

Standardized format(EDR)

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EEPROM VS Flash Memory

◀ EEPROM

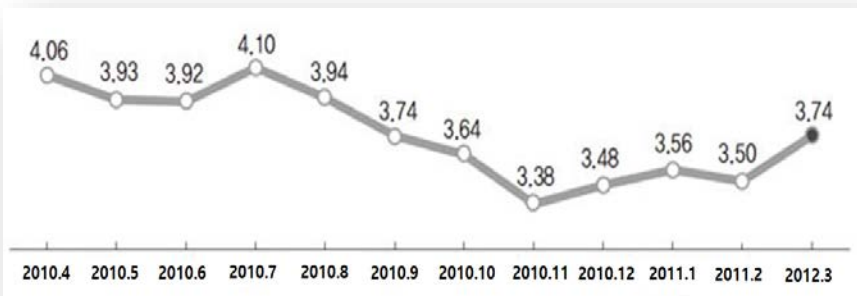
- ◉ EEPROM stands for electrically erasable programmable read-only memory and is a type of non-volatile memory used in computers, integrated in micro-controllers for smart cards and remote keyless systems, and other electronic devices to store relatively small amounts of data but allowing individual bytes to be erased and reprogrammed. → Read and Write in Bytes (relatively slow)

◀ Flash Memory

- ◉ Flash memory is an electronic (solid-state) non-volatile computer memory storage medium that can be electrically erased and reprogrammed. Flash memory is a type of floating-gate memory that was invented at Toshiba in 1980, based on EEPROM (electrically erasable programmable read-only memory) technology. Although flash memory is technically a type of EEPROM, the term "EEPROM" is generally used to refer specifically to non-flash EEPROM which is erasable in small blocks, typically bytes. → Read in Byte, Write in Page/Block (relatively fast)

Memory Price(unit : dollar)

◀ The trend of Nand-Flash price



Year(end)	Storage	Price(\$)	Price(\$)	Price(\$)	Storage(Gb) per 1\$
			per 1Gb		
2010.12	16Gb	3.48	0.22		4.60
2019.11	128Gb	4.31	0.03		29.70

* (December 2010) 4.60Gb per a dollar

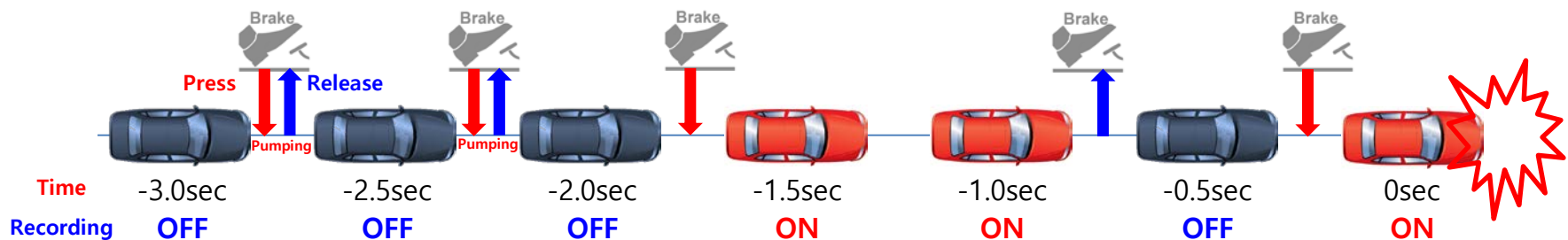
* (November 2011) 29.70Gb per a dollar

⇒ 1Gb memory purchase price is approximately one-sixth of that in 2019 compared to 2010.

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- Compared to 10 years ago, data storage that can be purchased per dollar increased by approximately 6 times in 2019 compared to 2010, and it is not reasonable to record the same element same method included in the "FINAL REGULATORY EVALUATION" published by NHTSA in July 2006.
- Therefore, the items recorded in the accident recorders and the time interval should be enlarged. However, it is necessary to expand to the appropriate level considering the level of technology.
- More data should be recorded by changing the "data sampling rate" for accurate accident analysis. Items that used to record two data per second should record five per second, and items requiring detailed analysis, such as "AEBS status," should record 10 per second.



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New element

Data Elements(PART 563)		Data Elements(New Standardized format)		
Mandatory	15 elements (70 samples)	Mandatory	22 (222 samples)	New 7 elements
Optional	30 elements (169 samples)	Optional	55 (679 samples)	New 25 elements

No.	Data element name	Required	Recording interval/time ¹⁾ (relative to time zero)	PART 563		New Standardized format		Minimum Range	Accuracy	Resolution
				Data sample rate (per second)	Max samples	Data sample rate (per second)	Max samples			
1	Delta-V, longitudinal	Mandatory	0 to 250 ms, or 0 to End of Event Time plus 30 ms, whichever is shorter	100	26	100	26	-100 km/h to +100 km/h	± 10%	1 km/h
2	Maximum delta-V, longitudinal	Mandatory	0-300 ms or 0 to End of Event Time plus 30 ms, whichever is shorter	N/A	1	N/A	1	-100 km/h to + 100 km/h	±10%	1 km/h.
3	Time, maximum delta-V, longitudinal	Mandatory	0-300 ms or 0 to End of Event Time plus 30 ms, whichever is shorter	N/A	1	N/A	1	0-300 ms, or 0-End of Event Time plus 30 ms, whichever is shorter	±3 ms	2.5 ms.
4	Safety belt status, driver (buckled, not buckled).	Mandatory	-1.0 sec	N/A	1	N/A	1	On or Off	N/A	On or Off.
5	Speed, vehicle indicated	Mandatory	-5.0 to 0 sec	2	11	5	26	0 km/h to 200 km/h	±1 km/h	1 km/h.
6	Engine throttle, Percent full	Mandatory	-5.0 to 0 sec	2	11	5	26	0 to 100%	±5%	1%.
7	Accelerator control (pedal) position, Percent Full	Mandatory	-5.0 to 0 sec	-	-	5	26	0 to 100%	±5%	1%.
8	Service brake, on/off	Mandatory	-5.0 to 0 sec	2	11	5	26	On or Off	N/A	On or Off.
9	Ignition cycle, crash	Mandatory	-1.0 sec	N/A	1	N/A	1	0 to 60,000	±1 cycle	1 cycle.
10	Ignition cycle, download	Mandatory	At time of download	N/A	1	N/A	1	0 to 60,000	±1 cycle	1 cycle.
11	Frontal air bag warning lamp, on/off	Mandatory	-1.0 sec	N/A	1	N/A	1	On or Off	N/A	On or Off.
12	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 multistage air bag, driver.	Mandatory	Event	N/A	1	N/A	1	0 to 250 ms	±2 ms	1 ms.
13	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 multistage air bag, front passenger.	Mandatory	Event	N/A	1	N/A	1	0 to 250 ms	±2 ms	1 ms.
14	Multi-event, number of events (1,2)	Mandatory	Event	N/A	1	N/A	1	1 or 2	N/A	1 or 2.
15	Time from event X to Y	Mandatory	As needed	N/A	1	N/A	1	0 to 5.0 sec	0.1 sec	0.1 sec.
16	Complete file recorded (yes, no)	Mandatory	Following other data	N/A	1	N/A	1	Yes or No	N/A	Yes or No.
17	Brake System Internal Pressure	Mandatory	-5.0 to 0 sec	2	-	5	26	0 to 20,000 kPa(200bar)	±10	100 kPa(1bar)
18	Gear Selection Status	Mandatory	-5.0 to 0 sec	2	-	5	26	N/A	N/A	Park, Reverse, Neutral, or Drive
19	Brake override system	Mandatory	-5.0 to 0 sec	2	-	5	26	On or Off	N/A	On or Off.
20	ECU Hardware number	Mandatory		N/A	-	N/A	1	N/A	N/A	N/A
21	ECU(s) Software Number(s)	Mandatory		N/A	-	N/A	1	N/A	N/A	N/A
22	Tool Software Number(s)	Mandatory		N/A	-	N/A	1	N/A	N/A	N/A

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				Data sample rate (per second)	Max samples	Data sample rate (per second)	Max samples			
23	Lateral Acceleration	Optional	0 to 250 ms	100	26	100	26	-50 g to +50 g	± 5%	0.1g
24	Longitudinal acceleration	Optional	0 to 250 ms	100	26	100	26	-50 g to +50 g	± 5%	0.1g
25	Normal acceleration	Optional	0 to 250 ms	100	26	100	26	-50 g to +50 g	± 5%	0.1g
26	Delta-V, lateral	Optional	0 to 250 ms, or 0 to End of Event Time plus 30 ms, whichever is shorter	100	26	100	26	-100 km/h to +100 km/h	± 10%	1 km/h
27	Maximum delta-V, lateral	Optional	0-300 ms or 0 to End of Event Time plus 30 ms, whichever is shorter	N/A	1	N/A	1	-100 km/h to + 100 km/h	±10%	1 km/h.
28	Time, maximum delta-V, lateral	Optional	0-300 ms or 0 to End of Event Time plus 30 ms, whichever is shorter	N/A	1	N/A	1	0-300 ms, or 0-End of Event Time plus 30 ms, whichever is shorter	±3 ms	2.5 ms.
29	Time, maximum delta-V resultant	Optional	0-300 ms or 0 to End of Event Time plus 30 ms, whichever is shorter	N/A	1	N/A	1	0-300 ms, or 0-End of Event Time plus 30 ms, whichever is shorter	±3 ms	2.5 ms.
30	Engine RPM	Optional	-5.0 to 0 sec	2	11	5	26	0 to 10,000 rpm	±100 rpm	100 rpm.
31	Vehicle roll angle	Optional	-1.0 up to 5.0 sec ³	10	-	10	-	-1080 deg to + 1080 deg	±10%	10 deg.
32	ABS activity	Optional	-5.0 to 0 sec	2	11	5	26	On or Off	N/A	On or Off.
33	Stability Control	Optional	-5.0 to 0 sec	2	11	5	26	On, Off, or Engaged	N/A	On, Off, or Engaged.
34	Steering input	Optional	-5.0 to 0 sec	2	11	5	26	-250 deg CW to + 250 deg CCW	±5%	±1%.
35	Safety belt status, right front passenger (buckled, not buckled).	Optional	-1.0 sec	N/A	1	N/A	1	On or Off	N/A	On or Off.
36	Frontal air bag suppression switch status, right front passenger (on, off, or auto).	Optional	-1.0 sec	N/A	1	N/A	1	On, Off, or Auto	N/A	On, Off, or Auto.
37	Front air bag deployment time to nth stage, driver.	Optional	Event	N/A	1	N/A	1	0 to 250 ms	±2 ms	1 ms.
38	Frontal air bag deployment, time to nth stage, front passenger.	Optional	Event	N/A	1	N/A	1	0 to 250 ms	±2 ms	1 ms.
39	Frontal air bag deployment, nth stage disposal, driver, Y/N (whether the nth stage deployment was for occupant restraint or propellant disposal purposes).	Optional	Event	N/A	1	N/A	1	Yes or No	N/A	Yes or No.
40	Frontal air bag deployment, nth stage disposal, front passenger, Y/N (whether the nth stage deployment was for occupant restraint or propellant disposal)	Optional	Event	N/A	1	N/A	1	Yes or No	N/A	Yes or No.
41	Side air bag deployment, time to deploy, driver.	Optional	Event	N/A	1	N/A	1	0 to 250 ms	±2 ms	1 ms.
42	Side air bag deployment, time to deploy, front passenger.	Optional	Event	N/A	1	N/A	1	0 to 250 ms	±2 ms	1 ms.

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43	Side curtain/tube air bag deployment, time to deploy, driver.	Optional	Event	N/A	1	N/A	1	0 to 250 ms	±2 ms	1 ms.
44	Side curtain/tube air bag deployment, time to deploy, front passenger.	Optional	Event	N/A	1	N/A	1	0 to 250 ms	±2 ms	1 ms.
45	Pretensioner deployment, time to deploy, driver.	Optional	Event	N/A	1	N/A	1	0 to 250 ms	±2 ms	1 ms.
46	Pretensioner deployment, time to deploy, front passenger.	Optional	Event	N/A	1	N/A	1	0 to 250 ms	±2 ms	1 ms.
47	Seat track position switch, foremost, status, driver.	Optional	-1.0 sec	N/A	1	N/A	1	Yes or No	N/A	Yes or No.
48	Seat track position switch, foremost, status, front passenger.	Optional	-1.0 sec	N/A	1	N/A	1	Yes or No	N/A	Yes or No.
49	Occupant size classification, driver.	Optional	-1.0 sec	N/A	1	N/A	1	5th percentile female or larger	N/A	Yes or No.
50	Occupant size classification, front passenger.	Optional	-1.0 sec	N/A	1	N/A	1	Child	N/A	Yes or No.
51	Occupant position classification, driver.	Optional	-1.0 sec	N/A	1	N/A	1	Out of position	N/A	Yes or No.
52	Occupant position classification, front passenger.	Optional	-1.0 sec	N/A	1	N/A	1	Out of position	N/A	Yes or No.
53	Tyre Pressure Monitoring System (TPMS) Warning Lamp Status	Optional	-1.0 sec	-	-	N/A	1	On or Off	N/A	On or Off.
54	Brake Pedal Position	Optional	-5.0 to 0 sec	-	-	5	26	0 to 100 %	± 10 % of the full range	5
55	Yaw Angle	Optional	-5.0 to 0 sec	-	-	5	26	-1080 to +1080 degrees	± 10% of the full range of the sensor	10
56	Yaw Rate	Optional	-5.0 to 0 sec	-	-	5	26	-75 to +75 degrees / second	± 10% of the full range of the sensor	0.1
57	Traction Control Status	Optional	-5.0 to 0 sec	-	-	5	26	On or Off	N/A	On or Off.
58	AEBS status	Optional	-5.0 to 0 sec	-	-	10	51	N/A	N/A	Actively Warning, Actively Engaged, Faulted, Off, Not Active, or Driver Override
59	Steering Assist Function status	Optional	-5.0 to 0 sec	-	-	10	51	N/A	N/A	Actively Warning, Actively Engaged, Faulted, Off, Not Active, or Driver Override
60	Cruise Control System	Optional	-5.0 to 0 sec	-	-	5	26	N/A	N/A	Actively Controlling, Faulted, Commanded Off, On but Not Controlling, or Driver Override
61	Adaptive Cruise Control Status (driving automation system level 1)	Optional	-5.0 to 0 sec	-	-	5	26	N/A	N/A	Actively Controlling, Faulted, Commanded Off, On but Not Controlling, or Driver Override

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62	Lane Departure Warning Status	Optional	-5.0 to 0 sec	-	-	10	51	On, Off or Warning	N/A	On, Off or Warning
63	Lane Keep Assist Status	Optional	-5.0 to 0 sec	-	-	10	51	On, Off, Warning and Engaged	N/A	On, Off, Warning and Engaged
64	Forward Collision Warning Status	Optional	-5.0 to 0 sec	-	-	10	51	On, Off or Engaged	N/A	On, Off or Engaged
65	Partial Driving Operating Status (driving automation system level 2)	Optional	-5.0 to 0 sec	-	-	5	26	N/A	N/A	Off - Not Controlling, On - Actively Controlling, Faulted, Request to Intervene
66	Accident Year	Optional	-1.0 sec	-	-	N/A	1	2000 to 2253	± 1	1
67	Accident Month	Optional	-1.0 sec	-	-	N/A	1	1 to 12	± 1	1
68	Accident Day	Optional	-1.0 sec	-	-	N/A	1	1 to 31	± 1	1
69	Accident Hour	Optional	-1.0 sec	-	-	N/A	1	1 to 23	± 1	1
70	Accident Minute	Optional	-1.0 sec	-	-	N/A	1	1 to 59	± 1	1
71	Accident Second	Optional	-1.0 sec	-	-	N/A	1	1 to 59	± 1	1
72	Download Year	Optional	-1.0 sec	-	-	N/A	1	2000 to 2253	± 1	1
73	Download Month	Optional	-1.0 sec	-	-	N/A	1	1 to 12	± 1	1
74	Download Day	Optional	-1.0 sec	-	-	N/A	1	1 to 31	± 1	1
75	Download Hour	Optional	-1.0 sec	-	-	N/A	1	1 to 23	± 1	1
76	Download Minute	Optional	-1.0 sec	-	-	N/A	1	1 to 59	± 1	1
77	Download Second	Optional	-1.0 sec	-	-	N/A	1	1 to 59	± 1	1

total samples(max)

239

901

Data retrieval tools

◀ US PART 563 – Event Data Recorders

- ◉ Each manufacturer of a motor vehicle equipped with an EDR shall ensure by licensing agreement or other means that a tool(s) is commercially available that is capable of accessing and retrieving the data stored in the EDR that are required by this part. The tool(s) shall be **commercially available not later than 90 days after the first sale** of the motor vehicle for purposes other than resale.

◀ ROK Vehicle Management Act, Enforcement rules Article 30-2, paragraph 3

- ◉ If the vehicle **owner or driver (including the family), the transport minister, and the performance test agent (KATRI)** require the records of the "Event Data Recorder", each manufacturer shall **hand-deliver or mail** the records of the "Event Data Recorder" **within 15 days of the required date**.

◀ Proposal

- ◉ (US or ROK) “commercially available not later than 90 days after the first sale” or “hand-deliver or mail within 15 days of the required date”



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THANK YOU

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