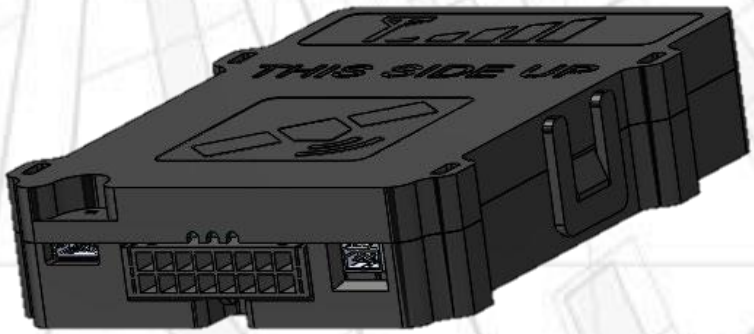
LX41-NA

GNSS VEHICLE TRACKER



User manual

Version LX41-NA

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Contents

1. LX41-NA general device information

1.1. Safety and legal information

Do not disassemble the device.

May interfere operation of adjacent electronic devices.

Device may be damaged by water and high humidity.

Installed by qualified professionals only.

1.2. Description

LX41-NA is a device with GNSS and Cellular connectivity, designed for object tracking. It is able to acquire information on object location, speed, direction, etc. and transfer the data via Cellular network. Digital and analog inputs of the device may be used to connect different external sensors/devices. Outputs of the device may be used to control external equipment remotely.

Flexible configuration allows users/dealers to adjust the device to meet their specific requirements. All device settings and firmwares are updated remotely via cellular. It is possible to create setting templates for groups of vehicles, use mass updates and create unique device operation logic, fulfilling requirements of most cases on the market.

1.3. Package

LX41-NA is shipped to a customer in a cardboard box and contains all required components for operation, except a SIM card. Package contents:

1. LX41-NA device (control unit)
2. Wires + fuse

Note. SIM card is not included but is necessary to operate the device. Contact your local Network provider to purchase a SIM card. Xirgo Global recommends an 4FF or MFF2 SIM card for best performance and reliability.

1.4. Technical specifications

Table 1. LX41-NA technical specifications

Device Variant	LX41-NA
General	Physical Peripherals
	1x Input 1x Output
Digital Inputs	1x discrete (frequency, impulse counter, ON/OFF modes)
Voltage threshold	dynamic
Outputs	Open Collector type – temperature protected
OUT1 maximum current	0,5A
Extender connector	3 PIN connector
Maximum current	50 mAh
Voltage options	5V or VCC
Power supply	9 – 31V
Rated voltage	12/24V
Average consumption (at 12V)* *With internal battery	Full active without load on outputs: 100mA Deep sleep: <4mA
Internal memory	8MB / 32MB (optional)
Accelerometer	3 axis digital accelerometer
Operational temperature range	
Internal battery options	210, 850, 1200 mAh
With internal Lithium battery	from -20 to +60C° [Charging starts from 0 C°]
Without internal Lithium battery	from -40 to +85C°
Dimensions	68x90x19mm
Weight	Tracker – 64 g, set – 160 g
Bluetooth	Bluetooth Low Energy
BLE version supported	5.4
Specification	2.4GHz
Data rates	1Mbps, 2Mbps
Transmit Power	TX power -20 to +4dBm in 4dB steps
Cellular and GNSS module	Quectel BG95-M3
RF function	CAT-M1/ EGPRS
Bands/Frequency	GSM/EDGE Bands 2: 1850 – 1910 MHz (TX), 1930 – 1990 MHz (RX) GSM/EDGE Bands 3: 1710 – 1785 MHz (TX), 1805 – 1880 MHz (RX) GSM/EDGE Bands 5: 824 – 849 MHz (TX), 869 – 894 MHz (RX) GSM/EDGE Bands 8: 880 – 915 MHz (TX), 925 – 960 MHz (RX) LTE BANDS 2: 1850 – 1910 MHz (TX), 1930 – 1990 MHz (RX) LTE BANDS 4: 1710 – 1755 MHz (TX), 2110 – 2155 MHz (RX) LTE BANDS 12: 699 – 716 MHz (TX), 729 – 746 MHz (RX) LTE BANDS 13: 777 – 787 MHz (TX), 746 – 756 MHz (RX) LTE BANDS 66: 1710 – 1780 MHz (TX), 2110 – 2180 MHz (RX)
Transmitting power	Class 5(21dBm+1.7/-3dB) for LTE-FDD Bands Class 1(33dBm±2dB) for GSM850/EGSM900 Class 1(30dBm±2dB) for DCS1800/PCS1900
Cellular antenna	PCB Antenna

GNSS	GPS BeiDou (optional) Galileo (optional) QZSS (optional) SBAS (optional)
GNSS antenna	SMD patch antenna
GNSS antenna gain	GPS：-0.14 dBi typ
GNSS sensitivity	Cold start: -148dBm Reacquisition: -160dBm Tracking: -159dBm

1.5. Physical properties

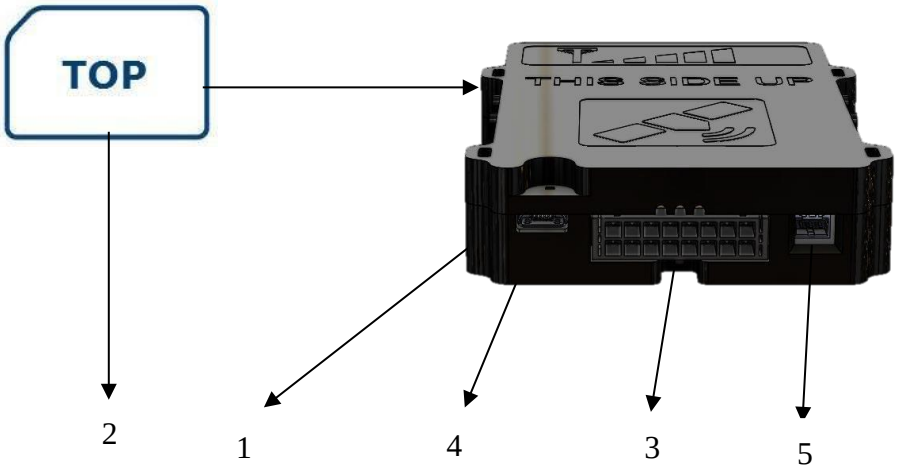


Fig. 1. LX41-NA front view.

Note. To insert a SIM card, open the box by lifting plastic holders from both sides.

Table 2. LX41-NA components.

No.	Short description
1	LED indicator
2	SIM card
3	Socket 4 pins
4	USB interface
5	Extender connector

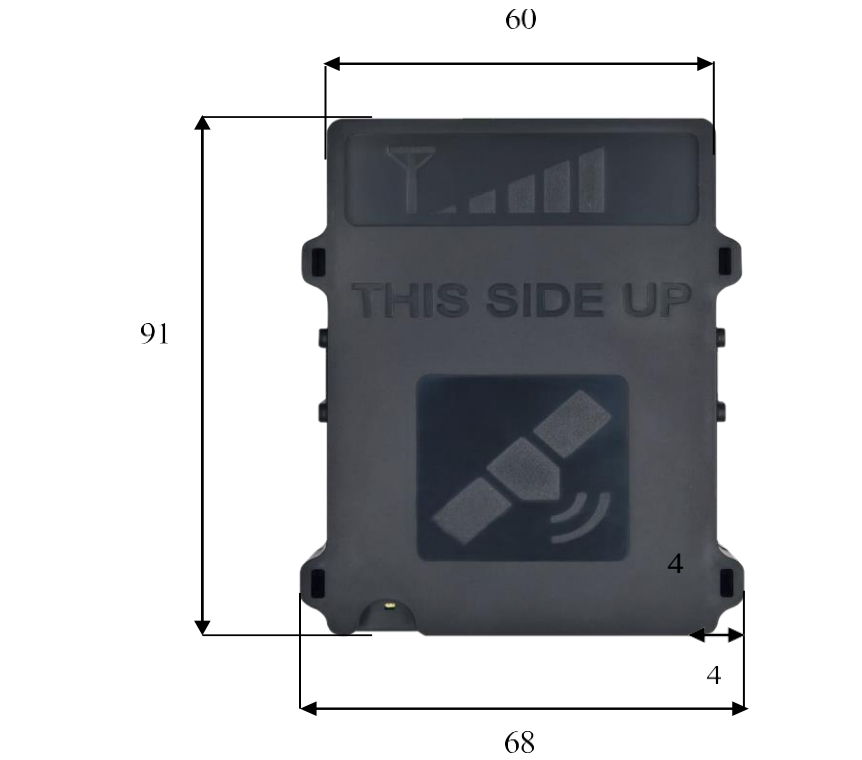
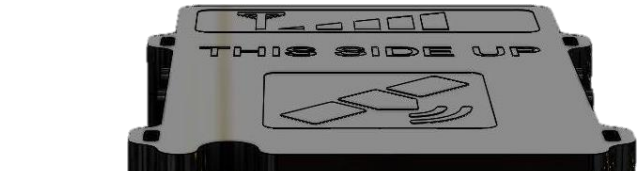


Fig. 2. LX41-NA dimensions, mm

1.6. Pinout & diagnostic LED

1.6.1. Pinout



OUT1 Green	IN5 Blue	GND Black	Battery+ Red

Fig. 3. LX41-NA pinout and cable colors.

1.6.2. Diagnostic LED

LX41-NA has an indication LED – for GNSS, Cellular modem and CAN line status. LED starts flashing only if IN5 digital input is connected to battery +.

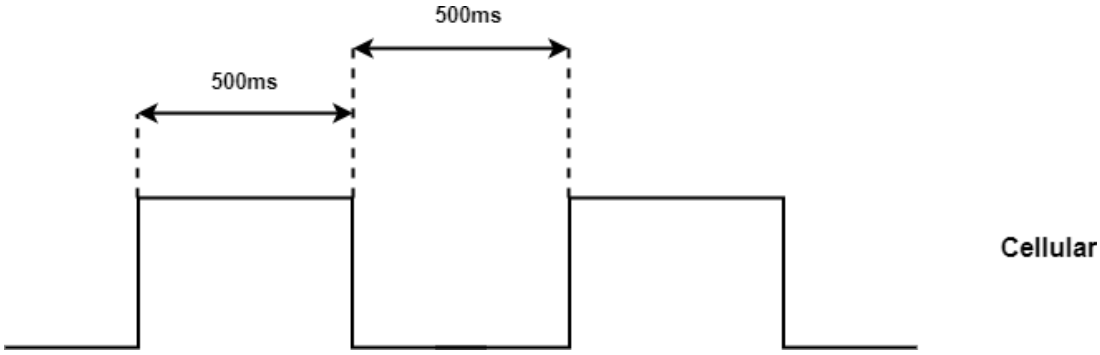


Fig 4. Cellular signal flashing example

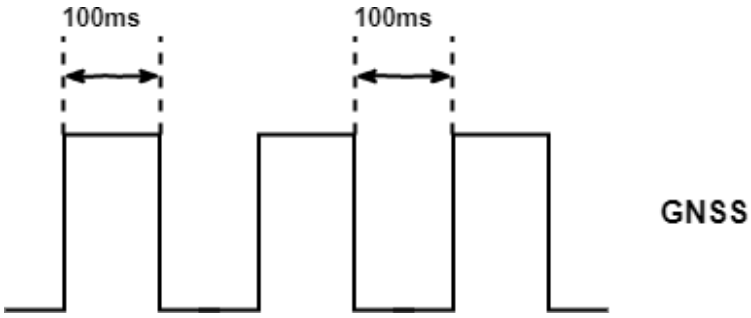


Fig 5. GNSS signal flashing example

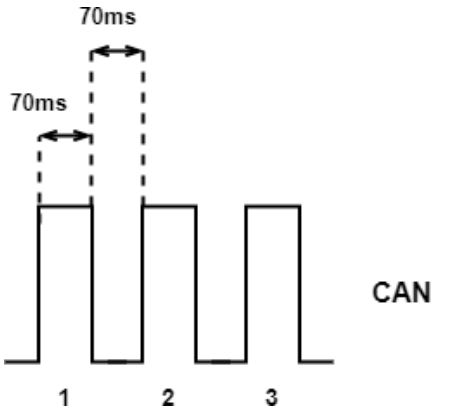


Fig 6. CAN signal flashing example

Table 3. CAN status flashing meaning

Flashes count	Meaning
1	Reading CAN1 line
2	Reading CAN2 line
3	Reading CAN1 & CAN2 lines

Table 4. GNSS status flashing meaning

Flashes count	Meaning
1	No GNSS signal
2	Poor precision. HDOP>1.5
3	3 satellites locked. HDOP<1.5
…	…
12	12 satellites locked. HDOP<1.5

Table 5. Cellular modem status flashing meaning

Flashes count	Meaning
1	Modem connected to server, Modem connected to Internet, Modem GPRS registered, Modem GSM registered, Modem SIM card ok, Modem turned on
2	Modem connected to Internet, Modem GPRS registered, Modem GSM registered, Modem SIM card ok, Modem turned on
3	Modem GPRS registered, Modem GSM registered, Modem SIM card ok, Modem turned on
4	Modem GSM registered, Modem SIM card ok, Modem turned on
5	Modem SIM card ok, Modem turned on
6	Modem turned on
7	Device started

1.7. Installation

LX41-NA is installed where risk of mechanical damage, high humidity and extreme heat is low. Device is mounted stable to vehicle body, therefore ensuring correct operation of the internal accelerometer. Complete installation manual is available as Annex 1.

1.8. Configuration

LX41-NA is to be configured via a configuration server, where dealers/users can adjust operation of their devices to fulfill specific requirements.

1.9. Update

LX41- NA firmware and configuration can be updated both via over-the-air through the configuration server or via the micro-USB interface.

1.9.1. Uploading files to device

Instructions on how to perform local Firmware or configuration upload to the device:

Step 1: Using a USB – micro-USB cable connect device to a computer.
Note: The device must be disconnected from any power source (internal battery also).

Step 2: A new flash drive will appear. In some cases, you might need to format the flash, before uploading the file.

Step 3: Copy/paste the configuration file or the firmware file to the flash drive.

Step 4: Disconnect the USB cable and power up the device. It should take a couple of seconds for the device to boot up and flash the new settings or FW.

1.10. Support

LX41-NA is built to be a reliable, stable and easy to install device. Please read and follow provided installation and operating instructions carefully. However, if you encounter difficulties while installing or using this product, technical support is available and may be reached by e-mail supportxg@sensata.com.

2. Annex 1. Installation instructions

General

Central unit is only mounted in inside of the vehicle, it can not be installed in the engine chamber, next to the cabin, or in the area of exposure to direct external conditions. Central unit should be protected from moisture exposure. Device must be fastened in a stable position to avoid random twitches and displacements (suspension on cables is strictly prohibited). Central unit must be mounted horizontally. Precise orientation is of particular importance to flawless operation of the system, since the device is equipped with acceleration sensors recording the data which directly affects the results obtained.

List of suitable vehicles

LX41-NA is intended for internal combustion engines, hybrid and electric engines, where power supply specifications are met. Device must be connected to the vehicle battery (12/24V), ensuring constant power supply even if the engine is not working and ignition is off.

Basic instructions before beginning the installation

Quality of connections, location of the device, etc. play a significant role on accurate operation of the system. Below are some tips and rules for correct installation to attain professional quality and ensure maximum efficiency of the device.

Mechanical connections

To highest possible extent, cavities in the vehicle should be used for wiring. If you need to make a new hole, it must be protected against corrosion appropriately!

Wiring connection must be made by brazing, and not merely mechanical wire connection. It is especially important to protect the connections with insulation for high-resistance atmospheric conditions. Do not use insulation with unknown resistance parameters.

Efforts should be made to tie the new wiring into the car's standard wiring bales.

Installation of central unit

Steps to install central unit:

2.1. Open the housing by gently lifting the plastic holders on each side and remove the PCB from it.

2.1.1. Use thin screwdriver to lift the enclosure holders as alternative to open them without breaking it.

2.2. Locate the SIM holder and following the printed picture on the PCB insert the SIM card.

2.3. Place the PCB to the housing and close it.

2.4. Use plastic fastening straps to fix device in a stable position (units housing has four holes, for straps to go through and fasten them to the body of the vehicle).

2.5. Connect power supply;

2.6. Connect ignition wire to a digital input (usually IN5);

2.7. Connect array;

2.8. Connect other devices (optional).

Tools/equipment necessary for the installation:

1. Pliers
2. Stripping pliers
3. Screwdriver
4. Multimeter (tester)
5. Fastening straps
6. Isolation tape

SIM card

SIM card must be inserted into the device before starting installation. The device must be turned off when inserting SIM card. Before inserting the SIM card, make sure you have all network services activated, the card's PIN code must be disabled.

If the vehicle is travelling to foreign countries, roaming service must be activated for the SIM card. The SIM card and phone number must be checked and clearly marked on the installation certificate of the device.

IMPORTANT! *Before inserting a SIM card, do not forget to disable PIN code. Otherwise, the device will not work, and the SIM card will be blocked.*

GNSS antenna

GNSS antenna is the main element responsible for vehicle positioning accuracy and quality. LX41-NA units are equipped with internal GNSS antennas. To ensure best possible signal reception and evaluating GNSS signal character, there are strict requirements for correct installation of the tracking unit:

- The accordingly marked side of the device must be invariably directed to the sky. The device must be oriented horizontally (not at an angle) and oriented with the corresponding side towards the top.
- The device should not be covered with metal sheet or reinforced glass. In vehicles with standard glass (e.g., without built-in heating elements).
- Fixing of the device must be stable and immobile, providing for the installation durability. It is necessary to take into account events, which may lead to loss of device stability, to select the mounting location and methods that would allow to avoid these factors.

Cellular antenna

Cellular antenna is responsible for transfer of collected data and connection with central server. Good antenna's performance is the key element in obtaining information from the device. LX41-NA series trackers are equipped with internal Cellular antennas.

Cellular antenna does not require orientation to open sky; however you should be aware that metal elements weaken the cellular signal. It is also necessary to take into account the emission of the antenna's high frequency radio waves, which may interfere with operation of electronic devices.

3. REGULATORY STATEMENTS

FCC:

This equipment with FCC-ID: GKM-LX45 and IC-ID: 10281A-LX45,

Models: LX41-NA, LT41-NA, LX42-NA, LT42-NA, LX43-NA, LT43-NA, LX44-NA, LT44-NA, LX45-NA, LT45-NA subject to the Federal Communications Commission (FCC) and Industry Canada (IC)rules.

NOTICE:

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

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,
2. this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications made to this equipment not expressly approved by Xirgo Technologies, LLC may void the FCC authorization to operate this equipment.

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. 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:

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

Radio frequency radiation exposure Information:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 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.

IC:

Antenna Statement

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

License exempt

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

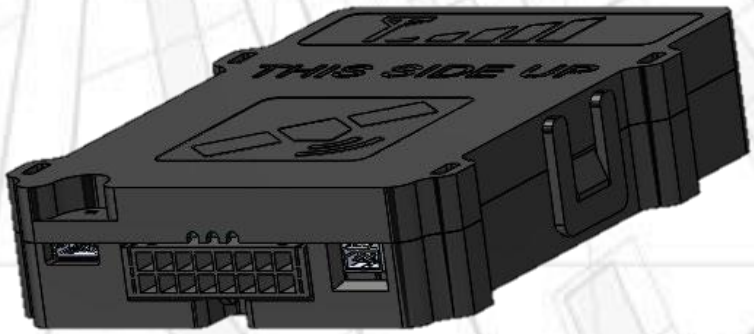
1. this device may not cause interference,
2. this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

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

LX42-NA

GNSS VEHICLE TRACKER



User manual

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1.3. Package

LX42-NA is shipped to a customer in a cardboard box and contains all required components for operation, except a SIM card. Package contents:

1. LX42-NA device (control unit)
2. Wires + fuse

Note. SIM card is not included, but is necessary to operate the device. Contact your local Network provider to purchase a SIM card. Xirgo Global recommends an 4FF or MFF2 SIM card for best performance and reliability.

1.4. Technical specifications

1. Table 1. LX42-NA technical specifications

Device Variant	LX42-NA
General	Physical Peripherals
	1-wire
Digital Inputs	4x discrete (frequency, impulse counter, ON/OFF modes)
Voltage threshold	dynamic
Analog Inputs	3x analogue, 12 bit, 0-31V
Outputs	Open Collector type – temperature protected
OUT1 maximum current	0,5A
OUT2 maximum current	0,5A
Extender connector	3 PIN connector
Maximum current	50 mAh
Voltage options	5V or VCC
Power supply	9 – 31V
Rated voltage	12/24V
Average consumption (at 12V)* *With internal battery	Full active without load on outputs: 100mA Deep sleep: <4mA
Internal memory	8MB / 32MB (optional)
Accelerometer	3 axis digital accelerometer
Operational temperature range	
Internal battery options	210, 850, 1200 mAh
With internal Lithium battery	from -20 to +60C° [Charging starts from 0 C°]
Without internal Lithium battery	from -40 to +85C°
Dimensions	68x90x19mm
Weight	Tracker – 64 g, set – 160 g
Bluetooth	Bluetooth Low Energy
BLE version supported	5.4
Specification	2.4GHz
Data rates	1Mbps, 2Mbps
Transmit Power	TX power -20 to +4dBm in 4dB steps
Cellular and GNSS module	Quectel BG95-M3
RF function	CAT-M1/ EGPRS
Bands/Frequency	GSM/EDGE Bands 2: 1850 – 1910 MHz (TX), 1930 – 1990 MHz (RX) GSM/EDGE Bands 3: 1710 – 1785 MHz (TX), 1805 – 1880 MHz (RX) GSM/EDGE Bands 5: 824 – 849 MHz (TX), 869 – 894 MHz (RX) GSM/EDGE Bands 8: 880 – 915 MHz (TX), 925 – 960 MHz (RX) LTE BANDS 2: 1850 – 1910 MHz (TX), 1930 – 1990 MHz (RX) LTE BANDS 4: 1710 – 1755 MHz (TX), 2110 – 2155 MHz (RX) LTE BANDS 12: 699 – 716 MHz (TX), 729 – 746 MHz (RX) LTE BANDS 13: 777 – 787 MHz (TX), 746 – 756 MHz (RX) LTE BANDS 66: 1710 – 1780 MHz (TX), 2110 – 2180 MHz (RX)
Transmitting power	Class 5(21dBm+1.7/-3dB) for LTE-FDD Bands Class 1(33dBm±2dB) for GSM850/EGSM900 Class 1(30dBm±2dB) for DCS1800/PCS1900
Cellular antenna	PCB Antenna
GNSS	GPS

	BeiDou (optional) Galileo (optional) QZSS (optional) SBAS (optional)
GNSS antenna	SMD patch antenna
GNSS antenna gain	GPS：-0.14 dBi typ.
GNSS sensitivity	Cold start: -148dBm Reacquisition: -160dBm Tracking: -159dBm

1.5. Physical properties

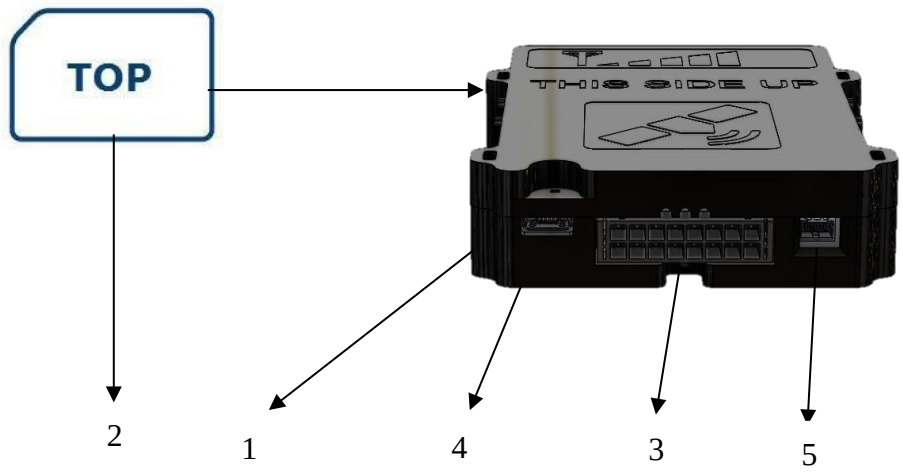


Fig. 1. LX42-NA front view.

Note. To insert a SIM card, open the box by lifting plastic holders from both sides.

Table 2. LX42-NA components.

No.	Short description
1	LED indicator
2	SIM card
3	Socket 2x4 pins
4	USB interface
5	Extender connector

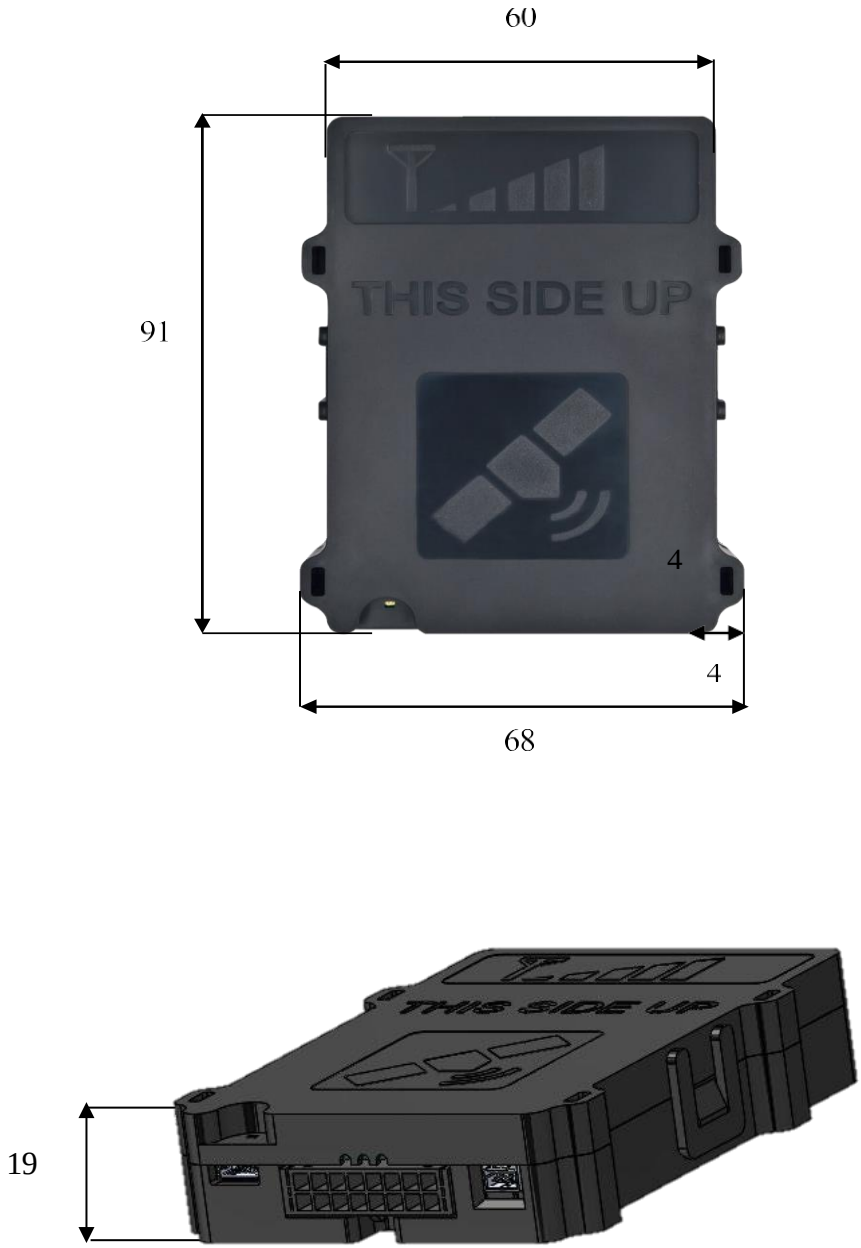
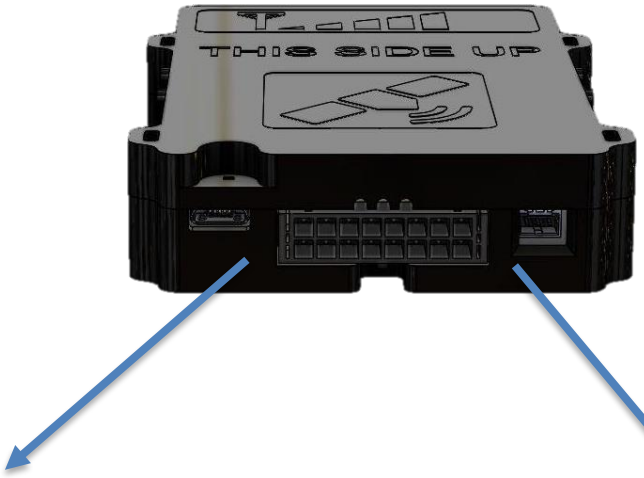


Fig. 2. LX42-NA dimensions, mm

1.6. Pinout & diagnostic LED

1.6.1. Pinout



OUT2 White	IN4/ADC3 Blue/black	GND Black	Battery+ Red
1-WIRE Brown	IN5/ADC5 Grey/black	IN3/OUT1 Purple/black	IN2/ADC4 White/black

Fig. 3. LX42-NA pinout and cable colors.

1.6.2. Diagnostic LED

LX42-NA has an indication LED – for GNSS, Cellular modem and CAN line status. LED starts flashing only if IN5 digital input is connected to battery +.

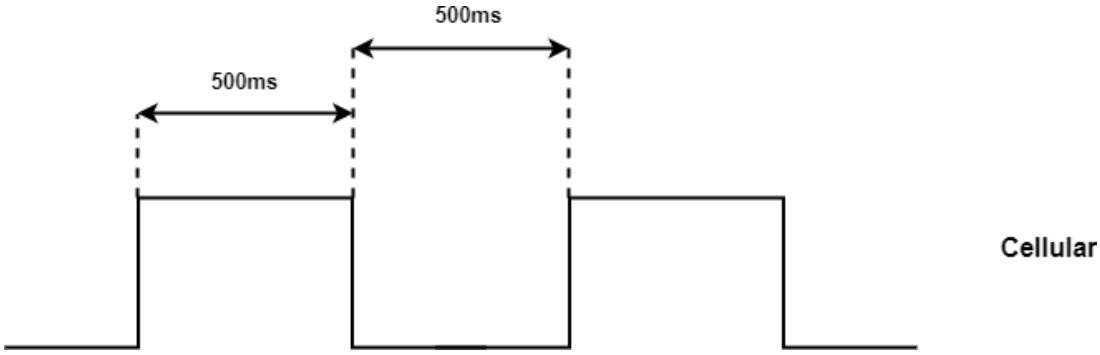


Fig 4. Cellular signal flashing example

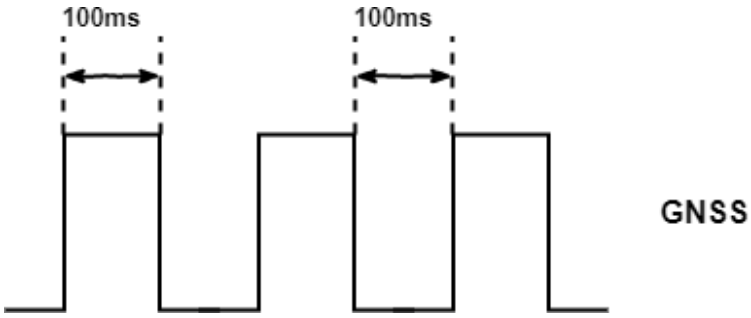


Fig 5. GNSS signal flashing example

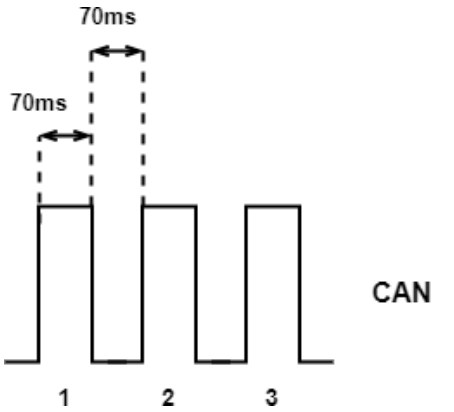


Fig 6. CAN signal flashing example

Table 3. CAN status flashing meaning

Flashes count	Meaning
1	Reading CAN1 line
2	Reading CAN2 line
3	Reading CAN1 & CAN2 lines

Table 4. GNSS status flashing meaning

Flashes count	Meaning
1	No GNSS signal
2	Poor precision. HDOP>1.5
3	3 satellites locked. HDOP<1.5
…	…
12	12 satellites locked. HDOP<1.5

Table 5. Cellular modem status flashing meaning

Flashes count	Meaning
1	Modem connected to server, Modem connected to Internet, Modem GPRS registered, Modem GSM registered, Modem SIM card ok, Modem turned on
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6	Modem turned on
7	Device started

1.7. Installation

LX42-NA is installed where risk of mechanical damage, high humidity and extreme heat is low. Device is mounted stable to vehicle body, therefore ensuring correct operation of the internal accelerometer. Complete installation manual is available as Annex 1.

1.8. Configuration

LX42-NA is to be configured via a configuration server, where dealers/users can adjust operation of their devices to fulfill specific requirements.

1.9. Update

LX42-NA firmware and configuration can be updated both via over-the-air through the configuration server or via the micro-USB interface.

1.9.1. Uploading files to device

Instructions on how to perform local Firmware or configuration upload to the device:

Step 1: Using a USB – micro-USB cable connect device to a computer.
Note: The device must be disconnected from any power source (internal battery also).

Step 2: A new flash drive will appear. In some cases, you might need to format the flash, before uploading the file.

Step 3: Copy/paste the configuration file or the firmware file to the flash drive.

Step 4: Disconnect the USB cable and power up the device. It should take a couple of seconds for the device to boot up and flash the new settings or FW.

1.10. Support

LX42-NA is built to be a reliable, stable and easy to install device. Please read and follow provided installation and operating instructions carefully. However, if you encounter difficulties while installing or using this product, technical support is available and may be reached by e-mail supportxg@sensata.com.

2. Annex 1. Installation instructions

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Quality of connections, location of the device, etc. play a significant role on accurate operation of the system. Below are some tips and rules for correct installation to attain professional quality and ensure maximum efficiency of the device.

Mechanical connections

To highest possible extent, cavities in the vehicle should be used for wiring. If you need to make a new hole, it must be protected against corrosion appropriately!

Wiring connection must be made by brazing, and not merely mechanical wire connection. It is especially important to protect the connections with insulation for high-resistance atmospheric conditions. Do not use insulation with unknown resistance parameters.

Efforts should be made to tie the new wiring into the car's standard wiring bales.

Installation of central unit

Steps to install central unit:

2.1. Open the housing by gently lifting the plastic holders on each side and remove the PCB from it.

2.1.1. Use thin screwdriver to lift the enclosure holders as alternative to open them without breaking it.

2.2. Locate the SIM holder and following the printed picture on the PCB insert the SIM card.

2.3. Place the PCB to the housing and close it.

2.4. Use plastic fastening straps to fix device in a stable position (units housing has four holes, for straps to go through and fasten them to the body of the vehicle).

2.5. Connect power supply;

2.6. Connect ignition wire to a digital input (usually IN5);

2.7. Connect array;

2.8. Connect other devices (optional).

Tools/equipment necessary for the installation:

1. Pliers
2. Stripping pliers
3. Screwdriver
4. Multimeter (tester)
5. Fastening straps
6. Isolation tape

SIM card

SIM card must be inserted into the device before starting installation. The device must be turned off when inserting SIM card. Before inserting the SIM card, make sure you have all network services activated, the card's PIN code must be disabled.

If the vehicle is travelling to foreign countries, roaming service must be activated for the SIM card. The SIM card and phone number must be checked and clearly marked on the installation certificate of the device.

IMPORTANT! *Before inserting a SIM card, do not forget to disable PIN code. Otherwise, the device will not work, and the SIM card will be blocked.*

GNSS antenna

GNSS antenna is the main element responsible for vehicle positioning accuracy and quality. LT42-EA units are equipped with internal GNSS antennas. To ensure best possible signal reception and evaluating GNSS signal character, there are strict requirements for correct installation of the tracking unit:

- The accordingly marked side of the device must be invariably directed to the sky. The device must be oriented horizontally (not at an angle) and oriented with the corresponding side towards the top.
- The device should not be covered with metal sheet or reinforced glass. In vehicles with standard glass (e.g., without built-in heating elements).
- Fixing of the device must be stable and immobile, providing for the installation durability. It is necessary to take into account events, which may lead to loss of device stability, to select the mounting location and methods that would allow to avoid these factors.

Cellular antenna

Cellular antenna is responsible for transfer of collected data and connection with central server. Good antenna's performance is the key element in obtaining information from the device. LX42-NA series trackers are equipped with internal Cellular antennas.

Cellular antenna does not require orientation to open sky; however you should be aware that metal elements weaken the cellular signal. It is also necessary to take into account the emission of the antenna's high frequency radio waves, which may interfere with operation of electronic devices.

3. REGULATORY STATEMENTS

FCC:

This equipment with FCC-ID: GKM-LX45 and IC-ID: 10281A-LX45,

Models: LX41-NA, LT41-NA, LX42-NA, LT42-NA, LX43-NA, LT43-NA, LX44-NA, LT44-NA, LX45-NA, LT45-NA subject to the Federal Communications Commission (FCC) and Industry Canada (IC)rules.

NOTICE:

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

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,
2. this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications made to this equipment not expressly approved by Xirgo Technologies, LLC may void the FCC authorization to operate this equipment.

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. 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:

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

Radio frequency radiation exposure Information:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 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.

IC :

Antenna Statement

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

License exempt

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

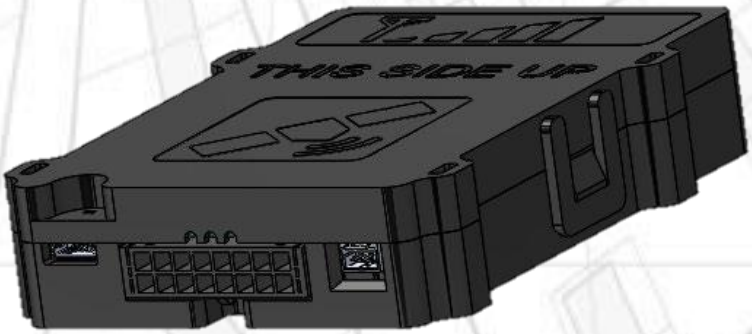
1. this device may not cause interference,
2. this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

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

LX43-NA

GNSS VEHICLE TRACKER



User manual

Version LX43-NA

XIRGO GLOBAL
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www.xirgoglobal.com

Contents

1. LX43-NA general device information

1.1. Safety and legal information

Do not disassemble the device.

May interfere operation of adjacent electronic devices.

Device may be damaged by water and high humidity.

Installed by qualified professionals only.

1.2. Description

LX43-NA is a device with GNSS and Cellular connectivity, designed for object tracking. It is able to acquire information on object location, speed, direction, etc. and transfer the data via Cellular network. Digital and analog inputs of the device may be used to connect different external sensors/devices. Outputs of the device may be used to control external equipment remotely.

Flexible configuration allows users/dealers to adjust the device to meet their specific requirements. All device settings and firmwares are updated remotely via cellular. It is possible to create setting templates for groups of vehicles, use mass updates and create unique device operation logic, fulfilling requirements of most cases on the market.

1.3. Package

LX43-NA is shipped to a customer in a cardboard box and contains all required components for operation, except a SIM card. Package contents:

1. LX43-NA device (control unit)
2. Wires + fuse

Note. SIM card is not included, but is necessary to operate the device. Contact your local Network provider to purchase a SIM card. Xirgo Global recommends an 4FF or MFF2 SIM card for best performance and reliability.

1.4. Technical specifications

Table 1. LX43-NA technical specifications

Device Variant	LX43-NA
General	Physical Peripherals
	1-Wire RS-232 EIA-485 / J1708
Digital Inputs	4x discrete (frequency, impulse counter, ON/OFF modes)
Voltage threshold	dynamic
Analog Inputs	3x analogue, 12 bit, 0-31V
Outputs	Open Collector type – temperature protected
OUT1 maximum current	0,5A
OUT2 maximum current	0,5A
OUT3 maximum current	0,5A
OUT4 maximum current	0,5A
Extender connector	3 PIN connector
Maximum current	50 mAh
Voltage options	5V or VCC
Power supply	9 – 31V
Rated voltage	12/24V
Average consumption (at 12V)* *With internal battery	Full active without load on outputs: 100mA Deep sleep: <4mA
Internal memory	8MB / 32MB (optional)
Accelerometer	3 axis digital accelerometer
Operational temperature range	
Internal battery options	210, 850, 1200 mAh
With internal Lithium battery	from -20 to +60C° [Charging starts from 0 C°]
Without internal Lithium battery	from -40 to +85C°
Dimensions	68x90x19mm
Weight	Tracker – 64 g, set – 160 g
Bluetooth	Bluetooth Low Energy
BLE version supported	5.4
Specification	2.4GHz
Data rates	1Mbps, 2Mbps
Transmit Power	TX power -20 to +4dBm in 4dB steps
Cellular and GNSS module	Quectel BG95-M3
RF function	CAT-M1/ EGPRS
Bands/Frequency	GSM/EDGE Bands 2: 1850 – 1910 MHz (TX), 1930 – 1990 MHz (RX) GSM/EDGE Bands 3: 1710 – 1785 MHz (TX), 1805 – 1880 MHz (RX) GSM/EDGE Bands 5: 824 – 849 MHz (TX), 869 – 894 MHz (RX) GSM/EDGE Bands 8: 880 – 915 MHz (TX), 925 – 960 MHz (RX) LTE BANDS 2: 1850 – 1910 MHz (TX), 1930 – 1990 MHz (RX) LTE BANDS 4: 1710 – 1755 MHz (TX), 2110 – 2155 MHz (RX) LTE BANDS 12: 699 – 716 MHz (TX), 729 – 746 MHz (RX) LTE BANDS 13: 777 – 787 MHz (TX), 746 – 756 MHz (RX)

	LTE BANDS 66: 1710 – 1780 MHz (TX), 2110 – 2180 MHz (RX)
Transmitting power	Class 5(21dBm+1.7/-3dB) for LTE-FDD Bands Class 1(33dBm±2dB) for GSM850/EGSM900 Class 1(30dBm±2dB) for DCS1800/PCS1900
Cellular antenna	PCB Antenna
GNSS	GPS BeiDou (optional) Galileo (optional) QZSS (optional) SBAS (optional)
GNSS antenna	SMD patch antenna
GNSS antenna gain	GPS：-0.14 dBi typ.
GNSS sensitivity	Cold start: -148dBm Reacquisition: -160dBm Tracking: -159dBm

1.5. Physical properties

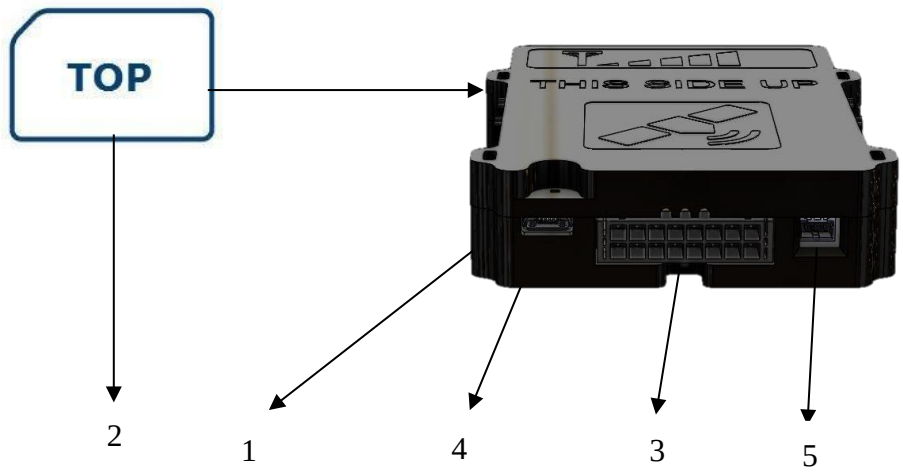


Fig. 1. LX43-NA front view.

Note. To insert a SIM card, open the box by lifting plastic holders from both sides.

Table 2. LX43-NA components.

No.	Short description
1	LED indicator
2	SIM card
3	Socket 2x8 pins
4	USB interface
5	Extender connector

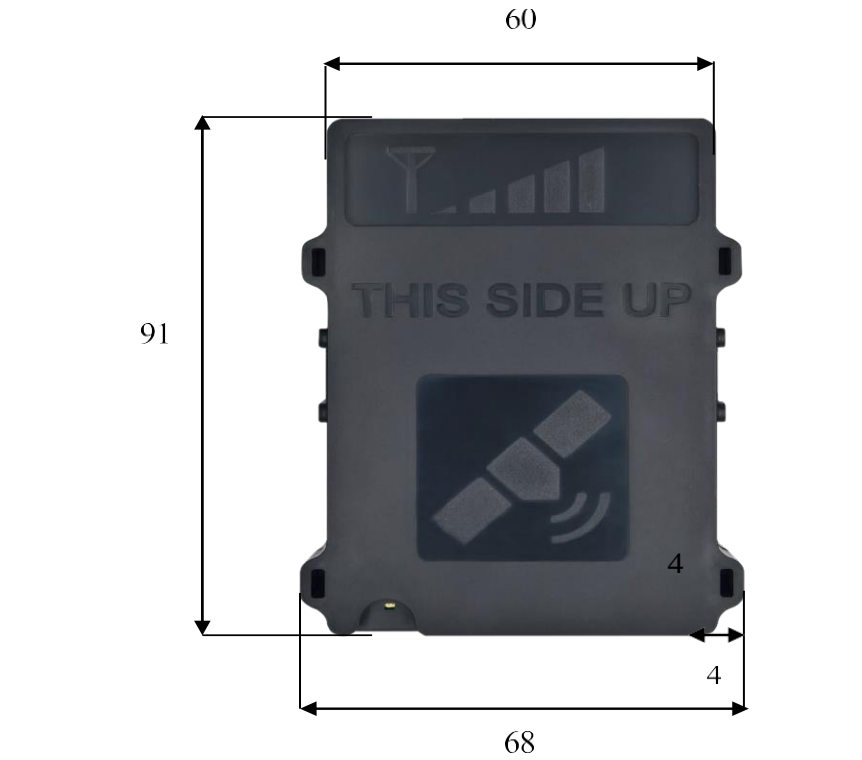


Fig. 2. LX43-NA dimensions, mm

1.6. Pinout & diagnostic LED

1.6.1. Pinout

ADC5 Orange	OUT1 Orange/black	OUT2 White	IN4 Blue/black	GND Black	Battery+ Red	RS232(TX) Purple	RS232(RX) Blue
OUT3 Yellow	ADC3 Yellow/black	1-WIRE Brown	IN5 Grey/black	IN3 Purple/black	IN2/ADC4 White/black	EIA-485 B Green	EIA-485 A Green/black

Fig. 3. LX43-NA pinout and cable colors.

1.6.2. Diagnostic LED

LX43-NA has an indication LED – for GNSS, Cellular modem and CAN line status. LED starts flashing only if IN5 digital input is connected to battery +.

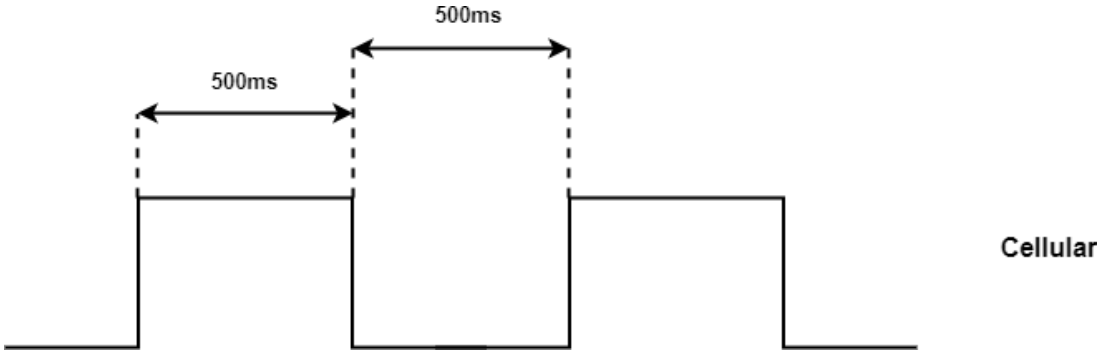


Fig 4. Cellular signal flashing example

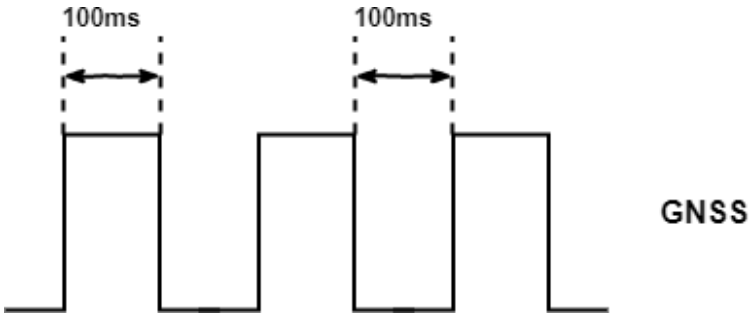


Fig 5. GNSS signal flashing example

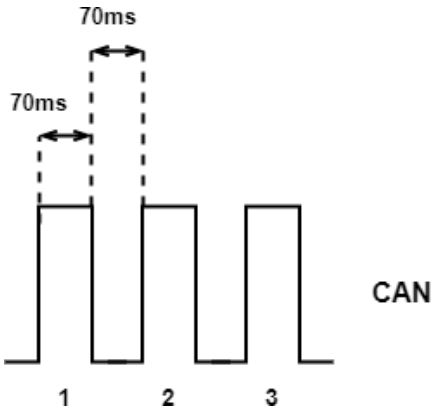


Fig 6. CAN signal flashing example

Table 3. CAN status flashing meaning

Flashes count	Meaning
1	Reading CAN1 line
2	Reading CAN2 line
3	Reading CAN1 & CAN2 lines

Table 4. GNSS status flashing meaning

Flashes count	Meaning
1	No GNSS signal
2	Poor precision. HDOP>1.5
3	3 satellites locked. HDOP<1.5
…	…
12	12 satellites locked. HDOP<1.5

Table 5. Cellular modem status flashing meaning

Flashes count	Meaning
1	Modem connected to server, Modem connected to Internet, Modem GPRS registered, Modem GSM registered, Modem SIM card ok, Modem turned on
2	Modem connected to Internet, Modem GPRS registered, Modem GSM registered, Modem SIM card ok, Modem turned on
3	Modem GPRS registered, Modem GSM registered, Modem SIM card ok, Modem turned on
4	Modem GSM registered, Modem SIM card ok, Modem turned on
5	Modem SIM card ok, Modem turned on
6	Modem turned on
7	Device started

1.7. Installation

LX43-NA is installed where risk of mechanical damage, high humidity and extreme heat is low. Device is mounted stable to vehicle body, therefore ensuring correct operation of the internal accelerometer. Complete installation manual is available as Annex 1.

1.8. Configuration

LX43-NA is to be configured via a configuration server, where dealers/users can adjust operation of their devices to fulfill specific requirements.

1.9. Update

LX43-NA firmware and configuration can be updated both via over-the-air through the configuration server or via the micro-USB interface.

1.9.1. Uploading files to device

Instructions on how to perform local Firmware or configuration upload to the device:

Step 1: Using a USB – micro-USB cable connect device to a computer.
Note: The device must be disconnected from any power source (internal battery also).

Step 2: A new flash drive will appear. In some cases, you might need to format the flash, before uploading the file.

Step 3: Copy/paste the configuration file or the firmware file to the flash drive.

Step 4: Disconnect the USB cable and power up the device. It should take a couple of seconds for the device to boot up and flash the new settings or FW.

1.10. Support

LX43-NA is built to be a reliable, stable and easy to install device. Please read and follow provided installation and operating instructions carefully. However, if you encounter difficulties while installing or using this product, technical support is available and may be reached by e-mail supportxg@sensata.com.

2. Annex 1. Installation instructions

General

Central unit is only mounted in inside of the vehicle, it can not be installed in the engine chamber, next to the cabin, or in the area of exposure to direct external conditions. Central unit should be protected from moisture exposure. Device must be fastened in a stable position to avoid random twitches and displacements (suspension on cables is strictly prohibited). Central unit must be mounted horizontally. Precise orientation is of particular importance to flawless operation of the system, since the device is equipped with acceleration sensors recording the data which directly affects the results obtained.

List of suitable vehicles

LX43-NA is intended for internal combustion engines, hybrid and electric engines, where power supply specifications are met. Device must be connected to the vehicle battery (12/24V), ensuring constant power supply even if the engine is not working and ignition is off.

Basic instructions before beginning the installation

Quality of connections, location of the device, etc. play a significant role on accurate operation of the system. Below are some tips and rules for correct installation to attain professional quality and ensure maximum efficiency of the device.

Mechanical connections

To highest possible extent, cavities in the vehicle should be used for wiring. If you need to make a new hole, it must be protected against corrosion appropriately!

Wiring connection must be made by brazing, and not merely mechanical wire connection. It is especially important to protect the connections with insulation for high-resistance atmospheric conditions. Do not use insulation with unknown resistance parameters.

Efforts should be made to tie the new wiring into the car's standard wiring bales.

Installation of central unit

Steps to install central unit:

2.1. Open the housing by gently lifting the plastic holders on each side and remove the PCB from it.

2.1.1. Use thin screwdriver to lift the enclosure holders as alternative to open them without breaking it.

2.2. Locate the SIM holder and following the printed picture on the PCB insert the SIM card.

2.3. Place the PCB to the housing and close it.

2.4. Use plastic fastening straps to fix device in a stable position (units housing has four holes, for straps to go through and fasten them to the body of the vehicle).

2.5. Connect power supply;

2.6. Connect ignition wire to a digital input (usually IN5);

2.7. Connect array;

2.8. Connect other devices (optional).

Tools/equipment necessary for the installation:

1. Pliers
2. Stripping pliers
3. Screwdriver
4. Multimeter (tester)
5. Fastening straps
6. Isolation tape

SIM card

SIM card must be inserted into the device before starting installation. The device must be turned off when inserting SIM card. Before inserting the SIM card, make sure you have all network services activated, the card's PIN code must be disabled.

If the vehicle is travelling to foreign countries, roaming service must be activated for the SIM card. The SIM card and phone number must be checked and clearly marked on the installation certificate of the device.

IMPORTANT! *Before inserting a SIM card, do not forget to disable PIN code. Otherwise, the device will not work, and the SIM card will be blocked.*

GNSS antenna

GNSS antenna is the main element responsible for vehicle positioning accuracy and quality. LT43-EA units are equipped with internal GNSS antennas. To ensure best possible signal reception and evaluating GNSS signal character, there are strict requirements for correct installation of the tracking unit:

- The accordingly marked side of the device must be invariably directed to the sky. The device must be oriented horizontally (not at an angle) and oriented with the corresponding side towards the top.
- The device should not be covered with metal sheet or reinforced glass. In vehicles with standard glass (e.g., without built-in heating elements).
- Fixing of the device must be stable and immobile, providing for the installation durability. It is necessary to take into account events, which may lead to loss of device stability, to select the mounting location and methods that would allow to avoid these factors.

Cellular antenna

Cellular antenna is responsible for transfer of collected data and connection with central server. Good antenna's performance is the key element in obtaining information from the device. LX43-NA series trackers are equipped with internal Cellular antennas.

Cellular antenna does not require orientation to open sky; however you should be aware that metal elements weaken the cellular signal. It is also necessary to take into account the emission of the antenna's high frequency radio waves, which may interfere with operation of electronic devices.

3. REGULATORY STATEMENTS

FCC:

This equipment with FCC-ID: GKM-LX45 and IC-ID: 10281A-LX45,

Models: LX41-NA, LT41-NA, LX42-NA, LT42-NA, LX43-NA, LT43-NA, LX44-NA, LT44-NA, LX45-NA, LT45-NA subject to the Federal Communications Commission (FCC) and Industry Canada (IC)rules.

NOTICE:

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

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,
2. this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications made to this equipment not expressly approved by Xirgo Technologies, LLC may void the FCC authorization to operate this equipment.

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. 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:

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

Radio frequency radiation exposure Information:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 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.

IC :

Antenna Statement

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

License exempt

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

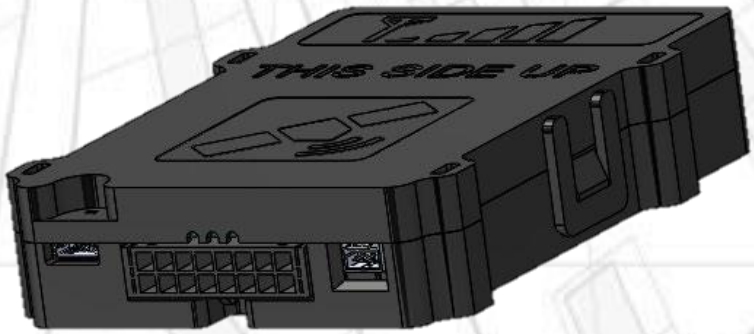
1. this device may not cause interference,
2. this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

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

LX44-NA

GNSS VEHICLE TRACKER



User manual

Version LX44-NA

XIRGO GLOBAL
Chemijos st. 15 LT-51332, Kaunas, Lithuania
www.xirgoglobal.com

Contents

1. LX44-NA general device information

1.1. Safety and legal information

Do not disassemble the device.

May interfere operation of adjacent electronic devices.

Device may be damaged by water and high humidity.

Installed by qualified professionals only.

1.2. Description

LX44-NA is a device with GNSS and Cellular connectivity, designed for object tracking. It is able to acquire information on object location, speed, direction, etc. and transfer the data via Cellular network. Digital and analog inputs of the device may be used to connect different external sensors/devices. Outputs of the device may be used to control external equipment remotely.

Flexible configuration allows users/dealers to adjust the device to meet their specific requirements. All device settings and firmwares are updated remotely via cellular. It is possible to create setting templates for groups of vehicles, use mass updates and create unique device operation logic, fulfilling requirements of most cases on the market.

1.3. Package

LX44-NA is shipped to a customer in a cardboard box and contains all required components for operation, except a SIM card. Package contents:

1. LX44-NA device (control unit)
2. Wires + fuse

Note. SIM card is not included, but is necessary to operate the device. Contact your local Network provider to purchase a SIM card. Xirgo Global recommends an 4FF or MFF2 SIM card for best performance and reliability.

1.4. Technical specifications

Table 1. LX44-NA technical specifications

Device Variant	LX44-NA
General	Physical Peripherals
	2x CAN BUS 1-Wire RS-232
Digital Inputs	4x discrete (frequency, impulse counter, ON/OFF modes)
Voltage threshold	dynamic
Analog Inputs	3x analogue, 12 bit, 0-31V
Outputs	Open Collector type – temperature protected
OUT1 maximum current	0,5A
OUT2 maximum current	0,5A
OUT3 maximum current	0,5A
OUT4 maximum current	0,5A
Extender connector	3 PIN connector
Maximum current	50 mAh
Voltage options	5V or VCC
Power supply	9 – 31V
Rated voltage	12/24V
Average consumption (at 12V)* *With internal battery	Full active without load on outputs: 100mA Deep sleep: <4mA
Internal memory	8MB / 32MB (optional)
Accelerometer	3 axis digital accelerometer
Operational temperature range	
Internal battery options	210, 850, 1200 mAh
With internal Lithium battery	from -20 to +60C° [Charging starts from 0 C°]
Without internal Lithium battery	from -40 to +85C°
Dimensions	68x90x19mm
Weight	Tracker – 64 g, set – 160 g
Bluetooth	Bluetooth Low Energy
BLE version supported	5.4
Specification	2.4GHz
Data rates	1Mbps, 2Mbps
Transmit Power	TX power -20 to +4dBm in 4dB steps
Cellular and GNSS module	Quectel BG95-M3
RF function	CAT-M1/ EGPRS
Bands/Frequency	GSM/EDGE Bands 2: 1850 – 1910 MHz (TX), 1930 – 1990 MHz (RX) GSM/EDGE Bands 3: 1710 – 1785 MHz (TX), 1805 – 1880 MHz (RX) GSM/EDGE Bands 5: 824 – 849 MHz (TX), 869 – 894 MHz (RX) GSM/EDGE Bands 8: 880 – 915 MHz (TX), 925 – 960 MHz (RX) LTE BANDS 2: 1850 – 1910 MHz (TX), 1930 – 1990 MHz (RX) LTE BANDS 4: 1710 – 1755 MHz (TX), 2110 – 2155 MHz (RX) LTE BANDS 12: 699 – 716 MHz (TX), 729 – 746 MHz (RX) LTE BANDS 13: 777 – 787 MHz (TX), 746 – 756 MHz (RX)

	LTE BANDS 66: 1710 – 1780 MHz (TX), 2110 – 2180 MHz (RX)
Transmitting power	Class 5(21dBm+1.7/-3dB) for LTE-FDD Bands Class 1(33dBm±2dB) for GSM850/EGSM900 Class 1(30dBm±2dB) for DCS1800/PCS1900
Cellular antenna	PCB Antenna
GNSS	GPS BeiDou (optional) Galileo (optional) QZSS (optional) SBAS (optional)
GNSS antenna	SMD patch antenna
GNSS antenna gain	GPS：-0.14 dBi typ.
GNSS sensitivity	Cold start: -148dBm Reacquisition: -160dBm Tracking: -159dBm

1.5. Physical properties

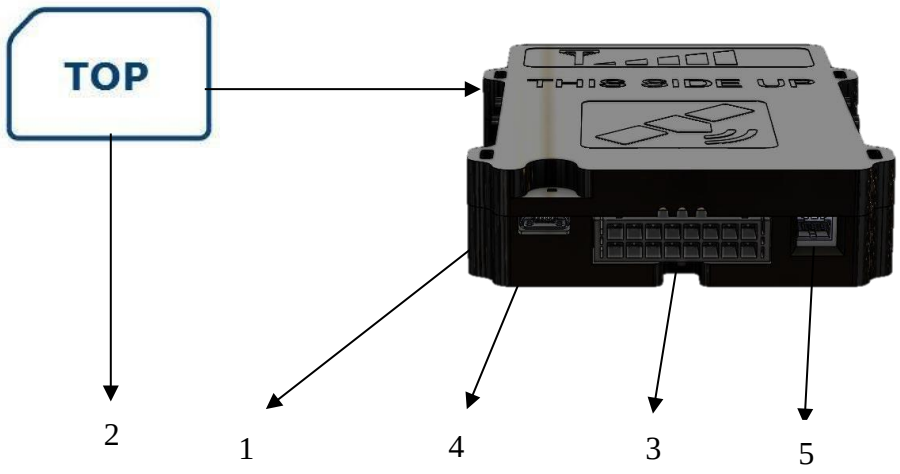


Fig. 1. LX44-NA front view.

Note. To insert a SIM card, open the box by lifting plastic holders from both sides.

Table 2. LX44-NA components.

No.	Short description
1	LED indicator
2	SIM card
3	Socket 2x8 pins
4	Micro-USB interface
5	Extender connector

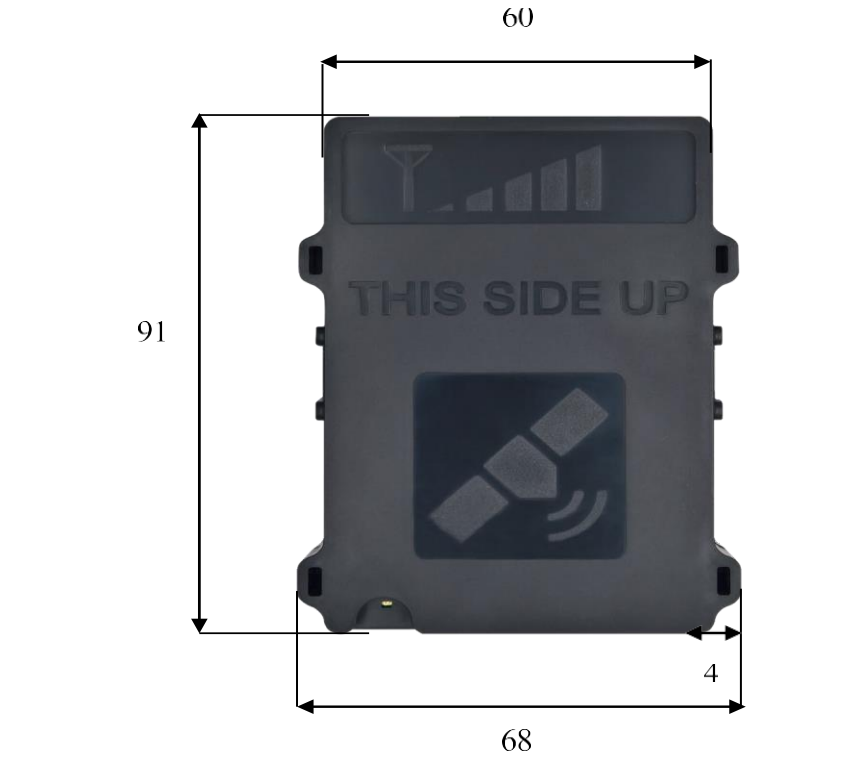


Fig. 2. LX44-NA dimensions, mm

1.6. Pinout & diagnostic LED

1.6.1. Pinout

CAN H Orange	CAN L Orange/black	OUT2/ADC3 White	IN4 Blue/black	GND Black	Battery+ Red	RS232(TX) Purple	RS232(RX) Blue
CAN2 H Yellow	CAN2 L Yellow/black	1-WIRE Brown	IN5/ADC5 Grey/black	IN3/OUT1 Purple/black	IN2/ADC4 White/black	RS485 (B) Green	RS485 (A) Green/black

Fig. 3. LX44-NA pinout and cable colors.

1.6.2. Diagnostic LED

LX44-NA has an indication LED – for GNSS, Cellular modem and CAN line status. LED starts flashing only if IN5 digital input is connected to battery +.

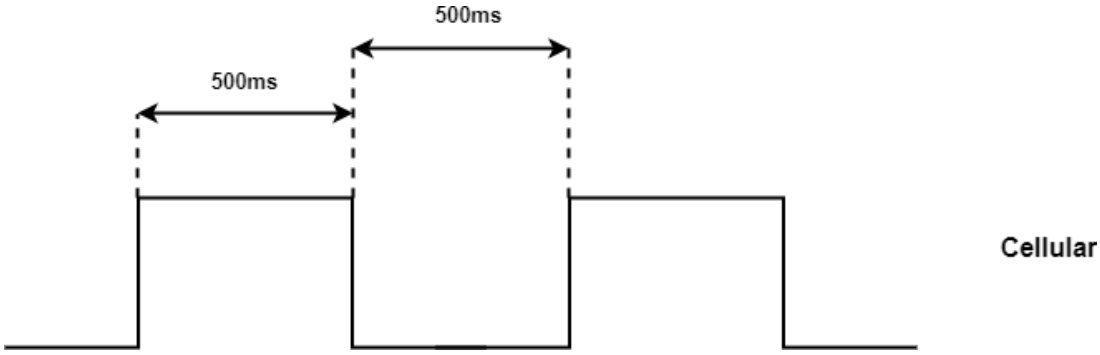


Fig 4. Cellular signal flashing example

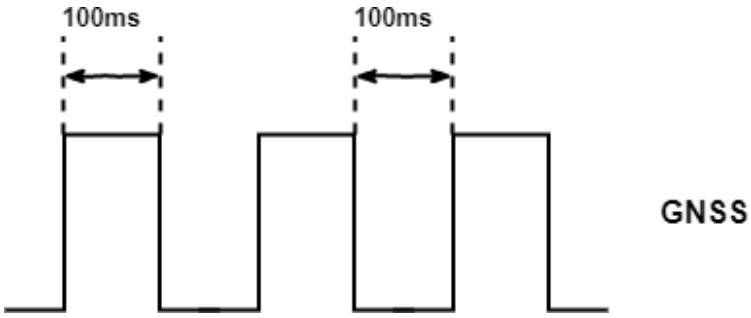


Fig 5. GNSS signal flashing example

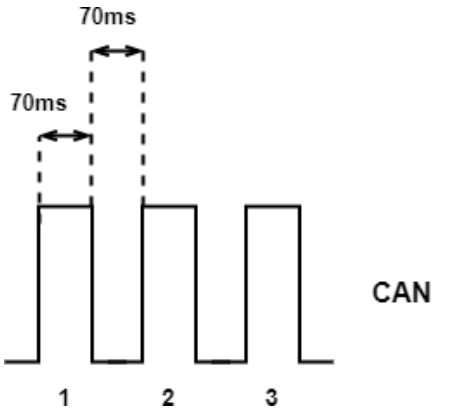


Fig 6. CAN signal flashing example

Table 3. CAN status flashing meaning

Flashes count	Meaning
1	Reading CAN1 line
2	Reading CAN2 line
3	Reading CAN1 & CAN2 lines

Table 4. GNSS status flashing meaning

Flashes count	Meaning
1	No GNSS signal
2	Poor precision. HDOP>1.5
3	3 satellites locked. HDOP<1.5
…	…
12	12 satellites locked. HDOP<1.5

Table 5. Cellular modem status flashing meaning

Flashes count	Meaning
1	Modem connected to server, Modem connected to Internet, Modem GPRS registered, Modem GSM registered, Modem SIM card ok, Modem turned on
2	Modem connected to Internet, Modem GPRS registered, Modem GSM registered, Modem SIM card ok, Modem turned on
3	Modem GPRS registered, Modem GSM registered, Modem SIM card ok, Modem turned on
4	Modem GSM registered, Modem SIM card ok, Modem turned on
5	Modem SIM card ok, Modem turned on
6	Modem turned on
7	Device started

1.7. Installation

LX44-NA is installed where risk of mechanical damage, high humidity and extreme heat is low. Device is mounted stable to vehicle body, therefore ensuring correct operation of the internal accelerometer. Complete installation manual is available as Annex 1.

1.8. Configuration

LX44-NA is to be configured via a configuration server, where dealers/users can adjust operation of their devices to fulfill specific requirements.

1.9. Update

LX44-NA firmware and configuration can be updated both via over-the-air through the configuration server or via the micro-USB interface.

1.9.1. Uploading files to device

Instructions on how to perform local Firmware or configuration upload to the device:

Step 1: Using a USB – micro-USB cable connect device to a computer.
Note: The device must be disconnected from any power source (internal battery also).

Step 2: A new flash drive will appear. In some cases, you might need to format the flash, before uploading the file.

Step 3: Copy/paste the configuration file or the firmware file to the flash drive.

Step 4: Disconnect the USB cable and power up the device. It should take a couple of seconds for the device to boot up and flash the new settings or FW.

1.10. Support

LX44-NA is built to be a reliable, stable and easy to install device. Please read and follow provided installation and operating instructions carefully. However, if you encounter difficulties while installing or using this product, technical support is available and may be reached by e-mail supportxg@sensata.com.

2. Annex 1. Installation instructions

General

Central unit is only mounted in inside of the vehicle, it can not be installed in the engine chamber, next to the cabin, or in the area of exposure to direct external conditions. Central unit should be protected from moisture exposure. Device must be fastened in a stable position to avoid random twitches and displacements (suspension on cables is strictly prohibited). Central unit must be mounted horizontally. Precise orientation is of particular importance to flawless operation of the system, since the device is equipped with acceleration sensors recording the data which directly affects the results obtained.

List of suitable vehicles

LX44-NA is intended for internal combustion engines, hybrid and electric engines, where power supply specifications are met. Device must be connected to the vehicle battery (12/24V), ensuring constant power supply even if the engine is not working and ignition is off.

Basic instructions before beginning the installation

Quality of connections, location of the device, etc. play a significant role on accurate operation of the system. Below are some tips and rules for correct installation to attain professional quality and ensure maximum efficiency of the device.

Mechanical connections

To highest possible extent, cavities in the vehicle should be used for wiring. If you need to make a new hole, it must be protected against corrosion appropriately!

Wiring connection must be made by brazing, and not merely mechanical wire connection. It is especially important to protect the connections with insulation for high-resistance atmospheric conditions. Do not use insulation with unknown resistance parameters.

Efforts should be made to tie the new wiring into the car's standard wiring bales.

Installation of central unit

Steps to install central unit:

1. Open the housing by gently lifting the plastic holders on each side and remove the PCB from it.
    - Use thin screwdriver to lift the enclosure holders as alternative to open them without breaking it.
2. Locate the SIM holder and following the printed picture on the PCB insert the SIM card.
3. Place the PCB to the housing and close it.
4. Use plastic fastening straps to fix device in a stable position (units housing has four holes, for straps to go through and fasten them to the body of the vehicle).
5. Connect power supply;
6. Connect ignition wire to a digital input (usually IN5);
7. Connect array;
8. Connect other devices (optional).

Tools/equipment necessary for the installation:

1. Pliers
2. Stripping pliers
3. Screwdriver
4. Multimeter (tester)
5. Fastening straps
6. Isolation tape

SIM card

SIM card must be inserted into the device before starting installation. The device must be turned off when inserting SIM card. Before inserting the SIM card, make sure you have all network services activated, the card's PIN code must be disabled.

If the vehicle is travelling to foreign countries, roaming service must be activated for the SIM card. The SIM card and phone number must be checked and clearly marked on the installation certificate of the device.

IMPORTANT! *Before inserting a SIM card, do not forget to disable PIN code. Otherwise, the device will not work, and the SIM card will be blocked.*

GNSS antenna

GNSS antenna is the main element responsible for vehicle positioning accuracy and quality. LT45-EA units are equipped with internal GNSS antennas. To ensure best possible signal reception and evaluating GNSS signal character, there are strict requirements for correct installation of the tracking unit:

- The accordingly marked side of the device must be invariably directed to the sky. The device must be oriented horizontally (not at an angle) and oriented with the corresponding side towards the top.
- The device should not be covered with metal sheet or reinforced glass. In vehicles with standard glass (e.g., without built-in heating elements).
- Fixing of the device must be stable and immobile, providing for the installation durability. It is necessary to take into account events, which may lead to loss of device stability, to select the mounting location and methods that would allow to avoid these factors.

Cellular antenna

Cellular antenna is responsible for transfer of collected data and connection with central server. Good antenna's performance is the key element in obtaining information from the device. LX44-NA series trackers are equipped with internal Cellular antennas.

Cellular antenna does not require orientation to open sky; however you should be aware that metal elements weaken the cellular signal. It is also necessary to take into account the emission of the antenna's high frequency radio waves, which may interfere with operation of electronic devices.

3. REGULATORY STATEMENTS

FCC:

This equipment with FCC-ID: GKM-LX45 and IC-ID: 10281A-LX45,

Models: LX41-NA, LT41-NA, LX42-NA, LT42-NA, LX43-NA, LT43-NA, LX44-NA, LT44-NA, LX45-NA, LT45-NA subject to the Federal Communications Commission (FCC) and Industry Canada (IC)rules.

NOTICE:

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

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,
2. this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications made to this equipment not expressly approved by Xirgo Technologies, LLC may void the FCC authorization to operate this equipment.

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. 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:

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

Radio frequency radiation exposure Information:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 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.

IC :

Antenna Statement

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

License exempt

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

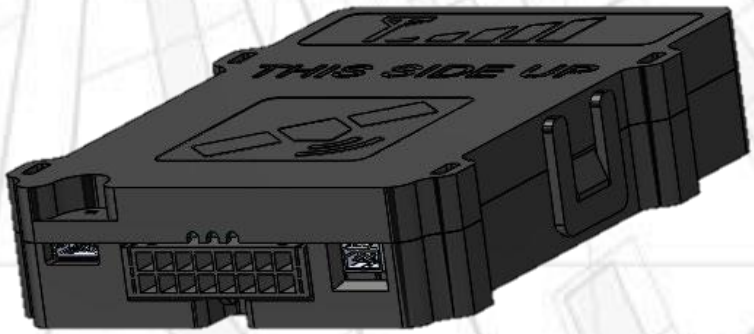
1. this device may not cause interference,
2. this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

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

LX45-NA

GNSS VEHICLE TRACKER



User manual

Version LX45-NA

XIRGO GLOBAL
Chemijos st. 15 LT-51332, Kaunas, Lithuania
www.xirgoglobal.com

Contents

1. LX45-NA general device information

1.1. Safety and legal information

Do not disassemble the device.

May interfere operation of adjacent electronic devices.

Device may be damaged by water and high humidity.

Installed by qualified professionals only.

1.2. Description

LX45-NA is a device with GNSS and Cellular connectivity, designed for object tracking. It is able to acquire information on object location, speed, direction, etc. and transfer the data via Cellular network. Digital and analog inputs of the device may be used to connect different external sensors/devices. Outputs of the device may be used to control external equipment remotely.

Flexible configuration allows users/dealers to adjust the device to meet their specific requirements. All device settings and firmwares are updated remotely via cellular. It is possible to create setting templates for groups of vehicles, use mass updates and create unique device operation logic, fulfilling requirements of most cases on the market.

1.3. Package

LX45-NA is shipped to a customer in a cardboard box and contains all required components for operation, except a SIM card. Package contents:

1. LX45-NA device (control unit)
2. Wires + fuse

Note. SIM card is not included, but is necessary to operate the device. Contact your local Network provider to purchase a SIM card. Xirgo Global recommends an 4FF or MFF2 SIM card for best performance and reliability.

1.4. Technical specifications

Table 1. LX45-NA technical specifications

Device Variant	LX45-NA
General	Physical Peripherals
	2x CAN BUS 1-Wire EIA-485 / J1708
Digital Inputs	4x discrete (frequency, impulse counter, ON/OFF modes)
Voltage threshold	dynamic
Analog Inputs	3x analogue, 12 bit, 0-31V
Outputs	Open Collector type – temperature protected
OUT1 maximum current	0,5A
OUT2 maximum current	0,5A
Extender connector	3 PIN connector
Maximum current	50 mAh
Voltage options	5V or VCC
Power supply	9 – 31V
Rated voltage	12/24V
Average consumption (at 12V)* *With internal battery	Full active without load on outputs: 100mA Deep sleep: <4mA
Internal memory	8MB / 32MB (optional)
Accelerometer	3 axis digital accelerometer
Operational temperature range	
Internal battery options	210, 850, 1200 mAh
With internal Lithium battery	from -20 to +60C° [Charging starts from 0 C°]
Without internal Lithium battery	from -40 to +85C°
Dimensions	68x90x19mm
Weight	Tracker – 64 g, set – 160 g
Bluetooth	Bluetooth Low Energy
BLE version supported	5.4
Specification	2.4GHz
Data rates	1Mbps, 2Mbps
Transmit Power	TX power -20 to +4dBm in 4dB steps
Cellular and GNSS module	Quectel BG95-M3
RF function	CAT-M1/ EGPRS
Bands/Frequency	GSM/EDGE Bands 2: 1850 – 1910 MHz (TX), 1930 – 1990 MHz (RX) GSM/EDGE Bands 3: 1710 – 1785 MHz (TX), 1805 – 1880 MHz (RX) GSM/EDGE Bands 5: 824 – 849 MHz (TX), 869 – 894 MHz (RX) GSM/EDGE Bands 8: 880 – 915 MHz (TX), 925 – 960 MHz (RX) LTE BANDS 2: 1850 – 1910 MHz (TX), 1930 – 1990 MHz (RX) LTE BANDS 4: 1710 – 1755 MHz (TX), 2110 – 2155 MHz (RX) LTE BANDS 12: 699 – 716 MHz (TX), 729 – 746 MHz (RX) LTE BANDS 13: 777 – 787 MHz (TX), 746 – 756 MHz (RX) LTE BANDS 66: 1710 – 1780 MHz (TX), 2110 – 2180 MHz (RX)

Transmitting power	Class 5(21dBm+1.7/-3dB) for LTE-FDD Bands Class 1(33dBm±2dB) for GSM850/EGSM900 Class 1(30dBm±2dB) for DCS1800/PCS1900
Cellular antenna	PCB Antenna
GNSS	GPS BeiDou (optional) Galileo (optional) QZSS (optional) SBAS (optional)
GNSS antenna	SMD patch antenna
GNSS antenna gain	GPS：-0.14 dBi typ.
GNSS sensitivity	Cold start: -148dBm Reacquisition: -160dBm Tracking: -159dBm

1.5. Physical properties

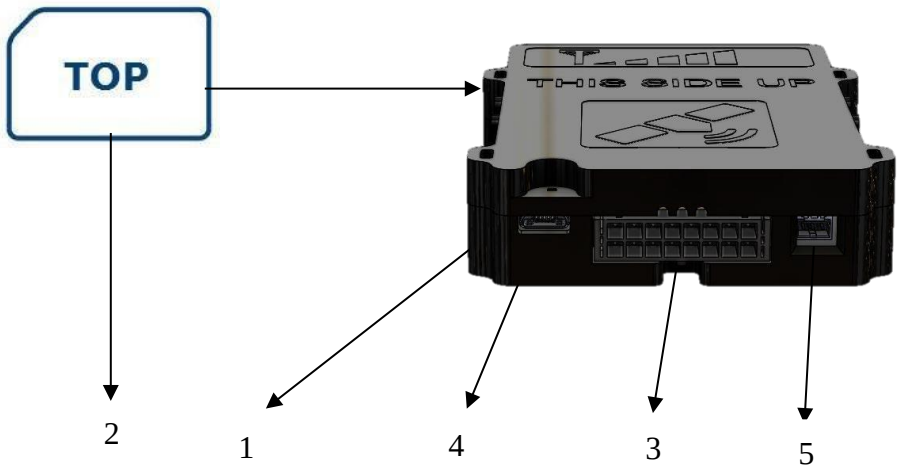


Fig. 1. LX45-NA front view.

Note. To insert a SIM card, open the box by lifting plastic holders from both sides.

Table 2. LX45-NA components.

No.	Short description
1	LED indicator
2	SIM card
3	Socket 2x8 pins
4	Micro-USB interface
5	Extender connector

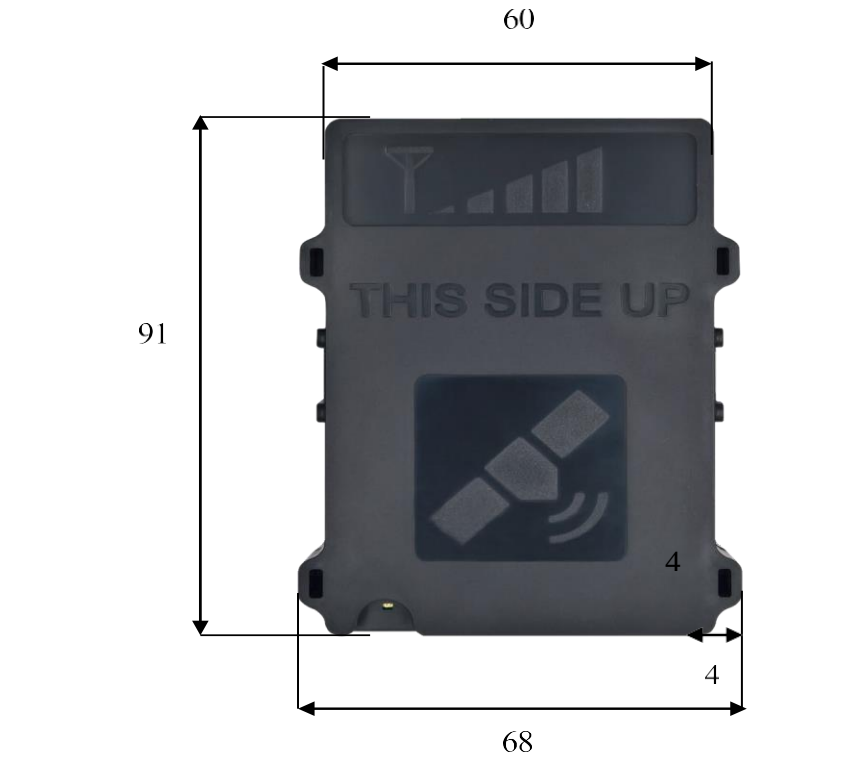


Fig. 2. LX45-NA dimensions, mm

1.6. Pinout & diagnostic LED

1.6.1. Pinout

CAN H Orange	CAN L Orange/black	OUT2/ADC3 White	IN4 Blue/black	GND Black	Battery+ Red	RS232(TX) Purple	RS232(RX) Blue
CAN2 H Yellow	CAN2 L Yellow/black	1-WIRE Brown	IN5/ADC5 Grey/black	IN3/OUT1 Purple/black	IN2/ADC4 White/black	RS485 (B) Green	RS485 (A) Green/black

Fig. 3. LX45-NA pinout and cable colors.

1.6.2. Diagnostic LED

LX45-NA has an indication LED – for GNSS, Cellular modem and CAN line status. LED starts flashing only if IN5 digital input is connected to battery +.

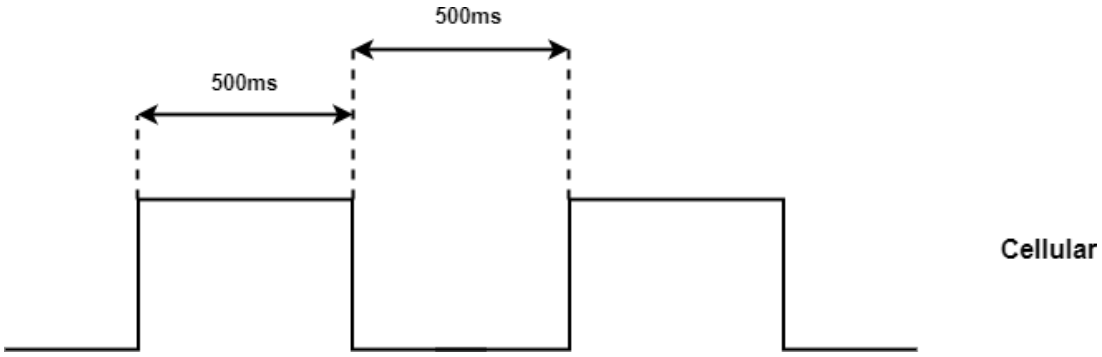


Fig 4. Cellular signal flashing example

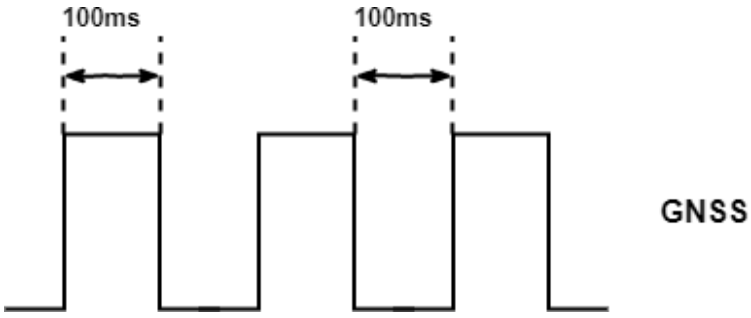


Fig 5. GNSS signal flashing example

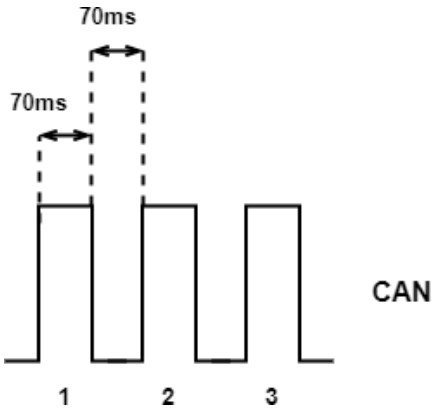


Fig 6. CAN signal flashing example

Table 3. CAN status flashing meaning

Flashes count	Meaning
1	Reading CAN1 line
2	Reading CAN2 line
3	Reading CAN1 & CAN2 lines

Table 4. GNSS status flashing meaning

Flashes count	Meaning
1	No GNSS signal
2	Poor precision. HDOP>1.5
3	3 satellites locked. HDOP<1.5
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Table 5. Cellular modem status flashing meaning

Flashes count	Meaning
1	Modem connected to server, Modem connected to Internet, Modem GPRS registered, Modem GSM registered, Modem SIM card ok, Modem turned on
2	Modem connected to Internet, Modem GPRS registered, Modem GSM registered, Modem SIM card ok, Modem turned on
3	Modem GPRS registered, Modem GSM registered, Modem SIM card ok, Modem turned on
4	Modem GSM registered, Modem SIM card ok, Modem turned on
5	Modem SIM card ok, Modem turned on
6	Modem turned on
7	Device started

1.7. Installation

LX45-NA is installed where risk of mechanical damage, high humidity and extreme heat is low. Device is mounted stable to vehicle body, therefore ensuring correct operation of the internal accelerometer. Complete installation manual is available as Annex 1.

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LX45-NA is to be configured via a configuration server, where dealers/users can adjust operation of their devices to fulfill specific requirements.

1.9. Update

LX45-NA firmware and configuration can be updated both via over-the-air through the configuration server or via the micro-USB interface.

1.9.1. Uploading files to device

Instructions on how to perform local Firmware or configuration upload to the device:

Step 1: Using a USB – micro-USB cable connect device to a computer.
Note: The device must be disconnected from any power source (internal battery also).

Step 2: A new flash drive will appear. In some cases, you might need to format the flash, before uploading the file.

Step 3: Copy/paste the configuration file or the firmware file to the flash drive.

Step 4: Disconnect the USB cable and power up the device. It should take a couple of seconds for the device to boot up and flash the new settings or FW.

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LX45-NA is built to be a reliable, stable and easy to install device. Please read and follow provided installation and operating instructions carefully. However, if you encounter difficulties while installing or using this product, technical support is available and may be reached by e-mail supportxg@sensata.com.

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Central unit is only mounted in inside of the vehicle, it can not be installed in the engine chamber, next to the cabin, or in the area of exposure to direct external conditions. Central unit should be protected from moisture exposure. Device must be fastened in a stable position to avoid random twitches and displacements (suspension on cables is strictly prohibited). Central unit must be mounted horizontally. Precise orientation is of particular importance to flawless operation of the system, since the device is equipped with acceleration sensors recording the data which directly affects the results obtained.

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Quality of connections, location of the device, etc. play a significant role on accurate operation of the system. Below are some tips and rules for correct installation to attain professional quality and ensure maximum efficiency of the device.

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1. Open the housing by gently lifting the plastic holders on each side and remove the PCB from it.
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6. Connect ignition wire to a digital input (usually IN5);
7. Connect array;
8. Connect other devices (optional).

Tools/equipment necessary for the installation:

1. Pliers
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SIM card

SIM card must be inserted into the device before starting installation. The device must be turned off when inserting SIM card. Before inserting the SIM card, make sure you have all network services activated, the card's PIN code must be disabled.

If the vehicle is travelling to foreign countries, roaming service must be activated for the SIM card. The SIM card and phone number must be checked and clearly marked on the installation certificate of the device.

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GNSS antenna is the main element responsible for vehicle positioning accuracy and quality. LT45-EA units are equipped with internal GNSS antennas. To ensure best possible signal reception and evaluating GNSS signal character, there are strict requirements for correct installation of the tracking unit:

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Cellular antenna does not require orientation to open sky; however you should be aware that metal elements weaken the cellular signal. It is also necessary to take into account the emission of the antenna's high frequency radio waves, which may interfere with operation of electronic devices.

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This equipment with FCC-ID: GKM-LX45 and IC-ID: 10281A-LX45,

Models: LX41-NA, LT41-NA, LX42-NA, LT42-NA, LX43-NA, LT43-NA, LX44-NA, LT44-NA, LX45-NA, LT45-NA subject to the Federal Communications Commission (FCC) and Industry Canada (IC)rules.

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NOTE:

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4. Consult the dealer or an experienced radio/TV technician for help.

Radio frequency radiation exposure Information:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 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.

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Antenna Statement

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

License exempt

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 interference,
2. this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

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