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ACU6 User Manual - 103360002	ACTIA Group	U - Uncontrolled	1.2	1.2 Released

ACU6 User Manual - 103360002



Revision history

Revision	Date	Author(s)	Cause of changes	Updates
1.0	210618	N. Andersson		First version
1.1	210624	N. Andersson	Update	5.1.1 Updated safety distance.
1.2	210708	N.Andersson	Update	5.2.1 Updated antenna information

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1 PRODUCT DESCRIPTION

1.1 General

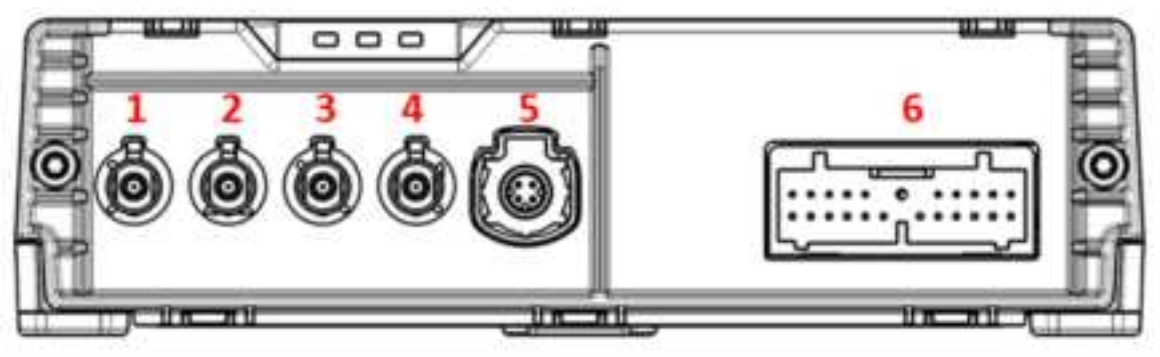
ACU6 is a telematics product for vehicles. It provides data connection over cellular networks for embedded telematics applications. It also provides data connection for other devices in the vehicle, such as the infotainment head unit.

ACU6 has WLAN functionality and can act as both access point and station.

Hands-free voice calls are possible for telematics services, like emergency calls and breakdown calls. A voice call is started by using specific buttons in the car, or automatically triggered after a crash. The voice call is set up to a pre-defined number (depending on country).

The product can be attached to external antennas, but also have internal antennas that can be used if e.g. an external antenna would be broken. There is also an internal backup battery that is used if the external power source (vehicle battery) is lost.

1.2 Connections



- | | |
|--------------------------|---|
| 1. Violet Fakra (code D) | LTE main antenna |
| 2. Red Fakra | LTE diversity antenna |
| 3. Blue Fakra | GNSS antenna |
| 4. Violet Fakra (code H) | WLAN antenna |
| 5. HSD connector | Ethernet and USB |
| 6. 22-pin JAE | Main connector (power supply, CAN, buttons, audio...) |

1.3 SIM

The product has an internal eSIM that is soldered to the PCB.

It is also possible to attach a micro-SIM (3FF) to a SIM tray inside the product. The SIM card is placed in the SIM tray during manufacturing. The product is not designed so that the user can replace the SIM.



1.4 POWER SUPPLY

1.4.1 External supply

Operating voltage range: 8-16 VDC. Nominal 13.8V.

1.4.2 Backup battery

ACU6 can also be operated without external power source using an internal rechargeable battery. In this mode some functionality is disabled.

1.5 TEMPERATURE RANGE

Operating temperature range: -20 - +55°C.

2 RF DESCRIPTION

2.1 GENERAL

ACU6 supports different radio technologies:

- Cellular
- WLAN 2.4GHz AP and STA
- WLAN 5GHz AP
- Bluetooth
- GNSS

When the product is in normal operation mode and powered by external power source all technologies can be activated. When powered by the internal backup battery only cellular and GNSS can be activated.

2.2 CELLULAR

ACU6 uses an embedded CAT 6 LTE modem.

Both internal or external cellular antennas can be used.

2.2.1 Bands and output power

Technology	Bands	Max. output power
GSM/GPRS/EDGE	850/900/1800/1900	Class 4 (+33dBm $\pm$ 2dB) for EGSM850 and EGSM900 Class 1 (+30dBm $\pm$ 2dB) for GSM1800 and GSM1900 Class E2 (+27dBm $\pm$ 3dB) for GSM 850 8-PSK and GSM 900 8-PSK Class E2 (+26dBm +3 /-4dB) for GSM 1800 8-PSK and GSM 1900 8-PSK
WCDMA/HSPA	II (1900), IV (1700), V (850)	Class 3 (+24dBm +1/-3dB)
LTE FDD	Bd2 (1900), Bd4 (1700), Bd5 (850), Bd12 (700), Bd66 (1700)	Class 3 (+23dBm $\pm$ 2dB)

2.2.2 Carrier aggregation

The following table lists the supported CA configurations (supported band combinations).

Downlink CA	Bandwidth combination set
Intra-band continuous	
CA_2C	0
CA_5B	0,1
CA_12B	0
CA_66B	0
CA_66C	0
Intra-band non-continuous	
CA_2A-2A	0
CA_4A-4A	0,1
CA_66A-66A	0
Inter-band (two bands)	
CA_2A-5A	0,1
CA_2A-12A	0,1,2
CA_4A-5A	0,1
CA_4A-12A	0,1,2,3,4,5
CA_5A-66A	0
CA_12A-66A	0,1,2,3,4,5

2.3 WLAN

ACU6 supports WLAN 802.11b/g/n/ac on 2.4 and 5GHz.

On 2.4GHz ACU6 can act as Access Point (AP) or Station (STA). On 5GHz only AP is supported.

Dual band simultaneous (DBS) operation is supported with 2.4GHz STA and 5GHz AP.

Tables below show supported channels and maximum output power (tolerance +/- 2dB).

2.3.1 2.4GHz

ACU6 can act as Access Point (AP) or Station (STA) on 2.4GHz. Both internal or external WLAN antennas can be used.

Channel	Max. power set with external antenna	Max. power set with internal antenna
1 – 11	13 dBm	13 dBm

2.3.2 5GHz

ACU6 can act as Access Point (AP) on 5GHz. Both internal or external WLAN antennas can be used.

2.3.2.1 20 MHz bandwidth

Channel	Max. power set with external antenna	Max. power set with internal antenna
36	USA: 12 dBm Canada: 11dBm	USA: 12 dBm Canada: 8dBm
40	USA: 12 dBm Canada: 11dBm	USA: 12 dBm Canada: 8dBm
44	USA: 12 dBm Canada: 11dBm	USA: 12 dBm Canada: 8dBm
48	USA: 12 dBm Canada: 11dBm	USA: 12 dBm Canada: 8dBm
149	17 dBm	17 dBm
153	17 dBm	17 dBm
157	17 dBm	17 dBm
161	17 dBm	17 dBm
165	17 dBm	17 dBm

2.3.2.2 40 MHz bandwidth

Channel	Max. power set with external antenna	Max. power set with internal antenna
38	10 dBm	USA: 10 dBm Canada: 8dBm
46	USA: 13 dBm Canada: 11dBm	USA: 13 dBm Canada: 8dBm
151	17 dBm	17 dBm
159	17 dBm	17 dBm

2.3.2.3 80 MHz bandwidth

Channel	Max. power set with external antenna	Max. power set with internal antenna
42	10 dBm	USA: 10 dBm Canada: 8dBm
155	15 dBm	15 dBm

2.4 BLUETOOTH

Both Bluetooth Classic and Bluetooth Low Energy (BLE) is supported.

Output power class 1.

2.5 GNSS

System	Band
GPS	L1
GLONASS	L1 FDMA
Galileo	L1
Beidou	B1

3 FUNCTIONAL DESCRIPTION

3.1 CAN CONNECTION

ACU6 has a CAN interface for connection to CAN buss vehicles. CAN data can be sent and received.

3.2 WLAN STATION

The unit can be set in a mode where it acts like a WLAN station. This mode can e.g. be used for connection to a hotspot in a workshop.

3.3 WLAN ACCESS POINT

ACU6 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.

3.4 DATA GATEWAY

ACU6 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.

3.5 POSITIONING INFORMATION

The product can send GNSS position data on the CAN bus. The GNSS data can be used by other ECUs in the vehicle, for instance the navigation system.

3.6 TELEMATICS APPLICATIONS

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

3.6.1 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 call is sent to an OEM's customer call center. ACU6 does not support 911 emergency calls.

Should the vehicle's power feed be compromised the TCU has its own backup battery in order to self-sustain the emergency call process.

3.6.2 Manual emergency call

It is also possible to manually start an emergency call to a customer call center by pressing a button.

3.6.3 Theft warning

The call center and the car owner are contacted with a data message if the car alarm indicates the car is being stolen. The ACU6 is connected to the cloud and can detect tampering such as towing or power manipulation. The ACU6 will then engage theft notification and enter alert mode.

3.6.4 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.



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Tracking updates of the vehicle can be adjusted depending on power usage. ACU6 is complying with the Thatcham S5 classification.

3.6.5 Remote vehicle immobilization

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

3.6.6 Remote door unlock

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

4 INSTALLATION AND MAINTENANCE

4.1 INSTALLATION

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

4.2 CABLE HARNESS

Wire insulation and tubing in cable harness shall comply with IEC 60332-1-2, IEC 60332-1-3, IEC 60332-2-2 or IEC/TS 60695-11-21.

4.3 SAFETY DISTANCE

Minimum safety distance for the device and the internal transmitting antennas is 22 cm.

Minimum safety distance for external antennas is 23 cm.

4.4 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.

5 REGULATORY CERTIFICATIONS

5.1 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.

5.1.1 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 23 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

5.1.2 OEM Requirements

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

Type Approval USA

FCC ID: 2AGKK103360002

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.

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.

5.2 CANADA (ISED)

5.2.1 ISED Warnings and Notices

This device is compliant with the Radio-Electrical Standards for Radio Devices for Canadian Industry exempt from license. Operation is permitted under the following two conditions: (1) the device shall not produce any interference, and (2) the user of the device must accept any received radio-electrical interference, even if the interference is likely to compromise its operation.

This radio transmitter 20839-103360002 has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this 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.

Le présent émetteur radio 20839-103360002 a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

Technology	Type	Max. gain	Imedance
Cellular LTE1	Calearo 7680588	3,2 dBi	50 ohm
WLAN	Calearo 7750162	3,0 dBi	50 ohm

5.2.2 OEM Requirements

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

Type Approval Canada

IC: 20839-103360002

This device contains license-exempt transmitters/receivers that comply with Innovation, Science and Economic Development Canada's licence-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.

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:



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