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Road vehicles — Tachograph systems —

Part 4: CAN interface

Véhicules routiers — Systèmes tachygraphes —

Partie 4: Interface CAN

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Foreword

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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).

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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.

This second edition cancels and replaces the first edition (ISO 16844-4:2004), which has been technically revised.

The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

ISO 16844 consists of the following parts, under the general title *Road vehicles — Tachograph systems*:

— *Part 1: Electrical connectors*

— *Part 2: Electrical interface with recording unit*

— *Part 3: Motion sensor interface*

— *Part 4: CAN interface*

— *Part 5: Secured CAN interface*

— *Part 6: Diagnostics*

— *Part 7: Parameters*

Introduction

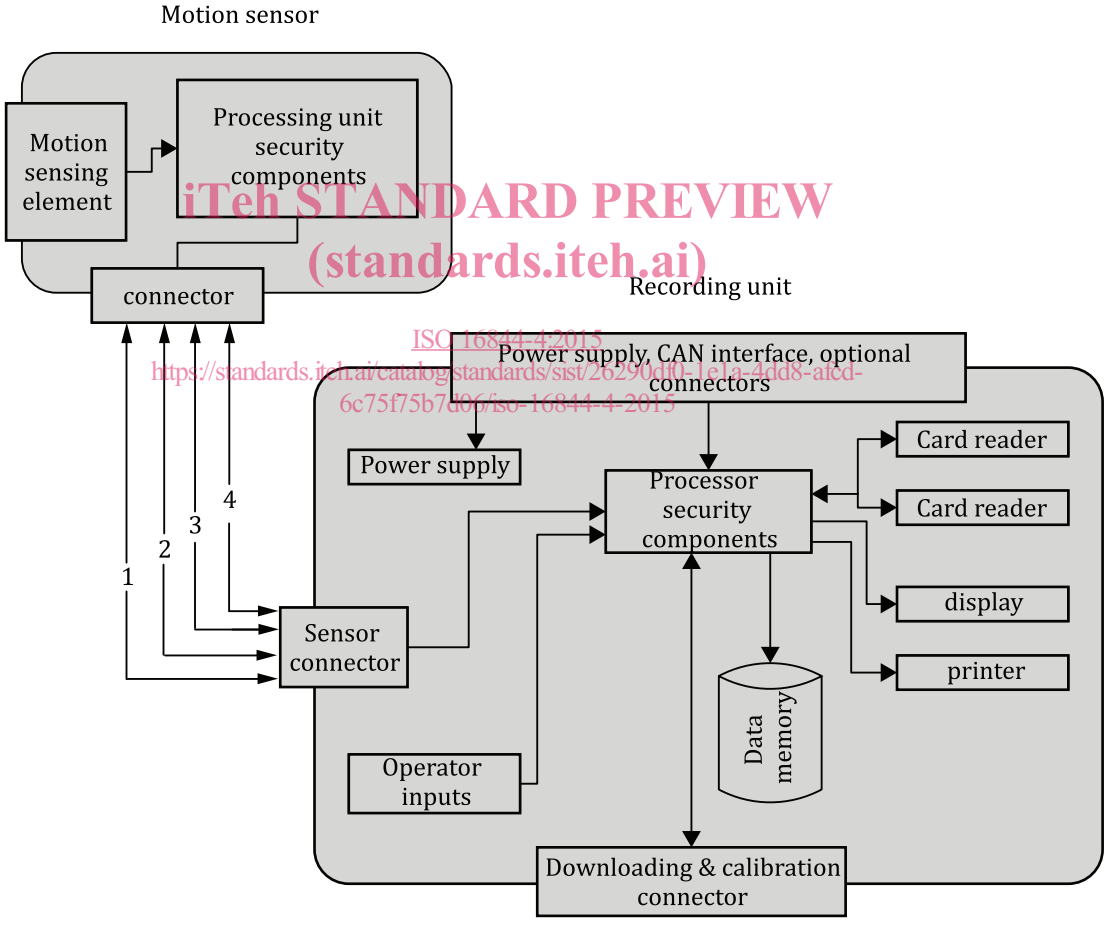
This International Standard supports and facilitates the communication between electronic control units and a tachograph. The tachograph is based upon the European Council Regulation (EC) No 561/2006[1] and (EEC) No 3821/85[2] as last amended.

The digital tachograph concept is based upon an RU storing data, related to the activities of the various drivers driving the vehicle, on which it is installed.

During the normal operational status of the RU, data stored in its memory are accessible to different entities (drivers, authorities, workshops, transport companies) in different ways (displayed on a screen, printed by a printing device, downloaded to an external device). Access to stored data is controlled by smart card inserted in the tachograph.

In order to prevent manipulation of the tachograph system, the speed signal sender (motion sensor) is provided with an encrypted data link.

A typical tachograph system is shown in Figure 1.



Key

1 positive supply
2 battery minus
3 speed signal, real time
4 data signal in/out

Figure 1 — Typical tachograph system

Road vehicles — Tachograph systems —

Part 4:
CAN interface

1 Scope

This part of ISO 16844 specifies the controller area network (CAN) interface for the interchange of digital information between a road vehicle's tachograph system and vehicle units, and within the tachograph system itself. It specifies parameters of, and requirements for, the application of physical and data link layers of the electrical connection used in the electronic systems.

2 Normative reference

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

ISO 16844-7, *Road vehicles — Tachograph systems — Part 7: Parameters*

3 Terms and definitions

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

3.1
recording unit
RU
part of the tachograph system which acquires and stores data concerning the vehicle and its driver(s) and their activities

Note 1 to entry: A recording unit is also referenced as a vehicle unit in other standards, both are synonyms.

3.2
visual instrument
speedometer and display(s) for odometer and trip meter data

4 Symbols and abbreviated terms

ACK	positive acknowledge
BAM	broadcast announce message
CAN	controller area network
DA	destination address
DP	data page
ECU	electronic control unit

EDP	extended data page
EOL	end-of-line
LSB	least significant bit/byte
MSB	most significant bit/byte
NACK	negative acknowledge
P	priority
PDU	protocol data unit
PF	PDU format
PG	parameter group
PGN	parameter group number
Phase_Seg1	phase buffer segment 1
Phase_Seg2	phase buffer segment 2
Prop_Seg	propagation time segment
PS	PDU specific
RU	recording unit
SA	source address
Sync_Seg	synchronization segment
TP.DT	transport protocol data transfer
t_s	bit time
t_q	time quanta
t_{SEG1}	timing segment 1
t_{SEG2}	timing segment 2
t_{SJW}	synchronization jump width
VIN	vehicle identification number

5 Physical layer application requirements

5.1 General

The physical layer shall meet the requirements of SAE J1939-11[4] for 250 kbit/s and SAE J1939-14[5] for 500 kbit/s unless otherwise specified in this part of ISO 16844.

5.2 Bit timing requirements

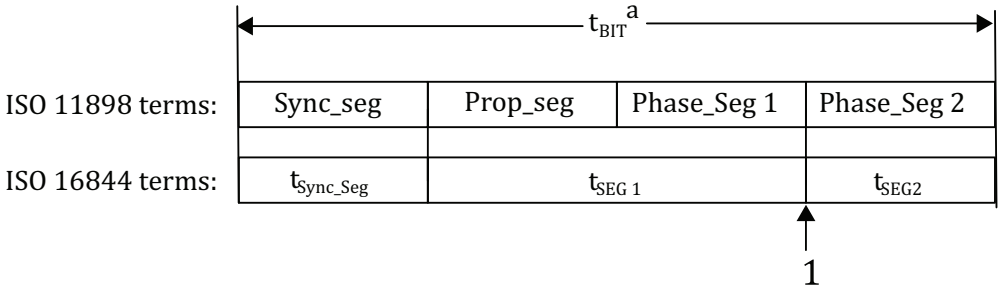
5.2.1 General

The following values of CAN bit timing parameters specified in ISO 11898-1 shall be used for the settings of the tachograph ECUs as given in Figure 2.

$t_{Sync\_Seg} = 1t_q$

$t_{SEG1} = t_{Prop\_Seg} + t_{Phase\_Seg1}$

$t_{SEG2} = t_{Phase\_Seg2}$



Key

1 sample point

a Nominal bit time.

Figure 2 — Partition of bit time

5.2.2 CAN bit timing requirements for 250 kbit/s

For a physical layer configured to 250 kbit/s, the parameter values given in Table 1 shall apply.

Table 1 — CAN bit timing parameter values for 250 kbit/s, single data sampling mode

Parameter	Timing setting		
	Min	Nominal	Max
t_B	3 980 ns	4 000 ns	4 020 ns
t_q	—	—	400 ns
t_{SEG1}	$t_{SEG1} = t_B - 1t_q - t_{SEG2}$	$t_{SEG1} = t_B - 1t_q - t_{SEG2}$	$t_{SEG1} = t_B - 1t_q - t_{SEG2}$

The CAN bit timing values shall also comply with the following conditions:

— nominal bit rate: 250 kbit/s ±0,5 %;

— sample point: between 80 % and 88 % of nominal bit time of single data sampling mode.

Values for the bit timing shall be according to Table 2, which is based on time quanta, t_q.

Table 2 — CAN bit timing parameter values for 250 kbit/s for a given time quanta, t_q

Parameter		
t_q	t_{SJW}	t_{SEG2}
200 ns	600 ns	600 ns
250 ns	500 ns	750 ns
334 ns	668 ns	668 ns
400 ns	800 ns	800 ns

5.2.3 CAN bit timing requirements for 500 kbit/s

For a physical layer configured to 500 kbit/s, the parameter values given in Table 3 shall apply.

Table 3 — CAN bit timing parameter values for 500 kbit/s, single data sampling mode

Parameter	Timing setting		
	Min	Nominal	Max
t_B	1 980 ns	2 000 ns	2 020 ns
t_q	—	—	200 ns
t_{SEG1}	$t_{SEG1} = t_B - 1t_q - t_{SEG2}$	$t_{SEG1} = t_B - 1t_q - t_{SEG2}$	$t_{SEG1} = t_B - 1t_q - t_{SEG2}$

The CAN bit timing values shall also comply with the following conditions:

— nominal bit rate: 500 kbit/s ±1 %;

— clock tolerance: ±0,05 %;

— sample point: between 80 % and 88 % of nominal bit time of single data sampling mode.

Values for the bit timing shall be according to Table 4, which is based on time quanta, t_q.

Table 4 — CAN bit timing parameter values for 500 kbit/s for a given time quanta, t_q

Parameter values		
t_q	t_{SJW}	t_{SEG2}
100 ns	300 ns	400 ns
125 ns	375 ns	375 ns
167 ns	334 ns	334 ns
200 ns	400 ns	400 ns

6 Data link layer application requirements

6.1 Message frame format

6.1.1 General

For the data link layer, the application layer provides a string of information that is assimilated into a PDU. The PDU provides a framework for organizing the information, which shall be sent in the CAN data frame.

The 29-bit identifier shall be in accordance with ISO 11898-1.

The PDU shall consist of seven fields in addition to the specific CAN fields specified in Figure 3.

The PDU fields shall contain P, EDP, DP, PF, PS, which may be a DA or a GE, SA, and data field.

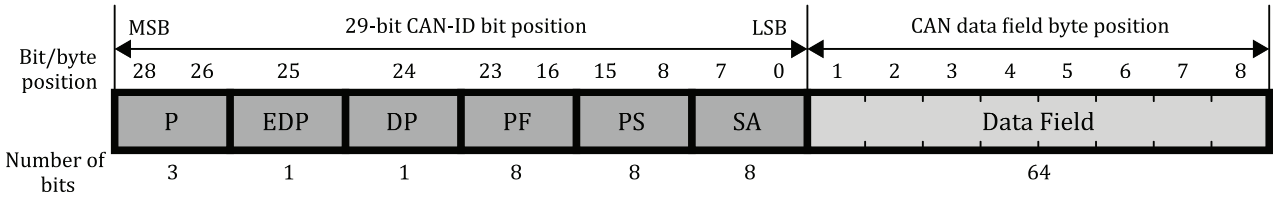


Figure 3 — Usage of 29 bit CAN identifier and data field

NOTE For compatibility with other definitions (e.g. ISO 11898-1, J1939), the bit positions of the identifier field start with index 0, and the bit/byte positions within the data field start with index 1.

6.1.2 Priority (P) bits

This 3-bit subfield shall be used to optimize PDU message 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 the default values as given in the PGN specifications. Other values may be specified by the system integrator (vehicle manufacturer).

6.1.3 Extended data page (EDP) bit

This 1-bit subfield shall be used in conjunction with the DP subfield to select a range of PGNs. The definition of a PGN is given in 6.2.

6.1.4 Data page (DP) bit

This 1-bit subfield shall be used in conjunction with the EDP subfield to select a range of PGNs. The definition of a PGN is given in 6.2.

6.1.5 PDU format (PF) field

This 8-bit subfield shall determine the PDU format and the transmission method as specified in 6.2.

6.1.6 PDU specific (PS) field

6.1.6.1 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).

6.1.6.2 Destination address (DA) field

The DA addresses the ECU intended to receive and act upon the message. In case of the global destination address (255_{10}/FF_{16}), all nodes shall process the PDU.

6.1.6.3 Group extension (GE) field

The GE field extends the four least significant bits of the PF field, and provides 4 096 PGNs. It indicates that the PS field is a group extension when the four most significant bits of PF field are set.

6.1.7 Source address (SA) field

The SA field shall be 8-bit long. There shall be only one device on the network with a given SA, i.e. the SA assures that the CAN identifiers are unique.

