Vehicle Cockpit Unit (VCU)

Technical Description and Installers Manual

Model: VCUNM1

This technical manual is intended for usage in the context of regulatory approvals (please ensure that the correct model-name reference is used).
It does not replace a vehicle- or region-specific OEM owners or user manual.

It is the OEMs responsibility (General Motors) to ensure that all mandatory information with regulatory relevance is made available to end-customers in the owners and user manuals.

Business name of device manufacturer:	Robert Bosch GmbH
Address:	Robert Bosch GmbH Robert-Bosch-Platz 1 70839 Gerlingen Germany
Brand:	Bosch

09/14/23 – v1

Table of Contents

1. DEVICE DESCRIPTION

General Motors' ("GM") Vehicle Cockpit Unit (VCU) 1.0 is a technology upgrade for the previous generation GM Cockpit ECU platform ("Info 3.x").

The GM Vehicle Cockpit System ("VCS") is responsible for the user experience in the cockpit of GM vehicles.

The VCU, a Bosch device for GM vehicles, is a silver box solution providing interfaces to displays, speakers, sensors and optional components of the VCS.

The VCU, provides the following capabilities:

1 Vehicle and infotainment related information to the slim-IPC, ICS, auxiliary, HVAC, and HUD displays. This includes processing of various vehicle camera viewing streams to certain displays.
2 Audio capability that includes processing various radio broadcasts to the vehicle, voice capturing using microphone inputs, user media playback via phone or USB, and integrating audio enhancements (for example ANC) using microphone inputs.
3 Wi-Fi, Bluetooth, and GPS connectivity.
4 Various analog and digital I/O, including but not limited to switches, HUDs, sensors, etc.

It supports two major GM electrical vehicle architectures (called "Global B" and "CLEA") and is offered in two major product variants: "MID" and "HIGH". In terms of regional support, a distinction is made between North America ("NA"), China ("CN") and RestOfWorld ("RoW") configurations.

The VCU hardware is based on a two-processor approach where Qualcomm's latest ARM-based automotive system-on-chip (SoC) family 8195 (High) and 8155 (Mid) acts as core computing element and Renesas Electronics' latest automotive micro-controller RH850F1KM/KH (Vehicle Interface Processor, VIP) is used for real-time processing needs.

The VCU software architecture is mainly based on 3 run-time environments (called SW domains):

- Running on VIP:
  - AUTOSAR OS as real-time processing system
- Running on SoC:
  - Blackberry Hypervisor V2.x based on QNX7.x to realize a host environment and guest environment as virtual machine
  - Host: QNX7.x operating system
  - Guest: Android system based on Linux kernel

The VCU can determine its geographical location:

- In the VCUNM1 the positioning information is provided by an external device, the Telematics Module.

Operational conditions of the device:

- Nominal supply voltage: 13.5 V DC
- Extended voltage range: 6.0 V to 16.0 V DC
- Max. Current consumption: <15A
- Nominal supply current: 1 … 2 A
- Sleep current consumption: <200µA
- Speaker output: 4Ohm with 13,5V ➔ 21W (10%THD).
- Operating Temperature Range: -40°C to +85°C (Note: Feature degradation expected from +50°C)
- Storage Temperature: -40°C to +85°C
- IP protection class: IP5K2
- ASIL level: B
- Device class: Class B
- Lowest internal frequency 1Hz
- Highest Internal frequency 6.264 GHz

External Antenna Information:

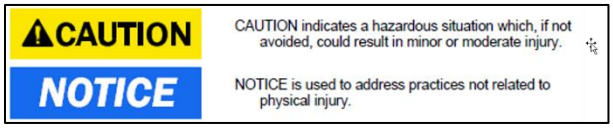
Description	External WiFi Antenna
Manufacturer	TE Connectivity
Manufacturer Part number	2310901
Antenna Type	Dipole printed (Passive unfiltered)
Antenna Pigtail Length	125 mm
Antenna Pigtail Type	RG174LL
Specified coax length from pigtail connection to radio connection	1 - 1.5 m
Coax type	RTK044
Antenna Frequency Ranges	2.4 GHz (2401-2483) and 5 GHz (5-5.9)
Peak Gain 2.4 Ghz Band	2.1 dbi
Peak Gain 5 Ghz Band	2.6 dbi

Internal Antenna Information:

Peak Gain 2.4 Ghz Band	5.2 dbi
Peak Gain 5 Ghz Band	4.9 dbi

2. SAFETY AND WARNING NOTES

This paragraph contains important safety and warning notes for handling and operating the device in series applications.



CAUTION

- The product is intended, and has been approved, for installation and operation in vehicles with a rated voltage of 12 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 may be used (e.g.: proper current carrying capability, proper EMC shielding, flammability verified with appropriate certificates). Compliance with the applicable standards can no longer be guaranteed if the device – including the software – is modified without the agreement of Bosch.
- 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.

NOTICE

- Do not cover ventilation openings and heat sinks. Otherwise, a build-up of heat that could lead to malfunction may occur in the device.
- Do not insert foreign bodies into the insertion slots or openings of the device. Injury, or damage to the device, may occur otherwise.
- The device must not come into contact with hot or burning objects (e.g. cigarettes).
- Never use hard or sharp objects that could scratch or damage the protective pane or housing to clean the device. Do not use aggressive cleaning agents such as thinners, gasoline, 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 device. Afterwards, wipe the cleaned surface with a clean, dry cloth.
- The housing/surface of the VCU may be very hot when the device is operational. Please exercise caution and use appropriate protective equipment (PPE).

3. OPERATING MODES AND WIRELESS CHARACTERISTICS

Bluetooth and WiFi can work together. The device operates with two Antennas (one internal and one external Antenna). Bluetooth signals are sent over the internal Antenna. WiFi signals are sent over both, internal and external Antenna.
A Bluetooth and WiFi combined module is integrated in the VCU: Alps UGKZDA2001AC.

3.1. Bluetooth

- Version 5.2 (class2)
- Bluetooth operates in the 2.4 GHz band (2402 ~ 2480MHz)
- Bluetooth works in both the BDR and EDR
- In the VCU the Bluetooth operates in the Classic and Low Energy modes.

3.2. WiFi

In the VCU, the WIFI has the following operating Modes. The device can connect to the external Access points in Station mode. The device can also operate as an Access point.

Declaration of WiFi Transmission Power:

WLAN 2412 – 2462 MHz	<20 dBm
WLAN 5150 – 5250 MHz & 5750 – 5850 MHZ	<20 dBm

Used WLAN Modes:

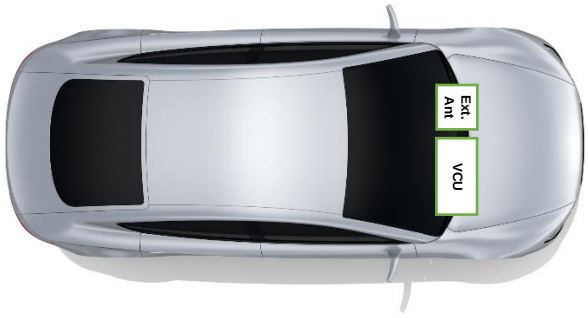
- Station Mode (STA)
  - Device does not connect to external AP on DFS Channels
- Access Point Mode (AP)
  - DFS channels are not used

4. INSTALLATION

Please follow the safety and warning notices as documented above when handling and installing this Bosch device.

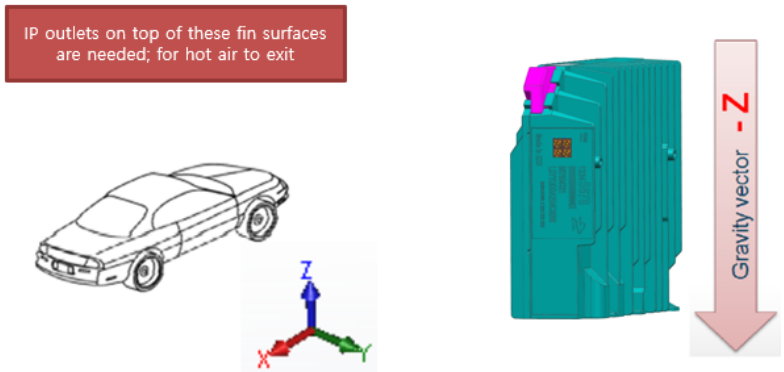
The VCU will be installed behind the dashboard (e.g. behind glove box) and is not exposed to the cabin. It will be fixed to the vehicle using a plastic bracket which is carline specific.

Exact mounting location of the VCU and its peripherals is carline specific. The below picture shows an schematic / example.

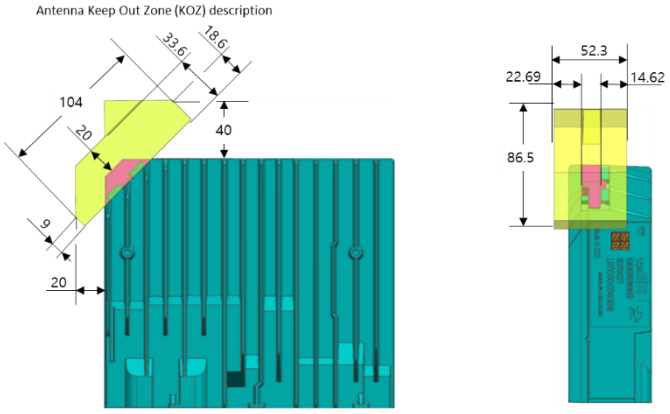


VCU Example VCU and external antenna mounting location

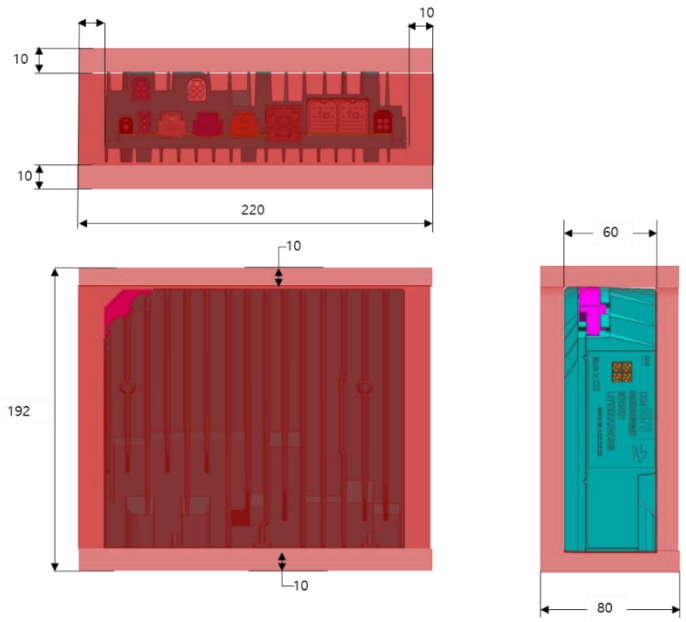
Mounting direction shall be vertical with the connectors facing down and with the antenna pointing up towards the vehicle compartment as shown below.



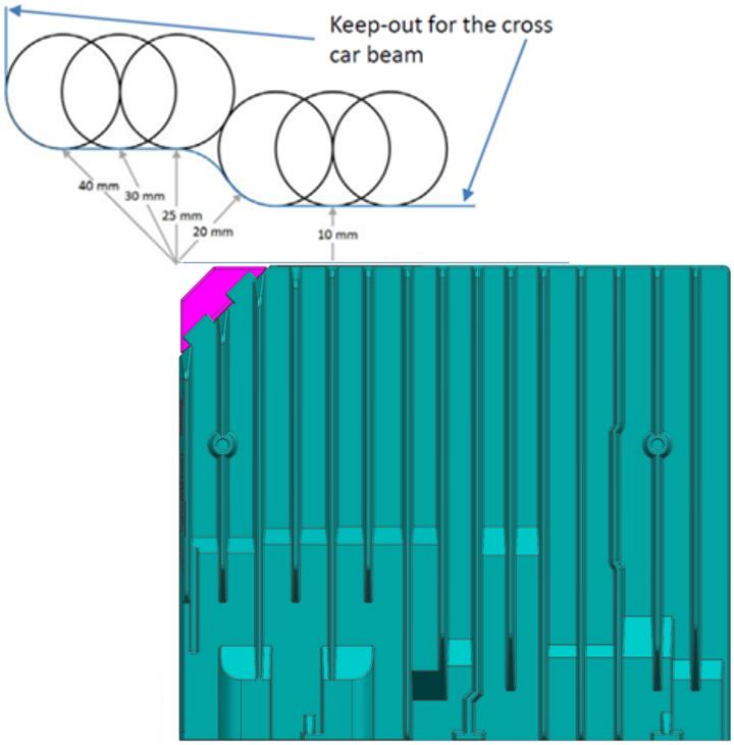
The OEM shall adhere to the below depicted keep-out zones when designing the packaging and when mounting the VCU in individual carlines during production.



VCU Antenna Keep-Out Zone



VCU Mandatory (Minimum) Thermal Keep-Out Zone



VCU Mandatory (Minimum) Keep-Out Zone for metal cross-vehicle beam

Additional Installation Requirements:

- Cable length to external Antenna: 1 – 1.5 m.
- Distance external Antenna to VCU (center of gravity): 55cm
- Minimal permissible distance[1] VCU internal / external Antenna and nearest interior Class-A surface[2]: 47.1 mm

[1] Measured from antenna dipol.
[2] Class-A interior surface is any high-quality component that a passenger inside a vehicle can see, touch, or engage with

5. CERTIFICATION NOTICES AND REGULATORY VERBIAGE

5.1. General Notices

Component Name: GM VCU 1.0
Type Designation: Cockpit Integration Platform (“CIP”)

Model Name: **VCUNM1**
Certificate Holder: Robert Bosch GmbH
Address: Robert-Bosch-Platz 1
70839 Gerlingen
Germany

This equipment shall be installed and operated according to the defined installation requirements including the minimum distance between the VCU internal / external antenna and the nearest interior Class-A surface.
External antenna to nearest interior Class-A surface min. distance of 47.11 mm
Internal antenna to nearest interior Class-A surface min. distance of 197 mm

Declaration of WiFi Transmission Power:

WLAN 2412 – 2462 MHz	<20 dBm
WLAN 5150 – 5250 MHz & 5750 – 5850 MHZ	<20 dBm

5.2. Additional Country Specific Requirements

5.2.1. USA

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.

To comply with FCC Exposure requirements the OEM is instructed by the Grantee to assure a minimum separation distance of 47mm between the housing where the integrated antenna is located and any human body as documented in the filing.

Changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

5.2.2. Canada

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s licence-exempt RSS(s). Operation is subject to the following two conditions:
(1) This device may not cause interference.

(2) This device must accept any interference, including interference that may cause undesired operation of the device.

L’émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d’Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L’exploitation est autorisée aux deux conditions suivantes :

1. L’appareil ne doit pas produire de brouillage;
2. L’appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d’en compromettre le fonctionnement.