INTERNATIONAL STANDARD

ISO 11992-2

Third edition
2014-05-01

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

Reference number
ISO 11992-2:2014(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is 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), which has been technically revised. It also replaces ISO 11992-2:2003/Amd 1:2007.

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 and data-link layers*

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

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

— *Part 4: Diagnostic communication*

Introduction

This part of ISO 11992 has been established in order to define the data interchange between a commercial vehicle and its towed vehicle(s), including the 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 electronically 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 the previous versions. In particular, it can become necessary to standardize new parameters and parameter groups. ISO members can request that such new parameters and parameter groups are to be included in the 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 ISO 11992 specifies the parameters and messages for electronically controlled braking systems, including anti-lock braking systems (ABS) and vehicle dynamics control systems (VDC), as well as for running gear equipment (i.e. systems for steering, suspension, and tyres), to ensure that the data communication interchange of information between road vehicles with a maximum authorized total mass greater than 3 500 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 the communication between those vehicles.

2 Normative references

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

ISO 7638 (all parts), *Road vehicles — Connectors for the electrical connection of towing and towed 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 and data-link layers*

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

3 Terms and definitions

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

3.1
anti-lock braking system
ABS
control function which automatically modulates the pressure producing the braking forces at the wheels to limit the degree of wheel slip, or a system that provides an anti-lock braking function

3.2
anti-spin regulation
ASR
control function which automatically modulates the engine torque or the pressure producing the braking forces at the wheels to limit the degree of wheel spin, or a system that provides an anti-spin control

3.3
center-axle trailer
towed vehicle equipped with a rigid towing device, and in which the axle(s) is (are) positioned close to the centre of gravity of the vehicle

3.4
commercial vehicle
motor vehicle which, on account of its design and appointments, is used mainly for conveying goods and which can also tow a trailer

3.5
converter dolly
dolly unit that couples to a semi-trailer with a fifth-wheel coupling and thereby "converts" the semi-trailer to a full trailer

3.6
electronic braking system
EBS
braking system in which control is generated and processed as an electrical signal in the control transmission

3.7
electronic control unit
ECU
electronic item consisting of a combination of basic parts, subassemblies, and assemblies packaged together as a physically independent entity

3.8
full trailer
towed vehicle equipped with a towing device which can move vertically (in relation to the trailer), and in which the axle(s) is (are) positioned less close to the centre of gravity of the vehicle

3.9
gateway
unit connecting different networks or parts of one network and performing any necessary protocol translation

3.10
link trailer
towed vehicle with a fifth-wheel coupling, designed for towing a semi-trailer

3.11
network segment
part of a network that is within the domain of a single link layer

3.12
node
device capable of sending or receiving data whose identification will be unambiguous for authentication purposes

3.13
running rear equipment
RGE
equipment of a vehicle, including steering, suspension, and tyres

3.14
roll-over prevention/protection
ROP
control function to prevent roll-over situations of a vehicle

Note 1 to entry: ROP is part of a *VDC* (3.20) function.

Note 2 to entry: In UNECE Regulation No. 13, roll-over prevention is referred to as “roll-over control”.

3.15
semi-trailer
trailer which is designed to be coupled to a semi-trailer towing vehicle and to impose a substantial part of its total weight on the towing vehicle

3.16
towed vehicle
non-power-driven road vehicle which, on account of its design and appointments, is used to transport persons or goods and is intended to be towed by a motor vehicle

3.17
towing full trailer
towed vehicle equipped with a towing device which can move vertically (in relation to the trailer), and in which the axle(s) is (are) positioned less close to the centre of gravity of the vehicle that is capable of towing another vehicle

3.18
towing semi-trailer
trailer which is designed to be coupled to a semi-trailer towing vehicle and to impose a substantial part of its total weight on the towing vehicle that is capable of towing another vehicle

3.19
towing vehicle
motor vehicle or non-power-driven vehicle which tows a succeeding vehicle

3.20
vehicle dynamic control
VDC
control function as part of the braking system that reacts to stabilize the vehicle during dynamic manoeuvres

Note 1 to entry: VDC has the possible sub-functions *ROP* (3.14) and *YC* (3.21).

3.21
yaw control
YC
control function to reduce an unwanted lateral movement of a vehicle

Note 1 to entry: Yaw control is part of a *VDC* (3.20) function.

Note 2 to entry: In UNECE Regulation No. 13, YC 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
TOS	type of service
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 the towing and towed vehicles' interface(s). These PDUs shall be transmitted between the 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 can be connected in any combination. The network shall be capable of addressing any towed vehicle, including dollies. The truck operator can 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 for the normal and diagnostic communications between the commercial vehicles and towed vehicles is the same as defined in Reference [1] and is specified in 6.1.2. Diagnostic communication between the towed vehicles shall use the subnet addressing PDU format as specified in 6.1.3.

6.1.2 PDU format for normal communication and diagnostic communication (PDU1 and PDU2)

The PDU1 and PDU2 shall consist of the following fields as shown in Figure 1:

— a 29-bit CAN-ID with the subfields priority (P), extended data page (EDP), data page (DP), PDU format (PF), PDU specific (PS) [which can be a destination address (DA) or a group extension (GE)], and source address (SA);

— a 64-bit data field.

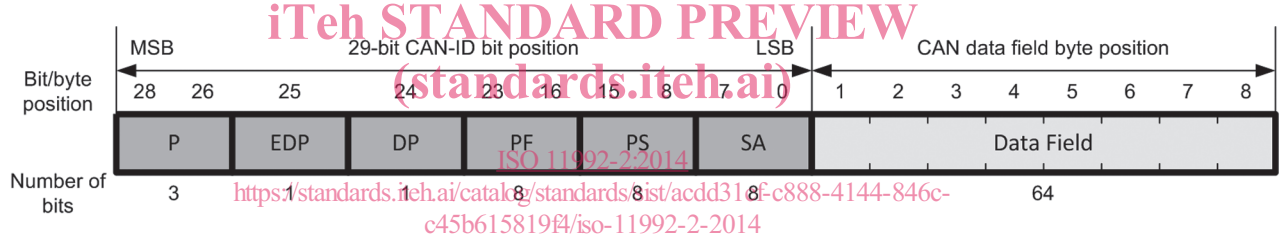


Figure 1 — PDU1 and PDU2 structure

Depending on the contents of the subfields, the PDUs are classified as PDU1 or PDU2 frames as given in the following definitions.

6.1.3 PDU format for subnet addressing communication (PDU3)

The PDU3 shall consist of the following fields as shown in Figure 2:

— a 29-bit CAN-ID with the subfields priority (P), extended data page (EDP), data page (DP), type of service (TOS), destination address (DA) and source address (SA);

— a 64-bit data field.

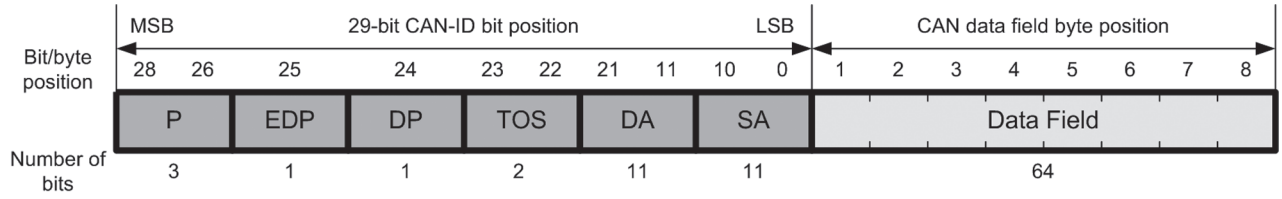


Figure 2 — PDU3 structure

The fields P, EDP, and DP shall be used as given in the following definitions. All other fields shall be used as defined in ISO 11992-4.

6.1.4 Priority (P)

This 3-bit subfield shall be used to optimize the 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 the receiver side and should be globally masked off by the receiver (ignored). The priority of any PDU can be set from highest, 0_{10} (000_2), to lowest, 7_{10} (111_2), and will use the following 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).

6.1.5 Extended data page (EDP)

This 1-bit subfield shall be used in conjunction with the DP subfield to select an auxiliary range of PGNs or to select subnet addressing diagnostic messages. The definition of a PGN is given in 6.2. The definition of CAN frames for subnet addressing diagnostic messages is given in 6.6.

6.1.6 Data page (DP)

This 1-bit subfield shall be used in conjunction with the EDP subfield to select an auxiliary range of PGNs or to select subnet addressing diagnostic messages. The definition of a PGN is given in 6.2. The definition of CAN frames for subnet addressing diagnostic messages is given in 6.6.

6.1.7 PDU format (PF)

This 8-bit subfield 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 the 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.

6.1.8 PDU specific (PS)

6.1.8.1 General

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

6.1.8.2 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.

6.1.8.3 Group extension (GE)

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

6.1.9 Source address (SA)

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

6.1.10 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 PDU1 or PDU2 data field needs to be identified. A PGN is built from the CAN-ID subfields EDP, DP, PF, and PS as specified in Figure 3 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 (LSB) of the PGN shall always be set to zero (0).

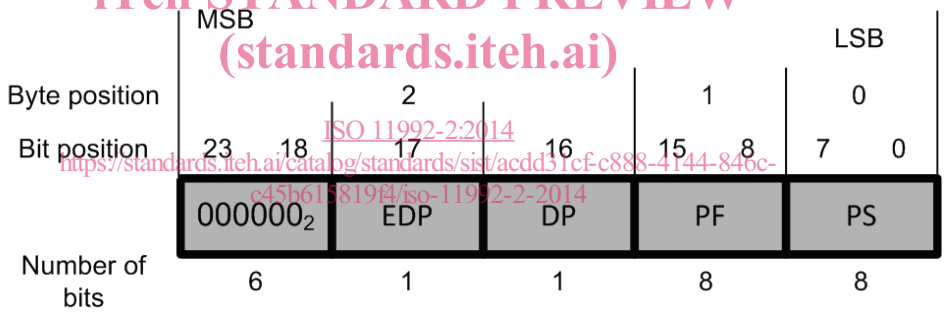


Figure 3 — PGN subfield definition

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

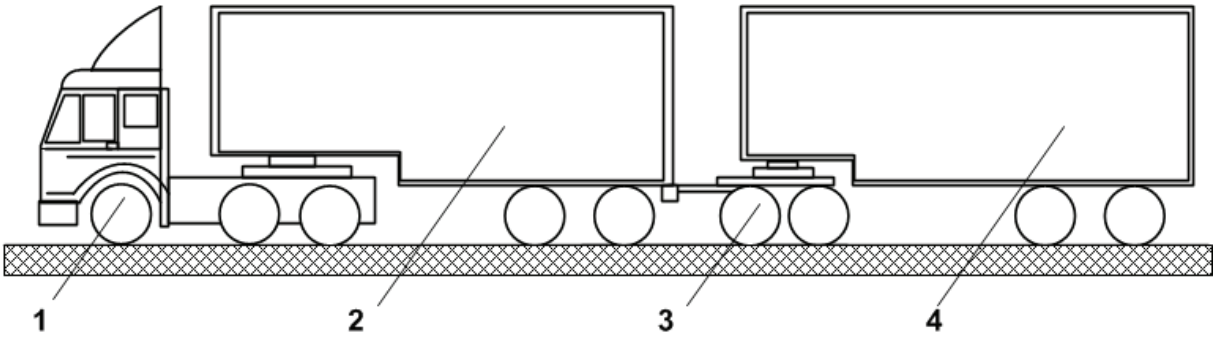
EXAMPLE For a message with CAN-ID 18FEC920$_{16}$ (PDU2 format), the subfields are P = 110$_2$, EDP = 0$_2$, DP = 0$_2$, PF = FE$_{16}$, PS = C9$_{16}$, and SA = 20$_{16}$. The corresponding PGN is 00FEC9$_{16}$ (65225$_{10}$).

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 4).

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 converter dolly/towed vehicle position #2
4 trailer/towed vehicle position #3

Figure 4 — Example of a possible road train configuration

For the towing vehicle/towed vehicle communication, each node shall use only the addresses given in Table 2 as SA and DA for all messages.

Table 2 — Commercial vehicle/towed vehicle addresses

Name	Address			Predecessor	Successor
commercial vehicle (#0)	32_{10}	/	20_{16}	n/a	towed vehicle #1
towed vehicle #1	200_{10}	/	$C8_{16}$	commercial vehicle (#0)	towed vehicle #2
towed vehicle #2	192_{10}	/	$C0_{16}$	towed vehicle #1	towed vehicle #3
towed vehicle #3	184_{10}	/	$B8_{16}$	towed vehicle #2	towed vehicle #4
towed vehicle #4	176_{10}	/	$B0_{16}$	towed vehicle #3	towed vehicle #5
towed vehicle #5	168_{10}	/	$A8_{16}$	towed vehicle #4	undefined
global destination address	255_{10}	/	FF_{16}	undefined	undefined

The global destination address shall only be used by the commercial vehicle to broadcast information to all the towed vehicles simultaneously.

6.3.2 Address assignment procedure

The address of the commercial vehicle is fixed. The respective address of a towed vehicle corresponds to its position within the road train and shall be (re)assigned each time

— a communication starts or

— the towed vehicle has been connected to the road train.

The dynamic address assignment shall be handled by the respective towing/towed vehicle's node and concerns the determination of the individual position within the road train. It is based on the transmission of the general initialization message (see 6.6.4.1) by the respective predecessor within the road train.

Within a road train, the address assignment procedure shall be initiated by the commercial vehicle, using its default address for the general initialization message. A powered-up towed vehicle's node shall use the address of towed vehicle #1 as the default address for transmitting the available information until the general initialization message has been received from the towing vehicle and a valid address can be assigned.

Each towed vehicle's node shall use the general initialization message received at the towing vehicle's network interface to determine its own address. It shall use the successor's address of that message's SA as its own address. This requires that a towed vehicle's node shall be capable of

— identifying its predecessor by the SA of the general initialization message,

— assigning its own address based on the predecessors address, and

— identifying the potential receiver(s) by the destination address and by the message type.

An assigned address shall be valid as long as the towed vehicle is powered and no message from the predecessor with a different SA is received. If a different SA is received, the assignment procedure shall be restarted.

To provide the address assignment for itself and for possible successors, a node shall be capable of continuously sending the general initialization message with its dynamically assigned own SA as illustrated in Figure 5.

This addressing method allows the towed vehicle's node to communicate and to identify its presence to its predecessor immediately after power-up. This means that several towed vehicles can use the same address until the address assignment procedure is completed. Continuous sending of the general initialization message is necessary to allow immediate towed vehicle address assignment at any time a towed vehicle should be connected.

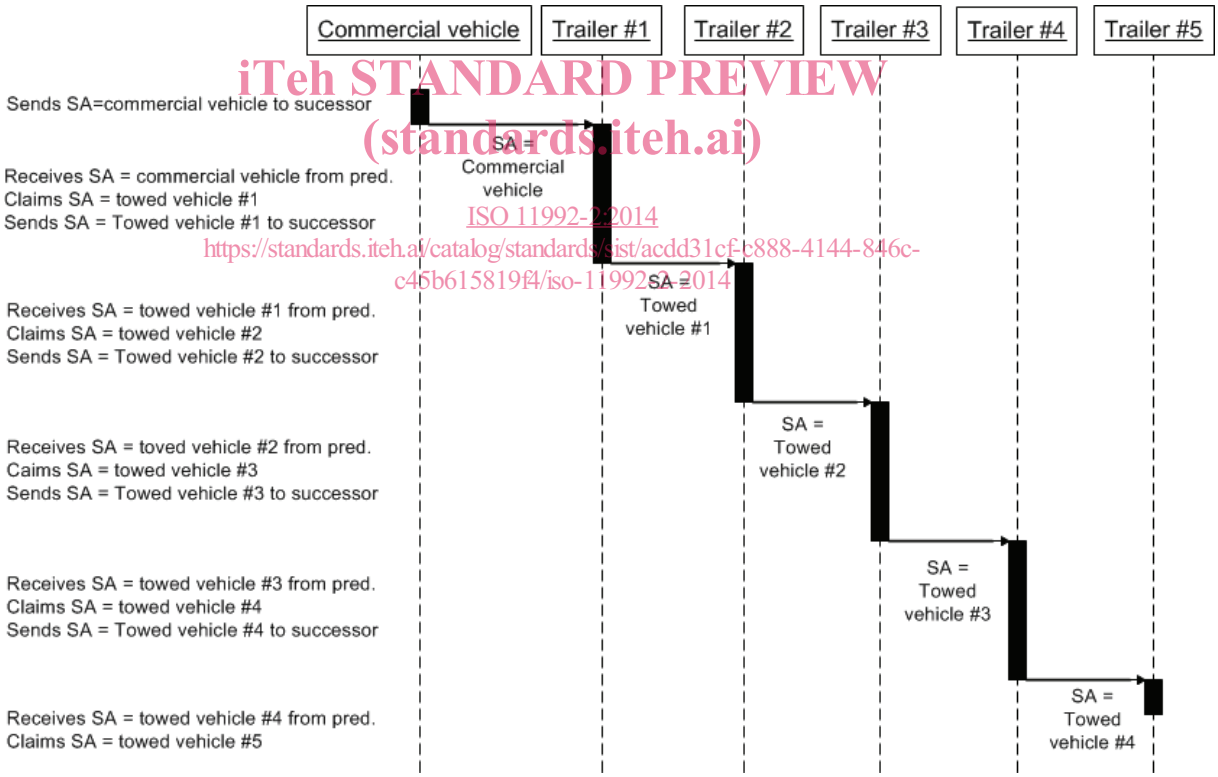


Figure 5 — Address assignment procedure

6.4 Message routing

If a vehicle has no provision for a successor, the message routing function is not required by the vehicle's node.

To allow communication between the towing and towed vehicles, a node shall be capable of

— receiving messages from its predecessor and successor within the road train,