ENGLISH TRANSLATION

Experimental Communication Message Guidelines of Safe Driving Support and Autonomous Driving Support Systems for General Roads

ITS FORUM RC-019 Version 1.0

Established on April 23, 2025

ITS Info-communications Forum of Japan

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Revision History

Version	Date	Chapter/Section	Reason	Revised Content
1.0	April 23, 2025	Establishment	Newly established	

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Introduction

This document is a guideline that establishes experimental communication message specifications for preventing traffic accidents and various types of incidents by having roadside units indicate the presence of traffic participants through wireless communication with the purpose of supporting safe driving and autonomous driving support for vehicles, bicycles, pedestrians, and other general traffic participants on general roads. The effects that are expected from the provision of information using such messages include preventing oversight of general traffic participants and complementing the cognitive functions (autonomous sensors) of automated vehicles in various scenarios, such as intersection entry, turning left or right, and single-lane driving.

These guidelines can also be used for purposes other than safe driving support and autonomous driving support (such as smoothing traffic flows, collecting probe information, and providing monitoring support).

It is hoped that these guidelines will be adequately verified through demonstration experiments and the like of the relevant systems and that they will further promote activities for practical application.

Contents

Chapter 1. General Matters

1.1 Overview

Demonstration tests are being conducted under the Digital Lifeline Development Plan[*1] and by the Automated Driving Infrastructure Study Group[*2] with the objective of achieving autonomous driving support and safe driving support using infrastructure. Also, the Next-Generation ITS Investigation Committee[*3] is investigating safe driving support systems using infrastructure.

These guidelines were formulated with the assumption of use in such demonstration tests and indicate message specifications for conducting demonstration tests for the realization of systems that prevent traffic accidents in various incidents by having roadside units transmit information via wireless communication to traffic participants on general roads where vehicles (including autonomous vehicles), bicycles, pedestrians, and other users are present (referred to as “Safe Driving Support and Autonomous Driving Support Systems For General Roads”).

*1: https://www.meti.go.jp/policy/mono_info_service/digital_architecture/lifeline_portal/index.html

*2: https://www.mlit.go.jp/road/ir/ir-council/jido-infra/index.html

*3: https://www.mlit.go.jp/road/ir/ir-council/jisedai_its/index.html

1.2 Scope of Application

Safe Driving Support and Autonomous Driving Support Systems for General Roads consist of roadside units, vehicles (including autonomous vehicles), bicycles, pedestrians, and other users, and each communicates by broadcasting using 700 MHz band ITS communication, a wireless communication band dedicated to ITS (Figure 1-1). Within those communications, these Guidelines handle roadside unit message sets broadcast from roadside units to vehicles through direct communications (I2V). Communications to bicycles and pedestrians (I2B/12P) can also be used. For information on other message sets, refer to other guidelines issued by the ITS Info-communications Forum.

The relationships among the scope of application of each guidelines are indicated in Tables 1-1 and 1-2. The applicable guidelines are organized with the transmission side on the vertical axis and the receiving side on the horizontal axis. These Guidelines specify information on transmissions from roadside units to (manually operated) vehicles, autonomous vehicles, bicycles, and pedestrians on general roads. The content established in these Guidelines (RC-019) are based on Chapter 4 of Roadside Unit Transmission Message Specifications (RC-016) version 1.0 and are expanded for automated driving support, but they are not mutually compatible. It is recommended that these Guidelines (RC-019) be used to plan future experiments (particularly by experimenters conducting transmissions from roadside units to autonomous vehicles). However, this does not restrict used by experimenters already using RC-016 version 1.0.

Details of wireless transmission methods use previously-established standards and are not handled in

these Guidelines. Refer to Chapter 3 regarding wireless transmission methods.

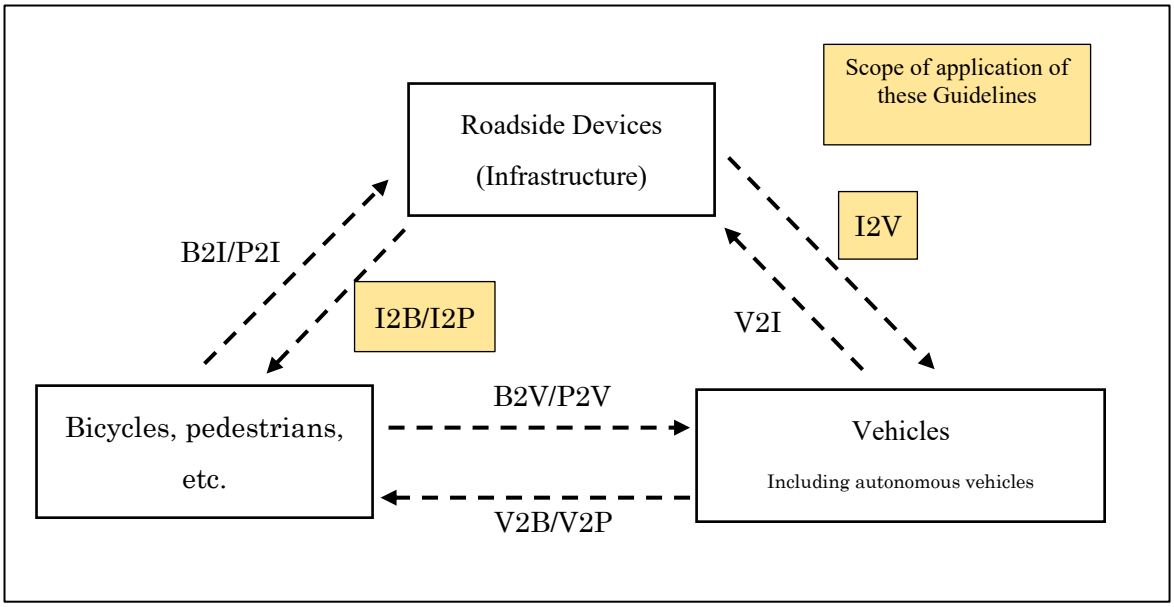


Figure 1-1. Target Systems and Scope of Application of These Guidelines

Table 1-1. Guidelines and their Scopes of Application (for General Roads)

		Receiving side			
		Roadside unit	(Manually-operated) vehicle	Autonomous vehicle	Bicycle/pedestrian
Transmitting side	Roadside unit	Specified other than by ITS Forum	RC-019 RC-016 ver. 1.0*1	RC-019	RC-019 RC-016 ver. 1.0*1
	(Manually-operated) vehicle	RC-013	RC-013	RC-013	RC-013
	Autonomous vehicle	Common area: RC-013 Free area: RC-018*2	Common area: RC-013 Free area: RC-018*2	Common area: RC-013 Free area: RC-018*2	Common area: RC-013 Free area: RC-018*2
	Bicycle/pedestrian	Common area: RC-013 Free area: RC-016	Common area: RC-013 Free area: RC-016	Common area: RC-013 Free area: RC-016	Common area: RC-013 Free area: RC-016

Note 1: It is recommended that these Guidelines (RC-019) be used for roadside unit transmission messages, but use of RC-016 version 1.0 is not prohibited.

Note 2: Expanded information relating to emergency vehicles and hazards.

Table 1-2. Guidelines and Their Scope of Application (for Highways)

		Receiving side		
		Roadside Unit	(Manually-operated) vehicle	Autonomous vehicle
Transmitting side	Roadside unit	Specified other than by ITS Forum	RC-018	RC-018
	(Manually-operated) vehicle	Common area: RC-013 Free area: RC-018	Common area: RC-013 Free area: RC-018	Common area: RC-013 Free area: RC-018
	Autonomous vehicle	Common area: RC-013 Free area: RC-018	Common area: RC-013 Free area: RC-018	Common area: RC-013 Free area: RC-018

1.3 Reference Materials

[1] 700 MHz Band Intelligent Transport Systems ARIB Standard, ARIB STD-T109 Ver. 1.3

[2] 700 MHz Band Intelligent Transport Systems - Extended Functions Guideline, ITS FORUM RC-010 Ver. 1.1

[3] 700 MHz Band Intelligent Transport Systems - Experimental Guideline for Inter-vehicle Communication Messages, ITS FORUM RC-013 Ver. 1.1

[4] Experimental Communication Messages Guidelines of Bicycle/Pedestrian Accident Prevention Support System, ITS FORUM RC-016 Ver. 1.0

[5] Experimental Guideline for 700 MHz Band Intelligent Transport Systems for Autonomous Driving Communication Utilization Use Cases—Support for SIP Use Cases, ITS FORUM RC-018 Ver. 1.1

[6] List of Standards, UTMS Society of Japan
https://utms.or.jp/wp-content/uploads/2024/03/kikaku.pdf

[7] ITS Wireless Roadside Device DSSS Road-to-Vehicle Communication Application Standard, UTMS Society of Japan, B3U01010 Ver. 1

1.4 Terms and Abbreviations

1.4.1 Terms

- **Roadside unit**: A general term for a device installed on the roadside for receiving, detecting, and transmitting information regarding the presence of bicycles and pedestrians for use with covered systems.
- **Target**: A general term for bicycles, pedestrians, vehicles, and so on treated as transmission subjects by roadside units.
- **Target information**: Information on the presence of a target
- **I2V**, **I2B/I2P, etc.**: A transmission to any of infrastructure, vehicle, bicycle, or pedestrian. For example, a transmission from a roadside unit to a vehicle is I2V, and a transmission from a roadside unit to a bicycle is I2B.

- **Message**: Application data exchange between application and communications protocol.
- **Message set**: An aggregation of message specifications defined for the relevant application.
- **Data frame (DF)**: The unit of data that comprises a message. Made up of one or more data elements. There are also cases where a message comprises multiple data frames or data elements.
- **Data element (DE)**: The smallest unit of data that comprises a message.
- **Integration**: Integrating outputs from multiple roadside sensors to improve the recognition accuracy of a single target or to eliminate duplicate recognition so that one target is not treated as multiple targets.
- **Merging**: In target tracking processing, recognizing what was previously identified as multiple targets as a single target (including a group of targets) in the current recognition.
- **Extrapolation**: A process that estimates and supplements the current information for a target ID whose target information is missing due to non-detection, based on past target information.
- **Fusion sensor**: A sensor in which the outputs of multiple roadside sensors are fused within the sensor unit and past to the roadside equipment's processing device as a single sensor output. In the specification, it is treated as one sensor (with a single sensor identifier).
- **Common service standard**: A standard for a service (service system) defined by a standards or specifications organization or the like. See Reference Material [3].
- **Individual Service Standard**: A standard for service (service system) defined by an individual company, specific alliance, or the like. See Reference Material [3].
- **Individual application**: Application software that performs operations defined by an individual service standard. See Reference Material [3].
- **Service**: The provision of target information or signal information.
- **Use case**: The content of support provided through the utilization of a service.

1.4.2 Abbreviations

- **GNSS**: Global Navigation Satellite System
- **HMI**: Human Machine Interface
- **LED**: Light Emitting Diode

Chapter 2. System Overview

This chapter provides an overview of Safe Driving Support and Autonomous Driving Support Systems for General Roads.

2.1 System Structure

Figure 2-1 shows the system structure conceptual diagram of a Safe Driving Support and Autonomous Driving Support Systems for General Roads. Such systems are made up of roadside units, vehicles (including autonomous vehicles), bicycles, pedestrians, and other users.

Roadside units detect the presence of vehicles, bicycles, pedestrians, and so on using roadside sensors (including receipt of presence information regarding each from radio units) and provide notice of their presence (referred to as “target information”) to others in the vicinity using wireless communications and HMI such as LED display units. In addition, information is shared with other networked roadside units, cloud services, and so on using an external interface.

Vehicles, bicycles, pedestrians, and so on acquire information from GNSS receiver units and various sensors, including acceleration sensors, and provide notice of it their own presence information to others in the vicinity through wireless communications (V2V and so on indicated in the figure).

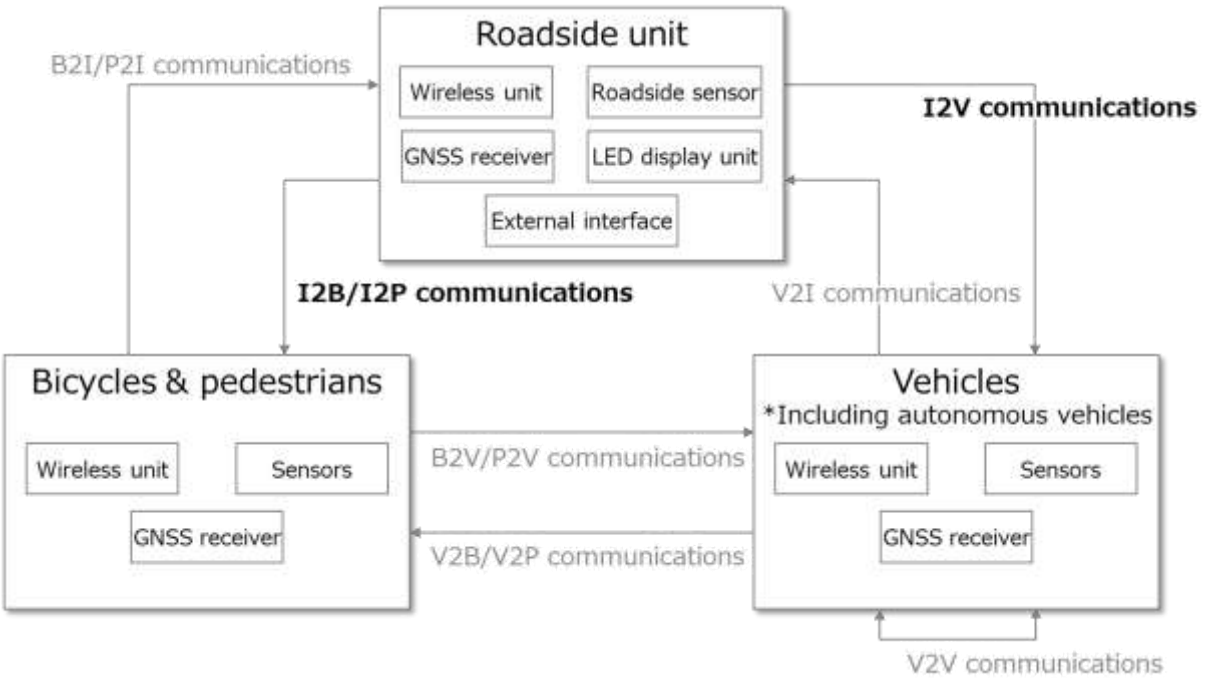


Figure 2-1. System Structure Conceptual Diagram

2.2 Safe Driving Support and Autonomous Driving Support Use Cases

The systems will be used to provide safe driving support for general traffic participants and driving support for autonomous vehicles. The following use cases are anticipated.

(a) Traffic signal awareness support
(b) Signalized intersection entry support
(c) Left turn support
(d) Right turn support
(e) Rear-end collision prevention support during initial acceleration
(f) Merging support
(g) Crossing collision prevention support, and others

To give one example, Figure 2-2 is a conceptual diagram of the crossing collision prevention support indicated in (g). A roadside unit is installed at an intersection with poor visibility where the risk of a head-on collision is high. The roadside unit detects targets on the intersecting roads that are outside the driver's line of sight (or outside the autonomous sensors' field of view in the case of an automated vehicle) using roadside centers. The presence information (target information) of these detected targets is stored in the roadside unit transmission message format defined in these Guidelines and transmitted via a radio unit. Vehicles receive the information through their onboard radio units, and providing driver alerts via the onboard HMI or by enabling vehicle control through the automated driving system, accidents and near miss incidents can be prevented, thereby ensuring smooth traffic flows.

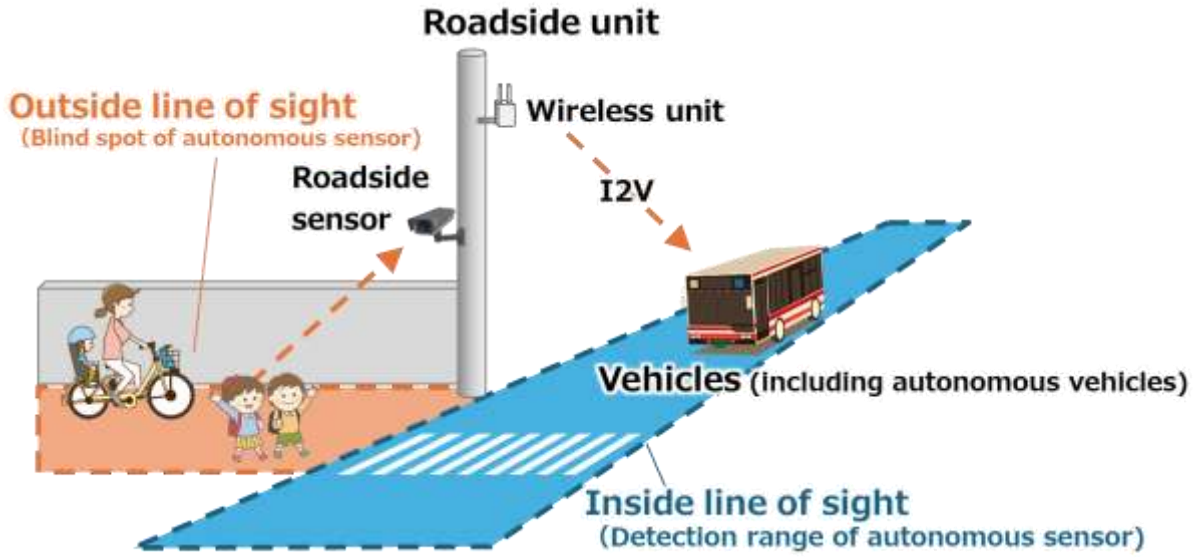


Figure 2-2. Conceptual Diagram of Prevention of Crossing Collision s

2.3 Other Use Cases

The systems can be used for applications other than safe driving support and autonomous driving support. Some possible uses include mitigating traffic congestion through the provision of lane restriction information or stopped vehicle information, evaluating road surface conditions using probe information, and watching over children or elderly persons by using external networks.

2.4 Fusion of Target Information by Roadside Units

The roadside units of the systems will use wireless transmissions from one or more roadside sensors, vehicles, bicycles, pedestrians, and so on as information sources. As a result, the detection ranges of each information source may overlap depending on the equipment composition, and cases where a single target is linked to multiple items of target information are anticipated. To address these types of cases, it will be necessary to perform processing to fuse target information.

Figure 2-3 is a conceptual diagram of this. In the case where a roadside unit has multiple information sources within a single detection range, the roadside unit performs matching through identification processing of the target information received from each information source and examines whether they are the same. If it determines that they are the same, it fuses the target information into a single entity through integration processing.

The detailed algorithm for integrating target information is not handled in this document.

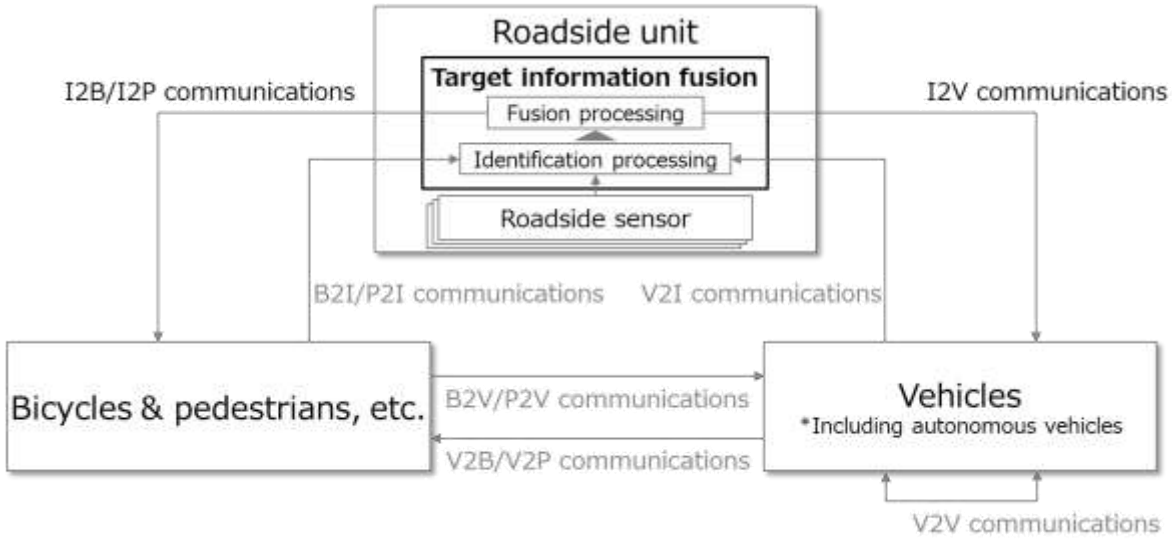


Figure 2-3 Conceptual Diagram of Target Information Integration

2.5 Tracking Status

Roadside units use target information messages to provide notice to vehicles and others regarding the target tracking status of targets that a roadside sensor currently detects or previously detected. Eight tracking states

are defined for each target: Initialization, Normal Tracking, Lost, Disappeared, Merged, Deleted, Divided, and Out of Field of View. The definitions of each are set forth below.

1. Initialization: The initial status in which a target is detected for the first time and tracking is initiated.
2. Normal tracking: The status in which tracking is being performed and detection results with a certain level of accuracy are obtained. This is the normal condition.
3. Lost: The status in which a previously detected target has temporarily not been detected, but the roadside unit determines to continue tracking and predicts the target's position (extrapolation) despite the absence of detection.
4. Disappeared: The status in which the "Lost" status has continued in the roadside unit abandoned tracking. After transitioning to this state, the target is removed from the tracking list after a certain period (e.g., three cycles or a short period of time), and the roadside unit no longer includes the target's information in transmitted messages.
5. Merged: The status in which multiple targets that were previously handled separately are combined into a single target. This status is assigned to a representative target among the multiple targets. Targets that are currently in the Lost status are also included. After transitioning to this status, the target is moved to either Normal Tracking or Lost after a certain period (e.g., three cycles or a short period of time).
6. Deleted: The status assigned to a target that is removed during merging. Targets currently included in the Lost status are also included. After transitioning to this status, the target is removed from the tracking list after a certain period (e.g., three cycles or a short period of time).
7. Divided: A status in which a target that was previously stored as a single entity is divided and corrected into multiple targets. Targets that are currently in the Lost status are also included. After transitioning to this status, the targets are moved to either Normal Tracking or Lost after a certain period (e.g., three cycles or a short period of time).
8. Out of Field of View: The status in which a target moves outside the sensor detection range while being tracked, and notifications are discontinued. Targets that are currently in the Lost status are also included. After transitioning to this status, the target is removed from the tracking list after a certain period (e.g., three cycles or a short period of time), and the roadside unit stops including the target's information in transmitted messages.

Among these statuses, Disappeared, Merged, Deleted, Divided, and Out of Field of View are temporary statuses and are maintained for short periods such as three cycles. This is a measure to prevent missed notifications in the event of a communications error. Among these, Disappeared, Deleted, and Out of Field of View are status that is intended to signal the impending discontinuation of target information storage. It is not anticipated that these target information statuses will be used on the receiving side. At such times, each data

element of DF_TargetIndividualInformation, with the Exception of DF_TargetIndividualManagementInformation, stores either an undefined value or copy of the value from the previous cycle.

Tracking status is expressed as DE_TrackingInformation. DE_TrackingInformation consists of seven types of information: initialization, detection status, reason for non-detection, notice of deletion, integration display, and division display, and combinations of these elements express the tracking status. See 5.3.3.2 for details.

2.6 Extrapolation at Time of Non-Detection of Target

There are times where a roadside unit is temporarily unable to detect a target that is present due to occlusion or for other such reasons. At such times, the roadside unit estimates the position and other attributes of the target through extrapolation and stores that information as the target information.

During extrapolation, 0 is stored in DE_TrackingInformation as the tracking status. Also, predicted values are stored in DF_TargetStatusInformation and DF_TargetPrecisionInformation and the predicted time is stored in DF_PresenceTime to enable continued use of information on the receiving side. The values at the time of the last detection are stored with respect to DF_TargetSizeInformation and DF_TargetTypeInformation. If extrapolation continues for an extended period, reliability declines, and therefore, deletion after the passage of a certain period is desirable. In these cases, the tracking status shifts to Deleted, and storages discontinued after a certain period.

The detailed algorithm for extrapolation is not handled in this document.

Chapter 3. Roadside Unit Transmission Message Specifications

This chapter defines the experimental message specifications for transmitting information from roadside units to vehicles and so on.

3.1 Wireless Communications Method

These Guidelines anticipate that a wireless communications method compliant with ARIB STD-T109 (Reference Material [1]) and ITS FORUM RC-010 (Reference Material [2]).

3.2 Positioning Relationships of Message Specifications

New message specifications were formulated for the anticipated use cases discussed in Chapter 2. The positioning relationships of the message specifications defined in these Guidelines are shown in Figure 3-1. For the communications protocol, the road-to-vehicle communications methods specified in Reference Materials [1] and [2] are anticipated.

When performing experiments, it is necessary to implement countermeasures so there is no impact on vehicles equipped with existing applications.

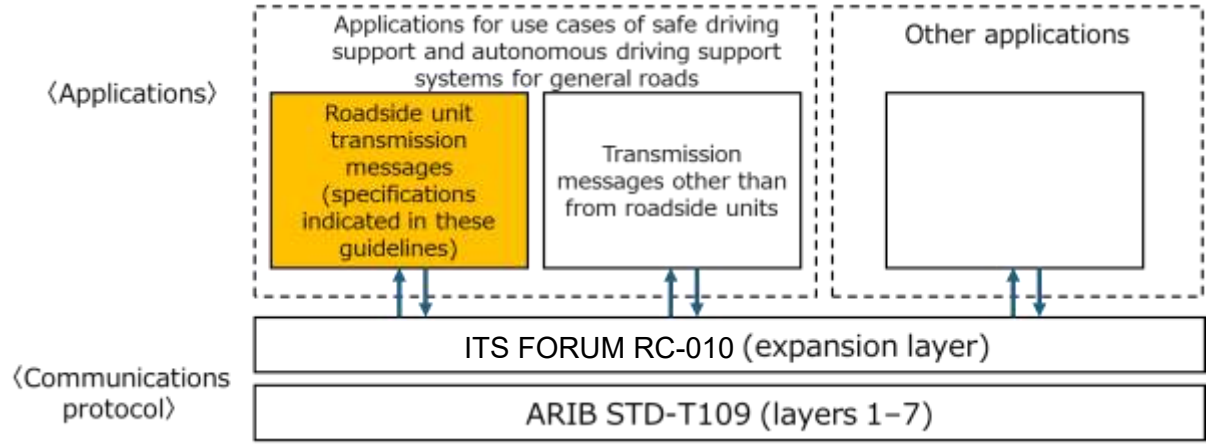


Figure 3-1. Positioning Relationship of Message Specifications Formulated in These Guidelines

3.3 Transmission Cycles

In general, each message is transmitted on a 100 ms cycle.

3.4 Data Storage Cycles

In general, data storage cycles are set the same as transmission cycles. However, among the roadside unit attribute information, longer storage cycles may be set for static data frames such as DF_ServiceLocationInformation, DF_UseCaseInformation, and DF_SensorInformation. Whether or not data

is stored is specified using DE_RoadsideUnitOptionFlag.

It should be noted that if data storage cycles are lengthened, it is possible that services will not be received immediately after entering the reception area of communications between roadside units and vehicles (for example, if the data cycle is 1 second and the applicable maximum speed for vehicles receiving services is 60 km/h, there is a possibility that service provision will not start until the vehicle travels 16.7 m after entering the reception area). In order to reliably provide services, data storage cycles should be set appropriately taking into consideration the range of road-to-vehicle communication, the actual speeds of detection targets, and other factors.

3.5 Message Sets

Roadside unit transmission message sets comprise five messages: roadside unit attribute information messages, target information messages, signal information messages, road shape information messages, and service support information messages (other messages may be added in the future). Roadside unit attribute information messages consist of a roadside header and roadside unit attribute information and are supported by all roadside units to which these guidelines apply. Target information messages consist of a roadside header and target information and are implemented by those roadside units to which these Guidelines apply that provide target information services. It is expected that Road-to-vehicle communication application standards issued by the UTMS Society of Japan Reference Materials [6] and [7]) will apply to signal information messages, road alignment information messages and service support information messages, and such messages will be implemented by roadside units to which these Guidelines apply that provide signal information services. When making additional reference to those standards, it should be kept in mind that it is necessary to enter into a confidentiality agreement with the UTMS Society of Japan. Also, care should be exercised during implementation, as the design of the message sets may differ under those standards and these Guidelines.

The roadside unit transmission messages necessary for each service and the basic structure of each message are indicated in Figure 3-2. It should be noted that roadside units that provide both target information services and signal information services implement all five types of messages.

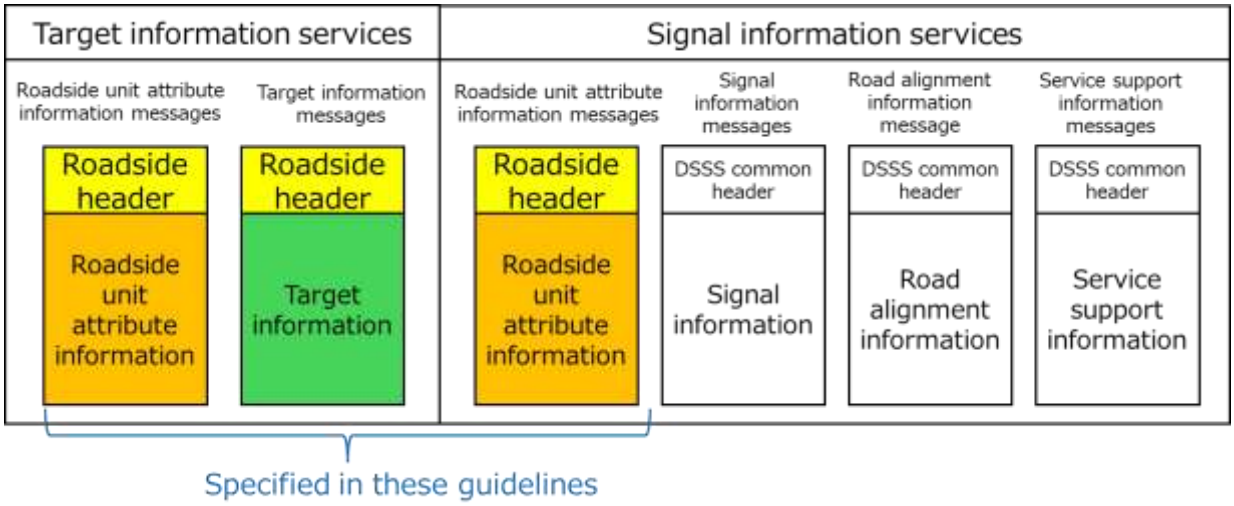


Figure 3-2. Roadside Unit Transmission Messages Necessary for Each Service and Basic Structure of Each Message

3.6 Roadside Unit Attribute Information Messages

The data structure of roadside unit attribute information messages is shown in Table 3-1. Regarding data marked in the mandatory storage column, it is required that the data be included in the message. However, if the value cannot be stored, a corresponding undefined value is assigned. For the overall data structure of the roadside header and roadside unit attribute information, refer to Appendix 2. For information on data frames and data elements, refer to Chapters 4 and 5.

Table 3-1. Data Structure of Roadside Unit Attribute Information Messages

Data structure	Storage DF/DE	Size (Bytes)	Mandatory storage ○: Mandatory △: Conditional	Remarks
Roadside header	DE_CommonServiceStandardID	1	○	
	DE_MessageVersion		○	
	DE_OperationClassificationCode		○	
	DE_IncrementCounter	1	○	
	DE_MessageID	2	○	
	DE_RoadsideUnitID	4	○	
	DF_TransmissionTime	4	○	
	DE_MessageSize	2	○	
	DE_Reserved(16)	2		
Roadside unit attribute information	DE_ServiceOperatingStatus	1	○	
	DE_RoadsideUnitOptionFlag	1	△Note 3	
	〈Roadside Unit Option Area [0]〉		△Note 2, Note 3	
	DE_RoadsideUnitOptionSize	2		
	DF_ServiceLocationInformation	J×7		
	〈RoadsideUnitOptionArea[1]〉		△Note 2, Note 3	
	DE_RoadsideUnitOptionSize	2		
	DF_UseCaseInformation	(1+8×K)×J		
	〈Roadside Unit Option Area [2]〉		△Note 2, Note 3	
	DE_Roadside Unit Option Size	2		
	DF_SensorInformation	1+(15+(2+8×N)×M)×L		
	〈Roadside Unit Option Area [7]〉		△Note 2, Note 3	
	DE_RoadsideUnitOptionSize	2		
	DF_RoadsideUnitAttributeExtendedInformation	Arbitrarily		

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 2. When the relevant option flag in the DE_RoadsideUnitOptionFlag is set to 0, data is not stored.

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

3.7 Target Information Messages

The data structure of target attribute information messages is shown in Table 3-2. Regarding data marked in the mandatory storage column, it is required that the data be included in the message. However, if the value cannot be stored, a corresponding undefined value is assigned. For the overall data structure of the roadside header and target information, refer to Appendix 2. For information on data frames and data elements, refer to Chapters 4 and 5.

Table 3-2. Data Structure of Target Information Messages

Data structure	Storage DF/DE	Size (Bytes)	Mandatory storage ○: Mandatory △: Conditional	Remarks
Roadside header	Same as roadside headers of roadside unit attribute information		△ Note 3	
Target information	DE_NumberOfTargets	1	△ Note 3	
	DF_IndividualTargetInformation: 1	P×(35+Q+(0~47+Arbitrary))	△ Note 3, Note 4	
	DF_IndividualTargetManagementInformation DE_TargetID DE_TrackingInformation DE_DataLength DE_IndividualTargetOptionFlag	7	△ Note 3, Note 4	
	DF_PresenceTime	4	△ Note 3, Note 4	
	DF_TargetStatusInformation	16	△ Note 3, Note 4	
	DF_TargetSizeInformation	7	△ Note 3, Note 4	
	DF_TargetTypeInformation	1+Q	△ Note 3, Note 4	
	〈Individual Target Option Area [0]〉 DF_Detection HistoryInformation	9	△ Note 2, Note 3, Note 4	
	〈Individual Target Option Area [1]〉 DF_TargetPrecisionInformation	13	△ Note 2, Note 3, Note 4	
	〈Individual Target Option Area [2]〉 DF_TargetStatusExtendedInformation	5	△ Note 2, Note 3, Note 4	
	〈Individual Target Option Area [3]〉 DF_TargetStatusForwardingInformation	6	△ Note 2, Note 3, Note 4	
	〈Individual Target Option Area [4]〉 DF_V2X-GNSSInformation	6	△ Note 2, Note 3, Note 4	
	〈Individual Target Option Area [5]〉 DF_ApplicationTypeInformation	8	△ Note 2, Note 3, Note 4	
	〈Individual Target Option Area [7]〉 〈Individual Target Extended Area〉	Arbitrary	△ Note 2, Note 3, Note 4	
	・・・			
	DF_IndividualTarget Information: P		△ Note 3, Note 4	

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 2. When the relevant option flag in the DE_RoadsideUnitOptionFlag is set to 0, data is not stored.

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

Note 4. When DE_NumberOfTargets is 0, data is not stored.

Chapter 4. Data Frames

This chapter describes the data frames that make up each message.

4.1 Roadside Header

4.1.1 DF_TransmissionTime

Indicates that transmission time of the message from the roadside unit.

Table 4-1. DF_TransmissionTime Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_TransmissionTime		○	
DE_LeapSecondCorrectionInformation	1	○	
DE_Time(Hour)	7	○	
DE_Time(Minute)	8	○	
DE_Time(Second)	16	○	

4.2 Roadside Unit Attribute Information

4.2.1 〈Roadside Unit Option Area〉

Areas for storing option information in the roadside unit attribute information. Roadside unit option area [0] to roadside unit option area [7] are available, and the data that is stored in each roadside unit option area is specified by DE_RoadsideUnitOptionFlag (5.2.2). As shown in Table 4-2, the roadside unit option areas consist of DE_RoadsideUnitOptionSize and DF_RoadsideUnitOptionInformation. DF_RoadsideUnitOptionInformation selectively stores reserved data frames corresponding to the roadside unit on area number.

Table 4-2. Roadside Unit Option Area Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
〈Roadside Unit Option Area [x]〉			
DE_RoadsideUnitOptionSize	16	△ Note 2, Note 3	
DF_RoadsideUnitOptionInformation	Arbitrary	△ Note 2, Note 3	

Note 2. When the relevant option flag in the DE_RoadsideUnitOptionFlag is set to 0, data is not stored.

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

4.2.2 DF_ServiceLocationInformation

Stores the service location ID, agent location information, number of connected routes, and route identification information. Stored as DF_RoadsideUnitOptionInformation in Roadside Unit Option Area [0].

Table 4-3. DF_ServiceLocationInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_ServiceLocationInformation			
DE_ServiceLocationID	24	△ Note 2, Note 3	
DF_AgentLocationInformation	80		
DE_NumberOfConnectedRoutes	8	△ Note 2, Note 3	Stores number of connected routes: J
DF_RouteIdentificationInformation: 1	56	△ Note 2, Note 3	Repeated J times.
・・・			
DF_RouteIdentificationInformation: J	56		

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 2. When the relevant option flag in the DE_RoadsideUnitOptionFlag is set to 0, data is not stored.

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

4.2.3 DF_AgentLocationInformation

Indicates the agent point coordinates of the service location. In the case of an intersection, it is the center, and in the case of a road section of uninterrupted flow, it is assumed to be location where an incident is expected to occur in the relevant use case (e.g., the center of a blind curve or the center of a crosswalk without a traffic signal). However, the details are to be determined and should be determined as appropriate among the relevant parties during testing.

Table 4-4. DF_AgentLocationInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_AgentLocationInformation			
DE_Latitude	32		
DE_Longitude	32		
DE_Altitude	16		

4.2.4 DF_RouteIdentificationInformation

Consists of the IDs of the roads connected to the service location and there connection orientations. DE_Reserved (40) is reserved for future expansion (e.g., alignment information for each route).

Table 4-5. DF_RouteIdentificationInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_RouteIdentificationInformation			
DE_RouteID	8	△ Note 2, Note 3	
DE_RouteConnectionOrientation	8	△ Note 2, Note 3	
DE_Reserved(40)	40		

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 2. When the relevant option flag in the DE_RoadsideUnitOptionFlag is set to 0, data is not stored.

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

4.2.5 DF_UseCaseInformation

Repeatedly stores use case information for each connected route up to the value set in DE_NumberOfConnectedRoutes. The data is stored as DF_RoadisdeUnitOptionInformation in Roadside Unit Option Area [1].

Table 4-7. DF_UseCaseInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_UseCaseInformation			
DF_UseCaseInformationByRoute: 1	8+64×K	△ Note 2, Note 3	Repeated J times
・・・			
DF_UseCaseInformationByRoute: J	8+64×K		

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 2. When the relevant option flag in the DE_RoadsideUnitOptionFlag is set to 0, data is not stored.

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

4.2.6 DF_UseCaseInformationByRoute

Indicates use case information corresponding to each route.

Table 4-8. DF_UseCaseInformationByRoute Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_DF_UseCaseInformationByRoute: 1			
DE_NumberOfUseCases	8	△ Note 2, Note 3	Stores number of use cases: K
DF_InformationByUseCase: 1	64	△ Note 2, Note 3, Note 5	Repeated K times.
・・・			
DF_InformationByUseCase: K	64		

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 2. When the relevant option flag in the DE_RoadsideUnitOptionFlag is set to 0, data is not stored.

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

Note 5. When DE_NumberOfUseCases = 0, data is not stored.

4.2.7 DF_InformationByUseCaseType

Provides notice of detailed information for each use case.

Table 4-9. DF_InformationByUseCaseType Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_DF_InformationByUseCaseType			
DE_SubjectUseCaseSupplementalCode	2	△ Note 2, Note 3	
DE_SubjectUseCaseType	6	△ Note 2, Note 3	
DE_ServiceProvisionTargetVehicle	4	△ Note 2, Note 3	
DE_Reserved(4)	4		
DE_TargetInformationSubjectRoute	16	△ Note 2, Note 3	
DE_TargetInformationSubjectSensorNumber	16	△ Note 2, Note 3	
DE_Reserved(16)	16		

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 2. When the relevant option flag in the DE_RoadsideUnitOptionFlag is set to 0, data is not stored.

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

4.2.8 DF_SensorInformation

Stores the number of sensors installed in the roadside units and sensor attribute information. Repeatedly stores attribute information up to the value set in DE_NumberOfSupportedSensors. The data is stored as DF_RoadisdeUnitOptionInformation in Roadside Unit Option Area [2].

Table 4-11. DF_SensorInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_SensorInforamtion		△Note 2, Note 3	
DE_NumberOfSupportedSensors	4	△Note 2, Note 3	Stores number of supported sensors: L
DE_Reserved(4)	4		
DF_AttributeInformationBySensor : 1	120+(16+64×N)×M	△Note 2, Note 3	Repeated L times.
・・・			
DF_AttributeInformationBySensor : L	120+(16+64×N)×M		

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 2. When the relevant option flag in the DE_RoadsideUnitOptionFlag is set to 0, data is not stored.

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

4.2.9 DF_IndividualSensorAttributeInformation

Stores the roadside sensor ID, installation location, operational status, operating status, number of detection ranges, and detection range information. A single sensor may have multiple detection ranges. The maximum number of detection ranges is 16, and detection range information is repeatedly stored up to the number set in DE_NumberOfSensorDetectionRanges.

Table 4-12. DF_IndividualSensorAttributeInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_IndividualSensorAttributeInformation			
DE_AttributeInformationAreaSize	8	△ Note 2, Note 3	
DE_SensorIdentificationID	24		
DF_SensorInstallationLocation	80	△ Note 2, Note 3	
DE_SensorOperationalStatus	1	△ Note 2, Note 3	
DE_SensorOperatingStatus	3	△ Note 2, Note 3	
DE_ NumberOfSensorDetectionRanges	4	△ Note 2, Note 3	Stores number of sensor detection ranges: M
DF_SensorDetectionRangeInformation: 1	16+64×N	△ Note 2, Note 3	Repeated M times.
・・・			
DF_SensorDetectionRangeInformation: M	16+64×N		

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 2. When the relevant option flag in the DE_RoadsideUnitOptionFlag is set to 0, data is not stored.

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

4.2.10 DF_SensorInstallationLocation

Indicates the installation location of a roadside sensor. In the case of a fusion sensor, the coordinates of the sensor that contributes the most to detection performance are stored. If the contributions are approximately equal, intermediate coordinates are input.

Table 4-13. DF_SensorInstallationLocation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_SensorInstallationLocation		△ Note 2, Note 3	
DE_Latitude	32	△ Note 2, Note 3	
DE_Longitude	32	△ Note 2, Note 3	
DE_Altitude	16	△ Note 2, Note 3	

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 2. When the relevant option flag in the DE_RoadsideUnitOptionFlag is set to 0, data is not stored.

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

4.2.11 DF_SensorDetectionRangeInformation

Stores the roadside sensor detection range ID, non-detection rate within the detection range, number of vertices, and vertex positions. Figure 4-1 shows an image of the detection range. The detection ranges represented as a polygon without altitude, and notice is provided of its vertex coordinates (latitude and longitude). The maximum number of vertices is 16, and the vertex positions are stored repeatedly up to the value set in DE_NumberOfVertices. The outer shape of the detection ranges drawn in sequence according to the order in which the vertex positions are communicated. It is desirable that the non-detection rate and vertex positions dynamically reflect the sensor's performance information at that time.

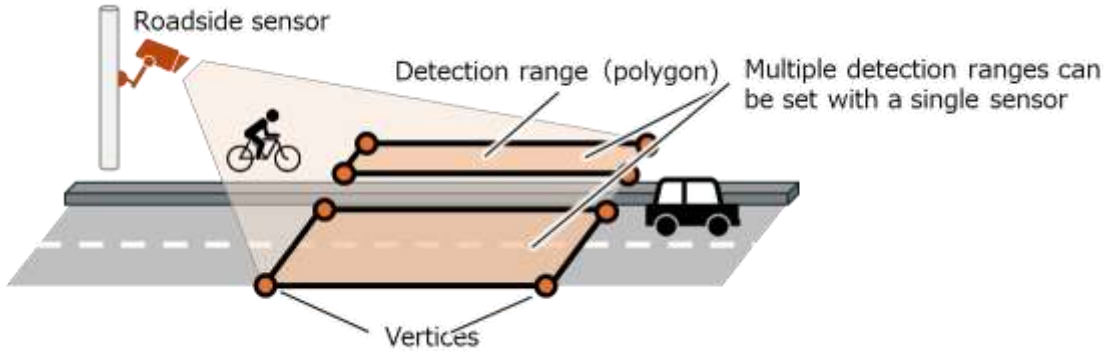


Figure 4-1. Sensor Detection Range Image

Table 4-14. DF_SensorDetectionRangeInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_SensorDetectionRangeInformation			
DE_DetrectionRangeID	4	△Note 2, Note 3	
DE_Non-detectionRate	8		
DE_NumberOfVertices	4	△Note 2, Note 3	Stores the number of vertices N
DF_VertexPosition: 1	64	△Note 2, Note 3	Repeated N times.
・・・			
DF_VertexPosition: N	64		

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 2. When the relevant option flag in the DE_RoadsideUnitOptionFlag is set to 0, data is not stored.

Note 3. When DE_ServiceOperationStatus displays "service suspended," data is not stored.

4.2.12 DF_VertxPosition

Indicates the latitude and longitude of the vertex position of the roadside sensor detection range.

Table 4-15. DF_VertxPosition Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_VertxPosition			
DE_Latitude	32	△ Note 2, Note 3	
DE_Longitude	32	△ Note 2, Note 3	

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 2. When the relevant option flag in the DE_RoadsideUnitOptionFlag is set to 0, data is not stored.

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

4.2.13 DF_RoadsideUnitAttributeExtendedInformation

Roadside unit attribute extended information. Experimenters can define and use arbitrary information using this data frame. Stored as DF_RoadsideUnitOptionInformation of Roadside Unit Option Area [7].

Table 4-16. DF_RoadsideUnitAttributeExtendedInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_RoadsideUnitAttributeExtendedInformation			
TBD	Arbitrary		
…	…		
TBD	Arbitrary		

4.3 Target Information

4.3.1 DF_IndividualTargetInformation

Stores information regarding each target. However, if P = 0, then no data is stored in this data field.

Table 4-17. DF_IndividualTargetInformation Data Structure

Storage DF/DE	Size	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_IndividualTargetInformation		△ Note 3, Note 4	Repeated P times.
DF_IndividualTargetManagementInformation		△ Note 3, Note 4	
DF_PresenceTime		△ Note 3, Note 4	
DF_TargetStatusInformation		△ Note 3, Note 4	
DF_TargetSizeInformation		△ Note 3, Note 4	
DF_TargetTypeInformation		△ Note 3, Note 4	
〈Individual Target Option Area [0]〉 DF_DetectionHistoryInformation			
〈Individual Target Option Area [1]〉 DF_TargetPrecisionInformation			
〈Individual Target Option Area [2]〉 DF_TargetStatusExtendedInformation			
〈Individual Target Option Area [3]〉 DF_TargetStatusForwardingInformation			
〈Individual Target Option Area [4]〉 DF_V2X-GNSSInformation			
〈Individual Target Option Area [5]〉 DF_ApplicationTypeInformation			
〈Individual Target Option Area [7]〉 〈Individual Target Extended Area〉			

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

Note 4. When DE_NumberOfTargets = 0, data transmission is omitted.

4.3.2 DF_IndividualTargetManagementInformation

Stores basic management information relating to individual target information.

Table 4-18. DF_IndividualTargetManagementInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_IndividualTargetManagementInformation			
DE_TargetID	32	△ Note 3, Note 4	
DE_TrackingInformation	8	△ Note 3, Note 4	
DE_DataLength	8	△ Note 3, Note 4	
DE_IndividualTargetOptionFlag	8	△ Note 3, Note 4	

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

Note 4. When DE_NumberOfTargets = 0, data transmission is omitted.

4.3.3 DF_PresenceTime

Indicates the time of detection by a roadside sensor (hour, minute, and second in millisecond units). In cases where the detection time cannot accurately be acquired due to processing relating to target information generation, the detection time is estimated by subtracting the expected processing time from the target information generation time and is stored. However, in cases where extrapolation is performed for undetected target information, the extrapolated time is stored in place of the detection time (see 2.6). Also, if the tracking status is “Lost,” “Deleted,” or “Out of Field of View,” indefinite value or copy of the value from the previous cycle is stored (see 2.5).

Table 4-19. DF_PresenceTime Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_PresenceTIme			
DE_LeapSecondCorrectionInformation	1	△ Note 3, Note 4	
DE_Time(Hours)	7	△ Note 3, Note 4	
DE_Time(Minutes)	8	△ Note 3, Note 4	
DE_Time(Seconds)	16	△ Note 3, Note 4	

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

Note 4. When DE_NumberOfTargets = 0, data transmission is omitted.

4.3.4 DF_TargetStatusInformation

Provides notice of information relating to the target position, speed, heading angle, and longitudinal acceleration.

Table 4-20. DF_TargetStatusInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_TargetStatusInformation			
DE_Latitude	32	△Note 3, Note 4	
DE_Longitude	32	△Note 3, Note 4	
DE_Altitude	16		
DE_Speed	16	△Note 3, Note 4	
DE_HeadingAngle	16	△Note 3, Note 4	
DE_LongitudinalAcceleration	16		

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

Note 4. When DE_NumberOfTargets = 0, data transmission is omitted.

4.3.5 DF_TargetSizeInformation

Stores information necessary to draw a bounding box for the target. In addition to size information, including the target’s width, length, and height, stores the status of determination of the target’s heading by the roadside unit, reference point information that serves as the basis for the target’s position, and information concerning the target’s heading (target heading angle).

Table 4-21. DF_TargetSizeInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_TargetSizeInformation			
DE_TargetHeadingDeterminationStatus	2	△Note 3, Note 4	
DE_TargetReferencePointInformation	4	△Note 3, Note 4	
DE_TargetHeadingAngle	16	△Note 3, Note 4	
DE_Width	10	△Note 3, Note 4	
DE_Length	14	△Note 3, Note 4	
DE_Height	10		

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

Note 4. When DE_NumberOfTargets = 0, data transmission is omitted.

4.3.6 DF_TargetTypeInformation

Indicates target type. Multiple candidates may be stored. The number is from 0 to 4 and is stored in descending order of accuracy, the number of times being the number of value set in DE_NumberOfTargetTypes.

Table 4-22. DF_IndividualTargetInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_TargetTypeInformation			
DE_NumberOfTargetTypes	8	△ Note 3, Note 4	Stores the number of target types Q.
DE_TargetType: 1	8	△ Note 3, Note 4	Repeated Q times.
・・・			
DE_TargetType: Q	8	△ Note 3, Note 4	

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

Note 4. When DE_NumberOfTargets = 0, data transmission is omitted.

4.3.7 〈Individual Target Option Areas〉

Areas for storing option information in individual target information. Individual Target Option Area [0] to [7] are available, and which individual target area data is stored in is indicated by DE_IndividualTargetOptionFlag (5.3.3.4). Reserved data frames corresponding to the individual target option area number are selectively stored in each individual target option area. Unlike the roadside unit option areas, Individual Target Option Area [0] to [6] have the data size within the area specified in advance, and consequently, no data elements indicating option size are stored.

4.3.8 DF_DetectionHistoryInformation

Stores the target’s past detection history, information sources, and reliability information (detection error rate). Ideally, the detection error rate should reflect the sensor’s performance information at the time and change dynamically. This information is stored in Individual Target Option Area [0].

Table 4-23. DF_DetectionHistoryInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
〈Individual Target Option Area [0]〉 DF_DetectionHistoryInformation			
DE_NumberOfDetections	16		
DE_NumberOfConsecutiveNon-Detections	4		
DE_StationaryStatus	12		
DE_PresenceTime	16		
DE_LatestInformationSource	16		
DE_DetectionErrorRate	8		

4.3.9 DF_TargetPrecisionInformation

Stores precision information for the target's position, velocity, heading angle, longitudinal acceleration, and size. Position error information is expressed two-dimensional using an error oval (figure 4-2). Velocity, heading, longitudinal acceleration, and size are represented as the absolute value of the deviation (2 σ). Ideally, these values should reflect the sensor's performance at the time and change dynamically. This information is stored in Individual Target Option Area [1].

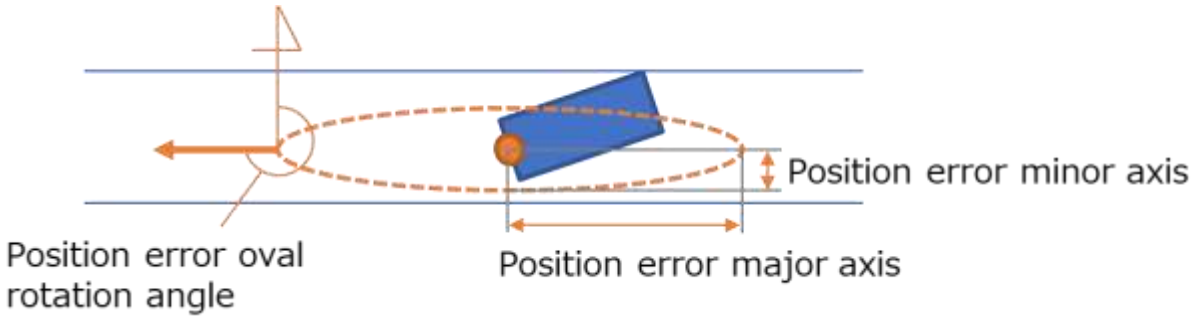


Figure 4-2. Image Diagram of Target Precision Information

Table 4-24. DF_TargetPrecisionInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
〈Individual Target Option Area [1]〉 DF_TargetPrecisionInformation			
DE_PositionInformationErrorOvalRotation Angle	16		
DE_PositionInformationErrorMajorAxis	12		
DE_PositionInformationErrorMinorAxis	12		
DE_SpeedError	12		
DE_HeadingAngleError	12		
DE_LongitudinalAccelerationError	10		
DE_TargetWidthError	9		
DE_TargetLengthError	10		
DE_TargetHeightError	9		
DE_Reserved(2)	2		

4.3.10 DF_TargetStatusExtendedInformation

Among the information that can be obtained from a vehicle via communication (V2X), this field stores information concerning elements that can be used on the vehicle side and can be obtained from sensors. This information is stored in Individual Target Option Area [2].

Table 4-25. DF_TargetStatusExtendedInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
〈Individual Target Option Area [2]〉 DF_TargetStatusExtendedInformation			
DE_YawRate	16		
DE_IlluminationStatus	8		
DE_YawRate_PrecisionInformation	12		
DE_IlluminationStatus_PrecisionInformation	4		

4.3.11 DF_TargetStatusForwardingInformation

Among the information that can be obtained from a vehicle via communication (V2X), this field stores information concerning elements that cannot be obtained from sensors. This information is stored in Individual Target Option Area [3].

Table 4-26. DF_TargetStatusForwardingInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
〈Individual Target Option Area [3]〉 DF_TargetStatusForwardingInformation			
DE_BrakeStatus	6		
DE_AuxiliaryBrakeStatus	2		
DE_AcceleratorPedalPosition	8		
DE_ShifterPosition	4		
DE_SteeringAngle	12		
DE_ACCOperatingStatus	2		
DE_C-ACCOperatingStatus	2		
DE_PCSOperatingStatus	2		
DE_ABSOperatingStatus	2		
DE_TRCOperatingStatus	2		
DE_ESCOperatingStatus	2		
DE_LKAOperatingStatus	2		
DE_LDWOperatingStatus	2		

4.3.12 DF_V2X-GNSS Information

Stores GNSS information acquired from a vehicle through communication (V2X) and precision information. This information is stored in Individual Target Option Area [4].

Table 4-27. DF_V2X-GNSSInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
〈Individual Target Option Area [4]〉 DF_V2X-GNSSInformation			
DE_PositionInformationErrorOvalRotationAngle	16		
DE_PositionInformationErrorMajorAxis	8		
DE_PositionInformationErrorMinorAxis	8		
DE_GNSSMeasurementMode	2		
DE_GNSSPositionAccuracyDeteriorationRate	6		
DE_GNSSNumberOfTrackedSatellites	4		
DE_GNSSMultipathDetection	2		
DE_AutonomousNavigationFunctionInformation	1		
DE_MapMatchingFunctionInformation	1		

4.3.13 DF_ApplicationTypeInformation

Stores information categorizing each detected target by application. From DE_PrivateVehicleExtendedInformation onward, only one data element is selected according to DE_ApplicationType. This information is stored in Individual Target Option Area [5].

Table 4-28. DF_ApplicationTypeInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
〈Individual Target Option Area [5]〉 DF_ApplicationTypeInformation			
DE_ApplicationType	4		
DE_Reserved(4)	4		
DE_PrivateVehicleExtendedInformation	8		
DE_EmergencyVehicleExtendedInformation	8		
DE_RoadMaintenanceWorkVehicleExtendedInformation	8		
DE_PassengerTransportVehicleExtendedInformation	8		
DE_CargoTransportVehicleExtendedInformation	8		
DE_SpecialVehicleExtendedInformation	8		
DE_OtherExtendedInformation	8		

4.3.14 〈Individual Target Extended Area〉

An extended area for individual target information that consolidates the free area management information and individual application data management information defined in RC-013. This information is stored in Individual Target Option Area [7]. The data structure is defined in these Guidelines, but the details of the individual extended data areas (individual extended data) are not defined.

Table 4-29. 〈Individual Target Extended Area〉 Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
〈Individual Target Option Area [7]〉 〈Individual Target Extended Area〉			
DF_IndividualExtendedAreaManagementInformation	8		
DF_IndividualExtendedDataManagementInformationSet			
〈Individual Extended Data Area〉			
(Individual Extended Data 1)			
・・・			
(Individual Extended Data R)			

Note 1. R: Number of stored individual extended data.

4.3.15 DF_IndividualExtendedAreaManagementInformation

Corresponds to free area management information under RC-013. Stores basic management information for individual extended data, such as information for bicycles and pedestrians.

Table 4-30. DF_IndividualExtendedAreaManagementInformation Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_IndividualExtendedAreaManagementInformation			
DE_IndividualExtendedAreaHeaderLength	5		
DE_NumberOfIndividualExtendedData	3		Stores the number of individual extended data R.

4.3.16 DF_IndividualExtendedDataManagementInformationSet

Corresponds to the individual application data management information under RC-013. Consolidates DF_IndividualExtendedDataManagementInformation.

Table 4-31. DF_IndividualExtendedDataManagementInformationSet Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_IndividualExtendedDataManagementInformationSet			
DF_IndividualExtendedDataManagement Information: 1			Repeats R times.
・・・			
DF_IndividualExtendedDataManagement Information: R			

4.3.17 DF_IndividualExtendedDataManagementInformation

Corresponds to individual application data management information under RC-013. Consists of the individual extended data service standard ID, storage start address, and data length information.

Table 4-32. DF_IndividualExtendedDataManagementInformationSet Data Structure

Storage DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DF_IndividualExtendedDataManagementInformation			
DE_IndividualServiceStandardID	8		
DE_IndividualExntededDataStartAddress	8		
DE_IndividualExtendedDataLength	8		

Chapter 5. Data Elements

This chapter defines data elements and describes data types.

5.1 Roadside Header

5.1.1 DE_CommonServiceStandardID

Data name	DE_CommonServiceStandardID
Definition	ID information that identifies the common service standard (the standard with which the message complies). However, the specific figure should be set for each experiment after consulting with the ITS Connect Promotion Consortium (https://www.itsconnect-pc.org/en/).
Data size	3 bits
Data type	Enumerated
Allocation	May be set arbitrarily for each experiment.

5.1.2 DE_MessageVersion

Data name	DE_MessageVersion
Definition	Version information regarding the message
Data size	4 bits
Data type	Unsigned integer
Expression range	0–15
Resolution	1
Allocation	Set to “1” under RC-019 Ver. 1.0.

5.1.3 DE_ OperationCategorizationCode

Data name	DE_OperationCategorizationCode
Definition	Indicates the experiment operating status category.
Data size	1 bit
Data type	Boolean
Allocation	0: Under adjustment 1: In operation When a device is being adjusted, set to “0.” In this case, the content and compatibility of the provided data are not guaranteed.

5.1.4 DE_IncrementCounter

Data name	DE_IncrementCounter
Definition	Number information that indicates the data transmission order. For each DE_MessageID, the value is incremented with each transmission.
Data size	8 bits
Data type	Unsigned integer
Expression range	0–255
Resolution	1

5.1.5 DE_MessageID

Data name	DE_MessageID
Definition	ID information that identifies the message.
Data size	16 bits
Data type	Enumerated
Expression range	0–65535
Resolution	1
Allocation	0x0101: Roadside unit attribute message 0x0102: Individual target information message

5.1.6 DE_RoadsideUnitID

Data name	DE_RoadsideUnitID
Definition	ID information that identifies the radio device.
Data size	32 bits
Data type	Unsigned integer
Expression range	0–4, 294, 967, 295
Resolution	1
Allocation	Under these Guidelines, arbitrary.

5.1.7 DF_TransmissionTime

5.1.7.1 DE_LeapSecondCorrectionInformation

Data name	DE_LeapSecondCorrectionInformation
Definition	Information indicating whether the time has a leap second correction function.
Data size	1 bit
Data type	Boolean
Allocation	0: No correction function 1: Correction function present

5.1.7.2 DE_Time(Hours)

Data name	DE_Time(Hours)
Definition	The standard time of the country where the roadside unit is installed should be used (JST in the case of Japan). If undefined, set the value to 127 (0x7F).
Data size	7 bits
Data type	Unsigned integer
Expression range	0–23 hours
Resolution	1 hour

5.1.7.3 DE_Time(Minutes)

Data name	DE_Time(Minutes)
Definition	Time (minute) information. If undefined, set the value to 255(0xFF).
Data size	8 bits
Data type	Unsigned integer
Expression range	0–59 minutes
Resolution	1 minute

5.1.7.4 DE_Time(Seconds)

Data name	DE_Time(Seconds)
Definition	Time (second) information expressed in milliseconds. If undefined, set the value to 65535(0xFFFF).
Data size	16 bits
Data type	Unsigned integer
Expression range	0–60.999 seconds
Resolution	0.001 seconds

5.1.8 DE_MessageSize

Data name	DE_MessageSize
Definition	Indicates the number of bytes of the total payload excluding the roadside header.
Data size	16 bits
Data type	Unsigned integer
Expression range	0–65535
Resolution	1

5.1.9 DE_Reserved(n)

Data name	DE_Reserved(n)
Definition	A reserved field for experiment extension or future use.
Data size	n bits
Allocation	These Guidelines recommend that all bits be set to 0.

Explanation of subsequent similar reserved bits is omitted.

5.2 Roadside Unit Attribute Information

5.2.1 DE_ServiceOperationStatus

Data name	DE_ServiceOperationStatus
Definition	Provides notice whether or not service is provided by a roadside unit.
Data size	8 bits
Data type	Bit string
Expression range	0–15
Resolution	1
Allocation	Subject bits that satisfy the relevant requirements (specified separately) are set to 1. [0] Service (1: In operation; 0: Suspended) [1] Provision of information/warning (the driver is operating the vehicle) [2] ADAS/Autonomous driving level 2 (vehicle control/driver responsibility) [3] Autonomous driving level 4 (system responsibility) [4]–[7] Reserved

5.2.2 DE_RoadsideUnitOptionFlag

Data name	DE_RoadsideUnitOptionFlag
Definition	Flag information indicating optional information stored in the roadside unit attribute information. The bit corresponding to the roadside unit option area to be stored is set to 1. For example, to store optional information relating to service location information, use case information, and sensor information, set to 0b00000111.
Data size	8 bits
Data type	Bit string
Allocation	[0]: Roadside unit option area [0] (service location information) [1]: Roadside unit option area: [1] (use case information) [2]: Roadside unit option area [2] (sensor information) [3]: Roadside unit option area [3] (Reserved) [4]: Roadside unit option area [4] (Reserved) [5]: Roadside unit option area [5] (Reserved) [6]: Roadside unit option area [6] (Reserved) [7]: Roadside unit option area [7] (Roadside unit attribute extended information)

5.2.3 〈Roadside Unit Option Area〉

5.2.3.1 DE_RoadsideUnitOptionSize

Data name	DE_RoadsideUnitOptionSize
Definition	Data size (in bytes) of the roadside unit option information that follows this item.
Data size	16 bits
Data type	Unsigned integer
Expression range	0–65535 bytes
Resolution	1 byte

5.2.4 DF_ServiceLocationInformation

5.2.4.1 DE_ServiceLocationID

Data name	DE_ServiceLocationID
Definition	A unique number that specifies the subject location. The assignment rules are to be determined as appropriate among the relevant parties at the time of experimentation.
Data size	24 bits
Data type	Unsigned integer
Expression range	0–16777215
Resolution	1

5.2.4.2 DE_NumberOfConnectedRoutes

Data name	DE_NumberOfConnectedRoutes
Definition	Indicates the number of connected routes to a representative point. The number of routes is indicated as (J) below (1–15). If there is a single route, the value was set to 1.
Data size	8 bits
Data type	Unsigned integer
Expression range	1–15
Resolution	1

5.2.5 DF_AgentLocationInformation

5.2.5.1 DE_Latitude

Data name	DE_Latitude
Definition	Latitude information for the location of the service site. The geodetic system is WGS84 (or equivalent). Positive values indicate north latitude, and negative values indicate south latitude. If undefined, the value is set to -2147483648 (0x80000000).
Data size	32 bits
Data type	Integer
Expression range	-90–90 degrees
Resolution	0.0000001 degree

5.2.5.2 DE_Longitude

Data name	DE_Longitude
Definition	Longitude information for the location of the service site. The geodetic system is WGS84 (or equivalent). Positive values indicate East longitude, and negative values indicate West longitude. If undefined, the value is set to -2147483648 (0x80000000).
Data size	32 bits
Data type	Integer
Expression range	-180–180 degrees
Resolution	0.0000001degree

5.2.5.3 DE_Altitude

Data name	DE_Altitude
Definition	Altitude information indicating the altitude from the service site. -409.5–0.1 m is represented as 0xF001–0xFFFF, and 0 to 6143.9 m is represented as 0x0000–0xEFFF. If 6,143.9 m or more, set to 0xEFFF, and if undefined, the value is set to 0xF000.
Data size	16 bits
Data type	Integer
Expression range	-409.5–6143.9 m
Resolution	0.1 m

5.2.6 DF_RouteIdentificationInformation

5.2.6.1 DE_RouteID

Data name	DE_RouteID
Definition	An ID number assigned to categorize route. In an intersection, the number is assigned uniquely, numbered from true north in a clockwise direction (1 to 15).
Data size	8 bits
Data type	Unsigned integer
Expression range	1–15
Resolution	1

5.2.6.2 DE_RouteConnectionOrientation

Data name	DE_RouteConnectionOrientation
Definition	Indicates the orientation at which the road connects to the reference point. *This expresses the form in which a route (link) connects to a reference point (node). The azimuth angle is set as the clockwise angle value measured from true North (0°). It is assumed that the angle is defined by the line segment extending from the base of the approach route to a point located at a fixed distance away on the side opposite the reference point. However, the details are to be determined as appropriate among the relevant parties at the time of experimentation. See Figure 5-1 for definitions of each term.
Data size	8 bits
Data type	Unsigned integer
Expression range	0–358.5 degrees
Resolution	1.5 degrees

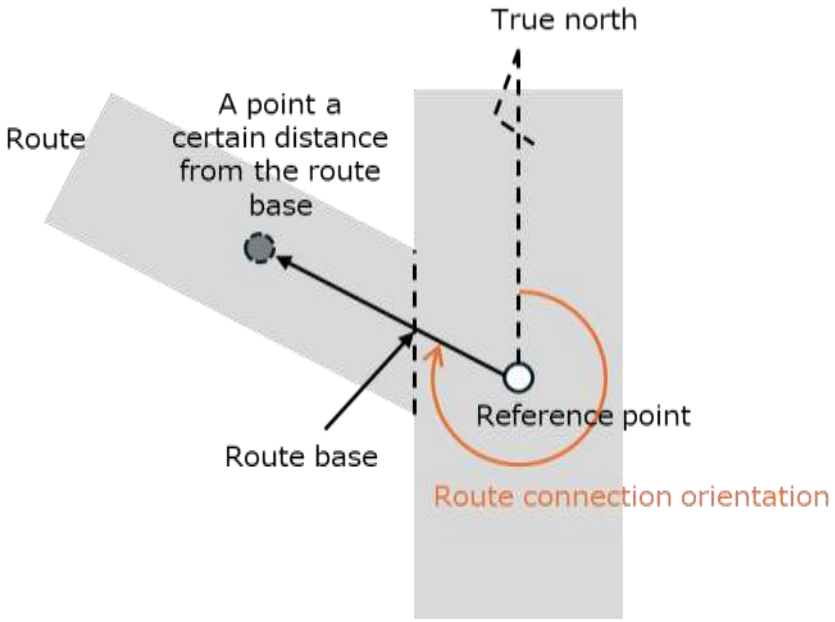


Figure 5-1. Definitions of Route Connection Orientation

5.2.7 DF_IndividualRouteUseCaseInformation

5.2.7.1 DE_NumberOfUseCases

Data name	DE_NumberOfUseCases
Definition	Stored as the number of use cases K (0–255).
Data size	8 bits
Data type	Unsigned integer
Expression range	0–255
Resolution	1 use case

5.2.8 DF_InformationByUseCase

5.2.8.1 DE_SubjectUseCaseSupplementalCode

Data name	DE_SubjectUseCaseSupplementalCode
Definition	In cases where further categorization is possible into the categories described below according to the use case, the subject bit is set to 1 as supplemental information.
Data size	2 bits
Data type	Bit string
Expression range	0–3
Resolution	1
Allocation	[In cases of head-on encounters or left/right turn assistance (others are TBD)] [0]: Standstill support (support for starting from a standstill or during waiting) [1]: Approach support (support when determining whether it is necessary to decelerate or come to a stop while in motion)

5.2.8.2 DE_SubjectUseCaseType

Data name	DE_SubjectUseCaseType
Definition	Indicates the type of subject use case. Definitions are indicated in Table 5-1.
Data size	6 bits
Data type	Enumerated
Expression range	0–39 h
Resolution	1

Table 5-1. Subject Use Case Categories

Category code	Use case category	Intersection or single road, etc.	Own vehicle driving status		Own vehicle prioritized or not prioritized
			In motion	Stopped	
01H	Traffic signal recognition support	Intersection with signal	○	○	
02H	Signalized intersection entry decision support	Intersection with signal	○	○	
03H	Stop sign oversight prevention support	Intersection without signal	○	—	Not prioritized
05H	Railway crossing passage support (bottlenecks)	Railway crossing	—	○	Not prioritized
11H	Left turn support	Intersection	○	—	Not prioritized
12H	Right turn support	Intersection	△	○	Not prioritized
1AH	Pedestrian oversight prevention support	Single road (pedestrian crosswalk, etc.)	○	—	Not prioritized
20H	Rear-end collision prevention support (at blind curves, etc.)	Single road	○	—	Not prioritized
21H	Evacuation area entry support	Single road	○	—	Not prioritized
22H	Rear vehicle collision prevention support at departure	Single road	—	○	Not prioritized
28H	Merging support (other vehicle merging)	Intersection	○	—	Prioritized
29H	Merging support (own vehicle merging)	Intersection	○	—	Not prioritized
30H	(Priority) head-on collision prevention support	Intersection	○	—	Prioritized
35H	(Non-priority) head-on collision prevention support	Intersection	△	○	Not prioritized

36H	(Priority unclear) head-on collision prevention support	Intersection	△	○	Non-prioritized equality
38H	Narrow road oncoming vehicle passing support	Single road (narrow road)	○	—	Not prioritized
39H	Parked/stopped vehicle overtaking support	Single road	○	—	Not prioritized

* △ under "own vehicle driving status" indicates that support may vary depending on the roadside unit design. The presence or absence of support is indicated by DE_SubjectUseCaseSupplementalCode.

5.2.8.3 DE_ServiceProvisionTargetVehicle

Data name	DE_ServiceProvisionTargetVehicle
Definition	Indicates the subject vehicle (autonomous driving level) to which the system (safe driving and autonomous driving support system) provide service. In cases where it is necessary to change (limit) the subject vehicles to which services provided due to temporary deterioration in roadside sensor performance or the like as a result of external environmental factors, this information may be dynamically changed. If the system is in degraded operation, all bits are set to 0.
Data size	4 bits
Data type	Bit string
Expression range	0–15
Resolution	1
Allocation	Subject bits that satisfy the requirements (specified separately) are set to 1. [0] Vehicles equivalent to autonomous driving level 1 or lower [1] Vehicles equivalent to autonomous driving level 2 [2] Vehicles equivalent to autonomous driving level 4 [3] Reserved

5.2.8.4 DE_TargetInformationSubjectRoute

Data name	DE_TargetInformationSubjectRoute
Definition	In the case of services that provide target information, the bit corresponding to the route ID of the subject (the main subject in the sensor detection area) is set to 1. If the intersection is included as a target, it is considered part of the target route mentioned above, but if only the intersection is a target, the support subject route is set to 1. For services unrelated to target information, all bits are set to 0.
Data size	16 bits
Data type	Bit string
Expression range	0–65535
Resolution	1
Allocation	[0]: Unused (0 fixed) [1]: Route ID = 1 ... [15]: Route ID = 15

5.2.8.5 DE_TargetInformationSubjectSensorNumber

Data name	DE_TargetInformationSubjectSensorNumber
Definition	In the case of services that provide target information, the relevant bit for the target sensor is set to 1 to comply with the order of DF_IndividualSensorAttributeInformation discussed below. For services unrelated to target information, all bits are set to 0.
Data size	16 bits
Data type	Bit string
Expression range	0–65535
Resolution	1
Allocation	[0]: 1st ... [15]: 16th

5.2.9 DF_SensorInformation

5.2.9.1 DE_NumberOfSupportedSensors

Data name	DE_NumberOfSupportedSensors
Definition	Indicates the number of roadside sensors installed in the roadside unit.
Data size	4 bits
Data type	Unsigned integer
Expression range	1–16
Resolution	1
Allocation	The number of supported sensors calculated by adding 1 to the value represented in bits (0–15)

5.2.10 DF_IndividualSensorAttributeInformation

5.2.10.1 DE_AttributeInformationAreaSize

Data name	DE_AttributeInformationAreaSize
Definition	Data size in bytes of the DF_IndividualSensorAttributeInformation that follows this item.
Data size	8 bits
Data type	Unsigned integer
Expression range	1–255 bytes
Resolution	1 byte

5.2.10.2 DE_SensorIdentificationID

Data name	DE_SensorIdentificationID
Definition	A unique ID for each roadside sensor. Indicates the sensor type, manufacturer, and product number. Transmitted for the purpose of performing processing by comparison with the detailed sensor information that the vehicle already has.
Data size	24 bits
Data type	Unsigned integer
Expression range	0–16777215
Resolution	1
Allocation	First 8 bits: Sensor type (definitions are TBD) Middle 8 bits: Manufacturer number (definitions are TBD) Last 8 bits: Unique manufacturer number for identifying the product number (definitions are TBD)

5.2.10.3 DE_SensorOperationalStatus

Data name	DE_SensorOperationalStatus
Definition	The operational status of a roadside sensor. If under adjustment, the content and compatibility of the provided data are not guaranteed.
Data size	1 bit
Data type	Boolean
Expression range	0–1
Resolution	1
Allocation	0: In operation 1: Under adjustment

5.2.10.4 DE_SensorOperatingStatus

Data name	DE_SensorOperatingStatus
Definition	Indicates whether a roadside sensor is operating normally.
Data size	3 bits
Data type	Enumerated
Expression range	0–7
Resolution	1
Allocation	0: In normal operation 1: In degraded operation 2: Suspended 3–7: Reserved

5.2.10.5 DE_NumberOfSensorDetectionRanges

Data name	DE_NumberOfSensorDetectionRanges
Definition	Provides notice of the number of detection ranges of a sensor. In cases where multiple detection ranges are separately defined for a single sensor (e.g., the range is divided into two areas divided by a central strip), the value is set to the number of separate ranges.
Data size	4 bits
Data type	Unsigned integer
Expression range	1–16
Resolution	1
Allocation	The number of detection ranges of a sensor calculated by adding 1 to the value represented in bits (0–15)

5.2.11 DF_SensorInstallationLocation

5.2.11.1 DE_Latitude

This data element is the same as DE_Latitude in 5.2.5.1, and a description is omitted here.

5.2.11.2 DE_Longitude

This data element is the same as DE_Longitude in 5.2.5.2, and a description is omitted here.

5.2.11.3 DE_Altitude

This data element is the same as DE_Altitude in 5.2.5.3, and a description is omitted here.

5.2.12 DF_SensorDetectionRangeInformation

5.2.12.1 DE_DetectionRangeID

Data name	DE_DetectionRangeID
Definition	Provides notice of the detection range ID using an index.
Data size	4 bits
Data type	Unsigned integer
Expression range	1–16
Resolution	1
Allocation	The detection range ID calculated by adding 1 to the value represented in bits (0–15)

5.2.12.2 DE_Non-detectionRate

Data name	DE_Non-detectionRate
Definition	Provides notice of non-detection rate information (the rate at which targets that are actually present cannot be detected) within the sensor detection range. The non-detection rate is set to the value of N with the following numerical range (expressed as a formula with N as a variable) corresponding to the non-detection rate. At least 10^(-N/10), less than 10^(-(N-1)/10) However, the range of N is 1 to 100. If the non-detection rate is 1, set to 0; if less than 1e-10, set to 101 (0x65), and if undetermined, set 255 (0xFF). The specific method for estimating the non-detection rate is not covered in these Guidelines.
Data size	8 bits
Data type	Enumerated
Expression range	1e-10–1 (Ratio)
Resolution	N/A
Allocation	The non-detection rate is in the range of 10^(-N/10) to less than 10^(-(N-1)/10) for bit representation value of N (1 to 100).

5.2.12.3 DE_NumberOfVertices

Data name	DE_NumberOfVertices
Definition	Provides notice of the number of vertices of the detection range.
Data size	4 bits
Data type	Unsigned integer
Expression range	3–16
Resolution	1
Allocation	The number of vertices calculated by adding 1 to the value represented in bits (0–15)

5.2.13 DF_VertexPosition

5.2.13.1 DE_Latitude

This data element is the same as DE_Latitude in 5.2.5.1, and a description is omitted here.

5.2.13.2 DE_Longitude

This data element is the same as DE_Longitude in 5.2.5.2, and a description is omitted here.

5.3 Target Information

5.3.1 DE_NumberOfTargets

Data name	DE_NumberOfTargets
Definition	Stores the number of DF_IndividualTargetInformation as the number of targets (0 or more) (P). The number of targets includes undetected targets whose tracking status is Lost, Disappeared, or Deleted.
Data size	8 bits
Data type	Unsigned integer
Expression range	0–255
Resolution	1

5.3.2 DF_IndividualTargetInformation

5.3.3 DF_IndividualTargetManagementInformation

5.3.3.1 DE_TargetID

Data name	DE_TargetID
Definition	ID information assigned by a roadside unit that enables determination whether the target is the same target as at the time of the previous transmission.
Data size	32 bits
Data type	Unsigned integer
Expression range	0–4, 294, 967, 295
Resolution	1

5.3.3.2 DE_TrackingInformation

Data name	DE_TrackingInformation
Definition	The eight tracking statuses of each detected target (target ID) (see 2.5) are represented using a combination of seven allocations. Table 5-2 shows the relationship between the tracking status (vertical axis) and each allocation (horizontal axis). For example, when the status of a target is normal tracking, [0]0, [1]1, [2]0, [3]0, [4]0, [5]0, and [6]0 are set. If undefined, values are set to 255 (0xFF).
Data size	8 bits
Data type	Bit string
Allocation	[0]: Initialization 0: OFF 1: ON [1]: Detection status 0: OFF 1: ON [2]: Reason for non-detection (occlusion) 0: OFF 1: ON [3]: Reason for non-detection (out of range) 0: OFF 1: ON [4]: Notice of deletion 0: OFF 1: ON [5]: Integration display 0: OFF 1: ON [6]: Division display 0: OFF 1: ON [7]: Reserved * If both [2] and [3] are 0, the reason for non-detection is unclear.

Table 5-2. Relationship between Tracking Status and Tracking Information

		Tracking information					
		Initialization	Detection status	Reason for non-detection	Notice of deletion	Integration display	Division display
Tracking status	Initialization	1	1	—	0	0	0
	Normal tracking	0	1	—	0	0	0
	Lost	0	0	Occlusion/Unclear	0	0	0
	Disappeared	0	0	Occlusion/Unclear	1	0	0
	Merged	0	0 or 1	Occlusion/Unclear	0	1	0
	Deleted	0	0 or 1	Occlusion/Unclear	1	1	0
	Divided	0	0 or 1	Occlusion/Unclear	0	0	1
	Out of field of view	0	0 or 1	Out of range	1	0	0

5.3.3.3 DE_DataLength

Data name	DE_DataLength
Definition	The individual target information size, excluding the individual target extended area, expressed as a number of bytes.
Data size	8 bits
Data type	Unsigned integer
Expression range	0–255 bytes
Resolution	1 byte

5.3.3.4 DE_IndividualTargetOptionFlag

Data name	DE_IndividualTargetOptionFlag
Definition	Flag information indicating optional information stored in the individual target information. The bit corresponding to the stored individual target option area is set to 1. For example, in the case where detection history information and target precision information is stored as option information, set to 0b00000011.
Data size	8 bits
Data type	Bit string
Allocation	[0]: Individual Target Option Area [0] (DF_DetectionHistoryInformation) [1]: Individual Target Option Area [1] (DF_TargetPrecisionInformation) [2]: Individual Target Option Area [2] (DF_TargetStatusExtendedInformation) [3]: Individual Target Option Area [3] (DF_TargetStatusForwardingInformation) [4]: Individual Target Option Area [4] (DF_V2X-GNSS Information) [5]: Individual Target Option Area [5] (DF_ApplicationTypeInformation) [6]: Individual Target Option Area [6] (Reserved) [7]: Individual Target Option Area [7] (Individual Target Extendede Area)

5.3.4 DF_PresenceTime

5.3.4.1 DE_LeapSecondCorrectionInformation

This data element is the same as DE_LeapSecondCorrectionInformation in 5.1.7.1, and a description is omitted here.

5.3.4.2 DE_Time(Hours)

This data element is the same as DE_Time(Hours) in 5.1.7.2, and a description is omitted here.

5.3.4.3 DE_Time(Minutes)

This data element is the same as DE_Time(Minutes) in 5.1.7.3, and a description is omitted here.

5.3.4.4 DE_Time(Seconds)

This data element is the same as DE_Time(Seconds) in 5.1.7.4, and a description is omitted here.

5.3.5 DF_TargetStatusInformation

5.3.5.1 DE_Latitude

This data element is the same as DE_Latitude in 5.2.5.1, and a description is omitted here.

5.3.5.2 DE_Longitude

This data element is the same as DE_Longitude in 5.2.5.2, and a description is omitted here.

5.3.5.3 DE_Altitude

This data element is the same as DE_Altitude in 5.2.5.3, and a description is omitted here.

5.3.5.4 DE_Speed

Data name	DE_Speed
Definition	Speed information for the target. If undetermined, set to 65535 (0xFFFF).
Data size	16 bits
Data type	Unsigned integer
Expression range	0–163.83 m/s
Resolution	0.01 m/s

5.3.5.5 DE_HeadingAngle

Data name	DE_HeadingAngle
Definition	Heading angle information for the target. North is set to 0 degrees, and angle values are set in a clockwise direction. If undetermined, set to 65535 (0xFFFF).
Data size	16 bits
Data type	Unsigned integer
Expression range	0–359.9875 degrees
Resolution	0.0125 degrees

5.3.5.6 DE_LongitudinalAcceleration

Data name	DE_LongitudinalAcceleration
Definition	Longitudinal acceleration information for the target. If undetermined, set to -32768 (0x8000).
Data size	16 bits
Data type	Integer
Expression range	-20–20 m/s^2
Resolution	0.01 m/s^2

5.3.6 DF_TargetSizeInformation

5.3.6.1 DE_TargetHeadingDeterminationStatus

Data name	DE_TargetHeadingDeterminationStatus
Definition	Provides notice of the status of determination of the target's heading.
Data size	2 bits
Data type	Enumerated
Expression range	0–3
Resolution	1
Allocation	0: Heading unclear 1: Forward/back, left/right unclear 2: Forward /back unclear 3: Forward direction known The details are shown in Figure 5-2.

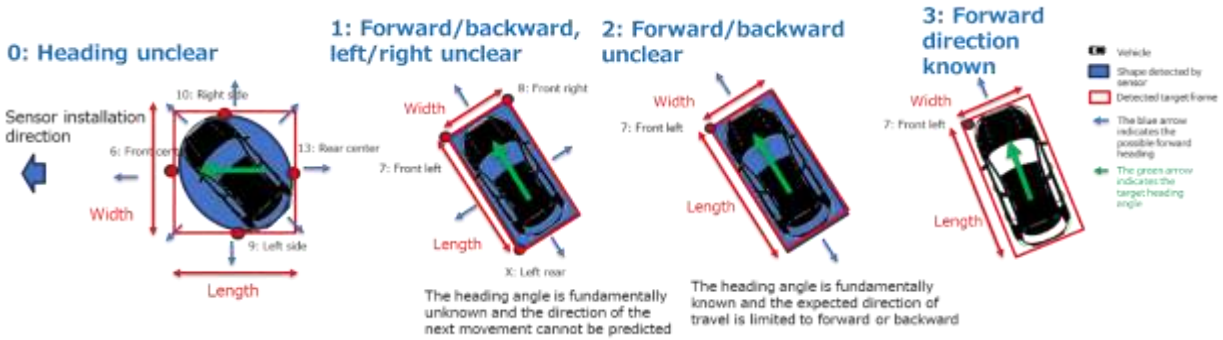


Figure 5-2. Definitions of Target Heading Determination Status

5.3.6.2 DE_TargetReferencePointInformation

Data name	DE_TargetReferencePointInformation
Definition	Provide notice of information concerning which point of the target is the reference point. If the reference position is unknown, the target reference is determined by a predetermined position such as 6: Front center.
Data size	4 bits
Data type	Enumerated
Expression range	0–13
Resolution	1
Allocation	0: Reference position unclear 1: RC-013 standard 2: Center of rear axle 3, 4: Reserved The target heading angle is forward and expressed as follows: 5: Center 6: Front center 7: Front left 8: Front right 9: Left side 10: Right side 11: Rear left 12: Rear right 13 Rear center. See Figure 5-3 for a conceptual diagram of the definitions for items 5 to 13.

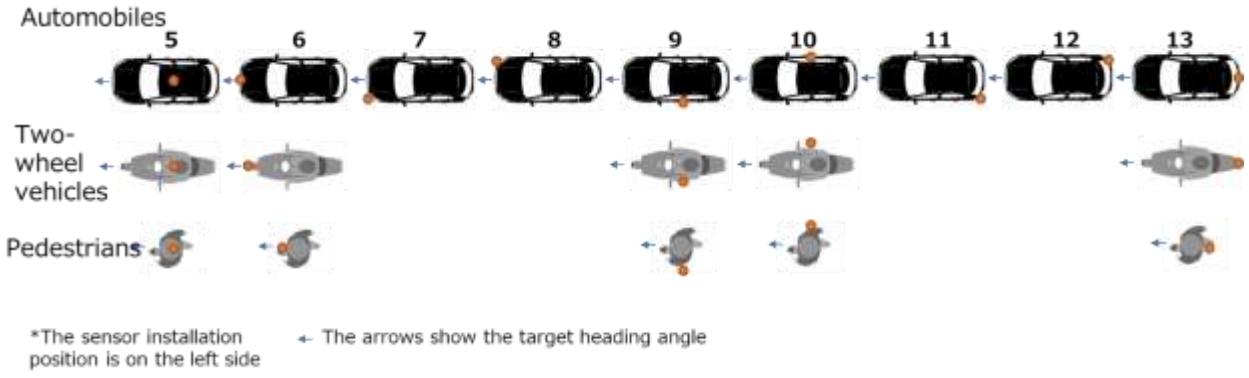


Figure 5-3. Definitions of Target Reference Points When Target Heading Angle is Forward

5.3.6.3 DE_TargetHeadingAngle

Data name	DE_TargetHeadingAngle
Definition	Information indicating the target heading. North is set to 0, and angle values are set in a clockwise direction. If the target heading is unknown, (0: heading unknown), the heading to a sensor detected from the target is set as the target heading angle. If the target heading is known (the target can be expressed as a frame of detected targets with angles), the target heading angle is set. If undetermined, set to 65535 (0xFFFF).
Data size	16 bits
Data type	Unsigned integer
Expression range	0–359.9875 degrees
Resolution	0.0125 degrees

5.3.6.4 DE_Width

Data name	DE_Width
Definition	The target length vertical to the target heading, the same as DE_VehicleWidth under RC-013. If undetermined, set to 1023 (0x3FF).
Data size	10 bits
Data type	Unsigned integer
Expression range	0.01–10.22 m
Resolution	0.01 m

5.3.6.5 DE_Length

Data name	DE_Length
Definition	The target length parallel to the target heading, the same as DE_VehicleLength under RC-013. If undetermined, set to 16383 (0x3FFF).
Data size	14 bits
Data type	Unsigned integer
Expression range	0.01–163.82 m
Resolution	0.01 m

5.3.6.6 DE_Height

Data name	DE_Height
Definition	The expression is the same as DE_VehicleWidth under RC-013. Information on the target height. If the height is unknown, set to 1023 (0x3FF).
Data size	10 bits
Data type	Unsigned integer
Expression range	0.01–10.22 m
Resolution	0.01 m

5.3.7 DF_TargetTypeInformation

5.3.7.1 DE_NumberOfTargetTypes

Data name	DE_ NumberOfTargetTypes
Definition	The number of target types, indicated by Q. The maximum is 4.
Data size	8 bits
Data type	Unsigned integer
Expression range	0–4
Resolution	1

5.3.7.2 DE_TargetType

Data name	DE TargetType
Definition	Target type information. Taking into account the target identification attributes detected by a sensor, up to four candidate types can be stored in the order of accuracy.
Data size	8 bits
Data type	Enumerated
Expression range	0–255
Resolution	1
Allocation	For details see Table 5-3.

Table 5-3. Allocation of Target Types

0−127: Vehicle	0−63: Four-wheel vehicle	0−11: Large	0: Truck, 1: Bus, 2: Trailer, 3: Car carrier, 4: Trolley, 5−10: Reserved, 11: Unclear	
		12−23: Medium-sized	12: Truck, 13: Bus, 14: Trailer, 15: Towing vehicle, 16−22: Reserved, 23: Unclear	
		24−35: Ordinary	24: Truck, 25: Van, 26: Trailer, 27: Towing vehicle, 28: Passenger vehicle, 29−34: Reserved, 35: Unclear	
		36−47: Small (light)	36: Truck, 37: Van, 38: Towing vehicle, 39: Passenger vehicle, 40: Small special (forklift), 41: Small special (tractor), 42−46: Reserved, 47: Unclear	
		48−62: Special	48: Police vehicle, 49: Ambulance, 50: Fire truck, 51: Large special (wheel loader), 52: Large special (crane vehicle), 53: Large special (bulldozer), 54: Agricultural vehicle, 55−60: Reserved, 61: Four-wheel vehicle group, 62: Unclear	
		63: Unclear		
	64−126: Other than four-wheel vehicle	64−75: Motorcycle	64: Motorcycle, 65: Motorized bicycle, 66: Side car, 67: Minicar, 68−73: Reserved, 74: Two-wheel vehicle group, 75: Unclear	
		76−87: Bicycle	76: Bicycle, 77: Tandem bicycle, 78: Carrier, 79−85: Reserved, 86: Bicycle group, 87: Unclear	
		88−99: Light vehicle, etc.	88: Scooter, 89: Wagon (towed), 90: Rikshaw, 91: Horse-drawn vehicle, 92−97: Reserved, 98: Light vehicle group, 99: Unclear	
		100−111: Train	100: Tram, 101: Electric train, 102−110: Reserved, 111: Unclear	
		112−125: Reserved	112−124: Reserved, 125: Unclear	
		126: Unclear		
	127: Unclear	–		
128−254: Non-vehicle	128−191: Person/ animal	128−167: Person	128: Pedestrian (adult), 129: Pedestrian (child), 130: Wheelchair, 131: Mobility scooter, 132: Stroller, 133: Skateboard, 134: Road worker, 135: Police officer, 136−166: Reserved, 167: Person group	
		168−190: Animal	168: Dog/fox, 169: Cat/racoon dog, 170: Bird, 171: Weasel/civet, 172: Cow, 173: Horse, 174: Deer, 175: Bear, 176: Monkey, 177: Boar, 178: Turtle, 179−188: Reserved, 189: Animal group, 190: Unclear	
		191: Unclear		
	192–253 Other	192−231: Object on road	192−205: Non-fixed	192: Waste bag, 193: Fallen leaves, 194: Fallen rock, 195: Tire, 196: Branch/tree, 197: Hole, 198: Overhang from side,

	than person/ animal		object (unintentional)	199−205: Reserved
			206−219: Non-fixed object (intentional)	206: Traffic cone, 207: Safety fence, 208: Construction sign, 209: Pole, 210: Bar, 211−219: Reserved
			220−230: Fixed object	220−230: Reserved
			231: Unclear	
		232–252: Object on roadside	232: Curb, 233: Guardrail (protective barrier), 234: Pole, 235: Electric pole, 236: Sign, 237: Wall (of house, etc.), 238: Trees, 239: Plants, 240−251: Reserved, 252: Unclear	
		253: Unclear		
	254: Unclear	–		
255: Unclear	–	–		

5.3.8 DF_DetectionHistoryInformation

5.3.8.1 DE_NumberOfDetections

Data name	NumberOfDetections
Definition	Provides notice of the number of times a target was previously detected. If information cannot be acquired, set to the unspecified value of 0 (0x0).
Data size	16 bits
Data type	Unsigned integer
Expression range	0–65535 times
Resolution	1 time
Allocation	The specific expression values are as follows. 0: Unclear (when expressed as a value) 1: 1 time …… 65534: 65534 times 65535: More than 65535 times

5.3.8.2 DE_NumberOfConsecutiveNon-Detections

Data name	DE_NumberOfConsecutiveNon-Detections
Definition	Provides notice of the number of consecutive times that a target was previously not detected.
Data size	4 bits
Data type	Unsigned integer
Expression range	0–15 times
Resolution	1 time
Allocation	0: Target detected 1–14: Number of consecutive non-detections indicated to the left 15: 15 or more consecutive non-detections

5.3.8.3 DE_StationaryStatus

Data name	DE_StationaryStatus
Definition	Provides notice of the time that a target has been stationary. If information cannot be acquired, set to the unspecified value of 4095 (0xFFF).
Data size	12 bits
Data type	Unsigned integer
Expression range	0–3600 seconds
Resolution	1 second
Allocation	0: In motion 1–3599: Target has been stationary for the number of seconds indicated to the left 3600: Target has been stationary for 3600 seconds or longer 4094: The target was not observed in motion 4095: Unclear

5.3.8.4 DE_PresenceTime

Data name	DE_PresenceTime
Definition	The time that has passed since the commencement of tracking. If information cannot be acquired, set to the unspecified value of 65535 (0xFFFF).
Data size	16 bits
Data type	Unsigned integer
Expression range	0–3600 seconds
Resolution	0.1 seconds
Allocation	The specific expression values are as follows. 0: 0 seconds (target initially detected) 1: 0.1 seconds …… 35999: 3599.9 seconds 36000: 3600.0 seconds or longer 65535: Unclear (when expressed as a value)

5.3.8.5 DE_LatestInformationSource

Data name	DE_LatestInformationSource
Definition	Indicates the last sensor that detected the relevant target ID. The relevant bit is set to 1 to comply with the order of DF_IndividualSensorAttributeInformation. If information cannot be acquired, set to the unspecified value (all 0).
Data size	16 bits
Data type	Bit string
Expression range	0–65535
Resolution	1
Allocation	[0]: DF_IndividualSensorAttributeInformation: 1 [1]: DF_IndividualSensorAttributeInformation: 2 …… [15]: DF_IndividualSensorAttributeInformation: 16

5.3.8.6 DE_DetectionErrorRate

Data name	DE_DetectionErrorRate
Definition	Provides notice of the detection error rate information for a Target ID as the reliability of target presence (the probability of detecting a target that does not actually exist). Set the N value corresponding to the following numeric range (expressed as a formula with N as the variable). At least 10^(-N/10), less than 10^(-(N-1)/10) However, the range of N is 1 to 100. If the detection error rate is 1, set to 0; if less than 1e-10, set to 101 (ox65); and if underdetermined, set to 255 (0xFF). The specific method for estimating the detection error rate is not covered in these Guidelines.
Data size	8 bits
Data type	Enumerated
Expression range	1e-10–1 (Ratio)
Resolution	N/A
Allocation	The detection error rate is within the range of at least 10^(-N/10) to less than 10^(-(N-1)/10) for a bit expression value of N (1 to 100).

5.3.9 DF_TargetPrecisionInformation

5.3.9.1 DE_PositionInformationErrorOvalRotationAngle

Data name	DE_PositionInformationErrorOvalRotationAngle
Definition	Rotation angle information for the horizontal error oval (2 σ), which serves as a reliability indicator for position information. The angle of the major axis is set as a clockwise value with north at 0 degrees. Normally, this corresponds to the heading of the target coordinates as viewed from the sensor coordinates. If undetermined, set to 65535 (0xFFFF).
Data size	16 bits
Data type	Unsigned integer
Expression range	0–359.9875 degrees
Resolution	0.0125 degrees

5.3.9.2 DE_PositionInformationErrorMajorAxis

Data name	DE_PositionInformationErrorMajorAxis
Definition	Major axis (2 σ) information regarding the error oval. The orientation of the major axis is parallel to the position information error oval rotation angle. If information cannot be acquired, set to the unspecified value of 4095 (0xFFF).
Data size	12 bits
Data type	Unsigned integer
Expression range	0–40.94 m
Resolution	0.01 m

5.3.9.3 DE_PositionInformationErrorMinorAxis

Data name	DE_PositionInformationErrorMinorAxis
Definition	Minor axis (2 σ) information regarding the error oval. The orientation of the minor axis is orthogonal to the position information error oval rotation angle. If information cannot be acquired, set to the unspecified value of 4095 (0xFFF).
Data size	12 bits
Data type	Unsigned integer
Expression range	0–40.94 m
Resolution	0.01 m

5.3.9.4 DE_SpeedError

Data name	DE_SpeedError
Definition	The absolute value of the speed error (2 σ). If information cannot be acquired, set to the unspecified value of 4095 (0xFFF).
Data size	12 bits
Data type	Unsigned integer
Expression range	0–40.94 m/s
Resolution	0.01 m/s

5.3.9.5 DE_HeadingAngleError

Data name	DE_HeadingAngleError
Definition	The absolute value of the heading angle error (2 σ). If information cannot be acquired, set to the unspecified value of 4095 (0xFFF).
Data size	12 bits
Data type	Unsigned integer
Expression range	0–51.175 degrees
Resolution	0.0125 degrees

5.3.9.6 DE_LongitudinalAccelerationError

Data name	DE_LongitudinalAccelerationError
Definition	The absolute value of the longitudinal acceleration error (2 σ). If information cannot be acquired, set to the unspecified value of 1023 (0x3FF).
Data size	10 bits
Data type	Unsigned integer
Expression range	0–10 m/s^2
Resolution	0.01 m/s^2

5.3.9.7 DE_TargetWidthError

Data name	DE_TargetWidthError
Definition	The absolute value of the target width error (2 σ). If information cannot be acquired, set to the unspecified value of 511 (0x1FF).
Data size	9 bits
Data type	Unsigned integer
Expression range	0–5.1 m
Resolution	0.01 m

5.3.9.8 DE_TargetLengthError

Data name	DE_TargetLengthError
Definition	The absolute value of the target length error (2 σ). If information cannot be acquired, set to the unspecified value of 1023 (0x3FF).
Data size	10bit
Data type	Unsigned integer
Expression range	0–10.22 m
Resolution	0.01 m

5.3.9.9 DE_TargetHeightError

Data name	DE_TargetHeightError
Definition	The absolute value of the target height error (2 σ). If information cannot be acquired, set to the unspecified value of 511 (0x1FF).
Data size	9 bits
Data type	Unsigned integer
Expression range	0–5.1 m
Resolution	0.01 m

5.3.10 DF_TargetStatusExtendedInformation

5.3.10.1 DE_YawRate

Data name	DE_YawRate
Definition	Vehicle yaw rate information. Positive numbers indicate clockwise rotation. If undetermined, set to -32768 (0x8000).
Data size	16 bits
Data type	Integer
Expression range	-327.67–327.67 degrees/second
Resolution	0.01 degrees/second

5.3.10.2 DE_IlluminationStatus

Data name	DE_IlluminationStatus
Definition	Vehicle turn signal, hazard light, and headlights status information. If information cannot be acquired, set to the unspecified value (all 1).
Data size	8 bits
Data type	Bit string
Expression range	0 - 255
Resolution	1
Allocation	[0]: Headlights (low beams) 0: OFF 1: ON [1]: Headlights (high beams) 0: OFF 1: ON [2]: Left turn signal 0: OFF 1: ON [3]: Right turn signal 0: OFF 1: ON [4]: Headlight status valid flag 0: Invalid 1: Valid [5]: Turn signal status valid flag 0: Invalid 1: Valid [6]: Hazard lights status valid flag 0: Invalid 1: Valid [7]: Reserved (If the hazard lights are ON, both [2] and [3] are set to 1

5.3.10.3 DE_RawRate_PrecisionInformation

Data name	DE_RawRate_PrecisionInformation
Definition	The absolute value of the vehicle yaw rate error (2 σ). If information cannot be acquired, set to the unspecified value of 4095 (0xFFF).
Data size	12 bits
Data type	Unsigned integer
Expression range	0 - 40.94 degrees
Resolution	0.01 degrees

5.3.10.4 DE_IlluminationStatus_PrecisionInformation

Data name	DE_IlluminationStatus_PrecisionInformation
Definition	Illumination status information source. If information cannot be acquired, set to the unspecified value (0xF).
Data size	4 bits
Data type	Enumerated
Expression range	0–1
Resolution	1
Allocation	0: Inter-vehicle communication 1: Sensor 2–14: Reserved 15: Unspecified value

5.3.11 DF_TargetStatusForwardingInformation

5.3.11.1 DE_BrakeStatus

Data name	DE_BrakeStatus
Definition	Vehicle brake status information. If individual wheel brake status information cannot be obtained, set the value of [5] to 0, and set [0] to [3] to all the same value depending on whether the brakes are ON or OFF.
Data size	6 bits
Data type	Bit string
Expression range	0–63
Resolution	1
Allocation	[0]: Left front brake 0: OFF 1: ON [1]: Left rear brake 0: OFF 1: ON [2]: Right front brake 0: OFF 1: ON [3]: Right rear brake 0: OFF 1: ON [4]: Brake information validity 0: Unspecified 1: Valid [5]: Individual wheel information acquisition 0: Invalid 1: Valid

5.3.11.2 DE_AuxiliaryBrakeStatus

Data name	DE_AuxiliaryBrakeStatus
Definition	Vehicle auxiliary brake status information. If the vehicle is not equipped with an auxiliary brake or if the information is unspecified, set to 0.
Data size	2 bits
Data type	Enumerated
Expression range	0–3
Resolution	1
Allocation	0: Unspecified 1: OFF 2: ON 3: Reserved

5.3.11.3 DE_AcceleratorPedalPosition

Data name	DE_AcceleratorPedalPosition
Definition	Sets the accelerator pedal operation amount. If unspecified, set to 255 (0xFF).
Data size	8 bits
Data type	Unsigned integer
Expression range	0–100%
Resolution	0.5%

5.3.11.4 DE_ShifterPosition

Data name	DE_ShifterPosition
Definition	Vehicle shifter position information. In the case of a vehicle with a manual transmission or with a continuously variable transmission, if the vehicle is in a forward gear position, set to drive. Alternatively, if unspecified, set to 7.
Data size	4 bits
Data type	Enumerated
Expression range	0–7
Resolution	1
Allocation	0: Neutral 1: Park 2: Drive 3: Reverse 4–6: Reserved 7: Unspecified

5.3.11.5 DE_SteeringAngle

Data name	DE_SteeringAngle
Definition	Steering wheel turning angle information. Positive numbers indicate clockwise rotation. If undetermined, set to -2048 (0x800).
Data size	12 bits
Data type	Integer
Expression range	-3070.5–3070.5 degrees
Resolution	1.5 degrees

5.3.11.6 DE_ACCOperatingStatus

Data name	DE_ACCOperatingStatus
Definition	Vehicle adaptive cruise control (ACC) system operating status information. If unspecified, set to 0.
Data size	2 bits
Data type	Enumerated
Expression range	0–3
Resolution	1
Allocation	0: Unspecified 1: OFF 2: ON (Not operating) 3: ON (Operating)

5.3.11.7 DE_C-ACCOperatingStatus

Data name	DE_C-ACCOperatingStatus
Definition	Vehicle Cooperative Adaptive Cruise Control (C-ACC) system operating status information. If unspecified, set to 0.
Data size	2 bits
Data type	Enumerated
Expression range	0–3
Resolution	1
Allocation	0: Unspecified 1: OFF 2: ON (Not operating) 3: ON (Operating)

5.3.11.8 DE_PCSOperatingStatus

Data name	DE_PCSOperatingStatus
Definition	Vehicle Pre-Crash Safety (PCS) system operating status information. If unspecified, set to 0.
Data size	2 bits
Data type	Enumerated
Expression range	0–3
Resolution	1
Allocation	0: Unspecified 1: OFF 2: ON (Not operating) 3: ON (Operating)

5.3.11.9 DE_ABSOperatingStatus

Data name	DE_ABSOperatingStatus
Definition	Vehicle Antilock Brake System (ABS) operating status information. If unspecified, set to 0.
Data size	2 bits
Data type	Enumerated
Expression range	0–3
Resolution	1
Allocation	0: Unspecified 1: OFF 2: ON (Not operating) 3: ON (Operating)

5.3.11.10 DE_TRCOperatingStatus

Data name	DE_TRCOperatingStatus
Definition	Vehicle Traction Control (TRC) system operating status information. If unspecified, set to 0.
Data size	2 bits
Data type	Enumerated
Expression range	0–3
Resolution	1
Allocation	0: Unspecified 1: OFF 2: ON (Not operating) 3: ON (Operating)

5.3.11.11 DE_ESCOperatingStatus

Data name	DE_ESCOperatingStatus
Definition	Vehicle Electronic Stability Control Antilock Brake (ESC) system operating status information. If unspecified, set to 0.
Data size	2 bits
Data type	Enumerated
Expression range	0–3
Resolution	1
Allocation	0: Unspecified 1: OFF 2: ON (Not operating) 3: ON (Operating)

5.3.11.12 DE_LKAOperatingStatus

Data name	DE_LKAOperatingStatus
Definition	Vehicle Lane Keeping Assist (LKA) system operating status information. If unspecified, set to 0.
Data size	2 bits
Data type	Enumerated
Expression range	0–3
Resolution	1
Allocation	0: Unspecified 1: OFF 2: ON (Not operating) 3: ON (Operating)

5.3.11.13 DE_LDWOperatingStatus

Data name	DE_LDWOperatingStatus
Definition	Vehicle Lane Departure Warning (LDW) system operating status information. If unspecified, set to 0.
Data size	2 bits
Data type	Enumerated
Expression range	0–3
Resolution	1
Allocation	0: Unspecified 1: OFF 2: ON (Not operating) 3: ON (Operating)

5.3.12 DF_V2X-GNSS Information

5.3.12.1 DE_PositionInformationErrorOvalRotationAngle

Data name	DE_PositionInformationErrorOvalRotationAngle
Definition	Rotation angle information concerning the horizontal error ellipse (2 σ), an indicator of the reliability of the position information obtained by GNSS. The angle of the major axis of the ellipse is set as a clockwise angle value, with north being 0 degrees. If unspecified, set to 65535 (0xFFFF).
Data size	16 bits
Data type	Unsigned integer
Expression range	0–359.9875 degrees
Resolution	0.0125 degrees

5.3.12.2 DE_PositionInformationErrorMajorAxis

Data name	DE_PositionInformationErrorMajorAxis
Definition	Major axis information for the horizontal error ellipse (2 σ), an indicator of the reliability of the position information obtained by GNSS. If more than 127 m, set to 254 (0xFE), and if unspecified, set to 255 (0xFF).
Data size	8 bits
Data type	Unsigned integer
Expression range	0–127 m
Resolution	0.5 m

5.3.12.3 DE_PositionInformationErrorMinorAxis

Data name	DE_PositionInformationErrorMinorAxis
Definition	Minor axis information for the horizontal error ellipse (2 σ), an indicator of the reliability of the position information obtained by GNSS. If more than 127 m, set to 254 (0xFE), and if unspecified, set to 255 (0xFF).
Data size	8 bits
Data type	Unsigned integer
Expression range	0–127 m
Resolution	0.5 m

5.3.12.4 DE_GNSSMeasurementMode

Data name	DE_GNSSMeasurementMode
Definition	Information indicating the measurement mode used to determine the position information obtained by GNSS. If unspecified, set to 0 (0x0).
Data size	2 bits
Data type	Enumerated
Expression range	0–3
Resolution	1
Allocation	0: Unspecified 1: Not measured 2: 2-dimensional measurement 3: 3-dimensional measurement

5.3.12.5 DE_GNSSPositionAccuracyDeteriorationRate

Data name	DE_GNSSPositionAccuracyDeteriorationRate
Definition	Information indicating the degree to which the position accuracy of the position information obtained from GNSS was affected by the geometrical arrangement of satellites. Sets the position dilution of precision (PDOP) value at the time the position information was obtained. If 12.4 or more, set to 62 (0x3E), and if unspecified, set to 63 (0x3F).
Data size	6 bits
Data type	Unsigned integer
Expression range	0–12.4
Resolution	0.2

5.3.12.6 DE_GNSSNumberOfTrackedSatellites

Data name	DE_GNSSNumberOfTrackedSatellites
Definition	Information indicating how many satellites were tracked when the position information was obtained from GNSS. If 14 or more, set to 14 (0xE), and if unspecified, set to 15 (0xF).
Data size	4 bits
Data type	Unsigned integer
Expression range	0–14
Resolution	1

5.3.12.7 DE_GNSS MultipathDetection

Data name	DE_GNSSMultipathDetection
Definition	Information indicating whether the position information obtained from GNSS was acquired under multipath conditions (a situation where radio waves emitted from satellites are refracted by surrounding objects, such as buildings, before being received). If unspecified, set to 0 (0x0).
Data size	2 bits
Data type	Enumerated
Expression range	0・3
Resolution	1
Allocation	0: Unspecified 1: Multipath not present 2: Multipath present 3: Reserved

5.3.12.8 DE_AutonomousNavigationFunctionInformation

Data name	DE_AutonomousNavigationFunctionInformation
Definition	Information indicating whether the devices are equipped with autonomous navigation functions using sensors and so on. If unspecified, set to 0 (0x0).
Data size	1 bit
Data type	Boolean
Expression range	0–1
Resolution	1
Allocation	0: Autonomous navigation functions not present/unspecified 1: Autonomous navigation functions present

5.3.12.9 DE_MapMatchingFunctionInformation

Data name	DE_MapMatchingFunctionInformation
Definition	Information indicating whether a map matching function for vehicle location information is installed. If unspecified, set to 0 (0x0).
Data size	1 bit
Data type	Boolean
Expression range	0–1
Resolution	1
Allocation	0: Map matching function not present/unspecified 1: Map matching function present

5.3.13 DF_IndividualApplicationInformation

5.3.13.1 DE_ApplicationType

Data name	DE_ApplicationType
Definition	Information indicating whether a map matching function for vehicle location information is installed. If unspecified, set to 15 (0xF).
Data size	4 bits
Data type	Enumerated
Expression range	0–15
Resolution	1
Allocation	0: Private vehicle 1: Emergency vehicle 2: Road maintenance work vehicle 3: Passenger transport vehicle 4: Cargo transport vehicle 5: Special vehicle (excluding road maintenance work vehicles) 6–14: Reserved 15: Other/unclear

5.3.13.2 DE_PrivateVehicleExtendedInformation

Data name	DE_PrivateVehicleExtendedInformation
Definition	Extended information for private vehicles. Set in cases where DE_ApplicationType is “private vehicle.”
Data size	8 bits
Data type	Enumerated
Expression range	0–255
Resolution	1
Allocation	0: Private vehicle The first four bits indicate operating and driving information and the last four bits indicate status information. < Operating and driving information > 0: In operation 1: Operation by novice driver 2: Operation by senior driver 3: Operation by disabled driver 4: Operation by hearing impaired driver 5: Operation by driver with provisional license 6: Operation with pre-school children onboard 7: Operation with welfare support recipients onboard 8–15: Reserved <Status information> 0: Normal status 1: General passenger boarding/exiting 2: Pre-school children boarding/exiting 3: Welfare support recipient boarding/exiting 4: Loading/unloading in progress 5–14: Reserved 15: Emergency stop

5.3.13.3 DE_EmergencyVehicleExtendedInformation

Data name	DE_EmergencyVehicleExtendedInformation
Definition	Extended information for emergency vehicles. Set in cases where DE_ApplicationType is “emergency vehicle.”
Data size	8 bits
Data type	Enumerated
Expression range	0–255
Resolution	1
Allocation	The first four bits are reserved and the last four bits indicate status information. <Vehicle information> 0: Ambulance 1: Fire vehicle 2: Police vehicle 3–14: Reserved 15: Other emergency vehicle <Status information> 0: Normal operation 1: Emergency operation 2: On-road activity 3–14: Reserved 15: Emergency stop

5.3.13.4 DE_RoadMaintenanceWorkVehicleExtendedInformation

Data name	DE_RoadMaintenanceWorkVehicleExtendedInformation
Definition	Extended information for road maintenance work vehicles. Set in cases where DE_ApplicationType is “road maintenance work vehicle.”
Data size	8 bits
Data type	Enumerated
Expression range	0–255
Resolution	1
Allocation	The first four bits are restriction information and the last four bits indicate status information. < Restriction information > 0: No restrictions 1: Lane restriction 2: Shoulder restriction 3–15: Reserved <Status information> 0: Normal status 1: Performing construction work 2: Vehicle shutdown during work 3: Performing low-speed work 4: Handling accident 5: Traffic congestion ahead 6–14: Reserved 15: Emergency stop

5.3.13.5 DE_PassengerTransportVehicleExtendedInformation

Data name	DE_PassengerTransportVehicleExtendedInformation
Definition	Extended information for passenger transport vehicles. Set in cases where DE_ApplicationType is “passenger transport vehicle.”
Data size	8 bits
Data type	Enumerated
Expression range	0–255
Resolution	1
Allocation	The first four bits indicate operating and driving information and the last four bits indicate status information. <Operating and driving information > 0: Normal/no information 1: Operating as route bus 2: Operating as school bus 3: Operating as welfare support vehicle 4: Operating as taxi 5–15: Reserved < Status information > 0: Normal status 1: General passenger boarding/exiting 2: Pre-school children boarding/exiting 3: Welfare support recipient boarding/exiting 4: Loading/unloading in progress 5: Departing 6–14: Reserved 15: Emergency stop

5.3.13.6 DE_CargoTransportVehicleExtendedInformation

Data name	DE_CargoTransportVehicleExtendedInformation
Definition	Extended information for cargo transport vehicles. Set in cases where DE_ApplicationType is “cargo transport vehicle.”
Data size	8 bits
Data type	Enumerated
Expression range	0–255
Resolution	1
Allocation	The first four bits are reserved and the last four bits indicate status information. <Reserved> 0: Normal/no information 1–15: Reserved <Status information> 0: Normal status 1: Loading/unloading cargo 2–14: reserved 15: Emergency stop

5.3.13.7 DE_SpecialVehicleExtendedInformation

Data name	DE_SpecialVehicleExtendedInformation
Definition	Extended information for special vehicles (excluding road maintenance work vehicles). Set in cases where DE_ApplicationType is “special vehicle.”
Data size	8 bits
Data type	Enumerated
Expression range	0–255
Resolution	1
Allocation	The first four bits are reserved and the last four bits indicate status information. <Reserved> 0: Normal/no information 1–15: Reserved <Status information> 0: Normal operation 1: Performing on-road work 2–14: Reserved 15: Emergency stop

5.3.13.8 DE_OtherExtendedInformation

Data name	DE_OtherExtendedInformation
Definition	Extended information for case where the vehicle application is not private, emergency, work maintenance work, passenger transport, cargo transport, or special. Set in cases where DE_ApplicationType is “Other/unclear.”
Data size	8 bits
Data type	Enumerated
Expression range	0–255
Resolution	1
Allocation	The first four bits are reserved and the last four bits indicate status information. <Reserved> 0: Normal/no information 1–15: Reserved <Status information> 0: Normal operation 1–14: Reserved 15: Emergency stop

5.3.14 DF_IndividualExtendedAreaManagementInformation

5.3.14.1 DE_IndividualExtendedAreaHeaderLength

Data name	DE_IndividualExtendedAreaHeaderLength
Definition	Indicates the individual extended area data size, excluding the individual extended data area, in bytes. Corresponds to DE_FreeAppHeaderLength under RC-013.
Data size	5 bits
Data type	Unsigned integer
Expression range	4–22 bytes
Resolution	1 byte

5.3.14.2 DE_NumberOfIndividualExtendedData

Data name	DE_NumberOfIndividualExtendedData
Definition	The number of individual extended data stored in the individual extended data area. Corresponds to DE_NumberOfIndividualAppData under RC-013.
Data size	3 bits
Data type	Unsigned integer
Expression range	1 - 7
Resolution	1

5.3.15 DF_IndividualExtendedDataManagementInformation

5.3.15.1 DE_IndividualServiceStandardID

Data name	DE_IndividualServiceStandardID (individual target area)
Definition	Corresponds to DE_IndividualServiceStandardID under RC-013.
Data size	8 bits

5.3.15.2 DE_IndividualExntededDataStartAddress

Data name	DE_IndividualExntededDataStartAddress
Definition	Indicates the storage start position of the individual extended data expressed in bytes with the beginning of the individual extended data area set to 0. Corresponds to DE_IndividualAppDataAddress under RC-013.
Data size	8 bits
Data type	Unsigned integer
Expression range	0–59th byte
Resolution	1 byte

5.3.15.3 DE_IndividualExtendedDataLength

Data name	DE_IndividualExtendedDataLength
Definition	Indicates the individual extended data size in bytes. Corresponds to DE_IndividualAppDataLength under RC-013.
Data size	8 bits
Data type	Unsigned integer
Expression range	1–60 bytes
Resolution	1 byte

Appendix 1. Sensor Fusion

These Guidelines anticipate the following three patterns as methods of handling in cases where a roadside unit has multiple sensors.

Pattern 1: Output from multiple roadside sensors is fused within a sensor unit and delivered to the roadside unit computing device as the output of a single sensor (fusion sensor).

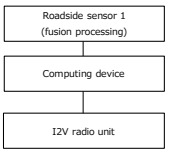
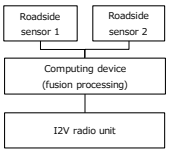
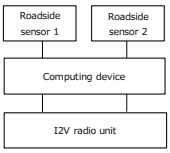
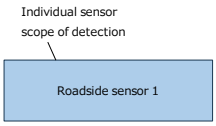
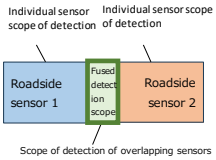
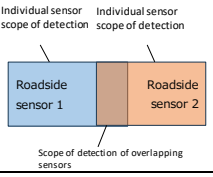
Pattern 2: After output from multiple roadside sensors is delivered to a roadside unit computing device, fusion processing is performed.

Pattern 3: Output from multiple roadside sensors is delivered to a roadside unit computing device, and the data is individually handled.

Under pattern 1, since the output is treated as output from a single roadside sensor, and consequently, there are no particular points to note. With patterns 2 and 3, output from multiple roadside sensors is handled, and therefore, there are instances where the scopes of detection overlap. Regarding pattern 2, fusion processing is performed by multiple sensors with overlapping detection ranges, and therefore, in addition to the individual detection range of each sensor, the overlapping detection range of multiple sensors is defined separately as a fusion detection range. Regarding pattern 3, data for overlapping detection ranges from multiple sensors is delivered to the computing device as-is without performing a fusion process, and therefore, the detection range of each sensor is defined in an overlapping manner.

Table A1-1 shows implementation examples in cases where two sensors overlap. Under pattern 2, DF_SensorDetectionRangeInformation from roadside sensor 1 defines both the detection range of roadside sensor 1 alone and the detection range of multiple sensors consisting of roadside sensor 1 and roadside sensor 2 and stores a value that takes into account the effect of fusion processing in DE_Non-detectionRate of the fusion detection range. Similarly, regarding DF_SensorDetectionRangeInformation for roadside sensor 2, both the detection range of roadside sensor 2 alone and the detection range of multiple sensors consisting of roadside sensor 1 and roadside sensor 2 are respectively defined in the value that takes into account the effect of fusion processing is stored in DE_Non-detectionRate of the fusion detection range. Under pattern 3, detection ranges are not individually defined for overlapping sensor detection ranges. Noted that these implementation examples concern cases where the detection ranges of two roadside sensors overlap, but DF_SensorDetectionRangeInformation is defined based on the same concept even where there are three or more sensors.

Table A1-1. Data Storage Methods in Cases Where Multiple Sensors with Overlapping Detection Ranges Are Installed

					Pattern 1 Output from multiple roadside sensors are fused within a sensor unit and delivered to the roadside unit computing device as the output of a single sensor (fusion sensor)	Pattern 2 After output from multiple roadside sensors is delivered to a roadside unit computing device, fusion processing is performed	Pattern 3 Output from multiple roadside sensors is delivered to a roadside unit computing device, and the data is individually handled
Sensor structure							
Range of detection							
Handling of range of detection				Range of detection of individual sensor	The individual sensor range of detection is used as-is	The range is the individual sensor range of detection excluding overlapping ranges of detection	The individual sensor range of detection is used as-is
				Range of detection of overlapping sensors	N/A	Individual fusion ranges of detection are set for multiple sensors For these ranges of detection, target information acquired from multiple sensors is fused and stored	Individual ranges of detection are not defined For these ranges of detection, target information acquired from multiple sensors is stored in duplicate
Data storage method * Examples of cases from the diagram	Roadside sensor 1	DF_UseCaseInforma	DE_TargetInformationSubjectSensorNum		Stores 1 to bit 0	Stores 1 to bit 0	Stores 1 to bit 0
		DF_SensorInformat	DE_SensorIdentificationID		Stores the identification ID of roadside sensor 1	Stores the identification ID of roadside sensor 1	Stores the identification ID of roadside sensor 1
			DE_ NumberOfSensorDetectionRanges		Stores 0 (*1)	Stores 1 (*1)	Stores 1 (*1)
			DF_SensorDetectionRangeInformation (single sensor detection range)	DE_DetectionRa	Stores 0 (*1)	Stores 0 (*1)	Stores 0 (*1)
				DE_Non-detecti	Stores the non-detection rate of a single sensor detection range	Stores the non-detection rate of a single sensor detection range	Stores the non-detection rate of a single sensor detection range
				DE_NumberOfVe	Stores 3 (*1)	Stores 3 (*1)	Stores 3 (*1)
				DE_VertexPositi	Stores the vertex position of a single sensor detection range	Stores the vertex position of a single sensor detection range	Stores the vertex position of a single sensor detection range
			DF_SensorDetectionRangeInformation (multiple sensor detection ranges)	DE_DetectionRa	N/A	Stores 1 (*1)	N/A
				DE_Non-detecti	N/A	Stores the non-detection rate of multiple sensor detection ranges	N/A
				DE_NumberOfVe	N/A	Stores 3 (*1)	N/A
				DE_VertexPositi	N/A	Stores the vertex position of multiple sensor detection ranges	N/A
		DF_IndividualTarge	DE_ClosestInformationSource		Stores 1 to bit 0	Stores 1 to bit 0	Stores 1 to bit 0
	Roadside sensor 2	DF_UseCaseInforma	DE_TargetInformationSubjectSensorNum		N/A	Stores 1 to bit 1	Stores 1 to bit 1
		DF_SensorInformat	DE_SensorIdentificationID		N/A	Stores the identification ID of roadside sensor 2	Stores the identification ID of roadside sensor 2
			DE_ NumberOfSensorDetectionRanges		N/A	Stores 1 (*1)	Stores 1 (*1)
			DF_SensorDetectionRangeInformation (single sensor detection range)	DE_DetectionRa	N/A	Stores 0 (*1)	Stores 0 (*1)
				DE_Non-detecti	N/A	Stores the non-detection rate of a single sensor detection range	Stores the non-detection rate of a single sensor detection range
				DE_NumberOfVe	N/A	Stores 3 (*1)	Stores 3 (*1)
				DE_VertexPositi	N/A	Stores the vertex position of a single sensor detection range	Stores the vertex position of a single sensor detection range
			DF_SensorDetectionRangeInformation (multiple sensor detection ranges)	DE_DetectionRa	N/A	Stores 1 (*1)	N/A
				DE_Non-detecti	N/A	Stores the non-detection rate of multiple sensor detection ranges	N/A
				DE_NumberOfVe	N/A	Stores 3 (*1)	N/A
				DE_VertexPositi	N/A	Stores the vertex position of multiple sensor detection ranges	N/A
		DF_IndividualTarge	DE_ClosestInformationSource		N/A	Stores 1 to bit 1	Stores 1 to bit 1

Appendix 2. Overall Data Structure

1. Roadside Headers

Component DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DE_CommonServiceStandardID	3	○	
DE_MessageVersion	4	○	
DE_OperationClassificationCode	1	○	
DE_IncrementCounter	8	○	
DE_MessageID	16	○	
DE_RoadsideUnitID	32	○	
DF_TransmissionTime		○	
DE_LeapSecondCorrectionInformation	1	○	
DE_Time(Hours)	7	○	
DE_Time(Minutes)	8	○	
DE_Time(Seconds)	16	○	
DE_MessageSize	16	○	
DE_Reserved(16)	16		

2. Roadside Unit Attribute Information

Component DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DE_ServiceOperationStatus	8	○	
DE_RoadsideUnitOptionFlag	8	○	
〈Roadside Unit Option Area [0]〉		△Note 2, Note 3	
DE_RoadsideUnitOptionSize	16	△Note 2, Note 3	
(DF_RoadsideUnitOptionInformation＝) DE_ServiceLocationInformation			
DE_ServiceLocationID	24	△Note 2, Note 3	
DF_AgentLocationInformation			
DE_Latitude	32		
DE_Longitude	32		
DE_Altitude	16		
DE_NumberOfConnectedRoutes	8	△Note 2, Note 3	Stores number of connected routes: J
DF_RouteIdentificationInformation: 1		△Note 2, Note 3	Repeated J times.
DE_RouteID	8	△Note 2, Note 3	
DE_RouteConnectionOrientation	8	△Note 2, Note 3	
DE_Reserved(40)	40		
・・・			
DF_RouteIdentificationInformation: J			

〈Roadside Unit Option Area [1]〉		△Note 2, Note 3	When this option is selected, Roadside Unit Option Area [0] is also selected.
DE_RoadsideUnitOptionSize	16	△Note 2, Note 3	
(DF_RoadsideUnitOptionInformation＝) DF_UseCaseInformation			
DF_UseCaseInformationByRoute: 1		△Note 2, Note 3	Repeated J times.
DE_NumberOfUseCases	8	△Note 2, Note 3	Stores the number of use cases: K
DF_InformationByUseCase: 1		△Note 2, Note 3, Note 5	Repeated K times.
DE_SubjectUseCaseSupplementalCode	2	△Note 2, Note 3	
DE_SubjectUseCaseType	6	△Note 2, Note 3	
DE_ServiceProvisionTargetVehicle	4	△Note 2, Note 3	
DE_Reserved(4)	4		
DE_TargetInformationSubjectRoute	16	△Note 2, Note 3	
DE_ TargetInformationSubjectSensorNumber	16	△Note 2, Note 3	
DE_Reserved(16)	16		
・・・			
DF_InformationByUseCase: K			
・・・			
DF　UseCaseInformationByRoute: J			
〈Roadside Unit Option Area [2]〉		△Note 2, Note 3	
DE_RoadsideUnitOptionSize	16	△Note 2, Note 3	
(DF_RoadsideUnitOptionInformation＝) DF_SensorInformation			
DE_NumberOfSupportedSensors	4	△Note 2, Note 3	Stores the number of supported sensors: L
DE_Reserved(4)	4		
DF_IndividualSensorAttributeInformation: 1		△Note 2, Note 3	Repeated L times.
DE_AttributeInformationAreaSize	8	△Note 2, Note 3	
DE_SensorIdentificationID	24		
DF_SensorInstallationLocation		△Note 2, Note 3	
DE_Latitude	32	△Note 2, Note 3	
DE_Longitude	32	△Note 2, Note 3	
DE_Altitude	16	△Note 2, Note 3	
DE_SensorOperationalStatus	1	△Note 2, Note 3	
DE_SensorOperatingStatus	3	△Note 2, Note 3	
DE_NumberOfSensorDetectionRanges	4	△Note 2, Note 3	Stores the number of sensor detection ranges: M
DF_SensorDetectionRangeInformation: 1		△Note 2, Note 3	Repeated M times.
DE_DetectionRangeID	4	△Note 2, Note 3	
DE_Non-detectionRate	8		
DE_NumberOfVertices	4	△Note 2, Note 3	Stores the number of vertices: N
DF_VertexPosition: 1		△Note 2, Note 3	Repeated N times.
DE_Latitude	32	△Note 2, Note 3	

DE_Longitude	32	△Note 2, Note 3	
・・・			
DF_VertexPosition: N			
・・・			
DF_SensorDetectionRangeInformation: M			
・・・			
DF_IndividualSensorAttributeInformation: L			
〈Roadside Unit Option Area [7]〉			
DE_RoadsideUnitOptionSize	16		
(DF_RoadsideUnitOptionInformation＝) DF_RoadsideUnitAttraibuteExtendedInformation	Arbitrary		

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 2. When the relevant option flag in the DE_RoadsideUnitOptionFlag is set to 0, data is not stored.

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

Note 5. When DE_NumberOfUseCases = 0, data is not stored.

3. Target Information

Component DF/DE	Size (bits)	Mandatory storage ○: Mandatory △: Conditional	Remarks
DE_NumberOfTargets	8	○	
DF_IndividualTargetInformation: 1		△Note 3, Note 4	Repeated P times.
DF_IndividualTargetManagementInformation		△Note 3, Note 4	
DE_TargetID	32	△Note 3, Note 4	
DE_TrackingInformation	8	△Note 3, Note 4	
DE_DataLength	8	△Note 3, Note 4	
DE_IndividualTargetOptionFlag	8	△Note 3, Note 4	
DF_PresenceTime		△Note 3, Note 4	
DE_LeapSecondCorrectionInformation	1	△Note 3, Note 4	
DE_Time(Hours)	7	△Note 3, Note 4	
DE_Time(Minutes)	8	△Note 3, Note 4	
DE_Time(Seconds)	16	△Note 3, Note 4	
DF_TargetStatusInformation		△Note 3, Note 4	
DE_Latitude	32	△Note 3, Note 4	
DE_Longitude	32	△Note 3, Note 4	
DE_Altitude	16		
DE_Speed	16	△Note 3, Note 4	
DE_HeadingAngle	16	△Note 3, Note 4	
DE_LongitudinalAcceleration	16		
DF_TargetSizeInformation		△Note 3, Note 4	
DE_TargetHeadingDeterminationStatus	2	△Note 3, Note 4	
DE_TargetReferencePointInformation	4	△Note 3, Note 4	
DE_TargetHeadingAngle	16	△Note 3, Note 4	

DE_Width	10	△Note 3, Note 4	
DE_Length	14	△Note 3, Note 4	
DE_Height	10		
DF_TargetTypeInformation		△Note 3, Note 4	
DE_NumberOfTargetTypes	8	△Note 3, Note 4	Stores the number of target types: Q
DE_TargetType: 1	8	△Note 3, Note 4	Repeated Q times.
・・・			
DE_ TargetType: Q	8		
〈Individual Target Option Area [0]〉 DF_DetectionHistoryInformation			
DE_NumberOfDetections	16		
DE_NumberOfConsecutiveNon-Detections	4		
DE_StationaryStatus	12		
DE_PresenceTime	16		
DE_LatestInformationSource	16		
DE_DetectionErrorRate	8		
〈Individual Target Option Area [1]〉 DF_TargetPrecisionInformation			
DE_PositionInformationErrorOvalRotationAngle	16		
DE_PositionInformationErrorMajorAxis	12		
DE_PositionInformationErrorMinorAxis	12		
DE_SpeedError	12		
DE_HeadingAngleError	12		
DE_LongitudinalAccelerationError	10		
DE_TargetWidthError	9		
DE_TargetLengthError	10		
DE_TargetHeightError	9		
DE_Reserved(2)	2		
〈Individual Target Option Area [2]〉 DF_TargetStatusExtendedInformation			
DE_YawRate	16		
DE_IlluminationStatus	8		
DE_RawRate_PrecisionInformation	12		
DE_IlluminationStatus_PrecisionInformation	4		
〈Individual Target Option Area [3]〉 DF_TargetStatusForwardingInformation			
DE_BrakeStatus	6		
DE_AuxilliaryBrakeStatus	2		
DE_AcceleratorPedalPosition	8		
DE_ShifterPosition	4		
DE_SteeringAngle	12		
DE_ACC OperatingStatus	2		
DE_C-ACC OperatingStatus	2		
DE_PCS OperatingStatus	2		
DE_ABS OperatingStatus	2		
DE_TRC OperatingStatus	2		
DE_ESC OperatingStatus	2		
DE_LKA OperatingStatus	2		
DE_LDW OperatingStatus	2		

〈Individual Target Option Area [4]〉 DF_V2X-GNSS Information			
DE_PositionInformationErrorOvalRotationAngle	16		
DE_PositionInformationErrorMajorAxis	8		
DE_PositionInformationErrorMinorAxis	8		
DE_GNSS MeasurementMode	2		
DE_GNSSPositionAccuracyDeteriorationRate	6		
DE_GNSS NumberOfTrackedSatellites	4		
DE_GNSS MultipathDetection	2		
DE_AutonomousNavigationFunctionInformation	1		
DE_MapMatchingFunctionInformation	1		
〈Individual Target Option Area [5]〉 DF_IndividualApplicationInformation			
DE_ApplicationType	4		
DE_Reserved(4)	4		
DE_PrivateVehicleExtendedInformation	8		
DE_EmergencyVehicleExtendedInformation	8		
DE_RoadMaintenanceWorkVehicleExtendedInformation	8		
DE_PassengerTransportVehicleExtendedInformation	8		
DE_CargoTransportVehicleExtendedInformation	8		
DE_SpecialVehicleExtendedInformation	8		
DE_OtherExtendedInformation	8		
〈Individual Target Option Area [7]〉 〈Individual Target Extended Area〉			
DF_IndividualExtendedAreaManagementInformation			
DE_IndividualExtendedAreaHeaderLength	5		
DE_NumberOfIndividualExtendedData	3		Stores the number of individual extended data: R
DF_IndividualExtendedDataManagementInformationSet			
DF_IndividualExtendedDataManagementInformation: 1			Repeated R times.
DE_IndividualServiceStandardID	8		
DE_IndividualExntededDataStartAddress	8		
DE_IndividualExtendedDataLength	8		
・・・			
DF_IndividualExtendedDataManagementInformation: R			
〈Individual Extended Data Area〉			
(Individual Extended Data 1)			
・・・			
(Individual Extended Data R)			
・・・			
DF_ IndividualTargetInformation: P			

Note 1. J: Number of connected routes; K: Number of use cases; L: Number of sensors; M: Number of sensor detection ranges; N: Number of vertices; P: Number of targets; Q: Number of target types

Note 3. When DE_ServiceOperationStatus displays “service suspended,” data is not stored.

Note 4. When DE_NumberOfTargetss = 0, data transmission is omitted.

Appendix 3. Transmission Message Specifications for CSMA Type Roadside Units

CSMA type roadside units use onboard unit specification radio devices as roadside units for short-term verification experiments, and as radio stations, they are mobile stations and use vehicle-to-vehicle communication. A comparison with the method using roadside units described in Chapter 3 is shown in Table A3-1.

When conducting experiments, it is necessary to coordinate with the relevant organizations from the perspective of the impact on actual operational stations. Also, it should be noted that radio equipment of CSMA type roadside units must satisfy the technical conditions for land mobile stations in the 700 MHz band Intelligent Transport Systems and it is necessary to obtain prior confirmation from the Ministry of Internal Affairs and Communications regarding the fixed use of mobile stations (it is possible that an experimental test station license is required).

Table A3-1. Comparison of Roadside Units Described in These Guidelines and CSMA Roadside Units

		Roadside units described in Chapter 3	CSMA type roadside units
Message specifications overview	Message specifications	Newly formulated as ordinary roadside units	Newly formulated as CSMA type roadside units
	Methods of expressing target status	Latitude/longitude, speed, heading, etc.	
	Number of targets per message	All transmission subjects	Maximum of 5
	In case of target non-detection	Transmits 0 as the number of targets	Transmits header only
Transmission periods in T-109		Roadside unit-to-vehicle communication period	Period other than roadside unit-to-vehicle/roadside unit-to-roadside unit
Handling of methods in these Guidelines		Specifications for experimentation for practical application	Provisional specifications for short-term demonstration testing

1. Message Structure

The transmission message structure for CSMA roadside units is shown in Table A3-2. The message structure consists of the initial CSMA roadside unit header area and the CSMA roadside unit target area. The CSMA roadside unit header area stores the service standards and information for identifying messages. The CSMA roadside unit target area stores information on targets detected by the roadside unit, and the number of areas can be increased from one in order to a maximum of five according to the number of

detected targets. If the roadside unit does not detect any targets, there is no CSMA roadside unit target area, and only the CSMA roadside unit header area is transmitted.

Table A3-2. CSMA Roadside Unit Transmission Message Structure

Data structure	Stored DF	Size	Remarks
CSMA roadside unit header area	DF_CSMA RoadsideUnitHeaderInformation	20 byte	
CSMA roadside unit target area 1	DF_CSMA RoadsideUnitTargetInformation	0 or 16 bytes	Increase the number of areas to a maximum of 5 according to the number of targets detected
CSMA roadside unit target area 2	DF_CSMA RoadsideUnitTargetInformation	0 or 16 bytes	
CSMA roadside unit target area 3	DF_CSMA RoadsideUnitTargetInformation	0 or 16 bytes	
CSMA roadside unit target area 4	DF_CSMA RoadsideUnitTargetInformation	0 or 16 bytes	
CSMA roadside unit target area 5	DF_CSMA RoadsideUnitTargetInformation	0 or 16 bytes	
		Total 20 – 100 bytes	

2. Data Frames

(1) DF_CSMA RoadsideUnitHeaderInformation

The structure of DF_CSMA RoadsideUnitHeaderInformation is indicated in Table A3-3.

Note that the structure from DF_CSMA RoadsideUnitHeaderInformation described in RC-016 version 1.0 has been partially revised, so caution must be exercised from the perspective of compatibility.

Table A3-3. DF_CSMA RoadsideUnitHeaderInformation Structure

Data frame/data element		Size (bits)	Remarks
DF_CSMA RoadsideUnitHeaderInformation		160	
	DE_CommonServiceStandardID	3	
	DE_RoadsideMessageVersion	4	*1
	DE_OperationClassificationCode	1	*1
	DE_IncrementCounter	8	
	DE_RoadsideMessageID	16	
	DE_RoadsideUnitID	32	
	DE_IntersectionID	32	*2
	DF_TransmissionTime	32	
	DE_MessageSize	16	
	DE_Reserved (16)	16	

*1. Changes from 4.5 of RC-016 version 1.0 (the DE storage order has been changed).

*2. Data element not included in the roadside header transmitted by the roadside unit described in Chapter 3.

(2) DF_TransmissionTime

The structure of DF_TransmissionTime is indicated in the following table.

Table A3-4. DF_TransmissionTime Structure

Data frame/data element		Size (bits)	Remarks
DF_TransmissionTimeInformation		32	
	DE_LeapSecondCorrectionInformation	1	
	DE_Time(Hours)	7	UTC “hours” +9
	DE_Time(Minutes)	8	UTC minutes
	DE_Time(Seconds)	16	UTC milliseconds

(3) DF_CSMA RoadsideUnitTargetInformation

The structure of DF_CSMA RoadsideUnitTargetInformation is indicated in the following table.

Table A3-5. DF_CSMA RoadsideUnitTargetInformation Structure

Data frame/data element		Size (bits)	Remarks
DF_CSMA RoadsideUnitTargetInformation		128	
	DE_TargetID_light	8	
	DF_PositionInformation_light	64	
	DF_StatusInformation_light	48	
	DF_TargetAttributeInformation_light	8	

(4) DF_PositionInformation_light

The structure of DF_PositionInformation_light is indicated in the following table.

Table A3-6. DF_PositionInformation_light Structure

Data frame/data element		Size (bits)	Remarks
DF_ PositionInformation _light		64	
	DE_Latitude	32	
	DE_Longitude	32	

(5) DF_StatusInformation_light

The structure of DF_StatusInformation_light is indicated in the following table.

Table A3-7. DF_StatusInformation_light Structure

Data frame/data element		Size (bits)	Remarks
DF_StatusInformation_light		48	
	DE_Speed	16	
	DE_HeadingAngle	16	
	DE_Acceleration	16	

(6) DF_TargetAttributeInformation_light

The structure of DF_TargetAttributeInformation_light is indicated in the following table.

Table A3-8. DF_TargetAttributeInformation_light Structure

Data frame/data element		Size (bits)	Remarks
DF_TargetAttributeInformation_light		8	
	DE_TargetType	4	
	DE_TargetSize	4	

3. Data Elements

See Chapter 5 for information on data elements that are defined in common with the header area of normal roadside units within DF_CSMA RoadsideUnitHeaderInformation.

(1) DE_IntersectionID

Data name	DE_IntersectionID
Definition	ID information for identifying an intersection that is subject to the target detection range of a roadside unit.
Data size	32 bits
Data type	Unsigned integer
Expression range	0–4,294,967,295
Resolution	1

(2) DE_TargetID_light

Data name	DE_TargetID_light
Definition	IF information for identifying a target.
Data size	8 bits
Data type	Unsigned integer
Expression range	0–255
Resolution	1

(3) DE_Latitude

Data name	DE_Latitude
Definition	Position latitude information. The geodetic system is WGS84 (or equivalent). Positive values indicate north latitude, and negative values indicate south latitude. If undetermined, set to -2147483648 (0x80000000).
Data size	32 bits
Data type	Integer
Expression range	-90–90 degrees
Resolution	0.0000001 degrees

(4) DE_Longitude

Data name	DE_Longitude
Definition	Position longitude information. The geodetic system is WGS84 (or equivalent). Positive values indicate east longitude, and negative values indicate west longitude. If undetermined, set to -2147483648 (0x80000000).
Data size	32 bits
Data type	Integer
Expression range	-180–180 degrees
Resolution	0.0000001 degrees

(5) DE_Speed

Data name	DE Speed
Definition	Target speed information. If undetermined, set to 65535 (0xFFFF).
Data size	16 bits
Data type	Unsigned integer
Expression range	0–163.83 m/s
Resolution	0.01 m/s

(6) DE_HeadingAngle

Data name	DE_HeadingAngle
Definition	Target heading angle information. North is set to 0 degrees, and angle values are set in a clockwise direction. If undetermined, set to 65535 (0xFFFF).
Data size	16 bits
Data type	Unsigned integer
Expression range	0–359.9875 degrees
Resolution	0.0125 degrees

(7) DE_Acceleration

Data name	DE_Acceleration
Definition	Target acceleration information. If undetermined, set to -32768 (0x8000).
Data size	16 bits
Data type	Integer
Expression range	-20–20 m/s^2
Resolution	0.01 m/s^2

(8) DE_TargetType

Data name	DE_TargetType
Definition	Target type information
Data size	4 bits
Data type	Enumerated
Allocation	0: Large vehicle (including large special vehicles) 1: Medium-size vehicle 2: Ordinary vehicle (including small special vehicles and light (four-wheel) vehicles) 3: Motorcycle (including large motorcycles and motorized bicycles) 4: Bicycle 5: Light vehicle other than bicycle (cart, rickshaw, etc.) 6: Pedestrian (including wheelchairs and mobility scooters) 7: Electric tram 8–14: Reserved 15: Other/unclear

(9) DE_TargetSize

Data name	DE_TargetSize
Definition	Target width information. If less than 0.5 m, set to 0 (0x0); if 7 m or more, set to 14 (0xE), and if undetermined, set to 15 (0xF).
Data size	4 bits
Data type	Unsigned integer
Expression range	0–7 m
Resolution	0.5 m