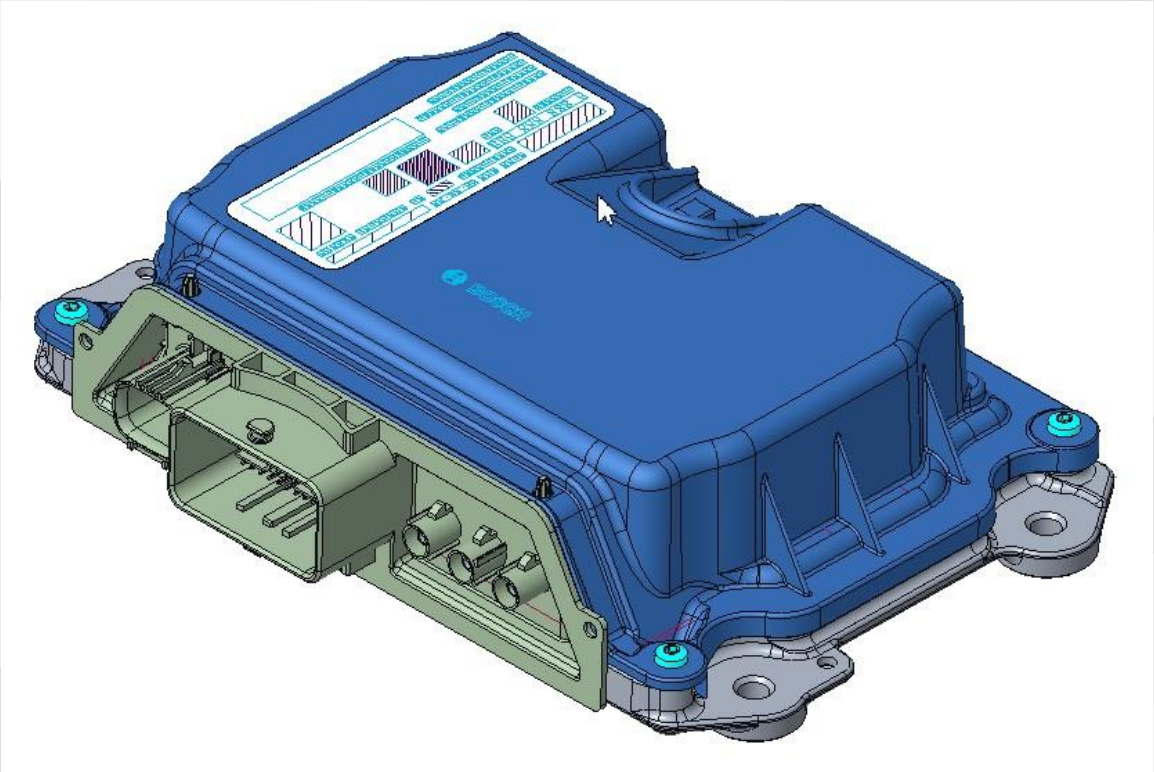
CCU
User Manual



- Product Name: Connectivity Control Unit
- Family Model Name: iTraMS CCU
- Model Name: CU-304-0800-00

This preliminary document presents the status of the agreed specifications. It will be confirmed when all the validations has been completed with positive result

Table of Contents

Table of Figures

1 Introduction

Intelligent Transport Management System (iTraMS) CCU is a telematics platform solution that provides transportation solutions to OEMs.

1.1 Objective

The purpose of this document is to set out for the customer information and requirements for what, according to our opinion, may be considered a proper and correct installation. Please note that Bosch does not assume any liability for the information/recommendations set out herein and that responsibility for the proper installation solely rests with the customer.

1.2 General

All efforts have been made to ensure the accuracy of material provided in this document at the time of release. However, the items described in this document are subject to continuous development and improvement. All specifications are subject to change without notice and do not represent a commitment on the part of Robert Bosch Engineering and Business Solutions Private Limited (RBEI). RBEI will not be responsible for any loss or damages incurred related to the use of information contained in this document.

Before starting up, connecting, and operating this product it is essential that the installation instructions and, in particular, the safety instructions are studied carefully. By doing so, any uncertainties in handling this product can be eradicated and will ultimately help avoid damage to the device.

FCC Compliance Notification to User

These devices comply with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) these devices may not cause harmful interference, and (2) these devices must accept any interference received, including interference that may cause undesired operation.

Co-Location Warning Statement

These devices and their antennas must not be co-located or operating in conjunction with any other antenna or transmitter.

Exposure Compliance

Do not touch the Primary antennas, which are transmitting RF signals. Always disconnect power to the CCU before installation or maintenance service.

The Primary antennas should always be separated from the operator or nearby person by a minimum distance of 20 cm.

Information to User:

These devices must be operated as supplied by RBEI. Any changes or modifications made to these devices without the express written approval of RBEI may void the user's authority to operate these devices.

1.3 Disclaimer

iTraMS functionalities cannot be guaranteed if the stated instructions are violated. This includes handing by untrained person, using the wrong connector, etc. This product is not intended for use in life-support appliances, devices, or systems where a malfunction of the product can result in personal injury. RBEI customer using, integrating, and/ or selling this product for use in such appliances do so at their own risk and agree to fully indemnify RBEI for any resulting from incorrect use or illegal sale.

WARNING: This device has been approved to use in the industrial circumstance (office use), there is possibility to have electro-magnetic interference if it is used in home

2 Copyright

The information in this document should not be altered or amended without special notification from Robert Bosch Engineering and Business Solutions Private Limited (RBEI). RBEI undertakes no further obligation in relation to this document. RBEI or RBEI- Approved Service Personnel can only use the product described in it. Under no circumstance may any part of this document be copied, reproduced, transmitted, stored in a retrieval system, or translated into another language without the express written permission of RBEI.

3 Agreed Product Use

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

3.1 Intended Use

RBEI will be responsible for delivered products being fit for use of purpose intended and/or having a defined level of quality, such responsibilities are subject to the application of the product conforming to the agreed upon environment, installation and stress conditions, as such are referenced in the attached specification.

When the product during the Bosch release procedures has successfully met the testing specifications agreed to the Customer, it is deemed to fully cover all requirements, if any, that the product be fit for the use or purpose intended and/or have a defined level of quality. Customer shall be responsible for the system application, which includes ensuring that the intended product application and all environmental, installation and stress conditions to which the product will be exposed are covered by such testing. 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.

The product is intended for and is undergoing approval for installation and operation in automobiles, commercial vehicles, off-highway vehicles and coaches with a rated voltage of 12 and 24 volts. It may be necessary to adapt the product's factory-set state to suit the specific country.

Only connecting cables and external devices that are appropriate for the device in question as regards safety, electromagnetic compatibility and grade of shielding may be used. Compliance with the applicable standards cannot be guaranteed if the device is modified without the agreement of Bosch.

Bosch is only responsible for implementing the device side connector (interface) according to the customer's specifications. Bosch does not assume any responsibility and does not provide any guarantee for the plug-in connection – in particular for its electrical functioning, durability and imperviousness – since this is applied by request of the customer.

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.

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 be exposed to hot or burning objects (e.g. cigarettes).

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 moisten a soft cloth with tepid water and wipe off the dirt. Make sure that no liquid enters the inside of the housing. Afterwards, wipe the cleaned surface with a clean, dry cloth.

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

4 Overview

iTraMS is a platform for TCU or CCU that is an onboard system that controls wireless tracking, diagnostics and communication to/from the vehicle; these systems can be used for fleet management and vehicle tracking, among many others. This CCU has the following connectivity solutions:

1. Wireless Connectivity
    - WLAN – 802.11 b/g/n
2. Wired Connectivity
    - CAN
    - RS485
    - Ethernet
    - USB2.0

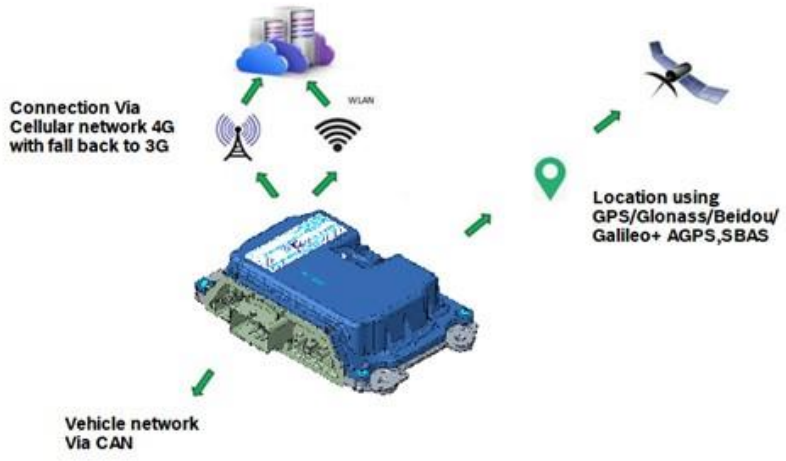


Figure 1 Overview

5 Symbols Used

The document conventions used in this manual are in the sections below:

KEYWORD	FORMAT	DESCRIPTION
Warning	WARNING: Mismatch may damage the connector.	Possible impending danger.

6 Warranty and Service Clauses

For any of the products outside applications or environments outside the agreed may lead to damage or malfunctioning of the product specification, no warranty shall apply and product

7 Safety and Instructions

7.1 Do's and Don'ts

- The different dos and don't s to be followed while handling the device are as seen below:
- The CCU should not be opened or modified in any way. Doing so will void the warranty.
- Do not pour any liquid into any opening. It may lead to damage or malfunctioning of the product.
- The equipment is operable within the temperature range -40DegC to +95DegC.

7.2 Precautions for Installation

The product must be installed by skilled and instructed personnel only. Personnel scheduled to be trained, familiarized and instructed or to take part in a general training course may only work with the product under the supervision of an experienced person.

- Electro Static Discharge (ESD) precautions should be taken while installation of CCU.
- The CCU should be installed on the vehicle in accordance to the instructions in the Installation manual. Refer to the annexure for guidelines.
- Follow the specifications and instructions of the vehicle manufacturer.
- During vehicle installation, switch the gearbox to neutral and actuate the hand brake. Secure the vehicle against rolling away with brake wedges.
- Switch off the ignition when you connect/disconnect the CCU to/from the OBD interface.
- Do not drop the CCU. It may lead to damage or malfunctioning of the product.
- Install the CCU at a location that
  - Does not impair any of the safety devices (such as the main airbag, knee airbag and steering).
  - Does not impair the driver of his/her driving.
  - At least 20 cm away from any human contact and fastened with sufficient space.
  - Prevent any contact of the CCU, OBD connection cable or wiring harness with hot components.
  - The functioning of other lines or cables is not impaired, or they are not clamped.
  - The CCU should only be removed or replaced by an authorized service personal.

8 Scope for Delivery

The scope of delivery includes:

- On-board Unit (CCU)
- Installation Manual
- The voltage and current rating of the wiring harness must be greater than the voltage and current rating mentioned in the technical specifications.
- It is recommended to have a fast blow fuse with below rating in series on the positive power supply line at vehicle wiring harness.
- 5A for 12and 24V applications
- If one of the following situations arise, get the equipment checked by service technician:
  - The wiring harness or connector is damaged.
  - Liquid has penetrated into the equipment.
  - The equipment has been exposed to moisture.
  - The equipment does not work as per specifications.
  - The equipment has been dropped and damaged.
  - The equipment has been exposed to elevated temperatures (beyond storage specifications).

Note: Check the product for any damages. Never use a damaged product. If you have any complaints, please contact the service technician.

9 Legal Requirements

iTRAMS CCU product family is undergoing Electromagnetic and Radio Frequency conformance tests and validations in different regions.

10 Device 3D Model

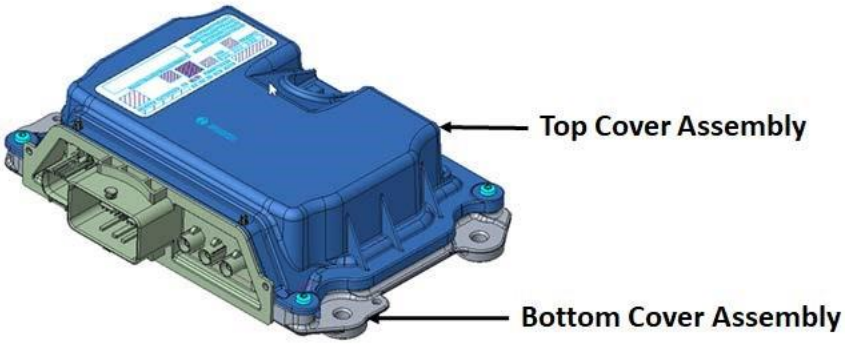


Figure 2 Device 3D model

11 Installation

11.1 Installation of Cable Harness

1. 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. Liquids and other media are not allowed to come in contact with the connectivity unit connector and its pins.
3. Plug the Cable harness cable into the CCU. Check the PIN numbers on the connector of the connecting cable.
4. Make sure that it is connected to the same pin slots on the device side connector. Lock the connector.
5. For a secure connection, the interlocking mechanism of the connector must not be damaged and must be in a completely closed state.
6. It must be ensured that the connector from the wiring harness side is disconnected only in dry and clean conditions.
7. Connection and disconnection procedure must be done in a particular sequence as given below:
    - Connection sequence during installation
        - Connect Antenna cables
        - Connect main connector
        - Connect HSAL Connector
    - Disconnection sequence
        - Disconnect HSAL connector
        - Disconnect main connector
        - Disconnect Antenna cables

WARNING: Mismatch of the sequence may damage the connector

NOTE: Un-used connectors (either Antenna Ports or Wired Connectors) must be closed appropriately to meet the specified IP rating of the product.

12 Technical Specifications

a. Analog inputs

ANALOG INPUTS	REMARKS
Number of inputs	3 Analog inputs

b. Digital inputs

DIGITAL INPUTS	REMARKS
Number of Inputs	5 digital inputs

c. Digital Output

DIGITAL OUTPUTS	REMARKS
Number of output	1 programmable High Side output
Max continuous current	450 mA

DIGITAL OUTPUTS	REMARKS
Number of output	2 programmable Low Side outputs
Max continuous current	450 mA of each output

d. Bus (CAN0 and CAN1)

Analog Inputs	REMARKS
Number of Interfaces	2 CAN Interfaces
Connection	2-wires (CANH-CANL)
Max Data rate	500 Kbps

e. Bus (RS485)

Interfaces	REMARKS
Interface	RS485 Interfaces
Connection	2-wires (D+ & D-)
Max Data rate	115.2Kbps

f. Bus (Ethernet)

Interfaces	REMARKS
Interface	Ethernet 10base T, 100Base TX
Connection	4-wires (RX+, RX-) & (TX+, TX-)
Max Data rate	10Mbps & 100Mbps

g. Bus (USB2.0)

Interfaces	REMARKS
Interface	USB Interfaces
Connection	4-wires (D+, D-) and supply, GND
Max Data rate	480Mbps

h. Internal Memory

Memory Type	REMARKS
Flash Memory	eMMC, 8 GB

i. Power Requirements

INPUT POWER	VOLTAGE	REMARKS
Supply Voltage	12 V	9 V to 32 V (Operational)
	24 V	
Maximum Operating Current	12 V	1.5 A
	24 V	1 A
Typical Operating Current	12 V	750 mA (Excluding Digital Output)
	24 V	400 mA (Excluding Digital Output)
Back up battery voltage range	9 V to 32V	Back up battery is an an optional feature. This feature is provided to support CCU operation in case of quick volate dip in main supply volage.

It is recommended to have a fast blow fuse with below rating, in series on the positive power line of 5A for 12and 24V applications.

Annexure

1 Document Details

Subject	iTraMS CCU User Manual
Status	
Approved By	
Released By	
Notion of Confidentiality	Public

2 Document Revision History

DATE	VERSION NUMBER	DESCRIPTION NUMBER	SIGNATURE OF APPROVER
May 03, 2021	1.0	iTraMS CCU User Manual	

3 Abbreviations Used

ABBREVIATION	DESCRIPTION
BLE	Bluetooth Low Energy
CCU	Connectivity Control Unit
CAN	Control Area Network
EMC	Electro Magnetic Compatibility
GPS	Global Position System
GNSS	Global Navigation Satellite System
I/O	Input and Output
IP	Ingress Protection
iTraMS	Intelligent Transport Management System
LTE	Long Term Evolution
OEM	Original Equipment Manufacturer
OBD	On Board Diagnosis
PCBA	Printed Circuit Board Assembly
TCU	Telematics Control Unit
USB	Universal Serial Bus
WLAN	Wireless Local Area Network
WCDMA	Wideband Code Division Multiple Access

4 EMC Recommendations

- Do not route the sensitive signals in parallel to high tension wires (ignition, Digital I/O).
- Wire from CCU to Vehicle battery should be as short as possible.
- Avoid loops in the routing.
- CCU ground shall be as short as possible fixed to chassis or directly to battery ground
- For CAN wiring, it is recommended to use a twisted pair (Figure 3).

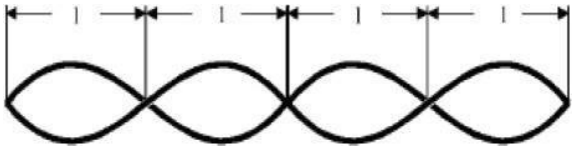


Figure 3 Wiring in iTraMS

5 General Info

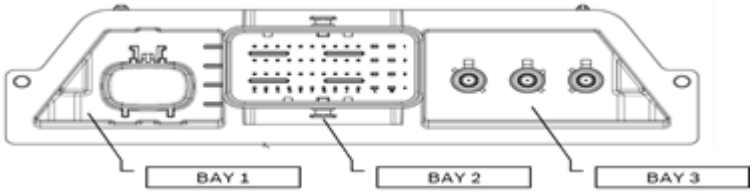
- Sensor signal wires should be separated from both actuator signals and ignition switching signals.
- Correct fuse rating as per the system load to be calculated by the OEM and used on Battery positive supply.
- Calculation for their ratings will be responsibility of the customer.
- Twisted pair wires should be used for CAN signals (Figure 3).
- For CCU power ground, multi-point grounding on chassis is recommended.
- Before fixing the ground wires to the chassis of vehicle, paint or any insulating material should be removed and the surface should be cleaned to ensure proper ground connection.
- Fasteners with serrated washers to be used for fixing the ground cables to chassis.

Wiring

- If necessary, wires of type FLR (R = reduced thickness of insulation) must be used.
- It is recommended to use constantly insulator copper strands as per DIN 72551 or the newer automotive norms LV112.
- Mechanically unloaded cables can also be connected as wires with reduced thickness of insulation (FLX or FLKr wiring).
- As per DIN 40621, the cables should be laid in a cable protection sleeve.
- Wiring harness layout in the vehicle - Sharp edges in the wiring layout should be avoided. The wiring and primarily the plug connections must be protected against direct water or spray mist.

6 Pin-Out details

The different connectors and their pin-out details are discussed in the below sections



BAY1: HSAL Connector

BAY2: Main Connector

BAY3: RF Connector

6.1 Main Connector

Pin Number	Pin Description	CCU Pin Label	Remarks
A1	Digital Output 1	O_V_OUT1	High Side Output
A2	Digital-Output 3	O_S_OUT3	Low Side Output
A3	Digital-Output 2	O_S_OUT2	Low Side Output
A4	RS-485-	B_D_RS485_DM	Communication
B4	RS-485+	B_D_RS485_DP	Communication
C1	AC signal monitoring Phase	I_A_ACDCP	AC signal monitoring Phase
C2	AC signal monitoring Neutral	I_A_ACDCN	AC signal monitoring Neutral
C4	RS-485 isolated ground	G_R_RS485ISO	Ground
D4	Analog-Input4	I_A_AN4	Analog input
E3	PWM input	I_T_PWM	PWM input
E4	Analog-Input2	I_A_AN2	Analog input
F1	Analog Ground	G_R_AN	Ground
F3	Digital-Input5	I_S_DIG5	Digital input
F4	KL15(Ignition)	I_S_T15	Digital input
G1	CAN1 high	B_D_CAN1H	Communication
G2	RTC backup power (Coin cell)	V_V_RTC	Power
G4	Analog-Input3	I_A_AN3	Analog input
H1	CAN1 low	B_D_CAN1L	Communication
H2	RTC backup ground (Coin cell)	G_G_RTC	Ground
H4	Digital-Input2	I_S_DIG2	Digital input
J1	Digital-Input4	I_S_DIG4	Digital input
J2	Digital-Input1	I_S_DIG1	Digital input
J3	CAN0 high	B_D_CAN0H	Communication
J4	CAN1-Shield	G_G_CAN1SH	Shield
K1	Digital-Input3	I_S_DIG3	Digital input
K3	CAN0 low	B_D_CAN0L	Communication
K4	CAN0-Shield	G_G_CAN0SH	Shield
L2	Backup battery supply	V_V_BAK_BAT	Power
L4	Backup battery Ground	G_G_BAK_BAT	Ground
M1	Vehicle Battery Plus	V_V_BAT	Power
M4	Vehicle Battery Ground	G_G_BAT	Ground

6.2 RF Connector

Pin Number	Signal Description
1	GNSS Antenna Port
2	NO Connection
3	WIFI Antenna Port

6.3 HSAL Connector

Pin Number	Pin Description	CCU Pin Label	Remarks
1	Ethernet TX -	B_D_ETH_TXM	Signal
2	Ethernet TX +	B_D_ETH_TXP	Signal
3	Ethernet GND	G_G_ETHSH1	Shield Ground
5	USB Supply	V_V_USB	Supply for USB
6	USB GND	G_G_USB	GND For USB
7	Ethernet RX +	B_D_ETH_RXP	Signal
8	Ethernet RX -	B_D_ETH_RXM	Signal
9	Ethernet GND	G_G_ETHSH2	Shield Ground
10	Ethernet GND	G_G_ETHSH3	Shield Ground
11	USB D+	B_D_HSD_DP	USB Data Plus
12	USB D-	B_D_HSD_DM	USB Data minus

7 Best Practice for Wiring Routing

- Due to the effects of gravity passing water through the wires, the CCU should be packaged higher than any wire end or splice in the harness.
- Measures should be taken to prevent water from collecting around the wiring harness. Plastic wire covering/protection should allow water to drain from harness.
- Wiring should be routed away from water drainage areas. Wires that are routed around sharp edges or that can be damaged from stone impingements should be protected.
- Water in the wiring harness can cause interference on various signal wires due to poor wiring insulation.
- Wires splices and ground eyelets must be located away from direct contact with high pressure cleaner.
- Any wire end terminating in a splash water area should be orientated so that the wire end is pointing down.

8 Grounding Scheme

The grounding scheme for Gen2A is as seen below:

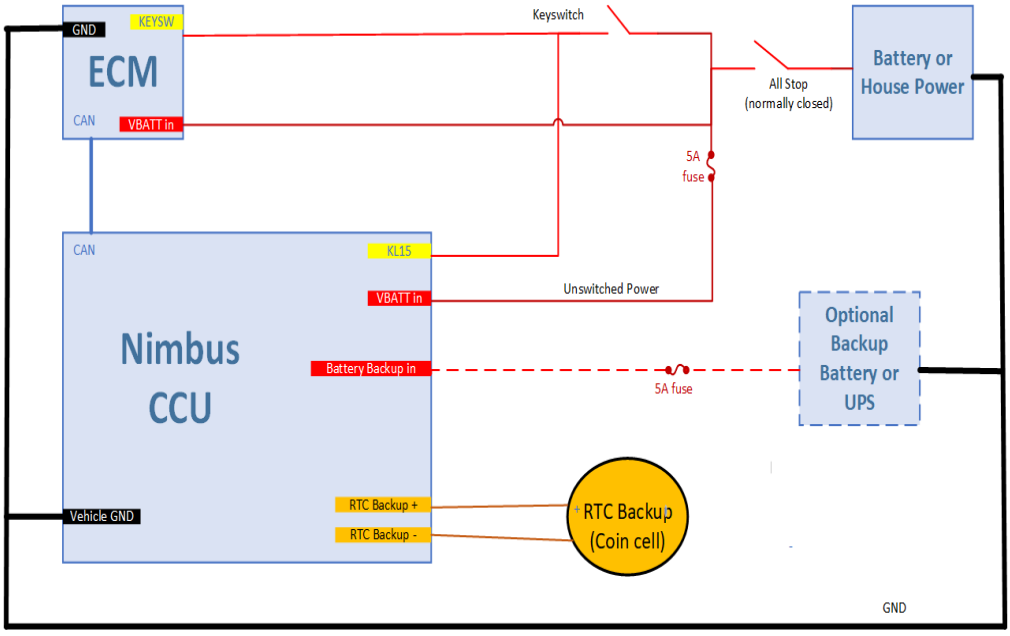


Figure 4 Grounding Scheme

Robert Bosch Engineering and Business Solutions Private Limited

123. Industrial Layout,
Hosur Road,
Koramangala,
Bangalore – 560095,
INDIA

Email: Connect@in.bosch.com
Official Website: www.bosch-india-software.com