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Road vehicles — Interchange of digital information on electrical connections between towing and towed vehicles —

Part 2:
Application layer for brakes and running gear

Véhicules routiers -- Échange d'informations numériques sur les connexions électriques entre véhicules tracteurs et véhicules tractés —

Partie 2: Couche d'application pour les équipements de freinage et les organes de roulement

[Revision of second edition (ISO 11992-2:2003) and ISO 11992-2:2003/Amd.1:2007]

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Foreword

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 11992-2 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

This third edition cancels and replaces the second edition (ISO 11992-2:2003) and its amendment 1 of which have been technically revised.

ISO 11992 consists of the following parts, under the general title *Road vehicles — Interchange of digital information on electrical connections between towing and towed vehicles*:

— *Part 1: Physical layer and data-link layer*

— *Part 2: Application layer for brakes and running gear*

— *Part 3: Application layer for equipment other than brakes and running gear*

— *Part 4: Diagnostics*

Introduction

This part of the internation standard has been established in order to define the data interchange between a commercial vehicle and its towed vehicle(s), including communication between towed vehicles, using a Controller Area Network (CAN) serial data link as specified in ISO 11992-1 for control and status data related to electronical controlled braking and running gear applications.

It is subject to additions which will become necessary in order to keep pace with experience and technical advances. Care has been taken to ensure that these additions can be introduced in a compatible way, and care will have to be taken in the future so that such additions remain compatible with previous versions. In particular, it may become necessary to standardize new parameters and parameter groups. ISO members can request that such new parameters and parameter groups to be included in future editions of ISO 11992.

Road vehicles — Interchange of digital information on electrical connections between towing and towed vehicles —

Part 2:
Application layer for brakes and running gear

1 Scope

This part of the ISO 11992 international standard specifies the parameters and messages for electronically controlled braking systems, including ABS (anti-lock braking systems) and VDC (vehicle dynamics control systems) as well as for running gear equipment (i.e. systems for steering, suspension and tyres), to ensure the data communication interchange of information between road vehicles with a maximum authorized total mass greater than 3500 kg, and their towed vehicles, including the communication between (several) towed vehicles, on a dedicated network. It does not include any other communication on that network that is not related to communication between those vehicles.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7638, *Road vehicles — Connectors for the electrical connection of towing and towed vehicles — Connectors for braking systems and running gear of vehicles*

ISO 11898-1, *Road vehicles — Controller area network (CAN) — Part 1: Data link layer and physical signalling*

ISO 11992-1, *Road vehicles — Interchange of digital information on electrical connections between towing and towed vehicles — Part 1: Physical layer and data-link layer*

ISO 11992-4, *Road vehicles — Interchange of digital information on electrical connections between towing and towed vehicles — Part 4: Diagnostics*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11992-1, ISO 11898-1 and the following apply.

3.1
ABS
This definition is used for a control function to support anti-lock braking (anti-lock braking system). It is also used for control systems providing an anti-lock braking function.

3.2
ASR
This definition is used for a control function to support traction control (anti-spin regulation).

3.3
Centre-axle trailer
This term is used for a towed vehicle equipped with a towing device which can not move vertically (in relation to the trailer), and in which the axle(s) is(are) positioned close to the center of gravity of the trailer.

3.4
Commercial vehicle
This term is used for a vehicle that is engine driven and capable of towing other vehicles; same as a truck or tractor.

3.5
EBS
This definition is used for a control system providing an electronically controlled braking that contains functions like ABS, ASR, VDC.

3.6
ECU
This term is used for an electronic control unit.

3.7
Drawbar trailer
This term is used for a towed vehicle with one axle group or single axle at the front that is steered by connection to the towing vehicle by a drawbar and one axle group or single axle at the rear. This vehicle may also be a towing type.

3.8
Dolly
This term is used for a towed vehicle with one axle group or single axle, and a fifth wheel coupling, designed to convert a semi trailer into the equivalent of a full trailer.

3.9
Gateway
This term is used for a network node that is able to filter and forward messages to different network segments.

3.10
Link trailer
This term is used for a towed vehicle with a fifth wheel coupling, designed for towing a semi trailer.

3.11
Network segment
This term is used for an electrical connection between one group of logically combined nodes of a communication network.

3.12
Node
This term is used for an electronic device providing means to receive and transmit messages.

3.13
RGE
This definition is used for running gear equipment of a vehicle, including steering, suspension and tyres.

3.14
ROP
This definition is used for a control function to prevent roll-over situations of a vehicle (roll-over prevention / protection), part of a VDC function.

NOTE In UNECE Regulation No. 13 Roll-over Prevention is referred to as Roll-over Control.

3.15
Semi-trailer
This term is used for a towed vehicle with one axle group or single axle at the rear and a means of attachment to a tractor that results in some of the load being imposed on the tractor.

3.16
Towed vehicle
This term is used for any type of vehicle that is actually being towed by another vehicle; usually these are trailers or dollies.

3.17
Towing vehicle
This term is used for any type of vehicle that is actually towing another vehicle; usually these are commercial vehicles (tractors) or a trailer or dolly towing another trailer

3.18
VDC
This definition is used for a control function as part of the braking system that reacts to stabilise the vehicle during dynamic manoeuvres (Vehicle Dynamic Control) with the possible sub-functions ROP, YC.

3.19
YC
This definition is used for a control function to reduce unwanted lateral movement of a vehicle (yaw control), part of a VDC function

NOTE In UNECE Regulation No. 13 Yaw Control is referred to as Directional Control.

4 Symbols and abbreviated terms

CAN	Controller Area Network
CAN-ID	CAN Identifier
DA	Destination Address
DLC	Data Length Code
DP	Data Page
EDP	Extended Data Page
GE	Group Extension
LSB	Least Significant Byte (or Bit)
MSB	Most Significant Byte (or Bit)
P	Priority
PDU	Protocol Data Unit
PF	PDU Format
PGN	Parameter Group Number
PS	PDU Specific

SA	Source Address
UTC	Universal Time Coordinate

5 General Specifications

The data link shall be in accordance with ISO 11898-1; the physical layer shall be in accordance with ISO 11992-1.

Appropriate PDUs are specified to structure the communication between towing and towed vehicle interface(s). These PDUs shall be transmitted between electronic devices (nodes) at the towing vehicle and each towed vehicle as defined in the following sections.

Each node at a vehicle shall provide logical separation between the network segments and any in-vehicle networks and act as a gateway to forward the messages as specified in the following sections.

Any combination of new and old towing and towed vehicles is allowed. Multiple towed vehicles may be connected in any combination; the network shall be capable of addressing any towed vehicle, including dollies. The truck operator may disconnect and connect towed vehicles at any time and any order and the network shall adjust and respond accordingly.

6 Application layer

6.1 Protocol Data Unit (PDU) specification

6.1.1 General

The application layer provides a string of information that is assembled as a PDU. The PDU provides a framework for organizing the information sent by means of CAN data frames.

All transmitted CAN data frames shall use the extended data frame format with a 29-bit CAN-ID as defined in ISO 11898-1. The PDU framework is the same as defined in SAE J1939-71 [2].

The PDU shall consist of the fields as shown in Figure 1, which are

— a 29-bit CAN-ID with the sub-fields Priority (P), Extended Data Page (EDP), Data Page (DP), PDU Format (PF), PDU Specific (PS) — which may be a Destination Address (DA) or a Group Extension (GE) —, and Source Address (SA),

— a 64-bit data field.

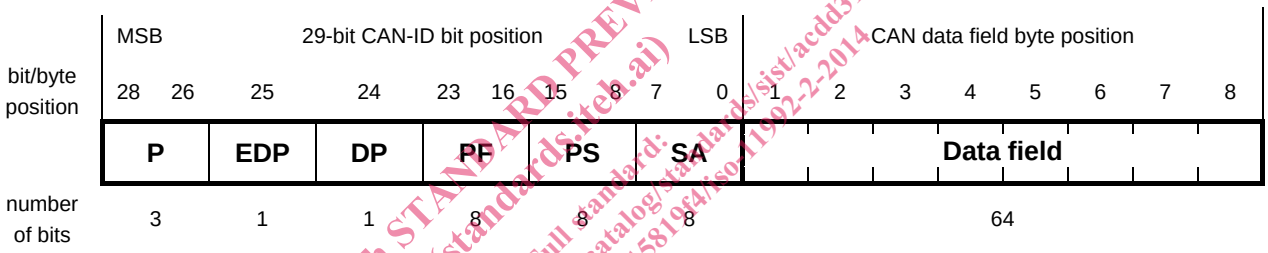


Figure 1 — PDU structure

Depending on the contents of the sub-fields the PDUs are classified as PDU1 or PDU2 frames as given in the following definitions.

6.1.2 Priority (P)

This 3-bit sub-field shall be used to optimize PDU frame latency for transmission onto the bus only and shall have no other specific meaning. It shall not be used for message validation on receiver side and should be globally masked off by the receiver (ignored). The priority of any PDU may be set from highest, 0_{10} (000_2), to lowest, 7_{10} (111_2) and will use this default values:

— The default for all control oriented PDUs shall be 3_{10} (011_2).

— The default of all other informational PDUs shall be 6_{10} (110_2).

— The default for diagnostic PDUs shall be 7_{10} (111_2).

6.1.3 Extended Data Page (EDP)

This 1-bit sub-field shall be used in conjunction with the DP sub-field to select an auxiliary range of PGNs. The definition of a PGN is given in clause 6.2. This bit shall always be set to zero.

6.1.4 Data Page (DP)

This 1-bit sub-field shall be used to select an auxiliary range of PGNs. The definition of a PGN is given in clause 6.2.

6.1.5 PDU Format (PF)

This 8-bit sub-field shall determine the PDU format and the transmission method as specified in Table 1.

— If the value of the PDU format field is below 240, then the PDU format is of type PDU1 and the PDU-specific field contains a destination address.

— If the value of the PDU format field is 240 to 255, then PDU format is of type PDU2 and the PDU-specific field contains a group extension.

Table 1 — PDU definition

PF value	PDU format	PS	Transmission method
0 to 239	PDU1	DA	This PDU 1 format shall be used for messages to be sent directly to either a specific or a global destination.
240 to 255	PDU2	GE	This PDU 2 format shall only be used to communicate global (broadcast) messages.

6.1.6 PDU Specific (PS)

6.1.6.1 General

This 8-bit sub-field shall depend on the PDU format. For a PDU1 format the PDU specific (PS) sub-field is a destination address (DA), for a PDU2 format the PS sub-field is a group extension (GE) (see Table 1).

6.1.6.2 Destination Address (DA)

The DA shall contain the specific address of the towing or towed vehicle to which the PDU is being sent. If the global destination address (255_{10} = FF_{16}) is sent, all nodes shall process the PDU.

6.1.6.3 Group Extension (GE)

The GE in conjunction with the four least significant bits of the PF sub-field shall be used as part of the specific PGN.

6.1.7 Source Address (SA)

This 8-bit sub-field shall provide the source address (SA) of the node that transmits the PDU. Therefore the SA sub-field assures that the CAN-ID is unique on all network segments.

6.1.8 Data field

All CAN data frames shall use a data field length of 8 byte, i.e. DLC=8. If less than 8 byte are required by the defined PGN all non-used bits shall be transmitted with all bits set to 1.

6.2 Parameter Group Number (PGN)

This 24-bit number shall be used in all cases where a group of parameters assembled in the PDU data field need to be identified. A PGN is built from the CAN-ID sub-fields EDP, DP, PF and PS as specified in Figure 2 and is used to identify or label a group of parameters. It is independent of the remaining fields of the CAN-ID.

The upper bits 18 to 23 are reserved and shall always be set to zero (0). For a PDU1 message, i.e. if the PS field is a DA, the least significant byte (PS) of the PGN shall always be set to zero (0).

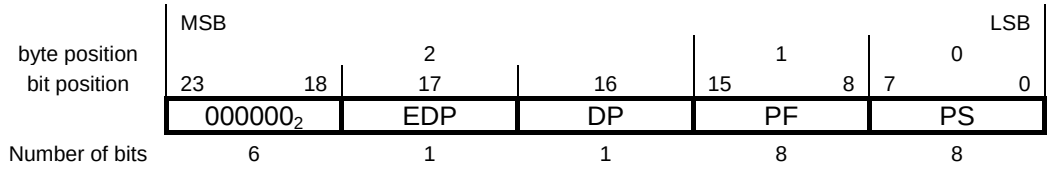


Figure 2 — PGN sub-field definition

NOTE To reduce the effort of exchanging PDUs between the ISO 11992-2 communication and any in-vehicle network, the PGNs within this standard are harmonized with those used in SAE J1939.

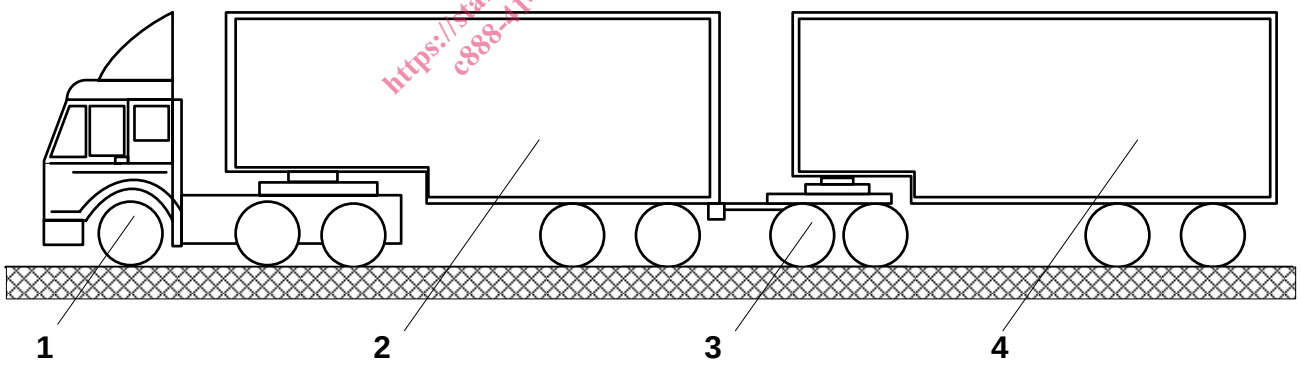
EXAMPLE For a message with CAN-ID $18FEC920_{16}$ (PDU2 format) the sub-fields are P= 110_2, EDP= 0_2, DP= 0_2, PF= FE_{16}, PS= $C9_{16}$, SA= 20_{16}. The corresponding PGN is $00FEC9_{16}$ (65225_{10}).

6.3 Address assignment

6.3.1 Address usage

A road-train consists of one truck (commercial vehicle) and one or more trailer(s) (towed vehicles). Dollies within the road train shall be treated as additional towed vehicles (see Figure 3).

The commercial vehicle is the towing vehicle of towed vehicle #1; towed vehicle #1 is the towing vehicle of towed vehicle #2; and so on.



Key:
1 truck / commercial vehicle (position #0)
2 trailer / towed vehicle position #1
3 dolly / towed vehicle position #2
4 trailer / towed vehicle position #3

Figure 3 — Example of a possible road train configuration