II

(Non-legislative acts)

REGULATIONS

COMMISSION IMPLEMENTING REGULATION (EU) 2021/1228

of 16 July 2021

amending Implementing Regulation (EU) 2016/799 as regards the requirements for the construction, testing, installation, operation and repair of smart tachographs and their components

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EU) No 165/2014 of the European Parliament and of the Council of 4 February 2014 on tachographs in road transport ([1]), and in particular Article 11 thereof,

Whereas:

(1) Regulation (EU) No 165/2014 has introduced smart tachographs, which include a connection to the global navigation satellite system ('GNSS') facility, a remote early detection communication facility, and an interface with intelligent transport systems.

(2) The technical requirements for the construction, testing, installation, operation and repair of tachographs and their components are set out in Commission Implementing Regulation (EU) 2016/799 ([2]).

(3) Regulation (EU) No 165/2014 and Regulation (EC) No 561/2006 of the European Parliament and of the Council ([3]) have been amended by Regulation (EU) 2020/1054 of the European Parliament and of the Council ([4]). Regulation (EU) 2020/1054 requires additional features to be implemented in the smart tachograph. Consequently, a new version of the smart tachograph needs to be defined by amending Implementing Regulation (EU) 2016/799.

(4) In accordance with Article 8(1) of Regulation (EU) No 165/2014, the position of the vehicle should be recorded automatically every time the vehicle crosses the border of a Member State and every time the vehicle performs loading or unloading activities.

(5) The interface with Intelligent Transport Systems, which is optional in the version of the smart tachograph implemented as of 15 June 2019, should be mandatory for the new version of the smart tachograph.

([1]) OJ L 60, 28.2.2014, p. 1.

([2]) Commission Implementing Regulation (EU) 2016/799 of 18 March 2016 implementing Regulation (EU) No 165/2014 of the European Parliament and of the Council laying down the requirements for the construction, testing, installation, operation and repair of tachographs and their components (OJ L 139, 26.5.2016, p. 1).

([3]) Regulation (EC) No 561/2006 of the European Parliament and of the Council of 15 March 2006 on the harmonisation of certain social legislation relating to road transport and amending Council Regulations (EEC) No 3821/85 and (EC) No 2135/98 and repealing Council Regulation (EEC) No 3820/85 (OJ L 102, 11.4.2006, p. 1).

([4]) Regulation (EU) 2020/1054 of the European Parliament and of the Council of 15 July 2020 amending Regulation (EC) No 561/2006 as regards minimum requirements on maximum daily and weekly driving times, minimum breaks and daily and weekly rest periods and Regulation (EU) No 165/2014 as regards positioning by means of tachographs (OJ L 249, 31.7.2020, p. 1).

(6) The new version of the smart tachograph should be prepared to authenticate the Galileo Satellite signal as soon as the Galileo system becomes operational.

(7) In order to avoid the physical replacement of the recording equipment whenever a modification to the technical specifications of the tachograph is adopted, it is necessary to ensure that future tachograph functionalities can be implemented and improved through software updates.

(8) Implementing Regulation (EU) 2016/799 allows for an adaptor to be installed between the motion sensor and the tachograph for vehicles that, whilst having a weight below 3,5 tons, may occasionally overcome that threshold, for instance when towing a trailer. Following the amendment to Regulation (EC) No 561/2006, the obligation to fit a tachograph has been extended to vehicles above 2,5 tons. The mandatory fitting of the smart tachograph in light commercial vehicles makes necessary to enhance the level of security provided by the adaptor by fitting an internal sensor inside the tachograph, which is independent of the motion sensor signal.

(9) The measures provided for in this Regulation are in accordance with the opinion of the committee established by Article 42(1) of Regulation (EU) No 165/2014,

HAS ADOPTED THIS REGULATION:

Article 1

Annex IC to Implementing Regulation (EU) 2016/799 is amended in accordance with the Annex to this Regulation.

Article 2

Entry into force

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

It shall apply from 21 August 2023.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 16 July 2021.

For the Commission
The President
Ursula VON DER LEYEN

ANNEX

Annex IC to Implementing Regulation (EU) 2016/799 is amended as follows:

(1) the table of content is amended as follows:

(a) the following point 3.6.4 is inserted:

'3.6.4 Entry of load/unload operation';

(b) the following point 3.9.18 is inserted:

'3.9.18 'GNSS anomaly' event';

(c) the following points 3.12.17, 3.12.18 and 3.12.19 are inserted:

'3.12.17 Border crossings

3.12.18 Load/unload operations

3.12.19 Digital map';

(d) point 3.20 is replaced by the following:

'3.20 Data exchanges with additional external devices';

(e) the following points 3.27 and 3.28 are inserted:

'3.27 Monitoring border crossings

3.28 Software update';

(f) the following point 4.5.3.2.1.1 is inserted:

'4.5.3.2.1.1 Additional application identification (not accessed by version 1 of second generation vehicle units)';

(g) the following points 4.5.3.2.17 to 4.5.3.2.22 are inserted:

'4.5.3.2.17 Authentication status for positions related to places where daily work periods start and/or end (not accessed by version 1 of second generation vehicle units)

4.5.3.2.18 Authentication status for positions where three hours accumulated driving time are reached (not accessed by version 1 of second generation vehicle units)

4.5.3.2.19 Border crossings (not accessed by version 1 of second generation vehicle units)

4.5.3.2.20 Load/unload operations (not accessed by version 1 of second generation vehicle units)

4.5.3.2.21 Load type entries (not accessed by version 1 of second generation vehicle units)

4.5.3.2.22 VU configurations (not accessed by version 1 of second generation vehicle units)';

(h) the following point 4.5.4.2.1.1 is inserted:

'4.5.4.2.1.1 Additional application identification (not accessed by version 1 of second generation vehicle units)';

(i) the following points 4.5.4.2.16 to 4.5.4.2.22 are inserted:

'4.5.4.2.16 Authentication status for positions related to places where daily work periods start and/or end (not accessed by version 1 of second generation vehicle units)

4.5.4.2.17 Authentication status for positions where three hours accumulated driving are reached (not accessed by version 1 of second generation vehicle units)

4.5.4.2.18 Border crossings (not accessed by version 1 of second generation vehicle units)

4.5.4.2.19 Load/unload operations (not accessed by version 1 of second generation vehicle units)

4.5.4.2.20 Load type entries (not accessed by version 1 of second generation vehicle units)

4.5.4.2.21 Calibration Additional Data (not accessed by version 1 of second generation vehicle units)

4.5.4.2.22 VU configurations (not accessed by version 1 of second generation vehicle units)';

(j) the following point 4.5.5.2.1.1 is inserted after point 4.5.5.2.1:

'4.5.5.2.1.1 Additional application identification (not accessed by version 1 of second generation vehicle units)';

(k) the following point 4.5.5.2.6 is inserted:

'4.5.5.2.6 VU configurations (not accessed by version 1 of second generation vehicle units)';

(l) the following point 4.5.6.2.1.1 is inserted after point 4.5.6.2.1:

'4.5.6.2.1.1 Additional application identification (not accessed by version 1 of second generation vehicle units)';

(m) the following point 4.5.6.2.6 is inserted:

'4.5.6.2.6 VU configurations (not accessed by version 1 of second generation vehicle units)';

(2) the introductory text before the List of Appendixes is replaced by the following:

'INTRODUCTION

This Annex contains second generation recording equipment and tachograph cards requirements.

Since June 15th 2019, second generation recording equipment is being installed in vehicles registered in the Union for the first time, and second generation tachograph cards are being issued.

In order to smoothly implement the second generation tachograph system, second generation tachograph cards have been designed to be also used in first generation vehicle units built in accordance with Annex IB to Regulation (EEC) No 3821/85.

Reciprocally, first generation tachograph cards may be used in second generation vehicle units. Nevertheless, second generation vehicle units can only be calibrated using second generation workshop cards.

The requirements regarding the interoperability between the first and the second generation tachograph systems are specified in this Annex. In this respect, Appendix 15 contains additional details on the management of the co-existence of both generations.

In addition, due to the implementation of new functions such as the use of Galileo Open Signal Navigation Messages Authentication, detection of border crossings, entry of load and unload operations, and also to the need to increase the driver card capacity to 56 days of driver activities, this Regulation introduces the technical requirements for the second version of the second generation recording equipment and tachograph cards.';

(3) section 1, is amended as follows:

(a) point (f) is replaced by the following:

'(f) 'calibration of a smart tachograph' means:

updating or confirming vehicle parameters to be held in the data memory. Vehicle parameters include vehicle identification (VIN, VRN and registering Member State) and vehicle characteristics (w, k, l, tyre size, speed-limiting device setting (if applicable), current UTC time, current odometer value, by-default load type); during the calibration of a recording equipment, the types and identifiers of all type-approval relevant seals in place shall also be stored in the data memory;

any update or confirmation of UTC time only, shall be considered as a time adjustment and not as a calibration, provided it does not contradict requirement 409 set out in point 6.4.

calibrating a recording equipment requires the use of a workshop card;';

(b) point (g) is replaced by the following:

'(g) 'card number' means:

a 16-alpha-numerical characters number that uniquely identifies a tachograph card within a Member State. The card number includes an identification, which consists in a driver identification, or in a card owner identification together with a card consecutive index, a card replacement index and a card renewal index;

a card is therefore uniquely identified by the code of the issuing Member State and the card number;';

(c) points (i) and (j) are replaced by the following:

'(i) 'card renewal index' means:

the 16th alpha-numerical character of a card number which is incremented each time a tachograph card corresponding to a given identification, i.e. driver identification or owner identification together with consecutive index, is renewed;

(j) 'card replacement index' means:

the 15th alpha-numerical character of a card number which is incremented each time a tachograph card corresponding to a given identification, i.e. driver identification or owner identification together with consecutive index, is replaced;';

(d) point (ee) is replaced by the following:

'(ee) 'non-valid card' means:

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

a card is also considered as non-valid by the vehicle unit:

— if a card with the same card issuing Member State, the same identification, i.e. driver identification or owner identification together with consecutive index, and a higher renewal index has already been inserted in the vehicle unit, or

— if a card with the same card issuing Member State, the same identification, i.e. driver identification or owner identification together with consecutive index and renewal index but with a higher replacement index has already been inserted in the vehicle unit;';

(e) point (ll) is replaced by the following:

'(ll) 'remote communication facility', 'remote communication module' or 'remote early detection facility' means:

the equipment of the vehicle unit which is used to perform targeted roadside checks;';

(f) point (nn) is replaced by the following:

'(nn) 'card 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;';

(g) point (pp) is replaced by the following:

'(pp) 'card replacement' means:

issue of a new tachograph card in replacement of an existing card, which has been declared as lost, stolen or malfunctioning and has not been returned to the issuing authority;';

(h) point (tt) is replaced by the following:

'(tt) 'time adjustment' means:

an adjustment of current time; this adjustment can be automatic, using the time provided by the GNSS receiver as a reference, or performed in calibration mode;';

(i) in point (yy), the first indent is replaced by the following:

'- installed and used only in M1 and N1 type vehicles, as defined in Article 4 of Regulation (EU) 2018/858 of the European Parliament and of the Council ([1]),';

(j) point (aaa) is replaced by the following:

'(aaa) reserved for future use;';

(k) point (ccc) is replaced by the following:

'(ccc) 'introduction date' means:

the date set out in Regulation (EU) No 165/2014 as from which vehicles registered for the first time shall be fitted with a tachograph in accordance with this Regulation.';

(4) point 2.1 is amended as follows:

(a) paragraph (5) is replaced by the following:

'(5) The vehicle unit shall include an ITS interface, which is specified in Appendix 13.

The recording equipment may be connected to other facilities through additional interfaces and/or through the ITS interface.';

(b) in paragraph (7), the last subparagraph is replaced by the following:

'This is done in accordance with the applicable Union legislation regarding data protection and in compliance with Article 7 of Regulation (EU) No 165/2014.';

(5) point 2.2 is amended as follows:

(a) the sixth indent is replaced by the following:

'- drivers manual entries:

— entry of places where daily work periods begin and/or end,

— manual entry of driver activities and driver consent for ITS interface,

— entry of specific conditions,

— entry of load/unload operations,';

(b) the following indents are added

'— monitoring border crossings,

— software update.';

(6) point 2.3 is amended as follows

(a) in paragraph (12), the fifth indent is replaced by the following:

'- The downloading function is not accessible in the operational mode, except:

(a) as provided for in requirement 193,

(b) downloading a driver card when no other card type is inserted into the VU.';

(b) paragraph (13) is amended as follows:

(i) the second indent is replaced by the following:

'- in the company mode, driver related data (requirements 102, 105, 108, 133a and 133e) can be output only for periods where no lock exists or no other company holds a lock (as identified by the first 13 digits of the company card number),';

(ii) the fourth indent is replaced by the following:

'- personal data recorded and produced by either the tachograph or the tachograph cards shall not be output through the ITS interface of the VU unless the consent of the driver to whom the data relates is verified.';

([1]) Regulation (EU) 2018/858 of the European Parliament and of the Council of 30 May 2018 on the approval and market surveillance of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles, amending Regulations (EC) No 715/2007 and (EC) No 595/2009 and repealing Directive 2007/46/EC (OJ L 151, 14.6.2018, p.1)

(7) in point 2.4(14), the fourth indent is replaced by the following:

'- external GNSS facility (this Profile is only needed and applicable for the external GNSS facility variant).';

(8) point 3.1 is amended as follows:

(a) paragraph (16) is replaced by the following:

'(16) Upon card insertion (or remote card authentication) the recording equipment shall detect whether the card is a valid tachograph card in accordance with definition (ee) in section 1, and in such a case identify the card type and the card generation.

For checking if a card has already been inserted, the recording equipment shall use the tachograph card data stored in its data memory, as set out in requirement 133.';

(b) paragraph (20) is replaced by the following:

'(20) The withdrawal of tachograph cards may function only when the vehicle is stopped and after the relevant data have been stored on the cards. The withdrawal of the card shall require positive action by the user.';

(9) point 3.2 is amended as follows:

(a) paragraphs (26) and (27) are replaced by the following:

'(26) To detect manipulation of motion data, information from the motion sensor shall be corroborated by vehicle motion information derived from the GNSS receiver and by other source(s) independent from the motion sensor. At least another independent vehicle motion source shall be inside the VU without the need of an external interface.

(27) This function shall measure the position of the vehicle in order to allow for the recording of:

— positions where the driver and/or the co-driver begins his daily work period;

— positions where the accumulated driving time reaches a multiple of three hours;

— positions where the vehicle has crossed the border of a country;

— positions where operations of load/unload have been carried out;

— positions where the driver and/or the co-driver ends his daily work period.';

(b) in point 3.2.1, the following sentence is added in paragraph (30):

'The tolerances shall not be used to intentionally alter the distance measured.';

(c) in point 3.2.2, paragraph (33) is replaced by the following:

'(33) 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 recording equipment shall, for speeds between 20 and 180 km/h, and for characteristic coefficients of the vehicle between 2 400 and 25 000 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 recording equipment.';

(d) in point 3.2.3, paragraph (37) is replaced by the following:

'(37) The absolute position shall be measured in geographical coordinates of latitude and longitude in degrees and minutes with a resolution of 1/10 of a minute.';

(10) point 3.3 is amended as follows

(a) paragraph (41) is replaced by the following:

'(41) Time drift shall be ± 1 second per day or less, in temperature conditions in accordance with requirement 213, in the absence of any time adjustment.';

(b) the following paragraphs (41a), (41b) and (41c) are inserted:

'(41a) Time accuracy when time is adjusted by workshops in accordance with requirement 212 shall be 3 seconds or better.

(41b) The vehicle unit shall include a drift counter, which computes the maximal time drift since the last time adjustment in accordance with point 3.23. The maximal time drift shall be defined by the vehicle unit manufacturer and shall not exceed 1 second per day, as set out in requirement 41.

(41c) The drift counter shall be reset to 1 second after each time adjustment of the recording equipment in accordance with point 3.23. This includes:

— automatic time adjustments,

— time adjustments performed in calibration mode.';

(11) point 3.6 is amended as follows:

(a) point 3.6.1 is amended as follows:

(i) paragraphs (57) to (59) are replaced by the following:

'(57) Places are defined as the country and, in addition where applicable, the region.

(58) Upon driver (or workshop) card withdrawal, the recording equipment shall display the current place of the vehicle on the basis of the GNSS information, and of stored digital map in accordance with point 3.12.19, and shall request the cardholder to confirm or to manually rectify the place.

(59) The place entered in accordance with requirement 58 shall be considered as the place where the daily work period ends. It shall be recorded in the relevant driver (or workshop) card as a temporary record, and may therefore be later overwritten.

Under the following conditions temporary entry made at last card withdrawal is validated (i.e. shall not be overwritten anymore):

— entry of a place where the current daily work period begins during manual entry according to requirement (61);

— the next entry of a place where the current daily work period begins if the card holder does not enter any place where the work period begins or ended during the manual entry according to requirement (61).

Under the following conditions temporary entry made at last card withdrawal is overwritten and the new value is validated:

— the next entry of a place where the current daily work period ends if the card holder does not enter any place where the work period begins or ended during the manual input according to requirement (61).';

(ii) the following subparagraph is added in paragraph (60):

'The recording equipment shall display the current place of the vehicle on the basis of the GNSS information, and of stored digital map(s) in accordance with point 3.12.19 and shall request the driver to confirm or to manually rectify the place.';

(b) in point 3.6.2, paragraph (61) is replaced by the following:

'(61) Upon driver (or workshop) card insertion, and only at this time, the recording equipment shall allow manual entries of activities. Manual entries of activities shall be performed using local time and date values of the time zone (UTC offset) currently set for the vehicle unit.

At driver or workshop card insertion the cardholder shall be reminded of:

— the date and time of his last card withdrawal;

— optionally: the local time offset currently set for the vehicle unit.

At the first insertion of a given driver card or workshop card currently unknown to the vehicle unit, the cardholder shall be invited to express his consent for tachograph related personal data output through the ITS interface. For checking if a card has already been inserted, the recording equipment shall use the tachograph card data stored in its data memory, as set out in requirement 133.

At any moment, the driver (resp. workshop) consent can be enabled or disabled through commands in the menu, provided the driver (resp. workshop) card is inserted.

It shall be possible to input activities with the following restrictions:

— Activity type shall be WORK, AVAILABILITY or BREAK/REST;

— Start and end times for each activity shall be within the period of the last card withdrawal – current insertion only;

— Activities shall not be allowed to overlap mutually in time.

It shall be possible to make manual entries, if required, at the first insertion of a previously unused driver (or workshop) card.

The procedure for manual entries of activities shall include as many consecutive steps as necessary to set a type, a start time and an end time for each activity. For any part of the time period between last card withdrawal and current card insertion, the cardholder shall have the option not to declare any activity.

During the manual entries associated with card insertion and if applicable, the card holder shall have the opportunity to input:

— a place where a previous daily work period ended, associated to the relevant time (thus overwriting and validating the entry made at the last card withdrawal),

— a place where the current daily work period begins, associated to the relevant time (thus validating a temporary entry made at last card withdrawal).

For the place where the current daily work period begins entered at the current card insertion, the recording equipment shall display the current place of the vehicle on the basis of the GNSS information, and of stored digital map(s) in accordance with point 3.12.19, and shall request the driver to confirm or to manually rectify the place.

If the card holder does not enter any place where the work period begins or ended, during the manual entries associated with card insertion, this shall be considered as a declaration that his work period has not changed since the last card withdrawal. The next entry of a place where a previous daily work period ends shall then overwrite the temporary entry made at the last card withdrawal.

If a place is entered, it shall be recorded in the relevant tachograph card.

Manual entries shall be interrupted if:

— the card is withdrawn or,

— the vehicle is moving and the card is in the driver slot.

Additional interruptions are allowed, e.g. a timeout after a certain period of user inactivity. If manual entries are interrupted, the recording equipment shall validate any complete place and activity entries (having either unambiguous place and time, or activity type, begin time and end time) already made.

If a second driver or workshop card is inserted while manual entries of activities are in progress for a previously inserted card, the manual entries for this previous card shall be allowed to be completed before manual entries start for the second card.

The cardholder shall have the option to insert manual entries according to the following minimum procedure:

— Enter activities manually, in chronological order, for the period last card withdrawal – current insertion.

— Begin time of the first activity shall be set to card withdrawal time. For each subsequent entry, the start time shall be preset to immediately follow the end time of the previous entry. Activity type and end time shall be selected for each activity.

The procedure shall end when the end time of a manually entered activity equals the card insertion time.

The recording equipment shall allow drivers and workshops to alternately upload manual entries that need to be entered during the procedure through the ITS interface specified in Appendix 13 and, optionally, through other interfaces.

The recording equipment shall allow the card holder to modify any activity manually entered, until validation by selection of a specific command. Thereafter, any such modification shall be forbidden.';

(c) in point 3.6.3, paragraph (62) is replaced by the following:

'(62) The recording equipment shall allow the driver to enter, in real time, the following two specific conditions:

— 'OUT OF SCOPE' (begin, end),

— 'FERRY / TRAIN CROSSING' (begin, end).

A 'FERRY / TRAIN CROSSING' shall not occur if an 'OUT OF SCOPE' condition is opened. If an 'OUT OF SCOPE' condition is opened, the recording equipment shall not allow users to enter a 'FERRY / TRAIN CROSSING' begin flag.

An opened 'OUT OF SCOPE' condition must be automatically closed, by the recording equipment, if a driver card is inserted or withdrawn.

An opened 'OUT OF SCOPE' condition shall inhibit the following events and warnings:

— Driving without an appropriate card,

— Warnings associated with continuous driving time.

The driver shall enter the FERRY / TRAIN CROSSING begin flag immediately after selecting BREAK/REST on the ferry or train.

An opened FERRY / TRAIN CROSSING must be ended by the recording equipment when any of the following options occurs:

— the driver manually ends the FERRY/TRAIN CROSSING, which shall occur upon arrival to destination of the ferry/train, before driving off the ferry/train,

— an 'OUT OF SCOPE' condition is opened,

— the driver ejects his card,

— driver activity is computed as DRIVING during a calendar minute in accordance with point 3.4.

If more than one specific conditions entry of the same type is done within one calendar minute, only the last one shall be kept recorded.';

(d) the following point 3.6.4 is added:

'3.6.4 *Entry of load/unload operation*

(62a) The recording equipment shall allow the driver to enter and confirm, in real time, information indicating that the vehicle is being loaded, unloaded or that simultaneous load/unload operation is being performed.

If more than one load/unload operation entry of the same type is done within one calendar minute, only the last one shall be kept recorded.

(62b) Load, unload or simultaneous load/unload operations shall be recorded as separate events.

(62c) The load/unload information shall be entered before the vehicle leaves the place where the load/unload operation is carried out.';

(12) point 3.9 is amended as follows:

(a) in point 3.9.12, paragraph (83) is replaced by the following:

'(83) This event shall be triggered, **while not in calibration mode**, 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. This event shall also be triggered, **while not in calibration mode**, in case the speed calculated from the motion sensor pulses increases from 0 to more than 40 km/h within 1 second, and then stays above 40km/h during at least 3 seconds.';

(b) in point 3.9.13, paragraph (84) is replaced by the following:

'(84) This event shall be triggered, as specified in Appendix 12, **while not in calibration mode**, in case motion information calculated from the motion sensor is contradicted by motion information calculated from the internal GNSS receiver or from the external GNSS facility or by other independent source(s) in accordance with requirement 26. This event shall not be triggered during a ferry/train crossing.';

(c) in point 3.9.15, paragraph (86) is replaced by the following:

'(86) This event shall be triggered, **while not in calibration mode**, when the VU detects a discrepancy between the time of the vehicle unit's time measurement function and the time originating from the authenticated positions transmitted by the GNSS receiver or the external GNSS facility. A 'time discrepancy' is detected if the time difference exceeds ±3 seconds corresponding to the time accuracy set out in requirement 41a, the latter increased by the maximal time drift per day. This event shall be recorded together with the internal clock value of the recording equipment. The VU shall perform the check for triggering the 'time conflict' event right before the VU automatically re-adjusts the VU internal clock, in accordance with requirement 211.';

(d) in point 3.9.17, the eighth indent is replaced by the following:

'- ITS interface fault.';

(e) the following point is added:

'3.9.18 *'GNSS anomaly' event*

(88a) This event shall be triggered, while not in calibration mode, when the GNSS receiver detects an attack, or when authentication of navigation messages has failed, as specified in Appendix 12. After a GNSS anomaly event has been triggered, the VU shall not generate other GNSS anomaly events for the next 10 minutes.';

(13) in point 3.10, the last row in the table is replaced by the following:

'ITS interface	Proper operation'	

(14) point 3.12 is amended as follows:

(a) the first paragraph is replaced by the following:

'For the purpose of this point,

— '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 2 190 drivers or co-drivers, 2 190 card insertion withdrawal cycles, and 93 440 activity changes,

— the average number of place entries per day is defined as at least 6 entries where the daily work period begins and 6 entries where the daily work period ends, so that '365 days' include at least 4 380 place entries,

— the average number of positions per day when the accumulated driving time reaches a multiple of three hours is defined as at least 6 positions, so that '365 days' include at least 2 190 such positions,

— the average number of border crossings per day is defined as at least 20 crossings, so that '365 days' include at least 7 300 border crossings,

— the average number of load/unload operations per day is defined as at least 25 operations (irrespective of the type), so that '365 days' include at least 9 125 load/unload operations,

— 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,

— positions (latitudes and longitudes) are recorded in degrees and minutes, with a resolution of 1/10 of minute, with the associated GNSS accuracy and acquisition time, and with a flag indicating whether the position has been authenticated.';

(b) point 3.12.1.1 is amended as follows:

(i) in paragraph (93), the following indent is added:

'- digital map version identifier (requirement 133l).';

(ii) paragraph (94) is replaced by the following:

'(94) Vehicle unit identification data are recorded and stored once and for all by the vehicle unit manufacturer, except data which may be changed in case of software update in accordance with this Regulation, and the ability to use first generation tachograph cards.';

(c) in point 3.12.1.2, the first subparagraph of paragraph (97) is replaced by the following:

'(97) The vehicle unit shall be able to record and store in its data memory the following data related to the 20 most recent successful pairings of motion sensors (if several pairings happen within one calendar day, only the first and the last one of the day shall be stored):';

(d) in point 3.12.1.3, the first subparagraph of paragraph (100) is replaced by the following:

'(100) The vehicle unit shall be able to record and store in its data memory the following data related to the 20 most recent successful couplings of external GNSS facilities (if several couplings happen within one calendar day, only the first and the last one of the day shall be stored).';

(e) point 3.12.5 is amended as follows:

(i) paragraph (110) is amended as follows:

(1) the first indent is replaced by the following:

'- the driver and/or co-driver card number and card issuing Member State';

(2) the following indent is added:

'- a flag indicating whether the position has been authenticated.';

(ii) the following paragraph (110a) is inserted:

'(110a) For places where the daily work period begins or ends entered during the manual entry procedure at card insertion in accordance with requirement 61, the current odometer value and position of the vehicle shall be stored.';

(f) in point 3.12.8, the table in paragraph (117) is amended as follows:

(i) the fifth row is replaced by the following:

'Last card session not correctly closed	— the 10 most recent events.	— date and time of card insertion, — card(s) type, number, issuing Member State and generation, — last session data as read from the card: — date and time of card insertion.'

(ii) the following row is added:

'GNSS anomaly	— the longest events 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, — card(s) type, number, issuing Member State and generation of any card inserted at beginning and/or end of the event, — number of similar events that day.'

(g) in point 3.12.10, the following indents are added in paragraph (120):

'- the serial numbers of the motion sensor, the external GNSS facility (if any), and the external remote communication facility (if any),

- the by-default load type associated to the vehicle (load of either goods or passengers),

- the country in which the calibration has been performed, and the date time when the position used to determine this country was provided by the GNSS receiver.';

(h) the following points are added:

'3.12.17 *Border crossings*

(133a) The recording equipment shall record and store in its data memory the following information about border crossings:

— the country that the vehicle is leaving,

— the country that the vehicle is entering,

— the position where the vehicle has crossed the border.

(133b) Together with countries and position, the recording equipment shall record and store in its data memory:

— the driver and/or co-driver card number and card issuing Member State,

— the card generation,

— the related GNSS accuracy, date and time,

— a flag indicating whether the position has been authenticated

— the vehicle odometer value at the time of border crossing detection.

(133c) The data memory shall be able to hold border crossings for at least 365 days.

(133d) When storage capacity is exhausted, new data shall replace oldest data.

3.12.18 *Load/unload operations*

(133e) The recording equipment shall record and store in its data memory the following information about load and unload operations of the vehicle:

— the type of operation (load, unload or simultaneous load/unload),

— the position where the load/unload operation has occurred.

(133f) When the position of the vehicle is not available from the GNSS receiver at the time of the load/unload operation, the recording equipment shall use the latest available position, and the related date and time.

(133g) Together with the type of operation and position, the recording equipment shall record and store in its data memory:

— the driver and/or co-driver card number and card issuing Member State,

— the card generation,

— the date and time of the load/unload operation,

— the related GNSS accuracy, date and time if applicable,

— a flag indicating whether the position has been authenticated,

— the vehicle odometer value.

(133h) The data memory shall be able to store load/unload operations for at least 365 calendar days.

(133i) When storage capacity is exhausted, new data shall replace oldest data.

3.12.19 *Digital map*

(133j) For the purpose of recording the position of the vehicle when the border of a country is crossed, the recording equipment shall store in its data memory a digital map.

(133k) Allowed digital maps for supporting the border crossing monitoring function of the recording equipment shall be made available by the European Commission for download from a dedicated secured website, under various formats.

(133l) For each of these maps, a version identifier and a hash value shall be available on the website.

(133m) The maps shall feature:

— a level of definition corresponding to NUTS level 0, according to the Nomenclature of Territorial Units for Statistics,

— a scale of 1:1 million.

(133n) Tachograph manufacturers shall select a map from the website and download it securely.

(133o) Tachograph manufacturers shall only use a downloaded map from the website after having verified its integrity using the hash value of the map.

(133p) The selected map shall be imported in the recording equipment by its manufacturer, under an appropriate format, but the semantic of the imported map shall remain unchanged.

(133q) The manufacturer shall also store the version identifier of the map used in the recording equipment.

(133r) It shall be possible to update or replace the stored digital map by a new one made available by the European Commission.

(133s) Digital map updates shall be made using the software update mechanisms set up by the manufacturer, in application of requirements 226d and 226e, so that the recording equipment can verify the authenticity and integrity of a new imported map, before storing it and replacing the previous one.

(133t) Tachograph manufacturers may add additional information to the basic map referred to in requirement (133m), for purposes other than recording border crossings, such as the borders of the EU regions, provided that the semantic of the basic map is not changed.';

(15) point 3.13 is amended as follows:

(a) in paragraph (134), the third indent is replaced by the following:

'- to compute the driver's continuous driving time, cumulative break time and accumulated driving times for the previous and the current week,';

(b) the following paragraph (135a) is added:

'(135a) The structure in the 'TACHO_G2' application depends on the version. Version 2 cards contain additional Elementary Files to the ones of version 1 cards, in particular:

— in driver and workshop cards:

— EF Places_Authentication shall contain the authentication status of the vehicle positions stored in EF Places. A timestamp shall be stored with each authentication status, which shall be exactly the same as the date and time of the entry stored with the corresponding position in EF Places.

— EF GNSS_Places_Authentication shall contain the authentication status of the vehicle positions stored in EF GNSS_Places. A timestamp shall be stored with each authentication status, which shall be exactly the same as the date and time of the entry stored with the corresponding position in EF Places.

— EF Border_Crossings, EF Load_Unload_Operations and EF Load_Type_Entries shall contain data related to border crossings, load/unload operations and load types.

— in workshop cards:

— EF Calibration_Add_Data shall contain additional calibration data to the ones stored in EF Calibration. The old date and time value and the vehicle identification number shall be stored with each additional calibration data record, which shall be exactly the same as the old date and time value and the vehicle identification number stored with the corresponding calibration data in EF Calibration.

— in all tachograph cards:

— EF VU_Configuration shall contain the cardholder tachograph specific settings.

The vehicle unit shall ignore any authentication status found in EF Places_Authentication or EF GNSS_Places_Authentication, when no vehicle position with the same timestamp is found in EF Places or EF GNSS_Places.

The vehicle unit shall ignore the elementary file EF VU_Configuration in all cards insofar as no specific rules have been provided with respect to the use of such elementary file. Those rules shall be set out through an amendment of Annex IC, which shall include the modification or deletion of this paragraph.';

(16) point 3.14 is amended as follows:

(a) point 3.14.1 is amended as follows:

(i) paragraph (140) is replaced by the following:

'(140) All events and faults not defined for the first generation recording equipment shall not be stored on the first generation driver and workshop cards.';

(ii) paragraph (143) is replaced by the following:

'(143) Before releasing a driver or workshop card and after all relevant data have been stored on the card, the recording equipment shall reset the 'card session data'.';

(b) point 3.14.2 is amended as follows:

(i) in paragraph (144), the following sub-paragraph is added:

'The structure in the 'TACHO_G2' application depends on the version. Version 2 cards contain additional Elementary Files to the ones of version 1 cards.';

(ii) the following paragraphs (147a) and (147b) are inserted:

'(147a) On insertion of a driver or workshop card, the recording equipment shall store on the card the by-default load type of the vehicle.

(147b) On insertion of a driver or workshop card, and after the manual entry procedure, the recording equipment shall check the last place where the daily work period begins or ends stored on the card. This place may be temporary, as specified in requirement 59. If this place is in a different country from the current one in which the vehicle is located, the recording equipment shall store on the card a border crossing record, with:

— the country that the driver left: not available,

— the country that the driver is entering: the current country in which the vehicle is located,

— the date and time when the driver has crossed the border: the card insertion time,

— the position of the driver when the border has been crossed: not available,

— the vehicle odometer value: not available.';

(iii) the following paragraph (150a) is added:

'(150a) The vehicle unit shall ignore the elementary file EF VU_Configuration in all cards insofar as no specific rules have been provided with respect to the use of such elementary file. Those rules shall be set out through an amendment of Annex IC, which shall include the modification or deletion of this paragraph.';

(17) in point 3.15.4, paragraph (167) is amended as follows:

(a) the second indent is replaced by the following:

'- the content of any of the printouts listed in requirement 169 under the same formats as the printouts themselves,';

(b) the fifth and sixth indents are replaced by the following:

'- the accumulated driving time of the driver for the previous and the current week,

- the accumulated driving time of the co-driver for the previous and the current week,';

(c) the eighth, ninth and tenth indents are replaced by the following:

'- the accumulated driving time of the driver for the current week,

- the accumulated driving time of the co-driver for the current daily work period,

- the accumulated driving time of the driver for the current daily work period.';

(18) point 3.18 is amended as follows:

(a) paragraph (193) is replaced by the following:

'(193) In addition and as an optional feature, the recording equipment may, in any mode of operation, download data through any other interface to a company authenticated through this channel. In such a case, company mode data access rights shall apply to this download.';

(b) the following paragraphs (196a) and (196b) are added:

'(196a) A transport undertaking which uses vehicles that are fitted with recording equipment complying with this Annex and fall within the scope of Regulation (EC) No 561/2006, shall ensure that all data are downloaded from the vehicle unit and driver cards.

The maximum period within which the relevant data are downloaded shall not exceed:

— 90 days for data from vehicle unit;

— 28 days for data from the driver card.

(196b) Transport undertakings shall keep the data downloaded from the vehicle unit and driver cards for at least twelve months following recording.';

(19) in point 3.19, the following indents are added in paragraph (199):

'- vehicle position,

- an indication if the driver may currently infringe the driving times.';

(20) point 3.20 is amended as follows:

(a) the header is replaced by the following:

'3.20 **Data exchanges with additional external devices**';

(b) paragraph (200) is replaced by the following:

'(200) The recording equipment shall also be equipped with an ITS interface in accordance with Appendix 13, allowing the data recorded or produced by either the tachograph or the tachograph cards to be used by an external facility.

In operational mode, the driver consent shall be needed for the transmission of personal data through the ITS interface. Nevertheless, the driver consent shall not apply to tachograph or card data accessed in control, company or calibration mode. The data and functional access rights for these modes are specified in requirements 12 and 13.

The following requirements shall apply to ITS data made available through that interface:

— personal data shall only be available after the verifiable consent of the driver has been given, accepting that personal data can leave the vehicle network.

A set of selected existing data that can be available via the ITS interface, and the classification of the data as personal or not personal are specified in Appendix 13. Additional data may also be output in addition to the set of data provided in Appendix 13. The VU manufacturer shall classify those data as 'personal' or 'not personal', being the driver consent applicable to those data classified as 'personal',

— at any moment, the driver consent can be enabled or disabled through commands in the menu, provided the driver card is inserted,

— in any circumstances, the presence of the ITS interface shall not disturb or affect the correct functioning and the security of the vehicle unit.

Additional vehicle unit interfaces may co-exist, provided they fully comply with the requirements of Appendix 13 in terms of driver consent. The recording equipment shall have the capacity to communicate the driver consent status to other platforms in the vehicle network and to external devices.

For personal data injected in the vehicle network, which are further processed outside the vehicle network, it shall not be the responsibility of the tachograph manufacturer to have that personal data process compliant with the applicable Union legislation regarding data protection.

The ITS interface shall also allow for data entry during the manual entry procedure in accordance with requirement 61, for both the driver and the co-driver.

The ITS interface may also be used to enter additional information, in real time, such as:

— driver activity selection, in accordance with requirement 46,

— places in accordance with requirement 56,

— specific conditions, in accordance with requirement 62,

— load/unload operations, in accordance with requirement 62a.

This information may also be entered through other interfaces.';

(c) paragraph (201) is replaced by the following:

'(201) The serial link interface as specified in Annex IB to Regulation (EEC) No 3821/85, as last amended, can continue to equip tachographs for back compatibility. The serial link is classified as a part of the vehicle network, in accordance with requirement 200.';

(21) point 3.21 is amended as follows,

(a) paragraph (202) is amended as follows:

(i) the ninth indent is replaced by the following:

'- to update or confirm other parameters known to the recording equipment: vehicle identification, w, l, tyre size and speed limiting device setting if applicable, and by-default load type,';

(ii) the following indent is added:

'- to automatically store the country in which the calibration has been performed, and the date time when the position used to determine this country was provided by the GNSS receiver.';

(b) paragraph (205) is replaced by the following:

'(205) Coupling the external GNSS facility to the VU shall consist, at least, in:

— updating external GNSS facility installation data held by the external GNSS facility (as needed),

— copying from the external GNSS facility to the VU data memory the necessary external GNSS facility identification data including the serial number of the external GNSS facility.';

(22) in point 3.22, the following sub-paragraph is added in paragraph (209):

'When the I/O mode of the calibration I/O signal line is active according to this requirement, the 'Driving without an appropriate card' warning (requirement 75) shall not be triggered by the vehicle unit.';

(23) point 3.23 is amended as follows:

(a) paragraph (211) is replaced by the following:

'(211) The time setting of the VU internal clock shall be automatically re-adjusted at variable time intervals. The next automatic time re-adjustment shall be triggered between 72h and 168h after the previous one, and after the VU can access to GNSS time through a valid authenticated position message in accordance with Appendix 12. Nevertheless, the time adjustment shall never be bigger than the accumulated maximal time drift per day, as calculated by the VU manufacturer in accordance with requirement 41b. If the difference between internal VU clock time and GNSS receiver time is bigger than the accumulated maximum time drift per day, then the time adjustment shall bring the VU internal clock as close as possible to the GNSS receiver time. The time setting may only be done if the time provided by the GNSS receiver is obtained using authenticated position messages as set out in Appendix 12. The time reference for the automatic time setting of the VU internal clock shall be the time provided in the authenticated position message.';

(b) paragraph (212) is replaced by the following:

'(212) The time adjustment function shall also allow for triggered adjustment of the current time, in calibration mode.

Workshops may adjust time:

— either by writing a time value in the VU, using the WriteDataByIdentifier service in accordance with section 6.2 of Appendix 8,

— or by requesting an alignment of the VU clock to the time provided by the GNSS receiver. This may only be done if the time provided by the GNSS receiver is obtained using authenticated position messages. In this latter case, the RoutineControl service shall be used in accordance with section 8 of Appendix 8.';

(24) the following points 3.27 and 3.28 are inserted:

'3.27 **Monitoring border crossings**

(226a) This function shall detect when the vehicle has crossed the border of a country, which country has been left and which country has been entered.

(226b) The border crossing detection shall be based on the position measured by the recording equipment, and stored digital map in accordance with point 3.12.19.

(226c) Border crossings related to the presence of the vehicle in a country for a shorter period than 120s shall not be recorded.

3.28 **Software update**

(226d) The vehicle unit shall incorporate a function for the implementation of software updates whenever such updates do not involve the availability of additional hardware resources beyond the resources set out in requirement 226f, and the type-approval authorities give their authorisation to the software updates based on the existing type-approved vehicle unit, in accordance with Article 12(5) of Regulation (EU) No 165/2014.

(226e) The software update function shall be designed for supporting the following functional features, whenever they are legally required:

— modification of the functions referred to in point 2.2, except the software update function itself,

— the addition of new functions directly related to the enforcement of Union legislation on road transport,

— modification of the modes of operation in point 2.3,

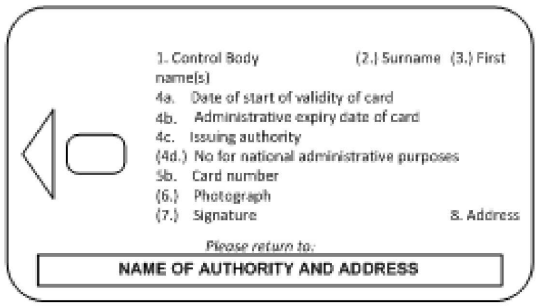
— modification of the file structure such as the addition of new data or the increase of the file size,

— deployment of software patches to address software as well as security defects or reported attacks on the functions of the recording equipment.

(226f) The vehicle unit shall provide free hardware resources of at least 35% for software and data needed for the implementation of requirement 226e and free hardware resources of at least 65% for the update of the digital map based on the hardware resources required for the NUTS 0 map version 2021.';

(25) in point 4.1, after paragraph (235), the image 'Community model tachograph cards', the reverse side of the control card is replaced by the following:

'



';

(26) point 4.5 is amended as follows:

(a) paragraph (246) is replaced by the following:

'(246) Any additional data may be stored on tachograph cards, provided that the storage of those data complies with the applicable legislation regarding data protection.';

(b) in paragraph (247), the following note is inserted after the second indent:

'Note: version 2 of second generation cards contains additional Elementary Files in DF Tachograph_G2.';

(c) point 4.5.3.2 is amended as follows:

(i) the header is replaced by the following:

'4.5.3.2 Tachograph generation 2 application (not accessible to first generation vehicle units, accessible to version 1 and version 2 of second generation vehicle units)';

(ii) the following point 4.5.3.2.1.1 is inserted after point 4.5.3.2.1:

'4.5.3.2.1.1 Additional application identification (not accessed by version 1 of second generation vehicle units)

(278a) The driver card shall be able to store additional application identification data only applicable for version 2.';

(iii) in point 4.5.3.2.7, paragraph (287) is replaced by the following:

'(287) The driver card shall be able to store data for the 12 most recent events of each type (i.e. 132 events).';

(iv) in point 4.5.3.2.8, paragraph (290) is replaced by the following:

'(290) The driver card shall be able to store data for the 24 most recent faults of each type (i.e. 48 faults).';

(v) in point 4.5.3.2.9, paragraph (292) is replaced by the following:

'(292) The driver card memory shall be able to hold driver activity data for 56 days (the average activity of a driver is defined for this requirement as 117 activity changes per day).';

(vi) in point 4.5.3.2.10, paragraph (295) is replaced by the following:

'(295) The driver card shall be able to store 200 such records.';

(vii) in point 4.5.3.2.11, paragraph (297) is replaced by the following:

'(297) The driver card memory shall be able to hold 112 such records.';

(viii) in point 4.5.3.2.14, paragraph (302) is replaced by the following:

'(302) The driver card shall be able to store 112 such records.';

(ix) in point 4.5.3.2.15, paragraph (304) is replaced by the following:

'(304) The driver card shall be able to store 200 such records.';

(x) in point 4.5.3.2.16, paragraph (306) is replaced by the following:

'(306) The driver card shall be able to store 336 such records.';

(xi) the following points 4.5.3.2.17 to 4.5.3.2.22 are added:

'4.5.3.2.17 Authentication status for positions related to places where daily work periods start and/or end (not accessed by version 1 of second generation vehicle units)

(306a) The driver card shall be able to store additional data related to places where daily work periods begin and/or end, entered by the driver in accordance with point 4.5.3.2.11:

— the date and time of the entry, which shall be exactly the same date and time as the one stored in EF Places under the DF Tachograph_G2,

— a flag indicating whether the position has been authenticated.

(306b) The driver card memory shall be able to hold 112 such records.

4.5.3.2.18 Authentication status for positions where three hours accumulated driving time are reached (not accessed by version 1 of second generation vehicle units)

(306c) The driver card shall be able to store additional data related to the position of the vehicle where the accumulated driving time reaches a multiple of three hours in accordance with point 4.5.3.2.16:

— the date and time when the accumulated driving time reaches a multiple of three hours, which shall be exactly the same date and time as the one stored in EF GNSS_Places under the DF Tachograph_G2,

— a flag indicating whether the position has been authenticated.

(306d) The driver card shall be able to store 336 such records.

4.5.3.2.19 Border crossings (not accessed by version 1 of second generation vehicle units)

(306e) The driver card shall be able to store the following data related to border crossings either upon card insertion in accordance with requirement 147b or with the card already inserted:

— the country that the vehicle is leaving,

— the country that the vehicle is entering,

— the date and time when the vehicle has crossed the border,

— the position of the vehicle when the border was crossed,

— the GNSS accuracy,

— a flag indicating whether the position has been authenticated,

— the vehicle odometer value.

(306f) The driver card memory shall be able to store 1120 such records.

4.5.3.2.20 Load/unload operations (not accessed by version 1 of second generation vehicle units)

(306g) The driver card shall be able to store the following data related to load/unload operations:

— operation type (load, unload or simultaneous load/unload),

— the date and time of the load/unload operation,

— the position of the vehicle,

— the GNSS accuracy, date and time when the position was determined,

— a flag indicating whether the position has been authenticated,

— the vehicle odometer value.

(306h) The driver card shall be able to store 1624 load/unload operations.

4.5.3.2.21 Load type entries (not accessed by version 1 of second generation vehicle units)

(306i) The driver card shall be able to store the following data related to load type automatically entered by the VU at each card insertion:

— the load type entered (goods or passengers),

— the date and time of the entry.

(306j) The driver card shall be able to store 336 such records.

4.5.3.2.22 VU configurations (not accessed by version 1 of second generation vehicle units)

(306k) The driver card shall be able to store the cardholder tachograph specific settings.

(306l) The driver card storage capacity for cardholder tachograph specific settings shall be 3072 bytes.';

(d) point 4.5.4.2 is amended as follows:

(i) the header is replaced by the following:

'4.5.4.2 Tachograph Generation 2 application (not accessible to first generation vehicle units, accessible to version 1 and version 2 of second generation vehicle units)';

(ii) the following point 4.5.4.2.1.1 is inserted after point 4.5.4.2.1:

'4.5.4.2.1.1 Additional application identification (not accessed by version 1 of second generation vehicle units)

(330a) The workshop card shall be able to store additional application identification data only applicable for version 2.';

(iii) in point 4.5.4.2.6, paragraph (338) is replaced by the following:

'(338) The workshop card shall be able to store 255 such records.';

(iv) in point 4.5.4.2.8, paragraph (344) is replaced by the following:

'(344) The workshop card shall be able to hold driver activity data for 1 day containing 240 activity changes.';

(v) in point 4.5.4.2.9, paragraph (346) is replaced by the following:

'(346) The workshop card shall be able to store 8 such records.';

(vi) point 4.5.4.2.10 is replaced by the following:

'4.5.4.2.10 Places and positions where daily work periods start and/or end data

(347) The workshop card shall be able to store places and positions where daily work periods begin and/or end data records in the same manner as a driver card.

(348) The workshop card shall be able to store 4 pairs of such records.';

(vii) in point 4.5.4.2.13, paragraph (352) is replaced by the following:

'(352) The workshop card shall be able to store 8 such records.';

(viii) in point 4.5.4.2.14, paragraph (354) is replaced by the following:

'(354) The workshop card shall be able to store 24 such records.';

(ix) in point 4.5.4.2.15, paragraph (356) is replaced by the following:

'(356) The workshop card shall be able to store 4 such records.';

(x) the following points 4.5.4.2.16 to 4.5.4.2.22 are added:

'4.5.4.2.16 Authentication status for positions related to places where daily work periods start and/or end (not accessed by version 1 of second generation vehicle units)

(356a) The workshop card shall be able to store additional data related to places where daily work periods start and/or end in the same manner as a driver card.

(356b) The workshop card memory shall be able to store 4 pairs of such records.

4.5.4.2.17 Authentication status for positions where three hours accumulated driving are reached (not accessed by version 1 of second generation vehicle units)

(356c) The workshop card shall be able to store additional data related to the position of the vehicle where the accumulated driving time reaches a multiple of three hours in the same manner as a driver card.

(356d) The workshop card shall be able to store 24 such records.

4.5.4.2.18 Border crossings (not accessed by version 1 of second generation vehicle units)

(356e) The workshop card shall be able to store the border crossings in the same manner as a driver card.

(356f) The workshop card memory shall be able to store 4 such records.

4.5.4.2.19 Load/unload operations (not accessed by version 1 of second generation vehicle units)

(356g) The workshop card shall be able to store the load/unload operations in the same manner as a driver card.

(356h) The workshop card shall be able to store 8 load, unload or simultaneous load/unload operations.

4.5.4.2.20 Load type entries (not accessed by version 1 of second generation vehicle units)

(356i) The workshop card shall be able to store the load type entries in the same manner as a driver card.

(356j) The workshop card shall be able to store 4 such records.

4.5.4.2.21 Calibration Additional Data (not accessed by version 1 of second generation vehicle units)

(356k) The workshop card shall be able to store additional calibration data only applicable for version 2:

— the old date and time and the vehicle identification number, which shall be exactly the same values as the one stored in EF Calibration under the DF Tachograph_G2,

— the by-default load type entered during this calibration,

— the country in which the calibration has been performed, and the date time when the position used to determine this country was provided by the GNSS receiver.

(356l) The workshop card shall be able to store 255 such records.

4.5.4.2.22 VU configurations (not accessed by version 1 of second generation vehicle units)

(356m) The workshop card shall be able to store the cardholder tachograph specific settings.

(356n) The workshop card storage capacity for cardholder tachograph specific settings shall be 3072 bytes.';

(e) point 4.5.5 is amended as follows:

(i) in point 4.5.5.1.5 the second indent is replaced by the following:

'- type of the control (displaying and/or printing and/or VU downloading and/or card downloading),';

(ii) the following point 4.5.5.2.1.1 is inserted after point 4.5.5.2.1:

'4.5.5.2.1.1 Additional application identification (not accessed by version 1 of second generation vehicle units)

(363a) The control card shall be able to store additional application identification data only applicable for version 2.';

(iii) the following point is inserted after point 4.5.5.2.5:

'4.5.5.2.6 VU configurations (not accessed by version 1 of second generation vehicle units)

(368a) The control card shall be able to store the cardholder tachograph specific settings.

(368b) The control card storage capacity for cardholder tachograph specific settings shall be 3072 bytes.';

(f) point 4.5.6.2 is amended as follows:

(i) the following point is inserted after point 4.5.6.2.1:

'4.5.6.2.1.1 Additional application identification (not accessed by version 1 of second generation vehicle units)

(375a) The company card shall be able to store additional application identification data only applicable for version 2.';

(ii) the following point 4.5.6.2.6 is added:

'4.5.6.2.6 VU configurations (not accessed by version 1 of second generation vehicle units)

(380a) The company card shall be able to store the cardholder tachograph specific settings.

(380b) The company card storage capacity for cardholder tachograph specific settings shall be 3072 bytes.';

(27) point 5 is amended as follows:

(a) point 5.1 is amended as follows:

(i) paragraph (383) is replaced by the following:

'(383) Before its activation, the recording equipment shall neither record nor store data referred to by the requirements 102 to 133 inclusive. Nevertheless, before its activation, the recording equipment may record and store the security breach attempt events in accordance with requirement 117, and the recording equipment faults in accordance with requirement 118.';

(ii) paragraph (392) is replaced by the following:

'(392) Installation shall be followed by a calibration. The first calibration may not necessarily include entry of the vehicle registration identification (VRN and Member State), when it is not known by the approved workshop having to undertake this calibration. In these circumstances, it shall be possible, for the vehicle owner, and at this time only, to enter the VRN and the Member State using his company card prior to using the vehicle in scope of Regulation (EC) No 561/2006 (e.g by using commands through an appropriate menu structure of the vehicle unit's man-machine interface). Any update or confirmation of this entry shall only be possible using a workshop card.';

(b) point 5.2 is amended as follows:

(i) the first subparagraph in paragraph (395) is replaced by the following:

'After the recording equipment has been checked on installation, an installation plaque, engraved or printed in a permanent way, which is clearly visible and easily accessible shall be affixed onto the recording equipment. In cases where this is not possible, the plaque shall be affixed to the vehicle's 'B' pillar so that it is clearly visible. For vehicles that do not have a 'B' pillar, the installation plaque should be affixed in the area of the door of the vehicle and be clearly visible in all cases.';

(ii) paragraph (396) is amended as follows:

(1) the tenth indent is replaced by the following:

'- the serial number of the remote communication facility, if any,';

(2) the following sixteenth indent is added:

'- the by-default load type associated to the vehicle.';

(28) point 6.4 is amended as follows:

(a) paragraph (409) is replaced by the following:

'(409) 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 5 minutes, or when the VRN has changed, and at least once within two years (24 months) of the last inspection.';

(b) in paragraph (410), the following ninth indent is added:

'- that the version identifier of the stored digital map is the most recent one.';

(c) the following paragraph (410a) is inserted:

'(410a) In case of detection of a manipulation by the competent national authorities, the vehicle may be sent to an authorised workshop for a recalibration of the recording equipment.';

(29) point 8 is amended as follows:

(a) in point 8.1, paragraphs (429) and (430) are replaced by the following:

'(429) Procedures to update in-situ recording equipment software shall be approved by the authority which granted type approval for the recording equipment. Software update must not alter nor delete any driver activity data stored in the recording equipment. Software may be updated only under the responsibility of the equipment manufacturer.

(430) Type approval of software modifications aimed to update a previously type approved recording equipment may not be refused if such modifications only apply to functions not specified in this Annex. Software update of a recording equipment may exclude the introduction of new character sets, if not technically feasible.';

(b) point 8.4 is amended as follows:

(i) paragraph (443) is replaced by the following:

'(443) No interoperability tests shall be carried out by the laboratory, for recording equipment or tachograph cards that have not passed the vulnerability analysis of their security evaluation and a functional evaluation, except in the exceptional circumstances described in requirement 432.';

(ii) paragraph (447) is replaced by the following:

'(447) The interoperability certificate shall be issued by the laboratory to the manufacturer only after all required interoperability tests have been successfully passed and after the manufacturer has shown that both a valid functional certificate and a valid security certificate for the product has been granted, except in the exceptional circumstances described in requirement 432.';

(30) Appendix 1 is amended as follows:

(a) the Table of Content is amended as follows:

(i) the following points 2.11a and 2.11b are inserted:

'2.11a. CardBorderCrossing

2.11b. CardBorderCrossingRecord';

(ii) the following points 2.24a, 2.24b, 2.24c and 2.24d are inserted:

'2.24a. CardLoadTypeEntries

2.24b. CardLoadTypeEntryRecord

2.24c. CardLoadUnloadOperations

2.24d. CardLoadUnloadRecord';

(iii) the following point 2.26a is inserted:

'2.26a. CardPlaceAuthDailyWorkPeriod';

(iv) the following point 2.48a is inserted:

'2.48a. CompanyCardApplicationIdentificationV2';

(v) the following point 2.50a is inserted:

'2.50a. ControlCardApplicationIdentificationV2';

(vi) the following point 2.60a is inserted:

'2.60a. DownloadInterfaceVersion';

(vii) the following point 2.61a is inserted:

'2.61a. DriverCardApplicationIdentificationV2';

(viii) the following points 2.79a, 2.79b and 2.79c are inserted:

'2.79a. GNSSAuthAccumulatedDriving

2.79b. GNSSAuthStatusADRecord

2.79c. GNSSPlaceAuthRecord';

(ix) point 2.84 is replaced by the following:

'2.84. Reserved for future use';

(x) the following point 2.89a is inserted:

'2.89a. LengthOfFollowingData';

(xi) the following point 2.90a is inserted:

'2.90a. LoadType';

(xii) the following point 2.101a is inserted:

'2.101a. NoOfBorderCrossingRecords';

(xiii) the following point 2.111a is inserted:

'2.111a. NoOfLoadUnloadRecords';

(xiv) the following point 2.112a is inserted:

'2.112a. NoOfLoadTypeEntryRecords';

(xv) the following point 2.114a is inserted:

'2.114a. OperationType';

(xvi) the following points 2.116a and 2.116b are inserted:

'2.116a. PlaceAuthRecord

2.116b. PlaceAuthStatusRecord';

(xvii) the following point 2.117a is inserted:

'2.117a. PositionAuthenticationStatus';

(xviii) the following point 2.158a is inserted:

'2.158a. TachographCardsGen1Suppression';

(xix) the following point 2.166a is inserted:

'2.166a. VehicleRegistrationIdentificationRecordArray';

(xx) the following point 2.185a is inserted:

'2.185a. VuConfigurationLengthRange';

(xxi) the following point 2.192a is inserted:

'2.192a. VuDigitalMapVersion';

(xxii) the following points 2.203a and 2.203b are inserted:

'2.203a. VuBorderCrossingRecord

2.203b. VuBorderCrossingRecordArray';

(xxiii) the following point 2.204a is inserted:

'2.204a. VuGnssMaximalTimeDifference';

(xxiv) the following points 2.208a and 2.208b are inserted:

'2.208a. VuLoadUnloadRecord

2.208b. VuLoadUnloadRecordArray';

(xxv) the following point 2.222a is inserted:

'2.222a. VuRtcTime';

(xxvi) the following points 2.234a, 2.234b and 2.234c are inserted:

'2.234a. WorkshopCardApplicationIdentificationV2

2.234b. WorkshopCardCalibrationAddData

2.234c. WorkshopCardCalibrationAddDataRecord';

(b) in point 2, the text before point 2.1 is replaced by the following:

'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 Hex 'FF' bytes, unless otherwise specified.

All data types are used for Generation 1 and Generation 2 applications unless otherwise specified. Data types only used for Generation 2, version 2 applications are indicated.

For card data types used for Generation 1 and Generation 2 applications, the size specified in this Appendix is the one for Generation 2 application. The size for Generation 1 application is supposed to be already known by the reader. The Annex IC requirement numbers related to such data types cover both Generation 1 and Generation 2 applications.

Card data types not defined for Generation 1 cards are not stored in Generation 1 application of Generation 2 cards. In particular:

— Type approval numbers stored in Generation 1 application of Generation 2 cards are truncated to the 8 first characters where needed,

— Only the 'FERRY / TRAIN CROSSING begin' of a 'FERRY / TRAIN CROSSING' specific condition is stored in Generation 1 application of Generation 2 cards.';

(c) the following points 2.11a and 2.11b are inserted:

'2.11a. **CardBorderCrossings**

Generation 2, version 2:

Information, stored in a driver or workshop card, related to the border crossings of the vehicle when the latter has crossed the border of a country (Annex IC requirements 306f and 356f).

```
CardBorderCrossings ::= SEQUENCE {
     borderCrossingPointerNewestRecord     INTEGER (0..NoOfBorderCrossingRecords -1),
     cardBorderCrossingRecords            SET SIZE (NoOfBorderCrossingRecords)
                                          OF CardBorderCrossingRecord
}
```

borderCrossingPointerNewestRecord is the index of the last updated card border crossing record.

Value assignment is the number corresponding to the numerator of the card border crossing record, beginning with '0' for the first occurrence of the card border crossing record in the structure.

cardBorderCrossingRecords is the set of card border crossing records.

2.11b. **CardBorderCrossingRecord**

Generation 2, version 2:

Information, stored in a driver or workshop card, related to the border crossings of the vehicle when the latter has crossed the border of a country (Annex IC requirements 147b, 306e and 356e).

```
CardBorderCrossingRecord ::= SEQUENCE {
 countryLeft                    NationNumeric,
 countryEntered                 NationNumeric,
 gnssPlaceAuthRecord            GNSSPlaceAuthRecord,
 vehicleOdometerValue           OdometerShort
 }
```

countryLeft is the country which was left by the vehicle, or 'no information available' according to Annex IC requirement 147b. 'Rest of the World' (NationNumeric code 'FF'H) shall be used when the vehicle unit is not able to determine the country where the vehicle is located (e.g. the current country is not part of the stored digital maps).

countryEntered is the country into which the vehicle has entered, or the country in which the vehicle is located at card insertion time. 'Rest of the World' (NationNumeric code 'FF'H) shall be used when the vehicle unit is not able to determine the country where the vehicle is located (e.g. the current country is not part of the stored digital maps).

gnssPlaceAuthRecord contains information related to the position of the vehicle, when the vehicle unit has detected that the vehicle has crossed the border of a country, or 'no information available' according to requirement 147b of Annex IC, and its authentication status.

vehicleOdometerValue is the odometer value when the vehicle unit has detected that the vehicle has crossed the border of a country, or 'no information available' according to requirement 147b of Annex IC.';

(d) the following points 2.24a, 2.24b, 2.24c and 2.24d are inserted:

'2.24a. **CardLoadTypeEntries**

Generation 2, version 2:

Information, stored in a driver or workshop card, related to the load type entries when the card is inserted in a vehicle unit (Annex IC requirements 306j and 356j).

```
CardLoadTypeEntries ::= SEQUENCE {
 loadTypeEntryPointerNewestRecord INTEGER(0..NoOfLoadTypeEntryRecords -1),
 cardLoadTypeEntryRecords         SET SIZE(NoOfLoadTypeEntryRecords) OF
                                  CardLoadTypeEntryRecord
}
```

loadTypeEntryPointerNewestRecord is the index of the last updated card load type entry record.

Value assignment: number corresponding to the numerator of the card load type entry record, beginning with '0' for the first occurrence of the card load type entry record in the structure.

cardLoadTypeEntryRecords is the set of records containing the date and time of the entry and the load type entered.

2.24b. **CardLoadTypeEntryRecord**

Generation 2, version 2:

Information, stored in a driver or workshop card, related to the load type changes entered when the card is inserted in a vehicle unit (Annex IC requirements 306i and 356i).

```
CardLoadTypeEntryRecord ::= SEQUENCE {
     timeStamp                    TimeReal,
     loadTypeEntered              LoadType
}
```

timeStamp is the date and time when the load type was entered.

loadTypeEntered is the load type entered.

2.24c. **CardLoadUnloadOperations**

Generation 2, version 2:

Information, stored in a driver or workshop card, related to load/unload operations of the vehicle (Annex IC requirements 306h and 356h).

```
CardLoadUnloadOperations ::= SEQUENCE {
   loadUnloadPointerNewestRecord     INTEGER(0..NoOfLoadUnloadRecords -1),
  cardLoadUnloadRecords              SET SIZE(NoOfLoadUnloadRecords) OF
                                     CardLoadUnloadRecord

}
```

loadUnloadPointerNewestRecord is the index of the last updated card load/unload record.

Value assignment: is the number corresponding to the numerator of the card load/unload record, beginning with '0' for the first occurrence of the card load/unload record in the structure.

cardLoadUnloadRecords is the set of records containing the indication of the type of operation performed (load, unload, or simultaneous load and unload), the date and time the load/unload operation has been entered, information about the position of the vehicle, and the vehicle odometer value.

2.24d. **CardLoadUnloadRecord**

Generation 2, version 2:

Information, stored in a driver or workshop card, related to load/unload operations of the vehicle (Annex IC requirements 306g and 356g).

```
CardLoadUnloadRecord ::= SEQUENCE {
              timeStamp                TimeReal,
              operationType            OperationType,
              gnssPlaceAuthRecord      GNSSPlaceAuthRecord,
              vehicleOdometerValue     OdometerShort
}
```

timeStamp is the date and time at the beginning of the load/unload operation.

operationType is the type of operation entered (load, unload, or simultaneous load/unload).

gnssPlaceAuthRecord contains information related to the position of the vehicle.

vehicleOdometerValue is the odometer value related to the beginning of the load/unload operation.';

(e) the following point 2.26a is inserted:

'2.26a. **CardPlaceAuthDailyWorkPeriod**

Generation 2, version 2:

Information, stored in a driver or a workshop card, providing the authentication status of places where daily work periods begin and/or end (Annex IC requirements 306b and 356b).

```
CardPlaceAuthDailyWorkPeriod ::= SEQUENCE {
  placeAuthPointerNewestRecord     INTEGER(0 .. NoOfCardPlaceRecords-1),
  placeAuthStatusRecords            SET SIZE(NoOfCardPlaceRecords) OF
                                    PlaceAuthStatusRecord
}
```

placeAuthPointerNewestRecord is the index of the last updated place authentication status record.

Value assignment: Number corresponding to the numerator of the place authentication status record, beginning with '0' for the first occurrence of the place authentication status records in the structure.

placeAuthStatusRecords is the set of records containing the place authentication status of the places entered.';

(f) in point 2.36, the text corresponding to the value assignment 'bbH' is replaced by the following:

"bb'H Index for changes concerning the use of the data elements defined for the structure given by the high byte.

'00'H for Generation 1 applications

'00'H for version 1 of Generation 2 applications

'01'H for version 2 of Generation 2 applications';

(g) in point 2.40, the paragraph between the header and the code is replaced by the following:

'Generation 2:

Information, stored in a driver or workshop card, related to the vehicle units used by the card holder (Annex IC requirements 304 and 352).';

(h) the following point 2.48a is inserted:

'2.48a. **CompanyCardApplicationIdentificationV2**

Generation 2, version 2:

Information, stored in a company card related to the identification of the application of the card (Annex IC requirement 375a).

```
CompanyCardApplicationIdentificationV2 ::= SEQUENCE {
      lengthOfFollowingData         LengthOfFollowingData,
      vuConfigurationLengthRange    VuConfigurationLengthRange
}
```

lengthOfFollowingData is the number of bytes following in the record.

vuConfigurationLengthRange is the number of bytes in a tachograph card, available to store VU configurations.';

(i) the following point 2.50a is inserted:

'2.50a. **ControlCardApplicationIdentificationV2**

Generation 2, version 2:

Information, stored in a control card related to the identification of the application of the card (Annex IC requirement 363a).

```
ControlCardApplicationIdentificationV2 ::= SEQUENCE {
      lengthOfFollowingData         LengthOfFollowingData,
      vuConfigurationLengthRange    VuConfigurationLengthRange
}
```

lengthOfFollowingData is the number of bytes following in the record.

vuConfigurationLengthRange is the number of bytes in a tachograph card, available to store VU configurations.';

(j) the following point 2.60a is inserted:

'2.60a. **DownloadInterfaceVersion**

Generation 2, version 2:

Code indicating the version of the downlaod interface of a vehicle unit.

```
DownloadInterfaceVersion ::= OCTET STRING (SIZE(2))
```

Value assignment: 'aabb'H:

'aa'H '00'H: not used,

'01'H: Generation 2 vehicle unit,

'bb'H '00'H: not used,

'01'H: version 2 of Generation 2 vehicle unit.';

(k) the following point 2.61a is inserted:

'2.61a. **DriverCardApplicationIdentificationV2**

Generation 2, version 2:

Information, stored in a driver card related to the identification of the application of the card (Annex IC requirement 278a).

```
DriverCardApplicationIdentificationV2 ::= SEQUENCE {
          lengthOfFollowingData                    LengthOfFollowingData,
          noOfBorderCrossingRecords
                                   NoOfBorderCrossingRecords,
          noOfLoadUnloadRecords                    NoOfLoadUnloadRecords,
          noOfLoadTypeEntryRecords                 NoOfLoadTypeEntryRecords,
          vuConfigurationLengthRange               VuConfigurationLengthRange
}
```

lengthOfFollowingData is the number of bytes following in the record.

noOfBorderCrossingRecords is the number of border crossing records the driver card can store.

noOfLoadUnloadRecords is the number of load/unload records the driver card can store.

noOfLoadTypeEntryRecords is the number of load type entry records the driver card can store.

vuConfigurationLengthRange is the number of bytes in a tachograph card, available to store VU configurations.';

(l) point 2.63 is replaced by the following:

'2.63. **DSRCSecurityData**

Generation 2:

For the definition of this data type, see Appendix 11.';

(m) in point 2.66, the text corresponding to generation 2 is replaced by the following:

'Generation 2

```
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)
}
```

Value assignment: according to ISO/IEC8824-1.';

(n) point 2.70 is amended as follows:

(i) the header corresponding to Generation 2 is replaced by the following:

'Generation 2, version 1:';

(ii) the following text is added:

'Generation 2, version 2:

'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	Vehicle Motion Conflict,
'0B'H	Time conflict (GNSS versus VU internal clock),
'0C'H	Communication error with the remote communication facility,
'0D'H	Absence of position information from GNSS receiver,
'0E'H	Communication error with the external GNSS facility,
'0F'H	GNSS anomaly,
'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	Tamper detection of GNSS,
'1A'H	External GNSS facility authentication failure,
'1B'H	External GNSS facility certificate expired,
'1C'H	Inconsistency between motion data and stored driver activity data,

'1D'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	Recording equipment 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	Internal GNSS receiver,
'37'H	External GNSS facility,
'38'H	Remote communication facility,
'39'H	ITS interface,
'3A'H	Internal Sensor Fault,
'3B'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.';

(o) point 2.71 is replaced by the following:

'2.71. **ExtendedSealIdentifier**

Generation 2:

The extended seal identifier uniquely identifies a seal (Annex IC requirement 401).

```
ExtendedSealIdentifier ::= SEQUENCE{
      manufacturerCode        IA5String (SIZE(2)),
      sealIdentifier          IA5String (SIZE(8))
}
```

manufacturerCode is a code of the manufacturer of the seal. **Value assignment:** see database registration to be managed by the European Commission (see https://dtc.jrc.ec.europa.eu).

sealIdentifier is an identifier for the seal which is unique for the manufacturer. **Value assignment:** alpha-numeric number, unique in the manufacturer domain according to [ISO8859-1].';

(p) in point 2.76, the paragraph between the header and the code is replaced by the following:

'Generation 2:

The geo-coordinates are encoded as integers. These integers are multiples of the ±DDMM.M encoding for the latitude and ±DDDMM.M for the longitude. Here ±DD respectively ±DDD denotes the degrees and MM.M the minutes. Longitude and latitude of an unknown position shall be represented as Hex '7FFFF' (Decimal 8388607).';

(q) the following points 2.79a, 2.79b and 2.79c are inserted:

'2.79a. **GNSSAuthAccumulatedDriving**

Generation 2, version 2:

Information, stored in a driver or workshop card, providing the authentication status of GNSS positions of the vehicle if the accumulated driving time reaches a multiple of three hours (Annex IC requirements 306d and 356d).

```
GNSSAuthAccumulatedDriving ::= SEQUENCE {
 gnssAuthADPointerNewestRecord        INTEGER(0..NoOfGNSSADRecords -1),
 gnssAuthStatusADRecords              SET SIZE (NoOfGNSSADRecords) OF
                                      GNSSAuthStatusADRecord

}
```

gnssAuthADPointerNewestRecord is the index of the last updated GNSS position authentication status record.

Value assignment is the number corresponding to the numerator of the GNSS position authentication status record, beginning with '0' for the first occurrence of the GNSS position authentication status record in the structure.

gnssAuthStatusADRecords is the set of records containing the date and time the accumulated driving reaches a multiple of three hours and the authentication status of the GNSS position.

2.79b. **GNSSAuthStatusADRecord**

Generation 2, version 2:

Information, stored in a driver or workshop card, providing the authentication status of a GNSS position of the vehicle if the accumulated driving time reaches a multiple of three hours (Annex IC requirements 306c and 356c). Other information related to the GNSS position itself is stored in another record (see 2.79 GNSSAccumulatedDrivingRecord).

```
GNSSAuthStatusADRecord ::= SEQUENCE {
        timeStamp                TimeReal,
        authenticationStatus     PositionAuthenticationStatus
}
```

timeStamp is the date and time when the accumulated driving time reaches a multiple of three hours (which is the same date and time as in the corresponding GNSSAccumulatedDrivingRecord).

authenticationStatus is the authentication status of the GNSS position when the accumulated driving time reaches a multiple of three hours.

2.79c. **GNSSPlaceAuthRecord**

Generation 2, version 2:

Information related to the GNSS position of the vehicle (Annex IC requirements 108, 109, 110, 296, 306a, 306c, 306e, 306g, 356a, 356c, 356e and 356g).

```
GNSSPlaceAuthRecord ::= SEQUENCE {
       timeStamp                   TimeReal,
       gnssAccuracy                GNSSAccuracy,
       geoCoordinates              GeoCoordinates,
       authenticationStatus        PositionAuthenticationStatus
}
```

timeStamp is the date and time when the GNSS position of the vehicle was determined.

gnssAccuracy is the accuracy of the GNSS position data.

geoCoordinates is the recorded location using GNSS.

authenticationStatus is the authentication status of the GNSS position when it was determined.';

(r) point 2.84 is replaced by the following:

'2.84. **Reserved for future use**';

(s) the following point 2.89a is inserted:

'2.89a. **LengthOfFollowingData**

Generation 2, version 2:

Length indicator for extensible records.

```
LengthOfFollowingData ::= INTEGER(0.. 2^16-1)
```

Value assignment: See Appendix 2.';

(t) the following point 2.90a is inserted:

'2.90a. **LoadType**

Generation 2, version 2:

Code identifying a load type entered.

```
LoadType ::= INTEGER(0..255)
```

Value assignment:

'00'H	Undefined load type,
'01'H	Goods,
'02'H	Passengers,
'03'H .. 'FF'H	RFU.';

(u) the following point 2.101a is inserted:

'2.101a. **NoOfBorderCrossingRecords**

Generation 2, version 2:

Number of border crossing records a driver or workshop card can store.

```
NoOfBorderCrossingRecords ::= INTEGER(0.. 2^16-1)
```

Value assignment: see Appendix 2.';

(v) the following point 2.111a is inserted:

'2.111a. **NoOfLoadUnloadRecords**

Generation 2, version 2:

Number of load/unload records a card can store.

```
NoOfLoadUnloadRecords ::= INTEGER(0..2^16-1)
```

Value assignment: see Appendix 2.';

(w) the following point 2.112a is inserted:

'2.112a. **NoOfLoadTypeEntryRecords**

Generation 2, version 2:

Number of load type entry records a driver or workshop card can store.

```
NoOfLoadTypeEntryRecords ::= INTEGER(0..2^16-1)
```

Value assignment: see Appendix 2.';

(x) the following point 2.114a is inserted:

'2.114a. **OperationType**

Generation 2, version 2:

Code identifying a type of operation entered.

```
OperationType ::= INTEGER(0..255)
```

Value assignment:

'00'H	RFU,
'01'H	Load operation,
'02'H	Unload operation,
'03'H	Simultaneous load/unload operation,
'04'H .. 'FF'H	RFU.';

(y) the following points 2.116a and 2.116b are inserted:

'2.116a. **PlaceAuthRecord**

Information related to a place where a daily work period begins or ends (Annex IC requirements 108, 271, 296, 324 and 347).

Generation 2, version 2:

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

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.

entryGNSSPlaceAuthRecord is the recorded location, GNSS authentication status and time.

2.116b. **PlaceAuthStatusRecord**

Generation 2, version 2:

Information, stored in a driver or workshop card, providing the authentication status of a place where a daily work period begins or ends (Annex IC requirements 306a and 356a). Other information related to the place itself is stored in another record (see 2.117 PlaceRecord).

```
PlaceAuthStatusRecord ::= SEQUENCE {
  entryTime                    TimeReal,
  authenticationStatus         PositionAuthenticationStatus
}
```

entryTime is a date and time related to the entry (which is the same date and time as in the corresponding PlaceRecord).

authenticationStatus is the authentication status of the recorded GNSS position.';

(z) the following point 2.117a is inserted:

'2.117a. **PositionAuthenticationStatus**

Generation 2, version 2:

```
PositionAuthenticationStatus ::= INTEGER(0..255)
```

Value assignment (see Appendix 12):

'00'H	Not Authenticated (see Appendix 12, requirement GNS_39),
'01'H	Authenticated (see Appendix 12, requirement GNS_39),
'02'H .. 'FF'H	RFU.';

(aa) in point 2.120, value assignments '22'H to '7F'H are replaced by the following:

"22'H	VuBorderCrossingRecord,
'23'H	VuLoadUnloadRecord,
'24'H	VehicleRegistrationIdentification,
'25'H to '7F'H	RFU.';

(bb) the following point 2.158a is inserted:

'2.158a. **TachographCardsGen1Suppression**

Generation 2, version 2:

Ability of a second generation VU to use first generation of driver, control and company cards (see Appendix 15, MIG_002).

```
TachographCardsGen1Suppression ::= INTEGER (0..2^16-1)
```

Value assignment:

'0000'H	The VU is able to use the generation 1 of tachograph cards (default value),
'A5E3'H	The VU is not able to use the tachograph cards generation 1,
All other values	Not used.';

(cc) the following point 2.166a is inserted:

'2.166a. **VehicleRegistrationIdentificationRecordArray**

Generation 2, version 2:

The Vehicle Registration Identification plus metadata as used in the download protocol.

```
VehicleRegistrationIdentificationRecordArray ::= SEQUENCE {
    recordType                  RecordType,
    recordSize                  INTEGER(1..65535),
    noOfRecords                 INTEGER(0..65535),
    records                     SET SIZE(noOfRecords) OF
                                VehicleRegistrationIdentification
}
```

recordType denotes the type of the record (VehicleRegistrationIdentification). **Value assignment**: see RecordType.

recordSize is the size of the VehicleRegistrationIdentification in bytes.

noOfRecords is the number of records in the set records.

records is the set of vehicle registration identification.';

(dd) in point 2.168, the first line after the header is replaced by the following:

'Generation 2, version 1:';

(ee) point 2.174 is amended as follows:

(i) the header for Generation 2 is replaced by the following:

'Generation 2, version 1:';

(ii) the following text is added:

'Generation 2, version 2:

```
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,
 sensorSerialNumber                 SensorSerialNumber,
 sensorGNSSSerialNumber             SensorGNSSSerialNumber,
 rcmSerialNumber                    RemoteCommunicationModuleSerialNumber,
 sealDataVu                         SealDataVu,
 byDefaultLoadType                  LoadType,
 calibrationCountry                 NationNumeric,
 calibrationCountryTimestamp        TimeReal
}
```

In addition to generation 1 the following data element is used:

sensorSerialNumber is the serial number of the motion sensor paired with the vehicle unit at the end of the calibration,

sensorGNSSSerialNumber is the serial number of the external GNSS facility coupled with the vehicle unit at the end of the calibration (if any),

rcmSerialNumber is the serial number of the remote communication facility coupled with the vehicle unit at the end of the calibration (if any),

sealDataVu gives information about the seals that are attached to different components of the vehicle.

byDefaultLoadType is the by-default load type of the vehicle (only present in version 2).

calibrationCountry is the country in which the calibration has been performed.

calibrationCountryTimestamp is the date and time when the position used to determine the country in which the calibration has been performed was provided by the GNSS receiver.';

(ff) the following point 2.185a is inserted:

'2.185a. **VuConfigurationLengthRange**

Generation 2, version 2:

Number of bytes in a tachograph card, available to store VU configurations.

```
VuConfigurationLengthRange ::= INTEGER(0..2^16-1)
```

Value assignment: see Appendix 2.';

(gg) the following point 2.192a is inserted:

'2.192a. **VuDigitalMapVersion**

Generation 2, version 2:

Version of the digital map stored in the vehicle unit (Annex IC requirement 133j).

```
VuDigitalMapVersion ::= IA5String(SIZE(12))
```

Value assignment: as specified on the dedicated secured website made available by the European Commission (Annex IC requirement 133k).';

(hh) point 2.203 is amended as follows:

(i) the header corresponding to Generation 2 is replaced by the following:

'Generation 2, version 1:';

(ii) the following text is added:

'Generation 2, version 2:

Information, stored in a vehicle unit, related to the GNSS position of the vehicle if the accumulated driving time reaches a multiple of three hours (Annex IC requirement 108, 110).

```
VuGNSSADRecord ::= SEQUENCE {
      timestamp                   TimeReal,
      cardNumberAndGenDriverSlot  FullCardNumberAndGeneration,
      cardNumberAndGenCodriverSlot FullCardNumberAndGeneration,
      gnssPlaceAuthRecord         GNSSPlaceAuthRecord,
      vehicleOdometerValue        OdometerShort
}
```

In Generation 2 version 2, instead of gnssPlaceRecord, the gnssPlaceAuthRecord is used, which contains the GNSS authentication status in addition.';

(ii) the following points 2.203a and 2.203b are inserted:

'2.203a. **VuBorderCrossingRecord**

Generation 2, version 2:

Information, stored in a vehicle unit, related to border crossings of the vehicle when the latter has crossed the border of a country (Annex IC requirement 133a and 133b).

```
VuBorderCrossingRecord ::= SEQUENCE {
    cardNumberAndGenDriverSlot      FullCardNumberAndGeneration,
    cardNumberAndGenCodriverSlot    FullCardNumberAndGeneration,
    countryLeft                     NationNumeric,
    countryEntered                  NationNumeric,
    gnssPlaceAuthRecord             GNSSPlaceAuthRecord,
    vehicleOdometerValue            OdometerShort
}
```

cardNumberAndGenDriverSlot identifies the card including its generation which is inserted in the driver slot.

cardNumberAndGenCodriverSlot identifies the card including its generation which is inserted in the co-driver slot.

countryLeft is the country which was left by the vehicle, based on the last available position before the border crossing has been detected. 'Rest of the World' (NationNumeric code 'FF'H) shall be used when the vehicle unit is not able to determine the country where the vehicle is located (e.g. the current country is not part of the stored digital maps).

countryEntered is the country into which the vehicle has entered. 'Rest of the World' (NationNumeric code 'FF'H) shall be used when the vehicle unit is not able to determine the country where the vehicle is located (e.g. the current country is not part of the stored digital maps).

gnssPlaceAuthRecord contains information related to the position of the vehicle when the border crossing was detected, and its authentication status.

vehicleOdometerValue is the odometer value when the vehicle unit has detected that the vehicle has crossed the border of a country.

2.203b. **VuBorderCrossingRecordArray**

Generation 2, version 2:

Information, stored in a vehicle unit, related to border crossings of the vehicle (Annex IC requirement 133c).

```
VuBorderCrossingRecordArray  ::= SEQUENCE {
   recordType         RecordType,
   recordSize         INTEGER(1..65535),
   noOfRecords        INTEGER(0..65535),
   records            SET SIZE(noOfRecords) OF VuBorderCrossingRecord
}
```

recordType denotes the type of the record (VuBorderCrossingRecord). **Value assignment**: see RecordType.

recordSize is the size of the VuBorderCrossingRecord in bytes.

noOfRecords is the number of records in the set records.

records is a set of border crossing records.';

(jj) the following point 2.204a is inserted:

'2.204a. **VuGnssMaximalTimeDifference**

Generation 2, version 2:

The maximal difference between true time and the VU Real Time Clock time, based on the maximal time drift specified in Annex IC requirement 041, transmitted by the vehicle unit to an external GNSS Facility, see Appendix 12 requirement GNS_3g.

```
VuGnssMaximalTimeDifference ::= INTEGER(0..65535)
```

';

(kk) in point 2.205, the text corresponding to Generation 2 is replaced by the following:

'Generation 2:

```
VuIdentification ::= SEQUENCE {
        vuManufacturerName              VuManufacturerName,
        vuManufacturerAddress           VuManufacturerAddress,
        vuPartNumber                    VuPartNumber,
        vuSerialNumber                  VuSerialNumber,
        vuSoftwareIdentification        VuSoftwareIdentification,
        vuManufacturingDate             VuManufacturingDate,
        vuApprovalNumber                VuApprovalNumber,
        vuGeneration                    Generation,
        vuAbility                       VuAbility,
        vuDigitalMapVersion             VuDigitalMapVersion
}
```

In addition to generation 1 the following data elements are used:

vuGeneration identifies the generation of the vehicle unit.

vuAbility provides information whether the VU supports generation 1 tachograph cards or not.

vuDigitalMapVersion is the version of the digital map stored in the vehicle unit (only present in version 2).';

(ll) the following points 2.208a and 2.208b are inserted:

'2.208a. **VuLoadUnloadRecord**

Generation 2, version 2:

Information, stored in the vehicle unit, related to a load/unload operation entered (Annex IC requirements 133e, 133f and 133g).

```
VuLoadUnloadRecord ::= SEQUENCE {
        timeStamp                       TimeReal,
        operationType                   OperationType
        cardNumberAndGenDriverSlot      FullCardNumberAndGeneration,
        cardNumberAndGenCodriverSlot    FullCardNumberAndGeneration,
        gnssPlaceAuthRecord             GNSSPlaceAuthRecord,
        vehicleOdometerValue            OdometerShort
}
```

timeStamp is the date and time when the load/unload operation was entered.

operationType is the type of the operation entered (load, unload, or simultaneous load/unload).

cardNumberAndGenDriverSlot identifies the card including its generation which is inserted in the driver slot.

cardNumberAndGenCodriverSlot identifies the card including its generation which is inserted in the co-driver slot.

gnssPlaceAuthRecord contains information related to the position of the vehicle, and its authentication status.

vehicleOdometerValue is the odometer value related to the load/unload operation.

2.208b. **VuLoadUnloadRecordArray**

Generation 2, version 2:

Information, stored in a vehicle unit, related to a load/unload operation vehicle entered (Annex IC requirement 133h).

```
VuLoadUnloadRecordArray  ::= SEQUENCE {
        recordType                  RecordType,
        recordSize                  INTEGER(1..65535),
        noOfRecords                 INTEGER(0..65535),
        records                     SET SIZE(noOfRecords) OF VuLoadUnloadRecord
}
```

recordType denotes the type of the record (VuLoadUnloadRecord).**Value Assignment**: See RecordType.

recordSize is the size of the VuLoadUnloadRecord in bytes.

noOfRecords is the number of records in the set records.

records is a set of load/unload operation records.';

(mm) point 2.219 is amended as follows:

(i) the header for Generation 2 is replaced by the following:

'Generation 2, version 1:';

(ii) the following text is added:

'Generation 2, version 2:

Information, stored in a vehicle unit, related to a place where a driver begins or ends a daily work period (Annex 1B requirement 087 and Annex 1C requirement 108 and 110).

```
VuPlaceDailyWorkPeriodRecord ::= SEQUENCE {
            fullCardNumberAndGeneration   FullCardNumberAndGeneration,
            placeAuthRecord               PlaceAuthRecord
}
```

Instead of placeRecord, the generation 2 version 2 data structure makes use of the following data element:

placeAuthRecord contains the information related to the place entered, the recorded position, GNSS authentication status and position determination time.';

(nn) the following point is inserted after point 2.222:

'2.222a. **VuRtcTime**

Generation 2, version 2:

The time of the VU RTC clock, transmitted by the VU to an External GNSS Facility, see Appendix 12 requirement GNS_3f.

```
VuRtcTime ::= TimeReal
```

';

(oo) the following points 2.234a, 2.234b and 2.234c are inserted:

'2.234a. **WorkshopCardApplicationIdentificationV2**

Generation 2, version 2:

Information, stored in a workshop card related to the identification of the application of the card (Annex IC requirement 330a).

```
WorkshopCardApplicationIdentificationV2 ::= SEQUENCE {
  lengthOfFollowingData                 LengthOfFollowingData,
  noOfBorderCrossingRecords             NoOfBorderCrossingRecords,
  noOfLoadUnloadRecords                 NoOfLoadUnloadRecords,
  noOfLoadTypeEntryRecords              NoOfLoadTypeEntryRecords,
  vuConfigurationLengthRange            VuConfigurationLengthRange
}
```

lengthOfFollowingData is the number of bytes following in the record.

noOfBorderCrossingRecords is the number of border crossing records the workshop card can store.

noOfLoadUnloadRecords is the number of load/unload records the workshop card can store.

noOfLoadTypeEntryRecords is the number of load type entry records the workshop card can store.

vuConfigurationLengthRange is the number of bytes in a tachograph card, available to store VU configurations.

2.234b. **WorkshopCardCalibrationAddData**

Generation 2, version 2:

Information, stored in a workshop card, related to the additional data (i.e. by-default load type) entered during a calibration (Annex IC requirement 356l).

```
WorkshopCardCalibrationAddData ::= SEQUENCE {
  calibrationPointerNewestRecord              INTEGER(0..NoOfCalibrationRecords -1),
  workshopCardCalibrationAddDataRecords       SET SIZE(NoOfCalibrationRecords) OF
                                          WorkshopCardCalibrationAddDataRecord
}
```

calibrationPointerNewestRecord is the index of the last updated calibration additional data record.

Value assignment is the number corresponding to the numerator of the calibration additional data record, beginning with '0' for the first occurrence of the calibration additional data record in the structure.

workshopCardCalibrationAddDataRecords is the set of records containing the old date and time value, the vehicle identification value and the by-default load type of the vehicle.

2.234c. **WorkshopCardCalibrationAddDataRecord**

Generation 2, version 2:

Information, stored in a workshop card, related to the by-default load type entered during a calibration (Annex IC requirement 356k).

```
WorkshopCardCalibrationAddDataRecord ::= SEQUENCE {
          oldTimeValue                        TimeReal,
          vehicleIdentificationNumber         VehicleIdentificationNumber,
          byDefaultLoadType                   LoadType,
          calibrationCountry                  NationNumeric,
          calibrationCountryTimestamp         TimeReal
}
```

oldTimeValue is the old value of date and time contained in the corresponding WorkshopCardCalibrationRecord,

vehicleIdentificationNumber is the vehicle identification number of the vehicle, also contained in the corresponding WorkshopCardCalibrationRecord,

byDefaultLoadType is the by-default load type of the vehicle (only present in version 2).

calibrationCountry is the country in which the calibration has been performed,

calibrationCountryTimestamp is the date time when the position used to determine this country was provided by the GNSS receiver.';

(31) Appendix 2 is amended as follows:

(a) in point 2.5, the second sub-paragraph in paragraph TCS_09 is replaced by the following:

'Operation state while executing commands or interfacing with Vehicle Unit,';

(b) point 3 is amended as follows:

(i) in point 3.2.1, the fourth indent in paragraph TCS_16 is deleted.

(ii) point 3.5.7.2 is amended as follows:

(1) paragraph TCS_86 is replaced by the following:

'TCS_86 The command can be performed in the MF, DF Tachograph and DF Tachograph_G2, see also TCS_34.';

(2) paragraphs TCS_88 and TCS_89 are replaced by the following:

'TCS_88 For short length APDUs the following provisions apply: the IFD shall use the minimum number of APDUs required to transmit the command payload and transmit the maximum number of bytes in the first command APDU. However any value of 'Lc' up to 255 bytes must be supported by the card.

TCS_89 For extended length APDUs the following provisions apply: if the certificate does not fit into a single APDU, the card shall support command chaining. The IFD shall use the minimum number of APDUs required to transmit the command payload and transmit the maximum number of bytes in the first command APDU. If chaining is needed, any value of 'Lc' up to the maximum extended length size indicated must be supported by the card.

Note: According to Appendix 11 the card stores the certificate or the relevant contents of the certificate and updates its currentAuthenticatedTime.

The response message structure and status words are as defined in TCS_85.';

(iii) in point 3.5.10, the last row of the table in paragraph TCS_101 is replaced by the following:

'Le	1	'00h'	As specified in ISO/IEC 7816-4'

;

(iv) in point 3.5.16, the last row of the table in paragraph TCS_138 is replaced by the following:

'Le	1	'00h'	As specified in ISO/IEC 7816-4'

;

(c) point 4 is amended as follows:

(i) in paragraph TCS_141, the second subparagraph is replaced by the following:

'The maximum and minimum numbers of records are specified in this chapter for the different applications. In version 2 of generation 2 driver and workshop cards, the generation 1 application shall support the maximum number of records specified in TCS_150 and TCS_158.';

(ii) in point 4.2.1, the table in paragraph TCS_150 is amended as follows:

(1) the row corresponding to cardIssuingAuthorityName is replaced by the following:

‘

```
│ │ └cardIssuingAuthorityName                    36     36 {00,20..20}
```

’;

(2) the row corresponding to LastCardDownload is replaced by the following:

‘

```
│   └LastCardDownload                              4      4 {00..00}
```

’;

(iii) point 4.2.2 is amended as follows:

(1) paragraph TCS_152 is replaced by the following:

‘TCS_152 After its personalisation, the driver card application generation 2 shall have the following permanent file structure and file access rules:

Notes:

— The short EF identifier SFID is given as decimal number, e.g. the value 30 corresponds to 11110 in binary.

— EF Application_Identification_V2, EF Places_Authentication, EF GNSS_Places_Authentication, EF Border_Crossings, EF Load_Unload_Operations, EF VU_Configuration and EF Load_Type_Entries are only present in version 2 of the generation 2 driver card.

— cardStructureVersion in EF Application_Identification is equal to {01 01} for version 2 of the generation 2 driver card, while it was equal to {01 00} for version 1 of the generation 2 driver card.

			Access rules	
File	**File ID**	**SFID**	**Read / Select**	**Update**
└─DF Tachograph G2			SC1	
├─EF Application Identification	‘0501h	1	SC1	NEV
├─EF CardMA Certificate	‘C100h	2	SC1	NEV
├─EF CardSignCertificate	‘C101h	3	SC1	NEV
├─EF CA Certificate	‘C108h	4	SC1	NEV
├─EF Link Certificate	‘C109h	5	SC1	NEV
├─EF Identification	‘0520h	6	SC1	NEV
├─EF Card Download	‘050Eh	7	SC1	SC1
├─EF Driving Licence Info	‘0521h	10	SC1	NEV
├─EF Events Data	‘0502h	12	SC1	SM-MAC-G2
├─EF Faults Data	‘0503h	13	SC1	SM-MAC-G2
├─EF Driver Activity Data	‘0504h	14	SC1	SM-MAC-G2
├─EF Vehicles Used	‘0505h	15	SC1	SM-MAC-G2
├─EF Places	‘0506h	16	SC1	SM-MAC-G2
├─EF Current Usage	‘0507h	17	SC1	SM-MAC-G2
├─EF Control Activity Data	‘0508h	18	SC1	SM-MAC-G2
├─EF Specific Conditions	‘0522h	19	SC1	SM-MAC-G2
├─EF VehicleUnits Used	‘0523h	20	SC1	SM-MAC-G2
├─EF GNSS Places	‘0524h	21	SC1	SM-MAC-G2
├─EF Application Identification	‘0525h	22	SC1	NEV
├─EF Places Authentication	‘0526h	23	SC1	SM-MAC-G2
├─EF GNSS Places Authentication	‘0527h	24	SC1	SM-MAC-G2
├─EF Border Crossings	‘0528h	25	SC1	SM-MAC-G2
├─EF Load Unload Operations	‘0529h	26	SC1	SM-MAC-G2
├─EF Load Type Entries	‘0530h	27	SC1	SM-MAC-G2
└─EF Vu Configuration	‘0540h	30	SC5/SC1	SM-MAC-G2

The following abbreviations for the security condition are used in this table:

SC1	ALW OR SM-MAC-G2
SC5	For the Read Binary command with even INS byte: SM-C-MAC-G2 AND SM-R-ENC-MAC-G2 For the Read Binary command with odd INS byte (if supported): NEV';

(2) paragraph TCS_154 is replaced by the following:

'TCS_154 The driver card application generation 2 shall have the following data structure:

File Element / Data	No of Records	Size (bytes) Min	Max	Default Values
		9830	988	
DF Tachograph_G2		0	48	
EF Application_Identification		*17*	*17*	
DriverCardApplicationIdentification		17	17	
typeOfTachographCardId		1	1	{00}
cardStructureVersion		2	2	{01 01}
noOfEventsPerType		1	1	{00}
noOfFaultsPerType		1	1	{00}
activityStructureLength		2	2	{00 00}
noOfCardVehicleRecords		2	2	{00 00}
noOfCardPlaceRecords		2	2	{00 00}
noOfGNSSADRecords		2	2	{00 00}
noOfSpecificConditionRecords		2	2	{00 00}
noOfCardVehicleUnitRecords		2	2	{00 00}
EF CardMA_Certificate		*204*	*341*	
CardMA_Certificate		204	341	{00..00}
EF CardSignCertificate		*204*	*341*	
CardSignCertificate		204	341	{00..00}
EF CA_Certificate		*204*	*341*	
MemberStateCertificate		204	341	{00..00}
EF Link_Certificate		*204*	*341*	
LinkCertificate		204	341	{00..00}
EF Identification		*143*	*143*	
CardIdentification		65	65	
cardIssuingMemberState		1	1	{00}
cardNumber		16	16	{20..20}
cardIssuingAuthorityName		36	36	{00, 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, 20..20}
holderFirstNames		36	36	{00, 20..20}
cardHolderBirthDate		4	4	{00..00}
cardHolderPreferredLanguage		2	2	{20 20}
EF Card_Download		4	4	
LastCardDownload		4	4	{00..00}
EF Driving_Licence_Info		*53*	*53*	
CardDrivingLicenceInformation		*53*	*53*	
drivingLicenceIssuingAuthority		36	36	{00, 20..20}
drivingLicenceIssuingNation		1	1	{00}
drivingLicenceNumber		16	16	{20..20}
EF Events_Data		*3168*	*3168*	
CardEventData		*3168*	*3168*	
cardEventRecords	11	288	288	
CardEventRecord	n1	24	24	
eventType		1	1	{00}
eventBeginTime		4	4	{00..00}
eventEndTime		4	4	{00..00}
eventVehicleRegistration				
vehicleRegistration Nation		1	1	{00}
vehicleRegistration Number		14	14	{00, 20..20}
EF Faults_Data		*1152*	*1152*	
CardFaultData		*1152*	*1152*	
cardFaultRecords	2	576	576	
CardFaultRecord	n2	24	24	
faultType		1	1	{00}
faultBeginTime		4	4	{00..00}
faultEndTime		4	4	{00..00}
faultVehicleRegistration				
vehicleRegistration Nation		1	1	{00}

File Element / Data	No of Records	Size (bytes) Min	Max	Default Values
vehicleRegistrationNumber		14	14	{00, 20..20}
EF Driver_Activity_Data		*13780*	*13780*	
CardDriverActivity		*13780*	*13780*	
activityPointerOldestDayRecord		2	2	{00 00}
activityPointerNewestRecord		2	2	{00 00}
activityDailyRecords	n6	13776	13776	{00..00}
EF Vehicles_Used		*9602*	*9602*	
CardVehiclesUsed		*9602*	*9602*	
vehiclePointerNewestRecord		2	2	{00 00}
cardVehicleRecords		9600	9600	
cardVehicleRecord	n3	48	48	
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, 20..20}
vuDataBlockCounter		2	2	{00 00}
vehicleIdentificationNumber		17	17	{20..20}
EF Places		*2354*	*2354*	
CardPlaceDailyWorkPeriod		*2354*	*2354*	
placePointerNewestRecord		2	2	{00 00}
placeRecords		2352	2352	
PlaceRecord	n4	21	21	
entryTime		4	4	{00..00}
entryTypeDailyWorkPeriod		1	1	{00}
dailyWorkPeriodCountry		1	1	{00}
dailyWorkPeriodRegion		1	1	{00}
vehicleOdometerValue		3	3	{00..00}
entryGNSSPlaceRecord		11	11	
timeStamp		4	4	{00..00}
gnssAccuracy		1	1	{00}
geoCoordinates		6	6	{00..00}
EF Current_Usage		*19*	*19*	
CardCurrentUse		*19*	*19*	
sessionOpenTime		4	4	{00..00}
sessionOpenVehicle				
vehicleRegistrationNation		1	1	{00}
vehicleRegistrationNumber		14	14	{00, 20..20}
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, 20..20}
controlDownloadPeriodBegin		4	4	{00..00}
controlDownloadPeriodEnd		4	4	{00..00}
EF Specific_Conditions		*562*	*562*	
SpecificConditions		*562*	*562*	
conditionPointerNewestRecord		2	2	{00 00}
specificConditionRecords		560	560	
SpecificConditionRecord	n9	5	5	
entryTime		4	4	{00..00}
specificConditionType		1	1	{00}
EF VehicleUnits_Used		*2002*	*2002*	
CardVehicleUnitsUsed		*2002*	*2002*	
vehicleUnitPointerNewestRecord		2	2	{00 00}
cardVehicleUnitRecords		2000	2000	
CardVehicleUnitRecord	n7	10	10	
timeStamp		4	4	{00..00}
manufacturerCode		1	1	{00}
deviceID		1	1	{00}
vuSoftwareVersion		4	4	{00..00}
EF GNSS_Places		*6050*	*6050*	
GNSSAccumulatedDriving		*6050*	*6050*	
gnssADPointerNewestRecord		2	2	{00 00}

File Element / Data	No of Records	Size (bytes) Min	Max	Default Values
gnssAccumulatedDrivingRecords		6048	6048	
GNSSAccumulatedDrivingRecord	n8	18	18	
timeStamp		4	4	{00..00}
gnssPlaceRecord		14	14	
timeStamp		4	4	{00..00}
gnssAccuracy		1	1	{00}
geoCoordinates		6	6	{00..00}
vehicleOdometerValue		3	3	{00..00}
EF Application_Identification_V2		10	10	
DriverCardApplicationIdentificationV2		*10*	*10*	
lengthOfFollowingData		2	2	{00 00}
noOfBorderCrossingRecords		2	2	{00 00}
noOfLoadUnloadRecords		2	2	{00 00}
noOfLoadTypeEntryRecords		2	2	{00 00}
VuConfigurationLengthRange		2	2	{00 00}
EF Places_Authentication		*562*	*562*	
CardPlaceAuthDailyWorkPeriod		*562*	*562*	
placeAuthPointerNewestRecord		2	2	{00 00}
placeAuthStatusRecords		560	560	
PlaceAuthStatusRecord	n4	5	5	
entryTime		4	4	{00..00}
authenticationStatus		1	1	{00}
EF GNSS_Places_Authentication		*1682*	*1682*	
GNSSAuthAccumulatedDriving		*1682*	*1682*	
gnssAuthADPointerNewestRecord		2	2	{00 00}
gnssAuthStatusADRecords		1680	1680	
GNSSAuthStatusADRecord	n8	5	5	
timeStamp		4	4	{00..00}
authenticationStatus		1	1	{00}
EF Border_Crossings		*19042*	*19042*	
CardBorderCrossings		*19042*	*19042*	
borderCrossingPointerNewestRecord		2	2	{00 00}
cardBorderCrossingRecords		19040	19040	
CardBorderCrossingRecord	n10	17	17	
countryLeft		1	1	{00}
countryEntered		1	1	{00}
gnssPlaceAuthRecord		12	12	
timeStamp		4	4	{00..00}
gnssAccuracy		1	1	{00}
geoCoordinates		6	6	{00..00}
authenticationStatus		1	1	{00}
vehicleOdometerValue		3	3	{00..00}
EF Load_Unload_Operations		*32482*	*32482*	
CardLoadUnloadOperations		*32482*	*32482*	
loadUnloadPointerNewestRecord		2	2	{00 00}
cardloadUnloadRecords		32480	32480	
CardLoadUnloadRecord	n11	20	20	
timestamp		4	4	{00}
operationType		1	1	{00..00}
gnssPlaceAuthRecord		12	12	
timeStamp		4	4	{00..00}
gnssAccuracy		1	1	{00}
geoCoordinates		6	6	{00..00}
authenticationStatus		1	1	{00}
vehicleOdometerValue		3	3	{00..00}
EF Load_Type_Entries		*1682*	*1682*	
CardLoadTypeEntries		*1682*	*1682*	
loadtypeEntryPointerNewestRecord		2	2	{00 00}
cardLoadTypeEntryRecords		1680	1680	
CardLoadTypeEntryRecord	n12	5	5	
timestamp		4	4	{00..00}
loadTypeEntered		1	1	{00}
EF VU_Configuration		*3072*	*3072*	
VuConfigurations	n13	*3072*	*3072*	

';

(3) in paragraph TCS_155, the table is replaced by the following:

‘

		Min	Max
n_1	NoOfEventsPerType	12	12
n_2	NoOfFaultsPerType	24	24
n_3	NoOfCardVehicleRecords	200	200
n_4	NoOfCardPlaceRecords	112	112
n_6	CardActivityLengthRange	13776 Bytes (56 days * 117 activity changes)	13776 Bytes (56 days * 117 activity changes)
n_7	NoOfCardVehicleUnitRecords	200	200
n_8	NoOfGNSSADRecords	336	336
n_9	NoOfSpecificConditionRecords	112	112
n_{10}	NoOfBorderCrossingRecords	1120	1120
n_{11}	NoOfLoadUnloadRecords	1624	1624
n_{12}	NoOfLoadTypeEntryRecords	336	336
n_{13}	VuConfigurationLengthRange	3072 Bytes	3072 Bytes

’;

(iv) point 4.3.2 is amended as follows:

(1) paragraph TCS_160 is replaced by the following:

‘TCS_160 After its personalisation, the workshop card application generation 2 shall have the following permanent file structure and file access rules.

Notes:

— The short EF identifier SFID is given as decimal number, e.g. the value 30 corresponds to 11110 in binary.

— EF Application_Identification_V2, EF Places_Authentication, EF GNSS_Places_Authentication, EF Border_Crossings, EF Load_Unload_Operations, EF Load_Type_Entries, EF VU_Configuration and EF Calibration_Add_Data are only present in version 2 of the generation 2 workshop card.

— cardStructureVersion in EF Application_Identification is equal to {01 01} for version 2 of the generation 2 workshop card, while it was equal to {01 00} for version 1 of the generation 2 workshop card.

			Access rules		
File	**File ID**	**SFID**	**Read**	**Select**	**Update**
└DF Tachograph_G2			SC1	SC1	
├EF Application_Identification	'0501h'	1	SC1	SC1	NEV
├EF CardMA_Certificate	'C100h'	2	SC1	SC1	NEV
├EF CardSignCertificate	'C101h'	3	SC1	SC1	NEV
├EF CA_Certificate	'C108h'	4	SC1	SC1	NEV
├EF Link_Certificate	'C109h'	5	SC1	SC1	NEV
├EF Identification	'0520h'	6	SC1	SC1	NEV
├EF Card_Download	'0509h'	7	SC1	SC1	SC1
├EF Calibration	'050Ah'	10	SC1	SC1	SM-MAC-G2
├EF Sensor_Installation_Data	'050Bh'	11	**SC5**	SM-MAC-G2	NEV
├EF Events_Data	'0502h'	12	SC1	SC1	SM-MAC-G2
├EF Faults_Data	'0503h'	13	SC1	SC1	SM-MAC-G2
├EF Driver_Activity_Data	'0504h'	14	SC1	SC1	SM-MAC-G2
├EF Vehicles_Used	'0505h'	15	SC1	SC1	SM-MAC-G2
├EF Places	'0506h'	16	SC1	SC1	SM-MAC-G2
├EF Current_Usage	'0507h'	17	SC1	SC1	SM-MAC-G2
├EF Control_Activity_Data	'0508h'	18	SC1	SC1	SM-MAC-G2
├EF Specific_Conditions	'0522h'	19	SC1	SC1	SM-MAC-G2
├EF VehicleUnits_Used	'0523h'	20	SC1	SC1	SM-MAC-G2
├EF GNSS_Places	'0524h'	21	SC1	SC1	SM-MAC-G2
├EF Application_Identification_V2	'0525h'	22	SC1	SC1	NEV
├EF Places_Authentication	'0526h'	23	SC1	SC1	SM-MAC-G2
├EF GNSS_Places_Authentication	'0527h'	24	SC1	SC1	SM-MAC-G2
├EF Border_Crossings	'0528h'	25	SC1	SC1	SM-MAC-G2
├EF Load_Unload_Operations	'0529h'	26	SC1	SC1	SM-MAC-G2
├EF Load_Type_Entries	'0530h'	27	SC1	SC1	SM-MAC-G2
├EF Calibration_Add_Data	'0531h'	28	SC1	SC1	SM-MAC-G2
└EF VU_Configuration	'0540h'	30	SC5	SC1	SM-MAC-G2

The following abbreviations for the security conditions are used in this table:

SC1 ALW OR SM-MAC-G2

SC5 For the Read Binary command with even INS byte: SM-C-MAC-G2 AND SM-R-ENC-MAC-G2

For the Read Binary command with odd INS byte (if supported): NEV';

(2) in paragraph TCS_162, the table is replaced by the following:

‘

File / Data Element	No of Records	Size (bytes) Min	Max	Default Values
DF Tachograph_G2		59582	60214	
EF Application_Identification		*19*	*19*	
WorkshopCardApplicationIdentification		*19*	*19*	
typeOfTachographCardId		1	1	{00}
cardStructureVersion		2	2	{01 01}
noOfEventsPerType		1	1	{00}
noOfFaultsPerType		1	1	{00}
activityStructureLength		2	2	{00 00}
noOfCardVehicleRecords		2	2	{00 00}
noOfCardPlaceRecords		2	2	{00 00}
noOfCalibrationRecords		2	2	{00 00}
noOfGNSSADRecords		2	2	{00 00}
noOfSpecificConditionRecords		2	2	{00 00}
noOfCardVehicleUnitRecords		2	2	{00 00}
EF CardMA_Certificate		*204*	*341*	
CardMA_Certificate		204	341	{00..00}
EF CardSignCertificate		*204*	*341*	
CardSignCertificate		204	341	{00..00}
EF CA_Certificate		*204*	*341*	
MemberStateCertificate		204	341	{00..00}
EF Link_Certificate		*204*	*341*	
LinkCertificate		204	341	{00..00}
EF Identification		*211*	*211*	
CardIdentification		65	65	
cardIssuingMemberState		1	1	{00}
cardNumber		16	16	{20..20}
cardIssuingAuthorityName		36	36	{00, 20..20}
cardIssueDate		4	4	{00..00}
cardValidityBegin		4	4	{00..00}
cardExpiryDate		4	4	{00..00}
WorkshopCardHolderIdentification		146	146	
workshopName		36	36	
workshopAddress		36	36	
cardHolderName		72	72	
holderSurname		36	36	{00, 20..20}
holderFirstNames		36	36	{00, 20..20}
cardHolderPreferredLanguage		2	2	{20 20}
EF Card_Download		*2*	*2*	
NoOfCalibrationsSinceDownload		2	2	{00 00}
EF Calibration		*45394*	*45394*	
WorkshopCardCalibrationData		*45394*	*45394*	
calibrationTotalNumber		2	2	{00 00}
calibrationPointerNewestRecord		2	2	{00 00}
calibrationRecords		45390	45390	
WorkshopCardCalibrationRecord	n5	178	178	
calibrationPurpose		1	1	{00}
vehicleIdentificationNumber		17	17	{20..20}
vehicleRegistration				
vehicleRegistrationNation		1	1	{00}
vehicleRegistrationNumber		14	14	{00, 20..20}
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}

File / Data Element	No of Records	Size (bytes) Min	Max	Default Values
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}
sensorGNSSSerialNumber		8	8	{00..00}
rcmSerialNumber		8	8	{00..00}
vuAbility		1	1	{00}
sealDataCard		56	56	
noOfSealRecords		1	1	{00}
SealRecords		55	55	
SealRecord	5	11	11	
equipmentType		1	1	{00}
extendedSealIdentifier		10	10	{00..00}
EF Sensor_Installation_Data		18	102	
SensorInstallationSecData		18	102	{00..00}
EF Events_Data		*792*	*792*	
CardEventData		*792*	*792*	
cardEventRecords	11	72	72	
CardEventRecord	n1	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, 20..20}
EF Faults_Data		*288*	*288*	
CardFaultData		*288*	*288*	
cardFaultRecords	2	144	144	
CardFaultRecord	n2	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, 20..20}
EF Driver_Activity_Data		*496*	*496*	
CardDriverActivity		*496*	*496*	
activityPointerOldestDayRecord		2	2	{00 00}
activityPointerNewestRecord		2	2	{00 00}
activityDailyRecords	n6	492	492	{00..00}
EF Vehicles_Used		*386*	*386*	
CardVehiclesUsed		*386*	*386*	
vehiclePointerNewestRecord		2	2	{00 00}
cardVehicleRecords		384	384	
cardVehicleRecord	n3	48	48	
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, 20..20}
vuDataBlockCounter		2	2	{00 00}

File / Data Element		No of Records	Size (bytes) Min	Max	Default Values
	vehicleIdentificationNumber		17	17	{20..20}
EF Places			*170*	*170*	
CardPlaceDailyWorkPeriod			*170*	*170*	
placePointerNewestRecord			2	2	{00 00}
placeRecords			168	168	
	PlaceRecord	n4	21	21	
	entryTime		4	4	{00..00}
	entryTypeDailyWorkPeriod		1	1	{00}
	dailyWorkPeriodCountry		1	1	{00}
	dailyWorkPeriodRegion		1	1	{00}
	vehicleOdometerValue		3	3	{00..00}
	entryGNSSPlaceRecord		11	11	
	timeStamp		4	4	{00..00}
	gnssAccuracy		1	1	{00}
	geoCoordinates		6	6	{00..00}
EF Current_Usage			*19*	*19*	
CardCurrentUse			*19*	*19*	
sessionOpenTime			4	4	{00..00}
sessionOpenVehicle					
	vehicleRegistrationNation		1	1	{00}
	vehicleRegistrationNumber		14	14	{00, 20..20}
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, 20..20}
controlDownloadPeriodBegin			4	4	{00..00}
controlDownloadPeriodEnd			4	4	{00..00}
EF VehicleUnits_Used			*82*	*82*	
CardVehicleUnitsUsed			*82*	*82*	
vehicleUnitPointerNewestRecord			2	2	{00 00}
cardVehicleUnitRecords			80	80	
	CardVehicleUnitRecord	n7	10	10	
	timeStamp		4	4	{00..00}
	manufacturerCode		1	1	{00}
	deviceID		1	1	{00}
	vuSoftwareVersion		4	4	{00..00}
EF GNSS_Places			*434*	*434*	
GNSSAccumulatedDriving			*434*	*434*	
gnssADPointerNewestRecord			2	2	{00 00}
gnssAccumulatedDrivingRecords			432	432	
	GNSSAccumulatedDrivingRecord	n8	18	18	
	timeStamp		4	4	{00..00}
	gnssPlaceRecord		14	14	
	timeStamp		4	4	{00..00}
	gnssAccuracy		1	1	{00}
	geoCoordinates		6	6	{00..00}
	vehicleOdometerValue		3	3	{00..00}
EF Specific_Conditions			*22*	*22*	
SpecificConditions			*22*	*22*	
conditionPointerNewestRecord			2	2	{00 00}
specificConditionRecords			20	20	
	SpecificConditionRecord	n9	5	5	
	entryTime		4	4	{00..00}
	specificConditionType		1	1	{00}
EF Application_Identification_V2			10	10	
WorkshopCardApplicationIdentificationV2			*10*	*10*	

File / Data Element		No of Records	Size (bytes) Min	Max	Default Values
	LengthOfFollowingData		2	2	{00 00}
	noOfBorderCrossingRecords		2	2	{00 00}
	noOfLoadUnloadRecords		2	2	{00 00}
	noOfLoadTypeEntryRecords		2	2	{00 00}
	VuConfigurationLengthRange		2	2	{00 00}
EF Places_Authentication			*42*	*42*	
CardPlaceAuthDailyWorkPeriod			*42*	*42*	
	placeAuthPointerNewestRecord		2	2	{00 00}
	placeAuthStatusRecords		40	40	
	PlaceAuthStatusRecord	n4	5	5	
	entryTime		4	4	{00..00}
	authenticationStatus		1	1	{00}
EF GNSS_Places_Authentication			*122*	*122*	
GNSSAuthAccumulatedDriving			*122*	*122*	
	gnssAuthADPointerNewestRecord		2	2	{00 00}
	gnssAuthStatusADRecords		120	120	
	GNSSAuthStatusADRecord	n8	5	5	
	timeStamp		4	4	{00..00}
	authenticationStatus		1	1	{00}
EF Border_Crossings			*70*	*70*	
CardBorderCrossings			*70*	*70*	
	borderCrossingPointerNewestRecord		2	2	{00 00}
	cardBorderCrossingRecords		68	68	
	CardBorderCrossingRecord	n10	17	17	
	countryLeft		1	1	{00}
	countryEntered		1	1	{00}
	gnssPlaceAuthRecord		12	12	
	timeStamp		4	4	{00..00}
	gnssAccuracy		1	1	{00}
	geoCoordinates		6	6	{00..00}
	authenticationStatus		1	1	{00}
	vehicleOdometerValue		3	3	{00..00}
EF Load_Unload_Operations			*162*	*162*	
CardLoadUnloadOperations			*162*	*162*	
	loadUnloadPointerNewestRecord		2	2	{00 00}
	cardloadUnloadRecords		160	160	
	CardLoadUnloadRecord	n11	20	20	
	timestamp		4	4	{00}
	operationType		1	1	{00..00}
	gnssPlaceAuthRecord		12	12	
	timeStamp		4	4	{00..00}
	gnssAccuracy		1	1	{00}
	geoCoordinates		6	6	{00..00}
	authenticationStatus		1	1	{00}
	vehicleOdometerValue		3	3	{00..00}
EF Load_Type_Entries			*22*	*22*	
CardLoadTypeEntries			*22*	*22*	
	loadtypeEntryPointerNewestRecord		2	2	{00 00}
	cardLoadTypeEntryRecords		20	20	
	CardLoadTypeEntryRecord	n12	5	5	
	timestamp		4	4	{00..00}
	loadTypeEntered		1	1	{00}
EF Calibration_Add_Data			*6887*	*6887*	
WorkshopCardCalibrationAddData			*6887*	*6887*	
	calibrationPointerNewestRecord		2	2	{00 00}
	workshopCardCalibrationAddDataRecords	6885	6885		
	WorkshopCardCalibrationAddDataRecord	n5	27	27	
	oldTimeValue		4	4	{00..00}
	vehicleIdentificationNumber		17	17	{20..20}
	byDefaultLoadType		1	1	{00}
	calibrationCountry		1	1	{00}
	calibrationCountryTimestamp		4	4	{00..00}
EF VU_Configuration			*3072*	*3072*	
VuConfigurations		n13	*3072*	*3072*	

';

(3) in paragraph TCS_163, the table is replaced by the following:

'

		Min	Max
n_1	NoOfEventsPerType	3	3
n_2	NoOfFaultsPerType	6	6
n_3	NoOfCardVehicleRecords	8	8
n_4	NoOfCardPlaceRecords	8	8
n_5	NoOfCalibrationRecords	255	255

		Min	Max
n_6	CardActivityLengthRange	492 bytes (1 day * 240 activity changes)	492 bytes (1 day * 240 activity changes)
n_7	NoOfCardVehicleUnitRecords	8	8
n_8	NoOfGNSSADRecords	24	24
n_9	NoOfSpecificConditionRecords	4	4
n_{10}	NoOfBorderCrossingRecords	4	4
n_{11}	NoOfLoadUnloadRecords	8	8
n_{12}	NoOfLoadTypeEntryRecords	4	4
n_{13}	VuConfigurationLengthRange	3072 Bytes	3072 Bytes

';

(v) point 4.4.2 is amended as follows:

(1) paragraph TCS_168 is replaced by the following:

'TCS_168 After its personalisation, the control card application generation 2 shall have the following permanent file structure and file access rules.

Notes:

— the short EF identifier SFID is given as decimal number, e.g. the value 30 corresponds to 11110 in binary,

— EF Application_Identification_V2, and EF VU_Configuration are only present in version 2 of the generation 2 control card,

— cardStructureVersion in EF Application_Identification is equal to {01 01} for version 2 of the generation 2 control card, while it was equal to {01 00} for version 1 of the generation 2 control card.

			Access rules	
File	**File ID**	**SFID**	**Read / Select**	**Update**
└DF Tachograph_G2			SC1	
├EF Application_Identification	'0501h'	1	SC1	NEV
├EF CardMA_Certificate	'C100h'	2	SC1	NEV
├EF CA_Certificate	'C108h'	4	SC1	NEV
├EF Link_Certificate	'C109h'	5	SC1	NEV
├EF Identification	'0520h'	6	SC1	NEV
├EF Controller_Activity_Data	'050Ch'	14	SC1	SM-MAC-G2
├EF Application_Identification_V2	'0525h'	22	SC1	NEV
└EF VU_Configuration	'0540h'	30	SC5/SC1	SM-MAC-G2

The following abbreviations for the security condition are used in this table:

SC1 ALW OR SM-MAC-G2

SC5 For the Read Binary command with even INS byte: SM-C-MAC-G2 AND SM-R-ENC-MAC-G2

For the Read Binary command with odd INS byte (if supported): NEV';

(2) in paragraph TCS_170, the table is replaced by the following:

‘

File / Data Element	No of Records	Min	Max	Default Values
DF Tachograph_G2		14486	28237	
EF Application_Identification		*5*	*5*	
ControlCardApplicationIdentification		*5*	*5*	
typeOfTachographCardId		1	1	{00}
cardStructureVersion		2	2	{01 01} V2
noOfControlActivityRecords		2	2	{00 00}
EF CardMA_Certificate		*204*	*341*	
CardMA_Certificate		204	341	{00..00}
EF CA_Certificate		*204*	*341*	
MemberStateCertificate		204	341	{00..00}
EF Link_Certificate		*204*	*341*	
LinkCertificate		204	341	{00..00}
EF Identification		*211*	*211*	
CardIdentification		65	65	
cardIssuingMemberState		1	1	{00}
cardNumber		16	16	{20..20}
cardIssuingAuthorityName		36	36	{00, 20..20}
cardIssueDate		4	4	{00..00}
cardValidityBegin		4	4	{00..00}
cardExpiryDate		4	4	{00..00}
ControlCardHolderIdentification		146	146	
controlBodyName		36	36	{00, 20..20}
controlBodyAddress		36	36	{00, 20..20}
cardHolderName				
holderSurname		36	36	{00, 20..20}
holderFirstNames		36	36	{00, 20..20}
cardHolderPreferredLanguage		2	2	{20 20}
EF Controller_Activity_Data		*10582*	*23922*	
ControlCardControlActivityData		*10582*	*23922*	
controlPointerNewestRecord		2	2	{00 00}
controlActivityRecords		10580	23920	
controlActivityRecord	n7	46	46	
controlType		1	1	{00}
controlTime		4	4	{00..00}
controlledCardNumber				
cardType		1	1	{00}

File / Data Element	No of Records	Min	Max	Default Values
cardIssuingMemberState		1	1	{00}
cardNumber		16	16	{20..20}
controlledVehicleRegistration				
vehicleRegistrationNation		1	1	{00}
vehicleRegistrationNumber		14	14	{00, 20..20}
controlDownloadPeriodBegin		4	4	{00..00}
controlDownloadPeriodEnd		4	4	{00..00}
EF Application_Identification_V2		4	4	
ControlCardApplicationIdentificationV2		*4*	*4*	
lengthOfFollowingData		*2*	*2*	{00 00}
VuConfigurationLengthRange		2	2	{00 00}
EF VuConfiguration		*3072*	*3072*	
VuConfigurations	n13	*3072*	*3072*	

';

(3) in paragraph TCS_171, the table is replaced by the following:

'

		Min	Max
n_7	NoOfControlActivityRecords	230	520
n_{13}	VuConfigurationLengthRange	3072 Bytes	3072 Bytes

';

(vi) point 4.5.2 is amended as follows:

(1) paragraph TCS_176 is replaced by the following:

'TCS_176 After its personalisation, the company card application generation 2 shall have the following permanent file structure and file access rules.

Notes:

— the short EF identifier SFID is given as decimal number, e.g. the value 30 corresponds to 11110 in binary,

— EF Application_Identification_V2, and EF VU_Configuration are only present in version 2 of the generation 2 company card,

— cardStructureVersion in EF Application_Identification is equal to {01 01} for version 2 of the generation 2 company card, while it was equal to {01 00} for version 1 of the generation 2 company card.

File	File ID	SFID	Access rules: Read / Select	Access rules: Update
└DF Tachograph_G2			SC1	
├EF Application_Identification	'0501h'	1	SC1	NEV
├EF CardMA_Certificate	'C100h'	2	SC1	NEV
├EF CA_Certificate	'C108h'	4	SC1	NEV
├EF Link_Certificate	'C109h'	5	SC1	NEV
├EF Identification	'0520h'	6	SC1	NEV
├EF Company_Activity_Data	'050Dh'	14	SC1	SM-MAC-G2
├EF Application_Identification_V2	'0525h'	22	SC1	NEV
└EF VU_Configuration	'0540h'	30	SC5/SC1	SM-MAC-G2

The following abbreviations for the security condition are used in this table:

SC1	ALW OR SM-MAC-G2
SC5	For the Read Binary command with even INS byte: SM-C-MAC-G2 AND SM-R-ENC-MAC-G2 For the Read Binary command with odd INS byte (if supported):NEV';

(2) in paragraph TCS_178, the table is replaced by the following:

'

File / Data Element	No of Records	Min	Max	Default Values
DF Tachograph_G2		14414	28165	
EF Application_Identification		*5*	*5*	
CompanyCardApplicationIdentification		*5*	*5*	
typeOfTachographCardId		1	1	{00}
cardStructureVersion		2	2	{01 01} V2
noOfCompanyActivityRecords		2	2	{00 00}
EF CardMA_Certificate		*204*	*341*	
CardMA_Certificate		204	341	{00..00}
EF CA_Certificate		*204*	*341*	
MemberStateCertificate		204	341	{00..00}
EF Link_Certificate		*204*	*341*	
LinkCertificate		204	341	{00..00}
EF Identification		*139*	*139*	
CardIdentification		65	65	
cardIssuingMemberState		1	1	{00}
cardNumber		16	16	{20..20}
cardIssuingAuthorityName		36	36	{00, 20..20}
cardIssueDate		4	4	{00..00}
cardValidityBegin		4	4	{00..00}
cardExpiryDate		4	4	{00..00}
CompanyCardHolderIdentification		74	74	
companyName		36	36	{00, 20..20}
companyAddress		36	36	{00, 20..20}
cardHolderPreferredLanguage		2	2	{20 20}
EF Company_Activity_Data		*10582*	*23922*	
CompanyActivityData		*10582*	*23922*	
companyPointerNewestRecord		2	2	{00 00}
companyActivityRecords		10580	23920	
companyActivityRecord	n8	46	46	
companyActivityType		1	1	{00}
companyActivityTime		4	4	{00..00}
cardNumberInformation				
cardType		1	1	{00}
cardIssuingMemberState		1	1	{00}
cardNumber		16	16	{20..20}
vehicleRegistrationInformation				
vehicleRegistrationNation		1	1	{00}
vehicleRegistrationNumber		14	14	{00, 20..20}
downloadPeriodBegin		4	4	{00..00}
downloadPeriodEnd		4	4	{00..00}
EF Application_Identification_V2		4	4	
CompanyCardApplicationIdentificationV2		*4*	*4*	
lengthOfFollowingData		*2*	*2*	{00 00}
VuConfigurationLengthRange		2	2	{00 00}
EF VuConfiguration		*3072*	*3072*	
VuConfigurations	n13	*3072*	*3072*	

';

(3) in paragraph TCS_179, the table is replaced by the following:

‘

		Min	Max
n_8	NoOfCompanyActivityRecords	230	520
n_{13}	VuConfigurationLengthRange	3072 Bytes	3072 Bytes

’;

(32) Appendix 3 is amended as follows:

(a) point 1 is amended as follows:

(i) the paragraph on specific conditions is replaced by the following:

‘**Specific conditions, manual entries**

OUT Out of scope

Ferry/train crossing

Load operation

Unload operation

Simultaneous load/unload operation

Load type: passengers

Load type: goods

Load type: undefined load type’;

(ii) the pictograms for miscellaneous are amended as follows:

(1) the security pictogram is replaced by the following:

‘ Security/authenticated data/seals’;

(2) the following pictogram is added

‘ Digital map/border crossing’;

(b) point 2 is amended as follows:

(i) the following pictogram combinations are added to the pictograms for miscellaneous:

‘

Position where the vehicle has crossed the border between two countries

Position where a load operation has occurred

Position where an unload operation has occurred

Position where a simultaneous load/unload operation has occurred’;

(ii) the following pictogram combination is added to the pictograms for printouts:

‘ Historic of inserted cards printout’;

(iii) the following pictogram combination is added to the pictograms for events:

! ? GNSS anomaly’;

(33) Appendix 4 is amended as follows:

(a) in point 1, paragraph PRT_005 is replaced by the following:

'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 may be printed in two lines.';

(b) point 2 is amended as follows:

(i) the following indents are added after the table and before paragraph PRT_007:

'- In a data block, the text after 'pi=' refers to the corresponding pictogram or pictogram combination defined in Appendix 3,

- When printed after the longitude and the latitude of a recorded position, or after the timestamp when the position was determined, the 🔒 pictogram indicates that this position has been computed from authenticated navigation messages,

- * data only available in GEN2 tachographs (all versions),

- ** data only available in GEN2 version 2.';

(ii) blocks 2 and 3 are replaced by the following:

'

2 ***Type of printout.***

Block identifier

VU generation and version**

Printout pictogram combination (see App. 3),

Speed limiting device setting (Over speeding printout only)

```
-----------▼------------
          GEN2 v2

Picto xxx km/h
```

3 ***Card holder identification.***

Block identifier. P= people pictogram

Card holder surname

Card holder first name(s) (if any)

Card identification

Card expiry date (if any) and Card generation number (GEN1 or GEN2)* and version**

```
-----------P------------
P Last_Name_____________
  First_Name_____________
Card_Identification_____

  dd/mm/yyyy - GEN2 v2
```

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.';

(iii) before block 4, the sentence preceded by an asterisk is deleted.

(iv) the following block is inserted after block 4:

'

4a ***Vehicle by-default load type****

pi = by-default load type of the vehicle pictogram**

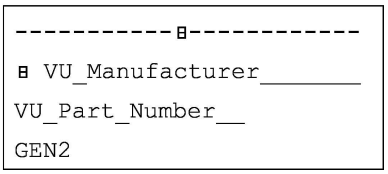
```
pi
```

';

(v) block 5 is replaced by the following:

‘

5 ***VU identification.***
Block identifier
VU manufacturer’s name
VU part number
VU generation number*



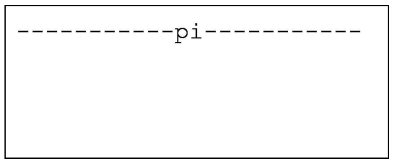
’;

(vi) before block 6, the sentence preceded by an asterisk is deleted.

(vii) the following block is inserted after block 8a:

‘

8b *Load type in the beginning of this day*** (if the card is inserted in a VU, leave blank otherwise), pi=load type pictogram**

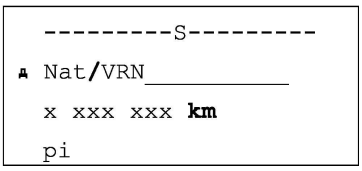


’;

(viii) block 8.2 is replaced by the following:

‘

8.2 *Card insertion in slot S*
Record identifier; S = Slot pictogram
Vehicle registering Member State and VRN
Vehicle odometer at card insertion
pi = vehicle load type at card insertion**

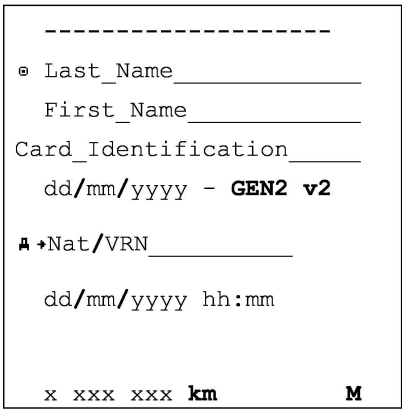


’;

(ix) block 10.2 is replaced by the following:

‘

10.2 *Card insertion*
Card insertion Record identifier
Driver’s name
Driver’s first name
Driver’s Card identification
Card expiry date (if any) and Card generation number (GEN1 or GEN2)* and version**
Registering Member State and VRN of previous vehicle used
Date and time of card withdrawal from previous vehicle
Blank line
Vehicle odometer at card insertion, Manual entry of driver activities flag (M if yes, Blank if No).
If no card insertion of a driver card happened on the day for which the printout is done then for block 10.2 the odometer data reading from the last available card insertion before that day shall be used.



’;

(x) before block 11, the sentence preceded by an asterisk is deleted.

(xi) blocks 11.4 and 11.5 are replaced by the following:

‘

11.4 *Entry of place where a daily work period begins and/or ends*

pi=location begin / end pictogram, time, country, region latitude of the recorded position*, authentication status** longitude of the recorded position*, authentication status** timestamp when position was determined*, authentication status**	pihh:mm Cou Reg lat ± DD°MM.M′ 🔒 lon ±DDD°MM.M′ 🔒 dd/mm/yyyy hh:mm 🔒
Odometer	x xxx xxx **km**

11.5 *Position after 3 hours accumulated driving time**

pi=position after 3 hours accumulated driving time*, time of the record * latitude of the recorded position*, authentication status** longitude of the recorded position*, authentication status** timestamp when position was determined*, authentication status**	pihh:mm lat ± DD°MM.M′ 🔒 lon ±DDD°MM.M′ 🔒 dd/mm/yyyy hh:mm 🔒
Odometer*	x xxx xxx **km**

11.5a *Border crossing***

pi=position where the vehicle has crossed the border of a country** Country that the vehicle was leaving/entering** latitude of the recorded position**, authentication status** longitude of the recorded position**, authentication status** timestamp when position was determined**, authentication status**	pi Cou → Cou lat ± DD°MM.M′ 🔒 lon ±DDD°MM.M′ 🔒 dd/mm/yyyy hh:mm 🔒
Odometer**	x xxx xxx **km**

11.5b *Load/unload operation***

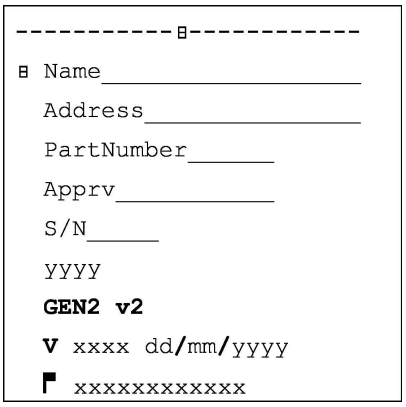
pi=position where a load/unload operation has occurred, time of the record** latitude of the recorded position**, authentication status** longitude of the recorded position**, authentication status** timestamp when position was determined**	pihh:mm lat ± DD°MM.M′ 🔒 lon ±DDD°MM.M′ 🔒 dd/mm/yyyy hh:mm 🔒
Odometer**	x xxx xxx **km**

’;

(xii) block 14 is replaced by the following:

‘

14 ***VU Identification***
Block identifier
VU manufacturer name
VU manufacturer address
VU part number
VU approval number
VU serial number
VU year of manufacture
VU generation and version**
VU software version and installation date
Version of the stored digital map**

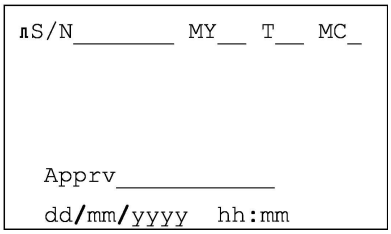


’;

(xiii) block 15.1 is replaced by the following:

‘

15.1 *Pairing record*
Sensor serial number (S/N = `serialNumber` in decimal, MY = `monthYear` in decimal, T = `type` in decimal, MC = `manufacturerCode` in hexadecimal, see Appendix 1, `ExtendedSerialNumber`)
Sensor approval number
Sensor pairing date



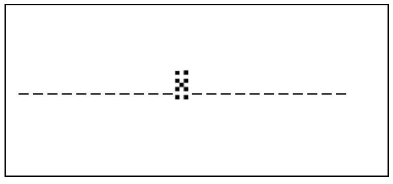
’;

(xiv) blocks 16 and 16.1 are replaced by the following:

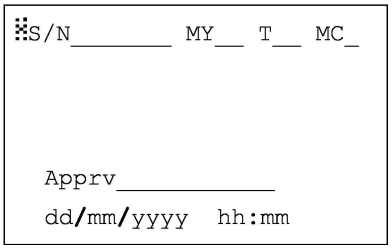
‘

16 GNSS identification*

Block identifier*



16.1 *Coupling record**
External GNSS facility serial number* (S/N = `serialNumber` in decimal, MY = `monthYear` in decimal, T = `type` in decimal, MC = `manufacturerCode` in hexadecimal, see Appendix 1, `ExtendedSerialNumber`)
External GNSS facility approval number*
External GNSS facility coupling date*



16a ***Remote communication facility identification*****

Block identifier**

```
-----------T-----------
```

16a.1 *Remote communication facility serial number***

Remote communication facility serial number** (S/N = `serialNumber` in decimal, MY = `monthYear` in decimal, T = `type` in decimal, MC = `manufacturerCode` in hexadecimal, see Appendix 1, `ExtendedSerialNumber`)

```
TS/N________ MY__ T__ MC_
```

';

(xv) block 17.1 is replaced by the following:

'

17.1 *Calibration record*

Record identifier	`----------`
Workshop having performed the calibration	`1 Workshop_name_____`
Workshop address	`Workshop_address_____`
Workshop card identification	`Card_Identification_____`
Workshop card expiry date	`dd/mm/yyyy`
Blank line	
Calibration date time (`oldTimeValue` in the calibration record) + calibration purpose in hexadecimal	`1 dd/mm/yyyy hh:mm (p)`
VIN	`A VIN_____`
Registering Member State & VRN	`Nat/VRN_____`
Characteristic coefficient of vehicle	**`w xx xxx Imp/km`**
Constant of the recording equipment	**`k xx xxx Imp/km`**
Effective circumference of wheel tyres	**`l xx xxx mm`**
Size of tyres mounted	`o TyreSize_____`
Speed limiting device setting	**`> xxx km/h`**
Old and new odometer values	`x xxx xxx - x xxx xxx km`
pi=by-default load type of the vehicle**	`pi`
Country in which the calibration has been performed and date time	`Cou dd/mm/yyyy hh:mm`
Seal data (up to 5 seal records, 1 line for each used seal), ET = `equipmentType` in decimal**, MC = `manufacturerCode` as two characters**, SI = `sealIdentifier` as 8 characters**, see Appendix 1, `SealRecord`)	`ET_ MC SI_____`

The calibration purpose (p) is a numerical code explaining why these calibration parameters were recorded, coded in accordance with the data element CalibrationPurpose.';

(xvi) block 23 is replaced by the following:

'

23 ***Most recent cards inserted in VU****

Block identifier*

23.1 Inserted Card*

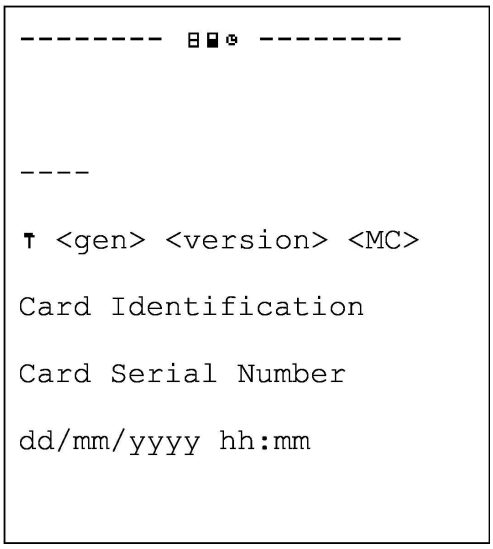
Record identifier*

Type of card, Generation, Version, Manufacturer*[1]

Card Identification*

Card Serial Number*

Date and time of last card insertion*



[1] (everything in one line)

with

type of card: Pictogram, one character + space

gen: GEN1 or GEN2, 4 characters + space

version: up to 10 characters

MC: manufacturer code, 3 characters';

(c) point 3 is amended as follows:

(i) in point 3.1, paragraph PRT_008 is replaced by the following :

'PRT_008 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 + GEN)
4	Vehicle identification (vehicle from which printout is taken)
5	VU identification (VU from which printout is taken + GEN)
6	Last calibration of this VU
7	Last control the inspected driver has been subject to
8	Driver activities delimiter
8a	Out of scope condition in the beginning of this day
8b	Load type in the beginning of the day (if the card is inserted in a VU)
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	Positions after 3 hours accumulated driving time, in chronological order
11.5a	Border crossings, in chronological order
11.5b	Load/unload operations, in chronological order
11.6	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)
22.1	Control place
22.2	Controller's signature
22.5	Driver's signature';

(ii) in point 3.2, paragraph PRT_009 is replaced by the following:

'PRT_009 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 + GEN)
4	Vehicle identification (vehicle from which printout is taken)
4a	Vehicle by-default load type
5	VU identification (VU from which printout is taken + GEN)
6	Last calibration of this VU
7	Last control on this tachograph
9	Driver activities delimiter
10	Driver slot delimiter (slot 1)
10a	Out of scope condition in the beginning of this day
10.1 / 10.2 / 10.3 /10.3a / 10.4	Activities in chronological order (driver slot)
10	Co-driver slot delimiter (slot 2)
10a	Out of scope condition in the beginning of this day
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
11.5	Positions after 3 hours accumulated driving time, in chronological order
11.5a	Border crossings, in chronological order
11.5b	Load/unload operations, in chronological order
11.7	Activity totals
11.2	Summary of periods without card in co-driver slot
11.4	Places entered in chronological order
11.5	Positions after 3 hours accumulated driving time, in chronological order
11.5a	Border crossings, in chronological order
11.5b	Positions where load/unload operation has occurred, in chronological order
11.8	Activity totals
11.3	Summary of activities for a driver both slots included
11.4	Places entered by this driver in chronological order
11.5	Positions after 3 hours accumulated driving time in chronological order
11.5a	Border crossings, in chronological order
11.5b	Load/unload operations, in chronological order
11.9	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)
22.1	Control place
22.2	Controller's signature
22.3	From time(space available for a driver without a card to indicate
22.4	To time which periods are relevant to himself)
22.5	Driver's signature ';

(iii) in point 3.5, paragraph PRT_012 is replaced by the following:

'PRT_012 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 + GEN)
4	Vehicle identification (vehicle from which printout is taken)
14	VU identification
15	Sensor identification
15.1	Sensor Pairing data (all data available in chronological order)
16	GNSS identification
16.1	External GNSS facility coupling data (all data available in chronological order)
16a	Remote communication facility identification
16a.1	Remote communication facility serial number
17	Calibration data delimiter
17.1	Calibration records (all records available in chronological order)
18	Time adjustment delimiter
18.1	Time adjustment records (all records available from time adjustment and from calibration data records)
19	Most recent event and Fault recorded in the VU
2	Type of printout (indicates the end of the printout)';

(iv) in point 3.7, paragraph PRT_014 is replaced by the following:

'PRT_014 The historic of inserted cards 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 identifications (of all cards inserted in the VU)
23	Most recent card inserted in the VU
23.1	Inserted cards (up to 88 records)
2	Type of printout (indicates the end of the printout) ';

(34) Appendix 7 is amended as follows:

(a) the Table of Content is amended as follows:

(i) points 2.2.6.1 to 2.2.6.5 are replaced by the following:

'2.2.6.1 Positive Response Transfer Data Download Interface Version

2.2.6.2 Positive Response Transfer Data Overview

2.2.6.3 Positive Response Transfer Data Activities

2.2.6.4 Positive Response Transfer Data Events and Faults

2.2.6.5 Positive Response Transfer Data Detailed Speed';

(ii) the following point is added:

'2.2.6.6 Positive Response Transfer Data Technical Data';

(b) point 2 is amended as follows:

(i) in point 2.2.2, the message structure table and the notes after the table are replaced by the following:

'

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		00,00,00,0-0,00,FF,FF,FF,FF	99
Positive Response Request Upload	80	F0	EE	03	75		00,FF	D5
Transfer Data Request								
Download interface version	80	EE	F0	02	36	00		96
Overview	80	EE	F0	02	36	01, 21 or 31		CS
Activities	80	EE	F0	06	36	02, 22 or 32	Date	CS
Events & Faults	80	EE	F0	02	36	03, 23 or 33		CS
Detailed Speed	80	EE	F0	02	36	04 or 24		CS
Technical Data	80	EE	F0	02	36	05, 25 or 35		CS
Card download	80	EE	F0	02 or 03	36	06	Slot	CS
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 denote 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.

— Slot is the slot number, either '1' (card on driver slot) or '2' (card on co-driver slot).

— In case the slot is not specified, the VU shall select slot 1 if a card is inserted in this slot and it shall select slot 2 only in case it is specifically selected by the user.

— TRTP 24 is used for Generation 2, for version 1 and version 2 type of VU data download requests.

— TRTP 00, 31, 32, 33 and 35 are used for Generation 2 version 2 type of VU data download requests.

— TRTP 21, 22, 23, and 25 are used for Generation 2 version 1 type of VU data download requests.

— TRTP 01 to 05 are used for Generation 1 type of VU data download requests. They can optionally be accepted by Generation 2 type of VU, but only in the frame of drivers' control performed by a non-EU control authority, using a first generation control card.

— TRTP 11 to 1F are reserved for manufacturer specific download requests.';

(ii) point 2.2.2.9 is amended as follows:

(1) in paragraph DDP_011, the second subparagraph and the first table are replaced by the following:

'There are seven types of data transfer. For VU data download, two different TRTP values can be used for each transfer type:

Data transfer type	TRTP value for generation 1 type of VU data download	TRTP value for generation 2, version 1 type of VU data download	TRTP value for generation 2, version 2 type of VU data download
Download interface version	Not used	Not used	00
Overview	01	21	31
Activities of a specified date	02	22	32
Events and faults	03	23	33
Detailed speed	04	24	24
Technical data	05	25	35

';

(2) paragraph DDP_054 is replaced by the following:

'DDP_054 It is mandatory for the IDE to request the overview data transfer (TRTP 01, 21 or 31) 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 third case (TRTP 02, 22 or 32) the Transfer Data Request message includes the indication of the calendar day (TimeReal format) to be downloaded.';

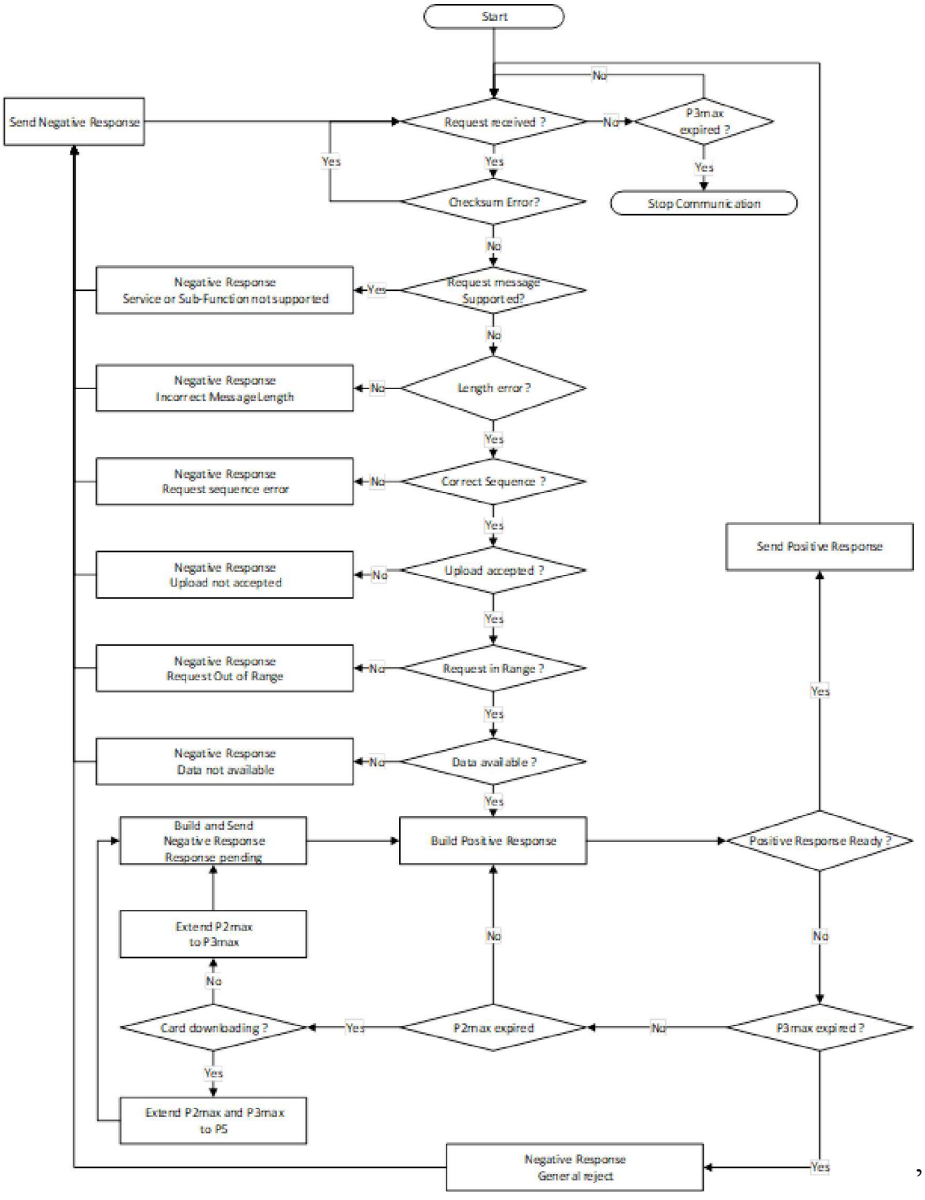
(iii) in point 2.2.2.10, the text before the indents in paragraph DDP_055 is replaced by the following:

'DDP_055 In the first case (TREP 01, 21 or 31), 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:';

(iv) in point 2.2.5.2, Figure 2 is replaced by the following:

'*Figure 2*

VU error handling



';

(v) points 2.2.6.1 to 2.2.6.5 are replaced by the following:

'2.2.6.1 Positive Response Transfer Data Download Interface Version

DDP_028a The data field of the 'Positive Response Transfer Data Download Interface Version' message shall provide the following data in the following order under the SID 76 Hex, the TREP 00 Hex:

Data structure generation 2, version 2 (TREP 00 Hex)

Data element	Comment
DownloadInterfaceVersion	Generation and version of the VU: 02,02 Hex for Generation 2, version 2. Not supported by Generation 1 and Generation 2, version 1 VU, which shall respond negatively (Sub function not supported, see DDP_018)

2.2.6.2 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, 21 or 31 Hex and appropriate sub message splitting and counting:

Data structure generation 1 (TREP 01 Hex)

Data element	Comment
MemberStateCertificate	VU Security certificates
VUCertificate	
VehicleIdentificationNumber	Vehicle identification
VehicleRegistrationIdentification	
CurrentDateTime	VU current date and time
VuDownloadablePeriod	Downloadable period
CardSlotsStatus	Type of cards inserted in the VU
VuDownloadActivityData	Previous VU download
VuCompanyLocksData	All company locks stored. If the section is empty, only noOfLocks = 0 is sent.
VuControlActivityData	All control records stored in the VU. If the section is empty, only noOfControls = 0 is sent
Signature	RSA signature of all data (except certificates) starting from VehicleIdentificationNumber down to last byte of last VuControlActivityData.

Data structure generation 2, version 1 (TREP 21 Hex)

Data element	Comment
MemberStateCertificateRecordArray	Member state certificate
VUCertificateRecordArray	VU certificate
VehicleIdentificationNumberRecordArray	Vehicle identification
VehicleRegistrationIdentificationRecordArray	Vehicle registration number
CurrentDateTimeRecordArray	VU current date and time
VuDownloadablePeriodRecordArray	Downloadable period
CardSlotsStatusRecordArray	Type of cards inserted in the VU
VuDownloadActivityDataRecordArray	Previous VU download
VuCompanyLocksRecordArray	All company locks stored. If the section is empty, an array header with noOfRecords = 0 is sent
VuControlActivityRecordArray	All control records stored in the VU. If the section is empty, an array header with noOfRecords = 0 is sent
SignatureRecordArray	ECC signature of all preceding data except the certificates.

Data structure generation 2, version 2 (TREP 31 Hex)

Data element	Comment
MemberStateCertificateRecordArray	Member state certificate
VUCertificateRecordArray	VU certificate
VehicleIdentificationNumberRecordArray	Vehicle identification
VehicleRegistrationNumberRecordArray	Vehicle registration number
CurrentDateTimeRecordArray	VU current date and time
VuDownloadablePeriodRecordArray	Downloadable period
CardSlotsStatusRecordArray	Type of cards inserted in the VU
VuDownloadActivityDataRecordArray	Previous VU download
VuCompanyLocksRecordArray	All company locks stored. If the section is empty, an array header with noOfRecords = 0 is sent
VuControlActivityRecordArray	All control records stored in the VU. If the section is empty, an array header with noOfRecords = 0 is sent
SignatureRecordArray	ECC signature of all preceding data except the certificates.

2.2.6.3 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, 22 or 32 Hex and appropriate sub message splitting and counting:

Data structure generation 1 (TREP 02 Hex)

Data element		Comment
TimeReal		Date of day downloaded
OdometerValueMidnight		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.
VuActivityDailyData		Slots status at 00:00 and activity changes recorded for the day downloaded.
VuPlaceDailyWorkPeriodData		Places related data recorded for the day downloaded. If the section is empty, only noOfPlaceRecords = 0 is sent.
VuSpecificConditionData		Specific conditions data recorded for the day downloaded. If the section is empty, only noOfSpecificConditionRecords=0 is sent
Signature		RSA signature of all data starting from TimeReal down to last byte of last specific condition record.

Data structure generation 2, version 1 (TREP 22 Hex)

Data element		Comment
DateOfDayDownloadedRecordArray		Date of day downloaded
OdometerValueMidnightRecordArray		Odometer at end of downloaded day
VuCardIWRecordArray		Cards insertion withdrawal cycles data. — If this section contains no available data, an array header with noOfRecords = 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.

VuActivityDailyRecordArray		Slots status at 00:00 and activity changes recorded for the day downloaded.
VuPlaceDailyWorkPeriodRecordArray		Places related data recorded for the day downloaded. If the section is empty, an array header with noOfRecords = 0 is sent.
VuGNSSADRecordArray		GNSS positions of the vehicle if the accumulated driving time of the vehicle reaches a multiple of three hours. If the section is empty, an array header with noOfRecords = 0 is sent.
VuSpecificConditionRecordArray		Specific conditions data recorded for the day downloaded. If the section is empty, an array header with noOfRecords =0 is sent
SignatureRecordArray		ECC signature of all preceding data.

Data structure generation 2, version 2 (TREP 32 Hex)

Data element		Comment
DateOfDayDownloadedRecordArray		Date of day downloaded
OdometerValueMidnightRecordArray		Odometer at end of downloaded day
VuCardIWRecordArray		Cards insertion withdrawal cycles data. — If this section contains no available data, an array header with noOfRecords = 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.
VuActivityDailyRecordArray		Slots status at 00:00 and activity changes recorded for the day downloaded.
VuPlaceDailyWorkPeriodRecordArray		Places related data recorded for the day downloaded. If the section is empty, an array header with noOfRecords = 0 is sent.
VuGNSSADRecordArray		GNSS positions of the vehicle if the accumulated driving time of the vehicle reaches a multiple of three hours. If the section is empty, an array header with noOfRecords = 0 is sent.
VuSpecificConditionRecordArray		Specific conditions data recorded for the day downloaded. If the section is empty, an array header with noOfRecords =0 is sent
VuBorderCrossingRecordArray		Border crossings for the day downloaded. If the section is empty, an array header with noOfRecords = 0 is sent.
VuLoadUnloadRecordArray		Load/unload operations for the day downloaded. If the section is empty, an array header with noOfRecords = 0 is sent.
SignatureRecordArray		ECC signature of all preceding data.

2.2.6.4 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, 23 or 33 Hex and appropriate sub message splitting and counting:

Data structure generation 1, (TREP 03 Hex)

Data element		Comment
VuFaultData		All faults stored or on-going in the VU. If the section is empty, only noOfVuFaults = 0 is sent.
VuEventData		All events (except over speeding) stored or on-going in the VU. If the section is empty, only noOfVuEvents = 0 is sent.
VuOverSpeedingControlData		Data related to last over speeding control (default value if no data).
VuOverSpeedingEventData		All over speeding events stored in the VU. If the section is empty, only noOfVuOverSpeedingEvents = 0 is sent.
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.
Signature		RSA signature of all data starting from noOfVuFaults down to last byte of last time adjustment record

Data structure generation 2, version 1 (TREP 23 Hex)

Data element		Comment
VuFaultRecordArray		All faults stored or on-going in the VU. If the section is empty, an array header with noOfRecords = 0 is sent.
VuEventRecordArray		All events (except over speeding) stored or on-going in the VU. If the section is empty, an array header with noOfRecords = 0 is sent.
VuOverSpeedingControlDataRecordArray		Data related to last over speeding control (default value if no data).
VuOverSpeedingEventRecordArray		All over speeding events stored in the VU. If the section is empty, an array header with noOfRecords = 0 is sent.
VuTimeAdjustmentRecordArray		All time adjustment events stored in the VU (outside the frame of a full calibration).

		If the section is empty, an array header with noOfRecords = 0 is sent.
SignatureRecordArray		ECC signature of all preceding data.

Data structure generation 2, version 2 (TREP 33 Hex)

Data element		Comment
VuFaultRecordArray		All faults stored or on-going in the VU. If the section is empty, an array header with noOfRecords = 0 is sent.
VuEventRecordArray		All events (except over speeding) stored or on-going in the VU. If the section is empty, an array header with noOfRecords = 0 is sent.
VuOverSpeedingControlDataRecordArray		Data related to last over speeding control (default value if no data).
VuOverSpeedingEventRecordArray		All over speeding events stored in the VU. If the section is empty, an array header with noOfRecords = 0 is sent.
VuTimeAdjustmentRecordArray		All time adjustment events stored in the VU (outside the frame of a full calibration). If the section is empty, an array header with noOfRecords = 0 is sent.
SignatureRecordArray		ECC signature of all preceding data.

2.2.6.5 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 or 24 Hex and appropriate sub message splitting and counting:

Data structure generation 1 (TREP 04 Hex)

Data element		Comment
VuDetailedSpeedData		All detailed speed stored in the VU (one speed block per minute during which the vehicle has been moving) 60 speed values per minute (one per second).
Signature		RSA signature of all data starting from noOfSpeedBlocks down to last byte of last speed block.

Data structure generation 2 (TREP 24 Hex)

Data element		Comment
VuDetailedSpeedBlockRecordArray		All detailed speed stored in the VU (one speed block per minute during which the vehicle has been moving) 60 speed values per minute (one per second).
SignatureRecordArray		ECC signature of all preceding data.

';

(vi) the following point is added:

'2.2.6.6 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, 25 or 35 Hex and appropriate sub message splitting and counting:

Data structure generation 1 (TREP 05 Hex)

Data element		Comment
VuIdentification		
SensorPaired		
VuCalibrationData		All calibration records stored in the VU.
Signature		RSA signature of all data starting from vuManufacturerName down to last byte of last VuCalibrationRecord.

Data structure generation 2, version 1 (TREP 25 Hex)

Data element		Comment
VuIdentificationRecordArray		
VuSensorPairedRecordArray		All MS pairings stored in the VU
VuSensorExternalGNSSCoupledRecordArray		All external GNSS facility couplings stored in the VU
VuCalibrationRecordArray		All calibration records stored in the VU.
VuCardRecordArray		All card insertion data stored in the VU.
VuITSConsentRecordArray		
VuPowerSupplyInterruptionRecordArray		
SignatureRecordArray		ECC signature of all preceding data.

Data structure generation 2, version 2 (TREP 35 Hex)

Data element		Comment
VuIdentificationRecordArray		
VuSensorPairedRecordArray		All MS pairings stored in the VU
VuSensorExternalGNSSCoupledRecordArray		All external GNSS facility couplings stored in the VU
VuCalibrationRecordArray		All calibration records stored in the VU.
VuCardRecordArray		All card insertion data stored in the VU.
VuITSConsentRecordArray		
VuPowerSupplyInterruptionRecordArray		
SignatureRecordArray		ECC signature of all preceding data.

';

(c) in point 3.3, paragraph DDP_035 is replaced by the following

'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.

— For first and second generation tachograph cards

— Download EFs within Tachograph DF:

— 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, using Appendix 11 Common Security Mechanisms Part A.

— It is mandatory to download at least the EFs Application_Identification and Identification 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.

— For second generation tachograph cards only:

— Except when a download of a driver card inserted in a VU is performed during drivers' control by a non EU control authority, using a first generation control card, download EFs within Tachograph_G2 DF:

— Download the EFs CardSignCertificate, CA_Certificate and Link_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_G2 DF) except EF Card_Download. This information is secured with a digital signature, using Appendix 11 Common Security Mechanisms Part B.

— It is mandatory to download at least the EFs Application_Identification, Application_Identification_V2 (if present) and Identification 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,

VehicleUnits_Used,

GNSS_Places,

Places_Authentication, if present,

GNSS_Places_Authentication, if present,

Border_Crossings, if present,

Load_Unload_Operations, if present,

Load_Type_Entries, if present.

— When downloading a driver card, update the LastCardDownload date in EF Card_Download, in the Tachograph and, if applicable, Tachograph_G2 DFs.

— When downloading a workshop card, reset the calibration counter in EF Card_Download in the Tachograph and, if applicable, Tachograph_G2 DFs.

— When downloading a workshop card the EF Sensor_Installation_Data in the Tachograph and, if applicable, Tachograph_G2 DFs shall not be downloaded.';

(35) Appendix 8 is amended as follows:

(a) the Table of Content is amended as follows:

(i) points 8, 8.1 and 8.2 are replaced by the following:

'8. ROUTINECONTROL SERVICE (TIME ADJUSTMENT)

8.1. Message description

8.2. Message format';

(ii) the following points 9, 9.1 and 9.2 are added:

'9. DATARECORDS FORMATS

9.1. Transmitted parameter ranges

9.2. dataRecords formats';

(b) in point 3.1, the following row is added to Table 1:

'

			Diagnostic Sessions		
RoutineControl	8	31		■	■

';

(c) in point 6.1.3, paragraph CPR_053 is replaced by the following:

'CPR_053 recordDataIdentifier values defined by this document are shown in the table below.

The recordDataIdentifier table consists of five 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 Appendix 1 on which the recordDataIdentifier is based (transcoding is sometimes necessary).

— The **3rd column (Description)** specifies the corresponding recordDataIdentifier name.

— The **4th column (Access rights)** specifies the access rights to this recordDataIdentifier.

— The **5th 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)	Access rights (Read/Write)	Mnemonic
F90B	CurrentDateTime	TimeDate	R/W	RDI_TD
F912	HighResOdometer	HighResolutionTotalVehicle-Distance	R/W	RDI_HRTVD
F918	K-ConstantOfRecordingEquipment	Kfactor	R/W	RDI_KF
F91C	L-TyreCircumference	LfactorTyreCircumference	R/W	RDI_LF
F91D	W-VehicleCharacteristicConstant	WvehicleCharacteristicFactor	R/W	RDI_WVCF
F921	TyreSize	TyreSize	R/W	RDI_TS
F922	nextCalibrationDate	NextCalibrationDate	R/W	RDI_NCD
F92C	SpeedAuthorised	SpeedAuthorised	R/W	RDI_SA

F97D	vehicleRegistrationNation	RegisteringMemberState	R/W	RDI_RMS
F97E	VehicleRegistrationNumber	VehicleRegistrationNumber	R/W	RDI_ VRN
F190	VehicleIdentificationNumber	VIN	R/W	RDI_ VIN
F9D0	SensorSerialNumber	MotionSensorSerialNumber	R	RDI_SSN
F9D1	RemoteCommunicationModuleSerial-Number	RemoteCommunicationFacili-tySerialNumber	R	RDI_RCSN
F9D2	SensorGNSSSerialNumber	ExternalGNSSFacilitySerial-Number	R	RDI_GSSN
F9D3	SealDataVu	SmartTachographSealsSerial-Number	R/W	RDI_SDV
F9D4	VuSerialNumber	VuSerialNumber	R	RDI_VSN
F9D5	ByDefaultLoadType	ByDefaultLoadType	R/W	RDI_BDLT
F9D6	TachographCardsGen1Suppression	TachographCardsGen1Sup-pression	R/W	RDI_TCG1S
F9D7	VehiclePosition	VehiclePosition	R	RDI_VP
F9D8	LastCalibrationCountry	CalibrationCountry	R	RDI_CC

';

(d) point 8 is replaced by the following:

'8. ROUTINECONTROL SERVICE (TIME ADJUSTMENT)

8.1. **Message description**

CPR_065a The service RoutineControl (TimeAdjustment) provides the ability to trigger an alignment of the VU clock to the time provided by the GNSS receiver.

For the service RoutineControl (TimeAdjustment) execution the VU must be in CALIBRATION mode.

Precondition: it is ensured that the VU is able to receive authenticated position messages from the GNSS receiver.

As long the time adjustment is ongoing, the VU shall respond to the request RoutineControl, subfunction requestRoutineResults, with routineInfo = 0x78.

Note: the time adjustment may take some time. The diagnostic tester shall request the time adjustment status by using the sub-function requestRoutineResults.

8.2. **Message format**

CPR_065b The message formats for the service RoutineControl (TimeAdjustment) and its primitives are detailed in the following tables.

Table 37a

RoutineControl, routine (TimeAdjustment) Request Message, subfunction startRoutine

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	**RoutineControl Request Sid**	**31**	**RC**
#6	routineControlType = [startRoutine]	01	RCTP_STR
#7 and #8	routineIdentifier = [TimeAdjustment]	0100	RI_TA
#9	Checksum	00-FF	CS

Table 37b

RoutineControl, routine (TimeAdjustment), subfunction startRoutine, 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	**RoutineControl Positive Response Sid**	**71**	**RCPR**
#6	routineControlType = [startRoutine]	01	RCTP_STR
#7 and #8	routineIdentifier= [TimeAdjustment]	0100	RI_TA
#9	Checksum	00-FF	CS

Table 37c

RoutineControl, routine (TimeAdjustment) Request Message, subfunction requestRoutineResults

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	**RoutineControl Request Sid**	**31**	**RC**
#6	routineControlType = [requestRoutineResults]	03	RCTP_RRR
#7 and #8	routineIdentifier= [TimeAdjustment]	0100	RI_TA
#9	Checksum	00-FF	CS

Table 37d

RoutineControl, routine (TimeAdjustment), subfunction requestRoutineResults, 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	**RoutineControl Positive Response Sid**	**71**	**RCPR**
#6	routineControlType = [requestRoutineResults]	03	RCTP_RRR
#7 and #8	routineIdentifier= [TimeAdjustment]	0100	RI_TA
#9	routineInfo (see Table 37f)	XX	RINF_TA
#10	routineStatusRecord[] = routineStatus#1 (see Table 37g)	XX	RS_TA
#11	Checksum	00-FF	CS

Table 37e

RoutineControl, routine (TimeAdjustment) 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	31	**RC**
#7	responseCode=[sub-functionNotSupported incorrectMessageLengthOrInvalidFormat conditionsNotCorrect requestOutOfRange]	12 13 22 31	SFNS IMLOIF CNC ROOR
#8	Checksum	00-FF	CS

Table 37f

RoutineControl, routine (TimeAdjustment), routineInfo

routineInfo	Hex Value	Description
NormalExitWithResultAvailable	61	The routine was executed completely; additional routine results available.
RoutineExecutionOngoing	78	The requested routine is still executed.

Table 37g

RoutineControl, routine (TimeAdjustment), routineStatus

Hex Value	Test result	Description
01	positive	The time adjustment successfully finished.
02..0F		RFU
10	negative	No GNSS signal reception.
11..7F		RFU
80..FF		Manufacturer specific'

;

(e) the following point 9 is added:

'9. 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).

9.1. **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 tachograph.

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.

9.2. **dataRecords formats**

Table 39 to Table 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
SealDataVu	55	See details in Table 43	
ByDefaultLoadType	1	See details in Table 44	
VuSerialNumber	8	See details in Table 45	
SensorSerialNumber	8	See details in Table 45	

SensorGNSSSerialNumber	8	See details in Table 45	
RemoteCommunicationModule-SerialNumber	8	See details in Table 45	
TachographCardsGen1Suppression	2	See details in Table 46	
VehiclePosition	14	See details in Table 47	
CalibrationCountry	3	ASCII	NationAlpha as defined in Appendix 1

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:

1) 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.
2) This parameter does not influence or change the hours parameter above.

NOTE concerning the use of the '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 Appendix 1)	not applicable	VehicleRegistrationNumber
2 – 14	Vehicle Registration Number (as defined in Appendix 1)	not applicable	VehicleRegistrationNumber

CPR_090 Table 43 details the formats of the different bytes of the SealDataVu parameter:

Table 43

Detailed format of SealDataVu (recordDataIdentifier value # F9D3)

Byte	Parameter definition	Resolution	Operating range
1 – 11	sealRecord1. Format SealRecord as defined in Appendix 1.	not applicable	SealRecord
12 - 22	sealRecord2. Format SealRecord as defined in Appendix 1.	not applicable	SealRecord
23 – 33	sealRecord3. Format SealRecord as defined in Appendix 1.	not applicable	SealRecord
34 – 44	sealRecord4. Format SealRecord as defined in Appendix 1.	not applicable	SealRecord
45 – 55	sealRecord5. Format SealRecord as defined in Appendix 1.	not applicable	SealRecord

NOTE: If there are less than 5 seals available the value of the EquipmentType in all unused sealRecords shall be set to 15, i.e. unused.

CPR_091 Table 44 details the formats of the different bytes of the ByDefaultLoadType parameter:

Table 44

Detailed format of ByDefaultLoadType (recordDataIdentifier value # F9D5)

Byte	Parameter definition	Resolution	Operating range
1	loadType '00'H: Undefined load type '01'H: Goods '02'H: Passengers	not applicable	'00'H to '02'H

CPR_092 Table 45 details the formats of the different bytes of the VuSerialNumber, SensorSerialNumber, SensorGNSSSerialNumber and RemoteCommunicationModuleSerialNumber parameters:

Table 45

Detailed format of VuSerialNumber, SensorSerialNumber, SensorGNSSSerialNumber and RemoteCommunicationModuleSerialNumber (recordDataIdentifier values # F9D4, F9D0, F9D2, F9D1)

Byte	Parameter definition	Resolution	Operating range
1	VuSerialNumber, SensorSerialNumber, SensorGNSSSerialNumber and RemoteCommunicationModuleSerialNumber: format ExtendedSerialNumber as defined in Appendix 1.	not applicable	ExtendedSerialNumber

CPR_093 Table 46 details the formats of the different bytes of the TachographCardsGen1Suppression parameter:

Table 46

Detailed format of TachographCardsGen1Suppression (recordDataIdentifier value # F9D6)

Byte	Parameter definition	Resolution	Operating range
1-2	TachographCardsGen1Suppression. Format TachographCardsGen1Suppression as defined in Appendix 1.	not applicable	'0000'H, 'A5E3'H

CPR_094 Table 47 details the formats of the different bytes of the VehiclePosition parameter.

Table 47

Detailed format of VehiclePosition (recordDataIdentifier value # F9D7)

Byte	Parameter definition	Resolution	Operating range
1 - 4	Time stamp of the vehicle position was determined.	Not applicable	TimeReal
5	GNSS accuracy	Not applicable	GNSSAccuracy
6 - 11	Vehicle position	Not applicable	GeoCoordinates
12	Authentication status	Not applicable	PositionAuthenticationStatus
13	Current country	Not applicable	NationNumeric
14	Current region	Not applicable	RegionNumeric

Note: after vehicle position update, the update of current country and region may be delayed.';

(36) Appendix 9 is amended as follows:

(a) in the Table of Content, the following point 9 is added:

'9. OSNMA TESTS';

(b) point 1 is amended as follows:

(i) in point 1.1, the following sub-paragraph is added:

'The Member States authority in charge of the functional tests of a vehicle unit or an external GNSS facility must make sure that the embedded GNSS receiver has successfully passed the OSNMA tests specified in this Appendix. These tests are considered to be a part of the functional tests of the vehicle unit or the external GNSS facility.';

(ii) in point 1.2, the following reference is added:

'RGODP JRC Technical Report - Receiver guidelines for OSNMA data processing';

(c) in point 2, rows 3.1 to 3.41 are replaced by the following:

‘3.1	Functions provided	02, 03, 04, 05, 07, 382,
3.2	Modes of operation	09 to 11*, 134, 135
3.3	Functions and data access rights	12*, 13*, 382, 383, 386 to 389
3.4	Monitoring cards insertion and withdrawal	15, 16, 17, 18, 19*, 20*, 134
3.5	Speed, position and distance measurement	21 to 37
3.6	Time measurement (test performed at 20°C)	38 to 43
3.7	Monitoring driver activities	44 to 53, 134
3.8	Monitoring driving status	54, 55, 134
3.9	Driver’s entries	56 to 62c
3.10	Company locks management	63 to 68
3.11	Monitoring control activities	69, 70
3.12	Detection of events and/or faults	71 to 88a, 134
3.13	Equipment identification data	93*, 94*, 97, 100
3.14	Driver or workshop card insertion and withdrawal data	102* to 104*
3.15	Driver activity data	105* to 107*
3.16	Places and positions data	108* to 112*
3.17	Odometer data	113* to 115*
3.18	Detailed speed data	116*
3.19	Events data	117*
3.20	Faults data	118*
3.21	Calibration data	119* to 121*
3.22	Time adjustment data	124*, 125*
3.23	Control activity data	126*, 127*
3.24	Company locks data	128*
3.25	Download activity data	129*
3.26	Specific conditions data	130*, 131*
3.27	Tachograph cards data	132*, 133*
3.28	Border crossings	133a* to 133d*
3.29	Load/unload operation	133e* to 133i*
3.30	Digital map	133j* to 133t*
3.31	Recording and storing on tachographs cards	136, 137, 138*, 139*, 141*, 142, 143 144, 145, 146*, 147*, 147a*, 147b*, 148*, 149, 150, 150a

3.32	Displaying	90, 134, 151 to 168, PIC_001, DIS_001
3.33	Printing	90, 134, 169 to 181, PIC_001, PRT_001 to PRT_014
3.34	Warning	134, 182 to 191, PIC_001
3.35	Data downloading to external media	90, 134, 192 to 196
3.36	Remote communication for targeted roadside checks	197 to 199
3.37	Data exchanges with additional external devices	200, 201
3.38	Calibration	202 to 206*, 383, 384, 386 to 391
3.39	Roadside calibration checking	207 to 209
3.40	Time adjustment	210 to 212*
3.41	Monitoring border crossings	226a to 226c
3.42	Software update	226d to 226f
3.43	Non-interference of additional functions	06, 425
3.44	Motion sensor interface	02, 122
3.45	External GNSS facility	03, 123
3.46	Verify that the VU detects, records and stores the event(s) and/or fault(s) defined by the VU manufacturer when a paired motion sensor reacts to magnetic fields disturbing vehicle motion detection.	217
3.47	Cypher suite and standardized domain parameters	CSM_48, CSM_50’

(d) the following point 9 is added:

‘9. OSNMA TESTS

9.1. **Introduction**

This chapter describes the tests to prove the correct implementation of OSNMA in the GNSS receiver. Since satellite signal authentication is carried out solely by the GNSS receiver with independence of any other component of the tachograph, the tests set out in this chapter may be performed on the GNSS receiver as a stand-alone element. In this case, the tachograph manufacturer shall present a report to the type-approval authorities providing details about the development and results of the tests that are performed under the responsibility of the GNSS receiver manufacturer.

9.2 **Applicable conditions**

— The pass/fail criteria defined in the OSNMA tests shall be considered valid only for the identified testing conditions.

— The criteria might be revised at the moment of the Galileo OSNMA service declaration and considering the associated service performance commitments.

9.3. **Definitions and acronyms**

9.3.1 Definitions

GNSS cold/warm/hot start:	refers to the start condition of a GNSS receiver based on the availability of time (T), current almanac (A) and ephemeris (E), position (P): — GNSS Cold Start: none — GNSS Warm Start: T, A, P — GNSS Hot Start: T, A, E, P
OSNMA cold/warm/hot start:	refers to the start condition of the OSNMA function based on the availability of the Public Key (P) and DSM-KROOT (K) information (as defined in the OSNMA Receiver Guidelines referred to in Appendix 12): — OSNMA Cold Start: none — OSNMA Warm Start: P — OSNMA Hot Start: P, K

9.3.2 Acronyms

ADKD	Authentication Data & Key Delay
DSM-KROOT	Digital Signature Message KROOT
GNSS	Global Navigation Satellite System
KROOT	Root Key of the TESLA key chain
MAC	Message Authentication Code
NMACK	Number of MAC & key blocks (per 30 seconds)
OSNMA	Galileo Open Service Navigation Message Authentication
SLMAC	Slow MAC
TESLA	Timed Efficient Stream Loss-tolerant Authentication (Protocol used in OSNMA)

9.4. **Equipment for the generation of the GNSS signals**

The generation of the GNSS signals can be carried out using a multi-constellation GNSS simulator supporting OSNMA message transmission. Alternatively, a radiofrequency signal re-player capable of playing back GNSS signal samples from files can be used. Typical bit depth and sampling rate are respectively 4 bits I/Q and 10MHz.

It is assumed that the GNSS receiver has interfaces to command the clearing of the receiver memory (to independently erase the public key, KROOT, clock information, position information, ephemeris and almanac), to set the receiver local time realisation for the OSNMA timing verification requirement, and to load the cryptographic information. These commands may be limited to test purposes and therefore may not be available for the receiver nominal operation.

9.5 **Test conditions**

9.5.1 GNSS conditions

The simulated or replayed GNSS signals will have the following features:

— Static user receiver scenario;

— At least GPS and Galileo constellations;

— E1/L1 frequency;

— At least 4 Galileo satellites with elevation angle greater than 5°;

— Duration as required for each test;

— Constant navigation ephemerides from the satellites during the test.

9.5.2 OSNMA conditions

The OSNMA message transmitted in the RF signal will have the following features:

— An HKROOT message with OSNMA Status set to Operational or Test and a fixed DSM-KROOT of 8 blocks for the chain in force;

— At least 4 Galileo satellites transmitting OSNMA;

— A MACK message with one MACK block (i.e. NMACK=1), and at least one ADKD=0 and one ADKD=12 per satellite and MACK block;

— A tag size of 40 bits;

— The minimum equivalent tag length as required in the OSNMA Receiver Guidelines (currently 80 bits).

Except when noted, the internal receiver time realisation shall be known with sufficient accuracy and properly aligned with the simulated time. This guarantees that the OSNMA initial time synchronisation requirement is fulfilled for each test condition, i.e., nominal synchronization for all but the SLMAC test. See the OSNMA Receiver Guidelines for more details on the time initialization.

Note that the identified pass/fail criteria are conservative and do not represent the expected Galileo OSNMA performance.

9.6. **Tests specification**

No	Test	Description	Related requirements
1.	**Administrative examination**		
1.1	Documentation	Correctness of documentation	
2	**General Tests**		
2.1	OSNMA hot start	Objective: verify that the GNSS receiver computes a position with OSNMA after a hot start. Procedure: The GNSS receiver starts in GNSS and OSNMA hot start conditions and acquires the signals of visible Galileo satellites. The receiver authenticates the Galileo navigation data with OSNMA (ADKD = 0) and provides a position with authenticated data. Pass/fail criteria: the receiver computes an authenticated position fix within 160 seconds.	Appendix 12, GNS_3b

2.2	OSNMA warm start	Objective: verify that the GNSS receiver computes a position with OSNMA after a warm start. Procedure: Before starting the test, the ephemeris and KROOT information shall be erased from the GNSS receiver memory in order to force a warm GNSS and OSNMA start. The GNSS receiver starts and acquires the signals of the visible Galileo satellites. The DSM-KROOT is received and verified. The receiver authenticates the Galileo navigation data with OSNMA (ADKD=0) and provides a position with authenticated data. Pass/fail criteria: the receiver computes an authenticated valid position fix within 430 seconds.	Appendix 12, GNS_3b
2.3	OSNMA warm start with SLMAC	Objective: verify that the GNSS receiver computes a position with OSNMA after a warm start with a time initialisation requiring SLMAC mode, as defined in the OSNMA Receiver Guidelines. Procedure: The internal receiver time realisation shall be configured in order to have an initial time uncertainty of a value between 2 and 2.5 minutes so that, according to OSNMA Receiver Guidelines, the Slow MAC mode is activated. Before starting the tests, the ephemeris and KROOT information shall be erased from the GNSS receiver memory in order to force a warm GNSS and OSNMA start. The GNSS receiver starts and acquires the signals of the visible Galileo satellites. The DSM-KROOT is received and verified. The receiver authenticates the Galileo navigation data with only OSNMA Slow MAC (ADKD=12) and provides a position with authenticated data. Pass/fail criteria: the receiver computes an authenticated valid position fix within 730 seconds.	Appendix 12, GNS_3b

2.4	OSNMA hot start with replayed signal	Objective: verify that the GNSS receiver detects a replayed signal. Procedure: The GNSS receiver starts in GNSS and OSNMA hot start conditions and acquires the signals of visible Galileo satellites. The receiver authenticates the Galileo navigation data with OSNMA (ADKD=0) and provides a position with authenticated data. Once the receiver provides PVT solution with authenticated data, it is switched off. A replayed signal with a delay of 40 seconds with respect to the previous one is simulated, and the receiver is switched on. The receiver detects that the Galileo System Time from the signal-in-space time and the local timing realisation do not meet the synchronisation requirement and it stops processing OSNMA data as defined in OSNMA Receiver Guidelines. Pass/fail criteria: the receiver detects the replay and does not compute an authenticated valid position since the start of the replay until the end of the test.	Appendix 12, GNS_3b
2.5	OSNMA hot start with false data	Objective: Verify that OSNMA detects false data. Procedure: The GNSS receiver starts in GNSS and OSNMA hot start conditions. The GNSS receiver shall be able to acquire the signal of all the visible Galileo satellites and verify the authenticity of their navigation messages by means of OSNMA. At least one bit of the ephemeris data provided by each Galileo satellite does not correspond with the original and authenticated data, but the Galileo I/NAV message must be coherent, including CRC. Pass/fail criteria: the receiver detects the false data within 160 seconds and does not compute an authenticated valid position until the end of the test.	Appendix 12, GNS_3b

';

(37) Appendix 12 is amended as follows:

(a) the Table of Content is amended as follows:

(i) the following point 1.1.1 is inserted after point 1.1:

'1.1.1 References';

(ii) point 2 is replaced by the following:

'2. BASIC CHARACTERISTICS OF THE GNSS RECEIVER';

(iii) point 3 is replaced by the following:

'3. SENTENCES PROVIDED BY THE GNSS RECEIVER';

(iv) the following points 4.2.4 and 4.2.5 are inserted:

'4.2.4 Structure of the WriteRecord command

4.2.5 Other commands';

(v) point 5.2 is replaced by the following:

'5.2. Transfer of information from the GNSS receiver to the VU';

(vi) point 5.2.1 is deleted;

(vii) the following points 5.3, 5.4 and 5.4.1 are inserted:

'5.3. Transfer of information from the VU to the GNSS receiver

5.4. Error handling

5.4.1 Absence of position information from GNSS receiver';

(viii) points 6 and 7 are replaced by the following:

'6. POSITION DATA PROCESSING AND RECORDING BY THE VU

7. GNSS TIME CONFLICT';

(ix) the following point 8 is added:

'8. VEHICLE MOTION CONFLICT';

(b) point 1 is amended as follows

(i) the text before Figure 1 is replaced by the following:

'1. INTRODUCTION

This Appendix provides the technical requirements for the GNSS receiver and GNSS data used by the Vehicle Unit, including the protocols that must be implemented to assure the secure and correct data transfer of the positioning information.

1.1. **Scope**

GNS_1 The Vehicle Unit shall collect location data from at least one GNSS satellite network.

The Vehicle Unit may be with or without an external GNSS facility as described in Figure 1:';

(ii) the following point 1.1.1 is inserted after point 1.1:

'1.1.1 References

The following references are used in this part of this Appendix.

NMEA NMEA (National Marine Electronics Association) 0183 Interface Standard, V4.11';

(iii) in point 1.2, the following acronyms are added:

'OSNMA	Galileo Open Service Navigation Messages Authentication
RTC	Real Time Clock

';

(c) point 2 is amended as follows:

(i) the header is replaced by the following:

'2. BASIC CHARACTERISTICS OF THE GNSS RECEIVER';

(ii) paragraph GNS_3 is replaced by the following:

'GNS_3	The GNSS receiver shall have the capability to support Navigation Messages Authentication on the Open Service of Galileo (OSNMA).';

(iii) the following paragraphs GNS_3a to GNS_3g are added:

'GNS_3a	The GNSS receiver shall perform a number of consistency checks in order to verify that the measurements computed by the GNSS receiver on the basis of the OSNMA data have resulted in the correct information about the position, velocity and data of the vehicle, and have therefore not been influenced by any external attack such as meaconing. These consistency checks shall consist, for instance, of: — detection of abnormal power emissions by means of combined monitoring of the Automatic Gain Control (AGC) and Carrier-to-Noise density ratio (C/N0), — pseudorange measurement consistency and Doppler measurement consistency over time, including the detection of abrupt measurement jumps, — receiver autonomous integrity monitoring (RAIM) techniques, including the detection of inconsistent measurements with the estimated position, — position and velocity checks, including abnormal position and velocity solutions, sudden jumps and behaviour not consistent with the dynamics of the vehicle, — time and frequency consistency, including clock jumps and drifts that are not consistent with the receiver clock characteristics.
GNS_3b	The European Commission shall develop and approve the following documents: — A Signal in Space Interface Control Document (SIS ICD), specifying in detail the OSNMA information transmitted in the Galileo signal. — OSNMA Receiver Guidelines, providing the requirements and processes in the receivers to guarantee a secure implementation of OSNMA, as well as recommendations to enhance OSNMA performance. GNSS receivers fitted in tachographs, either internal or external, shall be constructed in accordance with the SIS ICD and the OSNMA receiver guidelines.

GNS_3c	The GNSS receiver shall provide position messages, called authenticated position messages in this Annex and its Appendixes, which are elaborated using only satellites from which the authenticity of the navigation messages has been successfully verified.
GNS_3d	The GNSS receiver shall also provide standard position messages, elaborated using the satellites in view, regardless whether they are authenticated or not.
GNS_3e	The GNSS receiver shall use the VU Real Time Clock (RTC) as time reference for the time synchronisation necessary for OSNMA.
GNS_3f	The VU RTC time shall be provided to the GNSS receiver by the VU.
GNS_3g	The maximal time drift specified in requirement 41 of Annex IC, shall be provided to the GNSS receiver by the VU, along with the VU RTC time.';

(d) point 3 is replaced by the following:

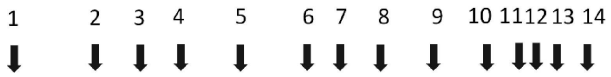
'3. SENTENCES PROVIDED BY THE GNSS RECEIVER

This section describes the sentences used in the functioning of the Smart Tachograph, for transmitting standard and authenticated position messages. This section is valid both for the configuration of the Smart Tachograph with or without an external GNSS facility.

GNS_4	The standard position data is based on the NMEA sentence Recommended Minimum Specific (RMC) GNSS Data, which contains the Position information (Latitude, Longitude), Time in UTC format (hhmmss.ss), and Speed Over Ground in Knots plus additional values. The format of the RMC sentence is the following (as from NMEA V4.11 standard):

Figure 2

Structure of the RMC sentence



$–RMC,hhmmss.ss,A,llll.ll,a,yyyyy.yy,a,x.x,x.x,xxxx,x.x,a,a,a*hh

(1) Time (UTC)

(2) Status, A= Valid position, V= Warning

(3) Latitude

(4) N or S

(5) Longitude

(6) E or W

(7) Speed over ground in knots

(8) Track made good, degrees true

(9) Date, ddmmyy

(10) Magnetic Variation, degrees

(11) E or W

(12) FAA Mode Indicator

(13) Navigational status

(14) Checksum

The Navigational status is optional and may not be present in the RMC sentence.

The Status gives indication if the GNSS signal is available. Until the value of the Status is not set to 'A', the received data (e.g., on Time or Latitude/Longitude) cannot be used to record the position of the vehicle in the VU.

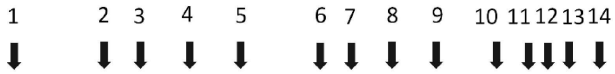
The resolution of the position is based on the format of the RMC sentence described above. The first part of the fields 3) and 5) are used to represent the degrees. The rest are used to represent the minutes with three decimals. So the resolution is 1/1 000 of minute or 1/60 000 of degree (because one minute is 1/60 of a degree).

GNS_4a The authenticated position data is based on a NMEA-like sentence, Authenticated Minimum Specific (AMC) Data, which contains the Position information (Latitude, Longitude), Time in UTC format (hhmmss.ss), and Speed Over Ground in Knots plus additional values.

The format of the AMC sentence is the following (as from NMEA V4.11 standard, except for value number 2):

Figure 3

Structure of the AMC sentence



$–AMC,hhmmss.ss,A,llll.ll,a,yyyyy.yy,a,x.x,x.x,xxxx,x.x,a,a,a*hh

(1) Time (UTC)

(2) Status, A=Authenticated position (established using at least 4 satellites from which the authenticity of the navigation messages has been successfully verified), J=jamming or O=other GNSS attack in the absence of failed authentication of navigation messages (by implemented consistency checks according to GNS_3a), F=failed authentication of navigation messages (as detected by OSNMA verifications specified in the documents referred to in GNS_3b), V=Void (authenticated position is not available for any other reason)

(3) Latitude

(4) N or S

(5) Longitude

(6) E or W

(7) Speed over ground in knots

(8) Track made good, degrees true

(9) Date, ddmmyy

(10) Magnetic Variation, degrees

(11) E or W

(12) FAA Mode Indicator

(13) Navigational status

(14) Checksum

The Navigational status is optional and may not be present in the AMC sentence.

The Status gives indication if an authenticated GNSS position is available, if an attack on the GNSS signals has been detected, if authentication of navigation messages has failed, or if GNSS position is void. When the value of the Status is not set to 'A', the received data (e.g. Time or Latitude/Longitude) are considered to be not valid, and may not be used to record the position of the vehicle in the VU. When the value of the Status is set to 'J' (jamming), 'O' (other GNSS attack), or 'F' (failed authentication of navigation messages), a GNSS anomaly event shall be recorded in the VU, as defined in Annex IC and Appendix 1 (EventFaultCode).

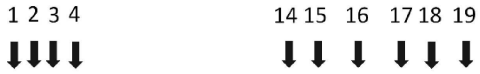
GNS_5 The Vehicle Unit shall store in the VU database the position information for latitude and longitude with a resolution of 1/10 of minute or 1/600 of a degree as described in Appendix 1 for type GeoCoordinates.

The GPS DOP and active satellites (GSA) command, as from NMEA V4.11 standard, can be used by the VU to determine and record the signal availability and accuracy of standard positions. In particular the HDOP is used to provide an indication on the level of accuracy of the recorded location data (see 4.2.2). The VU will store the value of the Horizontal Dilution of Precision (HDOP) calculated as the minimum of the HDOP values collected on the available GNSS systems.

The GNSS Id. indicates the corresponding NMEA Id. for every GNSS constellation and Satellite-Based Augmentation System (SBAS).

Figure 4

Structure of the GSA sentence (standard positions)



$–GSA,a,a,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,a*hh

(1) Selection mode

(2) Mode

(3) ID of 1st satellite used for fix

(4) ID of 2nd satellite used for fix

…

(14) ID of 12th satellite used for fix

(15) PDOP

(16) HDOP

(17) VDOP

(18) System ID

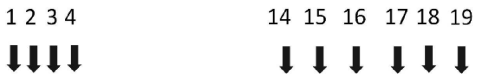
(19) Checksum

The System ID is optional and may not be present in the GSA sentence.

Similarly, the NMEA-like sentence authenticated active satellites (ASA) command can be used by the VU to determine and record the signal availability and accuracy of authenticated positions. Values 1 to 18 are defined in NMEA V4.11 standard.

Figure 5

Structure of the ASA sentence (authenticated positions)



$–ASA,a,a,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,a*hh

(1) Selection mode

(2) Mode

(3) ID of 1st satellite used for fix

(4) ID of 2nd satellite used for fix

…

(14) ID of 12th satellite used for fix

(15) PDOP

(16) HDOP

(17) VDOP

(18) System ID

(19) Checksum

The System ID is optional and may not be present in the ASA sentence.

GNS_6 When an external GNSS facility is used, the *GSA* sentence shall be stored in the GNSS Secure Transceiver with record number ’02’ to ’06’, and the ASA sentence shall be stored with record number ‘12’ to ‘16’.

GNS_7 The maximum size of the sentences (e.g., RMC, AMC, GSA, ASA or others), which can be used for the sizing of the read record command shall be 85 bytes (see Table 1).’;

(e) point 4 is amended as follows:

(i) in point 4.1.1, paragraph GNS_9 is amended as follows:

(1) the text before sub-paragraph (b) is replaced by the following:

'GNS_9 The external GNSS facility shall consist of the following components (see Figure 6):

(a) A commercial GNSS receiver to provide the position data through the GNSS data interface. For example, the GNSS data interface can be NMEA standard V4.11 where the GNSS receiver acts as a talker and transmits NMEA sentences to the GNSS Secure Transceiver with a frequency of 1Hz for the pre-defined set of NMEA and NMEA-like sentences, which must include at least the RMC, AMC, GSA and ASA sentences. The implementation of the GNSS data interface is a choice of the manufacturers of the external GNSS facility.';

(2) subparagraph (c) is replaced by the following:

'(c) An enclosure system with tamper detection function, which encapsulates both the GNSS receiver and the GNSS Secure Transceiver. The tamper detection function shall implement the security protection measures as requested in the Protection Profile of the Smart Tachograph.';

(ii) point 4.2.1 is amended as follows:

(1) paragraph GNS_14 is replaced by the following:

'GNS_14 The communication protocol between the external GNSS facility and the vehicle unit shall support the following functions:

1. The collection and distribution of GNSS data (e.g., position, timing, speed),
2. The collection of the configuration data of the external GNSS facility,
3. The management protocol to support the coupling, mutual authentication and session key agreement between the external GNSS facility and the VU,
4. The transmission to the external GNSS facility of the VU RTC time and of the maximal difference between true time and the VU RTC time.';

(2) the following paragraph is inserted after paragraph GNS_18:

'GNS_18a Regarding the function 4) the transmission to the external GNSS facility of the VU RTC time and of the maximal difference between true time and the VU RTC time, the GNSS Secure Transceiver shall use an EF (EF VU) in the same DF with file identifier equal to '2F30' as described in Table 1.';

(3) the following paragraph is inserted after paragraph GNS_19:

'GNS_19a The GNSS Secure Transceiver shall store the data coming from the VU in the EF VU. This is a linear, fixed-length record file with an identifier equal to '2F30' in hexadecimal format.';

(4) in paragraph GNS_20, the first subparagraph is replaced by the following:

'GNS_20 The GNSS Secure Transceiver shall use a memory to store the data and be able to perform as many read/write cycles as needed during a lifetime of at least 15 years. Apart from this aspect, the internal design and implementation of the GNSS Secure Transceiver is left to the manufacturers.';

(5) in GNS_21, Table 1 is replaced by the following:

'

Table 1

File Structure

		Access conditions		
File	File ID	Read	Update	Encrypted
MF	3F00			
EF.ICC	0002	ALW	NEV (by VU)	No
DF GNSS Facility	0501	ALW	NEV	No
EF EGF_MACertificate	C100	ALW	NEV	No
EF CA_Certificate	C108	ALW	NEV	No
EF Link_Certificate	C109	ALW	NEV	No
EF EGF	2F2F	SM-MAC	NEV (by VU)	No
EF VU	2F30	SM-MAC	SM-MAC	No

File / Data element	Record no	Size (bytes)		Default values
		Min	Max	
MF		552	1031	
EF.ICC				
sensorGNSSSerialNumber		8	8	
DF GNSS Facility		*612*	*1023*	
EF EGF_MACertificate		*204*	*341*	
EGFCertificate		204	341	{00..00}
EF CA_Certificate		*204*	*341*	
MemberStateCertificate		204	341	{00..00}
EF Link_Certificate		*204*	*341*	
LinkCertificate		204	341	{00..00}
EF EGF				
RMC NMEA Sentence	'01'	85	85	

1st GSA NMEA Sentence	'02'	85	85	
2nd GSA NMEA Sentence	'03'	85	85	
3rd GSA NMEA Sentence	'04'	85	85	
4th GSA NMEA Sentence	'05'	85	85	
5th GSA NMEA Sentence	'06'	85	85	
Extended serial-number of the external GNSS facility defined in Appendix 1 as SensorGNSSSerialNumber.	'07'	8	8	
Operating system identifier of the GNSS Secure Transceiver defined in Appendix 1 as SensorOSIdentifier.	'08'	2	2	
Type approval number of the external GNSS facility defined in Appendix 1 as SensorExternalGNSSApprovalNumber.	'09'	16	16	
Identifier of the security component of the external GNSS facility defined in Appendix 1 as SensorExternalGNSSSCIdentifier	'10'	8	8	
AMC Sentence	'11'	85	85	
1st ASA Sentence	'12'	85	85	
2nd ASA Sentence	'13'	85	85	
3rd ASA Sentence	'14'	85	85	
4th ASA Sentence	'15'	85	85	
5th ASA Sentence	'16'	85	85	
RFU – Reserved for Future Use	From '17' to 'FD'			
EF VU				
VuRtcTime (see Appendix 1)	'01'	4	4	{00..00}
VuGnssMaximalTimeDifference (see Appendix 1)	'02'	2	2	{00..00}'

;

(iii) point 4.2.2 is amended as follows:

(1) in paragraph GNS_22, the first subparagraph is replaced by the following:

'GNS_22 The secure transfer of GNSS position data, VU RTC time and maximal time difference between true time and the VU RTC time shall be allowed only in the following conditions:';

(2) paragraph GNS_23 is replaced by the following:

'GNS_23 Every T seconds, where T is a value lower or equal to 20, unless coupling or mutual authentication and session key agreement takes place, the VU requests from the external GNSS facility the position information on the basis of the following flow:

1. The VU requests position data from the External GNSS facility together with Dilution of Precision data (from the GSA and ASA sentences). The VU Secure Transceiver shall use the ISO/IEC 7816-4:2013 SELECT and READ RECORD(S) commands in secure messaging authentication-only mode as described in section 11.5 of Appendix 11 with the file identifier '2F2F' and RECORD number equal to '01' for RMC NMEA sentence, '02','03','04','05','06' for GSA NMEA sentence, '11' for AMC sentence, and '12','13','14','15','16' for ASA sentence.
2. The last position data received is stored in the EF with identifier '2F2F' and the records described in Table 1 in the GNSS secure transceiver as the GNSS secure transceiver receives NMEA data with a frequency of at least 1 Hz from the GNSS receiver through the GNSS data interface.
3. The GNSS Secure Transceiver sends the response to the VU Secure Transceiver by using the APDU response message in secure messaging authentication-only mode as described in section 11.5 of Appendix 11.
4. The VU Secure Transceiver checks the authenticity and integrity of the received response. In case of positive outcome, the position data is transferred to the VU processor through the GNSS data interface.
5. The VU processor checks the received data extracting the information (e.g., latitude, longitude, time) from the RMC NMEA sentence. The RMC NMEA sentence includes the information if the non-authenticated position is valid. If the non-authenticated position is valid, the VU processor also extracts the values of HDOP from GSA NMEA sentences and calculates the minimum value on the available satellite systems (i.e., when the fix is available).
6. The VU processor also extracts the information (e.g., latitude, longitude, time) from the AMC sentence. The AMC sentence includes the information if the authenticated position is not valid or GNSS signal has been attacked. If the position is valid, the VU processor also extracts the values of HDOP from ASA sentences and calculates the minimum value on the available satellite systems (i.e., when the fix is available).

GNS_23a The VU shall also write VU RTC time and maximal time difference between true time and the VU RTC time as needed, by using the ISO/IEC 7816-4:2013 SELECT and WRITE RECORD(S) commands in secure messaging authentication-only mode as described in section 11.5 of Appendix 11 with the file identifier '2F30' and RECORD number equal to '01' for VuRtcTime and '02' for MaximalTimeDifference.';

(iv) point 4.2.3 is amended as follows:

(1) in paragraph GNS_26, the fourth and fifth indents are replaced by the following:

'- If the record is not found, the GNSS secure transceiver returns '6A83'.

- If the external GNSS facility has detected tampering, it shall return status words '6690'.';

(2) paragraph GNS_27 is deleted;

(v) the following points 4.2.4 and 4.2.5 are inserted:

‘4.2.4 Structure of the WriteRecord command

This section describes in detail the structure of the Write Record command. Secure messaging (authentication-only mode) is added as described in Appendix 11 Common security mechanisms.

GNS_26a The command shall support the Secure Messaging authentication-only-mode, see Appendix 11.

GNS_26b Command Message

Byte	Length	Value	Description
CLA	1	‘0Ch’	Secure messaging asked.
INS	1	‘D2h’	Write Record
P1	1	‘XXh’	Record number (’00’ references the current record)
P2	1	‘04h’	Write the record with the record number indicated in P1
Data	X	‘XXh’	Data

GNS_26c The record referenced in P1 becomes the current record.

Byte	Length	Value	Description
SW	2	‘XXXXh’	Status Words (SW1,SW2)

— If the command is successful, the GNSS secure transceiver returns ‘**9000**’.

— If the current file is not record oriented, the GNSS secure transceiver returns **’6981’**.

— If the command is used with P1 = ’00’ but there is no current EF the GNSS secure transceiver returns **’6986’** (command not allowed).

— If the record is not found, the GNSS secure transceiver returns **’6A83’**.

— If the external GNSS facility has detected tampering, it shall return status words **’6690’**.

4.2.5 Other commands

GNS_27 The GNSS Secure Transceiver shall support the following tachograph generation 2 commands specified in Appendix 2:

Command	Reference
Select	Appendix 2 chapter 3.5.1
Read Binary	Appendix 2 chapter 3.5.2
Get Challenge	Appendix 2 chapter 3.5.4
PSO: Verify Certificate	Appendix 2 chapter 3.5.7
External Authenticate	Appendix 2 chapter 3.5.9
General Authenticate	Appendix 2 chapter 3.5.10
MSE:SET	Appendix 2 chapter 3.5.11

';

(vi) in point 4.4.1, paragraph GNS_28 is replaced by the following:

'GNS_28 A communication error with the external GNSS facility event shall be recorded in the VU, as defined in requirement 82 of Annex IC and Appendix 1 (EventFaultType). In this context, a communication error is triggered when the VU Secure Transceiver does not receive a response message after a request message as described in 4.2.';

(vii) in point 4.4.2, paragraph GNS_29 is replaced by the following:

'GNS_29 If the external GNSS facility has been breached, the GNSS Secure Transceiver shall ensure that cryptographic material is unavailable. As described in GNS_25 and GNS_26, the VU shall detect tampering if the Response has status '6690'. The VU shall then generate and record a security breach attempt event as defined in requirement 85 of Annex IC and Appendix 1 (EventFaultType for tamper detection of GNSS). Alternately, the external GNSS facility may respond to VU requests without secure messaging and with status '6A88'.';

(viii) in point 4.4.3, paragraph GNS_30 is replaced by the following:

'GNS_30 If the GNSS Secure Transceiver does not receive data from the GNSS receiver, the GNSS Secure Transceiver shall generate a response message to the READ RECORD command with RECORD number equal to '01' with a Data Field of 12 bytes all set to 0xFF. Upon reception of the Response message with this value of the data field, the VU shall generate and record an absence of position information from GNSS receiver event, as defined in requirement 81 of Annex IC and Appendix 1 (EventFaultType).';

(ix) point 4.4.4 is amended as follows:

(1) paragraph GNS_31 is replaced by the following:

'GNS_31 If the VU detects that the EGF certificate used for mutual authentication is not valid any longer, the VU shall generate and record a security breach attempt event as defined in requirement 85 of Annex IC and Appendix 1 (EventFaultType for external GNSS facility certificate expired). The VU shall still use the received GNSS position data.';

(2) the header of figure 4 is replaced by the following:

'*Figure 6*

Schema of the external GNSS facility';

(f) point 5 is amended as follows:

(i) in point 5.1, paragraph GNS_32 is replaced by the following:

'GNS_32 For transmitting position, DOP and satellites data, the GNSS receiver shall act as a talker and transmit NMEA or NMEA-like sentences to the VU processor, which shall act as a listener with a frequency of 1/10 Hz or faster for the pre-defined set of sentences, which shall include at least the RMC, GSA, AMC and ASA sentences. Alternatively, the VU processor and the internal GNSS receiver may use other data formats to exchange the data contained in the NMEA or NMEA-like sentences specified in GNS_4, GNS_4a and GNS_5.';

(ii) point 5.2 is replaced by the following:

'5.2. **Transfer of information from the GNSS receiver to the VU**

GNS_34 The VU processor checks the received data extracting the information (e.g., latitude, longitude, time) from the RMC NMEA sentence and the AMC sentence.

GNS_35 The RMC NMEA sentence includes the information if the non-authenticated position is valid. If the non-authenticated position is not valid, the position data is not available and it cannot be used to record the position of the vehicle. If the non-authenticated position is valid, the VU processor also extracts the values of HDOP from GSA NMEA.

GNS_36 The VU processor also extracts the information (e.g. latitude, longitude, time) from the AMC sentence. The AMC sentence includes the information if the non-authenticated position is valid according to GNS_4a. If the non-authenticated position is valid, the VU processor also extracts the values of HDOP from ASA sentences.

5.3. **Transfer of information from the VU to the GNSS receiver**

GNS_37 The VU processor provides to the GNSS receiver the VU RTC time and the maximal difference between true time and the VU RTC time, in accordance with GNS_3f and GNS_3g.

5.4. **Error handling**

5.4.1 Absence of position information from GNSS receiver

GNS_38 The VU shall generate and record an absence of position information from GNSS receiver event, as defined in requirement 81 of Annex IC and Appendix 1 (EventFaultType).';

(g) points 6 and 7 are replaced by the following:

'6. POSITION DATA PROCESSING AND RECORDING BY THE VU

This section is valid both for the configuration of the Smart Tachograph with or without an external GNSS facility.

GNS_39 Position data shall be stored in the VU, together with a flag indicating if the position has been authenticated. When position data need to be recorded in the VU, the following rules shall apply:

(a) If both authenticated and standard positions are valid and consistent, the standard position and its accuracy shall be recorded in the VU and the flag shall be set to 'authenticated'.

(b) If both authenticated and standard positions are valid but not consistent, the VU shall store the authenticated position and its accuracy, and the flag shall be set to 'authenticated'.

(c) If the authenticated position is valid and the standard position is not valid, the VU shall record the authenticated position and its accuracy, and the flag shall be set to 'authenticated'.

(d) If the standard position is valid and the authenticated position is not valid, the VU shall record the standard position and its accuracy, and the flag shall be set to 'not authenticated'.

Authenticated and standard positions are considered as consistent, as shown in Figure 7, when the horizontal authenticated position can be found in a circle centered at the horizontal standard position, which radius results of rounding up to the nearest upper whole number the value of R_H calculated according to the following formula:

$$R\_H = 1.74 \bullet \sigma_{UERE} \bullet HDOP$$

where:

— R_H is the relative radius of a circle around the estimated horizontal position, in meters. It is an indicator that is used to check consistency between standard and authenticated positions.

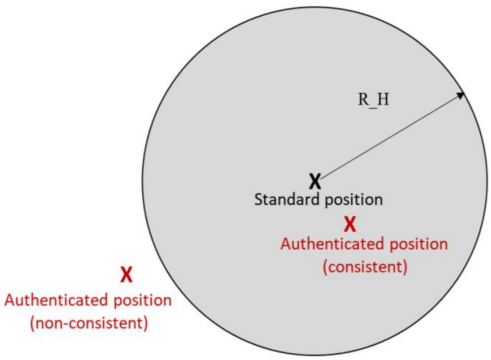
— σ_{UERE} is the standard deviation for the user equivalent range error (UERE), which models all measurement errors for the target application, including urban environments. A constant value of σ_{UERE} = 10 meters shall be used.

— HDOP is the horizontal dilution of precision calculated by the GNSS receiver.

— σ_{UERE} . HDOP is the estimation of the root mean squared error in the horizontal domain.

Figure 7

Consistent Authenticated and Standard (non-authenticated) positions



GNS_40 When the value of the Status in a received AMC sentence is set to 'J' or 'O' or 'F' in accordance with requirement GNS_4a, the VU shall generate and record a GNSS anomaly event, as defined in requirement 88a of Annex IC and Appendix 1 (EventFaultType). The vehicle unit may perform additional checks before storing a GNSS anomaly event following the reception of a 'J' or 'O' setting.

7. GNSS TIME CONFLICT

GNS_41 If the VU detects a discrepancy between the time of the vehicle unit's time measurement function and the time originating from the GNSS signals, it shall generate and record a time conflict event, as defined in requirement 86 of Annex IC and Appendix 1 (EventFaultType).';

(h) the following point 8 is added:

'8. VEHICLE MOTION CONFLICT

GNS_42 The VU shall trigger and record a Vehicle Motion Conflict event in accordance with requirement 84 of Annex IC, in case motion information calculated from the motion sensor is contradicted by motion information calculated from the internal GNSS receiver, from the external GNSS facility, or by other independent motion source(s) as set out in requirement 26 of Annex IC.

The vehicle motion conflict event shall be triggered upon occurrence of one of the following trigger conditions:

Trigger condition 1:

The trimmed mean value of the speed differences between these sources shall be used, when the position information from the GNSS receiver is available and when the ignition of the vehicle is switched on, as specified below:

— every 10 seconds maximum, the absolute value of the difference between the vehicle speed estimated from the GNSS and the one estimated from the motion sensor shall be computed.

— all the computed values in a time window containing the last 5 minutes of vehicle movement shall be used to compute the trimmed mean value.

— the trimmed mean value shall be computed as the average of 80% of the remaining values, after having eliminated the highest ones in absolute values.

The Vehicle Motion Conflict event shall be triggered if the trimmed mean value is above 10 km/h for five uninterrupted minutes of vehicle movement. (Note: the use of the trimmed mean on the last 5 minutes is applied to mitigate the risk of measurement outliers and transient values).

For the trimmed mean computation, the vehicle shall be considered as moving if at least one vehicle speed value estimated either from motion sensor or from GNSS receiver is not equal to zero.

Trigger condition 2:

The vehicle motion conflict event shall also be triggered if the following condition is true:

$$GnssDistance > [OdometerDifference \times OdometerToleranceFactor + Minimum(SlipDistanceUpperlimit; (OdometerDifference \times SlipFactor)) + GnssTolerance + FerryTrainDistance]$$

where:

— *GnssDistance* is the distance between the current position of the vehicle and the previous one, both obtained from valid authenticated position messages, without considering the height,

— OdometerDifference is the difference between the current odometer value and the odometer value corresponding to the previous valid authenticated position message,

— OdometerToleranceFactor is equal to 1.1 (worst case tolerance factor for all measurement tolerances of the vehicle odometer),

— GnssTolerance is equal to 1 km (worst case GNSS tolerance),

— Minimum (SlipDistanceUpperLimit; (OdometerDifference * SlipFactor)) is the minimum value between:

  — SlipDistanceUpperLimit which is equal to 10 km (upper limit of the slip distance caused by slipping effects during braking),

  — and OdometerDifference * SlipFactor, in which SlipFactor is equal to 0.2 (maximal influence of slipping effects during breaking),

— FerryTrainDistance is computed as: FerryTrainDistance =200km/h * tFerryTrain, where tFerryTrain is the sum of the durations in hours of the ferry/train crossings in the considered time interval. The duration of a ferry/train crossings is defined as the time difference between its end flag and its beginning flag.

The preceding verifications shall be performed every 15 minutes if the necessary position data are available, otherwise as soon as the position data are available.

For this trigger condition:

— date and time of beginning of event shall be equal to the date and time when the previous position message was received,

— date and time of end of event shall be equal to the date and time when the checked condition becomes false again.

Trigger condition 3:

The vehicle unit encounters a discrepancy consisting of the motion sensor not detecting any movement and the independent motion source detecting movement for a specific period. The conditions to record a discrepancy as well as the period of detection of the discrepancy shall be set out by the vehicle unit manufacturer, although the discrepancy shall be detected in no more than three hours.';

(38) Appendix 13 is replaced by the following:

'Appendix 13

ITS INTERFACE

TABLE OF CONTENTS

1. INTRODUCTION

1.1. Scope

1.2. Acronyms and definitions

2. REFERENCED STANDARDS

3. ITS INTERFACE WORKING PRINCIPLES

3.1. Communication technology

3.2. Available services

3.3. Access through the ITS interface

3.4. Data available and need of driver consent

4. LIST OF DATA AVAILABLE THROUGH THE ITS INTERFACE AND PERSONAL/NOT PERSONAL CLASSIFICATION

1. INTRODUCTION

1.1. **Scope**

ITS_01 This Appendix specifies the basics of the communication through the tachograph interface with Intelligent Transport Systems (ITS), requested in Articles 10 and 11 of Regulation (EU) No 165/2014.

ITS_02 The ITS interface shall allow external devices to obtain data from the tachograph, to use tachograph services and also to provide data to the tachograph.

Other tachograph interfaces (e.g. CAN bus) may also be used for that purpose.

This Appendix does not specify:

— how data provided through the ITS interface are collected and managed within the tachograph,

— the form of presentation of collected data to applications hosted on the external device,

— the ITS security specification in addition to what provides Bluetooth®,

— the Bluetooth® protocols used by the ITS interface.

1.2. **Acronyms and definitions**

The following acronyms and definitions specific to this Appendix are used:

GNSS	Global Navigation Satellite System
ITS	Intelligent Transport System
OSI	Open Systems Interconnection
VU	Vehicle Unit
ITS unit	an external device or application using the VU ITS interface.

2. REFERENCED STANDARDS

ITS_03 This Appendix refers to and depends upon all or parts of the following regulations and standards. Within the clauses of this Appendix, the relevant standards, or relevant clauses of standards, are referred to. In the event of any contradiction the clauses of this Appendix shall take precedence.

Standards referenced to in this Appendix are:

— Bluetooth® – Core Version 5.0.

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

— ISO/IEC 7498-1:1994 Information technology - Open Systems Interconnection - Basic Reference Model, the Basic Model

3. ITS INTERFACE WORKING PRINCIPLES

ITS_04 The VU shall be responsible to keep updated and maintain tachograph data transmitted through the ITS interface, without any involvement of the ITS interface.

3.1. **Communication technology**

ITS_05 Communication through the ITS interface shall be performed via Bluetooth® interface and be compatible to Bluetooth® Low Energy according to Bluetooth version 5.0 or newer.

ITS_06 The communication between the VU and the ITS unit shall be established after a Bluetooth® pairing process has been completed.

ITS_07 A secure and encrypted communication shall be established between the VU and the ITS unit, in accordance with the Bluetooth® specification mechanisms. This Appendix does not specify encryption or other security mechanisms in addition to what Bluetooth® provides.

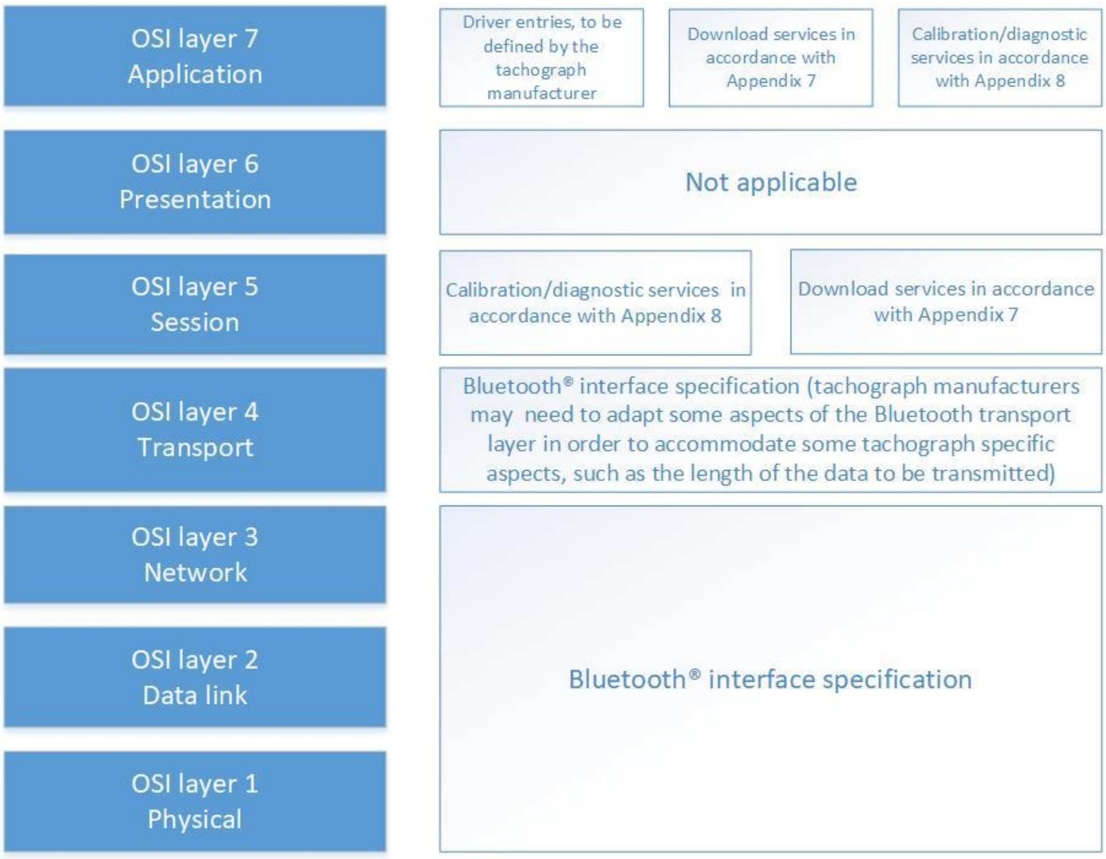
ITS_08 Bluetooth® is using a server/client model to control the transmission of data between devices, in which the VU shall be the server and the ITS unit shall be the client.

3.2. **Available services**

ITS_09 The data to be transmitted through the ITS interface in accordance with point 4 shall be made available through the services specified in Appendix 7 and Appendix 8. In addition, the VU shall make available to the ITS unit the services that are necessary for manual data entry in accordance with requirement 61 of Annex IC, and optionally, for other data entries in real time.

Figure 1

partition of the communication through the ITS interface according to the OSI Model layers



ITS_10 When the download interface is used via the front connector, the VU shall not provide the download services specified in Appendix 7 via ITS Bluetooth® connection.

ITS_11 When the calibration interface is used via the front connector, the VU shall not provide the calibration services specified in Appendix 8 via ITS Bluetooth® connection.

3.3. **Access through the ITS interface**

ITS_12 The ITS interface shall provide a wireless access to all services specified in Appendix 7 and Appendix 8, in replacement of a cable connection to the front connector for calibration and download specified in Appendix 6.

ITS_13 The VU shall make the ITS interface available to the user according to the combination of valid tachograph cards inserted in the VU, as specified in Table 1.

Table 1

Availability of ITS interface depending on the type of card inserted in the tachograph

Availability of the ITS interface		Driver slot				
		No card	Driver card	Control card	Workshop card	Company card
Co-driver slot	No card	Not available	Available	Available	Available	Available
	Driver card	Available	Available	Available	Available	Available
	Control card	Available	Available	Available	Not available	Not available
	Workshop card	Available	Available	Not available	Available	Not available
	Company card	Available	Available	Not available	Not available	Available

ITS_14 After a successful ITS Bluetooth® pairing, the VU shall assign the ITS Bluetooth® connection to the specific inserted tachograph card according to Table 2:

Table 2

Assignment of the ITS connection depending on the type of card inserted in the tachograph

Assignment of the ITS Bluetooth® connection		Driver slot				
		No card	Driver card	Control card	Workshop card	Company card
Co-driver slot	No card	Not available	Driver card	Control card	Workshop card	Company card
	Driver card	Driver card	Driver card (**)	Control card	Workshop card	Company card
	Control card	Control card	Control card	Control card (*)	Not available	Not available
	Workshop card	Workshop card	Workshop card	Not available	Workshop card (*)	Not available
	Company card	Company card	Company card	Not available	Not available	Company card (*)

(*) The ITS Bluetooth® connection shall be assigned to the tachograph card in the driver slot of the VU.
(**) The user shall select the card to which the ITS Bluetooth® connection shall be assigned (inserted in the driver or in the co-driver slot).

ITS_15 If a tachograph card is withdrawn, then the VU shall terminate the ITS Bluetooth® connection which is assigned to this card.

ITS_16 The VU shall support the ITS connection to at least one ITS unit and may support connections to multiple ITS units at the same time.

ITS_17 The access rights to the data and services available via the ITS interface shall comply with requirements 12 and 13 of Annex IC, in addition to the driver consent specified in section 3.4 of this Appendix.

3.4. **Data available and need of driver consent**

ITS_18 All tachograph data available via the services referred to in point 3.3 shall be classified as either personal or not personal for the driver, co-driver or both.

ITS_19 At least the list of data classified as mandatory in section 4 shall be made available through the ITS interface.

ITS_20 The data in section 4 that are classified as 'personal' shall only be accessible upon driver consent, accepting therefore that the personal data can leave the vehicle network, except in the case set out in requirement ITS_25, for which the driver consent is not needed.

ITS_21 Data additional to those gathered in point 4 and considered as mandatory may be made available through the ITS interface. Additional data which are not included in point 4 shall be classified as 'personal' or not 'personal' by the VU manufacturer, being the driver consent requested for those data that have been classified as personal, except in the case set out in requirement ITS_25, for which the driver consent is not needed.

ITS_22 Upon insertion of a driver card which is unknown to the vehicle unit, the cardholder shall be prompted by the tachograph to enter the consent for transmission of personal data output through the ITS interface, in accordance with requirement 61 of Annex IC.

ITS_23 The consent status (enabled/disabled) shall be recorded in the data memory of the vehicle unit.

ITS_24 In case of multiple drivers, only the personal data related to the drivers who gave their consent shall be accessible through the ITS interface. For instance, in a crew situation, if only the driver has given his/her consent, personal data related to the co-driver shall not be accessible.

ITS_25 When the VU is in control, company or calibration modes, the access rights through the ITS interface shall be managed according to requirements 12 and 13 of Annex IC, hence the driver consent not being needed.

4. LIST OF DATA AVAILABLE THROUGH THE ITS INTERFACE AND PERSONAL/NOT PERSONAL CLASSIFICATION

Data name	Data format	Source	Data classification (personal/ not personal)		Consent for the availability of the data	Availability
			driver	co-driver		
VehicleIdentificationNumber	Appendix 8	VU	not personal	not personal	no need of consent	mandatory
CalibrationDate	ISO 16844-7	VU	not personal	not personal	no need of consent	mandatory
TachographVehicleSpeed	ISO 16844-7	VU	personal	N/A	driver consent	mandatory
Driver1WorkingState	ISO 16844-7	VU	personal	N/A	driver consent	mandatory
Driver2WorkingState	ISO 16844-7	VU	N/A	personal	co-driver consent	mandatory
DriveRecognize	ISO 16844-7	VU	not personal	not personal	no need of consent	mandatory

Driver1TimeRelatedStates	ISO 16844-7	VU	personal	N/A	driver consent	mandatory
Driver2TimeRelatedStates	ISO 16844-7	VU	N/A	personal	co-driver consent	mandatory
DriverCardDriver1	ISO 16844-7	VU	personal	N/A	driver consent	mandatory
DriverCardDriver2	ISO 16844-7	VU	N/A	personal	co-driver consent	mandatory
OverSpeed	ISO 16844-7	VU	personal	N/A	driver consent	mandatory
TimeDate	Appendix 8	VU	not personal	not personal	no need of consent	mandatory
HighResolutionTotalVehicleDistance	ISO 16844-7	VU	not personal	not personal	no need of consent	mandatory
HighResolutionTripDistance	ISO 16844-7	VU	not personal	not personal	no need of consent	mandatory
ServiceComponentIdentification	ISO 16844-7	VU	not personal	not personal	no need of consent	mandatory
ServiceDelayCalendarTimeBased	ISO 16844-7	VU	not personal	not personal	no need of consent	mandatory
Driver1Identification	ISO 16844-7	Driver Card	personal	N/A	driver consent	mandatory
Driver2Identification	ISO 16844-7	Driver Card	N/A	personal	co-driver consent	mandatory
NextCalibrationDate	Appendix 8	VU	not personal	not personal	no need of consent	mandatory
Driver1ContinuousDrivingTime	ISO 16844-7	VU	personal	N/A	driver consent	mandatory
Driver2ContinuousDrivingTime	ISO 16844-7	VU	N/A	personal	co-driver consent	mandatory
Driver1CumulativeBreakTime	ISO 16844-7	VU	personal	N/A	driver consent	mandatory
Driver2CumulativeBreakTime	ISO 16844-7	VU	N/A	personal	co-driver consent	mandatory
Driver1CurrentDurationOfSelectedActivity	ISO 16844-7	VU	personal	N/A	driver consent	mandatory
Driver2CurrentDurationOfSelectedActivity	ISO 16844-7	VU	N/A	personal	co-driver consent	mandatory
SpeedAuthorised	Appendix 8	VU	not personal	not personal	no need of consent	mandatory

TachographCardSlot1	ISO 16844-7	VU	not personal	N/A	no need of consent	mandatory
TachographCardSlot2	ISO 16844-7	VU	N/A	not personal	no need of consent	mandatory
Driver1Name	ISO 16844-7	Driver Card	personal	N/A	driver consent	mandatory
Driver2Name	ISO 16844-7	Driver Card	N/A	personal	co-driver consent	mandatory
OutOfScopeCondition	ISO 16844-7	VU	not personal	not personal	no need of consent	mandatory
ModeOfOperation	ISO 16844-7	VU	not personal	not personal	no need of consent	mandatory
Driver1CumulatedDrivingTimePreviousAndCurrentWeek	ISO 16844-7	VU	personal	N/A	driver consent	mandatory
Driver2CumulatedDrivingTimePreviousAndCurrentWeek	ISO 16844-7	VU	N/A	personal	co-driver consent	mandatory
EngineSpeed	ISO 16844-7	VU	personal	N/A	driver consent	optional
RegisteringMemberState	Appendix 8	VU	not personal	not personal	no need of consent	mandatory
VehicleRegistrationNumber	Appendix 8	VU	not personal	not personal	no need of consent	mandatory
Driver1EndOfLastDailyRestPeriod	ISO 16844-7	VU	personal	N/A	driver consent	optional
Driver2EndOfLastDailyRestPeriod	ISO 16844-7	VU	N/A	personal	co-driver consent	optional
Driver1EndOfLastWeeklyRestPeriod	ISO 16844-7	VU	personal	N/A	driver consent	optional
Driver2EndOfLastWeeklyRestPeriod	ISO 16844-7	VU	N/A	personal	co-driver consent	optional
Driver1EndOfSecondLastWeeklyRestPeriod	ISO 16844-7	VU	personal	N/A	driver consent	optional
Driver2EndOfSecondLastWeeklyRestPeriod	ISO 16844-7	VU	N/A	Personal	co-driver consent	optional
Driver1TimeLastLoadUnloadOperation	ISO 16844-7	VU	personal	N/A	driver consent	optional
Driver2TimeLastLoadUnloadOperation	ISO 16844-7	VU	N/A	personal	co-driver consent	optional

Driver1CurrentDailyDrivingTime	ISO 16844-7	VU	personal	N/A	driver consent	optional
Driver2CurrentDailyDrivingTime	ISO 16844-7	VU	N/A	personal	co-driver consent	optional
Driver1CurrentWeeklyDrivingTime	ISO 16844-7	VU	personal	N/A	driver consent	optional
Driver2CurrentWeeklyDrivingTime	ISO 16844-7	VU	N/A	personal	co-driver consent	optional
Driver1TimeLeftUntilNewDailyRestPeriod	ISO 16844-7	VU	personal	N/A	driver consent	optional
Driver2TimeLeftUntilNewDailyRestPeriod	ISO 16844-7	VU	N/A	personal	co-driver consent	optional
Driver1CardExpiryDate	ISO 16844-7	Driver Card	personal	N/A	driver consent	optional
Driver2CardExpiryDate	ISO 16844-7	Driver Card	N/A	personal	co-driver consent	optional
Driver1CardNextMandatoryDownloadDate	ISO 16844-7	VU	personal	N/A	driver consent	optional
Driver2CardNextMandatoryDownloadDate	ISO 16844-7	VU	N/A	personal	co-driver consent	optional
TachographNextMandatoryDownloadDate	ISO 16844-7	VU	not personal	not personal	no need of consent	optional
Driver1TimeLeftUntilNewWeeklyRestPeriod	ISO 16844-7	VU	personal	N/A	driver consent	optional
Driver2TimeLeftUntilNewWeeklyRestPeriod	ISO 16844-7	VU	N/A	personal	co-driver consent	optional
Driver1NumberOfTimes9hDailyDrivingTimesExceeded	ISO 16844-7	VU	personal	N/A	driver consent	optional
Driver2NumberOfTimes9hDailyDrivingTimesExceeded	ISO 16844-7	VU	N/A	personal	co-driver consent	optional
Driver1CumulativeUninterruptedRestTime	ISO 16844-7	VU	personal	N/A	driver consent	optional
Driver2CumulativeUninterruptedRestTime	ISO 16844-7	VU	N/A	personal	co-driver consent	optional

Driver1MinimumDailyRest	ISO 16844-7	VU	personal	N/A	driver consent	optional
Driver2MinimumDailyRest	ISO 16844-7	VU	N/A	personal	co-driver consent	optional
Driver1MinimumWeeklyRest	ISO 16844-7	VU	personal	N/A	driver consent	optional
Driver2MinimumWeeklyRest	ISO 16844-7	VU	N/A	personal	co-driver consent	optional
Driver1MaximumDailyPeriod	ISO 16844-7	VU	personal	N/A	driver consent	optional
Driver2MaximumDailyPeriod	ISO 16844-7	VU	N/A	personal	co-driver consent	optional
Driver1MaximumDailyDrivingTime	ISO 16844-7	VU	personal	N/A	driver consent	optional
Driver2MaximumDailyDrivingTime	ISO 16844-7	VU	N/A	personal	co-driver consent	optional
Driver1NumberOfUsedReducedDailyRestPeriods	ISO 16844-7	VU	personal	N/A	driver consent	optional
Driver2NumberOfUsedReducedDailyRestPeriods	ISO 16844-7	VU	N/A	personal	co-driver consent	optional
Driver1RemainingCurrentDrivingTime	ISO 16844-7	VU	personal	N/A	driver consent	optional
Driver2RemainingCurrentDrivingTime	ISO 16844-7	VU	N/A	personal	co-driver consent	optional
VehiclePosition	Appendix 8	VU	personal	personal	driver and co-driver consent	mandatory
ByDefaultLoadType	Appendix 8	VU	personal	personal	driver and co-driver consent	mandatory’

(39) Appendix 14 is amended as follows:

(a) in the Table of Contents, the following point is inserted after point 5.4.8:

‘5.5 Reserved for future use’;

(b) in point 4.1.1.5, paragraph DCS_17 is replaced by the following:

‘DSC_17 Security data (*DSRCSecurityData)*, comprising the data required by the *REDCR* to complete its ability to decrypt *the Data* shall be supplied as defined in Appendix 11 Common Security Mechanisms, for temporary storage in the *DSRC-VU* as the current version of *DSRCSecurityData,* in the form defined in section 5.4.4 of this Appendix.’;

(c) point 5 is amended as follows:

(i) in point 5.4.4, the TachographPayload sequence in the ASN.1 module definition for the DSRC data within the RTM application, is replaced by the following:

‘

```
TachographPayload ::= SEQUENCE {
      tp15638VehicleRegistrationPlate     LPN -- Vehicle Registration Plate using the
                                          data structure from ISO 14906, but for the RTM
                                          application the LPN is fixed to 17 bytes (no
                                          length determinant)
      tp15638SpeedingEvent                BOOLEAN, -- 1= Irregularities in speed (see
                                          Annex IC
      tp15638DrivingWithoutValidCard      BOOLEAN,    -- 1= Invalid card usage (see Annex
                                          IC)
      tp15638DriverCard                   BOOLEAN,-- 0= Indicates a valid driver card
                                          (see Annex IC)
      tp15638CardInsertion                BOOLEAN, -- 1= Card insertion while driving
                                          (see Annex IC)
      tp15638MotionDataError              BOOLEAN, -- 1= Motion data error (see Annex IC)
      tp15638VehicleMotionConflict        BOOLEAN, -- 1= Motion conflict (see Annex IC)
      tp156382ndDriverCard                BOOLEAN, -- 1= Second driver card inserted (see
                                          Annex IC)
      tp15638CurrentActivityDriving       BOOLEAN, -- 1= other activity selected;
                                                -- 0= driving selected
      tp15638LastSessionClosed            BOOLEAN, -- 1= improperly, 0= properly, closed
      tp15638PowerSupplyInterruption      INTEGER (0..127), -- Supply interrupts in the
                                          last 10 days
      tp15638SensorFault                  INTEGER (0..255),-- eventFaultType as per data
                                          dictionary
-- All subsequent time related types as defined in Annex IC.
      tp15638TimeAdjustment               INTEGER(0..4294967295), -- Time of the last
                                          time adjustment
      tp15638LatestBreachAttempt          INTEGER(0..4294967295), -- Time of last breach
                                          attempt
      tp15638LastCalibrationData          INTEGER(0..4294967295), -- Time of last
                                          calibration data
      tp15638PrevCalibrationData          INTEGER(0..4294967295), -- Time of previous
                                          calibration data
      tp15638DateTachoConnected           INTEGER(0..4294967295), -- Date tachograph
                                          connected
      tp15638CurrentSpeed                 INTEGER (0..255), -- Last current recorded
                                          speed
      tp15638Timestamp                    INTEGER(0..4294967295) -- Timestamp of current
                                          record
      tp15638LatestAuthenticatedPosition  INTEGER(0..4294967295), - Time of latest
                                          authenticated position
      tp15638ContinuousDrivingTime        INTEGER (0..255), -- Continuous driving time of
                                          the driver
      tp15638DailyDrivingTimeShift        INTEGER (0..255), -- Longest daily driving time
                                          of the driver for the current ongoing and
                                          previous RTM-shift
      tp15638DailyDrivingTimeWeek         INTEGER (0..255), -- Longest daily driving time
                                          of the driver within the current ongoing week
      tp15638WeeklyDrivingTime            INTEGER (0..255), -- Weekly driving time of the
                                          driver
      tp15638FortnightlyDrivingTime       INTEGER (0..255) -- Fortnightly driving time of
}                                         the driver
```

’;

(ii) in point 5.4.5, Table 14.3 is replaced by the following:

‘

Table 14.3

Elements of RtmData, actions performed and definitions

(1) RTM Data Element	(2) Action performed by the VU		(3) ASN.1 definition of data
RTM1 **Vehicle Registration Plate**	The VU shall set the value of the *tp15638VehicleRegistrationPlate* data element RTM1 from the recorded value of the data type *VehicleRegistrationIdentification* as defined in Appendix 1 *VehicleRegistrationIdentification*	Vehicle Registration Plate expressed as a string of characters	tp15638VehicleRegistrationPlate LPN, –Vehicle RegistrationPlate using the data structure from ISO 14906, but with the following limitation for the RTM application: the SEQUENCE starts with the Country Code, followed by an alphabet indicator, followed by the plate number itself, which is always 14 octets (padded with zero's) so the LPN type length is always 17 octets (no length determinant needed), of which 14 are the 'real' plate number.
RTM2 **Speeding Event**	The VU shall generate a Boolean value for data element RTM2 tp15638SpeedingEvent. The tp15638SpeedingEvent value shall be calculated by the VU from the over speeding events recorded in the VU within the last 10 days, as defined in Annex IC.	1 (TRUE): if the most recent over speeding event ended within the last 10 days or is still ongoing; 0 (FALSE): in any other case.	tp15638SpeedingEvent BOOLEAN,
RTM3 **Driving Without Valid Card**	The VU shall generate a Boolean value for data element RTM3 tp15638DrivingWithoutValid-Card. The VU shall assign a value of TRUE to the tp15638DrivingWithoutValid-Card variable if at least one driving without an appropriate card event has been recorded in the VU within the last 10 days as defined in Annex IC.	1 (TRUE): if the most recent driving without an appropriate card event ended within the last 10 days or is still ongoing; 0 (FALSE): in any other case.	tp15638DrivingWithoutValid-Card BOOLEAN,

RTM4 **Valid Driver Card**	The VU shall generate a Boolean value for data element RTM4 tp15638DriverCard on the basis of the inserted valid driver card in the driver slot.	1 (TRUE): if no valid driver card is present in the driver slot of the VU; 0 (FALSE): if a valid driver card is present in the driver slot of the VU.	tp15638DriverCard BOOLEAN,
RTM5 **Card Insertion while Driving**	The VU shall generate a Boolean value for data element RTM5 tp15638CardInsertion. The VU shall assign a value of TRUE to the tp15638CardInsertion variable if at least one card insertion while driving event has been recorded in the VU within the last 10 days as defined in Annex IC.	1 (TRUE): if the most recent card insertion while driving event has occurred within the last 10 days; 0 (FALSE): in any other case.	tp15638CardInsertion BOOLEAN,
RTM6 **Motion Data Error**	The VU shall generate a Boolean value for data element RTM6. The VU shall assign a value of TRUE to the tp15638MotionDataError variable if at least one motion data error event has been recorded in the VU within the last 10 days as defined in Annex IC.	1 (TRUE): if the most recent motion data error event ended within the last 10 days or is still ongoing; 0 (FALSE): in any other case.	tp15638MotionDataError BOOLEAN,
RTM7 **Vehicle Motion Conflict**	The VU shall generate a Boolean value for data element RTM7. The VU shall assign a value of TRUE to the tp15638VehicleMotionConflict variable if at least one vehicle motion conflict event has been recorded in the VU within the last 10 days.	1 (TRUE): if the most recent vehicle motion conflict event ended within the last 10 days or is still ongoing; 0 (FALSE): in any other case.	tp15638VehicleMotionConflict BOOLEAN,
RTM8 **2nd Driver Card**	The VU shall generate a Boolean value for data element RTM8 on the basis of Annex IC (Driver Activity Data CREW and CO-DRIVER). If a valid co-driver card is present the VU shall set the value of RTM8 to TRUE.	1 (TRUE): if a valid co-driver card is present in the VU; 2 (FALSE): if no valid co-driver card is present in the VU.	tp156382ndDriverCard BOOLEAN,

RTM9 **Current Activity**	The VU shall generate a Boolean value for data element RTM9. If the current activity is recorded in the VU as any activity other than DRIVING as defined in Annex IC the VU shall set the value of RTM9 to TRUE.	1 (TRUE): other activity selected; 0 (FALSE): driving selected	tp15638CurrentActivityDriving BOOLEAN
RTM10 **Last Session Closed**	The VU shall generate a Boolean value for data element RTM10. If the last card session was not properly closed as defined in Annex IC the VU shall set the value of RTM10 to TRUE.	1 (TRUE): at least one of the inserted cards has triggered a last card session not correctly closed event; 0 (FALSE): None of the inserted cards has triggered a last card session not correctly closed event.	tp15638LastSessionClosed BOOLEAN
RTM11 **Power Supply Interruption**	The VU shall generate an integer value for data element RTM11. The VU shall assign a value for the tp15638PowerSupplyInterruption variable equal to the number of the recorded power supply interruption events stored in the VU within last 10 days as defined in Annex IC. If no power supply interruption event has been recorded in the VU within the last 10 days, it shall set the value of RTM11 to 0.	Number of the recorded power supply interruption events within the last 10 days.	tp15638PowerSupplyInterruption INTEGER (0..127),
RTM12 **Sensor Fault**	The VU shall generate an integer value for data element RTM12. The VU shall assign to the variable sensorFault a value of: — 1 if an event of type '35'H Sensor fault ended during the last 10 days or is still ongoing. — 2 if an event of type GNSS receiver fault (either internal or external with enum values '36'H or	–sensor fault one octet as per data dictionary	tp15638SensorFault INTEGER (0..255),

	'37'H) ended during the last 10 days or is still ongoing. — 3 if an event of type '0E'H Communication error with the external GNSS facility event ended during the last 10 days or is still ongoing. — 4 If both Sensor Fault and GNSS receiver faults ended during the last 10 days or are still ongoing. — 5 If both Sensor Fault and Communication error with the external GNSS facility event ended during the last 10 days or are still ongoing. — 6 If both GNSS receiver fault and Communication error with the external GNSS facility event ended during the last 10 days or are still ongoing. — 7 If all three sensor faults ended during the last 10 days or are still ongoing. If no event have ended during the last 10 days or is still ongoing, the VU shall set the value of RTM12 to 0.		
RTM13 **Time Adjustment**	The VU shall generate an integer value (timeReal from Appendix 1) for data element RTM13 on the basis of the presence of Time Adjustment data as defined in Annex IC. The VU shall set the value of RTM13 to the time at which the last time adjustment data event has occurred. If no time adjustment event as defined in Annex IC is present in the VU data, it shall set the value of RTM13 to 0.	oldTimeValue of the most recent time adjustment.	tp15638TimeAdjustment INTEGER(0..4294967295),
RTM14 **Security Breach Attempt**	The VU shall generate an integer value (timeReal from Appendix 1) for data element RTM14 on the basis of the presence of a security breach attempt event as defined in Annex IC.	Beginning time of the latest stored security breach attempt event.	tp15638LatestBreachAttempt INTEGER(0..4294967295),

	The VU shall set the value of the time of the latest security breach attempt event recorded by the VU. If no security breach attempt event as defined in Annex IC is present in the VU data, it shall set the value of RTM14 to 0.		
RTM15 **Last Calibration**	The VU shall generate an integer value (timeReal from Appendix 1) for data element RTM15 on the basis of the presence of Last Calibration data as defined in Annex IC and Appendix 1. The VU shall set the value of RTM15 to the oldTimeValue of the latest calibration record. If there has been no calibration, the VU shall set the value of RTM15 to 0.	oldTimeValue of the most recent calibration record.	tp15638LastCalibrationData INTEGER(0..4294967295),
RTM16 **Previous Calibration**	The VU shall generate an integer value (timeReal from Appendix 1) for data element RTM16 on the basis of the calibration record preceding the last calibration. The VU shall set the value of RTM16 to the oldTimeValue of the calibration record preceding the last calibration. If there has been no previous calibration, the VU shall set the value of RTM16 to 0.	oldTimeValue of the calibration record preceding the most recent calibration record.	tp15638PrevCalibrationData INTEGER(0..4294967295),
RTM17 **Date Tachograph Connected**	The VU shall generate an integer value (timeReal from Appendix 1) for data element RTM17. The VU shall set the value of RTM17 to the date of first calibration of the VU in the current vehicle. The VU shall extract this data from the VuCalibrationData (Appendix 1) from the vuCalibrationRecords with CalibrationPurpose equal to: '03'H	Date of first calibration of the VU in the current vehicle.	tp15638DateTachoConnected INTEGER(0..4294967295),

	If there has been no previous calibration, the VU shall set the value of RTM17 to 0.		
RTM18 **Current Speed**	The VU shall generate an integer value for data element RTM18. The VU shall set the value of RTM18 to the last current recorded speed at the time of the latest update of the RtmData.	Last current recorded speed	tp15638CurrentSpeed INTEGER (0..255),
RTM19 **Timestamp**	The VU shall generate an integer value for data element RTM19 (timeReal from Appendix 1). The VU shall set the value of RTM19 to the time of the latest update of the RtmData.	Timestamp of current TachographPayload record	tp15638Timestamp INTEGER(0..4294967295),
RTM20 **Time at which the latest authenticated vehicle position was available**	The VU shall generate an integer value (timeReal from Appendix 1) for data element RTM20. The VU shall set the value of RTM20 to the time at which the latest authenticated vehicle position was available from the GNSS receiver. If no authenticated vehicle position was available ever from the GNSS receiver the VU shall set the value of RTM20 to 0.	Timestamp of the latest authenticated vehicle position	tp15638LatestAuthenticatedPosition INTEGER(0..4294967295),
RTM21 **Continuous driving time**	The VU shall generate an integer value for data element RTM21. The VU shall set the value of RTM21 to the ongoing continuous driving time of the driver.	Continuous driving time of the driver, encoded as an integer value. Length: 1 byte Resolution: 2 minutes/bit No offset Data range: 0 to 250 A value of 250 shall indicate that the continuous driving time of the driver is equal or greater than 500 minutes. Values 251 to 254 are not used.	tp15638ContinuousDrivingTime INTEGER(0..255),

		Value 255 indicates that the information is not available.	
RTM22 **Longest daily driving time for the ongoing and previous RTM-shift, calculated in accordance with the Addendum to Appendix 14**	The VU shall generate an integer value for data element RTM22. The VU shall set the value of RTM22 to the longer of the two daily driving times of the driver, being either the ongoing or the previous RTM-shift.	Daily driving time of the driver, encoded as an integer value. Length: 1 byte Resolution: 4 minutes/bit No offset Data range: 0 to 250 A value of 250 shall indicate that the daily driving time of the driver is equal or greater than 1 000 minutes. Values 251 to 254 are not used. Value 255 indicates that the information is not available.	tp15638DailyDrivingTimeShift INTEGER(0..255),
RTM23 **Longest daily driving time within the ongoing week, calculated in accordance with the Addendum to Appendix 14**	The VU shall generate an integer value for data element RTM23. The VU shall set the value of RTM23 to the longest daily driving time of the driver, being either the ongoing RTM-shift or any completed RTM-shift having started or finished in the ongoing week.	Daily driving time of the driver, encoded as an integer value. Length: 1 byte Resolution: 4 minutes/bit No offset Data range: 0 to 250 A value of 250 shall indicate that the daily driving time of the driver is equal or greater than 1 000 minutes. Values 251 to 254 are not used. Value 255 indicates that the information is not available.	tp15638DailyDrivingTimeWeek INTEGER(0..255),
RTM24 **Weekly driving time, calculated in accordance with the Addendum to Appendix 14**	The VU shall generate an integer value for data element RTM24. The VU shall set the value of RTM24 to the weekly driving time of the driver.	Weekly driving time of the driver, encoded as an integer value. Length: 1 byte Resolution: 20 minutes/bit No offset Data range: 0 to 250	tp15638WeeklyDrivingTime INTEGER(0..255),

		A value of 250 shall indicate that the weekly driving time of the driver is equal or greater than 5 000 minutes. Values 251 to 254 are not used. Value 255 indicates that the information is not available.	
RTM25 **Fortnightly driving time, calculated in accordance with the Addendum to Appendix 14**	The VU shall generate an integer value for data element RTM25. The VU shall set the value of RTM25 to the fortnightly driving time of the driver.	Fortnightly driving time of the driver, encoded as an integer value. Length: 1 byte Resolution: 30 minutes/bit No offset Data range: 0 to 250 A value of 250 shall indicate that the fortnightly driving time of the driver is equal or greater than 7 500 minutes. Values 251 to 254 are not used. Value 255 indicates that the information is not available.	tp15638FortnightlyDrivingTime INTEGER(0..255),

Note: RTM22, RTM23, RTM24 and RTM25 shall be computed according to the Addendum to this Appendix';

(iii) in point 5.4.7, Table 14.9 is replaced by the following:

'*Table 14.9*

Initialisation – VST frame contents example

Octet #	Attribute/Field	Bits in octet	Description
1	FLAG	0111 1110	Start flag
2	Private LID	xxxx xxxx	Link address of the specific DSRC-VU

3		xxxx xxxx	
4		xxxx xxxx	
5		xxxx xxxx	
6	MAC Control field	1100 0000	Command PDU
7	LLC Control field	0000 0011	UI command
8	Fragmentation header	1xxx x001	No fragmentation
9	VST SEQUENCE { Fill BIT STRING (SIZE(4))	1001	Initialisation response
		0000	Unused and set to 0
10	Profile INTEGER (0..127,...) Applications SEQUENCE OF {	0000 0000	No extension. Example profile 0 No extension, 1 application
11		0000 0001	
12	SEQUENCE { OPTION indicator OPTION indicator AID DSRCApplicationEntityID	1	EID present
		1	Parameter present
		00 0010	No extension. AID= 2 Freight&Fleet
13	EID Dsrc-EID	xxxx xxxx	Defined within the OBU and identifying the application instance.
14	Parameter Container {	0000 0010	No extension, Container Choice = 02, Octet string
15		0000 0110	No extension, Rtm Context Mark length = 6
16	Rtm-ContextMark ::= SEQUENCE { StandardIdentifier	0000 0101	First octet is 05H, which is its length. Subsequent 5 octets encode the Object Identifier of the supported standard, part and version. {ISO (1) Standard (0) TARV (15638) part9(9) Version2 (2)}
17	standardIdentifier	0010 1000	
18		1111 1010	
19		0001 0110	
20		0000 1001	
21		0000 0010	
22	ObeConfiguration Sequence { OPTION indicator	0	ObeStatus not present
	EquipmentClass INTEGER (0..32767)	xxx xxxx	This field shall be used to carry
23		xxxx xxxx	manufacturer's indications about the software/hardware version of the DSRC interface
24	ManufacturerId INTEGER (0..65535)	xxxx xxxx	Manufacturer identifier for the DSRC-VU as described in ISO 14816 Register
25		xxxx xxxx	
26	FCS	xxxx xxxx	Frame check sequence
27		xxxx xxxx	
28	Flag	0111 1110	End Flag

';

(iv) the following point 5.5 is inserted:

'5.5 Reserved for future use';

(v) in point 5.7, paragraphs DSC_77 and DSC_78 are replaced by the following:

'DSC_77	*The Data* shall be provided, already secured, by the *VUSM* function to the *DSRC-VU*. The *VUSM* shall verify that data recorded in the *DSRC-VU* has been transmitted successfully to the DSRC-VU. The recording and reporting of any errors in the transfer of data from the *VU* to the memory of the *DSRC-VU* shall be recorded with type EventFaultType and enum value set to '0C'H Communication error with the remote communication facility event together with the timestamp. The *VUSM* shall verify that the data has been transmitted successfully to the DSRC-VU.
DSC_78	Reserved for future use.';

(d) the following addendum is added:

'Addendum

Rules for the computation of daily, weekly and fortnightly driving time

1. Basic computation rules

The VU shall compute the daily driving time, the weekly driving time and the fortnightly driving time using relevant data stored in a driver (or workshop) card inserted in the driver slot (slot 1, card reader #1) of the Vehicle Unit, and selected driver's activities while this card is inserted in the VU.

The driving times shall not be calculated while no driver (or workshop) card is inserted.

UNKNOWN period(s) found during the time period needed for computations shall be assimilated to BREAK/REST .

UNKNOWN periods and activities of negative duration (i.e. start of the activity occurs later than the end of the activity) due to time overlaps between two different VUs or due to time adjustment, are not taken into account.

Activities recorded in the driver card corresponding to 'OUT OF SCOPE' periods in accordance with definition (gg) of Annex IC, shall be interpreted as follows:

— BREAK/REST shall be computed as 'BREAK' or 'REST'

— WORK and DRIVING shall be considered as 'WORK'

— AVAILABILITY shall be considered as 'AVAILABILITY'

In the context of this Addendum, the VU shall assume to have a daily rest period at the beginning of the card activities records.

2. Concepts

The following concepts apply exclusively to this appendix, and are intended to specify the computation of driving times by the VU and its later transmission by the remote communication facility.

(a) 'RTM-shift' is the period between the end of a daily rest period and the end of the directly following daily rest period.

The VU shall start a new RTM-shift after a daily rest period has finished.

The ongoing RTM-shift is the period since the end of last daily rest period;

(b) 'accumulated driving time' is the sum of the duration of all DRIVING activities of the driver within a period while not in OUT OF SCOPE;

(c) 'daily driving time' is the accumulated driving time within a RTM-shift;

(d) 'weekly driving time' is the accumulated driving time for the ongoing week;

(e) 'continuous rest period' is any uninterrupted period of BREAK/REST;

(f) 'fortnightly driving time' is the accumulated driving time for the previous and the ongoing week;

(g) 'daily rest period' is a period of BREAK/REST, which can be either

— a regular daily rest period,

— a split daily rest period or

— a reduced daily rest period

In the context of Appendix 14, when a VU is computing weekly rest periods, those weekly rest periods shall be considered as daily rest periods;

(h) 'regular daily rest period' is a continuous rest period of at least 11 hours.

As a matter of exception, when a FERRY/TRAIN CROSSING condition is active the regular daily rest period may be interrupted a maximum of two times by activities other than rest, with a maximal accumulated duration of one hour, i.e. the regular daily rest period containing ferry/train crossing period(s) may be split into two or three parts. The VU shall then compute a regular daily rest period when the accumulated rest time computed according to point 3 is at least 11 hours.

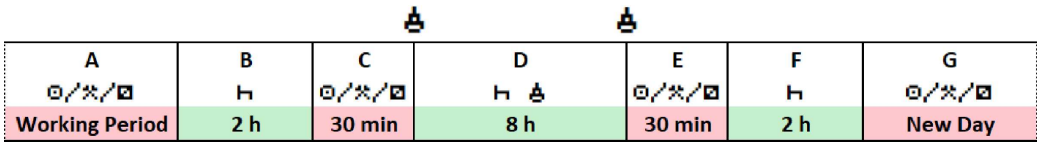
When a regular daily rest period has been interrupted the VU:

— shall not incorporate the driving activity encountered during those interruptions to the computation of the daily driving time, and

— shall start a new RTM-shift at the end of the regular daily rest period that has been interrupted.

Figure 1.

Example of daily rest period interrupted due to ferry/train crossing



(i) 'reduced daily rest period' is a continuous rest period of at least 9 hours and less than 11 hours;

(j) 'split daily rest period' is a daily rest period taken in two parts:

— the first part shall be a continuous rest period of at least 3 hours and less than 9,

— the second part shall be a continuous rest period of at least 9 hours.

As a matter of exception, when a FERRY/TRAIN CROSSING condition is active during one or both of the parts of a split daily rest period, the split daily rest period may be interrupted a maximum of two times by other activities with the accumulated duration of maximal one hour, i.e.:

— the first part of the split daily rest period may be interrupted one or two times, or

— the second part of the split daily rest period may be interrupted one or two times, or

— the first part of the split daily rest period may be interrupted one time and the second part of the split daily rest period may be interrupted one time.

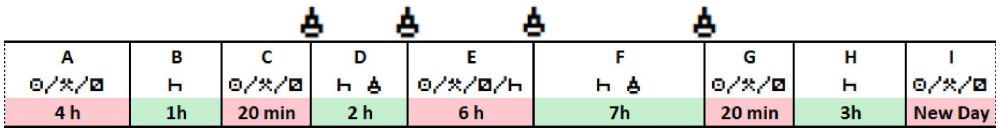
The VU shall then compute a split daily rest period when the accumulated rest time computed according to point 3 is:

— at least three hours and less than 11 hours for the first rest period and at least 9 hours for the second rest period, when the first rest period has been interrupted by FERRY/TRAIN CROSSING.

— at least three hours and less than 9 hours for the first rest period and at least 9 hours for the second rest period, when the first rest period has not been interrupted by FERRY/TRAIN CROSSING.

Figure 2.

Example of split daily rest period interrupted due to ferry/train crossing



When the split daily rest period is interrupted, the VU:

— shall not incorporate the driving activity encountered during those interruptions to the computation of the daily driving time, and

— shall start a new RTM-shift at the end of the split daily rest period that has been interrupted;

(k) 'week' is the period in UTC time between 00:00 hours on Monday and 24:00 hours on Sunday;

3. Computation of the rest period when it has been interrupted due to ferry/train crossing

For the computation of the rest period when it has been interrupted due to ferry/train crossing, the VU shall calculate the accumulated rest time according to the following steps:

a) Step 1

The VU shall detect interruptions to the rest time occurring before the activation of the FERRY/TRAIN CROSSING (BEGIN) flag, according to figure 3 and in its case figure 4, and shall evaluate for each interruption detected if the following conditions are met:

— the interruption makes the total duration of the interruptions detected, including in its case interruptions occurring during the first part of a split daily rest period due to ferry/train crossing, to exceed more than one hour in total,

— the interruption makes the total number of interruptions detected, including in its case interruptions occurring during the first part of a split daily rest period due to ferry/train crossing, to be bigger than two,

— there is an 'Entry of place where daily work periods end' stored after the interruption ended.

If none of the above conditions are met, the continuous rest period immediately preceding the interruption shall be added to the accumulated rest time.

If at least one of the above conditions is met, the VU shall either stop the computation of the accumulated rest time according to step 2 or detect interruptions to the rest time occurring after the FERRY/TRAIN CROSSING (BEGIN) flag according to step 3.

b) Step 2

For each interruption detected according to step 1, the VU shall evaluate whether the computation of the accumulated rest time should stop. The VU shall stop the computation process when two continuous rest periods occurring before the activation of the FERRY/TRAIN CROSSING (BEGIN) flag have been added to the accumulated rest time, including in its case rest periods added in the first part of a split daily rest period also interrupted by ferry/train crossing. Otherwise, the VU shall proceed according to step 3.

c) Step 3

If after performance of step 2 the VU continues the computation of the accumulated rest time, the VU shall detect interruptions occurring after the deactivation of the FERRY/TRAIN CROSSING condition according to figure 3 and in its case figure 4.

For each interruption found, the VU shall evaluate if the interruption makes the accumulated time of all the interruptions detected to exceed more than one hour in total, in which case the computation of the accumulated rest period shall finish at the end of the continuous rest period previous to the interruption. Otherwise, the continuous rest periods occurring after the respective interruptions shall be added to the computation of the daily rest period until the condition in step 4 is fulfilled.

d) Step 4

The computation of the accumulated rest time shall stop when the VU has added, as result of steps 1 and 3, a maximum of two continuous rest periods to the rest period for which the FERRY/TRAIN CROSSING condition is activated, including in its case interruptions occurring during the first part of a split daily rest period due to ferry/train crossing.

Figure 3.

Processing of rest times by the VU in order to determine whether an interrupted rest period shall compute as regular daily rest period or as the first part of a split daily rest period

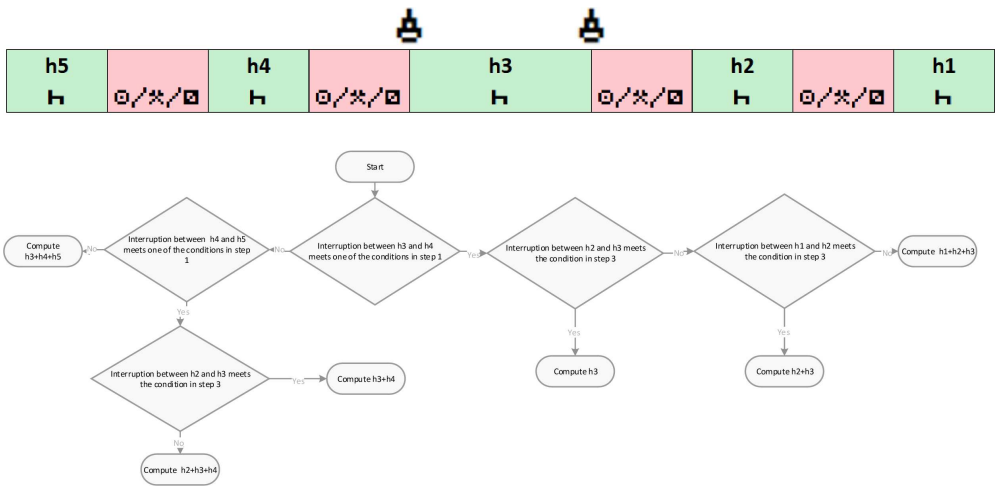


Figure 4.

Processing of rest times by the VU in order to determine whether an interrupted rest period shall compute as the second part of a split daily rest period

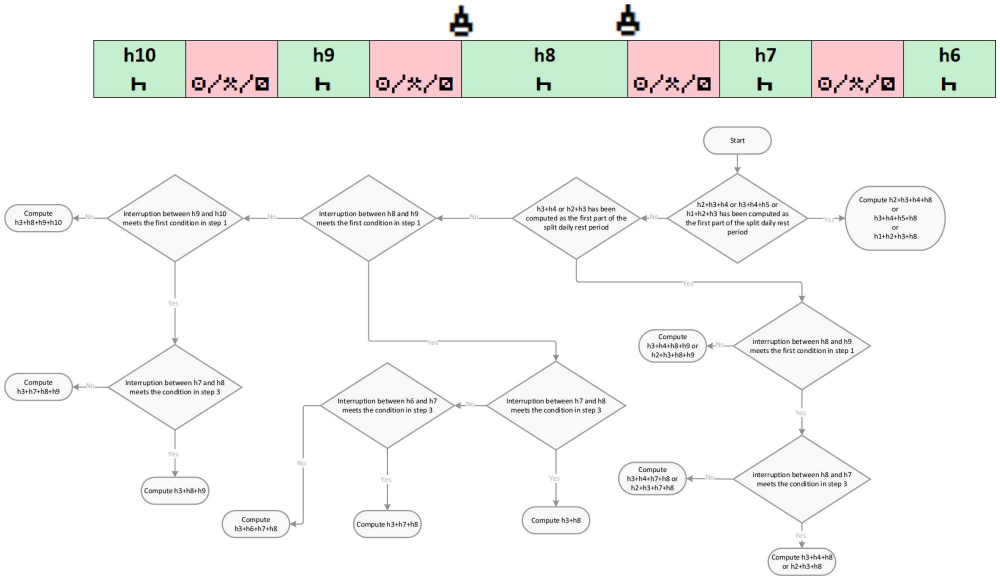


Figure 5.

Example of a daily rest period interrupted more than twice causing rest period H not to be included in the computation

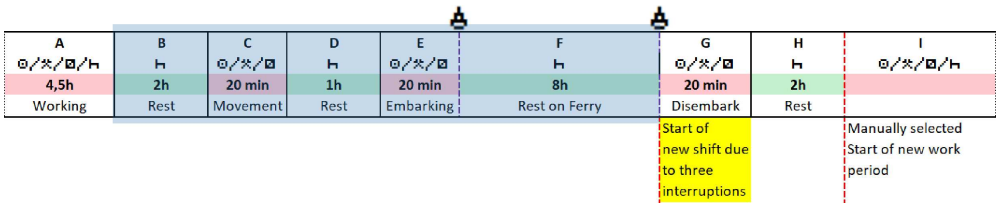


Figure 6.

Example of a daily rest period where Ferry/Train Calculation period is commenced at end of work period

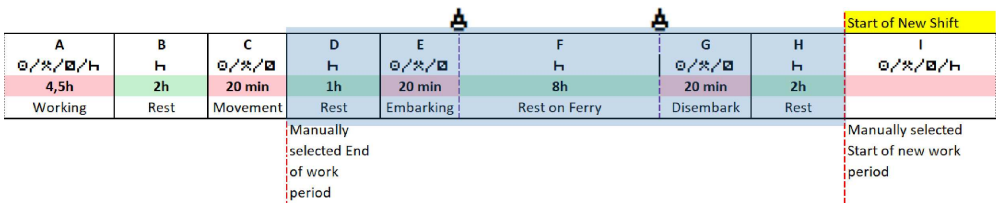
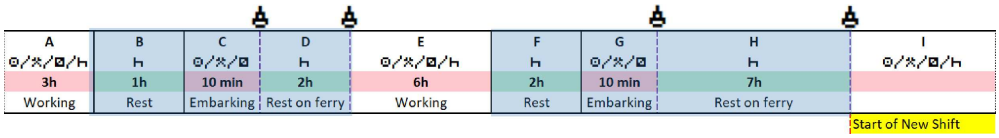


Figure 7.

Example of a daily rest period interrupted more than twice causing rest period B not to be included in the computation

Figure 8.

Example of a split daily rest period interrupted once during the first rest period and once during 2nd rest period



4. Computation of daily, weekly and fortnightly- driving times

The VU shall compute the daily driving time(s) for the ongoing and previous RTM-shifts. The driving time occurring during the interruptions of the daily rest periods shall not be added to the computation of the daily driving time, when such interruptions are due to ferry/train crossing and the requirements provided for in paragraphs (h) and (j) of point 2 and in point 3 have been fulfilled. Nevertheless, insofar as a complete regular or split daily rest period has not been computed by the VU according to point 3, the driving times occurring during the interruptions shall be added to the daily driving time for the ongoing RTM-shift.

The VU shall also compute the weekly and the fortnightly driving times. The driving time occurring during the interruptions of the daily rest periods due to ferry/train crossing shall be added to the computation of the weekly and the fortnightly driving times.';

(40) Appendix 15 is amended as follows:

(a) the header is replaced by the following:

'*Appendix 15*

MIGRATION: MANAGING THE CO-EXISTENCE OF EQUIPMENT GENERATIONS AND VERSIONS;'.

(b) the Table of Content is amended as follows:

(i) point 2.2 is replaced by the following:

'2.2. Interoperability between VU and cards';

(ii) the following point 5 is added:

'5. RECORDING OF BORDER CROSSINGS IN FIRST GENERATION AND FIRST VERSION OF SECOND GENERATION TACHOGRAPHS';

(c) points 2 to 4 are replaced by the following:

'2. GENERAL PROVISIONS

2.1. **Overview of the transition**

The introduction of this Annex provides an overview of the transition between the first and the second generation tachograph systems, and of the introduction of the second version of second generation recording equipment and tachograph cards.

In addition to the provisions of this introduction, the following information can be reminded:

— first generation motion sensors are not interoperable with any version of second generation vehicle units,

— only second generation motion sensors can be installed in vehicles equipped with any version of second generation vehicle units,

— data download and calibration equipment need to support use of both generations or versions of recording equipment and tachograph cards.

2.2. **Interoperability between VU and cards**

It is understood that first generation tachograph cards are interoperable with first generation vehicle units (in compliance with Annex IB of Regulation (EEC) No 3821/85), any version of second generation tachograph cards are interoperable with any version of second generation vehicle units (in compliance with Annex IC of this Regulation). In addition, the requirements below shall apply.

MIG_001	Except as provided for in requirement MIG_004 and MIG_005, first generation tachograph cards may continue to be used in any version of second generation vehicle units until their end of validity date. Their holders may however ask for their replacement by second generation tachograph cards as soon as they are available.
MIG_002	Any version of second generation vehicle units shall be able to use any valid first generation driver, control and company card inserted.
MIG_003	This capability may be suppressed once and forever in such vehicle units by workshops, so that first generation tachograph cards cannot be accepted anymore. This may only be done after the European Commission has launched a procedure aiming to request workshops to do so, for example during each periodic inspection of tachograph.
MIG_004	Second generation vehicle units shall only be able to use second generation workshop cards.
MIG_005	For determining the mode of operation, any version of second generation vehicle units shall only consider the types of the valid cards inserted, regardless of their generations or versions.
MIG_006	Any version of valid second generation tachograph card shall be able to be used in first generation vehicle units exactly the same manner as a first generation tachograph card of the same type.

2.3. **Interoperability between VU and MS**

It is understood that first generation motion sensors are interoperable with first generation vehicle units, while second generation motion sensors are interoperable with any version of second generation vehicle units. In addition, the requirements below shall apply.

MIG_007	Any version of second generation vehicle units shall not be able to be paired and used with first generation motion sensors.
MIG_008	Second generation motion sensors may be paired and used with second generation vehicle units only, whichever the version, or with both generations of vehicle units.

2.4. **Interoperability between vehicle units, tachograph cards and equipment for data download**

MIG_009	Equipment for data download may be compatible with all generations and versions of vehicle units and tachograph cards.

2.4.1 Direct card download by IDE

MIG_010	Data shall be downloaded by IDE from tachograph cards of one generation inserted in their card readers, using the security mechanisms and the data download protocol of this generation, and downloaded data shall have the format defined for this generation and version.

MIG_011 To allow drivers' control by non EU control authorities, it shall also be possible to download second generation driver (and workshop) cards, whichever the version, in exactly the same manner as first generation drivers (and workshop) cards. Such download shall include:

— non signed EFs IC and ICC (optional),

— non signed EFs (first generation) Card_Certificate and CA_Certificate,

— the other application data EFs (within DF Tachograph) requested by the first generation card download protocol. This information shall be secured with a digital signature, according to the first generation security mechanisms.

Such download shall not include application data EFs only present in version 1 or version 2 second generation driver (and workshop) cards (application data EFs within DF Tachograph_G2).

2.4.2 Card download through a vehicle unit

MIG_012 Data shall be downloaded from any version of second generation card, inserted in a first generation vehicle unit using the first generation data download protocol. The card shall answer to the vehicle unit commands exactly the same manner as a first generation card and downloaded data shall have the same format as data downloaded from a first generation card.

MIG_013 Data shall be downloaded from a first generation card inserted in any version of second generation vehicle unit using the data download protocol defined in Appendix 7 of this Annex. The vehicle unit shall send commands to the card exactly the same manner as a first generation vehicle unit, and downloaded data shall respect the format defined for first generation cards.

2.4.3 Vehicle unit download

MIG_014 Outside of the frame of drivers' control by non EU control authorities, data shall be downloaded from second generation vehicle units using the second generation security mechanisms, and the data download protocol specified in Appendix 7 of this Annex for the relevant version.

MIG_015 To allow drivers' control by non EU control authorities, it may optionally also be possible to download data from any version of second generation vehicle units using the first generation security mechanisms. Downloaded data shall then have the same format as data downloaded from a first generation vehicle unit. This capability may be selected through commands in the menu.

2.5. **Interoperability between VU and calibration equipment**

MIG_016 Calibration equipment shall be able to perform calibration of each generation or version of tachograph, using the calibration protocol of this generation or version. Calibration equipment may be compatible with all generations and versions of vehicle units.

3. MAIN STEPS DURING THE PERIOD BEFORE THE INTRODUCTION DATE

MIG_017 Test keys and certificates shall be available to manufacturers at the publication date of this Annex.

MIG_018 Interoperability tests shall be ready to start with version 2 of vehicle units and version 2 of tachograph cards if requested by manufacturers at the latest **15 months** before the introduction date.

MIG_019	For version 2 of generation 2 tachographs, tachograph cards and motion sensors, the same keys and certificates are used as for generation 2 version 1 equipment.
MIG_020	Member States shall be able to issue version 2 of second generation workshop cards at the latest **1 month** before the introduction date.
MIG_021	Member States shall be able to issue all other types of version 2 of second generation tachograph cards at the latest **1 month** before the introduction date.

4. PROVISIONS FOR THE PERIOD AFTER THE INTRODUCTION DATE

MIG_022	With effect from the introduction date, Member States shall only issue version 2 of second generation tachograph cards.
MIG_023	Vehicle units / motion sensors manufacturers shall be allowed to produce first generation vehicle units / motion sensors as long as they are used in the field, so that malfunctioning components can be replaced.
MIG_023a	With effect from the introduction date, malfunctioning version 1 of second generation vehicle units or external GNSS facilities shall be replaced with version 2 of second generation vehicle units or external GNSS facilities.
MIG_024	Vehicle units / motion sensors manufacturers shall be allowed to request and obtain type approval maintenance of first generation vehicle units / motion sensors types or version 1 of second generation vehicle units already type approved.’;

(d) the following point 5 is added:

‘5. RECORDING OF BORDER CROSSINGS IN FIRST GENERATION AND FIRST VERSION OF SECOND GENERATION TACHOGRAPHS

MIG_025	The symbol of the country and, if applicable, the region that the driver enters after crossing a border of a Member State in application of Article 34(7) of Regulation (EU) No 165/2014, shall be entered as a place where the daily work period begins in accordance with the manual entry of places set out in requirements 60 of Annex IC to Regulation (EU) No 165/2014 and 50 of Annex IB to Regulation (EEC) No 3821/85.’;

(41) in appendix 16, paragraph ADA_012 is replaced by the following:

‘ADA_012	The adaptor input interface shall be able, if applicable, to multiply or divide the frequency pulses of the incoming speed pulses by a fixed factor, to adapt the signal to the k factor range defined by this Annex (2 400 to 25 000 pulses/km). This fixed factor may only be programmed by the adaptor manufacturer, and the approved workshop performing the adaptor installation.’