

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14 EUROTECH EVERYWARE IoT

Eurotech Everyware IoT is a combination of hardware, firmware, operating systems, programming frameworks, and cloud platforms. It enables you to layer you added-value components on a reliable ready-to-use infrastructure, dramatically accelerating the time to market of your IoT projects.

14.1 Everyware Software Framework (ESF)

Everyware Software Framework (ESF) Edge Computing Platform is a high-level, multi-platform and flexible application development environment.

ESF is a smart application container that enables remote management of IoT gateways and provides a wide range of APIs allowing you to write and deploy your own IoT application.

ESF allows the connection and communication with field devices (close to data sources), thanks to already tested libraries for field protocol communication, the visual IoT Edge Computing applications development and the connection with leading IoT Cloud Services such as Everyware Cloud (Eurotech IoT Integration Platform), Eclipse Kapua, AWS IoT and Microsoft Azure IoT.

ESF runs on top of the Java Virtual Machine (JVM) and leverages OSGi (a dynamic component system for Java) to simplify the process of writing reusable software building blocks.

ESF APIs offer:

- Easy access to the underlying hardware including: serial ports, positioning, watchdog, USB, GPIOs, I2C, etc.
- OSGi bundles to simplify the management of network configurations, the communication with IoT servers, and the remote management of the gateway.

ESF is based on Kura, the popular Eclipse open source project that was originally contributed to the Eclipse community by Eurotech.

14.2 The ESF Web UI

ESF provides a web-based user interface: **ESF Web UI**.

The ESF Web UI provides several functions such as:

- Monitor the gateway status
- Manage the network configuration
- Oversee the installed application(s) and services.

The ESF Web UI is available on port 80 of the gateway IP.

The default user is: *admin*

The default password is: *admin*

The following picture shows an example of the ESF Web UI:

The screenshot displays the ESF Web UI interface. On the left is a navigation sidebar with sections for 'System' and 'Services'. The 'System' section includes links for Status, Device, Network, Firewall, Cloud Services, Drivers and Assets, Wires, Packages, and Settings. The 'Services' section includes a search bar and a list of services: Simple Artemis MQTT Broker, ActiveMQ Artemis Broker, ClockService, DeploymentService, CommandService, WebConsole, and DiagnosticsService. The main content area is titled 'Status' and features a 'Refresh' button. Below this, there are three main sections: 'Cloud Services', 'Wireless Settings', and 'Ethernet Settings'. The 'Cloud Services' section shows a table with columns for 'Connection Name' and 'Service Status'. The 'Wireless Settings' section shows details for the 'wlan0' interface. The 'Ethernet Settings' section shows details for the 'eth1' and 'eth0' interfaces.

Status	
Refresh	
Cloud Services	
Connection Name	org.eclipse.kura.cloud.CloudService
Service Status	CONNECTED
Auto-connect	ON (Retry Interval is 60s)
Broker URL	ssl://broker-sandbox.everyware-cloud.com:8883
Account	[REDACTED]
Username	[REDACTED]
Client ID	[REDACTED]
Wireless Settings	
wlan0	Subnet Mask: Mode: LAN IP Acquisition: DHCP Router Mode: Wireless Mode: Station Mode SSID: ET-CMD-WIFI01
Ethernet Settings	
eth1	192.168.3.136 Subnet Mask: 255.255.255.0 Mode: WAN IP Acquisition: DHCP Router Mode:
eth0	172.16.0.1 Subnet Mask: 255.255.255.0 Mode: LAN IP Acquisition: Manual

14.3 The ESF Wires application

ESF provides also a dataflow programming model: **Wires**.

Wires simplifies the development of Edge Computing Applications leveraging reusable configurable components.

In the dataflow programming model, the application logic is expressed as a directed graph (flow) where each node can have inputs, outputs and independent processing units.

The processing unit of a node executes independently and does not affect the execution of other nodes. Thus, the nodes are highly reusable and portable.

The screenshot displays the ESF Wires application interface. On the left is a navigation sidebar with sections for System, Services, and Wire Components. The main area shows a 'Wire Graph' with three nodes: 'TIMER', 'MODBUSASSET', 'LOGGER', and 'PUBLISHER'. Arrows indicate a flow from 'TIMER' to 'MODBUSASSET', and from 'MODBUSASSET' to both 'LOGGER' and 'PUBLISHER'. Below the graph is a configuration table for 'Channels (modbusDriver)'. The table has columns for name, type, value type, unit.id, primary.table, memory.address, and data.ort. It lists three channels: Temperature, Humidity, and Pressure, all with a type of 'READ' and value type of 'INTEGER'.

name	type	value type	unit.id	primary.table	memory.address	data.ort
Temperature	READ	INTEGER	1	INPUT_REGISTERS	1000	MSW
Humidity	READ	INTEGER	1	INPUT_REGISTERS	1500	MSW
Pressure	READ	INTEGER	1	INPUT_REGISTERS	2000	MSW

14.4 Everyware Cloud (EC)

Eurotech's Everyware™ Cloud (EC) is an IoT Integration Platform that simplifies system and data management by connecting distributed devices over secure and reliable cloud services.

Everyware Cloud allows you to connect, configure and manage devices through all the lifecycle, from deployment through maintenance to retirement.

With EC you can:

- Connect any sensor, device or asset to the platform to quickly create new IoT scenarios
- Dynamically and remotely create and add new services and functions to your field devices
- Configure the platform to analyze data in real-time and trigger immediate alerts
- Leverage a device-specific message-oriented infrastructure for fast and easy creation of reliable, device-independent IoT applications
- Integrate MVNO Connectivity Platforms to have a single point of management of Connected Devices and associated SIM cards
- Enable IoT Analytics through built-in connectors to on-line Dashboards and Analytical Reports
- Enable IoT Business Application Integrations through native REST APIs

14.5 For more information

For more information and tutorials about ESF and EC, refer to the following links:

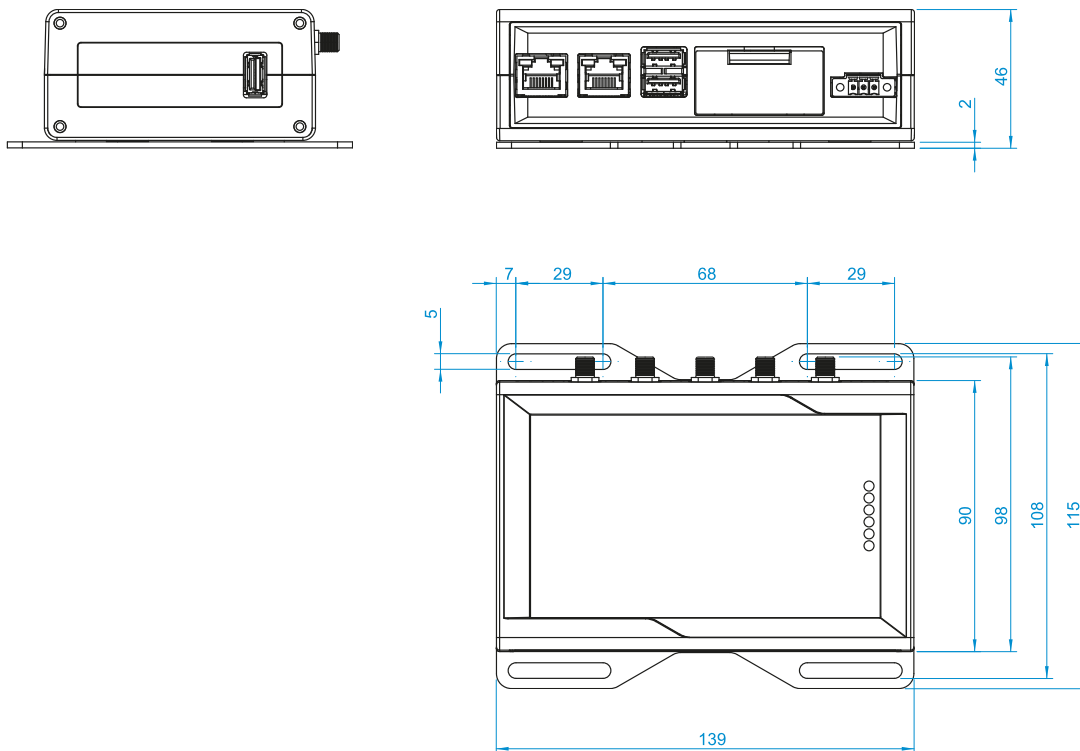
Information	Available at
ESF Website	esf.eurotech.com
ESF Download	www.eurotech.com/download/en/pb.aspx?pg=ESF (click the <i>Developer Environment</i> tab)
EC Integration Platform	everyware+cloud+m2m+platform
EC Developer's Guide	everywarecloud.eurotech.com/doc/ECDevGuide/
Kura Website	eclipse.org/kura/

15 MECHANICAL SPECIFICATIONS

15.1 Product mechanical dimensions

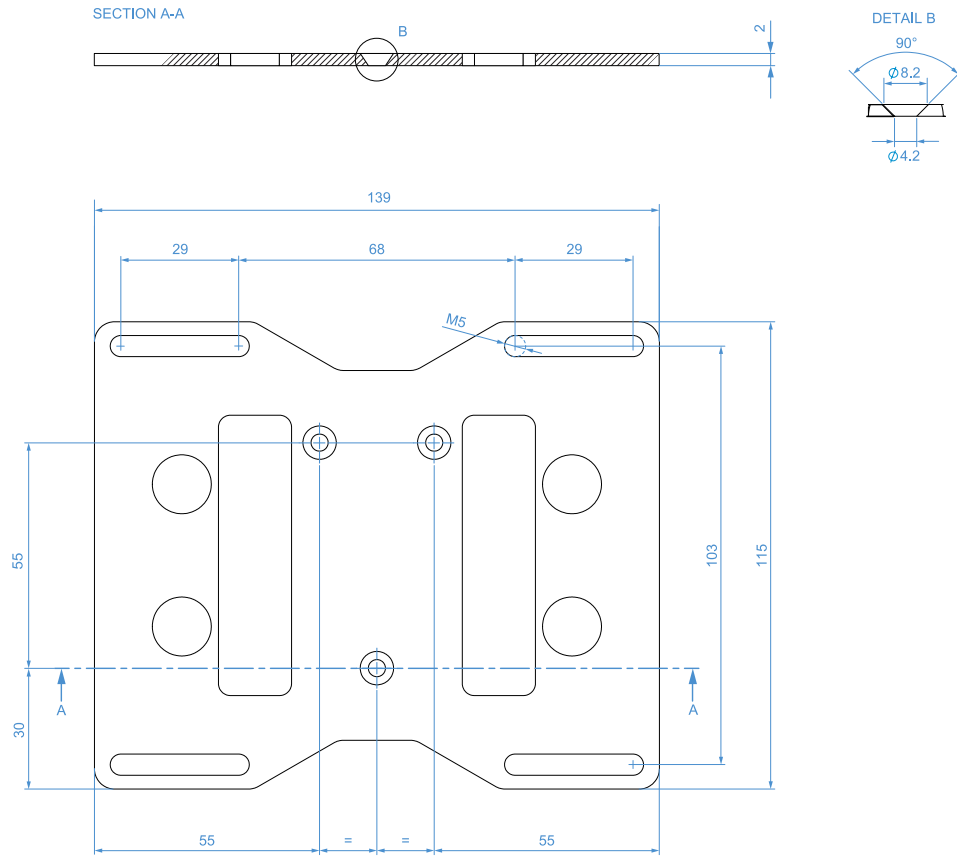
The product electronics are housed in an ABS enclosure having the following dimensions: 139 (L) x 115 (W) x 46 (H); mm - Antennas Connectors and Mounting Bracket included.

All dimensions are in millimeters.



15.2 Mounting bracket mechanical dimensions

The Mounting Bracket fastened on the bottom side of the ReliaGATE 10-12 has the following dimensions. All dimensions are in millimeters.



16 HOW TO INSTALL THE PRODUCT

The product is intended for professional use and must be installed by qualified personnel only. The product must be installed in a secured location, accessible to authorized personnel only (for example in a cabinet / technical compartment).

By default, the ReliaGATE 10-12 comes with a Mounting Bracket fastened on the bottom side. You can use this Mounting Bracket to install the ReliaGATE 10-12.

Optionally, you can replace the Mounting Bracket with the DIN Rail Mounting Clip (optionally available). You can then use this DIN Rail Mounting Clip to install the ReliaGATE 10-12.

See also:

- ["How to install the product using the Mounting Bracket" below](#)
- ["How to replace the Mounting Bracket with the DIN Rail Mounting Clip or vice versa" on the next page](#)
- ["How to install/ remove the product on/ from a DIN Rail" on page 103](#)

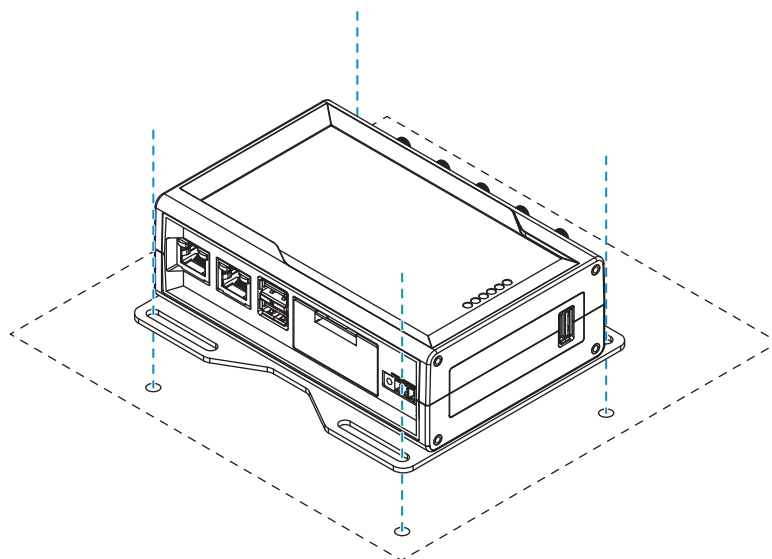
16.1 How to install the product using the Mounting Bracket

To install the product in place, complete the following steps:

1. See ["Mechanical specifications" on page 97](#)
2. Use the 4 slots available on the Mounting Bracket
3. Add all the necessary mounting hardware to safely fasten the ReliaGATE 10-12 in place according to your installation requirements (for example use 4x M5 screws, with a minimum length of 15 mm). **Material, type, and length of the screws, and the maximum torque applicable, depend on your installation requirements.**

To simplify the installation, the ReliaGATE 10-12 is already provided with a Mounting Bracket. The Mounting Bracket is made of 2 mm aluminum alloy 6061 T6.

In case of uncertainties contact the Eurotech Technical Support Team (see ["How to receive technical assistance" on page 17](#)).



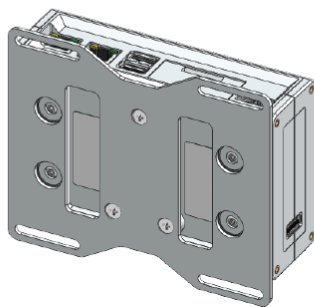
16.2 How to replace the Mounting Bracket with the DIN Rail Mounting Clip or vice versa

16.2.1 How to replace the Mounting Bracket with the DIN Rail Mounting Clip

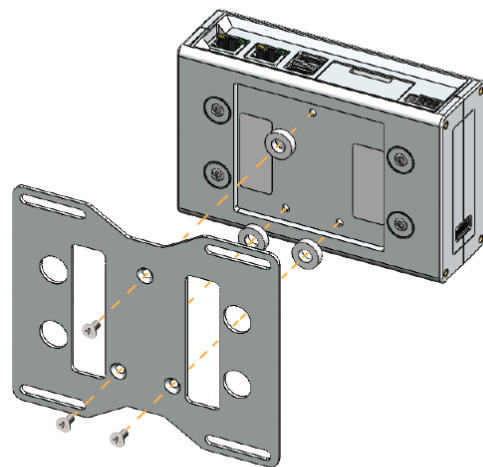
To replace the Mounting Bracket with the DIN Rail Mounting Clip on the product, complete the following steps:

1. Remove the 3 screws that hold the Mounting Bracket in place
2. Remove the Mounting Bracket and the 3 spacers (H = 4mm; Ext. diam. = 14mm; Int. diam. = 7mm)
3. Place the DIN Rail Mounting Clip
4. Tighten the 3 screws removed at step 1 by applying a torque of 0.7 Nm

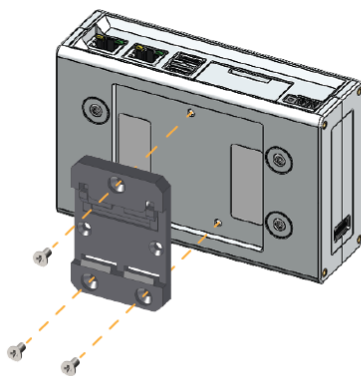
①



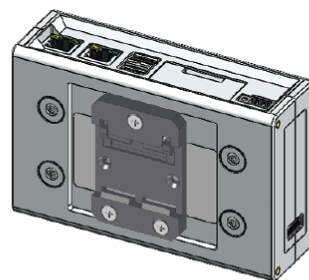
②



③



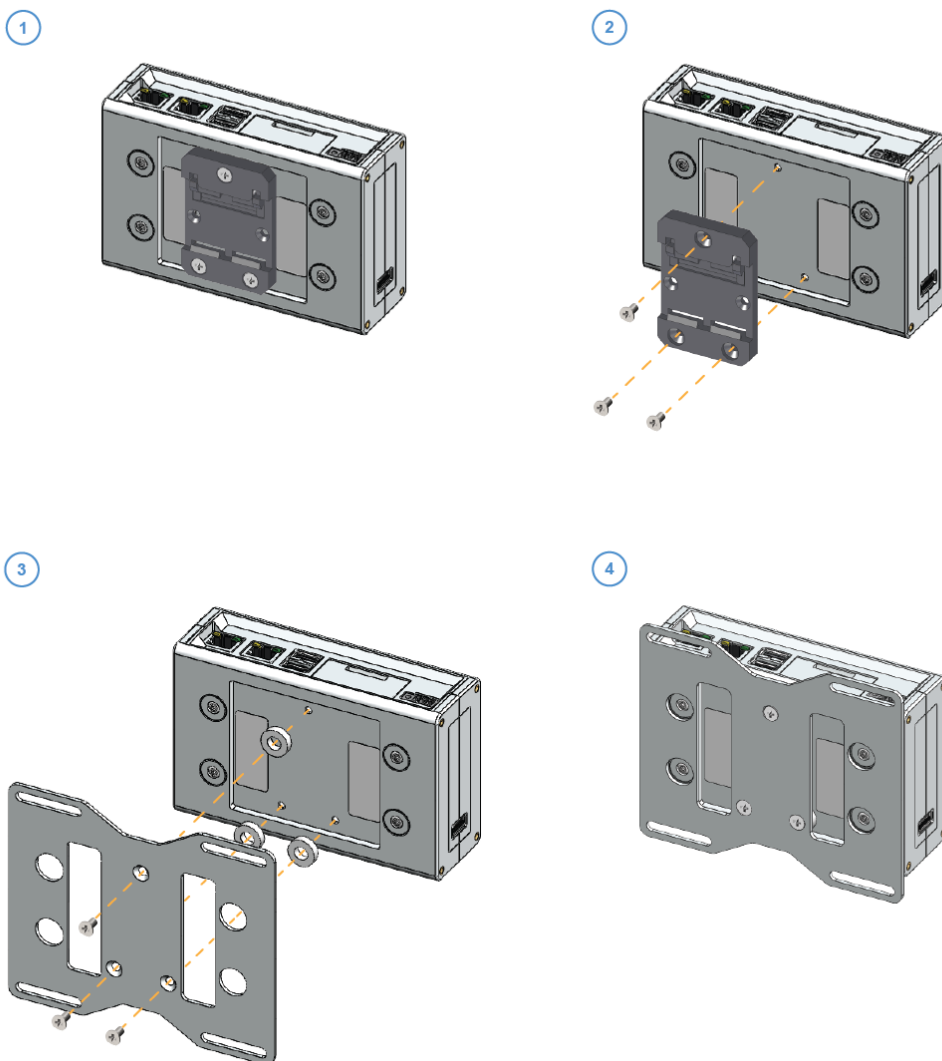
④



16.2.2 How to replace the DIN Rail Mounting Clip with the Mounting Bracket

To replace the DIN Rail Mounting Clip with the Mounting Bracket on the product, complete the following steps:

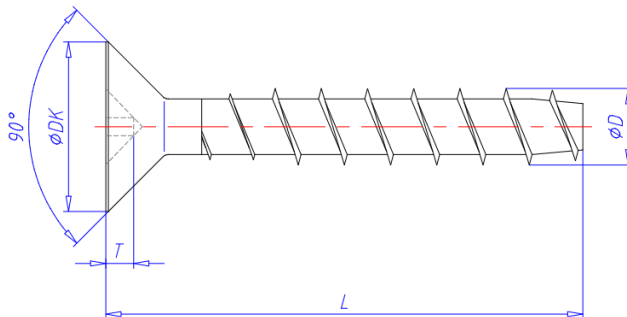
1. Remove the 3 screws that hold the DIN Rail Mounting Clip in place
2. Remove the DIN Rail Mounting Clip
3. Place the 3 spacers (H = 4mm; Ext. diam. = 14mm; Int. diam. = 7mm) and the Mounting Bracket
4. Tighten the 3 screws removed at step 1 by applying a torque of 0.7 Nm



16.2.3 Which screws are used with the Mounting Bracket or with the DIN Rail Mounting Clip

The 3 screws that hold in place the Mounting Bracket or the DIN Rail Mounting Clip have the following features:

- Phillips type H cross flat countersunk head screw KA35x12
- Fully threaded
- Stainless steel
- Example of Manufacturer and Part Number: Bossard BN 13580 2000997



Reference	Value (mm)
ΦDK	7.3
T	1.3
L	12
ΦD	3.5

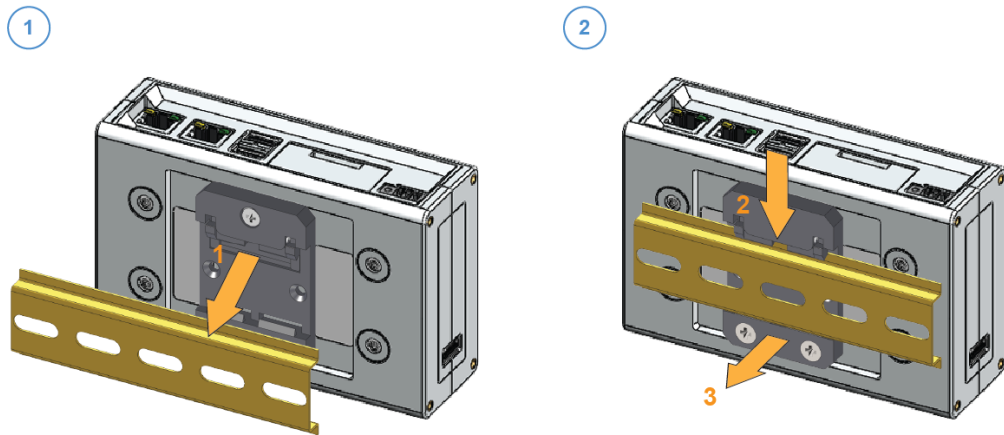
16.3 How to install/ remove the product on/ from a DIN Rail

16.3.1 How to install the product on a DIN Rail

Prerequisite: Replace the Mounting Bracket with the DIN Rail Mounting Clip

To install the product on a horizontal DIN rail, complete the following steps:

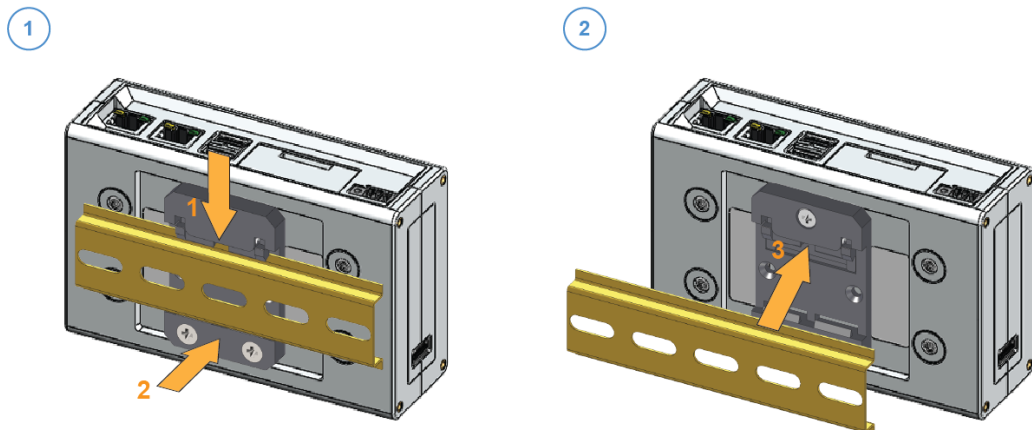
1. Hook the upper mobile latches of the DIN Rail Mounting Clip on the upper edge of the DIN rail
2. Push the product against the DIN rail. The lower latches of the DIN Rail Mounting Kit are locked on the DIN rail.



16.3.2 How to remove the product from a DIN Rail

To remove the product from a horizontal DIN rail, complete the following steps:

1. Push downwards the upper mobile latches of the DIN Rail Mounting Clip. The lower latches are released from the DIN rail
2. Pull the product out



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17 POWER SUPPLY. HOW TO TURN ON/OFF AND RESET THE PRODUCT

This product is not provided with any ON/OFF switch.
 The Power IN connector is the disconnecting means from the power supply network.

17.1 Power supply specifications

Power supply	Nominal: 12 or 24 VDC; Range: 9 to 30 VDC with transient protection
Power consumption	2 W idle; 15 W maximum
Peak demand	< 15 W

17.2 Power IN connector specifications

The power input is protected against: surge, noise, reverse polarity, over-voltage.

NOTICE

The Power IN connector is NOT protected against short circuit.
Always include an external fuse to protect the product!

The ReliaGATE 10-12 provides the Power IN connector on the rear side.

Connector Layout:



Connector Specifications:

- Base strip, Header
- Gender: Male
- Type: 3-pin, 3.5 mm pitch

Mating Connector Specifications:

- Pluggable screw terminal block
- Gender: Female
- Type: 3-pin, 3.5 mm pitch
- Example:
 - Manufacturer: Phoenix Contact
 - Part Number: MC 1,5/3-STF-3,5 - 1847068
 - (or equivalent)

Connector Pinout:

Pin #	Signal	Type	Description
1	Power IN +	P	Positive power supply input
2	Power IN -	P	Negative power supply input
3	NC	NC	Not Connected

17.3 How to supply power and turn ON the product



WARNING

ELECTRIC SHOCK HAZARD

Failure to supply power correctly or to follow all operating instructions correctly, may create an electric shock hazard, which could result in personal injury or loss of life, and / or damage the equipment or other property.

To avoid injuries and safely supply power to the product, complete the following steps:

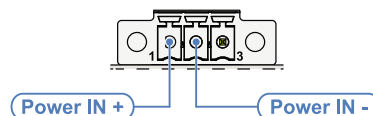
1. Observe all the instructions for safety, installation, and operation
2. Make sure your hands are dry
3. Make sure that all the cables to use:
 - a. Are in good condition
 - b. Meet the product requirements and comply with the relevant standards and regulations
4. Position cables with care. Do not position cables in places where they may be trampled or compressed
5. Make sure that the power-points and plugs are in good condition before using them
6. Do not overload the power-points and plugs
7. Make sure that the product maintains a proper grounding connection
8. Use a power supply that meets the product requirements and complies with the relevant standards and regulations. In case of uncertainties, contact the Eurotech Technical Support (for more information see ["How to receive technical assistance" on page 17](#))
9. Connect power after the installation of the system has been completed
10. Never connect or disconnect the cables with the system or the external apparatus switched ON.

Before supplying power to the product, complete the following steps:

1. Make sure that you have thoroughly reviewed all installation, operation, and safety instructions
2. Make sure that the electrical installation is made correctly in compliance with the relevant standards and regulations.

To supply power and turn ON the ReliaGATE 10-12, complete the following steps:

1. Setup a DC power source that:
 - o Meets the ReliaGATE 10-12 power requirements
 - o Deliver a maximum current of 2 A
2. Check the input voltage as close as possible to the Power IN connector. This is to compensate for any cable losses, caused by cable length and other cable characteristics
3. **Make sure that the DC power source is turned OFF**
4. Setup an external 2 A fuse on the line coming from the negative terminal of the DC power source
5. Connect the DC power source terminals ("Power IN +" and "Power IN -") to Pins 1 and 2 of the Power IN connector:



6. Turn ON the DC power source. The ReliaGATE 10-12 automatically turns ON and the LED 6 (POWER) turns ON.

17.4 How to turn OFF the product

To turn the ReliaGATE 10-12 OFF follow these steps:

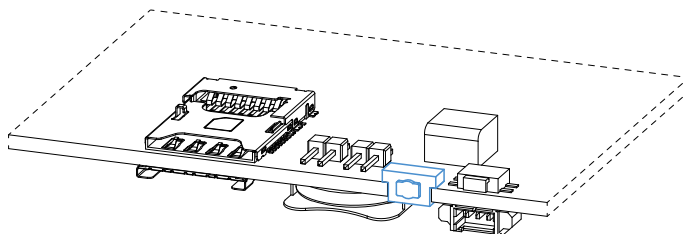
1. Login the Administration Console
2. Enter the command `poweroff`. The system turns OFF
3. Remove the power from the Power IN connector.

17.5 How to reduce the power consumption of the product

To reduce the power consumption of the ReliaGATE 10-12, turn OFF the radio interfaces and disable unnecessary services that contribute to overall system power consumption.

17.6 How to hardware reset the product

To trigger a hardware reset of the ReliaGATE 10-12, push the hardware reset pushbutton available in the Service Panel.



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18 HOW TO MAINTAIN THE PRODUCT

Periodically inspect the product to verify its integrity and to ensure proper operation.

To maintain the product, complete the following steps:

1. Carefully read and understand the instructions contained in the section "[Safety instructions](#)" on [page 9](#)
2. Safely remove the power supply
3. Verify the installation of the product
4. Clean the product

18.1 How to safely remove the power supply



WARNING

ELECTRIC SHOCK HAZARD

Failure to remove power correctly may create an electric shock hazard, which could result in personal injury or loss of life, and / or damage the equipment or other property.

To avoid injuries and safely remove power supply from the product, complete the following steps:

1. Make sure your hands are dry
2. Turn OFF all the power supply sources
3. Disconnect all the cables
4. Make sure that all the circuits are discharged.

18.2 How to verify the installation of the product

To verify the installation of the product, complete the following steps:

1. Verify that the product is clean and not damaged
2. Verify that the LED indicators are visible and not damaged
3. Verify that all the locking parts (for example: screws, bolts, nuts) are correctly fastened
4. Verify that the product is installed correctly.

18.3 How to clean the product

To clean the product, complete the following steps:

1. Never use detergents, aerosol sprays, solvents or abrasive sponges
2. To remove dust from the case of the product, use a dry, lint-free, cloth
3. To remove the dirt, use water-based, non-flammable, cleaner products.

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APPENDIX 1: ADVANCED BOOT OPTIONS

1.1 Advanced boot options availability

The ReliaGATE 10-12 bootloader provides a number of advanced boot options, that allow a developer to run different build artifacts.

The following advanced boot options are currently available:

Boot option	How it works	Notes
fitboot	<ol style="list-style-type: none"> 1. It retrieves the production fitImage from /boot/fitImage in the filesystem 2. It executes the fitImage 3. By default, it boots the kernel@1 and fdt@reliagate-10-12-xx.dtb partitions within the fitImage. 	This is the default boot option, which boots the production kernel fitImage.
fitImageTftpboot	<ol style="list-style-type: none"> 1. It retrieves a file called fitImage from the root of the tftp server 2. It executes the fitImage 3. By default, it boots the kernel@1 and fdt@reliagate-10-12-xx.dtb partitions within the fitImage. 	This option is a fast and easy way to test development fitImages.
zImageboot	<ol style="list-style-type: none"> 1. It retrieves the zImage from /boot/zImage and the device tree from /boot/reliagate-10-12.dtb within the filesystem 2. It boots both the zImage and the device tree. 	This option is a way to boot a production zImage and device, should the default verified boot system not be required.
zImageTftpboot	<ol style="list-style-type: none"> 1. It retrieves zImage and reliagate-10-12.dtb from the root of the tftp server 2. It executes the zImage and the fdt. 	This option is a fast and easy way to develop kernel images and device trees.

If you are using a tftp boot option (**fitImageTftpboot** or **zImageTftpboot**), note that:

- The system will use the tftp server specified by **serverip** and it assumes that a dhcp address can be obtained through interface **eth0**. Always ensure that this ties in with your network architecture before attempting to boot the tftp options
- All runtime artifacts are loaded into RAM before execution, no execution from flash is currently supported.

1.1.1 How to configure a boot option

To configure a boot option, you need access to the bootloader CLI.

1.1.2 How to gain access to the Bootloader CLI

To gain access to the bootloader CLI, complete the following procedure:

1. Connect a serial cable to the ReliaGATE 10-12 Console
2. Type `stop` before the timeout expires

1.1.3 How to change the default boot option

The default boot option is *fitboot* which boots the production kernel fitimage.

To change the default option, complete the following steps:

1. Access to the bootloader CLI
2. Enter the following commands:

```
setenv bootcmd 'run <target>'
saveenv
boot
```

where:

- <target> is one of the available boot options
- `saveenv` is the command that writes the changes to flash, making them permanent. Do not enter the `saveenv` command if you wish the change to only apply to the current boot

1.2 The production fitImage

The production fitImage contains all of the Device Tree Blobs (DTB's) required to configure the currently supported variants.

A fitImage is essentially a partitioned binary filesystem, where each partition is signed and carries a reference.

The current layout of the fitImage is as follows:

Image	Reference	Description	Size (bytes)*	Hash*
0	kernel@1	Linux kernel	4527064	4de8ed98e0ca6bede28794feca66d8681ac323
1	fdt@reliagate-10-12-xx.dtb	xx variant Flattened DTB	37215	96ea8ceec55f50fceb7dd6ac60ccfabd4946ca55
2	fdt@reliagate-10-12-spi.dtb	spi variant Flattened DTB	36763	2249f9c342e6555a9f255d54632c98b6c11128fc
3	fdt@reliagate-10-12-gpio.dtb	gpio variant Flattened DTB	36557	b9b9beea936c92333afb036c6d7888e2febaab7f

* Image size and hash values shown are provided for example purposes only.

1.2.1 How to define the variants

At installation, to define the variant use the `eurotech_install.sh` script with the `-c` option:

```
./eurotech_install.sh -c gpio --no-java
```

This will select the 'gpio' DTB variant in the production fitImage.

NOTE: If no `-c` option is present, the `-cxx` option will be selected.

1.2.2 How to manually configure the system to boot from a different DTB within the current fitImage

To manually configure the system to boot from a different DTB within the current fitImage, you have the following options:

- Option1: Configure the system in Linux (the `fw_utils` must be installed)
- Option2: Configure the system in the bootloader

To configure the system in Linux, insert the following commands:

```
fw_setenv fitboot `setenv image_path $fit_path; run imageload; bootm ${loadaddr}:kernel@1 -  
${loadaddr}:fdt@reliagate-10-12-<variant>.dtb;
```

where <variant> is either: xx, spi or gpio.

To configure the system in the bootloader, insert the following commands:

```
setenv fitboot `setenv image_path $fit_path; run imageload; bootm ${loadaddr}:kernel@1 -  
${loadaddr}:fdt@reliagate-10-12-<variant>.dtb;
```

where <variant> is either: xx, spi or gpio.

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APPENDIX 2: EXPANSION CONNECTOR PIN MAP WITH RESPECT TO DEVICE TREE PIN ASSIGNMENT

The ReliaGATE 10-12 provides an Expansion connector on the right side.

For more information see:

- ["Right Side Interface overview" on page 42](#)
- ["Expansion connector" on page 62](#)
- ["How to enable the 3.3V and 5V power supply on the Expansion connector" on page 86.](#)

The following table shows the Expansion connector pin map with respect to the device tree¹ pin assignment:

Pin #	Signal	CPU Pin Name	GPIO*	DTB #1	DTB #2	Generic	Notes
				6x DTB	SPI DTB		
1	VCC 3v3 EXT						Power line
2	DGND						Power line
3	VCC 5v_EXT						Power line
4	USB_EXP+	USB1_DP		USB_EXP+	USB_EXP+	USB_EXP+	USB line: fixed
5	USB_EXP-	USB1_DM		USB_EXP-	USB_EXP-	USB_EXP-	USB line: fixed
6	DGND						Power line
7	MCASP0_FSX	LCD_DATA9	GPIO2_15	ReliaIO: CPU_RST	GPIO2_15	GPIO2_15	
8	MCASP0_AXR0	LCD_DATA10	GPIO2_16	Reserved: cannot be user-controlled	GPIO2_16	GPIO2_16	Power Enable for LoRa devices
9	MCASP0_ACLKX	LCD_DATA8	GPIO2_14	ReliaIO: BOOT0	GPIO2_14	GPIO2_14	
10	MCASP0_AXR1	LCD_DATA14	GPIO0_10	ReliaIO: INT_CPU	GPIO0_10	GPIO0_10	
11	DGND						Power line
12	Reserved	UART1_RXD	GPIO0_14	Reserved	Reserved	Reserved	Reserved
13	Reserved	UART1_TXD	GPIO0_15	Reserved	Reserved	Reserved	Reserved
14	USB_EXP_EN	USB1_DRVVBUS	GPIO3_13	GPIO3_13	GPIO3_13	GPIO3_13	
15	GPIO_EXP_2	LCD_DATA1	GPIO2_7	Reserved: cannot be user-controlled	GPIO2_7 VCC_3v3_EXT Enable	GPIO2_7 VCC_3v3_EXT Enable	Reserved: VCC_3v3_EXT Enable
16	GPIO_EXP_1	LCD_DATA0	GPIO2_6	Reserved: cannot be user-controlled	GPIO2_6 VCC_5v_EXT Enable	GPIO2_6 VCC_5v_EXT Enable	Reserved: VCC_5v_EXT Enable
17	DGND						Power line
18	SPI1_D1	MCASP0_AXR0	GPIO3_16	SPI1_D1	SPI1_D1	GPIO3_16	
19	SPI1_CS0	MCASP0_AHCLKR	GPIO3_17	SPI1_CS0	SPI1_CS0	GPIO3_17	
20	SPI1_D0	MCASP0_FSX	GPIO3_15	SPI1_D0	SPI1_D0	GPIO3_15	
21	SPI1_SCLK	MCASP0_ACLKX	GPIO3_14	SPI1_SCLK	SPI1_SCLK	GPIO3_14	
22	DGND						Power line
23	I2C1: SDA	SPI0_D1	GPIO0_4	I2C1: SDA	I2C1: SDA	I2C1: SDA	Reserved: I2C internal
24	I2C1: SCL	SPI0_CS0	GPIO0_5	I2C1: SCL	I2C1: SCL	I2C1: SCL	Reserved: I2C internal

* This column lists the GPIO pins that might be available if the default function is not used or reserved.

¹See also ["The production fitImage" on page 112.](#)

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