

Document: **User Manual**

Product: **TCAM**
Telematics and Connectivity Antenna Module
Model: **TCAM1NA2**

Date: 15. Oct 2021

Number of pages: 15

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1 Scope of Document

The aim of this document is to provide a short overview on the TCAM module model TCAM1NA2 and to describe the TCAM.

2 General Product Information

2.1 Product type:

Telematics and Connectivity Antenna Module (TCAM)

2.2 Manufacturer, Applicant:

Continental Automotive GmbH
Siemensstrasse 12
93055 Regensburg
Germany

2.3 Brand/Trademark:

Continental

2.4 Factory/Manufacturing Location:

Continental Automotive Systems S.R.L.
Strada Salzburg 8
550018 Sibiu
Romania

2.5 Country of origin:

Romania

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3 System Overview

3.1 Short Description of the TCAM

The TCAM (Telematics and Connectivity Antenna Module) is a vehicle intelligent antenna module for telematic and connectivity purposes.

It is designed for roof mounting, with integrated antennas protected by a shark-fin cover. It consists of a fin antenna with integrated telematics transceivers for different wireless services, as well as several interfaces to the vehicle.

A built-in backup antenna provides cellular network access in case of the main integrated antennas under the shark fin cover get damaged, e.g. during a roll-over crash scenario. The TCAM is connected to the power supply via a four-pin battery connector, and to the vehicle interfaces via a 20 pin connector and a BroadR-Reach connector.

4 North America (NA) Variant

Model number: TCAM1NA2

TCAM Variant	Model number	SIM Variant / MNO
TCAM NA	TCAM1NA2	G&D - NA/ AT&T

4.1 Picture of the TCAM Module

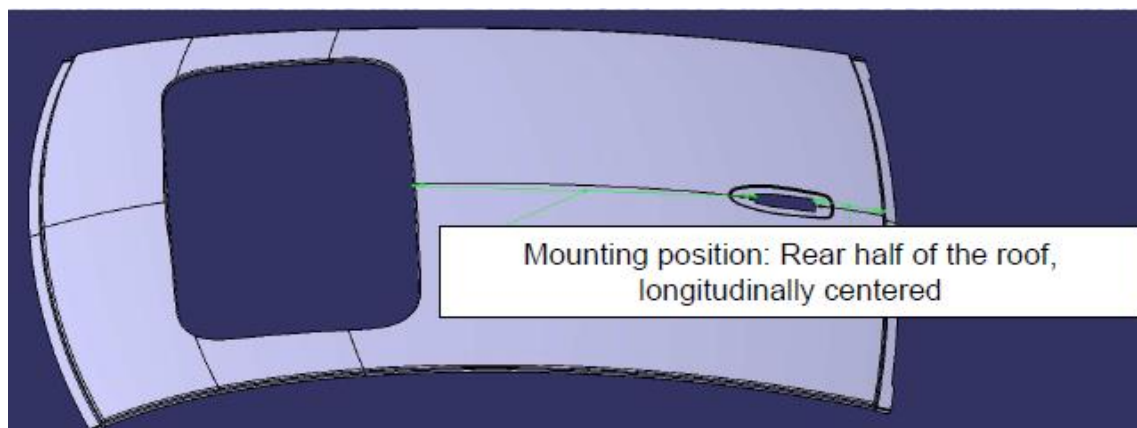


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5 Mechanical design

5.1 Car mounting position

- › The mounting location is partly under and over the roof of the vehicle.
- › The fixing cap will, after installation of the module on the vehicle, will be covered by a design cap (outer cover).



6 In vehicle System

The in-vehicle system consists of the following components:

- TCAM (= Multi Antenna Module)
- BUB (Backup Battery)
- OHC (Overhead Compartment) with built-in microphones
- Backup speaker
- IHU (Infotainment Head Unit)
- CEM (Central Electronic Module)
- OBC (On Board Charger)

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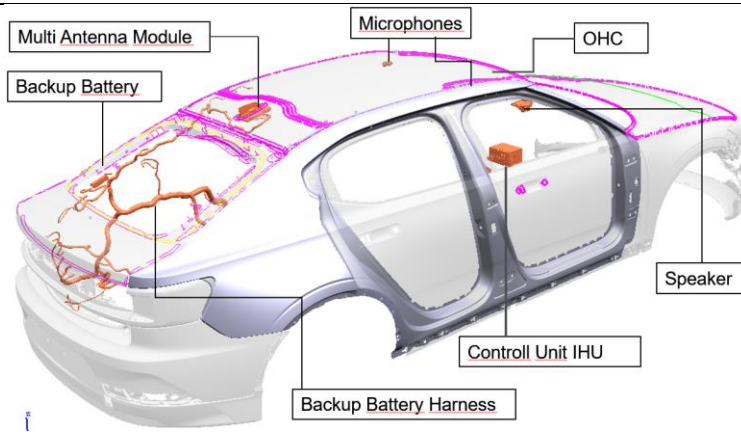


Figure: IVS components and position in the vehicle

6.1 OHC (Overhead Compartment) – by Volvo

The OHC acts as the operation panel of the system. It consists of the following:

- Volvo onCall button (Road Assistance call)
- Call status indicator LED
- Microphone
- Slot for private SIM card



Figure: Overhead Compartment

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6.2 Backup speaker– by Volvo

The backup speaker is a separate speaker additional to the car speakers, see picture below



Figure: Backup speaker (left: front side, right: back side)

6.3 BUB (Backup Battery)

The BUB serves as the emergency backup power supply for the TCAM, if the main battery is disconnected during a crash or its discharged.



Figure: Backup Battery

6.4 DIM (Driver Information Module)

The DIM is the Volvo driver information display on the dashboard. Fault messages will be displayed there.

6.5 VGM (Vehicle Gateway Module)

The VGM from Continental handles the interconnection between TCAM, IHU and DIM.

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7 Description of the TCAM module

7.1 Product features

The TCAM1NA2 main parts are:

- Antennas for cellular, WLAN, BLE, ISM receiver (RKE), SDARS with LNA
- GNSS with LNA for Navigation: Beidou, Galileo, GPS, Glonass
- Antenna selection via RF switches
- TCAM internal antennas (all are TCAM internal, no extern antenna connections):
- Tel1 antenna: 2G, 3G, 4G/LTE1 (vehicle outside)
- Tel2 antenna: LTE2 (Rx only) (vehicle outside)
- MIMO with LTE1- and LTE2-antenna. LTE2 is Rx only.
- Backup telephone antenna: 2G, 3G, 4G/LTE (vehicle inside)
- Wi-Fi internal antenna (vehicle inside)
- Wi-Fi external antenna (vehicle outside)
- BLE antenna (vehicle outside)
- Stacked patch antenna featuring GNSS (vehicle outside)
- ISM receiver antenna (vehicle inside)
- SDARS antenna (vehicle outside)
- CAT4 NAD with 2G/3G/4G/LTE and GNSS, FCC certified
- VoLTE
- ISM receiver module (434MHz) for: RKE (Remote Keyless Entry), PASE (Passive Start and Entry, TPMS (Tire Pressure Monitoring System)
- Wi-Fi chip
- BLE chip
- 1st internal embedded Sim-IC
- Service calls

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External interfaces:

- Main power supply
- External backup battery
- External SIM card slot (2nd private customer SIM, optional)
- External microphone in the OHC (Overhead Compartment)
- A2B to the OHC
- External backup speaker
- BroadR-Reach
- CEM connection (K-Line)
- Infotainment CAN
- Airbag input
- Debug interfaces (USB, UART)

7.2 Wireless services:

- 2G
- 3G
- 4G/LTE
- VoLTE
- Contains a FCC/IC certified CAT4 NAD with 2G/3G/4G/LTE and GNSS
- Voice/Assistance Calls:
 - Assistance Calls
 - Calls are only possible to some fixed phone numbers
- Global Positioning and Navigation
- Car Access, Tire pressure Monitoring:
 - Contains an FCC tested ISM RF receiver module
- WLAN a/b/g/n/ac
- Access point
- Station/client
- BLE
- Data Services

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7.3 Interfaces:

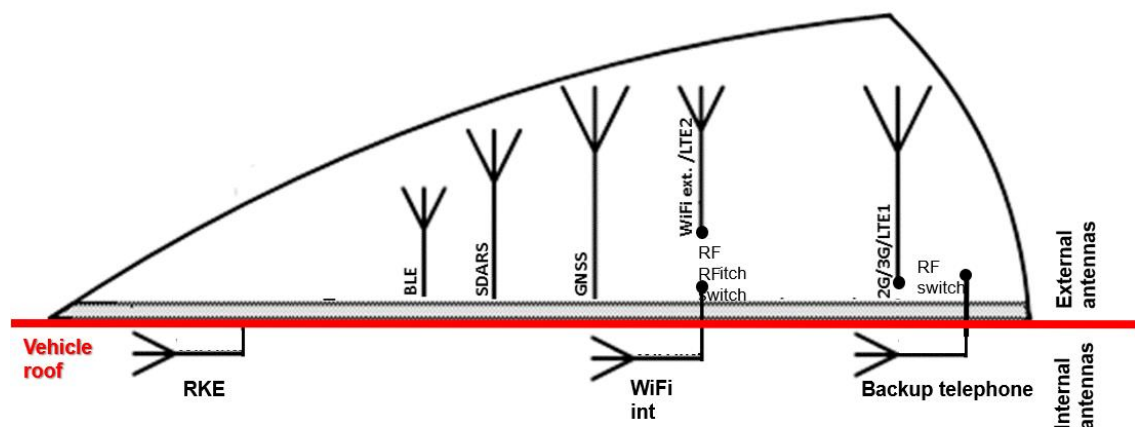
- CAN
- LIN
- BroadReach
- USB (for development only)

7.4 TCAM1NA2 internal Antennas:

- Tel1 antenna: 2G/3G/LTE1 (outside vehicle)
- Tel2 antenna: LTE2 (Rx LTE only), Wi-Fi extern antenna (outside vehicle)
- Backup telephone antenna: 2G/3G/LTE (inside vehicle)
- Wi-Fi internal antenna (inside vehicle)
- GNSS antenna (outside vehicle)
- SDARS antenna (outside vehicle)
- BLE antenna (outside vehicle)
- ISM/RKE antenna (inside vehicle)

There are no connectors for external antennas, except for the SDARS antenna signal OUT connection.

All necessary antennas are integrated into the TCAM.



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8 Technical data

8.1 Storage temperature Range

-40°C to 105°C

8.2 Operating temperature Range

-10°C to 55°C

8.3 Supply Voltage

Nominal.: 12 V dc

Supply Voltage Range: 8 V to 16 V dc

8.4 Supply current consumption

Typical standby current: 3.5 mA dc (at 12 V)

Typical active current consumption: 350 mA dc (at 12 V)
(Cellular, Wi-Fi, BLE, GNSS active)

8.5 Power Consumption

Typical power consumption: 4.2 W dc
(cellular, Wi-Fi, BLE, GNSS active)

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9 Wireless services

9.1 2G/GSM:

Wireless service:	2G/GSM
Frequency bands / range:	Band 2 (GSM1900): 1850-1910 / 1930-1990 MHz, Band 5 (GSM850): 824-849 / 869-894 MHz
Electrical output power:	GSM: Low Band (850): + 32.5 dBm (+/- 1dB) High Band (1900): + 29.5 dBm (+/- 1dB) EDGE: Low Band (850): + 26.5 dBm (+/- 1dB) High Band (1900): + 25.5 dBm (+/- 1dB)

9.2 3G/UMTS:

Wireless service:	3G/UMTS
Frequency bands / range:	Band II (B2: 1900 UMTS): 1850-1910 / 1930-1990 MHz, Band IV (B4: 1700 UMTS): 1710-1755 / 2110-2155 MHz, Band V (B5: 850 UMTS): 824-849 / 869-894 MHz
Electrical output power:	+23.5 dBm (+/- 1dB)

9.3 4G/LTE:

Wireless service:	4G/LTE
Frequency bands / range:	FDD Band 2 (1900 LTE): 1850-1910 / 1930-1990 MHz, FDD Band 4 (1700 LTE): 1710-1755 / 2110-2155 MHz, FDD Band 5 (850 LTE): 824-849 / 869-894 MHz, FDD Band 7 (2600 LTE): 2500-2570 / 2620-2690 MHz, FDD Band 12 (700 LTE): 698-716 / 728-746 MHz, FDD Band 13 (750 LTE): 777-787 / 746-756 MHz
Electrical output power:	+23.0 dBm (+/- 1dB)

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9.4 GNSS receiver:

Wireless service:	GNSS Receiver
Frequency bands / range:	GPS L1 band: 1575.42 MHz Galileo E1 band: 1575.42 MHz Glonass band L1: 1602 MHz BeiDou L1 band: 1561 MHz

9.5 ISM receiver:

Wireless service:	ISM Receiver
Frequency bands / range:	ISM Band 434 MHz
Number of channels:	3: CH1: 433.66 MHz, CH3: 433.92 MHz, CH2: 434.18 MHz

9.6 Wi-Fi:

Wireless service:	Wi-Fi		
Frequency bands / range:	Freq. Range	Bands	DFS
	2402 - 2472 MHz		without DFS
	5150 - 5250 MHz	U-NII-1	without DFS
	5725 - 5850 MHz	U-NII-3	without DFS
Electrical output power:	2402 - 2472 MHz: ≤ 24 dBm 5150 - 5250 MHz: ≤ 6 dBm 5725 - 5850 MHz: ≤ 24 dBm		

9.7 Bluetooth Low Energy:

Wireless service:	BLE
Frequency bands / range:	2400-2483.5MHz
Electrical output power	≤ 4 dBm

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10 Label Information

10.1 USA/Canada

Continental
Model: TCAM1NA2
FCC ID: KR5TCAM1NA2
IC: 7812D-TCAM1NA2
Contains FCC ID: LHJ-BL28NARD1
Contains IC: 2807E-BL28NARD1

11 Owner Manual Statements

11.1 Owner manual USA/Canada

Continental
Model: TCAM1NA2
FCC ID:KR5TCAM1NA2
IC:7812D-TCAM1NA2
Contains FCC ID: LHJ-BL28NARD1
Contains IC: 2807E-BL28NARD1

This device complies with Part 15 of the FCC Rules and Industry Canada licence-exempt RSS standard(s). 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.

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.

This device complies with FCC/ISED radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines and RSS-102 of the ISED radio frequency (RF) Exposure rules. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. The antenna should be installed and operated with minimum distance of 2.4 cm between the radiator and your body.

Le présent appareil est conforme à l'exposition aux radiations FCC / ISED définies pour un environnement non contrôlé et répond aux directives d'exposition de la fréquence de la FCC radiofréquence (RF) et RSS-102 de la fréquence radio (RF) ISED règles d'exposition. L'émetteur ne doit pas être colocalisé ni fonctionner conjointement avec à autre antenne ou autre émetteur. L'antenne doit être installée de façon à garder une distance minimale de 2.4 centimètres entre la source de rayonnements et votre corps.

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FCC Class B digital device notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Continental Automotive GmbH has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

Continental Automotive GmbH n'approuve aucune modification apportée à l'appareil par l'utilisateur, quelle qu'en soit la nature. Tout changement ou modification peuvent annuler le droit d'utilisation de l'appareil par l'utilisateur.

CAN ICES-3 (B) / NMB-3 (B)

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de classe B est conforme à la norme canadienne ICES-003.

END OF DOCUMENT

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