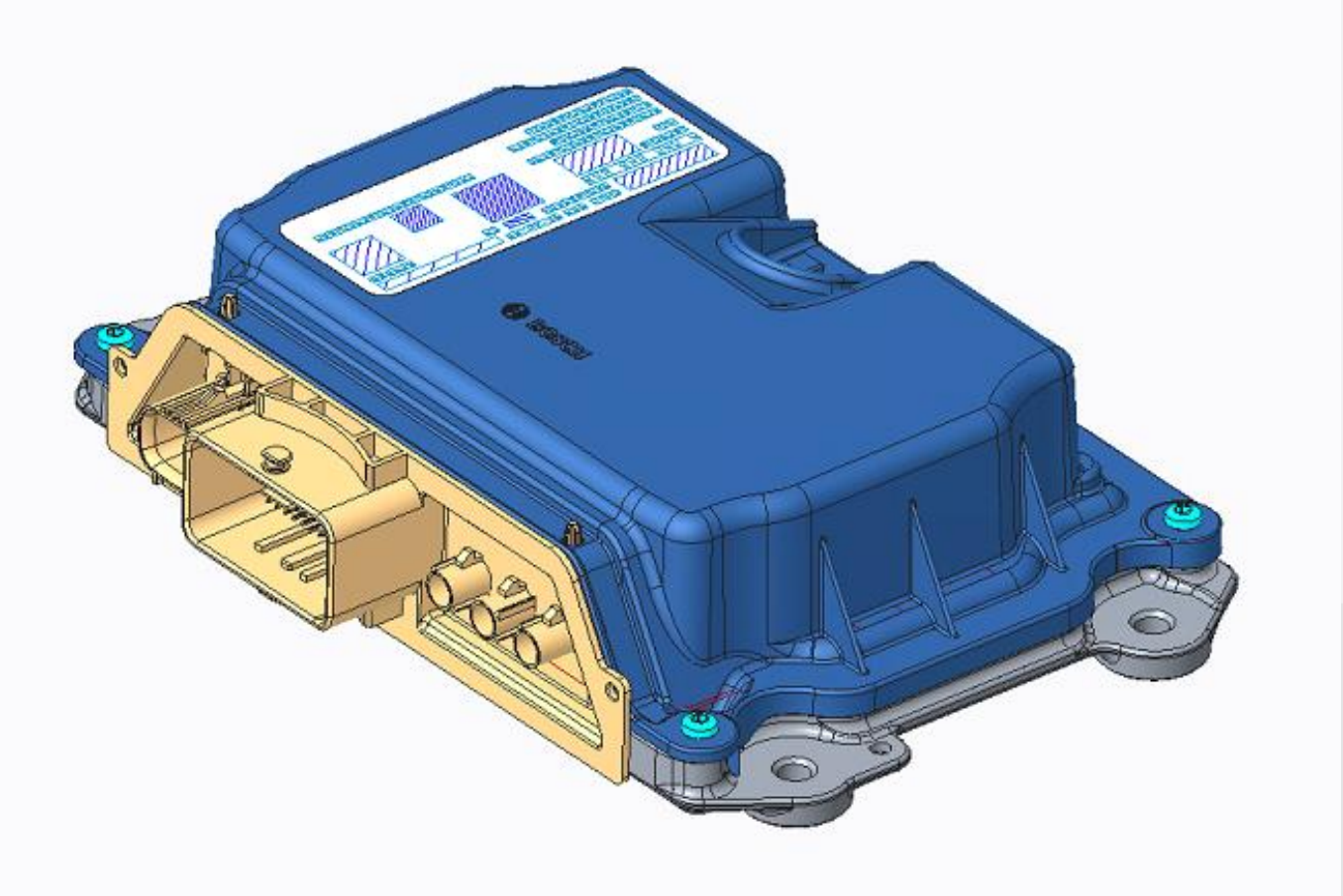
User Manual

Product Designation: Connectivity Control Unit (CCU)
Model Name: CU-304-0510

BOSCH
Invented for life

iTraMS – Connectivity Control Unit (CCU)



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iTraMS – Connectivity Control Unit (CCU)

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CU-304-510

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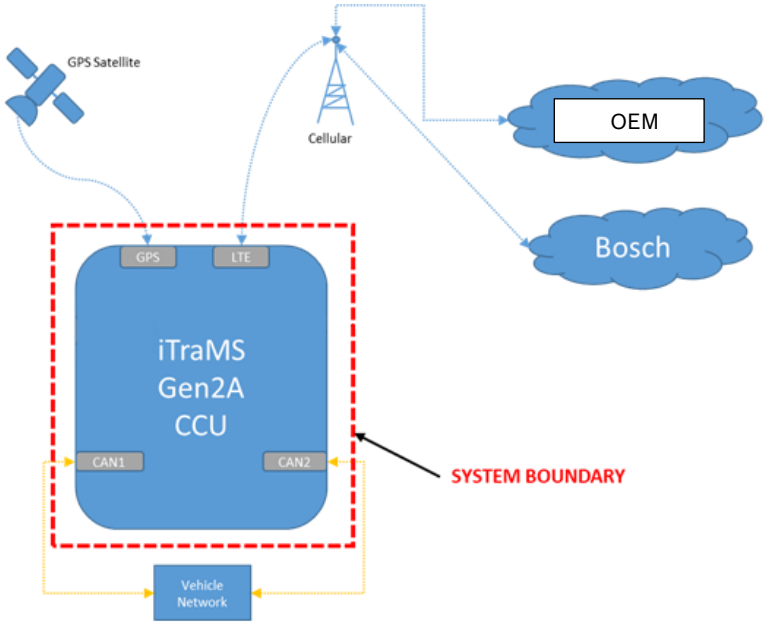

Figure 1 iTraMS CCU Ecosystem

Interfaces:

External (Wireless):

LTE:

- Device management, FoTA (Software Updates, Configuration etc.).
- Telematics (Vehicle Data, Remote Diagnostics).

GPS:

- For acquiring Geo Location.

Vehicle (Wired):

- CAN (either directly to Vehicle sub-net or via CGW)
- KeySwitch (KL15 - Ignition)
- Battery +ve, -ve. (12V and 24V systems)

2.2 Intended Use

2.2.1 Product Intended Use

Bosch complied with the following regulations specific to the target market when developing the product: USA, Canada.

If other or additional regulations are required for marketing the product or marketing is effected outside the named target markets, the customer requests compliance with the specific regulations of the target market from Bosch, or ensures these by itself.

Provided that iTraMS CCU is used within the conditions (environment, application, installation, loads, antennae) as described in this user manual and the corresponding agreed upon documents, Bosch ensures that the product complies with the agreed properties. Agreements beyond this require the written approval by Bosch. The product is considered fit for the intended use when the product successfully has passed the tests in accordance with the user manual and agreed upon documents.

It is the responsibility of the customer to ensure the proper application of the product in the overall system/vehicle.

Bosch does not assume any responsibility for changes to the environment of the product that deviate from the user man and the agreed upon documents.

If, in order to connect the device, ignition and battery are bridged, the device will draw the full operating current even when switched off. In this case, without any further deactivation on the vehicle-side, there is a risk of battery depletion. No liability is assumed for any damage occurring because of this. There are no specific ventilation openings or heat sinks in CCU device but mounting in a thermal capsuled environment should be avoided, as it will lead to an increase of the operating temperature.

2.3 Product Safety

2.3.1 Functional Safety

Bosch points out that the system/product does not implement any ASIL-classified requirements (in the sense of ISO 26262). Therefore, it has not been approved by Bosch for applications in which Bosch delivered system/product has an ASIL related (above QM) role.

2.3.2 Data Protection, Cyber Security and Over-The-Air Aspects

2.3.2.1 Data Protection

The product processes personal data that are listed below:
The terms and conditions are mentioned in the appendix “Data Security Addendum” which covers the following aspects but not limited to:

- Definition of following terms: Customer Data, Data Protection Laws, Personal Data, Security Incident
- Ownership and Use of Customer Data
- Data Security Breach Notification
- Audits and Inspection
- Security

2.3.2.2 General Information and Limits About Cybersecurity

The Robert Bosch GmbH (“Bosch”) determines the State-of-the-Art of information security (Cybersecurity) of his products on yearly basis. In case the product does not fulfill the requirements derived from the State-of-the-Art of information security any more, Bosch reserves the right to stop shipment of the affected product. Before,

Bosch will inform the customer as soon as possible and support the customer to fulfill new security requirements.

In case a security vulnerability is discovered or disclosed to the customer, Bosch should be informed up-front its publication.

The installation of security relevant updates has to be done by the customer.

The product or embedded control unit contains engineering access points in hardware and software to execute Bosch services for manufacturing and development investigation purposes, including the capability to perform a software reflash. These Bosch interfaces are secured by:

- The design of the printed circuit board (PCB)
- Device individual passwords

The product does not contain any measures to resist (D)DoS attacks, as there is currently no known effective mechanism within individual E/E components available. If (D)DoS attacks have been evaluated as safety critical, this shall be considered by measures on vehicle level.

The product is not designed in a way to withstand fault injection or side channel attacks.

The Software used in the product, contains intellectual property (“IP”) from Bosch, the customer and probably 3th parties. For the purpose of IP protection and to avoid re-engineering, the Software shall be handled as confidential during the distribution process into plants, workshops and FOTA. This shall be considered by measures within the Customer’s Software Logistic Infrastructure and involved processes.

2.3.2.3 Cybersecurity Assumptions

Information security measures can be implemented differently in the vehicle and its environment (security layers). Therefore, Bosch presumes that the customer satisfies the following assumptions by his security design of the overall system.

Integrity

- The by the customer or 3rd parties designed or implemented interfaces do not offer any service or routine to alter the memory content, besides the regular Software Update (Reflash) services.
- The by the customer or 3rd parties designed or implemented interfaces which are offering services to change executable memory content, are well secured and limited to engineering purposes (e.g. XCP).

Confidentiality

- The by the customer or 3rd parties designed or implemented interfaces do not offer any service or routines to readout data from Bosch or 3rd parties.

Availability

- The by the customer or 3rd parties designed or implemented software does not compromise the intended code execution or system availability of the product.
- Only, secured (signed) Software Updates (Reflash) are possible and no unsecure software update mechanism is implemented by the customer or 3rd parties.
- Bosch presumes that the customer takes care of a secure in-vehicle communication by implementing measures beyond the scope of the product or system to preserve the authenticity and freshness of the relevant signals, that are essential for the functionality of the product or system that contribute to vehicle automation features, at any time during operation.

2.3.3 Safety and Warning Notes

Read this document carefully. The information applies to the devices described in this manual. Save this manual: it contains important safety information and operating instructions.

- Always observe all standard and accepted safety precautions and guidelines when handling any electrical device.
- Only trained and qualified personnel may work on the vehicle.
- Always follow the specifications and instructions of the vehicle manufacturer.
- Do not attempt to disassemble the product: Doing so will void the warranty.
- Opening or trying to open can lead to damage or malfunctions of the CCU or components connected to it.
- Your workplace has to be dry, as well as sufficiently lit and ventilated. Do not smoke in the workplace.
- The device must not come into contact with hot or burning objects (e.g. cigarettes).
- Do not insert foreign bodies in the insertion slots or openings of the device – otherwise injury or damage to the device may occur.
- RF exposure. Keep at least 20 cm (8 inches) separation distance from the controller and the human body.
- Check the electrical lines to make sure they are properly insulated and fastened.
- Wear suitable protective clothing, as the situation requires.
- Bosch assumes no responsibility for damage as a result of incorrect indicators/displays. These may arise if the device has not been connected or has been incorrectly connected or if the device receives false or erroneous signals from the system.
- Formation of condensation on the device must be avoided. In case of condensation formation, you must allow an acclimatization time of up to two hours to pass.
- Ensure enough ventilation around the device otherwise a build-up of heat may occur in the device that could lead to malfunction.
- It is to be ensured that there is no water ingress into the CCU with the right installation and packaging inside the vehicle.
- The product's operating safety is only ensured if the permissible conditions are maintained
- The CCU operation is permitted only with the software and configuration data verified and released for the respective project. A change in the software, configuration data of the CCU, or in other control units in the vehicle network, or the change of components can lead to malfunctions resulting in possible damage to components or non-conformance to the legal requirements, or can lead to hazards.
- The connection of the CCU to vehicles or engines, which do not correspond to the validated configuration, can lead to damage or malfunction of the CCU or connected components. E.g., this can occur if different types of control units having identical electrical connectors are used.
- For a secure connection, the interlocking mechanism of the connector must not be damaged and must be in a completely closed state.
- It must be ensured that the connector from the wiring harness side is disconnected only in dry and clean conditions
- A connection / disconnection of the control unit to / from the positive / negative terminals of the battery when ignition (T15) is switched on (closed main relay) can lead to malfunction or errors in diagnostics and is therefore prohibited.
- Depending on the software used, for a complete functional capability of the CCU after “ignition off” (T15-OFF) the supply voltage to the CCU must be maintained via the main relay (e.g. for storing the functional parameters, conducting diagnosis tests, writing of the error memory etc.).
- Hint regarding the eMMC (Flash): The periodic or repetitive saving of important characteristic data (diagnostics results, error memory etc.) takes place in an eMMC. The maximum number of write cycles of this memory is limited and is also dependent on the ambient conditions, especially the temperature. Frequent overwriting can lead to defects, data loss and function errors. The customer is responsible for the compliance with the limit values if he creates the software.
- The life time of eMMC depends on RW/WR cycles used in application, discussed and agreed between BOSCH and customer.
- External antenna selection compatibility should be agreed between BOSCH and customer
- The instructions in this document and the instructions relative to the wiring harness must be followed.
- The number of mating cycles (10) of the plug connection and antenna connection between control unit and wiring harness plug is limited. Repeated connection and disconnection can lead to contact degradation and subsequent malfunctions and/or trigger diagnostic errors.

- The number of mating cycles can be found in the technical specification of male and female (wiring harness side) connector.
- If the unpacked control unit falls on a hard surface, such as a concrete floor, it is NOT ALLOWED to use the control unit because non-detectable damages can affect functions and the reliability.
- The mounting of the CCU in the vehicle should be selected such that the conditions described in this manual and the associated documents are adhered to. Specifically damage could result from excessive temperature, vibration loads or the effect of specific substances. Customer to inform Bosch the mounting location of the CCU with pictures, this is very critical for Bosch to validate the mounting, if required Bosch will visit and assess the mounting location on site.
- Suitable protective measures against electrostatic discharges are to be taken for persons and tools. In particular, CCU connector pins are not supposed to be touched.

2.4 Labelling Of Product

- Label Printer at Plant (RBAI) supports printing any label of **100mm** width or lesser only
- Maximum size of Label fixed to 85mm * 32mm

2.4.1 Label Overview

Figure 2 Representative Label

2.5 Dimensions and Weights

2.5.1 Picture Of Device

The below images show the assembled view of the device and the exploded view.

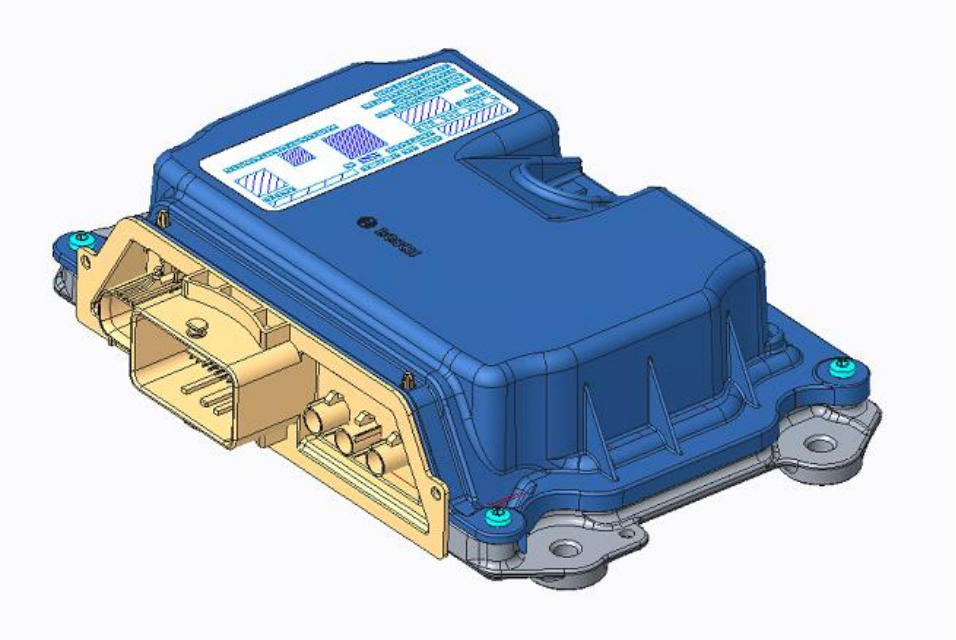

Figure 3 Assembled device view

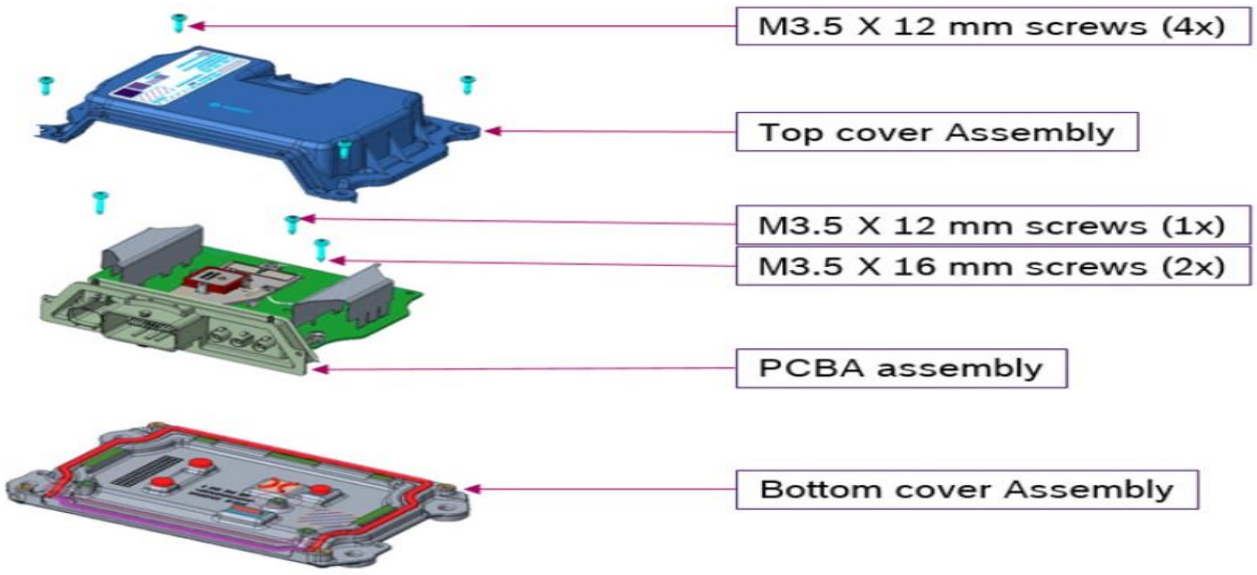

Figure 4 Exploded View of the device

Note:

- HSAL connector shell projection will be part of header, but pins shall not present.
- FAKRA connector shell projection will be part of header, but pins shall not be present.

2.5.2 Properties

Property	Details
Ambient temperature active	-40º C to 95º C
Ambient temperature passive	-40º C to 105º C
Degree of protection	IP6KX (Dust), IPX9K (Water)
Housing	Plastic top cover and Aluminum Die cast bottom cover
Mounting location	Engine (Commercial Vehicle-CV and Passenger Vehicle-PV)
Mounting position	Horizontal (Top cover facing up side and connector in the front side)
PCB Technology	Multi-layer technology PCB, Lead free soldering with SAC
Weight	660g +/- 5%
Wire Harness	The wiring harness plug is not included in the scope of delivery and must be ordered separately directly by customer The wiring harnesses must be supported mechanically at the CCU mounting position (distance < 150 mm) in a way that the excitation of the CCU is in phase (e.g. at the CCU screw-on plate). The connector system shall be the customer's responsibility. The customer shall secure the endurance limit within its own responsibility. Robert Bosch GmbH does not assume liability for defects of the connector system. Unused pins should be sealed in wire harness; wire harness should be built as per design proposed by supplier.
Fuse	5A fuse to be used for both Battery+ and KL15 (Key Switch)

Table 1 Device Properties

2.6 Service, Repair, And Maintenance

NOTE

Replacement of the product may only be performed by authorized personnel.

Product does not have ***any*** serviceable parts that can be repaired and, in most case, needs to be replaced if there are any malfunctions detected in the field.

2.7 Information on Disposal and Recycling

Customer is responsible for proper product disposal and recycling of the device at its end-of-life as per the existing regional regulations.

The recycling of the product is strictly in customer purview. It is expected that the customer sets up necessary procedure and support systems to manage the safe recycling of the product.

The life cycle of device with supported IMEI number and ICC ID is the responsibility of customer. The customer shall ensure that necessary procedure is followed to manage IMEI end of life, according to the mandatory local regulations.

Bosch shall support OEMs in sharing any information that would be required for OEMs and work along with them to have this complete process established.

3 Hardware Description

3.1 Hardware Block Diagram

Figure 5 Hardware Block Diagram

3.2 Hardware Details

Communication	Details
Processor	i.MX8DX, 2x Cortex-A35 1.2 GHz, 1x Cortex-M4F 266 MHz
Flash Memory	eMMC, 8GB
RAM	DDR3, 512MB
Network Connectivity	LTE Cat 1 Support up to four LTE bands
Cellular variant:	LARA-R6001D - North America Variant Band 2,4,5,12 - LTE Bands Band 2,5 - WCDMA Bands 1575MHz-GPS
CAN	2 wire CAN_H and CAN_L signals, auto-baudrate detection of 250 and 500 kbaud
GNSS	Configured for GPS only as per regulatory requirement.
eSIM	eUICC - MFF2
Internal Antennas	1 X GPS Antenna 1 X LTE Main Antenna 1 X LTE Diversity Antenna

Table 2 Hardware Details

4 Mechanical Description

4.1 Mechanical Characteristics

4.1.1 Mounting Of CCU In Vehicle

The CCU has to be fastened in the vehicle so as to avoid bouncing against other vehicle parts and additional fastening elements of the CCU. The admissible interfaces to the vehicle and the resulting load on the cover and the bottom have to be clarified with the responsible development department of the Robert BOSCH Group and a prior approval in written form is required

CCU is recommended to be mounted parallel to the ground, GPS antenna facing sky for better GPS accuracy. For every vehicle platform release, mission profile at the mounting location to be provided for proper RF signal strength, environmental conditions for CCU functioning as per this specifications.

Ensure 50mm metal free zone surrounding the CCU, no major metal obstructions allowed near 5 sides of top cover, side facing bottom cover is exempted.

For every vehicle platform, the CCU requires an application specific release by responsible development department of Robert BOSCH Group.

No standing and permanently running water in the PCE area permissible. Water stress according to specification is permissible.

No standing and running water in the area of revolving groove (sealant groove) permissible.

4.1.2 Fastening

The CCU has to be fastened at 4 points (screwing area a, b, c & d). Maximum surface pressure allowed on these 4 points is 225 n/mm2.

The minimum tightening torque required to assure the function of the screwed joint depends on the particular mounting location and so is within customer responsibility. Minimum gap between the bottom and the screw-on surfaces of the vehicle: 1 mm.

Even surface of customer's screw-on surface between the points a, b, c, d: _c_ 0.5. In case of deviation, it has to be clarified with the responsible development department of Robert BOSCH Group and a prior approval in written form is required.

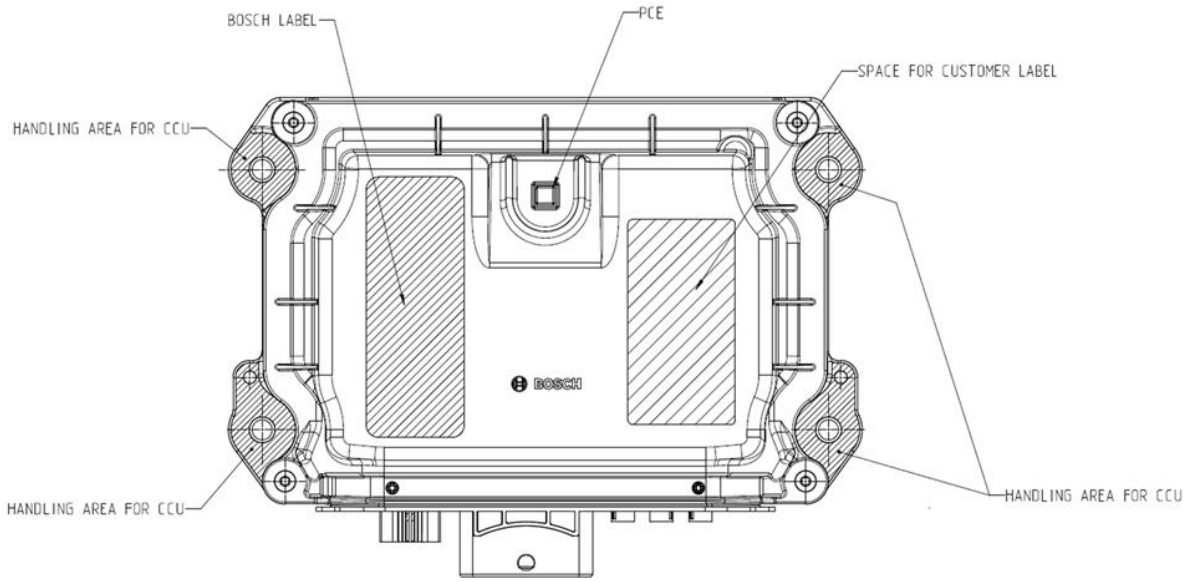

Figure 6 Top side view of the CCU

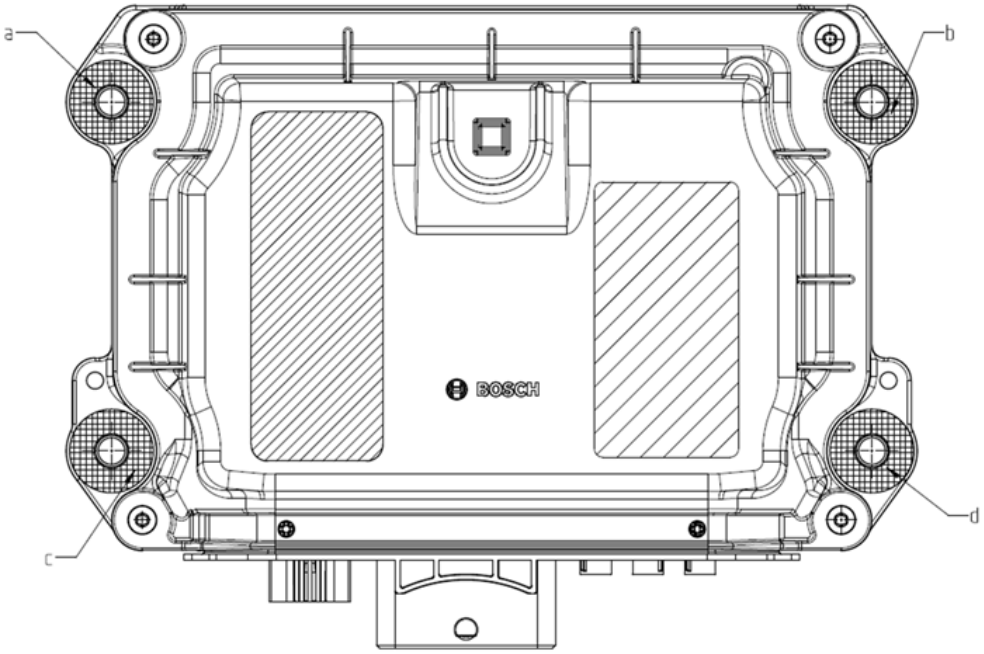

Figure 7 Mounting screw positions

4.1.3 Protection Against Water and Dust

The CCU is rated for IP6K9K protection class

4.1.4 Permissible Vibration Load

Frequency (Hz)	Power Spectral Density G2/ Hz	Power Spectral Density (m/s2)2/ Hz
20	0.005	0.4802
30	0.240	23.0496
100	0.240	23.0496
200	0.100	9.604
300	0.100	9.604
300.5	0.005	0.4802
2000	0.005	0.4802

Table 3 Permissible Vibration load

4.1.5 Permissible Pressure Load

No external loads are allowed to apply on the surfaces of the product, except for mounting area. Maximum surface pressure allowed on the fastening surfaces is 225N/mm2.

4.2 Electrical Characteristics

Supply Voltage ranges:
Voltages mentioned below are at CCU connector pins.

- Full functional range: 9V to 32V
- VBat Extreme Max: 36V for 5mins

Reverse polarity
CCU is protected for reverse polarity of -36V

Load dump pulse
CCU is protected against a load dump impulse (Pulse 5b) on V_V_BAT

Over voltage protection
CCU is protected for over voltage of 36V for 5 minutes

Short circuit protection
CCU pins are protected against short circuit to battery and short circuit to ground.

4.3 Chemical Characteristics

For chemical compatibility tests, see the Chemical Resistance Test under Product Reliability Tests from section "Testing by Bosch" within this manual. Note: Passing a test according to ISO 16750-5 does not imply that the chemicals and the performed application method (e.g. spray acetone, pour denatured alcohol) are permitted as a cleaning approach.

4.4 Lifetime

With respect to the use and usage conditions described in this manual, the life of the product is designed for maximum 10000 hours, or maximum 5 years (whichever occurs first). The commercial warranty and liability is not affected by this and is governed separately by the delivery conditions.

4.5 Transport, Assembly, Start and End of Operation, Storage

4.5.1 Transport

The devices shall be shipped in pallet packing of dimensions 1200 x 1000 x 830 mm.
Each pallet shall consist of 12 corrugated boxes, each containing 20 devices.
Each pallet is further labelled and packaged with stretch wrapped plastic.

4.5.2 Assembly

- The CCU has to be fastened in the vehicle so as to avoid bouncing against other vehicle parts and additional fastening elements of the CCU.
- The admissible interfaces to the vehicle and the resulting load on the CCU have to be clarified with the responsible development department of the Robert Bosch GmbH and a prior approval in written form is required.
- CCU is recommended to be mounted with CCU oriented horizontal to ground and GPS antenna facing sky for optimal GPS accuracy.
- Use M6 bolt for fastening the CCU to the vehicle.
- No standing and running water is allowed around CCU, near wiring harness and PCE area.
- Distance to metal surface from the CCU to be maintained minimum 50mm.

4.5.3 Storage

Because of the ageing process of the electronic components, electronic devices cannot be stored for an unlimited period of time.
The devices shall be stored under the above conditions, prior to use within 5 years from manufacturing date.

5 Compliance Statements

5.1 FCC Compliance Statement (USA)

FCC ID: 2AVVT-CU3040510-R6

Compliance Statements:
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
1. This device may not cause harmful interference.
2. This device must accept any interference received, including, an interference that may cause undesired operation.

Caution Statements:
• Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.
• This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

5.2 Industry Canada (IC) Compliance Statement

IC ID: 25763-CU3040510R6

Compliance Statements: This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:
1) This device may not cause interference.
2) This device must accept any interference, including interference that may cause undesired operation of the device.

Déclarations de conformité: Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.
L'exploitation est autorisée aux deux conditions suivantes :
(1) l'appareil ne doit pas produire de brouillage, et
(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Caution Statements:
• This equipment complies with radio frequency exposure limits set forth by Industry Cananda for an uncontrolled environment.
• This equipment should be installed and operated with a minimum distance of 20 cm between the device and the user or bystanders.

Déclarations de mise en garde:
• Cet équipement est conforme aux limites d'exposition aux radiofréquences défines par Indstrie Canada pourun environment non contrôlé.
• Cet équipement doit être installé et utilisé aven un minimum de 20 cm de distance dispositif et l'utilisateur ou des tiers.

INFORMATION TO THE USER

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.