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Working Party on Road Transport

EUROPEAN AGREEMENT CONCERNING THE WORK OF CREWS OF VEHICLES ENGAGED IN INTERNATIONAL ROAD TRANSPORT (AETR)

Note by the secretriat

Addendum

Appendix 1B of the Annex to the AETR related to Requirements for Construction, Testing, Installation, and Inspection of the Digital Control Device used in Road Transport

Consolidated version

1. This document is submitted in conformity with the mandate given to the secretariat of the United Nations Economic Commission for Europe (UNECE) by Article 1 (Preamble), paragraph 2, introducing Appendix 1B of the Annex to the European Agreement concerning the Work of Crews of Vehicles Engaged in International Road Transport (AETR) (see ECE/TRANS/SC.1/2006/2). According to this mandate, the secretariat has elaborated a consolidated version of this Appendix taking into account the modifications described in Article 2 introducing this Appendix and incorporating successive amendments and corrections brought by the EU to the basic text (named Annex 1B). This consolidated version having a purely documentary value, **no legal value must be attached to it.**

2. To consult the official text of Annex 1B (whose Appendix 1B is an adaptation) in force in the European Union, Contracting Parties are invited to refer to Commission Regulations No. 1360/2002 of 13 June 2002 and No. 432/2004 of 5 March 2004, adapting for the seventh and eighth times to technical progress Council Regulation (EEC) No. 3821/85 concerning recording equipment in the field of road transport, and preferably to the original English version of these documents.

APPENDIX 1B
OF THE ANNEX TO THE AETR

REQUIREMENTS FOR CONSTRUCTION, TESTING, INSTALLATION, AND INSPECTION OF THE DIGITAL CONTROL DEVICE USED IN ROAD TRANSPORT

(Consolidated version)

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SUB-APPENDIXES

I. DEFINITIONS

In this Appendix:

a) “activation” means:

phase where the control device becomes fully operational and implements all functions, including security functions;

Activating a control device requires the use of a workshop card and the entry of its PIN code.

b) “authentication” means:

A function intended to establish and verify a claimed identity;

c) “authenticity” means:

The property that an information is coming from a party whose identity can be verified;

d) “built-in-test (BIT)” means:

Tests run at request, triggered by the operator or by an external equipment;

e) “calendar day” means:

a day ranging from 00.00 hours to 24.00 hours. All calendar days relate to UTC time (Universal Time Co-ordinated);

f) “calibration” means:

updating or confirming vehicle parameters to be held in the data memory. Vehicle parameters include vehicle identification (VIN, VRN and registering Contracting Party) and vehicle characteristics (w, k, l, tyre size, speed limiting device setting (if applicable), current UTC time, current odometer value);

Calibrating a control device requires the use of a workshop card.

g) “card number” means:

a 16 alpha-numerical characters number that uniquely identifies a tachograph card within a Contracting Party. The card number includes a consecutive index (if applicable), a replacement index and a renewal index;

A card is therefore uniquely identified by the code of the issuing Contracting Party and the card number.

h) “card consecutive index” means:

the 14th alpha-numerical character of a card number that is used to differentiate the different cards issued to a company or a body entitled to be issued several tachograph cards. The company or the body is uniquely identified by the 13 first characters of the card number;

i) “card renewal index” means:

the 16th alpha-numerical character of a card number which is incremented each time a tachograph card is renewed;

j) “card replacement index” means:

the 15th alpha-numerical character of a card number which is incremented each time a tachograph card is replaced;

k) “characteristic coefficient of the vehicle” means:

the numerical characteristic giving the value of the output signal emitted by the part of the vehicle linking it with the control device (gearbox output shaft or axle) while the vehicle travels a distance of one kilometre under standard test conditions (see Chapter VI.-5.). The characteristic coefficient is expressed in impulses per kilometre (w = … imp/km);

l) “company card” means:

a tachograph card issued by the authorities of a Contracting Party to the owner or holder of vehicles fitted with control devices

The company card identifies the company and allows for displaying, downloading and printing of the data stored in the control device which has been locked by this company.

m) “constant of the control device” means:

the numerical characteristic giving the value of the input signal required to show and record a distance travelled of one kilometre; this constant shall be expressed in impulses per kilometre (k = … imp/km);

n) “continuous driving time” is computed within the control device as[1] the continuous driving time is computed as the current accumulated driving times of a particular driver, since the end of his last AVAILABILITY or BREAK/REST or UNKNOWN[2] period of 45 minutes or more (this period may have been split in several periods of 15 minutes or more). The computations involved take into account, as needed, past activities stored on the driver card. When the driver has not inserted his card, the computations involved are based on the data memory recordings related to the current period where no card was inserted and related to the relevant slot;

o) “control card” means:

a tachograph card issued by the authorities of a Contracting Party to a national competent control authority;

The control card identifies the control body and possibly the control officer and allows for getting access to the data stored in the data memory or in the driver cards for reading, printing and/or downloading.

[1] This way of computing the continuous driving time and the cumulative break time serves into the control device for computing the continuous driving time warning. It does not prejudge the legal interpretation to be made of these times.

[2] UNKNOWN periods correspond to periods where the driver’s card was not inserted in a control device and for which no manual entry of driver activities was made.

p) "cumulative break time" is computed within the control device as:

the cumulative break from driving time is computed as the current accumulated AVAILABILITY or BREAK/REST or UNKNOWN[2] times of 15 minutes or more of a particular driver, since the end of his last AVAILABILITY or BREAK/REST or UNKNOWN[2] period of 45 minutes or more(this period may have been split in several periods of 15 minutes or more).

The computations involved take into account, as needed, past activities stored on the driver card. Unknown periods of negative duration (start of unknown period > end of unknown period) due to time overlaps between two different control devices, are not taken into account for the computation.

When the driver has not inserted his card, the computations involved are based on the data memory recordings related to the current period where no card was inserted and related to the relevant slot;

q) "data memory" means:

an electronic data storage device built into the control device;

r) "digital signature" means:

data appended to, or a cryptographic transformation of, a block of data that allows the recipient of the block of data to prove the authenticity and integrity of the block of data;

s) "downloading" means:

copying together with digital signature of a part or of a complete set of data stored in the data memory of the vehicle or in the memory of a tachograph card;

Downloading may not alter or delete any stored data.

t) "driver card" means:

a tachograph card issued by the authorities of a Contracting Party to a particular driver;

The driver card identifies the driver and allows for storage of driver activity data.

u) "effective circumference of the wheel tyres" means:

the average of the distances travelled by each of the wheels moving the vehicle (driving wheels) in the course of one complete rotation. The measurement of these distances shall be made under standard test conditions (Chapter VI-5.) and is expressed in the form "l = … mm". Vehicle manufacturers may replace the measurement of these distances by a theoretical calculation which takes into account the distribution of the weight on the axles, vehicle unladen in normal running order[3]. The methods for such theoretical calculation will be approved by a competent Contracting Party authority;

[3] The measurement of distances conforms to the provisions of Council Directive No. 97/27/EC of 22 July 1997 relating to the masses and dimensions of certain categories of motor vehicles and their trailers and amending Directive 70/156/EEC (OJ L 233, 25.08.97).

v) “event” means:

abnormal operation detected by the control device which may come from a fraud attempt;

w) “fault” means:

abnormal operation detected by the control device which may come from an equipment malfunction or failure;

x) “installation” means:

mounting of the control device in a vehicle;

y) “motion sensor” means:

part of the control device, providing a signal representative of vehicle speed and/or distance travelled;

z) “non valid card” means:

a card detected as faulty, or which initial authentication failed, or which start of validity date is not yet reached, or which expiry date has passed;

aa) “out of scope” means:

when the use of the control device is not required, according to the provisions of this Agreement.

bb) “over speeding” means:

exceeding the authorised speed of the vehicle, defined as any period of more than 60 seconds during which the vehicle’s measured speed exceeds the limit for setting the speed limitation device[4].

cc) “periodic inspection” means:

set of operations performed to control that the control device works properly and that its settings correspond to the vehicle parameters;

dd) “printer” means:

component of the control device which provides printouts of stored data;

ee) “control device”means:

the total equipment intended for installation in road vehicles to show, record and store automatically or semi-automatically details of the movement of such vehicles and of certain work periods of their drivers;

[4] The limit for setting the speed limitation device conforms to the provisions of Council Directive No. 92/6/EEC of 10 February 1992 on the installation and use of speed limitation devices for certain categories of motor vehicles in the Community (OJ No L 057, 02/03/1992)

ff) "renewal" means:

issue of a new tachograph card when an existing card reaches its expiry date, or is malfunctioning and has been returned to the issuing authority. Renewal always implies the certainty that two valid cards do not co-exist;

gg) "repair" means:

any repair of a motion sensor or of a vehicle unit that requires disconnection of its power supply, or disconnection from other control device components, or opening of it;

hh) "replacement" means:

issue of a tachograph card in replacement of an existing card, which has been declared lost, stolen or malfunctioning and has not been returned to the issuing authority. Replacement always implies a risk that two valid cards may co-exist;

ii) "security certification" means:

process to certify, by a certification authority [5] that the control device (or component) or the tachograph card under investigation fulfils the security requirements defined in sub-appendix 10 Generic security targets;

jj) "self test" means:

tests run cyclically and automatically by the control device to detect faults;

kk) "tachograph card" means:

smart card intended for use with the control device. Tachograph cards allow for identification by the control device of the identity (or identity group) of the cardholder and allow for data transfer and storage. A tachograph card may be of the following types:

- driver card,
- control card,
- workshop card,
- company card;

ll) "type approval" means:

Process to certify, by a Contracting Party, that the control device (or component) or the tachograph card under investigation fulfils the requirements of the AETR;

mm) "tyre size" means:

the designation of the dimensions of the tyres (external driving wheels) in accordance with ECE Regulation N°54[6];.

[5] The provisions on security shall conform with the provisions laid out in Council Recommendation 95/144/CE of 7 April 1995 on common information technology security evaluation criteria (O.J. No L093, 26/04/1995).

[6] Reference text in the EU is Directive 92/23/EEC of 31 March 1992 relating to tyres for motor vehicles and their trailers and to their fitting (OJ No L 129, 14/05/1992).

nn) "vehicle identification" means:

numbers identifying the vehicle: Vehicle Registration Number (VRN) with indication of the registering Contracting Party and Vehicle Identification Number (VIN)[7];

oo) "vehicle unit (VU)" means:

the control device excluding the motion sensor and the cables connecting the motion sensor. The vehicle unit may either be a single unit or be several units distributed in the vehicle, as long as it complies with the security requirements of the AETR;

pp) for computing sake in the control device "week" means:

the period between 00.00 hours UTC on Monday and 24.00 UTC on Sunday;

qq) "workshop card" means:

a tachograph card issued by the authorities of a Contracting Party to a control device manufacturer, a fitter, a vehicle manufacturer or workshop, approved by that Contracting Party.

The workshop card identifies the cardholder and allows for testing, calibration and/or downloading of the control device.

[7] Vehicle identification conforms to the provisions of Council Directive No. 76/114/EEC of 18 December 1975 on the approximation of the laws of the Member States relating to statutory plates and inscriptions for motor vehicles and their trailers, and their location and method of attachment (OJ, No. L 24, 30/01/1976).

II. GENERAL CHARACTERISTICS AND FUNCTIONS OF THE RECORDING EQUIPMENT

000 Any vehicle fitted with the control device complying with the provisions of this Appendix, must include a speed display and an odometer. These functions may be included within the control device.

1. General characteristics

The purpose of the control device is to record, store, display, print, and output data related to driver activities.

001 The control device includes cables, a motion sensor, and a vehicle unit.

002 The vehicle unit includes a processing unit, a data memory, a real time clock, two smart card interface devices (driver and co-driver), a printer, a display, a visual warning, a calibration/downloading connector, and facilities for entry of user's inputs.

The control device may be connected to other devices through additional connectors.

003 Any inclusion in or connection to the control device of any function, device, or devices, approved or otherwise, shall not interfere with, or be capable of interfering with, the proper and secure operation of the control device and the provisions of this Agreement.

Control device users identify themselves to the equipment via tachograph cards.

004 The control device provides selective access rights to data and functions according to user's type and/or identity.

The control device records and stores data in its data memory and in tachograph cards.

This is done in accordance with the European provisions on the protection of individuals with regard to the processing of personal data and on the free movement of such data[8].

2. Functions

005 The control device shall ensure the following functions:

- monitoring cards insertions and withdrawals,
- speed and distance measurement,
- time measurement,
- monitoring driver activities,
- monitoring driving status,
- drivers manual entries:
    - entry of places where daily work periods begin and/or end,
    - manual entry of driver activities,
    - entry of specific conditions,

[8] The protection of individuals with regard to the processing of personal data and the free movement of such data conform to the provisions of Council Directive No. 95/46/EC of 24 October 1995, as last amended (OJ, No. L 281, 23/11/1995).

- company locks management,
- monitoring control activities,
- detection of events and/or faults,
- built-in and self tests,
- reading from data memory,
- recording and storing in data memory,
- reading from tachograph cards,
- recording and storing in tachograph cards,
- displaying,
- printing,
- warning,
- data downloading to external media,
- output data to additional external devices,
- calibration,
- time adjustment.

3. Modes of operation

006 The control device shall possess four modes of operation:

- operational mode,
- control mode,
- calibration mode,
- company mode.

007 The control device shall switch to the following mode of operation according to the valid tachograph cards inserted into the card interface devices:

Mode of operation		Driver slot				
		No card	Driver card	Control card	Workshop card	Company card
Co-driver slot	No card	Operational	Operational	Control	Calibration	Company
	Driver card	Operational	Operational	Control	Calibration	Company
	Control card	Control	Control	Control (*)	Operational	Operational
	Workshop card	Calibration	Calibration	Operational	Calibration (*)	Operational
	Company card	Company	Company	Operational	Operational	Company (*)

008 (*) In these situations the control device shall use only the tachograph card inserted in the driver slot.

009 The control device shall ignore non valid cards inserted, except displaying, printing or downloading data held on an expired card which shall be possible.

010 All functions listed in II.2. shall work in any mode of operation with the following exceptions:

- the calibration function is accessible in the calibration mode only,
- the time adjustment function is limited when not in the calibration mode,
- the driver manual entries functions are accessible in operational or calibration modes only,
- the company locks management function is accessible in the company mode only,
- the monitoring of control activities function is operational in the control mode only,
- the downloading function is not accessible in the operational mode (except as provided for in Requirement 150).

011 The control device can output any data to display, printer or external interfaces with the following exceptions:

- in the operational mode, any personal identification (surname and first name(s)) not corresponding to a tachograph card inserted shall be blanked and any card number not corresponding to a tachograph card inserted shall be partially blanked (every odd character – from left to right - shall be blanked),
- in the company mode, driver related data (requirements 081, 084 and 087) can be output only for periods not locked by another company (as identified by the first 13 digits of the company card number),
- when no card is inserted in thecontrol device, driver related data can be output only for the current and 8 previous calendar days.

4. Security

The system security aims at protecting the data memory in such a way as to prevent unauthorised access to and manipulation of the data and detecting any such attempts, protecting the integrity and authenticity of data exchanged between the motion sensor and the vehicle unit, protecting the integrity and authenticity of data exchanged between the control device and the tachograph cards, and verifying the integrity and authenticity of data downloaded.

012 In order to achieve the system security, the control device shall meet the security requirements specified in the motion sensor and vehicle unit generic security targets (sub-appendix 10).

III. CONSTRUCTION AND FUNCTIONAL REQUIREMENTS FOR RECORDING EQUIPMENT

1. Monitoring cards insertion and withdrawal

013 The control device shall monitor the card interface devices to detect card insertions and withdrawals.

014 Upon card insertion the control device shall detect whether the card inserted is a valid tachograph card and in such a case identify the card type.

015 The control device shall be so designed that the tachograph cards are locked in position on their proper insertion into the card interface devices.

016 The release of tachograph cards may function only when the vehicle is stopped and after the relevant data have been stored on the cards. The release of the card shall require positive action by the user.

2. Speed and distance measurement

017 This function shall continuously measure and be able to provide the odometer value corresponding to the total distance travelled by the vehicle.

018 This function shall continuously measure and be able to provide the speed of the vehicle.

019 The speed measurement function shall also provide the information whether the vehicle is moving or stopped. The vehicle shall be considered as moving as soon as the function detects more than 1 imp/sec for at least 5 seconds from the motion sensor, otherwise the vehicle shall be considered as stopped.

Devices displaying speed (speedometer) and total distance travelled (odometer) installed in any vehicle fitted with a control device complying with the provisions of this Ageement, shall comply with the requirements relating to maximum tolerances laid down in this Appendix (Chapters III.2.1 and III.2.2).

2.1 Measurement of distance travelled

020 The distance travelled may be measured either:

- so as to cumulate both forward and reverse movements, or
- so as to include only forward movement.

021 The control device shall measure distance from 0 to 9 999 999.9 km.

022 Distance measured shall be within the following tolerances (distances of at least 1000 m.):

- ± 1% before installation,
- ± 2% on installation and periodic inspection,
- ± 4% in use.

023 Distance measured shall have a resolution better than or equal to 0.1 km.

2.2 Measurement of speed

024 The control device shall measure speed from 0 to 220 km/h.

025 To ensure a maximum tolerance on speed displayed of ± 6 km/h in use, and taking into account:

- a ± 2 km/h tolerance for input variations (tyre variations, …),
- a ± 1 km/h tolerance in measurements made during installation or periodic inspections,

the control device shall, for speeds between 20 and 180 km/h, and for characteristic coefficients of the vehicle between 4000 and 25000 imp/km, measure the speed with a tolerance of ± 1 km/h (at constant speed).

Note: The resolution of data storage brings an additional tolerance of ± 0.5 km/h to speed stored by the control device.

025a The speed shall be measured correctly within the normal tolerances within 2 seconds of the end of a speed change when the speed has changed at a rate up to 2m/s².

026 Speed measurement shall have a resolution better than or equal to 1 km/h.

3. Time measurement

027 The time measurement function shall measure permanently and digitally provide UTC date and time.

028 UTC date and time shall be used for dating throughout the control device (recordings, printouts, data exchange, display, …).

029 In order to visualise the local time, it shall be possible to change the offset of the time displayed, in half hour steps.

030 Time drift shall be within ± 2 seconds per day in type approval conditions.

031 Time measured shall have a resolution better than or equal to 1 second.

032 Time measurement shall not be affected by an external power supply cut-off of less than 12 months in type approval conditions.

4 Monitoring driver activities

033 This function shall permanently and separately monitor the activities of one driver and one co-driver.

034 Driver activity shall be DRIVING, WORK, AVAILABILITY, or BREAK/REST.

035 It shall be possible for the driver and/or the co-driver to manually select WORK, AVAILABILITY, or BREAK/REST.

036 When the vehicle is moving, DRIVING shall be selected automatically for the driver and AVAILABILITY shall be selected automatically for the co-driver.

037 When the vehicle stops, WORK shall be selected automatically for the driver.

038 The first change of activity arising within 120 seconds of the automatic change to WORK due to the vehicle stop shall be assumed to have happened at the time of vehicle stop (therefore possibly cancelling the change to WORK).

039 This function shall output activity changes to the recording functions at a resolution of one minute.

040 Given a calendar minute, if any DRIVING activity has occurred within the minute, the whole minute shall be regarded as DRIVING.

041 Given a calendar minute, if any DRIVING activity has occurred within both the immediately preceding and the immediately succeeding minute, the whole minute shall be regarded as DRIVING.

042 Given a calendar minute that is not regarded as DRIVING according to previous requirements, the whole minute shall be regarded to be of the same type of activity as the longest continuous activity within the minute (or the latest of the equally longests).

043 This function shall also permanently monitor the continuous driving time and the cumulative break time of the driver.

5. Monitoring driving status

044 This function shall permanently and automatically monitor the driving status.

045 The driving status CREW shall be selected when two valid driver cards are inserted in the equipment, the driving status SINGLE shall be selected in any other case.

6. Drivers manual entries

6.1 Entry of places where daily work periods begin and/or end

046 This function shall allow for the entry of places where the daily work periods begin and/or end for a driver and/or a co-driver.

047 Places are defined as the country and, in addition where applicable, the region.

048 At the time of a driver (or workshop) card withdrawal, the control device shall prompt the (co-)driver to enter a “place where the daily work period ends”.

049 The control device shall allow this request to be disregarded.

050 It shall be possible to input places where daily work periods begin and/or end without card or at times other than card insertion or withdrawal.

6.2 Manual entry of driver activities

050a Upon driver (or workshop) card insertion, and only at this time, the control device shall:

- remind the cardholder the date and time of his last card withdrawal and,
- ask the cardholder to identify if the current insertion of the card represents a continuation of the current daily work period.

The control device shall allow the card holder to disregard the question without answering, or to answer positively, or to answer negatively:

- In the case where the cardholder disregards the question, the control device shall prompt the cardholder for a “place where the daily work period begins”. The control device shall allow this request to be disregarded. If a location is entered, then it shall be recorded, in the data memory and in the tachograph card, and related to the card insertion time.

- In the case of a negative or positive answer, the control device shall invite the cardholder to enter activities manually, with their dates and times of beginning and end, among WORK, AVAILABILITY, or BREAK/REST only, strictly included within the period last card withdrawal – current insertion only, and without allowing such activities to overlap mutually. This shall be done in accordance with the following procedures:

- In the case where the cardholder answers positively to the question, the control device shall invite the cardholder to enter activities manually, in chronological order, for the period last card withdrawal – current insertion. The process shall end when the end time of a manually entered activity equals the card insertion time.
- In the case where the cardholder answers negatively to the question, the control device shall:
    - Invite the card holder to enter manually activities in chronological order from the card withdrawal time up to the time of end of the related daily work period (or of the activities related to that vehicle in the case where the daily work period continues on a record sheet). The control device shall therefore, before allowing the cardholder to enter manually each activity, invite the cardholder to identify if the time of end of the last recorded activity represents the end of a previous work period (see note below),

      Note: In the case where the cardholder fails to declare when the previous work period ended, and manually enters an activity which end time equals the card insertion time, the control device shall:

        - Assume that the daily work period ended at the start of the first REST (or remaining UNKNOWN) period after card withdrawal or at the time of card withdrawal if no rest period has been entered (and if no period remains UNKNOWN),
        - Assume that the start time (see below) equals the card insertion time,
        - Proceed through the steps below.
    - Then, if the time of end of the related work period is different from the time of card withdrawal , or if no place of end of daily work period had been entered at that time, prompt the cardholder to “confirm or enter the place where the daily work period ended” (the control device shall allow this request to be disregarded). If a location is entered, it shall be recorded in the tachograph card only and only if different from the one entered at card withdrawal (if one was entered), and related to the time of end of the work period,
    - Then invite the cardholder to “enter a start time” of the current daily work period (or of the activities related to the current vehicle in the case where the card holder previously used a record sheet during this period), and prompt the cardholder for a “place where the daily work period begins” (the control device shall allow this request to be disregarded). If a location is entered, it shall be recorded in the tachograph card and related to this start time. If this start time is equal to the card insertion time, the location shall also be recorded in the data memory,
    - Then, if this start time is different from the card insertion time, invite the cardholder to enter manually activities in chronological order from this start time up to the time of card insertion. The process shall end when the end time of a manually entered activity equals the card insertion time.
- The control device shall then allow the card holder to modify any activity manually entered, until validation by selection of a specific command, and thereafter forbid any such modification.
- Such answers to the initial question followed by no activity entries, shall be interpreted by the as if the cardholder had disregarded the question.

During this whole process, the control device shall wait for entries no longer than the following time-outs:

- if no interaction with the equipment’s human machine interface is happening during 1 minute (with a visual, and possibly audible, warning after 30 seconds) or,
- if the card is withdrawn or another driver (or workshop) card is inserted or,
- as soon as the vehicle is moving,

in this case the control device shall validate any entries already made.

6.3 Entry of specific conditions

050b The shall allow the driver to enter, in real time, the following two specific conditions:

- “OUT OF SCOPE” (begin, end)
- “FERRY / TRAIN CROSSING”

A “FERRY / TRAIN CROSSING” may not occur if an “OUT OF SCOPE” condition is opened.

An opened “OUT OF SCOPE” condition must be automatically closed, by the control device , if a driver card is inserted or withdrawn.

7. Company locks management

051 This function shall allow the management of the locks placed by a company to restrict data access in company mode to itself.

052 Company locks consist in a start date/time (lock-in) and an end date/time (lock-out) associated with the identification of the company as denoted by the company card number (at lock-in).

053 Locks may be turned “in” or “out” in real time only.

054 Locking-out shall only be possible for the company whose lock is “in” (as identified by the first 13 digits of the company card number), or,

055 locking-out shall be automatic if another company locks in.

055a In the case where a company locks in and where the previous lock was for the same company, then it will be assumed that the previous lock has not been turned “out” and is still “in”.

8. Monitoring control activities

056 This function shall monitor DISPLAYING, PRINTING, VU and card DOWNLOADING activities carried while in control mode.

057 This function shall also monitor OVER SPEEDING CONTROL activities while in control mode. An over speeding control is deemed to have happened when, in control mode, the “over speeding” printout has been sent to the printer or to the display, or when “events and faults” data have been downloaded from the VU data memory.

9. Detection of events and/or faults

058 This function shall detect the following events and/or faults:

9.1 “Insertion of a non valid card” event

059 This event shall be triggered at the insertion of any non valid card and/or when an inserted valid card expires.

9.2 “Card conflict” event

060 This event shall be triggered when any of the valid cards combination noted X in the following table arise:

Card conflict		Driver slot				
		No card	Driver card	Control card	Workshop card	Company card
Co-driver slot	No card					
	Driver card				X	
	Control card			X	X	X
	Workshop card		X	X	X	X
	Company card			X	X	X

9.3 “Time overlap” event

061 This event shall be triggered when the date / time of last withdrawal of a driver card, as read from the card, is later than the current date / time of the control device in which the card is inserted.

9.4 “Driving without an appropriate card” event

062 This event shall be triggered for any tachograph cards combination noted X in the following table, when driver activity changes to DRIVING, or when there is a change of the mode of operation while driver activity is DRIVING:

Driving without an appropriate card		Driver slot				
		No (or non valid) card	Driver card	Control card	Workshop card	Company card
Co-driver slot	No (or non valid) card	X		X		X
	Driver card	X		X	X	X
	Control card	X	X	X	X	X
	Workshop card	X	X	X		X
	Company card	X	X	X	X	X

9.5 “Card insertion while driving” event

063 This event shall be triggered when a tachograph card is inserted in any slot, while driver activity is DRIVING.

9.6 “Last card session not correctly closed” event

064 This event shall be triggered when at card insertion the control device detects that, despite the provisions laid down in paragraph III.1., the previous card session has not been correctly closed (the card has been withdrawn before all relevant data have been stored on the card). This event shall be triggered by driver and workshop cards only.

9.7 “Over speeding” event

065 This event shall be triggered for each over speeding.

9.8 “Power supply interruption” event

066 This event shall be triggered, while not in calibration mode, in case of any interruption exceeding 200 milliseconds of the power supply of the motion sensor and/or of the vehicle unit. The interruption threshold shall be defined by the manufacturer. The drop in power supply due to the starting of the engine of the vehicle shall not trigger this event.

9.9 “Motion data error” event

067 This event shall be triggered in case of interruption of the normal data flow between the motion sensor and the vehicle unit and/or in case of data integrity or data authentication error during data exchange between the motion sensor and the vehicle unit.

9.10 “Security breach attempt” event

068 This event shall be triggered for any other event affecting the security of the motion sensor and/or of the vehicle unit as specified within the generic security targets of these components, while not in calibration mode.

9.11 “Card” fault

069 This fault shall be triggered when a tachograph card failure occurs during operation.

9.12 “Control device ” fault

070 This fault shall be triggered for any of these failures, while not in calibration mode:

- VU internal fault
- Printer fault
- Display fault
- Downloading fault
- Sensor fault

10 Built-in and self tests

071 The control device shall self-detect faults through self tests and built-in-tests, according to the following table:

Sub-assembly to test	self test	Built-in-test
Software		Integrity
Data memory	Access	Access, data integrity
Card interface devices	Access	Access
Keyboard		Manual check
Printer	(up to manufacturer)	Printout
Display		Visual check
Downloading (performed only during downloading)	Proper operation	
Sensor	Proper operation	Proper operation

11. Reading from data memory

072 The control device shall be able to read any data stored in its data memory.

12. Recording and storing in the data memory

For the purpose of this paragraph,

- "365 days" is defined as 365 calendar days of average drivers activity in a vehicle. The average activity per day in a vehicle is defined as at least 6 drivers or co-drivers, 6 card insertion withdrawal cycles, and 256 activity changes. "365 days" therefore include at least 2190 (co-)drivers, 2190 card insertion withdrawal cycles, and 93440 activity changes.
- times are recorded with a resolution of one minute, unless otherwise specified,
- odometer values are recorded with a resolution of one kilometre.
- speeds are recorded with a resolution of 1 km/h.

073 Data stored into the data memory shall not be affected by an external power supply cut-off of less than twelve months in type approval conditions.

074 The control device shall be able to record and store implicitly or explicitly in its data memory the following:

12.1 Equipment identification data

12.1.1 Vehicle Unit identification data

075 The control device shall be able to store in its data memory the following vehicle unit identification data:

- name of the manufacturer,
- address of the manufacturer,
- part number,
- serial number,
- software version number,
- software version installation date,
- year of equipment manufacture,
- approval number,

076 Vehicle unit identification data are recorded and stored once and for all by the vehicle unit manufacturer, except the software related data and the approval number which may be changed in case of software upgrade.

12.1.2 Motion sensor identification data

077 The motion sensor shall be able to store in its memory the following identification data:

- name of the manufacturer,
- part number,
- serial number,
- approval number,
- embedded security component identifier (e.g. internal chip/processor part number),
- operating system identifier (e.g. software version number).

078 Motion sensor identification data are recorded and stored once and for all in the motion sensor, by the motion sensor manufacturer.

079 The vehicle unit shall be able to record and store in its data memory the following currently paired motion sensor identification data:

- serial number,
- approval number,
- first pairing date,

12.2 Security elements

080 The control device shall be able to store the following security elements:

- European? public key,
- Contracting Party certificate,
- equipment certificate,
- equipment private key.

Control device security elements are inserted in the equipment by the vehicle unit manufacturer.

12.3 Driver card insertion and withdrawal data

081 For each insertion and withdrawal cycle of a driver or workshop card in the equipment, the control device shall record and store in its data memory:

- the card holder’s surname and first name(s) as stored in the card,
- the card’s number, issuing Contracting Party and expiry date as stored in the card,
- the insertion date and time,
- the vehicle odometer value at card insertion,
- the slot in which the card is inserted,
- the withdrawal date and time,
- the vehicle odometer value at card withdrawal,
- the following information about the previous vehicle used by the driver, as stored in the card:
  - VRN and registering Contracting Party,
  - card withdrawal date and time,
- a flag indicating whether, at card insertion, the card holder has manually entered activities or not.

082 The data memory shall be able to hold these data for at least 365 days.

083 When storage capacity is exhausted, new data shall replace oldest data.

12.4 Driver activity data

084 The control device shall record and store in its data memory whenever there is a change of activity for the driver and/or the co-driver, and/or whenever there is a change of driving status, and/or whenever there is an insertion or withdrawal of a driver or workshop card:

- the driving status (CREW, SINGLE)
- the slot (DRIVER, CO-DRIVER),
- the card status in the relevant slot (INSERTED, NOT INSERTED)(See Note),
- the activity (DRIVING, AVAILABILITY, WORK, BREAK/REST).
- the date and time of the change,

Note: INSERTED means that a valid driver or workshop card is inserted in the slot. NOT INSERTED means the opposite i.e. no valid driver or workshop card is inserted in the slot (e.g. a company card is inserted or no card is inserted)

Note: Activity data manually entered by a driver are not recorded in the data memory.

085 The data memory shall be able to hold driver activity data for at least 365 days.

086 When storage capacity is exhausted, new data shall replace oldest data.

12.5 Places where daily work periods start and/or end

087 The control device shall record and store in its data memory whenever a (co-)driver enters the place where a daily work period begins and/or ends:

- If applicable, the (co-)driver card number and card issuing Contracting Party,
- the date and time of the entry (or the date/time related to the entry when the entry is made during the manual entry procedure),
- the type of entry (begin or end, condition of entry),
- the country and region entered,
- the vehicle odometer value.

088 The data memory shall be able to hold daily work periods start and/or end data for at least 365 days (with the assumption that one driver enters two records per day).

089 When storage capacity is exhausted, new data shall replace oldest data.

12.6 Odometer data

090 The control device shall record in its data memory the vehicle odometer value and the corresponding date at midnight every calendar day.

091 The data memory shall be able to store midnight odometer values for at least 365 calendar days.

092 When storage capacity is exhausted, new data shall replace oldest data.

12.7 Detailed speed data

093 The control device shall record and store in its data memory the instantaneous speed of the vehicle and the corresponding date and time at every second of at least the last 24 hours that the vehicle has been moving.

12.8 Events data

For the purpose of this subparagraph, time shall be recorded with a resolution of 1 second.

094 The control device shall record and store in its data memory the following data for each event detected according to the following storage rules:

Event	Storage rules	Data to be recorded per event
Card conflict	- the 10 most recent events.	- date and time of beginning of event, - date and time of end of event, - cards’ type, number and issuing Contracting Party of the two cards creating the conflict.
Driving without an appropriate card	- the longest event for each of the 10 last days of occurrence, - the 5 longest events over the last 365 days.	- date and time of beginning of event, - date and time of end of event, - cards’ type, number and issuing Contracting Party of any card inserted at beginning and/or end of the event, - number of similar events that day.
Card insertion while driving	- the last event for each of the 10 last days of occurrence,	- date and time of the event, - card’s type, number and issuing Contracting Party, - number of similar events that day
Last card session not correctly closed	- the 10 most recent events.	- date and time of card insertion, - card’s type, number and issuing Contracting Party, - last session data as read from the card: - date and time of card insertion, - VRN and Contracting Party of registration.

Event	Storage rules	Data to be recorded per event
Over speeding (1)	- the most serious event for each of the 10 last days of occurrence (i.e. the one with the highest average speed), - the 5 most serious events over the last 365 days. - the first event having occurred after the last calibration	- date and time of beginning of event, - date and time of end of event, - maximum speed measured during the event, - arithmetic average speed measured during the event, - card's type, number and issuing Contracting Party of the driver (if applicable), - number of similar events that day.
Power supply interruption (2)	- the longest event for each of the 10 last days of occurrence, - the 5 longest events over the last 365 days.	- date and time of beginning of event, - date and time of end of event, - cards' type, number and issuing Contracting Party of any card inserted at beginning and/or end of the event, - number of similar events that day.
Motion data error	- the longest event for each of the 10 last days of occurrence, - the 5 longest events over the last 365 days.	- date and time of beginning of event, - date and time of end of event, - cards' type, number and issuing Contracting Party of any card inserted at beginning and/or end of the event, - number of similar events that day.
Security breach attempt	- the 10 most recent events per type of event.	- date and time of beginning of event, - date and time of end of event (if relevant), - cards' type, number and issuing Contracting Party of any card inserted at beginning and/or end of the event, - type of event.

095 (1) The control device shall also record and store in its data memory :

- the date and time of the last OVER SPEEDING CONTROL,
- the date and time of the first over speeding following this OVER SPEEDING CONTROL,
- the number of over speeding events since the last OVER SPEEDING CONTROL.

(2) These data may be recorded at power supply reconnection only, times may be known with an accuracy to the minute.

12.9 Faults data

For the purpose of this subparagraph, time shall be recorded with a resolution of 1 second.

096 The control device shall attempt to record and store in its data memory the following data for each fault detected according to the following storage rules:

Fault	Storage rules	Data to be recorded per fault
Card fault	- the 10 most recent driver card faults.	- date and time of beginning of fault, - date and time of end of fault, - card’s type number and issuing Contracting Party
Control device faults	- the 10 most recent faults for each type of fault, - the first fault after the last calibration.	- date and time of beginning of fault, - date and time of end of fault, - type of fault, - cards’ type, number and issuing Contracting Party of any card inserted at beginning and/or end of the fault.

12.10 Calibration data

097 The control device shall record and store in its data memory data relevant to:

- known calibration parameters at the moment of activation,
- its very first calibration following its activation,
- its first calibration in the current vehicle (as identified by its VIN),
- the 5 most recent calibrations (If several calibrations happen within one calendar day, only the last one of the day shall be stored).

098 The following data shall be recorded for each of these calibrations:

- Purpose of calibration (activation, first installation, installation, periodic inspection)
- workshop name and address,
- workshop card number, card issuing Contracting Party and card expiry date,
- vehicle identification,
- parameters updated or confirmed: w, k, l, tyre size, speed limiting device setting, odometer (old and new values), date and time (old and new values).

099 The motion sensor shall record and store in its memory the following motion sensor installation data:

- first pairing with a VU (date, time, VU approval number, VU serial number),
- last pairing with a VU (date, time, VU approval number, VU serial number).

12.11 Time adjustment data

100 The control device shall record and store in its data memory data relevant to:

- the most recent time adjustment,
- the 5 largest time adjustments, since last calibration,

performed in calibration mode outside the frame of a regular calibration (def. f)).

101 The following data shall be recorded for each of these time adjustments:

- date and time, old value,
- date and time, new value,
- workshop name and address,
- workshop card number, card issuing Contracting Party and card expiry date.

12.12 Control activity data

102 The control device shall record and store in its data memory the following data relevant to the 20 most recent control activities:

- date and time of the control,
- control card number and card issuing Contracting Party,
- type of the control (displaying and/or printing and/or VU downloading and/or card downloading).

103 In case of downloading, the dates of the oldest and of the most recent days downloaded shall also be recorded.

12.13 Company locks data

104 The control device shall record and store in its data memory the following data relevant to the 20 most recent company locks:

- lock-in date and time,
- lock-out date and time,
- company card number and card issuing Contracting Party,
- company name and address.

12.14 Download activity data

105 The control device shall record and store in its data memory the following data relevant to the last data memory downloading to external media while in company or in calibration mode:

- date and time of downloading,
- company or workshop card number and card issuing Contracting Party,
- company or workshop name.

12.15 Specific conditions data

105a The control device shall record in its data memory the following data relevant to specific conditions:

- Date and time of the entry,
- Type of specific condition.

105b The data memory shall be able to hold specific conditions data for at least 365 days (with the assumption that on average, 1 condition is opened and closed per day). When storage capacity is exhausted, new data shall replace oldest data.

13. Reading from tachograph cards

106 The control device shall be able to read from tachograph cards, where applicable, the necessary data:

- to identify the card type, the card holder, the previously used vehicle, the date and time of the last card withdrawal and the activity selected at that time,
- to check that last card session was correctly closed,
- to compute the driver’s continuous driving time, cumulative break time and cumulated driving times for the previous and the current week,
- to print requested printouts related to data recorded on a driver card,
- to download a driver card to external media.

107 In case of a reading error, the recording equipment shall try again, three times maximum, the same read command, and then if still unsuccessful, declare the card faulty and non valid.

14. Recording and storing on tachograph cards

108 The control device shall set the “card session data” in the driver or workshop card right after the card insertion.

109 The control device shall update data stored on valid driver, workshop and/or control cards with all necessary data relevant to the period while the card is inserted and relevant to the card holder. Data stored on these cards are specified in Chapter IV.

109a The control device shall update driver activity and location data (as specified in Chapter IV paragraphs 5.2.5 and 5.2.6), stored on valid driver and/or workshop cards, with activity and location data manually entered by the cardholder.

110 Tachograph cards data update shall be such that, when needed and taking into account card actual storage capacity, most recent data replace oldest data.

111 In the case of a writing error, the control device shall try again, three times maximum, the same write command, and then if still unsuccessful, declare the card faulty and non valid.

112 Before releasing a driver card, and after all relevant data have been stored on the card, the control device shall reset the “card session data”.

15. Displaying

113 The display shall include at least 20 characters.

114 The minimum character size shall be 5 mm high and 3.5 mm wide.

114a The display shall support the Latin1 and Greek character sets defined by ISO 8859 parts 1 and 7, as specified in sub-appendix 1, Chapter 4 ‘Character sets’. The display may use simplified glyphs (e.g. accented characters may be displayed without accent, or lower case letters may be shown as upper case letters).

115 The display shall be provided with adequate non-dazzling lighting.

116 Indications shall be visible from outside the control device.

117 The control device shall be able to display:

- default data,
- data related to warnings,
- data related to menu access,
- other data requested by a user.

Additional information may be displayed by the control device, provided that it is clearly distinguishable from information required above.

118 The display of the control device shall use the pictograms or pictograms combinations listed in sub-appendix 3. Additional pictograms or pictograms combinations may also be provided by the display, if clearly distinguishable from the aforementioned pictograms or pictograms combinations.

119 The display shall always be ON when the vehicle is moving.

120 The control device may include a manual or automatic feature to turn the display OFF when the vehicle is not moving.

Displaying format is specified in sub-appendix 5.

15.1 Default display

121 When no other information needs to be displayed, the control device shall display, by default, the following:

- the local time (as a result of UTC time + offset as set by the driver),
- the mode of operation,
- the current activity of the driver and the current activity of the co-driver,
- information related to the driver:
  - if his current activity is DRIVING, his current continuous driving time and his current cumulative break time,
  - if his current activity is not DRIVING, the current duration of this activity (since it was selected) and his current cumulative break time,
- information related to the co-driver:
  - the current duration of his activity (since it was selected).

122 Display of data related to each driver shall be clear, plain and unambiguous. In the case where the information related to the driver and the co-driver cannot be displayed at the same time, the control device shall display by default the information related to the driver and shall allow the user to display the information related to the co-driver.

123 In the case where the display width does not allow to display by default the mode of operation, the control device shall briefly display the new mode of operation when it changes.

124 The control device shall briefly display the card holder name at card insertion.

124a When an “OUT OF SCOPE” condition is opened, then the default display must show using the relevant pictogram that the condition is opened (It is acceptable that the driver’s current activity may not be shown at the same time).

15.2 Warning display

125 The control device shall display warning information using primarily the pictograms of sub-appendix 3, completed where needed by an additional numerically coded information. A literal description of the warning may also be added in the driver’s preferred language.

15.3 Menu access

126 The control device shall provide necessary commands through an appropriate menu structure.

15.4 Other displays

127 It shall be possible to display selectively on request:

- the UTC date and time,
- the mode of operation (if not provided by default)
- the continuous driving time and cumulative break time of the driver,
- the continuous driving time and cumulative break time of the co-driver,
- the cumulated driving time of the driver for the previous and the current week,
- the cumulated driving time of the co-driver for the previous and the current week,
- the content of any of the six printouts under the same formats as the printouts themselves.

128 Printout content display shall be sequential, line by line. If the display width is less than 24 characters the user shall be provided with the complete information through an appropriate mean (several lines, scrolling, …). Printout lines devoted to hand-written information may be omitted for display.

16. Printing

129 The control device shall be able to print information from its data memory and/or from tachograph cards in accordance with the six following printouts:

- driver activities from card daily printout,
- driver activities from Vehicle Unit daily printout,
- events and faults from card printout,
- events and faults from Vehicle Unit printout,
- technical data printout,
- over speeding printout.

The detailed format and content of these printouts are specified in sub-appendix 4.

Additional data may be provided at the end of the printouts

Additional printouts may also be provided by the control device, if clearly distinguishable from the six aforementioned printouts.

130 The “driver activities from card daily printout” and “Events and faults from card printout” shall be available only when a driver card or a workshop card is inserted in the control device. The control device shall update data stored on the relevant card before starting printing.

131 In order to produce the “driver activities from card daily printout” or the “events and faults from card printout”, the control device shall:

- either automatically select the driver card or the workshop card if one only of these cards is inserted,
- or provide a command to select the source card or select the card in the driver slot if two of these cards are inserted in thecontrol device.

132 The printer shall be able to print 24 characters per line.

133 The minimum character size shall be 2.1 mm high and 1.5 mm wide.

133a The printer shall support the Latin1 and Greek character sets defined by ISO 8859 parts 1 and 7, as specified in sub-appendix 1, Chapter 4 ‘Character sets’.

134 Printers shall be so designed as to produce these printouts with a degree of definition likely to avoid any ambiguity when they are read.

135 Printouts shall retain their dimensions and recordings under normal conditions of humidity (10-90%) and temperature.

136 The paper for use by the control device shall bear the relevant type approval mark and the indication of the type(s) of control device with which it may be used. Printouts shall remain clearly legible and identifiable under normal conditions of storage, in terms of light intensity, humidity and temperature, for at least one year.

137 It shall also be possible to add hand-written notes, such as the driver’s signature, to these documents.

138 The control device shall manage “paper out” events while printing by, once paper has been re-loaded, restarting printing from printout beginning or by continuing printing and providing an unambiguous reference to previously printed part.

17. Warnings

139 The control device shall warn the driver when detecting any event and/or fault.

140 Warning of a power supply interruption event may be delayed until the power supply is reconnected.

141 The control device shall warn the driver 15 minutes before and at the time of exceeding 4 h. 30 min. continuous driving time.

142 Warnings shall be visual. Audible warnings may also be provided in addition to visual warnings.

143 Visual warnings shall be clearly recognisable by the user, shall be situated in the driver’s field of vision and shall be clearly legible both by day and by night.

144 Visual warnings may be built into the control device and/or remote from the control device.

145 In the latter case it shall bear a “T” symbol and shall be amber or orange.

146 Warnings shall have a duration of at least 30 seconds, unless acknowledged by the user by hitting any key of the control device. This first acknowledgement shall not erase warning cause display referred to in next paragraph.

147 Warning cause shall be displayed on the control device and remain visible until acknowledged by the user using a specific key or command of the control device.

148 Additional warnings may be provided, as long as they do not confuse drivers in relation to previously defined ones.

18. Data downloading to external media

149 The control device shall be able to download on request data from its data memory or from a driver card to external storage media via the calibration/downloading connector. The control device shall update data stored on the relevant card before starting downloading.

150 In addition and as an optional feature, the control device may, in any mode of operation, download data through another connector to a company authenticated through this channel. In such a case, company mode data access rights shall apply to this download.

151 Downloading shall not alter or delete any stored data.

The calibration/downloading connector electrical interface is specified in sub-appendix 6.

Downloading protocols are specified in sub-appendix 7.

19. Output data to additional external devices

152 When the control device does not include speed and/or odometer display functions, the control device shall provide output signal(s) to allow for displaying the speed of the vehicle (speedometer) and/or the total distance travelled by the vehicle (odometer).

153 The vehicle unit shall also be able to output the following data using an appropriate dedicated serial link independent from an optional CAN bus connection (ISO 11898 Road vehicles – Interchange of digital information – Controller Area Network (CAN) for high speed communication), to allow their processing by other electronic units installed in the vehicle:

- current UTC date and time,
- speed of the vehicle,
- total distance travelled by the vehicle (odometer),
- currently selected driver and co-driver activity,
- information if any tachograph card is currently inserted in the driver slot and in the co-driver slot and (if applicable) information about the corresponding cards identification (card number and issuing Contracting Party).

Other data may also be output in addition to this minimum list.

When the ignition of the vehicle is ON, these data shall be permanently broadcasted. When the ignition of the vehicle is OFF, at least any change of driver or co-driver activity and/or any insertion or withdrawal of a tachograph card shall generate a corresponding data output. In the event that data output has been withheld whilst the ignition of the vehicle is OFF, that data shall be made available once the ignition of the vehicle is ON again.

20. Calibration

154 The calibration function shall allow:

- to automatically pair the motion sensor with the VU,
- to digitally adapt the constant of the control device (k) to the characteristic coefficient of the vehicle (w) (vehicles with two or more axle ratios shall be fitted with a switch device whereby these various ratios will automatically be brought into line with the ratio for which the equipment has been adapted to the vehicle),
- to adjust (without limitation) the current time,
- to adjust the current odometer value,
- to update motion sensor identification data stored in the data memory,
- to update or confirm other parameters known to the control device: vehicle identification, w, l, tyre size and speed limiting device setting if applicable.

155 Pairing the motion sensor to the VU shall consist, at least, in:

- updating motion sensor installation data held by the motion sensor (as needed),
- copying from the motion sensor to the VU data memory necessary motion sensor identification data.

156 The calibration function shall be able to input necessary data through the calibration/downloading connector in accordance with the calibration protocol defined in sub-appendix 8. The calibration function may also input necessary data through other connectors.

21. Time adjustment

157 The time adjustment function shall allow for adjusting the current time in amounts of 1 minute maximum at intervals of not less than 7 days.

158 The time adjustment function shall allow for adjusting the current time without limitation, in calibration mode.

22. Performance characteristics

159 The Vehicle Unit shall be fully operational in the temperature range -20°C to 70°C, and the motion sensor in the temperature range -40°C to 135°C. Data memory content shall be preserved at temperatures down to -40°C.

160 The control device shall be fully operational in the humidity range 10% to 90%.

161 The control device shall be protected against over-voltage, inversion of its power supply polarity, and short circuits.

162 The control device shall conform with ECE Regulation N°10[9] related to electromagnetic compatibility and shall be protected against electrostatic discharges and transients.

[9] Reference text in the EU is Commission Directive 95/54/EC of 31 October 1995 adapting to technical progress Council Directive 72/245/EEC on the approximation of the laws of the Member States relating to the suppression of radio interference produced by spark-ignition engines fitted to motor vehicles (OJ No L 266, 08/11/1995).

23. Materials

163 All the constituent parts of the control device shall be made of materials of sufficient stability and mechanical strength and with stable electrical and magnetic characteristics.

164 For normal conditions of use, all the internal parts of the equipment shall be protected against damp and dust.

165 The Vehicle Unit shall meet the protection grade IP 40 and the motion sensor shall meet the protection grade IP 64, as per standard IEC 529.

166 The control device shall conform to applicable technical specifications related to ergonomic design.

167 The control device shall be protected against accidental damage.

24. Markings

168 If the control device displays the vehicle odometer value and speed, the following details shall appear on its display:

- near the figure indicating the distance, the unit of measurement of distance, indicated by the abbreviation “km”,
- near the figure showing the speed, the entry “km/h”.

The control device may also be switched to display the speed in miles per hour, in which case the unit of measurement of speed shall be shown by the abbreviation “mph”.

169 A descriptive plaque shall be affixed to each separate component of the control device and shall show the following details:

- name and address of the manufacturer of the equipment,
- manufacturer’s part number and year of manufacture of the equipment,
- equipment serial number,
- approval mark for the equipment type,

170 When physical space is not sufficient to show all above mentioned details, the descriptive plaque shall show at least: the manufacturer’s name or logo, and the equipment’s part number.

IV. CONSTRUCTION AND FUNCTIONAL REQUIREMENTS FOR TACHOGRAPH CARDS

1. Visible data

The front page will contain:

171 the words “Driver card” or “Control card” or “Workshop card” or “Company card” printed in large type in the official language or languages of the Contracting Party issuing the card, according to the type of the card.[10]

172 the same words in the UNECE official languages, printed to form the background of the card (see models under 178):

EN	DRIVER CARD	CONTROL CARD	WORKSHOP CARD	COMPANY CARD
FR	CARTE DE CONDUCTEUR	CARTE DE CONTRÔLEUR	CARTE D’ATELIER	CARTE D’ENTREPRISE
RU	КАРТОЧКА ВОДИТЕЛЯ	КАРТОЧКА КОНТРОЛЕРА	КАРТОЧКА МАСТЕРСКОЙ	КАРТОЧКА ПРЕДПРИЯТИЯ

173 the name of the Contracting Party issuing the card (optional);

174 the distinguishing sign of the Contracting Party issuing the card. The official distinguishing signs of Contracting Parties are those drawn up in accordance with the 1968 Vienna Convention on Road Traffic or the 1949 Geneva Convention on Road Traffic. The distinguishing signs of AETR Contracting Parties shall be as follows:

AL	Albania	**GR**	Greece	**MD**	Republic of Moldova
AND	Andorra	**H**	Hungary	**RO**	Romania
A	Austria	**IR**	Ireland	**SRB**	Serbia
AM	Armenia	**I**	Italy	**SK**	Slovakia
AZ	Azerbaijan	**KZ**	Kazakhstan	**SLO**	Slovenia
BY	Belarus	**LV**	Latvia	**E**	Spain
B	Belgium	**FL**	Liechtenstein	**S**	Sweden
BIH	Bosnia and Herzegovina	**LT**	Lithuania	**CH**	Switzerland
BG	Bulgaria	**L**	Luxembourg	**MK**	The FYR of Macedonia
HR	Croatia	**M**	Malta	**TR**	Turkey
CY	Cyprus	**MNE**	Montenegro	**TM**	Turkmenistan
CZ	Czech Republic	**NL**	Netherlands	**UK**	United Kingdom
DK	Denmark	**N**	Norway	**UA**	Ukrainia
EST	Estonia	**PL**	Poland	**UZ**	Uzbekistan
FIN	Finland	**P**	Portugal		
F	France	**RUS**	Russian Federation		
D	Germany	**RSM**	San Marino		

[10] The Contracting Parties will communicate to the UNECE secretariat the words used in their national language.

175 information specific to the card issued, numbered as follows:

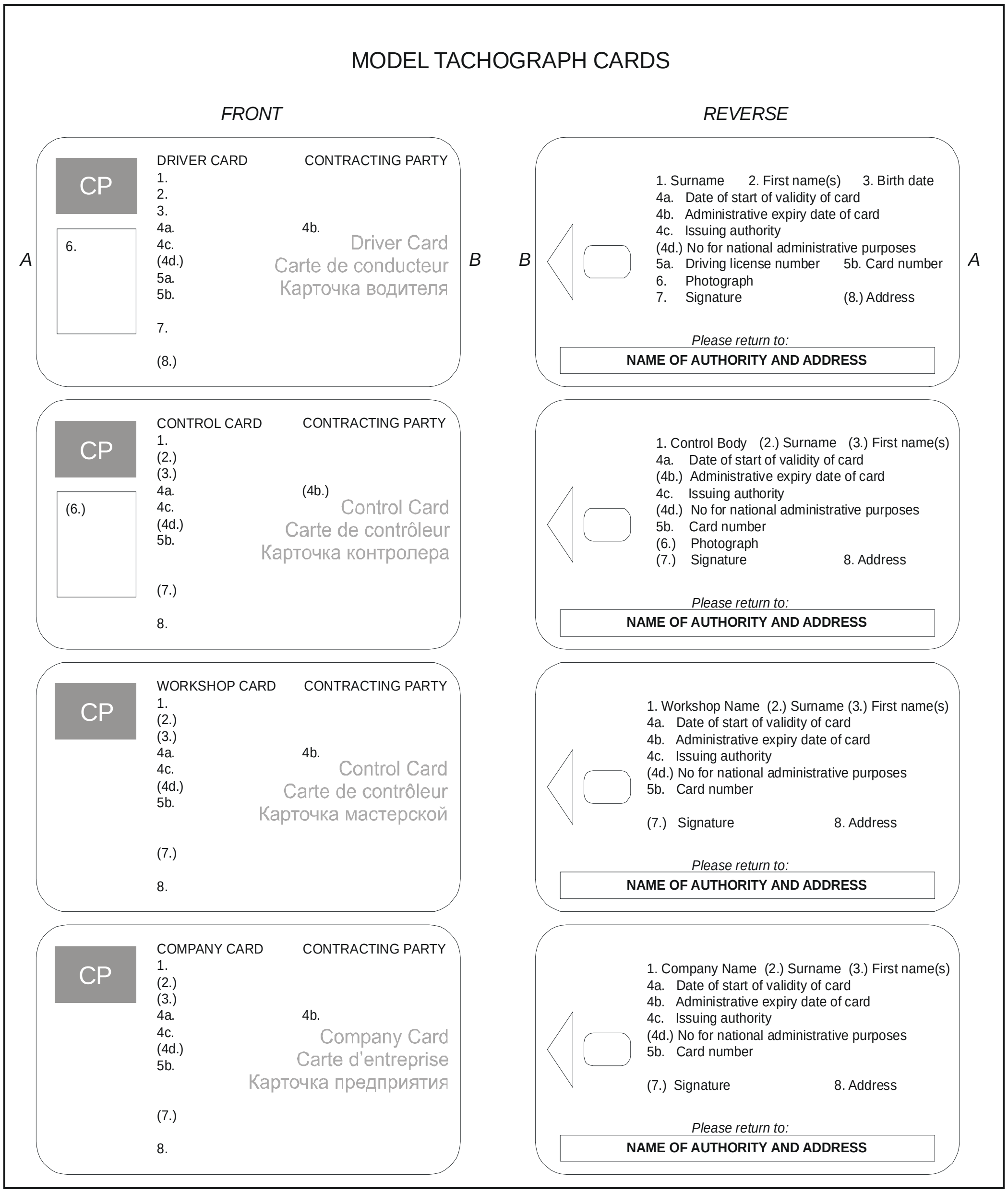
	Driver card	**Control Card**	**Company or Workshop card**
1.	surname of the driver	control body name	company or workshop name
2.	first name(s) of the driver	surname of the controller (if applicable)	surname of card holder (if applicable)
3.	birth date of the driver	first name(s) of the controller (if applicable)	first name(s) of card holder (if applicable)
4.(a)	card start of validity date		
(b)	card expiry date (if any)		
(c)	the name of the issuing authority (may be printed on page 2)		
(d)	a different number from the one under heading 5, for administrative purposes (optional)		
5. (a)	Driving licence number (at the date of issue of the driver card)	-	-
5. (b)	Card number		
6.	Photograph of the driver	photograph of the controller (optional)	-
7.	Signature of the driver	Signature of the holder (optional)	
8.	Normal place of residence, or postal address of the holder (optional).	Postal address of control body	postal address of company or workshop

176 dates shall be written using a “dd/mm/yyyy” or “dd.mm.yyyy” format (day, month, year).

The reverse page will contain:

177 an explanation of the numbered items which appear on the front page of the card;

178 with the specific written agreement of the holder, information which is not related to the administration of the card may also be added, such addition will not alter in any way the use of the model as a tachograph card.


MODEL TACHOGRAPH CARDS
FRONT
REVERSE
CP
DRIVER CARD
CONTRACTING PARTY
1.
2.
3.
4a.
4b.
4c.
(4d.)
5a.
5b.
6.
7.
(8.)
Driver Card
Carte de conducteur
Карточка водителя
A
B
B
A
1. Surname 2. First name(s) 3. Birth date
4a. Date of start of validity of card
4b. Administrative expiry date of card
4c. Issuing authority
(4d.) No for national administrative purposes
5a. Driving license number 5b. Card number
6. Photograph
7. Signature (8.) Address
Please return to:
NAME OF AUTHORITY AND ADDRESS
CP
CONTROL CARD
CONTRACTING PARTY
1.
(2.)
(3.)
4a.
(4b.)
4c.
(4d.)
5b.
(6.)
(7.)
8.
Control Card
Carte de contrôleur
Карточка контролера
1. Control Body (2.) Surname (3.) First name(s)
4a. Date of start of validity of card
(4b.) Administrative expiry date of card
4c. Issuing authority
(4d.) No for national administrative purposes
5b. Card number
(6.) Photograph
(7.) Signature 8. Address
Please return to:
NAME OF AUTHORITY AND ADDRESS
CP
WORKSHOP CARD
CONTRACTING PARTY
1.
(2.)
(3.)
4a.
4b.
4c.
(4d.)
5b.
(7.)
8.
Control Card
Carte de contrôleur
Карточка мастерской
1. Workshop Name (2.) Surname (3.) First name(s)
4a. Date of start of validity of card
4b. Administrative expiry date of card
4c. Issuing authority
(4d.) No for national administrative purposes
5b. Card number
(7.) Signature 8. Address
Please return to:
NAME OF AUTHORITY AND ADDRESS
CP
COMPANY CARD
CONTRACTING PARTY
1.
(2.)
(3.)
4a.
4b.
4c.
(4d.)
5b.
(7.)
8.
Company Card
Carte d'entreprise
Карточка предприятия
1. Company Name (2.) Surname (3.) First name(s)
4a. Date of start of validity of card
4b. Administrative expiry date of card
4c. Issuing authority
(4d.) No for national administrative purposes
5b. Card number
(7.) Signature 8. Address
Please return to:
NAME OF AUTHORITY AND ADDRESS

179 Tachograph cards shall be printed with the following background predominant colours:

- driver card: white,
- control card: blue,
- workshop card: red,
- company card: yellow.

180 Tachograph cards shall bear at least the following features for protection of the card body against counterfeiting and tampering:

- a security design background with fine guilloche patterns and rainbow printing,
- in the area of the photograph, the security design background and the photograph shall overlap,
- at least one two-coloured microprint line.

181 After consulting the UNECE secretariat, Contracting Parties may add colours or markings, such as national symbols and security features, without prejudice to the other provisions of this Appendix'.

2. Security

The system security aims at protecting integrity and authenticity of data exchanged between the cards and the control device, protecting the integrity and authenticity of data downloaded from the cards, allowing certain write operations onto the cards to control device only, ruling out any possibility of falsification of data stored in the cards, preventing tampering and detecting any attempt of that kind

182 In order to achieve the system security, the tachograph cards shall meet the security requirements defined in the tachograph cards generic security target (sub-appendix 10).

183 Tachograph cards shall be readable by other equipment such as personal computers.

3. Standards

184 The tachograph cards shall comply with the following standards:

- ISO/IEC 7810 Identification cards – Physical characteristics,
- ISO/IEC 7816 Identification cards - Integrated circuits with contacts:
  - Part 1: Physical characteristics,
  - Part 2: Dimensions and location of the contacts,
  - Part 3: Electronic signals and transmission protocols,
  - Part 4: Inter-industry commands for interchange,
  - Part 8: Security related inter-industry commands,
- ISO/IEC 10373 Identification cards – Test methods,

4. Environmental and electrical specifications

185 The tachograph cards shall be capable of operating correctly in all the climatic conditions normally encountered in the territory of Contracting Parties and at least in the temperature range -25°C to +70°C with occasional peaks of up to +85°C, "occasional" meaning not more than 4 hours each time and not over 100 times during the life time of the card.

186 The tachograph cards shall be capable of operating correctly in the humidity range 10% to 90%.

187 The tachograph cards shall be capable of operating correctly for a five-year period if used within the environmental and electrical specifications.

188 During operation, the tachograph cards shall conform ECE Regulation N°10[11] related to electromagnetic compatibility, and shall be protected against electrostatic discharges.

5. Data storage

For the purpose of this paragraph,

- times are recorded with a resolution of one minute, unless otherwise specified,
- odometer values are recorded with a resolution of one kilometre,
- speeds are recorded with a resolution of 1 km/h.

The tachograph cards functions, commands and logical structures, fulfilling data storage requirements are specified in sub-appendix 2.

189 This paragraph specifies minimum storage capacity for the various application data files. The tachograph cards shall be able to indicate to the control device the actual storage capacity of these data files.

Any additional data that may be stored on tachograph cards, related to other applications eventually borne by the card, shall be stored in accordance with the European provisions[12].on the protection of individuals with regard to the processing of personal data and on the free movement of such data.

5.1 Card identification and security data

5.1.1 Application identification

190 The tachograph cards shall be able to store the following application identification data:

- tachograph application identification,
- type of tachograph card identification.

5.1.2 Chip identification

191 The tachograph cards shall be able to store the following Integrated Circuit (IC) identification data:

- IC serial number,
- IC manufacturing references.

5.1.3 IC card identification

192 The tachograph cards shall be able to store the following smart card identification data:

- card serial number (including manufacturing references),
- card type approval number,
- card personaliser identification (ID),
- embedder ID,
- IC identifier.

[11] Reference text in the EU is Commission Directive 95/54/EC of 31 October 1995 adapting to technical progress Council Directive 72/245/EEC on the approximation of the laws of the Member States relating to the suppression of radio interference produced by spark-ignition engines fitted to motor vehicles (OJ No L 266, 08/11/1995).

[12] The protection of individuals with regard to the processing of personal data and the free movement of such data conform to the provisions of Council Directive No. 95/46/EC of 24 October 1995, as last amended (OJ No. L 281, 23/11/1995).

5.1.4 Security elements

193 The tachograph cards shall be able to store the following security elements data:

- European public key,
- Contracting Party certificate,
- card certificate,
- card private key.

5.2 Driver card

5.2.1 Card identification

194 The driver card shall be able to store the following card identification data:

- card number,
- issuing Contracting Party, issuing authority name, issue date,
- card beginning of validity date, card expiry date.

5.2.2 Card holder identification

195 The driver card shall be able to store the following card holder identification data:

- surname of the holder,
- first name(s) of the holder,
- date of birth,
- preferred language.

5.2.3 Driving licence information

196 The driver card shall be able to store the following driving licence data:

- issuing Contracting Party, issuing authority name,
- driving licence number (at the date of the issue of the card).

5.2.4 Vehicles used data

197 The driver card shall be able to store, for each calendar day where the card has been used, and for each period of use of a given vehicle that day (a period of use includes all consecutive insertion / withdrawal cycle of the card in the vehicle, as seen from the card point of view), the following data:

- date and time of first use of the vehicle (i.e. first card insertion for this period of use of the vehicle, or 00h00 if the period of use is on-going at that time),
- vehicle odometer value at that time,
- date and time of last use of the vehicle, (i.e. last card withdrawal for this period of use of the vehicle, or 23h59 if the period of use is on-going at that time),
- vehicle odometer value at that time,
- VRN and registering Contracting Party of the vehicle.

198 The driver card shall be able to store at least 84 such records.

5.2.5 Driver activity data

199 The driver card shall be able to store, for each calendar day where the card has been used or for which the driver has entered activities manually, the following data:

- the date,
- a daily presence counter (increased by one for each of these calendar days),
- the total distance travelled by the driver during this day,
- a driver status at 00:00,
- whenever the driver has changed of activity, and/or has changed of driving status, and/or has inserted or withdrawn his card:
    - the driving status (CREW, SINGLE)
    - the slot (DRIVER, CO-DRIVER),
    - the card status (INSERTED, NOT INSERTED),
    - the activity (DRIVING, AVAILABILITY, WORK, BREAK/REST).
    - the time of the change,

200 The driver card memory shall be able to hold driver activity data for at least 28 days (the average activity of a driver is defined as 93 activity changes per day).

201 The data listed under requirements 197 and 199 shall be stored in a way allowing the retrieval of activities in the order of their occurrence, even in case of a time overlap situation.

5.2.6 Places where daily work periods start and/or end

202 The driver card shall be able to store the following data related to places where daily work periods begin and/or end, entered by the driver:

- the date and time of the entry (or the date/time related to the entry if the entry is made during the manual entry procedure),
- the type of entry (begin or end, condition of entry),
- the country and region entered,
- the vehicle odometer value.

203 The driver card memory shall be able to hold at least 42 pairs of such records.

5.2.7 Events data

For the purpose of this subparagraph, time shall be stored with a resolution of 1 second.

204 The driver card shall be able to store data related to the following events detected by the control device while the card was inserted:

- Time overlap (where this card is the cause of the event),
- Card insertion while driving (where this card is the subject of the event),
- Last card session not correctly closed (where this card is the subject of the event),
- Power supply interruption,
- Motion data error,
- Security breach attempts.

205 The driver card shall be able to store the following data for these events:

- Event code,
- Date and time of beginning of the event (or of card insertion if the event was on-going at that time),
- Date and time of end of the event (or of card withdrawal if the event was on-going at that time),
- VRN and registering Contracting Party of vehicle in which the event happened.

Note: For the “Time overlap” event:

- Date and time of beginning of the event shall correspond to the date and time of the card withdrawal from the previous vehicle,
- Date and time of end of the event shall correspond to the date and time of card insertion in current vehicle,
- Vehicle data shall correspond to the current vehicle raising the event.

Note: For the “Last card session not correctly closed” event:

- date and time of beginning of event shall correspond to the card insertion date and time of the session not correctly closed,
- date and time of end of event shall correspond to the card insertion date and time of the session during which the event was detected (current session),
- Vehicle data shall correspond to the vehicle in which the session was not correctly closed.

206 The driver card shall be able to store data for the six most recent events of each type (i.e. 36 events).

5.2.8 Faults data

For the purpose of this subparagraph, time shall be recorded with a resolution of 1 second.

207 The driver card shall be able to store data related to the following faults detected by the control device while the card was inserted:

- Card fault (where this card is the subject of the event),
- Control device fault.

208 The driver card shall be able to store the following data for these faults:

- Fault code,
- Date and time of beginning of the fault (or of card insertion if the fault was on-going at that time),
- Date and time of end of the fault (or of card withdrawal if the fault was on-going at that time),
- VRN and registering Contracting Party of vehicle in which the fault happened.

209 The driver card shall be able to store data for the twelve most recent faults of each type (i.e. 24 faults).

5.2.9 Control activity data

210 The driver card shall be able to store the following data related to control activities:

- date and time of the control,
- control card number and card issuing Contracting Party,
- type of the control (displaying and/or printing and/or VU downloading and/or card downloading (see note)),
- Period downloaded, in case of downloading,
- VRN and registering Contracting Party of the vehicle in which the control happened.

Note: security requirements imply that card downloading will only be recorded if performed through a control device.

211 The driver card shall be able to hold one such record.

5.2.10 Card session data

212 The driver card shall be able to store data related to the vehicle which opened its current session:

- date and time the session was opened (i.e. card insertion) with a resolution of one second,
- VRN and registering Contracting Party.

5.2.11 Specific conditions data

212a The driver card shall be able to store the following data related to specific conditions entered while the card was inserted (whatever the slot):

- Date and time of the entry,
- Type of specific condition.

212b The driver card shall be able to hold 56 such records.

5.3 Workshop card

5.3.1 Security elements

213 The workshop card shall be able to store a Personal Identification Number (PIN code).

214 The workshop card shall be able to store the cryptographic keys needed for pairing motion sensors to vehicle units.

5.3.2 Card identification

215 The workshop card shall be able to store the following card identification data:

- card number,
- issuing Contracting Party, issuing authority name, issue date,
- card beginning of validity date, card expiry date.

5.3.3 Card holder identification

216 The workshop card shall be able to store the following card holder identification data:

- workshop name,
- workshop address,
- surname of the holder,
- first name(s) of the holder,
- preferred language.

5.3.4 Vehicles used data

217 The workshop card shall be able to store vehicles used data records in the same manner as a driver card.

218 The workshop card shall be able to store at least 4 such records.

5.3.5 Driver activity data

219 The workshop card shall be able to store driver activity data in the same manner as a driver card.

220 The workshop card shall be able to hold driver activity data for at least 1 day of average driver activity.

5.3.6 Daily work periods start and/or end data

221 The workshop card shall be able to store daily works period start and/or end data records in the same manner as a driver card.

222 The workshop card shall be able to hold at least 3 pairs of such records.

5.3.7 Events and faults data

223 The workshop card shall be able to store events and faults data records in the same manner as a driver card.

224 The workshop card shall be able to store data for the three most recent events of each type (i.e. 18 events) and the six most recent faults of each type (i.e. 12 faults).

5.3.8 Control activity data

225 The workshop card shall be able to store a control activity data record in the same manner as a driver card.

5.3.9 Calibration and time adjustment data

226 The workshop card shall be able to hold records of calibrations and/or time adjustments performed while the card is inserted in a control device.

227 Each calibration record shall be able to hold the following data:

- Purpose of calibration (activation, first installation, installation, periodic inspection,),
- Vehicle identification,
- Parameters updated or confirmed (w, k, l, tyre size, speed limiting device setting, odometer (new and old values), date and time (new and old values),
- Control device identification (VU part number, VU serial number, motion sensor serial number).

228 The workshop card shall be able to store at least 88 such records.

229 The workshop card shall hold a counter indicating the total number of calibrations performed with the card.

230 The workshop card shall hold a counter indicating the number of calibrations performed since its last download.

5.3.10 Specific conditions data

230a The workshop card shall be able to store data relevant to specific conditions in the same manner as the driver card. The workshop card shall be able to store 2 such records.

5.4 Control card

5.4.1 Card identification

231 The control card shall be able to store the following card identification data:

- card number,
- issuing Contracting Party, issuing authority name, issue date,
- card beginning of validity date, card expiry date (if any).

5.4.2 Card holder identification

232 The control card shall be able to store the following card holder identification data:

- control body name,
- control body address,
- surname of the holder,
- first name(s) of the holder,
- preferred language.

5.4.3 Control activity data

233 The control card shall be able to store the following control activity data:

- date and time of the control,
- type of the control (displaying and/or printing and/or VU downloading and/or card downloading)
- period downloaded (if any),
- VRN and Contracting Party registering authority of the controlled vehicle,
- card number and card issuing Contracting Party of the driver card controlled.

234 The control card shall be able to hold at least 230 such records.

5.5 Company card

5.5.1 Card identification

235 The company card shall be able to store the following card identification data:

- card number,
- issuing Contracting Party, issuing authority name, issue date,
- card beginning of validity date, card expiry date (if any).

5.5.2 Card holder identification

236 The company card shall be able to store the following card holder identification data:

- company name,
- company address.

5.5.3 Company activity data

237 The company card shall be able to store the following company activity data:

- date and time of the activity,
- type of the activity (VU locking in and/or out, and/or VU downloading and/or card downloading)
- period downloaded (if any),
- VRN and Contracting Party registering authority of vehicle,
- card number and card issuing Contracting Party (in case of card downloading).

238 The company card shall be able to hold at least 230 such records.

V. INSTALLATION OF CONTROL DEVICE

1. Installation

239 New control devices shall be delivered non-activated to fitters or vehicle manufacturers, with all calibration parameters, as listed in Chapter III.20, set to appropriate and valid default values. Where no particular value is appropriate, literal parameters shall be set to strings of “?” and numeric parameters shall be set to “0”.

240 Before its activation, the control device shall give access to the calibration function even if not in calibration mode.

241 Before its activation, the control device shall neither record nor store data referred by points III.12.3. to III.12.9. and III.12.12 to III.12.14. inclusive.

242 During installation, vehicle manufacturers shall pre-set all known parameters.

243 Vehicle manufacturers or fitters shall activate the installed control device before the vehicle leaves the premises where the installation took place.

244 The activation of the control device shall be triggered automatically by the first insertion of a workshop card in either of its card interface devices.

245 Specific pairing operations required between the motion sensor and the vehicle unit, if any, shall take place automatically before or during activation.

246 After its activation, the control device shall fully enforce functions and data access rights.

247 The recording and storing functions of the control device shall be fully operational after its activation.

248 Installation shall be followed by a calibration. The first calibration will include entry of VRN and will take place within 2 weeks of this installation or of VRN allocation whichever comes last.

248a The control device must be positioned in the vehicle in such a way as to allow the driver to access the necessary functions from his seat.

2. Installation plaque

249 After the control device has been checked on installation, an installation plaque which is clearly visible and easily accessible shall be affixed on, in or beside the control device. After every inspection by an approved fitter or workshop, a new plaque shall be affixed in place of the previous one.

250 The plaque shall bear at least the following details:

- Name, address or trade name of the approved fitter or workshop,
- Characteristic coefficient of the vehicle, in the form “w = … imp/km”,
- Constant of the control device, in the form “k = … imp/km”,
- Effective circumference of the wheel tyres in the form “l = … mm”,
- Tyre size,
- The date on which the characteristic coefficient of the vehicle was determined and the effective circumference of the wheel tyres measured,
- The Vehicle Identification Number.

3. Sealing

251 The following part shall be sealed:

- Any connection which, if disconnected, would cause undetectable alterations to be made or undetectable data loss;
- The installation plaque, unless it is attached in such a way that it cannot be removed without the markings thereon being destroyed.

252 The seals mentioned above may be removed:

- In case of emergency,
- To install, to adjust or to repair a speed limitation device or any other device contributing to road safety, provided that the control device continues to function reliably and correctly and is resealed by an approved fitter or workshop (in accordance with Chapter VI) immediately after fitting the speed limitation device or any other device contributing to road safety or within seven days in other cases.

253 On each occasion that these seals are broken a written statement giving the reasons for such action shall be prepared and made available to the competent authority.

VI. CHECKS, INSPECTIONS AND REPAIRS

Requirements on the circumstances in which seals may be removed, as referred to in article 9, paragraph 5 of the Annex to this Agreement. are defined in Chapter V, part 3 of this Appendix.

1. Approval of fitters or workshops

The Contracting Parties will approve, regularly control and certify the bodies to carry out:

- installations,
- checks,
- inspections,
- repairs.

In the framework of article 9, paragraph 1 of the Annex to this Agreement workshop cards will be issued only to fitters and/or workshops approved for the activation and/or the calibration of control device in conformity with this Appendix and, unless duly justified:

- who are not eligible for a company card;
- and whose other professional activities do not present a potential compromise of the overall security of the system as defined in sub-appendix 10.

2. Check of new or repaired instruments

254 Every individual device, whether new or repaired, shall be checked in respect of its proper operation and the accuracy of its reading and recordings, within the limits laid down in Chapter III.2.1. and III.2.2 by means of sealing in accordance with Chapter V.3. and calibration.

3. Installation inspection

255 When being fitted to a vehicle, the whole installation (including the control device) shall comply with the provisions relating to maximum tolerances laid down in Chapter III.2.1 and III.2.2.

4. Periodic inspections

256 Periodic inspections of the equipment fitted to the vehicles shall take place after any repair of the equipment, or after any alteration of the characteristic coefficient of the vehicle or of the effective circumference of the tyres, or after equipment UTC time is wrong by more than 20 minutes, or when the VRN has changed, and at least once within two years (24 months) of the last inspection.

257 These inspections shall include the following checks:

- that the control device is working properly, including the data storage in tachograph cards function,
- that compliance with the provisions of chapter III.2.1 and III.2.2 on the maximum tolerances on installation is ensured,
- that the control device carries the type approval mark,
- that the installation plaque is affixed,
- that the seals on the equipment and on the other parts of the installation are intact,
- the tyre size and the actual circumference of the wheel tyres.

258 These inspections shall include a calibration.

5. Measurement of errors

259 The measurement of errors on installation and during use shall be carried out under the following conditions, which are to be regarded as constituting standard test conditions:

- vehicle unladen, in normal running order,
- tyre pressures in accordance with the manufacturer's instructions,
- tyre wear, within the limits allowed by national law,
- vehicle movement:
  - the vehicle shall advance under its own engine power in a straight line on level ground and at a speed of 50 ± 5 km/h. The measuring distance shall be at least 1000m.
- provided that it is of comparable accuracy, alternative methods, such as a suitable test bench, may also be used for the test.

6. Repairs

260 Workshops shall be able to download data from the control device to give the data back to the appropriate transport company.

261 Approved workshops shall issue to transport companies a certificate of data un-downloadability where the malfunction of the control device prevents previously recorded data to be downloaded, even after repair by this workshop. The workshops will keep a copy of each issued certificate for at least one year.

VII. CARD ISSUING

The card issuing processes set-up by the Contracting Parties shall conform to the following:

262 The card number of the first issue of a tachograph card to an applicant shall have a consecutive index (if applicable) and a replacement index and a renewal index set to “0”.

263 The card numbers of all non personal tachograph cards issued to a single control body or a single workshop or a single transport company shall have the same first 13 digits, and shall all have a different consecutive index.

264 A tachograph card issued in replacement of an existing tachograph card shall have the same card number than the replaced one except the replacement index which shall be raised by “1” (in the order 0, …, 9, A, …, Z).

265 A tachograph card issued in replacement of an existing tachograph card shall have the same card expiry date as the replaced one.

266 A tachograph card issued in renewal of an existing tachograph card shall have the same card number as the renewed one except the replacement index which shall be reset to “0” and the renewal index which shall be raised by “1” (in the order 0, …, 9, A, …, Z).

267 The exchange of an existing tachograph card, in order to modify administrative data, shall follow the rules of the renewal if within the same Contracting Party or the rules of a first issue if performed by another Contracting Party.

268 The “card holder surname” for non personal workshop or control cards shall be filled with workshop or control body name.

VIII. Type approval of control device and tachograph cards

1. General points

For the purpose of this chapter, the words “control device” mean control device or its components”. No type approval is required for the cable(s) linking the motion sensor to the VU. The paper, for use by the control device, shall be considered as a component of the control device.

269 Control devices shall be submitted for approval complete with any integrated additional devices.

270 Type approval of control devices and of tachograph cards shall include security related tests, functional tests and interoperability tests. Positive results to each of these tests are stated by an appropriate certificate.

271 Contracting Parties type approval authorities will not grant a type approval certificate in accordance with article 2 of the annex to the AETR. as long as they do not hold:

- a security certificate,
- a functional certificate,
- and an interoperability certificate,

for the control device or the tachograph card, subject of the request for type approval.

272 Any modification in software or hardware of the equipment or in the nature of materials used for its manufacture shall, before being used, be notified to the authority which granted type-approval for the equipment. This authority shall confirm to the manufacturer the extension of the type approval, or may require an update or a confirmation of the relevant functional, security and/or interoperability certificates.

273 Procedures to upgrade in-situ control device software shall be approved by the authority which granted type approval for the control device. Software upgrade must not alter nor delete any driver activity data stored in the control device. Software may be upgraded only under the responsibility of the equipment manufacturer.

2. Security certificate

274 The security certificate is delivered in accordance with the provisions of sub-appendix 10 of this Appendix.

3. Functional certificate

275 Each candidate for type approval shall provide the Contracting Party's type approval authority with all the material and documentation that the authority deems necessary.

276 A functional certificate shall be delivered to the manufacturer only after all functional tests specified in sub-appendix 9, at least, have been successfully passed.

277 The type approval authority delivers the functional certificate. This certificate shall indicate, in addition to the name of its beneficiary and the identification of the model, a detailed list of the tests performed and the results obtained.

4. Interoperability certificate

278 Interoperability tests are carried out by a single competent laboratory recognised at the international level.

279 The laboratory shall register interoperability test requests introduced by manufacturers in the chronological order of their arrival.

280 Requests will be officially registered only when the laboratory is in possession of:

- the entire set of material and documents necessary for such interoperability tests,
- the corresponding security certificate,
- the corresponding functional certificate,

The date of the registration of the request shall be notified to the manufacturer.

281 No interoperability tests shall be carried out by the laboratory, for a control device or a tachograph card that have not been granted a security certificate and a functional certificate.

282 Any manufacturer requesting interoperability tests shall commit to leave to the laboratory in charge of these tests the entire set of material and documents which he provided to carry out the tests.

283 The interoperability tests shall be carried out, in accordance with the provisions of paragraph 5 of sub-appendix 9 of this Appendix, with respectively all the types of control devices or tachograph cards:

- for which type approval is still valid or,
- for which type approval is pending and that have a valid interoperability certificate.

284 The interoperability certificate shall be delivered by the laboratory to the manufacturer only after all required interoperability tests have been successfully passed.

285 If the interoperability tests are not successful with one or more of the control device(s) or tachograph card(s), as requested by requirement 283, the interoperability certificate shall not be delivered, until the requesting manufacturer has realised the necessary modifications and has succeeded the interoperability tests. The laboratory shall identify the cause of the problem with the help of the manufacturers concerned by this interoperability fault and shall attempt to help the requesting manufacturer in finding a technical solution. In the case where the manufacturer has modified its product, it is the manufacturer’s responsibility to ascertain from the relevant authorities that the security certificate and the functional certificates are still valid.

286 The interoperability certificate is valid for six months. It is revoked at the end of this period if the manufacturer has not received a corresponding type approval certificate. It is forwarded by the manufacturer to the type approval authority of the Contracting Party who has delivered the functional certificate.

287 Any element that could be at the origin of an interoperability fault shall not be used for profit or to lead to a dominant position.

5. Type approval certificate

288 The type approval authority of the Contracting Party may deliver the type approval certificate as soon as it holds the three required certificates.

289 The type approval certificate shall be copied by the type approval authority to the laboratory in charge of the interoperability tests at the time of deliverance to the manufacturer.

290 The laboratory competent for interoperability tests shall run a public web site on which will be updated the list of control devices or tachograph cards models:

- for which a request for interoperability tests have been registered,
- having received an interoperability certificate (even provisional),
- having received a type approval certificate.

6. Reserved

This part (Exceptional procedure: first interoperability certificates) does not concern the AETR.

SUB-APPENDIX I

DATA DICTIONARY

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I. Introduction

This sub-appendix specifies data formats, data elements, and data structures for use within the control devices and tachograph cards.

1.1 Approach for definitions of data types

This sub-appendix uses Abstract Syntax Notation One (ASN.1) to define data types. This enables simple and structured data to be defined without implying any specific transfer syntax (encoding rules) which will be application and environment dependent.

ASN.1 type naming conventions are done in accordance with ISO/IEC 8824-1. This implies that:

- where possible, the meaning of the data type is implied through the names being selected,
- where a data type is a composition of other data types, the data type name is still a single sequence of alphabetical characters commencing with a capital letter, however capitals are used within the name to impart the corresponding meaning,
- in general, the data types names are related to the name of the data types from which they are constructed, the equipment in which data is stored and the function related to the data.

If an ASN.1 type is already defined as part of another standard and if it is relevant for usage in the control device, then this ASN.1 type will be defined in this sub-appendix.

To enable several types of encoding rules, some ASN.1 types in this sub-appendix are constrained by value range identifiers. The value range identifiers are defined in paragraph 3.

1.2 References

The following references are used in this sub-appendix:

ISO 639 Code for the representation of names of languages. First Edition: 1988.

EN 726-3 Identification cards systems - Telecommunications integrated circuit(s) cards and terminals - Part 3 : Application independent card requirements. December 1994.

ISO 3779 Road vehicles - Vehicle identification number (VIN) - Content and structure.
Edition 3: 1983.

ISO/IEC 7816-5 Information technology - Identification cards - Integrated circuit(s) cards with contacts - Part 5: Numbering system and registration procedure for application identifiers.
First edition: 1994 + Amendment 1: 1996.

ISO/IEC 8824-1 Information technology - Abstract Syntax Notation 1 (ASN.1): Specification of basic notation. Edition 2: 1998.

ISO/IEC 8825-2 Information technology - ASN.1 encoding rules: Specification of Packed Encoding Rules (PER). Edition 2: 1998.

ISO/IEC 8859-1 Information technology - 8 bit single-byte coded graphic character sets - Part 1: Latin alphabet No.1. First edition: 1998.

ISO/IEC 8859-7 Information technology - 8 bit single-byte coded graphic character sets - Part 7: Latin/Greek alphabet. First edition: 1987.

ISO 16844-3 Road vehicles - Tachograph systems - Motion Sensor Interface. WD 3-20/05/99.

2. Data Type Definitions

For any of the following data types, the default value for an “unknown” or a “not applicable” content will consist in filling the data element with ‘FF’ bytes.

2.1 ActivityChangeInfo

This data type enables to code, within a two bytes word, a slot status at 00:00 and/or a driver status at 00:00 and/or changes of activity and/or changes of driving status and/or changes of card status for a driver or a co-driver. This data type is related to requirements 084, 109a, 199 and 219.

ActivityChangeInfo ::= OCTET STRING (SIZE(2))

Value assignment – Octet Aligned : ‘scpaattttttttttt’B (16 bits)

For Data Memory recordings (or slot status):

‘s’B Slot:
‘0’B: DRIVER,
‘1’B: CO-DRIVER,

‘c’B Driving status:
‘0’B: SINGLE,
‘1’B: CREW,

‘p’B Driver (or workshop) card status in the relevant slot:
‘0’B: INSERTED, a card is inserted,
‘1’B: NOT INSERTED, no card is inserted (or a card is withdrawn),

‘aa’B Activity:
‘00’B: BREAK/REST,
‘01’B: AVAILABILITY,
‘10’B: WORK,
‘11’B: DRIVING,

‘ttttttttttt’B Time of the change: Number of minutes since 00h00 on the given day.

For Driver (or Workshop) card recordings (and driver status):

‘s’B Slot (not relevant when ‘p’=1 except note below):
‘0’B: DRIVER,
‘1’B: CO-DRIVER,

‘c’B Driving status (case ‘p’=0) or Following activity status (case ‘p’=1):
‘0’B: SINGLE, ‘0’B: UNKNOWN
‘1’B: CREW, ‘1’B: KNOWN (=manually entered)

‘p’B Card status:
‘0’B: INSERTED, the card is inserted in a control device,
‘1’B: NOT INSERTED, the card is not inserted (or the card is withdrawn),

‘aa’B	Activity (not relevant when ‘p’=1 and ‘c’=0 except note below): ‘00’B: BREAK/REST, ‘01’B: AVAILABILITY, ‘10’B: WORK, ‘11’B: DRIVING,
‘tttttttttt’B	Time of the change: Number of minutes since 00h00 on the given day.

Note for the case ‘card withdrawal’:

When the card is withdrawn:

- ‘s’ is relevant and indicates the slot from which the card is withdrawn,
- ‘c’ must be set to 0,
- ‘p’ must be set to 1,
- ‘aa’ must code the current activity selected at that time,

As a result of a manual entry, the bits ‘c’ and ‘aa’ of the word (stored in a card) may be overwritten later to reflect the entry.

2.2 Address

An address.

```
Address ::= SEQUENCE {
    codePage                                INTEGER (0..255),
    address                                 OCTET STRING (SIZE(35))
}
```

codePage specifies the part of the ISO/IEC 8859 used to code the address,

address is an address coded in accordance with ISO/IEC 8859-codePage.

2.3 BCDString

BCDString is applied for Binary Code Decimal (BCD) representation. This data type is used to represent one decimal digit in one semi octet (4 bits). BCDString is based on the ISO/IEC 8824-1 ‘CharacterStringType’.

```
BCDString ::= CHARACTER STRING (WITH COMPONENTS {
    identification ( WITH COMPONENTS {
    fixed PRESENT }) })
```

BCDString uses an “hstring” notation. The leftmost hexadecimal digit shall be the most significant semi octet of the first octet. To produce a multiple of octets, zero trailing semi octets shall be inserted, as needed, from the leftmost semi octet position in the first octet.

Permitted digits are : 0, 1, .. 9.

2.4 CalibrationPurpose

Code explaining why a set of calibration parameters was recorded. This data type is related to requirements 097 and 098.

```
CalibrationPurpose ::= OCTET STRING (SIZE(1))
```

Value assignment:

‘00’H reserved value,

‘01’H activation: recording of calibration parameters known, at the moment of the VU activation,

‘02’H first installation: first calibration of the VU after its activation,

‘03’H installation: first calibration of the VU in the current vehicle,

‘04’ Hperiodic inspection.

2.5 CardActivityDailyRecord

Information, stored in a card, related to the driver activities for a particular calendar day. This data type is related to requirements 199 and 219.

```
CardActivityDailyRecord ::= SEQUENCE {
   activityPreviousRecordLength      INTEGER(0..CardActivityLengthRange),
   activityRecordLength              INTEGER(0..CardActivityLengthRange),
   activityRecordDate                TimeReal,
   activityDailyPresenceCounter      DailyPresenceCounter,
   activityDayDistance               Distance,
   activityChangeInfo                SET SIZE(1..1440) OF ActivityChangeInfo
}
```

activityPreviousRecordLength is the total length in bytes of the previous daily record. The maximum value is given by the length of the OCTET STRING containing these records (see CardActivityLengthRange paragraph 3). When this record is the oldest daily record, the value of activityPreviousRecordLength must be set to 0.

activityRecordLength is the total length in bytes of this record. The maximum value is given by the length of the OCTET STRING containing these records.

activityRecordDate is the date of the record.

activityDailyPresenceCounter is the daily presence counter for the card this day.

activityDayDistance is the total distance travelled this day.

activityChangeInfo is the set of ActivityChangeInfo data for the driver this day. It may contain at maximum 1440 values (one activity change per minute). This set always includes the activityChangeInfo coding the driver status at 00:00.

2.6 CardActivityLengthRange

Number of bytes in a driver or a workshop card, available to store driver activity records.

CardActivityLengthRange ::= INTEGER(0..2^{16}-1)

Value assignment: see paragraph 3.

2.7 CardApprovalNumber

Type approval number of the card.

Card Approval Number ::= IA5String(SIZE(8))

Value assignment: Unspecified.

2.8 CardCertificate

Certificate of the public key of a card.

```
CardCertificate ::= Certificate
```

2.9 CardChipIdentification

Information, stored in a card, related to the identification of the card’s Integrated Circuit (IC) (requirement 191).

```
CardChipIdentification ::= SEQUENCE {
   icSerialNumber                          OCTET STRING (SIZE(4)),
   icManufacturingReferences               OCTET STRING (SIZE(4))
}
```

icSerialNumber is the IC serial number as defined in EN 726-3.

icManufacturingReferences is the IC manufacturer identifier and fabrication elements as defined in EN 726-3.

2.10 CardConsecutiveIndex

A card consecutive index (definition h)).

```
CardConsecutiveIndex  ::=  IA5String(SIZE(1))
```

Value assignment: (see this Appendix, chapter VII)

Order for increase: ‘0 , …, 9, A , … , Z , a , … , z’

2.11 CardControlActivityDataRecord

Information, stored in a driver or workshop card, related to the last control the driver has been subject to (requirements 210 and 225).

```
CardControlActivityDataRecord ::= SEQUENCE {
   controlType                             ControlType,
   controlTime                             TimeReal,
   controlCardNumber                       FullCardNumber,
   controlVehicleRegistration              VehicleRegistrationIdentification,
   controlDownloadPeriodBegin              TimeReal,
   controlDownloadPeriodEnd                TimeReal
}
```

controlType is the type of the control.

controlTime is the date and time of the control.

controlCardNumber is the FullCardNumber of the control officer having performed the control.

controlVehicleRegistration is the VRN and registering Contracting Party of the vehicle in which the control happened.

controlDownloadPeriodBegin and **controlDownloadPeriodEnd** is the period downloaded, in case of downloading.

2.12 CardCurrentUse

Information about the actual usage of the card (requirement 212).

```
CardCurrentUse ::= SEQUENCE {
   sessionOpenTime                        TimeReal,
   sessionOpenVehicle                     VehicleRegistrationIdentification
}
```

sessionOpenTime is the time when the card is inserted for the current usage. This element is set to zero at card removal.

sessionOpenVehicle is the identification of the currently used vehicle, set at card insertion. This element is set to zero at card removal.

2.13 CardDriverActivity

Information, stored in a driver or a workshop card, related to the activities of the driver (requirements 199 and 219).

```
CardDriverActivity ::= SEQUENCE {
   activityPointerOldestDayRecord         INTEGER(0.. CardActivityLengthRange-1),
   activityPointerNewestRecord            INTEGER(0.. CardActivityLengthRange-1),
   activityDailyRecords                   OCTET STRING
                                          (SIZE(CardActivityLengthRange))
}
```

activityPointerOldestDayRecord is the specification of the begin of the storage place (number of bytes from the beginning of the string) of the oldest complete day record in the activityDailyRecords string. The maximum value is given by the length of the string.

activityPointerNewestRecord is the specification of the begin of the storage place (number of bytes from the beginning of the string) of the most recent day record in the activityDailyRecords string. The maximum value is given by the length of the string.

activityDailyRecords is the space available to store the driver activity data (data structure: CardActivityDailyRecord) for each calendar day where the card has been used.

Value assignment: this octet string is cyclically filled with records of CardActivityDailyRecord. At the first use storing is started at the first byte of the string. All new records are appended at the end of the previous one. When the string is full, storing continues at the first byte of the string independently of a break being inside a data element. Before placing new activity data in the string (enlarging current activityDailyRecord, or placing a new activityDailyRecord) that replaces older activity data, activityPointerOldestDayRecord must be updated to reflect the new location of the oldest complete day record, and activityPreviousRecordLength of this (new) oldest complete day record must be reset to 0.

2.14 CardDrivingLicenceInformation

Information, stored in a driver card, related to the card holder driver licence data (requirement 196).

```
CardDrivingLicenceInformation ::= SEQUENCE {
   drivingLicenceIssuingAuthority         Name,
   drivingLicenceIssuingNation            NationNumeric,
   drivingLicenceNumber                   IA5String(SIZE(16))
}
```

drivingLicenceIssuingAuthority is the authority responsible for issuing the driving licence.

drivingLicenceIssuingNation is the nationality of the authority that issued the driving licence.

drivingLicenceNumber is the number of the driving licence.

2.15 CardEventData

Information, stored in a driver or workshop card, related to the events associated with the card holder (requirements 204 and 223).

```
CardEventData ::= SEQUENCE SIZE(6) OF {
   cardEventRecords                       SET SIZE(NoOfEventsPerType) OF
                                          CardEventRecord
}
```

CardEventData is a sequence, ordered by ascending value of EventFaultType, of cardEventRecords (except security breach attempts related records which are gathered in the last set of the sequence).

cardEventRecords is a set of event records of a given event type (or category for security breach attempts events).

2.16 CardEventRecord

Information, stored in a driver or a workshop card, related to an event associated to the card holder (requirements 205 and 223).

```
CardEventRecord ::= SEQUENCE {
   eventType                              EventFaultType,
   eventBeginTime                         TimeReal,
   eventEndTime                           TimeReal,
   eventVehicleRegistration               Vehicle RegistrationI dentification
}
```

eventType is the type of the event.

eventBeginTime is the date and time of beginning of event.

eventEndTime is the date and time of end of event.

eventVehicleRegistration is the VRN and registering Contracting Party of vehicle in which the event happened.

2.17 CardFaultData

Information, stored in a driver or a workshop card, related to the faults associated to the card holder (requirements 207 and 223).

```
CardFaultData ::= SEQUENCE SIZE(2) OF {
    cardFaultRecords                    SET SIZE(NoOfFaultsPerType) OF
                                        CardFaultRecord
}
```

CardFaultData is a sequence of control device faults set of records followed by card faults set of records.

cardFaultRecords is a set of fault records of a given fault category (Control device or card).

2.18 CardFaultRecord

Information, stored in a driver or a workshop card, related to a fault associated to the card holder (requirement 208 and 223).

```
CardFaultRecord ::= SEQUENCE {
    faultType                           EventFaultType,
    faultBeginTime                      TimeReal,
    faultEndTime                        TimeReal,
    faultVehicleRegistration            VehicleRegistrationIdentification
}
```

faultType is the type of the fault.

faultBeginTime is the date and time of beginning of fault.

faultEndTime is the date and time of end of fault.

faultVehicleRegistration is the VRN and registering Contracting Party of vehicle in which the fault happened.

2.19 CardIccIdentification

Information, stored in a card, related to the identification of the integrated circuit (IC) card (requirement 192).

```
CardIccIdentification ::= SEQUENCE {
    clockStop                           OCTET STRING (SIZE(1)),
    cardExtendedSerialNumber            ExtendedSerialNumber,
    cardApprovalNumber                  CardApprovalNumber
    cardPersonaliserID                  OCTET STRING (SIZE(1)),
    embedderIcAssemblerId               OCTET STRING (SIZE(5)),
    icIdentifier                        OCTET STRING (SIZE(2))
}
```

clockStop is the Clockstop mode as defined in EN 726-3.

cardExtendedSerialNumber is the IC card serial number and IC card manufacturing reference as defined in EN 726-3 and as further specified by the ExtendedSerialNumber data type.

cardApprovalNumber is the type approval number of the card.

cardPersonaliserID is the card personaliser ID as defined in EN 726-3.

embedderIcAssemblerId is the embedder/IC assembler identifier as defined in EN 726-3.

icIdentifier is the Identifier of the IC on the card and its IC manufacturer as defined in EN 726-3.

2.20 CardIdentification

Information, stored in a card, related to the identification of the card (requirements 194, 215, 231, 235).

```
CardIdentification ::= SEQUENCE {
   CardIssuingMemberState              NationNumeric,
   cardNumber                          CardNumber,
   cardIssuingAuthorityName            Name,
   cardIssueDate                       Time Real,
   cardValidityBegin                   Time Real,
   cardExpiryDate                      Time Real
}
```

cardIssuingMemberState is the code of the Contracting Party issuing the card.

cardNumber is the card number of the card.

cardIssuingAuthorityName is the name of the authority having issued the Card.

cardIssueDate is the issue date of the Card to the current holder.

cardValidityBegin is the first date of validity of the card.

cardExpiryDate is the date when the validity of the card ends.

2.21 CardNumber

A card number as defined by definition (g).

```
CardNumber ::= CHOICE {
   SEQUENCE {
      driverIdentification             IA5String(SIZE(14)),
      cardReplacementIndex             CardReplacementIndex,
      cardRenewalIndex                 CardRenewalIndex
   },
    SEQUENCE {
        ownerIdentification             IA5String(SIZE(13)),
        cardConsecutiveIndex            CardConsecutiveIndex,
        cardReplacementIndex            CardReplacementIndex,
        cardRenewalIndex                CardRenewalIndex
    }
}
```

driverIdentification is the unique identification of a driver in a Contracting Party.

ownerIdentification is the unique identification of a company or a workshop or a control body within a Contracting Party.

cardConsecutiveIndex is the card consecutive index.

cardReplacementIndex is the card replacement index.

cardRenewalIndex is the card renewal index.

The first sequence of the choice is suitable to code a driver card number, the second sequence of the choice is suitable to code workshop, control, and company card numbers.

2.22 CardPlaceDailyWorkPeriod

Information, stored in a driver or a workshop card, related to the places where daily work periods begin and/or end (requirements 202 and 221).

```
CardPlaceDailyWorkPeriod ::= SEQUENCE {
    placePointerNewestRecord      INTEGER(0 .. NoOfCardPlaceRecords-1),
    placeRecords                  SET SIZE(NoOfCardPlaceRecords) OF PlaceRecord
}
```

placePointerNewestRecord is the index of the last updated place record.
Value assignment: Number corresponding to the numerator of the place record, beginning with ‘0’ for the first occurrence of the place records in the structure.

placeRecords is the set of records containing the information related to the places entered..

2.23 CardPrivateKey

The private key of a card.

```
CardPrivateKey ::= RSAKeyPrivateExponent
```

2.24 CardPublicKey

The public key of a card.

```
CardPublicKey ::= PublicKey
```

2.25 CardRenewalIndex

A card renewal index (definition i)).

```
CardRenewalIndex ::= IA5String(SIZE(1))
```

Value assignment: (see this Appendix,chapter VII).
‘0’ First issue.
Order for increase: ‘0 , … , 9 , A , … , Z’

2.26 CardReplacementIndex

A card replacement index (definition j)).

CardReplacementIndex ::= IA5String(SIZE(1))

Value assignment: (see this Appendix, chapter VII).
'0' Original card.
Order for increase: '0 , … , 9 , A , … , Z'

2.27 CardSlotNumber

Code to distinguish between the two slots of a Vehicle Unit.

```
CardSlotNumber ::= INTEGER {
   driverSlot                               (0),
   co-driverSlot                            (1)
}
```

Value assignment : not further specified.

2.28 CardSlotsStatus

Code indicating the type of cards inserted in the two slots of the vehicle unit.

CardSlotsStatus ::= OCTET STRING (SIZE(1))

Value assignment – Octet Aligned : 'ccccdddd'B

'cccc'B Identification of the type of card inserted in the co-driver slot,
'dddd'B Identification of the type of card inserted in the driver slot,

with the following identification codes:

'0000'B	no card is inserted,
'0001'B	a driver card is inserted,
'0010'B	a workshop card is inserted,
'0011'B	a control card is inserted,
'0100'B	a company card is inserted.

2.29 CardStructureVersion

Code indicating the version of the implemented structure in a tachograph card.

CardStructureVersion ::= OCTET STRING (SIZE(2))

Value assignment: 'aabb'H:

'aa'H Index for changes of the structure,
'00h' for this version

'bb'H Index for changes concerning the use of the data elements defined for the structure given by the high byte, '00h' for this version.

2.30 CardVehicleRecord

Information, stored in a driver or workshop card, related to a period of use of a vehicle during a calendar day (requirements 197 and 217).

```
CardVehicleRecord ::= SEQUENCE {
   vehicleOdometerBegin                          OdometerShort,
   vehicleOdometerEnd                            OdometerShort,
   vehicleFirstUse                               TimeReal,
   vehicleLastUse                                TimeReal,
   vehicleRegistration                           VehicleRegistrationIdentification,
   vuDataBlockCounter                            VuDataBlockCounter
}
```

vehicleOdometerBegin is the vehicle odometer value at the beginning of the period of use of the vehicle.

vehicleOdometerEnd is the vehicle odometer value at the end of the period of use of the vehicle.

vehicleFirstUse is the date and time of the beginning of the period of use of the vehicle.

vehicleLastUse is the date and time of the end of the period of use of the vehicle.

vehicleRegistration is the VRN and the registering Contracting Party of the vehicle.

vuDataBlockCounter is the value of the VuDataBlockCounter at last extraction of the period of use of the vehicle.

2.31 CardVehiclesUsed

Information, stored in a driver or workshop card, related to the vehicles used by the card holder (requirements 197 and 217).

```
CardVehiclesUsed := SEQUENCE {
   vehiclePointerNewestRecord                 INTEGER(0..NoOfCardVehicleRecords-1),
   cardVehicleRecords                         SET SIZE(NoOfCardVehicleRecords) OF
                                              CardVehicleRecord
}
```

vehiclePointerNewestRecord is the index of the last updated vehicle record.
Value assignment: Number corresponding to the numerator of the vehicle record, beginning with ‘0’ for the first occurrence of the vehicle records in the structure.

cardVehicleRecords is the set of records containing information on vehicles used.

2.32 Certificate

The certificate of a public key issued by a Certification Authority.

```
Certificate ::= OCTET STRING (SIZE(194))
```

Value assignment: digital signature with partial recovery of a CertificateContent according to sub-appendix 11 common security mechanisms: Signature (128 bytes) || Public Key remainder (58 bytes) || Certification Authority Reference (8 bytes).

2.33 CertificateContent

The (clear) content of the certificate of a public key according to sub-appendix 11 common security mechanisms.

```
CertificateContent ::= SEQUENCE {
   certificateProfileIdentifier         INTEGER(0..255),
   certificationAuthorityReference      KeyIdentifier,
   certificateHolderAuthorisation       CertificateHolderAuthorisation,
   certificateEndOfValidity             TimeReal,
   certificateHolderReference           KeyIdentifier,
   publicKey                            PublicKey
}
```

certificateProfileIdentifier is the version of the corresponding certificate.
Value assignment: ‘01h’ for this version.

certificationAuthorityReference identifies the Certification Authority issuing the certificate. It also references the Public Key of this Certification Authority.

certificateHolderAuthorisation identifies the rights of the certificate holder.

certificateEndOfValidity is the date when the certificate expires administratively.

certificateHolderReference identifies the certificate holder. It also references his Public Key.

publicKey is the public key that is certified by this certificate.

2.34 CertificateHolderAuthorisation

Identification of the rights of a certificate holder.

```
CertificateHolderAuthorisation ::= SEQUENCE {
   tachographApplicationID              OCTET STRING(SIZE(6))
   equipmentType                        EquipmentType
}
```

tachographApplicationID is the application identifier for the tachograph application.
Value assignment: 'FFh' '54h' '41h' '43h' '48h' '4Fh'. This AID is a proprietary non registered application identifier in accordance with ISO/IEC 7816-5.

equipmentType is the identification of the type of equipment to which the certificate is intended.
Value assignment: in accordance with EquipmentType data type. **0** if certificate is the one of a Contracting Party.

2.35 CertificateRequestID

Unique identification of a certificate request. It can also be used as a Vehicle Unit Public Key Identifier if the serial number of the vehicle Unit to which the key is intended is not known at certificate generation time.

```
CertificateRequestID ::= SEQUENCE{
   requestSerialNumber              INTEGER(0..2^32-1)
   requestMonthYear                 BCDString(SIZE(2))
   crIdentifier                     OCTET STRING(SIZE(1))
   manufacturerCode                 ManufacturerCode
}
```

requestSerialNumber is a serial number for the certificate request, unique for the manufacturer and the month below.

requestMonthYear is the identification of the month and the year of the certificate request.
Value assignment: BCD coding of Month (two digits) and Year (two last digits).

crIdentifier: is an identifier to distinguish a certificate request from an extended serial number.
Value assignment: ‘FFh’.

manufacturerCode: is the numerical code of the manufacturer requesting the certificate.

2.36 CertificationAuthorityKID

Identifier of the Public Key of a Certification Authority (a Contracting Party or the European Certification Authority)

```
CertificationAuthorityKID ::= SEQUENCE{
   nationNumeric                    NationNumeric
   nationAlpha                      NationAlpha
   keySerialNumber                  INTEGER(0..255)
   additionalInfo                   OCTET STRING(SIZE(2))
   caIdentifier                     OCTET STRING(SIZE(1))
}
```

nationNumeric is the numerical nation code of the Certification Authority.

nationAlpha is the alphanumerical nation code of the Certification Authority.

keySerialNumber is a serial number to distinguish the different keys of the Certification Authority in the case keys are changed.

additionalInfo is a two byte field for additional coding (Certification Authority specific).

caIdentifier is an identifier to distinguish a Certification Authority Key Identifier from other Key Identifiers.
Value assignment: ‘01h’.

2.37 CompanyActivityData

Information, stored in a company card, related to activities performed with the card (requirement 237).

```
CompanyActivityData ::= SEQUENCE {
   companyPointerNewestRecord        INTEGER(0..NoOfCompanyActivityRecords-1),
   companyActivityRecords            SET SIZE(NoOfCompanyActivityRecords) OF
      companyActivityRecord            SEQUENCE {
       companyActivityType               CompanyActivityType,
       companyActivityTime               TimeReal,
       cardNumberInformation             FullCardNumber,
       vehicleRegistrationInformation    VehicleRegistrationIdentification,
       downloadPeriodBegin               TimeReal,
       downloadPeriodEnd                 TimeReal
     }
}
```

companyPointerNewestRecord is the index of the last updated companyActivityRecord.
Value assignment: Number corresponding to the numerator of the company activity record, beginning with ‘0’ for the first occurrence of the company activity record in the structure.

companyActivityRecords is the set of all company activity records.

companyActivityRecord is the sequence of information related to one company activity.

companyActivityType is the type of the company activity.

companyActivityTime is the date and time of the company activity.

cardNumberInformation is the card number and the card issuing Contracting Party of the card downloaded, if any.

vehicleRegistrationInformation is the VRN and registering Contracting Party of the vehicle downloaded or locked in or out..

downloadPeriodBegin and **downloadPeriodEnd** is the period downloaded from the VU, if any.

2.38 CompanyActivityType

Code indicating an activity carried out by a company using its company card..

```
CompanyActivityType ::= INTEGER {
   card downloading                 (1),
   VU downloading                   (2),
   VU lock-in                       (3),
   VU lock-out                      (4)
}
```

2.39 CompanyCardApplicationIdentification

Information, stored in a company card related to the identification of the application of the card (requirement 190).

```
CompanyCardApplicationIdentification ::= SEQUENCE {
   typeOfTachographCardId             EquipmentType,
   cardStructureVersion               CardStructureVersion,
   noOfCompanyActivityRecords         NoOfCompanyActivityRecords
}
```

typeOfTachographCardId is specifying the implemented type of card.

cardStructureVersion is specifying the the version of the structure that is implemented in the card.

noOfCompanyActivityRecords is the number of company activity records the card can store.

2.40 CompanyCardHolderIdentification

Information, stored in a company card, related to the cardholder identification (requirement 236).

```
CompanyCardHolderIdentification ::= SEQUENCE {
   companyName                        Name,
   companyAddress                     Address,
   cardHolderPreferredLanguage        Language
}
```

companyName is the name of the holder company.

companyAddress is the address of the holder company.

cardHolderPreferredLanguage is the preferred language of the card holder.

2.41 ControlCardApplicationIdentification

Information, stored in a control card related to the identification of the application of the card (requirement 190).

```
ControlCardApplicationIdentification ::= SEQUENCE {
   typeOfTachographCardId             EquipmentType,
   cardStructureVersion               CardStructureVersion,
   noOfControlActivityRecords         NoOfControlActivityRecords
}
```

typeOfTachographCardId is specifying the implemented type of card.

cardStructureVersion is specifying the version of the structure that is implemented in the card.

noOfControlActivityRecords is the number of control activity records the card can store.

2.42 ControlCardControlActivityData

Information, stored in a control card, related to control activity performed with the card (requirement 233).

```
ControlCardControlActivityData ::= SEQUENCE {
   controlPointerNewestRecord          INTEGER(0.. NoOfControlActivityRecords-1),
   controlActivityRecords              SET SIZE(NoOfControlActivityRecords) OF
     controlActivityRecord               SEQUENCE {
       controlType                         ControlType,
       controlTime                         TimeReal,
       controlledCardNumber                FullCardNumber,
       controlledVehicleRegistration       VehicleRegistrationIdentification,
       controlDownloadPeriodBegin          TimeReal,
       controlDownloadPeriodEnd            TimeReal
     }
}
```

controlPointerNewestRecord is the index of the last updated control activity record.
Value assignment: Number corresponding to the numerator of the control activity record, beginning with ‘0’ for the first occurrence of the control activity record in the structure.

controlActivityRecords is the set of all control activity records.

controlActivityRecord is the sequence of information related to one control.

controlType is the type of the control.

controlTime is the date and time of the control.

controlledCardNumber is the card number and the card issuing Contracting Party of the card controlled.

controlledVehicleRegistration is the VRN and registering Contracting Party of the vehicle in which the control happened.

controlDownloadPeriodBegin and **controlDownloadPeriodEnd** is the period eventually downloaded.

2.43 ControlCardHolderIdentification

Information, stored in a control card, related to the identification of the cardholder (requirement 232).

```
ControlCardHolderIdentification ::= SEQUENCE {
   controlBodyName                       Name,
   controlBodyAddress                    Address,
   cardHolderName                        HolderName,
   cardHolderPreferredLanguage           Language
}
```

controlBodyName is the name of the control body of the card holder.

controlBodyAddress is the address of the control body of the card holder.

cardHolderName is the name and first name(s) of the holder of the Control Card.

cardHolderPreferredLanguage is the preferred language of the card holder.

2.44 ControlType

Code indicating the activities carried out during a control. This data type is related to requirements 102, 210 and 225.

ControlType ::= OCTET STRING (SIZE(1))

Value assignment – Octet aligned : 'cvpdxxxx'B (8 bits)

'c'B card downloading:
'0'B: card not downloaded during this control activity,
'1'B: card downloaded during this control activity

'v'B VU downloading:
'0'B: VU not downloaded during this control activity,
'1'B: VU downloaded during this control activity

'p'B printing:
'0'B: no printing done during this control activity,
'1'B: printing done during this control activity

'd'B display:
'0'B: no display used during this control activity,
'1'B: display used during this control activity

'xxxx'B Not used.

2.45 CurrentDateTime

The current date and time of the control device.

CurrentDateTime ::= TimeReal

Value assignment: not further specified.

2.46 DailyPresenceCounter

Counter, stored in a driver or workshop card, increased by one for each calendar day the card has been inserted in a VU. This data type is related to requirements 199 and 219.

DailyPresenceCounter ::= BCDString(SIZE(2))

Value assignment: Consecutive Number with maximum value = 9 999, starting again with 0. At the time of first issuing of the card the number is set to 0.

2.47 Datef

Date expressed in a readily printable numeric format.

```
Datef ::= SEQUENCE {
    year        BCDString(SIZE(2)),
    month       BCDString(SIZE(1)),
    day         BCDString(SIZE(1))
}
```

Value assignment:

yyyy	Year
mm	Month
dd	Day
'00000000'H	denotes explicitly no date.

2.48 Distance

A distance travelled (result of the calculation of the difference between two vehicle's odometer value in kilometres).

Distance ::= INTEGER(0..2^{16}-1)

Value assignment: Unsigned binary. Value in km in the operational range 0 to 9 999 km.

2.49 DriverCardApplicationIdentification

Information, stored in a driver card related to the identification of the application of the card (requirement 190).

```
DriverCardApplicationIdentification ::= SEQUENCE {
    typeOfTachographCardId          EquipmentType,
    cardStructureVersion            CardStructureVersion,
    noOfEventsPerType               NoOfEventsPerType,
    noOfFaultsPerType               NoOfFaultsPerType,
    activityStructureLength         CardActivityLengthRange,
    noOfCardVehicleRecords          NoOfCardVehicleRecords,
    noOfCardPlaceRecords            NoOfCardPlaceRecords
}
```

typeOfTachographCardId is specifying the implemented type of card.

cardStructureVersion is specifying the the version of the structure that is implemented in the card.

noOfEventsPerType is the number of events per type of event the card can record.

noOfFaultsPerType is the number of faults per type of fault the card can record.

activityStructureLength indicates the number of bytes available for storing activity records..

noOfCardVehicleRecords is the number of vehicle records the card can contain.

noOfCardPlaceRecords is the number of places the card can record.

2.50 DriverCardHolderIdentification

Information, stored in a driver card, related to the identification of the cardholder (requirement 195).

```
DriverCardHolderIdentification ::= SEQUENCE {
    cardHolderName                  HolderName,
    cardHolderBirthDate             Datef,
    cardHolderPreferredLanguage     Language
}
```

cardHolderName is the name and first name(s) of the holder of the Driver Card.

cardHolderBirthDate is the date of birth of the holder of the Driver Card.

cardHolderPreferredLanguage is the preferred language of the card holder.

2.51 EntryTypeDailyWorkPeriod

Code to distinguish between begin and end for an entry of a daily work period place and condition of the entry.

```
EntryTypeDailyWorkPeriod ::= INTEGER {
   Begin,   related time = card insertion time or time of entry          (0),
   End,     related time = card withdrawal time or time of entry         (1),
   Begin,   related time manually entered (start time)                   (2),
   End,     related time manually entered (end of work period)           (3),
   Begin,   related time assumed by VU                                   (4),
   End,     related time assumed by VU                                   (5)
}
```

Value assignment : according to ISO/IEC8824-1.

2.52 EquipmentType

Code to distinguish different types of equipment for the tachograph application.

```
EquipmentType ::= INTEGER(0..255)
--Reserved                        (0),
--Driver Card                     (1),
--Workshop Card                   (2),
--Control Card                    (3),
--Company Card                    (4),
--Manufacturing Card              (5),
--Vehicle Unit                    (6),
--Motion Sensor                   (7),
--RFU                             (8..255)
```

Value assignment: According to ISO/IEC8824-1.

Value 0 is reserved for the purpose of designating a Contracting Party or Europe in the CHA field of certificates.

2.53 EuropeanPublicKey

The European public key.

```
EuropeanPublicKey ::= PublicKey
```

2.54 EventFaultType

Code qualifying an event or a fault.

```
EventFaultType ::= OCTET STRING (SIZE(1))
```

Value assignment:

‘0x’H	General events,
‘00’H	No further details,
‘01’H	Insertion of a non valid card,
‘02’H	Card conflict,
‘03’H	Time overlap,
‘04’H	Driving without an appropriate card,
‘05’H	Card insertion while driving,
‘06’H	Last card session not correctly closed,
‘07’H	Over speeding,

‘08’H	Power supply interruption,
'09’H	Motion data error,
‘0A’H to ‘0F’H	RFU,
‘1x’H	Vehicle unit related security breach attempt events,
‘10’H	No further details,
‘11’H	Motion sensor authentication failure,
‘12’H	Tachograph card authentication failure,
‘13’H	Unauthorised change of motion sensor,
‘14’H	Card data input integrity error
‘15’H	Stored user data integrity error,
‘16’H	Internal data transfer error,
‘17’H	Unauthorised case opening,
‘18’H	Hardware sabotage,
‘19’H to ‘1F’H	RFU,
‘2x’H	Sensor related security breach attempt events,
‘20’H	No further details,
‘21’H	Authentication failure,
‘22’H	Stored data integrity error,
‘23’H	Internal data transfer error,
‘24’H	Unauthorised case opening,
‘25’H	Hardware sabotage,
‘26’H to ‘2F’H	RFU,
‘3x’H	Control device faults,
‘30’H	No further details,
‘31’H	VU internal fault,
‘32’H	Printer fault,
‘33’H	Display fault,
‘34’H	Downloading fault,
‘35’H	Sensor fault,
‘36’H to ‘3F’H	RFU,
‘4x’H	Card faults,
‘40’H	No further details,
‘41’H to ‘4F’H	RFU,
‘50’H to ‘7F’H	RFU,
‘80’H to ‘FF’H	Manufacturer specific.

2.55 EventFaultRecordPurpose

Code explaining why an event or a fault has been recorded.

EventFaultRecordPurpose ::= OCTET STRING (SIZE(1))

Value assignment:

‘00’H	one of the 10 most recent (or last) events or faults
‘01’H	the longest event for one of the last 10 days of occurrence
‘02’H	one of the 5 longest events over the last 365 days
‘03’H	the last event for one of the last 10 days of occurrence
‘04’H	the most serious event for one of the last 10 days of occurrence
‘05’H	one of the 5 most serious events over the last 365 days
‘06’H	the first event or fault having occurred after the last calibration
'07'H	an active/on-going event or fault
‘08’H to ‘7F’H	RFU
‘80’H to ‘FF’H	manufacturer specific

2.56 ExtendedSerialNumber

Unique identification of an equipment. It can also be used as an equipment Public Key Identifier.

```
ExtendedSerialNumber ::= SEQUENCE{
    serialNumber                    INTEGER(0..2^32-1)
    monthYear                       BCDString(SIZE(2))
    type                            OCTET STRING(SIZE(1))
    manufacturerCode                ManufacturerCode
}
```

serialNumber is a serial number for the equipment, unique for the manufacturer, the equipment’s type and the month below.

monthYear is the identification of the month and the year of manufacturing (or of serial number assignment).
Value assignment: BCD coding of Month (two digits) and Year (two last digits).

type is an identifier of the type of equipment.
Value assignment: manufacturer specific, with ‘FFh’ reserved value.

manufacturerCode: is the numerical code of the manufacturer of the equipment.

2.57 FullCardNumber

Code fully identifying a tachograph card.

```
FullCardNumber ::= SEQUENCE {
    cardType                        EquipmentType,
    cardIssuingMemberState          NationNumeric,
    cardNumber                      CardNumber
}
```

cardType is the type of the tachograph card.

cardIssuingMemberState is the code of the Contracting Party having issued the card.

cardNumber is the card number.

2.58 HighResOdometer

Odometer value of the vehicle: Accumulated distance travelled by the vehicle during its operation.

HighResOdometer ::= INTEGER(0..2^{32}-1)

Value assignment: Unsigned binary. Value in 1/200 km in the operating range 0 to 21 055 406 km.

2.59 HighResTripDistance

A distance travelled during all or part of a journey.

HighResTripDistance ::= INTEGER(0..2^{32}-1)

Value assignment: Unsigned binary. Value in 1/200 km in the operating range 0 to 21 055 406 km.

2.60 HolderName

The surname and first name(s) of a card holder.

```
HolderName ::= SEQUENCE {
   holderSurname                          Name,
   holderFirstNames                       Name
}
```

holderSurname is the surname (family name) of the holder. This surname does not include titles.
Value assignment: When a card is not personal, holderSurname contains the same information as companyName or workshopName or controlBodyName.

holderFirstNames is the first name(s) and initials of the holder.

2.61 K-ConstantOfRecordingEquipment

Constant of the control device (definition m)).

K-ConstantOfRecordingEquipment ::= INTEGER(0..2^{16}-1)

Value assignment: Pulses per kilometre in the operating range 0 to 64 255 pulses/km.

2.62 KeyIdentifier

A unique identifier of a Public Key used to reference and select the key. It also identifies the holder of the key.

```
KeyIdentifier ::= CHOICE {
   extendedSerialNumber                   ExtendedSerialNumber,
   certificateRequestID                   CertificateRequestID,
   certificationAuthorityKID              CertificationAuthorityKID
}
```

The first choice is suitable to reference the public key of a Vehicle Unit or of a tachograph card.

The second choice is suitable to reference the public key of a Vehicle Unit (in the case the serial number of the Vehicle Unit cannot be known at certificate generation time).

The third choice is suitable to reference the public key of a Contracting Party .

2.63 L-TyreCircumference

Effective circumference of the wheel tyres (definition u)).

L-TyreCircumference ::= INTEGER(0.. 2^{16}-1)

Value assignment: Unsigned binary, value in 1/8 mm in the operating range 0 to 8 031 mm.

2.64 Language

Code identifying a language.

Language ::= IA5String(SIZE(2))

Value assignment: Two-letter lower-case coding according to ISO 639.

2.65 LastCardDownload

Date and time, stored on a driver card, of last card download (for other purposes than control). This date is updateable by a VU or any card reader.

LastCardDownload ::= TimeReal

Value assignment : not further specified.

2.66 ManualInputFlag

Code identifying whether a cardholder has manually entered driver activities at card insertion or not (requirement 081).

```
ManualInputFlag ::= INTEGER {
    noEntry                                  (0)
    manualEntries                            (1)
}
```

Value assignment : not further specified.

2.67 ManufacturerCode

Code identifying a manufacturer.[13]

ManufacturerCode ::= INTEGER(0..255)

Value assignment :

‘00’H	No information available
‘01’H	Reserved value
‘02’H .. ‘0F’H	Reserved for Future Use
‘10’H	ACTIA
‘11’H .. ‘17’H	Reserved for manufacturers which name begins with ‘A’
‘18’H .. ‘1F’H	Reserved for manufacturers which name begins with ‘B’
‘20’H .. ‘27’H	Reserved for manufacturers which name begins with ‘C’
‘28’H .. ‘2F’H	Reserved for manufacturers which name begins with ‘D’
‘30’H .. ‘37’H	Reserved for manufacturers which name begins with ‘E’
‘38’H .. ‘3F’H	Reserved for manufacturers which name begins with ‘F’
‘40’H	Giesecke & Devrient GmbH
‘41’H	GEM plus

[13] An updated list of codes identifying the manufacturers is available on the website of the European Certification Authority at this address: http://dtc.jrc.ec.europa.eu/text/cm.html

‘42’H .. ‘47’H	Reserved for manufacturers which name begins with ‘G’
‘48’H .. ‘4F’H	Reserved for manufacturers which name begins with ‘H’
‘50’H .. ‘57’H	Reserved for manufacturers which name begins with ‘I’
‘58’H .. ‘5F’H	Reserved for manufacturers which name begins with ‘J’
‘60’H .. ‘67’H	Reserved for manufacturers which name begins with ‘K’
‘68’H .. ‘6F’H	Reserved for manufacturers which name begins with ‘L’
‘70’H .. ‘77’H	Reserved for manufacturers which name begins with ‘M’
‘78’H .. ‘7F’H	Reserved for manufacturers which name begins with ‘N’
‘80’H	OSCARD
‘81’H .. ‘87’H	Reserved for manufacturers which name begins with ‘O’
‘88’H .. ‘8F’H	Reserved for manufacturers which name begins with ‘P’
‘90’H .. ‘97’H	Reserved for manufacturers which name begins with ‘Q’
‘98’H .. ‘9F’H	Reserved for manufacturers which name begins with ‘R’
‘A0’H	SETEC
‘A1’H	SIEMENS VDO
‘A2’H	STONERIDGE
‘A3’H.. ‘A7’H	Reserved for manufacturers which name begins with ‘S’
‘AA’H	TACHOCONTROL
’AB’H .. ‘AF’H	Reserved for manufacturers which name begins with ‘T’
‘B0’H .. ‘B7’H	Reserved for manufacturers which name begins with ‘U’
‘B8’H .. ‘BF’H	Reserved for manufacturers which name begins with ‘V’
‘C0’H .. ‘C7’H	Reserved for manufacturers which name begins with ‘W’
‘C8’H .. ‘CF’H	Reserved for manufacturers which name begins with ‘X’
‘D0’H .. ‘D7’H	Reserved for manufacturers which name begins with ‘Y’
‘D8’H .. ‘DF’H	Reserved for manufacturers which name begins with ‘Z’

2.68 MemberStateCertificate

The certificate of the public key of a Contracting Party issued by the European Certification Authority..

MemberStateCertificate ::= Certificate

2.69 MemberStatePublicKey

The public key of a Contracting Party .

MemberStatePublicKey ::= PublicKey

2.70 Name

A name.

```
Name ::= SEQUENCE {
   codePage                                   INTEGER (0..255),
   name                                       OCTET STRING (SIZE(35))
}
```

codePage specifies the part of the ISO/IEC 8859 used to code the name,

name is a name coded in accordance with ISO/IEC 8859-codePage.

2.71 NationAlpha

Alphabetic reference to a country, in accordance with the conventional coding of countries (distinguishing signs) which is displayed at the rear of vehicles (either separately from the registration plate or incorporated into the registration plate) and/or mentioned in the green cards issued by the insurance companies.

NationAlpha ::= IA5String(SIZE(3))

Value assignment:

' '	No information available,
'A '	Austria,
'AL '	Albania,
'AND'	Andorra,
'ARM'	Armenia,
'AZ '	Azerbaijan,
'B '	Belgium,
'BG '	Bulgaria,
'BIH'	Bosnia and Herzegovina,
'BY '	Belarus,
'CH '	Switzerland,
'CY '	Cyprus,
'CZ '	Czech Republic,
'D '	Germany,
'DK '	Denmark,
'E '	Spain,
'EST'	Estonia,
'F '	France,
'FIN'	Finland,
'FL '	Liechtenstein,
'FR '	Faeroe Islands,
'UK '	United Kingdom, Alderney, Guernsey, Jersey, Isle of Man, Gibraltar,
'GE '	Georgia,
'GR '	Greece,
'H '	Hungary,
'HR'	Croatia,
'I '	Italy,
'IRL'	Ireland,
'IS '	Iceland,
'KZ '	Kazakhstan,
'L '	Luxembourg,
'LT '	Lithuania,
'LV '	Latvia,
'M '	Malta,
'MC '	Monaco,
'MD '	Republic of Moldova,
'MK '	The former Yugoslav Rep. of Macedonia,
'N '	Norway,
'NL '	The Netherlands,
'P '	Portugal,
'PL '	Poland,
'RO '	Romania,

‘RSM’	San Marino,
‘RUS’	Russian Federation,
‘S ’	Sweden,
‘SK ’	Slovakia,
‘SLO’	Slovenia,
‘SRB’	Serbia,
‘TM ’	Turkmenistan,
‘TR ’	Turkey,
‘UA ’	Ukraine,
‘V ’	Vatican City,
‘UNK’	Unknown,
‘EC ’	European Community,
‘EUR’	Rest of Europe,
‘WLD’	Rest of the world.

2.72 NationNumeric

Numerical reference to a country.

NationNumeric ::= INTEGER(0 .. 255)

Value assignment :

-- No information available	(00)H,
-- Austria	(01)H,
-- Albania	(02)H,
-- Andorra	(03)H,
-- Armenia	(04)H,
-- Azerbaijan	(05)H,
-- Belgium	(06)H,
-- Bulgaria	(07)H,
-- Bosnia and Herzegovina	(08)H,
-- Belarus	(09)H,
-- Switzerland	(0A)H,
-- Cyprus	(0B)H,
-- Czech Republic	(0C)H,
-- Germany	(0D)H,
-- Denmark	(0E)H,
-- Spain	(0F)H,
-- Estonia	(10)H,
-- France	(11)H,
-- Finland	(12)H,
-- Liechtenstein	(13)H,
-- Faeroe Islands	(14)H,
-- United Kingdom	(15)H,
-- Georgia	(16)H,
-- Greece	(17)H,
-- Hungary	(18)H,
-- Croatia	(19)H,
-- Italy	(1A)H,
-- Ireland	(1B)H,
-- Iceland	(1C)H,
-- Kazakhstan	(1D)H,

-- Luxembourg	(1E)H,
-- Lithuania	(1F)H,
-- Latvia	(20)H,
-- Malta	(21)H,
-- Monaco	(22)H,
-- Republic of Moldova	(23)H,
-- The former Yugoslav Rep. of Macedonia	(24)H,
-- Norway	(25)H,
-- Netherlands	(26)H,
-- Portugal	(27)H,
-- Poland	(28)H,
-- Romania	(29)H,
-- San Marino	(2A)H,
-- Russian Federation	(2B)H,
-- Sweden	(2C)H,
-- Slovakia	(2D)H,
-- Slovenia	(2E)H,
-- Turkmenistan	(2F)H,
-- Turkey	(30)H,
-- Ukraine	(31)H,
-- Vatican City	(32)H,
-- Serbia	(33)H,
-- RFU	(34 .. FC)H,
-- European Community	(FD)H,
-- Rest of Europe	(FE)H,
-- Rest of the world	(FF)H

2.73 NoOfCalibrationRecords

Number of calibration records, a workshop card can store.

NoOfCalibrationRecords ::= INTEGER(0..255)

Value assignment: see paragraph 3.

2.74 NoOfCalibrationsSinceDownload

Counter indicating the number of calibrations performed with a workshop card since its last download (requirement 230).

NoOfCalibrationsSinceDownload ::= INTEGER(0..2^{16}-1),

Value assignment: Not specified further.

2.75 NoOfCardPlaceRecords

Number of place records a driver or workshop card can store.

NoOfCardPlaceRecords ::= INTEGER(0..255)

Value assignment: see paragraph 3.

2.76 NoOfCardVehicleRecords

Number of vehicles used records a driver or workshop card can store.

NoOfCardVehicleRecords ::= INTEGER(0.. 2^{16}-1)

Value assignment: see paragraph 3.

2.77 NoOfCompanyActivityRecords

Number of company activity records, a company card can store.

NoOfCompanyActivityRecords ::= INTEGER(0.. 2^{16}-1)

Value assignment: see paragraph 3.

2.78 NoOfControlActivityRecords

Number of control activity records, a control card can store.

NoOfControlActivityRecords ::= INTEGER(0.. 2^{16}-1)

Value assignment: see paragraph 3.

2.79 NoOfEventsPerType

Number of events per type of event a card can store.

NoOfEventsPerType ::= INTEGER(0..255)

Value assignment: see paragraph 3.

2.80 NoOfFaultsPerType

Number of faults per type of fault a card can store.

NoOfFaultsPerType ::= INTEGER(0..255)

Value assignment: see paragraph 3.

2.81 OdometerValueMidnight

The vehicle’s odometer value at midnight on a given day (requirement 090).

OdometerValueMidnight ::= OdometerShort

Value assignment: not further specified.

2.82 OdometerShort

Odometer value of the vehicle in a short form.

OdometerShort ::= INTEGER(0..2^{24}-1)

Value assignment: Unsigned binary. Value in km in the operating range 0 to 9 999 999 km.

2.83 OverspeedNumber

Number of over speeding events since the last over speeding control.

OverspeedNumber ::= INTEGER(0..255)

Value assignment : 0 means that no over speeding event has occurred since the last over speeding control , 1 means that one over speeding event has occurred since the last over speeding control …255 means that 255 or more over speeding events have occurred since the last over speeding control.

2.84 PlaceRecord

Information related to a place where a daily work period begins or ends (requirements 087, 202, 221).

```
PlaceRecord ::= SEQUENCE {
   entryTime                              TimeReal,
   entryTypeDailyWorkPeriod               EntryTypeDailyWorkPeriod,
   dailyWorkPeriodCountry                 NationNumeric,
   dailyWorkPeriodRegion                  RegionNumeric,
   vehicleOdometerValue                   OdometerShort
}
```

entryTime is a date and time related to the entry.

entryTypeDailyWorkPeriod is the type of entry.

dailyWorkPeriodCountry is the country entered.

dailyWorkPeriodRegion is the region entered.

vehicleOdometerValue is the odometer value at the time of place entry.

2.85 PreviousVehicleInfo

Information related to the vehicle previously used by a driver when inserting his card in a vehicle unit (requirement 081).

```
PreviousVehicleInfo ::= SEQUENCE {
   vehicleRegistrationIdentification         VehicleRegistrationIdentification,
   cardWithdrawalTime                        TimeReal
}
```

vehicleRegistrationIdentification is the VRN and the registering Contracting Party of the vehicle.

cardWithdrawalTime is the card withdrawal date and time.

2.86 PublicKey

A public RSA key.

```
PublicKey ::= SEQUENCE {
   rsaKeyModulus                          RSAKeyModulus,
   rsaKeyPublicExponent                   RSAKeyPublicExponent
}
```

rsaKeyModulus is the Modulus of the key pair.

rsaKeyPublicExponent is the public exponent of the key pair.

2.87 RegionAlpha

Alphabetic reference to a region within a specified country.

RegionAlpha ::= IA5STRING(SIZE(3))

Value assignment:

‘ ’	No information available,
Spain:	
‘AN ’	Andalucía,
‘AR ’	Aragón,
‘AST’	Asturias,
‘C ’	Cantabria,
‘CAT’	Cataluña,
‘CL ’	Castilla-León,
‘CM ’	Castilla-La-Mancha,
‘CV’	Valencia,
‘EXT’	Extremadura,
‘G ’	Galicia,
‘IB ’	Baleares,
‘IC ’	Canarias,
‘LR ’	La Rioja,
‘M ’	Madrid,
‘MU ’	Murcia,
‘NA ’	Navarra,
‘PV ’	País Vasco

2.88 RegionNumeric

Numerical reference to a region within a specified country.

RegionNumeric ::= OCTET STRING (SIZE(1))

Value assignment:

‘00’H	No information available,
Spain:	
‘01’H	Andalucía,
‘02’H	Aragón,
‘03’H	Asturias,
‘04’H	Cantabria,
‘05’H	Cataluña,
‘06’H	Castilla-León,
‘07’H	Castilla-La-Mancha,
‘08’H	Valencia,
‘09’H	Extremadura,
‘0A’H	Galicia,
‘0B’H	Baleares,
‘0C’H	Canarias,
‘0D’H	La Rioja,
‘0E’H	Madrid,
‘0F’H	Murcia,
‘10’H	Navarra,
‘11’H	País Vasco

2.89 RSAKeyModulus

The modulus of a RSA key pair.

RSAKeyModulus ::= OCTET STRING (SIZE(128))

Value assignment: Unspecified.

2.90 RSAKeyPrivateExponent

The private exponent of a RSA key pair.

RSAKeyPrivateExponent ::= OCTET STRING (SIZE(128))

Value assignment: Unspecified.

2.91 RSAKeyPublicExponent

The public exponent of a RSA key pair.

RSAKeyPublicExponent ::= OCTET STRING (SIZE(8))

Value assignment: Unspecified.

2.92 SensorApprovalNumber

Type approval number of the sensor.

SensorApprovalNumber ::= IA5String(SIZE(8))

Value assignment: Unspecified.

2.93 SensorIdentification

Information, stored in a motion sensor, related to the identification of the motion sensor (requirement 077).

```
SensorIdentification ::= SEQUENCE {
   sensorSerialNumber                  SensorSerialNumber,
   sensorApprovalNumber                SensorApprovalNumber,
   sensorSCIdentifier                  SensorSCIdentifier,
   sensorOSIdentifier                  SensorOSIdentifier
}
```

sensorSerialNumber is the extended serial number of the motion sensor (includes part number and manufacturer code).

sensorApprovalNumber is the approval number of the motion sensor.

sensorSCIdentifier is the identifier of the security component of the motion sensor.

sensorOSIdentifier is the identifier of the operating system of the motion sensor.

2.94 SensorInstallation

Information, stored in a motion sensor, related to the installation of the motion sensor (requirement 099).

```
SensorInstallation ::= SEQUENCE {
    sensorPairingDateFirst             SensorPairingDate,
    firstVuApprovalNumber              VuApprovalNumber,
    firstVuSerialNumber                VuSerialNumber,
    sensorPairingDateCurrent           SensorPairingDate,
    currentVuApprovalNumber            VuApprovalNumber,
    currentVUSerialNumber              VuSerialNumber
}
```

sensorPairingDateFirst is the date of the first pairing of the motion sensor with a vehicle unit.

firstVuApprovalNumber is the approval number of the first vehicle unit paired with the motion sensor.

firstVuSerialNumber is the serial number of the first vehicle unit paired with the motion sensor.

sensorPairingDateCurrent is the date of the current pairing of the motion sensor with the vehicle unit.

currentVuApprovalNumber is the approval number of the vehicle unit currently paired with the motion sensor.

currentVUSerialNumber is the serial number of the vehicle unit currently paired with the motion sensor.

2.95 SensorInstallationSecData

Information, stored in a workshop card, related to the security data needed for pairing motion sensors to vehicle units (requirement 214).

SensorInstallationSecData ::= TDesSessionKey

Value assignment: in accordance with ISO 16844-3.

2.96 SensorOSIdentifier

Identifier of the operating system of the motion sensor.

SensorOSIdentifier ::= IA5String(SIZE(2))

Value assignment: manufacturer specific.

2.97 SensorPaired

Information, stored in a vehicle unit, related to the identification of the motion sensor paired with the vehicle unit (requirement 079).

```
SensorPaired ::= SEQUENCE {
    sensorSerialNumber                 SensorSerialNumber,
    sensorApprovalNumber               SensorApprovalNumber,
    sensorPairingDateFirst             SensorPairingDate
}
```

sensorSerialNumber is the serial number of the motion sensor currently paired with the vehicle unit.

sensorApprovalNumber is the approval number of the motion sensor currently paired with the vehicle unit.

sensorPairingDateFirst is the date of the first pairing with a vehicle unit of the motion sensor currently paired with the vehicle unit.

2.98 SensorPairingDate

Date of a pairing of the motion sensor with a vehicle unit.

SensorPairingDate ::= TimeReal

Value assignment: Unspecified.

2.99 SensorSerialNumber

Serial number of the motion sensor.

SensorSerialNumber ::= ExtendedSerialNumber

2.100 SensorSCIdentifier

Identifier of the security component of the motion sensor.

SensorSCIdentifier ::= IA5String(SIZE(8))

Value assignment: component manufacturer specific.

2.101 Signature

A digital signature.

Signature ::= OCTET STRING (SIZE(128))

Value assignment: in accordance with sub-appendix 11 Common security mechanisms.

2.102 SimilarEventsNumber

The number of similar events for one given day (requirement 094).

SimilarEventsNumber ::= INTEGER(0..255)

Value assignment : 0 is not used, 1 means that only one event of that type has occurred and has been stored on that day, 2 means that 2 events of that type has occurred on that day (one only has been stored), …255 means that 255 or more events of that type have occurred on that day.

2.103 SpecificConditionType

Code identifying a specific condition (requirements 050b, 105a, 212a and 230a).

SpecificConditionType ::= INTEGER(0..255)

Value assignment :

‘00’H	RFU
‘01’H	Out of scope – Begin
‘02’H	Out of scope – End
‘03’H	Ferry / Train crossing
‘04’H .. ‘FF’HRFU	

2.104 SpecificConditionRecord

Information, stored in a driver card, a workshop card or a vehicle unit, related to a specific condition (requirements 105a, 212a and 230a).

```
SpecificConditionRecord ::= SEQUENCE {
   entryTime                          TimeReal,
   specificConditionType              SpecificConditionType
}
```

entryTime is the date and time of the entry.

specificConditionType is the code identifying the specific condition.

2.105 Speed

Speed of the vehicle (km/h).

```
Speed ::= INTEGER(0..255)
```

Value assignment: kilometre per hour in the operational range 0 to 220 km/h.

2.106 SpeedAuthorised

Maximum authorised Speed of the vehicle (definition bb)).

```
SpeedAuthorised ::= Speed
```

2.107 SpeedAverage

Average speed in a previously defined duration (km/h).

```
SpeedAverage ::= Speed
```

2.108 SpeedMax

Maximum speed measured in a previously defined duration.

```
SpeedMax ::= Speed
```

2.109 TDesSessionKey

A triple DES session key.

```
TDesSessionKey ::= SEQUENCE {
   tDesKeyA                           OCTET STRING (SIZE(8))
   tDesKeyB                           OCTET STRING (SIZE(8))
}
```

Value assignment: not further specified.

2.110 TimeReal

Code for a combined date and time field, where the date and time are expressed as seconds past 00h.00m.00s. on 1 January 1970 GMT.

```
TimeReal{INTEGER:TimeRealRange} ::= INTEGER(0..TimeRealRange)
```

Value assignment – Octet Aligned: Number of seconds since midnight 1 January 1970 GMT.

The max. possible date/time is in the year 2106.

2.111 TyreSize

Designation of tyre dimensions.

```
TyreSize ::= IA5String(SIZE(15))
```

Value assignment: in accordance with ECE Regulation N°54[14].

2.112 VehicleIdentificationNumber

Vehicle Identification Number (VIN) referring to the vehicle as a whole, normally chassis serial number or frame number.

```
VehicleIdentificationNumber ::= IA5String(SIZE(17))
```

Value assignment: As defined in ISO 3779.

2.113 VehicleRegistrationIdentification

Identification of a vehicle, unique for Europe (VRN and Contracting Party)

```
VehicleRegistrationIdentification ::= SEQUENCE {
    vehicleRegistrationNation           NationNumeric,
    vehicleRegistrationNumber           VehicleRegistrationNumber
}
```

vehicleRegistrationNation is the nation where the vehicle is registered.

vehicleRegistrationNumber is the registration number of the vehicle (VRN).

2.114 VehicleRegistrationNumber

Registration number of the vehicle (VRN). The registration number is assigned by the vehicle licensing authority.

```
VehicleRegistrationNumber ::= SEQUENCE {
    codePage                            INTEGER (0..255),
    vehicleRegNumber                    OCTET STRING (SIZE(13))
}
```

codePage specifies the part of the ISO/IEC 8859 used to code the vehicleRegNumber,

vehicleRegNumber is a VRN coded in accordance with ISO/IEC 8859-codePage.

Value assignment: Country specific.

2.115 VuActivityDailyData

Information, stored in a VU, related to changes of activity and/or changes of driving status and/or changes of card status for a given calendar day (requirement 084) and to slots status at 00:00 that day.

```
VuActivityDailyData ::= SEQUENCE {
    noOfActivityChanges                 INTEGER SIZE(0..1440),
    activityChangeInfos                 SET SIZE(noOfActivityChanges) OF
                                        ActivityChangeInfo
}
```

[14] Reference text in the EU is Directive 92/23/EEC relating to tyres for motor vehicles and their trailers and to their fitting of 31 March 1992 (OJ No L 129, 14/05/1992).

noOfActivityChanges is the number of ActivityChangeInfo words in the activityChangeInfos set.

activityChangeInfos is the set of ActivityChangeInfo words stored in the VU for the day. It always includes two ActivityChangeInfo words giving the status of the two slots at 00:00 that day.

2.116 VuApprovalNumber

Type approval number of the vehicle unit.

```
VuApprovalNumber ::= IA5String(SIZE(8))
```

Value assignment: Unspecified.

2.117 VuCalibrationData

Information, stored in a vehicle unit, related to the calibrations of the control device (requirement 098).

```
VuCalibrationData ::= SEQUENCE {
   noOfVuCalibrationRecords            INTEGER(0..255),
   vuCalibrationRecords                SET SIZE(noOfVuCalibrationRecords) OF
                                       VuCalibrationRecord
}
```

noOfVuCalibrationRecords is the number of records contained in the vuCalibrationRecords set.

vuCalibrationRecords is the set of calibration records.

2.118 VuCalibrationRecord

Information, stored in a vehicle unit, related a calibration of the control device (requirement 098).

```
VuCalibrationRecord ::= SEQUENCE {
   calibrationPurpose                     CalibrationPurpose,
   workshopName                           Name,
   workshopAddress                        Address,
   workshopCardNumber                     FullCardNumber,
   workshopCardExpiryDate                 TimeReal,
   vehicleIdentificationNumber            VehicleIdentificationNumber,
   vehicleRegistrationIdentification      VehicleRegistrationIdentification,
   wVehicleCharacteristicConstant         W-VehicleCharacteristicConstant,
   kConstantOfRecordingEquipment          K-ConstantOfRecordingEquipment,
   lTyreCircumference                     L-TyreCircumference,
   tyreSize                               TyreSize,
   authorisedSpeed                        SpeedAuthorised,
   oldOdometerValue                       OdometerShort,
   newOdometerValue                       OdometerShort,
   oldTimeValue                           TimeReal,
   newTimeValue                    TimeReal,
   nextCalibrationDate             TimeReal
}
```

calibrationPurpose is the purpose of the calibration.

workshopName, workshopAddress are the workshop name and address.

workshopCardNumber identifies the workshop card used during the calibration.

workshopCardExpiryDate is the card expiry date.

vehicleIdentificationNumber is the VIN.

vehicleRegistrationIdentification contains the VRN and registering Contracting Party .

wVehicleCharacteristicConstant is the characteristic coefficient of the vehicle.

kConstantOfRecordingEquipment is the constant of the control device.

lTyreCircumference is the effective circumference of the wheel tyres.

tyreSize is the designation of the dimension of the tyres mounted on the vehicle

authorisedSpeed is the authorised speed of the vehicle.

oldOdometerValue, newOdometerValue are the old and new values of the odometer.

oldTimeValue, newTimeValue are the old and new values of date and time.

nextCalibrationDate is the date of the next calibration of the type specified in CalibrationPurpose to be carried out by the authorised inspection authority.

2.119 VuCardIWData

Information, stored in a vehicle unit, related to insertion and withdrawal cycles of driver cards or of workshop cards in the vehicle unit (requirement 081).

```
VuCardIWData ::= SEQUENCE {
    noOfIWRecords                INTEGER(0..2^16-1),
    vuCardIWRecords              SET SIZE(noOfIWRecords) OF
                                 VuCardIWRecord
}
```

noOfIWRecords is the number of records in the set vuCardIWRecords.

vuCardIWRecords is a set of records related to card insertion withdrawal cycles.

2.120 VuCardIWRecord

Information, stored in a vehicle unit, related to an insertion and withdrawal cycle of a driver card or of a workshop card in the vehicle unit (requirement 081).

```
VuCardIWRecord ::= SEQUENCE {
    cardHolderName                      HolderName,
    fullCardNumber                      FullCardNumber,
    cardExpiryDate                      TimeReal,
    cardInsertionTime                   TimeReal,
    vehicleOdometerValueAtInsertion     OdometerShort,
    cardSlotNumber                      CardSlotNumber,
    cardWithdrawalTime                  TimeReal,
    vehicleOdometerValueAtWithdrawal    OdometerShort,
    previousVehicleInfo                 PreviousVehicleInfo
    manualInputFlag                     ManualInputFlag
}
```

cardHolderName is the driver or workshop card holder’s surname and first names as stored in the card.

fullCardNumber is the type of card, its issuing Contracting Party and its card number as stored in the card.

cardExpiryDate is the card’s expiry date as stored in the card.

cardInsertionTime is the insertion date and time.

vehicleOdometerValueAtInsertion is the vehicle odometer value at card insertion.

cardSlotNumber is the slot in which the card is inserted.

cardWithdrawalTime is the withdrawal date and time.

vehicleOdometerValueAtWithdrawal is the vehicle odometer value at card withdrawal.

previousVehicleInfo contains information about the previous vehicle used by the driver, as stored in the card.

manualInputFlag is a flag identifying if the cardholder has manually entered driver activities at card insertion.

2.121 VuCertificate

Certificate of the public key of a vehicle unit.

```
VuCertificate ::= Certificate
```

2.122 VuCompanyLocksData

Information, stored in a vehicle unit, related to company locks (requirement 104).

```
VuCompanyLocksData ::= SEQUENCE {
    noOfLocks                           INTEGER(0..20),
    vuCompanyLocksRecords               SET SIZE(noOfLocks) OF
                                        VuCompanyLocksRecord
}
```

noOfLocks is the number of locks listed in vuCompanyLocksRecords.

vuCompanyLocksRecords is the set of company locks records.

2.123 VuCompanyLocksRecord

Information, stored in a vehicle unit, related to one company lock (requirement 104).

```
VuCompanyLocksRecord ::= SEQUENCE {
    lockInTime                              TimeReal,
    lockOutTime                             TimeReal,
    companyName                             Name,
    companyAddress                          Address,
    companyCardNumber                       FullCardNumber
}
```

lockInTime, lockOutTime are the date and time of lock-in and lock-out.

companyName, companyAddress are the company name and address related with the lock-in.

companyCardNumber identifies the card used at lock-in.

2.124 VuControlActivityData

Information, stored in a vehicle unit, related to controls performed using this VU (requirement 102).

```
VuControlActivityData ::= SEQUENCE {
    noOfControls                            INTEGER(0..20),
    vuControlActivityRecords                SET SIZE(noOfControls) OF
                                            VuControlActivityRecord
}
```

noOfControls is the number of controls listed in vuControlActivityRecords.

vuControlActivityRecords is the set of control activity records.

2.125 VuControlActivityRecord

Information, stored in a vehicle unit, related to a control performed using this VU (requirement 102).

```
VuControlActivityRecord ::= SEQUENCE {
    controlType                             ControlType,
    controlTime                             TimeReal,
    controlCardNumber                       FullCardNumber,
    downloadPeriodBeginTime                 TimeReal,
    downloadPeriodEndTime                   TimeReal
}
```

controlType is the type of the control.

controlTime is the date and time of the control.

controlCardNumber identifies the control card used for the control.

downloadPeriodBeginTime is the begin time of the downloaded period, in case of downloading.

downloadPeriodEndTime is the end time of the downloaded period, in case of downloading.

2.126 VuDataBlockCounter

Counter, stored in a card, identifying sequentially the insertion withdrawal cycles of the card in vehicle units.

VuDataBlockCounter ::= BCDString(SIZE(2))

Value assignment: Consecutive Number with max, value 9 999, starting again with 0.

2.127 VuDetailedSpeedBlock

Information, stored in a vehicle unit, related to the vehicle's detailed speed for a minute during which the vehicle has been moving (requirement 093).

VuDetailedSpeedBlock ::= SEQUENCE {
    speedBlockBeginDate   TimeReal,
    speedsPerSecond   SEQUENCE SIZE(60) OF Speed
}

speedBlockBeginDate is the date and time of the first speed value within the block.

speedsPerSecond is the chronological sequence of measured speeds every seconds for the minute starting at speedBlockBeginDate (included).

2.128 VuDetailedSpeedData

Information, stored in a vehicle unit, related to the detailed speed of the vehicle.

VuDetailedSpeedData ::= SEQUENCE {
    noOfSpeedBlocks   INTEGER(0.2^{16}-1),
    vuDetailedSpeedBlocks   SET SIZE(noOfSpeedBlocks) OF VuDetailedSpeedBlock
}

noOfSpeedBlocks is the number of speed blocks in the vuDetailedSpeedBlocks set.

vuDetailedSpeedBlocks is the set of detailed speed blocks.

2.129 VuDownloadablePeriod

Oldest and latest dates for which a vehicle unit holds data related to drivers activities (requirements 081, 084 or 087).

VuDownloadablePeriod ::= SEQUENCE {
    minDownloadableTime   TimeReal
    maxDownloadableTime   TimeReal
}

minDownloadableTime is the oldest card insertion or activity change or place entry date and time stored in the VU.

maxDownloadableTime is the latest card withdrawal or activity change or place entry date and time stored in the VU.

2.130 VuDownloadActivityData

Information, stored in a vehicle unit, related to its last download (requirement 105).

```
VuDownloadActivityData ::= SEQUENCE {
   downloadingTime                     TimeReal,
   fullCardNumber                      FullCardNumber,
   companyOrWorkshopName               Name
}
```

downloadingTime is the date and time of downloading.

fullCardNumber identifies the card used to authorise the download.

companyOrWorkshopName is the company or workshop name.

2.131 VuEventData

Information, stored in a vehicle unit, related to events (requirement 094 except over speeding event).

```
VuEventData ::= SEQUENCE {

noOfVuEvents                           INTEGER(0..255),

vuEventRecords                         SET SIZE(noOfVuEvents) OF VuEventRecord

}
```

noOfVuEvents is the number of events listed in the vuEventRecords set.

vuEventRecords is a set of events records.

2.132 VuEventRecord

Information, stored in a vehicle unit, related to an event (requirement 094 except over speeding event).

```
VuEventRecord ::= SEQUENCE {
   eventType                           EventFaultType,
   eventRecordPurpose                  EventFaultRecordPurpose,
   eventBeginTime                      TimeReal,
   eventEndTime                        TimeReal,
   cardNumberDriverSlotBegin           FullCardNumber,
   cardNumberCodriverSlotBegin         FullCardNumber,
   cardNumberDriverSlotEnd             FullCardNumber,
   cardNumberCodriverSlotEnd           FullCardNumber,
   similarEventsNumber                 SimilarEventsNumber
}
```

eventType is the type of the event.

eventRecordPurpose is the purpose for which this event has been recorded.

eventBeginTime is the date and time of beginning of event.

eventEndTime is the date and time of end of event.

cardNumberDriverSlotBegin identifies the card inserted in the driver slot at the beginning of the event.

cardNumberCodriverSlotBegin identifies the card inserted in the co-driver slot at the beginning of the event.

cardNumberDriverSlotEnd identifies the card inserted in the driver slot at the end of the event.

cardNumberCodriverSlotEnd identifies the card inserted in the co-driver slot at the end of the event.

similarEventsNumber is the number of similar events that day.

This sequence can be used for all events other than over speeding events.

2.133 VuFaultData

Information, stored in a vehicle unit, related to faults (requirement 096).

```
VuFaultData ::= SEQUENCE {
   noOfVuFaults                        INTEGER(0..255),
   vuFaultRecords                      SET SIZE(noOfVuFaults) OF VuFaultRecord
}
```

noOfVuFaults is the number of faults listed in the vuFaultRecords set.

vuFaultRecords is a set of faults records.

2.134 VuFaultRecord

Information, stored in a vehicle unit, related to a fault (requirement 096).

```
VuFaultRecord ::= SEQUENCE {
   faultType                           EventFaultType,
   faultRecordPurpose                  EventFaultRecordPurpose,
   faultBeginTime                      TimeReal,
   faultEndTime                        TimeReal,
   cardNumberDriverSlotBegin           FullCardNumber,
   cardNumberCodriverSlotBegin         FullCardNumber,
   cardNumberDriverSlotEnd             FullCardNumber,
   cardNumberCodriverSlotEnd           FullCardNumber
}
```

faultType is the type of control device fault.

faultRecordPurpose is the purpose for which this fault has been recorded.

faultBeginTime is the date and time of beginning of fault.

faultEndTime is the date and time of end of fault.

cardNumberDriverSlotBegin identifies the card inserted in the driver slot at the beginning of the fault.

cardNumberCodriverSlotBegin identifies the card inserted in the co-driver slot at the beginning of the fault.

cardNumberDriverSlotEnd identifies the card inserted in the driver slot at the end of the fault.

cardNumberCodriverSlotEnd identifies the card inserted in the co-driver slot at the end of the fault.

2.135 VuIdentification

Information, stored in a vehicle unit, related to the identification of the vehicle unit (requirement 075).

```
VuIdentification ::= SEQUENCE {
   vuManufacturerName                    VuManufacturerName,
   vuManufacturerAddress                 VuManufacturerAddress,
   vuPartNumber                          VuPartNumber,
   vuSerialNumber                        VuSerialNumber,
   vuSoftwareIdentification              VuSoftwareIdentification,
   vuManufacturingDate                   VuManufacturingDate,
   vuApprovalNumber                      VuApprovalNumber
}
```

vuManufacturerName is the name of the manufacturer of the vehicle unit.

vuManufacturerAddress is the address of the manufacturer of the vehicle unit.

vuPartNumber is the part number of the vehicle unit.

vuSerialNumber is the serial number of the vehicle unit.

vuSoftwareIdentification identifies the software implemented in the vehicle unit.

vuManufacturingDate is the manufacturing date of the vehicle unit.

vuApprovalNumber is the type approval number of the vehicle unit.

2.136 VuManufacturerAddress

Address of the manufacturer of the vehicle unit.

VuManufacturerAddress ::= Address

Value assignment: Unspecified.

2.137 VuManufacturerName

Name of the manufacturer of the vehicle unit.

VuManufacturerName ::= Name

Value assignment: Unspecified.

2.138 VuManufacturingDate

Date of manufacture of the vehicle unit.

VuManufacturingDate ::= TimeReal

Value assignment: Unspecified.

2.139 VuOverSpeedingControlData

Information, stored in a vehicle unit, related to over speeding events since the last over speeding control (requirement 095).

```
VuOverSpeedingControlData ::= SEQUENCE {
   lastOverspeedControlTime          TimeReal,
   firstOverspeedSince               TimeReal,
   numberOfOverspeedSince            OverspeedNumber
}
```

lastOverspeedControlTime is the date and time of the last over speeding control.

firstOverspeedSince is the date and time of the first over speeding following this over speeding control.

numberOfOverspeedSince is the number of over speeding events since the last over speeding control.

2.140 VuOverSpeedingEventData

Information, stored in a vehicle unit, related to over speeding events (requirement 094).

```
VuOverSpeedingEventData ::= SEQUENCE {
   noOfVuOverSpeedingEvents          INTEGER(0..255),
   vuOverSpeedingEventRecords        SET SIZE(noOfVuOverSpeedingEvents) OF
                                     VuOverSpeedingEventRecord
}
```

noOfVuOverSpeedingEvents is the number of events listed in the vuOverSpeedingEventRecords set.

vuOverSpeedingEventRecords is a set of over speeding events records.

2.141 VuOverSpeedingEventRecord

Information, stored in a vehicle unit, related to over speeding events (requirement 094).

```
VuOverSpeedingEventRecord ::= SEQUENCE {
   eventType                         EventFaultType,
   eventRecordPurpose                EventFaultRecordPurpose,
   eventBeginTime                    TimeReal,
   eventEndTime                      TimeReal,
   maxSpeedValue                     SpeedMax,
   averageSpeedValue                 SpeedAverage,
   cardNumberDriverSlotBegin         FullCardNumber,
   similarEventsNumber               SimilarEventsNumber
}
```

eventType is the type of the event.

eventRecordPurpose is the purpose for which this event has been recorded.

eventBeginTime is the date and time of beginning of event.

eventEndTime is the date and time of end of event.

maxSpeedValue is the maximum speed measured during the event.

averageSpeedValue is the arithmetic average speed measured during the event.

cardNumberDriverSlotBegin identifies the card inserted in the driver slot at the beginning of the event.

similarEventsNumber is the number of similar events that day.

2.142 VuPartNumber

Part number of the vehicle unit.

```
VuPartNumber ::= IA5String(SIZE(16))
```

Value assignment: VU manufacturer specific.

2.143 VuPlaceDailyWorkPeriodData

Information, stored in a vehicle unit, related to places where drivers begin or end a daily work periods (requirement 087).

```
VuPlaceDailyWorkPeriodData ::= SEQUENCE {
    noOfPlaceRecords                INTEGER(0..255),
    vuPlaceDailyWorkPeriodRecords   SET SIZE(noOfPlaceRecords) OF
                                    VuPlaceDailyWorkPeriodRecord
}
```

noOfPlaceRecords is the number of records listed in the vuPlaceDailyWorkPeriodRecords set.

vuPlaceDailyWorkPeriodRecords is a set of place related records.

2.144 VuPlaceDailyWorkPeriodRecord

Information, stored in a vehicle unit, related to a place where a driver begins or ends a daily work period (requirement 087).

```
VuPlaceDailyWorkPeriodRecord ::= SEQUENCE {
    fullCardNumber                  FullCardNumber,
    placeRecord                     PlaceRecord
}
```

fullCardNumber is the driver’s card type, card issuing Contracting Party and card number.

placeRecord contains the information related to the place entered.

2.145 VuPrivateKey

The private key of a vehicle unit.

```
VuPrivateKey ::= RSAKeyPrivateExponent
```

2.146 VuPublicKey

The public key of a vehicle unit.

VuPublicKey ::= PublicKey

2.147 VuSerialNumber

Serial number of the vehicle unit (requirement 075).

VuSerialNumber ::= ExtendedSerialNumber

2.148 VuSoftInstallationDate

Date of installation of the vehicle unit software version.

VuSoftInstallationDate ::= TimeReal

Value assignment: Unspecified.

2.149 VuSoftwareIdentification

Information, stored in a vehicle unit, related to the software installed.

```
VuSoftwareIdentification ::= SEQUENCE {
    vuSoftwareVersion                 VuSoftwareVersion,
    vuSoftInstallationDate            VuSoftInstallationDate
}
```

vuSoftwareVersion is the software version number of the Vehicle Unit.

vuSoftInstallationDate is the software version installation date.

2.150 VuSoftwareVersion

Software version number of the vehicle unit.

VuSoftwareVersion ::= IA5String(SIZE(4))

Value assignment: Unspecified.

2.151 VuSpecificConditionData

Information, stored in a vehicle unit, related to specific conditions.

VuSpecificConditionData ::= SEQUENCE {
    noOfSpecificConditionRecords   INTEGER(0..2^{16}-1)
    specificConditionRecords   SET SIZE (noOfSpecificConditionRecords) OF
                                      SpecificConditionRecord
}

noOfSpecificConditionRecords is the number of records listed in the specificConditionRecords set.

specificConditionRecords is a set of specific conditions related records.

2.152 VuTimeAdjustmentData

Information, stored in a vehicle unit, related to time adjustments performed outside the frame of a regular calibration (requirement 101).

```
VuTimeAdjustmentData ::= SEQUENCE {
   noOfVuTimeAdjRecords               INTEGER(0..6),
   vuTimeAdjustmentRecords            SET SIZE(noOfVuTimeAdjRecords) OF
                                      VuTimeAdjustmentRecord
}
```

noOfVuTimeAdjRecords is the number of records in vuTimeAdjustmentRecords**.**

vuTimeAdjustmentRecords is a set of time adjustment records.

2.153 VuTimeAdjustmentRecord

Information, stored in a vehicle unit, related a time adjustment performed outside the frame of a regular calibration (requirement 101).

```
VuTimeAdjustmentRecord ::= SEQUENCE {
   newTimeValue                       TimeReal,
   workshopName                       Name,
   workshopAddress                    Address,
   workshopCardNumber                 FullCardNumber
}
```

oldTimeValue, newTimeValue are the old and new values of date and time.

workshopName, workshopAddress are the workshop name and address.

workshopCardNumber identifies the workshop card used to perform the time adjustment.

2.154 W-VehicleCharacteristicConstant

Characteristic coefficient of the vehicle (definition k)).

W-VehicleCharacteristicConstant ::= INTEGER(0..2^{16}-1))

Value assignment: Impulses per kilometre in the operating range 0 to 64 255 pulses/km.

2.155 WorkshopCardApplicationIdentification

Information, stored in a workshop card related to the identification of the application of the card (requirement 190).

```
WorkshopCardApplicationIdentification ::= SEQUENCE {
   typeOfTachographCardId              EquipmentType,
   cardStructureVersion                CardStructureVersion,
   noOfEventsPerType                   NoOfEventsPerType,
   noOfFaultsPerType                   NoOfFaultsPerType,
   activityStructureLength             CardActivityLengthRange,
   noOfCardVehicleRecords              NoOfCardVehicleRecords,
   noOfCardPlaceRecords                NoOfCardPlaceRecords,
   noOfCalibrationRecords              NoOfCalibrationRecords
}
```

typeOfTachographCardId is specifying the implemented type of card.

cardStructureVersion is specifying the the version of the structure that is implemented in the card.

noOfEventsPerType is the number of events per type of event the card can record.

noOfFaultsPerType is the number of faults per type of fault the card can record.

activityStructureLength indicates the number of bytes available for storing activity records..

noOfCardVehicleRecords is the number of vehicle records the card can contain.

noOfCardPlaceRecords is the number of places the card can record.

noOfCalibrationRecords is the number of calibration records the card can store.

2.156 WorkshopCardCalibrationData

Information, stored in a workshop card, related to workshop activity performed with the card (requirements 227 and 229).

```
WorkshopCardCalibrationData ::= SEQUENCE {
   calibrationTotalNumber              INTEGER(0 .. 2^16-1),
   calibrationPointerNewestRecord      INTEGER(0 .. NoOfCalibrationRecords-1),
   calibrationRecords                  SET SIZE(NoOfCalibrationRecords) OF
                                       WorkshopCardCalibrationRecord
}
```

calibrationTotalNumber is the total number of calibrations performed with the card.

calibrationPointerNewestRecord is the index of the last updated calibration record.
Value assignment: Number corresponding to the numerator of the calibration record, beginning with ‘0’ for the first occurrence of the calibration records in the structure.

calibrationRecords is the set of records containing calibration and/or time adjustment information.

2.157 WorkshopCardCalibrationRecord

Information, stored in a workshop card, related to a calibration performed with the card (requirement 227).

```
WorkshopCardCalibrationRecord ::= SEQUENCE {
    calibrationPurpose                  CalibrationPurpose,
    vehicleIdentificationNumber         VehicleIdentificationNumber,
    vehicleRegistration                 VehicleRegistrationIdentification,
    wVehicleCharacteristicConstant      W-VehicleCharacteristicConstant,
    kConstantOfRecordingEquipment       K-ConstantOfRecordingEquipment,
    lTyreCircumference                  L-TyreCircumference,
    tyreSize                            TyreSize,
    authorisedSpeed                     SpeedAuthorised,
    oldOdometerValue                    OdometerShort,
    newOdometerValue                    OdometerShort,
    oldTimeValue                        TimeReal,
    newTimeValue                        TimeReal,
    nextCalibrationDate                 TimeReal,
    vuPartNumber                        VuPartNumber,
    vuSerialNumber                      VuSerialNumber,
    sensorSerialNumber                  SensorSerialNumber
}
```

calibrationPurpose is the purpose of the calibration.

vehicleIdentificationNumber is the VIN.

vehicleRegistration contains the VRN and registering Contracting Party .

wVehicleCharacteristicConstant is the characteristic coefficient of the vehicle.

kConstantOfRecordingEquipment is the constant of the control device.

lTyreCircumference is the effective circumference of the wheel tyres.

tyreSize is the designation of the dimensions of the tyres mounted on the vehicle.

authorisedSpeed is the maximum authorised speed of the vehicle.

oldOdometerValue, newOdometerValue are the old and new values of the odometer.

oldTimeValue, newTimeValue are the old and new values of date and time.

nextCalibrationDate is the date of the next calibration of the type specified in CalibrationPurpose to be carried out by the authorised inspection authority.

vuPartNumber, **vuSerialNumber** and **sensorSerialNumber** are the data elements for control device identification.

2.158 WorkshopCardHolderIdentification

Information, stored in a workshop card, related to the identification of the cardholder (requirement 216).

```
WorkshopCardHolderIdentification ::= SEQUENCE {
    workshopName                      Name,
    workshopAddress                   Address,
    cardHolderName                    HolderName,
    cardHolderPreferredLanguage       Language
}
```

workshopName is name of the workshop of the card holder.

workshopAddress is the address of the workshop of the card holder.

cardHolderName is the name and first name(s) of the holder (e.g. the name of the mechanic).

cardHolderPreferredLanguage is the preferred language of the card holder.

2.159 WorkshopCardPIN

Personal identification number of the Workshop Card (requirement 213).

WorkshopCardPIN ::= IA5String(SIZE(8))

Value assignment: The PIN known to the cardholder, right padded with ‘FF’ bytes up to 8 bytes.

3. Value and size range definitions

Definition of variable values used for definitions in paragraph 2.

TimeRealRange ::= 2^{32}-1

3.1 Definitions for the Driver Card:

Name of the variable value	Min	Max
CardActivityLengthRange	5544 bytes (28 days 93 activity changes per day)	13776 bytes (28 days 240 activity changes per day)
NoOfCardPlaceRecords	84	112
NoOfCardVehicleRecords	84	200
NoOfEventsPerType	6	12
NoOfFaultsPerType	12	24

3.2 Definitions for the Workshop Card:

Name of the variable value	Min	Max
CardActivityLengthRange	198 bytes (1 day 93 activity changes)	492 bytes (1 day 240 activity changes)
NoOfCardPlaceRecords	6	8
NoOfCardVehicleRecords	4	8
NoOfEventsPerType	3	3
NoOfFaultsPerType	6	6
NoOfCalibrationRecords	88	255

3.3 Definitions for the Control Card:

Name of the variable value	Min	Max
NoOfControlActivityRecords	230	520

3.4 Definitions for the Company Card:

Name of the variable value	Min	Max
NoOfCompanyActivityRecords	230	520

4. Character sets

IA5Strings use the ASCII characters as defined by ISO/IEC 8824-1. For readability and for easy referencing the value assignment is given below. The ISO/IEC 8824-1 supersedes this informative note in case of discrepancy.

```
  ! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ?
@ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^ _
` a b c d e f g h i j k l m n o p q r s t u v w x y z { | } ~
```

Other character strings (Address, Name, VehicleRegistrationNumber) use, in addition, the characters defined by the codes 192 to 255 of ISO/IEC 8859-1 (Latin1 character set) or ISO/IEC 8859-7 (Greek character set):

5. Encoding

When encoded with ASN.1 encoding rules, all data types defined shall be encoded according to ISO/IEC 8825-2, aligned variant.

SUB-APPENDIX II

TACHOGRAPH CARDS SPECIFICATION

CONTENTS

PAGE

CONTENTS (continued)

PAGE

1. Introduction

1.1 Abbreviations

For the purpose of this sub-appendix, the following abbreviations apply.

AC	Access conditions
AID	Application Identifier
ALW	Always
APDU	Application Protocol Data Unit (structure of a command)
ATR	Answer To Reset
AUT	Authenticated.
C6, C7	Contacts N° 6 and 7 of the card as described in ISO/IEC 7816-2
cc	clock cycles
CHV	Card holder Verification Information
CLA	Class byte of an APDU command
DF	Dedicated File. A DF can contain other files (EF or DF)
EF	Elementary File
ENC	Encrypted: Access is possible only by encoding data.
etu	elementary time unit
IC	Integrated Circuit
ICC	Integrated Circuit Card
ID	Identifier
IFD	Interface Device
IFS	Information Field Size
IFSC	Information Field Size for the card
IFSD	Information Field Size Device (for the Terminal)
INS	Instruction byte of an APDU command
Lc	Length of the input data for a APDU command
Le	Length of the expected data (output data for a command)
MF	Master File (root DF)
P1-P2	Parameter bytes
NAD	Node Address used in T=1 protocol
NEV	Never
PIN	Personal Identification Number
PRO SM	Protected with secure messaging
PTS	Protocol Transmission Selection
RFU	Reserved for Future Use
RST	Reset (of the card)
SM	Secure Messaging
SW1-SW2	Status bytes
TS	Initial ATR character
VPP	Programming Voltage
XXh	Value XX in hexadecimal notation
||	Concatenation symbol 03||04=0304

1.2 References

The following references are used in this sub-appendix:

EN 726-3 Identification cards systems - Telecommunications integrated circuit(s) cards and terminals - Part 3 : Application independent card requirements. December 1994.

ISO/IEC 7816-2 Information technology - Identification cards - Integrated circuit(s) cards with contacts - Part 2: Dimensions and location of the contacts. First edition: 1999.

ISO/IEC 7816-3 Information technology - Identification cards - Integrated circuit(s) cards with contacts - Part 3: Electronic signals and transmission protocol. Edition 2: 1997.

ISO/IEC 7816-4 Information technology - Identification cards - Integrated circuit(s) cards with contacts - Part 4: Interindustry commands for interexchange. First edition: 1995 + Amendment 1: 1997.

ISO/IEC 7816-6 Information technology - Identification cards - Integrated circuit(s) cards with contacts - Part 6: Interindustry data elements. First Edition: 1996 + Cor 1: 1998.

ISO/IEC 7816-8 Information technology - Identification cards - Integrated circuit(s) cards with contacts - Part 8: Security related interindustry commands. First Edition: 1999.

ISO/IEC 9797 Information technology - Security techniques - Data integrity mechanism using a cryptographic check function employing a block cipher algorithm. Edition 2: 1994.

2. Electrical and physical characteristics

TCS_200 All electronic signals shall be in accordance with ISO/IEC 7816-3 unless specified otherwise.

TCS_201 The location and dimensions of the card contacts shall comply with the ISO/IEC 7816-2.

2.1 Supply Voltage and Current Consumption

TCS_202 The card shall work according to specifications within the consumption limits specified in ISO/IEC 7816-3.

TCS_203 The card shall work with Vcc = 3V (± 0.3V) or with Vcc = 5V (± 0.5V).

Voltage selection shall be performed according to ISO/IEC 7816-3.

2.2 Programming Voltage V_{pp}

TCS_204 The card shall not require a programming voltage at pin C6. It is expected that pin C6 is not connected in an IFD. Contact C6 may be connected to V_{cc} in the card but shall not be connected to ground. This voltage should not be interpreted in any case.

2.3 Clock generation and Frequency

TCS_205 The card shall operate within a frequency range of 1 to 5 MHz. Within one card session the clock frequency may vary ± 2%. The clock frequency is generated by the Vehicle Unit and not the card itself. The duty cycle may vary between 40 and 60%.

TCS_206 Under conditions contained into the card file EF_{ICC}, the external clock can be stopped. The first byte of the EF_{ICC} file body codes the Clockstop mode conditions (see EN 726-3 for further details):

Low	High		
Bit 3	**Bit 2**	**Bit 1**	
0	0	1	Clockstop allowed, no preferred level
0	1	1	Clockstop allowed, high level preferred
1	0	1	Clockstop allowed, low level preferred
0	0	0	Clockstop not allowed
0	1	0	Clockstop only allowed on high level
1	0	0	Clockstop only allowed on low level

Bits 4 to 8 are not used.

2.4 I/O Contact

TCS_207 The I/O contact C7 is used to receive data from and to transmit data to the IFD. During operation only either the card or the IFD shall be in transmit mode. Should both units be in transmit mode no damage shall occur to the card. Unless transmitting, the card shall enter the reception mode.

2.5 States of the Card

TCS_208 The card works in two states while the supply voltage is applied:

- Operation state while executing commands or interfacing with Digital Unit,
- Idle state at all other times; in this state all data shall be retained by the card.

3. Hardware and communication

3.1 Introduction

This paragraph describes the minimum functionality required by Tachograph cards and VUs to ensure correct operation and interoperability.

Tachograph cards are as compliant as possible with the available ISO/IEC applicable norms (especially ISO/IEC 7816). However, commands and protocols are fully described in order to specify some restricted usage or some differences if they exist. The commands specified are fully compliant with the referred norms except where indicated.

3.2 Transmission Protocol

TCS_300 The Transmission protocol shall be compliant with ISO/IEC 7816-3. In particular, the VU shall recognise waiting time extensions sent by the card.

3.2.1 Protocols

TCS_301 The card shall provide both protocol **T=0** and protocol **T=1**.

TCS_302 **T=0** is the default protocol, a **PTS** command is therefore necessary to change the protocol to **T=1**.

TCS_303 Devices shall support **direct convention** in both protocols : the direct convention is hence mandatory for the card.

TCS_304 The **Information Field Size Card** byte shall be presented at the ATR in character TA3. This value shall be at least ‘F0h’ (=240 bytes).

The following restrictions apply to the protocols:

TCS_305 **T=0**

- The interface device shall support an answer on I/O after the rising edge of the signal on RST from 400 cc.
- The interface device shall be able to read characters separated with 12 etu.
- The interface device shall read an erroneous character and its repetition if separated with 13 etu. If an erroneous character is detected, the Error signal on I/O can occur between 1 etu and 2 etu. The device shall support a 1 etu delay.
- The interface device shall accept a 33 bytes ATR (TS+32)
- If TC1 is present in the ATR, the Extra Guard Time shall be present for characters sent by the interface device although characters sent by the card can still be separated with 12 etu. This is also true for the ACK character sent by the card after a P3 character emitted by the interface device.
- The interface device shall take into account a NUL character emitted by the card.
- The interface device shall accept the complementary mode for ACK.
- The get-response command cannot be used in chaining mode to get a data which length could exceed 255 bytes.

TCS_306 **T=1**

- NAD byte : not used (NAD shall be set to ‘00’).
- S-block ABORT : not used.
- S-block VPP state error : not used.
- The total chaining length for a data field will not exceed 255 bytes (to be ensured by the IFD).
- The Information Field Size Device (IFSD) shall be indicated by the IFD immediately after the ATR : the IFD shall transmit the S-Block IFS request after the ATR and the card shall send back S-Block IFS. The recommended value for IFSD is 254 bytes.
- The card will not ask for an IFS readjustment.

3.2.2 ATR

TCS_307 The device checks ATR bytes, according to ISO/IEC 7816-3. No verification shall be done on ATR Historical Characters.

Example of Basic Biprotocol ATR according to ISO/IEC 7816-3

Character	Value	Remarks
TS	‘3Bh’	Indicates direct convention.
T0	‘85h’	TD1 present; 5 historical bytes are presents.
TD1	‘80h’	TD2 present; T=0 to be used
TD2	‘11h’	TA3 present; T=1 to be used
TA3	‘XXh’ (at least ‘F0h’)	Information Field Size Card (IFSC)
TH1 to TH5	‘XXh’	Historical characters
TCK	‘XXh’	Check Character (exclusive OR)

TCS_308 After the Answer To Reset (ATR), the Master File (MF) is implicitly selected and becomes the Current Directory.

3.2.3 PTS

TCS_309 The default Protocol is T=0. To set the T=1 protocol, a PTS (also known as PPS) must be sent to the card by the device.

TCS_310 As both T=0 and T=1 protocols are mandatory for the card, the basic PTS for protocol switching is mandatory for the card.

The PTS can be used, as indicated in ISO/IEC 7816-3, to switch to higher baud rates than the default one proposed by the card in the ATR if any (TA(1) byte).

Higher baud rates are optional for the card.

TCS_311 If no other baud rate than the default one are supported (or if the selected baud rate is not supported), the card shall respond to the PTS correctly according to ISO/IEC 7816-3 by omitting the PPS1 byte.

Examples of basic PTS for protocol selection are the following :

Character	Value	Remarks
PPSS	‘FFh’	The Initiate Character.
PPS0	‘00h’ or ‘01h’	PPS1 to PPS3 are not present; ‘00h’ to select T0, ‘01h’ to select T1.
PK	‘XXh’	Check Character: ‘XXh’ = ‘FFh’ if PPS0 = ‘00h’, ‘XXh’ = ‘FEh’ if PPS0 = ‘01h’.

3.3 Access Conditions (AC)

Access Conditions (AC) for the UPDATE_BINARY and READ_BINARY commands are defined for each Elementary File.

TCS_312 The AC of the current file must be met before accessing the file via these commands.

The definitions of the available access conditions are the following:

- **ALW** : The action is always possible and can be executed without any restriction.
- **NEV** : The action is never possible.
- **AUT** : The right corresponding a successful external authentication must be opened up (done by the EXTERNAL_AUTHENTICATE command).
- **PRO SM**: Command must be transmitted with a cryptographic checksum using secure messaging (See sub-appendix 11).
- **AUT** and **PRO SM** (combined)

On the processing commands (UPDATE_BINARY and READ_BINARY), the following access conditions can be set in the card:

	UPDATE_BINARY	READ_BINARY
ALW	Yes	Yes
NEV	Yes	Yes
AUT	Yes	Yes
PRO SM	Yes	No
AUT and PRO SM	Yes	No

The PRO SM access condition is not available for the READ_BINARY command. It means that the presence of a cryptographic checksum for a READ command is never mandatory. However, using the value ‘OC’ for the class, it is possible to use the READ_BINARY command with secure messaging, as described in paragraph 3.6.2.

3.4 Data encryption

When confidentiality of data to be read from a file needs to be protected, the file is marked as “Encrypted” . Encryption is performed using secure messaging (See sub-appendix 11).

3.5 Commands and error codes overview

Commands and file organisation are deduced from and complies with ISO/IEC 7816-4.

TCS_313 This section describes the following APDU command-response pairs:

Command	**INS**
SELECT FILE	A4
READ BINARY	B0
UPDATE BINARY	D6
GET CHALLENGE	84
VERIFY	20
GET RESPONSE	C0
PERFORM SECURITY OPERATION : VERIFY CERTIFICATE COMPUTE DIGITAL SIGNATURE VERIFY DIGITAL SIGNATURE HASH	2A
INTERNAL AUTHENTICATE	88
EXTERNAL AUTHENTICATE	82
MANAGE SECURITY ENVIRONMENT : SETTING A KEY	22
PERFORM HASH OF FILE	2A

TCS_314 The status word SW1 SW2 are returned in any response message and denote the processing state of the command.

SW1	SW2	Meaning
90	00	Normal processing.
61	XX	Normal processing. XX = number of response bytes available.
62	81	Warning processing. Part of returned data may be corrupted
63	CX	Wrong CHV (PIN). Remaining attempts counter provided by 'X'.
64	00	Execution error - State of non-volatile memory unchanged. Integrity error.
65	00	Execution error - State of non-volatile memory changed
65	81	Execution error - State of non-volatile memory changed – Memory failure
66	88	Security error: wrong Cryptographic checksum (during Secure Messaging) or wrong certificate (during certificate verification) or wrong cryptogram (during external authentication) or wrong signature (during signature verification)
67	00	Wrong length (wrong Lc or Le)
69	00	Forbidden command (no response available in T=0)
69	82	Security status not satisfied.
69	83	Authentication method blocked.
69	85	Conditions of use not satisfied.
69	86	Command not allowed (no current EF).
69	87	Expected Secure Messaging Data Objects missing
69	88	Incorrect Secure Messaging Data Objects
6A	82	File not found.
6A	86	Wrong parameters P1-P2.
6A	88	Referenced data not found.
6B	00	Wrong parameters (offset outside the EF).
6C	XX	Wrong length, SW2 indicates the exact length. No data field is returned.
6D	00	Instruction code not supported or invalid.
6E	00	Class not supported.
6F	00	Other checking errors

3.6 Commands description

The mandatory commands for the Tachograph cards are described in this chapter.

Additional relevant details, related to cryptographic operations involved, are given in sub-appendix 11 Common security mechanisms.

All commands are described independently of the used protocol (T=0 or T=1). The APDU bytes CLA, INS, P1, P2, Lc and Le are always indicated. If Lc or Le is not needed for the described command, the associated length, value and description are empty.

TCS_315 If both length bytes (Lc and Le) are requested, the described command has to be split in two parts if the IFD is using protocol T=0 : the IFD sends the command as described with P3=Lc + data and then sends a GET_RESPONSE (see § 3.6.6) command with P3=Le.

TCS_316 If both length bytes are requested, and Le=0 (secure messaging):

- When using protocol T=1, the card shall answer to Le=0 by sending all available output data.
- When using protocol T=0, the IFD shall send the first command with P3=Lc + data, the card shall answer (to this implicit Le=0) by the Status bytes '**61La**', where La is the number of response bytes available. The IFD shall then generate a GET REPONSE command with P3 = La to read the data.

3.6.1 Select File

This command is compliant with ISO/IEC 7816-4, but has a restricted usage compared to the command defined in the norm.

The SELECT FILE command is used :
- to select an application DF (selection by name must be used)
- to select an elementary file corresponding to the submitted file ID

3.6.1.1 Selection by name (AID)

This command allows to select an application DF in the card.

TCS_317 This command can be performed from anywhere in the file structure (after the ATR or at anytime).

TCS_318 The selection of an application resets the current security environment. After performing the application selection, no current public key is selected anymore and the former session key is no longer available for secure messaging. The AUT access condition is also lost.

TCS_319 **Command Message**

Byte	Length	Value	Description
CLA	1	'00h'	
INS	1	'A4h'	
P1	1	'04h'	Selection by name (AID)
P2	1	'0Ch'	No response expected
Lc	1	'NNh'	Number of bytes sent to the card (length of the AID) : '06h' for the Tachograph application.
#6-#(5+NN)	NN	'XX..XXh'	AID : 'FF 54 41 43 48 4F' for the Tachograph application

No response to the SELECT FILE command is needed (Le absent in T=1, or no response asked in T=0).

TCS_320 **Response Message (no response asked)**

Byte	Length	Value	Description
SW	2	‘XXXXh’	Status Words (SW1,SW2)

- If the command is successful, the card returns ‘**9000**’.
- If the application corresponding with the AID is not found, the processing state returned is ‘**6A82**’.
- In T=1, if the byte Le is present, the state returned is **‘6700’**.
- In T=0, if a response is asked after the SELECT FILE command, the state returned is **‘6900’**.
- If the selected application is considered corrupted (integrity error is detected within the file attributes), the processing state returned is ‘**6400**’ or ‘**6581**’.

3.6.1.2 Selection of an Elementary File using its File Identifier

TCS_321 **Command Message**

Byte	Length	Value	Description
CLA	1	‘00h’	
INS	1	‘A4h’	
P1	1	‘02h’	Selection of an EF under the current DF
P2	1	‘0Ch’	No response expected
Lc	1	‘02h’	Number of bytes sent to the card
#6-#7	2	‘XXXXh’	File Identifier

No response to the SELECT FILE command is needed (Le absent in T=1, or no response asked in T=0).

TCS_322 **Response Message (no response asked)**

Byte	Length	Value	Description
SW	2	‘XXXXh’	Status Words (SW1,SW2)

- If the command is successful, the card returns ‘**9000**’.
- If the file corresponding with the file identifier is not found, the processing state returned is ‘**6A82**’.
- In T=1, if the byte Le is present, the state returned is **‘6700’**.
- In T=0, if a response is asked after the SELECT FILE command, the state returned is **‘6900’**.
- If the selected file is considered corrupted (integrity error is detected within the file attributes), the processing state returned is ‘**6400**’ or ‘**6581**’.

3.6.2 Read Binary

This command is compliant with ISO/IEC 7816-4, but has a restricted usage compared to the command defined in the norm.

The Read Binary command is used to read data from a transparent file.

The response of the card consists of returning the data read, optionally encapsulated in a secure messaging structure.

TCS_323 The command can be performed only if the security status satisfies the security attributes defined for the EF for the READ function.

3.6.2.1 Command without secure messaging

This command enables the IFD to read data from the EF currently selected, without secure messaging.

TCS_324 Reading data from a file marked as “Encrypted” shall not be possible through this command.

TCS_325 **Command Message**

Byte	Length	Value	Description
CLA	1	‘00h’	No Secure Messaging asked
INS	1	‘B0h’	
P1	1	‘XXh’	Offset in bytes from the beginning of the file : Most Significant Byte
P2	1	‘XXh’	Offset in bytes from the beginning of the file : Least Significant Byte
Le	1	‘XXh’	Length of data expected. Number of Bytes to be read.

Note: bit 8 of P1 must be set to 0.

TCS_326 **Response Message**

Byte	Length	Value	Description
#1-#X	X	‘XX..XXh’	Data read
SW	2	‘XXXXh’	Status Words (SW1,SW2)

- f the command is successful, the card returns ‘**9000**’.
- If no EF is selected , the processing state returned is **‘6986’**.
- If the Access Control of the selected file are not satisfied, the command is interrupted with ‘**6982**’.
- If the Offset is not compatible with the size of the EF (Offset > EF size), the processing state returned is **‘6B00’**.
- If the size of the data to be read is not compatible with the size of the EF (Offset + Le > EF size) the processing state returned is ‘**6700’** or ‘**6Cxx’** where 'xx' indicates the exact length.
- If an integrity error is detected within the file attributes, the card shall consider the file as corrupted and unrecoverable, the processing state returned is **‘6400’** or ‘**6581’.**
- If an integrity error is detected within the stored data, the card shall return the demanded data, and the processing state returned is **‘6281’**.

3.6.2.2 Command with secure messaging

This command enables the IDF to read data from the EF currently selected with secure messaging, in order to verify the integrity of the data received and to protect the confidentiality of the data in the case the EF is marked as “Encrypted”.

TCS_327 **Command Message**

Byte	Length	Value	Description
CLA	1	‘0Ch’	Secure Messaging asked
INS	1	‘B0h’	INS
P1	1	‘XXh’	P1 (offset in bytes from the beginning of the file) : Most Significant Byte
P2	1	‘XXh’	P2 (offset in bytes from the beginning of the file) : Least Significant Byte
Lc	1	‘09h’	Length of input data for secure messaging
#6	1	‘97h’	T_{LE} : Tag for expected length specification.
#7	1	‘01h’	L_{LE} : Length of expected length
#8	1	‘NNh’	Expected length specification (original Le) : Number of Bytes to be read
#9	1	‘8Eh’	T_{CC} : Tag for cryptographic checksum
#10	1	‘04h’	L_{CC} : Length of following cryptographic checksum
#11-#14	4	‘XX..XXh’	Cryptographic checksum (4 most significant bytes)
Le	1	‘00h’	As specified in ISO/IEC 7816-4

TCS_328 **Response Message if EF is not marked as “Encrypted” and if Secure Messaging input format is correct:**

Byte	Length	Value	Description
#1	1	‘81h’	T_{PV} : Tag for plain value data
#2	L	‘NNh’ or ‘81 NNh’	L_{PV} : length of returned data (=original Le). L is 2 bytes if L_{PV}>127 bytes.
#(2+L)-#(1+L+NN)	NN	‘XX..XXh’	Plain Data value
#(2+L+NN)	1	‘8Eh’	T_{CC} : Tag for cryptographic checksum
#(3+L+NN)	1	‘04h’	L_{CC} : Length of following cryptographic checksum
#(4+L+NN)-#(7+L+NN)	4	‘XX..XXh’	Cryptographic checksum (4 most significant bytes)
SW	2	‘XXXXh’	Status Words (SW1,SW2)

TCS_329 **Response Message if EF is marked as “Encrypted” and if Secure Messaging input format is correct:**

Byte	Length	Value	Description
#1	1	‘87h’	$T_{PI\ CG}$: Tag for encrypted data (cryptogram)
#2	L	‘MMh’ or ‘81 MMh’	$L_{PI\ CG}$: length of returned encrypted data (different of original Le of the command due to padding). L is 2 bytes if $L_{PI\ CG}$ > 127 bytes.
#(2+L)-#(1+L+MM)	MM	‘01XX..XXh’	Encrypted Data : Padding Indicator and cryptogram
#(2+L+MM)	1	‘8Eh’	T_{CC} : Tag for cryptographic checksum
#(3+L+MM)	1	‘04h’	L_{CC} : Length of following cryptographic checksum
#(4+L+MM)-#(7+L+MM)	4	‘XX..XXh’	Cryptographic checksum (4 most significant bytes)
SW	2	‘XXXXh’	Status Words (SW1,SW2)

The encrypted data returned contain a first byte indicating the used padding mode. For the tachograph application, the padding indicator always takes the value ‘01h’, indicating that the used padding mode is the one specified in ISO/IEC 7816-4 (one byte with value ‘80h’ followed by some null bytes: ISO/IEC 9797 method 2).

The "regular" processing states, described for the READ BINARY command with no secure messaging (see § 3.6.2.1), can be returned using the response message structures described above, under a ‘99h’ Tag (as described in TCS 335).

Additionally, some errors specifically related to secure messaging can happen. In that case, the processing state is simply returned, with no secure messaging structure involved:

TCS_330 **Response Message if incorrect Secure Messaging input format**

Byte	Length	Value	Description
SW	2	‘XXXXh’	Status Words (SW1,SW2)

- If no current session key is available, the processing state **‘6A88’** is returned. It happens either if the session key has not already been generated or if the session key validity has expired (in this case the IFD must re-run a mutual authentication process to set a new session key).
- If some expected data objects (as specified above) are missing in the secure messaging format, the processing state **‘6987’** is returned : this error happens if an expected tag is missing or if the command body is not properly constructed.
- If some data objects are incorrect, the processing state returned is **‘6988’** : this error happens if all the required tags are present but some lengths are different from the ones expected.
- If the verification of the cryptographic checksum fails, the processing state returned is **‘6688’**.

3.6.3 Update Binary

This command is compliant with ISO/IEC 7816-4, but has a restricted usage compared to the command defined in the norm.

The UPDATE BINARY command message initiates the update (erase + write) of the bits already present in an EF binary with the bits given in the command APDU.

TCS_331 The command can be performed only if the security status satisfies the security attributes defined for the EF for the UPDATE function (If the Access Control of the UPDATE function includes PRO SM, a Secure Messaging must be added in the command).

3.6.3.1 Command without secure messaging

This command enables the IFD to write data into the EF currently selected, without the card verifying the integrity of data received. This plain mode is allowed only if the related file is not marked as "Encrypted".

TCS_332 **Command Message**

Byte	Length	Value	Description
CLA	1	'00h'	No Secure Messaging asked
INS	1	'D6h'	
P1	1	'XXh'	Offset in bytes from the beginning of the file : Most Significant Byte
P2	1	'XXh'	Offset in bytes from the beginning of the file : Least Significant Byte
Lc	1	'NNh'	Lc Length of data to Update. Number of bytes to be written.
#6-#(5+NN)	NN	'XX..XXh'	Data to be written

Note: bit 8 of P1 must be set to 0.

TCS_333 **Response Message**

Byte	Length	Value	Description
SW	2	'XXXXh'	Status Words (SW1,SW2)

- ♦ If the command is successful, the card returns '**9000**'.
- ♦ If no EF is selected , the processing state returned is **'6986'**.
- ♦ If the Access Control of the selected file are not satisfied, the command is interrupted with '**6982**'.
- ♦ If the Offset is not compatible with the size of the EF (Offset > EF size), the processing state returned is **'6B00'**.
- ♦ If the size of the data to be written is not compatible with the size of the EF (Offset + Lc > EF size) the processing state returned is '**6700'**.
- ♦ If an integrity error is detected within the file attributes, the card shall consider the file as corrupted and unrecoverable, the processing state returned is **'6400'** or **'6500'**.
- ♦ If writing is unsuccessful, the processing state returned is **'6581'**.

3.6.3.2 Command with secure messaging

This command enables the IFD to write data into the EF currently selected, with the card verifying the integrity of data received. As no confidentiality is required, the data are not encrypted.

TCS_334 **Command Message**

Byte	Length	Value	Description
CLA	1	‘0Ch’	Secure Messaging. Asked
INS	1	‘D6h’	INS
P1	1	‘XXh’	Offset in bytes from the beginning of the file : Most Significant Byte
P2	1	‘XXh’	Offset in bytes from the beginning of the file : Least Significant Byte
Lc	1	‘XXh’	Length of the secured data field
#6	1	‘81h’	T_{PV} : Tag for plain value data
#7	L	‘NNh’ or ‘81 NNh’	L_{PV} : length of transmitted data. L is 2 bytes if L_{PV} > 127 bytes.
#(7+L)-#(6+L+NN)	NN	‘XX..XXh’	Plain Data value (Data to be written)
#(7+L+NN)	1	‘8Eh’	T_{CC} : Tag for cryptographic checksum
#(8+L+NN)	1	‘04h’	L_{CC} : Length of following cryptographic checksum
#(9+L+NN)-#(12+L+NN)	4	‘XX..XXh’	Cryptographic checksum (4 most significant bytes)
Le	1	‘00h’	As specified in ISO/IEC 7816-4

TCS_335 **Response message if correct Secure Messaging input format**

Byte	Length	Value	Description
#1	1	‘99h’	T_{SW} : Tag for Status Words (to be protected by CC)
#2	1	‘02h’	L_{SW} : length of returned Status Words
#3-#4	2	‘XXXXh’	Status Words (SW1,SW2)
#5	1	‘8Eh’	T_{CC} : Tag for cryptographic checksum
#6	1	‘04h’	L_{CC} : Length of following cryptographic checksum
#7-#10	4	‘XX..XXh’	Cryptographic checksum (4 most significant bytes)
SW	2	‘XXXXh’	Status Words (SW1,SW2)

The "regular" processing states, described for the UPDATE BINARY command with no secure messaging (see § 3.6.3.1), can be returned using the response message structure described above.

Additionally, some errors specifically related to secure messaging can happen. In that case, the processing state is simply returned, with no secure messaging structure involved:

TCS_336 **Response Message if error in secure messaging**

Byte	Length	Value	Description
SW	2	'XXXXh'	Status Words (SW1,SW2)

- ♦ If no current session key is available, the processing state **'6A88'** is returned**.**
- ♦ If some expected data objects (as specified above) are missing in the secure messaging format, the processing state **'6987'** is returned : this error happens if an expected tag is missing or if the command body is not properly constructed.
- ♦ If some data objects are incorrect, the processing state returned is **'6988'** : this error happens if all the required tags are present but some lengths are different from the ones expected.
- ♦ If the verification of the cryptographic checksum fails, the processing state returned is **'6688'**.

3.6.4 Get Challenge

This command is compliant with ISO/IEC 7816-4, but has a restricted usage compared to the command defined in the norm.

The GET CHALLENGE command asks the card to issue a challenge in order to use it in a security related procedure in which a cryptogram or some ciphered data are sent to the card.

TCS_337 The Challenge issued by the card is only valid for the next command, which uses a challenge, sent to the card.

TCS_338 **Command Message**

Byte	Length	Value	Description
CLA	1	'00h'	CLA
INS	1	'84h'	INS
P1	1	'00h'	P1
P2	1	'00h'	P2
Le	1	'08h'	Le (Length of Challenge expected).

TCS_339 **Response Message**

Byte	Length	Value	Description
#1-#8	8	'XX..XXh'	Challenge
SW	2	'XXXXh'	Status Words (SW1,SW2)

- ♦ If the command is successful, the card returns '**9000**'.
- ♦ If Le is different from '08h', the processing state is **'6700'.**
- ♦ If parameters P1-P2 are incorrect, the processing state is **'6A86'.**

3.6.5 Verify

This command is compliant with ISO/IEC 7816-4, but has a restricted usage compared to the command defined in the norm.

The Verify command initiates the comparison in the card of the CHV (PIN) data sent from the command with the reference CHV stored in the card.

Note: The PIN entered by the user must be right padded with ‘FFh’ bytes up to a length of 8 bytes by the IFD.

TCS_340 If the command is successful, the rights corresponding to CHV presentation are opened and the remaining CHV attempt counter is reinitialised.

TCS_341 An unsuccessful comparison is recorded in the card in order to limit the number of further attempts of the use of the reference CHV.

TCS_342 **Command Message**

Byte	**Length**	**Value**	**Description**
CLA	1	‘00h’	CLA
INS	1	‘20h’	INS
P1	1	‘00h’	P1
P2	1	‘00h’	P2 (the verified CHV is implicitly known)
Lc	1	‘08h’	Length of CHV code transmitted
#6-#13	8	‘XX..XXh’	CHV

TCS_343 **Response Message**

Byte	**Length**	**Value**	**Description**
SW	2	‘XXXXh’	Status Words (SW1,SW2)

- ♦ If the command is successful, the card returns ‘**9000**’.
- ♦ If the reference CHV is not found, the processing state returned is **‘6A88’.**
- ♦ If the CHV is blocked, (the remaining attempt counter of the CHV is null), the processing state returned is **‘6983’**. Once in that state, the CHV can never be successfully presented anymore.
- ♦ If the comparison is unsuccessful, the remaining attempt Counter is decreased and the status **‘63CX’** is returned (X>0 and X equals the remaining CHV attempts counter. If X = ‘F’, the CHV attempts counter is greater than ‘F’).
- ♦ If the reference CHV is considered corrupted, the processing state returned is **‘6400’** or **‘6581’**.

3.6.6 Get Response

This command is compliant with ISO/IEC 7816-4.

This command (only necessary and available for T=0 Protocol) is used to transmit prepared data from the card to the interface device (case where a command had included both Lc and Le).

The GET_RESPONSE command has to be issued immediately after the command preparing the data, otherwise, the data are lost. After the execution of the GET_RESPONSE command (except if the error ‘61xx’ or ‘6Cxx’ occur, see below), the previously prepared data are no longer available.

TCS_344 **Command Message**

Byte	Length	Value	Description
CLA	1	‘00h’	
INS	1	‘C0h’	
P1	1	‘00h’	
P2	1	‘00h’	
Le	1	‘XXh’	Number of bytes expected

TCS_345 **Response Message**

Byte	Length	Value	Description
#1-#X	X	‘XX..XXh’	Data
SW	2	‘XXXXh’	Status Words (SW1,SW2)

- If the command is successful, the card returns ‘**9000**’.
- If no data have been prepared by the card, the processing state returned is **‘6900’** or **‘6F00’.**
- If Le exceeds the number of available bytes or if Le is null, the processing state returned is **‘6Cxx’**, where xx denotes the exact number of available bytes. In that case, the prepared data are still available for a subsequent GET_RESPONSE command.
- If Le is not null and is smaller than the number of available bytes, the required data are sent normally by the card, and the processing state returned is **‘61xx’**, where 'xx' indicates a number of extra bytes still available by a subsequent GET_RESPONSE command.
- If the command is not supported (protocol T=1), the card returns **‘6D00’**.

3.6.7 PSO: Verify Certificate

This command is compliant with ISO/IEC 7816-8, but has a restricted usage compared to the command defined in the norm.

The VERIFY CERTIFICATE command is used by the card to obtain a Public Key from the outside and to check its validity.

TCS_346 When a VERIFY CERTIFICATE command is successful, the Public Key is stored for a future use in the Security environment. This key shall be explicitly set for the use in security related commands (INTERNAL AUTHENTICATE, EXTERNAL AUTHENTICATE or VERIFY CERTIFICATE) by the MSE command (see § 3.6.10) using its key identifier.

TCS_347 In any case, the VERIFY CERTIFICATE command uses the public key previously selected by the MSE command to open the certificate. This public key must be the one of a Contracting Party.

TCS_348 **Command Message**

Byte	Length	Value	Description
CLA	1	‘00h’	CLA
INS	1	‘2Ah’	Perform Security Operation
P1	1	‘00h’	P1
P2	1	‘AEh’	P2 : non BER-TLV coded data (concatenation of Data Elements)
Lc	1	‘C2h’	Lc : Length of the certificate, 194 Bytes.
#6-#199	194	‘XX..XXh’	Certificate : concatenation of data Elements (as described in sub-appendix 11)

TCS_349 **Response Message**

Byte	Length	Value	Description
SW	2	‘XXXXh’	Status Words (SW1,SW2)

- ♦ If the command is successful, the card returns ‘**9000**’.
- ♦ If the certificate verification fails, the processing state returned is **‘6688’**. The verification and unwrapping process of the certificate is described in sub-appendix 11.
- ♦ If no Public Key is present in the Security Environment, **‘6A88’** is returned.
- ♦ If the selected public key (used to unwrap the certificate) is considered corrupted, the processing state returned is **‘6400’** or **‘6581’**.
- ♦ If the selected public key (used to unwrap the certificate) has a CHA.LSB (CertificateHolderAuthorisation.equipmentType) different from '00' (i.e. is not the one of a Contracting Party) , the processing state returned is **‘6985’**.

3.6.8 *Internal Authenticate*

This command is compliant with ISO/IEC 7816-4.

Using the INTERNAL AUTHENTICATE command, the IFD can authenticate the card.

The authentication process is described in sub-appendix 11. It includes the following statements :

TCS_350 The INTERNAL AUTHENTICATE command uses the card Private Key (implicitly selected) to sign authentication data including K1 (first element for session key agreement) and RND1, and uses the Public Key currently selected (through the last MSE command) to encrypt the signature and form the authentication token (more details in sub-appendix 11).

TCS_351 **Command Message**

Byte	Length	Value	Description
CLA	1	‘00h’	CLA
INS	1	‘88h’	INS
P1	1	‘00h’	P1
P2	1	‘00h’	P2
Lc	1	‘10h’	Length of data sent to the card
#6 - #13	8	‘XX..XXh’	Challenge used to authenticate the card
#14 -#21	8	‘XX..XXh’	VU.CHR (see sub-appendix 11)
Le	1	‘80h’	Length of the data expected from the card

TCS_352 **Response Message**

Byte	Length	Value	Description
#1-#128	128	‘XX..XXh’	Card authentication token (see sub-appendix 11)
SW	2	‘XXXXh’	Status Words (SW1,SW2)

- If the command is successful, the card returns ‘**9000**’.
- If no Public Key is present in the Security Environment, the processing state returned is **‘6A88’** .
- If no Private Key is present in the Security Environment, the processing state returned is **‘6A88’** .
- If VU.CHR does not match the current public key identifier, the processing state returned is **‘6A88’.**
- If the selected private key is considered corrupted, the processing state returned is **‘6400’** or **‘6581’**.

TCS_353 If the INTERNAL_AUTHENTICATE command is successful, the current session key, if existing, is erased and no longer available. In order to have a new session key available, the EXTERNAL_AUTHENTICATE command must be successfully performed.

3.6.9 *External Authenticate*

This command is compliant with ISO/IEC 7816-4.

Using the EXTERNAL AUTHENTICATE command, the card can authenticate the IFD.

The authentication process is described in sub-appendix 11. It includes the following statements :

TCS_354 A GET CHALLENGE command must precede the EXTERNAL_AUTHENTICATE command immediately. The card issues a challenge to the outside (RND3).

TCS_355 The verification of the cryptogram uses RND3 (challenge issued by the card), the card private key (implicitly selected) and the public key previously selected by the MSE command.

TCS_356 The card verifies the cryptogram, and if it is correct, the AUT access condition is opened.

TCS_357 The input cryptogram carries the second element for session key agreement K2.

TCS_358 **Command Message**

Byte	Length	Value	Description
CLA	1	‘00h’	CLA
INS	1	‘82h’	INS
P1	1	‘00h’	P1
P2	1	‘00h’	P2 (the public Key to be used is implicitly known, and has been previously set by the MSE command)
Lc	1	‘80h’	Lc (Length of the data sent to the card)
#6-#133	128	‘XX..XXh’	Cryptogram (see sub-appendix 11)

TCS_359 **Response Message**

Byte	Length	Value	Description
SW	2	‘XXXXh’	Status Words (Status Words (SW1,SW2))

- ♦ If the command is successful, the card returns ‘**9000**’.
- ♦ If no Public Key is present in the Security Environment, **‘6A88’** is returned.
- ♦ If the CHA of the currently set public key is not the concatenation of the Tachograph application AID and of a VU equipment Type, the processing state returned is **‘6F00’** (see sub-appendix 11).
- ♦ If no Private Key is present in the Security Environment, the processing state returned is **‘6A88’** .
- ♦ If the verification of the cryptogram is wrong, the processing state returned is **‘6688’** .
- ♦ If the command is not immediately preceded with a GET CHALLENGE command, the processing state returned is **‘6985’**.
- ♦ If the selected private key is considered corrupted, the processing state returned is **‘6400’** or **‘6581’**.

TCS_360 If the EXTERNAL AUTHENTICATE command is successful, and if the first part of the session key is available from a successful INTERNAL AUTHENTICATE recently performed, the session key is set for future commands using secure messaging.

TCS_361 If the first session key part is not available from a previous INTERNAL AUTHENTICATE command, the second part of the session key, sent by the IFD, is not stored in the card. This mechanism ensures that the mutual authentication process is done in the order specified in sub-appendix 11.

3.6.10 *Manage Security Environment*

This command is used to set a public key for authentication purpose.

This command is compliant with ISO/IEC 7816-8. The use of this command is restricted regarding the related standard.

TCS_362 The key referenced in the MSE data field is valid for every file of the Tachograph DF.

TCS_363 The key referenced in the MSE data field remains the current public key until the next correct MSE command.

TCS_364 If the key referenced is not (already) present into the card, the security environment remains unchanged.

TCS_365 Command Message

Byte	Length	Value	Description
CLA	1	‘00h’	CLA
INS	1	‘22h’	INS
P1	1	‘C1h’	P1 : referenced key valid for all cryptographic operations
P2	1	‘B6h’	P2 (referenced data concerning Digital Signature)
Lc	1	‘0Ah’	Lc : length of subsequent data field
#6	1	‘83h’	Tag for referencing a public key in asymmetric cases
#7	1	‘08h’	Length of the key reference (key identifier)
#8-#15	08h	‘XX..XXh’	Key identifier as specified in sub-appendix 11

TCS_366 **Response Message**

Byte	Length	Value	Description
SW	2	‘XXXXh’	Status Words (SW1,SW2)

- If the command is successful, the card returns ‘**9000**’.
- If the referenced key is not present into the card, the processing state returned is **‘6A88’** .
- If some expected data objects are missing in the secure messaging format, the processing state **‘6987’** is returned. This can happen if the tag ‘83h’ is missing.
- If some data objects are incorrect, the processing state returned is **‘6988’**. This can happen if the length of the key identifier is not ‘08h’.
- If the selected key is considered corrupted, the processing state returned is **‘6400’** or **‘6581’**.

3.6.11 PSO: Hash

This command is used to transfer to the card the result of a hash calculation on some data. This command is used for the verification of digital signatures. The hash value is stored in EEPROM for the subsequent command verify digital signature.

This command is compliant with ISO/IEC 7816-8. The use of this command is restricted regarding the related standard.

TCS_367 **Command Message**

Byte	Length	Value	Description
CLA	1	‘00h’	CLA
INS	1	‘2Ah’	Perform Security Operation
P1	1	‘90h’	Return Hash code
P2	1	‘A0h’	Tag : data field contains DOs relevant for hashing
Lc	1	‘16h’	Length Lc of the subsequent data field
#6	1	‘90h’	Tag for the hash code
#7	1	‘14h’	Length of the hash code
#8-#27	20	‘XX..XXh’	Hash code

TCS_368 **Response Message**

Byte	Length	Value	Description
SW	2	‘XXXXh’	Status Words (SW1,SW2)

- ♦ If the command is successful, the card returns ‘**9000**’.
- ♦ If some expected data objects (as specified above) are missing, the processing state **‘6987’** is returned. This can happen if one of the tag ‘90h’ is missing.
- ♦ If some data objects are incorrect, the processing state returned is **‘6988’**. This error happens if the required tag is present but with a length different from ‘14h’.

3.6.12 Perform Hash of File

This command is not compliant with ISO/IEC 7816-8. Thus the CLA byte of this command indicates that there is a proprietary use of the PERFORM SECURITY OPERATION / HASH.

TCS_369 The perform hash file command is used to hash the data area of the currently selected transparent EF.

TCS_370 The result of the hash operation is stored in the card. It can then be used to get a digital signature of the file, using the PSO-COMPUTE_DIGITAL_SIGNATURE command. This result remains available for the COMPUTE DIGITAL SIGNATURE command until the next successful PERFORM HASH of FILE command.

TCS_371 **Command Message**

Byte	Length	Value	Description
CLA	1	‘80h’	CLA
INS	1	‘2Ah’	Perform Security Operation
P1	1	‘90h’	Tag: Hash
P2	1	‘00h’	P2: Hash the data of the currently selected transparent file

TCS_372 **Response Message**

Byte	Length	Value	Description
SW	2	‘XXXXh’	Status Words (SW1,SW2)

- ♦ If the command is successful, the card returns ‘**9000**’.
- ♦ If no application is selected, the processing state ‘**6985**’ is returned
- ♦ If the selected EF is considered corrupted (file attributes or stored data integrity errors), the processing state returned is ‘**6400**’ or **‘6581’**.
- ♦ If the selected file is not a transparent file, the processing state returned is ‘**6986**’.

3.6.13 PSO: Compute Digital Signature

This command is used to compute the digital signature of previously computed hash code (see PERFORM HASH of FILE, § 3.6.12).

This command is compliant with ISO/IEC 7816-8. The use of this command is restricted regarding the related standard.

TCS_373 The card private key is used to compute the digital signature and is implicitly known by the card.

TCS_374 The card performs a digital signature using a padding method compliant with PKCS1 (see sub-appendix 11 for details).

TCS_375 **Command Message**

Byte	Length	Value	Description
CLA	1	‘00h’	CLA
INS	1	‘2Ah’	Perform Security Operation
P1	1	‘9Eh’	Digital signature to be returned
P2	1	‘9Ah’	Tag: data field contains data to be signed. As no data field is included, the data are supposed to be already present in the card (hash of file)
Le	1	‘80h’	Length of the expected signature

TCS_376 **Response Message**

Byte	Length	Value	Description
#1-#128	128	‘XX..XXh’	Signature of the previously computed hash
SW	2	‘XXXXh’	Status Words (SW1,SW2)

- If the command is successful, the card returns ‘**9000**’.
- If the implicitly selected private key is considered as corrupted, the processing state returned is ‘**6400**’ or **‘6581’**.

3.6.14 PSO: Verify Digital Signature

This command is used to verify the digital signature, provided as an input, in accordance with PKCS1 of a message, whose hash is known to the card. The signature algorithm is implicitly known by the card.

This command is compliant with ISO/IEC 7816-8. The use of this command is restricted regarding the related standard.

TCS_377 The Verify Digital Signature command always uses the public key selected by the previous Manage Security Environment command, and the previous hash code entered by a PSO: Hash command.

TCS_378 **Command Message**

Byte	Length	Value	Description
CLA	1	‘00h’	CLA
INS	1	‘2Ah’	Perform Security Operation
P1	1	‘00h’	
P2	1	‘A8h’	Tag : data field contains DOs relevant for verification
Lc	1	‘83h’	Length Lc of the subsequent data field
#28	1	‘9Eh’	Tag for Digital Signature
#29-#30	2	‘8180h’	Length of digital signature (128 bytes, coded in accordance with ISO/IEC 7816-6)
#31-#158	128	‘XX..XXh’	Digital signature content

TCS_379 **Response Message**

Byte	Length	Value	Description
SW	2	‘XXXXh’	Status Words (SW1,SW2)

- If the command is successful, the card returns ‘**9000**’.
- If the verification of the signature fails, the processing state returned is **‘6688’**. The verification process is described in sub-appendix 11.
- If no public key is selected, the processing state returned is **‘6A88’**.
- If some expected data objects (as specified above) are missing, the processing state **‘6987’** is returned. This can happen if one of the required tag is missing.
- If no hash code is available to process the command (as a result of a previous PSO: Hash command), the processing state returned is **‘6985’**.
- If some data objects are incorrect, the processing state returned is **‘6988’**. This can happen if one of the required data objects length is incorrect.
- If the selected public key is considered corrupted, the processing state returned is **‘6400’** or **‘6581’**.

4. Tachograph cards structure

This paragraph specifies the file structures of the Tachograph cards for storage of accessible data.

It does not specify card manufacturer dependant internal structures, such as e.g. file headers, nor storage and handling of data elements needed for internal use only such as EuropeanPublicKey, CardPrivateKey, TDesSessionKey or WorkshopCardPin.

The useful storage capacity of Tachograph cards shall be of 11 Kbytes minimum. Greater capacities may be used. In such case, the structure of the card remains the same, but the number of records of some elements of the structure is increased. This paragraph specifies minimum and maximum values of these record numbers.

4.1 Driver card structure

TCS_400 After its personalisation, the driver card shall have the following permanent file structure and file access conditions:

		Access conditions		
File	**File ID**	**Read**	**Update**	**Encrypted**
MF	3F00			
├─EF ICC	0002	ALW	NEV	No
├─EF IC	0005	ALW	NEV	No
└─DF Tachograph	0500			
├─EF Application_Identification	0501	ALW	NEV	No
├─EF Card_Certificate	C100	ALW	NEV	No
├─EF CA_Certificate	C108	ALW	NEV	No
├─EF Identification	0520	ALW	NEV	No
├─EF Card_Download	050E	ALW	ALW	No
├─EF Driving_Licence_Info	0521	ALW	NEV	No
├─EF Events_Data	0502	ALW	PRO SM /	No
├─EF Faults_Data	0503	ALW	PRO SM /	No
├─EF Driver_Activity_Data	0504	ALW	PRO SM /	No
├─EF Vehicles_Used	0505	ALW	PRO SM /	No
├─EF Places	0506	ALW	PRO SM /	No
├─EF Current_Usage	0507	ALW	PRO SM /	No
├─EF Control_Activity_Data	0508	ALW	PRO SM /	No
└─EF Specific_Conditions	0522	ALW	PRO SM /	No

TCS_401 All EFs structures shall be transparent.

TCS_402 Read with secure messaging shall be possible for all files under the DF Tachograph.

TCS_403 The driver card shall have the following data structure:

	No of	**Size (bytes)**		**Default**
File / Data element	**Records**	**Min**	**Max**	**Values**
MF		*11411*	*24959*	
├─ICC		*25*	*25*	
└─CardIccIdentification		*25*	*25*	
├─clockStop		1	1	{00}
├─cardExtendedSerialNumber		8	8	{00..00}
├─cardApprovalNumber		8	8	{20..20}
├─cardPersonaliserID		1	1	{00}
├─embedderIcAssemblerId		5	5	{00..00}
└─icIdentifier		2	2	{00 00}
├─EF IC		*8*	*8*	
└─CardChipIdentification		*8*	*8*	
├─icSerialNumber		4	4	{00..00}
└─icManufacturingReferences		4	4	{00..00}
└─DF Tachograph		*11378*	*24926*	
├─EF Application_Identification		*10*	*10*	
└─DriverCardApplicationIdentification		*10*	*10*	
├─typeOfTachographCardId		1	1	{00}
├─cardStructureVersion		2	2	{00 00}
├─noOfEventsPerType		1	1	{00}
├─noOfFaultsPerType		1	1	{00}
├─activityStructureLength		2	2	{00 00}
├─noOfCardVehicleRecords		2	2	{00 00}
└─noOfCardPlaceRecords		1	1	{00}
├─EF Card_Certificate		*194*	*194*	
└─CardCertificate		194	194	{00..00}

├ EF CA_Certificate		*194*	*194*	
└ MemberStateCertificate		194	194	{00..00}
├ EF Identification		*143*	*143*	
├ CardIdentification		*65*	*65*	
├ CardIssuingMemberState		1	1	{00}
├ cardNumber		16	16	{20..20}
├ cardIssuingAuthorityName		36	36	{20..20}
├ cardIssueDate		4	4	{00..00}
├ cardValidityBegin		4	4	{00..00}
└ cardExpiryDate		4	4	{00..00}
└ DriverCardHolderIdentification		*78*	*78*	
├ cardHolderName		*72*	*72*	
├ holderSurname		36	36	{00,
└ holderFirstNames		36	36	{00,
├ cardHolderBirthDate		4	4	{00..00}
└ cardHolderPreferredLanguage		2	2	{20 20}
├ EF Card_Download		*4*	*4*	
└ LastCardDownload		4	4	
├ EF Driving_Licence_Info		*53*	*53*	
└ CardDrivingLicenceInformation		*53*	*53*	
├ drivingLicenceIssuingAuthority		36	36	{00,
├ drivingLicenceIssuingNation		1	1	{00}
└ drivingLicenceNumber		16	16	{20..20}
├ EF Events_Data		*864*	*1728*	
└ CardEventData		*864*	*1728*	
└ cardEventRecords	6	*144*	*288*	
└ CardEventRecord	n_1	*24*	*24*	
├ eventType		1	1	{00}
├ eventBeginTime		4	4	{00..00}
├ eventEndTime		4	4	{00..00}
└ eventVehicleRegistration				
├ vehicleRegistrationNation		1	1	{00}
└ vehicleRegistrationNumber		14	14	{00,
├ EF Faults_Data		*576*	*1152*	
└ CardFaultData		*576*	*1152*	
└ cardFaultRecords	2	*288*	*576*	
└ CardFaultRecord	n_2	*24*	*24*	
├ faultType		1	1	{00}
├ faultBeginTime		4	4	{00..00}
├ faultEndTime		4	4	{00..00}
└ faultVehicleRegistration				
├ vehicleRegistrationNation		1	1	{00}
└ vehicleRegistrationNumber		14	14	{00, 0..20}

├ EF Driver_Activity_Data		*5548*	*13780*	
└ CardDriverActivity		*5548*	*13780*	
├ activityPointerOldestDayRecord		2	2	{00 00}
├ activityPointerNewestRecord		2	2	{00 00}
└ activityDailyRecords	n_6	5544	13776	{00..00}

├EF Vehicles_Used		*2606*	*6202*	
└ CardVehiclesUsed		*2606*	*6202*	
├ vehiclePointerNewestRecord		2	2	{00 00}
└ cardVehicleRecords		*2604*	*6200*	
└ CardVehicleRecord	n_3	*31*	*31*	
├ vehicleOdometerBegin		3	3	{00..00}
├ vehicleOdometerEnd		3	3	{00..00}
├ vehicleFirstUse		4	4	{00..00}
├ vehicleLastUse		4	4	{00..00}
├ vehicleRegistration				
├ vehicleRegistrationNation		1	1	{00}
└ vehicleRegistrationNumber		14	14	{00,
└ vuDataBlockCounter		2	2	{00 00}
├EF Places		*841*	*1121*	
└ CardPlaceDailyWorkPeriod		*841*	*1121*	
├ placePointerNewestRecord		1	1	{00}
└ placeRecords		*840*	*1120*	
└ PlaceRecord	n_4	*10*	*10*	
├ entryTime		4	4	{00..00}
├ entryTypeDailyWorkPeriod		1	1	{00}
├ dailyWorkPeriodCountry		1	1	{00}
├ dailyWorkPeriodRegion		1	1	{00}
└ vehicleOdometerValue		3	3	{00..00}
├EF Current_Usage		*19*	*19*	
└ CardCurrentUse		*19*	*19*	
├ sessionOpenTime		4	4	{00..00}
└ sessionOpenVehicle				
├ vehicleRegistrationNation		1	1	{00}
└ vehicleRegistrationNumber		14	14	{00,
├EF Control_Activity_Data		*46*	*46*	
└ CardControlActivityDataRecord		*46*	*46*	
├ controlType		1	1	{00}
├ controlTime		4	4	{00..00}
├ controlCardNumber				
├ cardType		1	1	{00}
├ CardIssuingMemberState		1	1	{00}
└ cardNumber		16	16	{20..20}
├ controlVehicleRegistration				
├ vehicleRegistrationNation		1	1	{00}
└ vehicleRegistrationNumber		14	14	{00,
├ controlDownloadPeriodBegin		4	4	{00..00}
└ controlDownloadPeriodEnd		4	4	{00..00}
└EF Specific_Conditions		*280*	*280*	
└ SpecificConditionRecord	56	*5*	*5*	
├ entryTime		4	4	{00..00}
└ SpecificConditionType		1	1	{00}

TCS_404 The following values, used to provide sizes in the table above, are the minimum and maximum record number values the driver card data structure must use:

		Min	Max
n_1	NoOfEventsPerType	6	12
n_2	NoOfFaultsPerType	12	24
n_3	NoOfCardVehicleRecords	84	200
n_4	NoOfCardPlaceRecords	84	112
n_6	CardActivityLengthRange	5544 bytes (28 days * 93 activity changes)	13776 Bytes (28 days * 240 activity changes)

4.2 Workshop card structure

TCS_405 After its personalisation, the workshop card shall have the following permanent file structure and file access conditions:

		Access conditions		
File	**File ID**	**Read**	**Update**	**Encrypted**
MF	3F00			
├─EF ICC	0002	ALW	NEV	No
├─EF IC	0005	ALW	NEV	No
└─DF Tachograph	0500			
├─EF Application_Identification	0501	ALW	NEV	No
├─EF Card_Certificate	C100	ALW	NEV	No
├─EF CA_Certificate	C108	ALW	NEV	No
├─EF Identification	0520	ALW	NEV	No
├─EF Card_Download	0509	ALW	ALW	No
├─EF Calibration	050A	ALW	PRO SM /	No
├─EF Sensor_Installation_Data	050B	ALW	NEV	**Yes**
├─EF Events_Data	0502	ALW	PRO SM /	No
├─EF Faults_Data	0503	ALW	PRO SM /	No
├─EF Driver_Activity_Data	0504	ALW	PRO SM /	No
├─EF Vehicles_Used	0505	ALW	PRO SM /	No
├─EF Places	0506	ALW	PRO SM /	No
├─EF Current_Usage	0507	ALW	PRO SM /	No
├─EF Control_Activity_Data	0508	ALW	PRO SM /	No
└─EF Specific_Conditions	0522	ALW	PRO SM /	No

TCS_406 All EFs structures shall be transparent.

TCS_407 Read with secure messaging shall be possible for all files under the DF Tachograph.

TCS_408 The workshop card shall have the following data structure:

	No of	**Size (Bytes)**		**Default**
File / Data element	**Records**	**Min**	**Max**	**Values**
MF		*11088*	*29061*	
EF ICC		*25*	*25*	
CardIccIdentification		*25*	*25*	
clockStop		1	1	{00}
cardExtendedSerialNumber		8	8	{00..00}
cardApprovalNumber		8	8	{20..20}
cardPersonaliserID		1	1	{00}
embedderIcAssemblerId		5	5	{00..00}
icIdentifier		2	2	{00 00}
EF IC		*8*	*8*	
CardChipIdentification		*8*	*8*	
icSerialNumber		4	4	{00..00}
icManufacturingReferences		4	4	{00..00}
DF Tachograph		*11055*	*29028*	
EF Application_Identification		*11*	*11*	
WorkshopCardApplicationIdentification		*11*	*11*	
typeOfTachographCardId		1	1	{00}
cardStructureVersion		2	2	{00 00}
noOfEventsPerType		1	1	{00}
noOfFaultsPerType		1	1	{00}
activityStructureLength		2	2	{00 00}
noOfCardVehicleRecords		2	2	{00 00}
noOfCardPlaceRecords		1	1	{00}
noOfCalibrationRecords		1	1	{00}
EF Card_Certificate		*194*	*194*	
CardCertificate		194	194	{00..00}
EF CA_Certificate		*194*	*194*	
MemberStateCertificate		194	194	{00..00}
EF Identification		*211*	*211*	
CardIdentification		*65*	*65*	
CardIssuingMemberState		1	1	{00}
cardNumber		16	16	{20..20}
cardIssuingAuthorityName		36	36	{00,
cardIssueDate		4	4	{00..00}
cardValidityBegin		4	4	{00..00}
cardExpiryDate		4	4	{00..00}
WorkshopCardHolderIdentification		*146*	*146*	
workshopName		36	36	{00,
workshopAddress		36	36	{00,
cardHolderName				
holderSurname		36	36	{00,
holderFirstNames		36	36	{00,
cardHolderPreferredLanguage		2	2	{20 20}
EF Card_Download		*2*	*2*	
NoOfCalibrationsSinceDownload		2	2	{00 00}

├EF Calibration		*9243*	*26778*	
└WorkshopCardCalibrationData		*9243*	*26778*	
├calibrationTotalNumber		2	2	{00 00}
├calibrationPointerNewestRecord		1	1	{00}
└calibrationRecords		*9240*	*26775*	
└WorkshopCardCalibrationRecord	n_5	*105*	*105*	
├calibrationPurpose		1	1	{00}
├vehicleIdentificationNumber		17	17	{20..20}
├vehicleRegistration				
├vehicleRegistrationNation		1	1	{00}
└vehicleRegistrationNumber		14	14	{00,
├wVehicleCharacteristicConstant		2	2	{00 00}
├kConstantOfRecordingEquipment		2	2	{00 00}
├lTyreCircumference		2	2	{00 00}
├tyreSize		15	15	{20..20}
├authorisedSpeed		1	1	{00}
├oldOdometerValue		3	3	{00..00}
├newOdometerValue		3	3	{00..00}
├oldTimeValue		4	4	{00..00}
├newTimeValue		4	4	{00..00}
├nextCalibrationDate		4	4	{00..00}
├vuPartNumber		16	16	{20..20}
├vuSerialNumber		8	8	{00..00}
└sensorSerialNumber		8	8	{00..00}
├EF Sensor_Installation_Data		*16*	*16*	
└SensorInstallationSecData		16	16	{00..00}
├EF Events_Data		*432*	*432*	
└CardEventData		*432*	*432*	
└cardEventRecords	6	*72*	*72*	
└CardEventRecord	n_1	*24*	*24*	
├eventType		1	1	{00}
├eventBeginTime		4	4	{00..00}
├eventEndTime		4	4	{00..00}
└eventVehicleRegistration				
├vehicleRegistrationNation		1	1	{00}
└vehicleRegistrationNumber		14	14	{00,
├EF Faults_Data		*288*	*288*	
└CardFaultData		*288*	*288*	
└cardFaultRecords	2	*144*	*144*	
└CardFaultRecord	n_2	*24*	*24*	
├faultType		1	1	{00}
├faultBeginTime		4	4	{00..00}
├faultEndTime		4	4	{00..00}
└faultVehicleRegistration				
├vehicleRegistrationNation		1	1	{00}
└vehicleRegistrationNumber		14	14	{00,
├EF Driver_Activity_Data		*202*	*496*	
└CardDriverActivity		*202*	*496*	
├activityPointerOldestDayRecord		2	2	{00 00}
├activityPointerNewestRecord		2	2	{00 00}
└activityDailyRecords	n_6	198	492	{00..00}

╟─EF Vehicles_Used		*126*	*250*	
║ └─CardVehiclesUsed		*126*	*250*	
║ ├─vehiclePointerNewestRecord		2	2	{00 00}
║ └─cardVehicleRecords		*124*	*248*	
║ └─CardVehicleRecord	n_3	*31*	*31*	
║ ├─vehicleOdometerBegin		3	3	{00..00}
║ ├─vehicleOdometerEnd		3	3	{00..00}
║ ├─vehicleFirstUse		4	4	{00..00}
║ ├─vehicleLastUse		4	4	{00..00}
║ ├─vehicleRegistration				
║ │ ├─vehicleRegistrationNation		1	1	{00}
║ │ └─vehicleRegistrationNumber		14	14	{00,
║ └─vuDataBlockCounter		2	2	{00 00}
╟─EF Places		*61*	*81*	
║ └─CardPlaceDailyWorkPeriod		*61*	*81*	
║ ├─placePointerNewestRecord		1	1	{00}
║ └─placeRecords		*60*	*80*	
║ └─PlaceRecord	n_4	*10*	*10*	
║ ├─entryTime		4	4	{00..00}
║ ├─entryTypeDailyWorkPeriod		1	1	{00}
║ ├─dailyWorkPeriodCountry		1	1	{00}
║ ├─dailyWorkPeriodRegion		1	1	{00}
║ └─vehicleOdometerValue		3	3	{00..00}
╟─EF Current_Usage		*19*	*19*	
║ └─CardCurrentUse		*19*	*19*	
║ ├─sessionOpenTime		4	4	{00..00}
║ └─sessionOpenVehicle				
║ ├─vehicleRegistrationNation		1	1	{00}
║ └─vehicleRegistrationNumber		14	14	{00,
╟─EF Control_Activity_Data		*46*	*46*	
║ └─CardControlActivityDataRecord		*46*	*46*	
║ ├─controlType		1	1	{00}
║ ├─controlTime		4	4	{00..00}
║ ├─controlCardNumber				
║ │ ├─cardType		1	1	{00}
║ │ ├─CardIssuingMemberState		1	1	{00}
║ │ └─cardNumber		16	16	{20..20}
║ ├─controlVehicleRegistration				
║ │ ├─vehicleRegistrationNation		1	1	{00}
║ │ └─vehicleRegistrationNumber		14	14	{00,
║ ├─controlDownloadPeriodBegin		4	4	{00..00}
║ └─controlDownloadPeriodEnd		4	4	{00..00}
╙─EF Specific_Conditions		*10*	*10*	
└─SpecificConditionRecord	2	*5*	*5*	
├─entryTime		4	4	{00..00}
└─SpecificConditionType		1	1	{00}

TCS_409 The following values, used to provide sizes in the table above, are the minimum and maximum record number values the workshop card data structure must use:

		Min	Max
n_1	NoOfEventsPerType	3	3
n_2	NoOfFaultsPerType	6	6
n_3	NoOfCardVehicleRecords	4	8
n_4	NoOfCardPlaceRecords	6	8
n_5	NoOfCalibrationRecords	88	255
n_6	CardActivityLengthRange	198 bytes (1 day * 93 activity changes)	492 bytes (1 day * 240 activity changes)

4.3 Control card structure

TCS_410 After its personalisation, the control card shall have the following permanent file structure and file access conditions:

		Access conditions		
File	**File ID**	**Read**	**Update**	**Encrypted**
MF	3F00			
├ EF ICC	0002	ALW	NEV	No
├ EF IC	0005	ALW	NEV	No
└ DF Tachograph	0500			
├ EF Application_Identification	0501	ALW	NEV	No
├ EF Card_Certificate	C100	ALW	NEV	No
├ EF CA_Certificate	C108	ALW	NEV	No
├ EF Identification	0520	AUT	NEV	No
└ EF Controller_Activity_Data	050C	ALW	PRO SM /	No

TCS_411 All EFs structures shall be transparent.

TCS_412 Read with secure messaging shall be possible for files under the DF Tachograph.

TCS_413 The control card shall have the following data structure:

	No of	Size (Bytes)		Default
File / Data element	**Records**	**Min**	**Max**	**values**
MF		*11219*	*24559*	
├ EF ICC		*25*	*25*	
└ CardIccIdentification		*25*	*25*	
├ clockStop		1	1	{00}
├ cardExtendedSerialNumber		8	8	{00..00}
├ cardApprovalNumber		8	8	{20..20}
├ cardPersonaliserID		1	1	{00}
├ embedderIcAssemblerId		5	5	{00..00}
└ icIdentifier		2	2	{00 00}
├ EF IC		*8*	*8*	
└ CardChipIdentification		*8*	*8*	
├ icSerialNumber		4	4	{00..00}
└ icManufacturingReferences		4	4	{00..00}
└ DF Tachograph		*11186*	*24526*	
├ EF Application_Identification		*5*	*5*	
└ ControlCardApplicationIdentification		*5*	*5*	
├ typeOfTachographCardId		1	1	{00}
├ cardStructureVersion		2	2	{00 00}
└ noOfControlActivityRecords		2	2	{00 00}

╟EF Card_Certificate		*194*	*194*	
║ └CardCertificate		194	194	{00..00}
╟EF CA_Certificate		*194*	*194*	
║ └MemberStateCertificate		194	194	{00..00}
╟EF Identification		*211*	*211*	
║ ├CardIdentification		*65*	*65*	
║ │ ├CardIssuingMemberState		1	1	{00}
║ │ ├cardNumber		16	16	{20..20}
║ │ ├cardIssuingAuthorityName		36	36	{00,
║ │ ├cardIssueDate		4	4	{00..00}
║ │ ├cardValidityBegin		4	4	{00..00}
║ │ └cardExpiryDate		4	4	{00..00}
║ └ControlCardHolderIdentification		*146*	*146*	
║ ├controlBodyName		36	36	{00,
║ ├controlBodyAddress		36	36	{00,
║ ├cardHolderName				
║ │ ├holderSurname		36	36	{00,
║ │ └holderFirstNames		36	36	{00,
║ └cardHolderPreferredLanguage		2	2	{20 20}
╙EF Controller_Activity_Data		*10582*	*23922*	
└ControlCardControlActivityData		*10582*	*23922*	
├controlPointerNewestRecord		2	2	{00 00}
└controlActivityRecords		*10580*	*23920*	
└controlActivityRecord	n_7	*46*	*46*	
├controlType		1	1	{00}
├controlTime		4	4	{00..00}
├controlledCardNumber				
│ ├cardType		1	1	{00}
│ ├CardIssuingMemberState		1	1	{00}
│ └cardNumber		16	16	{20..20}
├controlledVehicleRegistration				
│ ├vehicleRegistrationNation		1	1	{00}
│ └vehicleRegistrationNumber		14	14	{00,
├controlDownloadPeriodBegin		4	4	{00..00}
└controlDownloadPeriodEnd		4	4	{00..00}

TCS_414 The following values, used to provide sizes in the table above, are the minimum and maximum record number values the control card data structure must use:

		Min	Max
n_7	NoOfControlActivityRecords	230	520

4.4 Company card structure

TCS_415 After its personalisation, the company card shall have the following permanent file structure and file access conditions:

		Access conditions		
File	**File ID**	**Read**	**Update**	**Encrypted**
MF	3F00			
├ EF ICC	0002	ALW	NEV	No
├ EF IC	0005	ALW	NEV	No
└ DF Tachograph	0500			
├ EF Application_Identification	0501	ALW	NEV	No
├ EF Card_Certificate	C100	ALW	NEV	No
├ EF CA_Certificate	C108	ALW	NEV	No
├ EF Identification	0520	AUT	NEV	No
└ EF Company_Activity_Data	050D	ALW	PRO SM / AUT	No

TCS_416 All EFs structures shall be transparent.

TCS_417 Read with secure messaging shall be possible for all files under the DF Tachograph.

TCS_418 The company card shall have the following data structure:

	No of	**Size (bytes)**		**Default**
File / Data element	**Records**	**Min**	**Max**	**Values**
MF		*11147*	*24487*	
├ EF ICC		*25*	*25*	
└ CardIccIdentification		*25*	*25*	
├ clockStop		1	1	{00}
├ cardExtendedSerialNumber		8	8	{00..00}
├ cardApprovalNumber		8	8	{20..20}
├ cardPersonaliserID		1	1	{00}
├ embedderIcAssemblerId		5	5	{00..00}
└ icIdentifier		2	2	{00 00}
├ EF IC		*8*	*8*	
└ CardChipIdentification		*8*	*8*	
├ icSerialNumber		4	4	{00..00}
└ icManufacturingReferences		4	4	{00..00}
└ DF Tachograph		*11114*	*24454*	
├ EF Application_Identification		*5*	*5*	
└ CompanyCardApplicationIdentification		*5*	*5*	
├ typeOfTachographCardId		1	1	{00}
├ cardStructureVersion		2	2	{00 00}
└ noOfCompanyActivityRecords		2	2	{00 00}
├ EF Card_Certificate		*194*	*194*	
└ CardCertificate		194	194	{00..00}
├ EF CA_Certificate		*194*	*194*	
└ MemberStateCertificate		194	194	{00..00}

+

╟EF Identification		*139*	*139*	
├CardIdentification		*65*	*65*	
├CardIssuingMemberState		1	1	{00}
├cardNumber		16	16	{20..20}
├cardIssuingAuthorityName		36	36	{00,
├cardIssueDate		4	4	{00..00}
├cardValidityBegin		4	4	{00..00}
└cardExpiryDate		4	4	{00..00}
└CompanyCardHolderIdentification		*74*	*74*	
├companyName		36	36	{00,
├companyAddress		36	36	{00,
└cardHolderPreferredLanguage		2	2	{20 20}
╙EF Company_Activity_Data		*10582*	*23922*	
└CompanyActivityData		*10582*	*23922*	
├companyPointerNewestRecord		2	2	{00 00}
└companyActivityRecords		*10580*	*23920*	
└companyActivityRecord	n_8	*46*	*46*	
├companyActivityType		1	1	{00}
├companyActivityTime		4	4	{00..00}
├vehicleRegistrationInformation				
├vehicleRegistrationNation		1	1	{00}
└vehicleRegistrationNumber		14	14	{00,
├downloadPeriodBegin		4	4	{00..00}
└downloadPeriodEnd		4	4	{00..00}

TCS_419 The following values, used to provide sizes in the table above, are the minimum and maximum record number values the company card data structure must use:

		Min	**Max**
n_8	NoOfCompanyActivityRecords	230	520

SUB-APPENDIX III

PICTOGRAMS

PIC_001 The control device may use the following pictograms and pictograms combinations:

Basic pictograms

	People	**Actions**	**Modes of operation**
⌂	Company		Company mode
⊓	Controller	Control	Control mode
⊙	Driver	Driving	Operational mode
T	Workshop/test station	Inspection/calibration	Calibration mode
⊟	Manufacturer		

	Activities	**Duration**
⊠	Available	Current availability period
⊙	Driving	Continuous driving time
⊢	Rest	Current rest period
⚒	Work	Current work period
▮▮	Break	Cumulative break time
?	Unknown	

	Equipment	**Functions**
1	Driver slot	
2	Co-driver slot	
▣	Card	
◷	Clock	
□	Display	Displaying
↧	External storage	Downloading
÷	Power supply	
▼	Printer/printout	Printing
⎍	Sensor	
●	Tyre size	
⊓	Vehicle/vehicle unit	

	Specific conditions
OUT	Out of scope
⛴	Ferry/train crossing

Miscellaneous

!	Events	✕	Faults
I▶	Start of daily work period	▶I	End of daily work period
✚	Location		
M	Manual entry of driver activities		
🔒	Security		
>	Speed		
◷	Time		
Σ	Total/summary		

Qualifiers

24h	Daily
I	Weekly
II	Two weeks
+	From or to

Pictogram combinations

Miscellaneous

▣✚	Control place		
✚I▶	Location start of daily work period	▶I✚	Location end of daily work period
◷+	From time	+◷	To time
⛟+	From vehicle		
OUT+	Out of scope begin	+OUT	Out of scope end

Cards

⊙▮	Driver card
⌂▮	Company card
▣▮	Control card
T▮	Workshop card
▮---	No card

Driving

⊙⊙	Crew driving
⊙I	Driving time for one week
⊙II	Driving time for two weeks

Printouts

24h▣▼	Driver activities from card daily printout
24h⍊▼	Driver activities from VU daily printout
!×▣▼	Events and faults from card printout
!×⍊▼	Events and faults from VU printout
T◷▼	Technical data printout
>>▼	Over speeding printout

Events

!▣	Insertion of a non valid card
!▣▣	Card conflict
!◷◷	Time overlap
!⊙▣	Driving without an appropriate card
!▣⊙	Card insertion while driving
!▣⍊	Last card session not correctly closed
>>	Over speeding
!÷	Power supply interruption
!⎍	Motion data error
!🔒	Security breach
!◷	Time adjustment (by workshop)
>▯	Over speeding control

Faults

×▣1	Card fault (driver slot)
×▣2	Card fault (co-driver slot)
×□	Display fault
×↧	Downloading fault
×▼	Printer fault
×⎍	Sensor fault
×⍊	VU internal fault

Manual entries procedure

❙▶?▶❙	Still same daily work period ?
▶❙?	End of previous work period ?
▶❙✚?	Confirm or enter location of end of work period
◷❙▶?	Enter start time
✚❙▶?	Enter location of start of work period.

Note: Additional pictogram combinations to form printout block or record identifiers are defined in sub-appendix 4.

SUB-APPENDIX IV

PRINTOUTS

CONTENTS

PAGE

1. Generalities

Each printout is built up by chaining various data blocks, possibly identified with a block identifier.

A data block contains one or more records, possibly identified with a record identifier.

PRT_001 When a block identifier immediately precedes a record identifier, the record identifier is not printed.

PRT_002 In the case where a data item is unknown, or must not be printed for data access rights reasons, spaces are printed instead.

PRT_003 If the content of a complete line is unknown, or need not to be printed, then the complete line is omitted.

PRT_004 Numerical data fields are printed right aligned, with a space separator for thousands and millions, and without leading zeros.

PRT_005 String data fields are printed left aligned and filled up with spaces to data item length, or truncated to data item length when needed (names and addresses).

2. Data blocks specification

In this chapter the following format notation conventions have been used:

- Characters printed in **bold** denote plain text to be printed (printing remains in normal characters),
- Normal characters denote variables (pictograms or data) to be replaced by their values for printing,
- Variable names have been padded with underscores to show the data item length available for the variable,
- Dates are specified with a “dd/mm/yyyy” (day, month, year) format. A “dd.mm.yyyy” format may also be used,
- The term “card identification” denotes the composition of: the type of card through a card pictograms combination, the card issuing Contracting Party code, a forward slash character and the card number with the replacement index and the renewal index separated with a space:

P	▪	x	x	x	/	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x		x
Card Pictogram combination		Issuing Contracting Party code				First 14 characters of card number (possibly including a consecutive index)															Replacement index		Renewal index

PRT_006 Printouts shall use the following data blocks and/or data records, in accordance with the following meanings and formats:

Block or record number Meaning		Data Format
1.	***Date and time at which the document is printed.***	▼ dd/mm/yyyy hh:mm **(UTC)**
2.	***Type of printout.***	
	Block identifier	-----------▼------------
	Printout pictogram combination (see App. 3), Speed limiting device setting (Over speeding printout only)	Picto xxx **km/h**
3.	***Card holder identification.***	
	Block identifier. P= people pictogram	-----------P------------
	Card holder surname	P Last_Name_____________
	Card holder first name(s) (if any)	First_Name____________
	Card identification	Card_Identification_____
	Card expiry date (if any)	dd/mm/yyyy

In the case where the card is a non-personal card, and holds no card holder surname, the company or workshop or control body name shall be printed instead.

4.	***Vehicle identification.***	
	Block identifier	-----------🚚------------
	VIN	🚚 VIN______________
	Registering Contracting Party and VRN	Nat/VRN__________
5.	***VU identification.***	
	Block identifier	-----------⊟------------
	VU manufacturer’s name	⊟ VU_Manufacturer_______
	VU part number	VU_Part_Number__
6.	***Last calibration of the control device***	
	Block identifier	-----------⊤------------
	Workshop name	⊤ Last_Name_______________
	Workshop card identification	Card_Identification_____
	Date of the calibration	⊤ dd/mm/yyyy

7.	***Last control (by a control officer)***	
	Block identifier	-----------□------------
	Controller’s card identification	Card_Identification_____
	Control date, time and type	□ dd/mm/yyyy hh**:**mm pppp

Type of the control: Up to four pictograms. The type of control can be (a combination) of: ▪: Card downloading, ↓: VU downloading, ▼: printing, □: Displaying

8.	***Driver activities stored on a card in order of occurrence***	
	Block identifier	-----------⊙------------
	Enquiry date (calendar day subject of the printout) + Daily card presence counter	dd/mm/yyyy xxx
8.1	*Period during which the card was not inserted*	
8.1a	Record identifier (start of period)	--------------------
8.1b	*Unknown period.* Start and end time, duration	hh**:**mm hh**:**mm hh**h**mm
8.1c	*Activity manually entered.* Activity pictogram, start and end time (included), duration, rest periods of at least one hour are tagged with a star.	A hh**:**mm hh**:**mm hh**h**mm *
8.2	*Card insertion in slot S*	
	Record identifier; S = Slot pictogram	---------S---------
	Vehicle registering Contracting Party and VRN	🚚 Nat/VRN____________
	Vehicle odometer at card insertion	x xxx xxx **km**
8.3	*Activity (while card was inserted)*	
	Activity pictogram, start and end time (included), duration, crew status (crew pictogram if CREW, blanks if SINGLE), rest periods of at least one hour are tagged with a star.	A hh**:**mm hh**:**mm hhhmm
8.3a	*Specific condition.* Time of entry, specific condition pictogram (or pictogram combination).	hh**:**mm -----pppp-----
8.4	*Card withdrawal*	
	Vehicle odometer and distance travelled since last insertion for which odometer is known	x xxx xxx **km;** x xxx **km**

9. ***Driver activities stored in a VU per slot in chronological order***

Block identifier	`-----------⊙------------`
Enquiry date (calendar day subject of the printout)	dd/mm/yyyy
Vehicle odometer at 00:00 and 24:00	`x xxx xxx - x xxx xxx` **km**

10. ***Activities carried in slot S***

Block identifier	`-----------S------------`

10.1 *Period where no card is inserted in slot S*

Record identifier.	`--------------------`
No Card inserted	⊙▮---
Vehicle odometer at beginning of period	`x xxx xxx` **km**

10.2 *Card insertion*

Card insertion Record identifier	`--------------------`
Driver's name	⊙ Last_Name_____________
Driver's first name	First_Name____________
Driver's Card identification	Card_Identification_____
Driver's card expiry date	dd/mm/yyyy
Registering CP and VRN of previous vehicle used	🚚+Nat/VRN__________
Date and time of card withdrawal from previous vehicle	dd/mm/yyyy hh:mm
Blank line	
Vehicle odometer at card insertion, Manual entry of driver activities flag (M if yes, Blank if No).	`x xxx xxx` **km** **M**

10.3 *Activity*

Activity pictogram, start and end time (included), duration, crew Status (crew pictogram if CREW, blanks if SINGLE), rests of at least one hour are tagged with a star.	`A hh:mm hh:mm hh`**h**`mm ⊙⊙ *`

10.3a	*Specific condition.* Time of entry, specific condition pictogram (or pictogram combination).	hh:mm -----pppp-----
10.4	*Card withdrawal or End of 'No Card' period*	
	Vehicle odometer at card withdrawal or at end of 'no card' period and distance travelled since insertion, or since beginning of the 'No Card' period.	x xxx xxx **km;** x xxx **km**

11.	***Daily summary***	
	Block identifier	-----------Σ------------
11.1	*VU summary of periods without card in driver slot*	
	Block identifier	**1**⊙▮---
11.2	*VU summary of periods without card in co-driver slot*	
	Block identifier	**2**⊙▮---
11.3	*VU daily summary per driver*	
	Record identifier	--------------------
	Driver's surname	Last_Name_____________
	Driver's first name(s)	First_Name____________
	Driver's card identification	Card_Identification_____
11.4	*Entry of place where a daily work period begins and/or ends*	
	pi=location begin / end pictogram, time, country, region,	pihh**:**mm Cou Reg
	Odometer	x xxx xxx **km**

11.5	*Activity totals (from a card)*	
	Total driving duration, distance travelled	⊙ hh**h**mm x xxx **km**
	Total working and availability duration	⚒ hh**h**mm ⊠ hh**h**mm
	Total resting and unknown duration	⊢ hh**h**mm ? hh**h**mm
	Total duration of crew activities	⊙⊙ hh**h**mm
11.6	*Activity totals (periods without card driver slot)*	
	Total driving duration, distance travelled	⊙ hh**h**mm x xxx **km**
	Total working and availability duration	⚒ hh**h**mm ⊠ hh**h**mm
	Total resting duration	⊢ hh**h**mm

11.7	*Activity totals (periods without card co-driver slot)*	
	Total working and availability duration	⚒ hh**h**mm ⊠ hh**h**mm
	Total resting duration	⊢ hh**h**mm
11.8	*Activity totals (per driver both slots included)*	
	Total driving duration, distance travelled	⊙ hh**h**mm x xxx **km**
	Total working and availability duration	⚒ hh**h**mm ⊠ hh**h**mm
	Total resting duration	⊢ hh**h**mm
	Total duration of crew activities	⊚⊚ hh**h**mm

When a daily printout is required for the current day, daily summary information is computed with available data at the time of the printout.

12.	***Events and/or faults stored on a card***	
12.1	Block identifier last 5 ‘Events and Faults’ from a card	----------!×▣-----------
12.2	Block identifier all recorded ‘Events’ on a card	-----------!▣-----------
12.3	Block identifier all recorded ‘Faults’ on a card	-----------×▣-----------
12.4	*Event and/or Fault record*	
	Record identifier	--------------------
	Event/fault pictogram, record purpose, date time of start,	Pic dd/mm/yyyy hh**:**mm
	Additional event/fault code (if any), duration	!xxx hh**h**mm
	Registering Contracting Party & VRN of vehicle in which the event or fault occurred	🚚 Nat/VRN__________
13.	***Events and/or faults stored or on-going in a VU***	
13.1	Block identifier last 5 ‘Events and Faults’ from VU	----------!×🚚-----------

13.2	Block identifier all recorded or on-going 'Events' in a VU	-----------!Д-----------
13.3	Block identifier all recorded or on-going 'Faults' in a VU	-----------×Д-----------

13.4 *Event and/or fault record*

Record identifier	--------------------
Event/fault pictogram, record purpose, date time of start,	Pic **(**p**)** dd/mm/yyyy hh**:**mm
Additional event/fault code (if any), No of similar events this day, duration	!xxx **(**xxx**)** hh**h**mm
Identification of the cards inserted at start or end of the event or fault (up to 4 lines without repeating twice the same card numbers)	Card_Identification_____ Card_Identification_____ Card_Identification_____ Card_Identification_____
Case where no card was inserted	▪---

The record purpose (p) is a numerical code explaining why the event or fault was recorded, coded in accordance with the data element EventFaultRecordPurpose.

14. ***VU Identification***

Block identifier	-----------⊟------------
VU manufacturer name	⊟ Name__________________
VU manufacturer address	Address_______________
VU part number	PartNumber______
VU approval number	Apprv___________
VU serial number	S/N_____
VU year of manufacture	yyyy
VU software version and installation date	**V** xx.xx.xx dd/mm/yyyy

15. ***Sensor identification***

Block identifier	-----------⎍------------
Sensor serial number	⎍ S/N_____
Sensor approval number	Apprv___________
Sensor first installation date	dd/mm/yyyy

16. ***Calibration data***

Block identifier	-----------⊤------------

16.1 *Calibration record*

Record identifier	--------------------
Workshop having performed the calibration	⊤ Workshop_name_________
Workshop address	Workshop_address______
Workshop card identification	Card_Identification_____
Workshop card expiry date	dd/mm/yyyy
Blank line	
Calibration date + calibration purpose	⊤ dd/mm/yyyy **(**p**)**
VIN	Д VIN______________
Registering Contracting Party& VRN	Nat/VRN__________
Characteristic coefficient of vehicle	**w** xx xxx **Imp/km**
Constant of the control device	**k** xx xxx **Imp/km**
Effective circumference of wheel tyres	**l** xx xxx **mm**
Size of tyres mounted	● TyreSize_______
Speed limiting device setting	› xxx **km/h**
Old and new odometer values	x xxx xxx – x xxx xxx **km**

The calibration purpose (p) is a numerical code explaining why these calibration parameters were recorded, coded in accordance with the data element `CalibrationPurpose`.

17 ***Time adjustment***

Block identifier	-----------◷-----------

17.1 *Time adjustment record*

Record identifier	--------------------
Old date and time	dd/mm/yyyy hh:mm
New date and time	dd/mm/yyyy hh:mm
Workshop having performed the time adjustment	Workshop_name_________
Workshop address	Workshop_address______
Workshop card identification	Card_Identification_____
Workshop card expiry date	dd/mm/yyyy

18 ***Most recent event and Fault recorded in the VU***

Block identifier	----------!×Д-----------
Most recent event date time	dd/mm/yyyy hh**:**mm
Most recent fault date time	dd/mm/yyyy hh**:**mm

19	***Over speeding control information***	
	Block identifier	**----------->>----------**
	Date and time of last OVER SPEEDING CONTROL	>dd/mm/yyyy hh**:**mm
	Date/time of first over speeding and number of over speeding events since	>>dd/mm/yyyy hh**:**mm **(**nnn**)**

20	***Over speeding record***	
20.1	Block identifier ‘First over speeding after the last calibration’	**-------->>T---------**
20.2	Block identifier ‘The 5 most serious over the last 365 days’	**------->>(365)------**
20.3	Block identifier ‘The most serious for each of the last 10 days of occurrence’	**------->>(10)-------**
20.4	Record identifier	**--------------------**
	Date time and duration	>>dd/mm/yyyy hh**:**mm hh**h**mm
	Max and average speeds, No. of similar events this day	xxx **km/h** xxx **km/h(**xxx**)**
	Driver’s surname	⊙ Last_Name_____________
	Driver’s first name(s)	First_Name____________
	Driver card identification	Card_Identification_____
20.5	If no over speeding record exists in a block	**>>---**

21	***Hand-written information***	
	Block identifier	**-----------------------**
21.1	Control Place	▯● . . . .
21.2	Controller’s signature	▯ . . . .
21.3	From time	◷+ . . . .
21.4	To time	+◷ . . . .
21.5	Driver’s signature	⊙ . . . .

‘Hand-written information’; Insert enough blank lines above a hand-written item, to be able to actually write the required information or to put a signature.

3. Printout specifications

In this chapter the following notation conventions have been used:

N	Print block or record number N
N	Print block or record number N repeated as many times as necessary
X / Y	Print blocks or records X and/or Y as needed, and repeating as many times as necessary.

3.1 Driver Activities from Card Daily Printout

PRT_007 The driver activities from card daily printout shall be in accordance with the following format:

1	Date and time at which the document is printed
2	Type of printout
3	Controller identification (if a control card is inserted in the VU)
3	Driver identification (from card subject of the printout)
4	Vehicle identification (vehicle from which printout is taken)
5	VU identification (VU from which printout is taken)
6	Last calibration of this VU
7	Last control the inspected driver has been subject to
8	Driver activities delimiter
8.1a / 8.1b / 8.1c / 8.2 / 8.3 / 8.3a / 8.4	Activities of the driver in order of occurrence
11	Daily summary delimiter
11.4	Places entered in chronological order
11.5	Activity totals
12.1	Events or faults from card delimiter
12.4	Event/Fault records (Last 5 events or faults stored in the card)
13.1	Events or faults from VU delimiter
13.4	Event/Fault records (Last 5 events or faults stored or on-going in the VU)
21.1	Control place
21.2	Controller’s signature
21.5	Driver's signature

3.2 Driver Activities from VU Daily Printout

PRT_008 The driver activities from VU daily printout shall be in accordance with the following format:

1	Date and time at which the document is printed
2	Type of printout
3	Card holder identification (for all cards inserted in VU)
4	Vehicle identification (vehicle from which printout is taken)
5	VU identification (VU from which printout is taken)
6	Last calibration of this VU
7	Last control on this control device
9	Driver activities delimiter
10	Driver slot delimiter (slot 1)
10.1 / 10.2 / 10.3 /10.3a / 10.4	Activities in chronological order (driver slot)
10	Co-driver slot delimiter (slot 2)
10.1 / 10.2 / 10.3 /10.3a / 10.4	Activities in chronological order (co-driver slot)
11	Daily summary delimiter
11.1	Summary of periods without card in driver slot
11.4	Places entered in chronological order
11.6	Activity totals
11.2	Summary of periods without card in co-driver slot
11.4	Places entered in chronological order
11.7	Activity totals
11.3	Summary of activities for a driver both slots included
11.4	Places entered by this driver in chronological order
11.7	Activity totals for this driver
13.1	Events faults delimiter
13.4	Event/Fault records (Last 5 events or faults stored or on-going in the VU)
21.1	Control place
21.2	Controller’s signature
21.3	From time (space available for a driver without a card to indicate
21.4	To time which periods are relevant to himself)
21.5	Driver's signature

3.3 Events and Faults from Card Printout

PRT_009 The events and faults from card printout shall be in accordance with the following format:

1	Date and time at which the document is printed
2	Type of printout
3	Controller identification (if a control card is inserted in the VU)
3	Driver identification (from card subject of the printout)
4	Vehicle identification (vehicle from which printout is taken)
12.2	Events delimiter
12.4	Event records (all events stored on the card)
12.3	Faults delimiter
12.4	Fault records (all faults stored on the card)
21.1	Control place
21.2	Controller’s signature
21.5	Driver's signature

3.4 Events and Faults from VU Printout

PRT_010 The events and faults from VU printout shall be in accordance with the following format:

1	Date and time at which the document is printed
2	Type of printout
3	Card holder identification (for all cards inserted in VU)
4	Vehicle identification (vehicle from which printout is taken)
13.2	Events delimiter
13.4	Event records (All Events stored or on-going in the VU)
13.3	Faults delimiter
13.4	Fault records (All Faults stored or on-going in the VU)
21.1	Control place
21.2	Controller’s signature
21.5	Driver's signature

3.5 Technical data Printout

PRT_011 The technical data printout shall be in accordance with the following format:

1	Date and time at which the document is printed
2	Type of printout
3	Card holder identification (for all cards inserted in VU)
4	Vehicle identification (vehicle from which printout is taken)
14	VU identification
15	Sensor identification

16	Calibration data delimiter
16.1	Calibration records (all records available in chronological order)
17	Time adjustment delimiter
17.1	Time adjustment records (all records available from time adjustment and from calibration data records)
18	Most recent event and Fault recorded in the VU

3.6 Over speeding Printout

PRT_012 The over speeding printout shall be in accordance with the following format:

1	Date and time at which the document is printed
2	Type of printout
3	Card holder identification (for all cards inserted in VU)
4	Vehicle identification (vehicle from which printout is taken)
19	Over speeding control information
20.1	Over speeding data identifier
20.4 / 20.5	First over speeding after the last calibration
20.2	Over speeding data identifier
20.4 / 20.5	The 5 most serious over speeding events over the last 365 days
20.3	Over speeding data identifier
20.4 / 20.5	The most serious over speeding for each of the last 10 days of occurrence
21.1	Control place
21.2	Controller’s signature
21.5	Driver's signature

SUB-APPENDIX V

DISPLAY

In this sub appendix the following format notation conventions have been used:

- characters printed in **bold** denote plain text to be displayed (display remains in normal character),
- normal characters denote variables (pictograms or data) to be replaced by their values for displaying:
- dd mm yyyy: day, month, year,
- hh: hours,
- mm: minutes,
- D: duration pictogram,
- EF: event or fault pictograms combination,
- O: mode of operation pictogram.

DIS_001 The control device shall display data using the following formats:

Data	Format
Default display	
Local time	hh**:**mm
Mode of operation	O
Information related to the driver	1Dhh**h**mm ▮hh**h**mm
Information related to the co-driver	2Dhh**h**mm
Out of scope condition opened	OUT
Warning display	
Exceeding continuous driving time	1⊙hh**h**mm ▮hh**h**mm
Event or fault	EF
Other displays	
UTC date time	**UTC**◷dd**/**mm**/**yyyy or **UTC**◷dd**.**mm**.**yyyy hh**:**mm
Driver's continuous driving time and cumulative break time	1⊙hh**h**mm ▮hh**h**mm
Co-driver's continuous driving time and cumulative break time	2⊙hh**h**mm ▮hh**h**mm
Driver's cumulated driving time for the previous and the current week	1⊙‖ hhh**h**mm
Co-driver's cumulated driving time for the previous and the current week	2⊙‖ hhh**h**mm

SUB- APPENDIX VI

EXTERNAL INTERFACES

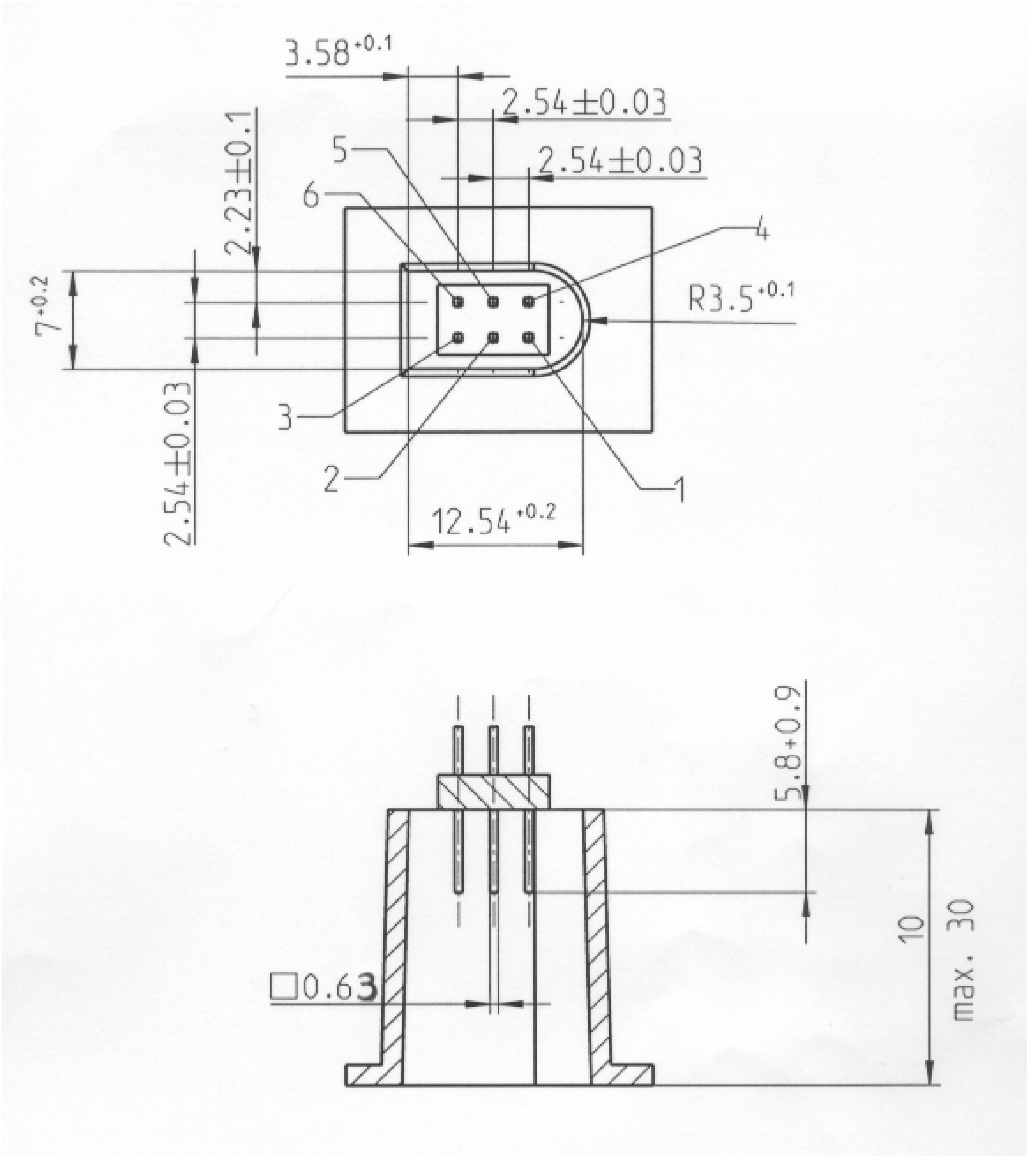
CONTENTS

PAGE

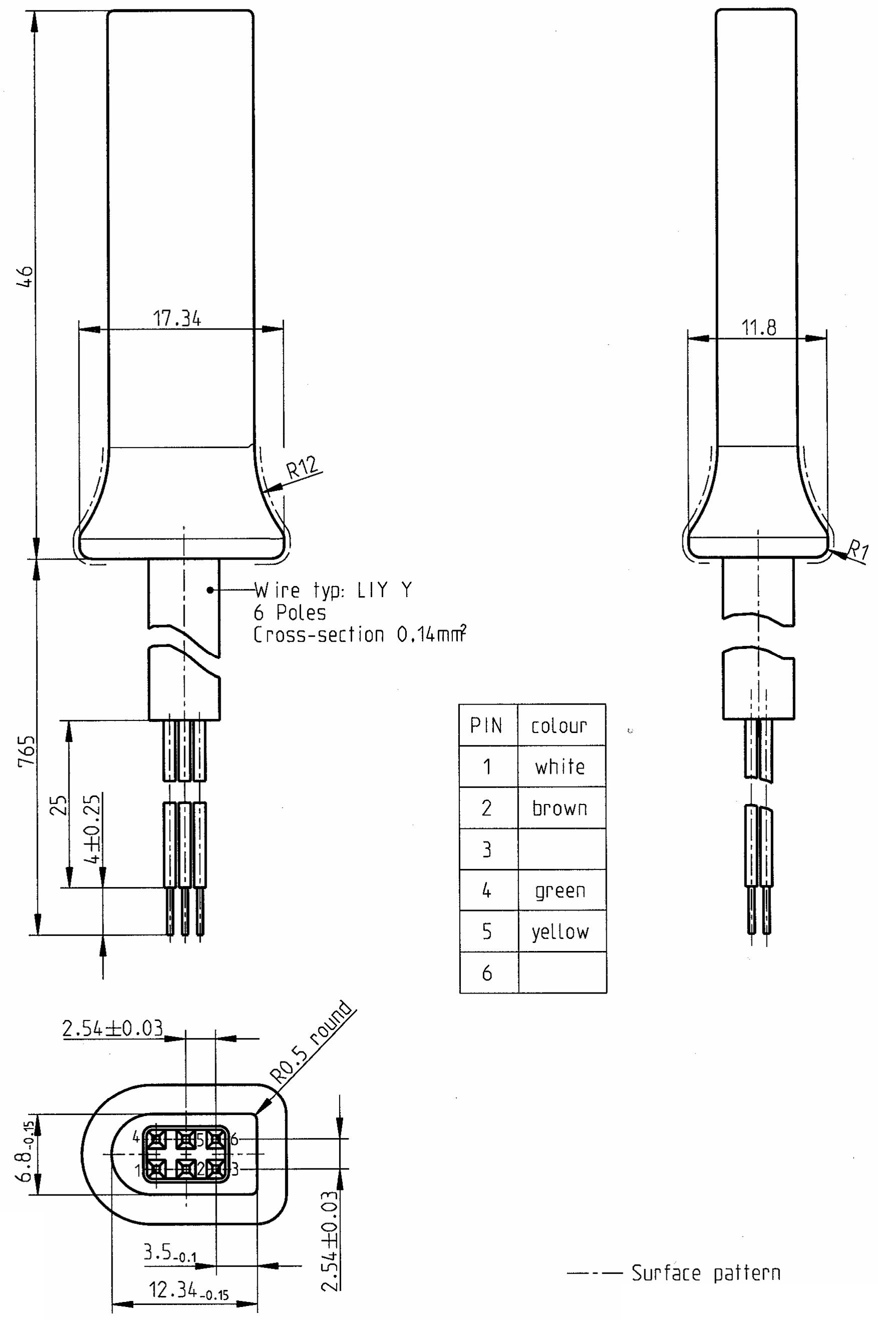
1. Hardware

1.1 Connector

INT_001 The downloading/calibration connector shall be a 6 pin connector, accessible on the front panel without the need to disconnect any part of the control deviceand shall comply with the following drawing (all dimensions in millimetres):



The following diagram shows a typical 6 pin mating plug:



PIN	colour
1	white
2	brown
3	
4	green
5	yellow
6	

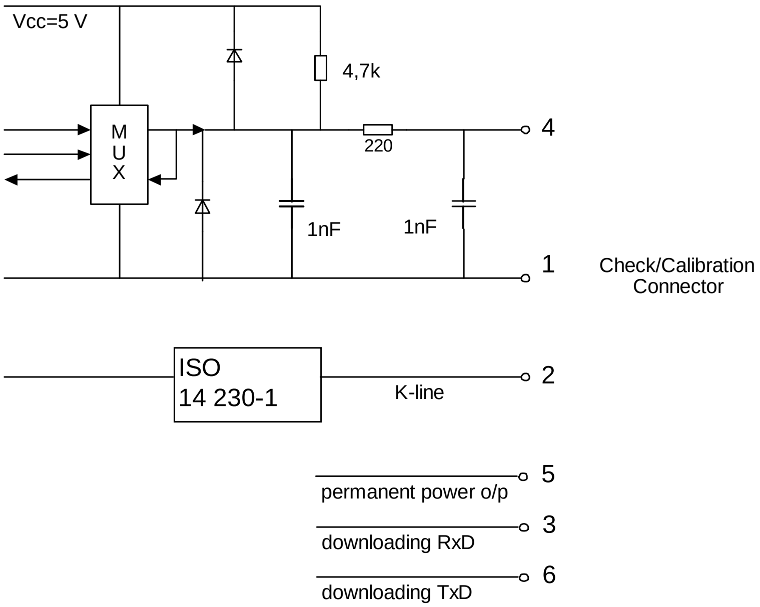
1.2 Contact allocation

INT_002 Contacts shall be allocated in accordance with the following table:

Pin	Description	Remark
1	Battery minus	Connected to the battery minus of the vehicle
2	Data communication	K-line (ISO 14230-1)
3	RxD – Downloading	Data input to control device
4	Input/output signal	Calibration
5	Permanent power output	The voltage range is specified to be that of the vehicle power minus 3V to allow for the voltage drop across the protective circuitry Output 40 mA
6	TxD – Downloading	Data output from control device

1.3 Block diagram

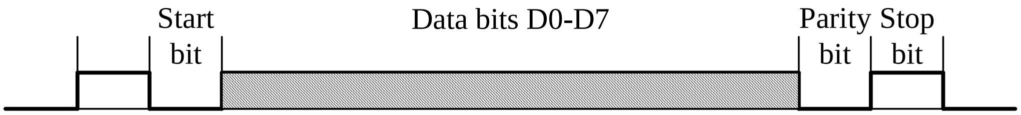
INT_003 The block diagram shall comply with the following:



2. Downloading interface

INT_004 The downloading interface shall comply to RS232 specifications.

INT_005 The downloading interface shall use one start bit, 8 data bits LSB first, one even parity bit and 1 stop bit.



Data byte organisation

Start bit: one bit with logic level 0;
Data bits: transmitted with LSB first;
Parity bit: even parity
Stop bit: one bit with logic level 1

When numerical data composed by more than one byte are transmitted, the most significant byte is transmitted first and the least significant byte last.

INT_006 Transmission baud rates shall be adjustable from 9 600 bps to 115 200 bps. Transmission shall be achieved at the highest possible transmission speed, the initial baud rate after a start of communication being set at 9 600 bps.

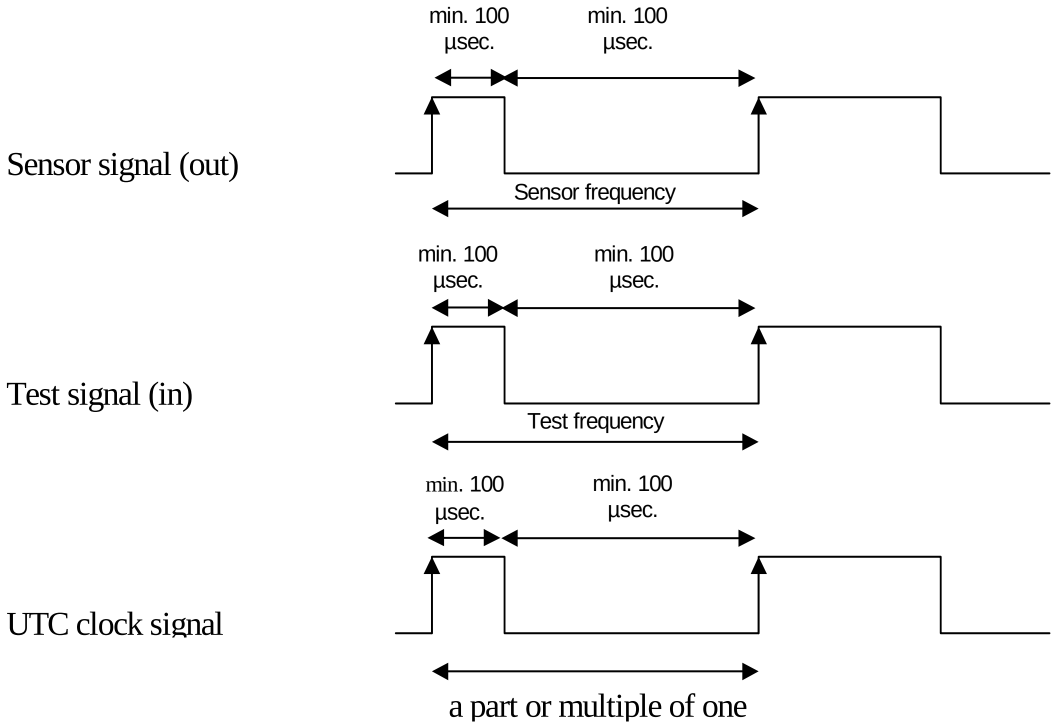
3. Calibration interface

INT_007 The data communication shall comply to ISO 14230-1 Road vehicles - Diagnostic systems - Keyword protocol 2000 - Part 1: Physical layer, First edition: 1999.

INT_008 The input/output signal shall comply with the following electrical specification:

Parameter	Minimum	Typical	Maximum	Remark
U_{low} (in)			1,0 V	I = 750 µA
U_{high} (in)	4 V			I = 200 µA
Frequency			4 kHz	
U_{low} (out)			1,0 V	I = 1 mA
U_{high} (out)	4 V			I = 1 mA

INT_009 The input/output signal shall comply with the following timing diagrams:


min. 100 µsec.
min. 100 µsec.
Sensor signal (out)
Sensor frequency
min. 100 µsec.
min. 100 µsec.
Test signal (in)
Test frequency
min. 100 µsec.
min. 100 µsec.
UTC clock signal
a part or multiple of one

SUB-APPENDIX VII

DATA DOWNLOADING PROTOCOLS

CONTENTS

PAGE

CONTENTS (continued)

PAGE

1. Introduction

This sub-appendix specifies the procedures to follow in order to perform the different types of data download to an External Storage Medium, together with the protocols that must be implemented to assure the correct data transfer and the full compatibility of the downloaded data format to allow any controller to inspect these data and be able to control their authenticity and their integrity before analysing them.

1.1 Scope

Data may be downloaded to an ESM:

- from a Vehicle Unit by an Intelligent Dedicated Equipment (IDE) connected to the VU,
- from a tachograph card by an IDE fitted with a card interface device (IFD),
- from a tachograph card via a vehicle unit by an IDE connected to the VU.

To give the possibility to verify the authenticity and integrity of downloaded data stored on an ESM, data is downloaded with a signature appended in accordance with sub-appendix 11 Common Security Mechanisms. The source equipment (VU or card) identification and its security certificates (Contracting Party and equipment) are also downloaded. The verifier of the data must possess independently a trusted European public key.

DDP_001 Data downloaded during one download session must be stored in the ESM within one file.

1.2 Acronyms and notations

The following acronyms are used in this sub-appendix:

AID	Application Identifier
ATR	Answer To Reset
CS	Checksum byte
DF	Dedicated File
DS_	Diagnostic Session
EF	Elementary File
ESM	External Storage Medium
FID	File Identifier (File ID)
FMT	Format Byte (first byte of message header)
ICC	Integrated Circuit Card
IDE	Intelligent Dedicated Equipment: The equipment used to perform data downloading to the ESM (e.g. Personal Computer)
IFD	Interface Device
KWP	Keyword Protocol 2000
LEN	Length Byte (last byte of message header)
PPS	Protocol Parameter Selection
PSO	Perform Security Operation
SID	Service Identifier
SRC	Source byte
TGT	Target Byte
TLV	Tag Length Value
TREP	Transfer Response Parameter
TRTP	Transfer Request Parameter
VU	Vehicle Unit

2. V.U. data downloading

2.1 Download procedure

In order to carry on a VU data download, the operator must perform the following operations:

- Insert his tachograph card inside a card slot of the VU(*);
- Connect the IDE to the VU download connector;
- Establish the connection between the IDE and the VU;
- Select on the IDE the data to download and send the request to the VU;
- Close the download session.

(*) The card inserted will trigger the appropriate access rights to the downloading function and to the data.

2.2 Data download protocol

The protocol is structured on a master-slave basis, with the IDE playing the master role and the VU playing the slave role.

The message structure, types and flow are principally based on the Keyword Protocol 2000 (KWP) (ISO 14230-2 Road vehicles – Diagnostic systems – Keyword protocol 2000 – Part2 : Data link layer).

The application layer is principally based on the current draft to date of ISO 14229-1 (Road vehicles – Diagnostic systems – Part 1 : Diagnostic services, version 6 of 22 February 2001).

2.2.1 Message structure

DDP_002 All the messages exchanged between the IDE and the VU are formatted with a structure consisting of three parts:

- Header composed by a Format byte (FMT), a Target byte (TGT), a Source byte (SRC) and possibly a Length byte (LEN),
- Data field composed by a Service Identifier byte (SID) and a variable number of data bytes, which can include an optional diagnostic session byte (DS_) or an optional transfer parameter byte (TRTP or TREP).
- Checksum composed by a Checksum byte (CS).

Header				Data field					Checksum
FMT	TGT	SRC	LEN	SID	DATA	……	…..	…..	CS
4 bytes				Max 255 bytes					1 byte

The TGT and SRC byte represent the physical address of the recipient and originator of the message. Values are F0 Hex for the IDE and EE Hex for the VU.

The LEN byte is the length of the Data field part.

The Checksum byte is the 8 bit sum series modulo 256 of all the bytes of the message excluding the CS itself.

FMT, SID, DS_, TRTP and TREP bytes are defined later in this document.

DDP_003 In the case where the data to be carried by the message is longer than the space available in the data field part, the message is actually sent in several sub messages. Each sub message bears a header, the same SID, TREP and a 2-byte sub message counter indicating the sub message number within the total message. To enable error checking and abort the IDE acknowledges every sub message. The IDE can accept the sub message, ask for it to be re-transmitted, request the VU to start again or abort the transmission.

DDP_004 If the last sub message contains exactly 255 bytes in the data field, a final sub message with an empty (except SID TREP and sub message counter) data field must be appended to show the end of the message.

Example:

Header	SID	TREP	Message	CS
4 Bytes	Longer than 255 Bytes			

Will be transmitted as:

Header	SID	TREP	00	01	Sub message 1	CS
4 Bytes	255 Bytes					

Header	SID	TREP	00	02	Sub message 2	CS
4 Bytes	255 Bytes					

…

Header	SID	TREP	xx	yy	Sub message n	CS
4 Bytes	Less than 255 Bytes					

or as:

Header	SID	TREP	00	01	Sub message 1	CS
4 Bytes	255 Bytes					

Header	SID	TREP	00	02	Sub message 2	CS
4 Bytes	255 Bytes					

…

Header	SID	TREP	xx	yy	Sub message n	CS
4 Bytes	255 Bytes					

Header	SID	TREP	xx	yy+1	CS
4 Bytes	4 bytes				

2.2.2 Message types

The communication protocol for data download between the VU and the IDE requires the exchange of 8 different message types.

The following table summarises these messages.

Message Structure	Max 4 Bytes Header				Max 255 Bytes Data			1 Byte CheckSum
IDE -> **<- VU**	FMT	TGT	SRC	LEN	SID	DS_ / TRTP	DATA	CS
Start Communication Request	81	EE	F0	■	81	■	■	E0
Positive Response Start Communication	80	F0	EE	03	C1	■	‘EA’ ‘8F’	9B
Start Diagnostic Session Request	80	EE	F0	02	10	81	■	F1
Positive Response Start Diagnostic	80	F0	EE	02	50	81	■	31
Link Control Service								
Verify Baud Rate (stage 1)								
9 600 Bd	80	EE	F0	04	87	■	01,01,01	EC
19 200 Bd	80	EE	F0	04	87	■	01,01,02	ED
38 400 Bd	80	EE	F0	04	87	■	01,01,03	EE
57 600 Bd	80	EE	F0	04	87	■	01,01,04	EF
115 200 Bd	80	EE	F0	04	87	■	01,01,05	F0
Positive Response Verify Baud Rate	80	F0	EE	02	C7	■	01	28
Transition Baud Rate (stage 2)	80	EE	F0	03	87	■	02,03	ED
Request Upload	80	EE	F0	0A	35	■	00,00,00,00,00,FF,FF,FF,FF	99
Positive Response Request Upload	80	F0	EE	03	75	■	00,FF	D5
Transfer Data Request								
Overview	80	EE	F0	02	36	01	■	97
Activities	80	EE	F0	06	36	02	Date	CS
Events & Faults	80	EE	F0	02	36	03	■	99
Detailed Speed	80	EE	F0	02	36	04	■	9A
Technical Data	80	EE	F0	02	36	05	■	9B
Card download	80	EE	F0	02	36	06	■	9C
Positive Response Transfer Data	80	F0	EE	Len	76	TREP	Data	CS
Request Transfer Exit	80	EE	F0	01	37	■	■	96
Positive Response Request Transfer Exit	80	F0	EE	01	77	■	■	D6
Stop Communication Request	80	EE	F0	01	82	■	■	E1
Positive Response Stop Communication	80	F0	EE	01	C2	■	■	21
Acknowledge sub message	80	EE	F0	Len	83	■	Data	CS
Negative responses								
General reject	80	F0	EE	03	7F	Sid Req	10	CS
Service not supported	80	F0	EE	03	7F	Sid Req	11	CS
Sub function not supported	80	F0	EE	03	7F	Sid Req	12	CS
Incorrect Message Length	80	F0	EE	03	7F	Sid Req	13	CS
Conditions not correct or Request sequence error	80	F0	EE	03	7F	Sid Req	22	CS
Request out of range	80	F0	EE	03	7F	Sid Req	31	CS
Upload not accepted	80	F0	EE	03	7F	Sid Req	50	CS
Response pending	80	F0	EE	03	7F	Sid Req	78	CS
Data not available	80	F0	EE	03	7F	Sid Req	FA	CS

Notes:

- Sid Req = the Sid of the corresponding request.
- TREP = the TRTP of the corresponding request.
- Dark cells denotes that nothing is transmitted.
- The term upload (as seen from the IDE) is used for compatibility with ISO 14229. It means the same as download (as seen from the VU).
- Potential 2-byte sub message counters are not shown in this table.

2.2.2.1 Start Communication Request (SID 81)

DDP_005 This message is issued by the IDE to establish the communication link with the VU. Initial communications are always performed at 9600 baud (until baud rate is eventually changed using the appropriate Link control services).

2.2.2.2 Positive Response Start Communication (SID C1)

DDP_006 This message is issued by the VU to answer positively to a start communication request. It includes the 2 key bytes ‘EA’ ‘8F’ indicating that the unit supports protocol with header including target source and length information.

2.2.2.3 Start Diagnostic Session Request (SID 10)

DDP_007 The Start Diagnostic Session request message is issued by the IDE in order to request a new diagnostic session with the VU. The sub function 'default session' (81 Hex) indicates a standard diagnostic session is to be opened.

2.2.2.4 Positive Response Start Diagnostic (SID 50)

DDP_008 The Positive Response Start Diagnostic message is sent by the VU to answer positively to Diagnostic Session Request.

2.2.2.5 Link Control Service (SID 87)

DDP_052 The Link Control Service is used by the IDE to initiate a change in baud rate. This takes place in two steps. In step one the IDE proposes the baud rate change, indicating the new rate. On receipt of a positive message from the VU the IDE sends out confirmation of the baud rate change to the VU (step two). The IDE then changes to the new baud rate. After receipt of the confirmation the VU changes to the new baud rate

2.2.2.6 Link Control Positive Response (SID C7)

DDP_053 The Link Control Positive response is issued by the VU to answer positively to Link Control Service request (step one). Note that no response is given to the confirmation request (step two).

2.2.2.7 Request Upload (SID 35)

DDP_009 The Request Upload message is issued by the IDE to specify to the VU that a download operation is requested. To meet the requirements of ISO14229 data is included covering address, the size and format details for the data requested. As these are not known to the IDE prior to a download, the memory address is set to 0, format is unencrypted and uncompressed and the memory size is set to the maximum.

2.2.2.8 Positive Response Request Upload (SID 75)

DDP_010 The Positive Response Request Upload message is sent by the VU to indicate to the IDE that the VU is ready to download data. To meet the requirements of ISO 14229 data is included in this positive response message, indicating to the IDE that further Positive Response Transfer Data messages will include 00FF hex bytes maximum.

2.2.2.9 Transfer Data Request (SID 36)

DDP_011 The Transfer Data Request is sent by the IDE to specify to the VU the type of data that are to be downloaded. A one byte Transfer Request Parameter (TRTP) indicates the type of transfer.

There are six types of data transfer:
- Overview (TRTP 01),
- Activities of a specified date (TRTP 02),
- Events and faults (TRTP 03),
- Detailed speed (TRTP 04),
- Technical data (TRTP 05),
- Card download (TRTP 06).

DDP_054 It is mandatory for the IDE to request the overview data transfer (TRTP 01) during a download session as this only will ensure that the VU certificates are recorded within the downloaded file (and allow for verification of digital signature).

In the second case (TRTP 02) the Transfer Data Request message includes the indication of the calendar day (`TimeReal` format) to be downloaded.

2.2.2.10 Positive Response Transfer Data (SID 76)

DDP_012 The Positive Response Transfer Data is sent by the VU in response to the Transfer Data Request. The message contains the requested data, with a Transfer Response Parameter (TREP) corresponding to the TRTP of the request.

DDP055 In the first case (TREP 01), the VU will send data helping the IDE operator to choose the data he wants to download further. The information contained within this message is:
- Security certificates,
- Vehicle identification,
- VU current date and time,
- Min and Max downloadable date (VU data),
- Indication of cards presence in the VU,
- Previous download to a company,
- Company locks,
- Previous controls.

2.2.2.11 Request Transfer Exit (SID 37)

DDP_013 The Request Transfer Exit message is sent by the IDE to inform the VU that the download session is terminated.

2.2.2.12 Positive Response Request Transfer Exit (SID 77)

DDP_014 The Positive Response Request Transfer Exit message is sent by the VU to acknowledge the Request Transfer Exit.

2.2.2.13 Stop Communication Request (SID 82)

DDP_015 The Stop Communication Request message is sent by the IDE to disconnect the communication link with the VU.

2.2.2.14 Positive Response Stop Communication (SID C2)

DDP_016 The Positive Response Stop Communication message is sent by the VU to acknowledge the Stop Communication Request.

2.2.2.15 Acknowledge Sub Message (SID 83)

DDP_017 The Acknowledge Sub Message is sent by the IDE to confirm receipt of each part of a message that is being transmitted as several sub messages. The data field contains the SID received from the VU and a 2-byte code as follows:

- MsgC +1 Acknowledges correct receipt of sub message number MsgC.
  Request from the IDE to the VU to send next sub message
- MsgC indicates a problem with the receipt of sub message number MsgC.
  Request from the IDE to the VU to send the sub message again.
- FFFF requests termination of the message.
  This can be used by the IDE to end the transmission of the VU message for any reason.

The last sub message of a message (LEN byte < 255) may be acknowledged using any of these codes or not acknowledged.

The VU responses that will consist of several sub messages are:

- Positive Response Transfer Data (SID 76)

2.2.2.16 Negative Response (SID 7F)

DDP_018 The Negative Response message is sent by the VU in response to the above request messages when the VU cannot satisfy the request. The data fields of the message contains the SID of the response (7F), the SID of the request, and a code specifying the reason of the negative response. The following codes are available:

- 10 general reject
  The action cannot be performed for a reason not covered below.
- 11 service not supported
  The SID of the request is not understood.
- 12 sub function not supported
  The DS_ or TRTP of the request is not understood, or there are no further sub messages to be transmitted.
- 13 incorrect message length
  The length of the received message is wrong.
- 22 conditions not correct or request sequence error
  The required service is not active or the sequence of request messages is not correct.
- 31 Request out of range
  The request parameter record (data field) is not valid.
- 50 upload not accepted
  The request cannot be performed (VU in a non appropriate mode of operation or internal fault of the VU).

- 78 response pending
  The action requested cannot be completed in time and the VU is not ready to accept another request.
- FA data not available
  The data object of a data transfer request are not available in the VU (e.g. no card is inserted, …).

2.2.3 Message flow

A typical message flow during a normal data download procedure is the following:

IDE		VU
Start Communication Request	⇨	
	⇦	Positive Response
Start Diagnostic Service Request	⇨	
	⇦	Positive Response
Request Upload	⇨	
	⇦	Positive Response
Transfer Data Request Overview	⇨	
	⇦	Positive Response
Transfer Data Request #2	⇨	
	⇦	Positive Response #1
Acknowledge Sub Message #1	⇨	
	⇦	Positive Response #2
Acknowledge Sub Message #2	⇨	
	⇦	Positive Response #m
Acknowledge Sub Message #m	⇨	
	⇦	Positive Response (Data Field<255 Bytes)
Acknowledge Sub Message (optional)	⇨	
…		
Transfer Data Request #n	⇨	
	⇦	Positive Response
Request Transfer Exit	⇨	
	⇦	Positive Response
Stop Communication Request	⇨	
	⇦	Positive Response

2.2.4 Timing

DDP_019 During normal operation the timing parameters shown in the following figure are relevant:

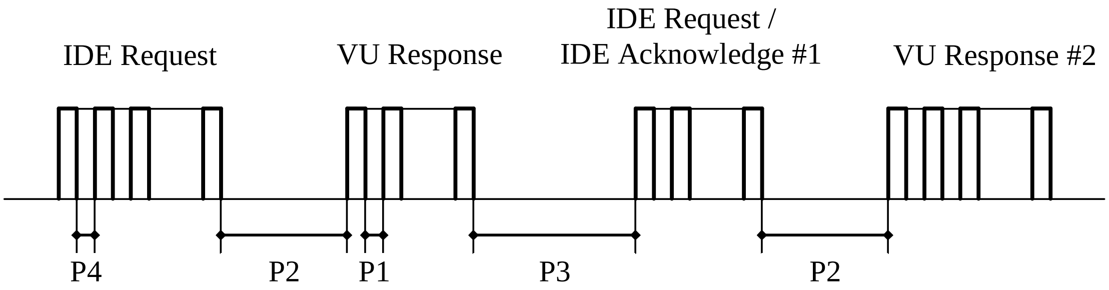


Figure 1

Message flow, timing

Where:

P1 = Inter byte time for VU response.

P2 = Time between end of IDE request and start of VU response, or between end of IDE acknowledge and start of next VU response.

P3 = Time between end of VU response and start of new IDE request, or between end of VU response and start of IDE acknowledge, or between end of IDE request and start of new IDE request if VU fails to respond.

P4 = Inter byte time for IDE request.

P5 = Extended value of P3 for card downloading.

The allowed values for the timing parameters are showed in the following table (KWP extended timing parameters set, used in case of physical addressing for faster communication).

Timing Parameter	Lower limit Value (ms)	Upper limit value (ms)
P1	0	20
P2	20	1000 (*)
P3	10	5000
P4	5	20
P5	10	20 minutes

(*) if the VU responds with a Negative Response containing a code meaning “request correctly received, response pending”, this value is extended to the same upper limit value of P3.

2.2.5 Error handling

If an error occurs during the message exchange, the message flow scheme is modified depending on which equipment has detected the error and on the message generating the error.

In figure 2 and figure 3 the error handling procedures for the VU and the IDE are respectively shown.

2.2.5.1 Start Communication phase

DDP_020 If the IDE detects an error during the Start Communication phase, either by timing or by the bit stream, then it will wait for a period P3min before issuing again the request.

DDP_021 If the VU detects an error in the sequence coming from the IDE, it shall send no response and wait for another Start Communication Request message within a period P3 max.

2.2.5.2 Communication phase

Two different error handling areas can be defined:

1. The VU detects an IDE transmission error.

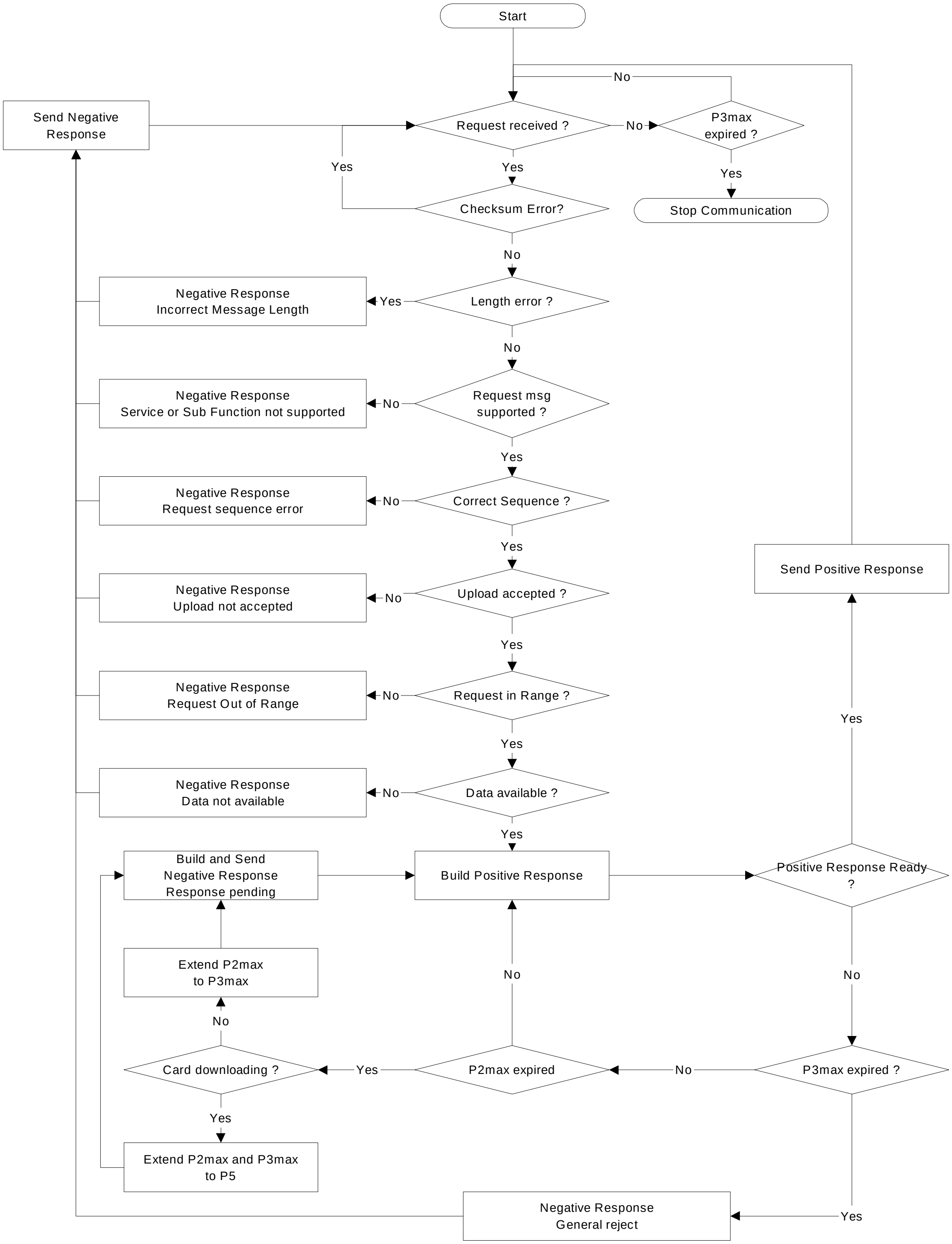
DDP_022 For every received message the VU shall detect timing errors, byte format errors (e.g. start and stop bit violations) and frame errors (wrong number of bytes received, wrong checksum byte).

DDP_023 If the VU detects one of the above errors, then it sends no response and ignores the message received.

DDP_024 The VU may detect other errors in the format or content of the received message (e.g. message not supported) even if the message satisfies the length and checksum requirements; in such a case, the VU shall respond to the IDE with a Negative Response message specifying the nature of the error.

Figure 2

VU error handling


Start
No
Send Negative Response
Request received ?
No
P3max expired ?
Yes
Yes
Yes
Checksum Error?
Stop Communication
No
Negative Response Incorrect Message Length
Yes
Length error ?
No
Negative Response Service or Sub Function not supported
No
Request msg supported ?
Yes
Negative Response Request sequence error
No
Correct Sequence ?
Yes
Send Positive Response
Negative Response Upload not accepted
No
Upload accepted ?
Yes
Negative Response Request Out of Range
No
Request in Range ?
Yes
Yes
Negative Response Data not available
No
Data available ?
Yes
Build and Send Negative Response Response pending
Build Positive Response
Positive Response Ready ?
Extend P2max to P3max
No
No
No
Card downloading ?
Yes
P2max expired
No
P3max expired ?
Yes
Extend P2max and P3max to P5
Negative Response General reject
Yes

2. The IDE detects a VU transmission error.

DDP_025 For every received message the IDE shall detect timing errors, byte format errors (e.g. start and stop bit violations) and frame errors (wrong number of bytes received, wrong checksum byte).

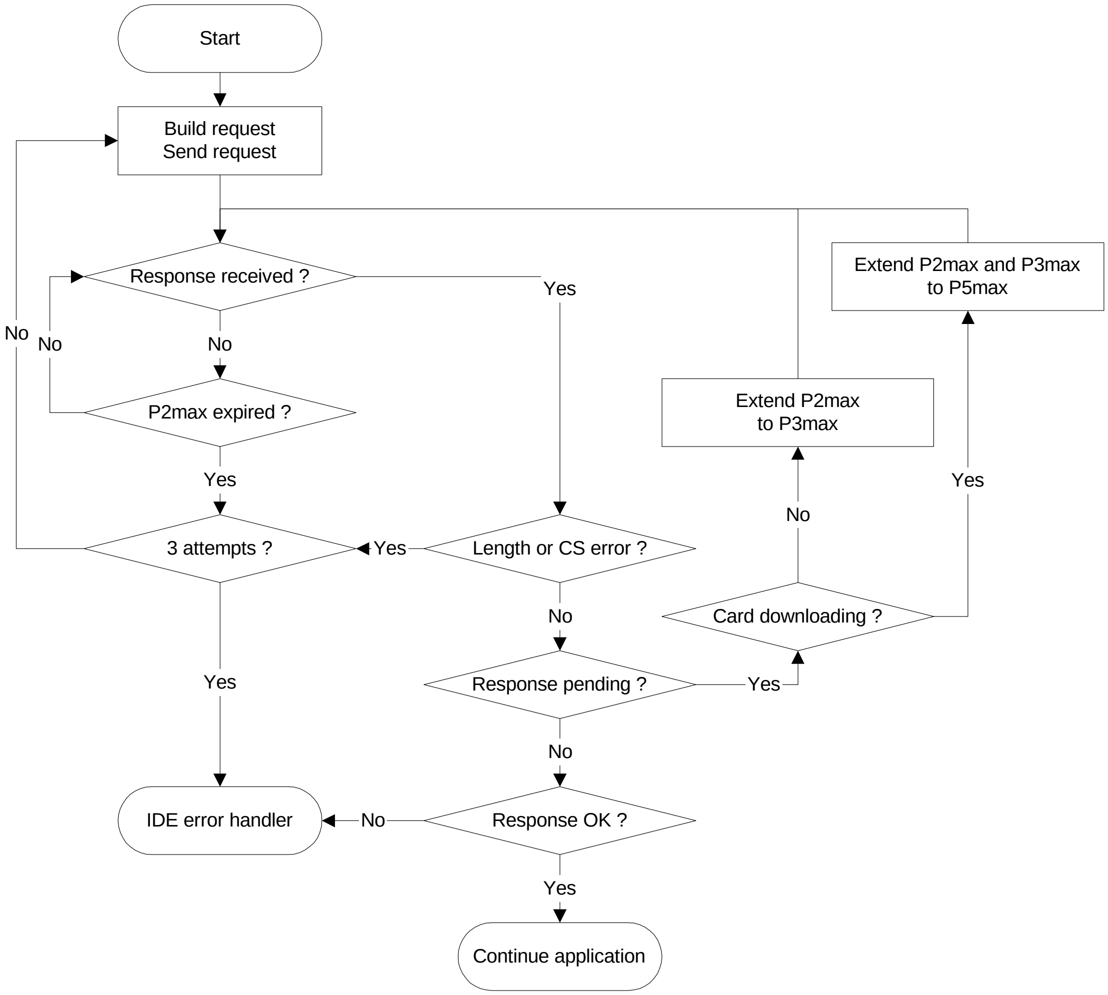
DDP_026 The IDE shall detect sequence errors, e.g. incorrect sub message counter increments in successive received messages.

DDP_027 If the IDE detects an error or there was no response from the VU within a P2max period, the request message will be sent again for a maximum of three transmissions in total. For the purposes of this error detection a sub message acknowledge will be considered as a request to the VU.

DDP_028 The IDE shall wait at least for a period of P3min before beginning each transmission; the wait period shall be measured from the last calculated occurrence of a stop bit after the error was detected.

Figure 3

IDE error handling



2.2.6 Response Message content

This paragraph specifies the content of the data fields of the various positive response messages.

Data elements are defined in sub-appendix 1 data dictionary.

2.2.6.1 *Positive Response Transfer Data Overview*

DDP_029 The data field of the "Positive Response Transfer Data Overview" message shall provide the following data in the following order under the SID 76 Hex, the TREP 01 Hex and appropriate sub message splitting and counting:

Data element		Length (Bytes)	Comment
MemberStateCertificate		194	VU Security certificates
VUCertificate		194	
VehicleIdentificationNumber		17	Vehicle identification
VehicleRegistrationIdentification			
vehicleRegistrationNation		1	
vehicleRegistrationNumber		14	
CurrentDateTime		4	VU current date and time
VuDownloadablePeriod			Downloadable period
minDownloadableTime		4	
maxDownloadableTime		4	
CardSlotsStatus		1	Type of cards inserted in the VU
VuDownloadActivityData			Previous VU download
downloadingTime		4	
fullCardNumber		18	
companyOrWorkshopName		36	
VuCompanyLocksData			All company locks stored. If the section is empty, only noOfLocks = 0 is sent.
noOfLocks		1	
...		(98)	
Vu Company Locks Record	lockInTime	4	
	lockOutTime	4	
	companyName	36	
	companyAddress	36	
	companyCardNumber	18	
...			
VuControlActivityData			All control records stored in the VU. If the section is empty, only noOfControls = 0 is sent.
noOfControls		1	
...		(31)	
Vu Control Activity Record	controlType	1	
	controlTime	4	
	controlCardNumber	18	
	downloadPeriodBeginTime	4	
	downloadPeriodEndTime	4	
...			
Signature		128	RSA signature of all data (except certificates) starting from VehicleIdentificationNumber down to last byte of last VuControlActivityRecord.

2.2.6.2 Positive Response Transfer Data Activities

DDP_030 The data field of the "Positive Response Transfer Data Activities" message shall provide the following data in the following order under the SID 76 Hex, the TREP 02 Hex and appropriate sub message splitting and counting:

	Data element	Length (Bytes)	Comment
	TimeReal	4	Date of day downloaded
	OdometerValueMidnight	3	Odometer at end of downloaded day
	VuCardIWData		Cards insertion withdrawal cycles data. – If this section contains no available data, only noOfVuCardIWRecords = 0 is sent. – When a VuCardIWRecord lies across 00:00 (card insertion on previous day) or across 24:00 (card withdrawal the following day) it shall appear in full within the two days involved.
	noOfVuCardIWRecords	2	
	...	(129)	
VuCardIWRecord	cardHolderName		
	holderSurname	36	
	holderFirstNames	36	
	fullCardNumber	18	
	cardExpiryDate	4	
	cardInsertionTime	4	
	vehicleOdometerValueAtInsertion	3	
	cardSlotNumber	1	
	cardWithdrawalTime	4	
	vehicleOdometerValueAtWithdrawal	3	
	previousVehicleInfo		
	vehicleRegistrationIdentification		
	vehicleRegistrationNation	1	
	vehicleRegistrationNumber	14	
	cardWithdrawalTime	4	
	manualInputFlag	1	
	...		
	VuActivityDailyData		Slots status at 00:00 and activity changes recorded for the day downloaded.
	noOfActivityChanges	2	
	...		
	ActivityChangeInfo	2	
	...		
	VuPlaceDailyWorkPeriodData		Places related data recorded for the day downloaded. If the section is empty, only noOfPlaceRecords = 0 is sent.
	noOfPlaceRecords	1	
	...	(28)	
VuPlaceDailyWorkPeriodRecord	fullCardNumber	18	
	placeRecord		
	entryTime	4	
	entryTypeDailyWorkPeriod	1	
	dailyWorkPeriodCountry	1	
	dailyWorkPeriodRegion	1	
	vehicleOdometerValue	3	
	...		

VuSpecificConditionData		Specific conditions data recorded for the day downloaded. If the section is empty, only noOfSpecificConditionRecords =0 is sent
noOfSpecificConditionRecords	2	
...	(5)	
SpecificConditionRecord		
entryTime	4	
specificConditionType	1	
...		
Signature	128	RSA signature of all data starting from TimeReal down to last byte of last specific condition record.

2.2.6.3 Positive Response Transfer Data Events and Faults

DDP_031 The data field of the "Positive Response Transfer Data Events and Faults" message shall provide the following data in the following order under the SID 76 Hex, the TREP 03 Hex and appropriate sub message splitting and counting:

Data element		**Length (Bytes)**	**Comment**
VuFaultData			All faults stored or on-going in the VU. If the section is empty, only noOfVuFaults = 0 is sent.
noOfVuFaults		1	
...		(82)	
VuFaultRecord	faultType	1	
	faultRecordPurpose	1	
	faultBeginTime	4	
	faultEndTime	4	
	cardNumberDriverSlotBegin	18	
	cardNumberCodriverSlotBegin	18	
	cardNumberDriverSlotEnd	18	
	cardNumberCodriverSlotEnd	18	
...			
VuEventData			All events (except over speeding) stored or on-going in the VU. If the section is empty, only noOfVuEvents = 0 is sent.
noOfVuEvents		1	
...		(83)	
VuEventRecord	eventType	1	
	eventRecordPurpose	1	
	eventBeginTime	4	
	eventEndTime	4	
	cardNumberDriverSlotBegin	18	
	cardNumberCodriverSlotBegin	18	
	cardNumberDriverSlotEnd	18	
	cardNumberCodriverSlotEnd	18	
	similarEventsNumber	1	
...			

VuOverSpeedingControlData				Data related to last over speeding control (default value if no data).
lastOverspeedControlTime			4	
firstOverspeedSince			4	
numberOfOverspeedSince			1	
VuOverSpeedingEventData				All over speeding events stored in the VU. If the section is empty, only noOfVuOverSpeedingEvents = 0 is sent.
noOfVuOverSpeedingEvents			1	
...			(31)	
	VuOverSpeeding EventRecord	eventType	1	
		eventRecordPurpose	1	
		eventBeginTime	4	
		eventEndTime	4	
		maxSpeedValue	1	
		averageSpeedValue	1	
		CardNumberDriverSlotBegin	18	
		similarEventsNumber	1	
...				
VuTimeAdjustmentData				All time adjustment events stored in the VU (outside the frame of a full calibration). If the section is empty, only noOfVuTimeAdjRecords = 0 is sent.
noOfVuTimeAdjRecords			1	
...			(98)	
	VuTime Adjustment Record	oldTimeValue	4	
		newTimeValue	4	
		workshopName	36	
		workshopAddress	36	
		workshopCardNumber	18	
...				
Signature			128	RSA signature of all data starting from noOfVuFaults down to last byte of last time adjustment record

2.2.6.4 Positive Response Transfer Data Detailed Speed

DDP_032 The data field of the “Positive Response Transfer Data Detailed Speed” message shall provide the following data in the following order under the SID 76 Hex, the TREP 04 Hex and appropriate sub message splitting and countering:

Data element		Length (Bytes)	Comment
VuDetailedSpeedData			All detailed speed stored in the VU (one speed block per minute during which the vehicle has been moving)
noOfSpeedBlocks		2	
...			
VuDeatailed SpeedBlock	speedBlockBeginDate	4	
	speedsPerSecond	60	60 speed values per minute (one per second).
...			
Signature		128	RSA signature of all data starting from noOfSpeedBlocks down to last byte of last speed block.

2.2.6.5 Positive Response Transfer Data Technical Data

DDP_033 The data field of the “Positive Response Transfer Data Technical Data” message shall provide the following data in the following order under the SID 76 Hex, the TREP 05 Hex and appropriate sub message splitting and counting:

Data element	**Length (Bytes)**	**Comment**
VuIdentification		
vuManufacturerName	36	
vuManufacturerAddress	36	
vuPartNumber	16	
vuSerialNumber	8	
vuSoftwareIdentification		
vuSoftwareVersion	4	
vuSoftInstallationDate	4	
vuManufacturingDate	4	
vuApprovalNumber	8	
SensorPaired		
sensorSerialNumber	8	
sensorApprovalNumber	8	
sensorPairingDateFirst	4	
VuCalibrationData		All calibration records stored in the VU.
noOfVuCalibrationRecords	1	
...	(167)	
VuCalibrationRecord		
calibrationPurpose	1	
workshopName	36	
workshopAddress	36	
workshopCardNumber	18	
workshopCardExpiryDate	4	
vehicleIdentificationNumber	17	
vehicleRegistrationIdentification		
vehicleRegistrationNation	1	
vehicleRegistrationNumber	14	
wVehicleCharacteristicConstant	2	
kConstantOfRecordingEquipment	2	
lTyreCircumference	2	
tyreSize	15	
authorisedSpeed	1	
oldOdometerValue	3	
newOdometerValue	3	
oldTimeValue	4	
newTimeValue	4	
nextCalibrationDate	4	
...		
Signature	128	RSA signature of all data starting from vuManufacturerName down to last byte of last VuCalibrationRecord.

2.3 ESM File storage

DDP_034 When a download session has included a VU data transfer, the IDE shall store within one physical file all data received from the VU during the download session within Positive Response Transfer Data messages. Data stored excludes message headers, sub-message counters, empty sub-messages and checksums but include the SID and TREP (of the first sub-message only if several sub-messages).

3. Tachograph cards downloading protocol

3.1 Scope

This paragraph describes the direct card data downloading of a tachograph card to an IDE. The IDE is not part of the secure environment; therefore no authentication between the card and the IDE is performed.

3.2 Definitions

Download session: Each time a download of the ICC data is performed. The session covers the complete procedure from the reset of the ICC by an IFD until the deactivation of the ICC (withdraw of the card or next reset).

Signed Data File: A file from the ICC. The file is transferred to the IFD in plain text. On the ICC the file is hashed and signed and the signature is transferred to the IFD.

3.4 Card Downloading

DDP_035 The download of a tachograph card includes the following steps:

- Download the common information of the card in the EFs ICC and IC. This information is optional and is not secured with a digital signature.
- Download the EFs Card_Certificate and CA_Certificate. This information is not secured with a digital signature.
  It is mandatory to download these files for each download session.
- Download the other application data EFs (within Tachograph DF) except EF Card_Download. This information is secured with a digital signature.
- It is mandatory to download at least the EFs Application_Identification and ID for each download session.
  - When downloading a driver card it is also mandatory to download the following EFs:
    - Events_Data,
    - Faults_Data,
    - Driver_Activity_Data,
    - Vehicles_Used,
    - Places,
    - Control_Activity_Data,
    - Specific_Conditions.
- When downloading a driver card, update the LastCardDownload date in EF Card_Download,
- When downloading a workshop card, reset the calibration counter in EF Card_Download.

3.3.1 Initialisation sequence

DDP_036 The IDE shall initiate the sequence as follows:

Card	Direction	IDE / IFD	Meaning / Remarks
	⇦	Hardware reset	
ATR	⇨		

It is optional to use PPS to switch to a higher baudrate as long as the ICC supports it.

3.3.2 Sequence for un-signed data files

DDP_037 The sequence to download the EFs ICC, IC, Card_Certificate and CA_Certificate is as follows:

Card	Direction	IDE / IFD	Meaning / Remarks
	⇦	Select File	Select by File identifiers
OK	⇨		
	⇦	Read Binary	If the file contains more data than the buffer size of the reader or the card the command has to be repeated until the complete file is read.
File Data OK	⇨	Store data to ESM	according to 3.4, (3.4 Data storage format)

Note: Before selecting the Card_Certificate EF, the Tachograph Application must be selected (selection by AID).

3.3.3 Sequence for Signed data files

DDP_038 The following sequence shall be used for each of the following files that has to be downloaded with their signature:

Card	Dir	IDE / IFD	Meaning / Remarks
	⇦	Select File	
OK	⇨		
	⇦	Perform Hash of File	Calculates the hash value over the data content of the selected file using the prescribed hash algorithm in accordance with sub-appendix 11. This command is not an ISO-Command.
Calculate Hash of File and store Hash value temporarily			
OK	⇨		
	⇦	Read Binary	If the file contains more data than the buffer of the reader or the card can hold, the command has to be repeated until the complete file is read.
File Data OK	⇨	Store received data to ESM	according to 3.4 (3.4 Data storage format)
	⇦	PSO: Compute Digital Signature	
Perform Security Operation „Compute Digital Signature“ using the temporarily stored Hash value			
Signature OK	⇨	Append data to the previous stored data on the ESM	according to 3.4 Data storage format**)**

3.3.4 Sequence for resetting the calibration counter.

DDP_039 The sequence to reset the NoOfCalibrationsSinceDownload counter in the EF Card_Download in a workshop card is the following:

Card	Dir	IDE / IFD	Meaning / Remarks
	⇦	Select File EF Card_Download	Select by File identifiers
OK	⇨		
	⇦	Update Binary NoOfCalibrationsSinceDownload = ‘00 00’	
resets card download number			
OK	⇨		

3.4 Data storage format

3.4.1 Introduction

DDP_040 The downloaded data has to be stored according to the following conditions:

- The data shall be stored transparent. This means that the order of the bytes as well as the order of the bits inside the byte that are transferred from the card has to be preserved during storage.
- All files of the card downloaded within a download session are stored in one file on the ESM.

3.4.2 File format

DDP_041 The file format is a concatenation of several TLV objects.

DDP_042 The tag for an EF shall be the FID plus the appendix „00“.

DDP_043 The tag of an EF’s signature shall be the FID of the file plus the appendix „01“.

DDP_044 The length is a two byte value. The value defines the number of bytes in the value field. The value „FF FF“ in the length field is reserved for future use.

DDP_045 When a file is not downloaded nothing related to the file shall be stored (no tag and no zero length).

DDP_046 A signature shall be stored as the next TLV object directly after the TLV object that contains the data of the file.

Definition	Meaning	Length
FID (2 Bytes) || „00“	Tag for EF (FID)	3 Bytes
FID (2 Bytes) || „01“	Tag for Signature of EF(FID)	3 Bytes
Xx xx	Length of Value field	2 Bytes

Example of data in a download file on an ESM:

Tag	Length	Value
00 02 00	00 11	Data of EF ICC
C1 00 00	00 C2	Data of EF Card_Certificate
		...
05 05 00	0A 2E	Data of EF Vehicles_Used
05 05 01	00 80	Signature of EF Vehicles_Used

4. Downloading a tachograph card via a vehicle unit.

DDP_047 The VU must allow for downloading the content of a driver card inserted to a connected IDE.

DDP_048 The IDE shall send a “Transfer Data Request Card Download” message to the VU to initiate this mode (see 2.2.2.9).

DDP_049 The VU shall then download the whole card, file by file, in accordance with the card downloading protocol defined in paragraph 0, and forward all data received from the card to the IDE within the appropriate TLV file format (see 3.4.2) and encapsulated within a “Positive Response Transfer Data” message.

DDP_050 The IDE shall retrieve card data from the “Positive Response Transfer Data” message (striping all headers, SIDs, TREPs, sub message counters, and checksums) and store them within one physical file as described in paragraph 2.3.

DDP_051 The VU shall then, as applicable, update the Control_Activity_Data or the Card_Download file of the driver card.

SUB-APPENDIX VIII

CALIBRATION PROTOCOL

CONTENTS

PAGE

CONTENTS (continued)

PAGE

1. Introduction

This sub-appendix describes how data is exchanged between a vehicle unit and a tester via the K-line which forms part of the calibration interface described in sub-appendix 6. It also describes control of the input / output signal line on the calibration connector.

Establishing K-line communications is described in Section 4 “Communication Services”.

This sub-appendix uses the idea of diagnostic “sessions” to determine the scope of K-line control under different conditions. The default session is the “StandardDiagnosticSession” where all data can be read from a vehicle unit but no data can be written to a vehicle unit.

Selection of the diagnostic session is described in Section 5 “Management Services”

CPR_001 The “ECUProgrammingSession” allows data entry into the vehicle unit. In the case of entry of calibration data (requirements 097 and 098), the vehicle unit must, in addition be in the CALIBRATION mode of operation.

Data transfer via K-line is described in Section 6 “Data Transmission Services”. Formats of data transferred are detailed in Section 8 “dataRecords formats”

CPR_002 The “ECUAdjustmentSession” allows the selection of the I/O mode of the calibration I/O signal line via the K-line interface. Control of the calibration I/O signal line is described in section 7 “Control of Test Pulses – Input/Output Control functional unit”.

CPR_003 Throughout this document the address of the tester is referred to as 'tt'. Although there may be preferred addresses for testers, the VU shall respond correctly to any tester address. The physical address of the VU is 0xEE.

2. Terms, Definitions and References

The protocols, messages and error codes are principally based on the current draft to date of ISO 14229-1 (Road vehicles – Diagnostic systems – Part 1 : Diagnostic services, version 6 of 22 February 2001).

Byte encoding and hexadecimal values are used for the service identifiers, the service requests and responses, and the standard parameters.

The term ‘tester’ refers to the equipment used to enter programming/calibration data into the VU.

The terms ‘client’ and ‘server’ refer to the tester and the VU respectively.

The term ECU means "Electronic Control Unit" and refers to the VU.

References :

ISO 14230-2 Road Vehicles -Diagnostic Systems - Keyword Protocol 2000- Part 2 : Data Link Layer. First edition: 1999. Vehicles – Diagnostic Systems.

3. Overview of services

3.1 Services available

The following table provides an overview of the services that will be available in the control device and are defined in this document.

CPR_004 The table indicates the services that are available in an enabled diagnostic session.

- The **1st column** lists the services that are available.
- The **2nd column** includes the section number in this sub-appendix where of service is further defined.
- The **3rd column** assigns the assigns the service identifier values for request messages.
- The **4th column** specifies the services of the **"StandardDiagnosticSession" (SD)** which must be implemented in each VU.
- The **5th column** specifies the services of the **"ECUAdjustmentSession" (ECUAS)** which must be implemented to allow control of the I/O signal line in the front panel calibration connector of the VU.
- The **6th column** specifies the services of the **"ECUProgrammingSession" (ECUPS)** which must be implemented to allow for programming of parameters in the VU.

Table 1

Service Identifier value summary table

			Diagnostic Sessions		
Diagnostic Service Name	**Paragraphs No.**	**SId Req.Value**	**SD**	**ECUAS**	**ECUPS**
StartCommunication	4.1	81	■	■	■
StopCommunication	4.2	82	■		
TesterPresent	4.3	3E	■	■	■
StartDiagnosticSession	5.1	10	■	■	■
SecurityAccess	5.2	27	■	■	■
ReadDataByIdentifier	6.1	22	■	■	■
WriteDataByIdentifier	6.2	2E			■
InputOutputControlByIdentifier	7.1	2F		■	

■ This symbol indicates that the service is mandatory in this diagnostic session.
No symbol indicates that this service is not allowed in this diagnostic session.

3.2 Response codes

Response codes are defined for each service.

4. Communication Services

Some services are necessary to establish and maintain communication. They do not appear on the application layer. The services available are detailed in the following table:

Table 2

Communication Services

Service name	**Description**
StartCommunication	The client requests to start a communication session with a server(s).
StopCommunication	The client requests to stop the current communication session.
TesterPresent	The client indicates to the server that it is still present.

CPR_005 The StartCommunication Service is used for starting a communication. In order to perform any service, communication must be initialised and the communication parameters need to be appropriate for the desired mode.

4.1 StartCommunication Service

CPR_006 Upon receiving a StartCommunication indication primitive, the VU shall check if the requested communication link can be initialised under the present conditions. Valid conditions for the initialisation of a communication link are described in document ISO 14230-2.

CPR_007 Then the VU shall perform all actions necessary to initialise the communication link and send a StartCommunication response primitive with the Positive Response parameters selected.

CPR_008 If a VU that is already initialised (and has entered any diagnostic session) receives a new StartCommunication Request (e.g. due to error recovery in the tester) the request shall be accepted and the VU shall be reinitialised.

CPR_009 If the communication link cannot be initialised for any reason, the VU shall continue operating as it was immediately prior to the attempt to initialise the communication link..

CPR_010 The StartCommunication Request message must be physically addressed.

CPR_011 Initialising the VU for services is performed through a 'fast initialisation' method,

- There is a bus-idle time prior to any activity.
- The tester then sends an initialisation pattern.
- All information which is necessary to establish communication is contained in the response of the VU.

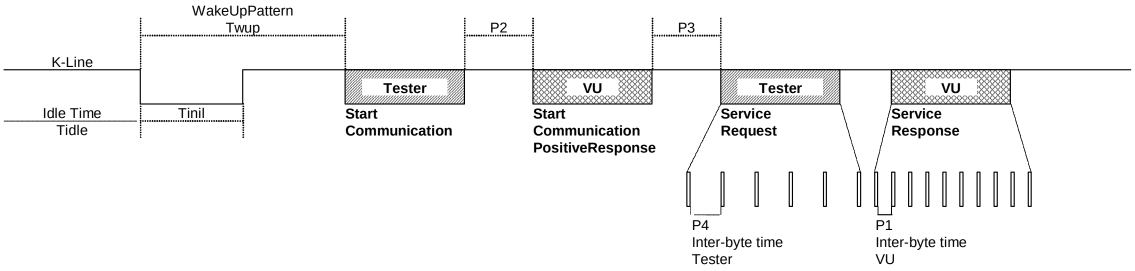
CPR_012 After completion of the initialisation,

All communication parameters are set to values defined in

- according to the key bytes.
- The VU is waiting for the first request of the tester.
- The VU is in the default diagnostic mode, i.e. StandardDiagnosticSession.
- The calibration I/O signal line is in the default state, i.e. disabled state.

CPR_014 The data rate on the K-line shall be 10 400 Baud.

CPR_016 The fast initialisation is started by the tester transmitting a Wake up pattern (Wup) on the K-line. The pattern begins after the idle time on K-line with a low time of Tinil. The tester transmits the first bit of the StartCommunication Service after a time of Twup following the first falling edge.



CPR_017 The timing values for the fast initialisation and communications in general are detailed in the tables below. There are different possibilities for the idle time :

- First transmission after power on, Tidle = 300ms.
- After completion of a StopCommunication Service, T_{idle} = P3 min.
- After stopping communication by time-out P3 max, T_{idle} = 0.

Table 3

Timing values for fast initialisation

Parameter		**min value**	**max value**
Tinil	25 ± 1 ms	24 ms	26 ms
Twup	50 ± 1 ms	49 ms	51 ms

Table 4

Communication timing values

Timing Parameter	**Parameter Description**	**lower limit values [ms]**	**upper limit values [ms]**
		min.	**max.**
P1	Inter byte time for VU response	0	20
P2	Time between tester request and VU response or two VU responses	25	250
P3	Time between end of VU responses and start of new tester request	55	5000
P4	Inter byte time for tester request	5	20

CPR_018 The message format for fast initialisation is detailed in the following tables.

Table 5

StartCommunication Request Message

Byte #	**Parameter Name**	**Hex Value**	**Mnemonic**
#1	Format byte - physical addressing	81	FMT
#2	Target address byte	EE	TGT
#3	Source address byte	tt	SRC
#4	**StartCommunication Request Service Id**	**81**	**SCR**
#5	Checksum	00-FF	CS

Table 6

StartCommunication Positive Response Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte - physical addressing	80	FMT
#2	Target address byte	tt	TGT
#3	Source address byte	EE	SRC
#4	Additional length byte	03	LEN
#5	**StartCommunication Positive Response Service Id**	**C1**	**SCRPR**
#6	Key byte 1	EA	KB1
#7	Key byte 2	8F	KB2
#8	Checksum	00-FF	CS

CPR_019 There is no negative response to the StartCommunication Request message, if there is no positive response message to be transmitted then the VU is not initialised, nothing is transmitted and it remains in its normal operation.

4.2 StopCommunication Service

4.2.1 Message description

The purpose of this communication layer service is to terminate a communication session.

CPR_020 Upon receiving a StopCommunication indication primitive, the VU shall check if the current conditions allow to terminate this communication. In this case the VU shall perform all actions necessary to terminate this communication.

CPR_021 If it is possible to terminate the communication, the VU shall issue a StopCommunication response primitive with the Positive Response parameters selected, before the communication is terminated.

CPR_022 If the communication cannot be terminated by any reason, the VU shall issue a StopCommunication response primitive with the Negative Response parameter selected.

CPR_023 If time-out of P3max is detected by the VU, the communication shall be terminated without any response primitive being issued.

4.2.2 Message format

CPR_024 The message formats for the StopCommunication primitives are detailed in the following tables.

Table 7

StopCommunication Request Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte – physical addressing	80	FMT
#2	Target address byte	EE	TGT
#3	Source address byte	tt	SRC
#4	Additional length byte	01	LEN
#5	**StopCommunication Request Service Id**	**82**	**SPR**
#6	Checksum	00-FF	CS

Table 8

StopCommunication Positive Response Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte – physical addressing	80	FMT
#2	Target address byte	tt	TGT
#3	Source address byte	EE	SRC
#4	Additional length byte	01	LEN
#5	**StopCommunication Positive Response Service Id**	**C2**	**SPRPR**
#6	Checksum	00-FF	CS

Table 9

StopCommunication Negative Response Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte - physical addressing	80	FMT
#2	Target address byte	tt	TGT
#3	Source address byte	EE	SRC
#4	Additional length byte	03	LEN
#5	**negative Response Service Id**	**7F**	**NR**
#6	StopCommunication Request Service Identification	82	SPR
#7	responseCode = generalReject	10	RC_GR
#8	Checksum	00-FF	CS

4.2.3 Parameter Definition

This service does not require any parameter definition.

4.3 TesterPresent Service

4.3.1 Message description

The TesterPresent service is used by the tester to indicate to the server that it is still present, in order to prevent the server from automatically returning to normal operation and possibly stopping the communication. This service, sent periodically, keeps the diagnostic session / communication active by resetting the P3 timer each time a request for this service is received.

4.3.2 Message format

CPR_079 The message formats for the TesterPresent primitives are detailed in the following tables.

Table 10

TesterPresent Request Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte – physical addressing	80	FMT
#2	Target address byte	EE	TGT
#3	Source address byte	tt	SRC
#4	Additional length byte	02	LEN
#5	**TesterPresent Request Service Id**	**3E**	**TP**
#6	Sub Function = responseRequired = [yes no]	01 02	RESPREQ_Y RESPREQ_NO
#7	Checksum	00-FF	CS

CPR_080 If the responseRequired parameter is set to 'yes', then the server shall respond with the following positive response message. If set to 'no', then no response is sent by the server.

Table 11

TesterPresent Positive Response Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte – physical addressing	80	FMT
#2	Target address byte	tt	TGT
#3	Source address byte	EE	SRC
#4	Additional length byte	01	LEN
#5	**TesterPresent Positive Response Service Id**	**7E**	**TPPR**
#6	Checksum	00-FF	CS

CPR_081 The service shall support the following negative responses codes:

Table 12

TesterPresent Negative Response Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte – physical addressing	80	FMT
#2	Target address byte	tt	TGT
#3	Source address byte	EE	SRC
#4	Additional length byte	03	LEN
#5	**negative Response Service Id**	**7F**	**NR**
#6	TesterPresent Request Service Identification	3E	TP
#7	ResponseCode = [SubFunctionNotSupported- InvalidFormat incorrectMessageLength]	 12 13	 RC_SFNS_IF RC_IML
#8	Checksum	00-FF	CS

5. Management Services

The services available are detailed in the following table:

Table 13

Management Services

Service name	Description
StartDiagnosticSession	The client requests to start a diagnostic session with a VU.
SecurityAccess	The client requests access to functions restricted to authorised users.

5.1 StartDiagnosticSession service

5.1.1 Message description

CPR_025 The service StartDiagnosticSession is used to enable different diagnostic sessions in the server. A diagnostic session enables a specific set of services according to Table 17. A session can enable vehicle manufacturer specific services which are not part of this document. Implementation rules shall conform to the following requirements:

- There shall be always exactly one diagnostic session active in the VU,
- The VU shall always start the StandardDiagnosticSession when powered up. If no other diagnostic session is started, then the StandardDiagnosticSession shall be running as long as the VU is powered,
- If a diagnostic session which is already running has been requested by the tester, then the VU shall send a positive response message,

- Whenever the tester requests a new diagnostic session, the VU shall first send a StartDiagnosticSession positive response message before the new session becomes active in the VU. If the VU is not able to start the requested new diagnostic session, then it shall respond with a StartDiagnosticSession negative response message, and the current session shall continue.

CPR_026 A diagnostic session shall only be started if communication has been established between the client and the VU.

CPR_027 The timing parameters defined in

shall be active after a successful StartDiagnosticSession with the diagnosticSession parameter set to “StandardDiagnosticSession” in the request message if another diagnostic session was previously active.

5.1.2 Message format

CPR_028 The message formats for the StartDiagnosticSession primitives are detailed in the following tables.

Table 14
Management Services

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte – physical addressing	80	FMT
#2	Target address byte	EE	TGT
#3	Source address byte	tt	SRC
#4	Additional length byte	02	LEN
#5	**StartDiagnosticSession Request Service Id**	10	STDS
#6	DiagnosticSession = [one value from Table 17]	xx	DS_…
#7	Checksum	00-FF	CS

Table 15
StartDiagnosticSession Positive Response Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte – physical addressing	80	FMT
#2	Target address byte	tt	TGT
#3	Source address byte	EE	SRC
#4	Additional length byte	02	LEN
#5	**StartDiagnosticSession Positive Response Service Id**	**50**	**STDSPR**
#6	DiagnosticSession = [same value as in byte #6 Table 14]	xx	DS_…
#7	Checksum	00-FF	CS

Table 16

StartDiagnosticSession Negative Response Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte – physical addressing	80	FMT
#2	Target address byte	tt	TGT
#3	Source address byte	EE	SRC
#4	Additional length byte	03	LEN
#5	**Negative Response Service Id**	**7F**	**NR**
#6	StartDiagnosticSession Request Service Id	10	STDS
#7	ResponseCode = [subFunctionNotSupported [a] incorrectMessageLength [b] conditionsNotCorrect [c]	12 13 22	RC_SFNS RC_IML RC_CNC
#8	Checksum	00-FF	CS

[a] **–** the value inserted in byte #6 of the request message is not supported, i.e. not in Table 17.
[b] – the length of the message is wrong,
[c] – the criteria for the request StartDiagnosticSession are not met.

5.1.3 Parameter definition

CPR_029 The parameter ***diagnosticSession (DS_)*** is used by the StartDiagnosticSession service to select the specific behaviour of the server(s). The following diagnostic sessions are specified in this document:

Table 17

Definition of diagnosticSession Values

Hex	Description	Mnemonic
81	StandardDiagnosticSession This diagnostic session enables all services specified in **Table 1, column 4 "SD"**. These services allow reading of data from a server (VU). This diagnostic Session is active after the initialisation has been successfully completed between client (tester) and server (VU). This diagnostic session may be overwritten by other diagnostic sessions specified in this section.	SD
85	ECUProgrammingSession This diagnostic session enables all services specified in **Table 1, column 6"ECUPS"**. These services support the memory programming of a server (VU) This diagnostic session may be overwritten by other diagnostic sessions specified in this section..	ECUPS
87	ECUAdjustmentSession This diagnostic session enables all services specified in **Table 1, column 5 "ECUAS"**. These services support the input/output control of a server (VU). This diagnostic session may be overwritten by other diagnostic sessions specified in this section.	ECUAS

5.2 SecurityAccess service

Writing of calibration data or access to the calibration input/output line is not possible unless the VU is in CALIBRATION mode. In addition to insertion of a valid workshop card into the VU, it is necessary to enter the appropriate PIN into the VU before access to the CALIBRATION mode is granted.

The SecurityAccess service provides a means to enter the PIN and to indicate to the tester whether or not the VU is in CALIBRATION mode.

It is acceptable that the PIN may be entered through alternative methods.

5.2.1 Message Description

The SecurityAccess service consists of a SecurityAccess "requestSeed" message, eventually followed by a SecurityAccess "sendKey" message. The SecurityAccess service must be carried out after the StartDiagnosticSession service.

CPR_033 The tester shall use the SecurityAccess "requestSeed" message to check if the vehicle unit is ready to accept a PIN.

CPR_034 If the vehicle unit is already in CALIBRATION mode, it shall answer the request by sending a “seed” of 0x0000 using the service SecurityAccess Positive Response.

CPR_035 If the vehicle unit is ready to accept a PIN for verification by a workshop card, it shall answer the request by sending a “seed” greater than 0x0000 using the service SecurityAccess Positive Response.

CPR_036 If the vehicle unit is not ready to accept a PIN from the tester, either because the workshop card inserted is not valid, or because no workshop card has been inserted, or because the vehicle unit expects the PIN from another method, it shall answer the request with a Negative Response with a response code set to conditionsNotCorrectOrRequestSequenceError.

CPR_037 The tester shall then, eventually, use the SecurityAccess "sendKey" message to forward a PIN to the Vehicle Unit. To allow time for the card authentication process to take place, the VU shall use the negative response code requestCorrectlyReceived-ResponsePending to extend the time to respond. However, the maximum time to respond shall not exceed 5 minutes. As soon as the requested service has been completed, the VU shall send a positive response message or negative response message with a response code different from this one. The negative response code requestCorrectlyReceived-ResponsePending may be repeated by the VU until the requested service is completed and the final response message is sent.

CPR_038 The vehicle unit shall answer to this request using the service SecurityAccess Positive Response only when in CALIBRATION mode.

CPR_039 In the following cases, the vehicle unit shall answer to this request with a Negative Response with a response code set to:

- subFunctionNot supported: Invalid format for the subfunction parameter (accessType),
- conditionsNotCorrectOrRequestSequenceError: Vehicle unit not ready to accept a PIN entry,
- invalidKey: PIN not valid and number of PIN checks attempts not exceeded,
- exceededNumberOfAttempts:PIN not valid and number of PIN checks attempts exceeded,
- generalReject: Correct PIN but mutual authentication with workshop card failed.

5.2.2 Message format - SecurityAccess - requestSeed

CPR_040 The message formats for the SecurityAccess "requestSeed" primitives are detailed in the following tables.

Table 18

SecurityAccess Request- requestSeed Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte – physical addressing	80	FMT
#2	Target address byte	EE	TGT
#3	Source address byte	tt	SRC
#4	Additional length byte	02	LEN
#5	**SecurityAccess Request Service Id**	**27**	**SA**
#6	accessType – requestSeed	7D	AT_RSD
#7	Checksum	00-FF	CS

Table 19

SecurityAccess - requestSeed Positive Response Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte – physical addressing	80	FMT
#2	Target address byte	tt	TGT
#3	Source address byte	EE	SRC
#4	Additional length byte	04	LEN
#5	**SecurityAccess Positive Response Service Id**	**67**	**SAPR**
#6	accessType – requestSeed	7D	AT_RSD
#7	Seed High	00-FF	SEEDH
#8	Seed Low	00-FF	SEEDL
#9	Checksum	00-FF	CS

Table 20

SecurityAccess Negative Response Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte – physical addressing	80	FMT
#2	Target address byte	tt	TGT
#3	Source address byte	EE	SRC
#4	Additional length byte	03	LEN
#5	**negativeResponse Service Id**	**7F**	**NR**
#6	SecurityAccess Request Service Id	27	SA
#7	responseCode = [conditionsNotCorrectOrRequestSequenceError incorrectMessageLength]	 22 13	 RC_CNC RC_IML
#8	Checksum	00-FF	CS

5.2.3 Message format - SecurityAccess - sendKey

CPR_041 The message formats for the SecurityAccess "sendKey" primitives are detailed in the following tables.

Table 21

SecurityAccess Request - sendKey Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte – physical addressing	80	FMT
#2	Target address byte	EE	TGT
#3	Source address byte	tt	SRC
#4	Additional length byte	m+2	LEN
#5	**SecurityAccess Request Service Id**	**27**	**SA**
#6	accessType – sendKey	7E	AT_SK
#7 to #m+6	Key #1 (High) … Key #m (low, m must be a minimum of 4, and a maximum of 8)	xx … xx	KEY
#m+7	Checksum	00-FF	CS

Table 22

SecurityAccess - sendKey Positive Response Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte – physical addressing	80	FMT
#2	Target address byte	tt	TGT
#3	Source address byte	EE	SRC
#4	Additional length byte	02	LEN
#5	**SecurityAccess Positive Response Service Id**	**67**	**SAPR**
#6	accessType – sendKey	7E	AT_SK
#7	Checksum	00-FF	CS

Table 23

SecurityAccess Negative Response Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte – physical addressing	80	FMT
#2	Target address byte	tt	TGT
#3	Source address byte	EE	SRC
#4	Additional length byte	03	LEN
#5	**NegativeResponse Service Id**	**7F**	**NR**
#6	SecurityAccess Request Service Id	27	SA
#7	ResponseCode = [generalReject subFunctionNotSupported incorrectMessageLength conditionsNotCorrectOrRequestSequenceError invalidKey exceededNumberOfAttempts requestCorrectlyReceived-ResponsePending]	10 12 13 22 35 36 78	RC_GR RC_SFNS RC_IML RC_CNC RC_IK RC_ENA RC_RCR_RP
#8	Checksum	00-FF	CS

6. Data Transmission Services

The services available are detailed in the following table:

Table 24

Data Transmission Services

Service name	Description
ReadDataByIdentifier	The client requests the transmission of the current value of a record with access by recordDataIdentifier.
WriteDataByIdentifier	The client requests to write a record accessed by recordDataIdentifier.

6.1 ReadDataByIdentifier service

6.1.1 Message description

CPR_050 The ReadDataByIdentifier service is used by the client to request data record values from a server. The data are identified by a recordDataIdentifier. It is the VU manufacturer's responsibility that the server conditions are met when performing this service.

6.1.2 Message format

CPR_051 The message formats for the ReadDataByIdentifier primitives are detailed in the following tables.

Table 25

ReadDataByIdentifier Request Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte - physical addressing	80	FMT
#2	Target address byte	EE	TGT
#3	Source address byte	tt	SRC
#4	Additional length byte	03	LEN
#5	**ReadDataByIdentifier Request Service Id**	**22**	**RDBI**
#6 to #7	recordDataIdentifier = [a value from Table 28]	xxxx	RDI_…
#8	Checksum	00-FF	CS

Table 26

ReadDataByIdentifier Positive Response Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte - physical addressing	80	FMT
#2	Target address byte	tt	TGT
#3	Source address byte	EE	SRC
#4	Additional length byte	m+3	LEN
#5	**ReadDataByIdentifier Positive Response Service Id**	**62**	**RDBIPR**
#6 and #7	recordDataIdentifier = [the same value as bytes #6 and #7 Table 25]	xxxx	RDI_...
#8 to #m+7	dataRecord[] = [data#1 : data#m]	xx : xx	DREC_DATA1 : DREC_DATAm
#m+8	Checksum	00-FF	CS

Table 27

ReadDataByIdentifier Negative Response Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte - physical addressing	80	FMT
#2	Target address byte	tt	TGT
#3	Source address byte	EE	SRC
#4	Additional length byte	03	LEN
#5	**NegativeResponse Service Id**	**7F**	**NR**
#6	ReadDataByIdentifier Request Service Id	22	RDBI
#7	ResponseCode= [requestOutOfRange incorrectMessageLength conditionsNotCorrect]	31 13 22	RC_ROOR RC_IML RC_CNC
#8	Checksum	00-FF	CS

6.1.3 Parameter Definition

CPR_052 The parameter *recordDataIdentifier (RDI_)* in the ReadDataByIdentifier request message identifies a data record.

CPR_053 recordDataIdentifier values defined by this document are shown in the table below.

The recordDataIdentifier table consists of four columns and multiple lines.

- The 1st column (Hex) includes the "Hex Value" assigned to the recordDataIdentifier specified in the 3rd column.
- The 2nd column (Data element) specifies the data element of sub-appendix 1 on which the recordDataIdentifier is based (transcoding is sometimes necessary).
- The 3rd column (Description) specifies the corresponding recordDataIdentifier name.
- The 4th column (Mnemonic) specifies the mnemonic of this recordDataIdentifier.
-

Table 28

Definition of recordDataIdentifier values

Hex	**Data element**	**recordDataIdentifier Name (see format in Section 8.2)**	**Mnemonic**
F90B	CurrentDateTime	TimeDate	RDI_TD
F912	HighResOdometer	HighResolutionTotalVehicleDistance	RDI_HRTVD
F918	K-ConstantOfRecordingEquipment	Kfactor	RDI_KF
F91C	L-TyreCircumference	LfactorTyreCircumference	RDI_LF
F91D	W-VehicleCharacteristicConstant	WvehicleCharacteristicFactor	RDI_WVCF
F921	TyreSize	TyreSize	RDI_TS
F922	nextCalibrationDate	NextCalibrationDate	RDI_NCD
F92C	SpeedAuthorised	SpeedAuthorised	RDI_SA
F97D	vehicleRegistrationNation	RegisteringMemberState	RDI_RMS
F97E	VehicleRegistrationNumber	VehicleRegistrationNumber	RDI_VRN
F190	VehicleIdentificationNumber	VIN	RDI_VIN

CPR_054 The parameter ***dataRecord (DREC_)*** is used by the ReadDataByIdentifier positive response message to provide the data record value identified by the recordDataIdentifier to the client (tester). Data formats are specified in section 8. Additional user optional dataRecords including VU specific input, internal and output data may be implemented, but are not defined in this document.

6.2 WriteDataByIdentifier service

6.2.1 Message description

CPR_056 The WriteDataByIdentifier service is used by the client to write data record values to a server. The data are identified by a recordDataIdentifier. It is the VU manufacturer's responsibility that the server conditions are met when performing this service. To update the parameters listed in Table 28, the VU must be in CALIBRATION mode.

6.2.2 Message format

CPR_057 The message formats for the WriteDataByIdentifier primitives are detailed in the following tables.

Table 29

WriteDataByIdentifier Request Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte - physical addressing	80	FMT
#2	Target address byte	EE	TGT
#3	Source address byte	tt	SRC
#4	Additional length byte	m+3	LEN
#5	**WriteDataByIdentifier Request Service Id**	**2E**	**WDBI**
#6 to #7	recordDataIdentifier = [a value from Table 28]	xxxx	RDI_…
#8 to m+7	dataRecord[] = [data#1 : data#m]	xx : xx	DREC_DATA1 : DREC_DATAm
#m+8	Checksum	00-FF	CS

Table 30

WriteDataByIdentifier Positive Response Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte - physical addressing	80	FMT
#2	Target address byte	tt	TGT
#3	Source address byte	EE	SRC
#4	Additional length byte	03	LEN
#5	**WriteDataByIdentifier Positive Response Service Id**	**6E**	**WDBIPR**
#6 to #7	recordDataIdentifier = [the same value as bytes #6 and #7 Table 29]	xxxx	RDI_...
#8	Checksum	00-FF	CS

Table 31

WriteDataByIdentifier Negative Response Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte – physical addressing	80	FMT
#2	Target address byte	tt	TGT
#3	Source address byte	EE	SRC
#4	Additional length byte	03	LEN
#5	**NegativeResponse Service Id**	**7F**	**NR**
#6	WriteDataByIdentifier Request Service Id	2E	WDBI
#7	ResponseCode=[requestOutOfRange incorrectMessageLength conditionsNotCorrect]	31 13 22	RC_ROOR RC_IML RC_CNC
#8	Checksum	00-FF	CS

6.2.3 Parameter definition

The parameter *recordDataIdentifier (RDI_)* is defined in Table 28.

The parameter *dataRecord (DREC_)* is used by the WriteDataByIdentifier request message to provide the data record values identified by the recordDataIdentifier to the server (VU). Data formats are specified in section 8.

7. Control of Test Pulses – Input/Output Control functional unit

The services available are detailed in the following table:

Table 32

InputOutputControlByIdentifier service

Service name	Description
InputOutputControlByIdentifier	The client requests the control of an input/output specific to the server.

7.1 InputOutputControlByIdentifier service

7.1.1 Message description

There is a connection via the front connector which allows test pulses to be controlled or monitored using a suitable tester.

CPR_058 This calibration I/O signal line can be configured by K-line command using the InputOutputControlByIdentifier service to select the required input or output function for the line. The available states of the line are:

- disabled,
- speedSignalInput, where the calibration I/O signal line is used to input a speed signal (test signal) replacing the motion sensor speed signal,
- realTimeSpeedSignalOutputSensor, where the calibration I/O signal line is used to output the speed signal of the motion sensor,
- RTCOutput, where the calibration I/O signal line is used to output the UTC clock signal.

CPR_059 The vehicle unit must have entered an adjustment session and must be in CALIBRATION mode to configure the state of the line. On exit of the adjustment session or of the CALIBRATION mode the vehicle unit must ensure the calibration I/O signal line is returned to the ‘disabled' (default) state.

CPR_060 If speed pulses are received at the real time speed signal input line of the VU while the calibration I/O signal line is set to input then the calibration I/O signal line shall be set to output or returned to the disabled state.

CPR_061 The sequence shall be:

- Establish communications by StartCommunication Service
- Enter an adjustment session by StartDiagnosticSession Service and be in CALIBRATION mode of operation (the order of these two operation is not important).
- Change the state of the output by InputOutputControlByIdentifier Service.

7.1.2 Message format

CPR_062 The message formats for the InputOutputControlByIdentifier primitives are detailed in the following tables.

Table 33

InputOutputControlByIdentifier Request Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte - physical addressing	80	FMT
#2	Target address byte	EE	TGT
#3	Source address byte	tt	SRC
#4	Additional length byte	xx	LEN
#5	**InputOutputControlByIdentifier Request Sid**	**2F**	**IOCBI**
#6 and #7	InputOutputIdentifier = [CalibrationInputOutput]	F960	IOI_CIO
#8 or #8 to #9	ControlOptionRecord = [inputOutputControlParameter - one value from Table 36 controlState – one value from Table 37 (see note below)]	 xx xx	COR_... IOCP_... CS_…
#9 or #10	Checksum	00-FF	CS

Note: The controlState parameter is present only in some cases (see 7.1.3).

Table 34

InputOutputControlByIdentifier Positive Response Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte – physical addressing	80	FMT
#2	Target address byte	tt	TGT
#3	Source address byte	EE	SRC
#4	Additional length byte	xx	LEN
#5	**inputOutputControlByIdentifier Positive Response SId**	**6F**	**IOCBIPR**
#6 and #7	inputOutputIdentifier = [CalibrationInputOutput]	F960	IOI_CIO
#8 or #8 to #9	controlStatusRecord = [inputOutputControlParameter (same value as byte #8 Table 33) controlState (same value as byte #9 Table 33)] (if applicable)	 xx xx	CSR_ IOCP_... CS_…
#9 or #10	Checksum	00-FF	CS

Table 35

InputOutputControlByIdentifier Negative Response Message

Byte #	Parameter Name	Hex Value	Mnemonic
#1	Format byte – physical addressing	80	FMT
#2	Target address byte	tt	TGT
#3	Source address byte	EE	SRC
#4	Additional length byte	03	LEN
#5	**negativeResponse Service Id**	**7F**	**NR**
#6	inputOutputControlByIdentifier Request SId	2F	IOCBI
#7	responseCode=[incorrectMessageLength conditionsNotCorrect requestOutOfRange deviceControlLimitsExceeded]	 13 22 31 7A	 RC_IML RC_CNC RC_ROOR RC_DCLE
#8	Checksum	00-FF	CS

7.1.3 Parameter definition

CPR_064 The parameter ***inputOutputControlParameter (IOCP_)*** is defined in the following table.

Table 36

Definition of inputOutputControlParameter values

Hex	Description	Mnemonic
00	**ReturnControlToECU** This value shall indicate to the server (VU) that the tester does no longer have control about the calibration I/O signal line.	RCTECU
01	**ResetToDefault** This value shall indicate to the server (VU) that it is requested to reset the calibration I/O signal line to its default state.	RTD
03	**ShortTermAdjustment** This value shall indicate to the server (VU) that it is requested to adjust the calibration I/O signal line to the value included in the controlState parameter.	STA

CPR_065 The parameter ***controlState*** is present only when the inputOutputControlParameter is set to ShortTermAdjustment and is defined in the following table:

Table 37

Definition of controlState values

Mode	Hex Value	Description
Disable	00	I/O line is disabled (default state)
Enable	01	Enable calibration I/O line as speedSignalInput
Enable	02	Enable calibration I/O line as realTimeSpeedSignalOutputSensor
Enable	03	Enable calibration I/O line as RTCOutput

8. dataRecords formats

This section details:

- general rules that shall be applied to ranges of parameters transmitted by the vehicle unit to the tester,
- formats that shall be used for data transferred via the Data Transmission Services described in section 6.

CPR_067 All parameters identified shall be supported by the VU.

CPR_068 Data transmitted by the VU to the tester in response to a request message shall be of the measured type (i.e. current value of the requested parameter as measured or observed by the VU).

8.1 Transmitted parameter ranges

CPR_069 Table 38 defines the ranges used to determine the validity of a transmitted parameter.

CPR_070 The values in the range «error indicator» provide a means for the vehicle unit to immediately indicate that valid parametric data is not currently available due to some type of error in the control device.

CPR_071 The values in the range «not available» provide a means for the vehicle unit to transmit a message which contains a parameter that is not available or not supported in that module. The values in the range «not requested» provide a means for a device to transmit a command message and identify those parameters where no response is expected from the receiving device.

CPR_072 If a component failure prevents the transmission of valid data for a parameter, the error indicator as described in Table 38 should be used in place of that parameter's data. However, if the measured or calculated data has yielded a value that is valid yet exceeds the defined parameter range, the error indicator should not be used. The data should be transmitted using the appropriate minimum or maximum parameter value.

Table 38

dataRecords ranges

Range Name	1 byte (Hex value)	2 bytes (Hex value)	4 bytes (Hex Value)	ASCII
Valid signal	00 to FA	0000 to FAFF	00000000 to FAFFFFFF	1 to 254
Parameter specific indicator	FB	FB00 to FBFF	FB000000 to FBFFFFFF	none
Reserved range for future indicator bits	FC to FD	FC00 to FDFF	FC000000 to FDFFFFFF	none
Error indicator	FE	FE00 to FEFF	FE000000 to FEFFFFFF	0
Not available or not requested	FF	FF00 to FFFF	FF000000 to FFFFFFFF	FF

CPR_073 For parameters coded in ASCII, the ASCII character "*" is reserved as a delimiter.

8.2 dataRecords formats

Tables 39 to 42 below detail the formats that shall be used via the ReadDataByIdentifier and WriteDataByIdentifier Services.

CPR_074 Table 39 provides the length, resolution and operating range for each parameter identified by its recordDataIdentifier:

Table 39

Format of dataRecords

Parameter Name	Data length (bytes)	Resolution	Operating range
TimeDate	8	*See details in Table 40*	
HighResolutionTotalVehicleDistance	4	5 m/bit gain, 0 m offset	0 to +21 055 406 km
Kfactor	2	0.001 pulse/m/bit gain, 0 offset	0 to 64.255 pulse/m
LfactorTyreCircumference	2	0.125 10^{-3} m /bit gain, 0 offset	0 to 8,031 m
WvehicleCharacteristicFactor	2	0.001 pulse/m/bit gain, 0 offset	0 to 64.255 pulse/m
TyreSize	15	ASCII	ASCII
NextCalibrationDate	3	*See details in Table 41*	
SpeedAuthorised	2	1/256 km/h/bit gain, 0 offset	0 to 250,996 km/h
RegisteringMemberState	3	ASCII	ASCII
VehicleRegistrationNumber	14	*See details in Table 42*	
VIN	17	ASCII	ASCII

CPR_075 Table 40 details the formats of the different bytes of the TimeDate parameter **:**

Table 40

Detailed format of TimeDate (recordDataIdentifier value # F90B)

Byte	**Parameter definition**	**Resolution**	**Operating range**
1	Seconds	0.25 s/bit gain, 0 s offset	0 to 59.75s
2	Minutes	1 min/bit gain, 0 min offset	0 to 59 min
3	Hours	1 h/bit gain, 0 h offset	0 to 23 h
4	Month	1 month/bit gain, 0 month offset	1 to 12 month
5	Day	0.25 day/bit gain, 0 day offset (see NOTE below Table 41)	0.25 to 31.75 day
6	Year	1 year/bit gain, +1985 year offset (see NOTE below Table 41)	1985 to 2235 year
7	Local Minute Offset	1 min/bit gain, -125 min offset	-59 to +59 min
8	Local Hour Offset	1 h/bit gain, -125 h offset	- 23 to +23 h

CPR_076 Table 41 details the formats of the different bytes of the NextCalibrationDate parameter.

Table 41

Detailed format of NextCalibrationDate (recordDataIdentifier value # F922)

Byte	**Parameter definition**	**Resolution**	**Operating range**
1	Month	1 month/bit gain, 0 month offset	1 to 12 month
2	Day	0.25 day/bit gain, 0 day offset (see NOTE below)	0.25 to 31.75 day
3	Year	1 year/bit gain, +1985 year offset (see NOTE below)	1985 to 2235 year

NOTE concerning the use of the “Day” parameter:

A value of 0 for the date is null. The values 1, 2, 3, and 4 are used to identify the first day of the month; 5, 6, 7, and 8 identify the second day of the month; etc.

This parameter does not influence or change the hours parameter above.

NOTE concerning the use of byte “Year” parameter:
A value of 0 for the year identifies the year 1985; a value of 1 identifies 1986; etc.

CPR_078 Table 42 details the formats of the different bytes of the VehicleRegistrationNumber parameter:

Table 42

Detailed format of VehicleRegistrationNumber (recordDataIdentifier value # F97E)

Byte	Parameter definition	Resolution	Operating range
1	Code Page (as defined in sub-appendix 1)	ASCII	01 to 0A
2 – 14	Vehicle Registration Number (as defined in sub-appendix 1)	ASCII	ASCII

SUB-APPENDIX IX

TYPE APPROVAL

LIST OF MINIMUM REQUIRED TESTS

CONTENTS

PAGE

1. Introduction

1.1 Type approval

The type approval procedure for the recording equipment (or component) or tachograph card is based on:

- a security certification, performed by an ITSEC authority, against a security target fully compliant with sub-appendix 10 to this appendix,

- a functional certification performed by a Contracting Party authority certifying that the item tested fulfils the requirements of this appendix in terms of functions performed, measurement accuracy and environmental characteristics,
- an interoperability certification performed by the competent body certifying that the control device(or tachograph card) is fully interoperable with the necessary tachograph card (or control device) models (see Chapter VIII of this appendix).

This sub-appendix specifies which tests, as a minimum, must be performed by a Contracting Party authority during the functional tests, and which tests, as a minimum, must be performed by the competent body during the interoperability tests. Procedures to follow to carry out the tests or the type of tests are not specified further.

The security certification aspects are not covered by this sub-appendix. If some tests requested for type approval are performed during the security evaluation and certification process, then these tests do not need to be performed again. In this case, only the results of these security tests may be inspected. For information, the requirements expected to be tested (or closely related to tests expected to be performed) during the security certification, are marked with a "*" in this sub-appendix.

This sub-appendix considers separately the type approval of the motion sensor and of the vehicle unit, as components of the control device. Interoperability between every model of motion sensor and every model of vehicle unit is not required, therefore the type approval for a motion sensor can be granted only in combination with the type approval of a vehicle unit and vice versa.

1.2 References

The following references are used in this sub-appendix:

IEC 68-2-1	Environmental testing - Part 2: Tests - Tests A: Cold. 1990 + Amendment 2: 1994.
IEC 68-2-2	Environmental testing - Part 2: Tests - Tests B: Dry heat. 1974 + Amendment 2: 1994.
IEC 68-2-6	Basic environmental testing procedures - Test methods - Test Fc and guidance: Vibration (sinusoidal). 6th edition: 1985.
IEC 68-2-14	Basic environmental testing procedures - Test methods - Test N: Change of temperature. Modification 1: 1986.
IEC 68-2-27	Basic environmental testing procedures - Test methods - Test Ea and guidance:Shock. Edition 3: 1987.

IEC 68-2-30 Basic environmental testing procedures - Test methods - Test Db and guidance: Damp heat, cyclic (12 + 12 - hour cycle). Modification 1: 1985.

IEC 68-2-35 Basic environmental testing procedure - Test methods - Test Fda: Random vibration wide band - Reproductibility High. Modification 1: 1983.

IEC 529 Degrees of protection provided by enclosures (IP code). Edition 2: 1989.

IEC 61000-4-2 Electromagnetic Compatibility (EMC) - Testing and measurement techniques - Electrostatic discharge immunity test: 1995 / Amendment 1: 1998

ISO 7637-1 Road vehicles - Electrical disturbance by conduction and coupling - Part 1: Passenger cars and light commercial vehicles with nominal 12 V supply voltage - Electrical transient conduction along supply lines only. Edition 2: 1990.

ISO 7637-2 Road vehicles - Electrical disturbance by conduction and coupling - Part 2: Commercial vehicles with nominal 24 V supply voltage - Electrical transient conduction along supply lines only. First edition: 1990.

ISO 7637-3 Road vehicles - Electrical disturbance by conduction and coupling - Part 3: Vehicles with 12 V or 24 V supply voltage - Electrical transient transmission by capacitive and inductive coupling via lines other than supply lines. First Edition: 1995 + Cor 1: 1995.

ISO/IEC 7816-1 Identification cards - Integrated circuit(s) cards with contacts - Part 1: Physical characteristics. First edition: 1998.

ISO/IEC 7816-2 Information technology - Identification cards - Integrated circuit(s) cards with contacts - Part 2: Dimensions and location of the contacts. First edition: 1999.

ISO/IEC 7816-3 Information technology - Identification cards - Integrated circuit(s) cards with contacts - Part 3: Electronic signals and transmission protocol. Edition 2: 1997.

ISO/IEC 10373 Identification cards - Test methods. First edition: 1993.

2. Vehicle unit functional tests

No	Test	Description	Related requirements
1	**Administrative examination**		
1.1	Documentation	Correctness of documentation	
1.2	Manufacturer test results	Results of manufacturer test performed during integration. Paper demonstrations.	070, 071, 073
2	**Visual inspection**		
2.1	Compliance with documentation		
2.2	Identification / markings		168, 169
2.3	Materials		163 to 167
2.4	Sealing		251

No	Test	Description	Related requirements
2.5	External interfaces		
3	**Functional tests**		
3.1	Functions provided		002, 004, 244
3.2	Modes of operation		006*, 007*, 008*, 009*, 106, 107
3.3	Functions and data access rights		010*, 011*, 240, 246, 247
3.4	Monitoring cards insertion and withdrawal		013, 014, 015*, 016*, 106
3.5	Speed and distance measurement		017 to 026
3.6	Time measurement (test performed at 20°C)		027 to 032
3.7	Monitoring driver activities		033 to 043, 106
3.8	Monitoring driving status		044, 045, 106
3.9	Manual entries		046 to 050b
3.10	Company locks management		051 to 055
3.11	Monitoring control activities		056, 057
3.12	Detection of events and/or faults		059 to 069, 106
3.13	Equipment identification data		075*, 076*, 079
3.14	Driver card insertion and withdrawal data		081* to 083*
3.15	Driver activity data		084* to 086*
3.16	Places data		087* to 089*
3.17	Odometer data		090* to 092*
3.18	Detailed speed data		093*
3.19	Events data		094*, 095
3.20	Faults data		096*
3.21	Calibration data		097*, 098*
3.22	Time adjustment data		100*, 101*
3.23	Control activity data		102*, 103*
3.24	Company locks data		104*
3.25	Download activity data		105*
3.26	Specific conditions data		105a*, 105b*
3.27	Recording and storing on tachographs cards		108, 109*, 109a*, 110*, 111, 112
3.28	Displaying		072, 106, 113 to 128, PIC_001, DIS_001

No	Test	Description	Related requirements
3.29	Printing		072, 106, 129 to 138, PIC_001, PRT_001 to PRT_012
3.30	Warning		106, 139 to 148, PIC_001
3.31	Data downloading to external media		072, 106, 149 to 151
3.32	Output data to additional external devices		152, 153
3.33	Calibration		154*, 155*, 156*, 245
3.34	Time adjustment		157*, 158*
3.35	Non-interference of additional functions		003, 269
4	**Environmental tests**		
4.1	Temperature	Verify functionality through: - IEC 68-2-1, test Ad, with a test duration of 72 hours at the lower temperature (-20°C), 1 hour operating, 1 hour non operating, - IEC 68-2-2, test Bd, with a test duration of 72 hours at the higher temperature (+70°C), 1 hour operating, 1 hour non operating Temperature cycles: verify that the vehicle unit can withstand rapid changes in the environment temperature through IEC 68-2-14 test Na, 20 cycles, each with temperature varying from the lower temperature (-20°C) to the higher temperature (+70°C) and a 2 hours stay at both the lower and the higher temperature A reduced set of tests (among those defined in section 3 of this table) can be carried out at the lower temperature, the higher temperature and during the temperature cycles	159
4.2	Humidity	Verify that the vehicle unit can withstand a cyclic damp (heat test) through IEC 68-2-30, test Db, six 24 hours cycles, each temperature varying from +25^{o}C to + 55^{o}C and a relative humidity of 97% at + 25^{o}C and equal to 93% at +55^{o}C	160

No	Test	Description	Related requirements
4.3	Vibration	1. Sinusoidal vibrations. verify that the vehicle unit can withstand sinusoidal vibrations with the following characteristics: constant displacement between 5 and 11 Hz: 10mm peak constant acceleration between 11 and 300 Hz: 5g This requirement is verified through IEC 68-2-6, test Fc, with a minimum test duration of 3x12 hours (12 hours per axis) 2. Random vibrations: verify that the vehicle unit can withstand random vibrations with the following characteristics: frequency 5-150 Hz, level 0.02g²/Hz This requirement is verified through IEC 68-2-35, test Ffda, with a minimum test duration of 3x12 hours (12 hours per axis), 1hour operating, 1 hour non operating The two tests described above are performed on two different samples of the equipment type being tested.	163
4.4	Protection against water and foreign bodies	Verify that the vehicle unit protection index according to IEC 529 is at least IP 40, when mounted in operating conditions in a vehicle	164, 165
4.5	Over-voltage protection	Verify that the vehicle unit can withstand a power supply of: 24 V versions: 34V at +40°C 1 hour 12 V versions: 17V at +40°C 1 hour	161
4.6	Reverse polarity protection	Verify that the vehicle unit can withstand an inversion of its power supply	161
4.7	Short-circuit protection	Verify that input output signals are protected against short circuits to power supply and ground	161
5	**EMC tests**		
5.1	Radiated emissions and susceptibility	Compliance with ECE Regulation N°10.	162

No	Test	Description	Related requirements
5.2	Electrostatic discharge	Compliance with IEC 61000-4-2, ±2kV (level 1)	162
5.3	Conducted transient susceptibility on power supply	For 24V versions: compliance with ISO 7637-2: pulse 1a: Vs=-100V, Ri=10 ohms pulse 2: Vs=+100V, Ri=10 ohms pulse 3a: Vs=-100V, Ri=50 ohms pulse 3b: Vs=+100V, Ri=50 ohms pulse 4: Vs= - 16V Va=-12V, t6=100ms pulse 5: Vs=+120V, Ri=2,2 ohms, td=250ms For 12V versions: compliance with ISO 7637-1: pulse 1: Vs=-100V, Ri=10 ohms pulse 2: Vs=+100V, Ri=10 ohms pulse 3a: Vs=-100V, Ri=50 ohms pulse 3b: Vs=+100V, Ri=50 ohms pulse 4: Vs=-6V Va=-5V, t6=15ms pulse 5: Vs=+65V, Ri=3 ohms, td=100ms Pulse 5 shall be tested only for vehicle units designed to be installed in vehicles for which no external common protection against load dump is implemented	162

3 Motion sensor functional tests

No	Test	Description	Related requirements
1.	**Administrative examination**		
1.1	Documentation	Correctness of documentation	
2.	**Visual inspection**		
2.1.	Compliance with documentation		
2.2.	Identification / markings		169, 170
2.3	Materials		163 to 167
2.4.	Sealing		251
3.	**Functional tests**		
3.1	Sensor identification data		077*
3.2	Motion sensor – vehicle unit pairing		099*, 155
3.3	Motion detection Motion measurement accuracy		 022 to 026
4.	**Environmental tests**		
4.1	Operating temperature	Verify functionality (as defined in test No 3.3) in temperature range [–40ºC; +135ºC] through: - IEC 68-2-1 test Ad, with a test duration of 96 hours at the lowest temperature To_{min}, - IEC 68-2-2 test Bd, with a test duration of 96 hours at the highest temperature To_{max}	159
4.2	Temperature cycles	Verify functionality (as defined in test No 3.3) through IEC 68-2-14 test Na, 20 cycles, each with temperature varying from the lower temperature (-40°C) to the higher temperature (+135°C) and a 2 hours stay at both the lower and the higher temperature. A reduced set of tests (among those defined in test 3.3) can be carried out at the lower temperature, the higher temperature and during the temperature cycles	159

4.3	Humidity cycles	Verify functionality (as defined in test No. 3.3) through IEC 68-2-30, test Db, six 24 hours cycles, each temperature varying from +25^{o}C to + 55^{o}C and a relative humidity of 97% at + 25^{o}C and equal to 93% at +55^{o}C	160
4.4	Vibration	Verify functionality (as defined in test No. 3.3) through IEC 68-2-6, test Fc, with a test duration of 100 frequency cycles: constant displacement between 10 and 57 Hz: 1,5 mm peak constant accelaration between 57 and 500 Hz: 20g	163
4.5	Mechanical shock	Verify functionality (as defined in test No. 3.3) through IEC 68-2-27, test Ea, 3 shocks in both directions of the 3 perpendicular axes	163
4.6	Protection against water and foreign bodies	Verify that the motion sensor protection index according to IEC 529 is at least IP 64, when mounted in operating conditions in a vehicle	165
4.7	Reverse polarity protection	Verify that the motion sensor can withstand an inversion of its power supply	161
4.8	Short circuit protection	Verify that input output signals are protected against short circuits to power supply and ground	161
5.	**EMC**		
5.1	radiated emissions and susceptibility	Verify compliance with ECE Regulation N°10.	162
5.2	Electrostatic discharge	Compliance with IEC 61000-4-2, ±2kV (level 1)	162
5.3	Conducted transient susceptibility on data lines)	Compliance with ISO7637-3 (level III)	162

4. Tachograph cards functional tests

No	Test	Description	Related requirements
1.	**Administrative examination**		
1.1	Documentation	Correctness of documentation	
2	**Visual inspection**		
2.1		Make sure that all features for protection and visible data are correctly printed on the card and compliant	171 to 181
3	**Physical tests**		
3.1		Check dimension of the card and location of the contacts	184 ISO/IEC 7816-1 ISO/IEC 7816-2
4	**Protocol tests**		
4.1	ATR	Check that the ATR is compliant	ISO/IEC 7816-3 TCS 304, 307, 308
4.2	T=0	Check that T=0 protocol is compliant	ISO/IEC 7816-3 TCS 302, 303, 305
4.3	PTS	Check that the PTS command is compliant by setting T=1 from T=0.	ISO/IEC 7816-3 TCS 309 to 311
4.4	T=1	Check that T=1 protocol is compliant	ISO/IEC 7816-3 TCS 303, / 306
5	**Card structure**		
5.1		Test that the file structure of the card is compliant by checking the presence of the mandatory files in the card and their access conditions	TCS 312 TCS 400*, 401, 402, 403*, 404, 405*, 406, 407, 408*, 409, 410*, 411, 412, 413*, 414, 415*, 416, 417, 418*, 419

6	**Functional tests**		
6.1	Normal processing	Test at least once each allowed usage of each command (ex: test the UPDATE BINARY command with CLA = '00', CLA = '0C' and with different P1,P2 and Lc parameters) Check that the operations have actually been performed in the card (ex: by reading the file the command has been performed on)	TCS 313 to TCS 379
6.2	Error messages	Test at least once each error message (as specified in sub-appendix 2) for each command Test at least once every generic error (except '**6400**' integrity errors checked during security certification)	
7	**Environmental tests**		
7.1		Make sure that the cards work within the limit conditions defined in accordance with ISO/IEC 10373.	185 to 188 ISO/IEC 7816-1

5. Interoperability tests

No	Test	Description
1	Mutual authentication	Check that the mutual authentication between the vehicle unit and the tachograph card runs normally
2	Write/read tests	Execute a typical activity scenario on the vehicle unit. The scenario shall be adapted to the type of card being tested and involve writings in as many EFs as possible in the card Verify through a card downloading that all corresponding recordings have been properly made Verify through a card daily printout that all corresponding recordings can be properly read

SUB-APPENDIX X

GENERIC SECURITY TARGETS

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Note concerning this sub-appendix

This sub-appendix specifies the minimum required content of motion sensor, vehicle unit and tachograph card security targets.

In order to form the security targets against which they may seek security certification, manufacturers shall refine and complete the documents as necessary, without amending nor deleting existing threats, objectives, procedural means and security enforcing functions specifications.

MOTION SENSOR GENERIC SECURITY TARGET

1. Introduction

This document contains a description of the motion sensor, of the threats it must be able to counteract and of the security objectives it must achieve. It specifies the required security enforcing functions. It states the claimed minimum strength of security mechanisms and the required level of assurance for the development and the evaluation.

Requirements referred to in the document, are those of the body of Appendix 1B. For clarity of reading, duplication sometimes arises between Appendix 1B body requirements and security target requirements. In case of ambiguity between a security target requirement and the Appendix 1B body requirement referred by this security target requirement, the Appendix 1B body requirement shall prevail.

Appendix 1B body requirements not referred by security targets are not the subject of security enforcing functions.

Unique labels have been assigned to threats, objectives, procedural means and SEF specifications for the purpose of traceability to development and evaluation documentation.

2. Abbreviations, definitions and references

2.1 Abbreviations

ROM	Read Only Memory
SEF	Security Enforcing Function
TBD	To Be Defined
TOE	Target Of Evaluation
VU	Vehicle Unit

2.2 Definitions

Digital Tachograph Control device

Entity A device connected to the motion sensor.

Motion data The data exchanged with the VU, representative of speed and distance travelled.

Physically separated parts. Physical components of the motion sensor that are distributed in the vehicle as opposed to physical components gathered into the motion sensor casing.

Security data	The specific data needed to support security enforcing functions (e.g. crypto keys).
System	Equipment, people or organisations, involved in any way with the control device.
User	A human user of the motion sensor (when not used in the expression "user data").
User data	Any data, other than motion or security data, recorded or stored by the motion sensor.

2.3 References

ITSEC	ITSEC Information Technology Security Evaluation Criteria 1991.

3. Product rationale

3.1 Motion sensor description and method of use

The motion sensor is intended to be installed in road transport vehicles. Its purpose is to provide a VU with secured motion data representative of vehicle's speed and distance travelled.

The motion sensor is mechanically interfaced to a moving part of the vehicle, which movement can be representative of vehicle's speed or distance travelled. It may be located in the vehicle's gear box or in any other part of the vehicle.

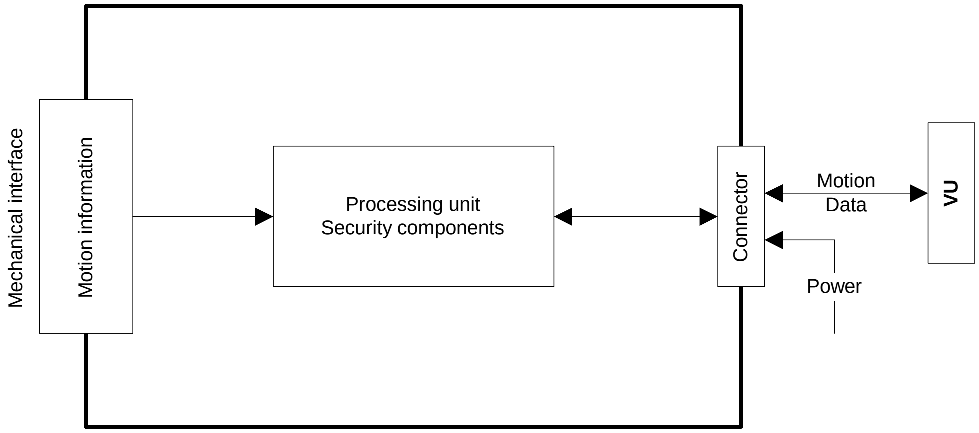
In its operational mode, the motion sensor is connected to a VU.

It may also be connected to specific equipment for management purposes (*TBD by manufacturer*)

The typical motion sensor is described in the following figure:

Figure 1

Typical motion sensor

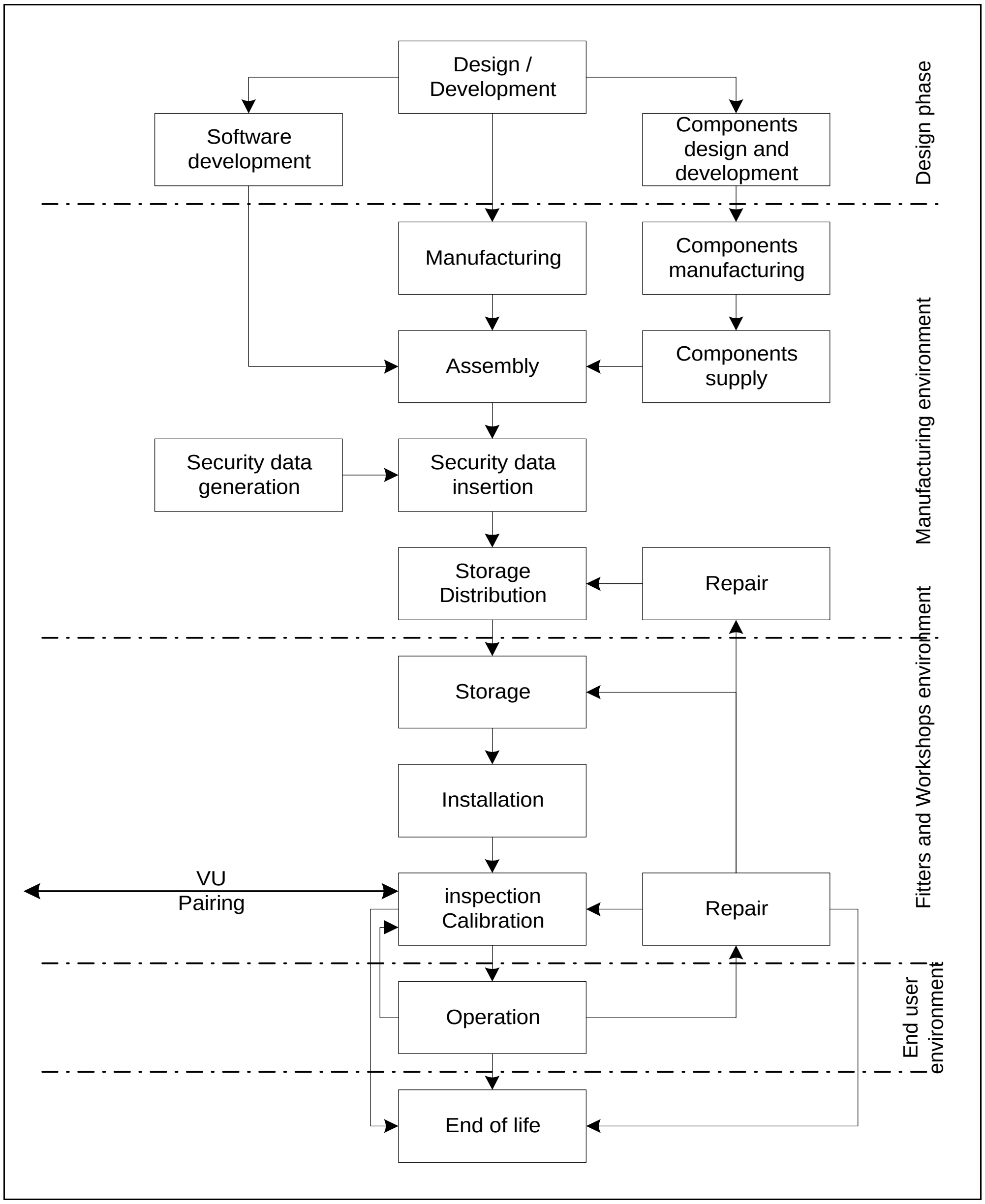


3.2 Motion sensor life cycle

The typical life cycle of the motion sensor is described in the following figure:

Figure 2

Motion sensor typical life cycle



3.3 Threats

This paragraph describes the threats the motion sensor may face.

3.3.1 Threats to access control policies

T.Access Users could try to access functions not allowed to them.

3.3.2 Design related threats

T.Faults Faults in hardware, software, communication procedures could place the motion sensor in unforeseen conditions compromising its security.

T.Tests The use of non invalidated test modes or of existing back doors could compromise the motion sensor security.

T.Design Users could try to gain illicit knowledge of design either from manufacturer’s material (through theft, bribery, …) or from reverse engineering.

3.3.3 Operation oriented threats

T.Environment Users could compromise the motion sensor security through environmental attacks (thermal, electromagnetic, optical, chemical, mechanical,…).

T.Hardware Users could try to modify motion sensor hardware.

T.Mechanical_Origin Users could try to manipulate the motion sensor input (e.g. unscrewing from gearbox, …).

T.Motion_Data Users could try to modify the vehicle’s motion data (addition, modification, deletion, replay of signal).

T.Power_Supply Users could try to defeat the motion sensor security objectives by modifying (cutting, reducing, increasing) its power supply.

T.Security_Data Users could try to gain illicit knowledge of security data during security data generation or transport or storage in the equipment.

T.Software Users could try to modify motion sensor software.

T.Stored_Data Users could try to modify stored data (security or user data).

3.4 Security objectives

The main security objective of the digital tachograph system is the following:

O.Main The data to be checked by control authorities must be available and reflect fully and accurately the activities of controlled drivers and vehicles in terms of driving, work, availability and rest periods and in terms of vehicle speed.

Therefore the security objective of the motion sensor, contributing to the global security objective, is:

O.Sensor_Main The data transmitted by the motion sensor must be available to the VU so as to allow the VU to determine fully and accurately the movement of the vehicle in terms of speed and distance travelled.

3.5 Information Technology Security Objectives

The specific IT security objectives of the motion sensor contributing to its main security objective, are the following:

O.Access The motion sensor must control connected entities' access to functions and data.

O.Audit The motion sensor must audit attempts to undermine its security and should trace them to associated entities.

O.Authentication The motion sensor must authenticate connected entities.

O.Processing The motion sensor must ensure that processing of input to derive motion data is accurate.

O.Reliability The motion sensor must provide a reliable service.

O.Secured_Data_Exchange The motion sensor must secure data exchanges with the VU.

3.6 Physical, personnel or procedural means

This paragraph describes physical, personnel or procedural requirements that contribute to the security of the motion sensor.

3.6.1 Equipment design

M.Development Motion sensor developers must ensure that the assignment of responsibilities during development is done in a manner which maintains IT security.

M.Manufacturing Motion sensor manufacturers must ensure that the assignment of responsibilities during manufacturing is done in a manner which maintains IT security, and that during the manufacturing process the motion sensor is protected from physical attacks which might compromise IT security.

3.6.2 Equipment delivery

M.Delivery Motion sensor manufacturers, vehicle manufacturers and fitters or workshops must ensure that handling of the motion sensor is done in a manner which maintains IT security.

3.6.3 Security data generation and delivery

M.Sec_Data_Generation Security data generation algorithms must be accessible to authorised and trusted persons only.

M.Sec_Data_Transport Security data must be generated, transported, and inserted into the motion sensor, in such a way to preserve its appropriate confidentiality and integrity.

3.6.4 Control device installation, calibration, and inspection

M.Approved_Workshops Installation, calibration and repair of control device must be carried by trusted and approved fitters or workshops.

M.Mechanical_Interface Means of detecting physical tampering with the mechanical interface must be provided (e.g. seals)

M.Regular_Inpections Control device must be periodically inspected and calibrated.

3.6.5 Law enforcement control

M.Controls Law enforcement controls must be performed regularly and randomly, and must include security audits.

3.6.6 Software upgrades

M.Software_Upgrade Software revisions must be granted security certification before they can be implemented in a motion sensor.

4. Security enforcing functions

4.1 Identification and authentication

UIA_101 The motion sensor shall be able to establish, for every interaction, the identity of any entity it is connected to.

UIA_102 The identity of a connected entity shall consist of:

- an entity group:
  - VU,
  - Management device,
  - Other,
- an entity ID (VU only).

UIA_103 The entity ID of a connected VU shall consist of the VU approval number and the VU serial number.

UIA_104 The motion sensor shall be able to authenticate any VU or management device it is connected to:

- at entity connection,
- at power supply recovery

UIA_105 The motion sensor shall be able to periodically re-authenticate the VU it is connected to.

UIA_106 The motion sensor shall detect and prevent use of authentication data that has been copied and replayed.

UIA_107 After (*TBD by manufacturer and not more than 20*) consecutive unsuccessful authentication attempts have been detected, the SEF shall:

- generate an audit record of the event,
- warn the entity,
- continue to export motion data in a non secured mode.

4.2 Access control

Access controls ensure that information is read from, created in, or modified into the TOE only by those authorised to do so.

4.2.1 Access control policy

ACC_101 The motion sensor shall control access rights to function and data.

4.2.2 Data access rights

ACC_102 The motion sensor shall ensure that motion sensor identification data can be written once only (requirement 078).

ACC_103 The motion sensor shall accept and/or store user data from authenticated entities only.

ACC_104 The motion sensor shall enforce appropriate read and write access rights to security data.

4.2.3 File structure and access conditions

ACC_105 Application and data files structure and access conditions shall be created during the manufacturing process, and then locked from any future modification or deletion.

4.3 Accountability

ACT_101 The motion sensor shall hold in its memory motion sensor identification data (requirement 077).

ACT_102 The motion sensor shall store in its memory installation data (requirement 099).

ACT_103 The motion sensor shall have a capability to output accountability data to authenticated entities at their request.

4.4 Audit

AUD_101 The motion sensor shall, for events impairing its security, generate audit records of the events.

AUD_102 The events affecting the security of the motion sensor are the following:

- security breach attempts:
  - authentication failure,
  - stored data integrity error,
  - internal data transfer error,
  - unauthorised case opening,
  - hardware sabotage.
- Sensor fault,

AUD_103 Audit records shall include the following data:

- date and time of the event,
- type of event,
- connected entity identity.

when required data is not available, an appropriate default indication shall be given (*TBD by manufacturer*).

AUD_104 The motion sensor shall send the generated audit records to the VU at the moment of their generation, and may also store them in its memory.

AUD_105 In the case where the motion sensor stores audit records, it shall ensure that 20 audit records will be maintained independent of audit storage exhaustion, and shall have a capability to output stored audit records to authenticated entities at their request.

4.5 Accuracy

4.5.1 Information flow control policy

ACR_101 The motion sensor shall ensure that motion data may only been processed and derived from sensor mechanical input.

4.5.2 Internal data transfers

The requirements of this paragraph apply only if the motion sensor makes use of physically separated parts.

ACR_102 If data are transferred between physically separated parts of the motion sensor, the data shall be protected from modification.

ACR_103 Upon detection of a data transfer error during an internal transfer, transmission shall be repeated and the SEF shall generate an audit record of the event.

4.5.3 Stored data integrity

ACR_104 The motion sensor shall check user data stored in its memory for integrity errors.

ACR_105 Upon detection of a stored user data integrity error, the SEF shall generate an audit record.

4.6 Reliability of service

4.6.1 Tests

RLB_101 All commands, actions, or test points, specific to the testing needs of the manufacturing phase shall be disabled or removed before the end of the manufacturing phase. It shall not be possible to restore them for later use.

RLB_102 The motion sensor shall run self-tests, during initial start-up, and during normal operation to verify its correct operation. The motion sensor self-tests shall include a verification of the integrity of security data and a verification of the integrity of stored executable code (if not in ROM).

RLB_103 Upon detection of an internal fault during self-test, the SEF shall generate an audit record (sensor fault).

4.6.2 Software

RLB_104 There shall be no way to analyse or debug the motion sensor software in the field.

RLB_105 Inputs from external sources shall not be accepted as executable code.

4.6.3 Physical protection

RLB_106 If the motion sensor is designed so that it can be opened, the motion sensor shall detect any case opening, even without external power supply for a minimum of 6 months. In such a case, the SEF shall generate an audit record of the event (It is acceptable that the audit record is generated and stored after power supply reconnection).

If the motion sensor is designed so that it cannot be opened, it shall be designed such that physical tampering attempts can be easily detected (e.g. through visual inspection).

RLB_107 The motion sensor shall detect specified (*TBD by manufacturer*) hardware sabotage.

RLB_108 In the case described above, the SEF shall generate an audit record and the motion sensor shall: (*TBD by manufacturer*).

4.6.4 Power supply interruptions

RLB_109 The motion sensor shall preserve a secure state during power supply cut-off or variations.

4.6.5 Reset conditions

RLB_110 In case of a power supply interruption, or if a transaction is stopped before completion, or on any other reset conditions, the motion sensor shall be reset cleanly.

4.6.6 Data availability

RLB_111 The motion sensor shall ensure that access to resources is obtained when required and that resources are not requested nor retained unnecessarily.

4.6.7 Multiple applications

RLB_112 If the motion sensor provides applications other than the tachograph application, all applications shall be physically and/or logically separated from each other. These applications shall not share security data. Only one task shall be active at a time.

4.7 Data exchange

DEX_101 The motion sensor shall export motion data to the VU with associated security attributes, such that the VU will be able to verify its integrity and authenticity.

4.8 Cryptographic support

The requirements of this paragraph are applicable only where needed, depending upon security mechanisms used and upon the manufacturer’s solutions.

CSP_101 Any cryptographic operation performed by the motion sensor shall be in accordance with a specified algorithm and a specified key size.

CSP_102 If the motion sensor generates cryptographic keys, it shall be in accordance with specified cryptographic key generation algorithms and specified cryptographic key sizes.

CSP_103 If the motion sensor distributes cryptographic keys, it shall be in accordance with specified key distribution methods.

CSP_104 If the motion sensor accesses cryptographic keys, it shall be in accordance with specified cryptographic keys access methods.

CSP_105 If the motion sensor destroys cryptographic keys, it shall be in accordance with specified cryptographic keys destruction methods.

5. Definition of security mechanisms

The security mechanisms, fulfilling the motion sensor security enforcing functions, are defined by the motion sensor manufacturers.

6. Minimum strength of security mechanisms

The minimum strength of the motion sensor security mechanisms is **High,** as defined in [ITSEC].

7. Level of assurance

The target level of assurance for the motion sensor is ITSEC level **E3**, as defined in [ITSEC].

8. Rationale

The following matrixes give a rationale for the SEFs by showing:

- which SEFs or means counteract which threats,
- which SEFs fulfil which IT security objectives.

	Threats												**IT Objectives**					
	Access	**Faults**	**Tests**	**Design**	**Environment**	**Hardware**	**Mechanical_Origin**	**Motion_Data**	**Power_Supply**	**Security_Data**	**Software**	**Stored_Data**	**Access**	**Audit**	**Authentication**	**Processing**	**Reliability**	**Secured_Data_Exchange**
Physical Personnel Procedural means																		
Development		x	x	x														
Manufacturing			x	x														
Delivery						x					x	x						
Security Data Generation										x								
Security Data Transport										x								
Approved Workshops							x											
Mechanical interface							x											
Regular Inspection						x	x		x		x							
Law enforcement controls					x	x	x		x	x	x							
Software Upgrades											x							
Security Enforcing Functions																		
Identification and authentication																		
UIA_101 Entities identification	x							x					x		x			x
UIA_102 Entities identity	x												x		x			
UIA_103 VU identity														x				

	Threats												**IT Objectives**					
	Access	**Faults**	**Tests**	**Design**	**Environment**	**Hardware**	**Mechanical_Origin**	**Motion_Data**	**Power_Supply**	**Security_Data**	**Software**	**Stored_Data**	**Access**	**Audit**	**Authentication**	**Processing**	**Reliability**	**Secured_Data_Exchange**
UIA_104 Entities authentication	**x**							**x**					**x**		**x**			**x**
UIA_105 re-authentication	**x**							**x**					**x**		**x**			**x**
UIA_106 Unforgeable authentication	**x**							**x**					**x**		**x**			
UIA_107 Authentication failure								**x**						**x**			**x**	
Access control																		
ACC_101 Access control policy	**x**									**x**		**x**	**x**					
ACC_102 Motion sensor ID												**x**	**x**					
ACC_103 User data												**x**	**x**					
ACC_104 Security Data										**x**		**x**	**x**					
ACC_105 File structure and access conditions	**x**									**x**		**x**	**x**					
Accountability																		
ACT_101 Motion sensor ID data														**x**				
ACT_102 Pairing data														**x**				
ACT_103 Accountability data														x				
Audit																		
AUD_101 Audit records														**x**				
AUD_102 Audit events list	**x**				**x**	**x**						**x**		**x**				
AUD_103 Audit data														**x**				
AUD_104 Audit tools														**x**				
AUD_105 Audit records storage														**x**				

	Threats												IT Objectives					
	Access	Faults	Tests	Design	Environment	Hardware	Mechanical_Origin	Motion_Data	Power_Supply	Security_Data	Software	Stored_Data	Access	Audit	Authentication	Processing	Reliability	Secured_Data_Exchange
Accuracy																		
ACR_101 Information flow control policy								x								x	x	
ACR_102 Internal transfers																x	x	
ACR_103 Internal transfers														x				
ACR_104 Stored data integrity												x					x	
ACR_105 Stored data integrity												x		x				
Reliability																		
RLB_101 Manufacturing tests			x	x													x	
RLB_102 Self tests		x				x			x		x						x	
RLB_103 Self tests						x			x		x			x				
RLB_104 Software analysis				x							x						x	
RLB_105 Software input											x					x	x	
RLB_106 Case opening				x	x	x				x	x	x					x	
RLB_107 Hardware sabotage						x											x	
RLB_108 Hardware sabotage						x								x				
RLB_109 Power supply interruptions									x								x	
RLB_110 Reset		x															x	
RLB_111 Data Availability																x	x	
RLB_112 Multiple Applications																	x	
Data exchange																		
DEX_101 Secured motion data export								x										x

	Threats												IT Objectives					
	Access	**Faults**	**Tests**	**Design**	**Environment**	**Hardware**	**Mechanical_Origin**	**Motion_Data**	**Power_Supply**	**Security_Data**	**Software**	**Stored_Data**	**Access**	**Audit**	**Authentication**	**Processing**	**Reliability**	**Secured_Data_Exchange**
Cryptographic support																		
CSP_101 Algorithms																	x	x
CSP_102 key generation																	x	x
CSP_103 key distribution																	x	x
CSP_104 key access																	x	x
CSP_105 key destruction																	x	x

VEHICLE UNIT GENERIC SECURITY TARGET

1. Introduction

This document contains a description of the vehicle unit, of the threats it must be able to counteract and of the security objectives it must achieve. It specifies the required security enforcing functions. It states the claimed minimum strength of security mechanisms and the required level of assurance for the development and the evaluation.

Requirements referred to in the document, are those of the body of Appendix 1B. For clarity of reading, duplication sometimes arises between Appendix 1B body requirements and security target requirements. In case of ambiguity between a security target requirement and the Appendix 1B body requirement referred by this security target requirement, the Appendix 1B body requirement shall prevail.

Appendix 1B body requirements not referred by security targets are not the subject of security enforcing functions.

Unique labels have been assigned to threats, objectives, procedural means and SEF specifications for the purpose of traceability to development and evaluation documentation.

2. Abbreviations, definitions and references

2.1 Abbreviations

PIN	Personal Identification Number
ROM	Read Only Memory
SEF	Security Enforcing Function

TBD	To Be Defined
TOE	Target Of Evaluation
VU	Vehicle Unit

2.2 Definitions

Digital tachograph	Control device.
Motion data	The data exchanged with the motion sensor, representative of speed and distance travelled.
Physically separated parts.	Physical components of the VU that are distributed in the vehicle as opposed to physical components gathered into the VU casing.
Security data	The specific data needed to support security enforcing functions (e.g. crypto keys).
System	Equipment, people or organisations, involved in any way with the control device.
User	Users are to be understood as human user of the equipment. Normal users of the VU comprise drivers, controllers, workshops and companies.
User data	Any data, other than security data, recorded or stored by the VU, required by Chapter III.12.

2.3 References

ITSEC	ITSEC Information Technology Security Evaluation Criteria 1991.

3. Product rationale

3.1 Vehicle Unit description and method of use

The VU is intended to be installed in road transport vehicles. Its purpose is to record, store, display, print and output data related to driver activities.

It is connected to a motion sensor with which it exchanges vehicle’s motion data.

Users identify themselves to the VU using tachograph cards.

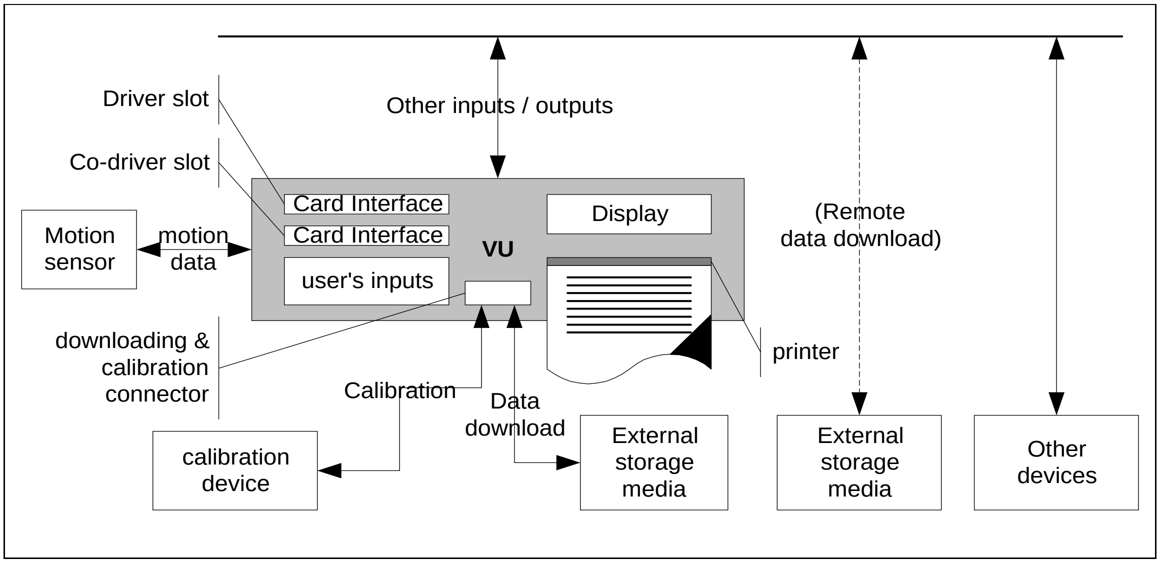
The VU records and stores user activities data in its data memory, it also records user activities data in tachograph cards.

The VU outputs data to display, printer and external devices.

The vehicle unit’s operational environment while installed in a vehicle is described in the following figure:

Figure 1

VU operational environment



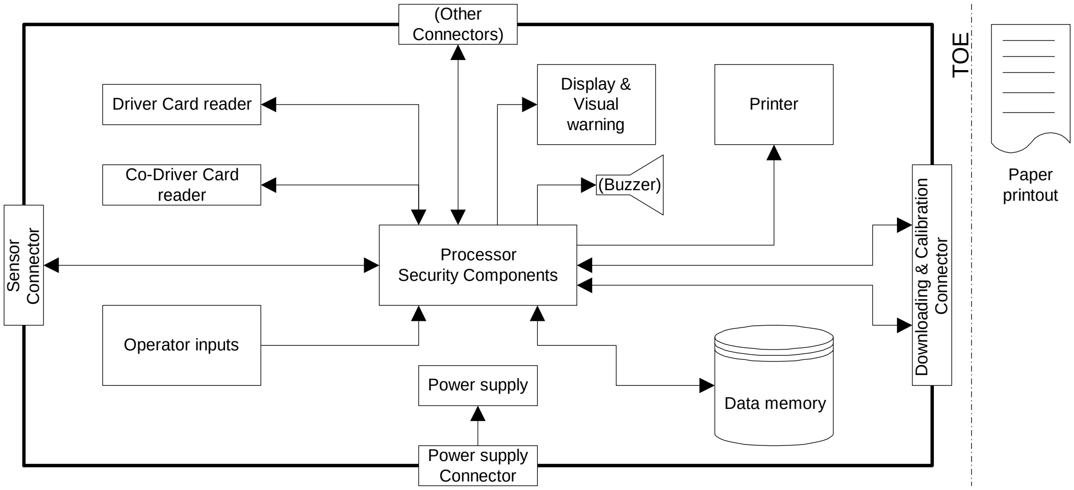
The VU general characteristics, functions and mode of operations are described in Chapter II of Appendix 1B.

The VU functional requirements are specified in Chapter III of Appendix 1B.

The typical VU is described in the following figure:

Figure 2

Typical VU (…) optional



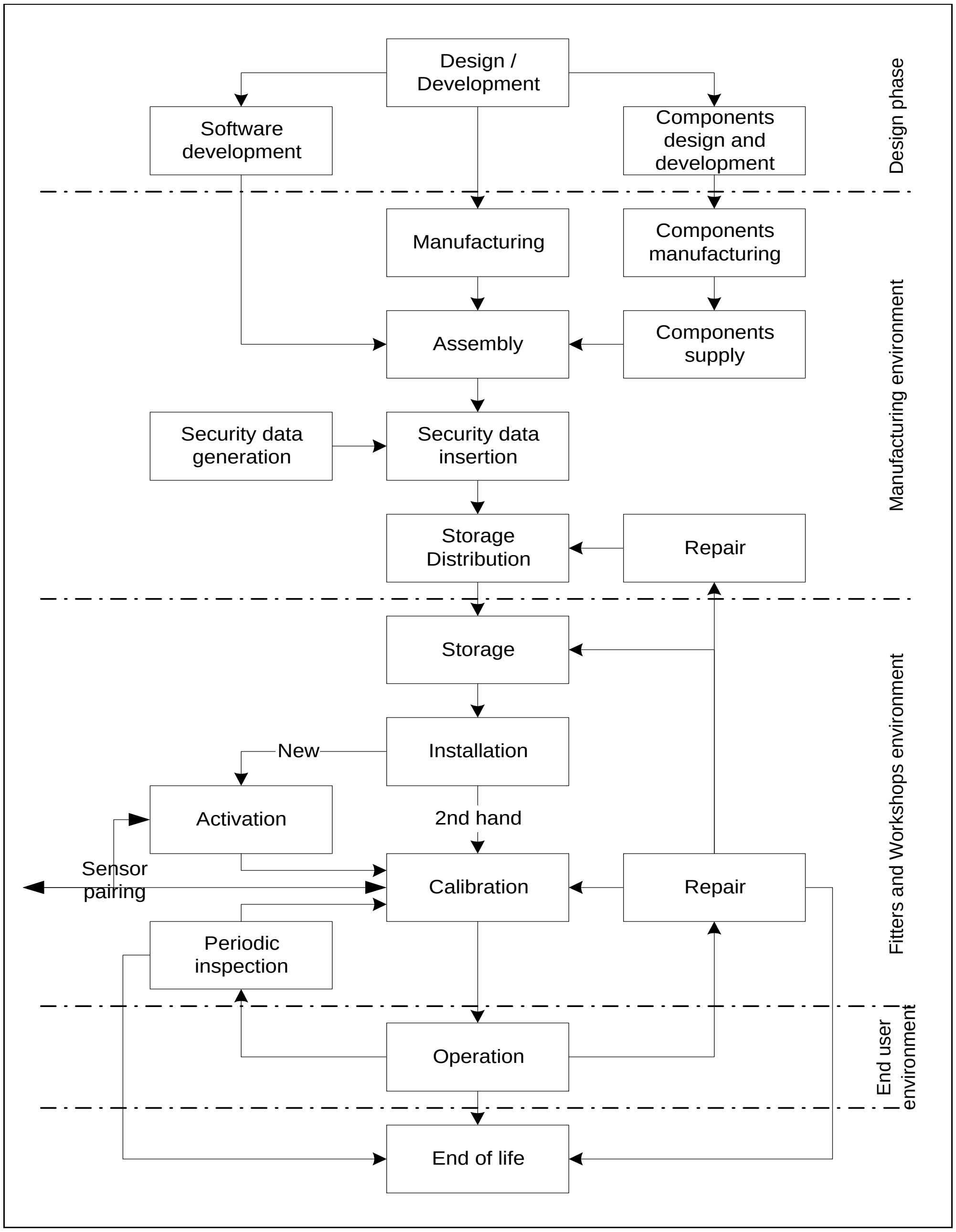
It must be noted that although the printer mechanism is part of the TOE, the paper document once produced is not.

3.2 Vehicle Unit life cycle

The typical life cycle of the VU is described in the following figure:

Figure 3

VU typical life cycle



3.3 Threats

This paragraph describes the threats the VU may face.

3.3.1 Threats to identification and access control policies

T.Access Users could try to access functions not allowed to them (e.g. drivers gaining access to calibration function).

T.Identification Users could try to use several identifications or no identification.

3.3.2 Design related threats

T.Faults Faults in hardware, software, communication procedures could place the VU in unforeseen conditions compromising its security.

T.Tests The use of non invalidated test modes or of existing back doors could compromise the VU security.

T.Design Users could try to gain illicit knowledge of design either from manufacturer's material (through theft, bribery, …) or from reverse engineering.

3.3.3 Operation oriented threats

T.Calibration_Parameters Users could try to use mis-calibrated equipment (through calibration data modification, or through organisational weaknesses).

T.Card_Data_Exchange Users could try to modify data while exchanged between VU and tachograph cards (addition, modification, deletion, replay of signal).

T.Clock Users could try to modify internal clock.

T.Environment Users could compromise the VU security through environmental attacks (thermal, electromagnetic, optical, chemical, mechanical,…).

T.Fake_Devices Users could try to connect fake devices (motion sensor, smart cards) to the VU.

T.Hardware Users could try to modify VU hardware.

T.Motion_Data Users could try to modify the vehicle's motion data (addition, modification, deletion, replay of signal).

T.Non_Activated Users could use non activated equipment.

T.Output_Data Users could try to modify data output (print, display or download).

T.Power_Supply Users could try to defeat the VU security objectives by modifying (cutting, reducing, increasing) its power supply.

T.Security_Data Users could try to gain illicit knowledge of security data during security data generation or transport or storage in the equipment.

T.Software Users could try to modify VU software.

T.Stored_Data Users could try to modify stored data (security or user data).

3.4 Security objectives

The main security objective of the digital tachograph system is the following:

O.Main The data to be checked by control authorities must be available and reflect fully and accurately the activities of controlled drivers and vehicles in terms of driving, work, availability and rest periods and in terms of vehicle speed.

Therefore the security objectives of the VU, contributing to the global security objective, are the following:

O.VU_Main The data to be measured and recorded and then to be checked by control authorities must be available and reflect accurately the activities of controlled drivers and vehicles in terms of driving, work, availability and rest periods and in terms of vehicle speed.

O.VU_Export The VU must be able to export data to external storage media in such a way as to allow for verification of their integrity and authenticity.

3.5 Information Technology Security Objectives

The specific IT security objectives of the VU contributing to its main security objectives, are the following:

O.Access The VU must control user access to functions and data.

O.Accountability The VU must collect accurate accountability data.

O.Audit The VU must audit attempts to undermine system security and should trace them to associated users.

O.Authentication The VU should authenticate users and connected entities (when a trusted path needs to be established between entities).

O.Integrity The VU must maintain stored data integrity.

O.Ouput The VU must ensure that data output reflects accurately data measured or stored.

O.Processing The VU must ensure that processing of inputs to derive user data is accurate.

O.Reliability The VU must provide a reliable service.

O.Secured_Data_Exchange The VU must secure data exchanges with the motion sensor and with tachograph cards.

3.6 Physical, personnel or procedural means

This paragraph describes physical, personnel or procedural requirements that contribute to the security of the VU.

3.6.1 Equipment design

M.Development VU developers must ensure that the assignment of responsibilities during development is done in a manner which maintains IT security.

M.Manufacturing VU manufacturers must ensure that the assignment of responsibilities during manufacturing is done in a manner which maintains IT security, and that during the manufacturing process the VU is protected from physical attacks which might compromise IT security.

3.6.2 Equipment delivery and activation

M.Delivery VU manufacturers, vehicle manufacturers and fitters or workshops must ensure that handling of non activated VUs is done in a manner which maintains VU security.

M.Activation Vehicle manufacturers and fitters or workshops must activate the VU after its installation before the vehicle leaves the premises where installation took place.

3.6.3 Security data generation and delivery

M.Sec_Data_Generation Security data generation algorithms must be accessible to authorised and trusted persons only.

M.Sec_Data_Transport Security data must be generated, transported, and inserted into the VU, in such a way to preserve its appropriate confidentiality and integrity.

3.6.4 Cards delivery

M.Card_Availability Tachograph cards must be available and delivered to authorised persons only.

M.Driver_Card_Uniqueness Drivers must possess, at one time, one valid driver card only.

M.Card_Traceability Card delivery must be traceable (white lists, black lists) , and black lists must be used during security audits.

3.6.5 Control device installation, calibration, and inspection

M.Approved_Workshops Installation, calibration and repair of control device must be carried by trusted and approved fitters or workshops.

M.Regular_Inpections Control device must be periodically inspected and calibrated.

M.Faithful_Calibration Approved fitters and workshops must enter proper vehicle parameters in control device during calibration.

3.6.6 Equipment operation

M.Faithful_Drivers Drivers must play by the rules and act responsibly (e.g. use their driver cards, properly select their activity for those that are manually selected, …).

3.6.7 Law enforcement control

M.Controls Law enforcement controls must be performed regularly and randomly, and must include security audits.

3.6.8 Software upgrades

M.Software_Upgrade Software revisions must be granted security certification before they can be implemented in a VU.

4. Security enforcing functions

4.1 Identification and authentication

4.1.1 Motion sensor identification and authentication

UIA_201 The VU shall be able to establish, for every interaction, the identity of the motion sensor it is connected to.

UIA_202 The identity of the motion sensor shall consist of the sensor approval number and the sensor serial number.

UIA_203 The VU shall authenticate the motion sensor it is connected to:

- at motion sensor connection,
- at each calibration of the control device,
- at power supply recovery.

Authentication shall be mutual and triggered by the VU.

UIA_204 The VU shall periodically (*period TBD by manufacturer and more frequently than once per hour*) re-identify and re-authenticate the motion sensor it is connected to, and ensure that the motion sensor identified during the last calibration of the control device has not been changed.

UIA_205 The VU shall detect and prevent use of authentication data that has been copied and replayed.

UIA_206 After (*TBD by manufacturer and not more than 20)* consecutive unsuccessful authentication attempts have been detected, and/or after detecting that the identity of the motion sensor has changed while not authorised (i.e. while not during a calibration of the control device), the SEF shall:

- generate an audit record of the event,
- warn the user,
- continue to accept and use non secured motion data sent by the motion sensor.

4.1.2 User identification and authentication

UIA_207 The VU shall permanently and selectively track the identity of two users, by monitoring the tachograph cards inserted in respectively the driver slot and the co-driver slot of the equipment.

UIA_208 The user identity shall consist of:

- a user group:
  - DRIVER (driver card),
  - CONTROLLER (control card),
  - WORKSHOP (workshop card),
  - COMPANY (company card),
  - UNKNOWN (no card inserted),
- a user ID, composed of :
  - the card issuing Contracting Party code and of the card number,
  - UNKNOWN if user group is UNKNOWN.

UNKNOWN identities may be implicitly or explicitly known.

UIA_209 The VU shall authenticate its users at card insertion.

UIA_210 The VU shall re-authenticate its users:

- at power supply recovery,
- periodically or after occurrence of specific events (*TBD by manufacturers and more frequently than once per day*).

UIA_211 Authentication shall be performed by means of proving that the card inserted is a valid tachograph card, possessing security data that only the system could distribute. Authentication shall be mutual and triggered by the VU.

UIA_212 In addition to the above, workshops shall be required to be successfully authenticated through a PIN check. PINs shall be at least 4 characters long.
Note: In the case the PIN is transferred to the VU from an outside equipment located in the vicinity of the VU, PIN confidentiality need not be protected during the transfer.

UIA_213 The VU shall detect and prevent use of authentication data that has been copied and replayed.

UIA_214 After 5 consecutive unsuccessful authentication attempts have been detected, the SEF shall:

- generate an audit record of the event,
- warn the user,
- assume the user as UNKNOWN, and the card as non valid (definition z) and requirement 007).

4.1.3 Remotely connected company identification and authentication

Company remote connection capability is optional. This paragraph therefore applies only if this feature is implemented.

UIA_215 For every interaction with a remotely connected company, the VU shall be able to establish the company’s identity.

UIA_216 The remotely connected company’s identity shall consist of its company card issuing Contracting Party code and of its company card number.

UIA_217 The VU shall successfully authenticate the remotely connected company before allowing any data export to it.

UIA_218 Authentication shall be performed by means of proving that the company owns a valid company card, possessing security data that only the system could distribute.

UIA_219 The VU shall detect and prevent use of authentication data that has been copied and replayed.

UIA_220 After 5 consecutive unsuccessful authentication attempts have been detected, the VU shall:

- warn the remotely connected company.

4.1.4 Management device identification and authentication

VU manufacturers may foresee dedicated devices for additional VU management functions (e.g. Software upgrading, security data reloading, …). This paragraph therefore applies only if this feature is implemented.

UIA_221 For every interaction with a management device, the VU shall be able to establish the device identity.

UIA_222 Before allowing any further interaction, the VU shall successfully authenticate the management device.

UIA_223 The VU shall detect and prevent use of authentication data that has been copied and replayed.

4.2 Access control

Access controls ensure that information is read from, created in, or modified into the TOE only by those authorised to do so.

It must be noted that the user data recorded by the VU, although presenting privacy or commercial sensitivity aspects, are not of a confidential nature. Therefore, the functional requirement related to data read access rights (requirement 011) is not the subject of a security enforcing function.

4.2.1 Access control policy

ACC_201 The VU shall manage and check access control rights to functions and to data.

4.2.2 Access rights to functions

ACC_202 The VU shall enforce the mode of operation selection rules (requirements 006 to 009).

ACC_203 The VU shall use the mode of operation to enforce the functions access control rules (requirement 010).

4.2.3 Access rights to data

ACC_204 The VU shall enforce the VU identification data write access rules (requirement 076)

ACC_205 The VU shall enforce the paired motion sensor identification data write access rules (requirements 079 and 155)

ACC_206 After the VU activation, the VU shall ensure that only in calibration mode, may calibration data be input into the VU and stored into its data memory (requirements 154 and 156).

ACC_207 After the VU activation, the VU shall enforce calibration data write and delete access rules (requirement 097).

ACC_208 After the VU activation, the VU shall ensure that only in calibration mode, may time adjustment data be input into the VU and stored into its data memory (This requirement does not apply to small time adjustments allowed by requirements 157 and 158).

ACC_209 After the VU activation, the VU shall enforce time adjustment data write and delete access rules (requirement 100).

ACC_210 The VU shall enforce appropriate read and write access rights to security data (requirement 080).

4.2.4 File structure and access conditions

ACC_211 Application and data files structure and access conditions shall be created during the manufacturing process, and then locked from any future modification or deletion.

4.3 Accountability

ACT_201 The VU shall ensure that drivers are accountable for their activities (requirements 081, 084, 087, 105a, 105b, 109 and 109a).

ACT_202 The VU shall hold permanent identification data (requirement 075).

ACT_203 The VU shall ensure that workshops are accountable for their activities (requirements 098, 101 and 109).

ACT_204 The VU shall ensure that controllers are accountable for their activities (requirements 102, 103 and 109).

ACT_205 The VU shall record odometer data (requirement 090) and detailed speed data (requirement 093).

ACT_206 The VU shall ensure that user data related to requirements 081 to 093 and 102 to 105b inclusive are not modified once recorded, except when becoming oldest stored data to be replaced by new data.

ACT_207 The VU shall ensure that it does not modify data already stored in a tachograph card (requirements 109 and 109a) except for replacing oldest data by new data (requirement 110) or in the case described in sub-appendix 1, Paragraph 2.1.Note.

4.4 Audit

Audit capabilities are required only for events that may indicate a manipulation or a security breach attempt. It is not required for the normal exercising of rights even if relevant to security.

AUD_201 The VU shall, for events impairing the security of the VU, record those events with associated data (requirements 094, 096 and 109).

AUD_202 The events affecting the security of the VU are the following:

- Security breach attempts:
  - motion sensor authentication failure,
  - tachograph card authentication failure,
  - unauthorised change of motion sensor,
  - card data input integrity error,
  - stored user data integrity error,
  - internal data transfer error,
  - unauthorised case opening,
  - hardware sabotage,
- Last card session not correctly closed,
- Motion data error event,
- Power supply interruption event,
- VU internal fault,

–

AUD_203 The VU shall enforce audit records storage rules (requirement 094 and 096).

AUD_204 The VU shall store audit records generated by the motion sensor in its data memory.

AUD_205 It shall be possible to print, display and download audit records.

4.5 Object reuse

REU_201 The VU shall ensure that temporary storage objects can be reused without this involving inadmissible information flow.

4.6 Accuracy

4.6.1 Information flow control policy

ACR_201 The VU shall ensure that user data related to requirements 081, 084, 087, 090, 093, 102, 104, 105, 105a and 109 may only be processed from the right input sources:

- vehicle motion data,
- VU's real time clock,
- control device calibration parameters,
- tachograph cards,
- user's inputs.

ACR_201a The VU shall ensure that user data related to requirement 109a may only be entered for the period last card withdrawal – current insertion (requirement 050a).

4.6.2 Internal data transfers

The requirements of this paragraph apply only if the VU makes use of physically separated parts.

ACR_202 If data are transferred between physically separated parts of the VU, the data shall be protected from modification.

ACR_203 Upon detection of a data transfer error during an internal transfer, transmission shall be repeated and the SEF shall generate an audit record of the event.

4.6.3 Stored data integrity

ACR_204 The VU shall check user data stored in the data memory for integrity errors.

ACR_205 Upon detection of a stored user data integrity error, the SEF shall generate an audit record.

4.7 Reliability of service

4.7.1 Tests

RLB_201 All commands, actions or test points, specific to the testing needs of the manufacturing phase of the VU shall be disabled or removed before the VU activation. It shall not be possible to restore them for later use.

RLB_202 The VU shall run self tests, during initial start-up, and during normal operation to verify its correct operation. The VU self tests shall include a verification of the integrity of security data and a verification of the integrity of stored executable code (if not in ROM).

RLB_203 Upon detection of an internal fault during self test, the SEF shall:

- generate an audit record (except in calibration mode) (VU internal fault),
- Preserve the stored data integrity.

4.7.2 Software

RBL_204 There shall be no way to analyse or debug software in the field after the VU activation.

RLB_205 Inputs from external sources shall not be accepted as executable code.

4.7.3 Physical protection

RLB_206 If the VU is designed so that it can be opened, the VU shall detect any case opening, except in calibration mode, even without external power supply for a minimum of 6 months. In such a case, the SEF shall generate an audit record (It is acceptable that the audit record is generated and stored after power supply reconnection).

If the VU is designed so that it cannot be opened, it shall be designed such that physical tampering attempts can be easily detected (e.g. through visual inspection).

RLB_207 After its activation, the VU shall detect specified (*TBD by manufacturer*) hardware sabotage.

RLB_208 In the case described above, the SEF shall generate an audit record and the VU shall: (*TBD by manufacturer*).

4.7.4 Power supply interruptions

RLB_209 The VU shall detect deviations from the specified values of the power supply, including cut-off.

RLB_210 In the case described above, the SEF shall:

- generate an audit record (except in calibration mode),
- preserve the secure state of the VU,
- maintain the security functions, related to components or processes still operational,
- preserve the stored data integrity.

4.7.5 Reset conditions

RLB_211 In case of a power supply interruption, or if a transaction is stopped before completion, or on any other reset conditions, the VU shall be reset cleanly.

4.7.6 Data availability

RLB_212 The VU shall ensure that access to resources is obtained when required and that resources are not requested nor retained unnecessarily.

RLB_213 The VU must ensure that cards cannot be released before relevant data have been stored to them (requirements 015 and 016)

RLB_214 In the case described above, the SEF shall generate an audit record of the event.

4.7.7 Multiple applications

RLB_215 If the VU provides applications other than the tachograph application, all applications shall be physically and/or logically separated from each other. These applications shall not share security data. Only one task shall be active at a time.

4.8 Data exchange

This paragraph addresses data exchange between the VU and connected devices.

4.8.1 Data exchange with motion sensor

DEX_201 The VU shall verify the integrity and authenticity of motion data imported from the motion sensor

DEX_202 Upon detection of a motion data integrity or authenticity error, the SEF shall:

- generate an audit record,
- continue to use imported data.

4.8.2 Data exchange with tachograph cards

DEX_203 The VU shall verify the integrity and authenticity of data imported from tachograph cards.

DEX_204 Upon detection of card data integrity or authenticity error, the VU shall:

- generate an audit record,
- not use the data.

DEX_205 The VU shall export data to tachograph smart cards with associated security attributes such that the card will be able to verify its integrity and authenticity.

4.8.3 Data exchange with external storage media (downloading function))

DEX_206 The VU shall generate an evidence of origin for data downloaded to external media.

DEX_207 The VU shall provide a capability to verify the evidence of origin of downloaded data to the recipient.

DEX_208 The VU shall download data to external storage media with associated security attributes such that downloaded data integrity and authenticity can be verified.

4.9 Cryptographic support

The requirements of this paragraph are applicable only where needed, depending upon security mechanisms used and upon the manufacturer’s solutions.

CSP_201 Any cryptographic operation performed by the VU shall be in accordance with a specified algorithm and a specified key size.

CSP_202 If the VU generates cryptographic keys, it shall be in accordance with specified cryptographic key generation algorithms and specified cryptographic key sizes.

CSP_203 If the VU distributes cryptographic keys, it shall be in accordance with specified key distribution methods.

CSP_204 If the VU accesses cryptographic keys, it shall be in accordance with specified cryptographic keys access methods.

CSP_205 If the VU destroys cryptographic keys, it shall be in accordance with specified cryptographic keys destruction methods.

5. Definition of security mechanisms

Required security mechanisms are specified in sub-appendix 11.

All other security mechanisms are to be defined by manufacturers.

6. Minimum strength of security mechanisms

The minimum strength of the Vehicle Unit security mechanisms is **High**, as defined in [ITSEC].

7. Level of assurance

The target level of assurance for the Vehicle Unit is ITSEC level **E3**, as defined in [ITSEC].

8. Rationale

The following matrixes give a rationale for the SEFs by showing:

- which SEFs or means counteract which threats,
- which SEFs fulfil which IT security objectives.

	Threats																			**IT Objectives**								
	Access	**Identification**	**Faults**	**Tests**	**Design**	**Calibration_Parameters**	**Card_Data_Exchange**	**Clock**	**Environment**	**Fake_Devices**	**Hardware**	**Motion_Data**	**Non_Activated**	**Output_Data**	**Power_Supply**	**(intentionally left blank)**	**Security_Data**	**Software**	**Stored_Data**	**Access**	**Accountability**	**Audit**	**Authentication**	**Integrity**	**Output**	**Processing**	**Reliability**	**Secured_Data_Exchange**
Physical Personnel Procedural Means																												
Development			x	x	x																							
Manufacturing				x	x																							
Delivery													x															
Activation	x												x															
Security Data Generation																	x											
Security Data Transport																	x											
Card Availability		x																										
One Driver Card		x																										
Card Traceability		x																										
Approved Workshops						x		x																				
Regular Inspection Calibration						x		x			x				x			x										

	Threats																		IT Objectives								
	Access	Identification	Faults	Tests	Design	Calibration_Parameters	Card_Data_Exchange	Clock	Environment	Fake_Devices	Hardware	Motion_Data	Non_Activated	Output_Data	Power_Supply	(intentionally left blank)	Security_Data	Software	Stored_Data	Access	Accountability	Audit	Authentication	Integrity	Output	Processing	Reliability	Secured_Data_Exchange
Faithful workshops						x		x																				
Faithful drivers		x																										
Law enforcement controls		x				x		x	x		x		x		x		x	x										
Software Upgrade																		x										
Security Enforcing Functions																												
Identification and Authentication																												
UIA_201 Sensor identification										x		x											x					x
UIA_202 Sensor identity										x		x											x					
UIA_203 Sensor authentication										x		x											x					x
UIA_204 Sensor re-identification and re-authentication										x		x											x					x
UIA_205 Unforgeable authentication										x		x											x					
UIA_206 Authentication failure										x		x										x					x	
UIA_207 Users identification	x	x								x										x			x					x
UIA_208 User identity	x	x								x										x			x					
UIA_209 User authentication	x	x								x										x			x					x
UIA_210 User re-authentication	x	x								x										x			x					x
UIA_211 Authentication means	x	x								x										x			x					
UIA_212 PIN checks	x	x				x		x												x			x					
UIA_213 Unforgeable authentication	x	x								x										x			x					
UIA_214 Authentication failure	x	x								x												x						
UIA_215 Remote user identification	x	x																		x			x					x
UIA_216 Remote user identity	x	x																		x			x					

		Threats																			IT Objectives								
		Access	Identification	Faults	Tests	Design	Calibration_Parameters	Card_Data_Exchange	Clock	Environment	Fake_Devices	Hardware	Motion_Data	Non_Activated	Output_Data	Power_Supply	(intentionally left blank)	Security_Data	Software	Stored_Data	Access	Accountability	Audit	Authentication	Integrity	Output	Processing	Reliability	Secured_Data_Exchange
UIA_217	Remote user authentication	x	x																		x			x					x
UIA_218	Authentication means	x	x																		x			x					
UIA_219	Unforgeable authentication	x	x																		x			x					
UIA_220	Authentication failure	x	x																										
UIA_221	Management device Identification	x	x																		x			x					
UIA_222	Management device Authentication	x	x																		x			x					
UIA_223	Unforgeable authentication	x	x																		x			x					
Access Control																													
ACC_201	Access control policy	x					x		x									x		x	x								
ACC_202	Access rights to functions	x					x		x												x								
ACC_203	Access rights to functions	x					x		x												x								
ACC_204	VU ID																			x	x								
ACC_205	Connected sensor ID										x									x	x								
ACC_206	Calibration data	x					x													x	x								
ACC_207	Calibration data						x													x	x								
ACC_208	Time adjustment data								x											x	x								
ACC_209	Time adjustment data								x											x	x								
ACC_210	Security Data																	x		x	x								

		Threats																			IT Objectives								
		Access	Identification	Faults	Tests	Design	Calibration_Parameters	Card_Data_Exchange	Clock	Environment	Fake_Devices	Hardware	Motion_Data	Non_Activated	Output_Data	Power_Supply	(intentionally left blank)	Security_Data	Software	Stored_Data	Access	Accountability	Audit	Authentication	Integrity	Output	Processing	Reliability	Secured_Data_Exchange
ACC_211	File structure and access conditions	x					x											x		x	x								
Accountability																													
ACT_201	Drivers accountability																					x							
ACT_202	VU ID data																					x	x						
ACT_203	Workshops accountability																					x							
ACT_204	Controllers accountability																					x							
ACT_205	Vehicle movement accountability																					x							
ACT_206	Accountability data modification																			x					x			x	
ACT_207	Accountability data modification																			x					x			x	
Audit																													
AUD_201	Audit records																						x						
AUD_202	Audit events list	x						x				x	x		x	x				x			x						
AUD_203	Audit records storage rules																						x						
AUD_204	Sensor audit records																						x						
AUD_205	Audit tools																						x						
Reuse																													
REU_201	Reuse																	x									x	x	

		Threats																			IT Objectives								
		Access	Identification	Faults	Tests	Design	Calibration_Parameters	Card_Data_Exchange	Clock	Environment	Fake_Devices	Hardware	Motion_Data	Non_Activated	Output_Data	Power_Supply	(intentionally left blank)	Security_Data	Software	Stored_Data	Access	Accountability	Audit	Authentication	Integrity	Output	Processing	Reliability	Secured_Data_Exchange
Accuracy																													
ACR_201	Information flow control policy							x			x		x														x	x	
ACR_202	Internal transfers														x											x	x	x	
ACR_203	Internal transfers														x								x						
ACR_204	Stored data integrity																			x					x			x	
ACR_205	Stored data integrity																			x			x						
Reliability																													
RLB_201	Manufacturing tests				x	x																						x	
RLB_202	Self tests			x								x				x			x									x	
RLB_203	Self tests											x				x			x				x						
RLB_204	Software analysis					x													x									x	
RLB_205	Software input																		x							x	x	x	
RLB_206	Case opening					x				x		x			x			x	x	x						x		x	
RLB_207	Hardware sabotage											x																x	
RLB_208	Hardware sabotage											x											x						
RLB_209	Power supply interruptions															x												x	
RLB_210	Power supply interruptions															x							x						
RLB_211	Reset			x																								x	
RLB_212	Data Availability																										x	x	
RLB_213	Card release																											x	
RLB_214	card session not correctly closed																						x						

	Threats																			IT Objectives								
	Access	Identification	Faults	Tests	Design	Calibration_Parameters	Card_Data_Exchange	Clock	Environment	Fake_Devices	Hardware	Motion_Data	Non_Activated	Output_Data	Power_Supply	(intentionally left blank)	Security_Data	Software	Stored_Data	Access	Accountability	Audit	Authentication	Integrity	Output	Processing	Reliability	Secured_Data_Exchange
RLB_215 Multiple Applications																											x	
Data exchange																												
DEX_201 Secured motion data import												x																x
DEX_202 Secured motion data import												x										x						
DEX_203 Secured card data import							x																					x
DEX_204 Secured card data import							x															x						
DEX_205 Secured data export to cards							x																					x
DEX_206 Evidence of origin														x											x			
DEX_207 Evidence of origin														x											x			
DEX_208 Secured export to external media														x											x			
Cryptographic support																												
CSP_201 Algorithms																											x	x
CSP_202 key generation																											x	x
CSP_203 key distribution																											x	x
CSP_204 key access																											x	x
CSP_205 key destruction																											x	x

TACHOGRAPH CARD GENERIC SECURITY TARGET

1. Introduction

This document contains a description of the tachograph card, of the threats it must be able to counteract and of the security objectives it must achieve. It specifies the required security enforcing functions. It states the claimed minimum strength of security mechanisms, and the required level of assurance for the development and the evaluation.

Requirements referred to in the document, are those of the body of Appendix 1B. For clarity of reading, duplication sometimes arises between Appendix 1B body requirements and security target requirements. In case of ambiguity between a security target requirement and the Appendix 1B requirement referred by this security target requirement, the Appendix 1B body requirement shall prevail.

Appendix 1B body requirements not referred by security targets are not the subject of security enforcing functions.

A tachograph card is a standard smart card carrying a dedicated tachograph application, and shall comply to up-to-date functional and assurance security requirements applicable to smart cards. This security target therefore incorporates only the extra security requirements needed by the tachograph application.

Unique labels have been assigned to threats, objectives, procedural means and SEF specifications for the purpose of traceability to development and evaluation documentation.

2. Abbreviations, definitions and references

2.1 Abbreviations

IC	Integrated Circuit (Electronic component designed to perform processing and/or memory functions),
OS	Operating system**,**
PIN	Personal Identification Number,
ROM	Read Only Memory,
SFP	Security Functions Policy,
TBD	To Be Defined,
TOE	Target of Evaluation,
TSF	TOE Security Function,
VU	Vehicle Unit.

2.2 Definitions

Digital tachograph Control device.

Sensitive data Data stored by the tachograph card that need to be protected for integrity, unauthorised modification and confidentiality (where applicable for security data). Sensitive data includes security data and user data.

Security data — The specific data needed to support security enforcing functions (e.g. crypto keys).

System — Equipment, people or organisations involved in any way with the control device.

User — Any entity (human user or external IT entity) outside the TOE that interacts with the TOE (when not used in the expression “user data”).

User data — Sensitive data stored in the tachograph card, other than security data. User data include identification data and activity data.

Identification data — Identification data include card identification data and cardholder identification data.

Card identification data — User data related to card identification as defined by requirements 190, 191, 192, 194, 215, 231 and 235.

Cardholder identification data — User data related to cardholder identification as defined by requirements 195, 196, 216, 232 and 236.

Activity data — Activity data include cardholder activities data, events and faults data and control activity data.

Cardholder activities data — User data related to the activities carried by the cardholder as defined by requirements 197, 199, 202, 212, 212a, 217, 219, 221, 226, 227, 229, 230a, 233 and 237.

Events and faults data — User data related to events or faults as defined by requirements 204, 205, 207, 208 and 223.

Control activity data — User data related to law enforcement controls as defined by requirements 210 and 225.

2.3 References

ITSEC — ITSEC Information Technology Security Evaluation Criteria 1991.

IC PP — Smartcard Integrated Circuit Protection Profile - version 2.0 - issue September 1998. Registered at French certification body under the number PP/9806.

ES PP — Smart Card Integrated Circuit With Embedded Software Protection Profile - version 2.0 - issue June 99. Registered at French certification body under the number PP/9911.

3. Product Rationale

3.1 Tachograph card description and method of use

A tachograph card is a smart card, as described in [IC PP] and [ES PP], carrying an application intended for its use with the control device.

The basic functions of the tachograph card are:

- to store card identification and card holder identification data. These data are used by the vehicle unit to identify the cardholder, provide accordingly functions and data access rights, and ensure cardholder accountability for his activities,
- to store cardholder activities data, events and faults data and control activities data, related to the cardholder.

A tachograph card is therefore intended to be used by a card interface device of a vehicle unit. It may also be used by any card reader (e.g. of a personal computer) which shall have full read access right on any user data.

During the end-usage phase of a tachograph card life-cycle (phase 7 of life-cycle as described in [ES PP]), vehicle units only may write user data to the card.

The functional requirements for a tachograph card are specified in Appendix 1B body text and sub-appendix 2.

3.2 Tachograph card life-cycle

The tachograph card life-cycle conforms to smart card life cycle described in [ES PP].

3.3 Threats

In addition to the smart card general threats listed in [ES PP] and [IC PP], the tachograph card may face the following threats:

3.3.1 Final aims

The final aim of attackers will be to modify user data stored within the TOE.

T.Ident_Data A successful modification of identification data held by the TOE (e.g. the type of card, or the card expiry date or the cardholder identification data) would allow a fraudulent use of the TOE and would be a major threat to the global security objective of the system.

T.Activity_Data A successful modification of activity data stored in the TOE would be a threat to the security of the TOE.

T.Data_exchange A successful modification of activity data (addition, deletion, modification) during import or export would be a threat to the security of the TOE.

3.3.2 Attack paths

TOE’s assets may be attacked by:

- trying to gain illicit knowledge of TOE’s hardware and software design and especially of its security functions or security data. Illicit knowledge may be gained though attacks to designer or manufacturer material (theft, bribery, …) or through direct examination of the TOE (physical probing, inference analysis, …).
- taking advantage of weaknesses in TOE design or realisation (exploit errors in hardware, errors in software, transmission faults, errors induced in TOE by environmental stress, exploit weaknesses of security functions such as authentication procedures, data access control, cryptographic operations,…).
- modifying the TOE or its security functions through physical, electrical or logical attacks or combination of these.

3.4 Security Objectives

The main security objective of the entire digital tachograph system is the following:

O.Main The data to be checked by control authorities must be available and reflect fully and accurately the activity of controlled drivers and vehicles in terms of driving, work, availability and rest period and in terms of vehicle speed.

Therefore the main security objectives of the TOE, contributing to this global security objective are the following :

O.Card_Identification_Data The TOE must preserve card identification data and cardholder identification data stored during card personalisation process.

O.Card_Activity_Storage The TOE must preserve user data stored in the card by vehicle units.

3.5 Information Technology security objectives

In addition to the smart card general security objectives listed in [ES PP] and [IC PP], the specific IT security objectives of the TOE that contributes to its main security objectives during its end-usage life-cycle phase are the following:

O.Data_Access The TOE must limit user data write access rights to authenticated vehicle units.

O.Secure_Communications The TOE must be able to support secure communication protocols and procedures between the card and the card interface device when required by the application.

3.6 Physical, personnel or procedural means

The physical, personnel or procedural requirements that contribute to the security of the TOE are listed in [ES PP] and [IC PP] (chapters security objectives for the environment).

4. Security enforcing functions

This paragraph refines some of the permitted operations such as assignment or selection of [ES PP] and provides additional SEF functional requirements.

4.1 Compliance to protection profiles

CPP_301 The TOE shall comply with [IC PP].

CPP_302 The TOE shall comply with [ES PP] as refined further.

4.2 User Identification and authentication

The card must identify the entity in which it is inserted and know whether it is an authenticated vehicle unit or not. The card may export any user data whatever the entity it is connected to, except the control card and company card which may export card holder identification data to authenticated vehicle units only (such that a controller is ensured that the vehicle unit is not a fake one by seeing his name on display or printouts).

4.2.1 User identification

Assignment (FIA_UID.1.1) *List of TSF mediated actions*: none.

Assignment (FIA_ATD.1.1) *List of security attributes*:

- **USER_GROUP**: VEHICLE_UNIT, NON_VEHICLE_UNIT,
- **USER_ID:** Vehicle Registration Number (VRN) and registering Contracting Party Code (USER_ID is known for USER_GROUP = VEHICLE_UNIT only).

4.2.2 User authentication

Assignment (FIA_UAU.1.1) *List of TSF mediated actions*:

- Driver and Workshop cards: Export user data with security attributes (card data download function),
- Control card: Export user data without security attributes except cardholder identification data.

UIA_301 Authentication of a vehicle unit shall be performed by means of proving that it possesses security data that only the system could distribute.

Selection (FIA_UAU.3.1 and FIA_UAU.3.2): prevent.

Assignment (FIA_UAU.4.1) *Identified authentication mechanism(s)*: any authentication mechanism.

UIA_302 The Workshop card shall provide an additional authentication mechanism by checking a PIN code (This mechanism is intended for the Vehicle Unit to ensure the identity of the card holder, it is not intended to protect Workshop card content).

4.2.3 Authentication failures

The following assignments describe the card reaction for each single user authentication failure.

Assignment (FIA_AFL.1.1) *Number*: 1, *list of authentication events*: authentication of a card interface device.

Assignment (FIA_AFL.1.2) *List of actions*:

- warn the entity connected,
- assume the user as NON_VEHICLE_UNIT.

Additionally the following assignments describe the card reaction in the case of failure of the additional authentication mechanism required in UIA_302.

Assignment (FIA_AFL.1.1) *Number*: 5, *list of authentication events*: PIN checks (workshop card).

Assignment (FIA_AFL.1.2) *List of actions*:

- warn the entity connected,
- block the PIN check procedure such that any subsequent PIN check attempt will fail,
- be able to indicate to subsequent users the reason of the blocking.

4.3 Access control

4.3.1 Access control policy

During end-usage phase of its life-cycle, the tachograph card is the subject of one single access control Security Function Policy (SFP) named AC_SFP.

Assignment (FDP_ACC.2.1) *Access control SFP*: AC_SFP.

4.3.2 Access control functions

Assignment (FDP_ACF.1.1) *Access control SFP*: AC_SFP.

Assignment (FDP_ACF.1.1) *Named group of security attributes*: USER_GROUP.

Assignment (FDP_ACF.1.2) *Rules governing access among controlled subjects and controlled objects using controlled operations on controlled objects*:

- GENERAL_READ: User data may be read from the TOE by any user, except cardholder identification data which may be read from control card and company card by VEHICLE_UNIT only.
- IDENTIF_WRITE: Identification data may only be written once and before the end of phase 6 of card's life-cycle. No user may write or modify identification data during end-usage phase of card's life-cycle.
- ACTIVITY_WRITE: Activity data may be written to the TOE by VEHICLE_UNIT only.
- SOFT_UPGRADE: No user may upgrade TOE's software.
- FILE_STRUCTURE: Files structure and access conditions shall be created before end of phase 6 of TOE's life-cycle and then locked from any future modification or deletion by any user.

4.4 Accountability

ACT_301 The TOE shall hold permanent identification data.

ACT_302 There shall be an indication of the time and date of the TOE's personalisation. This indication shall remain unalterable.

4.5 Audit

The TOE must monitor events that indicate a potential violation of its security.

Assignment (FAU_SAA.1.2) *Subset of defined auditable events*:

- cardholder authentication failure (5 consecutive unsuccessful PIN checks),
- self test error,
- stored data integrity error,
- activity data input integrity error.

4.6 Accuracy

4.6.1 Stored Data Integrity

Assignment (FDP_SDI.2.2) *Actions to be taken*: warn the entity connected,

4.6.2 Basic data authentication

Assignment (FDP_DAU.1.1) *List of objects or information types*: Activity data.

Assignment (FDP_DAU.1.2) *List of subjects*: Any.

4.7 Reliability of service

4.7.1 Tests

Selection (FPT_TST.1.1): during initial start-up, periodically during normal operation.

Note: during initial start-up means before code is executed (and not necessarily during Answer To Reset procedure).

RLB_301 The TOE's self tests shall include the verification of the integrity of any software code not stored in ROM.

RLB_302 Upon detection of a self test error the TSF shall warn the entity connected.

RLB_303 After OS testing is completed, all testing-specific commands and actions shall be disabled or removed. It shall not be possible to override these controls and restore them for use. Command associated exclusively with one life cycle state shall never be accessed during another state.

4.7.2 Software

RLB_304 There shall be no way to analyse, debug or modify TOE's software in the field.

RLB_305 Inputs from external sources shall not be accepted as executable code.

4.7.3 Power supply

RLB_306 The TOE shall preserve a secure state during power supply cut-off or variations.

4.7.4 Reset conditions

RLB_307 If power is cut (or if power variations occur) from the TOE, or if a transaction is stopped before completion, or on any other reset conditions, the TOE shall be reset cleanly.

4.8 Data exchange

4.8.1 Data exchange with a vehicle unit

DEX_301 The TOE shall verify the integrity and authenticity of data imported from a vehicle unit.

DEX_302 Upon detection of an imported data integrity error, the TOE shall:

- Warn the entity sending the data,
- not use the data.

DEX_303 The TOE shall export user data to the vehicle unit with associated security attributes, such that the vehicle unit will be able to verify the integrity and authenticity of data received.

4.8.2 Export of data to a non - vehicle unit (download function)

DEX_304 The TOE shall be able to generate an evidence of origin for data downloaded to external media.

DEX_305 The TOE shall be able to provide a capability to verify the evidence of origin of downloaded data to the recipient.

DEX_306 The TOE shall be able to download data to external storage media with associated security attributes such that downloaded data integrity can be verified.

4.9 Cryptographic Support

CSP_301 If the TSF generates cryptographic keys, it shall be in accordance with specified cryptographic key generation algorithms and specified cryptographic key sizes. Generated cryptographic session keys shall have a limited *(TBD by manufacturer and not more than 240*) number of possible use.

CSP_302 If the TSF distributes cryptographic keys, it shall be in accordance with specified cryptographic key distribution methods.

5. Definition of Security Mechanisms

Required security mechanisms are specified in sub-appendix 11.

All other security mechanisms are to be defined by the TOE manufacturer.

6. Claimed Minimum Strength of Mechanisms

The minimum strength of mechanisms for the Tachograph Card is **High** as defined in [ITSEC].

7. Level of Assurance

The target level of assurance for the Tachograph Card is ITSEC level **E3**, as defined in [ITSEC].

8. Rationale

The following matrixes give a rationale for the additional SEFs by showing:

- which SEFs counteract which threats,
- which SEFs fulfil which IT security objectives.

	Threats											IT Objectives								
	T.CLON*	T.DIS_ES2	T.T_ES	T.T_CMD	T.MOD_SOFT*	T.MOD_LOAD	T.MOD_EXE	T.MOD_SHARE	Ident_Data	Activity_Data	Data_Exchange	O.TAMPER_ES	O.CLON*	O.OPERATE*	O.FLAW*	O.DIS_MECHANISM2	O.DIS_MEMORY*	O.MOD_MEMORY*	Data_Access	Secured_Communications
UIA_301 Authentication means																			x	
UIA_302 PIN checks																			x	
ACT_301 Identification data																				
ACT_302 Personalisation date																				
RLB_301 Software integrity												x		x						
RLB_302 Self tests												x		x						
RLB_303 Manufacturing tests					x	x						x		x						
RLB_304 Software analysis					x		x	x				x		x						
RLB_305 Software input					x	x		x				x		x						
RLB_306 Power supply									x	x		x		x						
RLB_307 Reset												x		x						
DEX_301 Secured data import											x									x
DEX_302 Secured data import											x									x
DEX_303 Secured data export to VU											x									x
DEX_304 Evidence of origin											x									x
DEX_305 Evidence of origin											x									x
DEX_306 Secured export to external media											x									x
CSP_301 key generation												x								x
CSP_302 key distribution												x								x

SUB-APPENDIX XI

COMMON SECURITY MECHANISMS

CONTENTS

PAGE

1. Generalities

This sub-appendix specifies the security mechanisms ensuring:

- The mutual authentication between VUs and tachograph cards, including session key agreement,
- The confidentiality, integrity and authentication of data transferred between VUs and tachograph cards,
- The integrity and authentication of data downloaded from VUs to external storage media,
- The integrity and authentication of data downloaded from tachograph cards to external storage media.

1.1 References

The following references are used in this sub-appendix:

SHA-1	National Institute of Standards and Technology (NIST). *FIPS Publication 180-1 : Secure Hash Standard*. April 1995.
PKCS1	RSA Laboratories. PKCS # 1 : *RSA Encryption Standard*. Version 2.0. October 1998.
TDES	National Institute of Standards and Technology (NIST). *FIPS Publication 46-3 : Data Encryption Standard*. Draft 1999.
TDES-OP	ANSI X9.52, Triple Data Encryption Algorithm Modes of Operation. 1998.
ISO/IEC 7816-4	Information Technology – Identification cards – Integrated circuit(s) cards with contacts – Part 4: Interindustry commands for interexchange. First edition: 1995 + Amendment 1: 1997.
ISO/IEC 7816-6	Information Technology – Identification cards – Integrated circuit(s) cards with contacts – Part 6: Interindustry data elements. First edition: 1996 + Cor 1: 1998.
ISO/IEC 7816-8	Information Technology – Identification cards – Integrated circuit(s) cards with contacts – Part 8: Security related interindustry commands. First edition 1999.
ISO/IEC 9796-2	Information Technology – Security techniques – Digital signature schemes giving message recovery – Part 2: Mechanisms using a hash function. First edition: 1997.
ISO/IEC 9798-3	Information Technology – Security techniques – Entity authentication mechanisms – Part 3: Entity authentication using a public key algorithm. Second edition 1998.
ISO 16844-3	Road vehicles – Tachograph systems – Part 3: Motion sensor interface.

1.2 Notations and abbreviated terms

The following notations and abbreviated terms are used in this sub-appendix:

(K_a, K_b, K_c)	a key bundle for use by the Triple Data Encryption Algorithm,
CA	Certification Authority,
CAR	Certification Authority Reference,
CC	Cryptographic Checksum,
CG	Cryptogram,
CH	Command Header,
CHA	Certificate Holder Authorisation,
CHR	Certificate Holder Reference,
D()	Decryption with DES,
DE	Data Element,
DO	Data Object,
d	RSA private key, private exponent,
e	RSA public key, public exponent,
E()	Encryption with DES,
EQT	Equipment,
Hash()	hash value, an output of *Hash*,
Hash	hash function,
KID	Key Identifier,
Km	TDES key. Master Key defined in ISO 16844-3.
Km_{VU}	TDES key inserted in vehicle units.
Km_{WC}	TDES key inserted in workshop cards.
m	message representative, an integer between 0 and *n*-1,
n	RSA keys, modulus,
PB	Padding Bytes,
PI	Padding Indicator byte (for use in Cryptogram for confidentiality DO),
PV	Plain Value,
s	signature representative, an integer between 0 and *n*-1,
SSC	Send Sequence Counter,
SM	Secure Messaging,
TCBC	TDEA Cipher Block Chaining Mode of Operation
TDEA	Triple Data Encryption Algorithm,
TLV	Tag Length Value,
VU	Vehicle Unit,
X.C	the certificate of user X issued by a certification authority,
X.CA	a certification authority of user X,

X.CA.PK o X.C	the operation of unwrapping a certificate to extract a public key. It is an infix operator, whose left operand is the public key of a certification authority, and whose right operand is the certificate issued by that certification authority. The outcome is the public key of the user X whose certificate is the right operand,
X.PK	RSA public key of a user X,
X.PK[I]	RSA encipherment of some information I, using the public key of user X,
X.SK	RSA private key of a user X,
X.SK[I]	RSA encipherment of some information I, using the private key of user X,
‘xx’	an Hexadecimal value,
||	concatenation operator.

2. Cryptographic systems and algorithms

2.1 Cryptographic systems

CSM_001 Vehicle units and tachograph cards shall use a classical RSA public-key cryptographic system to provide the following security mechanisms:

- authentication between vehicle units and cards,
- transport of Triple-DES session keys between vehicle units and tachograph cards,
- digital signature of data downloaded from vehicle units or tachograph cards to external media.

CSM_002 Vehicle units and tachograph cards shall use a Triple DES symmetric cryptographic system to provide a mechanism for data integrity during user data exchange between vehicle units and tachograph cards, and to provide, where applicable, confidentiality of data exchange between vehicle units and tachograph cards.

2.2 Cryptographic algorithms

2.2.1 RSA algorithm

CSM_003 The RSA algorithm is fully defined by the following relations:

$$\mathrm{X.SK}[m] = s = m^{d} \bmod n$$

$$\mathrm{X.PK}[s] = m = s^{e} \bmod n$$

A more comprehensive description of the RSA function can be found in reference [PKCS1].

Public exponent, e, for RSA calculations is an integer between 3 and n-1 satisfying gcd(e, lcm(p-1, q-1)) =1.

2.2.2 Hash algorithm

CSM_004 The digital signature mechanisms shall use the SHA-1 hash algorithm as defined in reference [SHA-1].

2.2.3 Data Encryption Algorithm

CSM_005 DES based algorithms shall be used in Cipher Block Chaining mode of operation.

3. Keys and certificates

3.1 Keys generation and distribution

3.1.1 RSA Keys generation and distribution

CSM_006 RSA keys shall be generated through three functional hierarchical levels:

- European level,
- Contracting Party level,
- Equipment level.

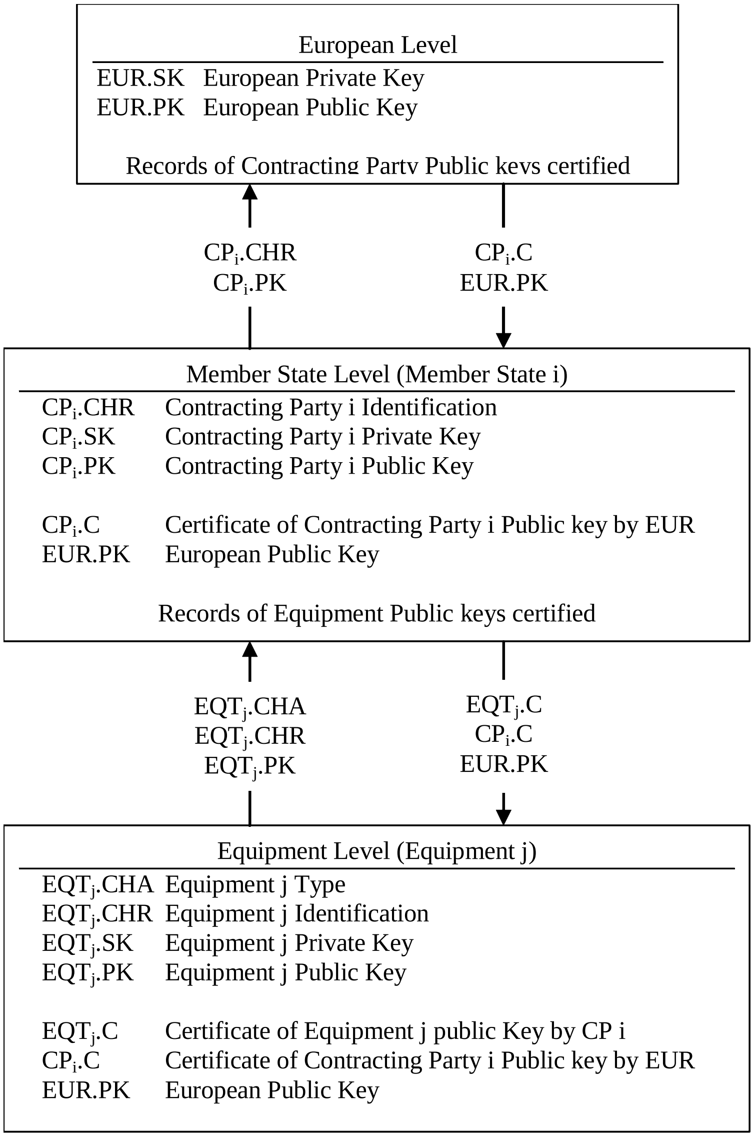
CSM_007 At European level, a single European key pair (EUR.SK and EUR.PK) shall be generated. The European private key shall be used to certify the Contracting Parties public keys. Records of all certified keys shall be kept. These tasks shall be handled by a European Certification Authority recognized at the international level.

CSM_008 At Contracting Party level, a Contracting Party key pair (CP.SK and CP.PK) shall be generated. Contracting Parties public keys shall be certified by the European Certification Authority. The Contracting Party private key shall be used to certify public keys to be inserted in equipment (vehicle unit or tachograph card). Records of all certified public keys shall be kept with the identification of the equipment to which it is intended. These tasks shall be handled by a Contracting Party Certification Authority. A Contracting Party may regularly change its key pair.

CSM_009 At equipment level, one single key pair (EQT.SK and EQT.PK) shall be generated and inserted in each equipment. Equipment public keys shall be certified by a Contracting Party Certification Authority. These tasks may be handled by equipment manufacturers, equipment personalisers or Contracting Party authorities. This key pair is used for authentication, digital signature and encipherement services

CSM_010 Private keys confidentiality shall be maintained during generation, transport (if any) and storage.

The following picture summarises the data flow of this process:


European Level
EUR.SK European Private Key
EUR.PK European Public Key
Records of Contracting Partv Public kevs certified
CP_i.CHR
CP_i.PK
CP_i.C
EUR.PK
Member State Level (Member State i)
CP_i.CHR Contracting Party i Identification
CP_i.SK Contracting Party i Private Key
CP_i.PK Contracting Party i Public Key
CP_i.C Certificate of Contracting Party i Public key by EUR
EUR.PK European Public Key
Records of Equipment Public keys certified
EQT_j.CHA
EQT_j.CHR
EQT_j.PK
EQT_j.C
CP_i.C
EUR.PK
Equipment Level (Equipment j)
EQT_j.CHA Equipment j Type
EQT_j.CHR Equipment j Identification
EQT_j.SK Equipment j Private Key
EQT_j.PK Equipment j Public Key
EQT_j.C Certificate of Equipment j public Key by CP i
CP_i.C Certificate of Contracting Party i Public key by EUR
EUR.PK European Public Key

3.1.2 RSA Test keys

CSM_011 For the purpose of equipment testing (including interoperability tests) the European Certification Authority shall generate a different single European test key pair and at least two Contracting Party test key pairs, the public keys of which shall be certified with the European private test key. Manufacturers shall insert, in equipment undergoing type approval tests, test keys certified by one of these Contracting Party test keys.

3.1.3 Motion sensor keys

The confidentiality of the three TDES keys described below shall be appropriately maintained during generation, transport (if any) and storage.

In order to support control device compliant with ISO 16844, the European Certification Authority and the Contracting Party Certification Authorities shall, in addition, ensure the following:

CSM_036 The European Certification Authority shall generate Km_{VU} and Km_{WC}, two independent and unique Triple DES keys, and generate Km as :

$$\boxed{Km = Km_{VU} \text{ XOR } Km_{WC}}$$

The European Certification Authority shall forward these keys, under appropriately secured procedures, to Contracting Party Certification Authorities at their request.

CSM_037 Contracting Party Certification Authorities shall:

- use Km to encrypt motion sensor data requested by motion sensor manufacturers (data to be encrypted with Km is defined in ISO 16844-3),
- forward Km_{VU} to vehicle unit manufacturers, under appropriately secured procedures, for insertion in vehicle units,
- ensure that Km_{WC} will be inserted in all workshop cards (SensorInstallationSecData in Sensor_Installation_Data elementary file) during card personalisation.

3.1.4 T-DES session keys generation and distribution

CSM_012 Vehicle units and tachograph cards shall, as a part of the mutual authentication process, generate and exchange necessary data to elaborate a common Triple DES session key. This exchange of data shall be protected for confidentiality through an RSA crypt-mechanism.

CSM_013 This key shall be used for all subsequent cryptographic operations using secure messaging. Its validity shall expire at the end of the session (withdrawal of the card or reset of the card) and/or after 240 use (one use of the key = one command using secure messaging sent to the card and associated response).

3.2 Keys

CSM_014 RSA keys shall have (whatever the level) the following lengths: modulus *n* 1024 bits, public exponent *e* 64 bits maximum, private exponent *d* 1024 bits.

CSM_015 Triple DES keys shall have the form (K_a, K_b, K_a) where K_a and K_b are independent 64 bits long keys. No parity error detecting bits shall be set.

3.3 Certificates

CSM_016 RSA Public key certificates shall be “non self-descriptive” “Card Verifiable” certificates (Ref.: ISO/IEC 7816-8)

3.3.1 Certificates content

CSM_017 RSA Public key certificates are built with the following data in the following order :

Data	Format	Bytes	Observations
CPI	INTEGER	1	Certificate Profile Identifier (‘01’ for this version)
CAR	OCTET STRING	8	Certification Authority Reference
CHA	OCTET STRING	**7**	Certificate Holder Authorisation
EOV	TimeReal	4	Certificate end of validity. Optional, “FF” padded if not used.
CHR	OCTET STRING	8	Certificate Holder Reference
n	OCTET STRING	128	Public key (modulus)
e	OCTET STRING	8	Public Key (public exponent)
		164	

Notes:

1. The “Certificate Profile Identifier” (CPI) delineates the exact structure of an authentication certificate. It can be used as an equipment internal identifier of a relevant headerlist which describes the concatenation of Data Elements within the certificate.

   The headerlist associated with this certificate content is as follows:

‘4D’	‘16’	‘5F 29’	‘01’	‘42’	‘08’	‘5F 4B’	‘07’	‘5F 24’	‘04’	‘5F 20’	‘08’	‘7F 49’	‘05’	‘81’	’81 80’	‘82’	‘08’
Extended Headerlist Tag	Length of header list	CPI Tag	CPI Length	CAR Tag	CAR Length	CHA Tag	CHA Length	EOV Tag	EOV Length	CHR Tag	CHR Length	Public Key Tag (Constructed)	Length of subsequent DOs	modulus Tag	modulus length	public exponent Tag	Public exponent length

2. The “Certification Authority Reference” (CAR) has the purpose of identifying the certificate issuing CA, in such a way that the Data Element can be used at the same time as an Authority Key Identifier to reference the Public Key of the Certification Authority (for coding, see Key Identifier below).

3. The “Certificate Holder Authorisation” (CHA) is used to identify the rights of the certificate holder. It consists of the Tachograph Application ID and of the type of equipment to which the certificate is intended (according to EquipmentType data element, ‘00’ for a Contracting Party).

4. The “Certificate Holder Reference” (CHR) has the purpose of identifying uniquely the certificate holder, in such a way that the Data Element can be used at the same time as a Subject Key Identifier to reference the Public Key of the certificate holder.

5. Key Identifiers uniquely identify certificate holder or certification authorities. They are coded as follows:

5.1 Equipment (VU or Card):

Data	**Equipment serial number**	**Date**	**Type**	**Manufacturer**
Length	4 Bytes	2 Bytes	1 Byte	1 Byte
Value	Integer	mm yy BCD coding	Manufacturer specific	Manufacturer code

In the case of a VU, the manufacturer, when requesting certificates, may or may not know the identification of the equipment in which the keys will be inserted.

In the first case, the manufacturer will send the equipment identification with the public key to its Contracting Party authority for certification. The certificate will then contain the equipment identification, and the manufacturer must ensure that keys and certificate are inserted in the intended equipment. The Key identifier has the form shown above.

In the later case, the manufacturer must uniquely identify each certificate request and send this identification with the public key to its Contracting Party authority for certification. The certificate will contain the request identification. The manufacturer must feed back its Contracting Party authority with the assignment of key to equipment (i.e. certificate request identification, equipment identification) after key installation in the equipment. The key identifier has the following form:

Data	**Certificate request serial number**	**Date**	**Type**	**Manufacturer**
Length	4 Bytes	2 Bytes	1 Byte	1 Byte
Value	integer	mm yy BCD coding	‘FF’	Manufacturer code

5.2 Certification Authority:

Data	**Authority Identification**	**Key serial number**	**Additional info**	**Identifier**
Length	4 Bytes	1 Byte	2 Bytes	1 Byte
Value	1 Byte nation numerical code 3 Bytes nation alphanumerical code	Integer	additional coding (CA specific) ‘FF FF’ if not used	‘01’

The key serial number is used to distinguish the different keys of a Contracting Party, in the case the key is changed.

6. Certificate verifiers shall implicitly know that the public key certified is an RSA key relevant to authentication, digital signature verification and encipherement for confidentiality services (the certificate contains no Object Identifier to specify it).

3.3.2 Certificates issued

CSM_018 The certificate issued is a digital signature with partial recovery of the certificate content in accordance with ISO/IEC 9796-2, except for its Annex A.4, with the “Certification Authority Reference” appended.

$$\boxed{\text{X.C = X.CA.SK[‘6A’} \parallel C_r \parallel \mathit{Hash}(\text{Cc}) \parallel \text{‘BC’]} \parallel C_n \parallel \text{X.CAR}}$$

With certificate content

$$\begin{array}{lccc} = \text{Cc} = & C_r & \parallel & C_n \\ & \text{106 bytes} & & \text{58 bytes} \end{array}$$

Notes:

1. This certificate is 194 bytes long.
2. CAR, being hidden by the signature, is also appended to the signature, such that the Public Key of the Certification Authority may be selected for the verification of the certificate.
3. The certificate verifier shall implicitly know the algorithm used by the Certification Authority to sign the certificate.
4. The headerlist associated with this issued certificate is as follows:

‘7F 21’	‘09’	‘5F 37’	’81 80’	‘5F 38’	‘3A’	‘42’	‘08’
CV Certificate Tag (Constructed)	Length of subsequent DOs	Signature Tag	Signature Length	Remainder Tag	Remainder Length	CAR Tag	CAR Length

3.3.3 Certificate verification and unwrapping

Certificate verification and unwrapping consists in verifying the signature in accordance with ISO/IEC 9796-2, retrieving the certificate content and the public key contained : X.PK = X.CA.PK **o** X.C, and verifying the validity of the certificate.

CSM_019 It involves the following steps :

Verify signature and retrieve content:

- from X.C retrieve Sign, C_n’ and CAR’:

$$\begin{array}{lccccc} \text{X.C} = & \text{Sign} & \parallel & C_n\text{’} & \parallel & \text{CAR’} \\ & \text{128 Bytes} & & \text{58 Bytes} & & \text{8 Bytes} \end{array}$$

- from CAR’ select appropriate Certification Authority Public Key (if not done before through other means)

- open Sign with CA Public Key : Sr'= X.CA.PK [Sign],
- check Sr' starts with '6A' and ends with 'BC'
- compute C_r' and H' from:

$$Sr' = \text{'6A'} \,\|\, \underset{\text{106 Bytes}}{C_r'} \,\|\, \underset{\text{20 Bytes}}{H'} \,\|\, \text{'BC'}$$

- Recover certificate content C' = C_r' || C_n',
- check *Hash*(C') = H'

If the checks are OK the certificate is a genuine one, its content is C'.

Verify validity. From C':
- if applicable, check End of validity date,

Retrieve and store public key, Key Identifier, Certificate Holder Authorisation and Certificate End of Validity from C':
- X.PK = *n* || *e*
- X.KID = CHR
- X.CHA = CHA
- X.EOV = EOV

4. Mutual authentication mechanism

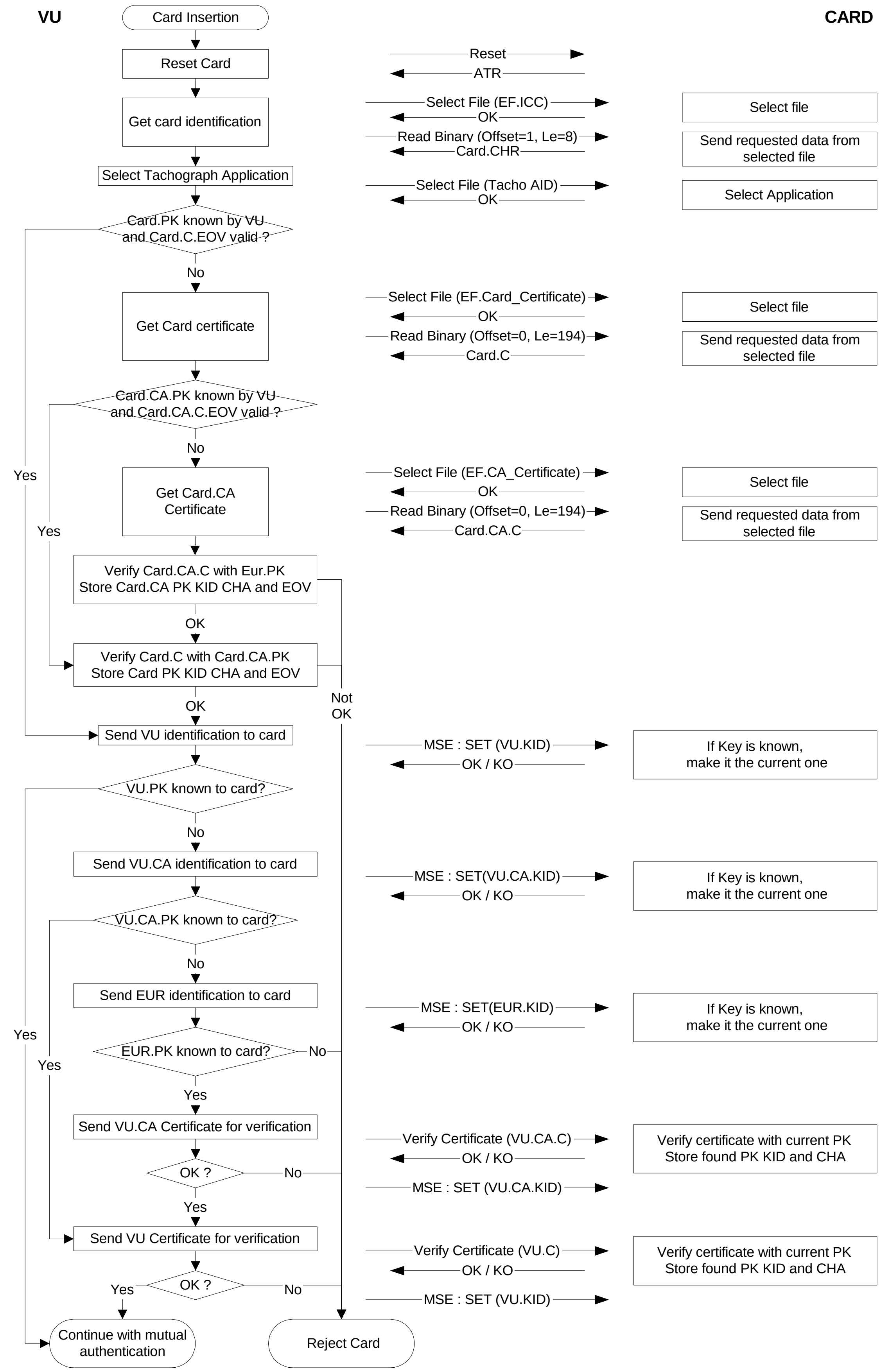
Mutual authentication between cards and VUs is based on the following principle :

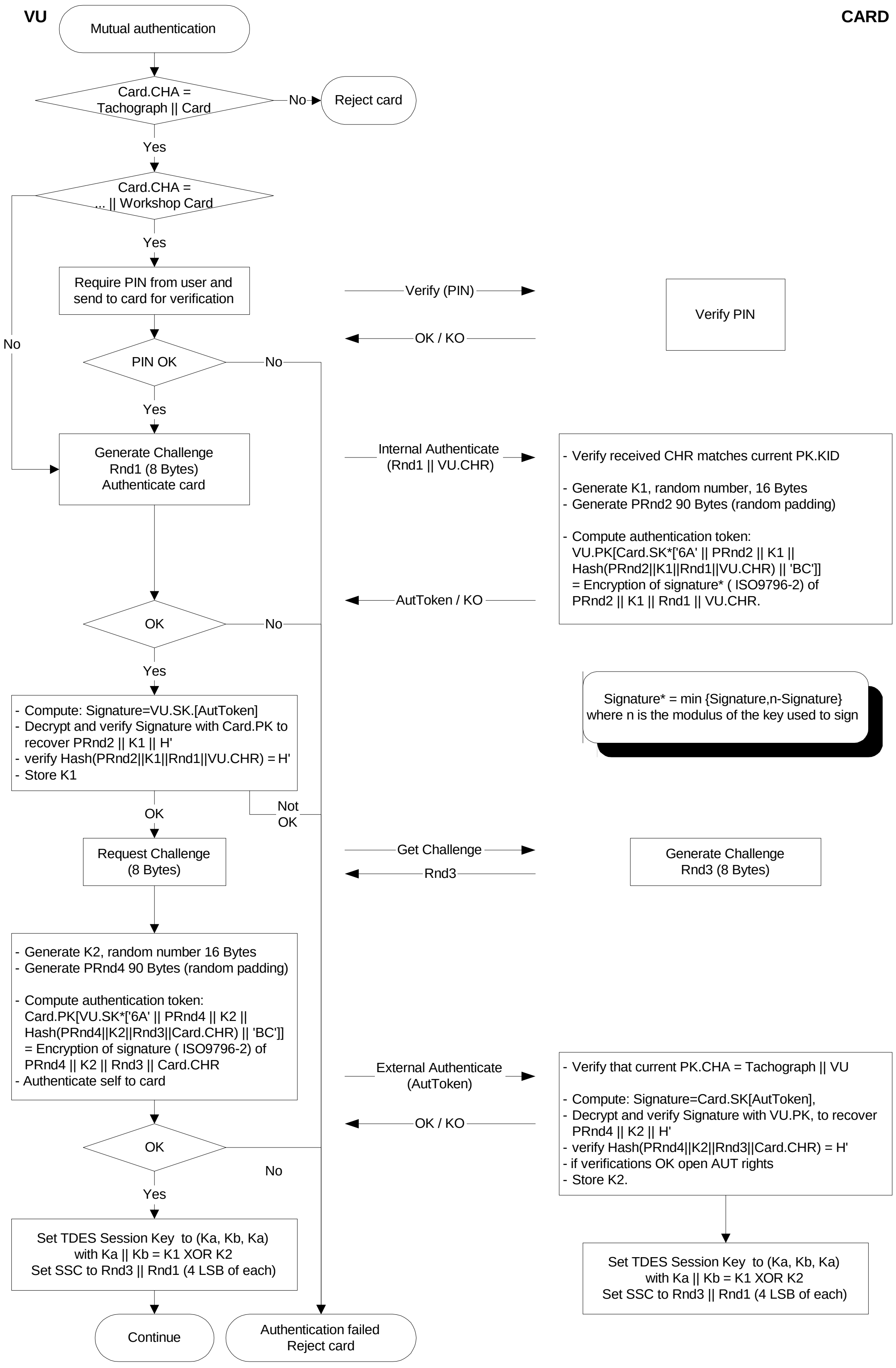
Each party shall demonstrate to the other that it owns a valid key pair, the public key of which has been certified by a Contracting Party certification authority, itself being certified by the European Certification Authority.

Demonstration is made by signing with the private key a random number sent by the other party, who must recover the random number sent when verifying this signature.

The mechanism is triggered at card insertion by the VU. It starts with the exchange of certificates and unwrapping of public keys, and ends with the setting of a session key.

CSM_020 The following protocol shall be used (arrows indicate commands and data exchanged (see sub-appendix 2)):


VU
CARD
Card Insertion
Reset Card
Reset
ATR
Get card identification
Select File (EF.ICC)
OK
Read Binary (Offset=1, Le=8)
Card.CHR
Select file
Send requested data from selected file
Select Tachograph Application
Select File (Tacho AID)
OK
Select Application
Card.PK known by VU and Card.C.EOV valid ?
No
Yes
Get Card certificate
Select File (EF.Card_Certificate)
OK
Read Binary (Offset=0, Le=194)
Card.C
Select file
Send requested data from selected file
Card.CA.PK known by VU and Card.CA.C.EOV valid ?
No
Yes
Get Card.CA Certificate
Select File (EF.CA_Certificate)
OK
Read Binary (Offset=0, Le=194)
Card.CA.C
Select file
Send requested data from selected file
Verify Card.CA.C with Eur.PK Store Card.CA PK KID CHA and EOV
OK
Verify Card.C with Card.CA.PK Store Card PK KID CHA and EOV
OK
Not OK
Send VU identification to card
MSE : SET (VU.KID)
OK / KO
If Key is known, make it the current one
VU.PK known to card?
No
Yes
Send VU.CA identification to card
MSE : SET(VU.CA.KID)
OK / KO
If Key is known, make it the current one
VU.CA.PK known to card?
No
Yes
Send EUR identification to card
MSE : SET(EUR.KID)
OK / KO
If Key is known, make it the current one
EUR.PK known to card?
No
Yes
Send VU.CA Certificate for verification
Verify Certificate (VU.CA.C)
OK / KO
Verify certificate with current PK Store found PK KID and CHA
OK ?
No
MSE : SET (VU.CA.KID)
Yes
Send VU Certificate for verification
Verify Certificate (VU.C)
OK / KO
Verify certificate with current PK Store found PK KID and CHA
OK ?
Yes
No
MSE : SET (VU.KID)
Continue with mutual authentication
Reject Card


VU
CARD
Mutual authentication
Card.CHA = Tachograph || Card
No
Reject card
Yes
Card.CHA = ... || Workshop Card
Yes
No
Require PIN from user and send to card for verification
Verify (PIN)
Verify PIN
OK / KO
PIN OK
No
Yes
Generate Challenge
Rnd1 (8 Bytes)
Authenticate card
Internal Authenticate
(Rnd1 || VU.CHR)
- Verify received CHR matches current PK.KID
- Generate K1, random number, 16 Bytes
- Generate PRnd2 90 Bytes (random padding)
- Compute authentication token:
VU.PK[Card.SK*['6A' || PRnd2 || K1 ||
Hash(PRnd2||K1||Rnd1||VU.CHR) || 'BC']]
= Encryption of signature* (ISO9796-2) of
PRnd2 || K1 || Rnd1 || VU.CHR.
AutToken / KO
OK
No
Yes
Signature* = min {Signature,n-Signature}
where n is the modulus of the key used to sign
- Compute: Signature=VU.SK.[AutToken]
- Decrypt and verify Signature with Card.PK to recover PRnd2 || K1 || H'
- verify Hash(PRnd2||K1||Rnd1||VU.CHR) = H'
- Store K1
OK
Not OK
Request Challenge
(8 Bytes)
Get Challenge
Rnd3
Generate Challenge
Rnd3 (8 Bytes)
- Generate K2, random number 16 Bytes
- Generate PRnd4 90 Bytes (random padding)
- Compute authentication token:
Card.PK[VU.SK*['6A' || PRnd4 || K2 ||
Hash(PRnd4||K2||Rnd3||Card.CHR) || 'BC']]
= Encryption of signature (ISO9796-2) of
PRnd4 || K2 || Rnd3 || Card.CHR
- Authenticate self to card
External Authenticate
(AutToken)
- Verify that current PK.CHA = Tachograph || VU
- Compute: Signature=Card.SK[AutToken],
- Decrypt and verify Signature with VU.PK, to recover PRnd4 || K2 || H'
- verify Hash(PRnd4||K2||Rnd3||Card.CHR) = H'
- if verifications OK open AUT rights
- Store K2.
OK / KO
OK
No
Yes
Set TDES Session Key to (Ka, Kb, Ka)
with Ka || Kb = K1 XOR K2
Set SSC to Rnd3 || Rnd1 (4 LSB of each)
Set TDES Session Key to (Ka, Kb, Ka)
with Ka || Kb = K1 XOR K2
Set SSC to Rnd3 || Rnd1 (4 LSB of each)
Continue
Authentication failed
Reject card

5. VU-Cards data transfer confidentiality, integrity and authentication mechanisms

5.1 Secure Messaging

CSM_021 VU-Cards data transfers integrity shall be protected through Secure Messaging in accordance with references [ISO/IEC 7816-4] and [ISO/IEC 7816-8].

CSM_022 When data need to be protected during transfer, a Cryptographic Checksum Data Object shall be appended to the Data Objects sent within the command or the response. The Cryptographic Checksum shall be verified by the receiver.

CSM_023 The cryptographic checksum of data sent within a command shall integrate the command header, and all data objects sent (=>CLA = ‘0C’, and all data objects shall be encapsulated with tags in which b1=1).

CSM_024 The response status-information bytes shall be protected by a cryptographic checksum when the response contains no data field.

CSM_025 Cryptographic checksums shall be 4 Bytes long.

The structure of commands and responses when using secure messaging is therefore the following:

The DOs used are a partial set of the Secure Messaging DOs described in ISO/IEC 7816-4:

Tag	Mnemonic	Meaning
‘81’	T_{PV}	Plain Value not BER-TLV coded data (to be protected by CC)
‘97’	$\mathbf{T_{LE}}$	Value of Le in the unsecured command (to be protected by CC)
‘99’	T_{SW}	Status-Info (to be protected by CC)
‘8E’	T_{CC}	Cryptographic Checksum
‘87’	$T_{PI\ CG}$	Padding Indicator Byte || Cryptogram (Plain Value not coded in BER-TLV)

Given an unsecured command response pair:

Command header	Command body
CLA INS P1 P2	[L_c field] [Data field] [L_e field]
four bytes	L bytes, denoted as B_1 to B_L

Response body	Response trailer	
[Data field]	SW1	SW2
L_r data bytes	two bytes	

The corresponding secured command response pair is:

Secured command:

Command header (CH)	Command body										
CLA INS P1 P2	[New L_c field]	[New Data field]									[New L_e field]
‘OC’	Length of New Data field	T_{PV}	L_{PV}	PV	T_{LE}	L_{LE}	L_e	T_{CC}	L_{CC}	CC	‘00’
		‘81’	L_c	Data field	‘97’	‘01’	L_e	‘8E’	‘04’	CC	

Data to be integrated in checksum = CH || PB || T_{PV} || L_{PV} || PV || T_{LE} || L_{LE} || L_e || PB
PB = Padding Bytes (80 .. 00) in accordance with ISO-IEC 7816-4 and ISO 9797 method 2.
DOs PV and LE are present only when there is some corresponding data in the unsecured command.

Secured response:

1. Case where response data field is not empty and needs not to be protected for confidentiality:

Response body						Response trailer
[New Data field]						new SW1 SW2
T_{PV}	L_{PV}	PV	T_{CC}	L_{CC}	CC	
‘81’	L_r	Data field	‘8E’	‘04’	CC	

Data to be integrated in checksum = T_{PV} || L_{PV} || PV || PB

2. Case where response data field is not empty and needs to be protected for confidentiality:

Response body						Response trailer
[New Data field]						new SW1 SW2
$T_{PI\ CG}$	$L_{PI\ CG}$	PI CG	T_{CC}	L_{CC}	CC	
‘87’		PI || CG	‘8E’	‘04’	CC	

Data to be carried by CG : non BER-TLV coded data and padding bytes.
Data to be integrated in checksum = $T_{PI\ CG}$ || $L_{PI\ CG}$ || PI CG || PB

3. Case where response data field is empty:

Response body						**Response trailer**
[New Data field]						new SW1 SW2
T_{SW}	L_{SW}	SW	T_{CC}	L_{CC}	CC	
‘99’	‘02’	New SW1 SW2	‘8E’	‘04’	CC	

Data to be integrated in checksum = T_{SW} || L_{SW} || SW || PB

5.2 Treatment of Secure Messaging errors

CSM_026 When the tachograph card recognises an SM error while interpreting a command, then the status bytes must be returned without SM. In accordance with ISO/IEC 7816-4, the following status bytes are defined to indicate SM errors:

’66 88’: Verification of Cryptographic Checksum failed,

’69 87’: Expected SM Data Objects missing,

’69 88’: SM Data Objects incorrect.

CSM_027 When the tachograph card returns status bytes without SM DOs or with an erroneous SM DO, the session must be aborted by the VU.

5.3 Algorithm to compute Cryptographic Checksums

CSM_028 Cryptographic checksums are built using a retail MACs in accordance with ANSI X9.19 with DES:

- Initial stage: The initial check block y0 is E(Ka, SSC).
- Sequential stage: The check blocks y1, .. , yn are calculated using Ka.
- Final stage: The cryptographic checksum is calculated from the last check block yn as follows: E(Ka, D(Kb, yn)).

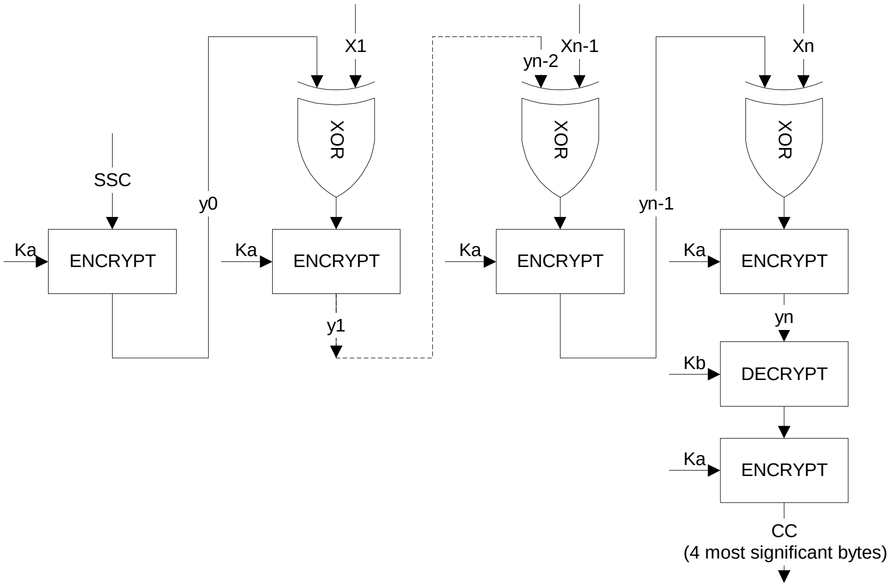
where E() means encryption with DES, and D() means decryption with DES.

The four most significant bytes of the cryptographic checksum are transferred

CSM_029 The Send Sequence Counter (SSC) shall be initiated during key agreement procedure to:
Initial SSC: Rnd3 (4 least significant bytes) || Rnd1 (4 least significant bytes).

CSM_030 The Send Sequence Counter shall be increased by 1 each time before a MAC is calculated (i.e. the SSC for the first command is Initial SSC + 1, the SSC for the first response is Initial SSC + 2).

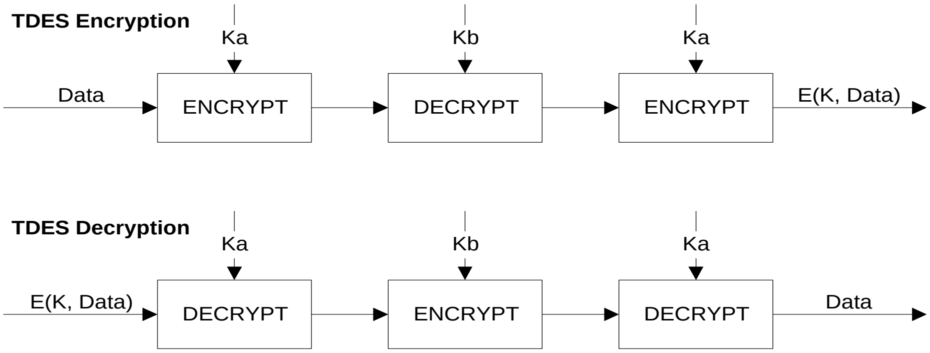
The following figure shows the calculation of the retail MAC:



5.4 Algorithm to compute cryptograms for confidentiality DOs

CSM_031 Cryptograms are computed using TDEA in TCBC mode of operation in accordance with references [TDES] and [TDES-OP] and with the Null vector as Initial Value block.

The following figure shows the application of keys in TDES:



6. Data download digital signature mechanisms

CSM_032 The Intelligent Dedicated Equipment (IDE) stores data received from an equipment (VU or card) during one download session within one physical data file. This file must contain the certificates CP_i.C and EQT.C. The file contains digital signatures of data blocks as specified in sub-appendix 7 (Data Downloading Protocols).

CSM_033 Digital signatures of downloaded data shall use a digital signature scheme with appendix such, that downloaded data may be read without any decipherment if desired.

6.1 Signature generation

CSM_034 Data signature generation by the equipment shall follow the signature scheme with appendix defined in reference [PKCS1] with the SHA-1 hash function :

Signature = EQT.SK[‘00’ || ‘01’ || *PS* || ‘00’ || DER(SHA-1(Data))]

PS = Padding string of octets with value ‘FF’ such that length is 128.

DER(SHA-1(*M*)) is the encoding of the algorithm ID for the hash function and the hash value into an ASN.1 value of type `DigestInfo` (distinguished encoding rules):

‘30’||‘21’||‘30’||‘09’||‘06’||‘05’||‘2B’||‘0E’||‘03’||‘02’||‘1A’||‘05’||‘00’||‘04’||‘14’||Hash Value.

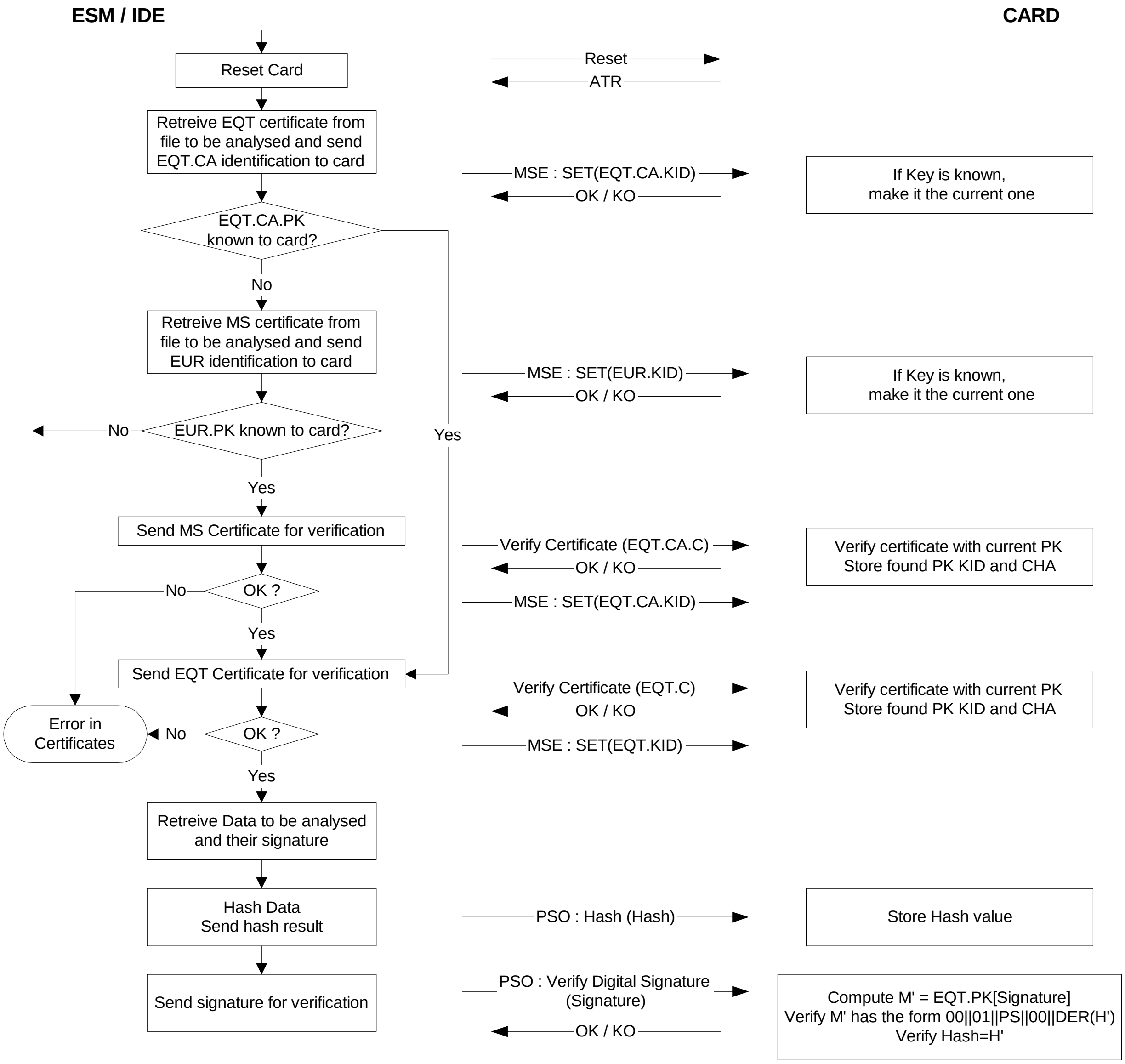
6.2 Signature verification

CSM_035 Data signature verification on downloaded data shall follow the signature scheme with appendix defined in reference [PKCS1] with the SHA-1 hash function.

The European public key EUR.PK needs to be known independently (and trusted) by the verifier.

The following table illustrates the protocol an IDE carrying a Control card can follow to verify the integrity of data downloaded and stored on the ESM (External Storage media). The control card is used to perform the decipherement of digital signatures. This function may in this case not be implemented in the IDE.

The equipment that has downloaded and signed the data to be analysed is denoted EQT.


ESM / IDE
CARD
Reset Card
Reset
ATR
Retreive EQT certificate from file to be analysed and send EQT.CA identification to card
MSE : SET(EQT.CA.KID)
OK / KO
If Key is known, make it the current one
EQT.CA.PK known to card?
No
Yes
Retreive MS certificate from file to be analysed and send EUR identification to card
MSE : SET(EUR.KID)
OK / KO
If Key is known, make it the current one
No
EUR.PK known to card?
Yes
Send MS Certificate for verification
Verify Certificate (EQT.CA.C)
OK / KO
Verify certificate with current PK Store found PK KID and CHA
No
OK ?
MSE : SET(EQT.CA.KID)
Yes
Send EQT Certificate for verification
Verify Certificate (EQT.C)
OK / KO
Verify certificate with current PK Store found PK KID and CHA
Error in Certificates
No
OK ?
MSE : SET(EQT.KID)
Yes
Retreive Data to be analysed and their signature
Hash Data
Send hash result
PSO : Hash (Hash)
Store Hash value
Send signature for verification
PSO : Verify Digital Signature (Signature)
OK / KO
Compute M' = EQT.PK[Signature]
Verify M' has the form 00||01||PS||00||DER(H')
Verify Hash=H'

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