**EDR for HD Vehicles Discussion Worksheet**

**Purpose/Goals** (per WP29-179-19 comparison document)

* Accident analysis

**What should not be included** (per WP29-179-19 comparison document)

* Detecting who is driving
* Identifying the owner/holder of the vehicle on the basis of the stored data.
* [Allowing for the tracking of the owner/the user/the holder of the vehicle]
* Providing information about the surroundings of the vehicle

**EDR Event Triggers**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SAE J2728 | R160 | EC/TRL Recommendations | OICA | Comments/Justifications |
| **Acceleration (longitudinal) trigger:** Vehicle speed changes at a rate higher than the programmable threshold set between 8.0 km/h/s (5.0 mph/s) and 22.5 km/h/s (14.0 mph/s) and persists beyond that threshold for at least 0.5 seconds. | 5.3.1.1. - Change in longitudinal vehicle velocity more than 8 km/h within a 150 ms or less interval.  5.3.1.2. - Change in lateral vehicle velocity more than 8 km/h within a 150 ms or less interval | 5.3.1.1. - Change in longitudinal vehicle velocity more than 8 km/h within a 150 ms or less interval.  5.3.1.2. - Change in lateral vehicle velocity more than 8 km/h within a 150 ms or less interval | Use SAE J2728 version to avoid noise trigger from driveshaft speed sensor derived acceleration. | China recommendation:   * 7 km/h/s or lower * Integrate more than one condition (vehicle status, brake or stop) simultaneously |
| **Last stop trigger:** The intent of this trigger is to capture an event when the vehicle has come to a complete stop for a period of time. The last stop event start will be the time the threshold is crossed. A suggested threshold is when the vehicle speed falls below 3.0 km/h (1.9 mph) for 15 seconds or more. To prevent last stop events from being overwritten due to the movement of the vehicle after an incident of interest, the last stop trigger cannot reoccur until the vehicle speed reaches a speed of 24.0 km/h (14.9 mph) or more for a minimum of 6 seconds. The act of turning the ignition off will not directly trigger a last stop event. |  | **See last stop trigger recommendation under safety system/VRU section below.** | Recommend. Other triggers will not be reliable for all accident types |  |
| **Safety system trigger:** Systems that are installed for control or driver alerts from safety systems should trigger an event record. Such as:   * + Safety restraint system deployment   + ABS System   + Adaptive cruise control/automated braking   + Electronic stability control   + AEBS (Advance Emergency Braking system) | 5.3.1.3. - Activation of Non-reversible occupant restraint system.  5.3.1.4. - Activation of Vulnerable road user secondary safety system  If a vehicle is not fitted with any Vulnerable Road User (VRU) secondary safety system, this document requires neither recording of data nor fitting of such systems. However, if the vehicle is fitted with such a system, then it is mandatory to record the event data following activation of this system. | 5.3.1.3. Activation of Non-reversible occupant restraint system.  5.3.1.4. Activation of Vulnerable road user secondary safety system  If a vehicle is not fitted with any Vulnerable Road User (VRU) secondary safety system, this document requires neither recording of data nor fitting of such systems. However, if the vehicle is fitted with such a system, then it is mandatory to record the event data following activation of this system.  [change of acceleration that exceeds a threshold of between 8 and 22.5 km/h/s for more than 0.5 s which is equivalent to between 0.23 and 0.64g (potential hard braking trigger based on SAE J2728)]  [If the speed of the vehicle falls below 3 km/h for a more than 15 s (potential last stop trigger based on SAE J2728)]  [To prevent last stop events from being overwritten due to the movement of the vehicle after an incident of interest, the last stop trigger cannot recur until the vehicle reaches a speed of 24.0 km/h or more for a minimum of 6 seconds.]  [automatic braking system (AEB) ] [an active safety system such as AEB is designed to reduce the risk of a collision occurring and to reduce the severity should it still occur; in the former case, triggering from the AEB would result in recording data from a non-collision event] *see comment* | Use all J2728 triggers.  Last stop + ESC/AEBS doesn’t work on loss of power. Becomes last stop only – redundant  5 records min in a buffer.  Wear leveling may require more. | **EC/DE:** with regard to AEB as a trigger, we would be interested to hear the views of the participants on a possibility to refer to the “Emergency Braking Phase” only, as referred to in Proposal for the 02 series of amendments to UN Regulation No. 131 “Uniform provisions concerning the approval of motor vehicles with  regard to the Advanced Emergency Braking System (AEBS) for M2, M3, N2 and N3 vehicles” (Informal document GRVA-12-50/Rev.1), paragraphs 5.2.1.2 and 5.2.2.2.:  “*When the system has detected the possibility of an imminent collision, there shall be a braking demand of at least 4 m/s² to the service braking system of the vehicle*”.  The aforementioned demand could work as a trigger (instead of acceleration trigger) where AEB is fitted. This would limit the probability of data being recorded in cases where no collision has occurred. |
| No back up power source | Passenger car has 150ms – for airbag deployment. |  | HDV does not have currently.  Other units will also not have power to give sensor data.  Can lose some events. How many? |  |

**Data Elements**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| J728 Data Element | R160 Data Element | EC/TRL Recommendations | OICA | Comments/Justifications |
| Alternate vehicle ID  (Vehicle unique alpha-numeric identifier substitute for the VIN) |  |  | Not recommend |  |
| Event data recording complete | Complete file recorded | Complete file recorded (M2, 3 and N2, 3) | Recommend  Or use Checksum |  |
| Event date |  |  | recommend |  |
| Engine hours |  |  | recommend |  |
| Odometer |  |  | recommend |  |
|  | Power cycles |  | ? Not sure if HDV have this..  Maybe less cycles on trucks – some “always running” |  |
| Latitude (GPS position) |  |  | Not recommend |  |
| Longitude (GPS position) |  |  | Not recommend |  |
| Event time |  |  | recommend |  |
| HVEDR make |  |  | ~~Truncated~~  VIN |  |
| HVEDR model |  |  | T~~runcated~~ VIN |  |
| HVEDR serial number |  |  | ~~Not recommend~~  VIN – Serial number gives exact build. |  |
| Rear axle ratio |  |  | Not recommend |  |
| Tire size |  |  | Not recommend |  |
| Trigger thresholds  (lists currently configured trigger thresholds) |  |  | Mainly this is to indicate the acceleration trigger threshold set in vehicle. But can be extended to mean which other signals are configured to trigger EDR |  |
| Trigger threshold activated  (indicates which trigger threshold was activated to cause EDR recording) |  |  | Indicate what caused the record to be created. |  |
| VIN |  |  | ~~Truncated~~ VIN – Is part of Tachograph in EU. |  |
| Vehicle configuration |  |  | ~~Truncated~~ VIN |  |
| Vehicle speed | Speed, vehicle indicated | Speed, vehicle indicated (M2, 3 and N2, 3) | Recommend |  |
| Front axle left wheel speed (ABS wheel based speed) |  |  | Not recommend. |  |
| Front axle right wheel speed (ABS wheel based speed) |  |  | Not recommend. |  |
| Rear axle left wheel speed (ABS wheel based speed) |  |  | Not recommend. |  |
| Rear axle right wheel speed (ABS wheel based speed) |  |  | Not recommend. |  |
| Retarder torque mode (state signal indicates which mode is generating, limiting, or controlling retarder torque) |  | Retarder Status (driver control status) (M3, N3) | On trucks can cause ABS events – and vehicle instability; Engine brake or regenerative braking.  Is a step in ACC radar control braking, early collision mitigation step.  May be difficult to split regen vs engine brake due to vehicle vs powertrain deceleration command not split.  ? |  |
| Brake status – parking |  |  | Roll away is a big issue. Driver forgets park brake.  Recommend |  |
| Brake status – service | Service brake, on/off | Service brake, on/off (M2, 3 and N2, 3) | Recommend |  |
| Engine speed | Engine rpm | Engine rpm (M2, 3 and N2, 3) | Recommend |  |
| Engine load (percent of available torque being generated) | Engine throttle, % full (or accelerator pedal, % full) |  | Recommend |  |
| Clutch switch |  |  | Not recommend. |  |
| Accelerator pedal position | Engine throttle, % full (or accelerator pedal, % full) | Engine throttle, % full (or accelerator pedal, % full) (M2, 3 and N2, 3) | Recommend |  |
| ABS brake control status – tractor | Anti-lock braking system activity | Anti-lock braking system activity (M2, 3 and N2, 3) | Recommend |  |
| ABS warning lamp status – tractor |  |  | Not recommend. redundant to control status. |  |
| ABS brake control status – trailer |  |  | Recommend |  |
| ABS warning lamp status – trailer |  |  | Not recommend. redundant to control status. |  |
| ACC mode | Adaptive Cruise Control Status (driving automation system level 1) | Adaptive Cruise Control Status (M2, 3 and N2, 3) | Recommend |  |
| ACC set distance mode |  |  | Not recommend. |  |
| Cruise control set speed |  |  | Not recommend. |  |
| Cruise control states (current state or mode of operation by the cruise control) | Cruise Control System Status | Cruise Control System Status (M2, 3 and N2, 3) | Recommend |  |
| Collision warning/Auto braking time to collision with relevant object |  |  | Not recommend. |  |
| Collision warning level (forward collision advanced emergency braking system state) | Advanced emergency braking system status | Advanced emergency braking system status (M2, 3 and N2, 3) | Not recommend.  (  0000b = no warning  0001b = warning level 1 - lowest  0010b = warning level 2  0011b = warning level 3  0100b = warning level 4  0101b = warning level 5  0110b = warning level 6  0111b = warning level 7 - highest  1000b to 1110b = reserved  1111b = don't care / take no action) |  |
| Speed of forward vehicle |  |  | Not recommend. |  |
| Distance to forward vehicle |  |  | Not recommend. |  |
| XBR control mode (ABS status indicating external brake request) |  |  | This may be better represented by J1939 PGN 61487.   |  |  | | --- | --- | | 5676 | Forward Collision Advanced Emergency Braking System State |   And intent is in J2728 as XBR PGN 64964 SPN 291 |  |
| Lane departure (system) warning – right |  |  | Not Recommend |  |
| Lane departure (system) warning – left |  |  | Not Recommend |  |
| Lane departure warning state | Lane departure warning system status | Lane departure warning system status (M2, 3 and N2, 3) | recommend |  |
| Steering wheel angle | Steering input | Steering input (M2, 3 and N2, 3) | Recommend |  |
| ROP engine control (stability control of engine retarder for rollover protection) | Stability control | Stability control (M2, 3 and N2, 3) | Not recommend |  |
| ROP brake control (stability control of wheel brakes for rollover protection) | Stability control | Stability control (M2, 3 and N2, 3) | Maybe only Brake control needed. Just call it stability control status (OEM can add more detail) |  |
| YC engine control (stability control of engine retarder for yaw control) | Stability control | Stability control (M2, 3 and N2, 3) | Not recommend |  |
| YC brake control (stability control of wheel brakes for yaw control) | Stability control | Stability control (M2, 3 and N2, 3) | Maybe only Brake control needed. Just call it stability control status (OEM can add more detail) |  |
| VDC system state |  |  | Need this in addition to above to see that system is operational. Above signals are active or not only. |  |
| Blind spot system status |  | Blind spot information system status (M2, 3 and N2, 3) | Not recommend. |  |
| Blind spot warning |  |  | Recommend. R151 requires system therefore…. (all items if fitted.) |  |
| Crash notification (indicates detection and type of crash by installed crash mitigation system) | Accident emergency call system status | Accident emergency call system status ([M2], [M3], [N2], [N3]) | Of because “If equipped clause”.   These aren’t the same. Both air bag crash type and Call status (no J1939 definition) should be logged if equipped  J1939 Crash Notification message has (SPN 4973)  Type of crash event.  00000b = no crash  00001b = frontal crash  00010b = rear crash  00100b = side crash (left)  01000b = side crash (right)  10000b = rollover |  |
| Seat belt status (driver) | Safety belt status, driver | Safety belt status, driver (M2, 3 and N2, 3) | Recommend |  |
| Seat belt status (passenger) | Safety belt status, front passenger 9 | Safety belt status, front passenger (M2, 3 and N2, 3) | Recommend |  |
| Safety restraint system status | Air bag warning lamp[[1]](#footnote-1) | Air bag warning lamp (M2, 3 and N2, 3) | Generally all below would be part of air bag log only and only if equipped. Not part of non-airbag truck EDR. How to word R160 for truck with air bag? Likely new reg should exclude airbag data or rather reference. I.e., “not recommend” the below except where noted.  Recommend to also support R160 if fitted with airbags |  |
|  | Delta-V, longitudinal | Delta-V, longitudinal (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Maximum delta-V, longitudinal | Maximum delta-V, longitudinal (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Time, maximum delta-V, longitudinal | Time, maximum delta-V, longitudinal (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Ignition cycle, crash | Ignition cycle, crash (M2, 3 and N2, 3) | Ok. key cycle count. Though redundant if time, date, etc. |  |
|  | Ignition cycle, download | Ignition cycle, download (M2, 3 and N2, 3) | Ok. key cycle count reference by tool at download. |  |
|  | Frontal air bag deployment, time to deploy, in the case of a single stage air bag, or time to first stage deployment, in the case of a multi-stage air bag, driver. | Frontal air bag deployment, time to deploy, in the case of a single stage air bag, or time to first stage deployment, in the case of a multi-stage air bag, driver. (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Frontal air bag deployment, time to deploy, in the case of a single stage air bag, or time to first stage deployment, in the case of a multi-stage air bag, front passenger[[2]](#footnote-2). | Frontal air bag deployment, time to deploy, in the case of a single stage air bag, or time to first stage deployment, in the case of a multi-stage air bag, front passenger (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Multi-event crash, number of event | Multi-event crash, number of event (M2, 3 and N2, 3) | If timestamps are excluded from EDR, then may need this. |  |
|  | Time from event 1 to 2 | Time from event 1 to 2 (M2, 3 and N2, 3) | If timestamps are excluded from EDR, then may need this. Also need some ID of which one is latest. |  |
|  | Lateral acceleration  (post-crash) | Lateral acceleration  (post-crash) (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Longitudinal acceleration  (post-crash) | Longitudinal acceleration  (post-crash) (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Normal acceleration  (post-crash) | Normal acceleration  (post-crash) (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Delta-V, lateral | Delta-V, lateral (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Maximum delta-V, lateral | Maximum delta-V, lateral (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Time maximum delta-V, lateral | Time maximum delta-V, lateral (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Time for maximum delta-V, resultant | Time for maximum delta-V, resultant (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Vehicle roll angle | Vehicle roll angle (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Vehicle roll rate[[3]](#footnote-3) | Vehicle roll rate (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Passenger air bag suppression status, front 9 | Passenger air bag suppression status, front (M2, [M3], [N2], [N3]) | NOT Recommend |  |
|  | Frontal air bag deployment, time to nth stage, driver**15**. | Frontal air bag deployment, time to nth stage, driver (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Frontal air bag deployment, time to nth stage, front passenger[[4]](#footnote-4), 9. | Frontal air bag deployment, time to nth stage, front passenger (M2, [M3], [N2], [N3]) | NOT Recommend |  |
|  | Side air bag deployment, time to deploy, driver. | Side air bag deployment, time to deploy, driver (M2, [M3], [N2], [N3]) | NOT Recommend |  |
|  | Side air bag deployment, time to deploy, front passenger. | Side air bag deployment, time to deploy, front passenger (M2, [M3], [N2], [N3]) | NOT Recommend |  |
|  | Side curtain/tube air bag deployment, time to deploy, driver side. | Side curtain/tube air bag deployment, time to deploy, driver side (M2, [M3], [N2], [N3]) | NOT Recommend |  |
|  | Side curtain/tube air bag deployment, time to deploy, passenger side. | Side curtain/tube air bag deployment, time to deploy, passenger side (M2, [M3], [N2], [N3]) | NOT Recommend |  |
|  | Pretensioner deployment, time to fire, driver. | Pretensioner deployment, time to fire, driver (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Pretensioner deployment, time to fire, front passenger9. | Pretensioner deployment, time to fire, front passenger (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Seat track position switch, foremost, status, driver. | Seat track position switch, foremost, status, driver (M2, [M3], [N2], [N3]) | NOT Recommend |  |
|  | Seat track position switch, foremost, status, front passenger 9. | Seat track position switch, foremost, status, front passenger (M2, [M3], [N2], [N3]) | NOT Recommend |  |
|  | Occupant size classification, driver | Occupant size classification, driver [M2] | NOT Recommend |  |
|  | Occupant size classification, front passenger9 | Occupant size classification, front passenger [M2] | NOT Recommend |  |
|  | Safety belt status, rear passengers[[5]](#footnote-5) | Safety belt status, rear passengers (M2, [M3], [N2], [N3]) | NOT Recommend |  |
|  | Tyre Pressure Monitoring System Warning Lamp Status | Tyre Pressure Monitoring System Warning Lamp Status (M2, 3 and N2, 3) | OK |  |
|  | Longitudinal acceleration  (pre – crash) | Longitudinal acceleration  (pre – crash) (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Lateral acceleration  (pre – crash) | Lateral acceleration  (pre – crash) (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Yaw Rate13 | Yaw Rate (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Traction Control Status | Traction Control Status (M2, 3 and N2, 3) | OK |  |
|  | Vulnerable road user secondary safety system deployment, time to deploy | Vulnerable road user secondary safety system deployment, time to deploy (M2, [M3], [N2], [N3]) | ok |  |
|  | Vulnerable road user secondary safety system warning indicator status**[[6]](#footnote-6)** | Vulnerable road user secondary safety system warning indicator status (M2, [M3], [N2], [N3]) | OK  MOIS R159 or Reversing Motion R158  Not as trigger due to frequent triggers |  |
|  | Safety belt status mid-position front | Safety belt status mid-position front (M2, 3 and N2, 3) | NOT Recommend |  |
|  | Far-side impact centre air bag deployment, time to deploy9 | Far-side impact centre air bag deployment, time to deploy (M2, [M3], [N2], [N3]) | NOT Recommend |  |
|  | Corrective steering function status | Corrective steering function status (M2, 3 and N2, 3) | Lane keeping? (need to understand applicability to HDV…. and items below) |  |
|  | Emergency steering function status | Emergency steering function status (M2, 3 and N2, 3) | Lane keeping? |  |
|  | Automatically commanded steering function category A status | Automatically commanded steering function category A status (M2, 3 and N2, 3) | Lane keeping? |  |
|  | Automatically commanded steering function category B1 status | Automatically commanded steering function category B1 status (M2, 3 and N2, 3) | Lane keeping? |  |
|  | Automatically commanded steering function category B2 status | Automatically commanded steering function category B2 status (M2, 3 and N2, 3) | Lane keeping? |  |
|  | Automatically commanded steering function category C status | Automatically commanded steering function category C status (M2, 3 and N2, 3) | Lane keeping? |  |
|  | Automatically commanded steering function category D status | Automatically commanded steering function category D status (M2, 3 and N2, 3) | Lane keeping? |  |
|  | Automatically commanded steering function category E status | Automatically commanded steering function category E status (M2, 3 and N2, 3) | Lane keeping? |  |
|  |  | Intelligent speed assistance (ISA) system (M2, 3 and N2, 3) |  |  |
|  |  | Turn table (fifth wheel) angle (N3) |  |  |
|  |  | Auxiliary braking systems (Driver control status) (M3,N3) |  |  |
|  |  | Cross wind assist status (N3) |  |  |
|  |  | Moving Off Information System Status (M2, 3 and N2, 3) |  |  |
|  |  | VRU Proximity Sensing system Reversing Motion Status (M2, 3 and N2, 3) | MOIS R159 or Reversing Motion R158  Not as trigger due to frequent triggers |  |
|  |  | Passenger door status front (M2, M3) |  |  |
|  |  | Passenger door status middle (M2, M3) |  |  |
|  |  | Passenger door status rear (M2, M3) |  |  |
|  |  | Driver cab door status ([M2], M3) |  |  |
|  |  | Halt brake system status (M2, M3) |  | Used to understand whether the brake is held by action of the driver, or by bespoke control program based on other parameters (doors, cab door, etc) around the vehicle. |
|  |  | Passenger count ([M2], [M3]) |  |  |
|  |  | Wheelchair ramp status (M2, M3) |  |  |
|  |  | Stop Bell status ([M2], M3) |  |  |
|  |  | Passengers on Stairs ([M3]) |  |  |
|  |  | Driver Radio Status ([M2], M3, [N2], [N3]) |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

1. The air bag warning lamp is the readiness indicator specified in national air bag requirements and may also illuminate to indicate a malfunction in another part of the deployable restraint system. [↑](#footnote-ref-1)
2. List this element n times, once for each device [↑](#footnote-ref-2)
3. The manufacturer will indicate the direction of positive roll/yaw rate [↑](#footnote-ref-3)
4. List this element n - 1 times, once for each stage of a multi-stage air bag system. [↑](#footnote-ref-4)
5. List this element n times, once for each device in 2nd, 3rd, row [↑](#footnote-ref-5)
6. 17 Multiple safety system status indications can be combined into the air bag warning indicator [↑](#footnote-ref-6)