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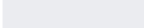
# iTraMS Gen 2A – User Manual

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Date: 09-March-2020

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Title	CUMMINS Product Specifications of Connectivity Control Unit <i>Product Name: iTraMS Gen 2A</i> <i>Model Name : CU-303-0403</i> <i>Defined in the next section</i>			
Version	0.1			
Status	Draft			
Date of Release	Draft			
Revision History	Rev. No.	Changed On	Valid from	Checked by
	0.1	 09 Mar2020	 	--
Issued by	Datta Santosh (RBEI/PAC)			
Contact Person	Pravin Swaminathan S (RBEI/PAC-CA1)			

**Note**

*This preliminary TCD documents the present status of the agreed specifications. It will be confirmed when all validation has been completed with positive results.*

# 1 General Product Description

## 1.1 Main functions and properties of the product

Lead Responsible	Gupte Rahul (RBEI/PAC-CA)
Status	YELLOW
Remarks	

### 1.1.1 iTraMS Gen2A EcoSystem overview

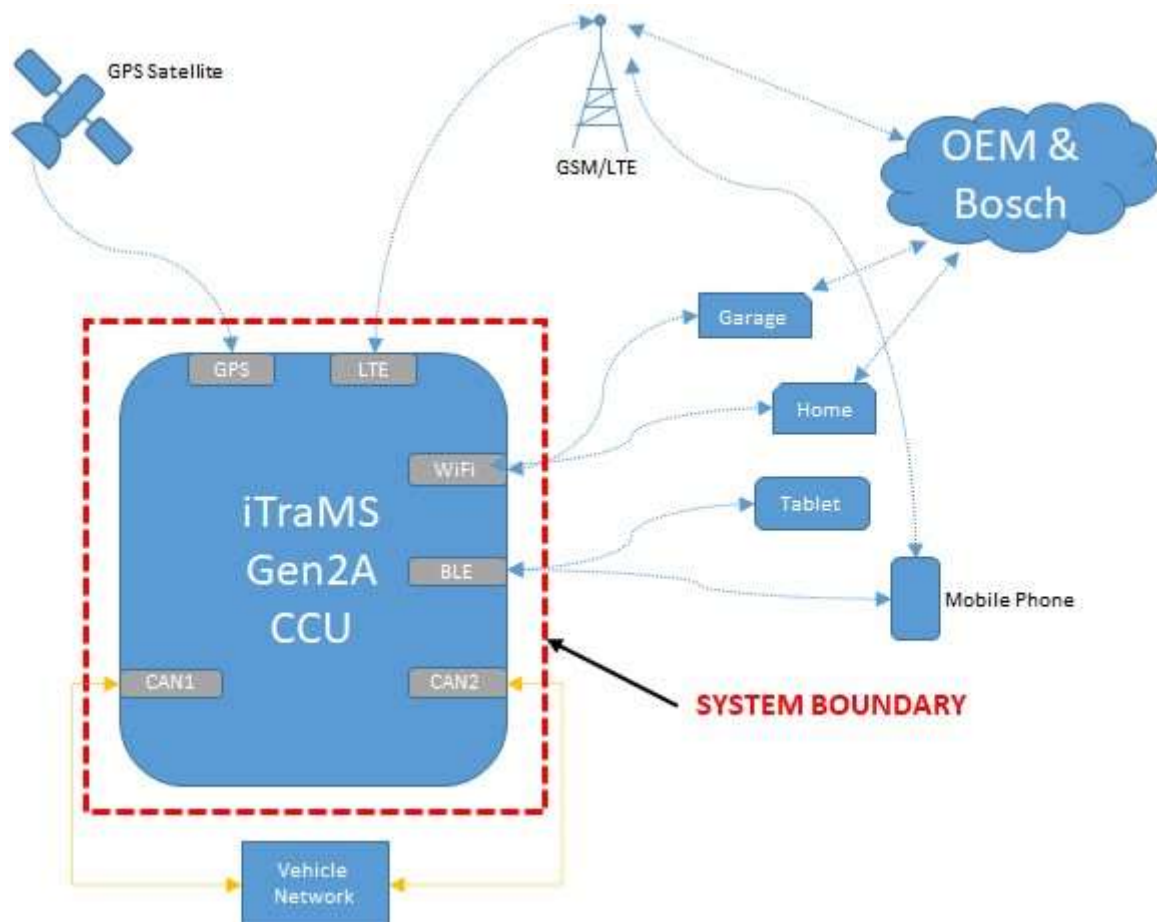


Figure 1: iTraMS Gen2a Ecosystem

Interfaces:

„External

- LTE
- CAN (either directly to
- Device Vehicle sub-net or via

FoTA (Software Updates, Configuration etc.)

- Telematics Inputs (Vehicle Data,

Interfaces:

Vehicle

„Miscellaneous

- Analog / Digital / Pulse

• Customer Production:

- KeySwitch (KL15 -

Actors:

- Bosch Production:

- Line Operator2: Testing the device

- Line Operator1:

Preventive

Ignition)

CCU Testing

Diagnostics,  
Remote  
Diagnostics)

- Wi-Fi
- Connectivity to external AP (CCU emulates a Wi-Fi station, and uses this as an alternative to LTE when Wi-Fi is in sight)
- BT
- No current usecase for InCabin/OnEngine

## 1.1.2 Data Flow diagram



Figure 2: Data Flow diagram with DM and FOTA use case

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.

## 1.2 Intended use

Lead Responsible	Ramachandran V (RBEI/PAC)
Status	YELLOW
Remarks	

### 1.2.1 Document intended use

This document provides a comprehensive overview of the design elements of the connectivity control unit. The document encapsulates the technical details of the iTraMS product and details the system, hardware, mechanical and software functional components. Besides includes the reliability requirements of CCU. The document can be used as a reference to understand the CCU and to use the same in a specified vehicle systems.

The document shall be specifically incorporated in the master sales agreement and hence forth be called Technical Customer Documentation ( TCD). The TCD to be mutually agreed by the customer & Bosch and shall be used as a reference and forms the basis in case of general warranty and liability obligations.

## 1.2.2 Product intended use

(Reference : *User Manual submitted as part of CE/RED and shall be placed while placing the product in the market*)

The intended and non-intended use of iTraMS CCU Gen2A product is discussed in the below sections.

The CCU is intended for use in automotive applications. The CCU is solely to be used in connection with the system components, mounting and environment conditions which have been validated and released together with this configuration.

Provided that CCU is used within the conditions (environment, application, installation, loads, and antennae) as described in this TCD 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 TCD 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 TCD and the agreed upon documents as well as all applications not released by Bosch.

The customer is responsible for the integration of the CCU in the overall system and the necessary validation. Customer shall be responsible for making sure that the product will not be exposed to conditions in excess of those referenced in such testing specifications.

The conditions of use (environment, application, installation and loads) contained in this manual and associated agreed documents constitute the scope of the product's suitability for its contractually required, intended or ordinary use and the scope of the product's condition/ quality. The customer is responsible for ensuring the product's usability in the vehicle.

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. Do not cover ventilation openings and heat sinks – otherwise a build-up of heat may occur in the device that could lead to malfunction. 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.

## 1.3 Safety and warning notes

Lead Responsible	Gupte Rahul (RBEI/PAC-CA)
Status	YELLOW
Remarks	

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.
- Your workplace has to be dry, as well as sufficiently lit and ventilated. Do not smoke in the workplace.
- 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 35 cm (14 in) 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.
- Do not cover ventilation openings and heat sinks – otherwise a build-up of heat may occur in the device that could lead to malfunction.
- Do not insert foreign bodies in the insertion slots or openings of the device – otherwise injury or damage to the device may occur.
- The device must not come into contact with hot or burning objects (e.g. cigarettes).
- It is to be ensured that no water ingress into the CCU with the right installation and packaging inside the vehicle
- To clean the device, never use hard or sharp objects that could damage the protective pane or housing. Do not use aggressive cleaning agents such as thinners, benzene, abrasive cleaners, spray cleaners, acidic or alkaline solutions, or wax. Do not spray any liquids onto the device. To clean the housing and protective pane / display, moisten a soft cloth with tepid water and wipe off the dirt. Make sure that no liquid enters the inside of the display. Afterwards, wipe the cleaned surface with a clean, dry cloth.

If the device is to be cleaned before installation in the vehicle, you must make sure the openings (in particular the connector contact points) are kept sealed so that no liquid can enter the device.

## 1.4 Important Instructions / Misuse

Lead Responsible	Varadharajaperumal Raghupathi (RBEI/EEG11)
Status	YELLOW
Remarks	

This paragraph contains important instructions and hints for handling and operating the CCU in series applications. Additionally, further hints and remarks in the individual chapters of this TCD or the other referenced documents must be strictly followed.

- 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.

- The mounting of the CCU in the vehicle should be selected such that the conditions described in this TCD and the associated documents are adhered to. An inappropriate installation can lead to damage of the control unit (and to malfunctions resulting from it). Specifically damage could result from excessive temperature, vibration loads or the effect of specific substances.
- Depending on the software used, for a complete functional capability of the CCU after “ignition off” (terminal 15-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.), The life time of eMMC depends on RW/WR cycles used in application, discussed and agreed between BOSCH and customer
- Operation of the connectivity unit without battery or suitable buffer element is not permitted.
- Electrostatic discharges can lead to damage of the electronic components, as is the case with all electronic devices. Thus, suitable protective measures are to be taken against electrostatic discharges for persons and tools. Specifically, the pins in the control unit of all connector should not be touched.
- The connectivity unit is protected against load dump impulses 5b on the positive battery lines. It must be ensured, through the installation of suitable protective measures (e.g. generator with suitable excess voltage protection), that during the occurrence of the load dump impulses, the voltage at the positive battery lines is limited centrally.
- In case of “jump start” of the engine, the values specified in this TCD must be strictly followed for protection from excess voltage. Non-compliance can lead to malfunctions, damage or failure of the connectivity unit.
- 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.
- Opening or trying to open can lead to damage or malfunctions of the CCU or components connected to it.
- If the unpacked control unit falls on a hard surface, such as a concrete floor, it is strongly recommended not to use the control unit because non-detectable damages can affect functions and the reliability.
- Hint regarding the eMMC (Flash): The periodic or repetitive saving of important characteristic data (diagnostics results, error memory etc.) takes place in an eMMC or an EEPROM emulation within the flash memory. 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. Further details in this regard are to be agreed upon with Bosch.



## 1.5 General Handling Instructions – In Cabin

Lead Responsible	Varadharajaperumal Raghupathi (RBEI/EEG11)
Status	YELLOW
Remarks	

### 1.5.1 Mounting position of the CCU

Cabin mount/driver compartment/passenger compartment

### 1.5.2 Connecting / Disconnecting of the CCU

- 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.
- Liquids and other media are not allowed to come in contact with the connectivity unit connector and its pins.
- A connection / disconnection of the control unit to / from the positive / negative terminals of the battery when ignition (terminal 15) is switched on (closed main relay) can lead to malfunction or errors in diagnostics and is therefore prohibited.
- The pins for the battery ground terminals are to be connected first while connecting the connectivity unit. These pins should be disconnected last during disconnection.
- Connection sequence during installation
  - a. Connect Antenna
  - b. Connect main connector
- Disconnection sequence
  - a. Disconnect Antenna
  - b. Disconnect main connector

#### • Power supply connection

Steps to power ON the Non-permanent supply CCU:

1. Apply the Wake-Up signal to the pin 24(I\_S\_T15) i.e. turn on KL15
2. Battery voltage (via Main relay/ Switched via T15 key) at pin 11 reaches inside through internal Relay. Main relay not controlled by CCU.

Steps to power ON the permanent supply CCU:

1. Apply the Wake-Up signal to the pin 24(I\_S\_T15) i.e. turn on KL15
2. Battery voltage gets connected to the pin 11 through internal Relay
3. A CAN Message wake up the CCU

Steps to be followed before disconnecting the CCU:

1. Turn off KL15
2. Wait until end of post-drive and opening of internal relay (~ 20sec)
3. Disconnect battery supply voltage (+) from the CCU supply pins

4. Disconnect battery ground (-) from the CCU power ground pins
5. Disconnect wiring harness connector from CCU

- 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

### 1.5.3 Operating voltage and connection to vehicle system components

The connection of the CCU to the vehicle system needs be done according to the connector details and related system components.

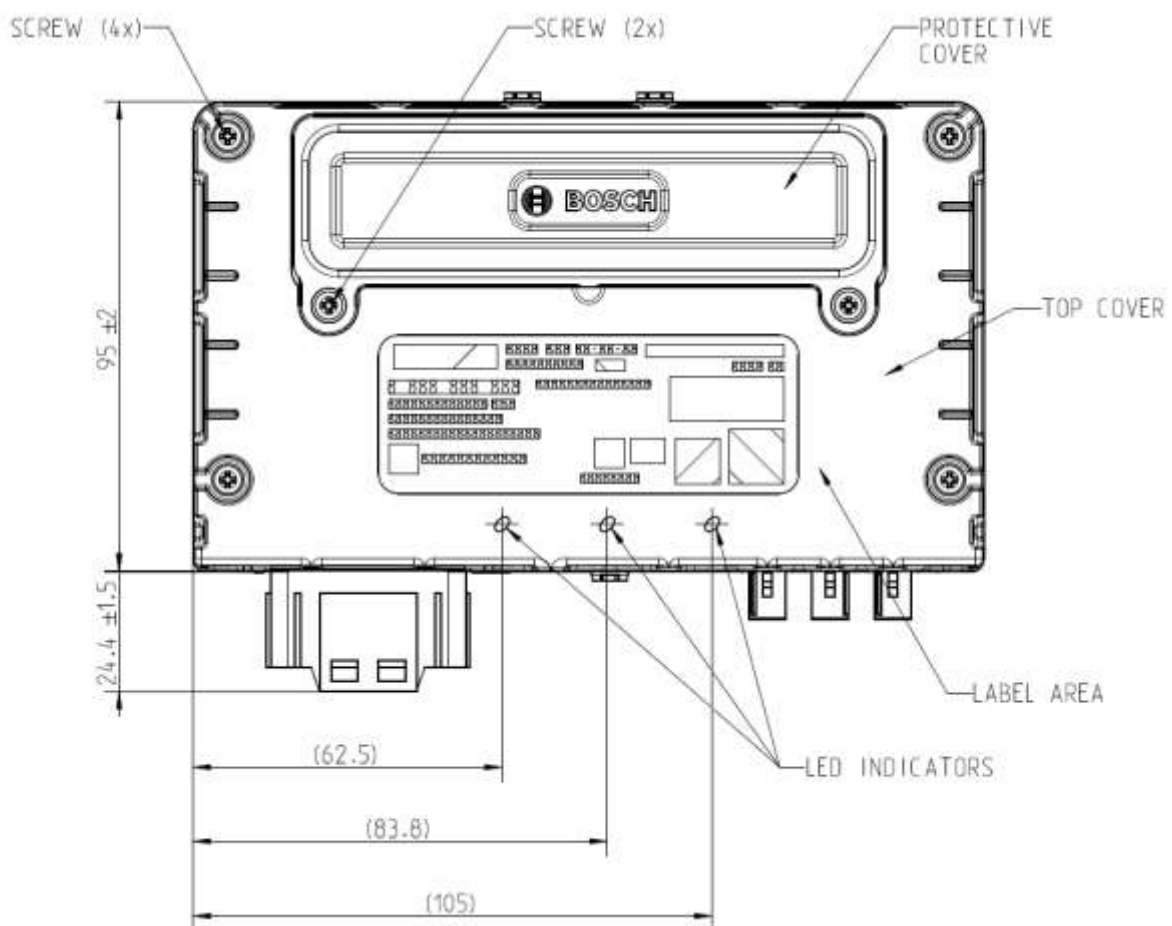
The CCU is designed for the operation in a vehicle with 12V/24V on-board power supply; the nominal voltage is 14V/28V.

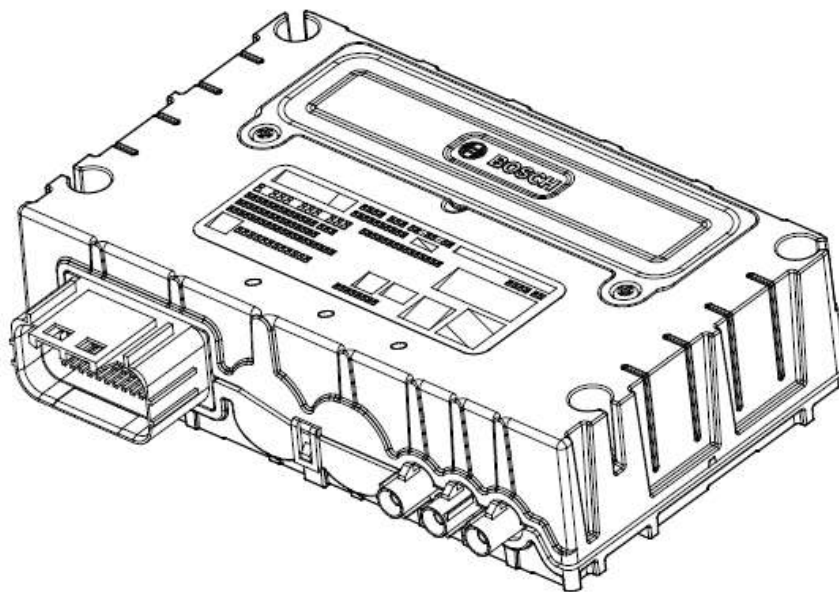
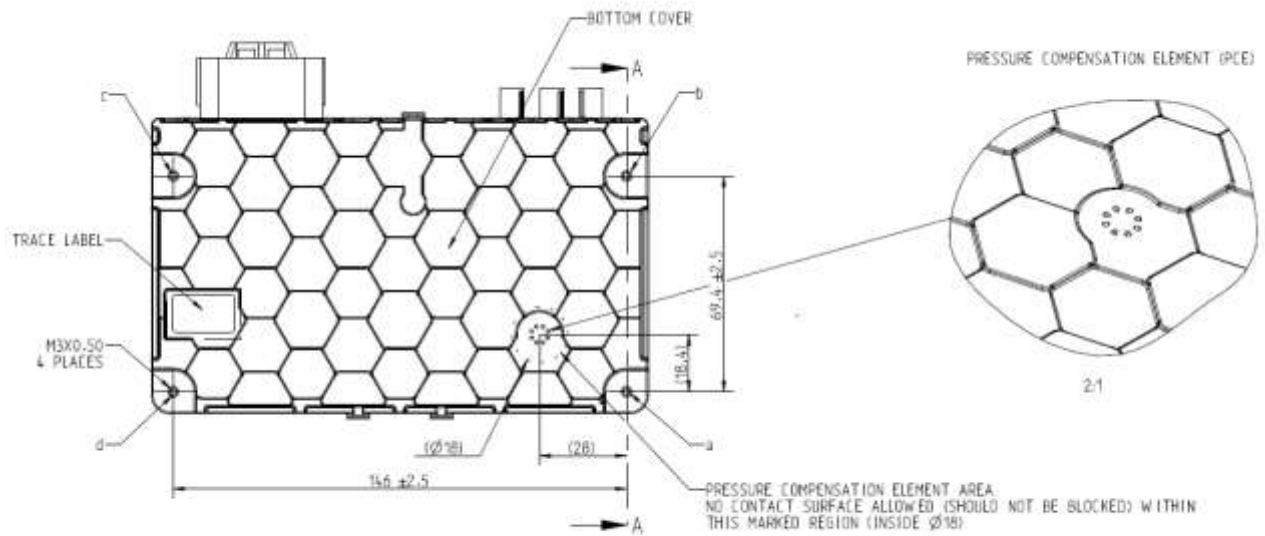
## 1.6 Dimensions and weights – In Cabin

Lead Responsible	Raghu Narayana (RBEI/EAX6)
Status	YELLOW
Remarks	

### Remark

In the sense of legibility, references to, e.g. offer drawings are to be avoided.





Ambient temperature	TBD
Connector	1 X 36 pin JAE connector 3 X Single pole FAKRA connector
Degree of protection	IP52
Housing	Plastic
Mounting location	Engine (Refer offer drawing "AD00A1A032-Ver00" for more information)
Mounting position	Horizontal to ground (Refer offer drawing "AD00A1A032-Ver00" for more information)
PCB Technology	8 layer, NANYA NP175F-BH TK6 material, Lead free soldering with SAC
Wire Harness	<p>a) The wiring harness plug is not included in the scope of delivery and must be ordered separately.</p> <p>b) The wiring harnesses must be supported mechanically at the CCU mounting position (distance &lt; 150 mm) in a way that the excitation of the CCU is in phase (e.g. at the CCU screw-on plate).</p> <p>c) 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</p> <p>d) The wiring harness connectors should have "GOLD PLATED" pins for all the bays (36 pin JAE connector and 3 FAKRAs)</p>

## 1.7 General remarks on service, repair, and maintenance

Lead Responsible	Gupte Rahul (RBEI/PAC-CA)
Status	YELLOW
Remarks	

### NOTE

Service or 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.

## 1.8 Information on disposal and recycling

Lead Responsible	Ramachandran V (RBEI/PAC)
Status	YELLOW
Remarks	

OEM is responsible for proper product disposal and recycling of the device at its end-of-life. Bosch, as component manufacturer shall adhere to meet regional and local requirements (EU WEEE, EU RoHS etc.) in the design considerations of the component.

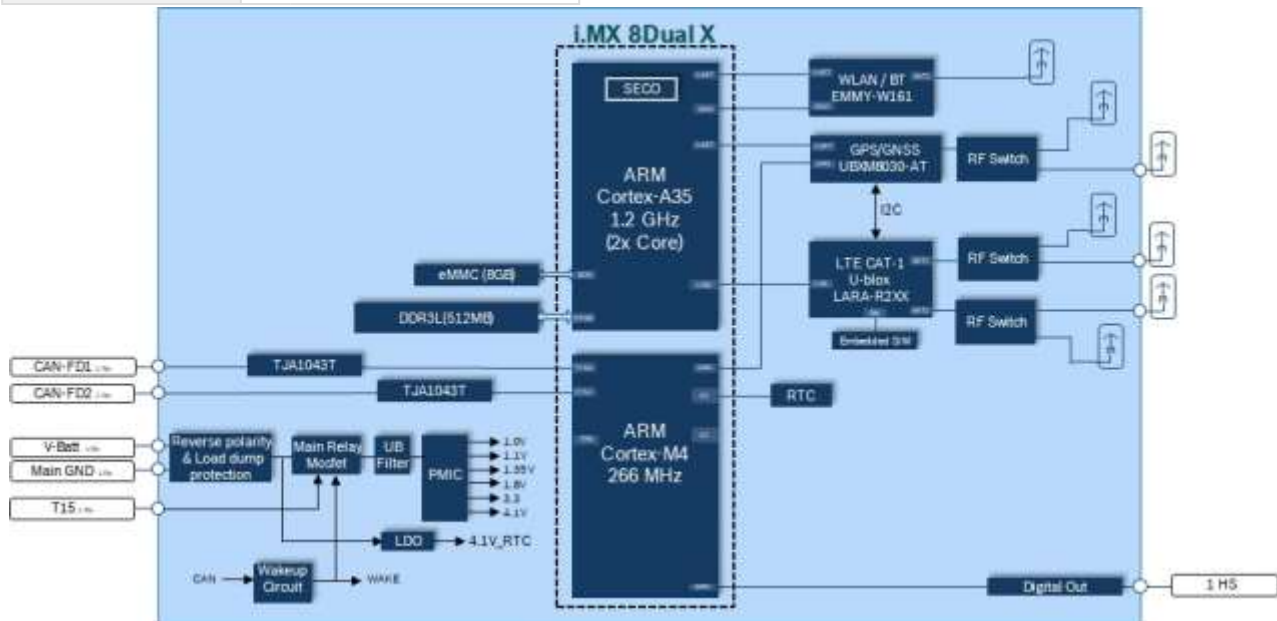


In line with these regulations, Bosch shall indicate appropriate marking indication on this component (as above) that shall indicate that this component shall not be disposed of in normal way but via separate collection of electronic waste disposal system which shall be in place within one year of putting the respective product on the market in EU. 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.

## 2 System Description

## 2.1 System of Interest (SOI) – In Cabin

Lead Responsible	Gupte Rahul (RBEI/PAC-CA)
Status	GREY
Remarks	



Communication	Details
Processor	i.MX8DX, 2x Cortex-A35 1.2 GHz 1x Cortex-M4F 266 MHz
Flash Memory	8GB eMMC
RAM	1 GB
Network Connectivity	LTE Cat 1 / 3G multi-mode module Support up to four LTE bands, up to two 3G UMTS/HSPA bands
Cellular variant:	LARA-R202 - North America Variant LTE bands: 2, 4, 5, 12 UMTS bands: 850, 1900 GSM bands: No support
CAN	2 wire CAN_H and CAN_L signals, Data rate upto 1Mbps



Communication	Details
GNSS	Supports GPS, Galileo, GLONASS and BeiDou Horizontal position accuracy (CEP) : 2.5m to 4.0m Time-To-First-Fix: Cold Start: 26s, Hot Start: 1s
eSIM	eUICC - MFF2 eSIM chip complies with the standards ISO/IEC 7816-3 and 3GPP TS 31.101 (Release 12)
Wi-Fi/BT	Wi-Fi Supports IEEE 802.11a/b/g/n/ac, 2.4 GHz & 5 GHz. Bluetooth v4.2 with Bluetooth low energy
Internal Antennas	1 X Wi-Fi / BT Antenna 1 X GNSS Antenna 1 X LTE Main Antenna 1 X LTE Diversity Antenna
External Antennas options	1 X GNSS Antenna 1 X LTE Main Antenna 1 X LTE Diversity Antenna

**FCC Statement:**

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, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**Information to User:**

Any changes or modifications not expressly approved by the party responsible for compliance could void the authority to operate equipment.

**FCC Co-Location Warning Statement:**

This device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter.

**FCC Exposure Compliance:**

This device should be installed and operated keeping the radiator atleast 20cm or more away from user's body.

**For IC(ISED):****RSS-Gen Issue 4 8.4**

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions: (1) This device may not cause interference; and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

## 2.2 Hardware interfaces - InCabin

### 2.2.1 Electrical interfaces

Interface	Type	Details
Outputs	High side	1 X 1 A
Communication	CANFD1	2 wire , CANH and CANL signals, Data rate up to 1 MBPS
	CANFD2	2 wire , CANH and CANL signals, Data rate up to 1 MBPS
	RS232	1 X RS232 on A35 ; only for development
	USB	1 X 4 -wire ( Device only) as per USB2.0 ; only for development

### 2.2.2 Main Connector Pin Assignment

Pin Number	Pin Description	CCU Pin Label	Remarks
5	CANFD0_Shielding	G_G_CAN0SH	CANFD0 : Shielding Ground
6	CANFD0_L	B_D_CAN0L	CANFD0 : Low
7	CANFD0_H	B_D_CAN0H	CANFD0 : High
10	HS Digital-Output 4	O_S_OUT4	Digital : Output - High Side
11	Battery Ground	G_G_BAT	Battery : Negative
12	Battery Plus	V_V_BAT	Battery : Positive
17	CANFD1_Shield	G_G_CAN1SH	CANFD1 : Shielding Ground
18	CANFD1_L	B_D_CAN1L	CANFD1 : Low
19	CANFD1_H	B_D_CAN1H	CANFD1 : High
24	KL15 (Ignition)	I_S_T15	T15