

# TGU-R ACCESS USER MANUAL

	Par	Date	Visa	Reference	Revision
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# EVOLUTION TRACKING SHEET

Index	Pages ou éléments concernés	Date	Evolution nature and motive
-	All VII.8.5 0 VI.1	2019-12-10 2020-03-10 2020-03-10 2020-04-10	Creation of document TGU-R ACCESS USER MANUAL Add Led chronograms Add initial customer SW download operation procedure Add recommended max storage duration for battery pack option
A	IV.4 IV.4  IV.4  VIII.1 Front page VI.3 VI.4 XI XI	2020-09-11 2020-09-11  2020-09-11  2020-09-11 2020-09-11 2020-09-14 2020-09-14 2020-09-15 2020-09-18	4G US variant: ALS3-US *Only 900 and 1800 are available in Europe WiFi 5GHz Frequency range: 5180-5825MHz (limited to 5470-5725MHz in Europe)  Note added on operating temperature range for NAD tests according to 3GPP standard WiFi 2,4GHz => WLAN 2,4GHz Luce site => Chartres site SIM card selection criterias added Network operator selection criterias added Additional export control information and recommendation added Update on list of cryptographic algorithms
B	V.1 II.2 IV.2 IV.3 IV.4 V.1 VI.4 XI VIII.1 0 VII.8.1 VII.8.2 VII.8.3 VII.8.4 VII.4  IV.4  VII.8.5 VII.8.6	2021-01-04 2021-03-17 2021-03-17 2021-03-17 2021-03-17 2021-03-22 2021-03-22 2021-03-22 2021-03-22 2021-03-22 2021-03-23 2021-03-23 2021-03-23 2021-03-23 2021-05-03  2021-05-03  2021-05-03 2021-06-01	Correction on USB – Ethernet position Add reference document TGU-R Security Manual Audience chapter updated to add additional REF documents Description updated with more details on vehicle interfaces Add 4G W variant specific feature list and NAD PLS83-W CN1 connector pinout update to add specific configuration for 4G W variants Specific handling for AT&T SIM cards with annual IMEI list reporting by customer cryptographic table updated on NAD modules + added for optional HSM Type approval chapter updated to add new 4G W variant + update on 4G EU Inviolability label removal instructions added Update to add more recommendation for initial SW download process Chapter added for OTA updates recommendations Chapter added for NAD module management Chapter added for power supply and temperature alerts management Fuse caliber chapter updated to add specific application use case for IEC 62368-1 safety standard applicable for CE marking and other countries based on it. Voltage range updated for 48V variant (16V min instead of 6V) to avoid to break 1.5A fuse required by new IEC 62368-1 safety standard applicable for CE marking Chapter added on signal termination management Chapter added on WIFI channel management

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## I PRÉSENTATION

### I.1 DOCUMENT SUBJECT

This manual presents the hardware features of TGU-R, assisting you to install it in safe way and ensure good operation in the vehicle.

### I.2 APPLICATION DOMAIN

This manual is intended to owners or drivers operating TGU-R product.

### I.3 DOCUMENT DESCRIPTION

This document includes:

- Product features overview
- Connectors interfaces
- Battery pack interface
- SIM card connector interface
- Product installation
- Product certification

### I.4 DOCUMENT LOCATION

Project folder: \\VM-FILE-SERVER1\projets\8000\8186\8186-03 (TGU-R Access)\02 - System  
Copy available for registered people on ACTIA City Delivery Street: TGU-R ACCESS

## II DOCUMENTS

### II.1 APPLICABLE DOCUMENTS

NA

### II.2 REFERENCE DOCUMENTS

<u>Link</u>	<u>Document reference</u>	<u>Document title</u>
REF1	P215806	TGU-R ACCESS Product Specification
REF2	P110149P01	TGU-R ACCESS Interface Drawing
REF3	P216166	TGU-R ACCESS Host CPU API Specification
REF4	P217767	TGU-R ACCESS Customer Setup Manager software specification
REF5	AC521209	AC16 BATTERY SPARE PART MAINTENANCE INSTRUCTION MANUAL
REF6	P218077	TGU-R ACCESS external antenna specification
REF7	P218723	TGU-R Security Manual

### III TERMINOLOGY

#### III.1 ABBREVIATIONS

ATEX	ATmospheres EXplosives according to European regulation
BAT	Battery
BW	BandWidth
CAN	Controller Area Network
ESD	Electro Static Discharge
GND	Ground
GSM	Global System for Mobile Communications
GNSS	Global Navigation Satellite System
IEA	Industrial Environment Agreement
PAA	Part Application Approval
SIM	Subscriber Identity Module
WLAN	Wireless Local Area Network

Table 1 : abbreviations

#### III.2 GLOSSARY

Heart beat	It is a periodic signal from processor informing application that the system is still alive
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Table 2 : glossary

### IV INTRODUCTION

#### IV.1 SCOPE

This document provides TGU-R ACCESS short description and recommendation to insure correct vehicle installation and interface.

The warranty on the product will not be applicable if the instructions described in this user manual are not followed.

TGU-R ACCESS installation in customer factory and vehicle must be checked by ACTIA during the IEA and PAA to confirm that it is aligned with this user manual recommendations and product specification.

PAA and IEA must be carried out for each new vehicle architecture.

During the vehicle life, any change in the vehicle architecture that could impact TGU-R ACCESS installation and operation must be reported to ACTIA.

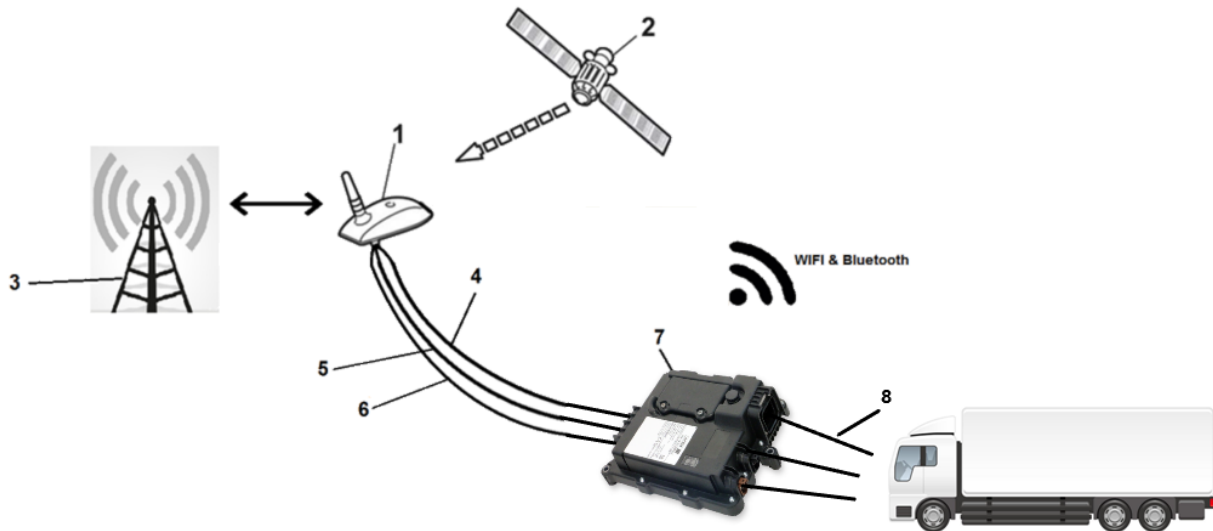
#### IV.2 AUDIENCE

This manual is intended to owners or drivers without professional or specialized knowledge on TGU-R ACCESS product.

This manual doesn't replace TGU-R ACCESS product specifications ([REF1](#) + [REF2](#) + [REF3](#) + [REF4](#) + [REF5](#) + [REF6](#) + [REF7](#)) which remains the reference.

IV.3 PRODUCT DESCRIPTION

TGU-R ACCESS is a rugged telematics unit intended to be used for fleet management, data logging, diagnostic, and lots of other applications requiring data exchange between vehicle interfaces (CAN network, USB, Ethernet, LIN, K-line, I-button, RS232) and wireless networks GSM / WIFI / BT. It is also providing GNSS positioning



1. GSM/GNSS/WIFI external antenna
2. GNSS satellite
3. Network operator antenna
4. GNSS antenna cable
5. GSM antenna cable
6. WIFI antenna cable
7. TGU-R ACCESS product (including internal antennas: WIFI, Bluetooth, GSM receive diversity)
8. Vehicle interfaces:
  - a. Main interface including power supply, inputs, outputs, CAN bus interfaces, LIN, RS232, I-button
  - b. Ethernet interface
  - c. USB interface



IV.4 PRODUCT FEATURE LIST

Product features (see <a href="#">REF1</a> for more details)	
Wireless interfaces	<p>NAD module :</p> <p><b>3G variant:</b> PHS8-P from Thales(ex Gemalto-Cinterion)</p> <p>Frequency bands:</p> <ul style="list-style-type: none"> <li>• GSM/GPRS/EDGE: Quad band, 850/900/1800/1900MHz</li> <li>• UMTS/HSPA+: 800/850/900/1900/2100MHz FDD-bands (1, 2, 5, 6, 8)</li> </ul> <p>Output power (according to Release 99):</p> <ul style="list-style-type: none"> <li>• Class 4 (+33dBm ±2dB) for EGSM850</li> <li>• Class 4 (+33dBm ±2dB) for EGSM900</li> <li>• Class 1 (+30dBm ±2dB) for GSM1800</li> <li>• Class 1 (+30dBm ±2dB) for GSM1900</li> <li>• Class E2 (+27dBm ± 3dB) for GSM 850 8-PSK</li> <li>• Class E2 (+27dBm ± 3dB) for GSM 900 8-PSK</li> <li>• Class E2 (+26dBm +3 /-4dB) for GSM 1800 8-PSK</li> <li>• Class E2 (+26dBm +3 /-4dB) for GSM 1900 8-PSK</li> <li>• Class 3 (+24dBm +1/-3dB) for UMTS 2100, WCDMA FDD Bdl</li> <li>• Class 3 (+24dBm +1/-3dB) for UMTS 1900,WCDMA FDD BdII</li> <li>• Class 3 (+24dBm +1/-3dB) for UMTS 900, WCDMA FDD BdVIII</li> <li>• Class 3 (+24dBm +1/-3dB) for UMTS 850, WCDMA FDD BdV</li> <li>• Class 3 (+24dBm +1/-3dB) for UMTS 800, WCDMA FDD BdVI</li> </ul> <p>GNSS:</p> <p>Frequency range:</p> <ul style="list-style-type: none"> <li>• GPS: 1575.42MHz typ.</li> <li>• GLONASS: 1597.551MHz to 1605.886MHz</li> </ul> <p>Modulation: BPSK</p> <p>Module certificats: CE, PTCRB, FCC, IC</p> <p><b>4G EU variant:</b> ALS3-E from Thales(ex Gemalto-Cinterion)</p> <p>Frequency bands:</p> <ul style="list-style-type: none"> <li>• GSM/GPRS/EDGE: Dual band, 900/1800MHz</li> <li>• UMTS/HSPA+: Triple band, 900 (BdVIII) / 1800 (BdIII) / 2100MHz (Bdl)</li> <li>• LTE: Five band, 800 (Bd20) / 900 (Bd8) / 1800 (Bd3) / 2100 (Bd1) /2600MHz (Bd7)</li> </ul> <p>Output power (according to Release 99):</p> <ul style="list-style-type: none"> <li>• Class 4 (+33dBm ±2dB) for EGSM900</li> <li>• Class 1 (+30dBm ±2dB) for GSM1800</li> <li>• Class E2 (+27dBm ± 3dB) for GSM 900 8-PSK</li> <li>• Class E2 (+26dBm +3 /-4dB) for GSM 1800 8-PSK</li> <li>• Class 3 (+24dBm +1/-3dB) for UMTS 2100, WCDMA FDD Bdl</li> <li>• Class 3 (+24dBm +1/-3dB) for UMTS 1800, WCDMA FDD BdIII</li> <li>• Class 3 (+24dBm +1/-3dB) for UMTS 900, WCDMA FDD BdVIII</li> </ul> <p>Output power (according to release 8):</p> <ul style="list-style-type: none"> <li>• Class 3 (+23dBm +-2dB) for LTE 2600, LTE FDD Bd7</li> <li>• Class 3 (+23dBm +-2dB) for LTE 2100, LTE FDD Bd1</li> <li>• Class 3 (+23dBm +-2dB) for LTE 1800, LTE FDD Bd3</li> <li>• Class 3 (+23dBm +-2dB) for LTE 900, LTE FDD Bd8</li> <li>• Class 3 (+23dBm +-2dB) for LTE 800, LTE FDD Bd20</li> </ul> <p>GNSS:</p> <p>Frequency range:</p> <ul style="list-style-type: none"> <li>• GPS: 1575.42MHz typ.</li> <li>• GLONASS: 1597.551MHz to 1605.886MHz</li> </ul> <p>Modulation: BPSK</p>

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Module certificates: RED

**4G US variant:** ALS3-US from Thales(ex Gemalto-Cinterion)

Note: \*Only available in Europe

Frequency bands:

- GSM/GPRS/EDGE: Quad band, 850/900\*/1800\*/1900MHz
- UMTS/HSPA+: Triple band, 850 (BdV) / AWS (BdIV) / 1900MHz (BdII)
- LTE: Quad band, 700 (Bd17) / 850 (Bd5) / AWS (Bd4) / 1900MHz (Bd2)

Output power (according to Release 99):

- Class 4 (+33dBm ±2dB) for EGSM850
- Class 4 (+33dBm ±2dB) for EGSM900\*
- Class 1 (+30dBm ±2dB) for GSM1800\*
- Class 1 (+30dBm ±2dB) for GSM1900
- Class E2 (+27dBm ± 3dB) for GSM 850 8-PSK
- Class E2 (+27dBm ± 3dB) for GSM 900 8-PSK
- Class E2 (+26dBm +3 /-4dB) for GSM 1800 8-PSK
- Class E2 (+26dBm +3 /-4dB) for GSM 1900 8-PSK
- Class 3 (+24dBm +1/-3dB) for UMTS 1900, WCDMA FDD BdII
- Class 3 (+24dBm +1/-3dB) for UMTS AWS, WCDMA FDD BdIV
- Class 3 (+24dBm +1/-3dB) for UMTS 850, WCDMA FDD BdV
- Output power (according to Release 8):
- Class 3 (+23dBm +-2dB) for LTE 1900, LTE FDD Bd2
- Class 3 (+23dBm +-2dB) for LTE AWS, LTE FDD Bd4
- Class 3 (+23dBm +-2dB) for LTE 850, LTE FDD Bd5
- Class 3 (+23dBm +-2dB) for LTE 700, LTE FDD Bd17

GNSS:

Frequency range:

- GPS: 1575.42MHz typ.
- GLONASS: 1597.551MHz to 1605.886MHz

Modulation: BPSK

Module certificates: FCC, PTCRB, IC

**4G W variant:** PLS83-W from Thales (ex Gemalto-Cinterion)

Note: \*Only available in Europe

Frequency bands:

- GSM/GPRS/EDGE: Quad band, 850/900\*/1800\*/1900 MHz
- UMTS/HSPA+: 2100\*/1900/1800/2100/850/850/900\*/850 MHz, FDD-Bands (1\*,2,3,4,5,6,8\*,19)
- LTE: 2100\*/1900/1800\*/2100/850/2600\*/900\*/700/700/850/850 /800\*/850/700\*/2100 MHz, FDD-Band (1\*, 2, 3\*, 4, 5, 7\*, 8\*, 12, 13, 18, 19, 20\*, 26, 28\*, 66) + 2600\*/2300\*/2500 MHz TDD bands (38\*, 40\*, 41)

Output power (according to Release 99):

- Class 4 (+33dBm ±2dB) for GSM850
- Class 4 (+33dBm ±2dB) for GSM900
- Class 1 (+30dBm ±2dB) for GSM1800
- Class 1 (+30dBm ±2dB) for GSM1900
- Class E2 (+27dBm ± 3dB) for GSM 850 8-PSK
- Class E2 (+27dBm ± 3dB) for GSM 900 8-PSK
- Class E2 (+26dBm +3 /-4dB) for GSM 1800 8-PSK
- Class E2 (+26dBm +3 /-4dB) for GSM 1900 8-PSK
- Class 3 (+24dBm +1/-3dB) for UMTS 850, WCDMA FDD BdXIX
- Class 3 (+24dBm +1/-3dB) for UMTS 850, WCDMA FDD BdVI

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- Class 3 (+24dBm +1/-3dB) for UMTS 850, WCDMA FDD BdV
- Class 3 (+24dBm +1/-3dB) for UMTS 900, WCDMA FDD BdVIII
- Class 3 (+24dBm +1/-3dB) for UMTS 1700, WCDMA FDD BdIII
- Class 3 (+24dBm +1/-3dB) for UMTS 1900, WCDMA FDD BdII
- Class 3 (+24dBm +1/-3dB) for UMTS 2100, WCDMA FDD BdIV
- Class 3 (+24dBm +1/-3dB) for UMTS 2100, WCDMA FDD BdI

Output power (according to release 8):

- Class 3 (+23dBm ±2dB) for LTE 700, LTE FDD Bd12
- Class 3 (+23dBm ±2dB) for LTE 700, LTE FDD Bd13
- Class 3 (+23dBm+2/-2.5dB) for LTE 700, LTE FDD Bd28
- Class 3 (+23dBm ±2dB) for LTE 850, LTE FDD Bd26
- Class 3 (+23dBm ±2dB) for LTE 850, LTE FDD Bd18
- Class 3 (+23dBm ±2dB) for LTE 850, LTE FDD Bd19
- Class 3 (+23dBm ±2dB) for LTE 800, LTE FDD Bd20
- Class 3 (+23dBm ±2dB) for LTE 850, LTE FDD Bd5
- Class 3 (+23dBm ±2dB) for LTE 900, LTE FDD Bd8
- Class 3 (+23dBm ±2dB) for LTE 1800, LTE FDD Bd3
- Class 3 (+23dBm ±2dB) for LTE 1900, LTE FDD Bd2
- Class 3 (+23dBm ±2dB) for LTE 2100, LTE FDD Bd1
- Class 3 (+23dBm ±2dB) for LTE 2100, LTE FDD Bd4
- Class 3 (+23dBm ±2dB) for LTE 2100, LTE FDD Bd66
- Class 3 (+23dBm ±2dB) for LTE 2600, LTE FDD Bd7
- Class 3 (+23dBm ±2dB) for LTE 2300, LTE TDD Bd40
- Class 3 (+23dBm ±2dB) for LTE 2500, LTE TDD Bd41
- Class 3 (+23dBm ±2dB) for LTE 2600, LTE TDD Bd38

GNSS:

Frequency range:

- GPS: 1563MHz to 1587MHz, 1575.42MHz center frequency
- GALILEO: 1559MHz to 1591MHz, 1575.42MHz center frequency
- GLONASS: 1597.5MHz to 1605.9MHz
- BEIDOU: 1559.1MHz to 1563.1MHz, 1561.098MHz center frequency

Modulation: BPSK, BOC

Module certificates: RED, JATE-TELEC, FCC, IC, PTCRB, IFETEL, ANATEL

**Combo WIFI – BT:** module reference LBEQ6ZZ1CL from MURATA

**WIFI :**

802.11 a/b/g/n/ac 2.4GHz & 5GHz HT20/HT40 (DFS feature not supported)

802.11b:

- Modes: DSSS / CCK
- Frequency range: 2412 – 2472MHz
- Data rates: 1, 2, 5.5, 11Mbps
- Power levels: 18dBm +-4dBm

• 802.11g:

- Modes: OFDM
- Frequency range: 2412 – 2472MHz
- Data rates: 6, 9, 12, 18, 24, 36, 48, 54Mbps
- Power levels: 14dBm +-4dBm

• 802.11n:

- Modes: OFDM (BW: 20MHz for 2,4GHz / 20 & 40MHz for 5GHz)
- Frequency range: 2412-2472MHz & 5180-5825MHz (limited to 5470-5725MHz in Europe)
- Data rates: MCS0-7

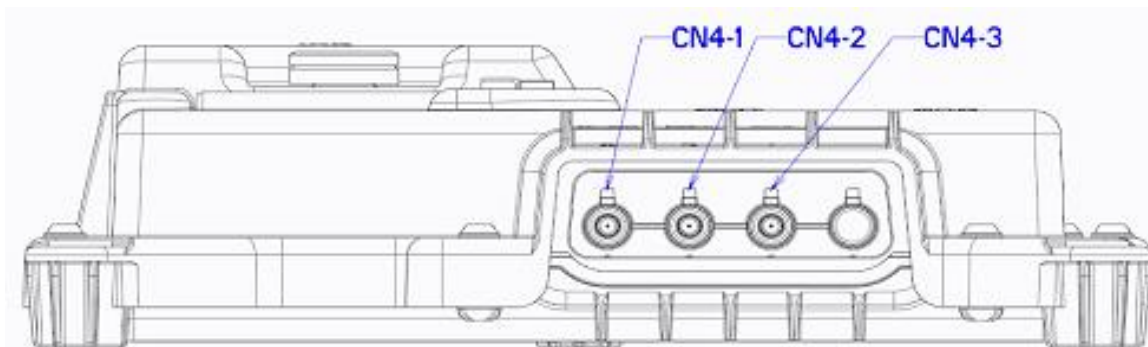
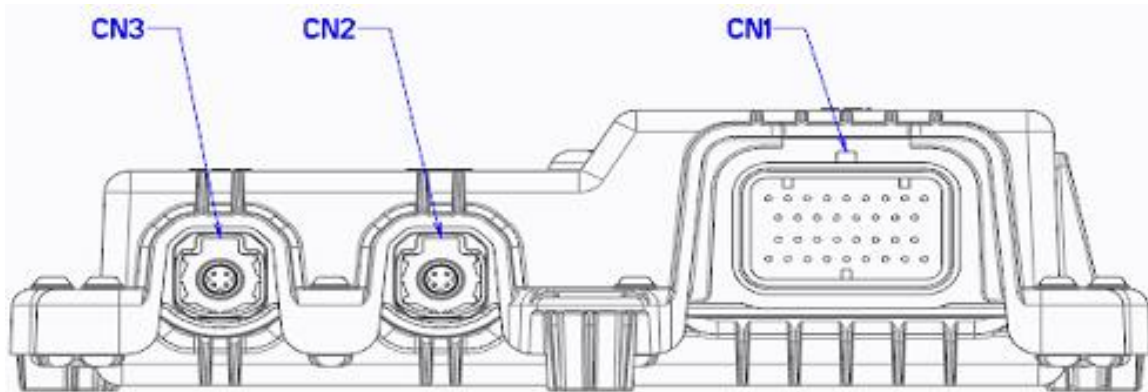
B

	<ul style="list-style-type: none"> <li>• Power levels:             <ul style="list-style-type: none"> <li>○ 14dBm +-4dBm for 2.4GHz</li> <li>○ 14dBm +-4dBm for 5GHz (BW: 20MHz)</li> <li>○ 13dBm +-4dBm for 5GHz (BW: 40MHz)</li> </ul> </li> </ul> <p>802.11a:</p> <ul style="list-style-type: none"> <li>• Modes: OFDM</li> <li>• Frequency range: 5180-5825MHz (limited to 5470-5725MHz in Europe)</li> <li>• Data rates: 6, 9, 12, 18, 24, 36, 48, 54Mbps</li> <li>• Power levels: 14dBm +-4dBm</li> </ul> <p>802.11ac:</p> <ul style="list-style-type: none"> <li>• Modes: OFDM (BW: 80MHz)</li> <li>• Frequency range: 5180-5825MHz 5825MHz (limited to 5470-5725MHz in Europe)</li> <li>• Data rates: MCS0-9</li> <li>• Power levels: 8dBm +-4dBm</li> </ul> <ul style="list-style-type: none"> <li>• Modulation type: CCK, DQPSK, DBPSK for DSSS, 64QAM, 16QAM, QPSK, BPSK for OFDM</li> <li>• Module certificates: RED, FCC, IC</li> </ul> <p><b><u>Important note:</u></b> 5GHz wifi outdoor usage is only possible depending of countries local regulations</p> <p><b>Bluetooth:</b></p> <ul style="list-style-type: none"> <li>• Bluetooth specification : Version 4.1</li> <li>• Channel spacing: 1MHz</li> <li>• Number of channels: 79</li> <li>• Power class : 1</li> <li>• Output power: 10dBm +-4dBm</li> <li>• Frequency range: 2400 to 2483.5MHz</li> <li>• Module certificates: RED, FCC, IC</li> </ul>
<p>Vehicle interfaces and other features</p>	<p>2 CAN interfaces including one with wakeup feature and one available with isolation</p> <p>1 LIN / K-line : 1 LIN or optional K-line</p> <p>1 RS232, isolation available as an option</p> <p>1 one wire interface (I-button)</p> <p>1 USB OTG 2.0 High speed with 500mA power output capability</p> <p>1 Ethernet 100 Base Tx</p> <p>1 GSM Audio interface (Microphone input and speaker output)**</p> <p>1 SIM card connector interface or optional ESIM</p> <p>3 Analog inputs</p> <p>2 frequency inputs</p> <p>1 Digital wakeup input with wakeup feature (ignition key)</p> <p>1 High side digital output 500mA</p> <p>Real Time clock with option coin cell for backup</p> <p>32bits ARM MCU with memories : RAM, Flash, EMMC</p> <p>Combo accelerometer – gyroscope with wakeup feature</p> <p>Optional rechargeable battery pack and charger</p> <p>Optional HSM for 4G W variant</p> <p>Note: ** feature not available in 4G W variants</p>

Software	
	LINUX system ACTIA SDK with API specification ( <a href="#">REF3</a> ) + Customer setup manager SW specification for first customer application SW installation ( <a href="#">REF4</a> )
Physical Characteristics (see interface drawing for more details <a href="#">REF2</a> )	
Dimensions	<ul style="list-style-type: none"> <li>176mm x 200mm x 46mm (51mm locally in the main connector – Gore-Tex vent area) without customer interface fixation</li> <li>176mm x 220mm x 46mm (51mm locally in the main connector – Gore-Tex vent area) including customer interface fixation</li> </ul>
Mounting	<p>Recommended mounting position : horizontal with product label on the top side to have better protection against water and dust + have LEDs visible from user</p> <p>Mounting position shall be considered when customer plan to use accelerometer and gyroscope features.</p> <p>Fixation done with 3 M6 screws with max torque : 10Nm</p>
Weight	<p>Around 730 +-5% grams with internal optional battery</p> <p>Around 660 +-5% grams without internal optional battery</p>
Environmental Parameters	
Temperature range	<p>Operating : -40°C to 85°C (NAD tested according to 3GPP standard from -20°C to +55°C)</p> <p>Storage : -55°C to +90°C</p>
Operating Voltage	<p>12/24V variants: <b>6 to 32V</b></p> <p>48V variant without load dump protection (specific HW variant): <b>16 to 52V</b></p>
Climatic testing levels	<p>High + low storage &amp; operating temperature tests according to IEC60068-2 -1 Ae &amp; -2 Be</p> <p>Temperature cycling test -40/85°C 10 cycles according to IEC60068-2-14 Nb</p> <p>Damp heat test 40°C 93% RH 21days according to IEC60068-2-78</p>
Electrical load tests	Overvoltage, reverse polarity, short circuit according to ISO16750-2
Electrical transient test levels	Pulse 1, 2a & 2b, 3a & 3b, 4, 5a & 5b according to ISO7637-2 & ISO16750-2 for 12 & 24V
EMC & ESD levels	Conducted & radiated emission per CISPR25/Radiated susceptibility @ 100V/m per ISO11452-2/ESD capability +/-8kV contact discharge and +/-15kV Air discharge
Mechanical test levels	<p>Shocks Half sinus 400 m/s<sup>2</sup> 6ms, 50 shocks/direction per IEC60068-2-27 Ea</p> <p>Random crawler vibration profile with RMS acceleration 80.827m/s<sup>2</sup> 100h / axis according to IEC60068-2-64</p> <p>IP67 &amp; IP69k according to EN60529</p> <p>1 meter drop test according to ISO16750-3</p> <p>Chemical resistance Diesel, Engine oil, Hydraulic fluid, Brake fluid, Antifreeze fluid, Windscreen washer fluid. Tmax=85°C according to ISO 16750-5:2010</p> <p>Salt spray 96hours according to IEC60068-2 -11</p>

## V PRODUCT INTERFACES DESCRIPTION

### V.1 CONNECTORS



**CN1 = 34 pins connector for power supply and vehicle interface**

**CN2 = Ethernet HSD connector for vehicle interface**

**CN3 = USB HSD connector for vehicle interface**

**CN4-1 = GNSS Antenna Fakra connector for GNSS positioning.**

**CN4-2 = GSM antenna Fakra connector for GSM connectivity.**

**CN4-3 = WIFI Antenna Fakra connector for WIFI connectivity.**

For more information on mating plugs references and electrical details on each pins, see TGU-R ACCESS product specification and interface drawing ([REF1](#) + [REF2](#)).

**CN1 connector pinout:**

Pin	Signal Name	Description	Direction
1	VBAT_RS232	Power supply to RS232 24V	IN
2	VBAT	Power supply duplicated pin on 4G W variant only (else NC)	IN
3	VBAT	Power supply	IN
4	CAN1_L	CAN1 communication interface	IN/OUT
5	CAN1_HT	CAN Termination connection	NA
6	1WIRE_CN	1-Wire interface	IN/OUT
7	DOUT1	Digital output	OUT
8	GND	Power ground	IN
9	VBAT_CAN	Power supply to isolated CAN	IN
10	RS232_TX	RS232 transmission line	OUT
11	CAN1_H	CAN1 High duplicated pin on 4G W variant only (else NC)	IN/OUT
12	CAN1_SHIELD	CAN1 shield	NA
13	CAN1_H	CAN1 communication interface	IN/OUT
14	FREQ_IN1	Frequential input 1	IN
15	AIN1	Analog input 1	IN
16	AIN2	Analog input 2	IN
17	CAN2_L	CAN2 communication interface	IN/OUT
18	RS232_RX	RS232 reception line	IN
19	GND	Power ground duplicated pin on 4G variant only (else NC)	IN
20	GND	Power ground	IN
21	LIN_KLINE_CN	LIN and K-Line interface	IN/OUT
22	FREQ_IN2	Frequential input 2	IN
23	WAKEUP_IN	Key input	IN
24	AIN3	Analog input 3	IN
25	CAN2_H	CAN2 communication interface	IN/OUT
26	GND_ISO_RS	Power ground for isolated RS232	IN
27	CAN2_H	CAN2 High duplicated pin on 4G W variant only (else NC)	IN/OUT
28	SPK_N	Speaker diff. minus output	OUT
29	SPK_P	Speaker diff. plus output	OUT
30	MIC_n	Microphone minus input	IN
31	MIC_P	Microphone plus input	IN
32	GND	Power ground	IN
33	VBAT_CAN_GND	Power ground for isolated CAN2	IN
34	CAN2_HT	CAN2 Termination connection	NA

**CN2 Ethernet connector pinout:**

Pin	Signal Name	Description	Direction
1	ETH_TX+	Ethernet interface TX+	OUT
2	ETH_RX-	Ethernet interface RX-	IN
3	ETH_TX-	Ethernet interface TX-	OUT
4	ETH_RX+	Ethernet interface RX+	IN
M1,M2,M3,M4	ETH_SHIELD	USB cable shield	NA

**CN3 USB connector pinout:**

Pin	Signal Name	Description	Direction
2	USB_VBUS	USB interface VBUS (+5V)	OUT
1	USB_DP	USB interface Data+	IN/OUT
3	USB_DM	USB interface Data-	IN/OUT
4	USB_GND	USB interface ground	NA
	USB_SHIELD	USB cable shield	NA

## V.2 BATTERY AND SIM CARD

Depending of TGU-R ACCESS variants, a rechargeable, replaceable battery pack is accessible behind a trap door.



Depending of TGU-R ACCESS variant, a SIM card connector or an eSIM is available.

If your product has SIM card connector, you can access to it by opening the trap door and removing the battery pack.

To access SIM card connector and optional battery pack, follow instructions described in VII.10



## VI PRODUCT OPERATION

TGU-R ACCESS shall not be used in environment not compliant to its specification.

User shall check that installation and operating range conditions are inside this user manual and product specification especially on:

- Power supply input range
- Operating temperature range
- Storage conditions

### VI.1 TRANSPORTATION AND STORAGE:

TGU-R ACCESS transportation must be done only using the original packaging.

Before TGU-R ACCESS installation and during transportation, ACTIA recommend to store the product in its original packaging, in a suitable indoor location with following conditions, to optimize internal battery pack option, RTC coin cell and other components life duration:

	Unit	min	Typ	Max	Conditions
<b>Optimal storage temperature</b> before installation and during transportation	°C	10	20	30	To prevent decrease of battery pack and coin cell and other components life duration
<b>Relative Humidity storage</b>	%	40	-	75	
<b>Storage duration @above optimal storage temperature range</b> before installation and during transportation	Year			1	To prevent deep discharged battery pack (for product variants without battery pack option, the duration is limited by RTC coin cell life time : 10 years max ) Also applicable for battery spare part
<b>Recommended min optional battery pack charging level</b>	%	30		*	To prevent deep discharge *Note: Maximum charging level during transportation shall be set according to transportation rules applicable in the countries.

### VI.2 HANDLING:

TGU-R ACCESS must be handled with care to avoid excessive shocks and unexpected fall down during handling, installation or use.

### VI.3 SIM CARD:

SIM card operating temperature range shall be chosen by customer to comply with their target application ambient operating temperature range + 10°C to consider TGU-R internal self-heating:

Examples:

- Using standard SIM card with operating temperature range = -20°C to +70°C → customer will be limited to following TGU-R application ambient temperature range = -20°C to +60°C
- Using rugged SIM card with operating temperature range = -40°C to +105°C → customer will reach full TGU-R application ambient temperature range = -40°C to +85°C

### VI.4 NETWORK OPERATOR:

Network operator shall be selected by customer to comply with their target application needs:

- countries coverage according to supported TGU-R frequencies (see §IV.4)
- countries regulations (product shall be certified on target countries usage, see §) and some local countries request the use of local server and SIM card
- data exchange quantity
- When using AT&T SIM cards, under AT&T request, customer shall provide annually TGU-R product IMEI list

## VII INSTALLATION

### VII.1 POWER DISSIPATION:

TGU-R ACCESS shall be mounted in a non-confined area and as far as possible from other power ECUs in the vehicle to prevent excessive heating and as consequence reduced operating range and accelerated aging.

### VII.2 MECHANICAL CONSTRAINTS

#### Fixation:

The mechanical support of the TGU-R ACCESS must have a surface flatness tolerance of 0.5 /100 mm. To fix the TGU-R ACCESS, use M6 flat-headed screws with or without a lock washer, with a tightening torque of max 10 Nm.

Customer installation shall be done according to TGU-R ACCESS interface drawing [REF2](#)

#### Protection index:

ACTIA recommend to install TGU-R ACCESS in the vehicle in the way it is protected against direct water jet and above vehicle water stream limit even if it complies with P67 and IP6K9K levels.

To keep TGU-R ACCESS waterproof level, sealing cap shall be used on all unconnected connectors using caps delivered by ACTIA with the product on USB / Ethernet / Fakra connectors. Main connector unused pins shall have a sealing cap as recommended in product specification [[REF1](#)]

Special care shall be taken to have TGU-R ACCESS Goretex vent always free of water and dust to operate and regulate humidity and pressure inside the product.



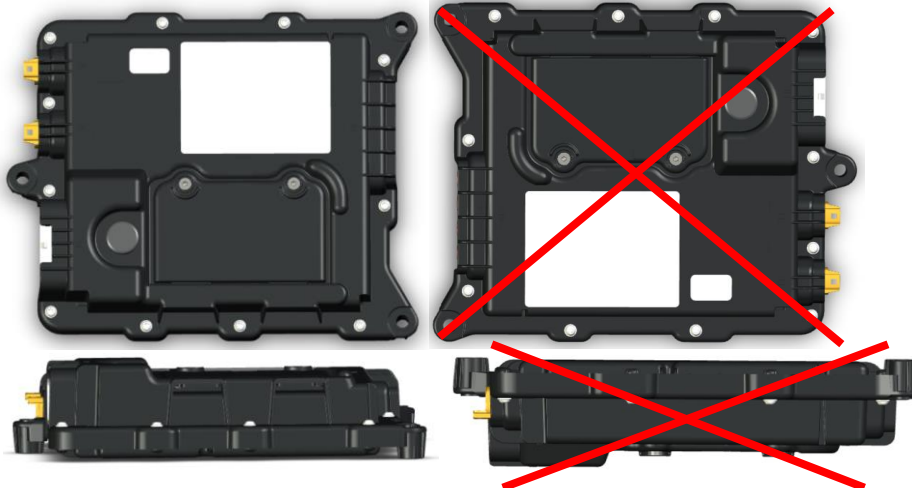
TGU-R ACCESS shall be installed in restricted access locations to prevent:

- Direct UV radiation, gravel projections, corrosion
- Hacking, theft, intentional damage

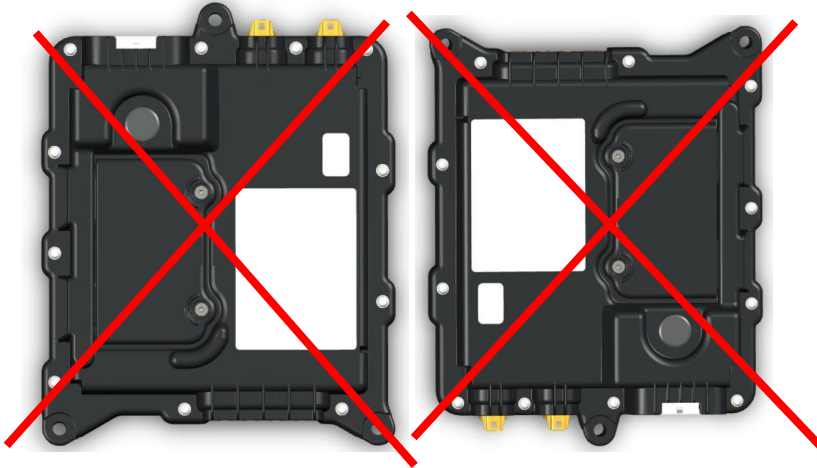
#### Orientation:

We recommend following positioning to avoid water and dust accumulation.

The 2 TGU-R ACCESS LEDs shall remain visible for easy diagnostics during maintenance operation.



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**VII.3 CONNECTORS AND WIRING :**

All matting plugs used to connect TGU-R ACCESS shall be according to the references stated in product specification [REF1](#) and operated according to supplier instructions to avoid connector stress, bad electrical contact, corrosion, loss of waterproof level.

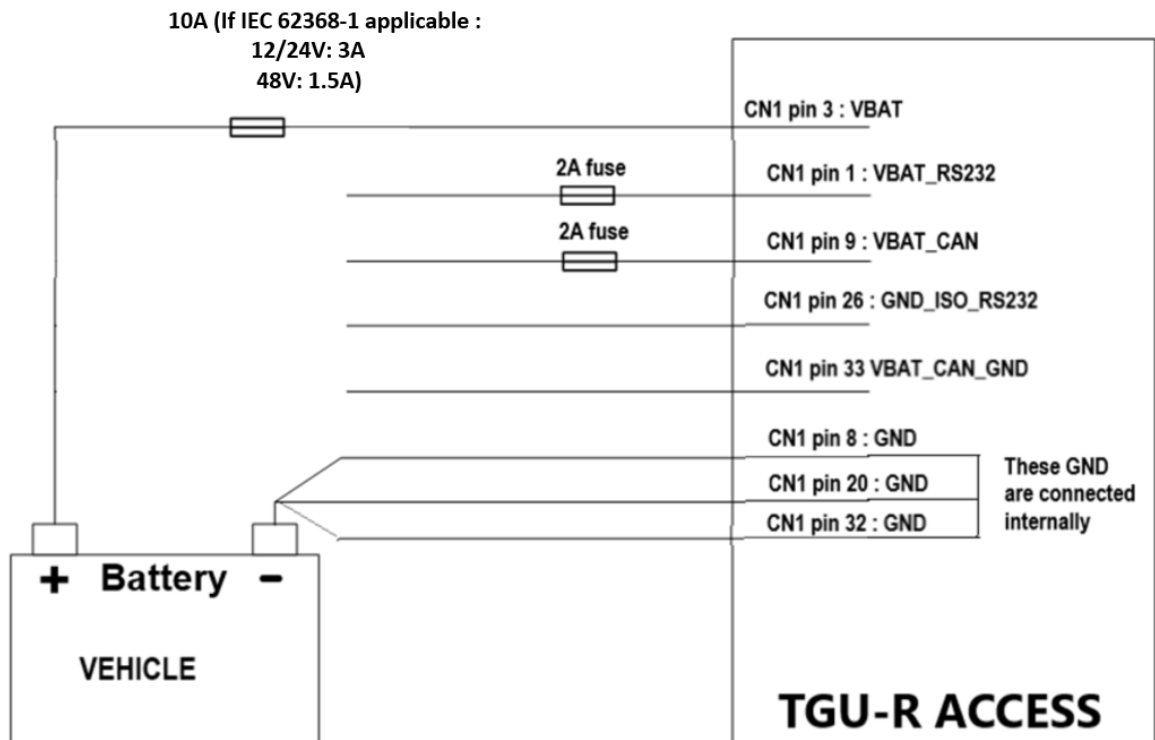
Cables fixations : All cables connected to the TGU-R ACCESS shall be tied between 10cm and 15cm from the product connector, and on the connector axis to avoid mechanical stress on connectors and plugs.

**VII.4 FUSES:**

No fuses are enclosed in the product. Thus an external protective fuse shall be installed outside of the unit, between the vehicle battery and the product VBAT power supply input.

- 12/24V vehicle battery system: 10A (shall be 3A if IEC 62368-1 applicable)
- 48V vehicle battery system: 10A (shall be 1.5A if IEC 62368-1 applicable with min operating voltage range at 16V instead of 6V)

An external **2A** fuse shall be installed on VBAT\_CAN and VBAT\_RS232 lines when isolated CAN and/or isolated RS232 interfaces options are used.



VII.5 CAN LINES

General:

CAN wiring lines must withstand the following constraints:

- We recommend to twist CANH, CANL lines to avoid EMC issues. The wire section must be at least 0,5 mm<sup>2</sup>.
- It is possible to twist a ground wire with CANH and CANL.

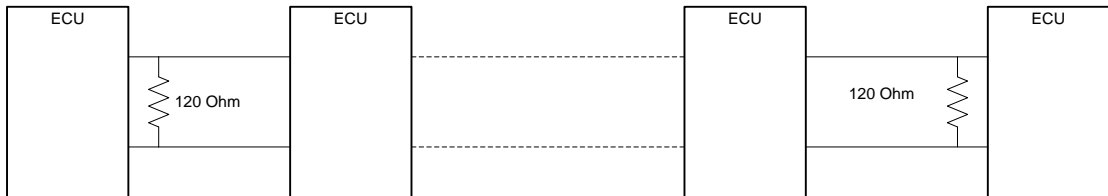
CAN lines layout:

The CAN lines must not be placed near disturbing cables such as:

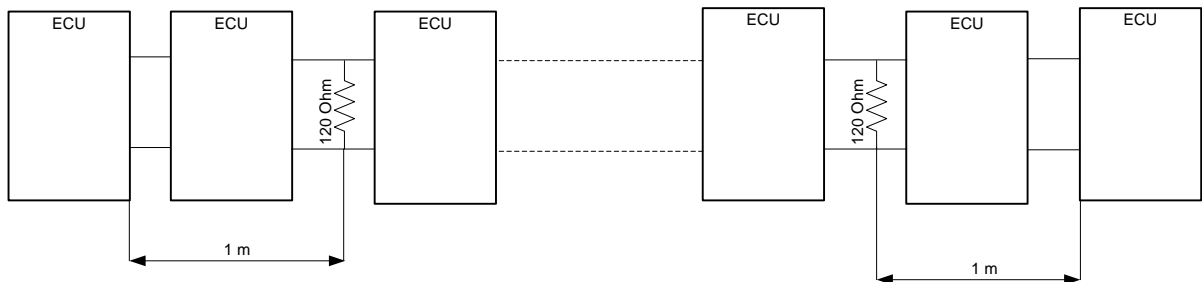
- Power cables (DC/DC converters)
- Cables connected to loads driven in PWM mode

The CAN line must be as short as possible. The loops on the CAN line must be avoided.

Two 120 Ω resistors must be placed at each bus termination:



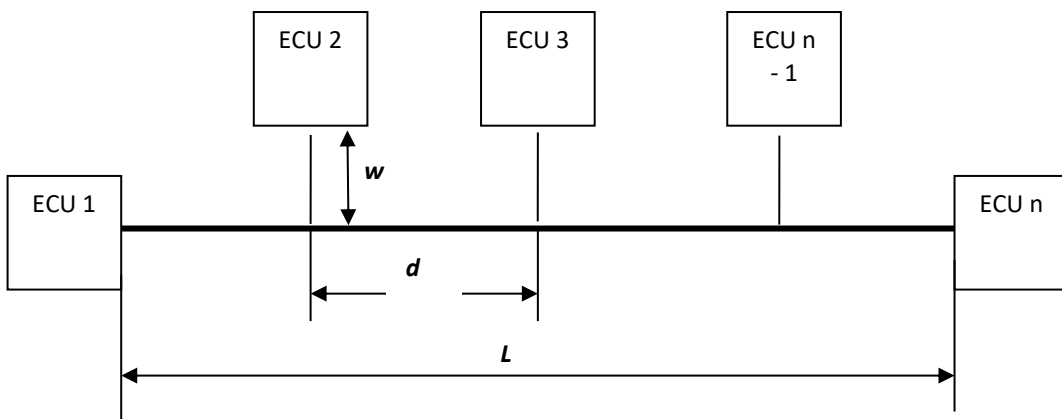
The following topology can be also used, when it is not possible to use the previous one:



Note: each rectangle represents an ECU. Depending on ECU version, the 120Ω internal resistor can be always present or selectable by external wiring: see each ECU data sheet.

If TGU-R ACCESS is acting as CAN termination node, CAN strap option could be done via CN1 wire harness, see product specification for more details [REF1](#).

Wiring layout:



The following values must be observed:

Dimension	Letter	Min. value	Max. value
Total length of bus	L	-	25 m
Length of stubs <sup>(1)</sup>	w	0	0.3 m
Distance between nodes	d	0.1 m	25 m

<sup>(1)</sup>: This length includes the length of external wiring and the length of the internal connection to the ECU. A length of 5 cm is necessary for each internal ECU connection.

## VII.6 ELECTROMAGNETIC COMPATIBILITY

The following rules must be followed to optimize electromagnetic compatibility results:

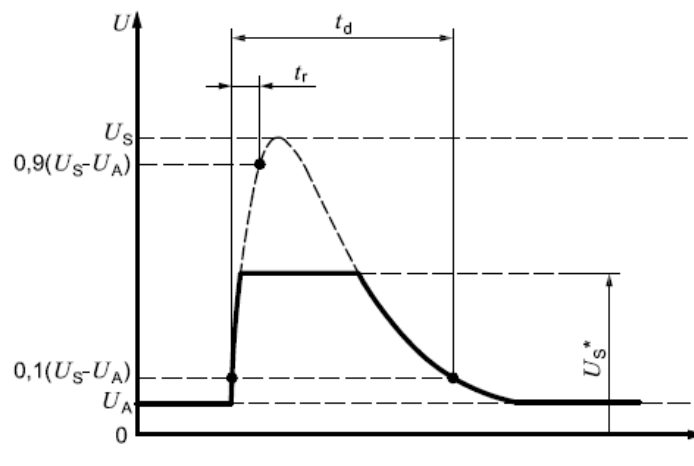
- Sensitive signals such as low level analogue signals, must have a length between sensor and TGU-R ACCESS as short as possible and far from disturbances sources like switching signals.
- If needed, the low level signal links may use shielded wires.
- The low level signals and communication signals must not be placed near cables generating high disturbances.
- The TGU-R ACCESS, its wire harnesses, antennas cables, antennas must not be placed near high disturbing modules such as power energy converters.
- Cables must be routed near the metallic structure of the vehicle

## VII.7 ECU PROTECTION

### VII.7.1 Load dump protection

TGU-R ACCESS 12/24V variant is protected from load dump up to 100V.

TGU-R ACCESS 12/24/48V is not protected against load dump, so an external protection shall be added in case of 12 or 24V vehicle battery used.



### VII.7.2 Reverse battery protection

The reverse battery protection is made using a serial diode inside the product, so external fuse will not be burned in that case.

## VII.8 SW MANAGEMENT

### VII.8.1 Initial SW download

After ACTIA delivery, customer shall install their application SW following “TGU-R ACCESS Customer Setup Manager » [\[REF4\]](#).

The end of customer initial SW application download shall be detected via LEDs behavior, see chapter VII.8.5.

Customer shall ensure:

- that there is no power supply loss till the process is completed
- when initial SW update is completed, initiate a **full shutdown** before removing VBAT power supply

### VII.8.2 OTA SW download

For OTA SW update, customer shall:

- ensure that there is no risk of sudden power loss (no VBAT under voltage condition or battery pack low charging level, and any vehicle conditions that could trigger a risk of VBAT loss) before initiating SW update
- follow SW update instructions specified in TGU-R ACCESS Host CPU API Specification [REF3](#) chapter *SOFTWARE UPDATE*:
  - It is important to wait signal `initiateUpdateDone` and check that the returned value is 0 (OK)
- ensure that the end of SW update is managed correctly by detecting end of downloading process via *UPDATE STATUS* information

### VII.8.3 NAD module

Customer shall ensure that NAD module is switched off via SW application before sudden power loss in order to avoid permanent NAD failure (this is especially required for product variants without optional battery pack)

NAD module switch OFF shall be done according to instructions specified in TGU-R ACCESS Host CPU API Specification [REF3](#).

### VII.8.4 Power supply and temperature alerts management

Customer shall manage following events reported by low level SW:

- VBAT and optional battery pack alerts (VBAT low voltage or/and discharged battery pack)
- Over temperature alerts (yellow and red status)

When a VBAT low voltage, or/and discharged optional battery pack, or over temperature is detected, customer application shall as soon as possible stop any data recording inside product memories and switch to **full shutdown** mode before power loss, this to avoid any memory corruption and permanent product failure at next startup.

This shall be done according to instructions specified in TGU-R ACCESS Host CPU API Specification [REF3](#).

### VII.8.5 Signal termination management

When low level SW reports **SIGTERM** or **SIGKILL** or **SIGINIT** events, customer application SW shall immediately close all application process using a signal handler after closing opened sockets and files and doing the needed cleanup to correctly exit (this to prevent filesystem error at next startup).

### VII.8.6 WIFI channels management

It is important to only use ACP services to manage WIFI channels in access point mode to avoid radar band interferences and forbidden frequencies depending of countries.

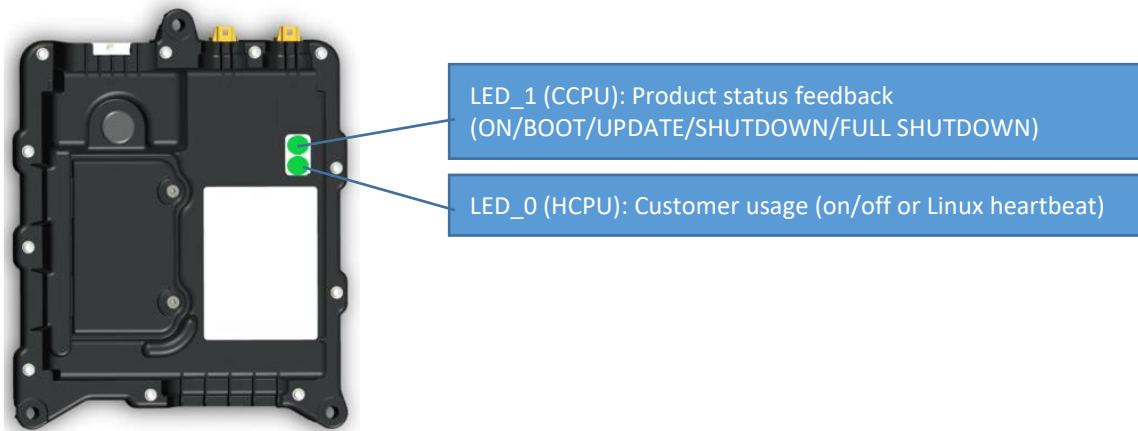
Customer application shall check which channels are allowed in the country by using following DBus ACP method:  
`com.actia.platform.wifi.accesspoint.control.GetAllowedChannels`

For more details see TGU-R ACCESS Host CPU API Specification [REF3](#) chapter IV.5.3.8.8.3.1 Interface `com.actia.platform.wifi.accesspoint.control`

VII.9 LEDS FUNCTIONALITY

TGU-R provides 2 LEDs interface visible on mechanical housing top side:

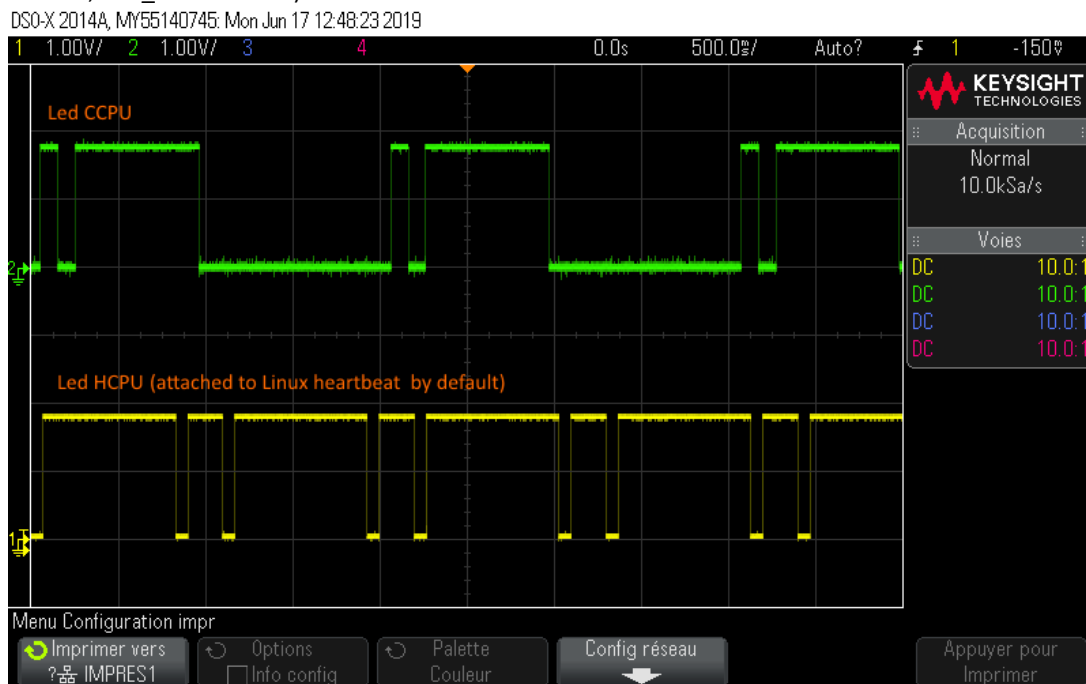
- LED\_0: Customer usage
- LED\_1: Product status feedback



Note: the behavior of LED\_0 will be dependent of customer application configuration (ON/OFF or heard beat by default), while LED\_1 is managed by ACTIA BSP. See TGU-R ACCESS Host CPU API Specification [REF3](#) for more details on LED\_0 management.

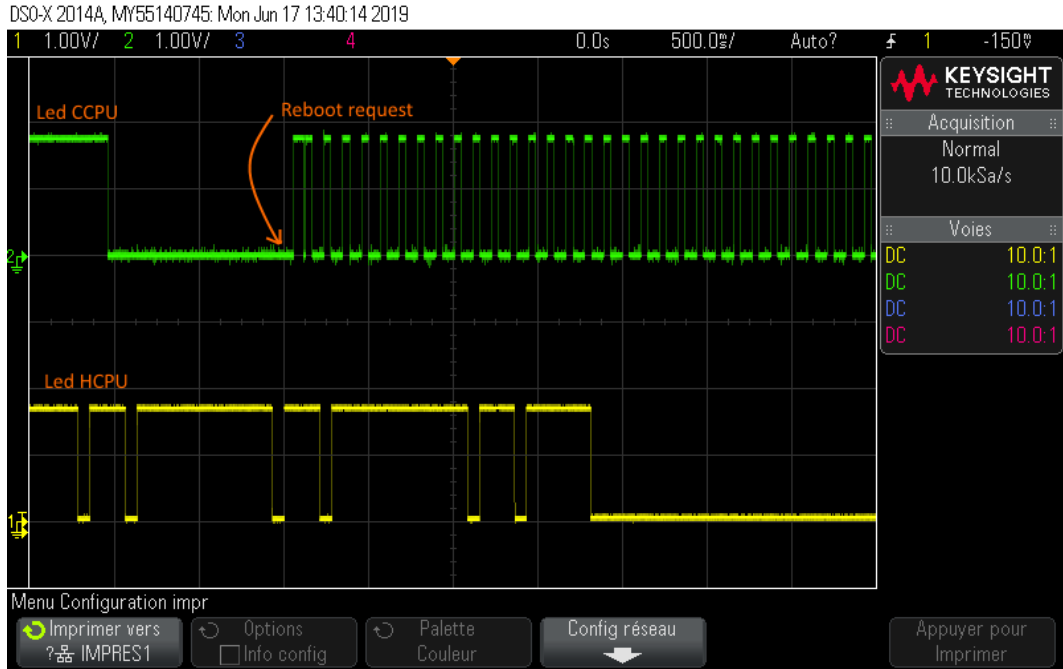
Find below LEDs chronograms:

- **Normal operation with customer application operating** (if customer application not downloaded or not operational, LED\_0 will be OFF)

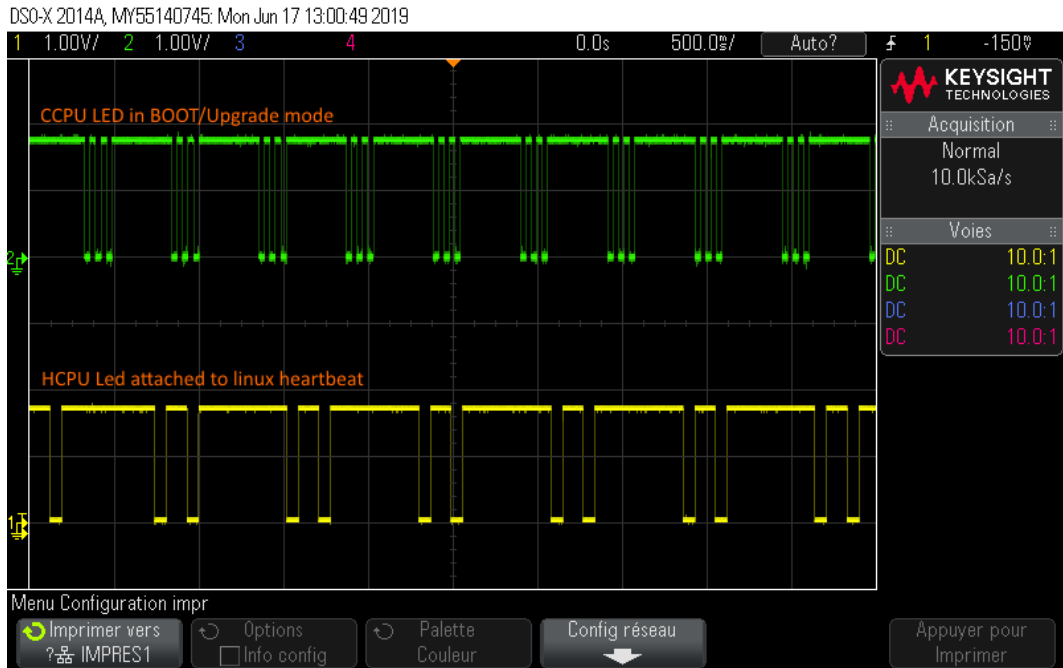


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- **Reboot operation in progress:** triggered by reboot or shutdown or full shutdown commands



- **Update distribution in progress:**





**VII.10 BATTERY PACK REPLACEMENT AND SIM CARD INSTALLATION PROCEDURE:**

**CAUTION:**

RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE.

Battery pack shall only be replaced by ACTIA original AC16 battery spare part (reference AC968975) and authorized people following ACTIA instructions ([REF5](#)).

RISK OF COMPONENT DAMAGE BY ESD IF NO PROTECTION EQUIPEMENT USED

1. Prior battery pack replacement or SIM card installation, to prevent any risk of product damage, it is important to switch OFF TGU-R ACCESS by following below steps:
  - a. Switch OFF TGU-R ACCESS digital wakeup input (ignition key)
  - b. Switch OFF TGU-R ACCESS VBAT input power supply.
  - c. Issue **full shutdown** command via dedicated API service (see document [REF3](#) for more details)
2. Remove dust around battery door in order to not experience sealing issue on next steps  
 No dust shall be on gasket and battery door and top housing mechanical part  
 Note: If dust present, product sealing will not be warrantied



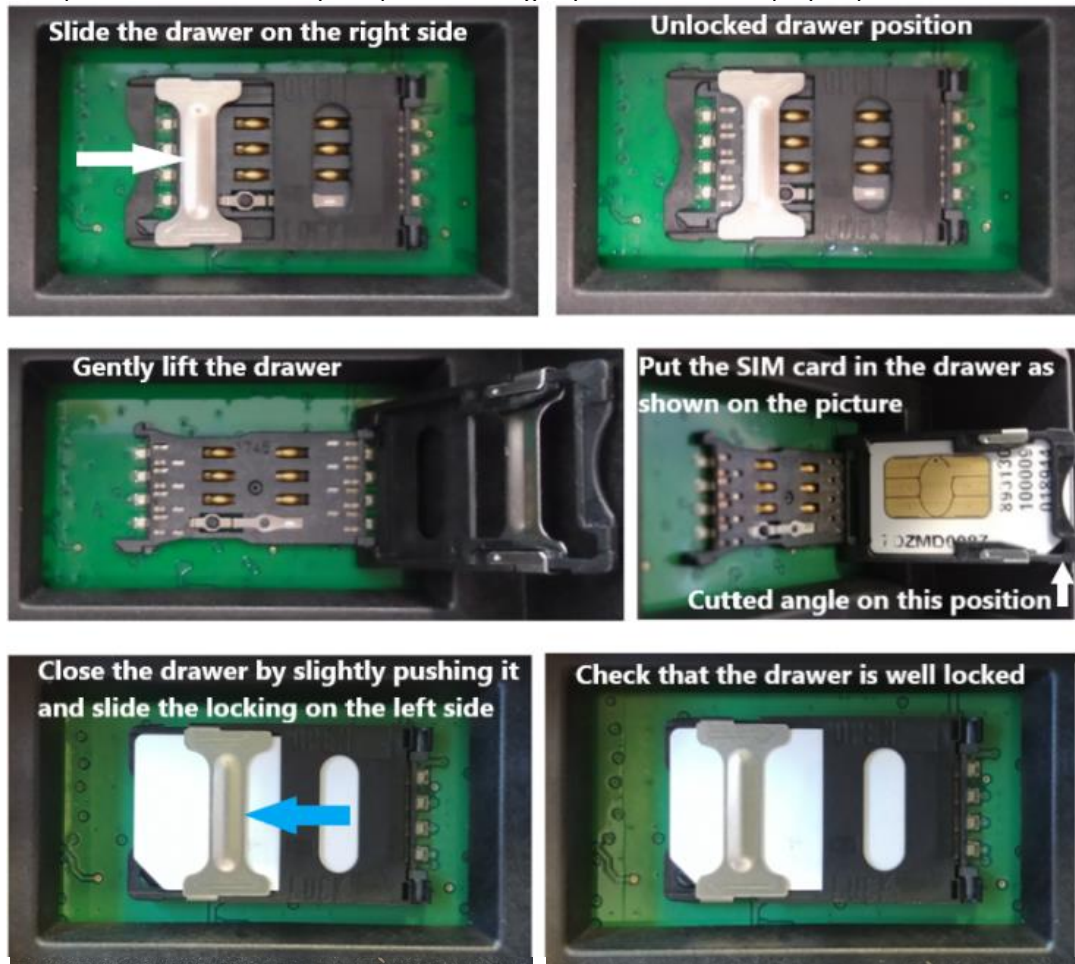
3. Battery door opening : unscrew the battery door screws (Torx n°10)
4. Access battery pack and SIM card connectors: lift the battery pack on the opposite side of wire/connector by pinching silicon rubber on the middle with your fingers (no tool shall be used in order to not damage the product and battery pack)



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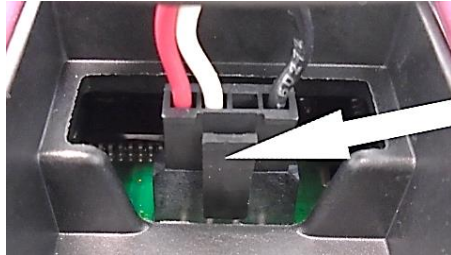
5. SIM card installation or replacement:

Warning: The SIM card connector shall be handled with care to prevent any mechanical damage and with protections to avoid any component damage by ESD. Proceed step by step as defined below:



6. Battery pack replacement:

- a. Unplug the battery pack : Unplug the connector by pressing the locking system



- b. Assemble brand new AC16 battery spare part (ACTIA reference AC968975) :

- i. Connect the battery connector
- ii. Check that it is correctly locked
- iii. Install battery pack by pushing it on inside the compartment
- iv. Separate battery cable wires as in below picture to avoid wires to be pinched when closing the trap door



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7. Close battery door :
  - a. Check that battery door gasket is well inserted in the groove
  - b. Close battery door and screw it with 0.8Nm +-0.1Nm torque
8. Reconnect main product connector and perform product maintenance operation if required (refer to vehicle manufacturer or Telematics service provider instructions).

**VII.11 ANTENNAS:**

The external antennas shall meet TGU-R ACCESS antennas requirements specified in the document [REF6](#).

In addition to external GNSS/GSM/WIFI antennas connector interfaces, TGU-R ACCESS provides the following internal antennas:

- BT internal antenna
- WIFI internal antenna
- GSM RX diversity internal antenna

The TGU-R ACCESS should be as much as possible kept away from metallic parts to maximize all its internal antennas performances.

The external antennas connected to the TGU-R ACCESS should be located at minimum 30cm from the TGU-R, and 30cm from other antennas or source of disturbances to avoid bad performances.

The TGU-R ACCESS external GNSS antenna should be installed to have clear sky view to maximize the GNSS positioning performance.

TGU-R ACCESS (internal antennas) and external antennas shall be installed at more than 30cm from person's body.

The GSM and WIFI external antennas shall integrate a resistor (between 2.5kOhm to 170kOhm) to ground to comply with TGU-R ACCESS antenna diagnostic feature.

The GNSS external antenna shall:

- integrate an amplifier (active antenna) with power input range between 3 and 5V
- have a current consumption between 3mA and 85mA to comply with TGU-R ACCESS GNSS antenna diagnostic feature.

**VII.12 INVIOABILITY LABEL REPLACEMENT:**

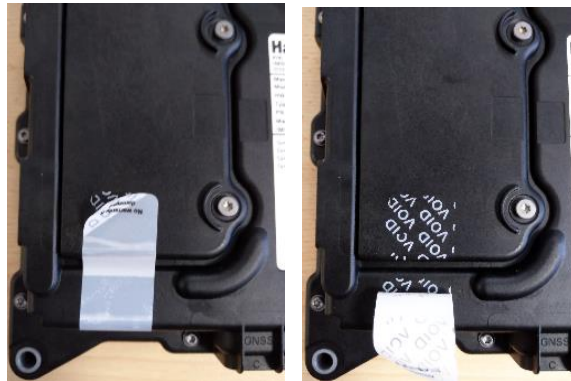
**Required material:**

- Isopropyl alcohol (few ml)
- Soft cloth
- A new inviolability label :
  - o AC525470 – White label
  - o AC525471 – Blue label
  - o AC525472 – Yellow label

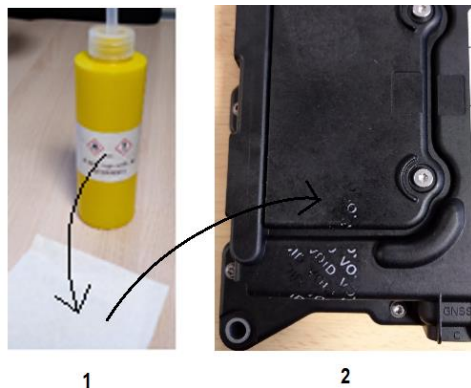
**Procedure:**

The following steps must be respected in order to replace an inviolability label on TGU-R (here with white label as example):

- 1- Unstick slowly the inviolability label by starting from one of the upper corners (see pictures below)



- 2- Once the inviolability label totally removed, put some isopropyl alcohol on a soft cloth, then clean quietly the adhesive prints with the soaked cloth.



- 3- Once the inviolability label zone is fully cleaned, let dry isopropyl alcohol for approximatively 1 minute.



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- 4- Stick the new inviolability label (following the variant) on the same zone than the old one by applying a slight pressure to drain the residual air out of under the inviolability label.



## VIII COUNTRIES REGULATIONS:

### VIII.1 TYPE APPROVAL

Depending of product variants, TGU-R ACCESS is certified in the following countries:

- 3G variants: Europe + US + Canada
  
- 4G EU variants:
  - Zone 1: Europe
  - Zone 2 as an option:
    - Australia
    - Brazil (under analysis if possible linked to specific IPV6 requirement not supported by 4G EU NAD module current FW)
    - Hong Kong (no mandatory approval required)
    - Israel (only importation process to be managed by Customer (local importer shall have telecom license))
    - Japan (with external filter)
    - New Zealand
    - Russia (covering also Armenia & Kazakhstan)
    - Singapore (only importation process to be managed by Customer (local importer shall have telecom license))
    - Saudi Arabia → requires to use local SIM card and server
    - South Africa
    - Thailand
  
- 4G US variants:
  - Zone 1:
    - US
    - Canada
  - Zone 2 as an option:
    - Chile
    - Mexico
  
- 4G CHINA variants: China
  
- 4G W variants:
  - Zone 1:
    - Europe
    - US
    - Canada
  - Zone 2 as an option:
    - Australia
    - Brazil
    - Hong Kong (no mandatory approval required)
    - Israel (only importation process to be managed by Customer (local importer shall have telecom license))
    - Japan
    - New Zealand
    - Russia (covering also Armenia & Kazakhstan)
    - Singapore (only importation process to be managed by Customer (local importer shall have telecom license))
    - Saudi Arabia → requires to use local SIM card and server
    - South Africa
    - Thailand

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**4G EU variants with ALS3-E module: (extract from Gemalto ALS3-E Rel3 HD §5.2 GSM/UMTS/LTE Antenna Interface)**

In order to comply with European regulation, external GSM antenna and cable shall meet following requirements:

RED requirements:

- 900 MHz GSM band : The combined cable loss antenna gain must not exceed 2.91 dBi
- 1800 MHz DCS band : The combined cable loss antenna gain must not exceed 9.36 dBi
- WCDMA band 1 : The combined cable loss antenna gain must not exceed 12.34 dBi
- WCDMA band 8 : The combined cable loss antenna gain must not exceed 9.06 dBi

The external antennas must be matched properly to achieve best performance regarding radiated power, modulation accuracy and harmonic suppression. Matching networks are not included on the ALS3-E PCB and should be placed in the host application, if the antenna does not have an impedance of 50ohm.

Regarding the return loss ALS3-E provides the following values in the active band:

State of module	Return loss of module	Recommended return loss of application
Receive	≥ 8dB	≥ 12dB
Transmit	not applicable	≥ 12dB
Idle	≤ 5dB	not applicable

**4G US variants with ALS3-US module: (extract from Gemalto ALS3-US Rel3 HD §9.2 Compliance with FCC and IC Rules and Regulations)**

In order to comply with US regulation, external GSM antenna and cable shall meet following requirements:

FCC:

- 850MHz GSM band : The combined cable loss and antenna gain must not exceed 3.92 dBi
- 1900 MHz DCS band : The combined cable loss and antenna gain must not exceed 2.51 dBi
- WLAN 2,4GHz: The combined cable loss and antenna gain must not exceed 2.07 dBi
- WiFi 5 GHz: The combined cable loss and antenna gain must not exceed 2.43 dBi

Manufacturers of mobile or fixed devices incorporating ALS3-US R3 modules are authorized to use the FCC Grants and Industry Canada Certificates of the ALS3-US R3 modules for their own final products according to the conditions referenced in these documents. In this case, the FCC label of the module shall be visible from the outside, or the host device shall bear a second label stating "Contains FCC ID: Q1PALS3-USR3" and accordingly "Contains IC: 7830AALS3USR3".

The integration is limited to fix or mobile categorized host devices, where a separation distance between the antenna and any person of min. 20cm can be assured during normal operating conditions.

For mobile and fixed operation configurations the antenna gain, including cable loss, must not exceed the limits listed in the following table for FCC and IC.

Operating band	FCC limit	IC limit	Unit
Maximum gain in lower operating bands with f< 1GHz (GSM850, WCDMA BdV, LTE Bd5 / Bd17)	3.25	0.63	dBi
Maximum gain in higher operating bands with f=1700MHz (WCDMA BdIV, LTE Bd4)	5.5	5.5	dBi
Maximum gain in higher operating bands with f=1900MHz (GSM1900, WCDMA BdII, LTE Band 2)	2.51	2.51	dBi

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 and with Industry Canada licence-exempt RSS standard(s). 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.

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

If Canadian approval is requested for devices incorporating ALS3-US R3 modules the above note will have to be provided in the English and French language in the final user documentation.

Manufacturers/OEM Integrators must ensure that the final user documentation does not contain any information on how to install or remove the module from the final product.

**4G CHINA variants with ALS3-C module: (extract from Gemalto ALS3-C HD 5.1 GSM/UMTS/LTE Antenna Interface)**

The ALS3-C GSM/UMTS/LTE antenna interface comprises a GSM/UMTS/LTE main antenna as well as a UMTS/LTE Rx diversity/MIMO antenna to improve signal reliability and quality<sup>1</sup>.

The interface has an impedance of 50ohm. ALS3-C is capable of sustaining a total mismatch at the antenna interface without any damage, even when transmitting at maximum RF power.

The external antennas must be matched properly to achieve best performance regarding radiated power, modulation accuracy and harmonic suppression. Matching networks are not included on the ALS3-C PCB and should be placed in the host application, if the antenna does not have an impedance of 50ohms.

Regarding the return loss ALS3-C provides the following values in the active band:

1. By delivery default the UMTS/LTE Rx diversity/MIMO antenna is configured as available for the module since its usage is mandatory for LTE.

State of module	Return loss of module	Recommended return loss of application
Receive	≥ 8dB	≥ 12dB
Transmit	not applicable	≥ 12dB
Idle	≤ 5dB	not applicable

**4G W variants with PLS83-W module: (extract from Gemalto PLSx3-W HID §5.4 Compliance with FCC and ISED Rules and Regulations)**

Manufacturers of mobile or fixed devices incorporating PLSx3 modules are authorized to use the FCC Grants and ISED Certificates of the PLSx3 modules for their own final products according to the conditions referenced in these documents. In this case, an FCC/IC label of the module shall be visible from the outside, or the host device shall bear a second label stating "Contains FCC ID: QIPPLSx3", and accordingly "Contains IC: 7830A-PLSx3". The integration is limited to fix or mobile categorized host devices, where a separation distance between the antenna and any person of min. 20cm can be assured during normal operating conditions.

For mobile and fixed operation configuration the antenna gain, including cable loss, must not exceed the limits listed in the following table for FCC and ISED.

Antenna gain limits for FCC and ISED (for W variant):

Operation band	FCC limit	ISED limit	Unit
Maximum gain in GSM/GPRS 850	8.60	5.30	dBi
Maximum gain in PCS 1900	10.20	10.20	dBi
Maximum gain in WCDMA Band 2	8.01	8.01	dBi
Maximum gain in WCDMA Band 4	5.00	5.00	dBi
Maximum gain in WCDMA Band 5	9.40	6.10	dBi
Maximum gain in LTE Band 2	8.01	8.01	dBi
Maximum gain in LTE Band 4	5.00	5.00	dBi
Maximum gain in LTE Band 5	9.40	6.10	dBi
Maximum gain in LTE Band 7	8.01	8.01	dBi
Maximum gain in LTE Band 12	8.70	5.61	dBi
Maximum gain in LTE Band 13	9.16	5.93	dBi
Maximum gain in LTE Band 26	9.30	6.10	dBi
Maximum gain in LTE Band 38	8.01	8.01	dBi
Maximum gain in LTE Band 41	8.01	8.01	dBi
Maximum gain in LTE Band 66	5.00	5.00	dBi



B

Note: 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 and with ISED license-exempt RSS standard(s).

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.

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

FCC Part 15.19 Warning 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 UNDESIRE OPERATION.

Notes (ISED):

(EN) This Class B digital apparatus complies with Canadian ICES-003 and RSS-210. 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.

(FR) Cet appareil numérique de classe B est conforme aux normes canadiennes ICES-003 et RSS-210. Son fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne doit pas causer d'interférence et (2) cet appareil doit accepter toute interférence, notamment les interférences qui peuvent affecter son fonctionnement.

(EN) Radio frequency (RF) Exposure Information

The radiated output power of the Wireless Device is below the Innovation, Science and Economic Development Canada (ISED) radio frequency exposure limits. The Wireless Device should be used in such a manner such that the potential for human contact during normal operation is minimized.

This device has also been evaluated and shown compliant with the ISED RF Exposure limits under mobile exposure conditions. (antennas at least 20cm from a person's body).

(FR) Informations concernant l'exposition aux fréquences radio (RF)

La puissance de sortie émise par l'appareil de sans fils est inférieure à la limite d'exposition aux fréquences radio d'Innovation, Sciences et Développement économique Canada (ISDE). Utilisez l'appareil de sans fil de façon à minimiser les contacts humains lors du fonctionnement normal.

Ce périphérique a également été évalué et démontré conforme aux limites d'exposition aux RF d'IC dans des conditions d'exposition à des appareils mobiles (les antennes se situent à moins de 20cm du corps d'une personne).

## VIII.2 DANGEROUS GOODS TRANSPORTATION REGULATION (ATEX):

TGU-R ACCESS is not compliant to dangerous good transportation regulation (ATEX) **with** internal optional battery pack and/or RTC coin cell options mounted.

When powered after vehicle master switch and without internal battery option and RTC coin cell (meaning no more power source inside and outside the TGUR ACCESS product during vehicle loading and unloading operation), the TGU-R ACCESS is not subject to dangerous good transportation regulation (ATEX).

A variant must then be created to comply with ATEX regulation.

## IX AFTER SALES

### IX.1 ECU REPLACEMENT

No item of equipment in a system will be replaced without prior testing with a diagnostic tool. This is to avoid the exchange of products that are operating correctly but connected via a faulty contact, for example.

Replacement products must comply with the manufacturer's specifications.

The ECU replacement must be done when the battery is switched off.

## IX.2 WARRANTY

The warranty on the ECU will be cancelled if:

- The present instructions are not followed
- The ECU has been opened (except on trap door for optional battery replacement and SIM card installation)
- The ECU has visible mechanical damage due to drop or bad handling

## X SAFETY INFORMATION ON BATTERY PACK

### **Battery pack DISPOSAL CONSIDERATIONS (extract from battery pack supplier MSDS - SECTION 13):**

Waste disposal must be in accordance with the applicable Federal, State and the Local regulations. Disposal of cells and batteries should be performed by permitted, the professional disposal company knowledgeable in Federal, State or Local requirements of hazardous waste treatment and hazardous waste transportation. The cell should have its terminal insulated in order to prevent short circuit during the transportation to the disposal site.

Incineration should never be performed by battery users.

TLI batteries contain recyclable materials. Recycling options should be considered when disposing of this product, through licensed waste carrier.

RCRA Waste Code- Nonregulated.

### **Battery pack TRANSPORTATION /SHIPPING (extract from battery pack supplier MSDS - SECTION 14):**

Shipping name: UN 3480: Lithium-ion cells and batteries

Worldwide besides the United State- the batteries are not subject to the Dangerous Goods Regulations, e.g., they are not restricted. The batteries must be packed in accordance with Packing Instructions / Special Provisions (SP) of the applicable code, e.g., IATA/ICAO (Packing Instructions: P965, P966 and P967), IMDG Code (SP188) and ADR (SP188). When required, reference shall be made to UN number 3480 (lithium ion batteries).

Transportation within, to and from the US- Parts 171, 172, 173 and 175 of US-DOT CFR 49 are governing the transportation of lithium cells and batteries. TLI- 1550/1B battery is defined as "Small lithium cells and batteries" and thus, is not considered as Class 9. Special Provision 188 details the required label and package of cells when transported separately or in equipment.

Hazard Classification: Class 9, Miscellaneous

Packing Group: II

Battery label: Identification and labeling should be in compliance with the applicable regulations. In addition, it should also include cell/battery title, nominal voltage, nominal energy, lot number and warning.

## XI EXPORT CONTROL

TGU-R includes cryptographic functionalities for:

- Authentication
- Integrity
- Confidentiality
- Signature

List of cryptographic algorithms:

NAD modules: All below NAD algorithms are standard algorithms used for protection of mobile network communication and they are only used for this purpose.

Algorithm	Key size	Function/Used in
A3	128	GSM
A8	128	GSM
A5-1	64	GSM Circuit Switched Ciphering Algorithms
A5-3	128	GSM EDGE Circuit Switched Ciphering Algorithms
GEA1	64	GPRS/GEA Ciphering Algorithms
GEA2	64	GPRS/GEA Ciphering Algorithms
GEA3	128	GPRS/GEA Ciphering Algorithms
UEA1	128	UTMS ciphering algorithm
UIA1	128	UTMS Integrity protection algorithms
AKA SHA-1	128	UMTS Authentication and Key Agreement
EEA1	128	LTE ciphering algorithms
EIA1	128	LTE Integrity protection algorithms
EEA2	128	LTE ciphering algorithms
EIA2	128	LTE Integrity protection algorithms
EEA3	128	LTE ciphering algorithms
EIA3	128	LTE Integrity protection algorithms

WLAN module:

In the WLAN module the following cryptographic algorithms are available:

Algorithm	Key size	Function/Used in
WEP	64 & 128	WiFi
WPA-PSK	128	WiFi
WPA2-PSK	128	WiFi
WPA2-Enterprise (AES/CCMP)	128	WiFi
E0	128	Bluetooth
AES-CCM	128	Bluetooth

These algorithms are the standard protection for WiFi & Bluetooth, they are only used for this purpose.

Other keys available for customer applications usage:

Algorithm	Key size	Function/Used in
AES	128	Authentication, signature of distant customer server
RSA	1024	Customer data exchange protection
AES	256	CPU – bootloader Authentication
RSA	4096	CPU – bootloader Authentication

HSM for 4G W variants only:

Algorithm	Key size (bits)	Function/Used in
RSA	1024/2048	Key generation, signature, encryption
SHA-1	160	Secure Hash Algorithm
SHA-2	256/384	Secure Hash Algorithm
SHA-3	256/384	Secure Hash Algorithm
HMAC SHA-1 /-2 /-3	160/256/384	Hash-based Message Authentication Code
AES	128/192/256	Advanced Encryption Standard
TDES	192	Triple Data Encryption Algorithm
ECC	256/384	Key generation, ECDH and ACDSA, ECSchnorr
ECDA	256	BN-256 curve

TGU-R is submitted to US regulations, & is under US/UE sanctions, as are most of telematics devices. The company that exports (subsidiary, customer) need to ask USA/Europe for authorization to export their product in the countries that are under sanction. Cuba, Iran, North Korea, Syria, Sudan, Crimea will 100% receive a NO answer from US government.

For more information, see each Government regulation, for example:

- <https://sanctionsmap.eu/#/main>
- <https://www.treasury.gov/resource-center/sanctions/Programs/pages/belarus.aspx>

This information is not contractually binding and is subject to change.

TGU-R Export Control Information:

- ECCN: 5A991.b
- CCATS: G176323
- License: No License Required (NLR)
- These items are controlled by the U.S. Government and authorized for export only to the country of ultimate destination for use by the ultimate consignee or end-user(s) herein identified. They may not be resold, transferred, or otherwise disposed of, to any other country or to any person other than the authorized ultimate consignee or end-user(s), either in their original form or after being incorporated into other items, without first obtaining approval from the U.S. government or as otherwise authorized by U.S. law and regulations.
- EU export control regulations: not subject

## XII EXPORT HS CODE

TGU-R is registered in custom category (HS code): 8517620000