

Event Data Recorder

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EDR Overview in KOREA

◀ EDR Status

- ◉ Korea introduced the EDR regulation in 2015(if equipped)
- ◉ Korea introduced Early Warning Report regulation and manufacturer submit the field report once a month with EDR data copy.
- ◉ Korea review the field report and EDR data to check the reliability(about 240 EDR data/month)
- ◉ Manufacturers are expanding their EDR recordings voluntarily



EDR data is objective evidence

EDR Case Study

◀ CASE

- ◉ Sudden Unintended Acceleration 1
 - The driver does not operate the accelerator pedal, but claims the vehicle has accelerated and caused the accident.
 - As a result of the EDR data check, the TPS value was recorded at 100%.
 - Aren't there any defects in the TPS system? Human error?
 - ⇒ The manufacturer records APS and TPS respectively. Also records whether or not cruise function is operated.

- ◉ Sudden Unintended Acceleration 2
 - The driver operate the brake pedal, but claims the vehicle has accelerated and caused the accident.
 - As a result of the EDR data check, the TPS value was recorded at 100% and Service Brake switch is ON.
 - Is this Sudden Unintended Acceleration?
 - ⇒ The manufacturer records APS and TPS respectively. Also records whether or not BOS is operated.

EDR Case Study

EDR data(2012)

- Final Rule published 2012 : 15 mandatory, 30 optional items
- Pre-crash data sample

Time (sec)	Speed (kph)	Engine RPM	Engine Throttle	Service Brake	ABS Activity	Stability Control	Steering Input
-5.0	53	6700	17	OFF	OFF	ESC 미작동 (ESC 스위치 on)	0
-4.5	55	6700	19	OFF	OFF	ESC 미작동 (ESC 스위치 on)	0
-4.0	54	6800	16	OFF	OFF	ESC 미작동 (ESC 스위치 on)	0
-3.5	53	6800	17	OFF	OFF	ESC 미작동 (ESC 스위치 on)	-5
-3.0	53	6800	17	OFF	OFF	ESC 미작동 (ESC 스위치 on)	-5
-2.5	52	6800	18	OFF	OFF	ESC 미작동 (ESC 스위치 on)	-85
-2.0	49	6800	19	OFF	OFF	ESC 미작동 (ESC 스위치 on)	-90
-1.5	49	6700	20	OFF	OFF	ESC 미작동 (ESC 스위치 on)	-75
-1.0	50	6800	17	OFF	OFF	ESC 미작동 (ESC 스위치 on)	-30
-0.5	50	6800	17	OFF	OFF	ESC 미작동 (ESC 스위치 on)	-30
0.0	42	6700	19	OFF	OFF	ESC 미작동 (ESC 스위치 on)	-30

EDR Case Study

◀ EDR data(2014)

○ Pre-crash data sample

Time (sec)	Speed (kph)	Engine RPM	Engine Throttle	Accelerator Pedal	Service Brake	ABS Activity	Stability Control	Steering Input
-5.0	46	1700	25	26	OFF	OFF	ESC 미작동 (ESC 스위치 on)	0
-4.5	47	1800	25	27	OFF	OFF	ESC 미작동 (ESC 스위치 on)	0
-4.0	49	1800	41	32	OFF	OFF	ESC 미작동 (ESC 스위치 on)	0
-3.5	50	1400	46	33	OFF	OFF	ESC 미작동 (ESC 스위치 on)	0
-3.0	51	1500	41	32	OFF	OFF	ESC 미작동 (ESC 스위치 on)	0
-2.5	53	1500	26	28	OFF	OFF	ESC 미작동 (ESC 스위치 on)	0
-2.0	54	1600	28	28	OFF	OFF	ESC 미작동 (ESC 스위치 on)	0
-1.5	55	1600	30	28	OFF	OFF	ESC 미작동 (ESC 스위치 on)	0
-1.0	57	1600	30	28	OFF	OFF	ESC 미작동 (ESC 스위치 on)	0
-0.5	58	1700	23	25	OFF	OFF	ESC 미작동 (ESC 스위치 on)	0
0.0	59	1700	17	18	OFF	OFF	ESC 미작동 (ESC 스위치 on)	0

EDR Case Study

EDR data

- Pre-crash data sample

**Pre-Crash Data -5.0 to 0 sec (100 msec) (Most Recent Event (Non-Deployment)) -
Table 1 of 6**

Time (sec)	Pre-Crash Recorder Status	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal, % Full (%)	Raw Pedal #1 (V)	Raw Pedal #2 (V)	Engine Throttle, % Full (%)	Raw Throttle #1 (V)	Raw Throttle #2 (V)
-5.0	Complete	60 [96]	0	0.410	0.195	SNA	4.980	4.980
-4.9	Complete	60 [96]	0	0.410	0.195	SNA	4.980	4.980
-4.8	Complete	59 [95]	0	0.410	0.195	SNA	4.980	4.980
-4.7	Complete	59 [95]	0	0.410	0.195	SNA	4.980	4.980
-4.6	Complete	58 [94]	0	0.410	0.195	SNA	4.980	4.980
-4.5	Complete	58 [94]	0	0.410	0.195	SNA	4.980	4.980
-4.4	Complete	58 [94]	0	0.410	0.195	SNA	4.980	4.980

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EDR data(2019)

Pre-crash data sample

Time (sec)	Speed (kph)	Engine RPM	Engine Throttle	Accelerator Pedal	Service Brake	ABS Activity	Stability Control	Steering Input
-5.0	7	500	유효하지 않은 데이터 또는 지원하지 않음	0	OFF	OFF	ESC 미작동 (ESC 스위치 on)	-70
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
0.0	21	1400	유효하지 않은 데이터 또는 지원하지 않음	99	OFF	OFF	ESC 미작동 (ESC 스위치 on)	-125

Time (sec)	Shift Position	Smart Cruise Control(On/Off)	Smart Cruise Control(Speed)	Smart Cruise Control(Unit)	Smart Cruise Control(Status)
-5.0	D	OFF	0	Km/h	ready
⋮	⋮	⋮	⋮	⋮	⋮
0.0	D	OFF	0	Km/h	준비

Time (sec)	Forward Collision-Avoidance Assist (Status)	Forward Collision-Avoidance Assist (Warning)	Time (sec)	Forward Collision-Avoidance Assist (Status)	Forward Collision-Avoidance Assist (Warning)
-5.0	on	미경보 / 시스템 고장 혹은 신호 미수신	-2.5	on	미경보 / 시스템 고장 혹은 신호 미수신
⋮	⋮	⋮	⋮	⋮	⋮
-2.5	on	미경보 / 시스템 고장 혹은 신호 미수신	-0.0	on	미경보 / 시스템 고장 혹은 신호 미수신

EDR Case Study

◀ CASE

- ◉ Defect of Brake system
 - The driver operated the brake pedal, but claims the vehicle is not reduced the speed and caused the accident.
 - As a result of the EDR data check, the Service Brake switch is ON.
 - The manufacturer claims that the driver did not operate the braking pedals sufficiently, but the driver didn't say that..
 - What is the truth?
 - ⇒ The manufacturer records Brake switch and the pressure of master cylinder actual brake force, brake booster vacuum level.

EDR Case Study

EDR 2019

Pre-crash data sample

Time (sec)	Speed (kph)	Engine RPM	Engine Throttle	Accelerator Pedal	Master Cylinder Pressure(bar)	Service Brake	ABS Activity	Stability Control	Steering Input
-5.0	71	4600	유효하지 않은 데이터 또는 지원하지 않음	0	0.0	OFF	OFF	ESC 미작동 (ESC 스위치 on)	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
0.0	17	1100	유효하지 않은 데이터 또는 지원하지 않음	0	173.2	on	on	ESC 미작동 (ESC 스위치 on)	0

Pre-Crash Data -5.0 to 0 sec (100 msec) (Most Recent Event (Non-Deployment)) - Table 3 of 6

Time (sec)	Brake Intervention Enabled	Maximum (hard) braking (ALS controls all wheels)	Any ABS brake event	Brake Booster Vacuum Level (kPa)	Brake Master Cylinder Pressure (bar)	Actual Brake Torque (Nm)	Wheel Speed LF (RPM)	Wheel Speed RF (RPM)
-5.0	True	False	False	-96.6	0	0	717	718
-4.9	True	False	False	-96.6	0	0	714	712
-4.8	True	False	False	-97.1	0	0	712	711
-4.7	True	False	False	-96.6	0	0	711	711
-4.6	True	False	False	-96.6	0	0	711	711
-4.5	True	False	False	-96.6	0	0	705	707

EDR Case Study

◀ CASE

- ◉ Defect of Transmission system
 - The driver changed gear from P to R and operated the accelerator pedal, but the vehicle starts to move forward. Finally accident is occurred. Moreover, the vehicle later moved back and the accident had happened again.
 - Shift lever position is not recorded in EDR data
 - How can we understand the accident and explain easily?
 - ⇒ The manufacturer records the position of shift lever

EDR Case Study

EDR data(2019)

Pre-crash data sample

Time (sec)	Speed (kph)	Engine RPM	Engine Throttle	Accelerator Pedal	Service Brake	ABS Activity	Stability Control	Steering Input
-5.0	7	500	유효하지 않은 데이터 또는 지원하지 않음	0	OFF	OFF	ESC 미작동 (ESC 스위치 on)	-70
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
0.0	21	1400	유효하지 않은 데이터 또는 지원하지 않음	99	OFF	OFF	ESC 미작동 (ESC 스위치 on)	-125

Time (sec)	Shift Position	Smart Cruise Control(On/Off)	Smart Cruise Control(Speed)	Smart Cruise Control(Unit)	Smart Cruise Control(Status)
-5.0	D	OFF	0	Km/h	ready
⋮	⋮	⋮	⋮	⋮	⋮
0.0	D	OFF	0	Km/h	준비

Conclusion

◀ EDR Data Element

- ◉ EDR data is helpful for accident analysis, but EDR alone cannot analyze the cause of the accident.
- ◉ It is necessary to investigate which data is needed to analyze the accident. After that we should add the data element in EDR.

Data element name	Definition	Required	Recording interval/time	Data sample rate (per second)
Engine throttle, % full	Percentage ratio of the engine throttle opening position	Mandatory	-5.0 to 0 sec.	[to be determined]
accelerator pedal, % full	Percentage ratio of the accelerator pedal position	Mandatory	-5.0 to 0 sec.	[to be determined]
Cruise Control System	Operating status of the cruise control system.	Mandatory (if equipped)	-5.0 to 0 sec.	[to be determined]
Adaptive Cruise Control Status	Operating status of ACC.	Mandatory (if equipped)	-5.0 to 0 sec.	[to be determined]
Brake override System	Operating status of the brake override system.	Mandatory (if equipped)	-5.0 to 0 sec.	[to be determined]
Master cylinder pressure	Pressure of the Master cylinder	Mandatory	-5.0 to 0 sec.	[to be determined]
Gear position	Gear (shift lever) position	Mandatory	-5.0 to 0 sec.	[to be determined]

EDR data element list will be proposed in EDR-DSSAD-03 session



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THANK YOU

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