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**Road vehicles — Tachograph systems —
Part 6:
Diagnostics**

*Véhicules routiers — Systèmes tachygraphes —
Partie 6: Diagnostic*



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ISO 16844-6:2004(E)

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 16844-6 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 connectors*
- *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

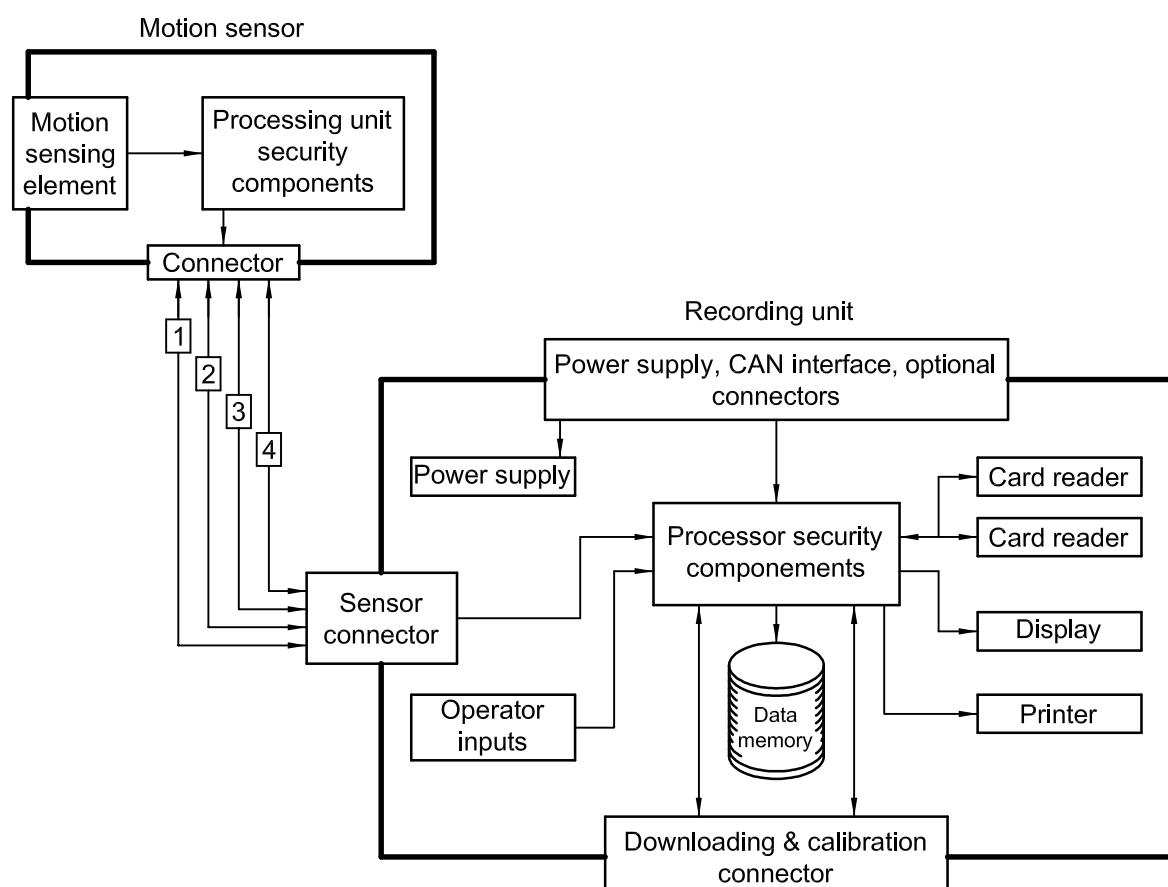
ISO 16844 supports and facilitates the communication between electronic units and a tachograph; the tachograph being based upon Council Regulations (EEC) No. 3820/85 [1] and (EEC) No. 3821/85 [2] and their amendments Council Regulation (EEC) No. 2135/98 [3] and Commission Regulation (EC) No. 1360/2002 [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 | 3 | speed signal, real time |
| 2 | battery minus | 4 | data signal in/out |

Figure 1 — Typical tachograph system

Road vehicles — Tachograph systems —

Part 6: Diagnostics

1 Scope

This part of ISO 16844 specifies diagnostic communication and services in tachograph systems used in road vehicles, for both the controller area network (CAN) and K-line communication modes. It is also applicable for programming purposes.

NOTE The diagnostic services base according to ISO 14229-1 and most services are common to the two communication modes, CAN and K-line. With CAN, however, there is no need for a service to start the communication, as the electronic control unit (ECU) always starts in the standard diagnostic session.

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

ISO 14229-1, *Road vehicles — Unified diagnostic services (UDS) — Part 1: Specification and requirements*

ISO 14230-1, *Road vehicles — Diagnostic systems — Keyword Protocol 2000 — Part 1: Physical layer*

ISO 14230-2, *Road vehicles — Diagnostic systems — Keyword Protocol 2000 — Part 2: Data link layer*

ISO 15765-2, *Road vehicles — Diagnostics on Controller Area Networks (CAN) — Part 2: Network layer services*

ISO 15765-3, *Road vehicles — Diagnostics on Controller Area Networks (CAN) — Part 3: Implementation of unified diagnostic services (UDS on CAN)*

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

3 Abbreviated terms

Cvt. convention

M mandatory

U user option

C conditional

4 Overview and conventions

4.1 Overview

Figure 2 shows the tachograph diagnostic communication links and their layers, based on the OSI (open systems interconnection) model.

NOTE The download protocol specification is not covered by this part of ISO 16844.

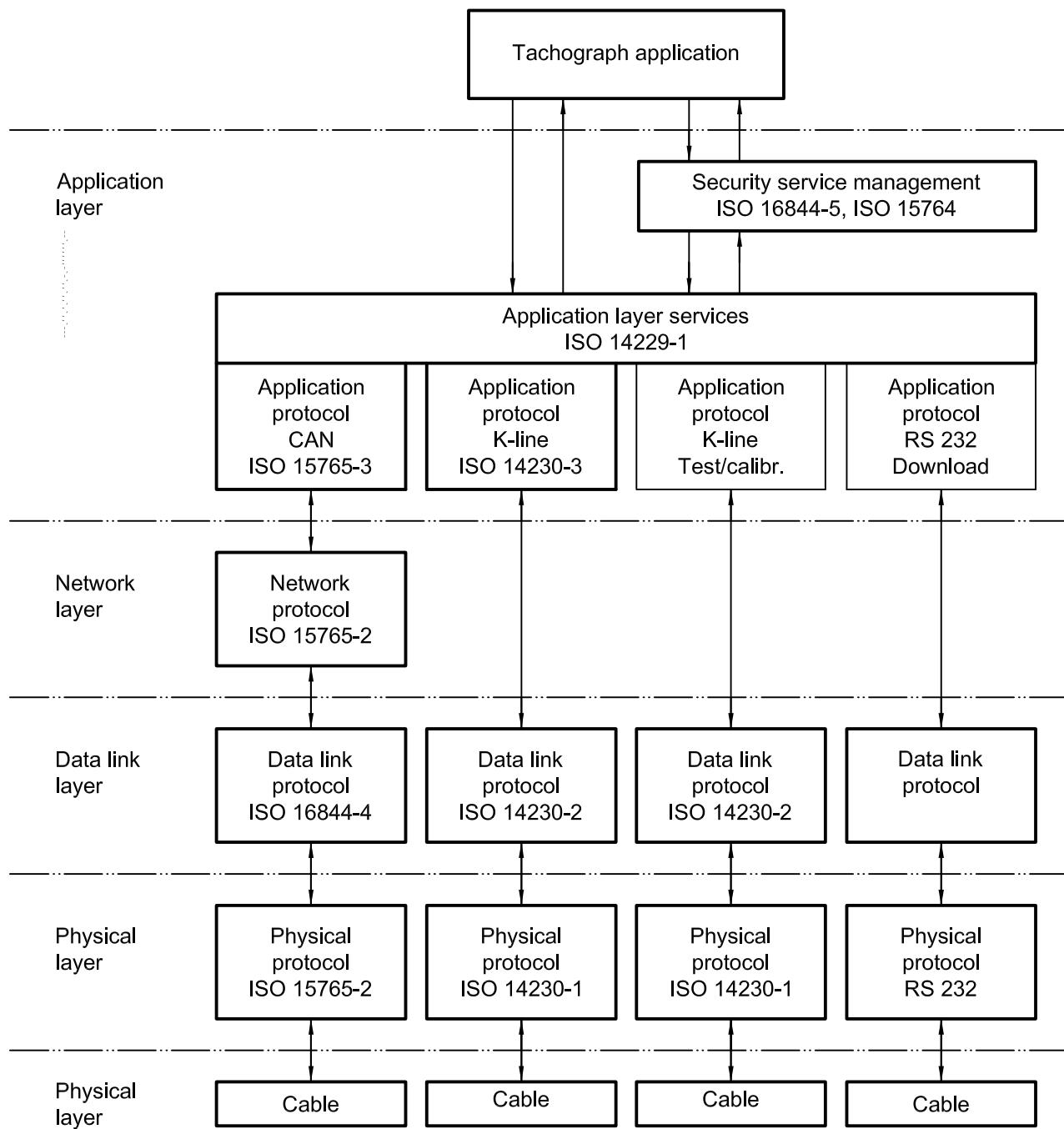


Figure 2 — Tachograph diagnostic communication links

4.2 Service description conventions

The service description conventions according to ISO 14229-1 shall be used.

5 Application layer services

The application layer services shall be implemented according to ISO 14229-1.

6 Application layer protocol

6.1 General

The application layer protocol shall be implemented according to ISO 15765-3 or ISO 14230-2, or both, as well as according to the additional requirements of this clause.

6.2 Application layer timing

6.2.1 Timing parameters for CAN

For CAN, using the data link layer in accordance with ISO 11898-1, the ECU(s) shall respond to a request message within P_{2CAN}. The application timing parameter values for CAN and their requirements shall be in accordance with Table 1.

Table 1 — Application layer timing parameters for CAN

Parameter	Value ms		Description/Requirement
	min.	max.	
P _{2CAN}	0	100	<p>Time between request message and the receipt of all unsegmented response messages and all first frames of segmented response message(s).</p> <p>Each ECU shall start sending its response message within P_{2CAN} after the request message has been correctly received.</p>
P _{2*CAN}	0	5 000	Time between the successful reception of a negative response message with response code 78 _{hex} and the next response message (positive or negative message).

6.2.2 Timing parameters for K-line

The normal timing parameter, set in accordance with ISO 14230-2 (K-line), shall apply, using the data link layer according to 8.2.

7 Network layer (CAN only)

7.1 General

This clause is applicable only when the data link layer in accordance with ISO 11898-1 (CAN) is used.

The network layer shall be implemented in accordance with ISO 15765-2, and according to the additional requirements of 7.2.

NOTE The testerPresent service must be executed in parallel with another ongoing service.

7.2 Communication parameters

The parameter N_WFTmax shall be set to 0, meaning "No FlowControl wait frames are allowed".

The time parameter N_Br shall be < 100 ms.

The time parameter N_Cs shall be < 100 ms.

8 Data link layer

8.1 CAN data link layer

8.1.1 General

The CAN data link layer shall be used with the physical layer according to 9.1.

The data link is shared by the application layer specified in ISO 16844-4 and the diagnostic communication specified in this part of ISO 16844.

8.1.2 Protocol

The protocol used shall be in accordance with ISO 16844-4.

8.1.3 Address coding method

The address coding method "Normal fixed addressing", in accordance with ISO 15765-2, shall be used.

8.2 K-line data link layer

8.2.1 General

The K-line data link layer shall be used with the physical layer according to 9.2.

The requirements given in ISO 14230-2 shall apply, together with the restrictions given in 8.2.2 and 8.2.3 of this part of ISO 16844.

8.2.2 Key bytes

Only the key word 2026 shall be used.

8.2.3 Initialisation

Only the fast initialisation shall be used.

8.2.4 Timing

The normal timing parameter set according to ISO 14230-2 shall apply.

9 Physical layer

9.1 CAN physical layer

The physical layer used for diagnostic communication on CAN shall be accordance with ISO 16844-4.

9.2 K-line physical layer

9.2.1 General

Additional to the CAN physical layer, the K-line physical layer in accordance with ISO 14230-1 may also be used.

9.2.2 Configuration

Only K-line shall be used.

10 Addresses

10.1 General

All ECUs shall be able to respond to both functional and physical diagnostic addresses.

10.2 Functional addresses

The recording equipment shall respond to the functional address 238 as the system address and the functional address 255 addressing all ECUs in the vehicle.

10.3 Physical addresses

Each ECU that is part of the recording unit shall have a physical address. The specific ECU containing the data memory for recorded data shall have the address 238. All other addresses shall be vehicle-manufacturer-specific.

11 Parameters

If a parameter value or a record value consists of more than one byte, the most significant byte shall always be transmitted first, followed by bytes of decreasing significance.

12 Diagnostic services

12.1 General and overview

The diagnostic services shall be in accordance with ISO 14229-1 and with Table 2, which gives a summary and an overview of all diagnostic services that may be available in the tachograph — specifying which sessions and services are mandatory in the tachograph and in which diagnostic sessions the diagnostic services are to be used.

Additional tachograph requirements, subfunctions, parameters and conventions of the diagnostic services are given in 12.2 to 12.7.

Table 2 — Diagnostic service usage and identifier value summary and overview

Diagnostic services			Diagnostic session				
Diagnostic service according to ISO 14229-1	Subclause	Service ID hex value ^a	DS ^b	PRGS ^c	EXTDS ^d	VMS ^e	SSS ^f
Diagnostic and communication management functional unit							
DiagnosticSessionControl	12.2.1	10	M	M	M	M	M
EcuReset	12.2.2	11	U	U	U	U	U
SecurityAccess	12.2.3	27	N	M	U	M	M
CommunicationControl	12.2.4	28	N	M	U	U	U
TesterPresent	12.2.5	3E	M	M	M	M	M
AccessTimingParameter	12.2.8	83	N	U	U	U	U
SecuredDataTransmission	12.2.6	84	N	U	U	U	U
ControlDTCSettings	12.2.7	85	N	M	U	U	U
ResponseOnEvent	12.2.9	86	U	U	U	U	U
LinkControl	12.2.10	87	N	U	U	U	U
Data Transmission functional unit							
ReadDataByIdentifier	12.3.1	22	M	M	M	U	U
ReadMemoryByAddress	12.3.2	23	N	N	N	U	U
ReadScalingDataByIdentifier	12.3.3	24	M	M	M	U	U
ReadDataByPeriodicIdentifier	12.3.4	2A	N	U	U	U	U
DynamicallyDefineDataIdentifier	12.3.5	2C	U	U	U	U	U
WriteDataByIdentifier	12.3.6	2E	N	M	U	U	U
WriteMemoryByAddress	12.3.7	3D	N	N	N	U	U
Stored data transmission functional unit							
ClearDiagnosticInformation	12.4.1	14	M	M	U	U	U
ReadDTCInformation	12.4.2	19	M	M	M	U	U
InputOutput control functional unit							
InputOutputControlByIdentifier	12.5	2F	N	N	M	U	U
Remote activation of routine functional unit							
RoutineControl	12.6	31	N	U	M	U	U
Upload download functional unit							
RequestDownload	12.7.1	34	N	U	N	U	U
RequestUpload	12.7.2	35	N	U	U	U	U
TransferData	12.7.3	36	N	U	U	U	U
RequestTransferExit	12.7.4	37	N	U	U	U	U

Table 2 (continued)

Diagnostic services			Diagnostic session				
Diagnostic service according to ISO 14229-1	Subclause	Service ID hex value ^a	DS ^b	PRGS ^c	EXTDS ^d	VMS ^e	SSS ^f
Data link layer services according to ISO 14230-2							
startCommunication	—	81	M	M	M	M	M
stopCommunication	—	82	M	N	N	N	N
accessTimingParameters	—	83	U	U	U	U	U
M the service is mandatory in this diagnostic session U the service may be available in this diagnostic session N the service is not allowed in this diagnostic session							
^a Assigns the service identifier values for the request message. ^b These services of the defaultSession (DS) may be implemented in each server (ECU) if the electronic system supports the functionality of these services. This session is mandatory. ^c These services of the ProgrammingSession (PRGS) may be implemented to allow for programming of memory (e.g. flash), variant coding, parameters, etc. in the server (ECU). This session is mandatory. ^d These services of the ExtendedDiagnosticSession (EXTDS) may be implemented to allow for adjustment of input/output signals of the server (ECU). This session is mandatory. ^e These services of the vehicleManufacturerSpecificSession (VMS) shall be specified by the vehicle manufacturer. This session is optional and may be as selected by the vehicle manufacturer. ^f These services of the systemSupplierSpecificSession (SSS) shall be specified by the system supplier. This session is optional and may be as selected by the vehicle manufacturer.							

12.2 Diagnostic and communication management functional unit

12.2.1 DiagnosticSessionControl service

The convention of the DiagnosticSessionControl subfunction parameter, DiagnosticSessionType, shall be in accordance with Table 3.

12.2.2 ECURestart service

The convention of the ECURestart subfunction parameter, ResetType, shall be in accordance with Table 4.

Table 3 — DiagnosticSessionControl subfunction parameter DiagnosticSessionType

Hex	Description	Cvt
01	defaultSession	M
02	programmingSession	M
03	extendedDiagnosticSession	M

Table 4 — ECUREset subfunction parameter ResetType

Hex	Description	Cvt.
01	hardReset	U
02	keyOffOnReset	M
03	softReset	U

12.2.3 SecurityAccess service

The convention of the SecurityAccess subfunction parameter, AccessType, shall be in accordance with Table 5.

The delay time for the positive response according to ISO 14229-1 shall be 10 s.

Table 5 — SecurityAccess subfunction parameter AccessType

Hex	Description	Cvt.
01	requestSeed	M
02	sendKey	M
03, 05, 07-5F	requestSeed	U
04, 06, 08-60	sendKey	U

12.2.4 CommunicationControl service

The convention of the CommunicationControl subfunction parameter, ControlType, shall be in accordance with Table 6.

Table 6 — CommunicationControl subfunction parameter ControlType

Hex	Description	Cvt.
00	enableRxAndTx	M
01	enableRxAndDisableTx	M
02	disableRxAndEnableTx	U
03	disableRxAndTx	U

The convention of the CommunicationControl CommunicationType, parameter shall be in accordance with Table 7.

Table 7 — CommunicationControl CommunicationType parameter

Bit 2 - 0 binary	Description	Cvt.
001	normalCommunicationMessages	M
010	networkManagementCommunicationMessages	U
100	diagnosticCommunicationMessages	U



12.2.5 TesterPresent service

The convention of the TesterPresent subfunction parameter shall be in accordance with Table 8.

Table 8 — TesterPresent subfunction parameter

Hex	Description	Cvt.
00/80	zeroSubFunction	M

12.2.6 SecuredDataTransmission service

The convention of the SecuredDataTransmission service shall be in accordance with ISO 16844-5.

12.2.7 ControlDTCSetting service

The convention of the ControlDTCSetting subfunction parameter, DTCSettingType, shall be in accordance with Table 9.

Table 9 — ControlDTCSetting subfunction parameter DTCSettingType

Hex	Description	Cvt.
01	on	M
02	off	M

12.2.8 AccessTimingParameter service

The convention of the AccessTimingParameter subfunction parameter, TimingParameterAccessType, shall be in accordance with Table 10.

Table 10 — AccessTimingParameter subfunction parameter TimingParameterAccessType

Hex	Description	Cvt.
01	readExtendedTimingParameterSet	U
02	setTimingParametersToDefaultValues	U
03	readCurrentlyActiveTimingParameters	U
04	setTimingParametersToGivenValues	U

12.2.9 ResponseOnEvent service

The convention of the ResponseOnEvent subfunction parameter, EventType, shall be in accordance with Table 11.

Table 11 — ResponseOnEvent subfunction parameter EventType

Hex	Description	Cvt.
00	stopResponseOnEvent	M
01	onDTCStatusChange	M
02	onTimerInterrupt	M
03	onChangeOfDataIdentifier	M
04	reportActivatedEvents	U
05	startResponseOnEvent	M
06	clearResponseOnEvent	M
07	OnComparisonOfValues	M

The convention of the ResponseOnEvent EventWindowTime parameter shall be in accordance with Table 12.

Table 12 — ResponseOnEvent EventWindowTime parameter

Hex	Description	Cvt.
02	infiniteTimeToResponse	M

The convention of the ResponseOnEvent ServiceToRespondToRecord parameter shall be in accordance with Table 13.

Table 13 — ResponseOnEvent ServiceToRespondToRecord parameter

SID	Description	Cvt.
22	readDataByIdentifier	U
19	readDTCInformation	M
31	routineControl	U
2F	inputOutputControlByIdentifier	U

12.2.10 LinkControl service

The convention of the LinkControl subfunction parameter, LinkControlType, shall be in accordance with Table 14.

Table 14 — LinkControl subfunction parameter LinkControlType

Hex	Description	Cvt.
01	verifyBaudrateTransitionWithFixedBaudrate	U
02	verifyBaudrateTransitionWithSpecificBaudrate	U
03	transitionBaudrate	U

The convention of the LinkControl BaudrateIdentifier parameter shall be in accordance with Table 15.

Table 15 — LinkControl BaudrateIdentifier parameter

Hex	Description	Cvt.
01	PC9600Baud	U
02	PC19200Baud	U
03	PC38400Baud	U
04	PC57600Baud	U
05	PC115200Baud	U

12.3 Data transmission functional unit

12.3.1 ReadDataByIdentifier service

The convention of ReadDataByIdentifier RecordDataIdentifiers parameter shall be according to ISO 16844-7.

12.3.2 ReadMemoryByAddress service

The convention of the ReadMemoryByAddress service shall be according to ISO 14229-1.

12.3.3 ReadScalingDataByIdentifier service

The convention of the ReadScalingDataByIdentifier service shall be according to ISO 14229-1.

12.3.4 ReadDataByPeriodicIdentifier service

The convention of the ReadDataByPeriodicIdentifier TransmissionMode parameter shall be according to Table 16.

Table 16 — ReadDataByPeriodicIdentifier TransmissionMode parameter

Hex	Description	Cvt.
01	sendAtSlowRate	U
02	sendAtMediumRate	U
03	sendAtFastRate	U
04	stopSending	C ^a

^a This parameter shall be supported if sendAtSlowRate, sendAtMediumRate, and/or sendAtFastRate are supported.

12.3.5 DynamicallyDefineDataIdentifier service

The convention of the DynamicallyDefineDataIdentifier subfunctions shall be in accordance with Table 17.

Table 17 — DynamicallyDefineDataIdentifier subfunctions

Hex	Description	Cvt.
01	defineByIdentifier	U
02	defineByMemoryAddress	C ^a
03	clearDynamicallyDefinedDataIdentifier	U

^a DefineByMemoryAddress shall not be used in defaultSession, programmingSession and extendedDiagnosticSession.

12.3.6 WriteDataByIdentifier service

The convention of the WriteDataByIdentifier service shall be in accordance with ISO 14229-1.

12.3.7 WriteMemoryByAddress service

The convention of the WriteMemoryByAddress service shall be in accordance with ISO 14229-1.

12.4 Stored data transmission functional unit

12.4.1 ClearDiagnosticInformation service

The convention of the ClearDiagnosticInformation GroupOfDTC parameter shall be in accordance with Table 18.

Table 18 — ClearDiagnosticInformation GroupOfDTC parameter

Hex	Description	Cvt.
000000 - FFFFFE	Individual DTC	M
FFFFFFFFFF	allDTCs	M

12.4.2 ReadDTCInformation service

The convention of the ReadDTCInformation subfunctions shall be in accordance with Table 19.

Table 19 — ReadDTCInformation subfunctions

Hex	Description	Cvt.
01	reportNumberOfDTCByStatusMask	M
02	reportDTCByStatusMask	M
03	reportDTCSnapshotIdentification	U
04	reportDTCSnapshotRecordByDTCNumber	U
05	reportDTCSnapshotRecordByRecordNumber	U
06	reportDTCExtendedDataRecordByDTCNumber	M
07	reportNumberOfDTCBySeverityMaskRecord	M
08	reportDTCBySeverityMaskRecord	M
09	reportSeverityInformationOfDTC	U
0A	reportSupportedDTC	U
0B	reportFirstTestFailedDTC	U
0C	reportFirstConfirmedDTC	U
0D	reportMostRecentTestFailedDTC	U
0E	reportMostRecentConfirmedDTC	U
0F	reportMirrorMemoryDTCByStatusMask	U
10	reportMirrorMemoryDTCExtendedDataRecordByDTCNumber	U
11	reportNumberOfMirrorMemoryDTCByStatusMask	U

The convention of the ReadDTCInformation DTC status bits shall be in accordance with Table 20.

Table 20 — ReadDTCInformation DTC status bits

Bit	Description	Cvt.
0	testFailed	M
1	testFailedThisMonitoringCycle	C ^a
2	pendingDTC	U
3	confirmedDTC	M
4	testNotCompletedSinceLastClear	M
5	testFailedSinceLastClear	M
6	testNotCompletedThisMonitoringCycle	M
7	warningIndicatorRequested	M

^a Bit 1 (testFailedThisMonitoringCycle) is Mandatory if bit 2 (pendingDTC) is supported. Bit 1 (testFailedThisMonitoringCycle) is User Optional if bit 2 (pendingDTC) is not supported.

12.5 InputOutput control functional unit

12.5.1 InputOutputControlByIdentifier service

The convention of the InputOutputControlByIdentifier InputOutputControlParameter shall be in accordance with Table 21.

The ControlState parameter shall be present only when the InputOutputControlParameter is set to ShortTermAdjustment in the InputOutputControl service.

The setting may be read by the service ReadDataByIdentifier. The DataRecord in the response shall be equal to the parameter ControlState.

Table 21 — InputOutputControlByIdentifier InputOutputControlParameter

Hex	Description	Cvt.
00	returnControlToECU	M
01	resetToDefault	U
02	freezeCurrentState	U
03	shortTermAdjustment ^a	M
^a ShortTermAdjustment shall not be used in defaultSession.		

12.6 Remote activation of routine functional unit

The convention of the RoutineControl subfunctions shall be in accordance with Table 22.

Table 22 — RoutineControl subfunctions

Hex	Definition	Cvt.
01	startRoutine	M
02	stopRoutine	U
03	requestRoutineResults	U

The convention of the RoutineControl parameter RoutineStatusRecord shall be in accordance with Table 23 when used for exiting status.

Table 23 — RoutineControl RoutineStatusRecord parameter

Hex	Description	Cvt.
61	normalExitWithResultsAvailable	U
62	normalExitWithoutResultsAvailable	U
63	abnormalExitWithResultsAvailable	U
64	abnormalExitWithoutResultsAvailable	U

12.7 Upload download functional unit

12.7.1 RequestDownload service

The convention of the RequestDownload service shall be in accordance with ISO 14229-1.

12.7.2 RequestUpload service

The convention of the RequestUpload service shall be according to ISO 14229-1.

12.7.3 TransferData service

The convention of the TransferData service shall be according to ISO 14229-1.

12.7.4 RequestTransferExit service

The convention of the RequestTransferExit service shall be according to ISO 14229-1.

Bibliography

- [1] Council Regulation (EEC) No. 3820/85 of 20 December 1985 on the harmonization of certain social legislation relating to road transport
- [2] Council Regulation (EEC) No. 3821/85 of 20 December 1985 on recording equipment in road transport
- [3] Council Regulation (EEC) No. 2135/98 of 24 September 1998 amending Regulation (EEC) No. 3821/85 on recording equipment in road transport and Directive 88/599/EEC concerning the application of Regulations (EEC) No. 3820/85 and (EEC) No. 3821/85
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