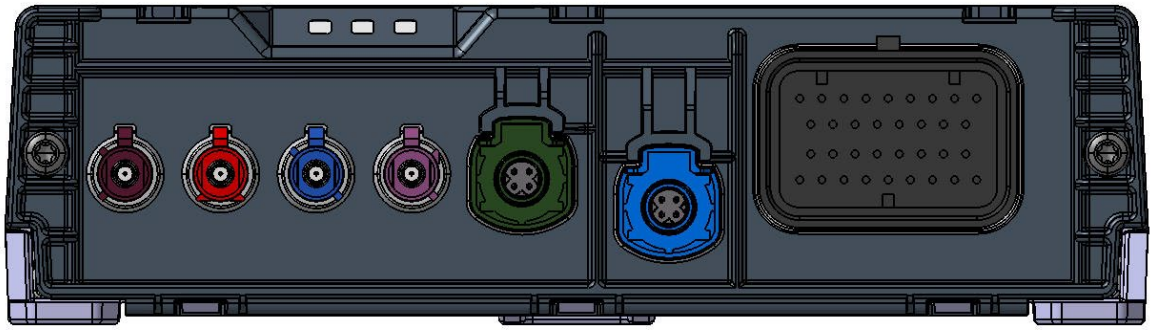
Project/Product/Process	Author	Project & doc ID / Product Id	Pages	Publish Date
Choose an item.	Salah Alazawi	0000-0000	12	2022-06-01
Title	*Distribution*	*Document Class*	*Template Rev*	*Revision & Status*
ACU6 Off Highway User Manual - 104760201	ACTIA Group	U - Uncontrolled	1.2	1.5 Released

ACU6 Off Highway User Manual - 104760201



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Revision history

Revi-sion	Date	Author(s)	Cause of changes	Updates
1.0	2020-08-10	S. Alazawi		First version - Draft
1.1	2023-04-18	S. Alazawi		Updated WLAN channels and WLAN gain
1.2	2023-04-24	S. Alazawi		Updated WLAN 2.4Ghz max power
1.3	2023-04-27	S. Alazawi		WLAN power correction
1.4	2023-05-29	S. Alazawi		LTE TDD B40 removed
1.5	2023-06-21	S. Alazawi		Corrected operating voltage

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1 PRODUCT DESCRIPTION

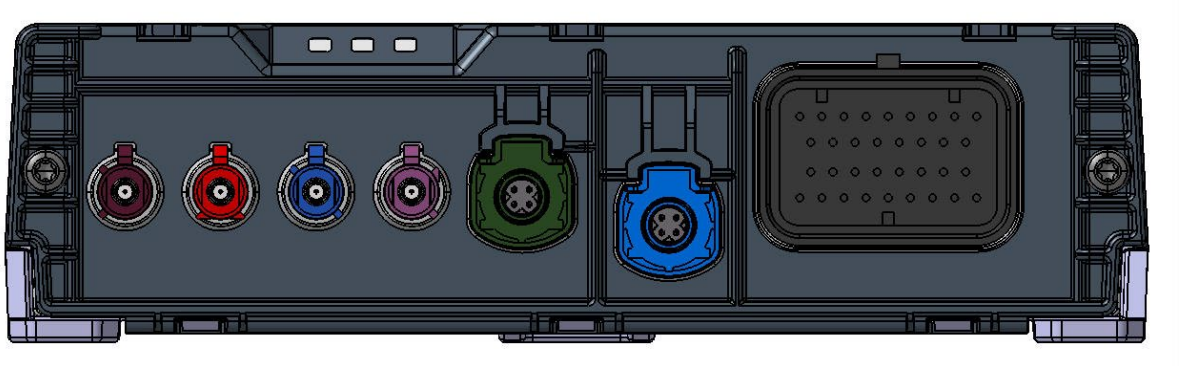
1.1 GENERAL

104760201 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.

104760201 has WLAN functionality and can act as both access point and station.

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 CONNECTORS



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. HSD connector — Ethernet and USB (NOT IN USED)
7. 34-pin TE AMP — Main connector

1.3 SIM

104760201 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 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: 7,5V – 60,0V. Nominal 12V, 24V, 48V

1.4.2 Backup battery

104760201 can also be operated without external power source using an internal rechargeable battery pack. In this mode some functionality is disabled.

1.5 TEMPERATURE RANGE

Operating temperature range: -40 to +70 C.

2 RF DESCRIPTION

2.1 GENERAL

104760201 supports different radio technologies:

- Cellular
- WLAN 2.4GHz and 5Ghz
- 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

104760201 Off Highway uses an embedded CAT 4 LTE modem.

Both internal or external cellular antennas can be used.

2.2.1 Bands and output power

Technology	Bands	Max. ouput power
GSM/GPRS/EDGE	850/900/1800/1900	Class 4 (+33dBm ±2dB) EGSM850 & EGSM900 Class 1 (+30dBm ±2dB) for GSM1800 & GSM1900 Class E2 (+27dBm ± 3dB) for GSM 850 / GSM 900 8-PSK Class E2 (+26dBm +3 /-4dB) for GSM 1800 & GSM 1900 8-PSK
WCDMA/HSPA	I (2100), II (1900), III (1700), IV (2100), V (850), VI (850), VIII (900), XIX (850)	Class 3 (+24dBm +1/-3dB)
LTE FDD	Bd1 (2100), Bd2 (1900), Bd3 (1800), Bd4 (2100), Bd5 (850), Bd7 (2600), Bd8 (900), Bd12 (70), Bd 13 (700), Bd18 (900), Bd19 (800), Bd 20 (800), Bd26 (850), Bd 28 (700), Bd66 (2100)	Class 3 (+23dBm ±2dB)
LTE TDD	Bd38 (2600), Bd41 (2600) *Bd41 not used in Europe, USA, Canada	Class 3 (+23dBm ±2dB)

2.3 WLAN

104760201 supports WLAN 802.11b/g/n/ac on 2.4Ghz and 5Ghz.

Both on 2.4GHz & 5GHz 104760201 can act as Access Point (AP) or Station (STA).

Dual band simultaneous (DBS) operation is supported.

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

2.3.1 2.4GHz

104760201 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	14 dBm	13 dBm

2.3.2 5GHz

104760201 can act as Access Point (AP) or Station (STA) 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	14 dBm	14 dBm
40	14 dBm	14 dBm
44	14 dBm	14 dBm
48	14 dBm	14 dBm
149	14 dBm	14 dBm
153	14 dBm	14 dBm
157	14 dBm	14 dBm
161	14 dBm	14 dBm
165	14 dBm	14 dBm

2.3.2.2 40 MHz bandwidth

Channel	Max. power set with external antenna	Max. power set with internal antenna
38	14 dBm	14 dBm
46	14 dBm	14 dBm
151	14 dBm	14 dBm
159	14 dBm	14 dBm

2.3.2.3 80 MHz bandwidth

Channel	Max. power set with external antenna	Max. power set with internal antenna
42	14 dBm	14 dBm
155	14 dBm	14 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

104760201 has a CAN interface for connection to CAN buss vehicles. CAN data can be sent and received.

3.2 WLAN STATION

The unit ca 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

104760201 can act as a WLAN access point for passengers in the vehicle. User interface needs to be implemented in an external unit, e.g., in a head unit with display.

3.4 DATA GATEWAY

104760201 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.

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 20 cm.

Minimum safety distance for external antennas is 20 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: 2AGKK104760201

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 20839-104760201has 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.

5.2.2 OEM Requirements

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

Type Approval Canada
IC: 20839-104760201

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:
(1) l'appareil ne doit pas produire de brouillage, et
(2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.