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Jiangsu Wulian Network Technology Development WL-TBOX4 Vehicle Terminal Instructions

Contents

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Hardware Specification

File status: [ ] Draft	Current version:	V1.0		
[ ] Official release [√] Changing	Document classification:	Internal disclosure		
	Made by		Date:	2021-11-22
	Reviewed by:		Date:	
	Approved by:		Date:	

Revision History

Version	Revision date	Reason and change description	Reviser
V1.0	2021.9.9	New-built	
V1.1	2021.11.22	Revised after review	

Product Introduction

The product described in this document is the vehical terminal with model WL-TOX4. WL-TOX4 vehical terminal is developed according to the requirements of HJ 1014-2020 technical requirements for pollutant emission control of non road diesel mobile machinery (hereinafter referred to as GB4), and it meets the technical requirements of Part H vehical terminal of HJ1014-2020 standard. The terminal can connect the vehical meter through the CAN bus to collect the data on the vehicle, upload it to the monitoring center through the 4G network, and it also receives the instructions issued by the monitoring center and realizes the specified operation. The vehicle terminal integrates GPS/BDS positioning module, and the monitoring center can query the vehicle position information through the vehicle terminal.

Referenced standards and documents

The following documents are essential for the application of this document. For dated references, only the dated version is applicable to this document. For undated references, the latest version (including all changes) is applicable to this document. GB 17691-2018 emission limits and measurement methods of pollutants from heavy

duty diesel vehicles (China phase VI) GB20891-2014 emission of exhaust pollutants from diesel engines for non road mobile machinery HJ 1014-2020 technical requirements for pollutant emission control of non road diesel mobile machinery ISO16750-1 – road vehicles – environmental conditions and tests for electrical and electronic device – Part 1: General Iso-16750-2 road vehicles – environmental conditions and tests for electrical and electronic device – Part 2 ISO16750-3 road vehicles – environmental conditions and tests for electrical and electronic device – Part 3: Mechanical loads ISO16750-4 – road vehicles – environmental conditions and tests for electrical and electronic device – Part 4 – Climatic environment GB/T 32960.1 technical specification for electric vehicle remote service and management system Part 1: General GB/T 32960.2 technical specification for electric vehicle remote service and management system Part 2: Vehicle terminal GB/T 32960.3 technical specification for electric vehicle remote service and management system Part 3: Communication protocol and data format ISO11898 road vehicles – digital information exchange – controller area network for high-speed communication SAE J1939/11 commercial vehicle control system LAN CAN communication protocol Part 11: Physical layer, 250kbit/s, shielded twisted pair SAE J1939/21 commercial vehicle control system LAN CAN communication protocol Part 21: Data link layer SAE J1939/31 commercial vehicle control system LAN CAN communication protocol Part 31: Network layer SAE J1939/71 commercial vehicle control system LAN CAN communication protocol Part 71: Vehicle application layer SAE J1939/73 commercial vehicle control system LAN CAN communication protocol Part 73: Diagnostic application layer GB/T 28046.1 environmental conditions and tests for electrical and electronic device of road vehicles Part 1: General Provisions GB/T 28046.2 environmental conditions and tests for electrical and electronic device of road vehicles Part 2: Electrical loads GB/T 28046.3 environmental conditions and tests for electrical and electronic device of road vehicles Part 3: Mechanical loads GB/T 28046.4 environmental conditions and tests for electrical and electronic device of road vehicles Part 4: Climatic loads ISO 20653 degree of protection for road vehicles (IP code) protection of electrical and electronic device against foreign objects, water and touch GB/T 21437.2 road vehicles – Electrical disturbances caused by conduction and coupling – Part 2: Electrical transient conduction along power lines GB/T 21437.3 road vehicles – Electrical disturbances caused by conduction and coupling – Part 3: Electrical transient emission of conductors other than power lines through capacitive and inductive coupling GB/T 19951 test method for electrical disturbance caused by electrostatic discharge of road vehicles GBT 4208 housing protection class (IP code) GB/T 18655 radio disturbance characteristics of vehicles, ships and internal combustion engines limits and measurement methods for protecting vehicle receivers

Fundamental performance parameter

Environment temperature

- Operating temperature: -30℃ +75℃
- Storage temperature: -40℃ +85℃

Climate environment

- Relative humidity: 25% 75%
- Atmospheric pressure: 86kPa 106kPa

Power supply
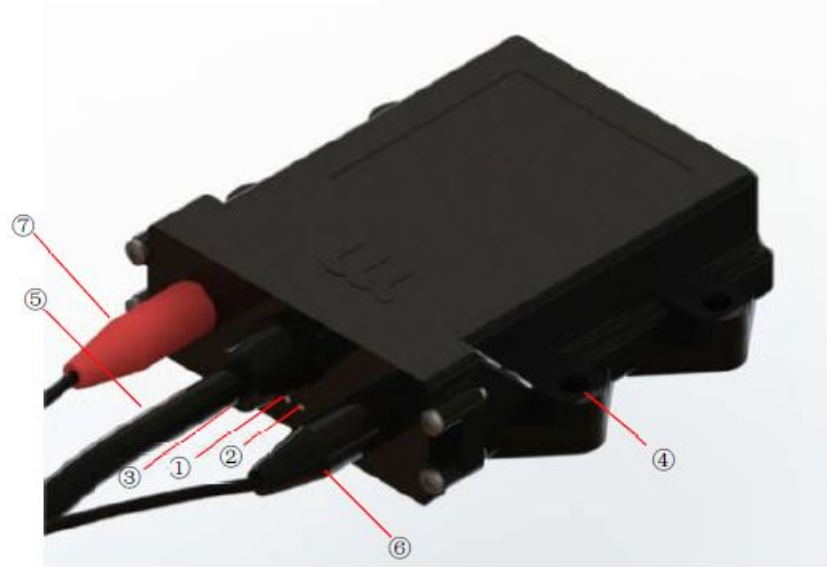
- Operating voltage range: 9V DC   36V DC
- Average operating current: <100mA@12V DC <50mA@24V DC
- Peak current: 500mA
- Quiescent current: ≤2mA

Housing protection class

- Meets IP67

Appearance and structural dimensions

Appearance design

1. LTE status indicator (red)
2. GNSS status indicator (blue)
3. System operation light (green)
4. Terminal mounting hole
5. External harness
6. 4G antenna connector (SMA)
7. GPS antenna connector (SMA)

Structure Size

- (L)101.5*(W)102.5*(H)35.2mm
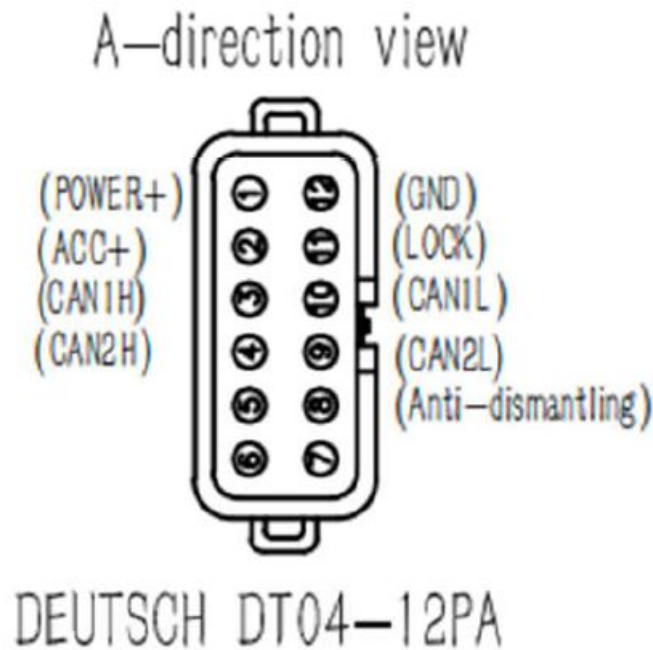
Quality

- Not exceeding 500g

Hardware interface

Interface
TBOX4 terminal interface model can be customized according to requirements, such as 6PIN, 8PIN and 12PIN. Take the definition of 12PIN terminal interface as an example:

A—direction view

(POWER+) (GND)
(ACC+) (LOCK)
(CAN1H) (CAN1L)
(CAN2H) (CAN2L)
(Anti—dismantling)

DEUTSCH DT04—12PA

Function introduction

Self-checking

When the vehicle terminal starts working after being powered on, it indicates the current main states through signal light, display screen or sound. The main states include: whether the communication is normal, whether the positioning is normal, and whether the power supply system of the vehicle terminal is normal.

Time and date

The vehicle terminal can provide time and date. It can record the time in the form of hour, minute, second or hh: mm: ss; The date can be recorded in the form of year, month, day or yyyy/mm/dd/. Compared with the standard time, the time error is ±5s within 24h.

Mechanical diagnosis information collection function

After the monitoring mechanical diesel engine is started and before the mechanical operation, the vehicle terminal reads the control diagnosis information in table H.6. And upload the control diagnosis information to the management platform once within 24 hours.

Data acquisition function of diesel engine

The vehicle terminal can collect relevant data of diesel engine according to table H.7, and the acquisition frequency meets the requirements of H.6.3. The data is transmitted within 60s after the engine is started, and the data may not be transmitted after the diesel engine is stopped.

Enterprise standard data transmission

The vehicle terminal collects data according to the requirements of the enterprise standard and uploads it to the enterprise platform. The transmission time interval and data type of real-time data meet the relevant technical requirements.

Storage function of vehicle terminal information data

The internal storage medium capacity of the vehicle terminal shall meet the internal data storage for at least 7 days. When the internal storage medium of the vehicle terminal is full, it has the function of automatic coverage of internal storage data. The data stored inside the vehicle terminal can be checked. When the vehicle terminal stops working after power failure, it can completely save the data saved in the internal medium before power failure without losing.

Data Reissue

When the communication is abnormal, the vehicle terminal will store the collected real-time data in the local storage medium and reissue it after the communication returns to normal. Reissue does not affect the upload of real-time data.

Registration and activation

The vehicle terminal has the function of supporting remote registration and activation on the enterprise platform.

Remote parameter query

It has the functions of remote inquiry and vehicle parameter setting.

Positioning function

The vehicle terminal can provide the positioning information specified in GB/T 32960.3. Accuracy requirements:

- Horizontal positioning accuracy is less than 5m;
- Positioning time;
    - Cold start: the time from system power on to capture shall not exceed 120s;
    - Hot start: the capture time should be less than 10s.
- Minimum position update rate: 1Hz.

Indicator light

The vehicle terminal displays its working conditions through three indicators, namely system operation, server connection and positioning status indicators. The installation personnel can find the problem directly through the indicator light. For details, please refer to the indicator light definition document:

Green light	**System running light**
	Normal status: 0.5Hz flashing, 1s on and 1s off
	Sleep: long off
Red light	**LTE status indication**
	Establish connection with the server: 0.5Hz flashes, 1s on and 1s off
	Connection not established with server: 0
	Sleep mode: long off
Blue light	**GNSS status indication**
	Precise positioning: 0.5Hz flashing, 1s on and 1s off
	Imprecise positioning: long off
	GNSS antenna fault or GNSS module fault: long on

CAN communication function

The vehicle terminal supports the communication interface of 2-channel CAN and connects with the vehicle CAN

bus to receive and send data flow.

Program upgrade

The vehicle terminal supports local program upgrade and OTA remote upgrade.

Security policy

The vehicle terminal provides technically feasible safety strategies to ensure that various performances and functions of the product are within the safe range. It can be realized from the following aspects:

- The data stored and transmitted by the vehicle terminal is encrypted, and the asymmetric encryption algorithm is adopted. The national secret SM2 algorithm or RSA algorithm can be used, and the private key is strictly protected by hardware;
- The data stored and transmitted by the vehicle terminal is complete;
- Scan the data during data transmission to find malicious data and attacks in time, such as writing commands to CAN bus devices such as ECU or other instructions beyond normal data reading. More than 95% of attacks are detected in security detection, and the false positive rate is less than 1%. Find and start protective measures within 10s after the attack;
- Without the consent of the enterprise, the terminal can only read the vehicle data and cannot send any instructions other than the diagnosis request to the ECU;
- The vehicle terminal only sends data to the outside and does not accept operation instructions other than the manufacturer.

Anti-dismantling technology

The vehicle terminal has anti-dismantling technical measures to ensure that the terminal will not be removed maliciously. The anti-dismantling technology of vehicle terminal and mechanical connection includes two ways:

1. Real-time detection of anti-dismantling wire connection status;
2. Send a heartbeat to the machine regularly when the connection is normal. In case of disconnection failure or removal of the anti-dismantling wire, send the removal alarm to the machinery, and send the removal alarm information to the management platform as far as possible according to the requirements of tables H.2 and H.10. The alarm information includes the removal status, removal time and positioning longitude and latitude information. The alarm system shall be activated when the machine receives the dismantling alarm or the anti-dismantling heartbeat exceeds 5 minutes.

Performance requirement

Start time

The time from power on operation to real-time data acquisition of vehicle terminal shall not exceed 60s.

Operating voltage range

The working voltage range of the vehicle terminal meets the requirements of Table 1. According to the test method of ISO 16750-2:2010 (4.2), all functions of the vehicle terminal during and after the test are at grade A defined in ISO 16750-1.

DC power supply system	Minimum operating voltage	Maximum operating voltage
12/24	8	32

Overvoltage performance
The overvoltage performance of vehicle terminal shall meet the requirements of 4.3 in ISO 16750-2:2010.
Power supply voltage test at startup
When the vehicle terminal is started, the power performance shall meet the requirements of 4.6.3 in ISO 16750-2:2010.
Reverse voltage performance
The reverse voltage performance of vehicle terminal shall meet the requirements of case 2 in 4.7 of ISO 16750-2:2010.
Environmental suitability
Operating temperature range
When the vehicle is powered by the main power supply, the working temperature range is: – 30 ℃ ~ + 75 ℃.
Storage temperature range
Storage temperature range: – 40 ℃ ~ + 85 ℃.

Resistance to mechanical vibration
The mechanical vibration resistance of vehicle terminal shall meet the requirements of 4.1 in GB/T28046,3-2011.
Resistance to Mechanical Shock
The mechanical impact resistance of vehicle terminal shall comply with GBT28046 according to the installation position of vehicle terminal 3-2011.
Housing protection performance
The housing protection of vehicle terminal shall comply with GBT 4208, and the housing protection grade shall be IP67. After the risk test, all functions of vehicle final drive shall be in class A defined in GB/T 28046.1-2011.
Low-temperature performance
Low-temperature storage and operation performance of vehicle terminal shall meet the requirements of 5.1.1 in ISO 16750-2:2010.
High-temperature performance
The high-temperature storage and operation performance of vehicle terminal shall meet the requirements of 5.1.2 in ISO 16750-2:2010.
Temperature gradient performance
The temperature gradient performance of vehicle terminal shall meet the requirements of 5.2 in ISO 16750-2:2010.
Damp heat cycle performance
The damp heat cycle performance of vehicle terminal shall meet the requirements of test 2 in 5.6.2 of GB/T 28046.4-2011.
Temperature cycle
The temperature cycle performance of vehicle terminal shall meet the requirements of 5.3.1 in ISO 16750-4:2010.
EMC performance
Electrical transient conduction immunity along the power line
The severity of electrical transient conducted immunity test pulse along the power line shall meet the requirements of class III in table A1 or table A2 of GB/T 21437.2-2008. The test shall be conducted according to 5.2.3.1, and all functions of vehicle terminal during and after the test shall meet the requirements of table A.4 or table A.5 of GB/T 21437.2-2008.
Radiated immunity
The radiation immunity limit complies with ISO 11452-1:2005, field strength grade: 75V/m, frequency 200-3000MHz. The test shall be carried out according to 5.2.3.3. During and after the test, all functions of vehicle terminal shall be in class a defined in GB/T 28046.1-2011.

Electrostatic discharge immunity

The immunity limit of electrostatic discharge shall meet the requirements of 8KV contact discharge soil and ±15KV air discharge in table B.3 of GB/T 19951-2005. Conduct the test according to 5.2.3.4. After the test, all functions of the vehicle terminal are in class A defined in GB/T 28046.1-2011.

Reliability performance

The service life of vehicle terminal shall not be less than 3,000 hours.

Installation method

Product installation steps

1. Paste the terminal on the selected installation position with 3M glue;
2. Fix M6/4 screws on the mounting holes respectively to ensure stability and firmness;
3. Ensure that the terminal housing and label are in good condition during installation.

Product installation sequence

1. First select the specific installation position of the terminal, paste 3M glue on the back of the terminal (one side of grid texture) (ensure firm pasting), tear off the 3M glue red protective paper, and then paste the front of the terminal (the label surface) upward or outward on the selected installation position;
2. Fix 4 M6 screws on the mounting hole with socket wrench or cross screwdriver to ensure the stability and firmness of the terminal;
3. Connect the terminal connector with the terminal harness connector of the whole vehicle;
4. Finally, connect the GPS antenna and GSM antenna to the terminal.

Precautions for product installation

1. The installation surface shall be smooth without oil stain and dust;
2. Ensure that the terminal housing and label are in good condition during installation.

Antenna installation and precautions

1. Before installing the antenna, wipe the installation surface clean without dust. It is best to install it on the surface of iron plate, which can be absorbed. In order to be firm and reliable, double-sided adhesive can also be added;
2. High power magnetic field shall be avoided around the antenna to prevent electromagnetic interference from affecting the receiving effect of GSM signal;
3. The antenna shall be installed in a closed metal protection or shelter to avoid affecting the receiving effect of GSM antenna;
4. Use 0.9N.m torque wrench to fasten GSM and GPS antennas respectively;
5. In order to achieve the best positioning performance, the flat bottom of the antenna shall be installed as flat as possible, and the inclination shall not exceed 45 °;
6. It should be noted that if the installation position of the antenna is deep (low), the angle of receiving the satellite signal will be small and good positioning effect cannot be obtained.

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.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the 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:

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

To maintain compliance with FCC's RF Exposure guidelines, This equipment should be installed and operated with minimum 20cm distance between the radiator and your body: Use only the supplied antenna.

Documents / Resources

	[**Jiangsu Wulian Network Technology Development WL-TBOX4 Vehicle Terminal**](#) [pdf] Instructions TBOX4, 2A6ME-TBOX4, 2A6METBOX4, WL-TBOX4, Vehicle Terminal, WL-TBOX4 Vehicle Terminal