

LEC014

GPS/BDS Dual-Mode GNSS Vehicle T-BOX



About This Document

This document describes vehicle T-BOX—software and hardware functions of LEC014.

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Important Notice

Due to the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. Although significant delays or losses of data are rare when wireless devices such as the T-BOX device is used in a normal manner with a well-constructed network, the device should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. Liugong accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the device, or for failure of the router to transmit or receive such data.

Safety Precautions

General

- The T-BOX generates radio frequency (RF) power. When using the router, care must be taken on safety issues related to RF interference as well as regulations of RF equipment.
- Do not use your T-BOX in aircraft, hospitals, petrol stations or in places where using cellular products is prohibited.
- Be sure that the T-BOX will not be interfering with nearby equipment. For example: pacemakers or medical equipment.
- RF exposure statements
 1. For mobile devices without co-location (the transmitting antenna is installed or located more than 20cm away from the body of user and nearby person)
- FCC RF Radiation Exposure Statement
 1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
 2. This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and human body.

Using the T-BOX in Vehicle

- Check for any regulation or law authorizing the use of cellular devices in vehicle in your country before installing the T-BOX.
- The driver or operator of any vehicle should not operate the T-BOX while driving.
- Install the T-BOX by qualified personnel. Consult your vehicle distributor for any possible interference of electronic parts by the T-BOX.
- The T-BOX should be connected to the vehicle's supply system by using a fuse-protected terminal in the vehicle's fuse box.
- Be careful when the T-BOX is powered by the vehicle's main battery. The battery may be drained after extended period.

Protecting Your T-BOX

To ensure error-free usage, please install and operate your T-BOX with care. Do remember the following:

- Do not expose the T-BOX to extreme conditions such as high humidity rain, high temperature, direct sunlight, caustic/harsh chemicals, dust, or water.
- Do not try to disassemble or modify the T-BOX. There is no user serviceable part inside and the warranty would be void.
- Do not drop, hit or shake the T-BOX. Do not use the T-BOX under extreme vibrating conditions.
- Do not pull the antenna or power supply cable. Attach/detach by holding the connector.

- Connect the T-BOX only according to the instruction manual. Failure to do it will void the warranty.
- In case of problem, please contact authorized distributor.

FCC Warning

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.

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 of the following measures:

- a. Reorient or relocate the receiving antenna.
 - b. Increase the separation between the equipment and receiver.
 - c. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
 - d. Consult the dealer or service representative for help.
-
- Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.
 - This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter

Regulatory and Type Approval Information

Table 1: Directives

2013/56/EC	Directive 2013/56/EU of the European Parliament and of the Council of 10 February 2013 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)	
2012/19/EU	Directive 2012/19/EU the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE)	

Table 2: Standards of the Ministry of Information Industry of the People's Republic of China

SJ/T 11363-2006	"Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products" (2006-06).	
SJ/T 11364-2006	"Marking for Control of Pollution Caused by Electronic Information Products" (2006-06). According to the "Chinese Administration on the Control of Pollution caused by Electronic Information Products" (ACPEIP) the EPUP, i.e., Environmental Protection Use Period, of this product is 20 years as per the symbol shown here, unless otherwise marked. The EPUP is valid only as long as the product is operated within the operating limits described in the Hardware Interface Description. Please see Table 3 for an overview of toxic or hazardous substances or elements that might be contained in product parts in concentrations above the limits defined by SJ/T 11363-2006.	

Table 3: Toxic or Hazardous Substances or Elements with Defined Concentration Limits

Name of the Part	Hazardous Substances					
	(Pb)	(Hg)	(Cd)	(Cr (VI))	(PBB)	(PBDE)
Metal parts	o	o	o	o	o	o
Circuit modules	x	o	o	o	o	o
Cables and cable assemblies	o	o	o	o	o	o
Plastic and polymeric parts	o	o	o	o	o	o
o: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006. x: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials for this part <i>might exceed</i> the limit requirement in SJ/T11363-2006.						

Document History

Updates between document versions are cumulative. Therefore, the latest document version contains all updates made to previous versions.

Date	Firmware Version	Document Version	Change Description
May. 15, 2018	1.0.0	v.1.0.0	Initial release
Jun. 29, 2018	1.0.0	v.1.0.1	- Deleted the description of protection level - Revised the company name - Added FCC warning
Sep.28,2018	1.0.0	v.1.0.2	- Deleted the description of ESD protection - Deleted the description of Over current protection - Revised the maximum withstand voltage value of DI/DO as “$\leq$ input voltage”

Contents

Contents..... 7

Chapter 1 **Product Concept** 8

 1.1 Overview 8

 1.2 Package Contents 9

 1.3 Specifications 9

 1.4 Dimensions..... 10

 1.5 Ordering Information 11

Chapter 2 **Hardware Installation**..... 12

 2.1 PIN Assignment 12

 2.2 LED Indicators..... 14

Glossary..... 15

Chapter 1 Product Concept

1.1 Overview

LEC014 is a vehicle T-BOX with GPS/BDS dual-mode GNSS to send location information to server. It enables to communicate with vehicle electronic equipment, monitor vehicle status and control vehicle operation through CAN page.

LEC014 is a powerful T-BOX, developed by RobustOS. RobustOS contains basic network function and protocol to provide customers with excellent user experience. Meanwhile, it achieves low power consumption, and meets a one-month use period using battery without external power input.

- RobustOS + SDK + App
- Support 3G network
- Support USIM/SMT SIM chip
- Support GPS/BDS dual mode location and upload location to sever
- Support low power consumption mode
- Support communication with vehicle electronic equipment through CAN port
- Support vehicle monitoring and controlling
- Support download and upgrade software remotely
- Support data cache and compensate for data transmission in non-signal areas

1.2 Package Contents

Before installing your LEC014 T-BOX, verify the kit contents as following.

Note: The following pictures are for illustration purposes only, not based on their actual sizes.

- 1 x LEC014 GPS/BDS dual-mode GNSS T-BOX



Note: This product without other optional accessories.

1.3 Specifications

Cellular Network Interface

- Antenna interface quantity: 1 (built-in)
- SIM 1 (3 V and 1.8 V)
- 3G version standards: GSM/GPRS/EDGE/WCDMA/HSDPA/HSUPA/HSPA+
GSM: max DL/UL = 9.6/2.7 Kbps
GPRS: max DL/UL = 86 Kbps
EDGE: max DL/UL = 236.8 Kbps
WCDMA/TD-SCDMA: max DL/UL = 2.8 Mbps/384 Kbps
HSPA+: max DL/UL = 21/5.76Mbps, fallback to 2G

GPS/BDS

- Antenna interface quantity: 1 (built-in)
- Tracking sensibility: more than -148 dBm
- Horizontal position accuracy: 2m
- Protocol: NMEA-0183 V4.0

Bus Interface

- Quantity: 1 x CAN
- Interface type: 16 pin ITT132015-0074/12 pin DTM06-12SX
- Baud rate: 250K
- CAN: CANH, CANL

DI/DO

- Type: 5 x DI; 1 x ADC
- Interface type: 16 pin ITT132015-0074/12 pin DTM06-12SX

- Wet contact (DI): positive
- Maximum withstand voltage: $\leq$ Input voltage

Other

- 1xRTC
- 1xWatchdog (built-in)
- LED indication 1xRUN, 1xGPS, 1xNET

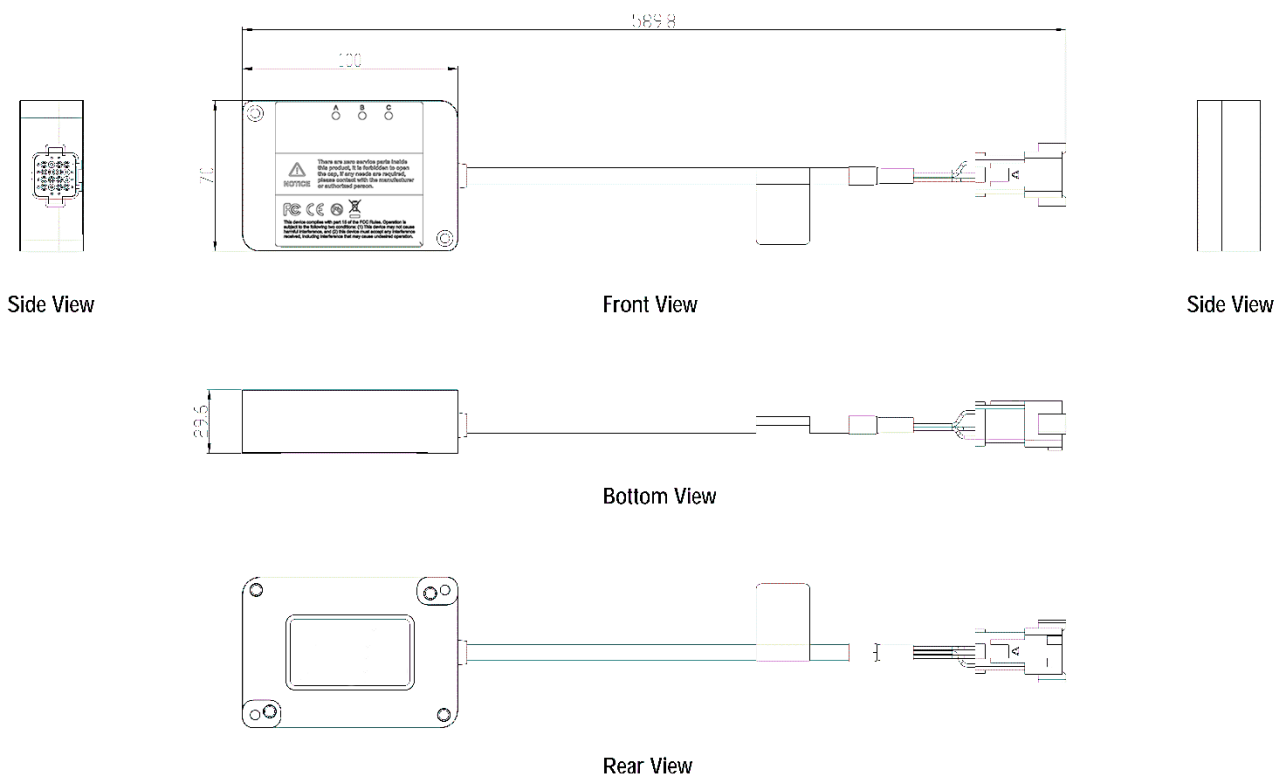
Power Supply and Consumption

- Interface type: 16 pin ITT132015-0074/12 pin DTM06-12SX
- Supply voltage: 9~36V DC
- Consumption: idle state 0.1 mA@2.6V
Communication state 200 mA@12 V

Physical Property

- Housing material and weight: plastic, 500g
- Dimension: 100 x 70 x 29.6 mm
- Installation: wall mounted

1.4 Dimensions



1.5 Ordering Information

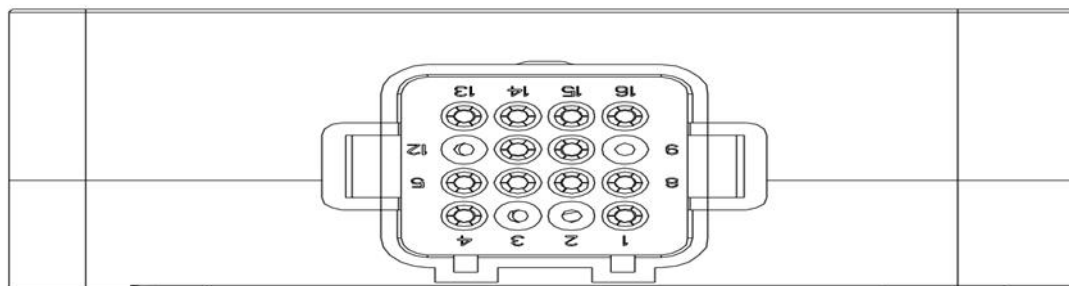
Product Type	LEC014
Air Interface	GSM/GPRS/EDGE/WCDMA/HSDPA/HSUPA/HSPA+
Frequency Bands	GSM:800/850/900/1900/2100 MHz ;WCDMA: Band1/2/5/6/8
Operating Environment	-30~+45 °C 5~95% RH
Storage Temperature	-40~+85 °C

*For more information about frequency bands, please contact your sales representative.

Chapter 2 Hardware Installation

2.1 PIN Assignment

16PIN automobile cables as shown below, marking the serial number and the definition of each PIN:



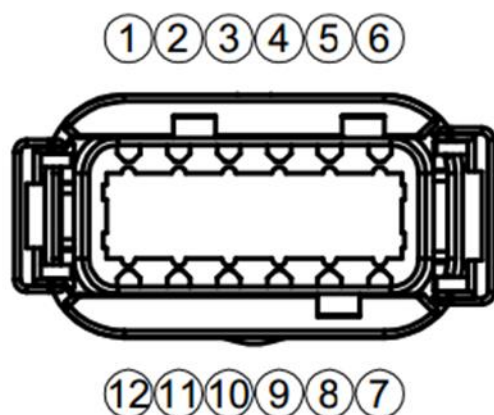
Serial Number	Cable Color	Signal Name
1	Blue	Generator D+
4	Green	ACC
5	Brown	CAN_L
6	Black	Power ground
7	Red	Battery power
8	White	CAN_H
13	Yellow	Count value A
14	Pink	BIT2
15	Yellow-and-green	Count value B
16	Black-and-white	BIT0

Definition of crane terminal connector pin:

Serial Number	Cable Color	Signal Name
1		
4	Green	ACC
5	Brown	CAN_L
6	Black	Power ground
7	Red	Battery power
8	White	CAN_H
13	Yellow	Signal to identify single and double devices (available for low electric level) Valid: double device Invalid: single device
14	Pink	Signal to identify get on/off

		(available for low electric level) Valid: T-BOX collects the get-on data of generator Invalid: T-BOX collects the get-off data of generator
15	Yellow-and-green	Switch (available for low electric level)
16	Black-and-white	Switch (available for low electric level)

12PIN excavator cables as shown below, marking the serial number and the definition of each PIN:



Serial Number	Cable Color	Signal Name
1		
2	Brown	Bonding strip
3		
4	Green	ACC
5	Pink	CAN_L
6	Black	Negative wire
7	Red	Positive wire
8	Yellow	CAN_H
9		
10	White	GND
11		
12		

Note: The color of cable depends on the actual product.

2.2 LED Indicators



Name	Color	Status	Description
A	Red	Solid	External power on.
		Off	External power off.
B	Red	blinking	GPS received signal.
		Solid	GPS disconnected.
C	Green	Blinking	Cellular network connected successfully.
		Solid	Cellular network disconnected.

Glossary

Abbr.	Description
T-BOX	Remote Information Processor
LPWAN	Low Power Wide Area Network
CAN	Controller Area Network
USB	Universal Serial Bus
DI	Digital Input
DO	Digital Output
GPS	Global Positioning System
BDS	Compass Navigation satellite System
GSM	Global System for Mobile Communications
WCDMA	Wide-band Code Division Multiple Access
EMC	Electra Magnetic Compatibility

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