

**INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

JT/T 1458-2023

**Performance requirements and testing approaches of
commercial vehicle communication system (V2X) terminal
(English Translation)**

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1 Scope

This document specifies the composition and application, performance requirements, positioning performance, communication performance test methods of vehicle-to-road/vehicle-to-vehicle communication (V2X) terminals for commercial vehicles.

This document applies to vehicle-to-road/vehicle-to-vehicle communication (V2X) terminals for commercial vehicles, as well as the communication performance and positioning performance test of such terminal equipment in direct communication of the Internet of Vehicles (intelligent connected vehicles).

2 Normative references

The contents of the following documents constitute essential clauses of this document through normative references in the text. Among them, for dated references, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies to this document.

GB/T 6113.104-2021 Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-4: Radio disturbance and immunity measuring apparatus - Antennas and test sites for radiated disturbance measurements

JT/T 1253-2019 GNSS for operating vehicles-Test methods of on-board unit

YD/T 3848-2021 LTE-based vehicle access wireless communication technology direct connection communication terminal equipment test support

SJ/T 11420-2010 General specification for GPS navigation receiver

3 Terms and definitions

The following terms and definitions apply to this document.

3.1

Commercial vehicle

Vehicles that have obtained road transport licenses and are engaged in commercial

4.1 Symbols

The following symbols apply to this document.

V_{max} - Maximum test speed of the vehicle

4.2 Abbreviations

The following abbreviations apply to this document.

AWGN: Additive White Gaussian Noise

GNSS: Global Navigation Satellite System

PDCCP: Packet Data Convergence Protocol

QPSK: Quadrature Phase Shift Keying

RB: Resource Block

SDU: Service Data Unit

V2I: Vehicle to Infrastructure

V2V: Vehicle to Vehicle

V2X: Vehicle to Everything

5.1 Composition

The on board unit shall include at least the following functional units:

- a) Radio communication unit: Receiving and sending signals; one or more radio communication subsystems can be installed in an on-board device;
- b) Positioning unit: This unit usually contains a global navigation satellite system receiver to provide information such as the vehicle's location, direction, speed, time;
- c) Signal processing unit: Run specific programs to process the signals to be sent and received;

d) Antenna: Used to receive and send RF signals.

The positioning reacquisition time shall be less than 5 s.

6.1.5 Sensitivity

The sensitivity shall meet the following requirements:

- a) The acquisition sensitivity is not less than -140 dBm;
- b) The tracking sensitivity is not less than -150 dBm.

6.2.1 Working frequency band

The working frequency band of the on-board unit's direct link communication shall meet the following requirements:

- a) Support working frequency range: 5905 MHz ~ 5925 MHz;
- b) Support channel bandwidth: 20 MHz.

6.2.2 Maximum output power

The maximum output power of the on-board unit's direct link is 23 dBm, which has a tolerance of ± 2 dB.

6.2.3 Receiver sensitivity

The working frequency is between 5905 MHz and 5925 MHz; the channel bandwidth is 20 MHz; it occupies 96 RB; the transmission block size is 6968 bits; it uses single transmission; the modulation mode is QPSK. Under the AWGN channel conditions, when the receiving power is -87.5 dBm, the throughput of the on-board unit is not less than 95% of the maximum throughput of the reference measurement channel.

6.2.4 Reliability

The communication reliability of the on-board unit shall meet the following requirements:

- a) The packet error rate within the safe communication distance shall not exceed 10%;
- b) The time delay within the safe communication distance shall not exceed 100 ms.

7.1 Test conditions

The RF conditions of the test site meet the RF requirements of the test site specified in GB/T 6113.104-2021.

7.2 Static positioning accuracy

The test method of static positioning accuracy shall comply with the provisions of 5.4.1.1 of SJ/T 11420-2010.

7.3 Dynamic positioning accuracy

The test method of dynamic positioning accuracy shall comply with the provisions of

7.3.3

of JT/T 1253-2019.

7.4.1 Cold start time to first fix

The test method for cold start time to first fix is as follows:

- a) Clear the short-term ephemeris and the latitude and longitude of the last positioning temporarily stored in the terminal to be tested; turn off the terminal to be tested;
- b) Determine a set of satellite simulator ephemeris samples;
- c) Load the ephemeris samples; adjust the output power of the satellite positioning simulator to -130 dBm;
- d) Cold start the terminal to be tested; start timekeeping, until the terminal is correctly positioned; record the timing time;
- e) It should repeat the above steps for no less than 5 times; take the average value of the time recorded in step d) as the test result. When selecting the ephemeris sample in step b), it shall be ensured that the time interval with the previous ephemeris scene exceeds 4 hours.

7.4.2 Warm start time to first fix

The warm start time to first fix test method is as follows:

- a) Clear the short-term ephemeris and the latitude and longitude of the last positioning temporarily stored in the terminal to be tested;
- b) Determine at least 2 sets of satellite simulator ephemeris samples, to ensure that the time interval between ephemeris scenes exceeds 2 hours;
- c) Load the first set of ephemeris samples; adjust the output power of the satellite positioning simulator to -130 dBm;
- a) Load the satellite positioning simulator with a fixed ephemeris sample; adjust the output power to -165 dBm;