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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

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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 16844-4 was prepared by Technical Committee 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 connector*
- *Part 2: Recording unit, electrical interface*
- *Part 3: Motion sensor interface*
- *Part 4: CAN interface*
- *Part 5: Secured CAN interface*
- *Part 6: Diagnostics*
- *Part 7: Parameters*

Introduction

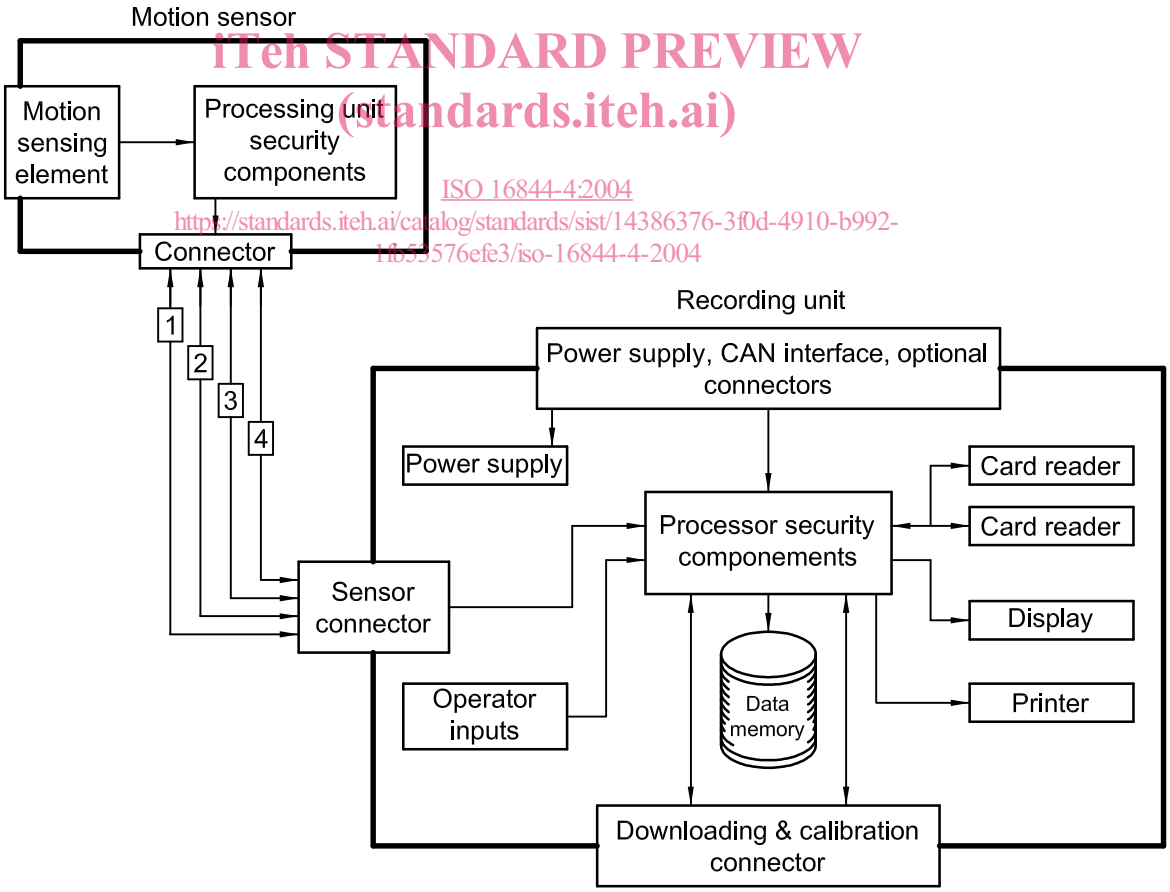
ISO 16844 supports and facilitates the communication between electronic units and a tachograph; the tachograph being based upon Council Regulations (EEC) No. 3820/85 [1] and (EEC) No. 3821/85 [2] and their amendments Council Regulation (EEC) No. 2135/98 [3] and Commission Regulation (EC) No. 1360/2002 [4].

Its purpose is to ensure the compatibility of tachographs from various tachograph manufacturers.

The basis of the digital tachograph concept is a recording unit (RU) that stores data related to the activities of the drivers of a vehicle on which it is installed. When the RU is in normal operational status, the data stored in its memory are made accessible to various entities such as drivers, authorities, workshops and transport companies in a variety of ways: they may be displayed on a screen, printed by a printing device or downloaded to an external device. Access to stored data is controlled by a 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 CAN (controller area network) interface for the interchange — performed in accordance ISO 16844-6 — 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 physical and data link layers of the electrical connection used in the electronic systems.

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 11898 (all parts), *Road vehicles — Controller area network (CAN)*

ISO 16844-6, *Road vehicles — Tachograph systems — Part 6: Diagnostics*

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

SAE J1939, *Recommended Practice for a Serial Control and Communications Vehicle Network*

SAE J1939/11, *Physical Layer — 250 kbits/s, Twisted Shielded Pair*

3 Terms and definitions

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

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

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

4 Abbreviated terms

ACK	positive acknowledgement	Phase_Seg1	phase segment 1
BAM	broadcast announce message	Phase_Seg2	phase segment 2
CAN	controller area network	PS	PDU specific
DA	destination address	R	reserved
DP	data page	RU	recording unit
ECU	electronic control unit	SA	source address
EEC1	electronic engine controller No. 1	Sync_Seg	synchronization segment
EOL	end of line	TBD	to be defined
GE	group extension	TP.DT	transport protocol data transfer
LSB	least significant bit	t_B	bit time
MSB	most significant bit	t_Q	time quanta
NACK	negative acknowledgement	t_{SEG1}	timing segment 1
P	priority	t_{SEG2}	timing segment 2
PDU	protocol data unit	t_{SJW}	synchronization jump width
PF	PDU format	t_{SYNC_SEG}	synchronization segment
PGN	parameter group number	VIN	vehicle identification number

5 Physical layer

5.1 General

The physical layer shall be in accordance with SAE J1939/11, except where otherwise specified in this part of ISO 16844.

5.2 Bit timing requirements

The following parameters of CAN bit timing values shall be used for the settings of the tachograph ECUs (see Figure 2), which shall be in accordance with Table 1.

t_{SJW}

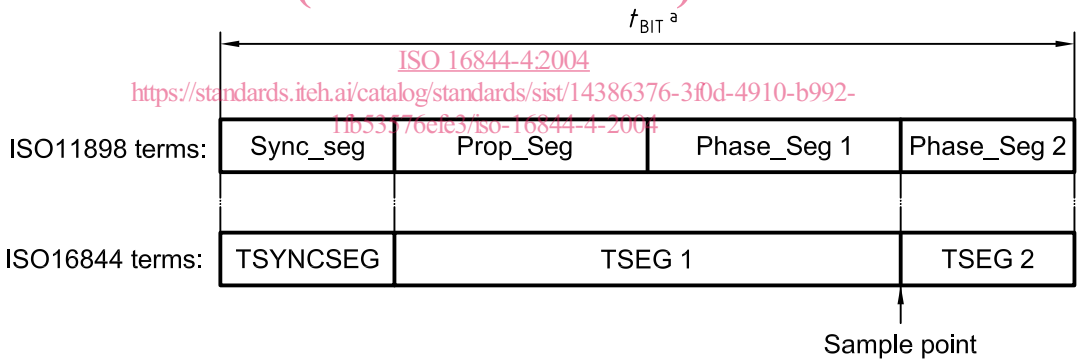
t_B

t_Q

$t_{SYNCSEG}$ = Sync_Seg = $1t_Q$

t_{SEG1} = Prop_Seg + Phase_Seg1

t_{SEG2} = Phase_Seg2



a Nominal bit time.

Figure 2 — Partition of bit time

Table 1 — CAN bit timing parameter values — 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 be in accordance with the following conditions:

— nominal bit rate of 250 kBit/s ± 0,5 %;

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

Values for the bit timing shall be in accordance with Table 2, which base on time quanta t_Q.

Table 2 — CAN bit timing parameter values for standard time quanta

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

6 Data link layer

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.

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

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

	P	R	DP	PF	PS	SA		Data field
Number of bits	3	1	1	8	8	8		0 to 64

Figure 3 — 29 bit CAN identifier and data field

6.1.2 P bits

Three priority bits shall be used to optimize message latency for transmission onto the bus only. They shall be globally masked off by the receiver. The priority of any message may be set from highest, 0 (000_2), to lowest priority, 7 (111_2). The default values shall be as given in the PGN specifications.

6.1.3 R bit

The R bit is reserved for future expansion. This bit shall be set to logic “0” within transmitted messages.

6.1.4 DP bit

The DP bit selects the page of PGNs.

6.1.5 PF field

The PF field shall contain eight bits that determine the PDU format. It is one of the fields used to determine the PGN assigned to the data field.

6.1.6 PS field

6.1.6.1 General

The PS field shall contain eight bits that depend on the PF. If the PF is below 240, the PS is a destination address; if the PF is 240 to 255, the PS shall contain a GE value.

6.1.6.2 DA

The DA addresses the ECU intended to receive and act upon the message. The global DA of 255dec requires all devices to listen.

6.1.6.3 GE field

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

6.1.7 SA field

The SA field shall be eight bits long. There shall be only one device on the network with a given SA, i.e. the SA assures that the CAN identifier is unique.

6.1.8 Data field

A single CAN frame shall provide a maximum of eight data bytes within the data field. All eight bytes shall be used, even if fewer are required. This provides a means to easily add parameters, while retaining compatibility with previous revisions, which only specified part of the data field.

6.2 PGN

6.2.1 General

The parameter group number shall be a 24 bit number, which contains R bit, DP bit, PF field and PS field, (see Figure 4).

Byte 1 (Most significant byte)			Byte 2	Byte 3
Bits 8 ... 3	Bit 2	Bit 1		
000000b	R	DP	PF	PS

Figure 4 — Contents of PGN