MCSAC Task 11-04: Electronic On-Board Recorder (EOBR) Communications Protocols, Security, Interfaces, and Display of Hours-of-Service Data During Driver/Vehicle Inspections and Safety Investigations

Discussion Notes from August 2, 2011, Subcommittee Meeting

Hours of service of drivers

Pt. 395, App. A

Appendix A to Part 395—Electronic On-Board Recorder Performance Specifications

1. Data Elements Dictionary for Electronic On-Board Recorders (EOBRs)

1.1 To facilitate the electronic transfer of records to roadside inspection personnel and compliance review personnel, and provide the ability of various third-party and proprietary EOBR devices to be interoperable, a consistent electronic file format and record layout for the electronic RODS data to be recorded are necessary. This EOBR data elements dictionary provides a standardized and consistent format for EOBR output data.

EOBR Data File Format

1.2 Regardless of the particular electronic file type (such as ASCII or XML) ultimately used for recording the electronic RODS produced by an EOBR, RODS data must be recorded according to a "flat file" database model format. A flat file is a simple database in which all information is stored in a plain text format with one database "record" per line. Each of these data records is divided into "fields" using delimiters (as in a comma-separate-values data file) or based on fixed column positions. Table 1 below presents the general concept of a flat data file consisting of data "fields" (columns) and data "records" (rows).

Comment [21]:

A. Recommendation: The use of Comma Separated Values (CSV) is both lightweight and human readable. It serves as a sound text based standard for data interchange and should be allowed for use in formatting log download files if peer to peer methods for data transfer are accommodated. The use of XML should be used for Commercial Mobile Radio Service (CMRS)-based approaches.
    1. The standard for CSV has been defined by the Internet Engineering Task Force (IETF) as: — "RFC 4180 – Common Format and MIME Type for Comma-Separated Values (CSV) Files."
    2. Flat file should be in one of the above specified formats.
B. Naming Convention Recommendation: Naming conventions have to consider the variety of OS platforms that may be employed in this solution and file systems with which they are compatible. The common denominator for file

systems is FAT32. Assuming a FAT32 file system, the most common naming convention is Windows with the following limitations:

1. File and folder names may be up to 255 characters.
2. Full pathname is limited to 260 characters.
3. Backslash ― "\" is used a directory separator.
4. File and directory names may not contain any of the following characters: "/*?<>|:
5. Periods are allowed in file and directory names except as the final character.
6. File and directory names preserve case but are not case-sensitive.

Directory and file name for a generated eRODs file should include enough information to be unique but should also be meaningful to a human reader.

The file location should be a nested two directory hierarchy. The first level is the carrier's FMCSA DOT Number. The second directory is the driver's carrier assigned Id. The name of the file is the UTC date time to the second of when the file was generated. It will be assumed that any file generated will include all relevant information for the driver's HOS at the time the file was created.

For example, if driver John Smith working for a carrier with the DOT number 12345678 and having been assigned an ID of JS2393 by the carrier has an eROD file generated for an official on September 1, 2012 at 3:14:02 PM (UTC) the resulting directory location and encrypted eRODs file name will be:

\123456789\JS2393\20120901151402.log

The corresponding manifest file directory and location will be:

\123456789\JS2393\20120901151402.manifest

Using this scheme log information is easily separated by carrier, driver, and time as needed by any consolidated storage repository.

C. Other Considerations:
   1. CSV is also the standard of choice for data downloads in ― "SAE J2728: Heavy Vehicle Event Data Recorder (HVEDR) Standard."

Table 1: Flat Data File Database Model

FIELDS →

RECORDS ↓

Person First Name	Person Last Name	Driver PIN	Event Date	Event Time	Status Code
William	Smith	978354	20050718	12:11	D
William	Smith	978354	20050718	15:17	SB
William	Smith	978354	20050718	18:53	D
William	Smith	978354	20050718	21:43	ON
William	Smith	978354	20050718	22:14	OFF
William	Smith	978354	20050719	06:25	ON
William	Smith	978354	20050719	06:47	D
William	Smith	978354	20050719	13:32	SB
William	Smith	978354	20050719	15:27	D
William	Smith	978354	20050719	20:04	SB

Table 2—EOBR Data Elements Dictionary

Data element	Data element definition	Type	Length	Valid values and notes
	Driver Identification Data			
Driver First Name	First name of the driver	A	35	See Note 1.
Driver Last Name	Last name, family name, or surname of the driver	A	35	See Note 1.
Driver PIN/ID	Numeric identification number assigned to a driver by the motor carrier	A	40	
Vehicle Identification Data				
Tractor Number	Motor carrier assigned identification number for tractor unit	A	10	
Trailer Number	Motor carrier assigned identification number for trailer	A	10	
Tractor VIN Number	Unique vehicle ID number assigned by manufacturer according to US DOT regulations	A	17	
Co-Driver Data				

Comment [22]: Check OMB and NIST guidance on PII.

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Co-Driver First Name	First name of the co-driver	A	35	See Note 1.
Co-Driver Last Name	Last name, family name or surname of the co-driver	A	35	See Note 1.
Co-Driver ID	Numeric identification number assigned to a driver by the motor carrier	A	40	
Company Identification Data				
Carrier USDOT Number	USDOT Number of the motor carrier assigned by FMCSA	N	8	
Carrier Name	Name or trade name of the motor carrier company appearing on the Form MCS–150	A	120	
Shipment Data				
Shipping Document Number	Shipping document number	A	40	
Event Data				
Event Sequence ID	A serial identifier for an event that is unique to a particular vehicle and a particular day	N	4	0001 through 9999.
Event Status Code	Character codes for the four driver duty status change events, State border crossing event, and diagnostic events	A	3	OFF = Off DutySB = Sleeper BerthD = On Duty DrivingON = On Duty Not DrivingDG = Diagnostic.
Event Date	The date when an event occurred	N (Date)	8	UTC (universal time) recommended. Format: YYYYMMDD.
Event Time	The time when an event occurred	N	6	UTC (universal time)

		(Time)		recommended. Format: HHMMSS (hours, minutes, seconds).
Event Latitude	Latitude of a location where an event occurred	N	2,6	Decimal format: XX.XXXXXX.
Event Longitude	Longitude of a location where an event occurred	N	3,6	Decimal format: XXX.XXXXXX.
Place Name	The location codes must correspond, at a minimum, to ANSI INCITS 446–2008, "American National Standard for Information Technology—Identifying Attributes for Named Physical and Cultural Geographic Features (Except Roads and Highways) of the United States, Its Territories, Outlying Areas, and Freely Associated Areas and the Waters of the Same to the Limit of the Twelve-Mile Statutory Zone (10/28/2008)," where "GNIS Feature Class" = "Populated Place" (incorporated by reference, see §395.18). (For further information, see also the Geographic Names Information System (GNIS) at http://geonames.usgs.gov/domestic/index.html	N	5	Unique within a FIPS state code. Lookup list derived from GNIS.
Place Distance Miles	Distance in miles to nearest populated place from the location where an event occurred	N	4	
Total Vehicle Miles	Total vehicle miles (as noted on vehicle odometer or as measured by any other compliant means such as vehicle location system, etc.)	N	7	With total vehicle mileage recorded at the time of each event, vehicle miles traveled while driving, etc., can be computed.
Event Update Status Code	A status of an event, either Current (the most up-to-date update or edit) or Historical (the original record if the record has subsequently been updated or edited)	A	1	C = Current, H = Historical.
Diagnostic Event Code	For diagnostic events (events where the "Event Status Code" is noted as "DG"), records the type of diagnostic performed (e.g., power-on, self test, power-off, etc.)	A	2	(See Table 3).
Event Error Code	Error code associated with an event	A	2	(See Table 3).
Event Update Date	The date when an event record was last updated or edited	N (Date)	8	UTC (universal time) recommended. Format: YYYYMMDD.

Comment [24]: Must include a sign numerical field.

Comment [25]: Must include a sign numerical field.

Comment [26]: Strike it or supply more information in Table 3 on the content of the code.

Event Update Time	Then time when an event record was last updated or edited	N (Time)	6	UTC (universal time) recommended. Format: HHMMSS (hours, minutes, seconds).
Event Update Person ID	An identifier of the person who last updated or edited a record	A	40	
Event Update Text	A textual note related to the most recent record update or edit	A	60	Brief narrative regarding reason for record update or edit.

Note 1: This element must not be included in the records downloaded from an EOBR or support system at roadside.

Table 3—EOBR Diagnostic Event Codes

Code class	Code	Briefdescription	Full description
General System Diagnostic	PWR_ON	Power on	EOBR initial power-on.
General System Diagnostic	PWROFF	Power off	EOBR power-off.
General System Diagnostic	TESTOK	test okay	EOBR self test successful.
General System Diagnostic	SERVIC	Service	EOBR Malfunction (return unit to factory for servicing).
General System Diagnostic	MEMERR	memory error	System memory error.
General System Diagnostic	LOWVLT	Low voltage	Low system supply voltage.
General System Diagnostic	BATLOW	battery low	Internal system battery backup low.
General System Diagnostic	CLKERR	clock error	EOBR system clock error (clock not set or defective).
General System Diagnostic	BYPASS	Bypass	EOBR system bypassed (RODS data not collected).

Data Storage Diagnostic	INTFUL	internal memory full	Internal storage memory full (requires download or transfer to external storage).
Data Storage Diagnostic	DATACC	Data accepted	System accepted driver data entry.
Data Storage Diagnostic	EXTFUL	external memory full	External memory full (smartcard or other external data storage device full).
Data Storage Diagnostic	EXTERR	external data access error	Access external storage device failed.
Data Storage Diagnostic	DLOADY	download yes	EOBR data download successful.
Data Storage Diagnostic	DLOADN	download no	Data download rejected (unauthorized request/wrong Password).
Driver Identification Issue	NODRID	no driver ID	No driver information in system and vehicle is in motion.
Driver Identification Issue	PINERR	PIN error	Driver PIN/identification number invalid.
Driver Identification Issue	DRIDRD	Driver ID read	Driver information successfully read from external storage device (transferred to EOBR).
Peripheral Device Issue	DPYERR	display error	EOBR display malfunction.
Peripheral Device Issue	KEYERR	keyboard error	EOBR keyboard/input device malfunction.
External Sensor Issue	NOLTLN	no latitude longitude	No latitude and longitude from positioning sensor.
External Sensor Issue	NOTSYC	no time synchronization	Unable to synchronize with external time reference input.
External Sensor Issue	COMERR	communications error	Unable to communicate with external data link (to home office or wireless service provider).
External Sensor Issue	NO_ECM	no ECM data	No sensory information received from vehicle's Engine Control Module (ECM).

External Sensor Issue	ECM_ID	ECM ID number mismatch	ECM identification/serial number mismatch (with preprogrammed information).

[In 1.3 the second reference to "event status code" should be "event status update code."]

2. Communications Standards for the Transmittal of Data Files From Electronic On-Board Recorders (EOBRs)

Comment [27]: Subcommittee recommends revisiting section 2 after third-party certification and security reviews.

2.1 EOBRs must produce and store RODS in accordance with the file format specified in this Appendix and must be capable of a one-way transfer of these records through wired and wireless methods to authorized safety officials upon request.

2.2 Wired. EOBRs must be capable of transferring RODS using the "Universal Serial Bus Specification (Revision 2.0)" (incorporated by reference, see §395.18). Each EOBR device must implement a single USB compliant interface featuring a Type A connector. The USB interface must implement the Mass Storage class (08h) for driverless operation.

2.3 Wireless. EOBRs must be capable of transferring RODS using one of the following wireless standards:

2.3.1 802.11g–2003 standard as defined in the 802.11–2007 base standard for wireless communication "IEEE Standard for Information Technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements: Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications" (IEEE Std. 802.11–2007) (incorporated by reference, see §395.18).

2.3.2 Commercial Mobile Radio Services (e.g., cellular).

3. Certification of EOBRs To Assess Conformity With FMCSA Standards

3.1 The following outcome-based performance requirements must be included in the certification testing conducted by the authorized organization:

3.1.1 Location

3.1.1.1 The location description for the duty status change must be sufficiently precise to enable enforcement personnel to quickly determine the vehicle's geographic location at each change of duty status on a standard map or road atlas.

3.1.1.2 When the CMV is in motion, location and time must be recorded at intervals of no greater than 60 minutes. This recorded information must be available for an audit of EOBR data, but is not required to be displayed on the EOBR's visual output device.3.1.1.3 Location codes derived from satellite or terrestrial sources, or a

combination thereof must be used. The location codes must correspond, at minimum, to the GNIS maintained by the United States Geological Survey.

3.1.2 Distance traveled

3.1.2.1 Distance traveled may use units of miles or kilometers driving during each on-duty driving period and total for each 24-hour period for each driver operating the CMV.

3.1.2.2 If the EOBR records units of distance in kilometers, it must provide a means to display the equivalent distance in English units.

3.1.2.3 If the EOBR obtains distance-traveled information from a source internal to the CMV, the information must be accurate to the CMV's odometer.

3.1.3 Date and time

3.1.3.1 The date and time must be reported on the EOBR output record and display for each change of duty status and at such additional entries as specified under “Location.”

3.1.3.2 The date and time must be obtained, transmitted, and recorded in such a way that it cannot be altered by a motor carrier or driver.

3.1.3.3 The time must be coordinated to the Universal Time Clock (UTC) and must not drift more than 60 seconds per month.

3.1.4 File format and communication protocols: The EOBR must produce and transfer a RODS file in the format and communication methods specified in sections 1.0 and 2.0 of this Appendix.

3.1.5 Environment

3.1.5.1 [Reserved]

3.1.5.2 Vibration and shock—The EOBR must meet industry standards for vibration stability and for preventing electrical shocks to device operators.

3.2 The EOBR and EOBR support systems must be certified by the manufacturer as evidence that their design has been sufficiently tested to meet the requirements of §395.16 under the conditions in which they would be used.

3.3 The exterior faceplate of EOBRs must be marked by the manufacturer with the text 'USDOT–EOBR' as evidence that the device has been tested and certified as meeting the performance requirements of §395.16.