

ICS 43.040
CCS T 36



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

GB/T 47126-2026

**Road vehicles - Data communication between sensors and data
fusion unit for automated driving functions - Logical interface**

道路车辆 自动驾驶传感器与数据融合单元间数据通信 逻辑接口

(English Translation)

Issued on: February 27, 2026

Implemented on: June 1, 2026

Issued by: State Administration for Market Regulation;

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1 Scope

This document specifies the logical interface between onboard environmental perception sensors and the fusion unit. It does not specify electronic, electrical, or mechanical interface standards, nor does it specify the raw data interface. The fusion unit generates a surrounding model based on sensor data and interprets the external scene. The logical interface is represented by a modular semantic description and provides object-level information as well as feature-level and detection-level information, based on sensor-specific technical information.

This document applies to road vehicles with automated driving capabilities.

Note 1: Onboard environmental perception sensors include millimeter-wave radar, lidar, cameras, ultrasonic radar, etc.

Note 2: Objects include potential moving objects, road objects, static objects, etc.

2 Normative references

This document has no normative references.

3 Terms and definitions

The following terms and definitions apply to this document.

3.1 Architecture

3.1.1

Fusion

The behavior of merging signals (3.3.1) from two or more sensors (3.1.5) and sensor clusters (3.1.6) to create a surrounding model (3.1.7).

Figure 8 -- Affine coordinate system

4 Abbreviations

The following abbreviations apply to this document.

AD. Automated driving AER. Alternative entity representation A2I. Assign to interface CDI. Camera detection interface CFI. Camera feature interface CSII. Common sensor input interface DLI. Detection level interface ECU. Electronic control unit EM. Error model FFT. Fast Fourier transform FLI. Feature level interface FLP. Front-left position of the ego-vehicle FOV. Field-of-view SPI. Sensor performance interface SSI. Supportive sensor interface UDI. Ultrasonic detection interface UFI. Ultrasonic feature interface UTL. Unrolling tuple list VRO. Value representation optimization

5.1 General rules

This document covers the logical interfaces of sensors and sensor clusters. Therefore, the term "interface" is used in the following sections of this document as an abbreviation of the defined term "logical interface" (3.1.4). The interface description is structured as follows.

- Each interface is described by Logical Signal Groups (LSGs), signal names, Requirement Levels (RLs) (including conditional requirements) and other options;
- Detailed descriptions of each signal in Appendix A;
- General options and general conditional requirements to be used in Appendix B.

The Requirement Level attribute "Conditional" shall be the element used in this document. Logical interconnections between interface signals and complex dependencies shall be defined in the configuration file of the corresponding interface.

5.2 Signals

Table 1 provides descriptions of the signals used by the interfaces defined in 5.3. All

signals are specified in Appendix A. Signal names shall be unique. Similar signals at different interface levels shall have the interface level added to the signal name to ensure unique signal naming.

Table 1 -- Signals. < Signal name >

Generally, for each signal with a value type of "enumeration", a list of enumeration values or enumeration examples is defined in an additional table in Appendix A (see

Table 2). Each list of enumeration examples is for reference only. During the system

design phase, specific enumeration values shall be defined according to the list of enumeration examples in Appendix A. This can be accomplished, by adding new ones, using a subset of existing enumeration examples, or adjusting existing enumeration example values. An implementation of the enumeration example value list shall contain at least one enumeration value and preferably has a default enumeration value (B.1.8).

Enumerations with enumeration example values can allow outputs of multiple enumeration values belonging to different classes. During system design, enumeration values of different classes can be specified using separate enumeration signal identifiers.

Each enumeration with enumeration examples shall have a default enumeration value (B.1.8). Each implementation's enumeration example list shall define at least one enumeration value. Multiple enumeration example values can be clustered, to handle different types of enumeration values, rather than providing multiple enumeration value categories.

Table 2 -- Enumerations. < Signal name>

5.3 Interface

Table 3 provides a description of the logical interface. The interface consists of signals.

For ease of logical grouping, signals can be part of a Logic Signal Group (LSG).

Table 3 -- Interface. < Interface name>

The grayed-out areas in the interface table indicate that the signals contained therein are part of the entity list. The number of valid entities is defined at the beginning of the gray area (i.e., the gray area header).

If an interface provides multiple interface entity types (e.g., a road object interface provides road surface, road markings, road boundaries), the interface may not require all entity types to be provided simultaneously (see B.2.4). Different entry types of the interface are separated by double horizontal lines.

A conditional LSG shall define its usage conditions. Under all other conditions, the LSG is optional (see 3.5.1).

An LSG shall have at least one mandatory signal. If a signal in an optional LSG is used, all signals in that LSG shall conform to its signal requirement level definition.

For a list, the "number of valid < ...> signals" and the requirement level of its LSG are the basic requirement levels for all signals in the list.

The symbol " " indicates that the LSG belongs to another LSG, making it a nested LSG.

If only one signal requirement level is defined for a signal with a signal identifier, then the requirement level for each signal identifier corresponds individually to the requirement level