SAE INTERNATIONAL™

**SURFACE VEHICLE
RECOMMENDED PRACTICE**

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(R) Event Data Recorder

RATIONALE

This Recommended Practice was first issued in 2005. It is being revised in order to separate the various aspects of EDRs into other more focused documents. This document now becomes an overall parent document to the other SAE J1698 series of documents.

EDR data has multiple potential uses. This document focuses on EDR data used to understand the operation of various vehicles systems such as the occupant protection system.   EDR data has application in support of crash reconstruction and assisting in setting roadway safety policies.

1.   SCOPE

This recommended practice describes common definitions and operational elements of Event Data Recorders. The SAE J1698 series of documents consists of the following:

- SAE J1698-1 - Event Data Recorder - Output Data Definition; Provides common data output formats and definitions for a variety of data elements that may be useful for analyzing vehicle crash and crash-like events that meet specified trigger criteria.

- SAE J1698-2 - Event Data Recorder - Retrieval Tool Protocol; Utilizes existing industry standards to identify a common physical interface and define the protocols necessary to retrieve records stored by light duty vehicle Event Data Recorders (EDRs).

- SAE J1698-3 - Event Data Recorder - Compliance Assessment; Defines procedures that may be used to validate that relevant EDR output records conform with the reporting requirements specified in Part 563, Table 1 during the course of FMVSS-208, FMVSS-214 and other applicable vehicle level crash testing.

2.   REFERENCES

2.1   Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1   SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J211-1   Instrumentation for Impact Test - Part 1 - Electronic Instrumentation

SAE J670   Vehicle Dynamics Terminology

SAE J1698-1   Event Data Recorder - Output Data Definition

SAE J1698-2   Event Data Recorder - Retrieval Tool Protocol

SAE J1698-3   Event Data Recorder - Compliance Assessment

SAE J1962   Diagnostic Connector Equivalent to ISO/DIS 15031-3: December 14, 2001

2.2   Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1   National Highway Traffic Safety Administration (NHTSA)

49 CFR Part 563   Event Data Recorders (Refer to http://www.ecfr.gov/)

2.2.2   American National Standards Institute (ANSI)/International Electrotechnical Commission (IEC)

ANSI/IEC 60529-2004   Degrees of Protection Provided by Enclosures: November 3, 2004

3.   DEFINITIONS

3.1   ACCELERATION – G

The rate of change in velocity as a function of time.

NOTE: In this document, the upper case "G" is used to designate the data element name for the acceleration of a vehicle. The lower case "g" is the unit of acceleration (1 g = 9.80665 m/s^2).

3.2   ARRAY

An arrangement of data elements in a defined method. In an EDR, an array will consist of an arrangement of data elements sampled at defined time instances for a defined duration.

3.3   AUTHENTICATION AND ENCRYPTION

A technique for ensuring that an EDR record is genuine and that it has not been altered since being imaged and stored by the EDR Retrieval Tool.

3.4   BITMAPPED DATA

Typically used to represent simple "yes/no" questions (e.g., buckled or unbuckled). Bitmapped values are typically packed together with other bit mapped values into one or more bytes.

3.5   COMPLIANCE

The act of adhering to and demonstrating adherence to a standard or regulation.

3.6   CRASH PULSE

The acceleration-time history of the event.

3.7   DATA CAPTURE

The process of buffering certain data, in a temporary volatile storage medium, where it is continuously updated at regular time intervals. This data may be used by the EDR.

3.8   DISPOSAL

The deployment command of the second (or higher, if present) stage of a frontal air bag for the purpose of disposing of the propellant from an air bag device.

3.9   EVENT DATA RECORDER (EDR)

A function within one or more vehicle electronic modules that monitors vehicle and occupant protection system time-series data, prior to and during specific events, defined within the applicable Recommended Practice, with the intent of retrieving the data after the event. This data is not intended to include freeze-frame type data (non EDR data), diagnostic data, or telematics system data.

3.10   EDR RECORD

Electronic data file(s) stored in non-volatile memory in one or more specified vehicle ECUs following the occurrence of an event.

3.11   EDR RECORD REPORT

The output by an EDR Retrieval Tool designed to image EDR records from motor vehicles and translate the data.

3.12   EDR RETRIEVAL TOOL

An electronic tool consisting of the hardware and software required to,

a.) Make a connection to the vehicle's SAE J1962 connector

b.) Image the EDR record

c.) Authenticate, encrypt and save the un-translated binary EDR record to a file on a PC

d.) Open and authenticate a saved, un-translated file(s) containing an EDR record(s) and translate it into a human-readable report

3.13   EDR RECORD RETRIEVAL

The process by which an EDR Retrieval Tool images, translates, and reports an EDR record.

3.14   FRONTAL AIR BAG

An inflatable occupant protection system that requires no action by vehicle occupants and is used to meet the applicable frontal crash protection requirements.

3.15   GROUND

Term used with the intention to indicate the local plane on which the vehicle is traveling, not an absolute horizontal plane.

3.16   IMAGING

The process by which an EDR Retrieval Tool reads an EDR record.

3.17   LATERAL ACCELERATION

The component of the acceleration vector of a point in the vehicle in the Y-direction.

The lateral acceleration is positive from left to right, from the perspective of the driver when seated in the vehicle facing the direction of forward vehicle travel.

Refer to Vehicle Coordinate System defined below.

3.18   LOCKED EVENT

An EDR record that is not overwritten by subsequent events.

3.19   LONGITUDINAL ACCELERATION

The component of the acceleration vector of a point in the vehicle in the X-direction.

The longitudinal acceleration is positive in the direction of forward vehicle travel.

Refer to Vehicle Coordinate System defined below.

3.20   LOWER CONTROL LIMITS (LCL)

Used to define the bottom limit for compliance testing of a variable.

3.21   NORMAL ACCELERATION

The component of the vector acceleration of a point in the vehicle in the Z-direction.

The normal acceleration is positive in a downward direction.

Refer to Vehicle Coordinate System defined below.

3.22   OCCUPANT PROTECTION CONTROL ALGORITHM

Crash sensing logic, not a pre-crash sensing logic that activates occupant protection devices as necessary.

3.23   PRETENSIONER

A device that is activated by a vehicle's occupant protection control algorithm and tightens the belt in a vehicle safety belt system.

3.24   RECORD

The process of saving captured EDR data into a non-volatile memory for subsequent retrieval.

3.25   REPORT HEADER

The first section of the EDR Record Report that contains information about the vehicle, EDR Retrieval Tool, and EDR record which provides context for the report.

3.26   REVERSIBLE/RESETTABLE RESTRAINT

A restraint system device that returns automatically to a condition in which it can be reused or requires only a mechanical input to be usable again.

3.27   SIDE AIR BAG / SIDE CURTAIN AIR BAG

An inflatable occupant protection system – typically mounted to the seat or side structure of the vehicle interior – that deploys during applicable side impact or rollover events.

3.28   SIGNED NUMERIC DATA

Typically used to represent data with positive, negative, or zero values. The typical convention is to store signed data using a two's complement system. The two's complement of a binary number is defined as the value obtained by subtracting the number from a power of two (specifically, from 2N for an N-bit two's complement). A two's complement system is a system in which negative numbers are represented by the two's complement of the absolute value.

3.29   TRANSLATING

The process by which an EDR Retrieval Tool uses vehicle manufacturer-proprietary information to convert data stored in an EDR record and render it into a human-readable report.

3.30   TRIGGER THRESHOLD

A change in vehicle velocity, in the longitudinal direction, that equals or exceeds 8 km/h within a 150 ms interval. For vehicles that record "delta–V, lateral," trigger threshold means a change in vehicle velocity in either the longitudinal or lateral direction that equals or exceeds 8 km/h within a 150 ms interval. For both cases above, if the event is less than 150 ms in duration, the trigger threshold means a change in vehicle velocity that equals or exceeds 8 km/h since the most recent time zero.

3.31   TIME ZERO

The beginning of a crash event.

Refer to SAE J1698-1.

3.32   UNLOCKED EVENT

An EDR record that may be overwritten by subsequent events.

3.33   UNSIGNED NUMERIC DATA

Typically used to represent data with only positive or zero values.

3.34   UPPER CONTROL LIMITS (UCL)

Used to define the upper limit for compliance testing of a variable.