Technical Standard for Electronic Logging Devices

Version 1.1

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Revision History

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1.0	November 14, 2019	Amendments to original document
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Technical Standard for Electronic Logging Devices

1 SCOPE AND DESCRIPTION

This Standard specifies the minimal requirements for an electronic logging device (ELD) necessary for an ELD provider to build a technology compliant with this Standard.

1.1 ELD Function

The ELD discussed in this Standard is an electronic module capable of recording the electronic records of duty status (RODS) for CMV drivers using the unit in a driving environment within a commercial motor vehicle (CMV) and meets the compliance requirements in this Standard.

1.2 System Users

Users of ELDs are:
a) CMV drivers; and
b) Support personnel who have been authorized by the motor carrier to:
(1) Create, remove, and manage user accounts;
(2) Configure allowed ELD parameters; and
(3) Access, review, and manage drivers' ELD RODS on behalf of the motor carrier.

1.3 System Architecture

An ELD may be implemented as a stand-alone technology or within another electronic module. It may be installed in a CMV or may be implemented on a handheld unit that may be moved from vehicle to vehicle. It may also incorporate a software application interface that can be used by the drivers and the support personnel. It may also allow data interchange with other software applications implemented by the motor carrier. The functional requirements are the same for all types of system architecture that may be used in implementing the ELD functionality.

1.4 System Design

a) An ELD is integrally synchronized with the engine of the CMV such that driving time can be automatically recorded for the driver driving the CMV and using the ELD.
b) An ELD allows for manual inputs from the driver and the motor carrier support personnel and automatically records date and time, vehicle position, and vehicle operational parameters.
c) An ELD records a driver's electronic RODS and other supporting events (as defined in provision 3.1.2 of this Standard) with the required data elements specified in this Standard and retain data to support the performance requirements specified in this Standard.
d) An ELD generates a standard ELD output file and transfers it to an authorized safety official upon request.
e) This Standard specifies minimally required data elements that must be part of an event record such that a standard ELD output file can be produced by all compliant ELDs.

2. ABBREVIATIONS

ASCII	American Standard Code for Information Interchange
CAN	Control Area Network
CCMTA	Canadian Council of Motor Transport Administrators
CMV	Commercial Motor Vehicle
CMVSS	Canadian Motor Vehicle Safety Standards
ECM	Electronic Control Module
ELD	Electronic Logging Device
HOS	Hours of Service
S/MIME	Secure/Multipurpose Internet Mail Extensions
RODS	Records of Duty Status
SMTP	Simple Mail Transfer Protocol
UCT	Coordinated Universal Time
USB	Universal Serial Bus
VIN	Vehicle Identification Number
XOR	Exclusive Or {bitwise binary operation}

3. DEFINITIONS AND NOTATIONS

3.1 Definitions

3.1.1 Databus

A vehicle databus refers to an internal communications network that interconnects components inside a vehicle and facilitates exchange of data between subsystems typically using serial or CAN protocols.

3.1.2 ELD Event

An ELD event refers to a distinct instance in time when the ELD records data with the data elements specified in this Standard. The distinct ELD events relate to the driver's duty status and ELD's operational integrity. They are either triggered by input from the driver (driver's duty status changes, driver's login/logout activity, etc.) or triggered by the ELD's internal monitoring functions (ELD malfunction detection, data diagnostics detection, intermediate logs, etc.). ELD events and required data elements for each type of ELD event are described in detail in provision 4.5.1 of this Standard.

3.1.3 Exempt Driver

As specified in further detail in provision 4.3.3.1.2 of this Standard, an ELD must allow a motor carrier to configure an ELD for a driver who may be exempt from the use of the ELD. An example of an exempt driver would be a driver driving under the short-haul exemption under current HOS regulations (within a radius of 160 km of the home terminal). Even though exempt drivers do not have to use an ELD, in operations when an ELD equipped CMV may be shared between exempt and non-exempt drivers, motor carriers can use this allowed configuration to avoid issues with unidentified driver data diagnostics errors.

3.1.4　Geo-Location

Geo-location is the conversion of a position measurement in latitude/longitude coordinates into a description of the distance and direction to the name of the nearest city, town, village, municipality or the location on a highway or in a legal subdivision. Geo-location information is used on an ELD's display or printout.

3.1.5　Ignition Power Cycle, Ignition Power On Cycle, Ignition Power Off Cycle

a) An ignition power cycle refers to the engine's power status changing from "on to off" or "off to on", typically with the driver controlling engine power status by switching the ignition key positions.

b) An ignition power on cycle refers to the engine power sequence changing from "off to on and then off". This refers to a continuous period when a CMV's engine is powered.

c) An ignition power off cycle refers to the engine power sequence changing from "on to off and then on". This refers to a continuous period when a CMV's engine is not powered.

3.1.6　Unidentified Driver

"Unidentified Driver" refers to the driving of a CMV featuring an ELD without an authenticated driver in the ELD. Functional specifications in this Standard require an ELD to automatically record driving time under such conditions and attribute such records to the unique "Unidentified Driver account," as specified in provision 4.1.5 of this Standard, until the motor carrier and the driver review the records and they are assigned to the true and correct owner.

3.1.7　Day

"Day" in respect of a RODS refers to the definition found in the current HOS regulations.

3.1.8　Work shift

The "Work shift" refers to the elapsed time period described in provision 13(3) of the current HOS regulations.

3.2 Notations

Throughout this Standard the following notations are used when data elements are referenced.

a) < . > indicates a parameter an ELD must track. For example, <ELD username> refers to the unique ELD username or identifier specified during the creation of an ELD account with the requirements set forth in provision 7.18 of this Standard.

b) { . } indicates which of multiple values of a parameter is being referenced. For example, <ELD username {for the co-driver}> refers specifically to the ELD username for the co-driver.

c) <CR> indicates a carriage return or new line or end of the current line. This notation is used in provision 4.8.2.1 of this Standard, which describes the standard ELD output data file.

4. FUNCTIONAL REQUIREMENTS

4.1 ELD User Accounts

4.1.1 Account Types

An ELD must support a user account structure that separates drivers and motor carrier's support personnel (i.e. non-drivers).

4.1.2 Account creation

a) Each user of the ELD must have a valid active account on the ELD with a unique identifier assigned by the motor carrier.
b) Each driver account must require the entry of the driver's license number and the jurisdiction that issued the driver's license into the ELD during the account creation process. The driver account must securely store this information on the ELD.
c) An ELD must not allow creation of more than one driver account associated with a driver's license for a given motor carrier.
d) A driver account must not have administrative rights to create new accounts on the ELD.
e) A support personnel account must not allow recording of ELD data for its account holder.
f) An ELD must reserve a unique driver account for recording events during non-authenticated driving of a CMV. This Standard will refer to this account as the "unidentified driver account."

4.1.3 Account Security

a) An ELD must provide secure access to data recorded and stored in the ELD by requiring user authentication.
b) Driver accounts must only have access to data associated with that driver, protecting the authenticity and confidentiality of the collected information.

4.1.4 Account Management

a) An ELD must be capable of separately recording and retaining ELD data for each individual driver using the ELD.
b) An ELD must provide for and require concurrent authentication for team drivers.
c) If more than one ELD unit is used to record a driver's electronic RODS within a motor carrier's operation, the ELD the driver is using most recently must be able to retrieve, retain and produce a complete ELD RODS for that driver, on demand, for the current day and each day during the required previous days as per current HOS regulations. For purposes of ELD compliance to this provision, there is no requirement for interoperability between ELD providers.

4.1.5   Non-Authenticated Driving of a CMV

a) An ELD must associate all non-authenticated driving of a CMV with a single ELD account labeled unidentified driver.

b) If a driver has not authenticated into the ELD, as soon as the vehicle is in motion, the ELD must:

   (1)   Provide a visual or visual and audible warning reminding the driver to stop and authenticate into the ELD;

   (2)   Record accumulated driving and on-duty, not-driving, time in accordance with the ELD defaults described in provision 4.4.1 of this Standard under the unidentified driver profile; and

   (3)   Not allow entry of any information into the ELD other than a response to the driver authentication prompt.

4.2 ELD-Vehicle Interface

a) An ELD must be integrally synchronized with the engine of the CMV. Engine synchronization for purposes of ELD compliance means the monitoring of the vehicle's engine activity to automatically record the engine's power status, vehicle's motion status, total distance driven value, and engine hours value when the CMV's engine is powered.

b) If the CMV has an engine ECM, the ELD must establish a link to the engine ECM when the CMV's engine is powered and receive automatically the engine's power status, vehicle's motion status, total distance driven value and engine hours value through the serial or CAN communication protocols supported by the vehicle's engine ECM. If the CMV does not have an ECM or any required data element cannot be captured from the engine ECM, an ELD must use alternative sources to obtain or estimate these vehicle parameters with the listed accuracy requirements under provision 4.3.1 of this Standard.

4.3 ELD Inputs

4.3.1   ELD Sensing

4.3.1.1 Engine Power Status

An ELD must be powered and become fully functional within 1 minute of the vehicle's engine receiving power and must remain powered for as long as the vehicle's engine stays powered.

4.3.1.2 Vehicle Motion Status

a) An ELD must automatically determine whether a CMV is in motion or stopped by comparing the vehicle speed information with respect to a set speed threshold as follows:

   (1) Once the vehicle speed exceeds the set speed threshold, it must be considered in motion.

   (2) Once in motion, the vehicle must be considered in motion until its speed falls to 0 km/h and stays at 0 km/h for 3 consecutive seconds. Then, the vehicle will be considered stopped.

   (3) An ELD's set speed threshold for determination of the in-motion state for the purpose of this provision must not be configurable to greater than 8 km/h.

b) If an ELD is required to have a link to the vehicle's engine ECM, vehicle speed information must be acquired from the engine ECM. Otherwise, vehicle speed information must be acquired using an independent source apart from the positioning services described under provision 4.3.1.6 of this Standard and must be accurate within ±5 km/h of the CMV's true ground speed for purposes of determining the in-motion state for the CMV.

4.3.1.3 Vehicle Distance

a) An ELD must monitor vehicle distance as accumulated by a CMV over the course of an ignition power on cycle (accumulated vehicle distance) and over the course of CMV's activity (total vehicle distance). Vehicle distance information must use or must be converted to units of whole kilometers.

b) If the ELD is required to have a link to the vehicle's engine ECM as specified in provision 4.2 of this Standard:

   (1) The ELD must monitor the engine ECM's odometer message broadcast and use it to record total vehicle distance information; and

   (2) The ELD must use the odometer message to determine accumulated vehicle distance since engine's last power on instance.

c) If the ELD is not required to have a link to the vehicle's engine ECM as specified in provision 4.2 of this Standard, the accumulated vehicle distance indication must be obtained or estimated from a source that is accurate to within ±10% of distance accumulated by the CMV over a day as indicated on the vehicle's odometer display.

d) An ELD must monitor the cumulative distance driven for personal use throughout the day.

e) Accumulated vehicle distance must exclude the distance driven in respect of the driver's personal use of the vehicle.

f) The ELD must automatically record the Total Vehicle Distance value for the beginning and end of each day. As specified in provision 4.8.1.3 of this Standard, such value must be reported as the ''End Odometer'' of the current day, and the ''Start Odometer'' of the next day.

4.3.1.4 Engine Hours

a) An ELD must monitor engine hours of the CMV over the course of an ignition power on cycle (elapsed engine hours) and over the course of the total engine hours of the CMV's activity (total engine hours). Engine hours must use or must be converted to hours in intervals of a tenth of an hour.

b) If an ELD is required to have a link to the vehicle's engine ECM, the ELD must monitor the engine ECM's total engine hours message broadcast and use it to record elapsed and total engine hours information. Otherwise, engine hours must be obtained or estimated from a source that monitors the ignition power of the CMV and must be accurate within ±0.1 hour of the engine's total activity within a given ignition power on cycle.

4.3.1.5 Date and Time

a) The ELD must obtain and record the date and time information automatically without allowing any external input or interference from a motor carrier, driver, or any other person.

b) The ELD time must be synchronized to UCT and the absolute deviation from UCT must not exceed 10 minutes at any point in time.

4.3.1.6 CMV Position

a) An ELD must determine automatically the position of the CMV in standard latitude/longitude coordinates with the accuracy and availability requirements of this provision.

b) The ELD must obtain and record this information without allowing any external input or interference from a motor carrier, driver, or any other person.

c) CMV position measurement must be accurate to ±0.8 kilometer of absolute position of the CMV when an ELD measures a valid latitude/longitude coordinate value.

d) Position information must be obtained in or converted to standard signed latitude and longitude values and must be expressed as decimal degrees to hundreds of a degree precision (i.e., a decimal point and two decimal places).

e) Measurement accuracy combined with the reporting precision requirement implies that position reporting accuracy will be on the order of ±1.6 kilometer of absolute position of the CMV during the course of a CMV's commercial operation.

f) An ELD must be able to acquire a valid position measurement at least once every 8 kilometers of driving; however, the ELD records CMV location information only during ELD events as specified in provision 4.5.1 of this Standard.

4.3.1.7 CMV VIN

The vehicle identification number (VIN) for the power unit of a CMV must be automatically obtained from the engine ECM and recorded if it is available on the vehicle databus.

4.3.2 Driver's Manual Entries

a) An ELD must prompt the driver to input information into the ELD only when the CMV is stationery and driver's duty status is not on-duty driving, except for the condition specified in provision 4.4.1.2 of this Standard.

b) If the driver's duty status is driving, an ELD must only allow the driver who is driving the CMV to change the driver's duty status to another duty status.

c) A stopped vehicle must maintain zero (0) km/h speed to be considered stationary for purposes of information entry into an ELD.

d) An ELD must allow an authenticated co-driver who is not driving, but who has authenticated into the ELD prior to the vehicle being in motion, to make entries over his or her own RODS when the vehicle is in motion. The ELD must not allow co-drivers to switch driving roles when the vehicle is in motion.

4.3.2.1 Driver's Entry of Required Event Data Fields

a) An ELD must provide a means for a driver to enter information pertaining to the driver's ELD RODS manually, e.g., CMV power unit number, as specified in provision 7.4 of this Standard; and trailer number(s), as specified in provision 7.42.

b) If these fields are populated automatically, the ELD must provide means for the driver to review such information and make corrections as necessary.

4.3.2.2 Driver's Status Inputs

4.3.2.2.1 Driver's Indication of Duty Status

a) An ELD must provide a means for the authenticated driver to select a driver's duty status.

b) The ELD must use the ELD duty status categories listed in Table 1 of this Standard.

4.3.2.2.2   Driver's Indication of Situations Impacting Driving Time Recording

a) An ELD must provide the means for a driver to indicate the beginning and end of a period when the driver may use the CMV for authorized personal use or for performing yard moves. The ELD must acquire this status in a standard format from the category list in Table 2 of this Standard. This list must be supported independent of the duty status categories described in provision 4.3.2.2.1 of this Standard.

b) An ELD must allow a driver to select only categories that a motor carrier enables by configuration for that driver, as described in provision 4.3.3.1.1 of this Standard.

c) An ELD must only allow one category to be selected at any given time and use the latest selection by the driver.

d) The ELD must prompt the driver to enter an annotation upon selection of a category from Table 2 of this Standard and record the driver's entry.

e) If the ELD or CMV's engine goes through a power off cycle (ELD or CMV's engine turns off and then on) during a period when the driver has indicated the use of the CMV for authorized personal use or yard moves, the ELD must require confirmation of continuation of the condition by the driver. If not confirmed by the driver and the vehicle is in motion, the ELD must default to the category "none".

f) If the accumulated distance driven for personal use throughout the day exceeds the maximum distance allowed under current HOS regulations, the ELD must not allow the driver to indicate the beginning of a period for authorized personal use.

g) If the ELD is implemented on a handheld unit and has not establish a link to the engine ECM as described in provision 4.2 of this Standard, the ELD must not allow the driver to indicate the beginning or end of a period when the driver may use the CMV for authorized personal use or for performing yard moves.

4.3.2.2.3 Driver's Indication of Situations Impacting Off-Duty Time Requirements

a) An ELD must provide the means for a driver to indicate deferral of daily Off-duty time to the following day.

    (1) This function must be available only if the driver is not splitting off-duty time for the current day.

    (2) When this function is selected, the ELD must prompt the driver to affirmatively review and confirm the off-duty time to be deferred.

    (3) The Off-duty time deferred must not exceed the maximum time allowed under current HOS regulations.

    (4) Upon driver confirmation, the ELD must defer the off-duty time to the following day and set the "Off-duty Time Deferral Status" to "Day one" for the current day.

    (5) The ELD must record the driver's confirmation as an event, and include data elements specified in provision 4.5.1.8 of this Standard.

    (6) Upon driver confirmation, the ELD must also set the new Off-Duty-hour minimum requirements for the current day.

b) When Off-duty time has been deferred during the previous day

    (1) The ELD must clearly indicate the Off-duty time deferred for that driver during the previous day.

    (2) The ELD must prompt the driver to affirmatively review and confirm the new Off-Duty-hour minimum requirements for the current day.

    (3) Upon driver confirmation, the ELD must set the "Off-duty Time Deferral Status" to "Day two" for the current day.

    (4) The ELD must record the driver's confirmation as an event, and include data elements specified in provision 4.5.1.8 of this Standard.

    (5) Upon driver confirmation, the ELD must set the new Off-Duty-hour minimum requirements for the current day.

4.3.2.2.4   Indication of Situations Impacting duty-/driving-hour limitations

a) An ELD must provide the means to indicate a cycle change.

    (1) This function must be available only if the minimum off-duty time requirements specified in the current HOS regulations are met.

    (2) When this function is selected, the ELD must prompt the driver to affirmatively review and confirm the new cycle (cycle 1 or cycle 2) and new duty-/driving-hour limitations.

    (3) The ELD must record the driver's confirmation as an event, and include data elements specified in provision 4.5.1.9 of this Standard.

    (4) Upon driver confirmation, the ELD must set back to zero the accumulated cycle hours and set the new cycle and duty-/driving-hour limitations.

b) An ELD must provide the means to indicate an operating zone change.

    (1) When this function is selected, the ELD must prompt the driver to confirm the new operating zone and duty-/driving-hour limitations for the current day, work shift and cycle.

    (2) Upon driver confirmation, the ELD must set the new operating zone and new duty-/driving-hour limitations.

    (3) The ELD must also record the driver's confirmation as an event, and include data elements specified in provision 4.5.1.10 of this Standard.

c) An ELD must provide the means to indicate additional hours that were not recorded for the current motor carrier during the current day or the required previous days specified in current HOS regulations.

    (1) When this function is selected, the ELD must prompt the user to select one of the following options

        i. Option 1: additional hours already recorded and reported in a RODS for another motor carrier.

        ii. Option 2: additional hours not recorded since the driver was not required to keep a RODS immediately before the beginning of the day.

    (2) When Option 1 is selected, the ELD must prompt the user to enter for the current day and the required previous days, the date, the time for beginning and end of each work shift period, and the total hours for each duty status.

    (3) When Option 2 is selected, the ELD must prompt the user to enter for the current day and the required previous days, the date, the time for beginning and end of each work shift period, and total hours for on-duty and off-duty statuses.

    (4) Upon confirmation of data entry as described under option 1 or 2 of this provision, the ELD must add those hours to the total hours already cumulated for each duty status and set the new duty-/driving-hour limitations.

    (5) Upon confirmation of data entry as described under option 2 of this provision, the ELD must also record the driver's confirmation as an event, and include data elements specified in provision 4.5.1.11 of this Standard

4.3.2.3 Driver's Certification of RODS

a) An ELD must include a function whereby a driver can certify the driver's RODS at the end of a day.

    (1) When this function is selected, the ELD must display a statement that reads "I hereby certify that my data entries and my record of duty status for this day are true and correct."

    (2) An ELD must prompt the driver to select "Agree" or "Not ready." An ELD must record the driver's affirmative selection of "Agree" as an event.

b) An ELD must only allow the authenticated driver to certify RODS associated with that driver.

c) If any edits are necessary after the driver certifies the RODS for a given day, the ELD must require and prompt the driver to re-certify the updated RODS.

d) If there are any past RODS on the ELD (excluding the current day) that require certification or re-certification by the driver, the ELD must indicate the required driver action on the ELD's display and prompt the driver to take the necessary action.

4.3.2.4 Driver's Data Transfer Initiation Input

a) An ELD must provide a standardized single-step driver interface for compilation of driver's ELD RODS and initiation of the data transfer to authorized safety officials when requested during a roadside inspection.

b) The ELD must input the data transfer request from the driver, require confirmation, present and request selection of the supported data transfer options by the ELD, and prompt for entry of the ELD output file comment as specified in provision 4.3.2.5 of this Standard. Upon confirmation, the ELD must generate the compliant ELD output file as specified in provision 4.8.2 of this Standard and perform the data transfer.

c) The supported single-step data transfer initiation mechanism (such as a switch or an icon on a touch-screen display) must be clearly marked and visible to the driver when the vehicle is stopped.

d) If the data transfer option selected by the driver is the email, the ELD must prompt the driver to confirm or enter the recipient's email address.

e) In addition to the requirements specified in this provision, the transfer process must also include the following steps if the ELD is implemented on a handheld unit that has not establish a link to the engine ECM as specified in provision 4.6.1.2 of this Standard. Upon receiving the data transfer request from the driver:

    (1) The ELD must notify the driver that it has not establish a link to the engine ECM and cannot capture required data elements from the engine ECM.

    (2) The ELD must prompt the driver to select one of the following options:

        i. Option 1: cancel the data transfer request; or

        ii. Option 2: acknowledge and confirm to proceed with the data transfer process, even if the ELD will generate and transfer an ELD output file that will not include all required data elements.

    (3) Upon confirmation of Option 2 as described in this provision, the following data elements may be left blank in the ELD output file if they are not available or cannot accurately be determined:

        i. Current Total Vehicle Distance as specified in provision 4.8.1.3 (item 19); and

        ii. Current Total Engine Hours as specified in provision 4.8.1.3 (item 20).

4.3.2.5 Driver's Entry of an Output File Comment

An ELD must accommodate the entry of an output file comment up to 60 characters long. If an authorized safety official provides a key phrase or code during an inspection to be included in the output file comment, it must be entered and embedded in the electronic ELD RODS in the exchanged dataset as specified in provision 4.8.2 of this Standard. The default value for the output file comment must be blank. This output file comment must be used only for the creation of the related ELD output file for the intended time, place, and ELD user..

4.3.2.6 Driver's Annotation of RODS

a) An ELD must allow a driver to add annotations in text format to recorded, entered, or edited ELD events.

b) The ELD must require annotations to be 4 characters or longer, including embedded spaces if driver annotation is required and driver is prompted by the ELD.

4.3.2.7 Driver's Entry of Location Information

a) An ELD must allow manual entry of a CMV's location by the driver in text format in support of the driver edit requirements described in provision 4.3.2.8 of this Standard.

b) The driver's manual location entry must be available as an option to a driver only when prompted by the ELD under allowed conditions as described in provision 4.6.1.4 of this Standard.

c) A manual location entry must show "M" in the latitude/longitude coordinates fields in ELD RODS.

4.3.2.8 Driver's Record Entry/Edit

a) An ELD must provide a mechanism for a driver to review, edit, and annotate the driver's ELD RODS when a notation of errors or omissions is necessary or enter the driver's missing ELD record(s) subject to the requirements specified in this provision.

b) An ELD must not permit alteration or erasure of the original information collected concerning the driver's ELD RODS or alteration of the source data streams used to provide that information.

4.3.2.8.1 Mechanism for Driver Edits and Annotations

a) If a driver edits or annotates an ELD record or enters missing information, the act must not overwrite the original record.

b) The ELD must use the process outlined in provision 4.4.4.2 of this Standard to configure required event attributes to track the edit history of records.

c) Driver edits must be accompanied by an annotation. The ELD must prompt the driver to annotate edits.

4.3.2.8.2   Driver Edit Limitations

a) An ELD must not allow or require the editing or manual entry of records with the following event types, as described in provision 7.25 of this Standard:

    (1)   An intermediate log

    (2)   A driver's login/logout activity

    (3)   CMV's engine power up/shut down, or

    (4)   ELD malfunctions and data diagnostic events

b) An ELD must not allow automatically recorded driving time to be shortened or the ELD username associated with an ELD record to be edited or reassigned, except under the following circumstances:

    (1)   Assignment of Unidentified Driver records. ELD events recorded under the "Unidentified Driver" profile may be edited and assigned to the driver associated with the record; and

    (2)   Correction of errors with team drivers. In the case of team drivers, the driver account associated with the driving time records may be edited and reassigned between the team drivers if there was a mistake resulting in a mismatch between the actual driver and the driver recorded by the ELD and if both team drivers were respectively indicated in each other's RODS as a co-driver. The ELD must require each co-driver to confirm the change for the corrective action to take effect.

    (3)   Correction of errors for a driving event that was originally recorded under the Unidentified Driver profile and assumed by the driver. The driver account associated with the driving time records may be edited as specified in provision 4.3.2.8.1 of this Standard and reassigned to the unique "Unidentified Driver account", until the motor carrier and the driver review the records and they are assigned to the true and correct owner. If the edits are requested by the motor carrier, the ELD must require the driver to confirm or reject the requested edit(s), as specified in provision 4.4.4.2.6 of this Standard.

4.3.3   Motor Carrier's Manual Entries

An ELD must restrict availability of motor carrier entries outlined in this provision only to authenticated "support personnel" account holders.

4.3.3.1 ELD Configuration

If an ELD or a technology that includes an ELD function offers configuration options to the motor carrier or the driver that are not otherwise addressed or prohibited in this Standard, the configuration options must not affect the ELD's compliance with the requirements of this rule for each configuration setting of the ELD.

4.3.3.1.1   Configuration of Available Categories Impacting Driving Time Recording

a) An ELD must allow a motor carrier to unilaterally configure the availability of each of the three categories listed on Table 2 of this Standard that the motor carrier chooses to authorize for each of its drivers. By default, none of these categories must be available to a new driver account without the motor carrier proactively configuring their availability.

b) A motor carrier may change the configuration for the availability of each category for each of its drivers. Changes to the configuration setting must be recorded by the ELD and communicated to the applicable driver upon authentication.

4.3.3.1.2   Configuration of Using ELDs

a) An ELD must provide the motor carrier the ability to configure a driver account exempt from use of an ELD.

b) The ELD must default the setting of this configuration option for each new driver account created on an ELD to "no exemption."

c) An exemption must be proactively configured for an applicable driver account by the motor carrier. The ELD must prompt the motor carrier to annotate the record and provide an explanation for the configuration of exemption.

d) If a motor carrier configures a driver account as exempt:

   (1) The ELD must present the configured indication that is in effect for that driver during the ELD login and logout processes.

   (2) The ELD must continue to record ELD driving time but suspend detection of missing data elements data diagnostic event for the driver described in provision 4.6.1.5 of this Standard and data transfer compliance monitoring function described in provision 4.6.1.7 when such driver is authenticated on the ELD.

4.3.3.1.3   Motor Carrier's Post-Review Electronic Edit Requests

a) An ELD may allow the motor carrier (via a monitoring algorithm or support personnel) to screen, review, and request corrective edits to the driver's certified (as described in provision 4.3.2.3 of this Standard) and submitted RODS through the ELD system electronically. If this function is implemented by the ELD, the ELD must also support functions for the driver to see and review the requested edits.

b) Edits requested by anyone or any system other than the driver must require the driver's electronic confirmation or rejection.

4.4 ELD Processing and Calculations

4.4.1   Conditions for Automatic Setting of Duty Status

4.4.1.1 Automatic Setting of Duty Status to Driving

An ELD must automatically record driving time when the vehicle is in motion by setting duty status to driving for the driver unless, before the vehicle is in motion, the driver:

a) Sets the duty status to off-duty and indicates personal use of CMV, in which case duty status must remain off-duty until driver's indication of the driving condition ends or until the cumulative distance driven for personal use throughout the day exceeds the maximum distance allowed under the personal use provision of the current HOS regulations; or

b) Sets the duty status to on-duty not driving and indicates yard moves, in which case duty status must remain on-duty not driving until any of the following conditions are met:

   (1) A driver's indication of the driving condition ends;

   (2) The ELD has reset to "none" after the ELD or CMV's engine went through a power off cycle (ELD or CMV's engine turns off and then on), as specified in provision 4.3.2.2.2 (e) of this Standard; or

   (3) The CMV exceeds a speed of 32 km/h.

4.4.1.2 Automatic Setting of Duty Status to On-Duty Not Driving

When the duty status is set to driving, and the CMV has not been in-motion for 5 consecutive minutes, the ELD must prompt the driver to confirm continued driving status or enter the proper duty status. If the driver does not respond to the ELD prompt within 1-minute after receiving the prompt, the ELD must automatically switch the duty status to on-duty not driving. The time thresholds for purposes of this provision must not be configurable.

4.4.1.3 Other Automatic Duty-Status Setting Actions Prohibited

An ELD must not feature any other automatic RODS setting mechanism than those described in provisions 4.4.1.1 and 4.4.1.2 of this Standard. Duty status changes that are not initiated by the driver, including duty status alteration recommendations by motor carrier support personnel or a software algorithm, are subject to motor carrier edit requirements in provision 4.3.3.1.3 of this Standard.

4.4.2   Geo-Location Conversions

a) For each event including vehicle position information, the ELD must convert automatically captured vehicle position in latitude/longitude coordinates into geo-location information, indicating approximate distance and direction to the name of the nearest city, town, village, municipality or the location on a highway or in a legal subdivision, and abbreviation of the province, territory or state.

b) Geo-location information for all Canadian jurisdictions must be derived from a database that contains all locations (cities, towns, villages, municipalities, etc.) listed in the latest Canadian Geo-Location database available on the CCMTA website and referenced in provision 6 of this Standard.

c) An ELD's viewable outputs (such as printouts or display) must feature geo-location information as place names in text format.

4.4.3   Date and Time Conversions

a) An ELD must have the capability to convert and track date and time captured in UTC standard to the time standard in effect at driver's home terminal, taking the daylight savings time changes into account by using the parameter "Time Zone Offset from UTC" as specified in provision 7.41 of this Standard.

b) An ELD must record the driver's RODS using the time standard in effect at the driver's home terminal for a day beginning with the time specified by the motor carrier for that driver's home terminal.

c) The data element "Time Zone Offset from UTC" must be included in the "Driver's Certification of Own RODS" events as specified in provision 4.5.1.4 of this Standard.

4.4.4   Setting of Event Parameters in Records, Edits, and Entries

This provision describes the security measures for configuring and tracking event attributes for ELD records, edits, and entries in a standardized manner.

4.4.4.1 Event Sequence Identifier (ID) number

a) Each ELD event must feature an event sequence ID number.

    (1) The event sequence ID number for each ELD event must use continuous numbering across all users of that ELD and across engine and ELD power on and off cycles.

    (2) An ELD must use the next available event sequence ID number (incremented by one) each time a new event is recorded.

    (3) The event sequence ID number must track at least the last 65,536 unique events recorded on the ELD.

b) The continuous event sequence ID numbering structure used by the ELD must be mapped into a continuous hexadecimal number between 0000 (Decimal 0) and FFFF (Decimal 65535).

4.4.4.2 Event Record Status, Event Record Origin, Event Type Setting

a) An ELD must retain the original records even when allowed edits and entries are made over a driver's ELD RODS.

b) An ELD must keep track of all event record history, and the process used by the ELD must produce the event record origin, event record status, and event type for the ELD RODS in the standard codes specified in provisions 7.22, 7.23, and 7.25 of this Standard, respectively for each record as a standard security measure.

c) In addition to the process specified in provision 4.4.4.2 (b) of this Standard, the event record history must also include the date, time and originator for all annotations and comments associated to edits or entries made over a driver's ELD RODS.

4.4.4.2.1 Records Automatically Recorded by ELD

At the instance an ELD creates a record automatically, the ELD must:

a) Set the "Event Record Status" to "1" (active); and

b) Set the "Event Record Origin" to "1" (automatically recorded by ELD).

4.4.4.2.2 Driver Edits

At the instance of a driver editing existing record(s), the ELD must:

a) Identify the ELD record(s) being modified for which the "Event Record Status" is currently set to "1" (active);

b) Acquire driver input for the intended edit and construct the ELD record(s) that will replace the record(s) identified in provision 4.4.4.2.2(a) of this Standard;

c) Set the "Event Record Status" of the ELD record(s) identified in provision 4.4.4.2.2(a) of this Standard, which is being modified, to "2" (inactive-changed);

d) Set the "Event Record Status" of the ELD record(s) constructed in provision 4.4.4.2.2(b) of this Standard to "1" (active); and

e) Set the "Event Record Origin" of the ELD record(s) constructed in provision 4.4.4.2.2(b) of this Standard to "2" (edited or entered by the driver).

4.4.4.2.3 Driver Entries

When a driver enters missing record(s), the ELD must:

a) Acquire driver input for the missing entries being implemented and construct the new ELD record(s) that will represent the driver entries;

b) Set the "event record status" of the ELD record(s) constructed in provision 4.4.4.2.3(a) of this Standard to "1" (active); and

c) Set the "event record origin" of the ELD record(s) constructed in provision 4.4.4.2.3(a) of this Standard to "2" (edited or entered by the driver).

4.4.4.2.4 Driver's Assumption of Unidentified Driver Logs

When a driver reviews and assumes ELD record(s) recorded under the unidentified driver profile, the ELD must:

a) Identify the ELD record(s) recorded under the unidentified driver profile that will be reassigned to the driver;

b) Use elements of the unidentified driver record(s) from provision 4.4.4.2.4(a) of this Standard and acquire driver input to populate missing elements of the record originally recorded under the unidentified driver profile, and construct the new event record(s) for the driver;

c) Set the "event record status" of the ELD record(s) identified in provision 4.4.4.2.4(a) of this Standard, which is being modified, to "2" (inactive–changed);

d) Set the "event record status" of the ELD record(s) constructed in provision 4.4.4.2.4(b) of this Standard to "1" (active); and

e) Set the "event record origin" of the ELD record(s) constructed in provision 4.4.4.2.4(b) of this Standard to "4" (assumed from unidentified driver profile).

4.4.4.2.5 Motor Carrier Edit Suggestions

If a motor carrier requests an edit on a driver's RODS electronically, the ELD must:

a) Identify the ELD record(s) the motor carrier requests to be modified for which the "event record status" is currently set to "1" (active);

b) Acquire motor carrier input for the intended edit and construct the ELD record(s) that will replace the record identified in provision 4.4.4.2.5(a) of this Standard —if approved by the driver;

c) Set the "event record status" of the ELD record(s) in provision 4.4.4.2.5(b) of this Standard to "3" (inactive–change requested); and

d) Set the "event record origin" of the ELD record constructed in provision 4.4.4.2.5(b) of this Standard to "3" (edit requested by an authenticated user other than the driver).

4.4.4.2.6 Driver's Actions Over Motor Carrier Edit Suggestions

a) If edits are requested by the motor carrier, the ELD must allow the driver to review the requested edits and indicate on the ELD whether the driver confirms or rejects the requested edit(s).

b) If the driver approves the motor carrier's edit suggestion the ELD must:

    (1) Set the event record status of the ELD record(s) identified under provision 4.4.4.2.5 (a) of this Standard being modified, to "2" (inactive–changed); and

    (2) Set the "event record status" of the ELD record(s) constructed in provision 4.4.4.2.5 (b) of this Standard to "1" (active).

c) If the driver disapproves the motor carrier's edit(s) suggestion, the ELD must set the "event record status" of the ELD record(s) identified in provision 4.4.4.2.5 (b) of this Standard to "4" (inactive–change rejected).

4.4.5 Data Integrity Check Functions

a) An ELD must support standard security measures that require the calculation and recording of standard data check values for each ELD event recorded, for each line of the output data file specified in provision 4.8.2.1 of this Standard, and for each output data file to be generated for transmission to an authorized safety official or the motor carrier.

b) For purposes of implementing data check calculations, the alphanumeric-to-numeric mapping provided in Table 3 of this Standard must be used.

c) Each ELD event record type specified in provisions 4.5.1.1 and 4.5.1.3 of this Standard must include an event data check value, which must be calculated as specified in provision 4.4.5.1. An event data check value must be calculated at the time of the following instances and must accompany that event record thereafter:

    (1) When an event record is automatically created by the ELD;

    (2) When an authorized edit is performed by the driver on the ELD;

    (3) When an electronic edit proposal is created by the motor carrier through the ELD system.

d) Each line of the output data file must include a line data check value, which must be calculated as specified in provision 4.4.5.2 of this Standard.

e) Each output data file must also include a file data check value, which must be calculated as specified in provision 4.4.5.3 of this Standard.

4.4.5.1 Event Data Check

The event data check value must be calculated as specified in provisions 4.4.5.1.1 and 4.4.5.1.2 of this Standard.

4.4.5.1.1   Event Checksum Calculation

a)   A checksum calculation includes the summation of numeric values or mappings of a specified group of alphanumeric data elements. The ELD must calculate an event checksum value associated with each ELD event at the instance of the event record being created.

b)   The event record elements that must be included in the checksum calculation are the following:

    (1)   <Event Type>,
    (2)   <Event Code>,
    (3)   <Event Date>,
    (4)   <Event Time>,
    (5)   <{Accumulated} Vehicle Distance>,
    (6)   <{Elapsed} Engine Hours>,
    (7)   <Event Latitude>,
    (8)   <Event Longitude>,
    (9)   <CMV Power Unit Number>, and
    (10) < ELD username>.

c)   The ELD must sum the numeric values of all individual characters making up the listed data elements using the character to decimal value coding specified in Table 3 of this Standard, and use the 8-bit lower byte of the hexadecimal representation of the summed total as the event checksum value for that event.

4.4.5.1.2   Event Data Check Calculation

The event data check value must be the hexadecimal representation of the output 8-bit byte, after the below bitwise operations are performed on the binary representation of the event checksum value, as set forth below:

a)   Three consecutive circular shift left (rotate no carry -left) operations; and

b)   A bitwise XOR operation with the hexadecimal value C3 (decimal 195; binary 11000011).

4.4.5.2 Line Data Check

A line data check value must be calculated at the time of the generation of the ELD output file, to transfer data to authorized safety officials or to catalogue drivers' ELD records at a motor carrier's facility. A line data check value must be calculated as specified in provisions 4.4.5.2.1 to 4.4.5.2.3 of this Standard.

4.4.5.2.1   Line Checksum Calculation

a)   The ELD must calculate a line checksum value associated with each line of the output data file specified in provision 4.8.2.1 of this Standard, at the instance when an ELD output file is generated.

b)   The data elements that must be included in the line checksum calculation vary as per the output data file specified in provision 4.8.2.1 of this Standard.

c)   The ELD must convert each character featured in a line of output using the character to decimal value coding specified on Table 3 of this Standard and sum the converted numeric values of each character listed on a given ELD output line item (excluding the line data check value being calculated), and use the 8-bit lower byte value of the hexadecimal representation of the summed total as the line checksum value for that line of output.

4.4.5.2.2   Line Data Check Calculation

The line data check value must be calculated by performing the following operations on the binary representation of the line checksum value as follows:

- a) Three consecutive circular shift left (rotate no carry -left) operations on the line checksum value; and
- b) A bitwise XOR operation with the hexadecimal value 96 (decimal 150; binary 10010110).

4.4.5.2.3   Line Data Check Value Inclusion in Output File

The calculated line data check value must be appended as the last line item of each of the individual line items of the output data file specified in provision 4.8.2.1 of this Standard.

4.4.5.3 File Data Check

A file data check value must also be calculated at the time of the creation of an ELD output file. A file data check value must be calculated as specified in provisions 4.4.5.3.1 to 4.4.5.3.3 of this Standard.

4.4.5.3.1   File Checksum Calculation

- a) The ELD must calculate a single 16-bit file checksum value associated with an ELD output file at the instance when an ELD output file is generated.
- b) The file data check value calculation must include all individual line data check values contained in that file.
- c) The ELD must sum all individual line data check values contained in a data file output created, and use the lower two 8-bit byte values of the hexadecimal representation of the summed total as the "file checksum" value.

4.4.5.3.2   File Data Check Value Calculation

- a) The file data check value must be calculated by performing the following operations on the binary representation of the file checksum value:
  - (1) Three consecutive circular shift left (commonly called rotate no carry -left) operations on each 8-bit bytes of the value; and
  - (2) A bitwise XOR operation with the hexadecimal value 969C (decimal 38556; binary 1001011010011100).
- b) The file data check value must be the 16-bit output obtained from the above process.

4.4.5.3.3   File Data Check Value Inclusion in Output File

The calculated 16-bit file data check value must be converted to hexadecimal 8-bit bytes and must be appended as the last line item of the output data file specified in provision 4.8.2.1 of this Standard.

4.4.6   Hours of service duty-/driving-hour limitations

a) An ELD must track total hours for each driver, each duty status and for current operating zone, day, work shift and cycle being used.

b) An ELD must automatically set the duty-/driving-hour limitations for the current operating zone, day, work shift and cycle being used as per prescribed limitations in the current HOS regulations.

c) If the driver has indicated additional hours as described in provision 4.3.2.2.4 (c) of this Standard, these additional hours must also be accounted for to notify the driver prior to any duty-/driving-hour limitation prescribed in the current HOS regulations.

4.5 ELD Recording

4.5.1   Events and Data to Record

a) An ELD must record data for all distinct events specified in provisions 4.5.1.1 – 4.5.1.11 of this Standard.

b) If the driver is using a software application specified in provision 4.7.4 of this Standard or the ELD is implemented on a handheld unit that has not establish a link to the engine ECM as described in provision 4.2 of this Standard, data elements from the vehicle's engine ECM and the CMV Power Unit Number may be omitted in the records for the following event types and conditions:

    (1) A driver's login/logout activity;

    (2) A change in Driver's duty status, only if the event is triggered by the driver and is not automatically recorded by the ELD, as specified in provisions 4.4.1.1 and 4.4.1.2 of this Standard.

    (3) Driver's certification/re-certification of RODS;

    (4) Off-Duty Time Deferral;

    (5) Change in Driver's Cycle; and

    (6) Additional Hours Not Recorded.

c) When the ELD meets the requirements specified in provision 4.5.1 (b) of this Standard, the following data elements may be left blank in the event records if they are not available or cannot accurately be determined:

    (1) Vehicle Distance as described in provision 7.43;

    (2) Engine Hours as described in provision 7.19;

    (3) CMV's VIN as described in provision 7.5; and

    (4) CMV Power Unit Number associated with the record. as described in provision 7.4.

d) For each event recorded when a subset of the required data elements is omitted in the RODS, the ELD must prompt the driver to acknowledge and confirm that required data elements were omitted in the event record.

e) For all data elements specified in provision 4.5.1 (c) of this Standard that are omitted in the event records, the ELD must not permit alteration of the original information recorded, as specified in provision 4.3.2.8 of this Standard.

4.5.1.1 Event: Change in Driver's Duty Status

When a driver's duty status changes, the ELD must associate the record with the driver, the record originator—if created during an edit or entry—the vehicle and the motor carrier, and must include the following data elements:

a) <Event Sequence ID Number> as described in provision 7.24 of this Standard;

b) <Event Record Status> as described in provision 7.23;

c) <Event Record Origin> as described in provision 7.22;

d) <Event Type> as described in provision 7.25;

e) <Event Code> as described in provision 7.20;

f) <{Event} Date> as described in provision 7.8;

g) <{Event} Time> as described in provision 7.40;

h) <{Accumulated} Vehicle Distance> as described in provision 7.43;

i) <{Elapsed} Engine Hours> as described in provision 7.19;

j) <{Event} Latitude> as described in provision 7.31;

k) <{Event} Longitude> as described in provision 7.33;

l) <Distance Since Last Valid Coordinates> as described in provision 7.9;

m) <Malfunction Indicator Status {for ELD}> as described in provision 7.35;

n) <Data Diagnostic Event Indicator Status {for Driver}> as described in provision 7.7;

o) <{Event} Comment /Annotation> as described in provision 7.6;

p) <Driver's Location Description> as described in provision 7.12; and

q) <Event Data Check Value> as described in provision 7.21.

4.5.1.2 Event: Intermediate Logs

a) When a CMV is in motion, as described in provision 4.3.1.2 of this Standard, and there has not been a duty status change event or another intermediate log event recorded in the previous 1-hour period, the ELD must record a new intermediate log event.

b) The ELD must associate the record to the driver, the vehicle, and the motor carrier, and must include the same data elements outlined in provision 4.5.1.1 of this Standard except for item (p) in provision 4.5.1.1.

4.5.1.3 Event: Change in Driver's Indication of Allowed Conditions that Impact Driving Time Recording

a) At each instance when the status of a driver's indication of personal use of CMV or yard moves changes, the ELD must record a new event.

b) The ELD must associate the record with the driver, the vehicle and the motor carrier, and must include the following data elements:

1) <Event Sequence ID Number> as described in provision 7.24 of this Standard;
2) <Event Record Status> as described in provision 7.23;
3) <Event Record Origin> as described in provision 7.22;
4) <Event Type> as described in provision 7.25;
5) <Event Code> as described in provision 7.20;
6) <{Event} Date> as described in provision 7.8;
7) <{Event} Time> as described in provision 7.40;
8) <{Accumulated} Vehicle Distance> as described in provision 7.43;
9) <{Elapsed} Engine Hours> as described in provision 7.19;
10) <{Event} Latitude> as described in provision 7.31;
11) <{Event} Longitude> as described in provision 7.33;
12) <Distance Since Last Valid Coordinates> as described in provision 7.9;
13) <Malfunction Indicator Status {for ELD}> as described in provision 7.35;
14) <Data Diagnostic Event Indicator Status {for Driver}> as described in provision 7.7;
15) <{Event} Comment /Annotation> as described in provision 7.6;
16) <Driver's Location Description> as described in provision 7.12;
17) <{Total } Vehicle Distance> as described in provision 7.43; and
18) <Event Data Check Value> as described in provision 7.21.

4.5.1.4 Event: Driver's Certification of Own RODS

a) At each instance when a driver certifies or re-certifies that the driver's RODS for a given day are true and correct, the ELD must record the event.

b) The ELD must associate the record with the driver, the vehicle and the motor carrier, and must include the following data elements:

(1) <Event Sequence ID Number> as described in provision 7.24 of this Standard;
(2) <Event Type> as described in provision 7.25;
(3) <Event Code> as described in provision 7.20;
(4) <Time Zone Offset from UTC> as described in provision 7.41.
(5) <{Event} Date>and <Date {of the certified RODS}> as described in provision 7.8; and
(6) <{Event} Time> as described in provision 7.40.

4.5.1.5 Event: Driver's Login/Logout Activity

a) At each instance when an authorized user authenticates in and out of the ELD, the ELD must record the event.

b) The ELD must associate the record with the driver, the vehicle and the motor carrier, and must include the following data elements:

   (1) <Event Sequence ID Number> as described in provision 7.24 of this Standard;
   (2) <Event Type> as described in provision 7.25;
   (3) <Event Code> as described in provision 7.20;
   (4) <{Event} Date> as described in provision 7.8;
   (5) <{Event} Time> as described in provision 7.40;
   (6) <{Total} Vehicle Distance> as described in provision 7.43; and
   (7) <{Total} Engine Hours> as described in provision 7.19.

4.5.1.6 Event: CMV's Engine Power Up and Shut Down Activity

a) When a CMV's engine is powered up or shut down, an ELD must record the event within 1 minute of occurrence and retain the earliest shut down and latest power-up event if the CMV has not moved since the last ignition power on cycle.

b) The ELD must associate the record with the driver or the unidentified driver profile, the vehicle, and the motor carrier, and must include the following data elements:

   (1) <Event Sequence ID Number> as described in provision 7.24 of this Standard;
   (2) <Event Type> as described in provision 7.25;
   (3) <Event Code> as described in provision 7.20;
   (4) <{Event} Date> as described in provision 7.8;
   (5) <{Event} Time> as described in provision 7.40;
   (6) <{Total} Vehicle Distance> as described in provision 7.43;
   (7) <{Total} Engine Hours> as described in provision 7.19;
   (8) <{Event} Latitude> as described in provision 7.31;
   (9) <{Event} Longitude> as described in provision 7.33; and
   (10) <Distance Since Last Valid Coordinates> as described in provision 7.9.

4.5.1.7 Event: ELD Malfunction and Data Diagnostics Occurrence

a) At each instance when an ELD malfunction or data diagnostic event is detected or cleared by the ELD, the ELD must record the event.

b) The ELD must associate the record with the driver, the vehicle and the motor carrier, and must include the following data elements:

   (1) <Event Sequence ID Number> as described in provision 7.24 of this Standard;
   (2) <Event Type> as described in provision 7.25;
   (3) <Event Code> as described in provision 7.20;
   (4) <Malfunction/Diagnostic Code> as described in provision 7.34;
   (5) <{Event} Date> as described in provision 7.8;
   (6) <{Event} Time> as described in provision 7.40;
   (7) <{Total} Vehicle Distance> as described in provision 7.43; and
   (8) <{Total} Engine Hours> as described in provision 7.19.

4.5.1.8 Event: Off-Duty Time Deferral

a) At each instance when the Off-duty time deferral status changes, the ELD must record a new event.

b) The ELD must associate the record with the driver, the record originator, the vehicle and the motor carrier, and must include the following data elements:

(1) <Event Sequence ID Number> as described in provision 7.24 of this Standard;

(2) <Event Record Status> as described in provision 7.23;

(3) <Event Record Origin> as described in provision 7.22;

(4) <Event Type> as described in provision 7.25;

(5) <Event Code> as described in provision 7.20;

(6) <{Event} Date> as described in provision 7.8;

(7) <{Event} Time> as described in provision 7.40;

(8) <{Event} Comment /Annotation> as described in provision 7.6;

(9) <Off-duty Time Deferral Status> as described in provision 7.44; and

(10) <Off-duty Time Deferred> as described in provision 7.45.

4.5.1.9 Event: Change in Driver's Cycle

a) At each instance when the cycle changes to either cycle 1 or cycle 2, the ELD must record a new event.

b) The ELD must associate the record with the driver, the record originator, the vehicle and the motor carrier, and must include the following data elements:

(1) <Event Sequence ID Number> as described in provision 7.24 of this Standard;

(2) <Event Record Status> as described in provision 7.23;

(3) <Event Record Origin> as described in provision 7.22;

(4) <Event Type> as described in provision 7.25;

(5) <Event Code> as described in provision 7.20;

(6) <{Event} Date> as described in provision 7.8;

(7) <{Event} Time> as described in provision 7.40;

(8) <{Event} Comment /Annotation> as described in provision 7.6; and

(9) <{Current} Cycle Used> as described in provision 7.36.

4.5.1.10   Event: Change in Operating Zone

a) At each instance when the operating zone changes, the ELD must record a new event.

b) The ELD must associate the record with the driver, the record originator, the vehicle and the motor carrier, and must include the following data elements:

    (1) <Event Sequence ID Number> as described in provision 7.24 of this Standard;

    (2) <Event Record Status> as described in provision 7.23;

    (3) <Event Record Origin> as described in provision 7.22;

    (4) <Event Type> as described in provision 7.25;

    (5) <Event Code> as described in provision 7.20;

    (6) <{Event} Date> as described in provision 7.8;

    (7) <{Event} Time> as described in provision 7.40;

    (8) <{Event} Latitude> as described in provision 7.31;

    (9) <{Event} Longitude> as described in provision 7.33;

    (10) <Distance Since Last Valid Coordinates> as described in provision 7.9;

    (11) <{Event} Comment /Annotation> as described in provision 7.6;

    (12) <Driver's Location Description> as described in provision 7.12; and

    (13) <{Current} Operating zone> as described in provision 7.46.

4.5.1.11   Event: Additional Hours Not Recorded

a) At each instance when an authorized user is entering additional hours that were not recorded during the current day or the required previous days specified in current HOS regulations, as described in provision 4.3.2.2.4 (Option 2) of this Standard, the ELD must record a new event.

b) The ELD must associate the record with the driver, the record originator, the vehicle and the motor carrier, and must include the following data elements for each day during the current day and the required previous days specified in current HOS regulations:

    (1) <Event Sequence ID Number> as described in provision 7.24 of this Standard;

    (2) <Event Record Status> as described in provision 7.23;

    (3) <Event Record Origin> as described in provision 7.22;

    (4) <Event Type> as described in provision 7.25;

    (5) <Event Code> as described in provision 7.20;

    (6) <{Event} Date> as described in provision 7.8;

    (7) <{Event} Time> as described in provision 7.40;

    (8) <Date {of the day}> as described in provision 7.8;

    (9) <{Beginning of work shift} Time> and <{End of work shift} Time> as described in provision 7.40;

    (10) <Total Hours {logged in off-duty}>;

    (11) <Total Hours {logged in on-duty}>; and

    (12) <{Event} Comment /Annotation> as described in provision 7.6.

4.6 ELD's Self-Monitoring of Required Functions

An ELD must have the capability to monitor its compliance with the technical requirements of this provision for the detectable malfunctions and data inconsistencies listed in Table 4 of this Standard and must keep records of its malfunction and data diagnostic event detection.

4.6.1   Compliance Self-Monitoring, Malfunctions and Data Diagnostic Events

4.6.1.1 Power Compliance Monitoring

a) An ELD must monitor data it receives from the engine ECM or alternative sources as allowed in provisions 4.3.1.1 to 4.3.1.4 of this Standard, its onboard sensors, and data record history to identify instances when it may not have complied with the power requirements specified in provision 4.3.1.1, in which case, the ELD must record a power data diagnostics event for the corresponding driver(s), or under the unidentified driver profile if no drivers were authenticated at the time of detection.

b) An ELD must set a power compliance malfunction if the power data diagnostics event described in provision 4.6.1.1(a) of this Standard indicates an aggregated driving time understatement of 30 minutes or more on the ELD over a 24-hour period across all driver profiles, including the unidentified driver profile.

4.6.1.2 Engine Synchronization Compliance Monitoring

a) An ELD must monitor the data it receives from the engine ECM or alternative sources as allowed in provisions 4.3.1.1 to 4.3.1.4 of this Standard, its onboard sensors, and data record history to identify instances and durations of its non-compliance with the ELD engine synchronization requirement specified in provision 4.2, in which case, the ELD must record an engine-synchronization data diagnostics event.

b) An ELD required to establish a link to the engine ECM as described in provision 4.2 must monitor its connectivity to the engine ECM and its ability to retrieve the vehicle parameters described under provision 4.3.1 of this Standard and must record an engine-synchronization data diagnostics event when it no longer can acquire updated values for the ELD parameters required for records within 60 seconds of the need.

c) An ELD must set an engine synchronization compliance malfunction if connectivity to any of the required data sources specified in provision 4.3.1 of this Standard is lost for more than 30 minutes during a 24-hour period aggregated across all driver profiles, including the unidentified driver profile.

d) If the ELD is implemented on a handheld unit and cannot establish a link to the engine ECM when the CMV's engine is not powered or when the ELD is away from the CMV:

1) The ELD must notify the driver that it cannot capture required data elements from the engine ECM and monitor the engine's power status and vehicle's motion status as specified in provisions 4.3.1.1 and 4.3.1.2 of this Standard.

2) At the beginning of a new period when the ELD is operated without a link to the engine ECM, the ELD must prompt the driver to acknowledge and confirm that no link to the engine ECM may have an impact on data recording and compliance to current HOS regulations.

3) The connectivity status with the engine ECM must be indicated to all drivers who may use that ELD. The ELD must provide a recognizable visual indicator, and may provide an audible signal, to the driver as to its limited connectivity status.

4) The ECM connectivity status must be continuously communicated to the driver when the ELD is powered.

4.6.1.3 Timing Compliance Monitoring

The ELD must periodically cross-check its compliance with the requirement specified in provision 4.3.1.5 of this Standard with respect to an accurate external UTC source and must record a timing compliance malfunction when it can no longer meet the underlying compliance requirement.

4.6.1.4 Positioning Compliance Monitoring

a) An ELD must continually monitor the availability of valid position measurements meeting the listed accuracy requirements in provision 4.3.1.6 of this Standard and must track the distance and elapsed time from the last valid measurement point.

b) ELD records requiring location information must use the last valid position measurement and include the latitude/longitude coordinates and distance traveled, in kilometers, since the last valid position measurement.

c) An ELD must monitor elapsed time during periods when the ELD fails to acquire a valid position measurement within 8 kilometers of the CMV's movement. When such elapsed time exceeds a cumulative 60 minutes over a 24-hour period, the ELD must set and record a positioning compliance malfunction.

d) If a new ELD event must be recorded at an instance when the ELD had failed to acquire a valid position measurement within the most recent elapsed 8 kilometers of driving, but the ELD has not yet set a positioning compliance malfunction, the ELD must record the character "X" in both the latitude and longitude fields, unless location is entered manually by the driver, in which case it must record the character "M" instead. Under the circumstances listed in this provision, if the ELD event is due to a change in duty status for the driver, the ELD must prompt the driver to enter location manually in accordance with provision 4.3.2.7 of this Standard. If the driver does not enter the location information and the vehicle is in motion, the ELD must record a missing required data element data diagnostic event for the driver.

e) If a new ELD event must be recorded at an instance when the ELD has set a positioning compliance malfunction, the ELD must record the character "E" in both the latitude and longitude fields regardless of whether the driver is prompted and manually enters location information.

4.6.1.5 Data Recording Compliance Monitoring

a) An ELD must monitor its storage capacity and integrity and must detect a data recording compliance malfunction if it can no longer record or retain required events or retrieve records that are not otherwise catalogued remotely by the motor carrier.

b) An ELD must monitor the completeness of the ELD event record information in relation to the required data elements for each event type and must record a missing data elements data diagnostics event for the driver if any required field is missing at the time of recording.

4.6.1.6 Monitoring Records Recorded under the Unidentified Driver Profile

a) When there are ELD records involving driving time recorded on an ELD under the unidentified driver profile, the ELD must prompt the driver(s) authenticating in with a warning indicating the existence of new unassigned driving time.

b) The ELD must provide a mechanism for the driver to review and either acknowledge the assignment of one or more of the unidentified driver records attributable to the driver under the authenticated driver's profile as described in provision 4.3.2.8.2 (b)(1) of this Standard or indicate that these records are not attributable to the driver.

c) If more than 30 minutes of driving in a 24-hour period show unidentified driver on the ELD, the ELD must detect and record an unidentified driving records data diagnostic event and the data diagnostic indicator must be turned on for all drivers authenticated into that ELD for the current day and the following 14 days.

d) An unidentified driving records data diagnostic event can be cleared by the ELD when driving time recorded under the unidentified driver profile for the current day and the required previous days specified in current HOS regulations drops to 15 minutes or less.

4.6.1.7 Data Transfer Compliance Monitoring

a) An ELD must implement in-service monitoring functions to verify that the data transfer mechanism(s) described in provision 4.9.1 of this Standard are continuing to function properly. An ELD must verify this functionality at least once every 7 days. These monitoring functions may be automatic or may involve manual steps for a driver.

b) If the monitoring mechanism fails to confirm proper in-service operation of the data transfer mechanism(s), an ELD must record a data transfer data diagnostic event and enter an unconfirmed data transfer mode.

c) After an ELD records a data transfer data diagnostic event, the ELD must increase the frequency of the monitoring function to check at least once every 24-hour period. If the ELD stays in the unconfirmed data transfer mode following the next three consecutive monitoring checks, the ELD must record a data transfer compliance malfunction.

4.6.1.8 Other Technology-Specific Operational Health Monitoring

In addition to the required monitoring schemes described in provisions 4.6.1.1 to 4.6.1.7 of this Standard, the ELD provider may implement additional, technology-specific malfunction and data diagnostic detection schemes and may use the ELD's malfunction status indicator and data diagnostic status indicator (described in provisions 4.6.2.1 and 4.6.3.1) to communicate the ELD's malfunction or non-compliant state to the operator(s) of the ELD.

4.6.2   ELD Malfunction Status Indicator

ELD malfunctions affect the integrity of the device and its compliance; therefore, active malfunctions must be indicated to all drivers who may use that ELD. An ELD must provide a recognizable visual indicator, and may provide an audible signal, to the driver as to its malfunction status.

4.6.2.1 Visual Malfunction Indicator

a) An ELD must display a single visual malfunction indicator for all drivers using the ELD on the ELD's display or on a stand-alone indicator. The visual signal must be visible to the driver when the driver is seated in the normal driving position.

b) The ELD malfunction indicator must be clearly illuminated when there is an active malfunction on the ELD.

c) The malfunction status must be continuously communicated to the driver when the ELD is powered.

4.6.3 ELD Data Diagnostic Status Indicator

ELD data diagnostic status affects only the authenticated user; therefore, an ELD must only indicate the active data diagnostics status applicable to the driver authenticated into the ELD. An ELD must provide a recognizable visual indicator, and may provide an audible signal, to the driver as to its data diagnostics status.

4.6.3.1 Visual Data Diagnostics Indicator

a) An ELD must display a single visual data diagnostics indicator, apart from the visual malfunction indicator described in provision 4.6.2.1 of this Standard, to communicate visually the existence of active data diagnostics events for the applicable driver.

b) The visual signal must be visible to the driver when the driver is seated in the normal driving position.

4.6.4 Driver notifications for Hours of service limitations

a) If the driver has indicated authorized personal use of the CMV, the ELD must notify the driver when the cumulative distance driven for personal use throughout the day exceeds the maximum distance allowed under current HOS regulations.

b) An ELD must be capable of notifying the driver at least 30 minutes in advance of reaching any duty-/driving-hour limitation prescribed in the current HOS regulations.

c) An ELD must also clearly indicate which limit the driver is about to reach for the current day, work shift or cycle being used.

4.7 Special Purpose ELD Functions

4.7.1 Driver's ELD Volume Control

a) If a driver selects the sleeper-berth state for the driver's RODS, and no co-driver has authenticated into the ELD as on-duty driving, and if the ELD outputs audible signals, the ELD must either:

   (1) Allow the driver to mute the ELD's volume or turn off the ELD's audible output, or

   (2) Automatically mute the ELD's volume or turn off the ELD's audible output.

b) For purposes of this provision, if an ELD operates in combination with another device or other hardware or software technology that is not separate from the ELD, the volume controls required herein apply to the combined device or technology.

4.7.2   Driver's Access to Own ELD RODS

a) An ELD must provide a mechanism for a driver to obtain a copy of the driver's own ELD RODS on demand, in either an electronic or printout format compliant with provision 4.8.1.3 of this Standard.

b) The process must not require a driver to go through the motor carrier to obtain copies of the driver's own ELD RODS if driver's RODS reside on or are accessible directly by the ELD unit used by the driver.

c) If an ELD meets the requirements of this provision by making output files available to the driver, it must also provide a utility function for the driver to display the data on a computer.

4.7.3   Privacy Preserving Provision for Use During Personal Uses of a CMV

a) During a period when a driver indicates authorized personal use of CMV, the ELD must:

(1) Monitor the cumulative distance driven for personal use as specified in provision 4.3.1.3 of this Standard.

(2) Prevent the driver from selecting any event category, except to indicate the end of authorized personal use described in provision 4.3.2.2.2 of this Standard.

(3) Only record authorized personal use events, ELD malfunction and data diagnostic events, as specified in provisions 4.5.1.3 and 4.5.1.7 of this Standard.

b) A driver's indication that the CMV is being driven for authorized personal purposes may span more than one CMV ignition on cycle if the driver proactively confirms continuation of the personal use condition prior to placing the vehicle in motion when the ELD prompts the driver at the beginning of the new ignition power on cycle.

4.7.4 ELD Events Recorded in a Software Application

a) An ELD may provide a means for a driver to record ELD events in a software application that is not integrally synchronized with the engine of the CMV, as specified in provision 4.2 of this Standard. Furthermore, such application may not include any sensing functionality described in provision 4.3.1 of this Standard, but it is compliant with the date and time requirements specified in provision 4.3.1.5 of this Standard.

b) If this function is implemented by the ELD, the software application specified in provision 4.7.4 (a) of this Standard must also meet the requirements of this provision.

c) When using this function, the ELD must allow the driver to select only the following event types, as described in provision 7.25 of this Standard:

    (1) Change in driver's duty status (only on-duty or off-duty);

    (2) Driver's certification/re-certification of RODS;

    (3) Driver's login/logout activity;

    (4) Off-duty time deferral;

    (5) Driver's cycle change; and

    (6) Additional hours not recorded.

d) The ELD must only allow one category to be selected at any given time and use the latest selection by the driver.

e) When using this function and for each event type listed in provision 4.7.4 (c) of this Standard, the ELD must record the same data elements outlined in provision 4.5.1 of this Standard. However, a subset of the required data elements must be omitted in the records, as described in further detail below. When a driver selects any of those events, the ELD must:

    (1) Record the character "X" in both the latitude and longitude fields, unless location description is entered manually by the driver, in which case it must record the character "M" instead. Under the circumstances listed in this provision, if the ELD event is due to a change in duty status for the driver, the ELD must prompt the driver to enter the location description in accordance with provision 4.3.2.7 of this Standard. If the driver does not enter the location description, ELD must record a missing required data element data diagnostic event for the driver.

4.8 ELD Outputs

4.8.1 Printout or Display

The ELD must be able to generate a compliant report as specified in this provision, either as a printout or on a display.

4.8.1.1 Printout Requirements

Printout must be able to accommodate the graph grid specifications as listed in provision 4.8.1.3 of this Standard.

4.8.1.2 Display Requirements

a) This provision does not apply if an ELD produces a printout for use at a roadside inspection.

b) An ELD must be designed so that its display may be reasonably viewed by an authorized safety official without entering theCMV. For example, the display may be untethered from its mount or connected in a manner that would allow it to be passed outside of the vehicle for a reasonable distance.

4.8.1.3 Information to be Shown on the Printout and Display at Roadside

a) The printout and display must show RODS for the inspected driver's profile and the unidentified driver profile separately. If there are no unidentified driver records existing on the ELD for the current day and for any of the required previous days specified in current HOS regulations, an ELD does not need to print or display unidentified driver records for the authorized safety official. Otherwise, both reports must be printed or displayed and provided to the authorized safety official.

b) The printout and display must show the following information for the current day and each of the required previous days specified in current HOS regulations: (Items in <. > are data elements.)

   (1) Date: <Date {of RODS}>

   (2) Day Starting Time, Time Zone Offset from UTC: <Day Starting Time>, <Time Zone Offset from UTC>

   (3) Start Odometer: <{Beginning of work shift or Day } {Total} Vehicle Distance {for each CMV}>

   (4) End Odometer: <{End of work shift or Day } {Total} Vehicle Distance {for each CMV}>

   (5) Carrier: <Carrier Name {for each carrier}>

   (6) Home Terminal Address, Principal Place of Business Address: <{Home terminal} Address {for each carrier}>, <{Principal place of Business} Address {for each carrier}>

   (7) Driver Name: <{Driver} Last Name>, <{Driver} First Name>

   (8) Driver ID: < ELD username {for the driver}>

   (9) Driver License Jurisdiction: <{Driver} Driver License Issuing Jurisdiction>

   (10) Driver License Number: <{Driver} Driver License Number>

   (11) Co-Driver Name: <{Co-Driver's} Last Name {for each co-driver}>, <{Co-Driver's} First Name {for each co-driver}>

   (12) Co-Driver ID: <ELD username {for each co-driver}>

   (13) Cycle: <{Current} Cycle Used {for the driver}>

   (14) Operating zone: <{Current} Operating Zone>

   (15) Total hours in work shift: <{Driver's} Total Hours {for current work shift}>

   (16) Total hours in cycle: <{Driver's} Total Hours {logged in on-duty and driving status} {for current cycle}>

   (17) Remaining hours in cycle: <{Driver's} remaining on-duty Hours {for current cycle}>

   (18) Distance Today: <Total Distance {accumulated for each CMV driven by the Driver}>

   (19) Current Total Distance: <{Current} {Total} Vehicle Distance>

   (20) Current Engine Hours: <{Current} {Total} Engine Hours>

   (21) ELD Provider: <ELD Provider>

   (22) ELD ID: <ELD Identifier>

   (23) ELD Authentication: < ELD Authentication Value>

   (24) ELD Certification: <ELD certification ID>

   (25) Truck Tractor ID: <CMV Power Unit Number {for each CMV driven by the Driver}>

   (26) Truck Tractor VIN: <CMV VIN {for each CMV driven by the Driver}>

   (27) Trailer ID: <Trailer Unit Number {for each trailer}>

   (28) Current Location: <{Current} Geo-location>, <{Current} Latitude>, <{Current} Longitude>

   (29) Unidentified Driving Records: <{Current} Data Diagnostic Event Indicator Status {for "Unidentified driving records data diagnostic" event}>

4.8.1.3 Information to be Shown on the Printout and Display at Roadside (cont'd)

(30) Exempt Driver Status: <Exempt Driver Configuration {for the Driver}>

(31) Off-duty Time Deferral: <Off-duty Time Deferral Status {and Description} {for the Driver}>

(32) Time Deferred: <Off-duty Time Deferred {for the Driver}>

(33) ELD Malfunction Status: <Malfunction Indicator Status {and Malfunction Description} {for the ELD}>

(34) Driver's Data Diagnostic Status: <Data Diagnostic Event Indicator Status {and Diagnostic Description} {for the Driver}>

(35) Date and Time: <{Current} Date {of Printout or Display}>, <{Current} Time {of Printout or Display}>

(36) Comment: <Output File Comment>

(37) Day [Graph Grid]

 - Total hours <Total Hours {in working day so far}>;

 - Off duty <Total Hours {logged in Off-duty status}>;

 - Sleeper Berth <Total Hours {logged in Sleeper berth status}>;

 - Driving <Total Hours {logged in Driving status}>; and

 - On duty not driving <Total Hours {logged in on-duty not driving status}>.

(38) [For each Change of Duty Status and Intermediate Logs Events specified in provisions 4.5.1.1 and 4.5.1.2 of this Standard]:

 - <Event Sequence ID Number>;

 - <Event Record Status>;

 - <Event Record Origin>;

 - <Event Description>;

 - <{Event} Date>;

 - <{Event} Time>;

 - <CMV Power Unit Number>;

 - <{Accumulated} Vehicle Distance>;

 - <{Elapsed} Engine Hours>;

 - <Geo-Location>#;

 - <{Event} Latitude>;

 - <{Event} Longitude>; and

 - <Distance Since Last Valid Coordinates>.

4.8.1.3 Information to be Shown on the Printout and Display at Roadside (cont'd)

(39) [For Each Change in Driver's Indication of Special Driving Conditions Events specified in provision 4.5.1.3 of this Standard]:
- <Event Sequence ID Number>;
- <Event Record Status>;
- <Event Record Origin>;
- <Event Description>;
- <{Event} Date>;
- <{Event} Time>;
- <CMV Power Unit Number>;
- <{Accumulated} Vehicle Distance>;
- <{Elapsed} Engine Hours>;
- <{Total } Vehicle Distance>;
- <Geo-Location>#;
- <{Event} Latitude>;
- <{Event} Longitude>; and
- <Distance Since Last Valid Coordinates>.

(40) [For Each Driver's Certification of RODS Events specified in provision 4.5.1.4 of this Standard]:
- <Event Sequence ID Number>;
- <Event Description>;
- <{Event} Date>;
- <{Event} Time>;
- <Time Zone Offset from UTC>; and
- <CMV Power Unit Number>.

(41) [For Each Malfunctions and Data Diagnostic Events specified in provision 4.5.1.7 of this Standard]:
- <Event Sequence ID Number>**;
- <Malfunction/Diagnostic Code {and Description}>;
- <{Event} Date>;
- <{Event} Time>;
- <{Total } Vehicle Distance>;
- <{Total} Engine Hours>; and
- <CMV Power Unit Number>.

** Printout report must only list up to 10 most recent ELD malfunctions and up to 10 most recent data diagnostics events within the time period for which the report is generated.

4.8.1.3 Information to be Shown on the Printout and Display at Roadside (cont'd)

(42) [For Each ELD Login/Logout Events specified in provision 4.5.1.5 of this Standard]:
- <Event Sequence ID Number>;
- <Event Description>;
- <{Event} Date>;
- <{Event} Time>;
- <{Total } Vehicle Distance>;
- <{Total} Engine Hours>; and
- <CMV Power Unit Number>.

(43) [For Each CMV Engine Power up / Shut Down Events specified in provision 4.5.1.6 of this Standard]
- <Event Sequence ID Number>;
- <Event Description>;
- <{Event} Date>;
- <{Event} Time>;
- <{Total } Vehicle Distance>;
- <{Total} Engine Hours>;
- <Geo-Location>#;
- <{Event} Latitude>;
- <{Event} Longitude>;
- <Distance Since Last Valid Coordinates>; and
- <CMV Power Unit Number>.

(44) [For Each Off-Duty Time Deferral Events specified in provision 4.5.1.8 of this Standard]:
- <Event Sequence ID Number>;
- <Event Record Status>;
- <Event Record Origin>;
- <Event Description>;
- <{Event} Date>;
- <{Event} Time>;
- <Off-duty Time Deferral Status {and Description}>;
- <Off-duty Time Deferred>; and
- <CMV Power Unit Number>.

(45) [For Each Change in Driver's Cycle Events specified in provision 4.5.1.9 of this Standard]:
- <Event Sequence ID Number>;
- <Event Record Status>;
- <Event Record Origin>;
- <Event Description>;
- <{Event} Date>;
- <{Event} Time>;
- <{Current} Cycle {and Description}>; and
- <CMV Power Unit Number>.

4.8.1.3   Information to be Shown on the Printout and Display at Roadside (cont'd)

(46) [For Each Change in Operating Zone Events specified in provision 4.5.1.10 of this Standard]:
- <Event Sequence ID Number>;
- <Event Record Status>;
- <Event Record Origin>;
- <Event Description>;
- <{Event} Date>;
- <{Event} Time>;
- <Geo-Location>#;
- <{Event} Latitude>;
- <{Event} Longitude>;
- <Distance Since Last Valid Coordinates>;
- <{Current} Operating Zone {and Description}>; and
- <CMV Power Unit Number>.

(47) [For each Additional Hours Not Recorded Events specified in provision 4.5.1.11 of this Standard]:
- <Event Sequence ID Number>;
- <Event Record Status>;
- <Event Record Origin>;
- <Event Description>;
- <Date {of the day}>;
- <{Beginning of work shift} Time>;
- <{End of work shift} Time>;
- <Total Hours {logged in off-duty}>;
- <Total Hours {logged in on-duty}>; and
- <CMV Power Unit Number>.

(48) [For each Annotation or Comment to driver's ELD records]:
- <Event Sequence ID Number>;
- <{Record Edit} Date>;
- <{Record Edit } Time>;
- <{Record Edit} Originator>; and
- <{Event} Comment/Annotation>.

"<Geo-location> must be substituted with "<Driver's Location Description>" field for manual entries.

4.8.1.3   Information to be Shown on the Printout and Display at Roadside (cont'd)

c) The printout and display must show a graph-grid consistent with current HOS regulations showing each change of duty status.

    (1) On the printout, the graph-grid for each day's RODS must be at least 15 centimeters by 4 centimeters in size.

    (2) On the printout, the Geo-location information for each duty status change can be omitted on the graph-grid.

d) If the ELD records units of distance in miles, it must provide a means to display the equivalent distance in kilometers.

e) The display must meet the requirements specified in this provision under all circumstances. However, the display may also provide an option to simplify the review process. When this option is selected by the driver, a subset of the required data elements can be omitted on the display, as described in further detail below. When a driver selects this option, the ELD must:

    (1) show the graph-grid specified in provision 4.8.1.3 (c) of this Standard;

    (2) show all data elements specified in provision 4.8.1.3 (b) of this Standard, except the following data elements:

        i. <Event Sequence ID Number>;

        ii. <Event Record Origin>;

        iii. <{Event} Latitude>;

        iv. <{Event} Longitude>; and

        v. <Distance Since Last Valid Coordinates>.

f) The printout must be consistent with the format specified in schedule 1 of this Standard.

4.8.2   ELD Output File

An ELD must have the capability to generate a consistent and secure electronic file output including an electronic document and data file compliant with the format described herein to facilitate the transfer, processing, and standardized display of ELD data sets on the authorized safety officials' computing environments.

4.8.2.1 ELD Output File Standard

The electronic document and data file included in the ELD output file must be compliant with the format and data elements specified thereafter:

a) The output document refers to an electronic document in pdf format being compliant with the format and data elements specified in provision 4.8.1.3.

b) The output data file refers to a data file in csv format (comma-separated values) being compliant with the format and data elements specified in provisions 4.8.2.1.1 to 4.8.2.1.16 of this Standard.

4.8.2.1.1   Header Segment

This segment must include the following data elements and format:
- ELD File Header Segment: <CR>
- <{Driver's} Last Name>, <{Driver's} First Name>, < ELD username {for the driver}>, <{Driver's} Driver's License Issuing State>, <{Driver's} Driver's License Number>, <Line Data Check Value> <CR>
- <{Co-Driver's} Last Name>, <{Co-Driver's} First Name>, <ELD username {for the co-driver}>, <Line Data Check Value> <CR>
- <CMV Power Unit Number>, <CMV VIN>, <Trailer Unit Number(s)>, <Line Data Check Value> <CR>
- <Carrier Name>, <{Home Terminal} Address>, <{Principal place of Business} Address>, <Cycle Used>, <Day Starting Time>, <Time Zone Offset from UTC>, <Line Data Check Value> <CR>
- <Exempt Driver Configuration>, <Line Data Check Value> <CR>
- <{Current} Date>, < {Current} Time>, <{Current} Latitude>, <{Current} Longitude, < {Current} {Total} Vehicle Distance>, <{Current} {Total} Engine Hours>, <Line Data Check Value> <CR>
- <ELD Certification ID>, <ELD Identifier>, <ELD Authentication Value>, <Output File Comment>, <Line Data Check Value> <CR>

4.8.2.1.2   User List

This segment must list all drivers and co-drivers with driving time records on the most recent CMV driven by the inspected driver and motor carrier's support personnel who requested edits within the time period for which this file is generated. The list must be in chronological order with most recent user of the ELD on top, and include the driver being inspected, the co-driver, and the unidentified driver profile. This segment has a variable number of rows depending on the number of profiles with activity over the time period for which this file is generated. This segment must start with the following title:
- User List: <CR>

Each subsequent row must have the following data elements:
- <{Assigned User} Order Number>, <{User's} ELD Account Type>, <{User's} Last Name>, <{User's} First Name>, <Line Data Check Value> <CR>

4.8.2.1.3   CMV List

This segment must list each CMV that the current driver drove and that has been recorded on the driver's ELD records within the time period for which this file is generated. The list must be rank ordered in accordance with the time of CMV use with the most recent CMV being on top. This segment has a variable number of rows depending on the number of CMVs driven by the driver over the time period for which this file is generated. This segment must start with the following title:
- CMV List: <CR>

Each subsequent row must have the following data elements:
- <{Assigned CMV} Order Number>, <CMV Power Unit Number>, <CMV VIN>, <Line Data Check Value> <CR>

4.8.2.1.4   ELD Event List for Driver's RODS

This segment must list ELD event records tagged with event types 1 (a change in duty status as described in provision 4.5.1.1 of this Standard), 2 (an intermediate log as described in provision 4.5.1.2), and 3 (a change in driver's indication of conditions impacting driving time recording as described in provision 4.5.1.3). The segment must list all event record status types and all event record origins for the driver, rank ordered with the most current record on top in accordance with the date and time fields of the record. This segment has a variable number of rows depending on the number of ELD events recorded for the driver over the time period for which this file is generated. This segment must start with the following title:

- ELD Event List: <CR>

Each subsequent row must have the following data elements:

- <Event Sequence ID Number>, <Event Record Status>, <Event Record Origin>, <Event Type>, <Event Code>, <{Event} Date>, <{Event} Time>, <{Accumulated} Vehicle Distance>, <{Elapsed} Engine Hours>, <{Total} Vehicle Distance>, <{Event} Latitude>, <{Event} Longitude>, <Distance Since Last Valid Coordinates>, <{Corresponding CMV} Order Number>, <{ User} Order Number {for Record Originator}>, <Malfunction Indicator Status {for ELD}>, <Data Diagnostic Event Indicator Status {for Driver}>, <Event Data Check Value>, <Line Data Check Value> <CR>

4.8.2.1.5   ELD Event List for Annotations, Comments, and Driver's Location Description

This segment must list only the elements of the ELD event list created in provision 4.8.2.1.4 of this Standard that have an annotation, comment, or a manual entry of location description by the driver. This segment has a variable number of rows depending on the number of ELD events under provision 4.8.2.1.4 that feature a comment, annotation, or manual location entry by the driver. This segment must start with the following title:

- ELD Event Annotations or Comments: <CR>

Each subsequent row must have the following data elements:

- <Event Sequence ID Number>, < ELD username {of the Record Originator} >, <{Event} Comment Text or Annotation>, <{Event} Date>, <{Event} Time>, <Driver's Location Description>, <Line Data Check Value> <CR>

4.8.2.1.6   ELD Event List for Driver's Certification of Own RODS

This segment must list ELD event records with event type 4 (driver's certification of own RODS as described in provision 4.5.1.4 of this Standard) for the inspected driver for the time period for which this file is generated. It must be rank ordered with the most current record on top in accordance with the date and time fields of the record. This segment has a variable number of rows depending on the number of certification and re-certification actions the authenticated driver may have executed on the ELD over the time period for which this file is generated. This segment must start with the following title:

- Driver's Certification/Recertification Events: <CR>

Each subsequent row must have the following data elements:

- <Event Sequence ID Number>, <Event Code>, <{Event} Date>, <{Event} Time>, <Date {of the certified RODS}>, <{Corresponding CMV} Order Number>, <Line Data Check Value> <CR>

4.8.2.1.7   ELD Event List for Malfunction and Data Diagnostic

This segment must list all malfunctions that have occurred on this ELD during the time period for which this file is generated. It must list diagnostic event records related to the driver being inspected, rank ordered with the most current record on top in accordance with the date and time fields of the record. This segment has a variable number of rows depending on the number of ELD malfunctions and ELD diagnostic event records recorded and relevant to the inspected driver over the time period for which this file is generated. This segment must start with the following title:

- Malfunctions and Data Diagnostic Events: <CR>

Each subsequent row must have the following data elements:

- <Event Sequence ID Number>, <Event Code>, <Malfunction/Diagnostic Code>, <{Event} Date>, <{Event} Time>, <{Total} Vehicle Distance>, <{Total} Engine Hours>, <{Corresponding CMV} Order Number>, <Line Data Check Value> <CR>

4.8.2.1.8   ELD Event List for Login/Logout Activity

This segment must list the login and logout activity on the ELD (ELD events with event type 5 (A driver's login/logout activity)) for the inspected driver for the time period for which this file is generated. It must be rank ordered with the most current record on top in accordance with the date and time fields of the record. This segment must start with the following title:

- ELD Login/Logout Events: <CR>

Each subsequent row must have the following data elements:

- <Event Sequence ID Number>, <Event Code>, <ELD username>, <{Event} Date>, <{Event} Time>, <{Total} Vehicle Distance>, <{Total} Engine Hours>, <Line Data Check Value> <CR>

4.8.2.1.9   ELD Event List for CMV's Engine Power-Up and Shut Down Activity

This segment must list the records created when a CMV's engine is powered up and shut down (ELD events with event type 6 (CMV's engine power up/shut down)) for the time period for which this file is generated. It must be rank ordered with the most current record on top in accordance with the date and time fields of the record. This segment must start with the following title:

- CMV's Engine Power-Up and Shut Down Events: <CR>

Each subsequent row must have the following data elements:

- <Event Sequence ID Number>, <Event Code>, <{Event} Date>, <{Event} Time>, <{Total} Vehicle Distance>, <{Total} Engine Hours>, <{Event} Latitude>, <{Event} Longitude>, <CMV Power Unit Number>, <CMV VIN>, <Trailer Number(s)>, <Line Data Check Value> <CR>

4.8.2.1.10 ELD Event List for the Unidentified Driver Profile

This segment must list the ELD event records for the Unidentified Driver profile, rank ordered with most current record on top in accordance with the date and time fields of the record. This segment has a variable number of rows depending on the number of Unidentified Driver ELD records recorded over the time period for which this file is generated. This segment must start with the following title:

- Unidentified Driver Profile Events: <CR>

Each subsequent row must have the following data elements:

- <Event Sequence ID Number>, <Event Record Status>, <Event Record Origin>, <Event Type>, <Event Code>, <{Event} Date>, <{Event} Time>, <{Accumulated} Vehicle Distance>, <{Elapsed} Engine Hours>, <{Event} Latitude>, <{Event} Longitude>, <Distance Since Last Valid Coordinates>, <{Corresponding CMV} Order Number>, <Malfunction Indicator Status {for ELD}>, <Event Data Check Value>, <Line Data Check Value> <CR>

4.8.2.1.11 [Reserved]

4.8.2.1.12 ELD Event List for Off-Duty Time Deferral

This segment must list the ELD event records with event type 20 (Off-Duty Time Deferral as described in provision 4.5.1.8 of this Standard) for the inspected driver for the time period for which this file is generated. It must be rank ordered with the most recent record on top in accordance with the date and time fields of the record. This segment has a variable number of rows depending on the number of Off-Duty Time Deferral records recorded over the time period for which this file is generated. This segment must start with the following title:

- Off-Duty Time Deferral Events: <CR>

Each subsequent row must have the following data elements:

- <Event Sequence ID Number>, <Event Record Status>, <Event Record Origin>, <Event Type>, <Event Code>, <{Event} Date>, <{Event} Time>, <{Corresponding CMV} Order Number>, <{ User} Order Number {for Record Originator}>, <Off-duty Time Deferral Status>, <Off-duty Time Deferred>, <Line Data Check Value> <CR>

4.8.2.1.13 ELD Event List for Change in Driver's Cycle

This segment must list the ELD event records with event type 21 (Change in Driver's Cycle as described in provision 4.5.1.9 of this Standard) for the inspected driver for the time period for which this file is generated. It must be rank ordered with the most recent record on top in accordance with the date and time fields of the record. This segment has a variable number of rows depending on the number of Change in Driver's Cycle records recorded over the time period for which this file is generated. This segment must start with the following title:

- Change in Driver's Cycle Events: <CR>

Each subsequent row must have the following data elements:

- <Event Sequence ID Number>, <Event Record Status>, <Event Record Origin>, <Event Type>, <Event Code>, <{Event} Date>, <{Event} Time>, <{Corresponding CMV} Order Number>, <{ User} Order Number {for Record Originator}>, <{Current} Cycle Used>, <Line Data Check Value> <CR>

4.8.2.1.14   ELD Event List for Change in Operating Zone

This segment must list the ELD event records with event type 22 (Change in Operating Zone as described in provision 4.5.1.10 of this Standard) for the inspected driver for the time period for which this file is generated. It must be rank ordered with the most recent record on top in accordance with the date and time fields of the record. This segment has a variable number of rows depending on the number of Change in Operating Zone records recorded over the time period for which this file is generated. This segment must start with the following title:

- Change in Operating Zone Events: <CR>

Each subsequent row must have the following data elements:

- <Event Sequence ID Number>, <Event Record Status>, <Event Record Origin>, <Event Type>, <Event Code>, <{Event} Date>, <{Event} Time>, <{Event} Latitude>, <{Event} Longitude>, <Distance Since Last Valid Coordinates>, <{Corresponding CMV} Order Number>, <{ User} Order Number {for Record Originator}>, <{Current} Operating zone>, <Line Data Check Value> <CR>

4.8.2.1.15   ELD Event List for Additional Hours Not Recorded

This segment must list the ELD event records with event type 23 (Additional Hours Not Recorded as described in provision 4.5.1.11 of this Standard) for the inspected driver for the time period for which this file is generated. It must be rank ordered with the most recent record on top in accordance with the date and time fields of the record. This segment has a variable number of rows depending on the number of records for Additional Hours Not Recorded that were recorded over the time period for which this file is generated. This segment must start with the following title:

- Additional Hours not recorded Events: <CR>

Each subsequent row must have the following data elements:

- <Event Sequence ID Number>,<Event Record Status>,<Event Record Origin>,<Event Type>, <Event Code>, <Date {of the day}>, <{Beginning of work shift} Time>, <{End of work shift} Time>, <Total Hours {logged in off-duty}>, <Total Hours {logged in on-duty}>, <{Corresponding CMV} Order Number>, <{ User} Order Number {for Record Originator}>, <Line Data Check Value> <CR>

4.8.2.1.16   File Data Check Value

This segment lists the file data check value as specified in provision 4.4.5.3 of this Standard. This segment includes a single line as follows:

- End of File: <CR>
- <File Data Check Value><CR>

4.8.2.2 ELD Output File Name Standard

For each electronic document and data file specified in provision 4.8.2.1 of this Standard, the ELD must follow the 25 character-long filename standard for transfer of electronic documents to authorized safety officials:

a) The first five position characters of the filename must correspond to the first five letters of the last name of the driver for whom the file is compiled. If the last name of the driver is shorter than five characters, remaining positions must use the character ''_'' [underscore] as a substitute character. For example, if the last name of the driver is ''Lee'', the first five characters of the ELD output file must feature ''Lee_ _''.

b) The sixth and seventh position characters of the filename must correspond to the last two digits of the driver's license number for the driver for whom the file is compiled.

c) The eighth and ninth position characters of the filename must correspond to the sum of all individual numeric digits in the driver's license number for the driver for whom the file is compiled. The result must be represented in two-digit format. If the sum value exceeds 99, use the last two digits of the result. For example, if the result equals ''113'', use ''13''. If the result is less than 10, use 0 as the first digit. For example, if the result equals ''5'', use ''05''.

d) The tenth through fifteenth position characters of the filename must correspond to the date the file is created. The result must be represented in six-digit format ''MMDDYY'' where ''MM'' represents the month, '''DD'' represents the day, and ''YY'' represents the last two digits of the year. For example, February 5, 2013, must be represented as ''020513''.

e) The sixteenth position character of the filename must be a hyphen ''-''.

f) The seventeenth through twenty-fifth position characters of the filename must, by default, be ''000000000'' but each of these nine digits can be freely configured by the motor carrier or the ELD provider to be a number between 0 and 9 or a character between A and Z to be able to produce distinct files—if or when necessary—that may otherwise be identical in filename as per the convention described in this provision. ELD providers or motor carriers do not need to disclose details of conventions they may use for configuring the seventeenth through twenty-fifth digits of the filename.

4.9 Data Transfer Capability Requirements

An ELD must be able to present the captured ELD RODS of a driver in the standard electronic format as described below, and transfer the ELD output files(s) specified in provision 4.8.2. of this Standard to an authorized safety official, on demand, for inspection purposes.

4.9.1 Transfer of Electronic Files During Roadside Safety Inspections

a) On demand during a roadside safety inspection, an ELD must produce ELD RODS for the current day and each day during the required previous days specified in current HOS regulations, and compliant with the ELD output file requirements specified in provision 4.8.2 of this Standard.

b) When a driver uses the single-step driver interface, as described in provision 4.3.2.4 of this Standard, to indicate that the ELD compile and transfer the driver's ELD RODS to authorized safety officials, the ELD must transfer the generated ELD output file(s) to the computing environment used by authorized safety officials via the standards referenced in this provision. To meet requirements for ELD output file(s) transfer during roadside inspections, the ELD must support at least the email transfer method.

c) In addition to the email transfer method specified in provision 4.9.1 (b) of this Standard, the ELD may also include any of the following local transfer method:

    (1) USB2 (incorporated by reference, see provision 6), or

    (2) Bluetooth (incorporated by reference, see provision 6).

d) An ELD must certify proper operation of each transfer mechanism supported by the ELD, as specified in provision 4.6.1.7 of this Standard.

4.9.2 Motor Carrier Data Reporting

a) An ELD must be capable of retaining copies of electronic ELD RODS for the prescribed retention period as per HOS regulations.

b) An ELD must produce, on demand, an electronic document or a series of electronic documents of ELD RODS for a subset of its drivers, a subset of its vehicles, and for a subset of the prescribed retention period, and may be either on a printout or in electronic format as specified in provision 4.8.2.1 of this Standard.

c) At a minimum, an ELD must be able to transfer the ELD RODS electronically by one of the following transfer mechanisms:

    (1) E-mail as specified in provision 4.10.1.2 of this Standard, or

    (2) USB 2.0 as specified in provision 4.10.1.3 of this Standard, or

    (3) Bluetooth as specified in provision 4.10.1.4 of this Standard.

4.10 Communications Standards for the Transmittal of Data Files from ELDs

ELDs must transmit ELD RODS electronically in accordance with the ELD output file format specified in provision 4.8.2.1 of this Standard and must be capable of a one-way transfer of these RODS to authorized safety officials upon request as specified in provision 4.9 of this Standard.

4.10.1 Communications Standards for the Transmittal of Data Files from ELDs

For each type of data transfer mechanism, an ELD must follow the specifications in this provision.

4.10.1.1 [Reserved]

4.10.1.2 Wireless Data Transfer Through E-Mail

a) The ELD must attach the ELD output file specified in provision 4.8.2 of this Standard to an email message to be sent using the SMTP as specified in RFC 5321 (incorporated by reference in provision 6 of this Standard), to a specific email address, which will be provided by authorized safety officials when requested during a roadside inspection.

b) The ELD output file must have the format specified in provision 4.8.2.1 of this Standard and must be encrypted using the S/MIME as specified in RFC 5751 (incorporated by reference in provision 6 of this Standard), and the RSA algorithm as specified in RFC 4056 (incorporated by reference in provision 6 of this Standard), with the public key compliant with the Canadian PKI Infrastructure to be provided to the ELD provider at the time of the ELD certification process. The content must be encrypted using AES in FIPS Publication 197 (incorporated by reference in provision 6 of this Standard), and RFC 3565 (incorporated by reference in provision 6 of this Standard).

c) The email must be formatted using the Internet Message Format as specified in RFC 5322 (incorporated by reference in provision 6 of this Standard), as follows:

Element	Format
To	<Address Provided for central server or by authorized safety officials during a roadside inspection>
From	<Desired return address for confirmation>
Subject	ELD RODS from <ELD Certification ID> <':'> <ELD Identifier>
Body	<Output File Comment>
Attachment	MIME encoded AES–256 encrypted file with <filename>. <Date string>. <unique identifier>.

d) A message confirming receipt of the ELD output file will be sent to the email address specified in the email. The ELD output filename must follow the requirements specified in provision 4.8.2.2 of this Standard.

4.10.1.3 Data Transfer via USB 2.0

a) ELDs certified for the USB data transfer mechanism must be capable of transferring ELD RODS using the Universal Serial Bus Specification (Revision 2.0) (incorporated by reference in provision 6 of this Standard).

b) Each ELD technology must implement a single USB-compliant interface with the necessary adaptors for a Type A connector. The USB interface must implement the Mass Storage class (08h) for driverless operation, to comply with IEEE standard 1667-2009, (incorporated by reference in provision 6 of this Standard).

c) The ELD must be capable of providing power to a standard USB-compatible drive.

d) An ELD must re-authenticate the driver prior to saving the driver's ELD output file(s) to an external device.

e) On initiation by an authenticated driver, an ELD must be capable of saving ELD output file(s) to USB-compatible drives (AES, in FIPS Publication 197, incorporated by reference in provision 6 of this Standard) that are provided by authorized safety officials during an inspection.

4.10.1.4   Data Transfer via Bluetooth®

a) Bluetooth SIG Specification of the Bluetooth System covering core package version 2.1 + EDR (incorporated by reference in provision 6 of this Standard) must be followed. ELDs using this standard must be capable of displaying a Personal Identification Number generated by the Bluetooth application profile for bonding with other devices.

b) Upon request of an authorized official, the ELD must become discoverable by the authorized safety officials' Bluetooth-enabled computing platform, and generate a random code, which the driver must share with the official.

c) An ELD must re-authenticate the driver prior to transmitting the driver's ELD output file(s) to an external device.

d) The ELD must connect to the roadside authorized safety officials' technology via Bluetooth and transfer the required ELD output file(s) to the Bluetooth compatible device (AES, in FIPS Publication 197, incorporated by reference in provision 6 of this Standard).

4.10.2   Motor Carrier Data Transmission

Regardless of the roadside transmission option supported by an ELD, ELD RODS are to be retained and must be able to transmit enforcement-specified historical data for their drivers using one of the methods specified under provision 4.9.2 of this Standard.

a) The email option must follow the specifications described under provision 4.10.1.2 of this Standard.

b) The USB option must follow the specifications of Universal Serial Bus Specification, revision 2.0 (incorporated by reference in provision 6 of this Standard) and described in provision 4.10.1.3 of this Standard.

c) Bluetooth must follow the specifications incorporated by reference in provision 6 of this Standard and described in provision 4.10.1.4 of this Standard.

5.   [RESERVED]

6. REFERENCES

a) Bluetooth SIG, Inc. 5209 Lake Washington Blvd. NE., Suite 350, Kirkland, WA 98033, https://www.bluetooth.com, (425) 691–3535.

    (1) Bluetooth SIG, Inc., Specification of the Bluetooth System: Wireless Connections Made Easy, Covered Core Package version 2.1 + EDR, volumes 0 through 4, approved July 26, 2007, IBR in provisions 4.9.1, 4.9.2, 4.10.1.4, 4.10.2 of this Standard.

    (2) [Reserved]

b) Institute of Electrical and Electronic Engineers (IEEE) Standards Association. 445 Hoes Lane, Piscataway, NJ 08854–4141, http://standards.ieee.org/index.html, (732) 981–0060

    (1) IEEE Std 1667–2009, IEEE Standard for Authentication in Host Attachments of Transient Storage Devices, approved 11 November 2009, IBR in provision 4.10.1.3 of this Standard.

    (2) [Reserved]

c) Internet Engineering Task Force (IETF). C/o Association Management Solutions, LLC (AMS) 48377 Freemont Blvd., Suite 117, Freemont, CA 94538, (510) 492–4080.

    (1) IETF RFC 3565, Use of the Advanced Encryption Standard (AES) Encryption Algorithm in Cryptographic Message Syntax (CMS), approved July 2003, IBR in provision 4.10.1.2 of this Standard.

    (2) IETF RFC 4056, Use of the RSASSA–PSS Signature Algorithm in Cryptographic Message Syntax (CMS), approved June 2005, IBR in provision 4.10.1.2 of this Standard.

    (3) IETF RFC 5321, Simple Mail Transfer Protocol, approved October 2008, IBR in provision 4.10.1.2 of this Standard.

    (4) IETF RFC 5322, Internet Message Format, approved October 2008, IBR in provision 4.10.1.2 of this Standard.

    (5) IETF RFC 5751, Secure/Multipurpose Internet Mail Extensions (S/MIME) Version 3.2, Message Specification, approved January 2010, IBR in provision 4.10.1.2 of this Standard.

d) National Institute of Standards and Technology (NIST). 100 Bureau Drive, Stop 1070, Gaithersburg, MD 20899–1070, http://www.nist.gov, (301) 975–6478

    (1) Federal Information Processing Standards Publication (FIPS PUB) 197, Advanced Encryption Standard (AES), approved November 26, 2001, IBR in provisions 4.10.1.2 and 4.10.1.3 of this Standard

    (2) [Reserved]

e) Universal Serial Bus Implementers Forum (USBIF). 3855 SW. 153rd Drive, Beaverton, Oregon 97006, http://www.usb.org, (503) 619–0426.

    (1) USB Implementers Forum, Inc., Universal Serial Bus Specification, Revision 2.0, approved April 27, 2000, as revised through April 3, 2015, IBR in provisions 4.9.1, 4.9.2, 4.10.1.3, and 4.10.2 of this Standard.

    (2) [Reserved]

f) Canadian Council of Motor Transport Administrator (CCMTA), 1111 Prince of Wales Drive, Suite 404, Ottawa (ON), K2C 3T2, https://ccmta.ca/en/, (613) 736-1003

    (1) Canadian geo-location Data Base. https://www.ccmta.ca/en/national-safety-code/canadian-eld-standard IBR in provisions 4.4.2 and 7.29 of this Standard.

7. DATA ELEMENTS DICTIONARY

7.1 Day Starting Time

Description: This data element refers to the day starting time specified by the motor carrier for driver's home terminal.

Purpose: Identifies the bookends of the work day for the driver; makes ELD RODS consistent with current HOS regulations requirements.

Source: Motor carrier.

Used in: ELD account profile; ELD outputs.

Data Type: Programmed or populated on the ELD during account creation and maintained by the motor carrier to reflect true and accurate information for drivers.

Data Range: 000000 to 235959; first two digits 00 to 23; middle two digits and last two digits 00 to 59.

Data Length: 6 characters.

Data Format: <HHMMSS> Military time format, where ''HH'' refers to hours, ''MM'' refers to minutes, and ''SS'' refers to seconds; designation for start time expressed in time standard in effect at the driver's home terminal.

Disposition: Mandatory.

Examples: [060000], [073000], [180000].

7.2 Carrier Name

Description: This data element refers to the motor carrier's legal name for conducting commercial business.

Purpose: Provides a recognizable identifier about the motor carrier on viewable ELD outputs.

Source: Motor carrier.

Used in: ELD account profile.

Data Type: Programmed on the ELD or entered once during the ELD account creation process.

Data Range: Any alphanumeric combination.

Data Length: Minimum: 4; Maximum: 120 characters.

Data Format: <Carrier Name> as in <CCCC> to <CCCC. . . . . .CCCC>.

Disposition: Mandatory.

Example: [CONSOLIDATED TRUCKLOAD INC.].

7.3 [RESERVED]

7.4 CMV Power Unit Number

Description: This data element refers to the identifier the motor carrier uses for their CMVs in their normal course of business.

Purpose: Identifies the vehicle a driver drives while a driver's ELD records are recorded; Makes ELD RODS consistent with current HOS regulations requirements.

Source: Unique CMV identifiers a motor carrier uses in its normal course of business and includes on dispatch documents, or the license number of the power unit.

Used in: ELD event records; ELD output file.

Data Type: Programmed on the ELD or populated by the motor carrier or entered by the driver.

Data Range: Any alphanumeric combination.

Data Length: Minimum: 1; Maximum: 10 characters.

Data Format: <CMV Power Unit Number> as in <C> to <CCCCCCCCCC>.

Disposition: Mandatory for all CMVs driven while using an ELD.

Examples: [123], [00123], [BLUEKW123], [TX12345].

7.5 CMV VIN

Description: This data element refers to the manufacturer-assigned VIN for the CMV powered unit.

Purpose: Uniquely identifies the driven CMV not only within a motor carrier at a given time but across all CMVs sold within a 30-year rolling period.

Source: A robust unique CMV identifier standardized in North America.

Used in: ELD event records; ELD output file.

Data Type: Retrieved from the engine ECM via the vehicle databus.

Data Range: Either blank or 17 characters long as specified in CMVSS 115, or 18 characters long with first character assigned as ''-'' (dash) followed by the 17-character long VIN. Check digit, i.e., VIN character position 9, as specified in CMVSS 115 must imply a valid VIN.

Data Length: Blank or 17–18 characters.

Data Format: <CMV VIN> or <''-''> <CMV VIN> or <{blank}> as in <CCCCCCCCCCCCCCCCC>, or <-CCCCCCCCCCCCCCCCC> or <>.

Disposition: Mandatory for all ELDs linked to the engine ECM and when VIN is available from the engine ECM over the vehicle databus; otherwise optional. If optionally populated and source is not the engine ECM, precede VIN with the character ''-'' in records.

Examples: [1FUJGHDV0CLBP8834], [-FUJGHDV0CLBP8896], [].

7.6 Comment/Annotation

Description: This is a textual note related to a record, update, or edit capturing the comment or annotation a driver or authorized support personnel may input to the ELD.

Purpose: Provides ability for a driver to offer explanations to records, selections, edits, or entries.

Source: Driver or authorized support personnel.

Used in: ELD events; ELD outputs.

Data Type: Entered by the authenticated user via ELD's interface.

Data Range: Free form text of any alphanumeric combination.

Data Length: 0–60 characters if optionally entered; 4–60 characters if annotation is required and driver is prompted by the ELD.

Data Format: <Comment/Annotation> as in <{blank}> or <C> to <CCC. . . . . CCC>.

Disposition: Optional in general; Mandatory if prompted by ELD.

Examples: [], [Personal use. Driving to Restaurant in bobtail mode], [Forgot to switch to SB. Correcting here].

7.7 Data Diagnostic Event Indicator Status

Description: This is a Boolean indicator identifying whether the used ELD unit has an active data diagnostic event set for the authenticated driver at the time of event recording.

Purpose: Documents the snapshot of ELD's data diagnostic status for the authenticated driver at the time of an event recording.

Source: ELD internal monitoring functions.

Used in: ELD events; ELD outputs.

Data Type: Internally monitored and managed.

Data Range: 0 (no active data diagnostic events for the driver) or 1 (at least one active data diagnostic event set for the driver).

Data Length: 1 character.

Data Format: <Data Diagnostic Event Indicator Status> as in <C>.

Disposition: Mandatory.

Examples: [0] or [1].

7.8 Date

Description: In combination with the variable ''Time'', this parameter stamps ELD records with a reference in time; even though date and time must be captured in UTC, event records must use date and time converted to the time zone in effect at the driver's home terminal as specified in provision 4.4.3.

Purpose: Provides ability to record the instance of recorded events, entries and edits.

Source: ELD's converted time measurement.

Used in: ELD events; ELD outputs.

Data Type: UTC date must be automatically captured by ELD; date in effect at the driver's home terminal must be calculated as specified in provision 4.4.3.

Data Range: Any valid date combination expressed in <MMDDYY> format where <MM> must be between 01 and 12, <DD> must be between 01 and 31, and <YY> must be between 00 and 99.

Data Length: 6 characters.

Data Format: <MMDDYY> where ''MM'' refers to months, ''DD'' refers to days of the month and ''YY'' refers to the last two digits of the calendar year.

Disposition: Mandatory.

Examples: [122815], [010114], [061228].

7.9 Distance Since Last Valid Coordinates

Description: Distance in whole kilometers traveled since the last valid latitude, longitude pair the ELD measured with the required accuracy.

Purpose: Provides ability to keep track of location for recorded events in cases of temporary position measurement outage.

Source: ELD internal calculations.

Used in: ELD events; ELD outputs.

Data Type: Kept track of by the ELD based on position measurement validity.

Data Range: An integer value between 0 and 9; If the distance traveled since the last valid coordinate measurement exceeds 9 kilometers; the ELD must enter the value as 9.

Data Length: 1 character.

Data Format: <Distance Since Last Valid Coordinates> as in <C>.

Disposition: Mandatory.

Examples: [0], [1], [5], [6].

7.10   Driver's License Issuing State

Description: This data element refers to the issuing State, Province or jurisdiction of the listed Driver's License for the ELD account holder.

Purpose: In combination with ''Driver's License Number'', it links the ELD driver account holder uniquely to an individual with driving credentials; ensures that only one driver account can be created per individual.

Source: Driver's license.

Used in: ELD account profile(s); ELD output file.

Data Type: Entered (during the creation of a new ELD account).

Data Range: To character abbreviation listed on Table 5 of this Standard.

Data Length: 2 characters.

Data Format: <Driver's License Issuing Jurisdiction> as in <CC>.

Disposition: Mandatory for all driver accounts created on the ELD; optional for ''non-driver'' accounts.

Examples: [QC], [ON], [MB].

7.11   Driver's License Number

Description: This data element refers to the unique Driver's License information required for each driver account on the ELD.

Purpose: In combination with driver's license issuing State, it links the ELD driver account holder to an individual with driving credentials; ensures that only one driver account can be created per individual.

Source: Driver's license.

Used in: ELD account profile(s); ELD output file.

Data Type: Entered (during the creation of a new ELD account).

Data Range: Any alphanumeric combination.

Data Length: Minimum: 1; Maximum: 20 characters.

Data Format: <Driver's License Number> as in <C> to <CCCCCCCCCCCCCCCCCCCC>.For ELD record keeping purposes, ELD must only retain characters in a Driver's License Number entered during an account creation process that are a number between 0–9 or a character between A–Z (non-case sensitive).

Disposition: Mandatory for all driver accounts created on the ELD; optional for ''non-driver'' accounts.

Examples: [SAMPLMJ065LD], [D000368210361], [198], [N02632676353666].

7.12   Driver's Location Description

Description: This is a textual note related to the location of the CMV input by the driver upon ELD's prompt.

Purpose: Provides ability for a driver to enter location information related to entry of missing records; provides ability to accommodate temporary positioning service interruptions or outage without setting positioning malfunctions.

Source: Driver, only when prompted by the ELD.

Used in: ELD events; ELD outputs.

Data Type: Entered by the authenticated driver when ELD solicits this information as specified in provision 4.3.2.7.

Data Range: Free form text of any alphanumeric combination.

Data Length: 5–60 characters.

Data Format: <CCCCC> to <CCC......CCC>.

Disposition: Mandatory when prompted by ELD.

Examples: [], [12 km North of North Bay, ON], [Vancouver, BC].

7.13   ELD Account Type

Description: An indicator designating whether an ELD account is a driver account or support personnel (non-driver) account.

Purpose: Enables authorized safety officials to verify account type specific requirements set forth in this Standard.

Source: ELD designated.

Used in: ELD outputs.

Data Type: Specified during the account creation process and recorded on ELD.

Data Range: Character ''D'', indicating account type ''Driver'', or ''S'', indicating account type ''motor carrier's support personnel'' (i.e. non-driver); ''Unidentified Driver'' account must be designated with type ''D''.

Data Length: 1 character.

Data Format: <C>.

Disposition: Mandatory.

Examples: [D], [S].

7.14 ELD Authentication Value

Description: An alphanumeric value that is unique to an ELD and verifies the authenticity of the given ELD.

Purpose: Provides ability to cross-check the authenticity of an ELD used in the recording of a driver's RODS during inspections.

Source: ELD provider-assigned value; includes a certificate component and a hashed component; necessary information related to authentication keys and hash procedures disclosed by the ELD provider during the ELD certification process.

Used in: ELD outputs.

Data Type: Calculated from the authentication key and calculation procedure privately distributed by the ELD provider to the certification entity during the ELD certification process.

Data Range: Alphanumeric combination.

Data Length: 16–32 characters.

Data Format: <CCCC………CCCC>.

Disposition: Mandatory.

Example: [D3A4506EC8FF566B506EC8FF566BDFBB].

7.15 ELD Identifier

Description: An alphanumeric identifier assigned by the ELD provider to the ELD model and software version that was certified.

Purpose: Provides ability to cross-check that the ELD used in the recording of a driver's RODS is certified through the ELD certification process.

Source: Assigned and submitted by the ELD provider during the ELD certification process of an ELD model and software version.

Used in: ELD outputs.

Data Type: Coded on the ELD by the ELD provider and disclosed to the certification entity during the ELD certification process.

Data Range: A six-character alphanumeric identifier using characters A–Z and number 0–9.

Data Length: 6 characters.

Data Format: <ELD Identifier> as in <CCCCCC>.

Disposition: Mandatory.

Examples: [1001ZE], [GAM112], [02P3P1].

7.16   ELD Provider

Description: An alphanumeric company name of the ELD provider disclosed during the ELD certification process.

Purpose: Provides ability to cross-check that the ELD used in the recording of a driver's RODS is certified through the ELD certification process.

Source: Assigned and submitted by the ELD provider during the ELD certification process.

Used in: ELD outputs.

Data Type: Coded on the ELD by the ELD provider and disclosed to the certification entity during the ELD certification process.

Data Range: Any alphanumeric combination.

Data Length: Minimum: 4; Maximum 120 characters.

Data Format: <ELD Provider> as in <CCCC> to <CCCC......CCCC>.

Disposition: Mandatory.

Examples: [ELD PROVIDER INC].

7.17   ELD Certification ID

Description: An alphanumeric identifier assigned to the ELD that was certified during the ELD certification process.

Purpose: Provides ability to cross-check that the ELD model and software version were certified.

Source: Received from the certification entity during the ELD certification process.

Used in: ELD outputs.

Data Type: Coded on the ELD by the provider.

Data Range: A four-character alphanumeric certification identifier using characters A–Z and numbers 0–9.

Data Length: 4 characters.

Data Format: <ELD certification ID> as in <CCCC>.

Disposition: Mandatory.

Examples: [ZA10], [QA0C], [FAZ2].

7.18   ELD Username

Description: This data element refers to the unique user identifier assigned to the account holder on the ELD to authenticate the corresponding individual; the individual may be a driver or a motor carrier's support personnel.

Purpose: Documents the user identifier assigned to the driver linked to the ELD account.

Source: Assigned by the motor carrier during the creation of a new ELD account.

Used in: ELD account profile; event records; ELD authentication process.

Data Type: Entered (during account creation and user authentication).

Data Range: Any alphanumeric combination.

Data Length: Minimum: 4; Maximum: 60 characters.

Data Format: <ELD Username> as in <CCCC> to <CCCC……CCCC>.

Disposition: Mandatory for all accounts created on the ELD.

Examples: [smithj], [100384], [sj2345], [john.smith].

7.19   Engine Hours

Description: This data element refers to the time the CMV's engine is powered in decimal hours with 0.1 hour (6-minute) resolution; this parameter is a placeholder for <{Total} Engine Hours>, which refers to the aggregated time of a vehicle's engine's activity since its inception, and used in recording ''engine power on'' and ''engine shut down'' events, and also for <{Elapsed} Engine Hours>, which refers to the elapsed time in the engine's activity in the given ignition power on cycle, and used in the recording of all other events.

Purpose: Provides ability to identify gaps in the driving of a CMV, when the vehicle's engine may be powered but the ELD may not; provides ability to cross check integrity of recorded data elements in events and prevent gaps in the recording of ELD.

Source: ELD measurement or sensing.

Used in: ELD events; ELD outputs.

Data Type: Acquired from the engine ECM or a comparable other source as allowed in provision 4.3.1.4 of this Standard.

Data Range: For <{Total} Engine Hours>, range is between 0.0 and 99,999.9; for <{Elapsed} Engine Hours>, range is between 0.0 and 99.9.

Data Length: 3–7 characters.

Data Format: <Engine Hours> as in <C.C> to <CCCCC.C>.

Disposition: Mandatory.

Examples: [0.0], [9.9], [346.1], [2891.4].

7.20   Event Code

Description: A dependent attribute on ''Event Type'' parameter that further specifies the nature of the change indicated in ''Event Type''; this parameter indicates the new status after the change.

Purpose: Provides ability to code the specific nature of the change electronically.

Source: ELD internal calculations.

Used in: ELD event records; ELD outputs.

Data Type: ELD recorded and maintained event attribute in accordance with the type of event and nature of the new status being recorded.

Data Range: Dependent on the ''Event Type'' as indicated on Table 6 of this Standard.

Data Length: 2 characters.

Data Format: <Event Type> as in <CC>.

Disposition: Mandatory.

Examples: [0], [1], [4], [22].

7.21   Event Data Check Value

Description: A hexadecimal ''check'' value calculated in accordance with the procedure outlined in provision 4.4.5.1 of this Standard and attached to each event record at the time of recording.

Purpose: Provides ability to identify cases where an ELD event record may have been inappropriately modified after its original recording.

Source: ELD internal.

Used in: ELD events; ELD output file.

Data Type: Calculated by the ELD in accordance with provision 4.4.5.1 of this Standard.

Data Range: A number between hexadecimal 00 (decimal 0) and hexadecimal FF (decimal 255).

Data Length: 2 characters.

Data Format: <Event Data Check Value> as in <CC>.

Disposition: Mandatory.

Examples: [05], [CA], [F3].

7.22   Event Record Origin

Description: An attribute for the event record indicating whether it is automatically recorded, or edited, entered or accepted by the driver, requested by another authenticated user, or assumed from unidentified driver profile.

Purpose: Provides ability to track origin of the records.

Source: ELD internal calculations.

Used in: ELD event records; ELD outputs.

Data Type: ELD recorded and maintained event attribute in accordance with the procedures outlined in provisions 4.4.4.2.2 to 4.4.4.2.6 of this Standard.

Data Range: 1, 2, 3 or 4 as described on Table 7 of this Standard.

Data Length: 1 character.

Data Format: <Event Record Origin> as in <C>.

Disposition: Mandatory.

Examples: [1], [2], [3], [4].

7.23   Event Record Status

Description: An attribute for the event record indicating whether an event is active or inactive and further, if inactive, whether it is due to a change or lack of confirmation by the driver or due to a driver's rejection of change request.

Purpose: Provides ability to keep track of edits and entries performed over ELD records while retaining original records.

Source: ELD internal calculations.

Used in: ELD event records; ELD outputs.

Data Type: ELD recorded and maintained event attribute in accordance with the procedures outlined in provisions 4.4.4.2.2 to 4.4.4.2.6 of this Standard.

Data Range: 1, 2, 3 or 4 as described on Table 8 of this Standard.

Data Length: 1 character.

Data Format: <Event Record Status> as in <C>.

Disposition: Mandatory.

Examples: [1], [2], [3], [4].

7.24   Event Sequence ID Number

Description: This data element refers to the serial identifier assigned to each required ELD event as described in provision 4.5.1 of this Standard.

Purpose: Provides ability to keep a continuous record, on a given ELD, across all users of that ELD.

Source: ELD internal calculations.

Used in: ELD event records; ELD outputs.

Data Type: ELD maintained; incremented by 1 for each new record on the ELD; continuous for each new event the ELD records regardless of owner of the records.

Data Range: 0 to FFFF; initial factory value must be 0; after FFFF hexadecimal (decimal 65535), the next Event Sequence ID number must be 0.

Data Length: 1–4 characters.

Data Format: <Event Sequence ID Number> as in <C> to <CCCC>.

Disposition: Mandatory.

Examples: [1], [1F2C], p2D3], [BB], [FFFE].

7.25   Event Type

Description: An attribute specifying the type of the event record.

Purpose: Provides ability to code the type of the recorded event in electronic format.

Source: ELD internal calculations.

Used in: ELD event records; ELD outputs.

Data Type: ELD recorded and maintained event attribute in accordance with the type of event being recorded.

Data Range: 1–23 as described on Table 9 of this Standard.

Data Length: 2 characters.

Data Format: <Event Type> as in <CC>.

Disposition: Mandatory.

Examples: [1], [5], [4], [22].

7.26   Exempt Driver Configuration

Description: A parameter indicating whether the motor carrier configured a driver's profile to claim exemption from ELD use.

Purpose: Provides ability to code the motor carrier-indicated exemption for the driver electronically.

Source: Motor carrier's configuration for a given driver.

Used in: ELD outputs.

Data Type: Motor carrier configured and maintained parameter in accordance with the qualification requirements.

Data Range: E (exempt) or 0 (number zero).

Data Length: 1 character.

Data Format: <Exempt Driver Configuration> as in <C>.

Disposition: Mandatory.

Examples: [E], [0].

7.27   File Data Check Value

Description: A hexadecimal ''check'' value calculated in accordance with the procedure outlined in provision 4.4.5.3 of this Standard and attached to each ELD output file.

Purpose: Provides ability to identify cases where an ELD file may have been inappropriately modified after its original creation.

Source: ELD internal.

Used in: ELD output files.

Data Type: Calculated by the ELD in accordance with provision 4.4.5.3 of this Standard.

Data Range: A number between hexadecimal 0000 (decimal 0) and hexadecimal FFFF (decimal 65535).

Data Length: 4 characters.

Data Format: <File Data Check Value> as in <CCCC>.

Disposition: Mandatory.

Examples: [F0B5], [00CA], [523E].

7.28   First Name

Description: This data element refers to the given name of the individual holding an ELD account.

Purpose: Links an individual to the associated ELD account.

Source: Driver's license for driver accounts; driver's license or government issued ID for support personnel accounts.

Used in: ELD account profile(s); ELD outputs (display and file).

Data Type: Entered (during the creation of a new ELD account).

Data Range: Any alphanumeric combination.

Data Length: Minimum: 2; Maximum: 30 characters.

Data Format: <First Name> as in <CC> to <CC......CC> where ''C'' denotes a character.

Disposition: Mandatory for all accounts created on the ELD.

Example: [John].

7.29   Geo-Location

Description: A descriptive indicator of the CMV position in terms of a distance and direction to a recognizable location derived from a database that contains all locations (cities, towns, villages, municipalities, etc.) listed in the latest Canadian Geo-Location database available on the CCMTA website and referenced in provision 6 of this Standard.

Purpose: Provide recognizable location information on a display or printout to users of the ELD.

Source: ELD internal calculations as specified in provision 4.4.2 of this Standard.

Used in: ELD display or printout.

Data Type: Identified from the underlying latitude/longitude coordinates by the ELD.

Data Range: Contains four segments in one text field; a recognizable location driven from a database containing—at a minimum— all locations (listed in the Canadian Geo-Location database available on the CCMTA website) in text format containing a location name and the province, territory or state abbreviation, distance from this location and direction from this location.

Data Length: Minimum: 5; Maximum: 60 characters.

Data Format: <Distance from {identified} Geo-location> <'km '> <Direction from {identified} Geo-location> <' '> <Place name of {identified} Geo-location> <' '> < province, territory or State Abbreviation {of identified} Geo Location> where:

<Distance from {identified} Geo-location> must either be <{blank}> or <C> or <CC> or <CCC> where the up-to three-character number specifies absolute distance between identified geo-location and event location;

<Direction from {identified} Geo-location> must either be <{blank}> or <C> or <CC> or <CCC>, must represent direction of event location with respect to the identified geo-location, and must take a value listed on Table 10 of this Standard; <Place name of {identified} Geo-location> must be the text description of the identified reference location; < province, territory or State Abbreviation {of identified} Geo Location> must take values listed on Table 5 of this Standard.

Overall length of the ''Geo-location'' parameter must not be longer than 60 characters long.

Disposition: Mandatory.

Examples: [2 km ESE Toronto ON], [1 km SE Montreal QC], [11 km NNW Squamish BC].

7.30   Last Name

Description: This data element refers to the last name of the individual holding an ELD account.

Purpose: Links an individual to the associated ELD account.

Source: Driver's license for driver accounts; driver's license or government issued ID for support personnel accounts.

Used in: ELD account profile(s); ELD outputs (display and file).

Data Type: Entered (during the creation of a new ELD account).

Data Range: Any alphanumeric combination.

Data Length: Minimum: 2; Maximum: 30 characters.

Data Format: <Last Name> as in <CC> to <CC.....CC>.

Disposition: Mandatory for all accounts created on the ELD.

Example: [Smith].

7.31   Latitude

Description: An angular distance in degrees north and south of the equator.

Purpose: In combination with the variable ''Longitude'', this parameter stamps records requiring a position attribute with a reference point on the face of the earth.

Source: ELD's position measurement.

Used in: ELD events; ELD outputs.

Data Type: Latitude and Longitude must be automatically captured by the ELD.

Data Range: -90.00 to 90.00 in decimal degrees (two decimal point resolution) in records requiring positioning information; latitudes north of the equator must be specified by the absence of a minus sign (-) preceding the digits designating degrees; latitudes south of the Equator must be designated by a minus sign (-) preceding the digits designating degrees.

Data Length: 4 to 6 characters.

Data Format: First character: [<'-'> or <{blank}>]; then [<C> or <CC>]; then <'.'>; then [<CC>].

Disposition: Mandatory.

Examples: [-15.68], [38.89], [5.07], [-6.11].

7.32   Line Data Check Value

Description: A hexadecimal ''check'' value calculated in accordance with procedure outlined in provision 4.4.5.2 of this Standard and attached to each line of output featuring data at the time of ELD output file being generated.

Purpose: Provides ability to identify cases where an ELD output file may have been inappropriately modified after its original generation.

Source: ELD internal.

Used in: ELD output file.

Data Type: Calculated by the ELD in accordance with provision 4.4.5.2 of this Standard.

Data Range: A number between hexadecimal 00 (decimal 0) and hexadecimal FF (decimal 255).

Data Length: 2 characters.

Data Format: <Line Data Check Value> as in <CC>.

Disposition: Mandatory.

Examples: [01], [A4], [CC].

7.33   Longitude

Description: An angular distance in degrees measured on a circle of reference with respect to the zero (or prime) meridian; The prime meridian runs through Greenwich, England.

Purpose: In combination with the variable ''Latitude'', this parameter stamps records requiring a position attribute with a reference point on the face of the earth.

Source: ELD's position measurement.

Used in: ELD events; ELD outputs.

Data Type: Latitude and Longitude must be automatically captured by the ELD.

Data Range: -179.99 to 180.00 in decimal degrees (two decimal point resolution) in records requiring positioning information; longitudes east of the prime meridian must be specified by the absence of a minus sign (-) preceding the digits designating degrees of longitude; longitudes west of the prime meridian must be designated by minus sign (-) preceding the digits designating degrees.

Data Length: 4 to 7 characters.

Data Format: First character: [<'-'> or <{blank}>]; then [<C>, <CC> or <CCC>]; then <'.'>; then [<CC>].

Disposition: Mandatory.

Examples: [-157.81], [-77.03], [9.05], [-0.15].

7.34   Malfunction and Diagnostic Code

Description: A code that further specifies the underlying malfunction or data diagnostic event.

Purpose: Enables coding the type of malfunction and data diagnostic event to cover the standardized set in Table 4 of this Standard.

Source: ELD internal monitoring.

Used in: ELD events; ELD outputs.

Data Type: Recorded by ELD when malfunctions and data diagnostic events are set or reset.

Data Range: As specified in Table 4 of this Standard.

Data Length: 1 character.

Data Format: <Malfunction/Diagnostic Code> as in <C>.

Disposition: Mandatory.

Examples: [1], [5], [P], [L].

7.35   Malfunction Indicator Status

Description: This is a Boolean indicator identifying whether the used ELD unit has an active malfunction set at the time of event recording.

Purpose: Documents the snapshot of ELD's malfunction status at the time of an event recording.

Source: ELD internal monitoring functions.

Used in: ELD events; ELD outputs.

Data Type: Internally monitored and managed.

Data Range: 0 (no active malfunction) or 1 (at least one active malfunction).

Data Length: 1 character.

Data Format: <Malfunction Indicator Status> as in <C>.

Disposition: Mandatory.

Examples: [0] or [1].

7.36   Cycle Used

Description: This data element refers to the cycle 1 (7 days) or cycle 2 (14 days) used to compute cumulative duty hours.

Purpose: Provides ability to apply the current HOS regulations accordingly.

Source: Motor carrier or driver.

Used in: ELD account profile; ELD outputs, ELD events.

Data Type: Entered by the motor carrier during account creation process or selected by the driver.

Data Range: 7 or 14

Data Length: 2 characters.

Data Format: <Cycle used> as in <CC>.

Disposition: Mandatory.

Examples: [7], [14].

7.37   Order Number

Description: A continuous integer number assigned in the forming of a list, starting at 1 and incremented by 1 for each unique item on the list.

Purpose: Allows for more compact report file output generation avoiding repetitious use of CMV identifiers and usernames affected in records.

Source: ELD internal.

Used in: ELD outputs, listing of users and CMVs referenced in ELD RODS.

Data Type: Managed by ELD.

Data Range: Integer between 1 and 99.

Data Length: 1–2 characters.

Data Format: <Order Number> as in <C> or <CC>.

Disposition: Mandatory.

Examples: [1], [5], [11], [28].

7.38   Output File Comment

Description: A textual field that may be populated with information pertaining to the created ELD output file; An authorized safety official may provide a key phrase or code to be included in the output file comment, which may be used to link the requested data to an inspection, inquiry, or other enforcement action; if provided to the driver by an authorized safety official, it must be entered into the ELD and included in the exchanged dataset as specified.

Purpose: The output file comment field provides an ability to link submitted data to an inspection, inquiry, or other enforcement action, if deemed necessary; further, it may also link a dataset to a vehicle, driver, carrier, and/or ELD that may participate in voluntary future programs that may involve exchange of ELD data.

Source: Enforcement personnel or driver or motor carrier.

Used in: ELD outputs.

Data Type: If provided, output file comment is entered or appended to the ELD dataset prior to submission of ELD data to enforcement.

Data Range: Blank or any alphanumeric combination specified and provided by an authorized safety official.

Data Length: 0–60 characters.

Data Format: <Output File Comment>, either <{blank}>, or <C> thru <CCCC……CCCC>.

Disposition: Mandatory.

Examples: [], [3BHG701015], [113G1EFW02], [7353930].

7.39   [RESERVED]

7.40   Time

Description: In combination with the variable ''Date'', this parameter stamps records with a reference in time; even though date and time must be captured in UTC, event records must use date and time converted to the time zone in effect at the driver's home terminal as specified in provision 4.4.3 of this Standard.

Purpose: Provides ability to record the instance of recorded events, entries and edits.

Source: ELD's converted time measurement.

Used in: ELD events; ELD outputs.

Data Type: UTC time must be automatically captured by ELD; time in effect at the driver's home terminal must be calculated as specified in provision 4.4.3 of this Standard.

Data Range: Any valid date combination expressed in <HHMMSS> format where <HH> must be between 00 and 23, <MM> and <SS> must be between 00 and 59.

Data Length: 6 characters.

Data Format: <HHMMSS> where ''HH'' refers to hours of the day, ''MM'' refers to minutes, and ''SS'' refers to seconds.

Disposition: Mandatory.

Examples: {070111}, {001259}, {151522}, {230945}.

7.41   Time Zone Offset from UTC

Description: This data element refers to the offset in time between UTC time and the time standard in effect at the driver's home terminal.

Purpose: Establishes the ability to link records stamped with local time to a universal reference.

Source: Calculated from measured variable <{UTC} Time> and <{Time Standard in Effect at driver's home terminal} Time>; Maintained together with ''Day Starting Time'' parameter by the motor carrier or tracked automatically by ELD.

Used in: ELD account profile; ELD event: Driver's certification of own RODS.

Data Type: Programmed or populated on the ELD during account creation and maintained by the motor carrier or ELD to reflect true and accurate information for drivers. This parameter must adjust for Daylight Saving Time changes in effect at the driver's home terminal.

Data Range: Any valid date combination expressed in <HHMM> format where <HH> must be between 03 and 08, and <MM> must be 00 or 30.

Data Length: 4 characters.

Data Format: <Time Zone Offset from UTC> as in <HHMM> where ''HH'' and ''MM'' refer to hours and minutes in difference; omit sign.

Disposition: Mandatory.

Examples: {0400}, {0500}, {0330}.

7.42   Trailer Number(s)

Description: This data element refers to the identifier(s) the motor carrier uses for the trailers in their normal course of business.

Purpose: Identifies the trailer(s) a driver is pulling while a driver's ELD records are recorded; makes ELD RODS consistent with current HOS regulations requirements.

Source: Unique trailer identifiers a motor carrier uses in their normal course of business and includes on dispatch documents, or the license number of each towed unit; trailer number(s) must be updated each time hauled trailers change.

Data Type: Automatically captured by the ELD or populated by the motor carrier or entered by the driver; must be updated each time the hauled trailer(s) change.

Data Range: Any alphanumeric combination.

Data Length: Minimum: blank; Maximum: 32 characters (3 trailer numbers each maximum 10 characters long, separated by spaces).

Data Format: Trailer numbers; separated by space in case of multiple trailers hauled at one time; field to be left ''blank'' for non-combination vehicles (such as a straight truck or bobtail tractor).

<Trailer Unit Number {#1}><' '><Trailer Unit Number {#2}> <' '><Trailer Unit Number {#3}> as in <{blank}> to <CCCCCCCCCC CCCCCCCCCC CCCCCCCCCC>.

Disposition: Mandatory when operating combination vehicles.

Examples: {987}, {00987 PP2345}, {BX987 POP712 10567}, {TX12345 LA22A21}.

7.43   Vehicle Distance

Description: This data element refers to the distance traveled using the CMV in whole kilometers; this parameter is a placeholder for <{Total} Vehicle Distance>, which refers to the odometer reading and is used in recording <{Accumulated} Vehicle Distance>, which refers to the accumulated distance in the given ignition power on cycle and is used in the recording of all other events.

Purpose: Provides ability to track distance traveled while driving the CMV in each duty status. Total distance traveled within a day is a required field in current HOS regulations.

Source: ELD measurement or sensing.

Used in: ELD events; ELD outputs.

Data Type: Acquired from the engine ECM or a comparable other source as allowed in provision 4.3.1.3 of this Standard.

Data Range: For <{Total} Vehicle Distance >, range is between 0 and 9,999,999; for <{Accumulated} Vehicle Distance >, range is between 0 and 9,999.

Data Length: 1–7 characters.

Data Format: <Vehicle Distance > as in <C> to <CCCCCCC>.

Disposition: Mandatory.

Examples: [99], [1004566], [0], [422].

7.44   Off-Duty Time Deferral Status

Description: This data element states that the driver is deferring off-duty time and clearly indicates whether the driver is driving under day one or day two of that time.

Purpose: Identifies the "day one" or "day two" of the work day for the driver; makes ELD RODS consistent with current HOS regulations requirements.

Source: driver.

Used in: ELD events; ELD outputs.

Data Type: ELD internal.

Data Range: 0 (none) or 1 (day one) or 2 (day two).

Data Length: 1 character.

Data Format: < Off-Duty Time Deferral Status> as in <C>.

Disposition: Mandatory.

Examples: [0], [1], [2].

7.45   Off-Duty Time Deferred

Description: This data element refers to the off-duty time deferred by the driver.

Purpose: Identifies the off-duty time deferred from "day one" to "day two" by the driver; makes ELD RODS consistent with current HOS regulations requirements.

Source: driver, only when prompted by the ELD.

Used in: ELD events; ELD outputs.

Data Type: entered by the driver.

Data Range: Any time allowed under current HOS regulations and expressed in <HHMM> format where ''HH'' refers to hours and ''MM'' refers to minutes.

Data Length: 4 characters.

Data Format: <Off-Duty Time Deferred> as in <HHMM> where <HH> must be between 00 and 02, <MM> must be between 00 and 59.

Disposition: Mandatory.

Examples: [0030], [0130], [0200].

7.46   Operating Zone

Description: This data element refers to the operating zone (south or north of latitude 60°N) used to compute cumulative duty hours.

Purpose: Provides ability to apply the current HOS regulations accordingly.

Source: populated by the motor carrier or entered by the driver.

Used in: ELD outputs, ELD events.

Data Type: Entered by the motor carrier during account creation process or entered by the driver.

Data Range: 1 (south of latitude 60°N in Canada) or 2 (north of latitude 60°N in Canada) or 3 (United States).

Data Length: 1 character.

Data Format: <Operating Zone> as in <C>.

Disposition: Mandatory.

Examples: [1], [2], [3].

7.47   [RESERVED]

7.48   Motor Carrier's Address

Description: This data element refers to the motor carrier's addresses. This parameter is a placeholder for <{Home Terminal} Address>, which refers to the address of the home terminal location defined by the motor carrier, and <{Principal place of Business} Address>, which refers to address of the principal place of business defined by the motor carrier.

Purpose: Identifies the home terminal and principal place of business addresses (2 addresses, either identical or different) of every motor carrier by whom the driver was employed or otherwise engaged during that day. Makes ELD RODS consistent with current HOS regulations requirements.

Source: Motor carrier.

Used in: ELD account profile, ELD outputs.

Data Type: Programmed on the ELD or entered once during the ELD account creation process.

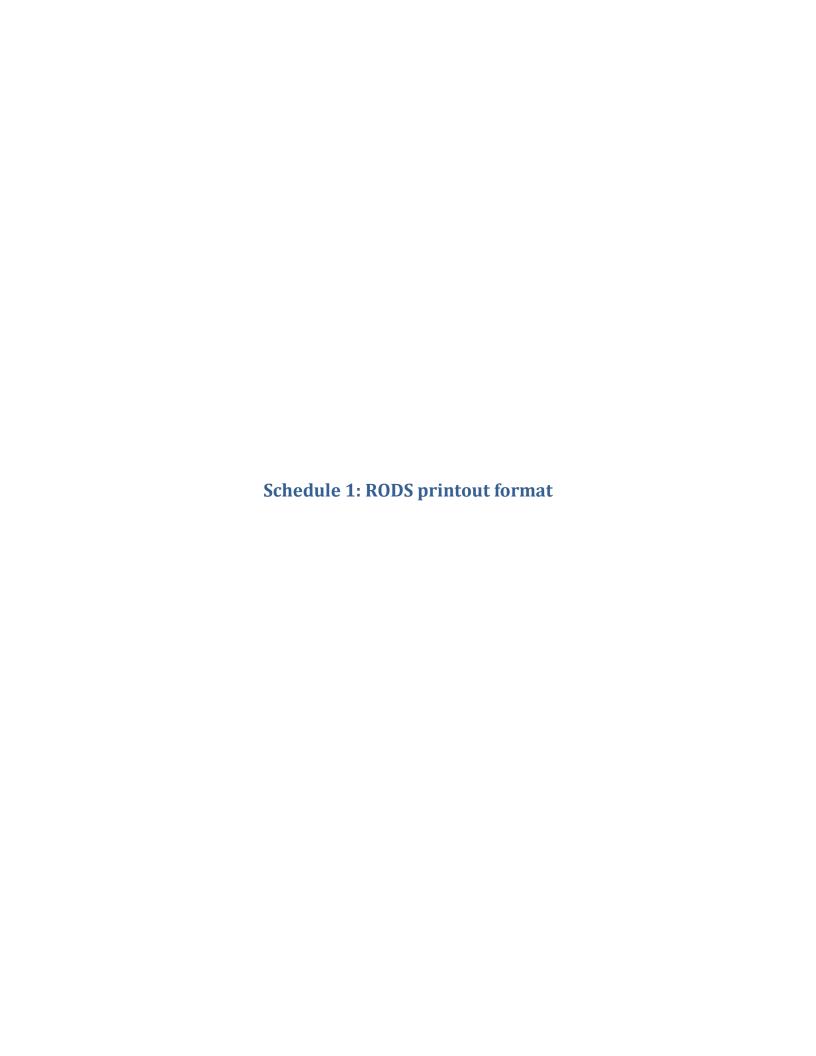Data Range: For <{Home Terminal} Address> and <{Principal place of Business} Address>, any alphanumeric combination.

Data Length: 60-120 characters.

Data Format: <Address> as in < CCCC. . . . . .CCCC >.

Disposition: Mandatory.

Example: [1234 Industrial St., Montreal, QC, H1C 1M1].

Schedule 1: RODS printout format

Printout Example – Header

Date of RODS	Day Starting Time	Time Zone	Current Location (latitude, longitude)			Comment	Current Date and Time
19 Nov. 2018	Midnight	EST (UTC-05:00)	6 km NNE Cornwall, ON (45.06, -74.68)			Officer W. J. Thompson, ID 17-0123	22 Nov. 2018 09:34:21
Driver Name (Last, First)	Driver ID	Exempt Driver Status	Driver license No and Jurisdiction			Co-Driver Name (Last, First)	Co-Driver ID
Smith, Richard	sr123456	No	SMIR-123456-01 (QC)				
Truck/Tractor ID	Truck/Tractor VIN	Total distance (Start - End)	Distance today	Current Total Distance	Current Total Engine Hours	Trailer ID	
1) 12345 2) FF98765	1) 1M2P267YSAM022445 2) -1FUJGHDV0CLBP8896	1) 346470 - 346608 2) 204885 - 204998	1) 138 2) 113	204998	6265.4	T12345 T542356 T45156-4	
Carrier Name	Carrier (Home Terminal Address)		Carrier (Principal Place of Business Address)				
Consolidated Truckload Inc.	1234 Industrial Street, Montreal, QC, H1C 1M1		1234 Industrial Street, Montreal, QC, H1C 1M1				
Current Operating Zone	Current Cycle	Total Hours (in work shift)	Total Hours (in cycle)	Remaining Hours (in cycle)		Off-Duty Time Deferral (Day and time deferred)	
Canada – South of lat. 60° N.	Cycle 1 (7 days)	9.2	53.5	16.5		Day 1 (2:00)	
Data Diagnostic Status	Unidentified Driving Records	Malfunction Status	ELD ID	ELD Provider	ELD Certification	ELD Authentication	
Yes (Missing Data Elements)	Yes	No	987654	ELD Provider Inc.	ZA10	D3A4506EC8FF566B506EC8FF566BDFBB	

Printout Example - HOS Grid

Printout Example – Event Details

Date & time	Event	Geo-Location	Latitude, Longitude		Distance last val. coord.	CMV	Distance (Acc.)	Hours (Acc.)	Distance (Total)	Record Status	Record Origin	Seq. No.
19 Nov. 2018												
00:20:12	ON	8 km SSW Montreal. QC	36.99	-121.55	0	12345	0	0.0		1	1	1110
00:21:45	YM start	8 km SSW Montreal. QC	36.99	-121.55	0	12345	0	0.0	346470	1	1	1111
00:52:52	YM end	8 km SSW Montreal. QC	36.99	-121.55	0	12345	1	0.5	346471	1	1	1112
00:53:31	DR	8 km SSW Montreal. QC	36.99	-121.55	0	12345	1	0.5		1	1	1113
01:53:31	INT	Geo-Location…	40.70	-85.46	0	12345	99	1.5		1	1	0FBB
02:53:31	INT	Geo-Location…	41.54	-85.06	0	12345	202	2.5		1	1	0FBC
03:15:28	SB	Geo-Location…	41.85	-85.00	0	12345	233	2.9		1	1	0FBD
16:48:29	ON	Geo-Location…	45.21	-74.34	0	12345	0	0.0		1	1	0FE2
17:19:15	DR	Geo-Location…	45.21	-74.34	0	12345	0	0.2		1	1	0FE6

Printout Example – Event Details (cont'd)

Login and Logout, Certification of RODS, Data Diagnostic and Malfunction

Date & time	Event	Additional info	CMV	Distance (Total)	Hours (Total)	Record Status	Record Origin	Seq. No.
19 Nov. 2018								
00:18:54	Login		12345	346470	6386.1	1	1	10FF
12:05:51	Data Diagnostic (active)	2: Engine synchronization	12345	346804	6391.4	1	1	1096
12:08:22	Data Diagnostic (inactive)	2: Engine synchronization	12345	346804	6391.5	1	1	1097
18:28:55	Certification of RODS	Time Zone: EST (UTC-5:00)	12345	--	--	1	1	1102
18:29:33	Logout		12345	346943	6395.8	1	1	112F
20 Nov. 2018								
07:41:22	Re-Certification of RODS (1)	Time Zone: EST (UTC-5:00)	12345	--	--	1	2	1222

Change in Driver's Cycle. Change in Operating Zone, Off-Duty Time Deferral

Date & time	Event	Geo-Location	Latitude. Longitude		Distance last val. Coord.	CMV	Record Status	Record Origin	Seq. No.
19 Nov. 2018									
00:19:15	Cycle 2 (14 days)					12345	1	3	1089
02:05:41	Operating Zone Canada – South of lat. 60° N.	Geolocation...	45.08	-73.42	0	12345	1	1	10FF
18:27:43	Off-Duty Time Deferral Day 1 (2:00)					12345	1	1	1201

Comments. Remarks and Annotations

Date	Time	Username (originator)	Seq. No.	Comment or Annotation
20 Nov. 2018	07:41:22	sr123456	1222	Driver error

Additional Hours not recorded

Date	Work shift Start (HH:MM)	Work shift End (HH:MM)	Total Hours (On-Duty)	Total Hours (Off-Duty)	CMV	Record Status	Record Origin	Seq. No.
18 Nov. 2018	00:00	23:59	0	24	12345	1	2	104E
17 Nov. 2018	00:00	23:59	0	24	12345	1	2	104F
16 Nov. 2018	07:00	17:00	9	15	12345	1	2	1106
15 Nov. 2018	07:00	17:00	9	15	12345	1	2	1107
...					12345	1	2	1108
5 Nov. 2018	07:00	17:00	9	15	12345	1	2	1109

Engine Power Up and Shut Down

Date & time	Event	Geo-Location	Latitude. Longitude		Distance last val. Coord.	CMV	Distance (Total)	Hours (Total)	Seq. No.
19 Nov. 2018									
00:18:45	Power Up	8 km SSW Montreal. QC	36.99	-121.55	0	12345	346470	6386.1	0FBE
03:16:12	Shut Down	Geo-Location...	41.85	-85.00	0	12345	346525	6388.7	0FC3
06:04:22	Power Up	Geo-Location...	41.85	-85.00	0	12345	346525	6388.9	0FC4
07:40:12	Shut Down	Geo-Location...	41.85	-85.00	0	12345	346608	6389.0	0FC5
07:42:55	Power Up	Geo-Location...	41.85	-85.00	0	12345	346608	6389.1	0FC8
07:43:39	Shut Down	Geo-Location...	41.85	-85.00	0	12345	346608	6389.1	0FCC

Schedule 2: Tables

Table 1		
Duty Status Categories		
Duty Status	**Abbreviation**	**Data Coding**
Off Duty	OFF	1
Sleeper Berth	SB	2
Driving	D	3
On-duty Not Driving	ON	4

Table 2		
Categories for Driver's Indication of Situations Impacting Driving Time Recording		
Category	**Abbreviation**	**Data Coding**
Authorized Personal Use of CMV	PC	1
Yard Moves	YM	2
Default: None	---	0

	Table 3		
	Character to Decimal Value Mapping for Checksum Calculations			
Character	Decimal mapping	Character	Decimal mapping
0	0	a	49
1	1	b	50
2	2	c	51
3	3	d	52
4	4	e	53
5	5	f	54
6	6	g	55
7	7	h	56
8	8	i	57
9	9	j	58
A	17	k	59
B	18	l	60
C	19	m	61
D	20	n	62
E	21	o	63
F	22	p	64
G	23	q	65
H	24	r	66
I	25	s	67
J	26	t	68
K	27	u	69
L	28	v	70
M	29	w	71
N	30	x	72
O	31	y	73
P	32	z	74
Q	33	All other characters including blank spaces	0
R	34		
S	35		
T	36		
U	37		
V	38		
W	39		
X	40		
Y	41		
Z	42		

Table 4	
Standard Coding for Required Compliance Malfunction and Data Diagnostic Event Detection	
Malfunction and Data Diagnostic Code	**Description**
P	Power compliance malfunction
E	Engine synchronization compliance malfunction
T	Timing compliance malfunction
L	Positioning compliance malfunction
R	Data recording compliance malfunction
S	Data transfer compliance malfunction
O	Other ELD detected malfunction
1	Power data diagnostic event
2	Engine synchronization data diagnostic event
3	Missing required data elements data diagnostic event
4	Data transfer data diagnostic event
5	Unidentified driving records data diagnostic event
6	Other ELD identified diagnostic event

Table 5	
Abbreviation Codes for provinces and territories	
CANADA	
PROVINCE CODE	**PROVINCE OR TERRITORY**
AB	Alberta
BC	British Columbia
MB	Manitoba
NB	New Brunswick
NL	Newfoundland and Labrador
NS	Nova Scotia
NT	Northwest Territories
NU	Nunavut
ON	Ontario
PE	Prince Edward Island
QC	Quebec
SK	Saskatchewan
YT	Yukon

Event Type	Event Code	Event Code Description
		Table 6
		"Event Type" Parameter Coding
Event Type	**Event Code**	**Event Code Description**
1	1	Driver's duty status changed to "Off-Duty"
1	2	Driver's duty status changed to "Sleeper Berth"
1	3	Driver's duty status changed to "Driving"
1	4	Driver's duty status changed to "On-duty not driving"
2	1	Intermediate log with conventional location precision
2	2	Intermediate log with reduced location precision
3	1	Driver indicates "Authorized Personal Use of CMV"
3	2	Driver indicates "Yard Moves"
3	0	Driver indication for PC and YM cleared
4	1	Driver's first certification of a RODS
4	n	Driver's n'th certification of a RODS (when recertification necessary). "n" is an integer between 1 and 9. If more than 9 certifications needed, use 9 for each new re-certification record.
5	1	Authenticaded driver's ELD login activity
5	2	Authenticaded driver's ELD logout activity
6	1	Engine power-up with conventional location precision
6	2	Engine power-up with reduced location precision
6	3	Engine shut down with conventional location precision
6	4	Engine shut down with reduced location precision
7	1	An ELD malfunction logged
7	2	An ELD malfunction cleared
7	3	An data diagnostic event logged
7	4	An data diagnostic event cleared
20	0	Off-duty time deferral set to "none"
20	1	Off-duty time deferral set to "Day 1"
20	2	Off-duty time deferral set to "Day 2"
21	1	Cycle set to "Cycle 1"
21	2	Cycle set to "Cycle 2"
22	1	Operating zone set to "south of latitude 60°N in Canada"
22	2	Operating zone set to "north of latitude 60°N in Canada"
22	3	Operating zone set to "United States"
23	1	Additional hours not recorded

Table 7	
"Event Record Origin" Parameter Coding	
Event Record Origin	**Event Record Origin Code**
Automatically recorded by ELD	1
Edited or entered by the Driver	2
Edit requested by an Authenticated User other than the Driver	3
Assumed from Unidentified Driver profile	4

<table>
<tr><td colspan="2" align="center">**Table 8**</td></tr>
<tr><td colspan="2" align="center">**"Event Record Status" Parameter Coding**</td></tr>
</table>

Event Record Status	Event Record Status Code
Active	1
Inactive - Changed	2
Inactive - Change Requested	3
Inactive - Change Rejected	4

<table>
<tr><td colspan="2" align="center">**Table 9**</td></tr>
<tr><td colspan="2" align="center">**"Event Type" Parameter Coding**</td></tr>
</table>

Event Type	Event Type Code
A change in driver's duty status	1
An intermediate log	2
A change in driver's indication of authorized personal use of CMV or yard moves	3
A driver's certification/re-certification of RODS	4
A driver's login/logout activity	5
CMV's engine power up/shut down activity	6
A malfunction or data diagnostic detection occurrence	7
Off-duty time deferral	20
A change in driver's cycle	21
An change in operating zone	22
Additional hours not recorded	23

<table>
<tr><td colspan="2" align="center">**Table 10**</td></tr>
<tr><td colspan="2" align="center">**Conventional Compass Rose Direction Coding**
To Be Used in the Geo-Location Parameter.</td></tr>
</table>

Direction	Direction Code
At indicated geo-location	{blank}
North of indicated geo-location	N
North - North East of indicated geo-location	NNE
North East of indicated geo-location	NE
East - North East of indicated geo-location	ENE
East of indicated geo-location	E
East - South East of indicated geo-location	ESE
South East of indicated geo-location	SE
South - South East of indicated geo-location	SSE
South of indicated geo-location	S
South - South West of indicated geo-location	SSW
South West of indicated geo-location	SW
West - South West of indicated geo-location	WSW
West of indicated geo-location	W
West - North West of indicated geo-location	WNW
North West of indicated geo-location	NW
North - North West of indicated geo-location	NNW