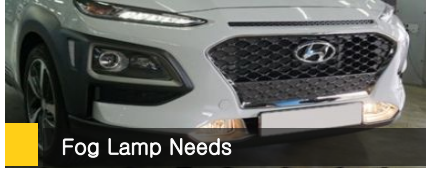


1. Concept & Outline



Fog Lamp Needs

- ✓ Increased visibility in Fog conditions
- ✓ Keeping others on the road alert



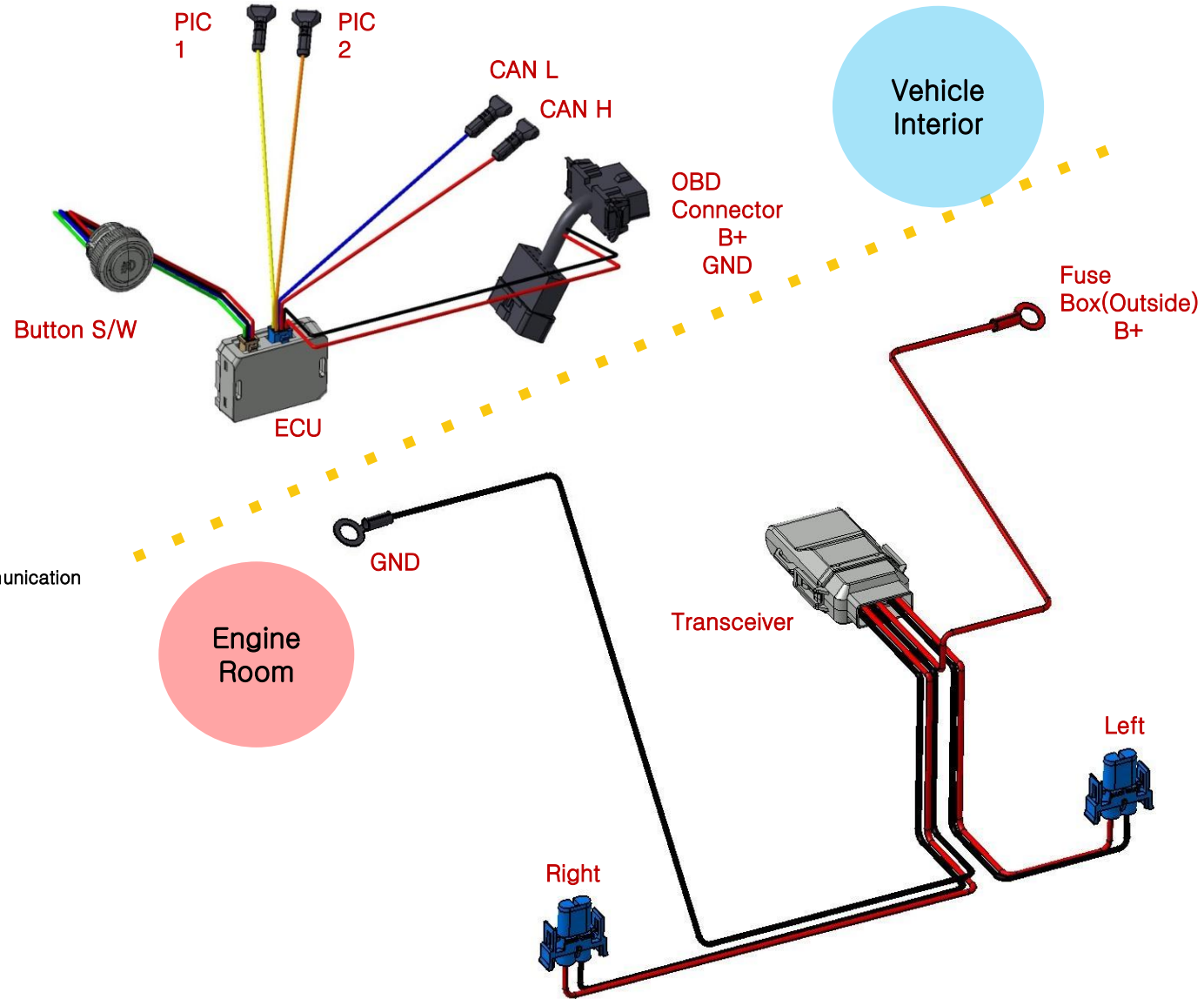
Easy installation design

- ✓ Harness wire minimized using Wireless communication
- ✓ Gained Reliability by minimized wire exposure



Option

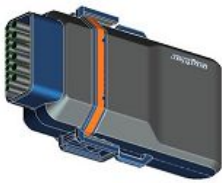
- ✓ Car Protection / Additional sensing device
- ✓ FOTA Support



2-1. Design Specification of System

Specifications	
Source Voltage	Vin 12V (Car Battery 12V)
Operating Temperature	-30 ~ 105°C (ES95400-10) → Lamp Module -30 ~ 75°C (ES95400-10) → ECU Module -30 ~ 85°C (ES95400-10) → Button Module
Storage Temperature	-40 ~ 115°C (ES95400-10) → Lamp Module -40 ~ 85°C (ES95400-10) → ECU Module -40 ~ 95°C (ES95400-10) → Button Module
Water proof	Applied (IP6K9K) → Lamp Module Not Applied → ECU Module Not Applied → Button Module
Communication Range	30m ~ 50m
Mounting Position	Perimeter of Head lamp→ Lamp Module Driver's lower dash Pannel→ ECU Module Driver's upper dash Pannel(Left,Right free space) Make a hole and Mounting→ Button Module

2-2. Design Specification of Each Module

	MAIN Controller	Engine Room Lamp Module	Button Module
Image			
RF	BLE4.2 / 2.4 ~ 2.48GHz / 40CH	BLE4.2 / 2.4 ~ 2.48GHz / 40CH	-
PCB	4Layer,FR4,1.2T,LF-HAL 32.5X47.3mm	4Layers, FR4, 1.6T	4Layer, FR4, 1.2T, LF-HAL, 32.5x47.3mm
F/W	BLE Protocol4.2 CAN Bus Protocol	BLE 4.2 Protocol	-
Communication encryption	AES128	AES128	-
Display	-	-	4EA (AMBER LED)
Button	-	-	1EA
UI	-	-	-
Voltage	Vehicle 12V	Vehicle 12V	3.3V (ECU Module)
Operation Temp.	-30℃ ~ +85℃	-30℃ ~ +105℃	-30℃ ~ +85℃
Antenna Type	Pattern	Pattern	-
Life time	-	-	-
Communication Range	50m (Max. Range)	50m (Max. Range)	-
Update solution	On-board Coding	On-board Coding	-
Surface treatment	부식+부분광택	TBD	부식+스프레이+레이저
Size/Weight	55.2 x 38.2 x 18.68T/ TBD	90.0 x 50.3 x 23T / TBD	Φ31.07X23.60 / 13g
Certification	FCC/IC	FCC/IC	-
Target sched.	2019' May	2019' May	2019' May

3-1. Operating Principle [Strong Point]

Solution	Description	Advantage
Auto grade Wireless SoC	◆ Auto grade AEC-Q100 qualified (Grade 2 : -40 ~ 105°C) BLE SoC	Reliability ↑
Power Saving	◆ Minimal System IC applied ◆ Use of Bluetooth Low Energy Chipset for 2way communications	Power Consumption ↓
Connectivity	◆ Easy Connection to Smartphone w/o any additional device. - Device management - Diagnostic function - Upgrades	Convenience ↑
RF technology	◆ Reliable Wireless Communications with Bluetooth RF technology - Prevents frequency interference with Frequency hopping technique - Maintaining communication with auto reconnection solution	Reliability ↑
Security	◆ Secure communication of Bluetooth Low Energy (Based on AES128) ◆ Hard to physically scan channel due to Frequency Hopping Technique	Security ↑
Diagnostic	◆ Managing BLE Connection status and registration status ◆ Monitoring wireless transmitter-receiver operation in Engine room (Connection/Temperature, etc.) ◆ Monitoring Fog Lamp Relay status	Reliability ↑

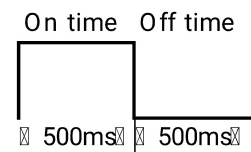
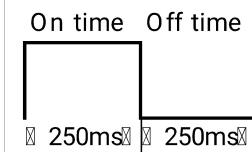
3-2. Operating Principle [Button & UI]

Button Functions

Short Tap	Long Tap(3sec)+Short Tap(5Times)
Fog Lamp On/Off	Bluetooth Paring



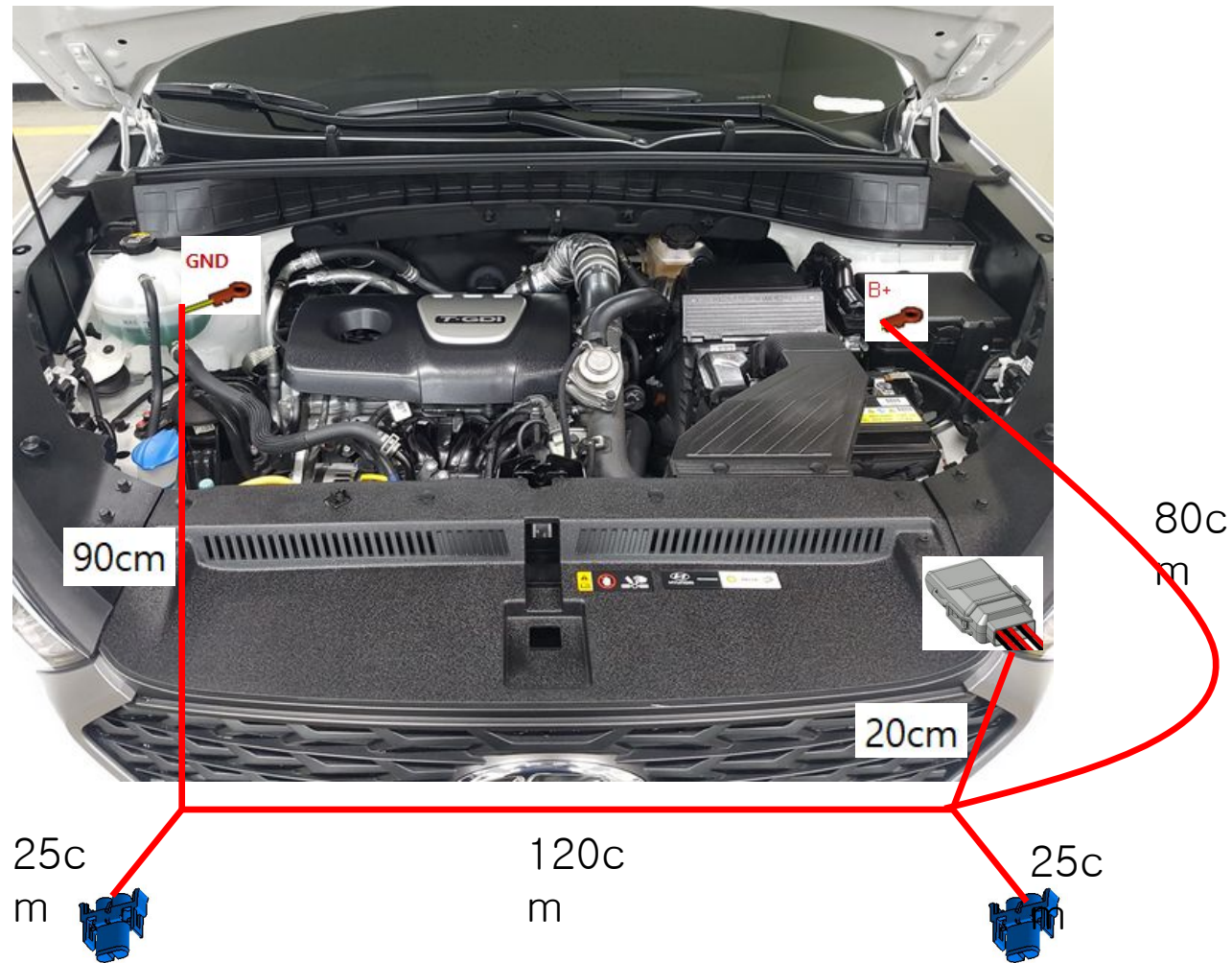
LED Functions

LED 표시 방식	ACC → IGN	Fog Lamp Switch ON	Error Code	ID Pairing
Fog Lamp	Dark AMBER	Strong AMBER	BLINK AMBER (500ms) 	BLINK AMBER (250ms) 

3-3. Operating Principle [Vehicle Lamp Condition]

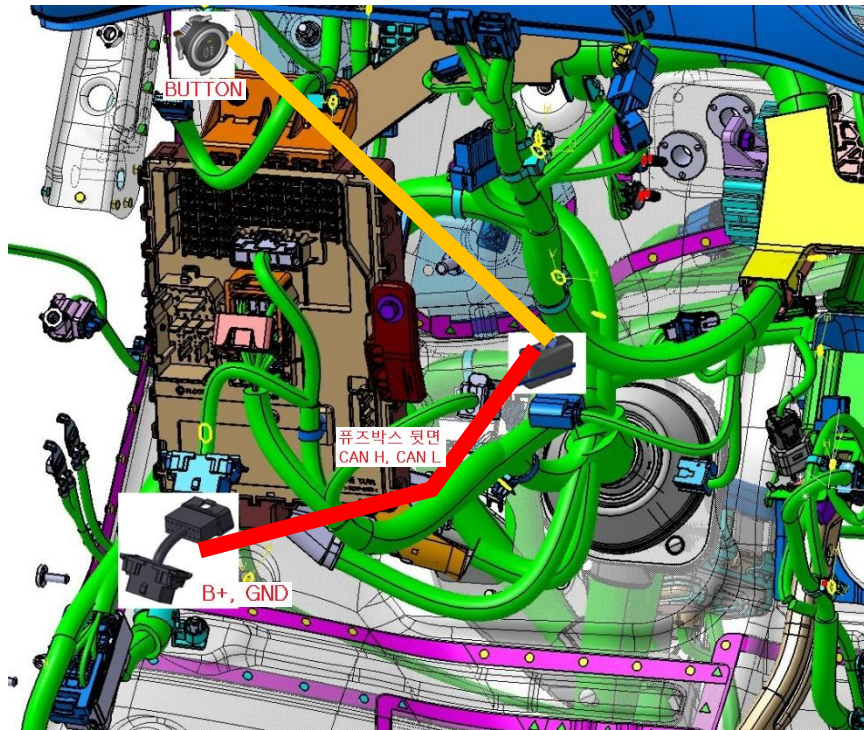
Fog Lamp Switch	Low Beam	High Beam	Fog Lamp
ON	OFF	OFF	OFF
ON	ON	OFF	ON
ON	ON	ON	OFF
ON	OFF	ON	OFF
OFF	DON'T CARE		OFF

4-1. [Mounting Position of Lamp Module]

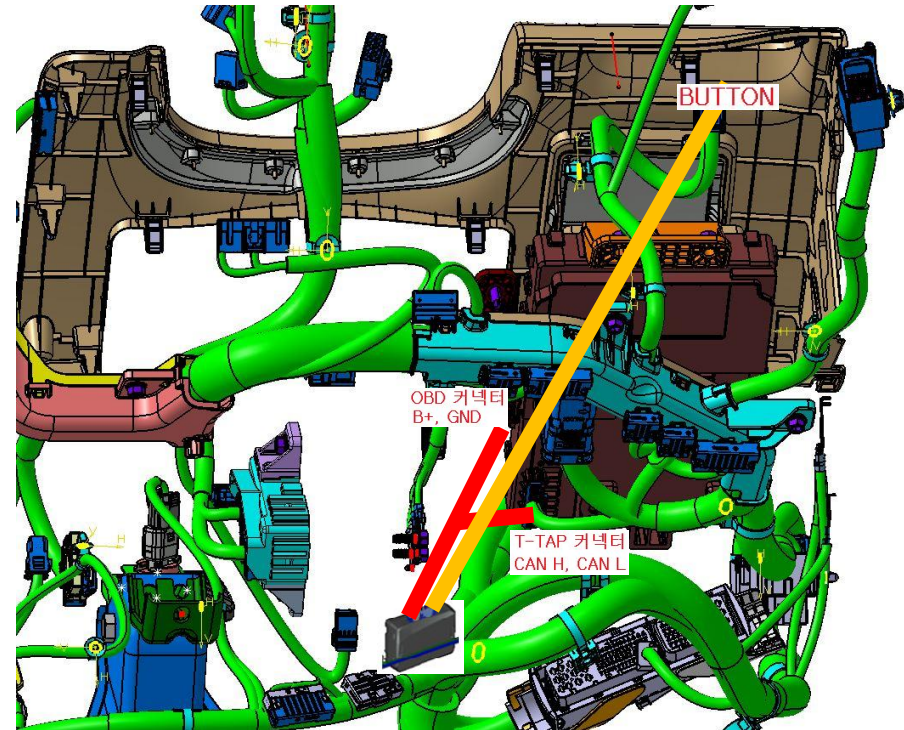


4-2. [Mounting Position of ECU Module]

[FRONT VIEW]

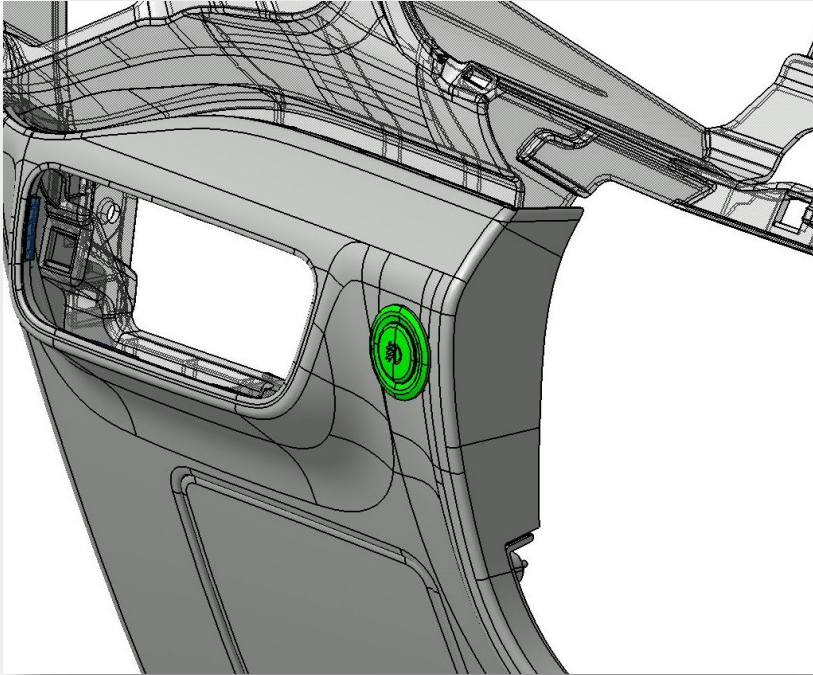


[BACK VIEW]



4-3. [Mounting Position of Button Module]

[FRONT VIEW]



[SIDE VIEW]

