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User Manual

BoltGATE 20-25

EN 50155 Multi-Service IoT Gateway

Rev. 1-1 — 20 May 2019 — BTGATE-20-25_Man_ENG_1-1 — 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	19 March 2019
1-1	Minor updates	20 May 2019

HOW TO GET STARTED

To get started with the BoltGATE 20-25, complete the following 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 13)

2. **Know the BoltGATE 20-25 and its interfaces.**

   For more information see:

   - "Product Overview" on page 17
   - "Technical Specifications" on page 19
   - "Front Side Overview" on page 25
   - "Rear Side Overview" on page 49

3. **Understand how to log in the Administration Console and how to access the interfaces under Linux.**

   For more information see:

   - "How to Log in the Administration Console" on page 67
   - "How to Access the Interfaces Under Linux" on page 69

4. **Install the BoltGATE 20-25.**

   For more information see:

   - "Mechanical Specifications" on page 91
   - "How to Install the Product" on page 93

5. **Supply power to the BoltGATE 20-25 respecting all safety instructions.**

   For more information see:"How to Supply Power to the Product" on page 95

6. **Start developing your IoT application.**

   The BoltGATE 20-25 can be pre-configured with ESF, the Eurotech Everyware Software Framework.

   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 87
   - http://esf.eurotech.com/docs.

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CONTENTS

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 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 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 13).

1.1 Safety Messages Used in this Document

1.1.1 Safety Messages for Hazards with a High Level of Risk

To indicate a hazard with a high level of risk which, if not avoided, **will result in death or serious injury**, the following safety message is used; the message also contains the safety instructions to follow to avoid any hazard:

DANGER

INSERT WARNING SIGN

TEXT THAT EXPLAINS THE SOURCE OF THE HAZARD (WRITTEN WITH BOLD UPPER-CASE CHARACTERS)

Text with the safety instructions to follow to avoid any hazard (written with bold lower-case characters)

Example:

DANGER

HIGH VOLTAGE INSIDE.
CONTACT WILL CAUSE ELECTRIC SHOCK OR BURN.

Turn OFF and disconnect power before opening the rack.

1.1.2 *Safety Messages for Hazards with a Medium Level of Risk*

To indicate a hazard with a medium level of risk which, if not avoided, **could result in death or serious injury**, the following safety message is used; the message also contains the safety instructions to follow to avoid any hazard:

WARNING	
INSERT WARNING SIGN	**TEXT THAT EXPLAINS THE SOURCE OF THE HAZARD (WRITTEN WITH BOLD UPPER-CASE CHARACTERS)** **Text with the safety instructions to follow to avoid any hazard (written with bold lower-case characters)**

1.1.3 *Safety Messages for Hazards with a Low Level of Risk*

To indicate a hazard with a low level of risk which, if not avoided, **could result in minor or moderate injury**, the following safety message is used; the message also contains the safety instructions to follow to avoid any hazard:

CAUTION	
INSERT WARNING SIGN	**TEXT THAT EXPLAINS THE SOURCE OF THE HAZARD (WRITTEN WITH BOLD UPPER-CASE CHARACTERS)** **Text with the safety instructions to follow to avoid any hazard (written with bold lower-case characters)**

1.2 Other Messages

1.2.1 *Instructions on How to Use the Product Effectively and Avoid any Damage*

To indicate:

- Instructions on how to use the product effectively
- Instructions on how to avoid damaging the product or third-party property (not related to personal injury),

the following message is used:

NOTICE	
INSERT SIGN IF NECESSARY	**Text with the instructions to follow to complete the specific task (written with bold characters).**

1.3 How to Prevent Damaging Electrostatic-Sensitive Devices

NOTICE

HOW TO PREVENT DAMAGING ELECTROSTATIC-SENSITIVE DEVICES

The symbol on the left is applied on electrostatic-sensitive devices.
To prevent damaging electrostatic-sensitive devices:

- **Handle the electrostatic-sensitive devices in an ESD Protected Area (EPA)**
- **Observe the appropriate antistatic precautions. For example: use a wrist strap kept in constant contact with bare skin and attached to ground.**

1.4 How to Safely Supply Power to the Product

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

WARNING

THE PRODUCT CAN BE POWERED WITH A HAZARDOUS VOLTAGE. CONTACT MAY CAUSE ELECTRIC SHOCK OR BURN.

To avoid injuries and safely supply power to the product:

- **Observe all the instructions for safety, installation, and operation**
- **Never operate with wet hands**
- **Make sure that all the cables used:**
  - **Are in good condition before using them**
  - **Meet the product requirements and comply with the relevant standards and regulations**
- **Position cables with care. Do not position cables in places where they may be trampled or compressed by objects placed on them**
- **Make sure that the power-points and plugs are in good condition before using them**
- **Do not overload the power-points and plugs**
- **Make sure that the product maintains a proper grounding connection**
- **Use a power supply that meets the product requirements and complies with the relevant standards and regulations. In case of uncertainties about the required power supply, contact the Eurotech Technical Support Team (for more information see "How to Receive Technical Assistance" on page 13)**
- **Connect power after the installation of the system has been completed**
- **Never connect or disconnect the cables with the system or the external apparatus switched ON**

1.5 Caution: Product's Surfaces may Become Hot

Depending on the operating environment temperature, product's surfaces may become hot, creating a burn hazard. **Always allow the product's surfaces to cool before touching them**.

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2 How to Receive Technical Assistance

2.1 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 Support Team with the information you required

2.2 How to Send a Product for Repair

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.

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

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3 CONVENTIONS USED IN THIS DOCUMENT

3.1 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

3.2 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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4 PRODUCT OVERVIEW

By offering integrated hardware and software connectivity towards the Field and the Cloud, the BoltGATE 20-25 is a Multi-service IoT Edge Gateway, EN 50155 and IP66 certified, designed to address the challenges of the next-generation applications for smart transportation and connected railway.

The BoltGATE 20-25 is a fanless, compact unit based on the Intel® Atom™ E38xx processor; with up to four cores, 4GB of RAM and 8GB of eMMC it exceeds the requirements of rolling stock in the TX temperature class. Up to two internal or removable SATA disks and a user-accessible microSD slot provide plenty of storage capacity; other features include video, audio, two protected USB 2.0 ports, four isolated serial interfaces, Digital I/O, and CAN bus interfaces – and a wide range of connectivity capabilities including two Gigabit Ethernet, up to two LTE Cat 4 cellular modems, Wi-Fi, Bluetooth Low Energy, and a dedicated internal GPS with Dead Reckoning.
The MVB versions of the BoltGATE 20-25 add integrated hardware and software components to interface with the train bus through two MVB ports on DB9 connectors. MVB options include EMD and ESD+ interfaces, both available in Read/Transmit or Read Only configurations.

Powered by the Eurotech IoT Edge Framework, Everyware Software Framework (ESF), the BoltGATE 20-25 offers a friendly web-based user interface that allows to visually compose powerful data flows to acquire data from its interfaces, analyze it on the Edge, and publish it to the Cloud though the popular MQTT protocol. Everyware Cloud, Eurotech IoT Integration Platform, completes this solution by providing data integration to the applications and by offering complete management of the devices deployed on the field.

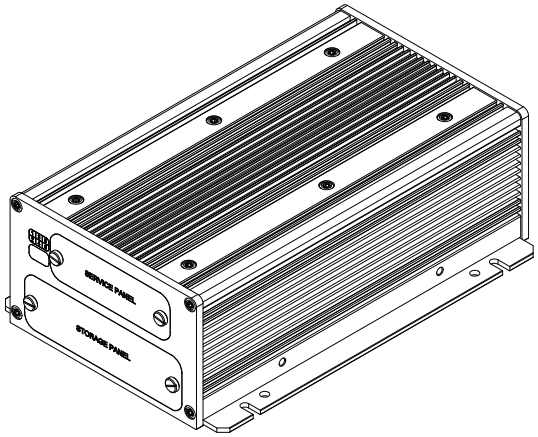


Figure 4.1 - Example of BoltGATE 20-25

4.1 Intended Use and Not Allowed Uses of the Product

NOTICE
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).

4.1.1 Intended Use

The BoltGATE 20-25 is a family of EN 50155 Multi-Service IoT Gateway devices that must be used only in on-board rail vehicles applications that meet the instructions and warnings contained in this document, and the standards required by the current legislation.

The BoltGATE 20-25 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 only in on-board rail vehicles applications
- Be used with appropriate interconnecting and power cables
- Be used with a power supply that meets the requirements stated on the identification label of the product.
- Be used with the earthing terminal connected to an earth point in the installation.

4.1.2 Not Allowed Uses

Do not use the BoltGATE 20-25:

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

4.2 Technical Specifications

The BoltGATE 20-25 family includes several product versions.

Each product version includes:

- Some **common features**: a common feature is a feature that is available for all the product versions (see "Common Features" below), and
- Some **version-specific features**: a version-specific feature is a feature that may be different according to the product version (see "Version-Specific Features" on page 21.

4.2.1 Common Features

The common features are listed in the following table:

Feature		Description
Processor	**CPU**	See "Version-Specific Features" on page 21
Memory	**ECC RAM**	See "Version-Specific Features" on page 21
Storage	**Embedded**	8 GB eMMC
	Drive Bay and Included Drives (in the Storage Panel)	See "Version-Specific Features" on page 21 for Drive Bay and Drives availability. A Removable Drive Bay can have up to 2x 2.5" HDD/SSD drives, max 9 mm height. The Removable Drive Bay is provided with a key-lock mechanism.
	Other	1x MicroSD card receptacle (in the Service Panel)
Wireless Interfaces	**Wi-Fi / Bluetooth**	Single Combo 802.11 a,b,g,n Wireless + BT 4.0 BLE coexistence 2x antenna connectors for MIMO 2Tx2R (2 Transmit & 2 Receive) technology
	Positioning	GPS/QZSS/GLONASS/BeiDou/Galileo receiver with Dead Reckoning
	Cellular	See "Version-Specific Features" on page 21
Wired Interfaces	**Ethernet**	2x 10/100/1000 Mbps Ethernet (ETH 1, ETH 2)
	USB	2x USB 2.0 Noise and Surge Protected (USB 0, USB 1)
	Serial	• 2x RS-232/422/485 Serials, 9-wire, Insulated (COM 1, COM 4) • 2x RS-422/485 Serials, 5-wire, Insulated (COM 2, COM 3)
	CAN 2.0B	2x CAN Bus 100mA with 5V Power Out, Insulated (CAN1, CAN2)
	MVB	See "Version-Specific Features" on page 21
	Digital I/O	4x Digital Input, 4x Digital Output, 1x Odometer (All DI/O are Insulated, EN 50155)
	Video	See "Version-Specific Features" on page 21
	Audio	Audio Lines: 1x Line In, 1x 2 W Class D Stereo Out
Expansion	**MiniPCIe Slots**	3x Full/Half-Size Mini PCIe Slots (USB/mSATA, USB/PCIe, USB)
LED Indicators		• 1x Power Status • 3x MiniPCIe Slot • 2x Programmable
Service Interfaces (in the Service Panel)		• 1x Reset Pushbutton • 1x Programmable Pushbutton • 1x Micro HDMI type D video port • 1x MicroSD Card Receptacle, Push-Push. Max MicroSD Card size: 32 GB • 2x MicroSIM Card Receptacles, Push-Push, Switchable for bandwidth aggregation and carrier/cellular backup (only for product versions integrating the Cellular. See "Version-Specific Features" on page 21) • 1x Maintenance USB 2.0 Port • 1x TTL Serial Console (RS-232 build option)

Feature		Description
Other	**RTC**	Yes, with SuperCAP (up to 2 months retain), Fast Reboot Support
	External Watchdog	Yes
	EEPORM	32 KB
	TPM	Factory Option: TPM 1.2/2.0
	Sensors	Internal Temperature, Accelerometer
Power	**Input**	Wide Voltage Input Range: 9 to 137.5 VDC EN 50155 class S2 for 24 and 110 VDC Nominal Voltage Inputs Factory option for: 48, 72, 96 VDC Nominal Voltage Inputs
	Consumption	30 W max
	Grounding	Earth connection terminal provided on the rear panel
Environment	**Operating Temperature**	-40 to +70°C, +85°C for 10 minutes (EN 50155 class TX)
	Storage Temperature	-40 to +85 °C
	Relative Humidity	5 to 95% (non condensing) at +40°C
Certifications	**Regulatory**	CE
	Safety	EN 62368-1, UL 60950[1]
	Vertical	EN 50155, EN 45545
	Environmental	RoHS2; REACH
	Wi-Fi / Bluetooth	CE
	Cellular	PCTRB (AT&T), CE. Only for product versions integrating the cellular. See "Version-Specific Features" on the facing page.
	Ingress	IP66
	MTBF	41000 hours @ 25°C GM
Operating System		Yocto Linux or Windows 10 IoT Enterprise. See "Version-Specific Features" on the facing page.
Mechanical	**Enclosure**	Material: Aluminium Alloy - Color: Black Anodized
	Dimensions	171 (W) x 273 (D) x 85 (H); mm - Connectors and Mounting Brackets included
	Weight	< 4 kg

[1] UL, NRTL listing Factory Option

4.2.2 *Version-Specific Features*

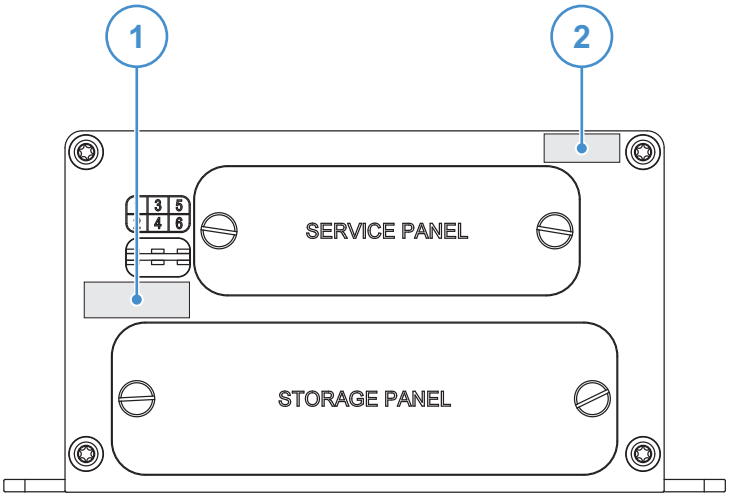
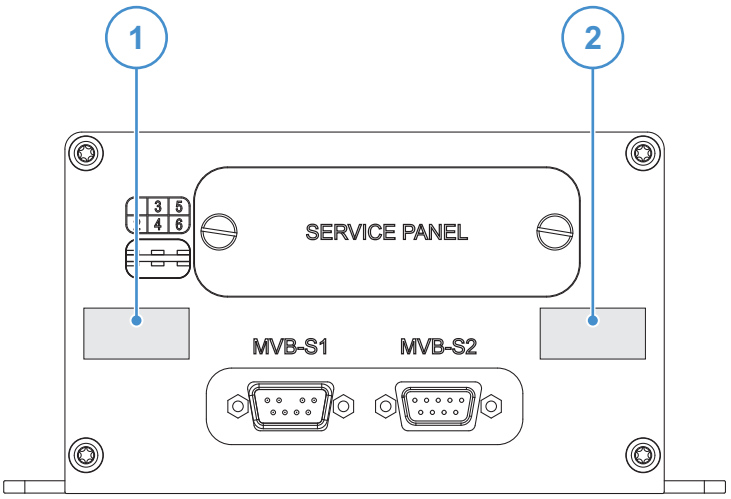
The version-specific features are listed in the following table:

Version	Feature								
	Processor	Memory	Storage		Wireless Interfaces		Wired Interfaces		OS
		ECC RAM	Drive Bay	Included Drives	Cellular		Video Out (Rear Side)	MVB (Front Side)	
-01	Intel® Atom™ E3815, 1.46 GHz, Single core	2 GB	Yes	0	0	0	0	0	Eurotech Yocto
-02	Intel® Atom™ E3827, 1.75 GHz, Dual core	2 GB	Yes	0	0	0	0	0	Eurotech Yocto
-03	Intel® Atom™ E3827, 1.75 GHz, Dual core	2 GB	Yes	1x 512 GB(1)	0	0	0	0	Eurotech Yocto
-04	Intel® Atom™ E3845, 1.91 GHz, Quad core	4 GB	Yes	1x 512 GB(1)	0	0	0	0	Eurotech Yocto
-11	Intel® Atom™ E3845, 1.91 GHz, Quad core	4 GB	Yes	1x 512 GB(1)	LTE(2)	0	1x HDMI	0	Eurotech Yocto
-15	Intel® Atom™ E3845, 1.91 GHz, Quad core	4 GB	Yes	1x 512 GB(1) 1x 64 GB mSATA	LTE(2)	0	1x HDMI	0	Windows 10 IoT ETP
-M1	Intel® Atom™ E3845, 1.91 GHz, Quad core	4 GB	No	0	LTE(2)	0	0	EMD TX+RX	Eurotech Yocto
-M2	Intel® Atom™ E3845, 1.91 GHz, Quad core	4 GB	No	0	LTE(2)	0	0	EMD RX Only	Eurotech Yocto
-M3	Intel® Atom™ E3845, 1.91 GHz, Quad core	4 GB	No	0	LTE(2)	0	0	ESD+ TX+RX	Eurotech Yocto
-M4	Intel® Atom™ E3845, 1.91 GHz, Quad core	4 GB	No	0	LTE(2)	0	0	ESD+ RX Only	Eurotech Yocto

(1) MLC high reliability disk installed in the Removable Drive Bay. See also the line **Storage** in the "Common Features" on page 19.
(2) LTE CAT 4 (EU).

4.3 Product Labels

The following labels are placed on the front side of the product, according to product version:

Product Version	Labels Ref# and Position
• -01 • -02 • -03 • -04 • -11 • -15	
• -M1 • -M2 • -M3 • -M4	

Label Ref#	Label Type and Information	Label Example
1	**Product information label** • Eurotech logo • CE mark • WEEE symbol • "MADE IN EU" statement • Power requirements*	EUROTECH CE MADE IN EU POWER: XXVdc ⎓ XXA
2	**Product identification label** • Product model number • Product serial number	P.N.: **BTGATE-20-25-xx** S.N.: **00000000000**

* the symbol ⎓ stands for direct current

5 NORMS AND CERTIFICATIONS

5.1 CE Marking

The product is CE marked and meets the features listed 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 CE marked and not compliant with the requirements specified in this document.

5.2 Directive RED 2014/53/EU

The product meets the requirements of the Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment.

5.2.1 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.

5.3 RoHS 3 Compliance

The product, including all its components and its sub-assemblies, have been manufactured in compliance with the 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.

5.4 REACH Compliance

The product is certified according to the REACH Directive, taking in account Substances of Very High Concern (SVHC), as specified in the list published by ECHA (European Chemical Agency) at the time of the design.

5.5 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.

The 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.
To avoid any possible legal implications, contact your local waste collection body for full collect and recycling information.

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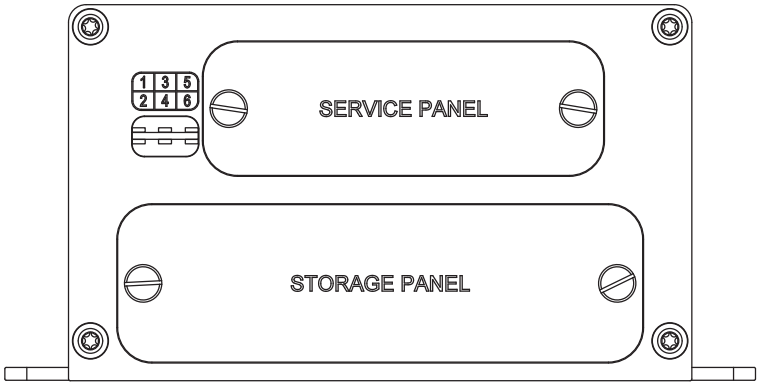
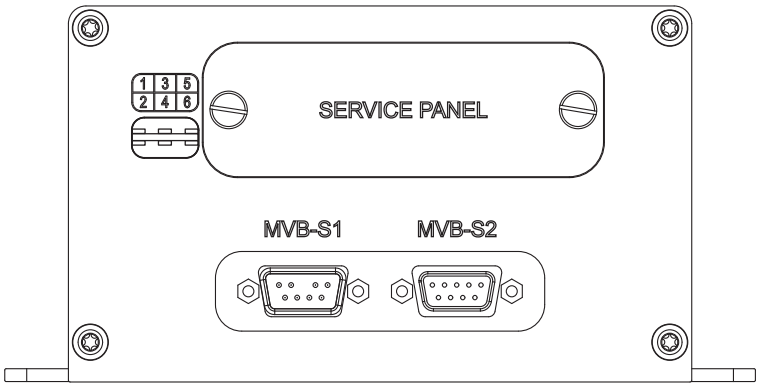
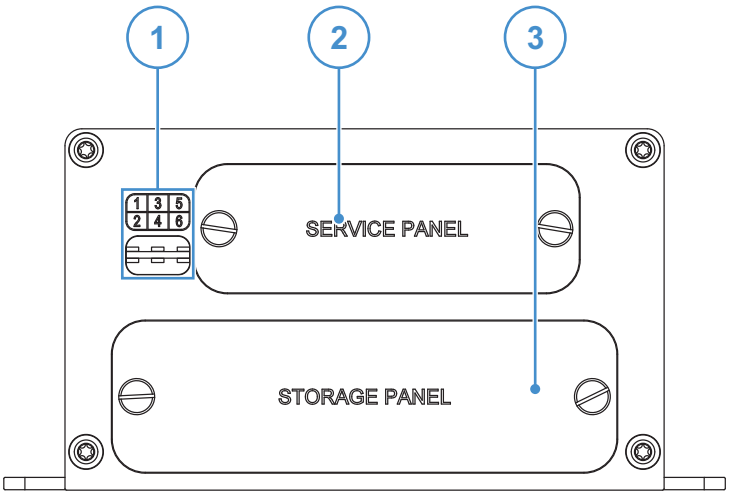
6 FRONT SIDE OVERVIEW

The following Front Side Layouts are available according to the BoltGATE 20-25 versions:

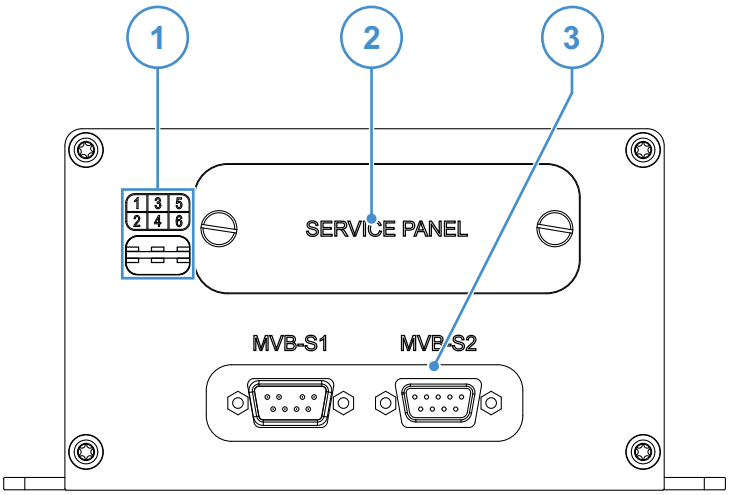
Product Version	Front Side Layout
• -01 • -02 • -03 • -04 • -11 • -15	
• -M1 • -M2 • -M3 • -M4	

6.1 Front Side Overview, vers.: -01 -02 -03 -04 -11 -15



Ref#	Description
1	LED Indicators
2	Service Panel
3	Storage Panel

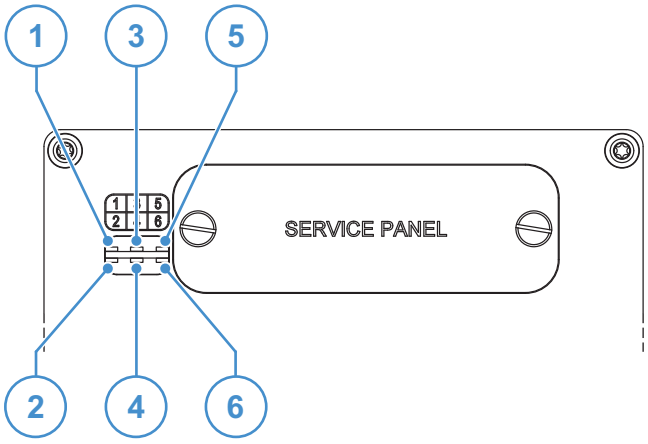
6.2 Front Side Overview, vers.: -M1 -M2 -M3 -M4



Ref#	Symbol	Description
1	-	LED Indicators
2	-	Service Panel
3	MVB-S1	MVB Interface: DB9 Male Connector
	MVB-S2	MVB Interface: DB9 Female Connector

6.3 LED Indicators Overview

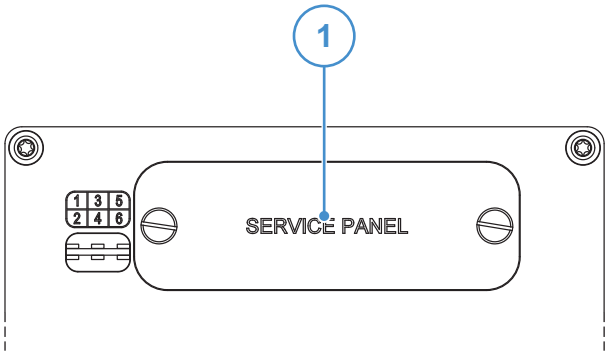
The following LED indicators are available on the Front Side:



Ref#	Description	Color
1	User 1	Dual Color (Green / Amber)
2	MiniPCIe Slot #3	Green
3	User 2	Dual Color (Green / Amber)
4	MiniPCIe Slot #2	Green
5	Power status	Blue
6	MiniPCIe Slot #1	Green

6.4 Service Panel and Service Interfaces

6.4.1 Service Panel Overview



Ref#	Description
1	Service Panel: includes the Service Interfaces

6.4.1.1 How to Remove the Service Panel Cover

NOTICE
The IP grade is not maintained when the Service Panel cover is removed. Do not use the product for extended periods of time with the Service Panel cover removed, otherwise dust and other particulates may enter the system. If it is necessary to have extended access to the Service Panel, take appropriate precautions to stop any particulates from entering.

To remove the Service Panel cover, complete the following steps:

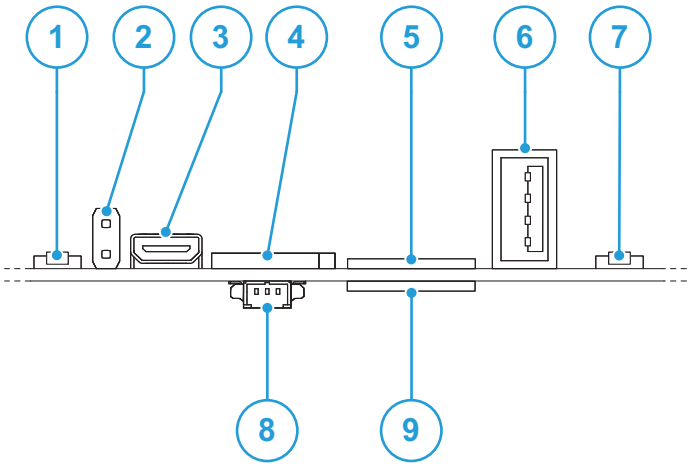
1. Unscrew the screws that keep the Service Panel cover in place
2. Remove the Service Panel cover. You can now have access to the Service Interfaces

6.4.1.2 How to Install the Service Panel Cover

To install the Service Panel cover, complete the following steps:

1. Place the Service Panel cover in place
2. Tighten the screws applying a torque of 1.00 Nm ± 0.05 Nm.

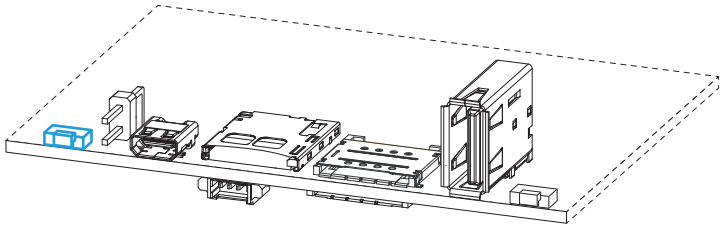
6.4.2 *Service Interfaces Overview*



Ref#	Description
1	Reset Pushbutton
2	Reserved
3	MicroHDMI Video Port
4	MicroSD Card Receptacle (Push-Push). Max MicroSD Card size: 32 GB
5	1st MicroSIM Card Receptacle (Push-Push)
6	Maintenance USB 2.0 Port
7	Programmable Pushbutton
8	TTL Serial Console
9	2nd MicroSIM Card Receptacle (Push-Push)

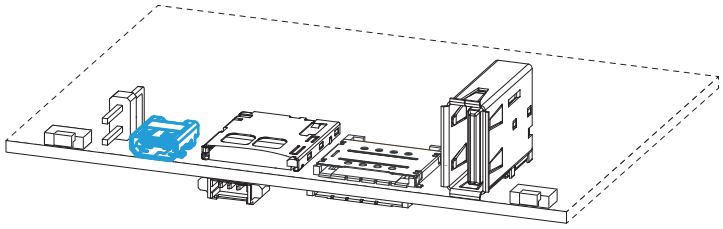
6.4.3 Reset pushbutton

This is a pushbutton that triggers a hardware reset of the product every time you push it.

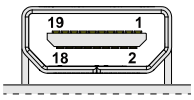


6.4.4 *Micro HDMI type D video port*

This is a Micro HDMI type D video port. It has the following layout and specifications:



Connector Layout:



Connector Specifications:

- MicroHDMI Type-D Socket
- Gender: Female

Mating Connector Specifications:

- Cable-mount MicroHDMI Type-D Plug
- Gender: Male

Connector pinout:

Pin #	Signal	Description
1	HPD	Hot Plug Detect
2	NC	Not Connected
3	D2+	TMDS Data2+
4	D2_SH	TMDS Data2 Shield
5	D2-	TMDS Data2-
6	D1+	TMDS Data1+
7	D1_SH	TMDS Data1 Shield
8	D1-	TMDS Data1-
9	D0+	TMDS Data0+
10	D0_SH	TMDS Data0 Shield
11	D0-	TMDS Data0-
12	CK+	TMDS Clock+
13	CK_SH	TMDS Clock Shield
14	CK-	TMDS Clock-
15	CEC	Consumer Electronics Control
16	DGND	DDC/CEC Ground
17	SCL	I²C serial clock for DDC
18	SDA	I²C serial data for DDC
19	+5V	+5V Power

6.4.5 *MicroSD card receptacle*

This is a push-push (push-to-lock/push-to-release) MicroSD card receptacle.

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

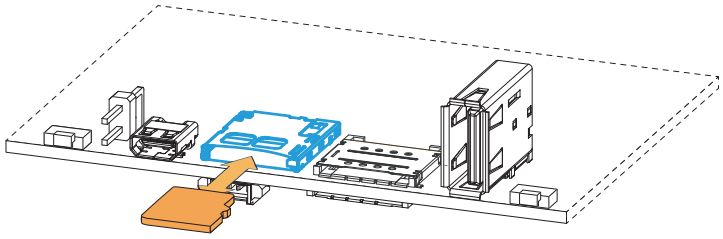
Insert the MicroSD card as showed in the figure below, with the contacts facing the circuit board.

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 in the receptacle to lock it

To remove the MicroSD card, complete the following steps:

1. Push the MicroSD in the receptacle to release it
2. Remove the MicroSD card from the receptacle



6.4.6 *1st and 2nd MicroSIM card receptacles*

These are 2 push-push (push-to-lock/push-to-release) MicroSIM card receptacles:

- 1st MicroSIM card receptacle is placed on the top side of the circuit board
- 2nd MicroSIM card receptacle is placed on the bottom side of the circuit board

If you have only one SIM card, use the 1st Micro SIM card receptacle.

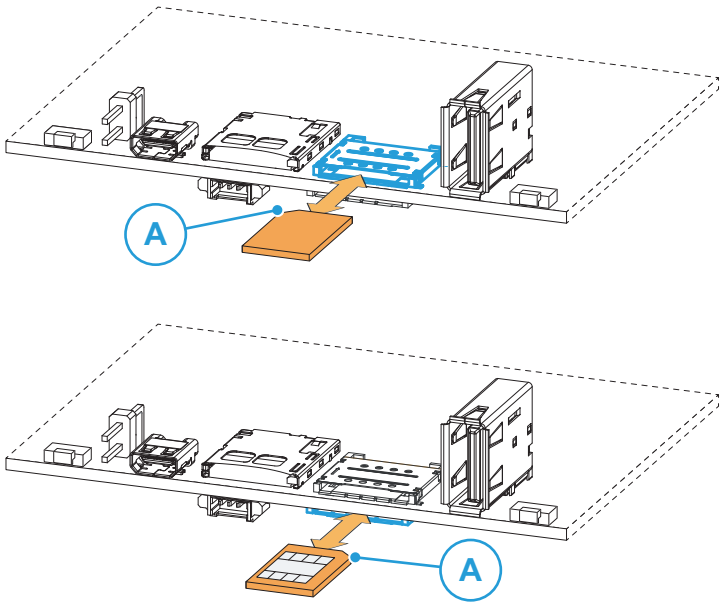
NOTICE
Turn OFF the SIM PIN before inserting the SIM card in the receptacle. **The cellular connection will not work if the SIM PIN is ON.**

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 receptacle
2. Push the MicroSIM in the receptacle to lock it

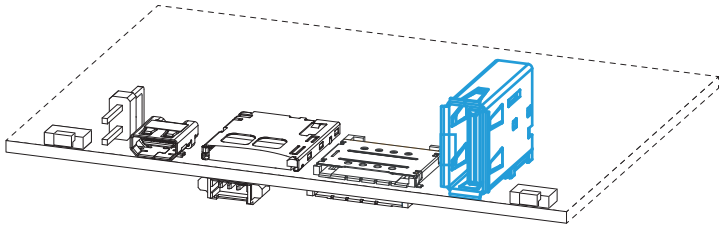
To remove the MicroSIM card, complete the following steps:

1. Push the MicroSIM in the receptacle to release it
2. Remove the MicroSIM card from the receptacle

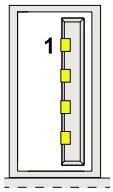


6.4.7 *Maintenance USB 2.0 port*

This is a USB 2.0 port available for maintenance only. It has the following layout and specifications:



Connector Layout:



Connector Pinout:

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

Connector Specifications:

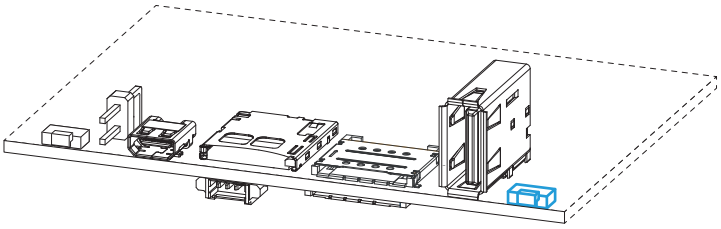
- USB Type-A socket
- Gender: Female

Mating Connector Specifications:

- USB Type-A plug
- Gender: Male

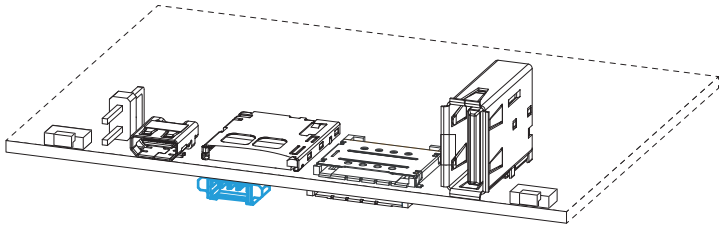
6.4.8 Programmable pushbutton

This is a pushbutton that can be programmed to execute a specific action every time you push it.

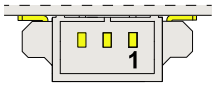


6.4.9 *TTL Serial Console*

This is a TTL Serial Console. It has the following layout and specifications:



Connector Layout:



Connector Specifications:

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

Mating Connector Specifications:

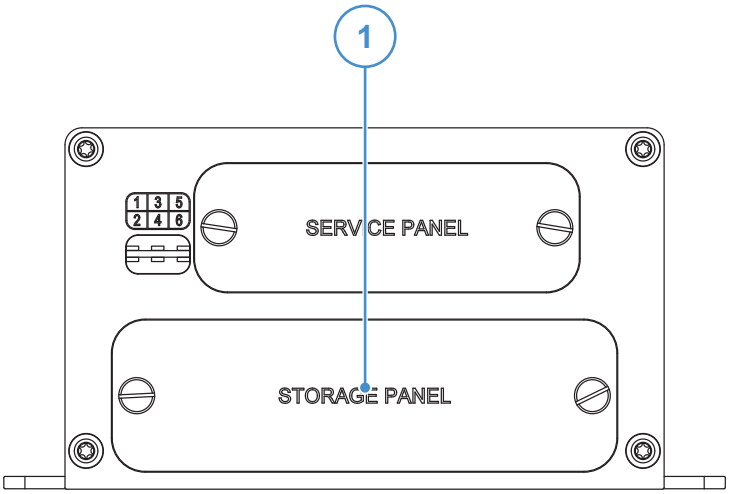
- Connector Housing
- Gender: Female
- Type: Pitch 1.25 mm; 3-pin
- Example:
  Manufacturer: Molex
  Part Number: 51021-0300
  (or equivalent)

Connector Pinout:

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

6.5 Storage Panel and Removable Drive Bay

6.5.1 Storage Panel Overview



Ref#	Description
1	Storage Panel: includes a Removable Drive Bay

6.5.1.1 How to Remove the Storage Panel Cover

NOTICE
The IP grade is not maintained when the Storage Panel cover is removed. Do not use the product for extended periods of time with the Storage Panel cover removed, otherwise dust and other particulates may enter the system. If it is necessary to have extended access to the Storage Panel, take appropriate precautions to stop any particulates from entering.

To remove the Storage Panel cover, complete the following steps:

1. Unscrew the 2 screws that keep the Storage Panel cover in place
2. Remove the Storage Panel cover. You can now have access to the Removable Drive Bay

6.5.1.2 How to Install the Storage Panel Cover

To install the Storage Panel cover, complete the following steps:

1. Place the Storage Panel cover in place
2. Tighten the screws applying a torque of 1.00 Nm ± 0.05 Nm.

6.5.2 Removable Drive Bay Overview

The Removable Drive Bay can have up to 2x 2.5" HDD/SSD drives, max 9 mm height.
The Removable Drive Bay is provided with a key-lock mechanism

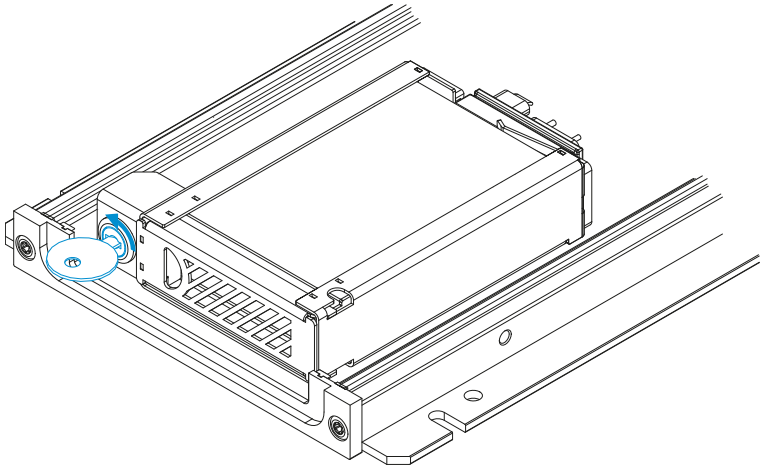
6.5.2.1 How to Remove/Insert the Drive Bay and Install the Disks

Prerequisites:

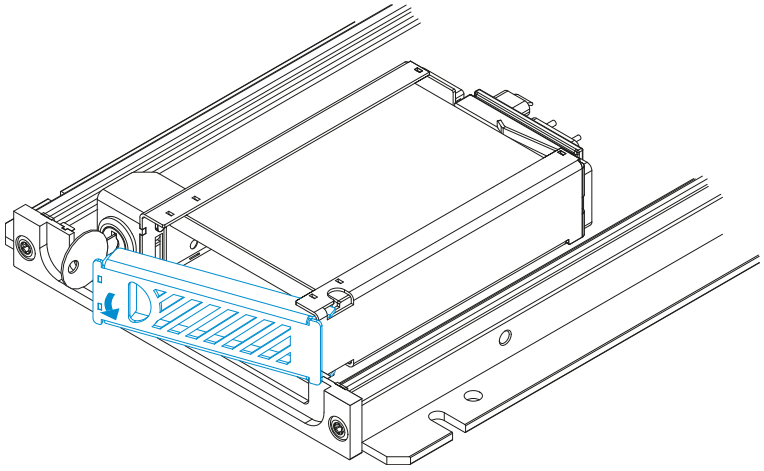
- The Storage Panel cover has been removed
- The Drive Bay has at least one free slot (in the following procedure both slots are free)
- For each disk: arrange four M3 x 4 mm slotted flat countersunk head machine screws (for example: Bossard BN 658, or equivalent)

To remove/insert the Drive Bay and install the disks, complete the following steps:

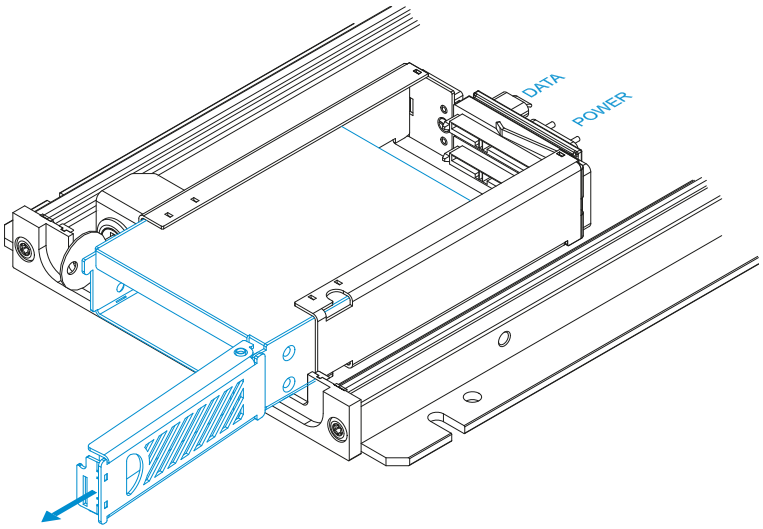
1. Open the latch of the locking mechanism using the key provided



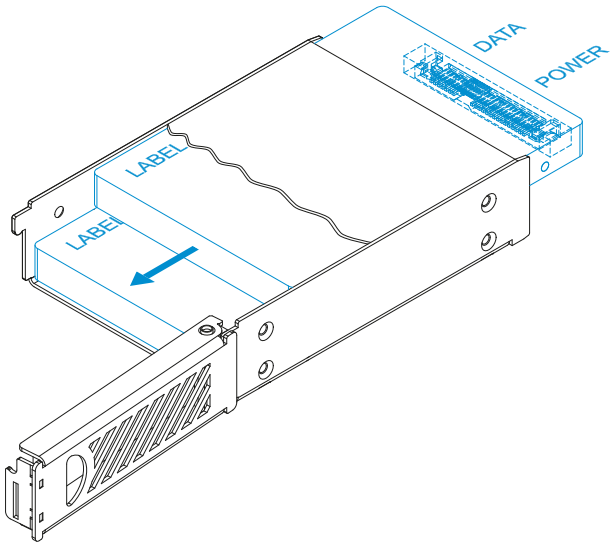
2. Open the security door



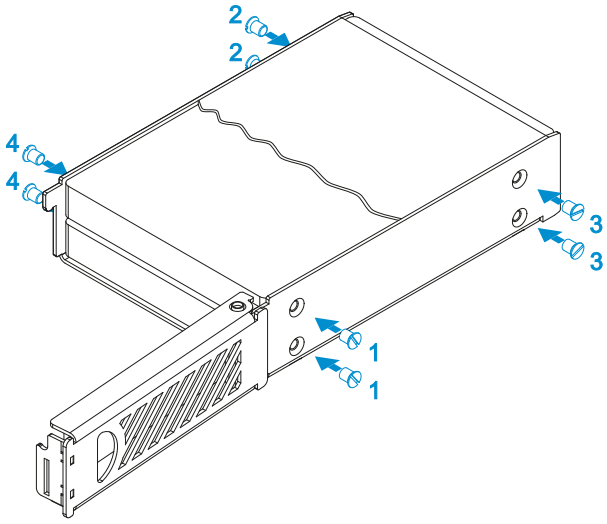
3. Remove the Drive Bay from its enclosure: use the security door to simplify the operation



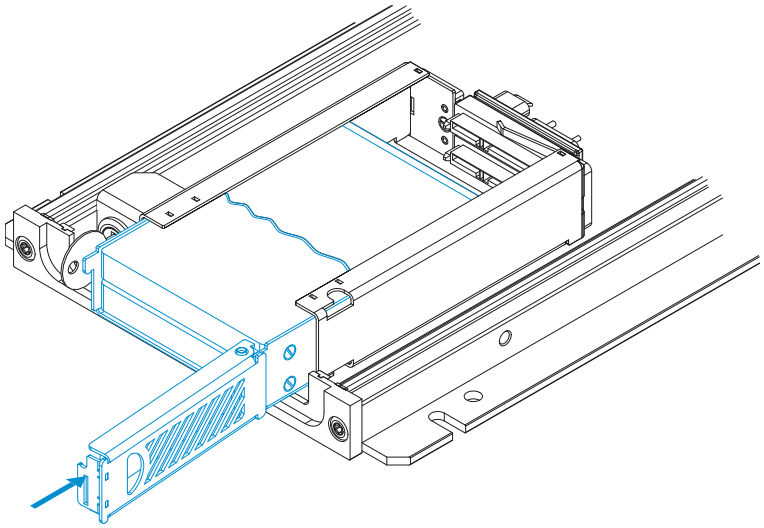
4. Insert the disks in the slots of the Drive Bay.
   For each disk:
   a. Make sure that the disk label is facing upwards
   b. Pay attention to the position of the data and power connectors



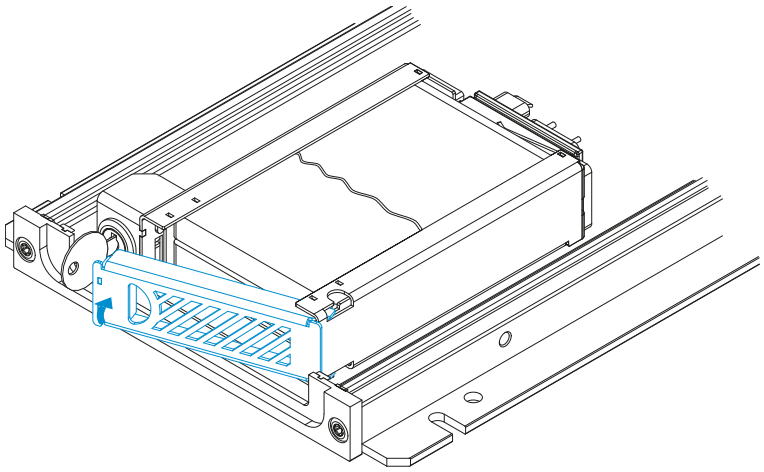
5. Fasten the disks to the Drive Bay.
   For each disk:
   a. Insert the four M3 x 4 mm screws without fastening them
   b. Fasten the screws **following the order indicated by the numbers from 1 to 4**



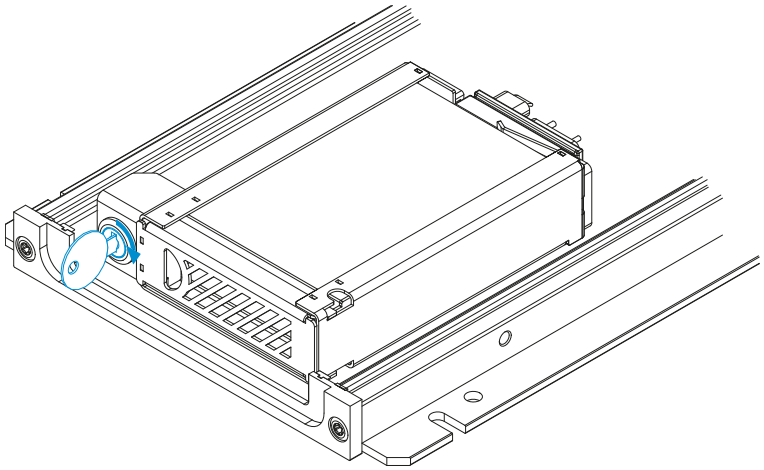
6. Insert the Drive Bay in its enclosure: use the security door to simplify the operation



7. Close the security door



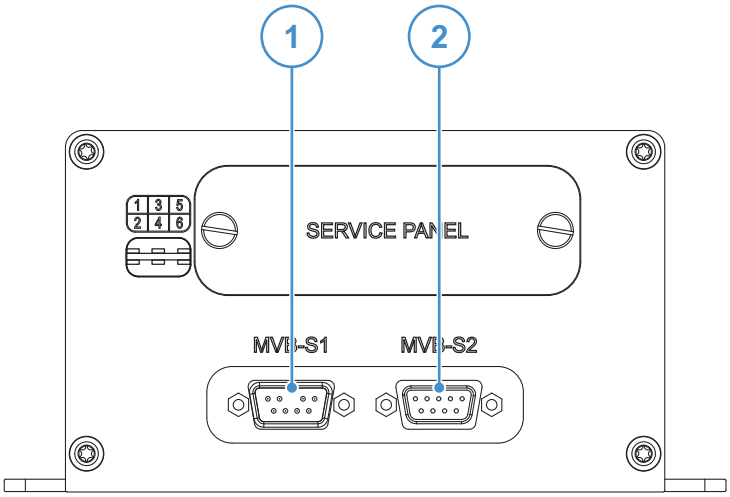
8. Close the latch of the locking mechanism. Remove the key.



6.6 MVB Interface Overview

The following MVB interfaces are available for BoltGATE 20-25, versions: -M1 -M2 -M3 -M4:

- EMD TX+RX for version -M1
- EMD RX Only for version -M2
- ESD+ TX+RX for version -M3
- ESD+ RX Only for version -M4



Ref#	Symbol	Description
1	MVB-S1	MVB Interface: DB9 Male Connector
2	MVB-S2	MVB Interface: DB9 Female Connector

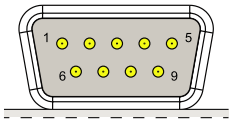
6.6.1 MVB Interface Features

- Fully compliant to IEC 61375
- 500 Vrms galvanic isolation between MVB line A and B
- 150mV receiver insensitivity
- Process data stack with 4096 process data ports, full process data length on all ports

6.6.2 *MVB EMD Interface Details*

6.6.2.1 MVB EMD Male Connector Specifications

Connector Layout:



Connector Specifications:

- Standard 9-Pin D-Sub (plug)
- Gender: Male

Mating Connector Specifications:

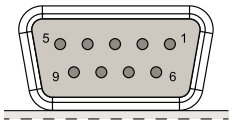
- Standard 9-Pin D-Sub (socket)
- Gender: Female

Connector Pinout:

Pin #	Signal	Type	Description
1	A.data.P	IO	Non-inverted MVB bus line A
2	A.data.N	IO	Inverted MVB bus line A
3	NC	NC	Not Connected
4	B.data.P	IO	Non-inverted MVB bus line B
5	B.data.N	IO	Inverted MVB bus line B
6	A.term	Passive resistor	Termination resistor between two pins
7	A.term		Termination resistor between two pins
8	B.term	Passive resistor	Termination resistor between two pins
9	B.term		Termination resistor between two pins

6.6.2.2 MVB EMD Female Connector Specifications

Connector Layout:



Connector Specifications:

- Standard 9-Pin D-Sub (socket)
- Gender: Female

Mating Connector Specifications:

- Standard 9-Pin D-Sub (plug)
- Gender: Male

Connector Pinout

Pin #	Signal	Type	Description
1	A.data.P	IO	Non-inverted MVB bus line A
2	A.data.N	IO	Inverted MVB bus line A
3	NC	NC	Not Connected
4	B.data.P	IO	Non-inverted MVB bus line B
5	B.data.N	IO	Inverted MVB bus line B
6	A.term	Passive resistor	Termination resistor between two pins
7	A.term		Termination resistor between two pins
8	B.term	Passive resistor	Termination resistor between two pins
9	B.term		Termination resistor between two pins

6.6.2.3 MVB EMD Connection Notes

To use the with MVB EMD segments, apply the following terminations on the 9-Pin D-Sub connectors:

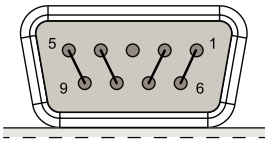


Figure 6.1 - MVB terminations on the Female 9-Pin D-Sub Connector

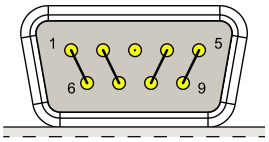


Figure 6.2 - MVB terminations on the Male 9-Pin D-Sub Connector

The appropriate pins from the MVB line are connected to the local terminating resistor within the MVB board . The effective line termination matches the recommended cable impedance of 120Ω.

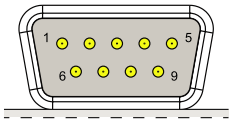
Assuming that the BoltGATE 20-25 is the last of several MVB nodes, one of the MVB connectors remains free. The terminator is mounted on this connector and delivers the correct line termination.
Depending on the cabling concept, it is typically required to have two types of terminators: one with a female D-sub connector and one with a male D-sub connector.

The terminator is not included with the BoltGATE 20-25.

6.6.3 MVB ESD+ Interface Details

6.6.3.1 MVB ESD+ Male Connector Specifications

Connector Layout:



Connector Specifications:
- Standard 9-Pin D-Sub (plug)
- Gender: Male

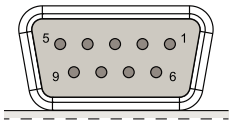
Mating Connector Specifications:
- Standard 9-Pin D-Sub (socket)
- Gender: Female

Connector Pinout:

Pin #	Signal	Type	Description
1	A.Data_P	IO	Line A Data+
2	A.Data_N	IO	Line A Data-
3	NC	NC	No Connection
4	B.Data_P	IO	Line B Data+
5	B.Data_N	IO	Line B Data-
6	A.Bus_GND	P	Ground Line A
7	B.Bus_GND	P	Ground Line B
8	A.Bus_5V	P	Line A Power Supply+
9	B.Bus_5V	P	Line B Power Supply+

6.6.3.2 MVB ESD+ Female Connector Specifications

Connector Layout:



Connector Specifications:
- Standard 9-Pin D-Sub (socket)
- Gender: Female

Mating Connector Specifications:
- Standard 9-Pin D-Sub (plug)
- Gender: Male

Connector Pinout:

Pin #	Signal	Type	Description
1	A.Data_P	IO	Line A Data+
2	A.Data_N	IO	Line A Data-
3	NC	NC	No Connection
4	B.Data_P	IO	Line B Data+
5	B.Data_N	IO	Line B Data-
6	A.Bus_GND	P	Ground Line A
7	B.Bus_GND	P	Ground Line B
8	A.Bus_5V	P	Line A Power Supply+
9	B.Bus_5V	P	Line B Power Supply+

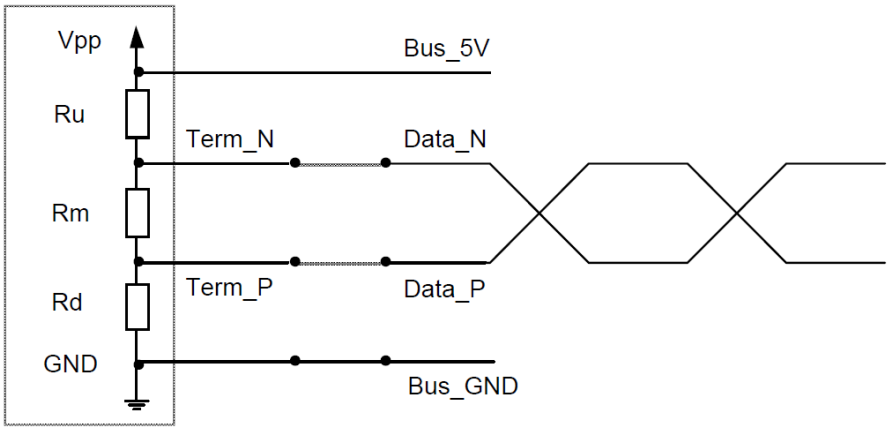
6.6.3.3 MVB ESD+ Connection Notes

An ESD segment shall be terminated electrically at each end by a terminator.

The terminator shall present an impedance of 120,0 Ω ± 2 % measured at 1,0 BR.

Example of terminator (from the IEC 61375-1: 2007):

The terminator shown in the following figure presents an impedance of 120,5 Ω and biases the line with about 0,786 V. Note that the Vpp source shall have a very low inner impedance in the frequency range of 0,5 BT until 2 BT in order that the equivalent terminator impedance seen by the line is within the specified tolerance. Resistors are belonging from the E96 series 1% tolerance.



Components	Type	Value	Connections	Type	Value
Ru	Resistor	383 Ω	Vpp	Supply voltage	5,0 V
Rm	Resistor	143 Ω	GND	Reference voltage	0,0 V
Rd	Resistor	383 Ω			

Figure 6.3 - Example of terminator

The terminator shall be included into a connector, to be plugged into the empty receptacle of a device located at the end of the segment, according to the wiring shown in the following figure:

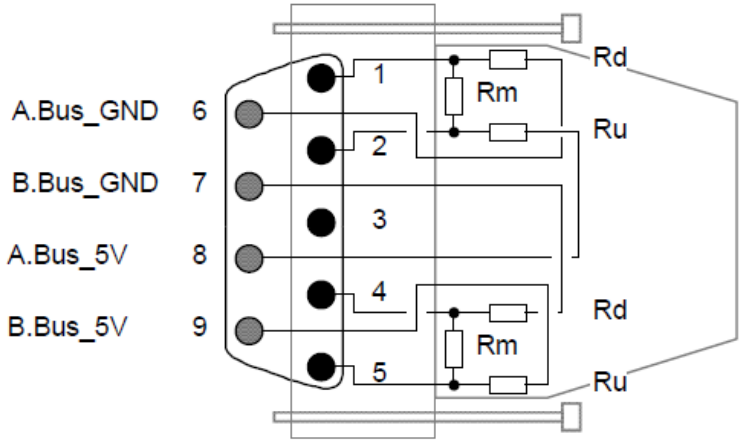


Figure 6.4 - ESD terminator connector arrangement

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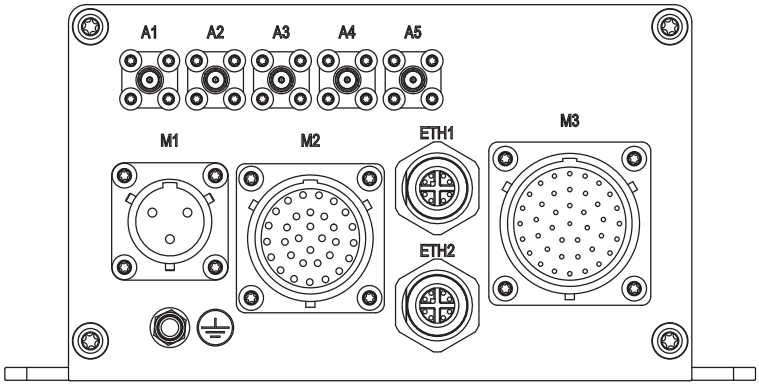
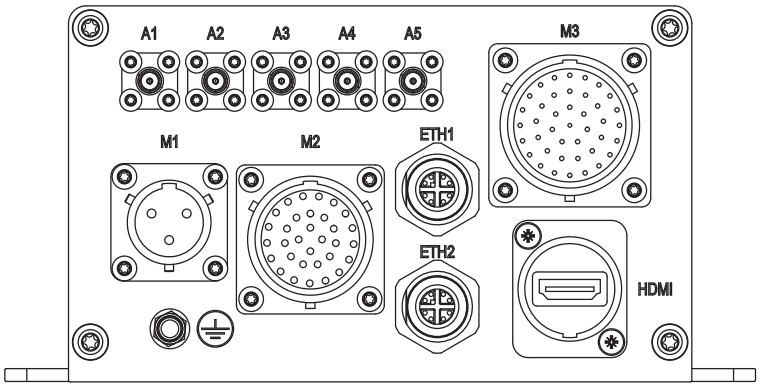
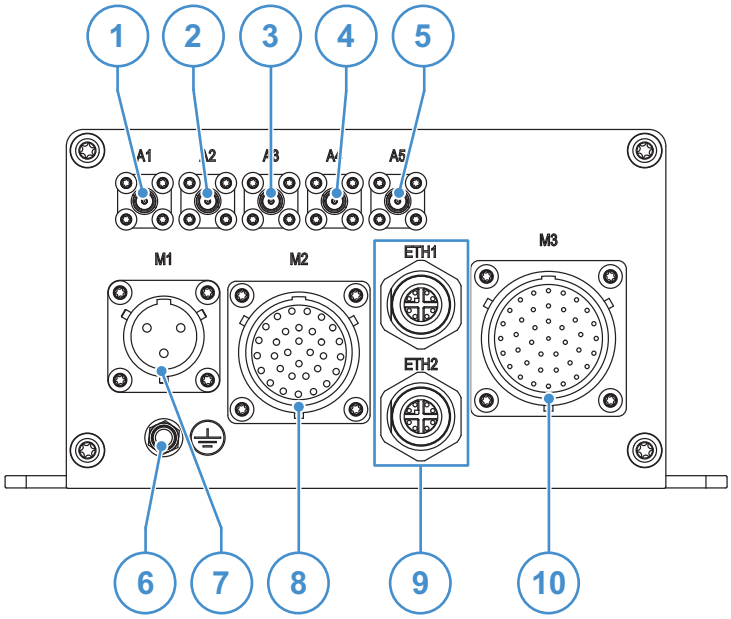
7 REAR SIDE OVERVIEW

The following Rear Side Layouts are available according to the BoltGATE 20-25 versions:

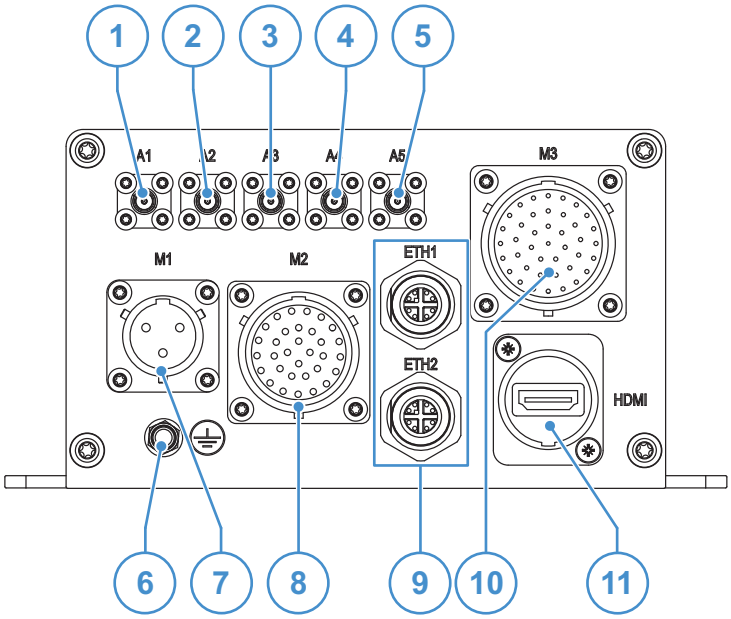
Product Version	Rear Side Layout
• -01 • -02 • -03 • -04 • -M1 • -M2 • -M3 • -M4	
• -11 • -15	

7.1 Rear Side Overview, vers.: -01 -02 -03 -04 -M1 -M2 -M3 -M4



Ref#	Symbol	Description
1	A1	Wi-Fi and Bluetooth Co-existence Main Antenna Connector
2	A2	Wi-Fi (MIMO) Diversity Antenna Connector
3	A3	Cellular Main Antenna Connector: • Not Available for Vers.: -01 -02 -03 -04 • LTE CAT 4 (EU) for Vers.: -M1 -M2 -M3 -M4
4	A4	Cellular Diversity Antenna Connector: • Not Available for Vers.: -01 -02 -03 -04 • LTE CAT 4 (EU) for Vers.: -M1 -M2 -M3 -M4
5	A5	GNSS Antenna Connector
6	⏚	Earth Connection Terminal
7	M1	Power IN Connector
8	M2	3xCOM, 1xCAN, Audio Connector: • 1x RS-232/422/485 Serials, 9-wire, Insulated (COM 1) • 2x RS-422/485 Serials, 5-wire, Insulated (COM 2, COM 3) • 1x CAN Bus 100mA with 5V Power Out, Insulated (CAN 2) • Audio Lines: 1x Line In, 1x 2 W Class D Stereo Out
9	ETH 1	1x 10/100/1000 Mbps Ethernet (ETH 1) Connector
	ETH 2	1x 10/100/1000 Mbps Ethernet (ETH 2) Connector
10	M3	1xCOM, 1xCAN, 4xDIO, 2xUSB Connector: • 1x CAN Bus 100mA with 5V Power Out, Insulated (CAN 1) • 4x Digital Input, 4x Digital Output, 1x Odometer (All DI/O are Insulated, EN 50155) • 1x RS-232/422/485 Serials, 9-wire, Insulated (COM 4) • 2x USB 2.0 Noise and Surge Protected (USB 0, USB 1)

7.2 Rear Side Overview, vers.: -11 -15



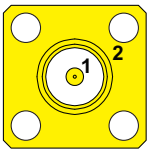
Ref#	Symbol	Description
1	A1	Wi-Fi and Bluetooth Co-existence Main Antenna Connector
2	A2	Wi-Fi (MIMO) Diversity Antenna Connector
3	A3	Cellular Main Antenna Connector: • LTE CAT 4 (EU) for vers.: -11 -15
4	A4	Cellular Diversity Antenna Connector: • LTE CAT 4 (EU) for vers.: -11 -15
5	A5	GNSS Antenna Connector
6	⏚	Earth Connection Terminal
7	M1	Power IN Connector
8	M2	3xCOM, 1xCAN, Audio Connector: • 1x RS-232/422/485 Serials, 9-wire, Insulated (COM 1) • 2x RS-422/485 Serials, 5-wire, Insulated (COM 2, COM 3) • 1x CAN Bus 100mA with 5V Power Out, Insulated (CAN 2) • Audio Lines: 1x Line In, 1x 2 W Class D Stereo Out
9	ETH 1	1x 10/100/1000 Mbps Ethernet (ETH 1) Connector
	ETH 2	1x 10/100/1000 Mbps Ethernet (ETH 2) Connector
10	M3	1xCOM, 1xCAN, 4xDIO, 2xUSB Connector: • 1x CAN Bus 100mA with 5V Power Out, Insulated (CAN 1) • 4x Digital Input, 4x Digital Output, 1x Odometer (All DI/O are Insulated, EN 50155) • 1x RS-232/422/485 Serials, 9-wire, Insulated (COM 4) • 2x USB 2.0 Noise and Surge Protected (USB 0, USB 1)
11	HDMI	HDMI Connector

7.3 Rear Side Connectors

The availability of the connectors vary according to the BoltGATE 20-25 version.

7.3.1 Connectors A1 and A2

Connector Layout:



Connector Pinout:

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

Connector Specifications:

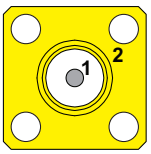
- RP-SMA connector
- Gender: Female

Mating Connector Specifications:

- RP-SMA connector
- Gender: Male

7.3.2 Connectors A3 to A5

Connector Layout:



Connector Pinout:

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

Connector Specifications:

- SMA connector
- Gender: Female

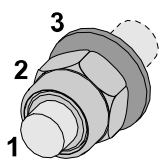
Mating Connector Specifications:

- SMA connector
- Gender: Male

7.3.3 Earth Connection Terminal

Always use this terminal to connect the BoltGATE 20-25 to an earth point in the installation. This terminal includes an M4 washer and an M4 lock nut.
Apply a tightening torque of 1.5 Nm (maximum guaranteed tightening torque = 2 Nm).

Terminal Layout:



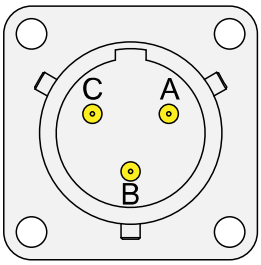
Terminal Label:

Terminal Parts:

Part #	Description
1	M4 stud bolt (length = 13 mm)
2	M4 lock nut
3	M4 washer

7.3.4 *Connector M1*

Connector Layout:



Connector Specifications:

- Panel-mount; MIL-26482 series
- Gender: Male
- Type: Size 12; 3-pin

Mating Connector Specifications:

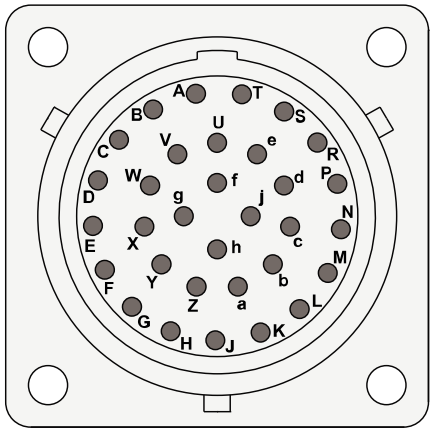
- Cable-Mount; MIL-26482 series
- Gender: Female
- Type: Size 12; 3-pin
- Example:
  Manufacturer: Souriau
  Part Number: 851-06RC12-03S5044
  (or equivalent)

Connector Pinout:

Pin #	Signal	Type	Description
A	VIN+	P	Power Supply Input +
B	KEY	P	Key Signal
C	VIN-	P	Power Supply Input -

7.3.5 Connector M2

Connector Layout:



Connector Specifications:

- Panel-mount; MIL-26482 series
- Gender: Female
- Type: Size 18; 32-pin

Mating Connector Specifications:

- Cable-Mount; MIL-26482 series
- Gender: Male
- Type: Size 18; 32-pin
- Example:
  Manufacturer: Amphenol
  Part Number: 62IN16F18-32P-5-416
  (or equivalent)

COM 3 Lines:

Pin #	RS-422 mode	RS-485 mode half / full duplex
d	TX -	RX / TX -
e	TX +	RX / TX +
f	GND	GND
g	RX -	Not Connected
h	RX+	Not Connected
j	-	Not Connected

Connector Pinout:

COM 1 Lines:

Pin #	RS-232 mode	RS-422 / 485 mode full duplex	RS-485 mode half duplex
A	DCD	TX -	TX - / RX-
B	RX	TX +	TX + / RX+
C	TX	RX +	Not Connected
D	DTR	RX -	Not Connected
E	GND	GND	GND
F	DSR	Not Connected	Not Connected
G	RTS	Not Connected	Not Connected
H	CTS	Not Connected	Not Connected
J	RI	Not Connected	Not Connected

CAN Lines:

Pin #	Signal	Type	Description
K	CAN VDD	P	CAN +5V
L	CAN H	IO	CAN Positive data
M	CAN L	IO	CAN Negative data
N	CAN GND	P	CAN Ground

COM 2 Lines:

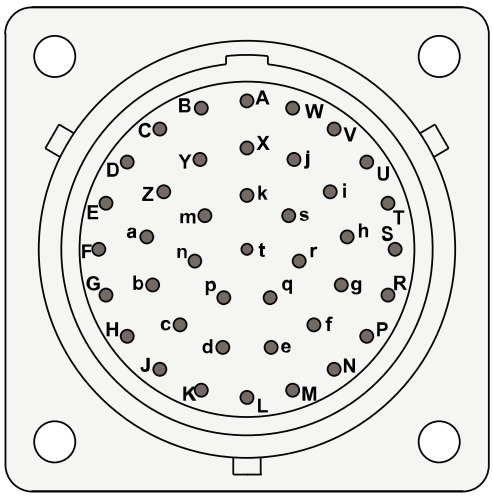
Pin #	RS-422 mode	RS-485 mode half / full duplex
P	TX -	RX / TX -
R	TX +	RX / TX +
S	GND	GND
T	RX -	Not Connected
U	RX+	Not Connected

Audio Lines:

Pin #	Signal	Type	Description
V	SPEAKER R+	O	Speaker Right +
W	SPEAKER R-	O	Speaker Right -
X	SPEAKER GND	O	Speaker Ground
Y	SPEAKER L+	O	Speaker Left +
Z	SPEAKER L-	O	Speaker Left-
a	AUDIO IN GND	I	Audio Input Ground
b	AUDIO IN L	I	Audio Input Left
c	AUDIO IN R	I	Audio Input Right

7.3.6 *Connector M3*

Connector Layout:



Connector Specifications:

- Panel-mount; MIL-26482 series
- Gender: Female
- Type: Size 20; 41-pin

Mating Connector Specifications:

- Cable-Mount; MIL-26482 series
- Gender: Male
- Type: Size 20; 41-pin
- Example:
  Manufacturer: Amphenol
  Part Number: 62IN16F20-41P-5-416
  (or equivalent)

Connector Pinout (pins not listed are not connected):

CAN Lines:

Pin #	Signal	Type	Description
A	CAN VDD	P	CAN +5V
B	CAN H	IO	CAN Data +
C	CAN L	IO	CAN Data -
D	CAN GND	P	CAN Ground

Digital I/O Lines:

Pin #	Signal	Type	Description
E	DOUT1 P	O	Digital Output 1 +
F	DOUT 1 N	O	Digital Output 1 -
G	DOUT2 P	O	Digital Output 2 +
H	DOUT 2 N	O	Digital Output 2 -
J	DOUT 3 P	O	Digital Output 3 +
K	DOUT 3 N	O	Digital Output 3 -
L	DOUT4 P	O	Digital Output 4 +
M	DOUT4 N	O	Digital Output 4 -
N	DIN1 P	I	Digital Input 1 +
P	DIN1 N	I	Digital Input 1 -
R	DIN2 P	I	Digital Input 2 +
S	DIN2 N	I	Digital Input 2 -
T	DIN3 P	I	Digital Input 3 +
U	DIN3 N	I	Digital Input 3 -
V	DIN4 P	I	Digital Input 4 +
W	DIN4 N	I	Digital Input 4 -
X	ODO+	I	Odometer Input +
Y	ODO-	I	Odometer Input -

USB Lines:

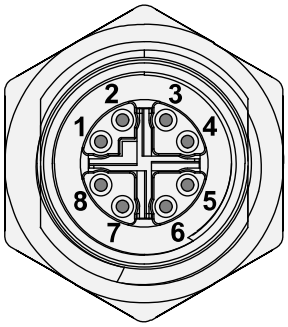
Pin #	Signal	Type	Description
j	USB 1 VDD	P	USB 1 +5V
k	USB1 D-	IO	USB 1 Data -
m	USB 1 D+	IO	USB 1 Data +
n	USB 1 GND	P	USB 1 Ground
p	USB 0 +VDD	P	USB 0 +5V
q	USB 0 D-	IO	USB 0 Data -
r	USB 0 D+	IO	USB 0 Data +
s	USB 0 GND	P	USB 0 Ground

COM Lines:

Pin #	RS-232 mode	RS-422/485 mode full duplex	RS-485 mode half duplex
a	DCD	TX -	TX - / RX -
b	RX	TX +	TX + / RX +
c	TX	RX +	Not Connected
d	DTR	RX -	Not Connected
e	GND	GND	GND
f	DSR	Not Connected	Not Connected
g	RTS	Not Connected	Not Connected
h	CTS	Not Connected	Not Connected
i	RI	Not Connected	Not Connected

7.3.7 Connectors ETH1 and ETH2

Connector Layout:



Connector Specifications:

- Panel-mount; M12 series
- Gender: Female
- Type: X-Coded; 8-pin

Mating Connector Specifications:

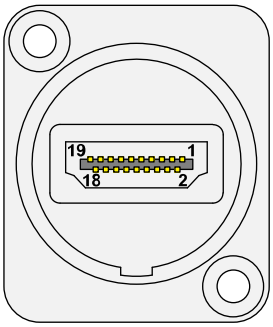
- Cable-Mount; M12 series
- Gender: Male
- Type: X-Coded; 8-pin
- Example of cable:
  Manufacturer: Metz Connect
  Part Number: 142M2X10005
  (or equivalent)

Connector Pinout:

Pin #	Signal	Type	Description	Male RJ45 Pin #
1	TX+ _D1	O	Transmit Data +	1
2	TX- _D1	O	Transmit Data -	2
3	RX+_D2	I	Receive Data +	3
4	RX-_D2	I	Receive Data -	6
5	BI+_D4	I/O	Bidirectional Data +	7
6	BI-_D4	I/O	Bidirectional Data -	8
7	BI-_D3	I/O	Bidirectional Data -	5
8	BI+_D3	I/O	Bidirectional Data +	4

7.3.8 Connector HDMI

Connector Layout:



Connector Specifications:

- HDMI Type-A Socket
- Gender: Female

Mating Connector Specifications:

- Cable-mount HDMI Type-A Plug
- Gender: Male
- Example:
  Manufacturer: Neutrik
  Part Number: NKHDMI-*
  (or equivalent)

Connector pinout:

Pin #	Signal	Description
1	D2+	TMDS Data2+
2	D2_SH	TMDS Data2 Shield
3	D2-	TMDS Data2−
4	D1+	TMDS Data1+
5	D1_SH	TMDS Data1 Shield
6	D1-	TMDS Data1−
7	D0+	TMDS Data0+
8	D0_SH	TMDS Data0 Shield
9	D0-	TMDS Data0−
10	CK+	TMDS Clock+
11	CK_SH	TMDS Clock Shield
12	CK-	TMDS Clock−
13	CEC	Consumer Electronics Control
14	NC	Not Connected
15	SCL	SCL (I²C serial clock for DDC)
16	SDA	SDA (I²C serial data for DDC)
17	DGND	DDC/CEC Ground
18	+5V	+5V Power
19	HPD	Hot Plug Detect

7.4 Wi-Fi and Bluetooth

Feature	Description
Frequency bands	WLAN: • 2.4 GHz ISM Bands 2.412 - 2.472 GHz, 2.484 GHz • 5.15 - 5.25 GHz (FCC UNII-low band) for US/Canada, Japan and Europe • 5.25 - 5.35 GHz (FCC UNII-middle band) for US/Canada and Europe • 5.47 - 5.725 GHz for Europe • 5.725 - 5.825 GHz (FCC UNII-high band) for US/Canada Bluetooth: • 2402 - 2483 MHz
Data Transfer Rates	WLAN 2.4 GHz: • 11n: Up to 300 Mbps (dynamic) • 11g: Up to 54 Mbps (dynamic) • 11b: Up to 11 Mbps (dynamic) WLAN 5 GHz: • 11n: Up to 300 Mbps (dynamic) • 11a: Up to 54 Mbps (dynamic) Bluetooth: • 1 Mbps, 2 Mbps and Up to 3 Mbps EDR
Media Access Control	CSMA/CA with ACK
Channel	2.4GHz: 1-13 (14 only for Japan) 5GHz: 36-48 149-165 Supports Fast Channel Switch (FTS): 1ms within and 2ms across bands
Channel Spacing	5 MHz
Spreading / Modulation	WLAN: • 802.11a/g/n: OFDM • 802.11b: CCK(11, 5.5Mbps), DQPSK(2Mbps), BPSK(1Mbps) Bluetooth: • Header GFSK • Payload 2M: 4-DQPSK • Payload 3M: 8DPSK
RF Output Power	• 802.11a: Typical 11 dBm at 54M / 15dBm at 6M +- 2dBm • 802.11b: Typical 17dBm +/- 2 dBm • 802.11g: Typical 15 dBm at 54M / 17dBm at 6M +- 2dBm • 802.11n 5G HT20 : Typical 9 dBm at MCS7 / 14dBm at MCS0 +/- 2dBm • 802.11n 5G HT40 : Typical 9 dBm at MCS7 / 14dBm at MCS0 +/- 2dBm • 802.11n 2.4G HT20 : Typical 14 dBm at MCS7 / 17dBm at MCS0 +/- 2dBm • 802.11n 2.4G HT40 : Typical 14 dBm at MCS7 / 16dBm at MCS0 +/- 2dBm • Bluetooth: (Class 2 Device) -6 ≤ Output Power ≤ +7 dBm (Conductive)

RF receive Sensitivity (Typical)	• 802.11a: 54M less than 68 dBm
	• 802.11b: 11M less than 78 dBm
	• 802.11g: 54M less than 68 dBm
	• 802.11n 2.4G:
	  ◦ HT20 MCS7 less than 64 dBm
	  ◦ HT40 MCS7 less than 61 dBm
	• 802.11n 5G:
	  ◦ HT20 MCS7 less than 64 dBm
	  ◦ HT40 MCS7 less than 61 dBm

7.5 LTE EU Cellular

Feature	Description
Frequency bands	• LTE: 800 (B20) / 900 (B8) / 1800 (B3) / 2100 (B1) / 2600 (B7) • UMTS | HSPA: 900, 2100 MHz • GSM | GPRS | EDGE: 900, 1800 MHz
Other	• LTE FDD Cat.4, 3GPP release 9 compliant • Rx Diversity and MIMO DL 2x2
Data Transfer Rates	• LTE Cat.4 • Uplink up to 50 Mbps • Downlink up to 150 Mbps DC-HSPA+ 42 Mbps
Output power	• Class 3 (0.2 W, 23 dBm) @LTE

7.6 Positioning

Feature	Description
Receiver type	• 72-channel GNSS receiver with untethered dead reckoning • GPS/QZSS L1 C/A • GLONASS L10F • BeiDou B1I • Galileo E1B/C • SBAS L1 C/A: WAAS, EGNOS, MSAS, GAGAN
Navigation update rate	Up to 20 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: –157 dBm
Assistance	• AssistNow GNSS Online • AssistNow GNSS Offline (up to 35 days) • AssistNow Autonomous (up to 6 days) • OMA SUPL & 3GPP compliant
Oscillator	Crystal
Sensor	Onboard accelerometer and gyroscope
Supported antennas	Active or passive antenna

7.7 Insulated Digital I/Os

The BoltGATE 20-25 includes: 4x Digital Input, 4x Digital Output, 1x Odometer (All DI/O are Insulated, EN 50155)

7.7.1 Insulated Digital Inputs

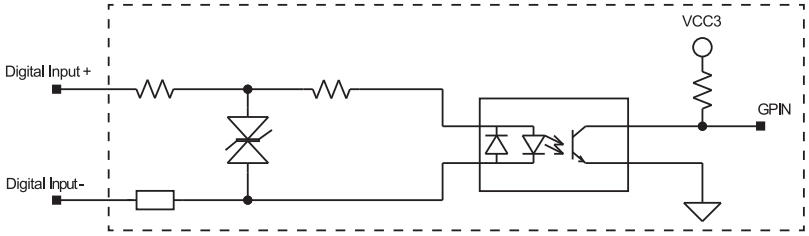
7.7.1.1 Electrical specifications

The table below shows the electrical specifications of the digital inputs at 24 and 110 VDC of nominal supply voltage:

Characteristic	Value @ 24 VDC	Value @ 110 VDC
Logic Zero	0 V ≤ VIN_low ≤ 1.5 V	0 V ≤ VIN_low ≤ 10 V
Logic One	9 V ≤ VIN_high ≤ 36 V	77 V ≤ VIN_high ≤ 137.5 V
Minimum duration of the pulse	10 ms	10 ms
Response Time	5 ms	5 ms
Input Current	6 mA	4 mA

7.7.1.2 Electrical schematics

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



7.7.2 *Insulated Digital Outputs*

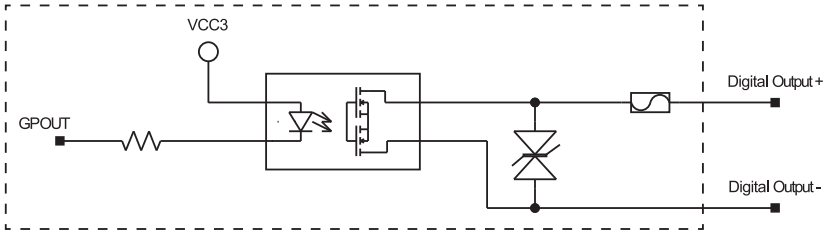
7.7.2.1 Electrical specifications

The table below shows the electrical specifications of the digital outputs at 24 and 110 VDC of nominal supply voltage:

Characteristic	Value @ 24 VDC	Value @ 110 VDC
Maximum Current	250 mA	60 mA
Output ON Resistance	Typical: 0.85 Ohm Maximum: 2.5 Ohm	Typical: 20 Ohm Maximum: 25 Ohm

7.7.2.2 Electrical schematics

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



7.7.3 Insulated Odometer Input

7.7.3.1 How the odometer input works

The odometer input is a digital interface that counts the input pulses and detect with them the speed of a vehicle.
The input, available on pins ODOM+ and ODOM-, is optically insulated and has a programmable threshold level.

The programmable input threshold allows you to configure the best threshold value for your application; the input can be seen as a trigger that counts the input pulses and deletes any spurious.

The ODOM+ input is compared with a programmable reference voltage threshold:

- If the input signal is higher than the programmed high threshold, the logic input is '1'
- If the input signal is lower than the programmed low threshold, the logic input is '0'

The programmable reference voltage comes from a 32-steps digital potentiometer (EEPOT: Electrically-Erasable Potentiometer), which wiper position is set to mid-scale at every power-up.

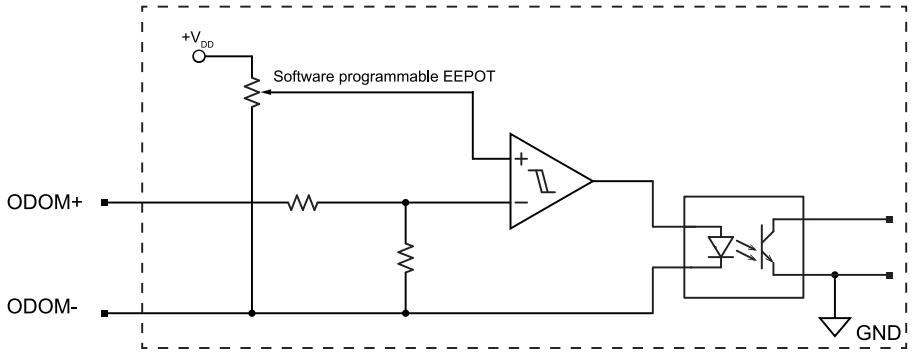
7.7.3.2 Electrical specifications

The table below shows the electrical specifications odometer input:

Characteristic	Value
Voltage Range	Minimum: 0 V Maximum: 32 V
Maximum Input Frequency	10 kHz

7.7.3.3 Electrical schematics

The figure below shows the electrical schematics of the odometer input:



7.7.3.4 Available wiper settings and corresponding threshold values

The following table shows the available wiper settings and the corresponding low and high threshold values.
The threshold values are measured with a 10 kHz square wave input signal that has a duty cycle of 20% ~ 80%.

Wiper settings	Low threshold [V]	High threshold [V]
1	0.3	1.2
2	1.5	4.0
3	2.6	6.6
4	3.6	8.6
5	4.4	10.5
6	5.2	12.5
7	6.0	13.7
8	6.8	15.4
9	7.5	16.7
10	8.2	17.5
11	9.0	18.5
12	9.6	20.1
13	10.3	21.2
14	10.6	21.4
15	11.8	22.4
16	12.5	23.2
17	13.4	24.2
18	14.0	25.0
19	14.9	25.6
20	15.0	26.3
21	16.8	27.3
22	17.7	27.9
23	18.8	28.8
24	20.1	29.6
25	21.3	31.2
26	22.6	32.2
27	24.2	33.7
28	26.1	35.0
29	27.8	35.7
30	29.9	35.7
31	32.4	35.7
32	33.5	35.7

8 THE SOFTWARE

According to the product version, the BoltGATE 20-25 can run the following Operating Systems: Yocto Linux or Windows 10 IoT Enterprise.

8.1 Yocto Linux Distribution

This is a Linux distribution based on Yocto framework, www.yoctoproject.org, with an SDK for application development.

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

8.2 Windows 10 IoT Enterprise

This is a full version of Windows 10, that delivers enterprise manageability and security to IoT solutions.

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9 How to Log in the Administration Console

This section describes how to enter the Administration Console to access the BoltGATE 20-25 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)

9.1 Default Credentials

The default credentials are the following (case sensitive):

- Username: **root**
- Password: **eurotech**

9.2 How to Login Using the TTL Serial Console

To log in using the Console port, complete the following steps:

1. To log in using the TTL Serial Console, complete the following steps:
2. Setup a Development PC (for example: a laptop) with a free USB port
3. Make sure that both the Development PC and the BoltGATE 20-25 are turned OFF
4. Connect the TTL-to-USB Cable between the USB port (of the Development PC) and the TTL Serial Console (of the BoltGATE 20-25)
5. Turn ON both the Development PC and the BoltGATE 20-25
6. 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...:~#
```

9.3 How to Login Via Secure Shell (SSH)

The default (out-of-the-box) network configuration of the BoltGATE 20-25 is as follows:

- **enp3s0**
  - Status: Enabled for LAN
  - Configure: Manually (Static IP)
  - IP Address: 172.16.0.1
  - Subnet Mask: 255.255.255.0
- **enp4s0**
  - Status: Enabled for LAN
  - Configure: DHCP (DHCP client)
- **wlp1s0**
  - Status: Disabled

9.3.1 How to Login Via the enp3s0 Port

BoltGATE 20-25 enp3s0 port is configured with the static IP address: 172.16.0.1/24.

To log in using enp3s0, complete the following steps:

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

9.3.2 How to Login Via the enp4s0 Port

BoltGATE 20-25 enp4s0 port is configured in DHCP client.

You have to know its IP address before you can log in, or you have to use a zeroconf implementation.

NOTICE

By default the BoltGATE 20-25 runs a zeroconf implementation.
You can detect the IP address of the unit remotely by running the command: `avahi-discover`.

Example:

1. **Run the the command: `avahi-discover`. A dialog box pops-up reporting all the devices on your network that support this mechanism**
2. **In "enp3s0 IPv4" > "local" > "Workstation", you should see your product's hostname (example: productname_serialnumber). Select it to see its IP address**
3. **Log in the BoltGATE 20-25 using: `ssh root@productname_serialnumber.local`**
4. **At the prompt, enter the default password (see "Default Credentials" on the previous page).**

9.4 How to Change the Security Settings

For security reasons, Eurotech recommends you to change the Linux 'root' password after your initial setup.

To change the Linux password, complete the following steps:

1. Login using the Administration Console
2. Run the command `passwd` and enter a new 'root' account password.

10 How to Access the Interfaces Under Linux

NOTICE
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 further details.**

10.1 How to Determine the Operating System Version Installed

To determine the Operating System version installed, enter the following command:

```
eurotech_versions
```

Example output:

```
root@xxx:~# eurotech_versions
eurotech_versions
eth_cpu_order_code: xxx
eth_vers_cpu: xxx
eth_vers_bios: xxx
eth_vers_ecfw: xxx
eth_vers_uctl: xxx
eth_name_bsp: xxx
eth_vers_bsp: Operating System version
eth_arch_bsp: xxx
```

10.2 Memory and Storage Devices

The BoltGATE 20-25 exposes the memory and the storage devices as follows:

- Internal memory: `/dev/mmcblk0`
- MicroSD card memory: `/dev/sda`
- Removable disk(s): `/dev/sdb` (1st SATA disk)
  `/dev/sdc` (2nd SATA disk, by default not installed)

10.3 Wi-Fi and Bluetooth

The BoltGATE 20-25 exposes the Wi-Fi and Bluetooth interfaces as follows:

- Wi-Fi interface: `wlp1s0` (default configuration: disabled)
- Bluetooth interface: `hci0` (default configuration: disabled)

10.3.1 Wi-Fi

The Wi-Fi interface supports both access point and station modes.
By default the Wi-Fi interface is configured in access point mode.

To start the access point, enter the following commands:

Note: before proceeding, make sure you have already configured `hostapd.conf`. For more information see: https://w1.fi/cgit/hostap/plain/hostapd/hostapd.conf

```
ifconfig wlp1s0 up
systemctl enable hostapd.service
```

To start the station, enter the following commands:

```
ifconfig wlp1s0 up
nmcli device wifi connect <AP NAME> password <password>
```

10.3.2 Bluetooth

You need to load the Bluetooth firmware before using the Bluetooth interface.

To load the Bluetooth firmware, enter the following commands:

```
hciconfig hci0 up
```

10.4 Cellular Modem

The BoltGATE 20-25 exposes the modem as follows:

- If modem is in slot 2 `/dev/ttyLE910v1-2-2`
  `/dev/ttyLE910v2-2-0`
  `/dev/ttyHE910-2-0`
- If modem is in slot 3 `/dev/ttyLE910v1-3-2`
  `/dev/ttyLE910v2-3-0`
  `/dev/ttyHE910-3-0`

By default the modem is turned ON.

To turn OFF unconditionally the modem in slot 2, enter the following commands:

```
echo 0 >/dev/pciex_slot2_power/value
echo 0 >/dev/pciex_slot2_wdisable/value
```

To turn OFF unconditionally the modem in slot 3, enter the following commands:

```
echo 0 >/dev/pciex_slot3_power/value
echo 0 >/dev/pciex_slot3_wdisable/value
```

To turn ON the modem in slot 2, enter the following commands:

```
echo 1 >/dev/pciex_slot2_power/value
sleep 3
echo 1 >/dev/pciex_slot2_wdisable/value
```

To turn ON the modem in slot 3, enter the following commands:

```
echo 1 >/dev/pciex_slot3_power/value
sleep 3
echo 1 >/dev/pciex_slot3_wdisable/value
```

10.5 Positioning

The BoltGATE 20-25 exposes positioning device as follows:

- `/dev/serial/by-path/pci-0000:00:14.0-usb-0:5.2.4:1.0`

To turn ON the positioning device, enter the following command:

```
echo 1 >/dev/gps_power/value turn_on
```

To turn OFF the positioning device, enter the following command:

```
echo 0 >/dev/gps_power/value turn_off
```

To reset the positioning device, enter the following commands:

```
echo 1 >/dev/gps_reset/value reset inactive
echo 0 >/dev/gps_reset/value reset active
```

To read the NMEA data, enter the following command:

```
cat /dev/ttyACM6
```

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

10.6 CAN

The BoltGATE 20-25 exposes the CAN as follows:

- CAN 1: `can0`
- CAN 2: `can1`

CAN ports are added through the SocketCAN kernel extension.
For further information on SocketCAN refer to the Linux kernel documentation:
www.kernel.org/doc/Documentation/networking/can.txt

10.6.1 How to Enable the CAN Bus 5V

To enable can0 5V, enter the following command:

```
echo 1 >/dev/canbus1_power/value
```

To enable can1 5V, enter the following command:

```
echo 1 >/dev/canbus2_power/value
```

10.6.2 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
```

10.6.3 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 001#FF.FF.FF.01

#Example of received message on CAN0
candump can0
```

10.7 COM 1 to 4, TTL Serial Console

The BoltGATE 20-25 has the following serial and console ports:

- 2x RS-232/422/485 Serials, 9-wire, Insulated (COM 1, COM 4)
- 2x RS-422/485 Serials, 5-wire, Insulated (COM 2, COM 3)
- 1x TTL Serial Console

The BoltGATE 20-25 exposes the ports as follows:

- COM 1: `/dev/ttyCOM1`
- COM 2: `/dev/ttyCOM2`
- COM 3: `/dev/ttyCOM3`
- COM 4: `/dev/ttyCOM4`
- TTL Serial Console: `/dev/ttyS0` (available in the Service Panel)

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

10.7.1 How to Set the RS-232/422/485 Mode

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

10.7.1.1 How to Use the Ethsetserial Utility to Configure the COM Ports

NOTE: `ser_port_name` can be: `/dev/ttyXRx , ttyCOMx`

To set a serial port in RS-232 mode, enter the following command:

```
ethsetserial -p ser_port_name -m232
```

To set a serial port in RS-422 mode, enter the following command:

```
ethsetserial -p ser_port_name -m422
```

To set a serial port in RS-485 mode, enter the following command:

```
ethsetserial -p ser_port_name -m485
```

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

```
ethsetserial -h
```

10.7.1.2 How to Implement the Ioctl in the Source Code to Configure the COM Ports

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

/*Ioctl to write */
 #define TIOCSRS485                                0x542F
```

Definition of the flags bit

```
//bit definition for serial_rs485.flags field
#define ETH_SER_MODE_HIZ    (1 << 31)
#define ETH_SER_MODE_LOOP   0
#define ETH_SER_MODE_RS232  (1 << 29)
#define ETH_SER_MODE_RS485  (2 << 29)
#define ETH_SER_MODE_RS422  (3 << 29)
#define ETH_SER_PORT_TERM   (1 << 28)
#define ETH_SET_RS485_DELAY (1 << 27)
#define ETH_SER_MODE_BITS   0x60000000
#define ETH_SERIAL_FLAGS    0xF8000000
```

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 a serial port in RS-232 mode

`ser_port_name` can be either `/dev/ttyXRUSBx` or `/dev/ttyCOMx`

```
struct serial_rs485 rs485conf;
rs458conf.flags=ETH_SER_MODE_RS232

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


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

Example: Configuring a serial port in RS-485 mode

`ser_port_name` can be either `/dev/APP0` or `/dev/APP1`.

```
struct serial_rs485 rs485conf;
rs485conf.flags=ETH_SER_MODE_RS485

//INSERT THE TERMINATION
rs485conf.flags|=ETH_SER_PORT_TERM
//INSERT CHARACTERS DELAY AFTER SEND
rs485conf.flags|=ETH_SET_RS485_DELAY
rs485conf.delay_rts_after_send=10

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

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

10.7.2 How to Test a Serial Port

To test the serial port, use the microcom utility:

```
#connect ttyCOM1 with a baud rate of 9600
microcom /dev/ttyCOM1 -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 sent data).

10.8 USB

The BoltGATE 20-25 exposes the USB ports as follows:

- USB 0: `usb0`
- USB 1: `usb1`

To turn ON USB 0, enter the following command:

```
echo 1 >/dev/usb_j10_h7_power/value
```

To turn OFF USB 0, enter the following command:

```
echo 0 >/dev/usb_j10_h7_power/value
```

To turn ON USB 1, enter the following command:

```
echo 1 >/dev/usb_j10_h8_power/value
```

To turn OFF USB 1, enter the following command:

```
echo 0 >/dev/usb_j10_h8_power/value
```

10.9 Digital I/O

The BoltGATE 20-25 exposes the Digital I/Os (GPIOs) as follows:

- Digital Input 1: `/dev/digital_in1/value`
- Digital Input 2: `/dev/digital_in2/value`
- Digital Input 3: `/dev/digital_in3/value`
- Digital Input 4: `/dev/digital_in4/value`
- Digital Output 1: `/dev/digital_out1/value`
- Digital Output 2: `/dev/digital_out2/value`
- Digital Output 3: `/dev/digital_out3/value`
- Digital Output 4: `/dev/digital_out4/value`

To set ON/OFF a Digital Output (for example Digital Output 1), enter the following commands:

```
#set the Digital Output to ON
echo 1 > /dev/digital_out1/value
```

```
#set the Digital Output to OFF
echo 0 > /dev/digital_out1/value
```

To read the state of a Digital Input (for example Digital Input 1), enter the following command:

```
#read the state of a Digital Input
cat /dev/digital_in1/value
```

The reply to the command is the following:

- If the Digital Input is ON, you will obtain the value "1"
- If the Digital Input is OFF, you will obtain the value "0"

To read the state of a Digital Output (for example Digital Output 1), enter the following command:

```
#read the state of a Digital Outpu
cat /dev/digital_out1/value
```

The reply to the command is the following:

- If the Digital Output is ON, you will obtain the value "1"
- If the Digital Output is OFF, you will obtain the value "0"

10.10 LED Indicators

The BoltGATE 20-25 exposes the LED indicators as follows:

- User 1: Green: `/sys/class/leds/led1-green`
  Amber: `/sys/class/leds/led1-amber`
- User 2: Green: `/sys/class/leds/led2-green`
  Amber: `/sys/class/leds/led2-amber`

You can manage User 1 and User 2 only. Other LEDs are reserved.

10.10.1 How to Drive a LED

Each LED is managed by its respective GPIO.

To turn ON/OFF a LED (for example LED User 2), enter the following commands:

```
#turn led on green
echo 1 > /sys/class/leds/led2-green/brightness
```

```
#turn led off
echo 0 > /sys/class/leds/led2-green/brightness
```

10.11 The Ignition Key

The Ignition Key is a digital input that enables the system to be turned ON / OFF.

- If Ignition Key = 1 the system turns ON
- If Ignition Key = 0 the system turns OFF automatically after 120 seconds
  (by default the shutdown time (timeout) is 120 seconds, but you can modify it)

For more information see "The Ignition Key (Key Signal)" on page 95.

To read the Ignition Key status, enter the following command:

```
cat /dev/ignition_key/value
```

The reply to the command is the following:

- If the Ignition Key is connected to VIN+, you will obtain value = "1"
- If the Ignition Key is connected to GND, you will obtain value = "0".

To read the Ignition Key timeout, enter the following command:

```
cat /sys/bus/usb/devices/1-5.3:1,.0/ignition_key_timeout
```

To set the Ignition Key timeout, enter the following command:

```
echo xx > /sys/bus/usb/devices/1-5.3:1,.0/ignition_key_timeout
```

10.11.1 Note About CPU Sleep States

By default the CPU cannot enter in the sleep states (S3 or S5) while the Ignition Key is ON.
If the CPU tries to enter in S3 or S5 while the Ignition Key is ON, the cortex will reset the system.

To allow the CPU to enter in S3 or S5 while the Ignition Key is ON, you have to prior notify this action to the cortex.

To notify the CPU sleep action to the cortex, enter the following command:

```
echo 0 >/sys/bus/usb/devices/1-5.3:1,.0/cpu_sleep_action
```

10.12 Ethernet

The BoltGATE 20-25 exposes the Ethernet ports as follows:

- ETH 1: `enp4s0` (default configuration: DHCP client)
- ETH 2: `enp3s0` (default configuration: 172.16.0.1 Static IP address)

To know the IP address of enp3s0, enter the following command:

```
#know the IP address of enp3s0
ifconfig
```

Example output:

```
enp3s0   Link encap:Ethernet HWaddr 00:e0:c7:09:ac:e5
         inet6 addr: fe80::2e0:c7ff:fe09:ace5/64 Scope:Link
         UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
         RX packets:80 errors:0 dropped:0 overruns:0 frame:0
         TX packets:8 errors:0 dropped:0 overruns:0 carrier:0
         collisions:0 txqueuelen:1000
         RX bytes:9820 (9.5 KiB) TX bytes:648 (648.0 B)
```

10.13 Odometer

The odometer is a 16-bit counter.

You can read the odometer ticks in two ways, A or B:

A. Enter the following command:

```
cat /sys/bus/usb/devices/1-5.3:1.0/odometer_ticks
```

This command returns the the odometer ticks.

NOTE: Two consecutive readings may be not monotonous.

B. Enter the following command:

```
cat /sys/bus/usb/devices/1-5.3:1.0/odometer_clear
```

This command returns the the odometer ticks and sets the counter to 0.

10.14 RTC

The BoltGATE 20-25 exposes the user-available RTC as follows:

- `/dev/rtc1`

`/dev/rtc1` offers 256 user-available bytes. The SuperCAP allows for up to 2 months of data retain.

10.14.1 How to Use the 256 User-Available Bytes

To read a byte from the location XX, enter the following commands:

```
echo XX >/sys/bus/i2c/devices/8-0069/ram_address
cat /sys/bus/i2c/devices/8-0069/ram_byte
```

To write the byte YY in the location XX, enter the following commands:

```
echo XX >/sys/bus/i2c/devices/8-0069/ram_address
echo YY > /sys/bus/i2c/devices/8-0069/ram_byte
```

10.14.2 How to Manage the BoltGATE 20-25 Sleep Mode

To make the BoltGATE 20-25 enter the sleep mode, enter the following commands:

```
echo 0 >/sys/bus/usb/devices/1-5.3:1,.0/cpu_sleep_action[1]
echo mem > /sys/power/state
```

To make the BoltGATE 20-25 enter and automatically exit from the sleep mode after 30 seconds, enter the following command:

```
echo 0 >/sys/bus/usb/devices/1-5.3:1,.0/cpu_sleep_action[1]
rtcwake -d rtc1 -s 30 -m mem
```

To make the BoltGATE 20-25 manually exiting from the sleep mode, complete the following procedure:

1. Make sure you have and USB keyboard connected to the BoltGATE 20-25
2. Send a character by pressing any key

[1] See "Note About CPU Sleep States" on page 80

10.15 Watchdog

The BoltGATE 20-25 exposes the watchdog as follows:

- /dev/watchdog1

10.15.1 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 lasdt 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_KEEPALIVE,0);
```

10.15.2 How to Manage the Watchdog From the Command Line

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

```
wdttest –d /dev/watchdog1 –t 30
```

To feed the watchdog, enter the following command:

```
echo 10 > /dev/watchdog1
```

To stop the watchdog, enter the following command:

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

10.15.3 For Further Information

For further information on Linux support for watchdog, see:
www.kernel.org/doc/Documentation/watchdog/watchdog-api.txt

10.16 Accelerometer

The BoltGATE 20-25 is provided with an accelerometer sensor.Data is read every 100 ms.

To print the information from the accelerometer, enter the following command:

```
evtest /dev/input/event11
```

Example output:

```
Input driver version is 1.0.1
Input device ID: bus 0x18 vendor 0x0 product 0x0 version 0x0
Input device name: "lis3dh_acc"
Supported events:
  Event type 0 (EV_SYN)
  Event type 3 (EV_ABS)
    Event code 0 (ABS_X)
      Value   -959
      Min   -16000
      Max    16000
    Event code 1 (ABS_Y)
      Value    -11
      Min   -16000
      Max    16000
    Event code 2 (ABS_Z)
      Value    -44
      Min   -16000
      Max    16000
    Event code 8 (ABS_WHEEL)
      Value      0
      Min   -2147483648
      Max   2147483647
    Event code 40 (ABS_MISC)
      Value      0
      Min   -2147483648
      Max   2147483647
Properties:
Testing ... (interrupt to exit)
Event: time 1524491642.806613, type 3 (EV_ABS), code 0 (ABS_X), value -957
Event: time 1524491642.806613, type 3 (EV_ABS), code 1 (ABS_Y), value -8
Event: time 1524491642.806613, type 3 (EV_ABS), code 2 (ABS_Z), value -46
Event: time 1524491642.806613, -------------- SYN_REPORT ------------
Event: time 1524491642.910626, type 3 (EV_ABS), code 0 (ABS_X), value -961
Event: time 1524491642.910626, type 3 (EV_ABS), code 1 (ABS_Y), value -11
Event: time 1524491642.910626, type 3 (EV_ABS), code 2 (ABS_Z), value -45
Event: time 1524491642.910626, -------------- SYN_REPORT ------------
```

To change the data poll rate (in ms), enter the following command:

```
echo xx >/sys/bus/i2c/devices/8-0018/pollrate_ms
```

10.17 Internal Temperature Sensor

The BoltGATE 20-25 is provided with a sensor that allows you to read the temperature inside the device.

To read the temperature of the carrier, enter the following command:

```
cat /sys/bus/usb/devices/1-5.3:1.0/temperature
```

To read the temperature of the CPU cores, enter the following commands:

```
cat /sys/class/hwmon/hwmon2/temp2_input
cat /sys/class/hwmon/hwmon2/temp3_input[1]
cat /sys/class/hwmon/hwmon2/temp4_input
cat /sys/class/hwmon/hwmon2/temp5_input[1]
```

To read the temperature of the CPU module, enter the following command:

```
cat /sys/class/hwmon/hwmon1/cpu_temp
```

10.18 The Programmable Pushbutton

To see the pushbutton status, enter the following command:

```
cat /dev/user_button/value
```

The output is the following:

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

[1] quad core only

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11 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.

11.1 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.

11.2 The ESF Web UI

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

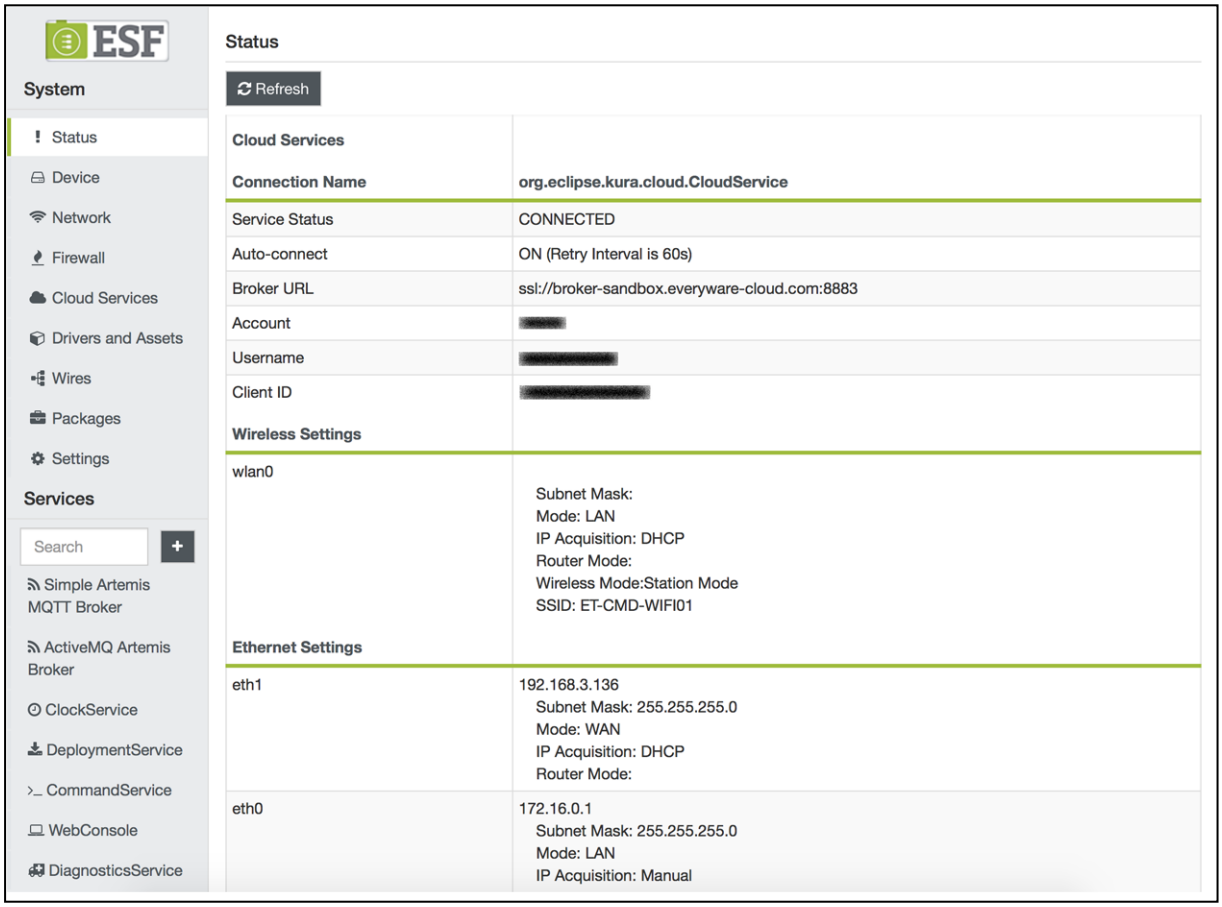
The ESF Web UI provides several functionalities such as:

- 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:



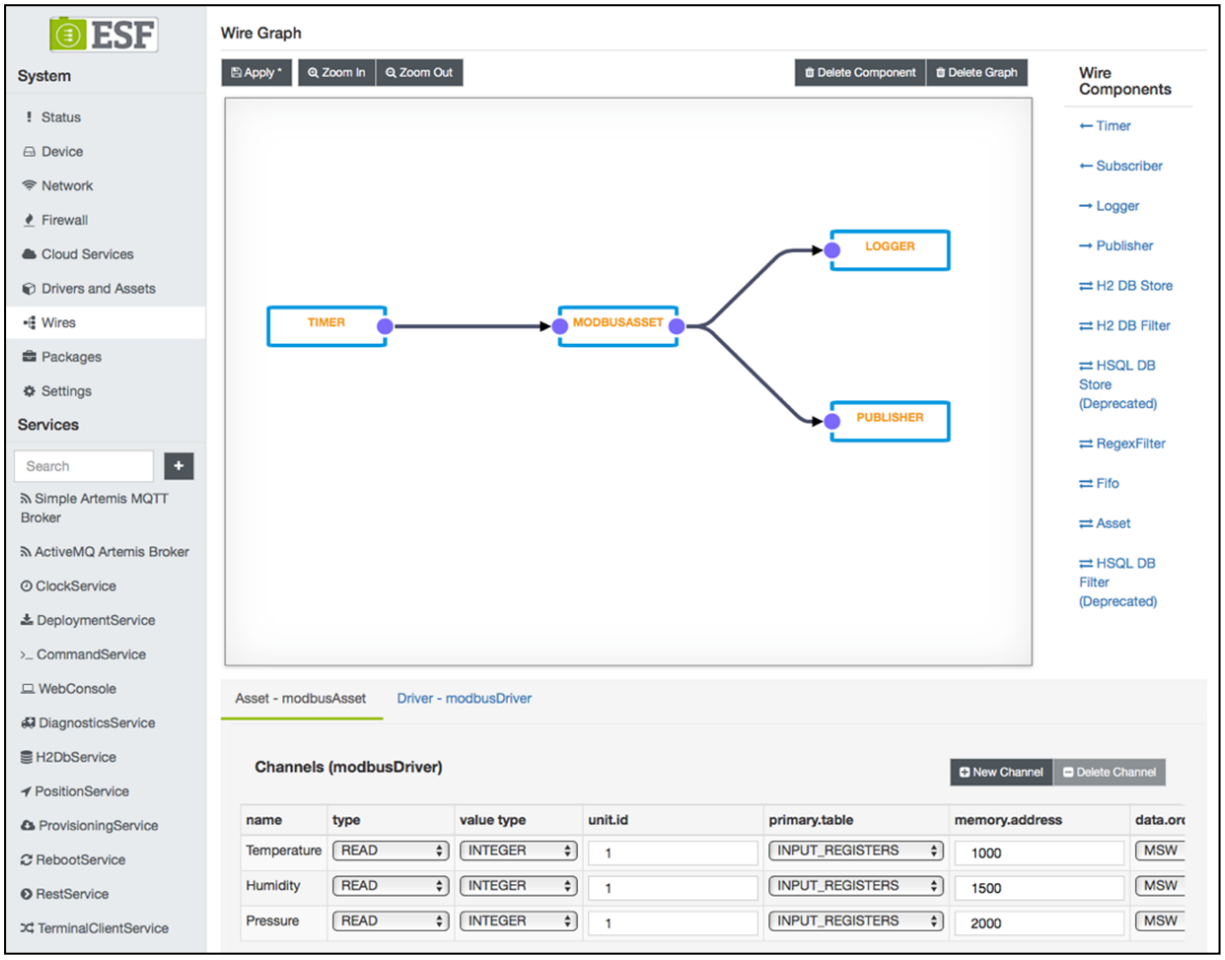
11.3 The ESF Wires Application

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.



11.4 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

11.5 For Further Information

For further 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 *Developer Environment* tab)
EC Integration Platform	www.eurotech.com/en/products/software+services/everyware+cloud+m2m+platform
EC Developer's Guide	everywarecloud.eurotech.com/doc/ECDevGuide/
Kura Website	eclipse.org/kura/

12 MECHANICAL SPECIFICATIONS

The enclosure has the following dimensions:

171 (W) x 273 (D) x 85 (H); mm - Connectors and Mounting Brackets included.

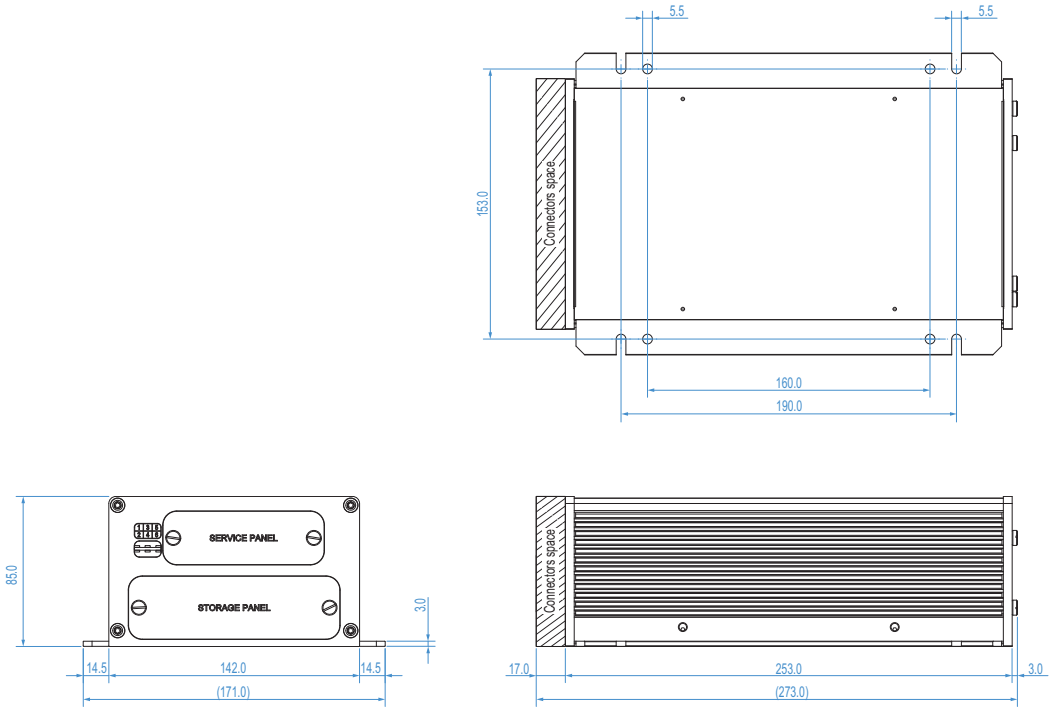


Figure 12.1 - Mechanical Dimensions, Storage Panel Versions

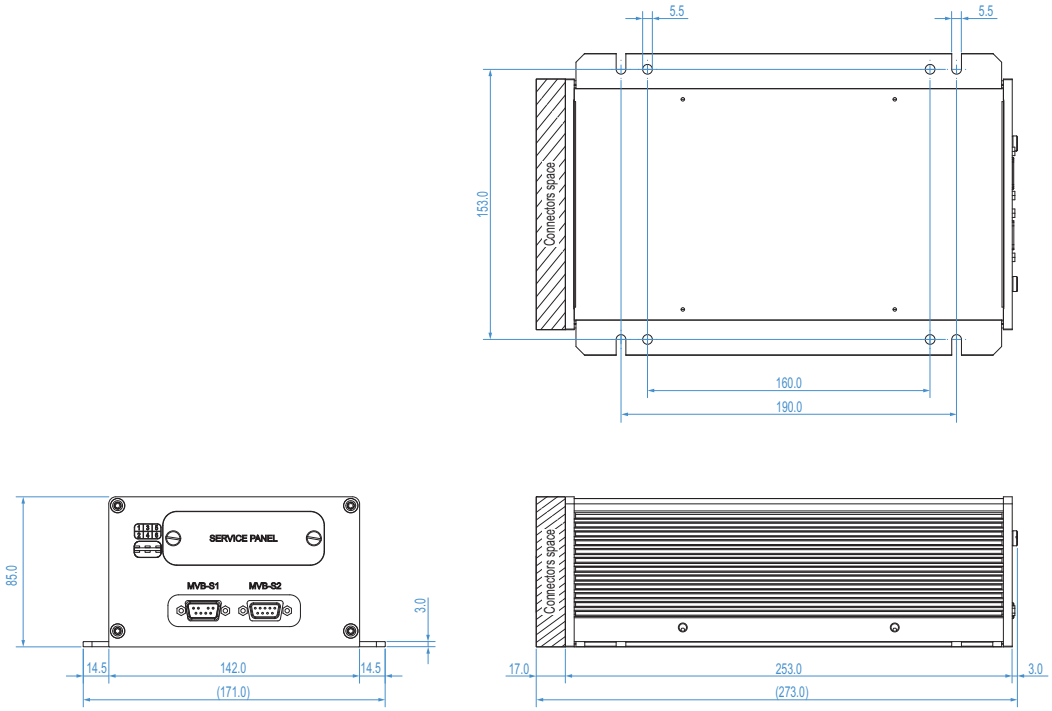


Figure 12.2 - Mechanical Dimensions, MVB Interface Versions

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13 How to Install the Product

NOTICE

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).

WARNING

THE PRODUCT CAN BE POWERED WITH A HAZARDOUS VOLTAGE. CONTACT MAY CAUSE ELECTRIC SHOCK OR BURN.

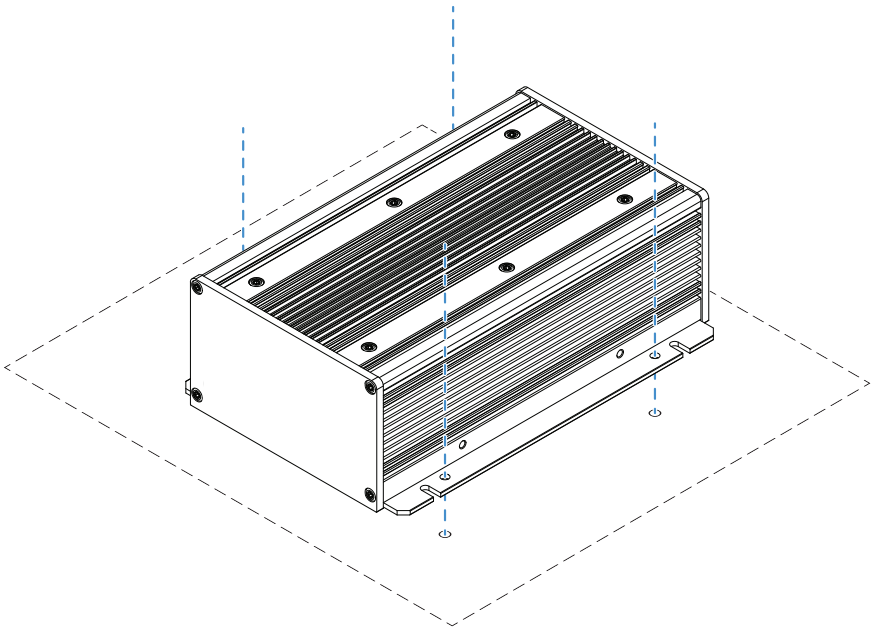
To avoid injuries, before installing the product:

1. **Make sure that you have read carefully and understood the instructions contained in the section "Safety Instructions" on page 9**
2. **Make sure that you have disconnected all power.**

To install the BoltGATE 20-25, complete the following steps:

1. See the "Mechanical Specifications" on page 91
2. Use the M5 holes and slots available on the Mounting Brackets
3. According to your installation requirements, firmly fasten the product in place, adding all the necessary locking parts (for example, screws and washers, that are not provided) and applying the required tightening torque.

In case of uncertainties contact the Eurotech Technical Support Team. For more information see "How to Receive Technical Assistance" on page 13.



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14 How to Supply Power to the Product

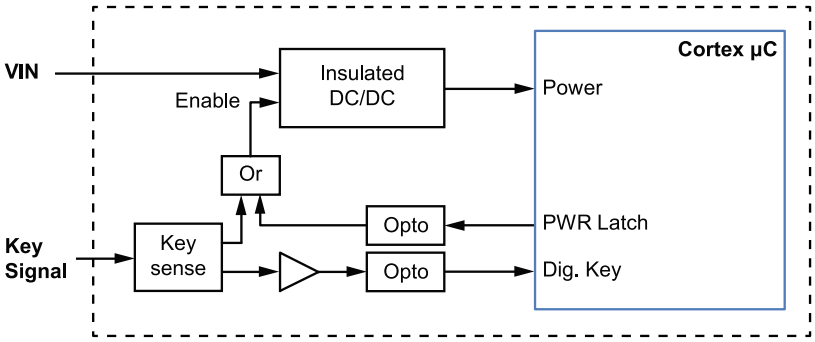
14.1 Power Supply Specifications

The power supply specifications of the BoltGATE 20-25 are the following:

Power supply	Wide Voltage Input Range: 9 to 137.5 VDC
Power consumption	30 W max

14.1.1 The Ignition Key (Key Signal)

The Ignition Key is a digital input that enables the system to be turned ON / OFF according to the following operating principle:



Dig. Key: Digital information of Ignition Key presence
PWR Latch: Power Latch control signal from logic for a safe shutdown

Ignition Key Status	Key Signal Level	System Status
From OFF (GND) to ON (VIN+)	From 0 to 1	The system turns ON
From ON (VIN+) to OFF (GND)	From 1 to 0	The system turns OFF after 120 seconds (default condition)

14.2 How to Supply Power to the Product and Turn it ON

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

WARNING

ELECTRIC SHOCK HAZARD

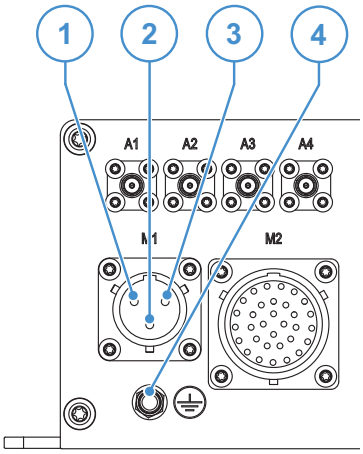
Failure to supply power correctly, or failure to follow all operating instructions correctly, may create an electric shock hazard, which could result in personal injury or loss of life, and / or damage to equipment or other property.

To avoid injuries:

- **Always perform any connections with dry hands**
- **Use only certified power cords, that are not damaged, and that meet the power requirements of the device**
- **Position cables with care. Avoid positioning cables in places where they may be trampled or compressed by objects placed on them**
- **Take particular care of plugs, power-points and outlets. Avoid overloading them**
- **Only use a power supply that meets the product requirements. In case of uncertainties about the required power supply, contact the Eurotech Technical Support Team (see "How to Receive Technical Assistance" on page 13) or the electricity authority.**

To supply power to the product and turn it ON, complete the following steps:

1. Setup a DC power source that meets the BoltGATE 20-25 power requirements and complies with the relevant standards and regulations
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. Connect the DC power source to the Power IN connector
5. Connect the earth connection terminal (Ref #4 in the table below) to an earth point in the installation
6. Turn ON the DC power source
7. Turn ON the Key. The BoltGATE 20-25 turns ON. The LEDs turn ON accordingly.



Ref#	Description
1	M1 connector; pin C; Negative power supply input (VIN-)
2	M1 connector; pin B; Key Signal
3	M1 connector; pin A; Positive power supply input (VIN+)
4	Earth connection terminal

14.3 How to Turn OFF the Product

There are two ways to turn OFF the BoltGATE 20-25:

- By entering the power OFF command
- By turning OFF the Ignition Key

To turn OFF the BoltGATE 20-25 by entering the power OFF command, complete the following steps:

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

To turn OFF the BoltGATE 20-25 by turning OFF the Ignition Key, complete the following steps:

1. Turn OFF the Ignition Key. The system turns OFF after 120 seconds (default condition)
2. Remove the power from the Power IN connector.

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15 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. Prevent damaging electrostatic-sensitive devices
4. Verify the installation of the product
5. Clean the product

15.1 How to Safely Remove the Power Supply

WARNING

THE PRODUCT CAN BE POWERED WITH A HAZARDOUS VOLTAGE. CONTACT MAY CAUSE ELECTRIC SHOCK OR BURN.

To avoid injuries, before maintaining the product:

1. **Make sure that you have read carefully and understood the instructions contained in the section "Safety Instructions" on page 9**
2. **Make sure that you have disconnected all power.**

Failure to follow the steps below may create an electric shock hazard, which could result in personal injury or loss of life, and/or damage the product or other property.

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

1. **ALWAYS make sure your hands are dry before performing any cables disconnection**
2. **ALWAYS turn OFF all the power supply sources**
3. **ALWAYS disconnect all the cables**
4. **ALWAYS make sure that all the circuits are discharged.**

15.2 How to Prevent Damaging Electrostatic-Sensitive Devices

NOTICE

HOW TO PREVENT DAMAGING ELECTROSTATIC-SENSITIVE DEVICES

The symbol on the left is applied on electrostatic-sensitive devices.
To prevent damaging electrostatic-sensitive devices:

- **Handle the electrostatic-sensitive devices in an ESD Protected Area (EPA)**
- **Observe the appropriate antistatic precautions. For example: use a wrist strap kept in constant contact with bare skin and attached to ground.**

15.3 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 screws, bolts, nuts are correctly fastened
4. Verify that the product is installed correctly.

15.4 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.

NOTES

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