

Traffic and Traveller Information — (TTI) — TTI Messages via Dedicated Short-Range Communication —

Part 1: Data Specification — Uplink (Vehicle to Roadside)

ICS 35.240.60

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Committees responsible for this Draft for Development

The preparation of this Draft for Development was entrusted to Technical Committee EPL/278, Road transport informatics, upon which the following bodies were represented:

- Automatic Identification Manufacturers Association (AIM UK)
- British Telecommunications plc
- Consumer Policy Committee of BSI
- Department of Transport
- GAMBICA (BEAMA Ltd.)
- Road Signalling Development Association
- Society of Motor Manufacturers and Traders Limited

This Draft for Development, having been prepared under the direction of the Electrotechnical Sector Board, was published under the authority of the Standards Board and comes into effect on 15 April 1997

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The following BSI references relate to the work on this publication:
Committee reference EPL/278

ISBN 0 580 27320 2

Amendments issued since publication

Amd. No.	Date	Comments

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National foreword

This Part of DD ENV 12315 has been prepared by Technical Committee EPL/278, and is the English language version of ENV 12315-2:1996, published by the European Committee for Standardization (CEN).

This Draft for Development is not to be regarded as a British Standard.

It is being issued in the Draft for Development series of publications and is of a provisional nature because the level of innovation on this subject is currently high. It should be applied on this provisional basis so that information and experience of its practical application may be obtained.

Comments arising from the use of this Draft for Development are requested so that the UK experience can be reported to the European organization responsible for its conversion to a European Standard. A review of this publication will be initiated 2 years after its publication by the European organization so that a decision can be taken on its status at the end of its three-year life. The commencement of the review period will be notified by an announcement in BSI Update.

According to the replies received by the end of the review period, the responsible BSI Committee will decide whether to support the conversion into a European Standard, to extend the life of the prestandard or to withdraw it. Comments should be sent in writing to the Secretary of BSI Technical Committee EPL/278 at BSI, 389 Chiswick High Road, London, W4 4AL, giving the document reference and clause number and proposing, where possible, an appropriate revision of the text.

Cross-references

Publication referred to	Corresponding British Standard
ISO 8824	BS ISO/IEC 8824:1990 <i>Information technology. Open systems interconnection. Specification of abstract syntax notation one (ASN.1)</i>
ISO 8825	BS ISO/IEC 8825:1990 <i>Information technology. Open systems interconnection. Specification of basic encoding rules for abstract syntax notation one (ASN.1)</i>

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the ENV title page, pages 2 to 26 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

English version

Traffic and Traveller Information (TTI) — TTI Messages via Dedicated Short-Range Communication — Part 2: Data Specification — Uplink (Vehicle to Roadside)

This European Prestandard (ENV) was approved by CEN on 1996-07-24 as a prospective standard for provisional application. The period of validity of this ENV is Limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the ENV can be converted into an European Standard (EN).

CEN members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword (Informative)

This Prestandard has been prepared by Working Group 4 (Sub-Working Group 4.2) of Technical Committee CEN/TC 278 “Road transport and traffic telematics”, the secretariat of which is held by NNI to cover the Work Item 4.2.2.

In the field of Traffic and Traveller Information, the innovative rate is high, with many research and development projects under way in many countries, and there is a need to establish prospective standards which allow competitive manufacturers to introduce products to the market in the knowledge that they can accommodate the future issues of the standard(s) without fundamental change to equipment.

It has been submitted as a first draft to TC278 for consideration and review by TC278 plenary meeting members, for initial comment, as CEN Stage 32. All comments have been reviewed and the document updated. It is hereby issued to CEN Central Secretariat for distribution in accordance with Internal Regulations (Part 2, Section 7) at CEN Stage 49, for formal voting.

No known national standards (identical or conflicting) exist on this subject.

This document constitutes: Part 1 of a two-part European Prestandard, being the data specification for one way (roadside to vehicle direction) of a two-way communications link. Part 2 of this Prestandard covers the reverse direction (vehicle to roadside).

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to announce this European Prestandard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction (INFORMATIVE)

Traffic and Traveller Information may be disseminated through a number of services or means of communication, covering static displays, interactive terminals and in-vehicle equipment.

For all such services, the data to be disseminated and the message structures involved in the various interfaces require clear definition and standard formats, in order to allow competitive products to operate with any received data.

This pre-Standard focuses on the data specification for an air-interface via dedicated short-range communication, whereby information is produced at a central location (known as the in-station, central office or traffic information and control centre) and disseminated via a network of roadside beacons (Part 1 of this pre-Standard) and information/data is transferred from in-vehicle units, via roadside beacons, to a central location (Part 2 of this pre-Standard). It enables messages to be exchanged between different systems and service providers adopting a variety of applications' specifications. Other pre-Standards are being produced by the CEN TC278 Working Group 4, to cover TTI dissemination via other means or services.

It is anticipated that the uses of the data set(s) described in this document will be closely linked to the widespread use of in-vehicle equipment which utilises them — known as “beacon data” — in an efficient manner to guide drivers through the road network accurately and safely. The principle of operation is to follow detailed guidance, step by step, from one beacon to another. The in-vehicle equipment is expected to offer “fall-back” facilities to assist the driver whenever he or she is travelling in an area unequipped with beacons or if the beacon data is unavailable, for whatever reason.

1 Scope (NORMATIVE)

1.1 GENERAL

A Centrally Determined Route Guidance (CDRG) system using Dedicated Short Range Communication (DSRC) is based on infrastructure and equipped vehicles. The Route Guidance Information (RGI) is generated by a Central Office (CO) and distributed via DSRC to the equipped vehicles.

To enable dynamic RGI the Central Office needs real time traffic flow data. This data is provided through the system itself using vehicles as probes.

This document is intended to specify the data telegram containing the measurement values transmitted from the vehicles to the beacons.

The data described here corresponds to the downlink specification, application RGI.

1.2 EMBEDDANCE IN ISO-LAYER MODEL

Figure 1 shows the inclusion of this standard with the separate communication means supplementing the deliverables of other WGs, where the protocols and communications “data frame” structures are defined.

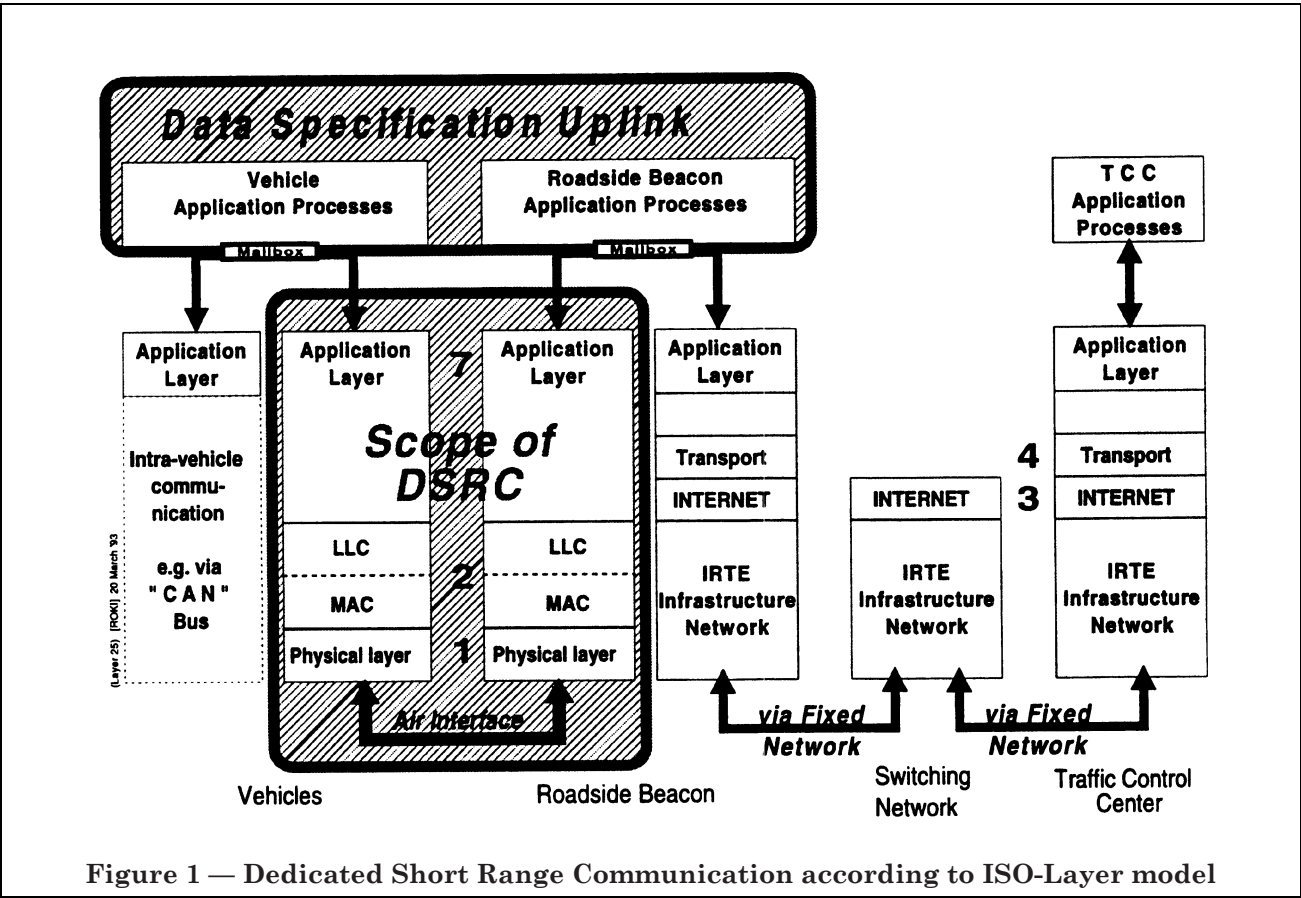
For transmitting the telegrams the transportation services defined by WG 9 (Dedicated Short Range Communication) are used, which ensure the application handling.

2 Normative References (NORMATIVE)

This document complements the “Data Specification RGI Downlink (Beacon to Vehicle)” specification prENV278/4/2/0016-1.

Additional references:

- ISO/IEC 8824 Specification of Abstract Syntax Notation One (ASN.1)
- ISO/IEC 8825 Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1)
- ISO/IEC DIS 8825-2 Information technology — Open Systems Interconnection — Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1) — Part 2: Packed Encoding Rules
- prENV (WI: 00278051) DSRC Application layer (OSI-Layer 7)
- prENV 278/9/#61 DSRC Communication Architecture



3 Definitions (NORMATIVE)

3.1 DEFINITIONS

For the purpose of this standard, the following definitions apply:

beacon	A roadside facility which is capable to communicate: Via “air interface” in a limited communication zone with IVU of passing vehicles. Via fixed network with centrally or decentrally located control units like central route guidance computer (optional). A beacon consists of a beacon controller and one or more connected beacon heads as transceivers for the air interface
beacon exit	This is the physical exit which a vehicle takes from a beacon equipped junction. It is important to be able to unambiguously identify the correct exit taken by a vehicle from a beacon site because, the route guidance information is referenced to this.
beacon site	A beacon installation location. There are several possible locations for beacon installation: beside the road — left and/or right hand, above the road — on gantries at intersections — on entry and/or exit.
central office	The central computer centre responsible for origination and generation of transmitted information.
dead reckoning	Calculating a vehicle’s position by keeping track of the distances and directions travelled from a known starting point.
departure point	Is the point on the link chain near to the destination at which guidance is switched back to autonomous mode in vehicle system to direct drivers to their destination.
destination region	The destination coordinate used for the actual journey with a resolution decreased to about 100 m. It is used for getting the origin-destination-relation.

downlink	Communication directed from roadside to IVU.
guidance information	A guidance information is a chain of “links”, a vehicle has to follow from its actual position to the next beacon or directly to its destination zone, if nearer than neighbouring beacons. Both the sequence of those links and their exact geometrical representation are described here, together with attributes, to be displayed to the driver.
journey	A journey starts with choosing a new destination by the driver and ends with the beginning of the next journey. It is independent of the particular IVU mode (guided or autonomous).
link	A link is a road section between two junctions. The link is the smallest individual addressable network element. Unidirectional connection between two nodes, mostly representing a connection between two intersections, in traffic assignment one intersection can be dissolved into several turning links or one link can comprise a sequence of connections between intersections.
link chain	Complete chain of links describing the route to the next beacon or to an departure point for the destination area.
maintenance data	Data used to maintain the IVU.
mapping information	Is the information transmitted by the beacon which describes the network in the beacon region and allows the vehicle to track its position as it moves in the network.
measurement point	Several traffic measurements (such as queueing time, number of stops etc) are assigned to a measurement point. These measurements are taken between the last and the actual measurement point. At least a measurement point is defined at the end of each link by default, but it is possible to define additional measurement points at the end of the vectors the link is build with.
modal change information	It contains data for evaluation of user behaviour such as offering and acceptance of parking information.
mode, autonomous	Is the mode of operation of the vehicle equipment in which the guidance information comprises the compass (“crow-fly”) direction and distance to the chosen destination. This can be derived from the vehicle current position and the co-ordinates of the destination. The vehicle unit may be in either Autonomous Mode or Guided Mode of operation. Usually the Autonomous Mode occurs before reaching the first beacon and after reaching the Departure Point for the destination.
number of stops	Number of recognized vehicle stops between two measurment points.
position detection line	This is a reference position at a beacon site where the vehicle detects a specific characteristic from the beacon (e.g. change of phase, Maximum field strength, loose of signal...).
queue speed limit	Speed limit which is used to measure the queueing time. This value can be defined for each link individually.
queueing time	The time accumulated between two measurement points while the vehicle travelled below a predefined queue speed limit.
reference time	Starting time of the first link in the uplink telegram. It is also used as a reference for other time values (such as stop time).
speed segment	A regular division of a link which can be defined individually for each link used for taken the speed profile.
speed profile	A sequence of averaged vehicle speeds. These speeds are determined by the IVU for each speed segment of a link.
stop	A stop of a vehicle is recognized if its speed goes below a predefined stop speed limit.
stop speed limit	Speed limit which is used to recognize vehicle stops. This value can be defined limit for all links in common only.
stop time	Time of the first stop since the last measurement point.

stop position	Position of the first stop since the last measurement point.
travel time	Travel time is the taken driving time on a Link including all queuing times. Travel times are measured by IVUs and transmitted via beacons to the CO. At measurement the travel time is assigned to the actual time related to the start of the link and the link number. Consequently it is possible to assign all travel times to real time and location in the CO.
uplink	Communication directed from IVU to roadside.
vector	A vector is a section of road that can be described as a length and direction only. A link can be made up of one or more vectors depending on physical layout of the road.
vehicle id	A random number which is changed at the beginning of a journey only. It is used for getting the origin-destination-relation.

3.2 SYMBOLS AND ABBREVIATIONS

ADES	Application Descriptor
ASN.1	Abstract Syntax Notation One
BST	Beacon Service Table
CDRG	Centrally Determined Route Guidance
CEN	European Committee for Standardization
CO	Central Office
DSRC	Dedicated Short Range Communication
EN	European Standard
ENV	European pre-Standard
FLEN	File Length
ISO	International Standardization Organisation
IVU	In Vehicle Unit
RGI	Route Guidance Information
RTTT	Road Transport and Traffic Telematics
TTI	Traffic and Traveller Information

4 General Structure: Uplink Data Set (NORMATIVE)

4.1 OVERALL STRUCTURE

This standard complies with the ASN.1 Packed Encoding Rules from ISO 8825-2. Its usage provides maximum interoperability and conformance to existing standards and meets a generic, standard model for RTTT in that it

- uses existing Standard Encoding Rules;
- is adaptable and expandable;
- does not include unnecessary information for a specific application;
- incurs a minimum of overhead in storage and transmission.

The Transmission of Uplink Data Sets is controlled by the Beacon Service Table (BST) of the Downlink Data Set (see prENV 278/4/2/0016-1, chapter 4). Within the BST the interactive applications are listed. The data elements of the BST are specified by the pre-Standard related to DSRC, CEN prENV 278/9/#65.

The Uplink Data Set has the following overall structure (following ASN.1 Encoding Rules):

ADES	Uplink Data Set
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- a) ADES: Application Descriptor (2 byte = 1 byte + 1 octet)