QV FCA System Manual

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EE Laboratory DAS System Design Team

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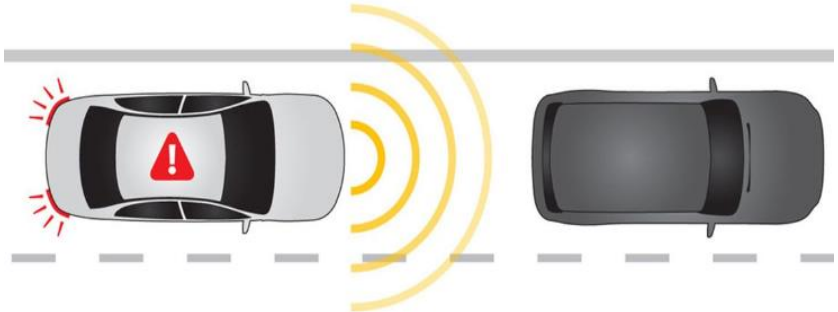
▣ FCA Outline

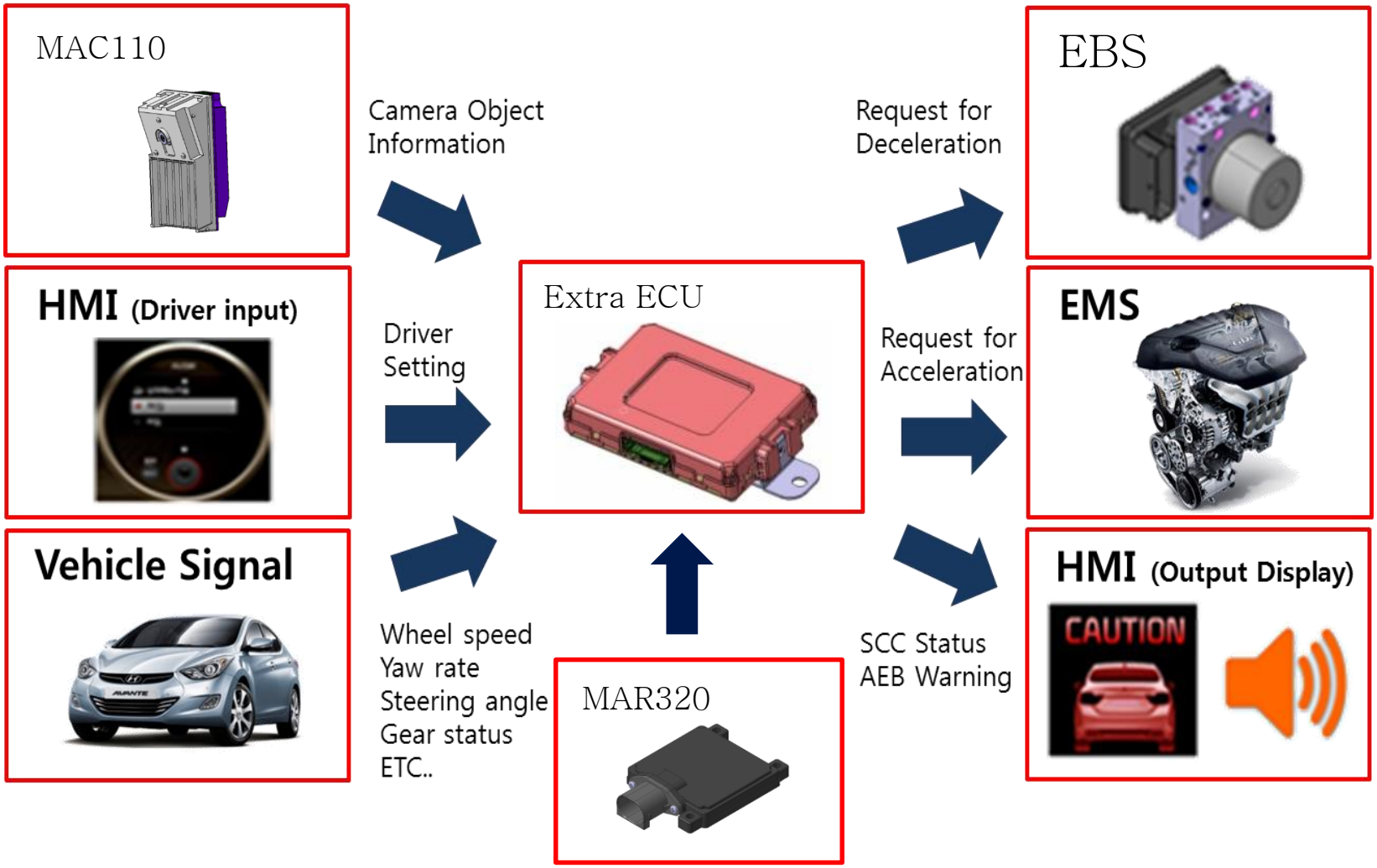
- Provide notifications and stop the vehicle when front sensor has recognized crash risk ahead.
- Primary components: Sensor (MOBIS radar [MAR320], MOBIS camera [MAC110], WABCO brake [EBS.ABS]



FCA (Forward Collision Avoidance Assist)

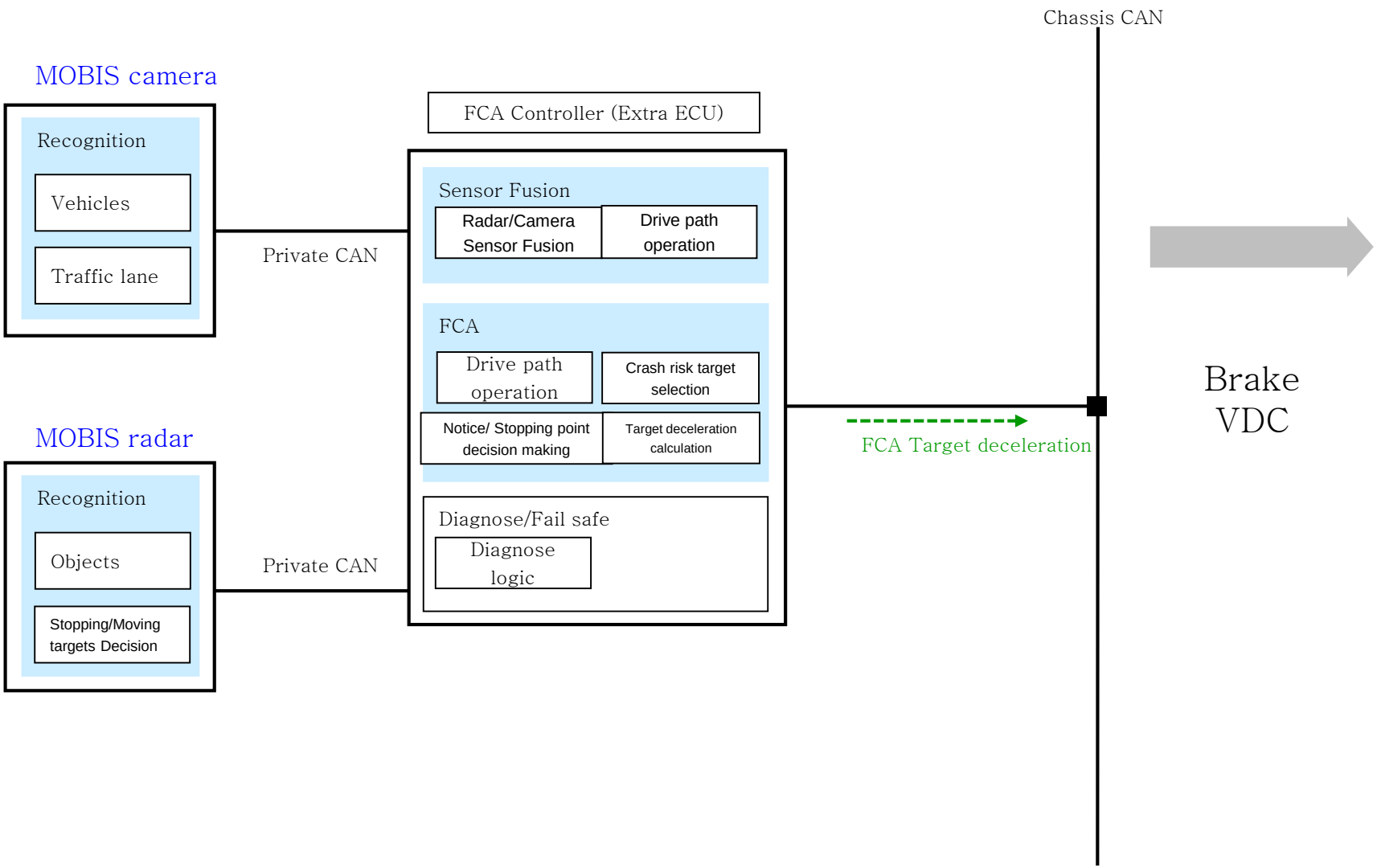
▣ FCA System Composition

- FCA System Composition



▣ FCA System Composition

- Features for each sensor



▣ FCA Operating Condition

Classification		Commercial	Riding
		Vehicle FCA	Vehicle/Pedestrian/Bicycle FCA
Operating Speed (Moving Vehicle)		Partial braking(*0.35g) : 0~178km/h Full-braking(0.6g) : 0~84km/h	Partial braking(0.2~0.4g) : 0~180km/h Full-braking(0.8~1.0g) : 0~80km/h
Control Entry Speed		Over 8km/h (FCA Default ON)	
HMI	Alarm Point	1st notification(FCW) : Available to select alarm point via USM 2nd notification(Pre-braking) and 3rd notification(Full-braking) : single point of view	
	Notice Type	Alarm sound and dashboard warning message (Caution for front → Collision warning → Emergency Braking)	
	System OFF	When system off selected, light a same warning light * asun sdeysr teminv brokestigatioen li ngh(t0.35g→0.3g or less)	

Regulations for commercial vehicle have to follow the regulations in gray boxes

Steps	Target Model	Stationary target			Moving target				Row
		Alarm Point		amount of deceleration	Alarm Point		amount of deceleration	Speed of front vehicle	
		1st	2nd		1st	2nd			
		Minimum 1 EA	Minimum 2 EA		Minimum 1 EA	Minimum 2 EA			
1step (pre-confirm) 347/2012	M3 N2 >8t N3	EBP start Before 1.4sec (sense of hearing/touch)	In 0.8sec before EBP starts (sense of hearing/touch/sight)	Over10 km/h	1.4sec before EBP starts (sense of hearing/touch	In 0.8sec before EBP starts (sense of hearing/touch/sight)	collision prevention	32±2km/h	
2step (pre-confirm) 347/2012	M3 N2＞8t N3	EBP start Before 1.4sec (sense of hearing/touch)	In 0.8sec before EBP starts (sense of hearing/touch/sight)	Over20 km/h	1.4sec before EBP starts(sense of hearing/touch	0.8sec before EBP starts(sense of hearing/touch/sight)	collision prevention	12±2km/h	1
2step (confirm) 2015/562	N2≤8t M2 *)	EBP start Before 0.8sec (sense of hearing/touch/sight)	Before EBP starts (sense of hearing/touch/sight)	Over10 km/h	0.8sec before EBP starts(sense of hearing/touch	Before EBP starts (sense of hearing/touch/sight)	collision prevention	67±2km/h	2

▣ FCA Cancel Control Condition/Critical Situation

Classification	Operating Specification
	Vehicle AEB
Cancel Control Condition	① Driver's normal cancelation - When AEBS OFF is selected - When ABS/VDC switch first gear is selected for OFF ② Driver's movement cancelation - When FCA operating speed is under 8ph - When FCA operating speed is above 178kph - In condition of sudden steering control (Over SAS 172 deg/sec and 115 deg) - When gear is P or R - When gas pedal is above 80% or driver Kick-down it - When road curve radius is under 50m ③ System error cancelation - When radar/camera is broken-down - When related other module or CAN telecommunication is broken-down
Critical Situation	① Abiotic Factors - Bad weather conditions - 역광, 반사광으로 카메라 인식 불가시 When camera is not operated because of counter light or reflected light - Contamination of camera or radar ② Camera or radar detection limit - Vehicle or pedestrian suddenly cut in front - If width of front object is narrow - If taillight of front vehicle is asymmetry or not operated at night - oncoming vehicles or oncoming vehicles with backward state

▣ Cluster Operation while FCA is Operating

구 분	Warning Messages
Dashboard Imeages	
Explanation	Warning from first step to three step warning message + OFF

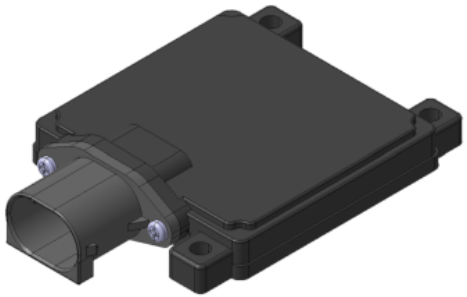
8Hz recurring sound

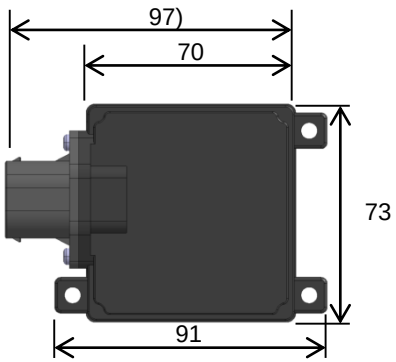
8Hz recurring sound

Continual sound

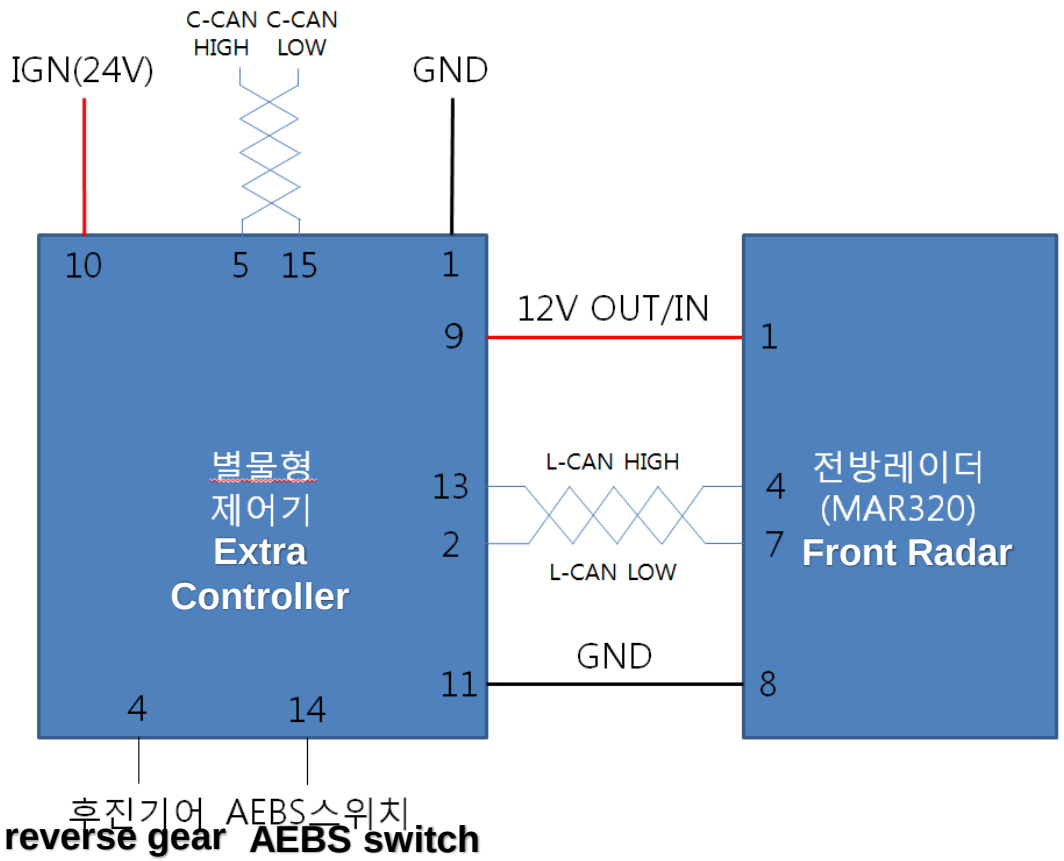
▣ Radar Specification

MAR320(Independent MRR)



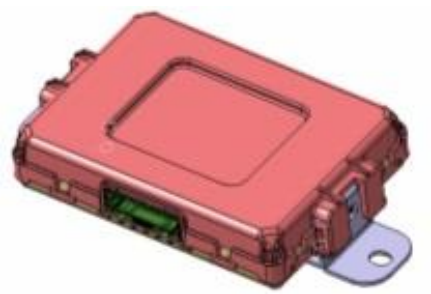


System Specification	Performance
Normal Voltage	12V
Using Frequency Range	76 ~ 77GHz
Size(mm)	73 x 70 x 15 (TBD)
Weight	<150g
Feature	High Speed FMCW
Mode	If power is connected, antenna is eradiated as single mode

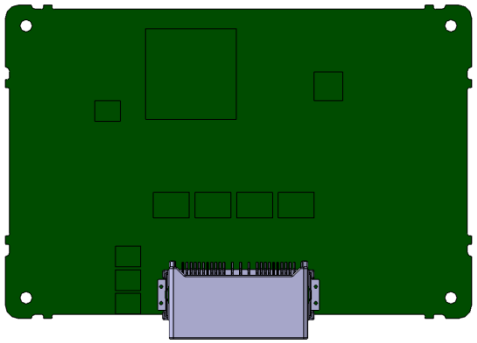


▣ Extra ECU Specification

QV FCA ECU	○ Purpose: communication (CAN, CAN-FD, LIN) based controller for controlled calculation. - FE RSPA ('18. 1) Controller based HW design for suitability of commercial product (24V power available) - RADAR product power supply feature added



<QV FCA Extra ECU Exterior>



<QV FCA Extra ECU Exterior>

Divisions	Items	Specifications	Note
ECU	Rated Voltage	DC 24 V±0.4V	
	Operating	DC 16V ~ 32V	IGN Power usage operation
	Operating Temperatures	-40℃ ~ 85℃	
	PCB Size [mm]	110 × 76 × 1.6	Material: FR-4(6L), Plating: with gold
	ECU Size [mm]	129.6 × 86 × 25	PP-(CF+CB)20 -> TBD
MCU	Core	32bit Dual-core	
	# of Cores	3 Core	Lockstep-core + Single-core
	Operating Frequency	200Mhz	
COM	HS-CAN/CAN-FD J1939	3 Ch. (reserve 1Ch.)	CAN-FD communication speed: Max. 2Mbps Common use CAN J1939 support
	LIN	(reserve 4 Ch.)	LIN 2.1 support
	SPI	2 Ch.	SPI (PMIC, EEPROM)
Memory	EEPROM	64Kbit with SPI	
In put/Out put	INDI. AEBS SW	Max. 30mA	Switch LED PWM output
	INDI. OUT_LED2	Max. 30mA	Switch LED PWM output (reserve)
	AEBS SW IN	Open/Short type	AEBS Switch signal input
	Reverse SW IN	24V/Open type	Reverse information signal input
	SW IN_3	Open/Short type	Switch signal input – 3 (reserve)
	Radar Sensor Power	Max. 1.5A → Dual-ch. HS Power IC	External sensor 12V power supply
	Exterior Sensor Power(reserve)		

Information

RF Exposure Statement (MPE)

The antenna(s) must be installed such that a minimum separation distance of at least 20 cm is maintained between the radiator (antenna) and all persons at all times. This device must not be co-located or operating in conjunction with any other antenna or transmitter.

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