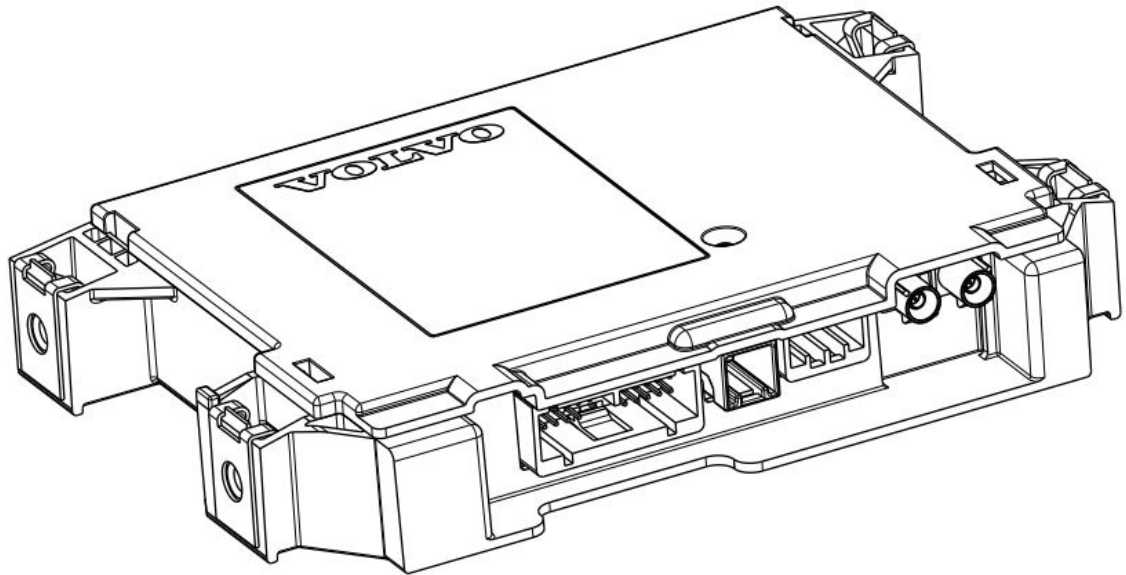

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# TEM4G User Manual (NAS)



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## 1 General

This document describes the North American (NAS) version of ACTIA's product ACUII-06.

### 1.1 Revision history


Revision	Author	Date	Description
W1.0	Nicklas Andersson	2017-03-27	Draft

### 1.2 Abbreviations

Abbreviation	Meaning
DoIP	Diagnostics over IP
ECU	Electrical Control Unit
GNSS	Global Navigation Satellite System
OBD	On-Board Diagnostics
SRS	Supplemental Restraint System
WLAN	Wireless Local Area Network

### 1.3 References

Reference	Title	Doc. number	Revision


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## 2 Introduction

The TEM4G is a connectivity ECU that is factory fitted in cars. It provides following functionality:

- WLAN access point - for people inside the vehicle.
- Data gateway - for the WLAN access point and other ECUs in the vehicle.
- Positioning information - for other ECUs in the vehicle, such as the navigation system.
- Telematics applications - like emergency calls, breakdown calls and stolen vehicle tracking.

The TEM4G has an integrated 2G/3G/4G modem that provides data connection and voice call functionality needed for the different applications.

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### 3 Technical Description

#### 3.1 Connectors



Connector No	Function
1	Main connector
2	Interface to head unit
3	SIM interface
4	GNSS antenna
5	2G/3G/4G antenna

##### 3.1.1 Main connector

The main connector is used to connect power, CAN communication, microphone, external buttons, and connection to the SRS control unit.

##### 3.1.2 Interface to head unit

This connector is used for communication with the head unit. Proprietary USB interface.

##### 3.1.3 SIM interface

This interface is to be connected to an external ACTIA SIM holder.

##### 3.1.4 GNSS antenna

The blue Fakra is the input for the GNSS antenna.

##### 3.1.5 2G/3G/4G antenna

The violet/bordeaux Fakra connector is used to connect an external 2G/3G/4G antenna.

#### 3.2 Power supply


Operating voltage range: 8-16 VDC. Nominal 13.8V.  
Maximum current consumption 1.5A @ 8V.

If the main power supply (car battery) is broken, e.g. after a crash, some telematics application is still functional using an internal backup battery.

#### 3.3 SIM interface

The embedded modem can use two different SIM sources:

- An ACTIA SIM card holder, where the user can put in his own SIM card.
- An embedded SIM chip.

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## 4 Antennas

### 4.1 Internal antennas

#### 4.1.1 WLAN antenna

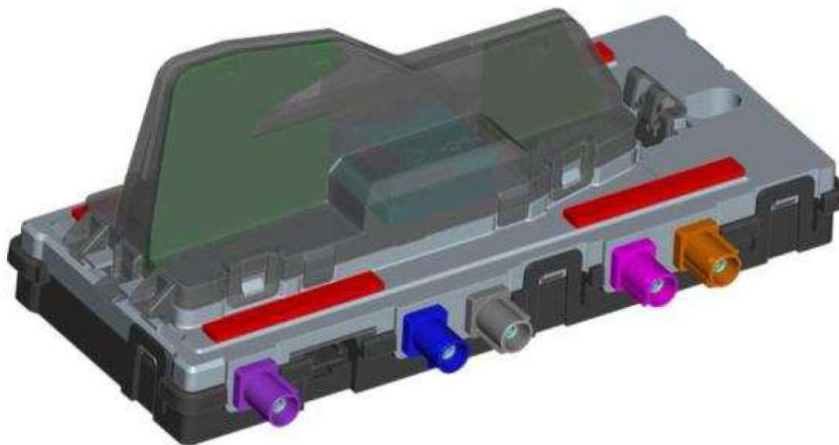
WLAN communication is made with an integrated antenna inside the TEM4G housing.

#### 4.1.2 Cellular backup antenna


If the external 2G/3G/4G antenna is broken, e.g. after a crash, the embedded modem can still be operating using an integrated backup antenna inside the TEM4G housing.

### 4.2 External antenna

TEM4G is certified to be used with an external roof mounted antenna. Volvo part number 31409875.



Connector No	Color	Connection on ACUII-06
1	Violet/Bordeaux	2G/3G/4G antenna
2	Black	(RKE, not connected to ACUII-06)
3	Blue	GNSS antenna
4	Grey	(SDARS, not connected to ACUII-06)
5	Pink	3G/4G diversity antenna
6	Orange	WLAN antenna

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## 5 RF parameters

### 5.1.1 Supported bands

Technology	Bands
GSM/GPRS/EDGE	850/900/1800/1900
WCDMA/HSPA	II (1900), IV (AWS), V (850)
LTE FDD	Bd2 (1900), Bd4 (AWS), Bd5 (850), Bd17 (700)

### 5.2 GNSS

GNSS antenna input is the blue Fakra connector.

#### 5.2.1 Supported bands

Technology	Bands
GPS	L1
GLONASS	L1 FDMA

### 5.3 WLAN

The WLAN antenna is inside the TEM4G housing.

The product supports 802.11b/g/n at 2.4GHz. Supported channels are listed below. When the product is installed in a vehicle the useable channels are limited to what is allowed in the current country.

#### 5.3.1 Supported bands

##### 5.3.1.1 802.11b


Parameter	
Channels	1-11
Data rates	1, 2, 5.5, 11 Mbps

##### 5.3.1.2 802.11g

Parameter	
Channels	1-11
Data rates	6, 9, 12, 18, 24, 36, 48, 54 Mbps

##### 5.3.1.3 802.11n

Parameter	
Channels	1-11 (2.4GHz)
Data rates	MCS0-MCS7

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## 6 Mechanical design

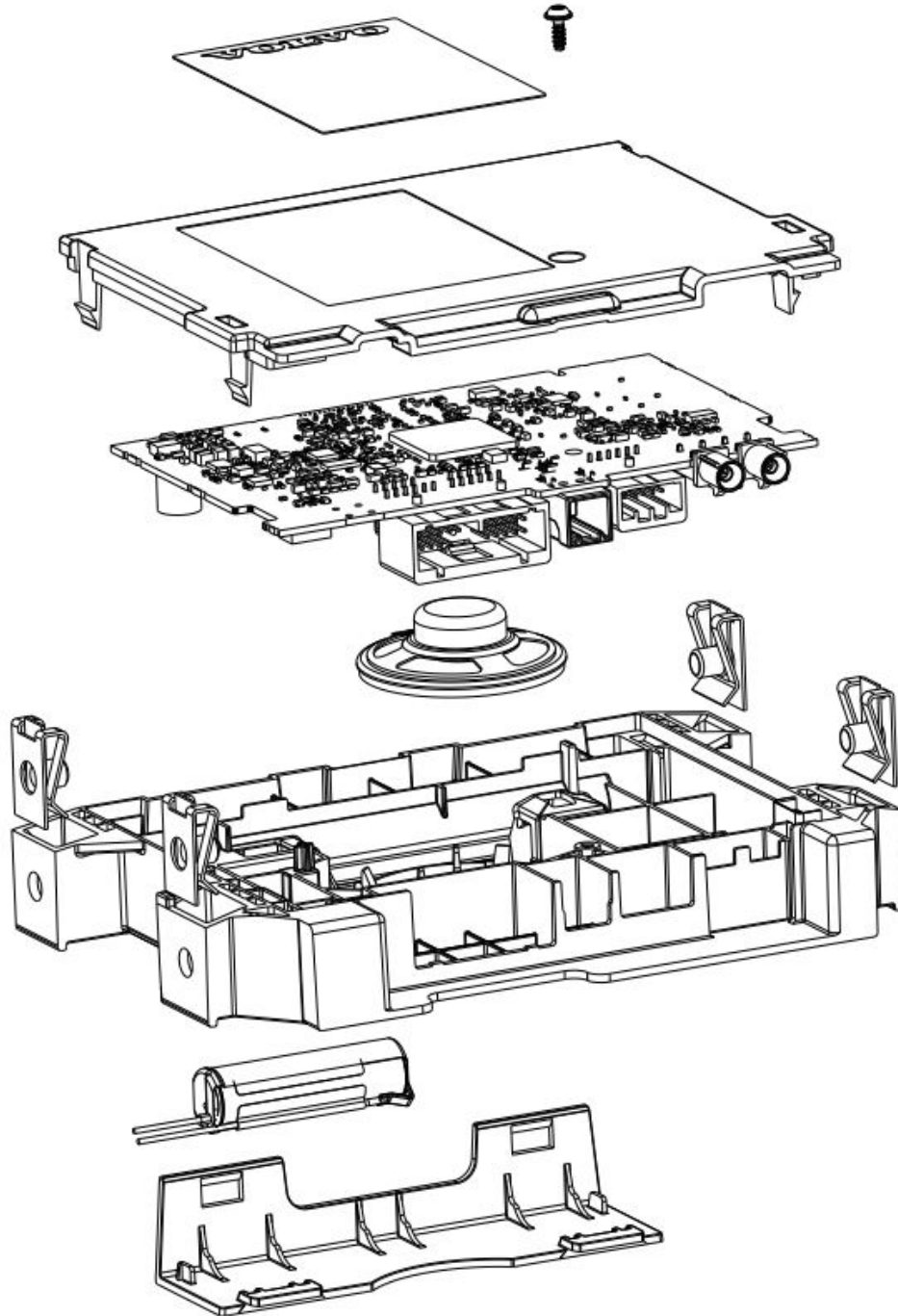



Figure 1 – Mechanical design



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## 7 Functional Description

### 7.1 WLAN access point

TEM4G can act as a WLAN access point for passengers in the car.

User interface needs to be implemented in an external unit, e.g. in a head unit with display. The WLAN access point functionality is controlled via IHU Ethernet interface.

### 7.2 Data gateway

TEM4G acts as a data gateway for the WLAN access point and other ECUs in the vehicle. It can e.g. provide internet connectivity for the head unit.

The data gateway is controlled via the IHU Ethernet interface.

### 7.3 Positioning information

The product automatically outputs GNSS raw position data on the CAN bus.

The GNSS data is used by other ECUs in the vehicle, for instance the Navigation system

### 7.4 Telematics applications

The product hosts a number of telematics applications. Some examples:

#### 7.4.1 Automatic emergency call

If the car is in a crash and the SRS control unit indicates seat belt pretensioners, airbags or inflatable curtain has deployed, an automatic alarm is sent to a predefined Customer Service Center, via data connection or SMS, with information about the vehicle's location and that one or more of the previously mentioned systems has deployed.

A voice call is also set up to the call center.

#### 7.4.2 Manual emergency call

It is also possible to start an emergency call manually by pressing a SOS button for at least 2 seconds.

A service that has been initiated can be cancelled by pressing the EXIT button within 10 seconds.


#### 7.4.3 Roadside assistance call

Another button for roadside assistance will send data message and set up a voice call to a predefined road side assistance number.

A service that has been initiated can be cancelled by pressing the EXIT button within 10 seconds.

#### 7.4.4 Theft Warning

The call center and the car owner is contacted with a data message if the car alarm indicates the car is being stolen.

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#### 7.4.5 Stolen Vehicle Tracking

The call center can initiate tracking of the car if it has been reported stolen. The vehicle location will then be reported to the call center.

#### 7.4.6 Remote Vehicle Immobilization

If the car has been reported stolen the call center can instruct the car not to start.


#### 7.4.7 Remote door unlock

The call center or the car owner can unlock the car remotely.

#### 7.4.8 Other applications

With data provided from TEM4G it is also possible to build applications in e.g. mobile phones to be used by the car owner. Examples:

- Vehicle location (present car location on a map)
- Instrument panel information (show e.g. mileage, fuel level)
- Status check (if service is needed)

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## 8 Installation and maintenance


### 8.1 Installation

The product is factory fitted in vehicles. It is not possible to buy this product separately.

### 8.2 Maintenance

The status of the product can be read via diagnostic connections using special workshop tools. In addition, other ECUs monitor the communication from the product and in case of missing/invalid communication, the Central Electronic Module in the vehicle is alerted, and will display a warning to the driver.

Maintenance and replacement of the product can only be performed by certified workshops.

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## 9 Regulatory Certifications

### 9.1 USA (FCC)

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.

#### 9.1.1 FCC Warnings and Notices

**WARNING:** The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by ACTIA Nordic AB could void the user's authority to operate the equipment.

**RF EXPOSURE WARNING:** This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

**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.

#### 9.1.2 OEM Requirements

Following text should be printed in the user manual for vehicles in US:

**Type Approval USA**  
FCC ID: 2AGKKTEM4G


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.

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

### 9.2 Canada (IC)

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.

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### 9.2.1 OEM Requirements

Following text should be printed in the user manual for vehicles in Canada:

#### Type Approval Canada

IC: 20839-TEM4G

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

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
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.