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Transport information and control systems — In-vehicle navigation systems — Communications message set requirements

Systèmes de commande et d'information des transports — Systèmes de navigation dans les véhicules — Exigences relatives à l'ensemble des messages des communications

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ISO 15075 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

Transport information and control systems — In-vehicle navigation systems — Communications message set requirements

1 Scope

This International Standard specifies message content and format utilized by in-vehicle navigation systems. Its emphasis is on messages that are required to generate or enhance routing instructions. There is a particular focus on messages that would not necessarily be included in a more general traffic management message list.

Although this International Standard emphasizes requirements for Locally Determined Route Guidance (LDRG) systems that utilize on-vehicle map databases, it also includes messages that would be utilized primarily by Centrally Determined Route Guidance (CDRG) systems and certain value-added messages.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
Locally Determined Route Guidance System
LDRG
system which provides a driver with step-by-step driving instructions that are determined by an on-vehicle system

NOTE   The system typically consists of a display screen, a computer, routing and guidance software, a navigable map database, and positioning equipment to track the vehicle's location as it proceeds along its path.

2.2
Centrally Determined Route Guidance System
CDRG
system which provides a driver with step-by-step driving instructions that are similar to those offered by a LDRG

NOTE   With a centrally determined system, the routing instructions are determined at an off-vehicle location and transmitted to the vehicle.

2.3
message
data element which is formatted for transmission and broadcast by means of electromagnetic field propagation

2.4
standard location references
standardized method for referencing geographic locations including points, links between points and geographic areas[1)]

2.5
traffic message centre
TMC
centre that transmits (receives) messages to (from) the vehicle by any communication means other than short range, vehicle-to-roadside communications (beacons)

NOTE   The bulk of these messages are expected to be traffic related.

2.6
roadside beacon
RS
short-range vehicle-to-roadside communication device with the inherent location feature that if the vehicle is receiving the signal, then the vehicle has to be positioned in a specific, localized area

3   Message set: Contents and format

The messages in this International Standard are divided into three categories, as follows.

⎯ Messages that are required by route guidance systems to determine their recommended routes on-board the vehicle (LOCALLY DETERMINED). These address a wide range of information such as traffic conditions, tolls, road construction and availability of parking.

⎯ Messages that are required by route guidance systems for which routes are determined off-board the vehicle (CENTRALLY DETERMINED). These primarily focus on requesting and transmitting routing information.

⎯ VALUE-ADDED messages that could be displayed by an in-vehicle navigation system, routed through a system, or utilized by a system in providing guidance. These include messages for communicating information regarding items such as emergencies, toll and fee payments, and ridesharing.

Tables 1, 2 and 3 consist of message contents and formats for locally determined route guidance systems, centrally determined route guidance systems, and value-added messages. The structure of the tables is as follows.

Item number: The alphanumeric number assigned to a message by ISO/TC 204. This signifies the message's relative position in the list and its classification:

L = LDRG; C = CDRG; V = value added

Message: A brief description of the message.

Data flow: IN means flow into the vehicle (navigation system) from the infrastructure (communication device); OUT means flow to the infrastructure (communication device) from the vehicle (navigation system). See Figure 1.

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1) ITS standards for location referencing are being developed within both CEN/TC 278, SWG 7.3, and ISO/TC 204, SWG 3.3. Oak Ridge National Laboratories in the US are working on a standard location message protocol. Japan utilizes a standard referencing system devised by the Japan Kokudo-Chiri-In. The field size estimates for location references in this International Standard are based on preliminary drafts from these efforts.

Data fields comprising the message: Description of the specific data fields required for the message. Note that this International Standard uses the same data fields in a modular way to create different messages.

Field type: A = alphanumeric; F = floating point; I = integer; V = variable

Required field size: Specified in bits.

Field format: F = fixed length; V = variable length
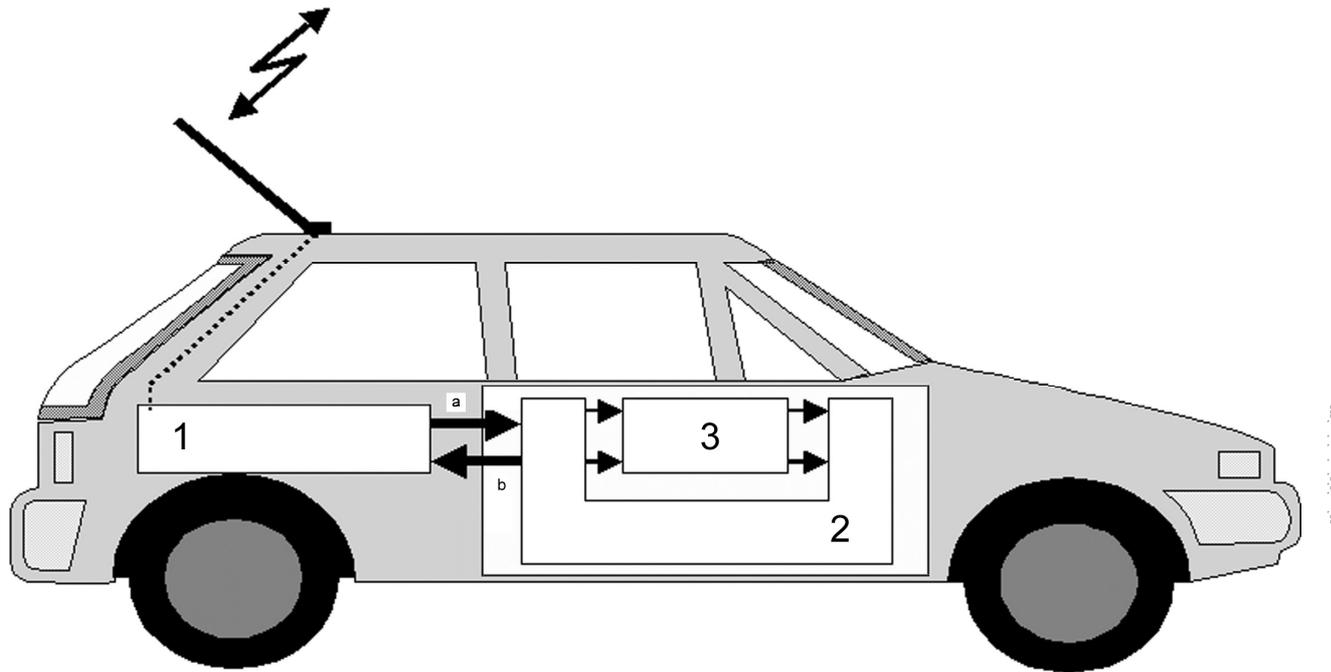
Key

1   communication device

2   in-vehicle application

3   navigation system

a   In

b   Out

Figure 1

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Table 1 — Messages used by locally determined route guidance systems

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
1L	Dynamic link times from traffic message centre (TMC)	IN	Message code [general use by TMC or roadside (RS) beacon]	I	16	F
			Sequence number	I	6	F
			Message time stamp (1 s resolution)	I	17	F
			Data format code [congestion levels, link travel times, travel time deltas, or time/speed factors (ratios)].	I	3	F
			Number (L) of 5 min time segments per link (L ⩽ 6) (1st = current; 2nd = predicted 5 min later; etc.)	I	3	F
			Standard location reference for a geographic area (1)	I	64	F
			Number (N) of links being reported in the message {repeated group: N times}	I	8	F
			— standard location reference for the link (1)	I	64	F
			— cause code type (2 bits: 00 = not specified)	I	2	F
			— cause code (optional) {repeated group: L times}	I	6	F
			Travel information for 5 min interval	I	V	V
2L	Dynamic link times from roadside beacons (RS) (Applicable to beacons only)	IN from RS	Message code (for use by RS beacons)	I	16	F
			Sequence number	I	6	F
			Message time stamp (1 s resolution)	I	17	F
			Beacon pair identification		(40)	
			— controller number	I	8	F
			— first beacon (location) ID number	I	16	F
			— second beacon's ID (for information supplied in pairs)	I	16	F
			Data format code [congestion levels, link travel times, travel time deltas, or time/speed factors (ratios)]	I	3	F
			Number (L) of 5 min time segments per link (L ⩽ 6)	I	3	F
			Number (N) of links being reported in the message {repeated group: N times}	I	8	F
			— standard location reference for the link (1)	I	64	F
			— cause code type (2 bits: 00 = not specified)	I	2	F
			— cause code (optional) {repeated group: L times}	I	6	F
			Travel information for 5 min interval	I	V	V
3L	Request for temporary vehicle ID	OUT	Message code (from vehicle to TMC or RS beacon)	I	16	F
			Transaction number (random) chosen by vehicle	I	16	F

Table 1 (*continued*)

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
4L	Assignment of temporary vehicle ID	IN	Message code (from TMC or RS beacon to vehicle)	I	16	F
			Transaction number sent by the vehicle	I	16	F
			Temporary vehicle ID assigned by TMC or RS beacon		(40)	
			— flag indicating ID was assigned by TMC (0) or RS beacon (1)	I	1	F
			— asssigned vehicle ID	I	39	F
			NOTE Japan uses the transaction number as the first 16 bits and then adds 23 bits as a beacon assigned ID.			
5L	Vehicle probe reports (database link travel times)	OUT	Message code (general use to TMC or RS beacon)	I	16	F
			Assigned vehicle ID	I	40	F
			Link database version	I	4	F
			Number (N) of links being reported in the message {repeated group: N times}	I	8	F
			— standard location reference for the link (1)	I	64	F
			— cause code type (2 bits: 00 = not specified)	I	2	F
			— cause code [optional: "time-out" while on link, ignition off while on link, traffic patterns (TBD codes)]	I	5	F
			— travel time (in s)	I	12	F
			— waiting (stopped) time (in s); FFF means no data are available	I	12	F
			— end-of-link travel time stamp (1 s resolution)	I	17	F
6L	Vehicle probe reports (beacon-to-beacon travel times)	OUT	Message code (general use to TMC or RS beacon)	I	16	F
			Assigned vehicle ID	I	40	F
			Vehicle measured travelling time (from previous location (beacon)		(40)	
			— beacon number (site Identification) for previously passed beacon		(24)	
			— beacon controller number	I	8	F
			— beacon (location) ID number	I	16	F
			— vehicle determined elapsed travel time (in s) between beacon	I	16	F

Table 1 (*continued*)

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
7L	Probe exception reporting rules (may vary by roadway type, zones, links, etc.)	IN	Message code	I	16	F
			Number (N) of exception rules reported in this message {repeated group: N times}	I	5	F
			— exception rule code (1, 2, 3 or 4)	I	2	F
			IF 1 (roadway type):			
			— roadway type code	I	4	F
			— threshold value	I	6	F
			IF 2 (zone):			
			— zone code ID	I	11	F
			— threshold value	I	6	F
			IF 3 (links):			
			— Number (n) of links in the message {repeated group: n times}	I	6	F
			— standard location reference for the link (1)	I	64	F
			— threshold values	I	6	F
			IF 4 (global):			
			— thresholds for the whole system	I	6	F
8L	Request for origin, destination and route	IN	Message code	I	16	F
			Assigned vehicle ID	I	40	F
9L	Reporting origin, destination and route	IN	Message code	I	16	F
			Assigned vehicle ID	I	49	F
			Origin			
			— standard location reference (1)	I	64	F
			Destination			
			— standard location reference (1)	I	64	F
			Number (N) of en route links being reported (00 = No route reported) {repeated group: N times}	I	16	F
			— standard location references for the links (1)	I	N*64	F
			NOTE This message can be used to report origin-destination pair and (optional) planned route for either locally or centrally determined systems.			
10L	Report of trip completion	OUT	Message code	I	16	F
			Assigned vehicle ID	I	40	F
			Origin			
			— standard location reference (1)	I	64	F
			Destination			
			— standard location reference (1)	I	64	F
			Travel time (1 min resolution)	I	16	F

Table 1 (*continued*)

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
11L	Request for vehicle's current position	IN	Message code	I	16	F
			Assigned vehicle ID	I	40	F
12L	Reporting current vehicle position	OUT	Message code	I	16	F
			Assigned vehicle ID	I	40	F
			— standard location reference for current vehicle position (1)	I	64	F
13L	Position report from RS beacon (standard location reference) (Applicable to beacons only)	IN from RS	Message code	I	16	F
			Beacon pair identification (site identification)		(40)	
			— controller number	I	8	F
			— first beacon's (location) ID number	I	16	F
			— second beacon's ID (supplied in pairs)	I	16	F
			Beacon location			
			— standard location reference (1)	I	64	F
			— offset from reference point (1 m resolution)	I	16	F
14L	Position report from RS beacon (verbal references) (Applicable to beacons only)	IN from RS	Message code	I	16	F
			Beacon pair Identification (site Identification)		(40)	
			— controller number	I	8	F
			— first beacon's (location) ID number	I	16	F
			— second beacon's ID (supplied in pairs)	I	16	F
			Beacon number (site Identification)		(1 or 24)	V
			— beacon controller number	I	8	
			— extension number (0 = end of repetition)	I	1	F
			— beacon (location) ID number	I	15	F
			Beacon location			
			— map version	I	16	F
			— standard location reference for the beacon (1)	I	64	F
			— road type	I	2	F
			— link number	I	12	F
			— road name			
			— number of characters for display: o	I	8	F
			— number of characters for phonetic output: p	I	8	F
			— road name for display	I	8*o	V
			— road name for phonetic output	I	8*p	V
			— point name:			
			— number of characters for display: q	I	8	F
			— number of characters for phonetic output: r	I	8	F
			— point name for display	A	8*q	V
			— point name for phonetic output	A	8*r	V

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Table 1 (*continued*)

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
15L	Differential GPS position correction factors	IN	Message code	I	16	F
			Use results of ISO GPS interface standards efforts	—	—	—
16L	General text messages	IN or OUT	Message code	I	16	F
			Message priority code	I	4	F
			Message time stamp (1 s resolution)	I	17	F
			Code for type of information	I	16	F
			Message character type (1 or 2 bytes) — to accommodate oriental characters	I	1	F
			Number (N) of characters in the text message. Limit N ≤ 120 (60 for oriental)	I	7	F
			Text message	I	N* (8 or 16)	F
17L	Advisory messages (traffic, safety, weather)	IN	Message code	I	16	F
			Sequence number	I	11	F
			Message time stamp (1 s resolution)	I	17	F
			Number (N) of advisory codes being reported in the message {repeated group: N times}	I	5	F
			— code for type of advisory (such as RDS-TMC)	I	5	F
			— codes for clarifying advisory information (such as Alert C or Alert + protocol) — duration — severity — region — other	I	V	V
			NOTE The vehicle must have a message code database in order to translate the codes.			
18L	Request for advisory messages (traffic, safety, weather)	OUT	Message code	I	16	F
			Assigned vehicle ID	I	40	F
			Billing ID	I	40	F
			Region ID (standard referencing) (1)	I	32	F
			Type of information being requested	I	5	F
19L	Vehicle transportation information (such as car train or car ferry)	IN	Message code	I	16	F
			Number (N) of transports being reported in the message {repeated group: N times}	I	5	F
			— standard location reference for departure point (1)	I	64	F
			— standard location reference for arrival point (1)	I	64	F
			— travel time (1 min resolution)	I	16	F
			— cost			
			— currency code	I	5	F
			— currency units (hundredths)	I	12	F
			— carrier ID	I	30	F
			Number (n) of departure times being reported {second repeated group: n times}	I	4	F
			— departure times (1 min resolution)	I	16	F
			— capacity/availability	I	6	F

Table 1 (*continued*)

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
20L	Park & ride information	IN	Message code	I	16	F
			Number (N) of locations being reported in the message {repeated group: N times}	I	5	F
			— standard location reference for departure point (1)	I	64	F
			— code for transportation mode	I	3	F
			— code for route	I	6	F
			— travel time (1 min resolution)	I	10	F
			— cost			
			— currency code	I	5	F
			— currency units (hundredths)	I	12	F
			— carrier ID	I	10	F
			Number (n) of departure times being reported {second repeated group: n times}	I	5	F
			— departure times (1 min resolution)	I	16	F
			— capacity/availability	I	6	F
			Number (M) of route way-points being reported {third repeated group: M times}	I	6	F
			— standard location references for route way-points (1)	I	64	F
21L	General parking information message	IN	Message code	I	16	F
			Message time stamp (1 s resolution)	I	17	F
			Number (N) of parking locations (lots) being reported {repeated group: N times}	I	16	F
			— standard location reference for the parking location (point(1))	I	64	F
			— capacity of the parking place	I	8	F
			— name of the parking place			
			— number of characters for display: o	I	8	F
			— number of characters for phonetic output: p	I	8	F
			— parking place for display	A	o*8	V
			— parking place for phonetic output	A	p*8	V
			— road name where parking entrance is located			
			— number of characters for display: q	I	8	F
			— road name for display	A	q*8	V
			— number of available parking spaces in the lot	I	8	F
			— estimated waiting time for next open parking space (min)	I	8	F
			— fee information	I	16	F
			— business hours	I	16	F
			— entrance information	I	40	F

Table 1 (*continued*)

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
22L	Request for parking information	OUT	Message code	I	16	F
			Assigned vehicle ID	I	40	F
			Billing ID	I	40	F
			Standard location reference for the destination (point) (1)	I	32	F
			Type of information being requested	I	5	F
23L	Response to request for parking information	IN	Message code	I	16	F
			Assigned vehicle ID	I	40	F
			Message time stamp (1 s resolution)	I	17	F
			Number (N) of parking locations (lots) being reported {repeated group: N times}	I	16	F
			— standard location reference for the parking location (point(1))	I	64	F
			— capacity of the parking place	I	8	F
			— name of the parking place			
			— number of characters for display: o	I	8	F
			— number of characters for phonetic output: p	I	8	F
			— parking place for display	A	o*8	V
			— parking place for phonetic output	A	p*8	V
			— road name where parking entrance is located			
			— number of characters for display: q	A	8	F
			— road name for display	I	q*8	V
			— number of available parking spaces in the lot	I	8	F
			— estimated waiting time for next open parking space	I	8	F
			— fee information	I	16	F
			— business hours	I	16	F
			— entrance information	I	40	F
24L	Navigation database updates (changes and additions)	IN	Message code	I	16	F
			Sequence number	I	11	F
			Region ID (standard referencing) (1)	I	32	F
			City ID (standard referencing) (1)	I	16	F
			Database version being modified	I	6	F
			Number (N) of database changes in this message {repeated group: N times}	I	5	F
			— modification code (such as: change attributes on existing link(s); add a new link(s); delete an existing link; or add a hotel)	I	5	F
			— size code for information field	I	7	F
			— updated information	I,A	V	V
			IF CHANGES ARE TIED TO LINKS, ADD THE FOLLOWING:			
			— number (n) of links receiving the specified modification {second repeated group: n times}	I	5	F
			— standard location references for the links (1)	I	64	F

Table 1 (*continued*)

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
25L	Request for navigation database updates	OUT	Message code	I	16	F
			Assigned vehicle ID	I	40	F
			Billing ID	I	40	F
			Region ID (standard referencing) (1)	I	32	F
			City ID (standard referencing) (1)	I	16	F
			Database version being modified	I	6	F
26L	Regional system status reports	IN	Message code	I	16	F
			Date (7 bits for year, 4 for month, 5 for day)	I	16	F
			Message time stamp (1 s resolution)	I	17	F
			Region ID (standard referencing) (1)	I	32	F
			City ID (standard referencing) (1)	I	16	F
			Database version	I	6	F
			Field definition code for the following global time change codes	I	3	F
			Global travel time change codes			
			— roadway classification codes	I	V	V
			— travel time factors or filters	I	V	V
27L	TMC network status report	IN	Message code	I	16	F
			Message time stamp (1 s resolution)	I	17	F
			Text message			
			— number of characters for display: o	I	8	F
			— number of characters for phonetic output: p	I	8	F
			— text message for display	A	o*8	V
			— text message for phonetic output	A	p*8	v
			ID of reporting subsystem			
			— type of subsystem	I	8	F
			— subsystem controller ID	I	32	F
			Status code	I	8	F
			Equipment failures			
			— number (N) of equipment failures	I	8	F
			— failed equipment IDs	I	N*32	V
28L	Status request to vehicle's communication system	IN	Message code	I	16	F
			Application code	I	6	F
			Application specific ID	I	40	F
			Test sequence number	I	6	F
			Message time stamp (1 s resolution)	I	17	F
			Code for requested test (such as communication, navigation, etc.)	I	8	F

Table 1 (*continued*)

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
29L	Vehicle response to communi-cation system status request	OUT	Message code	I	16	F
			Application code	I	6	F
			Application specific ID	I	40	F
			Test sequence number	I	6	F
			Message time stamp (1 s resolution)	I	17	F
			Code for test being reported (defines results field format)	I	10	F
			Test results	I	V	V
30L	Dynamic incident reports from TMC	IN	Message code (from TMC or RS beacon)	I	16	F
			Sequence number	I	6	F
			Message time stamp (1 s resolution)	I	17	F
			Number (N) of incidents being reported in the message {repeated group: N times}	I	5	F
			— type of incident	I	12	F
			— standard location reference for the link (1)	I	64	F
			— cause code type	I	2	F
			— cause code (optional)	I	6	F
			— time of incident	I	17	F
			— expected incident ending time	I	17	F
31L	Dynamic incident report from TMC (detailed)	IN	Message code (from TMC or RS beacon)	I	16	F
			Sequence number for the incident	I	6	F
			Message time stamp (1 s resolution)	I	17	F
			Link layer	I	2	F
			Type of cause code being used	I	4	F
			Cause starting time	I	8	F
			Cause information		(V)	
			— number of characters for display: o	I	8	F
			— cause information for display	A	o*8	V
			Main incident type	I	4	F
			Secondary incident type (optional)	I	8	F
			Starting time of incident	I	17	F
			Ending time of incident	I	17	F
			Distance from end of starting link (0,1 mile increments)	I	8	F
			Distance from end of ending link (0,1 mile increments)	I	8	F
			State of congestion	I	4	F
			Recovery information	I	22	F

Table 1 (*continued*)

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
			Number (N) of links being reported in the message {repeated group: N times}	I	8	F
			— standard location reference for the link (1)	I	64	F
			— name of the incident location (point) on the link		(V)	
			— number of characters for display: p	I	8	F
			— number of characters for phonetic output: q	I	8	F
			— location for display	A	p*8	V
			— location for phonetic output	A	q*8	V
			— road name of the link		(V)	
			— number of characters for display: r	I	8	F
			— number of characters for phonetic output: s	I	8	F
			— road name for display	A	r*8	V
			— road name for phonetic output	A	s*8	V
			— directional code	I	4	F
			— distance of incident from link starting point (0,1 mile increments)	I	14	F
32L	Status request to TMC/RS com. system	OUT	Message code	I	16	F
			Assigned vehicle ID	I	40	F
			Code for requested test	I	8	F
33L	Status response from TMC/RS com. system	IN	Message code	I	16	F
			Assigned vehicle ID	I	40	F
			Test sequence number	I	6	F
			Message time stamp (1 s resolution)	I	17	F
			Code for test reported (defines results field format)	I	10	F
			Test results	I	V	V

Table 2 — Additional messages used by centrally determined route guidance systems

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
1C	Request for routing (general)	OUT	Message code	I	16	F
			Assigned vehicle ID	I	40	F
			Origin (or current location)			
			— standard location reference for a point (1)	I	64	F
			— offset from reference point (20 m resolution)	I	8	F
			Destination designation code (1 = standard location reference; 2 = zones; 3 = area specific location codes: Type A, B, C or D)	I	4	F
			— If 1: standard location reference for a point (1)	I	64	F
			— If 2: zones [standard location reference for an area (1)]	I	64	F
			— If 3A: uniquely designated links (requesting route to designated link):		(34)	
			— code for area in which link is located	I	20	F
			— code for type of road (general or limited access)	I	2	F
			— link number	I	12	F
			— If 3B: selectively designated links (requesting whichever is better of two; one is route to designated link and the other, route with link which is in opposite direction to designated link and taken as designated):		(34)	
			— code for area in which backward link is located	I	20	F
			— code for type of road (general or limited access)	I	2	F
			— link number	I	12	F
			— If 3C: roadway Intersections (nodes):		(34)	
			— code for area in which node is located	I	20	F
			— code for type of road (general or limited access)	I	2	F
			— node number (link connected to the node)	I	12	F
			— If 3D: zones within a larger area:		(34)	
			— code for area in which zone is located	I	20	F
			— zone number	I	14	F
			Number (N) of constraint codes: If N = 15, then an 8 bit constraint flag follows {repeated group: N times}	I	4	F
			Routing constraint code (for example, no tolls, no freeways, scenic routing, trucks, hazardous materials, emergency vehicles, directional restrictions, high occupancy vehicles, or multimodal)	I	8*N (8 IF N=15)	V

Table 2 (*continued*)

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
2C	Request for RS beacon routing (Applicable to beacons only)	OUT	Message code	I	6	F
			Assigned vehicle ID	I	40	F
			Destination designation code (1 = standard location reference; 2 = zones; 3 = area specific location codes: Type A, B, C or D)	I	4	F
			— If 1: standard location reference for a point (1)	I	64	F
			— If 2: zones (standard location reference for an area (1))	I	64	F
			— If 3A: uniquely designated links (requesting route to designated link):		(34)	
			— code for area in which link is located	I	20	F
			— code for type of road (general or limited access)	I	2	F
			— link number	I	12	F
			— If 3B: selectively designated links (requesting whichever is better of two: one is route to designated link and the other, route with link which is in opposite direction to designated link and taken as designated):		(34)	
			— code for area in which backward link is located	I	20	F
			— code for type of road (general or limited access)	I	2	F
			— link number	I	12	F
			— If 3C: roadway intersections (nodes):		(34)	
			— code for area in which node is located	I	20	F
			— code for type of road (general or limited access)	I	2	F
			— node number (link connected to the node)	I	12	F
			— If 3D: zones within a larger area:		(34)	
			— code for area in which zone is located	I	20	F
			— zone number	I	14	F
			Number (N) of constraint codes: If N = 15, then an 8 bit constraint flag follows {repeated group: N times}	I	4	F
			— routing constraint code (for example, no tolls, no freeways, scenic routing, trucks, hazardous materials, emergency vehicles, directional restrictions, high occupancy vehicles, or multimodal)	I	8*N (8 IF N=15)	V
3C	Recomm-ended routes sent to individual vehicles before the start of a trip	IN	Message code	I	16	F
			Assigned vehicle ID	I	40	F
			Origin standard location reference for a point (1)	I	64	F
			Destination standard location reference for a point (1)	I	64	F
			Estimated time of arrival	I	16	F
			Number (N) of links in the route	I	8	F
			{repeated group: N times}			
			— route link IDs [standard location reference (1)]	I	N*64	V

Table 2 (*continued*)

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
4C	Recom-mended routes sent to individual vehicles during a trip (without congestion information)	IN	Message code	I	16	F
			Route number	I	3	F
			Assigned vehicle ID	I	40	F
			Current position standard location reference for a point (1)	I	64	F
			Destination designation code (1 = standard location reference; 2 = zones; 3 = area specific location codes: Type A, B, C or D)	I	4	F
			— If 1: standard location reference for a point (1)	I	64	F
			— If 2: zones [standard location reference for an area (1)]	I	64	F
			— If 3A: uniquely designated links (requesting route to designated link):		(34)	
			— code for area in which link is located	I	20	F
			— code for type of road (general or limited access)	I	2	F
			— link number	I	12	F
			— If 3B: selectively designated links (requesting whichever is better of two: one is route to designated link and the other, route with link which is in opposite direction to designated link and taken as designated):		(34)	
			— code for area in which backward link is located	I	20	F
			— code for type of road (general or limited access)	I	2	F
			— link number	I	12	F
			— If 3C: roadway intersections (nodes):		(34)	
			— code for area in which node is located	I	20	F
			— code for type of road (general or limited access)	I	2	F
			— node number (link connected to the node)	I	12	F
			— If 3D: zones within a larger area:		(34)	
			— code for area in which zone is located	I	20	F
			— zone number	I	14	F
			Estimated time of arrival	I	16	F
			Path specific route code (0 = random links; 1 = numerically ordered set of links)	I	1	F
			— If 0: number (N) of links remaining in the route	I	8	F
			{repeated group: N times}			
			— route link IDs [standard location reference (1)]	I	N*64	V
			— If 1: number (M) of areas through which the route passes	I	8	F
			{repeated group: M times}			
			— area code	I	16	F
			— number (M1) of sets of ordered links	I	8	F
			{repeated group: M1 times}		(22*M1)	
			— number of consecutive links	I	8	F
			— link layer code (0 = standard; 1 = "superlinks")	I	2	F
			— code for type of road	I	2	F
			— starting link number	I	12	F

Table 2 (*continued*)

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
5C	Recommended routes sent to individual vehicles during a trip (with route specific congestion information)	IN	Message code	I	16	F
			Assigned vehicle ID	I	40	F
			Current position standard location reference for a point (1)	I	64	F
			Destination designation code (1 = standard location reference; 2 = zones; 3 = area specific location codes: Type A, B, C or D)	I	4	F
			— If 1: standard location reference for a point (1)	I	64	F
			— If 2: zones [standard location reference for an area (1)]	I	64	F
			— If 3A: uniquely designated links (requesting route to designated link):		(34)	
			— code for area in which link is located	I	20	F
			— code for type of road (general or limited access)	I	2	F
			— link number	I	12	F
			— If 3B: selectively designated links (requesting whichever is better of two: one is route to designated link and the other, route with link which is in opposite direction to designated link and taken as designated):		(34)	
			— code for area in which backward link is located	I	20	F
			— code for type of road (general or limited access)	I	2	F
			— link number	I	12	F
			— If 3C: roadway intersections (nodes):		(34)	
			— code for area in which node is located	I	20	F
			— code for type of road (general or limited access)	I	2	F
			— node number (link connected to the node)	I	12	F
			— If 3D: zones within a larger area:		(34)	
			— code for area in which zone is located	I	20	F
			— zone number	I	14	F
			Number (N) of constraint codes: If N = 15, then an 8 bit constraint flag follows {repeated group: N times}	I	4	F
			— routing constraint code (for example, no tolls, no freeways, scenic routing, trucks, hazardous materials, emergency vehicles, directional restrictions, high occupancy vehicles, or multimodal)	I	8*N (8 IF N=15)	V
			System predicament code	I	8	F
			Service predicament code	I	8	F
			Number (N1) of route-specific information groups {repeated group: N1 times}	I	3	F
			— route number	I	3	F
			— route information flags	I	7	F
			— predicted route travel time information		(17)	
			— travel time representation flag	I	1	F
			— unit for most probable predicted travel time	I	2	F
			— most probable expected travel time prediction	I	6	F
			— unit for maximum predicted travel time	I	2	F
			— maximum predicted travel time	I	6	F
			— route length		(8)	
			— units	I	2	F
			— distance	I	6	F
			Number (N2) of additional route-specific information {repeated group: N2 times}	I	4	F
			— additional route-specific information (for example, number of right or left turns)	I	16*N2	V

Table 2 (*continued*)

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
6C	Localized routing information sent by RS beacon (Applicable to beacons only)	IN	Message code	I	16	F
			Route number	I	3	F
			Assigned vehicle ID	I	40	F
			Destination designation code (1 = standard location reference; 2 = zones; 3 = area specific location codes: Type A, B, C or D)	I	4	F
			— If 1: standard location reference for a point (1)	I	64	F
			— If 2: zones [standard location reference for an area (1)]	I	64	F
			— If 3A: uniquely designated links (requesting route to designated link):		(34)	
			— code for area in which link is located	I	20	F
			— code for type of road (general or limited access)	I	2	F
			— link number	I	12	F
			— If 3B: selectively designated links (requesting whichever is better of two: one is route to designated link and the other, route with link which is in opposite direction to designated link and taken as designated):		(34)	
			— code for area in which backward link is located	I	20	F
			— code for type of road (general or limited access)	I	2	F
			— link number	I	12	F
			— If 3C: roadway intersections (nodes):		(34)	
			— code for area in which node is located	I	20	F
			— code for type of road (general or limited access)	I	2	F
			— node number (link connected to the node)	I	12	F
			— If 3D: zones within a larger area:		(34)	
			— code for area in which zone is located	I	20	F
			— zone number	I	14	F
			Number (N) of links en route to next beacon {repeated group: N times}	I	8	F
			— route link ID [standard location reference (1)]	I	64	F
			— number of lanes on the link	I	4	F
			— recommended lane at beginning of link	I	4	F
			— recommended lane at end of link	I	4	F
			— recommended offset for getting into ending lane (20 m resolution)	I	8	F
			— turning code at end of link	I	4	F
			— offset for being ready to make turn (20 m resolution)	I	8	F
			— length of link (20 m resolution)	I	10	F
			— link direction (angle) for dead-reckoning	I	4	F

Table 2 (*continued*)

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
7C	Route specific messages sent by RS beacons to individual vehicles during a trip (Applicable to beacons only)	IN	Message code	I	16	F
			Route number	I	3	F
			Assigned vehicle ID	I	40	F
			Destination designation code (1 = standard location reference; 2 = zones; 3 = area specific location codes: Type A, B, C or D)	I	4	F
			— If 1: standard location reference for a point (1)	I	64	F
			— If 2: zones [standard location reference for an area (1)]	I	64	F
			— If 3A: uniquely designated links (requesting route to designated link):		(34)	
			— code for area in which link is located	I	20	F
			— code for type of road (general or limited access)	I	2	F
			— link number	I	12	F
			— If 3B: selectively designated links (requesting whichever is better of two: one is route to designated link and the other, route with link which is in opposite direction to designated link and taken as designated):		(34)	
			— code for area in which backward link is located	I	20	F
			— code for type of road (general or limited access)	I	2	F
			— link number	I	12	F
			— If 3C: roadway Intersections (nodes):		(34)	
			— code for area in which node is located	I	20	F
			— code for type of road (general or limited access)	I	2	F
			— node number (link connected to the node)	I	12	F
			— If 3D: zones within a larger area:		(34)	
			— code for area in which zone is located	I	20	F
			— zone number	I	14	F
			Number (N) of road points provided that will be passed on the route {repeated group: N times}	I	4	F
			— number of characters for display: F1 bytes	I	8	F
			— Number of characters for phonetic output: F2 bytes	I	8	F
			— Road point for display	A	8*F1	V
			— Road point for phonetic output	A	8*F2	V
			Number (N1) of route-specific traffic information groups {repeated group: N1 times}	I	4	F
			— information sentence number	I	8	F
			— number of characters for display: F3 bytes	I	8	F
			— number of characters for phonetic output: F4 bytes	I	8	F
			— inserted characters for display	A	8*F3	V
			— inserted characters for phonetic output	A	8*F4	V

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Table 2 (*continued*)

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
8C	Confirm route status is OK	In	Message code	I	16	F
			Assigned vehicle ID	I	40	F
9C	Broadcast applications: data reports (total length of broadcast not to exceed 64 K bytes)	IN	Message code	I	16	F
			Number of files (N)	I	8	F
			— addresses of the files (relative to the message code location) {repeated group: N times}	I	N*24	V
			— file header		(56)	
			— application description	I	16	F
			— file length (including the header)	I	24	F
			— repeated data length	I	16	F
			— data for the file	I	V	V
10C	Vehicle data reports (total length of message not to exceed 64K bytes)	OUT	Message code	I	16	F
			Number of files (N)	I	8	F
			— addresses of the files (relative to the message code location) {repeated group: N times}	I	N*24	V
			— file header		(56)	
			— application description	I	16	F
			— file length (including the header)	I	24	F
			— repeated data length	I	16	F
			— data for the file	I	V	V

Table 3 — Value-added information messages that may be routed through an in-vehicle navigation system

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
1V	Assistance requests	OUT	Message code	I	16	F
			Permanent vehicle ID			
			— license plate information		(104)	
			— country code (4 characters)	A	32	F
			— state (province, etc.) code (2 characters)	A	16	F
			— license number (7 characters)	A	56	F
			— vehicle make and model (8 characters)	A	64	F
			— vehicle color	I	8	F
			Vehicle location			
			— standard location reference (1)	I	64	F
			— offset from reference point (20 m resolution)	I	8	F
			Message time stamp (1 s resolution)	I	17	F
			Code for type of assistance requested (police, medical, mechanical, diagnostic, etc.)	I	4	F
			Code for the reason that assistance is being requested	I	4	F
			Number (N) of characters in custom text message	I	7	F
			Limit N ⩽ 120			
			N-character text (provides request specific information)	A	N*8	V
2V	Cancellation of assistance request	OUT	Message code	I	16	F
			Permanent vehicle ID (license plate information)		(104)	
			— country code (4 characters)	A	32	F
			— state (province, etc.) code (2 characters)	A	16	F
			— license number (7 characters)	A	56	F
3V	Acknowledge-ment that assistance has been received	OUT	Message code	I	16	F
			Permanent vehicle ID (license plate information)		(104)	
			— country code (4 characters)	A	32	F
			— state (province, etc.) code (2 characters)	A	16	F
			— license number (7 characters)	A	56	F
4V	Assistance response acknowledge-ments	IN	Message code	I	16	F
			Permanent vehicle ID (license plate information)		(104)	
			— country code (4 characters)	A	32	F
			— state (province, etc.) code (2 characters)	A	16	F
			— license number (7 characters)	A	56	F
			Message time stamp (1 s resolution)	I	17	F
			Code for type of assistance planned to be provided (police, medical, mechanical, diagnostic, etc.)	I	4	F
			Number (N) of characters in custom text message	I	7	F
			Limit N ⩽ 120			
			N-character text (provides specific information, instructions, etc.)	A	N*8	V

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Table 3 (*continued*)

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
5V	Request for vehicle on-board-diagnostics status	IN	Message code	I	16	F
			Permanent vehicle ID (license plate information)		(104)	
			— country code (4 characters)	A	32	F
			— state (province, etc.) code (2 characters)	A	16	F
			— license number (7 characters)	A	56	F
6V	Report of vehicle on-board-diagnostics status	OUT	Message code	I	16	F
			Billing ID	I	24	F
			USE: Standard "OBD-II" messages			F
7V	Electronic toll and traffic management (ETTM) system requests	IN	Message code	I	16	F
			ETTM station ID (for position determination)	I	14	F
			Transaction code (each transaction type will have its own TBD format)	I	6	F
			Examples of types of transactions:			
			— toll collection	I		
			— in-vehicle road sign information	A		
			— congestion pricing information	I		
			— CVO related activity			
8V	Responses to ETTM requests	OUT	Message code	I	16	F
			Billing ID	I	40	F
			Transaction code	I	10	F
9V	Ridesharing: TMC request for pick-up vehicles	IN	Message code	I	16	F
			Message sequence number	I	11	F
			Message time stamp (1 min resolution)	I	11	F
			Number (N) of rideshare pick-up groups being reported in the message {repeated group: N times}	I	5	F
			— rideshare group ID	I	5	F
			— standard location reference for pick-up point (1)	I	64	F
			— pick-up code (for special requirements, such as wheelchair)	I	6	F
			— time that the ride is required (1 min resolution)	I	11	F
			— number of people to be picked up at this location	I	5	F
			— standard location reference for destination (1)	I	64	F

Table 3 (*continued*)

Item No.	Message	Data flow	Data fields comprising the message	Field type	Required field size	Field format
10V	Ridesharing: vehicle confirmation of availability to pick-up	OUT	Message code	I	16	F
			Message sequence number	I	11	F
			Rideshare group ID	I	5	F
			Estimated time-of-arrival at the pick-up point (1 min resolution)	I	11	F
			Number of passengers that this vehicle can transport	I	5	F
			Permanent vehicle ID (license plate information)		(104)	
			— country code (4 characters)	I	32	F
			— state (province, etc.) code (2 characters)	I	16	F
			— license number (7 characters)	I	56	F
11V		IN	Message code	I	16	F
			Message sequence number	I	11	F
			Rideshare group ID	I	5	F
			Transaction code (acknowledge or cancel)	I	4	F
			Permanent vehicle ID (license plate information)		(104)	
			— country code (4 characters)	A	32	F
			— state (province, etc.) code (2 characters)	A	16	F
			— license number (7 characters)	A	56	F
12V	Ridesharing: vehicle acknowledge (or cancel) pick-up	OUT	Message code	I	16	F
			Message sequence number	I	11	F
			Rideshare group ID	I	5	F
			Transaction code (acknowledge or cancel)	I	4	F
			Permanent vehicle ID (license plate information)		(104)	
			— country code (4 characters)	A	32	F
			— state (province, etc.) code (2 characters)	A	16	F
			— license number (7 characters)	A	56	F

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