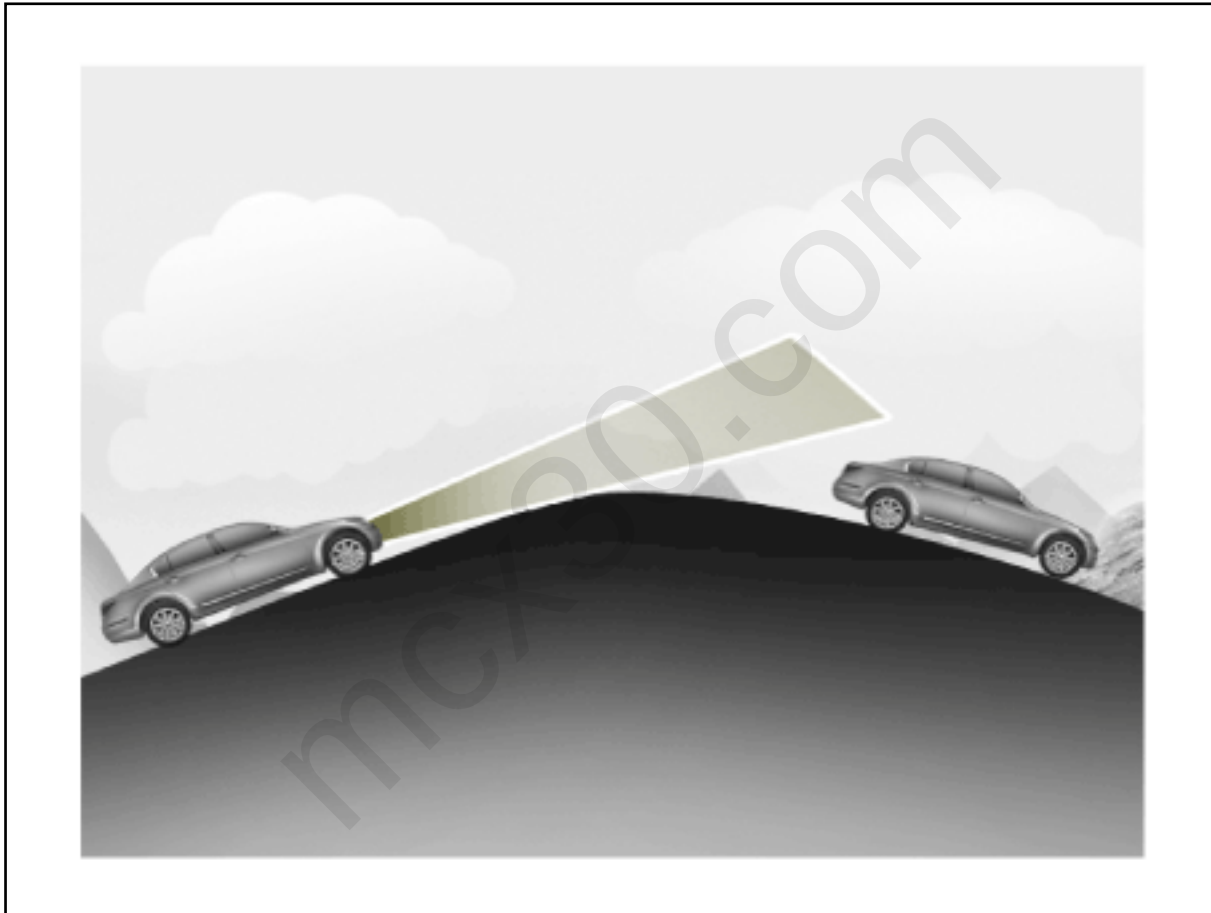


General Safety Information and Caution

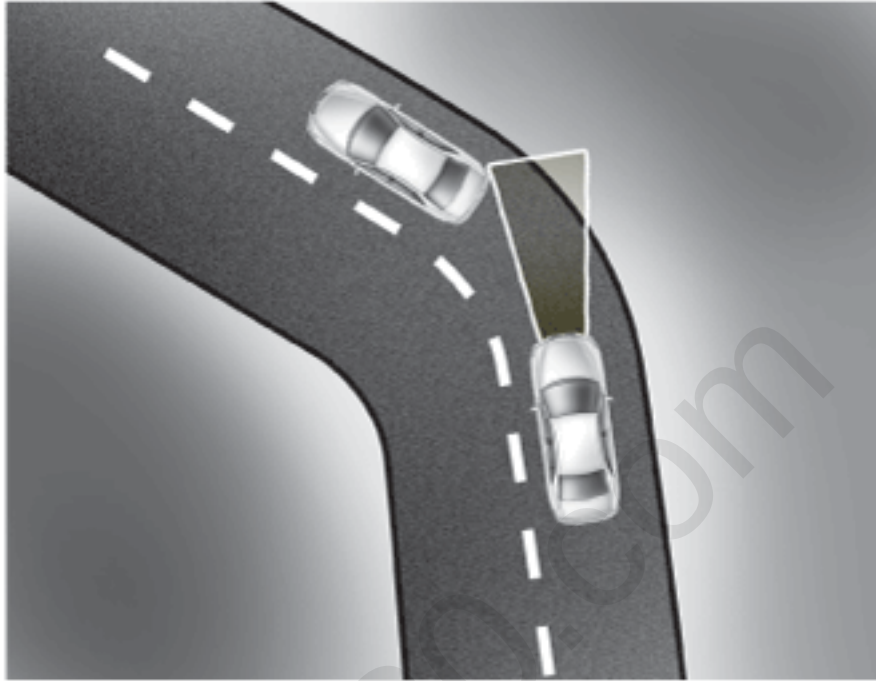
1. Be careful when driving the vehicle using the smart cruise control system as follows.

(1) On curves or inclines/declines

- The smart cruise control system may have limits to detect distance to the vehicle ahead due to road and traffic conditions.
- On curves or inclines/declines, the smart cruise control system may not detect a moving vehicle in your lane, and then your vehicle may accelerate to the set speed directly. Also, the vehicle speed may slow down abruptly when the vehicle ahead is recognized. Select the appropriate set speed on curves or inclines/declines and control the vehicle speed by applying the brake pedal if necessary.

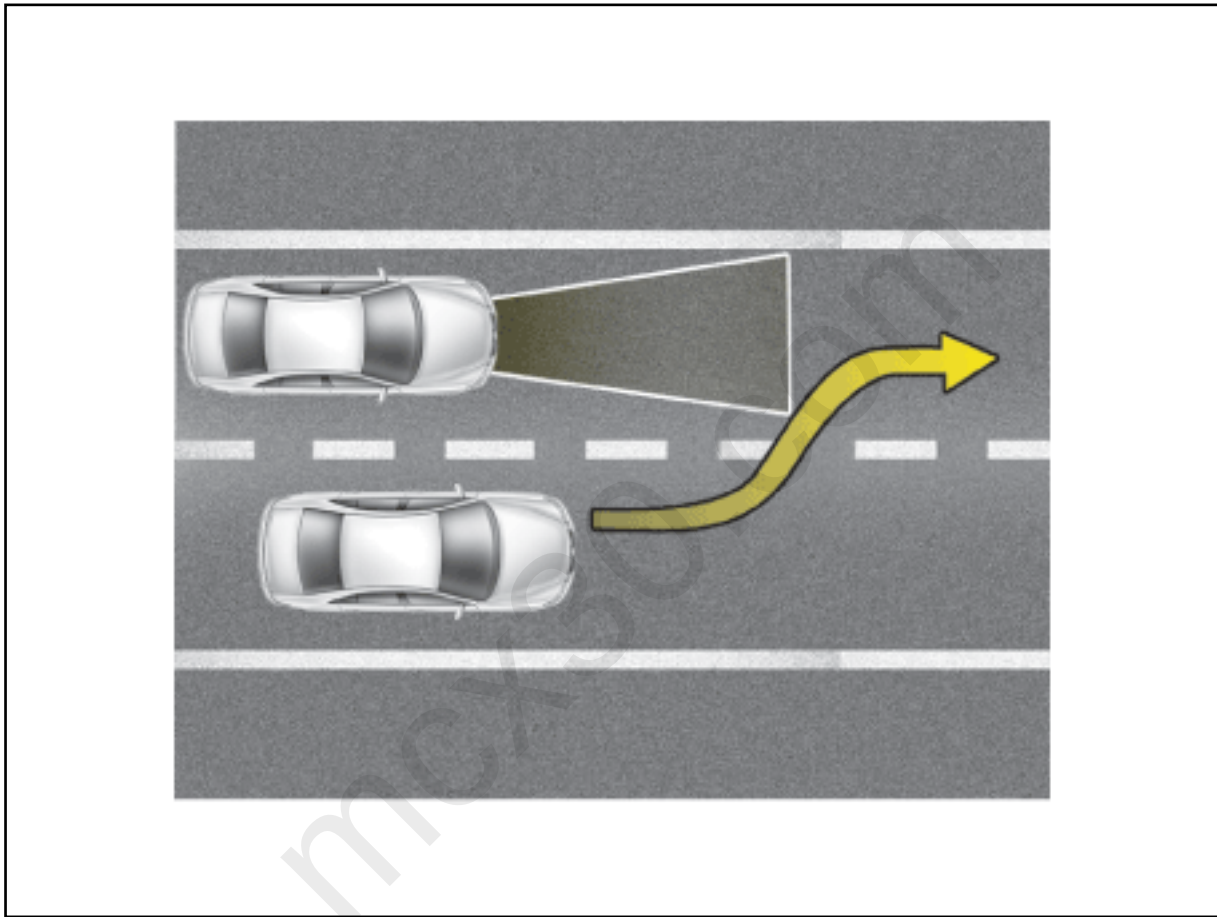


- Your vehicle speed can be reduced due to a vehicle in the adjacent lane. Apply the accelerator pedal and select the appropriate set speed. Check to be sure that the road conditions permit.



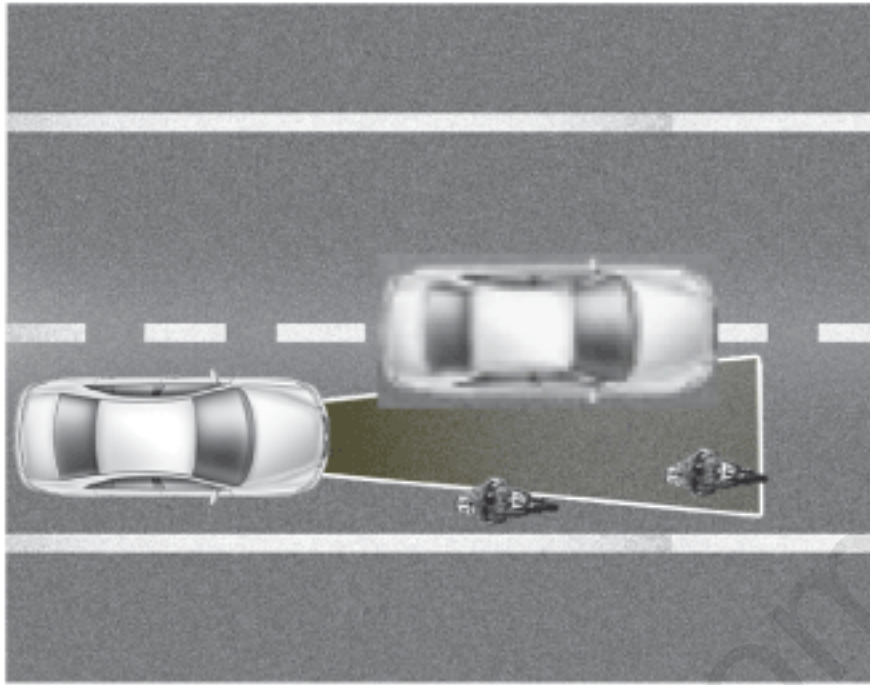
(2) Lane changing

- A vehicle which moves into your lane from an adjacent lane cannot be recognized by the sensor until it is in the sensor's detection range.
- Be always cautious because a vehicle which suddenly moves into your lane can be recognized late by the sensor.
- If the vehicle which moves into your lane is slower than your vehicle, the speed may decrease to maintain the distance to the vehicle ahead.
- If the vehicle which moves into your lane is faster than your vehicle, your vehicle will maintain the selected speed even the vehicle is in the sensor's detection range.



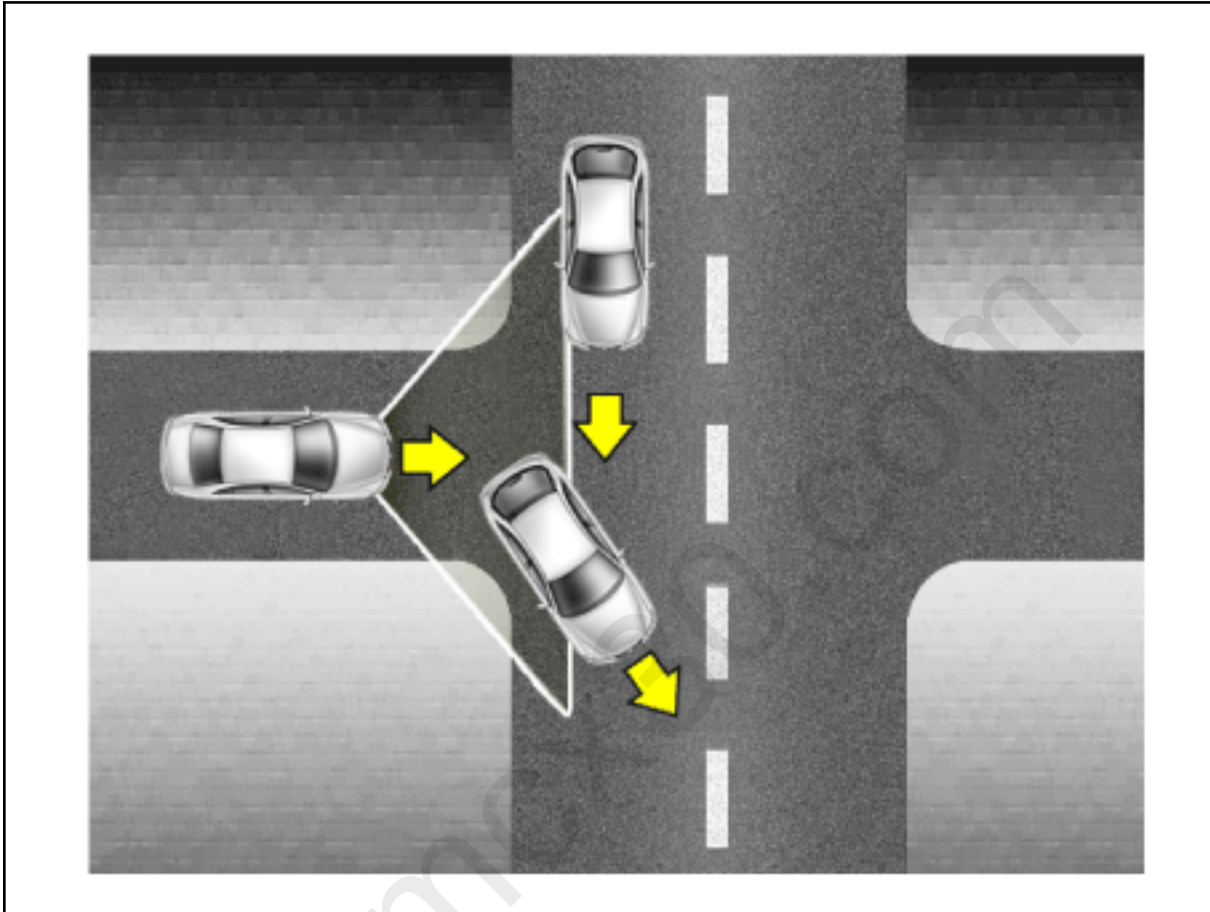
(3) Vehicle recognition

- Even though a vehicle is in the same lane, a vehicle which is out of the sensor's detection range cannot be recognized by the sensor.
- Small vehicle such as motorcycle, bicycle and cultivator
- A vehicle offset to one side
- A slow-moving vehicle or sudden-decelerating vehicle
- A stopped vehicle
- A vehicle with small rear profile such as trailer with no loads

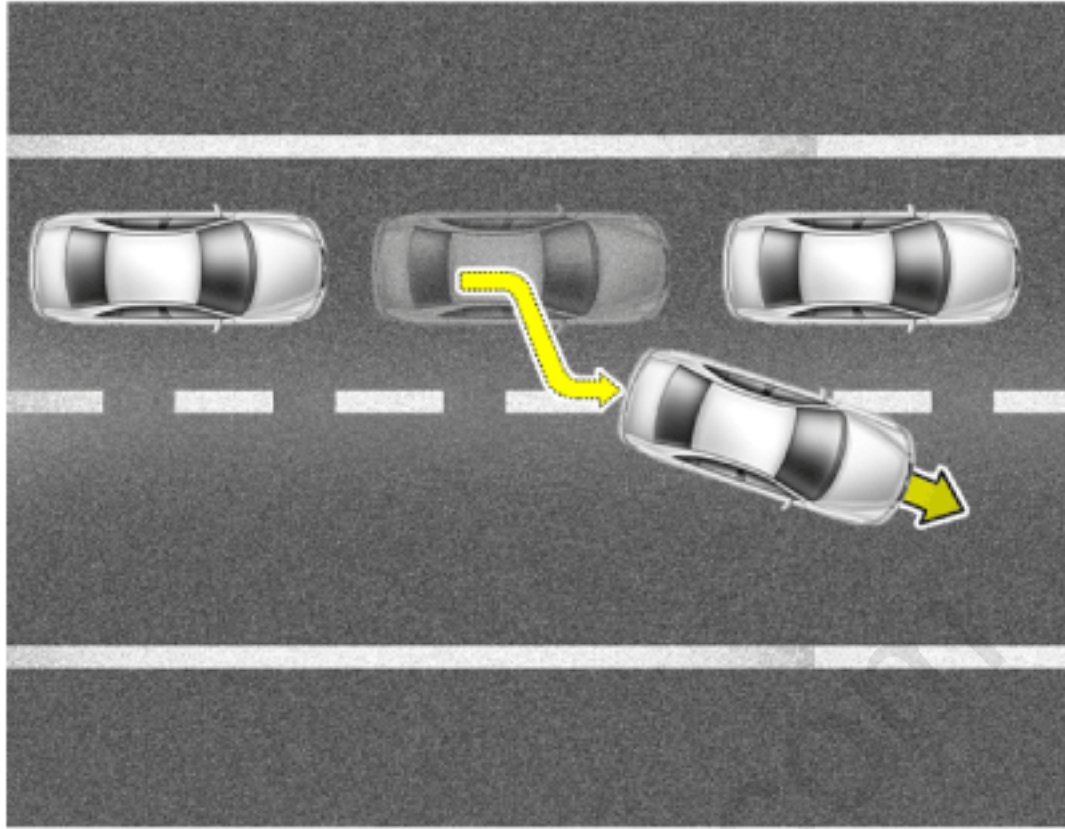


2. In this following situation, the front vehicle can't be recognized correctly so control the vehicle speed by applying the brake pedal or accelerator pedal if necessary.
 - (1) When the vehicle is pointing upwards due to overloading in the trunk
 - (2) While making turns by steering
 - (3) When driving to one side of the lane
 - (4) When driving on narrow lanes or on curves
3. If the smart cruise control is left on (CRUISE indicator light ON), the smart cruise control can be switched on accidentally. Keep the smart cruise control system off (CRUISE indicator light OFF) when the smart cruise control is not in use, to avoid inadvertently setting a speed.
4. Observe a regulation speed on road when setting the cruise speed.
5. Use the smart cruise control system only when traveling on open highways in good weather. Do not use the smart cruise control when it may not be safe to keep the car at a constant speed, for instance, driving in heavy or varying traffic, or on slippery (rainy, icy or snow-covered) or winding roads or over 6% up-hill or down-hill roads.
6. Pay particular attention to the driving conditions whenever using the smart cruise control system.
7. The vehicle cannot be stopped by using the smart cruise control system. If emergency stop is necessary, you should apply the brakes.
8. Keep the safety distance according to road conditions and vehicle speed. If the following distance is too close at a high speed driving, it is dangerous.
9. The smart cruise control system can not recognize a stopped vehicle, pedestrians or an oncoming vehicle. Always look ahead cautiously to prevent unexpected and sudden situations from occurring.

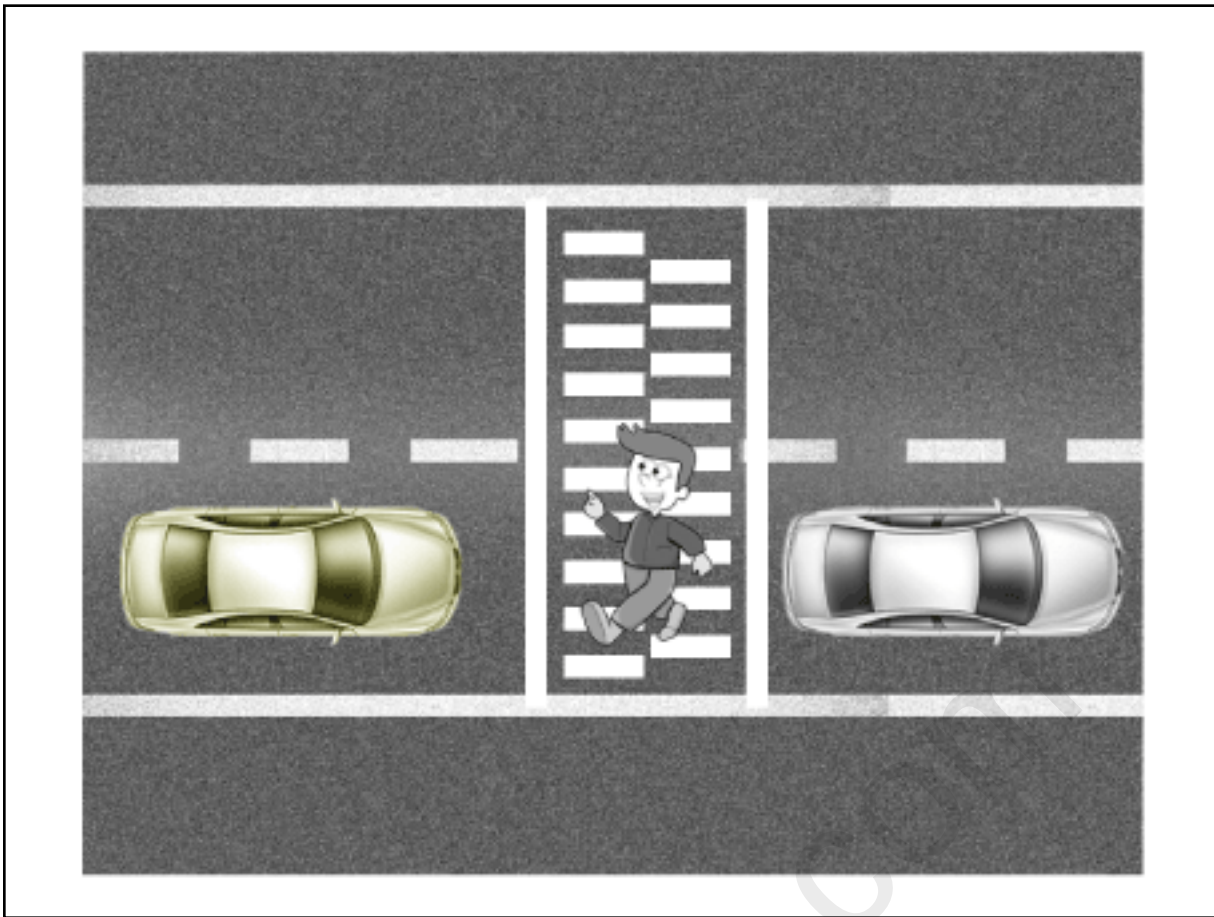
10. The smart cruise control system is not a substitute for safe driving practices but a supplementary function only. It is the responsibility of the driver to always check the speed and the distance to the vehicle ahead.
11. In front of you, vehicles moving with a frequent lane change may cause a delay in the system's reaction or may cause the system to react to a vehicle actually in adjacent lane. Always look ahead cautiously to prevent unexpected and sudden situations from occurring.
12. Your vehicle may accelerate when a vehicle ahead of you disappears. When you are warned that the vehicle ahead of you is not detected, drive with caution.



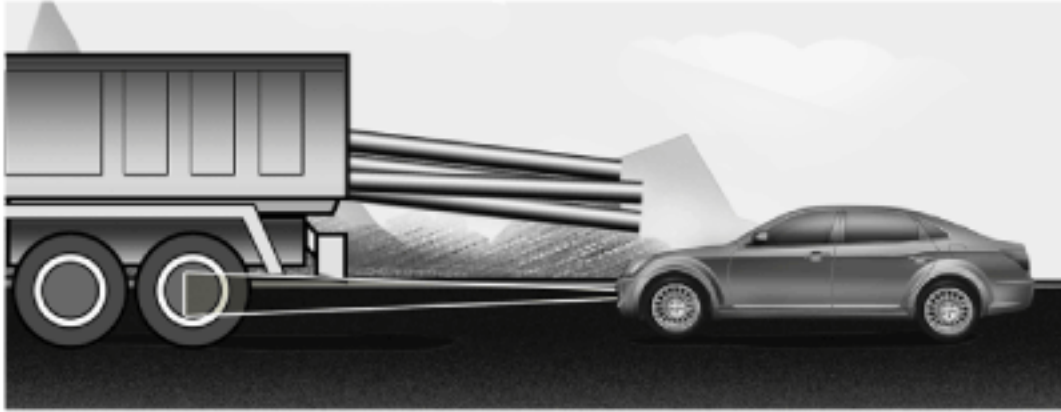
13. When vehicles are at a standstill and the vehicle in front of you changes to the next lane, be careful when your vehicle starts to move because it may not recognize the stopped vehicle in front of you.



14. Always look out for pedestrians when your vehicle is maintaining a distance with the vehicle ahead.



15. Always be cautious for vehicles with higher height or vehicles carrying loads that sticks out to the back of the vehicle.



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Description and operation

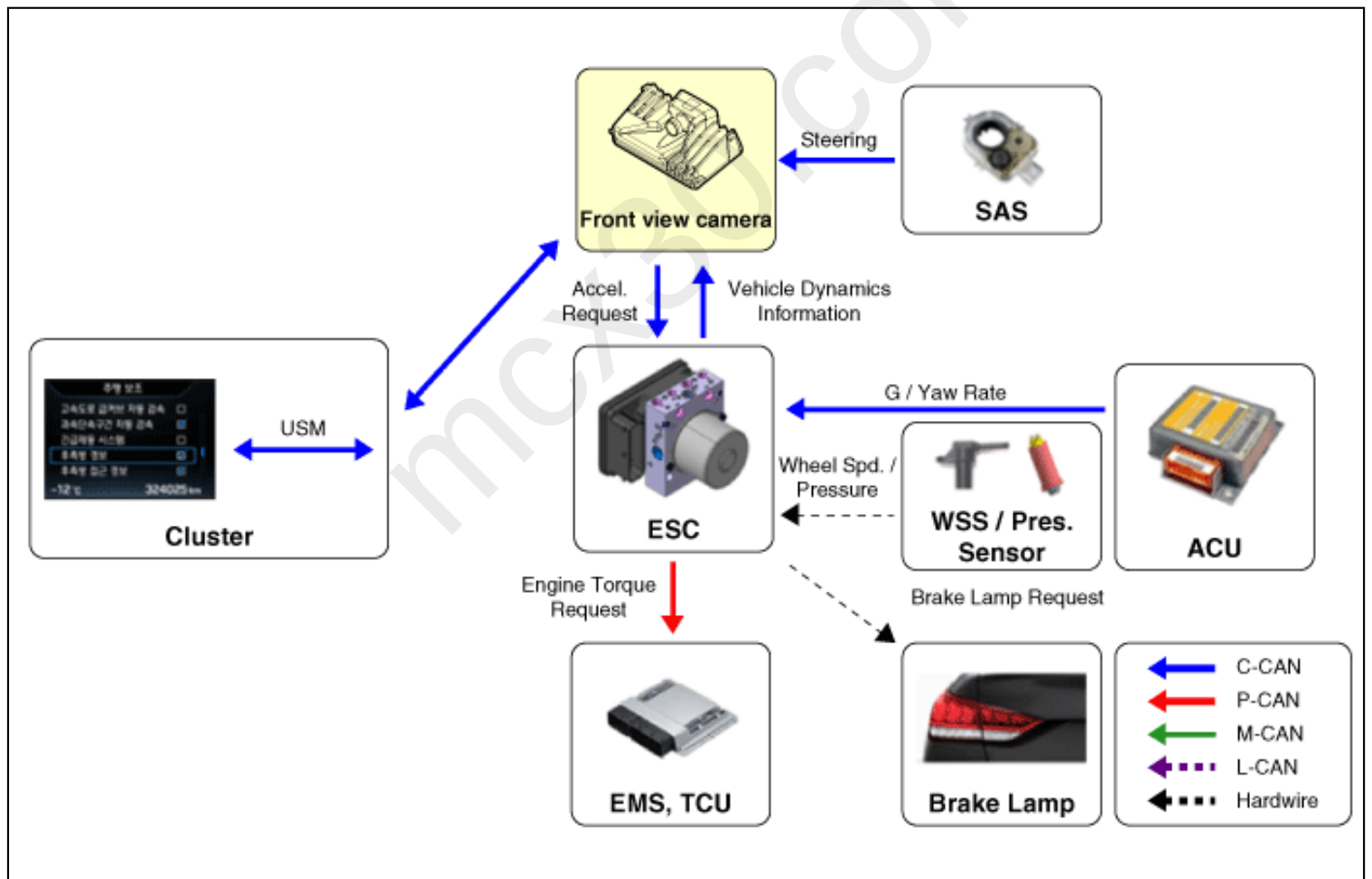


The System may be limited when

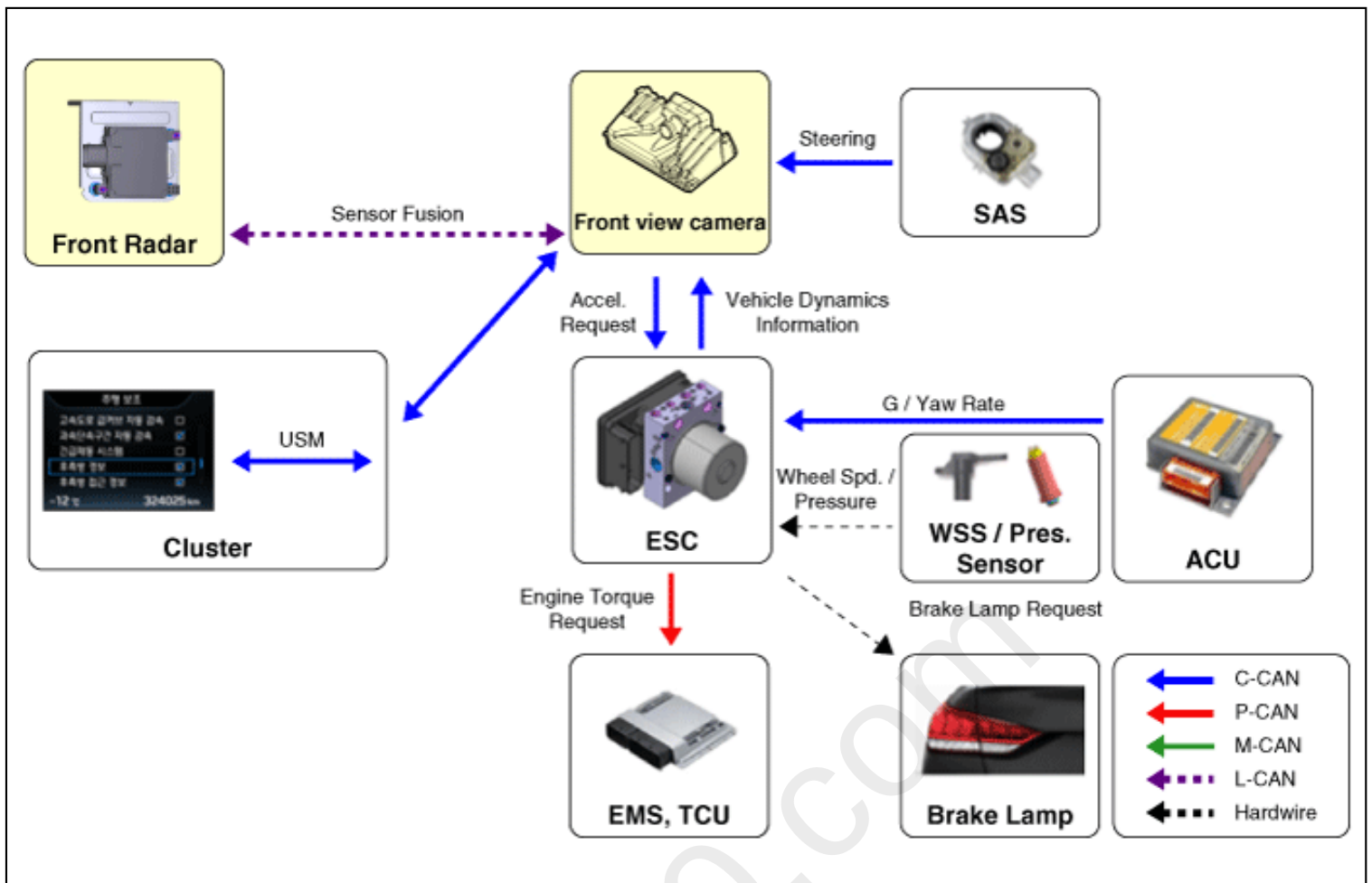
- The radar sensor or camera is blocked with a foreign object or debris.
- The camera lens is contaminated due to tinted filmed or coated windshield, damaged glass, or stuck of foreign matter (sticker, bug, etc.) on the glass.
- Inclement weather such as heavy rain or snow obscures the field of view of the radar sensor or camera.
- The target in front is too small to be detected.
- The vehicle in front is an oversize vehicle or trailer that is too big to be detected by the camera recognition system (for example a tractor trailer, etc.).
- The camera's field of view is not well illuminated (either too dark or too much reflection or too much backlight that obscures the field of view)
- The vehicle in front does not have their rear lights ON or their rear lights are located in an unusual location (modified).
- The windshield glass is fogged up and the clear view of the road has been obstructed.
- The camera or radar is damaged.

System Flow

A Type (Front radar none apply)



B Type (Front radar apply)



- Rader, Camera : Detection device (radar and camera) that can recognize potential obstacles in the front.
- Cluster : Human-Machine Interface (HMI) to warn driver or change settings.
- ESC : Braking system to automatically brake the car
- Sensors : FCA, contrary to FCA (Smart Cruise Control), has to work on a stationary car so the system uses the Fusion Target system to combine radar with camera.

System description

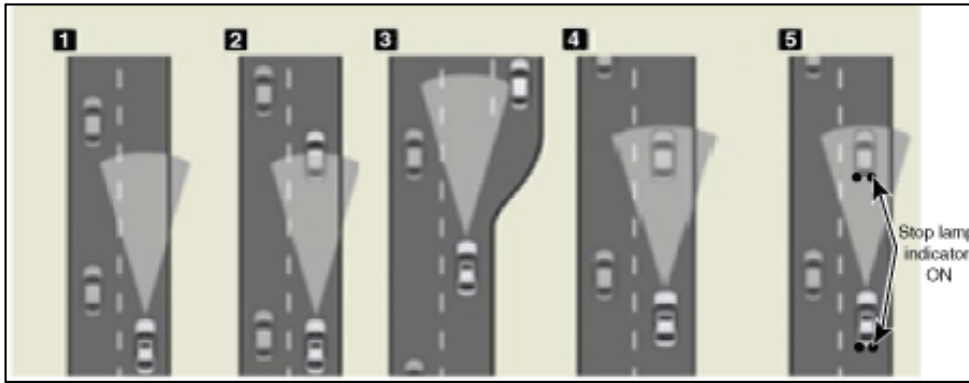
The smart cruise control system allows a driver to program the vehicle to control the speed and following distance detecting the vehicle ahead without depressing the brake pedal and the accelerator pedal.

1. FCA : Forward Collision-avoidance Assist

- (1) FCA system is designed to help avoid a potential collision or reduce its impact when drivers applies inadequate, delayed or no brakes at all to avoid a collision.
- (2) The system detects the risk factors on the road by using the frontal impact sensor and warn the driver and activate the emergency brake to prevent collision or reduce collision speed.

2. SCC : Smart Cruise Control

- (1) Cruise speed control : The vehicle maintains the selected speed if there are not vehicles ahead.
- (2) Retardation control : The vehicle decelerates if a vehicle ahead is detected.
- (3) Following distance control : The vehicle maintains the selected following distance.
- (4) Acceleration control : The vehicle accelerates to the selected speed if a vehicle ahead is not detected.



System function

1. Control on curves

- (1) The sensor may not detect a vehicle ahead or may detect a vehicle on other lanes because the detection range of the sensor is limited.
- (2) On curves, if the vehicle equipped the SCC is driving at high speed, the vehicle can slip outside. Therefore reduce the speed on curves even there is not a vehicle ahead. (There is no brake control by SCC.)
- (3) While the vehicle follows a vehicle ahead on straight road, if the vehicle ahead enters on curve, the vehicle equipped the SCC may accelerate to follow the vehicle ahead.
- (4) On curves, if a vehicle ahead followed is out of range, the vehicle does not accelerate to the set speed and maintain the following speed to prevent from accelerating and decelerating repeatedly. (If the vehicle equipped the SCC changes the lane or apply the accelerator pedal, the vehicle will accelerate.)

2. Warning alarm

If the vehicle equipped the SCC decelerates because a vehicle ahead decelerates or moves into your lane, the warning will operate.

- (1) In case that the vehicle equipped with SCC is able to decelerate properly by the system – No warning
- (2) In case that the vehicle equipped with SCC is not able to decelerate properly by the system
–Indicator in the cluster will blink and the warning buzzer will sound. (The warning and deceleration by the system will go on until the brake pedal is applied.)
- (3) If the vehicle ahead (vehicle speed: less than 30km/h) disappears to the next lane during following distance control, the warning chime will sound and a message will appear. Adjust your vehicle speed for vehicles or objects that can suddenly appear in front of you.

3. Accelerating by driver

Even the vehicle is being decelerated by the SCC system, the vehicle can be accelerated by applying the accelerator pedal. If the vehicle is accelerated above the set speed, the indicator in the cluster will blink.

4. Function of cruise control

- (1) The driver may choose to only use the cruise control mode (speed control function) by doing as follows:
- (2) With the smart cruise control system on (the cruise indicator light will be on but the system will not be activated), push the distance to distance switch for more than 2 seconds. "Smart cruise control (SCC) mode" and "Cruise control (CC) mode" can be selected. The speed control of the cruise control mode is the same as that of the smart cruise control mode.
- (3) When using the cruise control mode, the driver must manually access the distance to other vehicles as the system will not automatically brake to slow down for other vehicles.



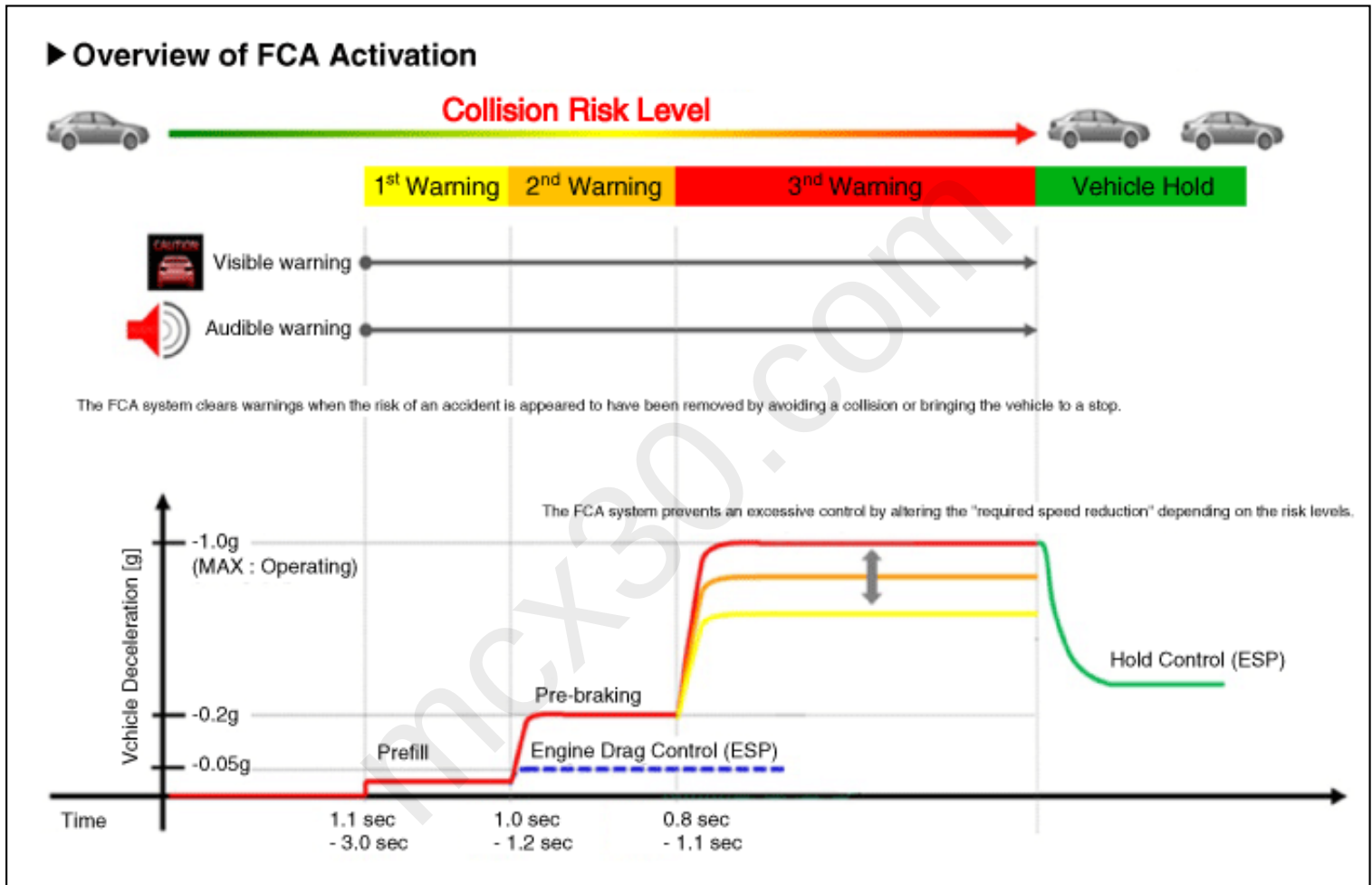
- When using the cruise control function, your vehicle may collide with the vehicle ahead when a driver does not brake properly.

5. (1) If vehicle speed is high, Highway Curve Zone Auto Slowdown function will temporarily decelerate your vehicle or limit acceleration to help you drive safely on a curve based on the curve information from the navigation.
 (2) If vehicle speed is high, Highway Curve Zone Auto Slowdown function will temporarily decelerate your vehicle or limit acceleration to help you drive safely on a curve based on the curve information from the navigation.
6. As a Smart Cruise Control, it prevents collision or slows down collision speed by alerting drivers and performing emergency braking while driving.
7. **Highway Driving Assist (HDA) function**
 It is a driving convenience system that controls the steering and speed to keep the safe distance from the vehicle ahead and to prevent lane departure on highway while Smart Cruise Control is operating.

System Operation

FCA : Forward Collision-avoidance Assist)

1. Basic specification (front view camera applied)



※ The time indicated will be changed according to vehicle speeds.

- Step 1 : Issue a visual (display) and vocal alarm when a danger is detected.
- Step 2 : Reduce engine torque and activates FCA when there is a high chance of collision.
- Step 3 : Activate emergency brake when a collision is imminent.
- After stopping the vehicle : Maintain the braking control for a certain time and then release it.



- Braking power is adjusted depending on the risk levels of collision, but it is released immediately when it detects the driver's action to avoid a collision.

- 1) When it exceeded the maximum operation speed.
- 2) When it detected driver's action to avoid a collision such as sudden steering changes.
- 3) When the shift lever is in R or P
- 4) When you pressed the accelerator pedal half way.

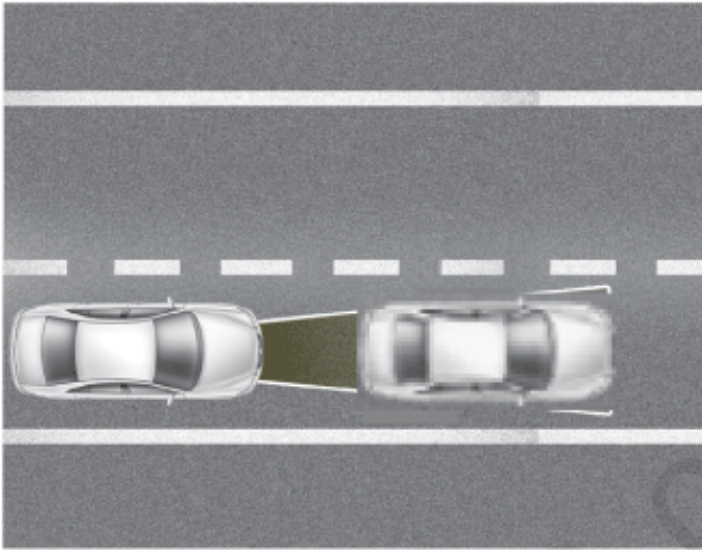


- 1) Offset should be less than 50%.
- 2) FCA does not work on the vehicles backing up or resisting.

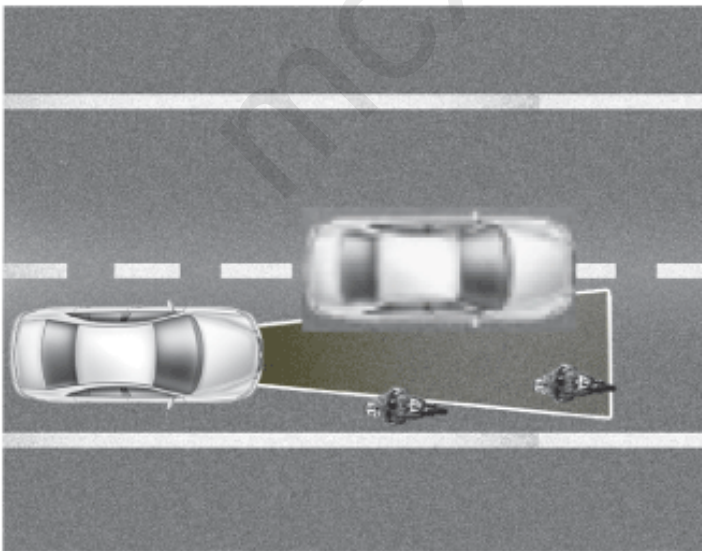


Offset : Rate of non-overlapping on the line between the front driving car and my car

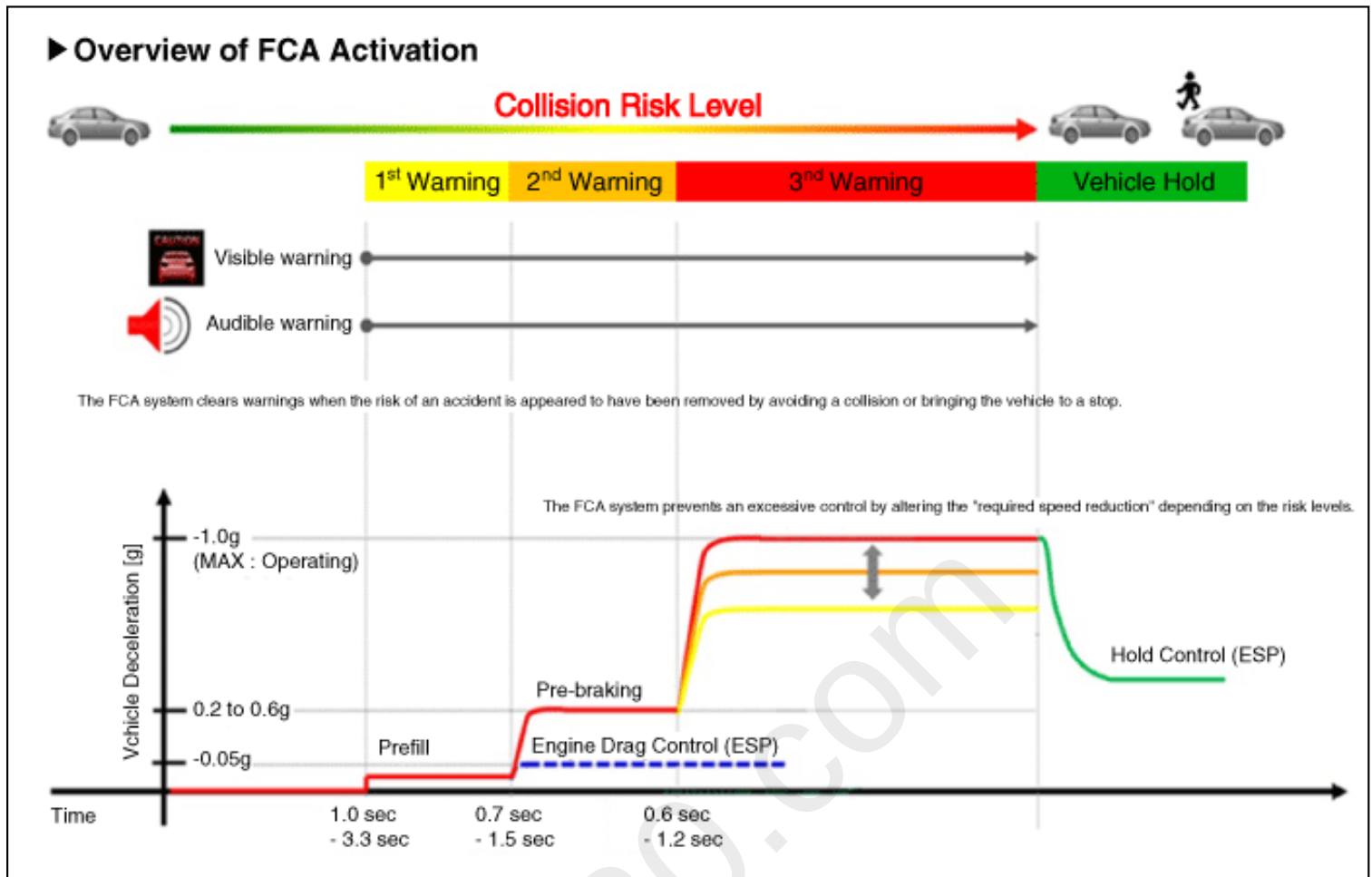
- 1) Offset 0% :



- 2) Offset 100% :



2. When the Smart Cruise Control is applied at the same time (front radar added)



The time indicated will be changed according to vehicle speeds.

- Step 1 : Issue a visual (display) and vocal alarm when a danger is detected.
- Step 2 : Reduce engine torque and activates FCA when there is a high chance of collision.
- Step 3 : Activate emergency brake when a collision is imminent.
- After stopping the vehicle : Maintain the braking control for a certain time and then release it.



- Braking power is adjusted depending on the risk levels of collision, but it is released immediately when it detects the driver's action to avoid a collision.

- 1) When it exceeded the maximum operation speed.
- 2) When it detected driver's action to avoid a collision such as sudden steering changes.
- 3) When the shift lever is in R or P
- 4) When you pressed the accelerator pedal half way.



- 1) When you drive over 180 km/h, the system does not go to step 2 of emergency braking.
 - Full auto braking is not available.
- 2) When you drive at 85 km/h - 180 km/h or faster, the system does not go to step 3 of emergency braking.
 - But a collision may occur at depending on the road conditions.
 - Partial braking may be applied according to the surrounding environment.
 - For the vehicle parked in front, full braking is applied at level 3 after the warning only when the vehicle speed is under 75 km/h.

Up to level 2 is performed when the vehicle speed is over 75 km/h.

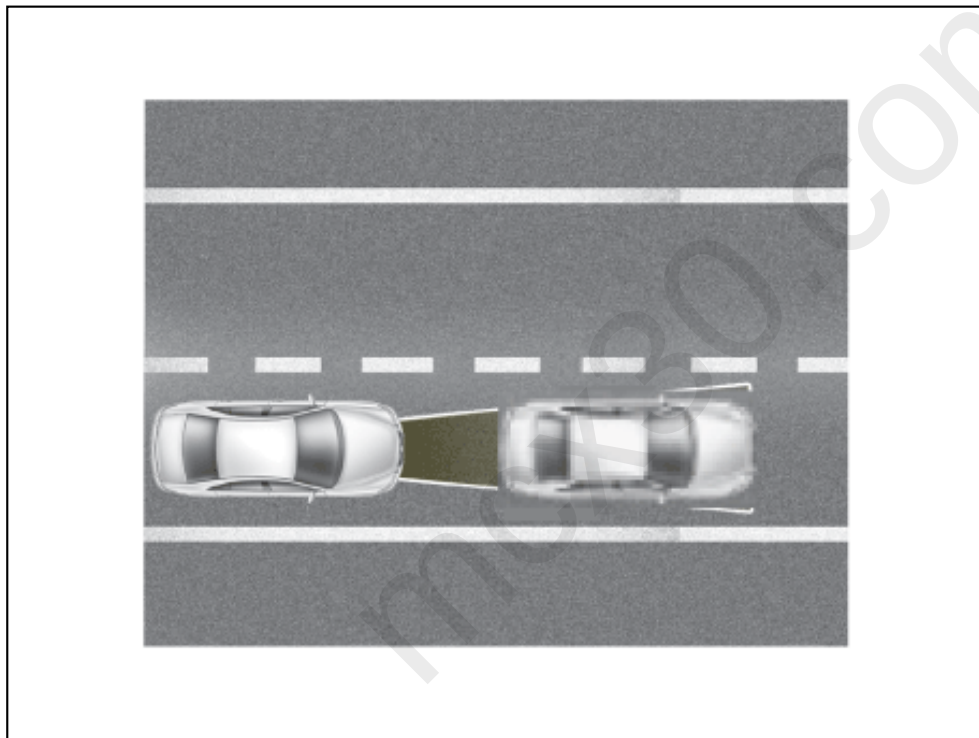
 - For the pedestrian and cyclists, full braking is applied at level 3 after the warning only when the vehicle speed is under 65 km/h.

Up to level 1 is performed when the vehicle speed is over 65 km/h.
- 3) Offset should be less than 50%.
- 4) FCA does not work on the vehicles backing up or resisting.

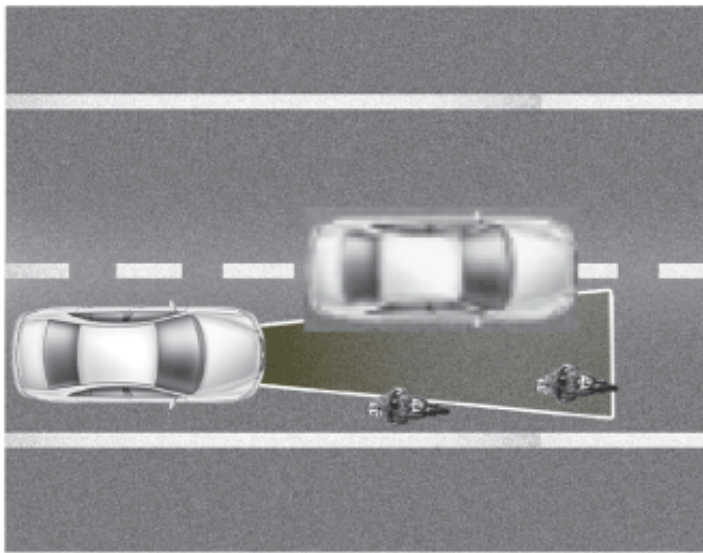


Offset : Rate of non-overlapping on the line between the front driving car and my car

1) Offset 0% :

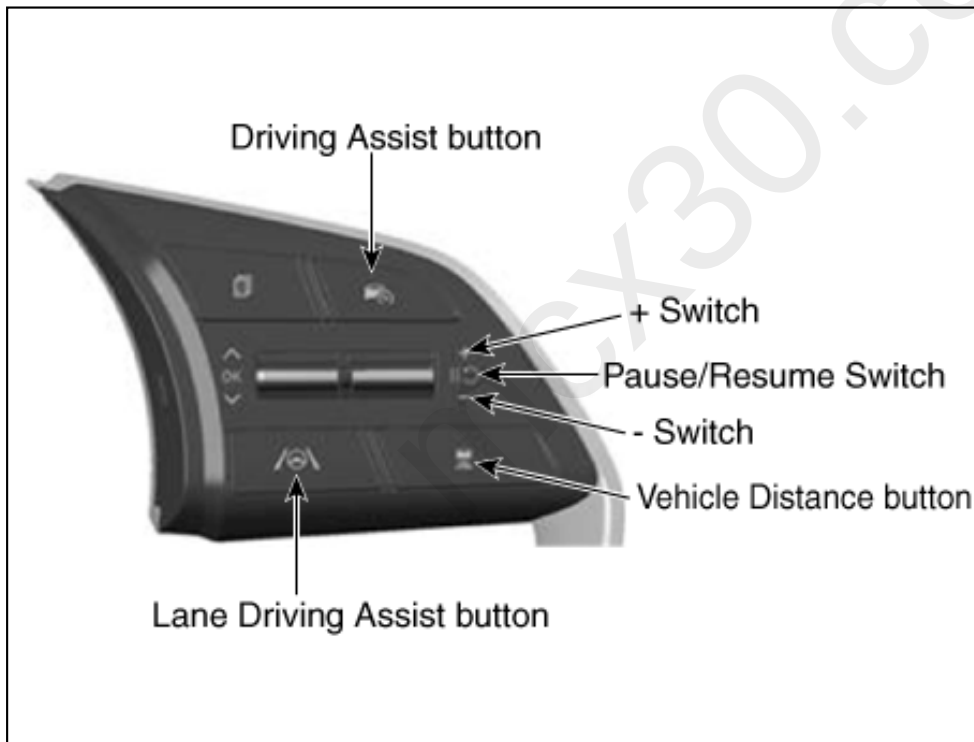


2) Offset 100% :



SCC : Smart Cruise Control

1. Smart cruise control operating mode.



•SCC : Smart Cruise Control

2. Smart cruise control operating conditions.

- (1) Vehicle speed at approximately 0-180km/h (0-110mph)
- (2) Transmission in D or Sports mode
- (3) "ESP OFF" switch OFF
- (4) "Driving Assist" button ON (CRUISE indicator ON)

3. Smart cruise control disabling conditions

- (1) "Driving Assist" button OFF
- (2) Brake pedal applied
- (3) Driver's door opened
- (4) Vehicle speed at more than approximately 190km/h (120mph)
- (5) Vehicle speed at less than approximately 10km/h (5mph)
- (6) Transmission in N or P or R
- (7) ESP/ TCS / ABS certain period of time operating
- (8) An accelerator pedal applied for more than 5min
- (9) ESP OFF" switch ON (ESP OFF indicator ON)
- (10) Parking brake applied
- (11) System failure (The warning indicator ON)
- (12) Crack, damage or wrong installation of smart cruise control unit cover (The warning indicator ON)

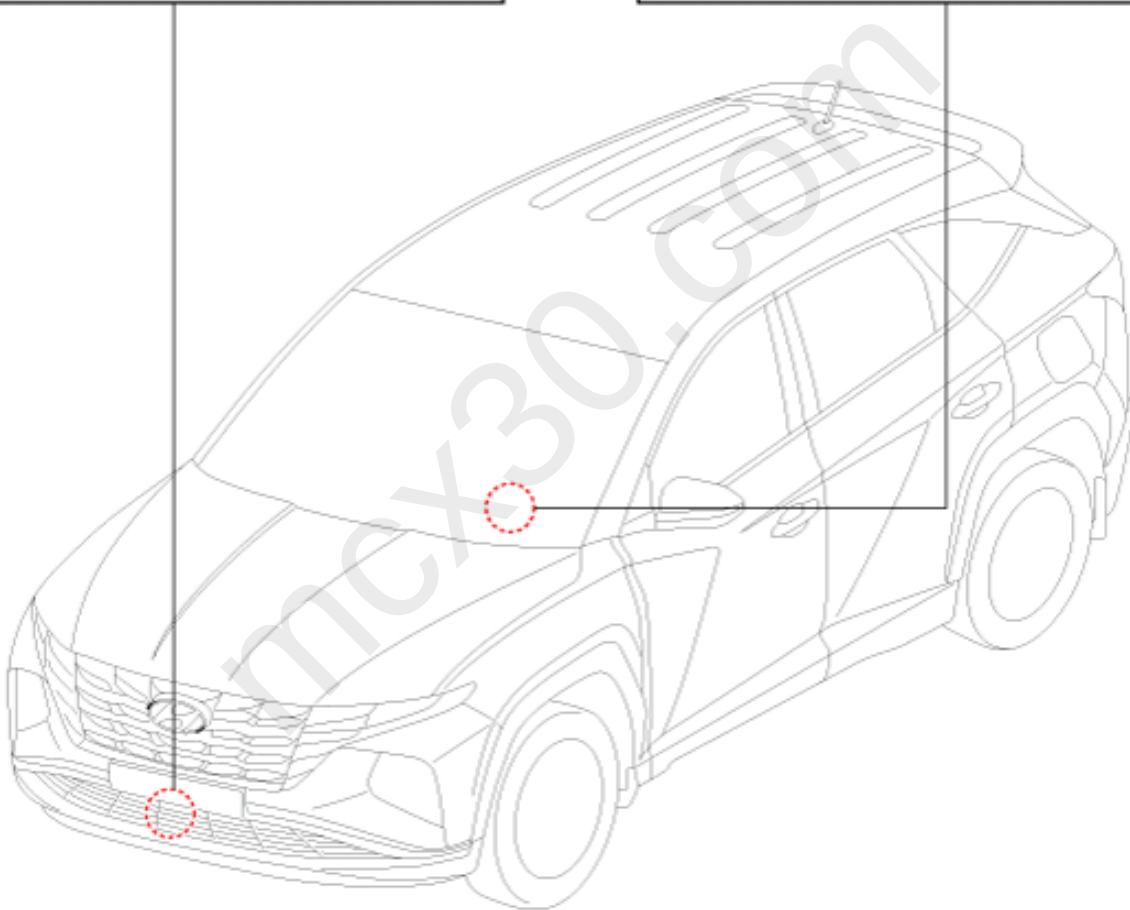
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Components
Location

[1]



[2]



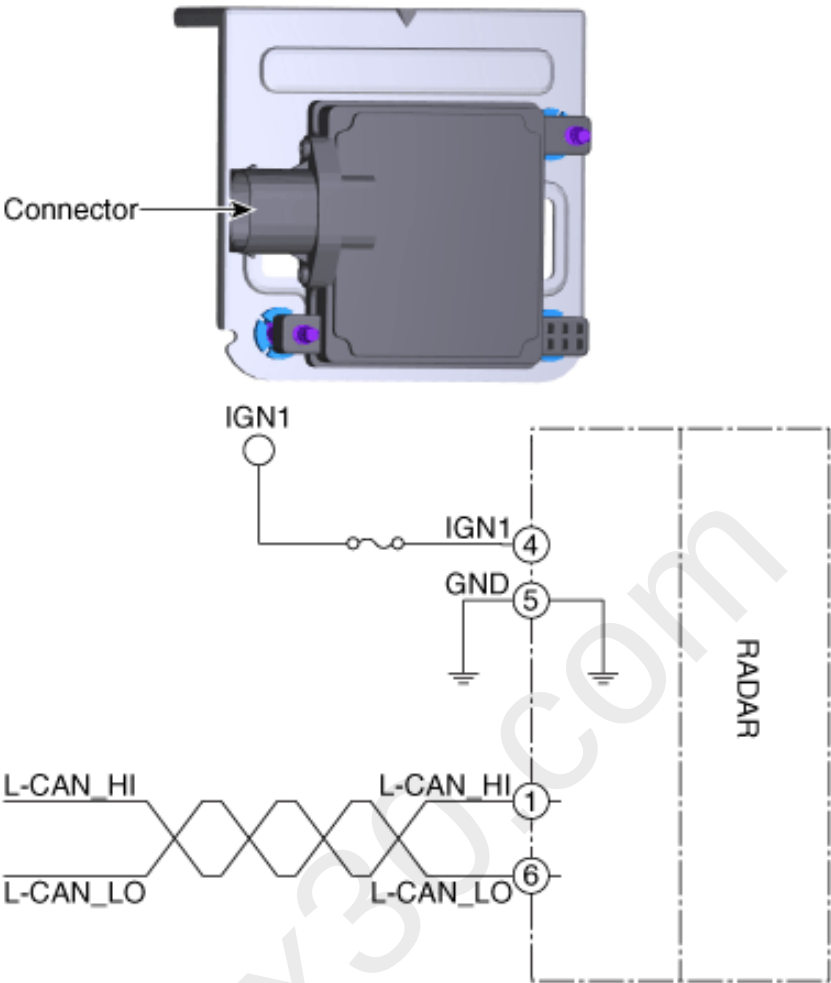
1. Front radar unit

2. Smart cruise control switch

Specification

Item	Specification
Power supply (V)	12
Operation voltage (V)	9 - 16

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Connector	Pin NO	Description
	1	L-CAN (High)
	2	-
	3	-
	4	IGN1
	5	Ground
	6	L-CAN (Low)
	7	-
	8	-

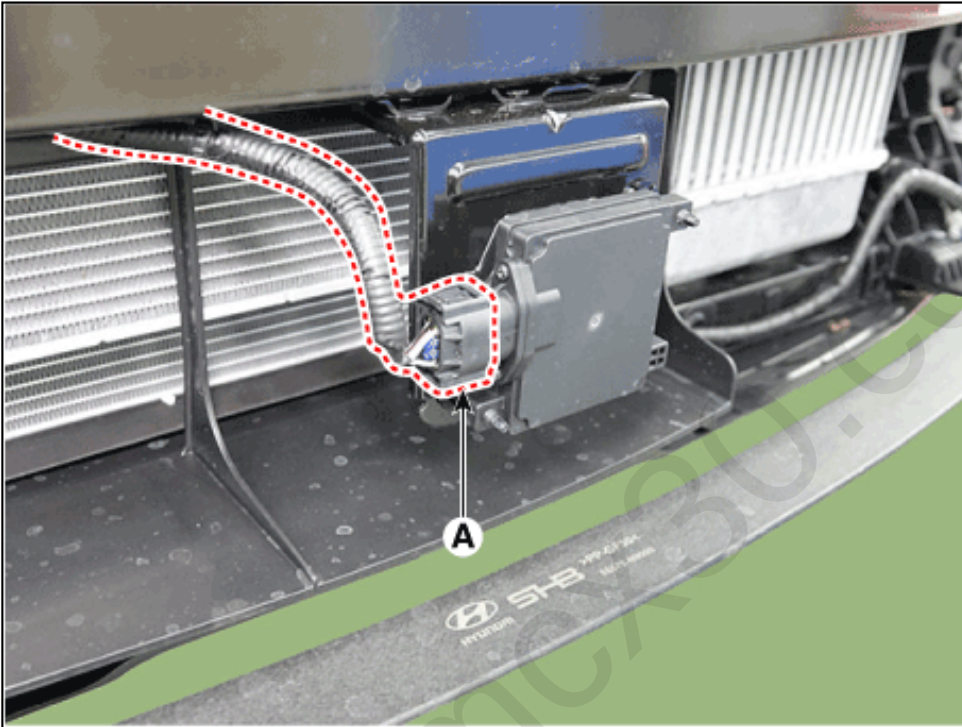
Inspection

Inspection procedure for vehicle with Forward Collision-Avoidance Assist and Smart Cruise Control system failure

1. Check the bumper appearance for accident (check the vehicle appearance visually and see bumper replacement history).
→ In case of the vehicle was involved in an accident, there is a high possibility that the FCA radar is out of the original default position.
2. Check for contamination of the radar sensor cover of the bumper.
→ If contaminated, there is a high possibility that the FCA system is deactivated during operation due to the foreign substances.
3. After turning on the engine, check the FAC warning lamp and DTC.
(Refer to the DTC diagnosis guide.)

Removal

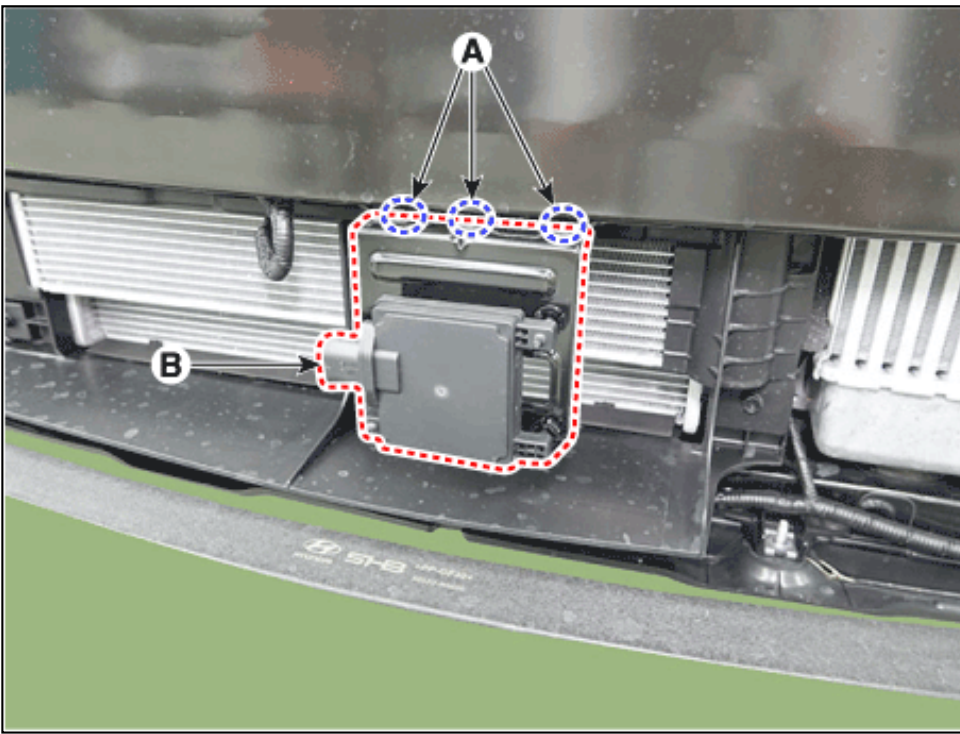
1. Turn ignition switch OFF and disconnect the negative (-) battery cable.
2. Remove the front bumper assembly.
(Refer to Body - "Front Bumper Assembly")
3. Disconnect the front radar connector (A).



4. Loosen the mounting nuts (A) and remove the front radar (B).

Front radar nuts :

9.5 - 10.5 N·m (0.97 - 1.07 kgf·m, 7.0 - 7.7 lb·ft)

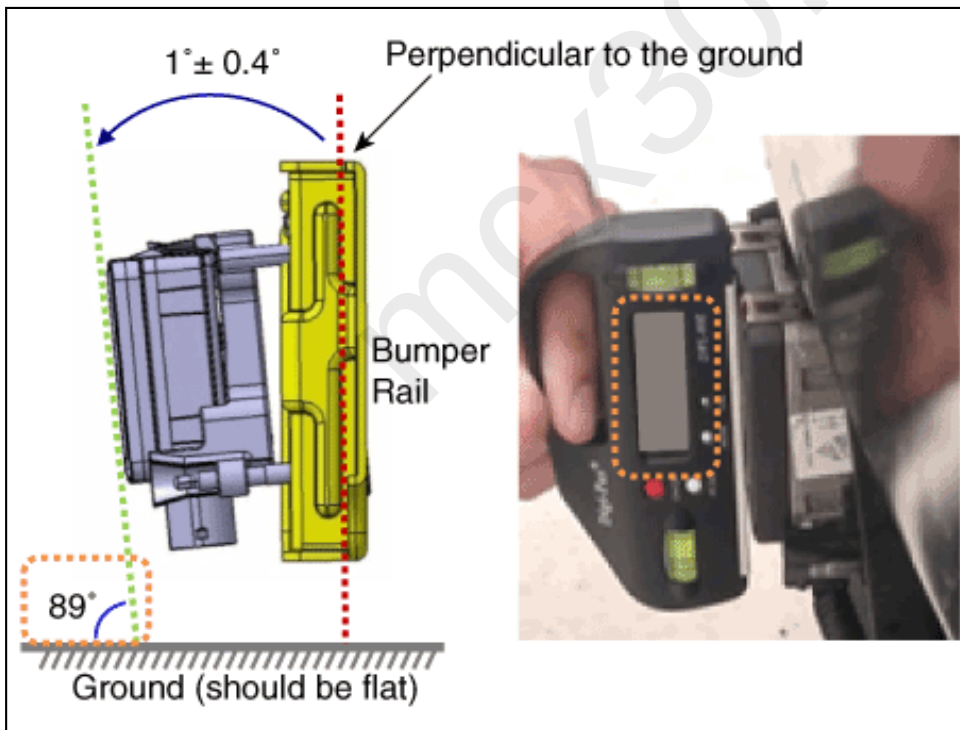


Installation

1. To install, reverse the removal procedure.



- The vertical installation angle of the unit must be within $1^\circ \pm 0.4^\circ$. (not 0 degree)
- ※ Before installing the bumper onto the vehicle, measure the vertical angle of the unit with a protractor as shown.



2. Connect the GDS to Data Link Connector (DLC).
3. Switch "ON" the ignition.
4. Select "Vehicle, Model year, Engine, System".
5. Select "Vehicle S/W Management".

Adjustment

FCA system is designed to help avoid a potential collision or reduce its impact when drivers applies inadequate, delayed or no brakes at all to avoid a collision.

In order for the radar sensor to operate correctly, it must be properly aligned parallel to the driving direction of the vehicle. For this reason, the radar sensor alignment procedure must be carried out whenever the sensor has been reinstalled or replaced with a new one.

If the sensor alignment procedure is not performed in the conditions mentioned above, the smart cruise control system may not operate correctly.



The FCA radar sensor alignment is required when :

- The FCA unit has been reinstalled or replaced with a new one.
- The radar sensor or the surrounding parts have been impacted by collision.
- The sensor cannot detect a vehicle in front.
- The Steering Angle Sensor (SAS) has been replaced or adjusted.



If the sensor cannot detect the vehicle in front :

- Park the vehicle on a level ground.
- Set all tires according to the specified pressure.
- Check wheel alignment.
- Check that the front surface of the FCA unit is clean.

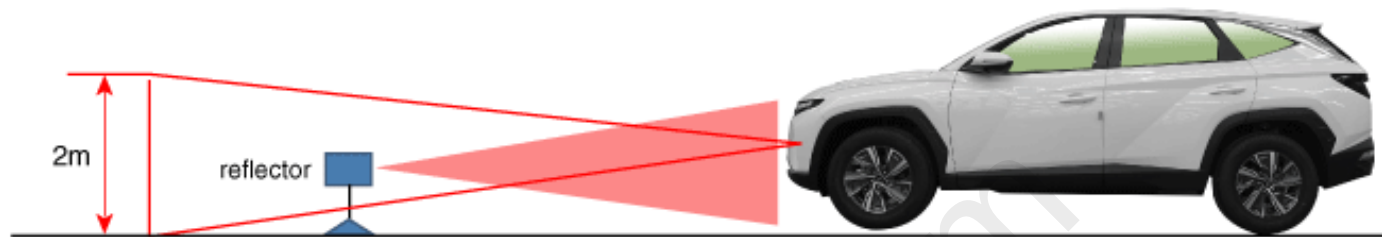
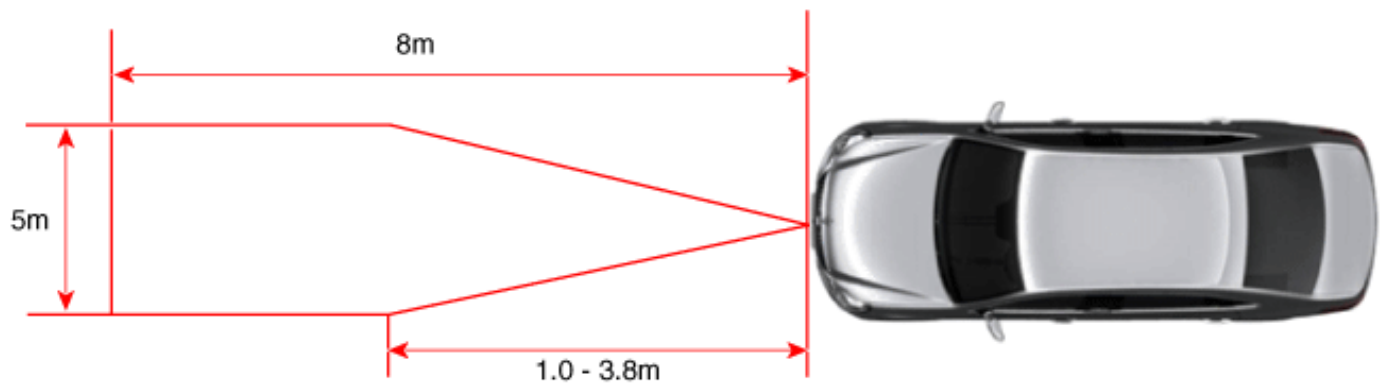
Front Radar Sensor Alignment



- Adjustment may not be accurate if the vehicle and reflector are placed on different ground levels or on a slope.
- Perform in an area with minimum clearance of 8 m to the front, 4 m wide, and 1.2 m above the ground.
- Remove heavy objects from inside of the vehicle (seating area and trunk).
- Ensure that all tires are filled with specified air pressure.
- Remove objects (metal plates, resins, etc.) that may cause electric signal interference from the area where sensor alignment is performed.
- Be sure that the vehicle is not moved and free from vibration when performing sensor alignment (getting in/out or opening/closing doors).
- Check that radiator grille and sensor cover are not dirty.
- Check for correct wheel alignment.
- Do not turn OFF the power when performing sensor alignment.
- Power supplied to the radar sensor must be between 9V - 16V.
- Temperature in the area where sensor alignment is performed must be between -30 - 60°C.

1. Park the vehicle on a level ground.

[Work Area Specification]



[Leveling: Installation surface of the vehicle and the reflector must be evenly levelled.]



[Inappropriate Location - Example]

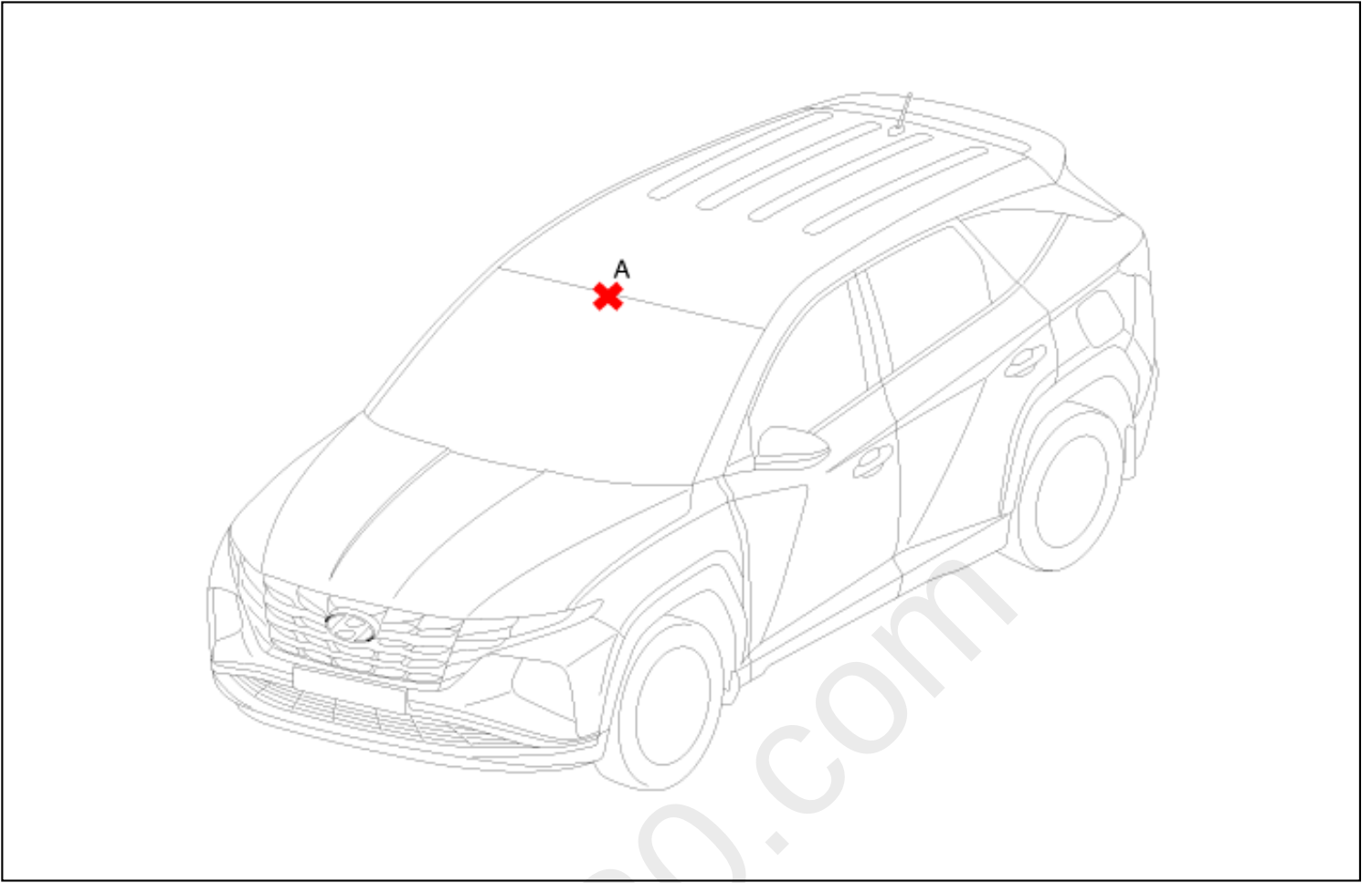
1. Ground level difference between the vehicle and the reflector.



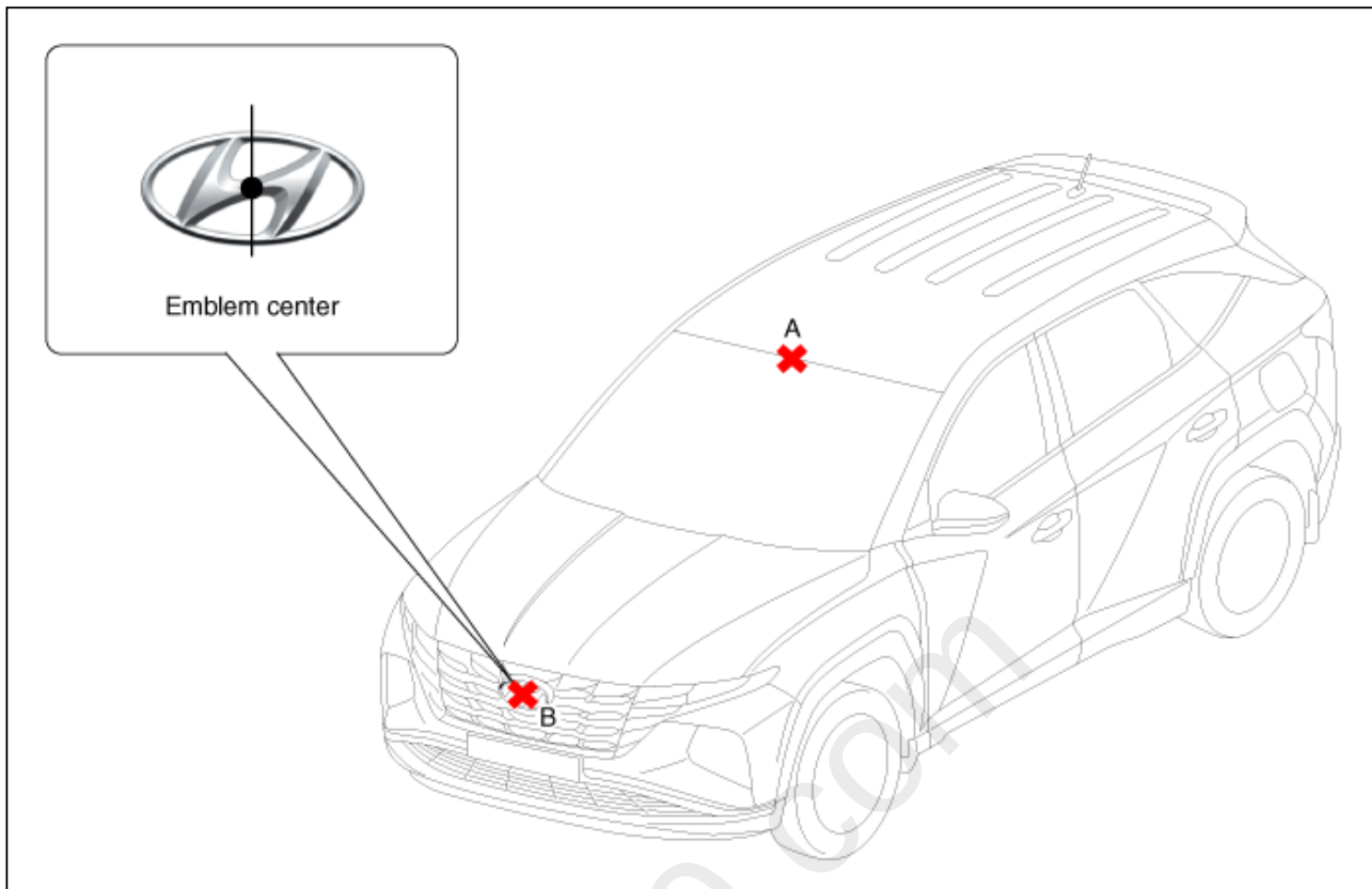
2. Vehicle and reflector are placed on a slope.



2. Mark the center point on top of wind glass (A).



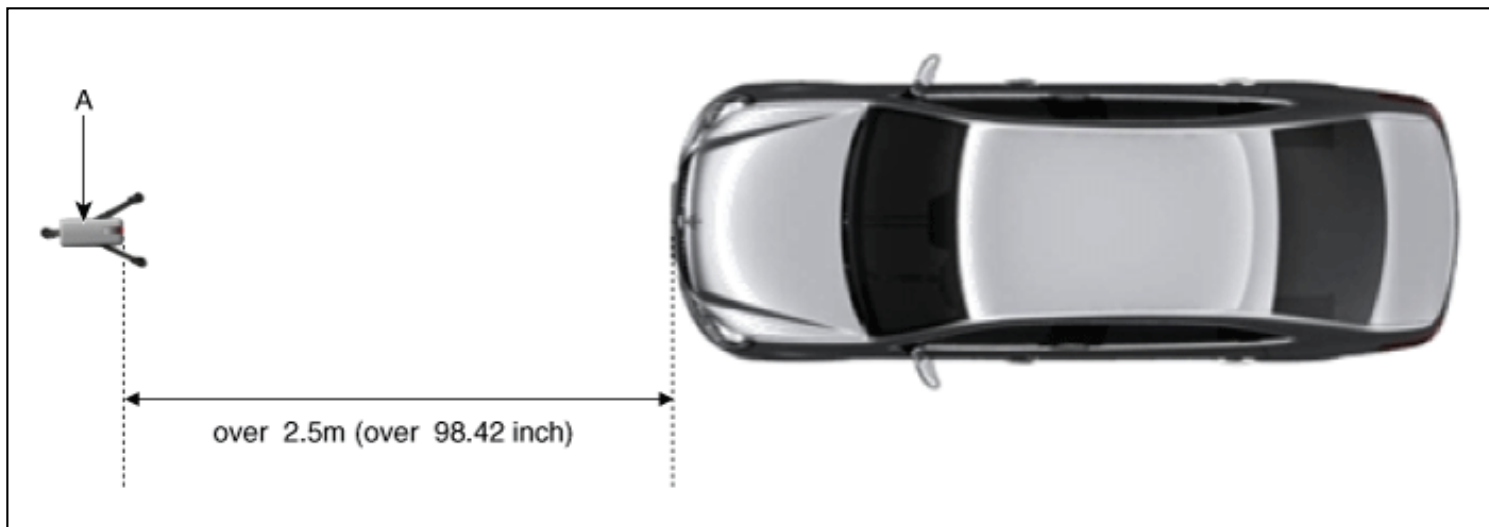
3. Mark the center point of emblem (A).



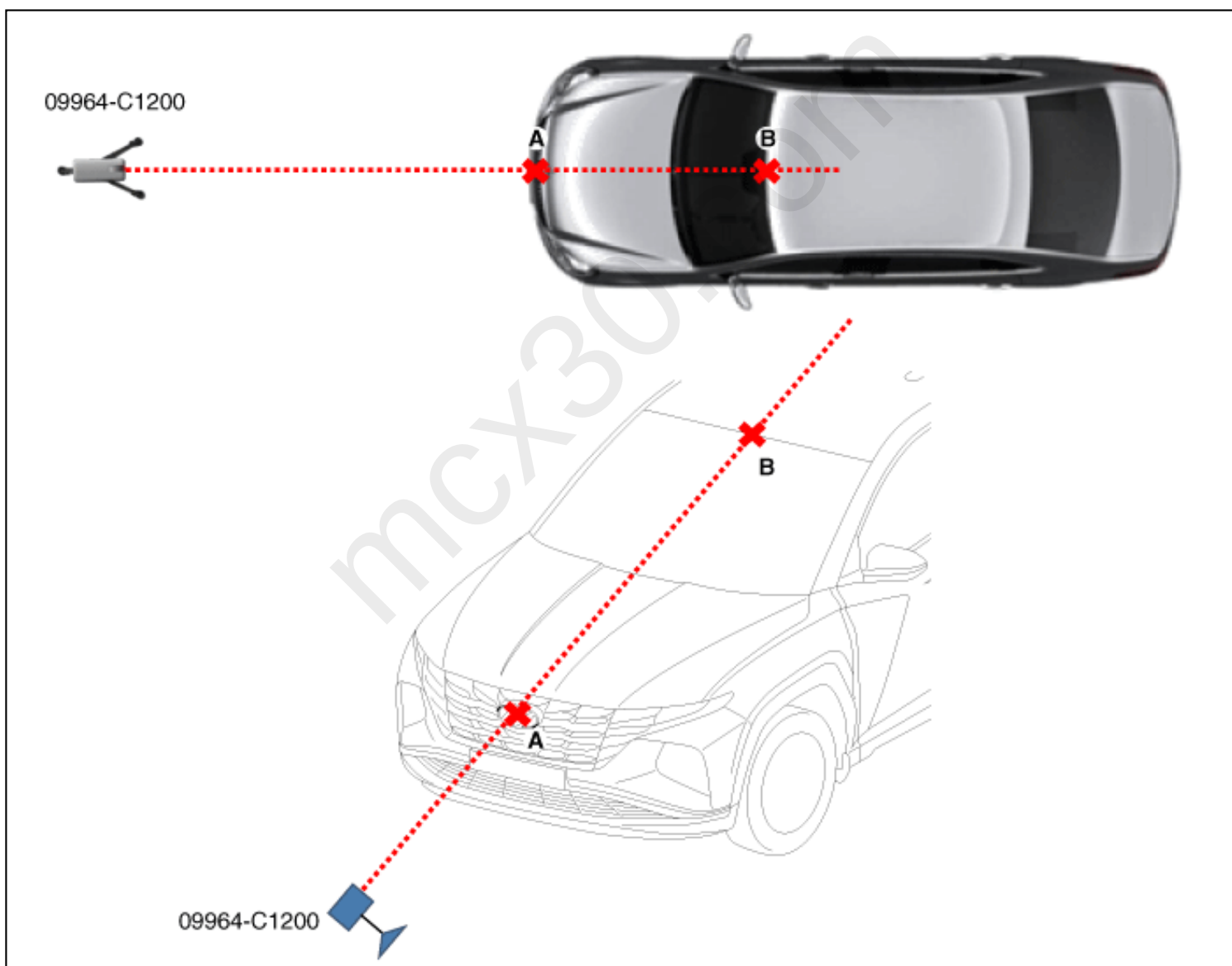
4. Mount the FCA Calibration Laser [SST No. : 09964-C1200] onto the tripod [SST No. : 09964-C1300].



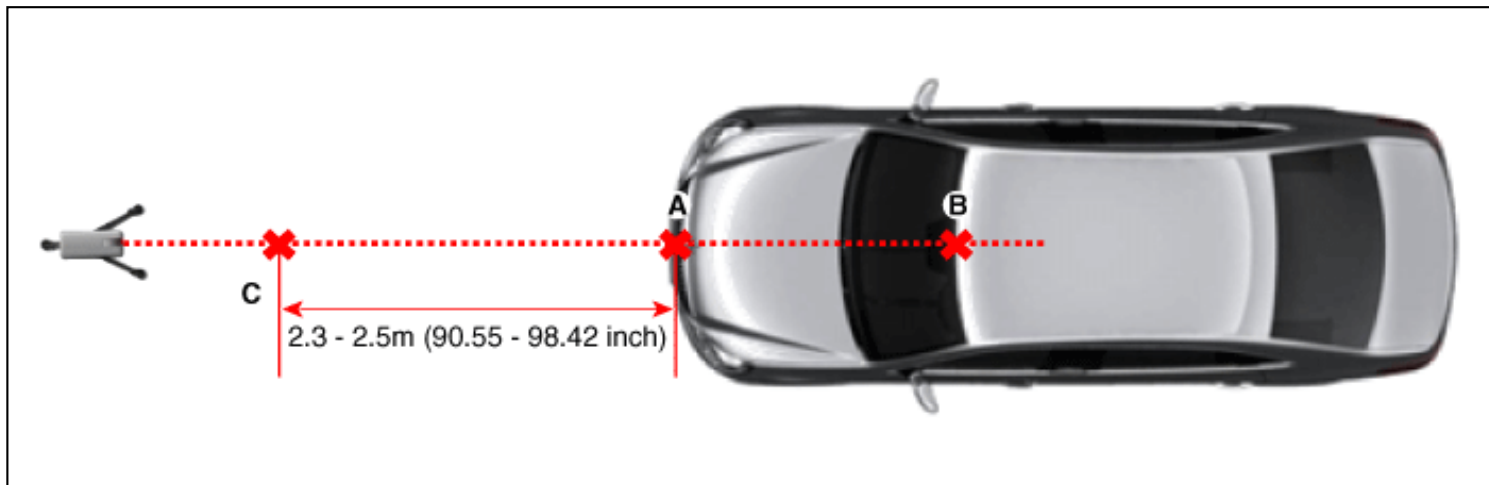
5. Install the vertical/horizontal laser [SST No. : 09964-C1200] (A) at least 2.5 m to the front of the vehicle.



6. Match the vertical line of laser to (A) and (B) using the vertical/horizontal laser (C) [SST No. : 09964-C1200].



7. Mark (C) at 2.3 - 2.5m (90.55 - 98.42 inch) from (A) in front of the vehicle.

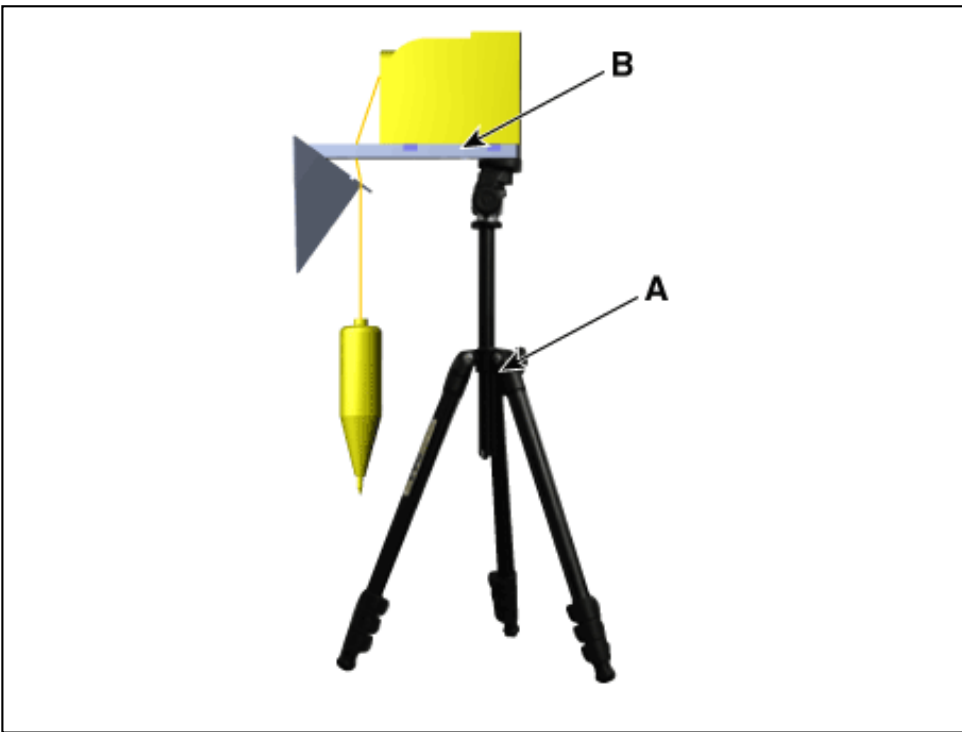


- If possible, perform calibration at the 2.5m position.

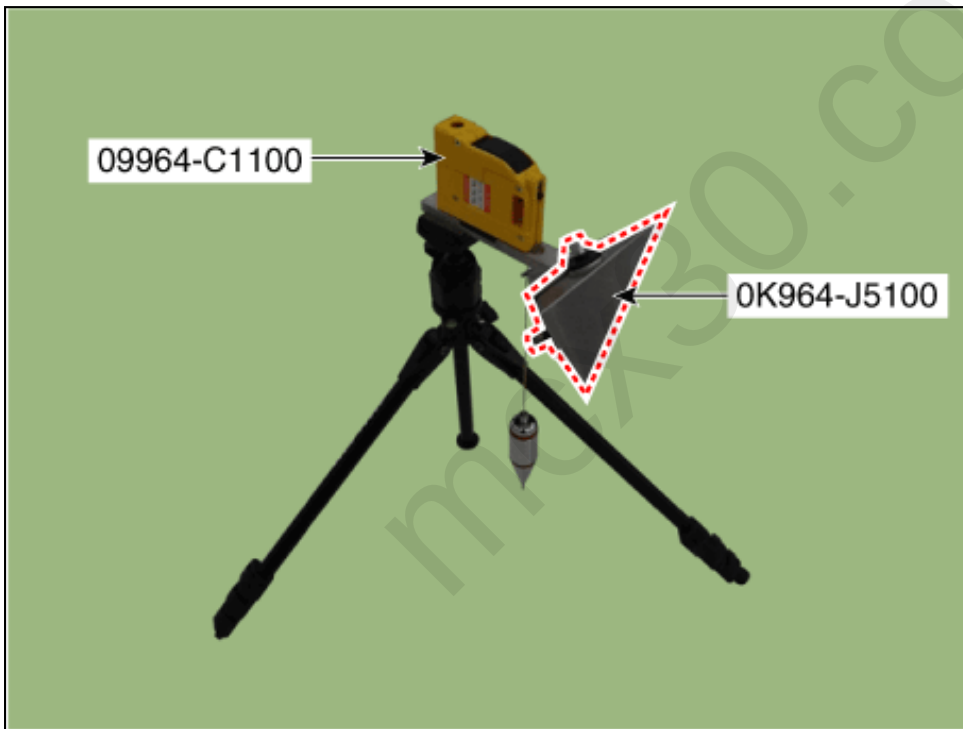
8. Remove the FCA Calibration Laser [SST No. : 09964-C1200] (B) from the tripod [SST No. : 09964-C1300] (A).



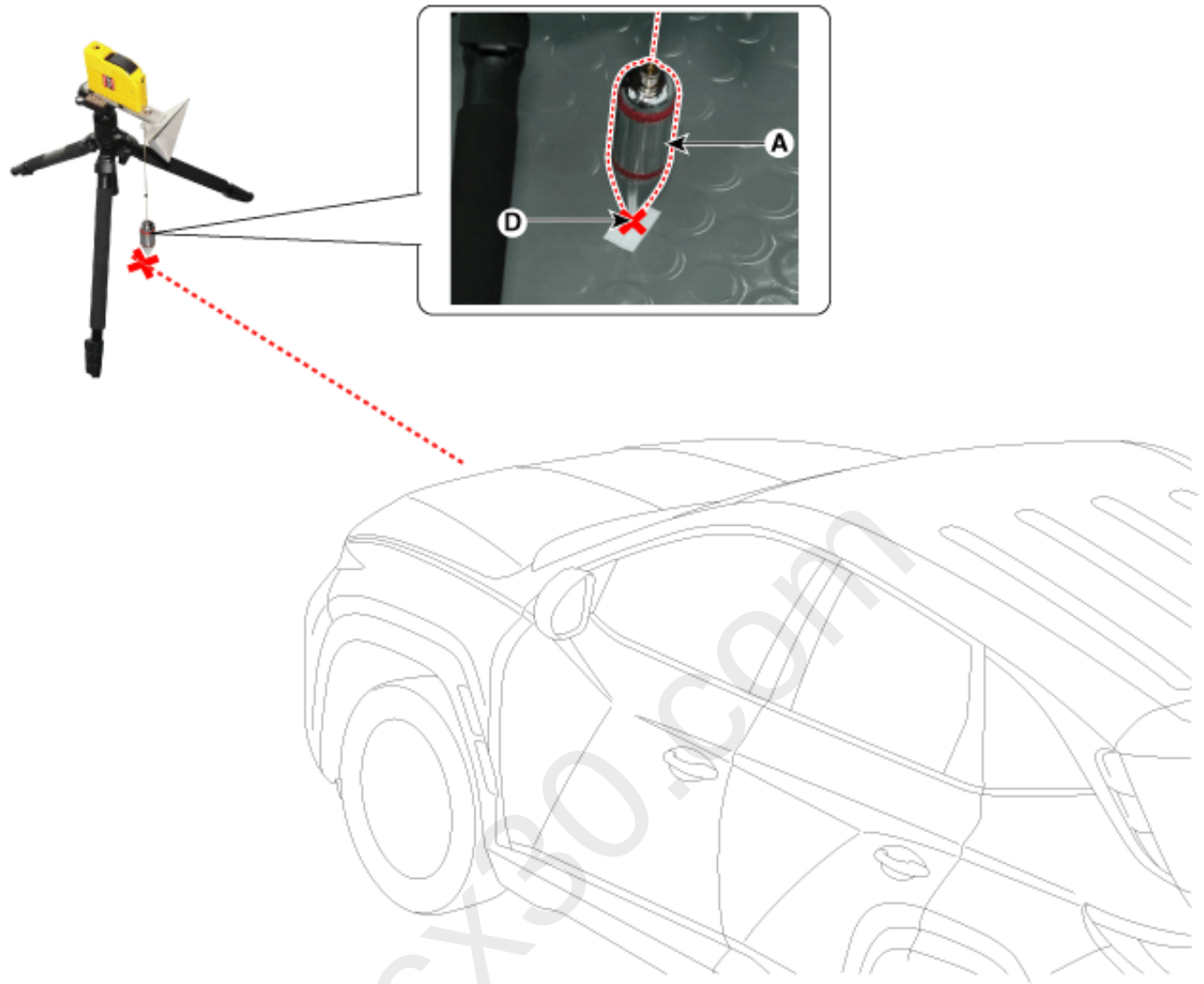
9. Mount the reflector [SST No. : 09964-C1100] (B) onto the tripod [SST No. : 09964-C1300] (A).



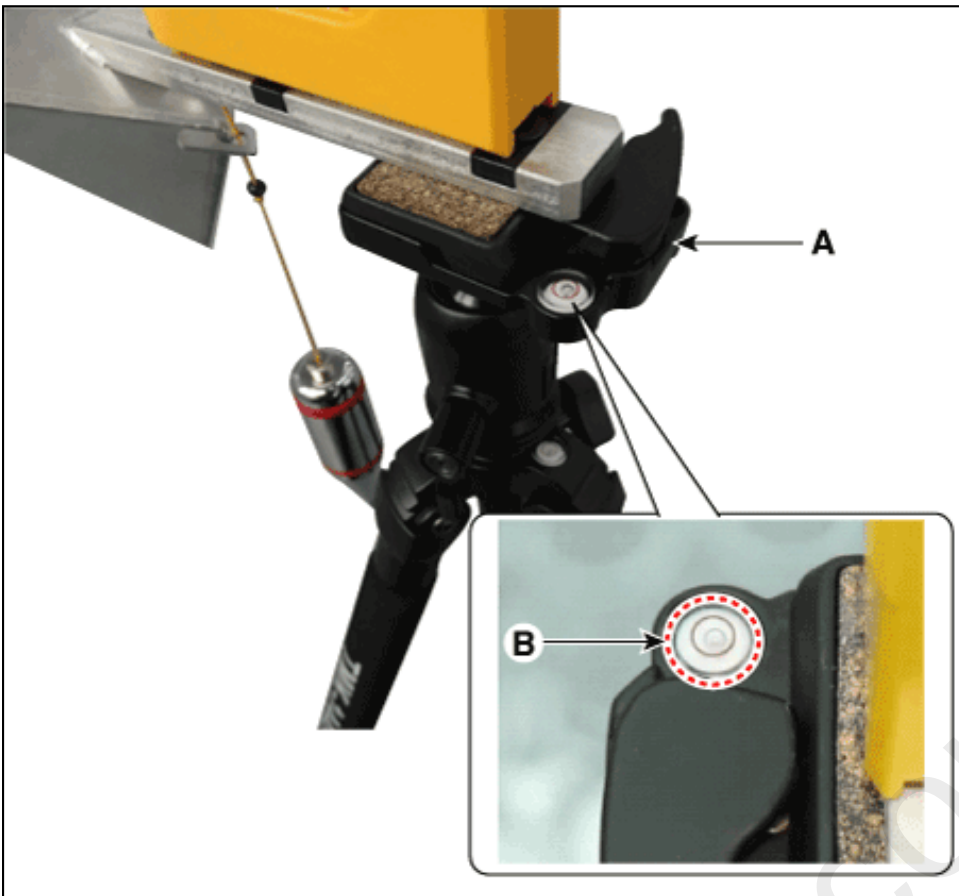
10. Mount the reflector adapter (0K964-J5100) to the reflector (09964-C1100).



11. Align the vertical weight (A) of the FCA Calibration Reflector [SST No. : 09964-C1100] with the point (D).



12. Using the bubble level (B) of the tripod [SST No. : 09964-C1300] (A), set the reflector horizontally.



13. Set the height of the FCA calibration reflector [SST No. : 09964-C1100] (A) to 395 mm (15.55 inch).



14. Visually check again the radar sensor and the surface of the front bumper for the following.



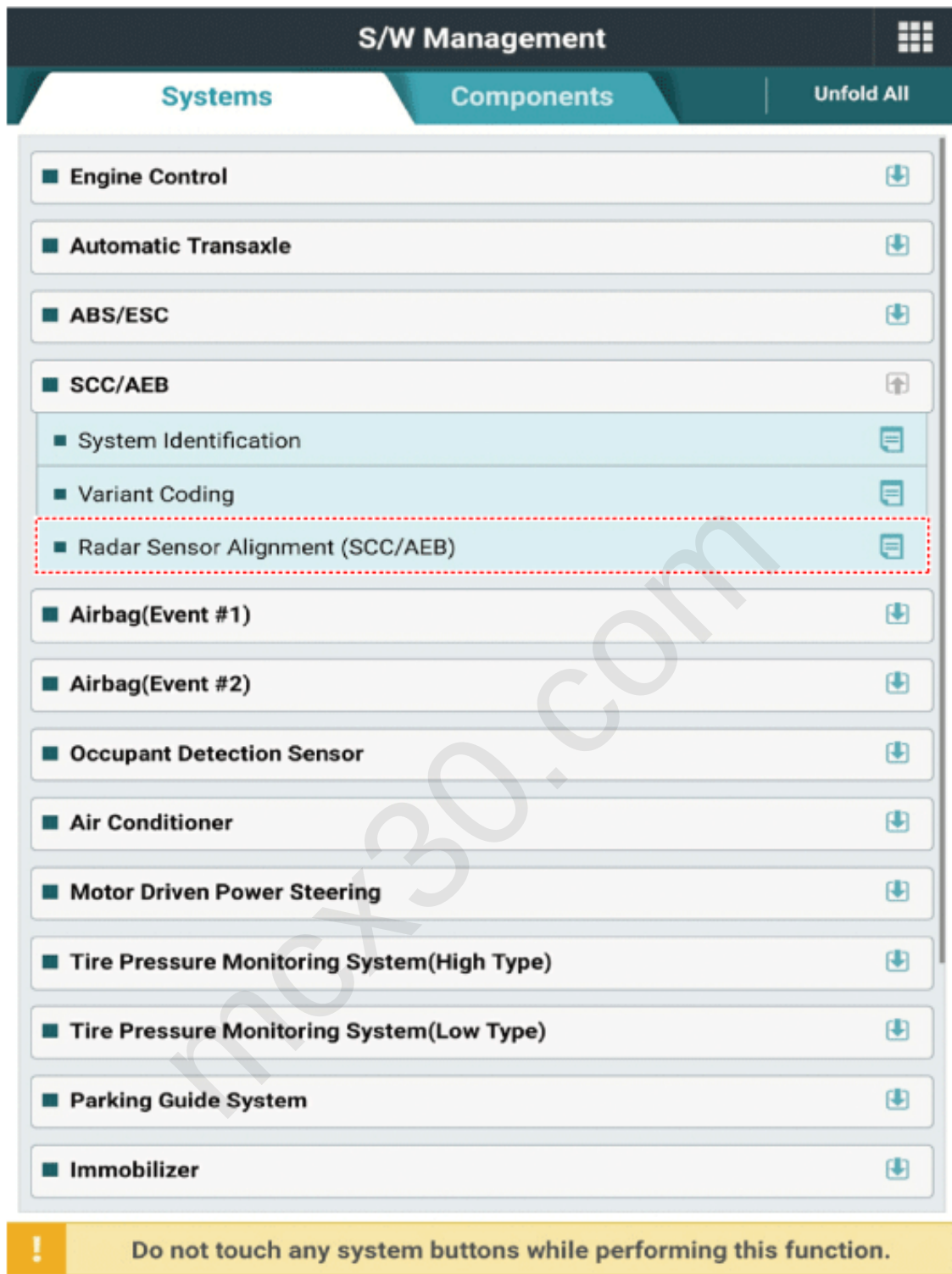
- Make sure that there is no debris, or reflecting object on the surface of the radar.
- Make sure that there is no debris, or reflecting object on the radiator grille.

15. Connect the GDS to the DLC of the vehicle and start sensor alignment.



- If the engine is running, the vibration may cause inaccurate sensor alignment, so perform sensor alignment in IG ON mode.

16. After correctly selecting the vehicle model, select "FCA Alignment" from the auxiliary functions in GDS Menu.



17. Perform sensor alignment as indicated on the GDS monitor.

S/W Management

■ Radar Sensor Alignment (SCC/AEB)

● [Radar Sensor Alignment (SCC/AEB)]

Enter the distance between the reflector and the radar sensor and click the **[OK]** button to start the alignment.

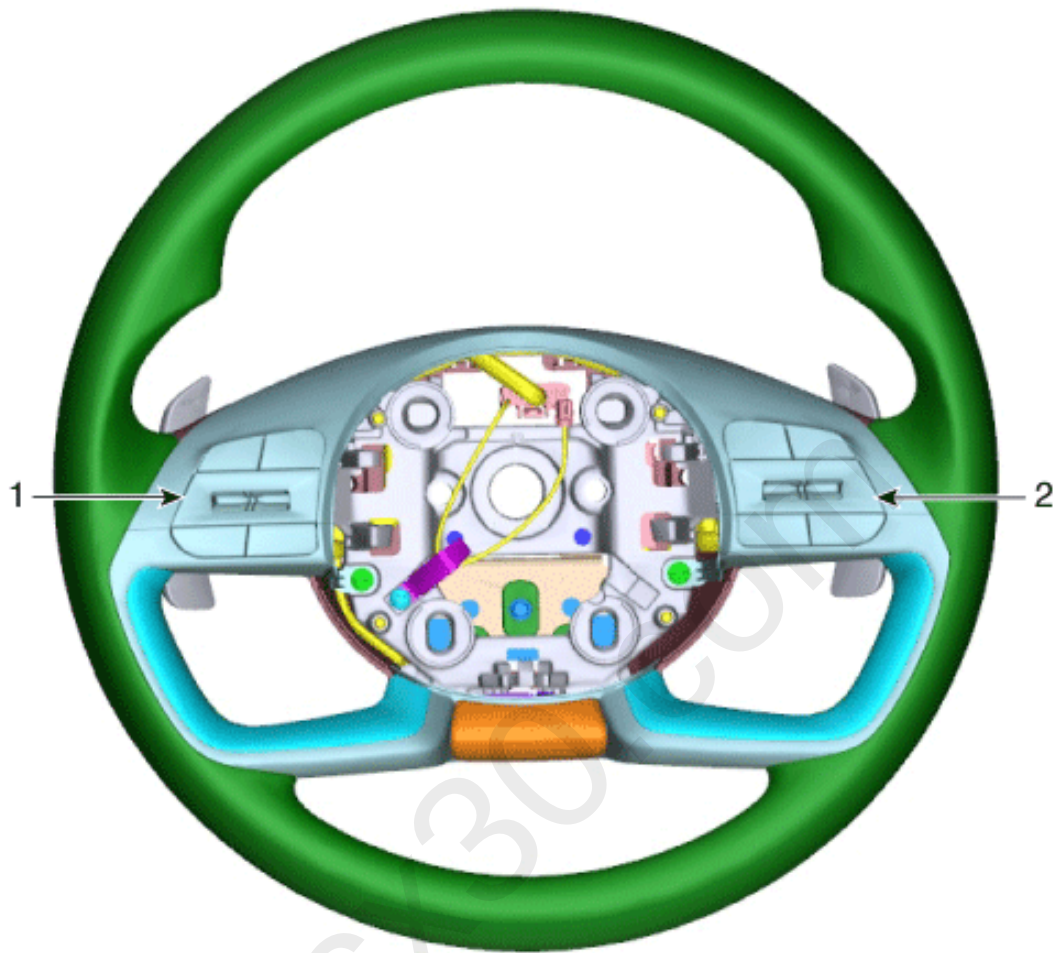
※ The alignment will be completed only when the distance to be entered is maintained same with the distance between the reflector and the radar sensor.

Distance input : inch(range : 39 inch ~ 149 inch)

OKCancel

! Do not touch any system buttons while performing this function.

18. In case of sensor alignment failure, check the alignment conditions. Turn the ignition key OFF, then reperform the sensor alignment procedure.

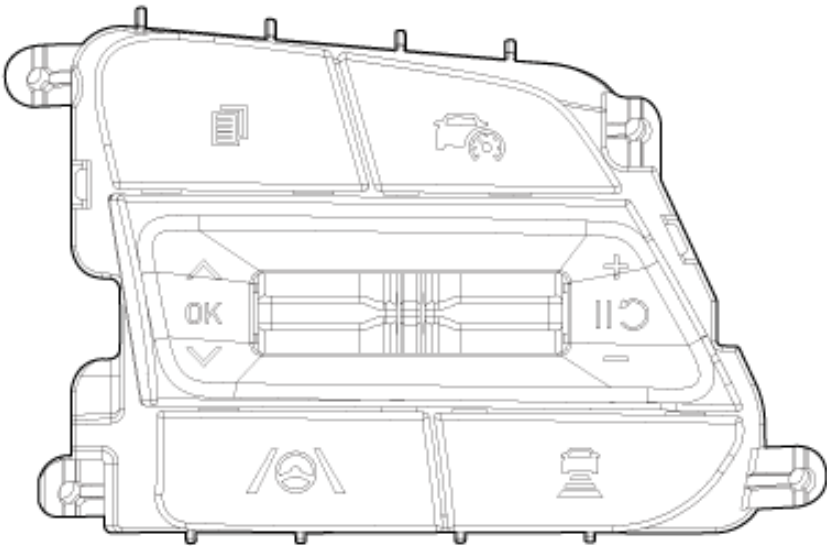


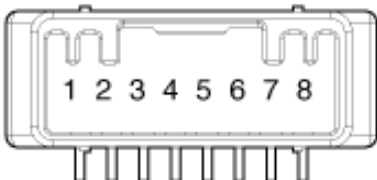
1. Remote control switch (LH : Audio)

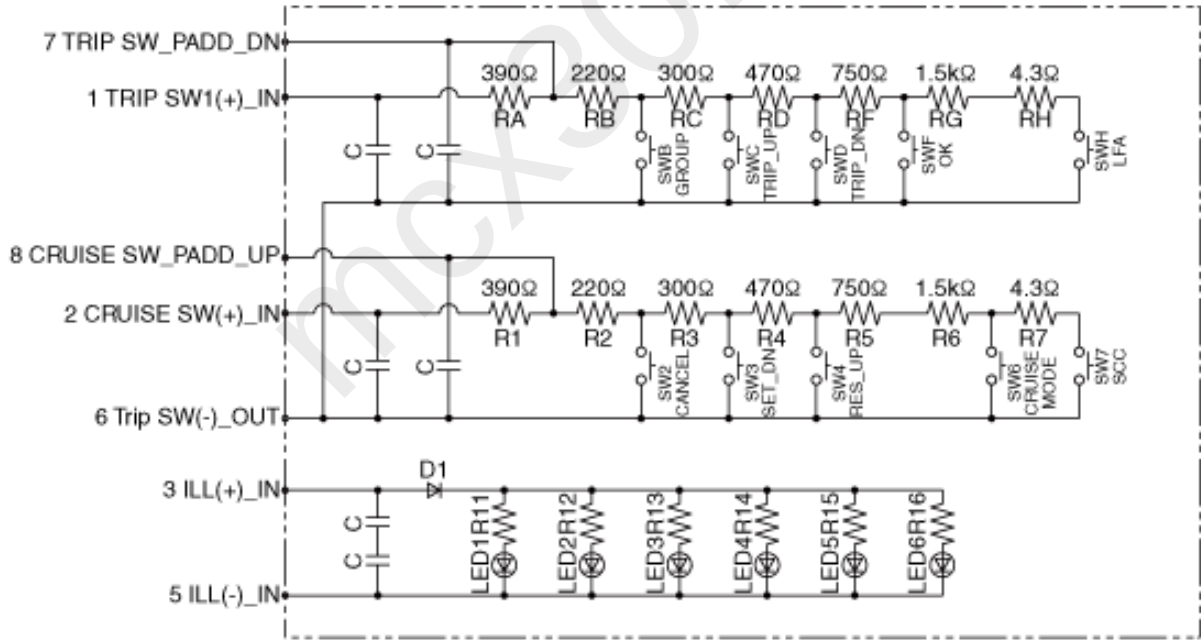
2. Remote control switch (RH : Trip + Cruise)

Circuit
Diagram

Trip+SCC+MSLA+LFA

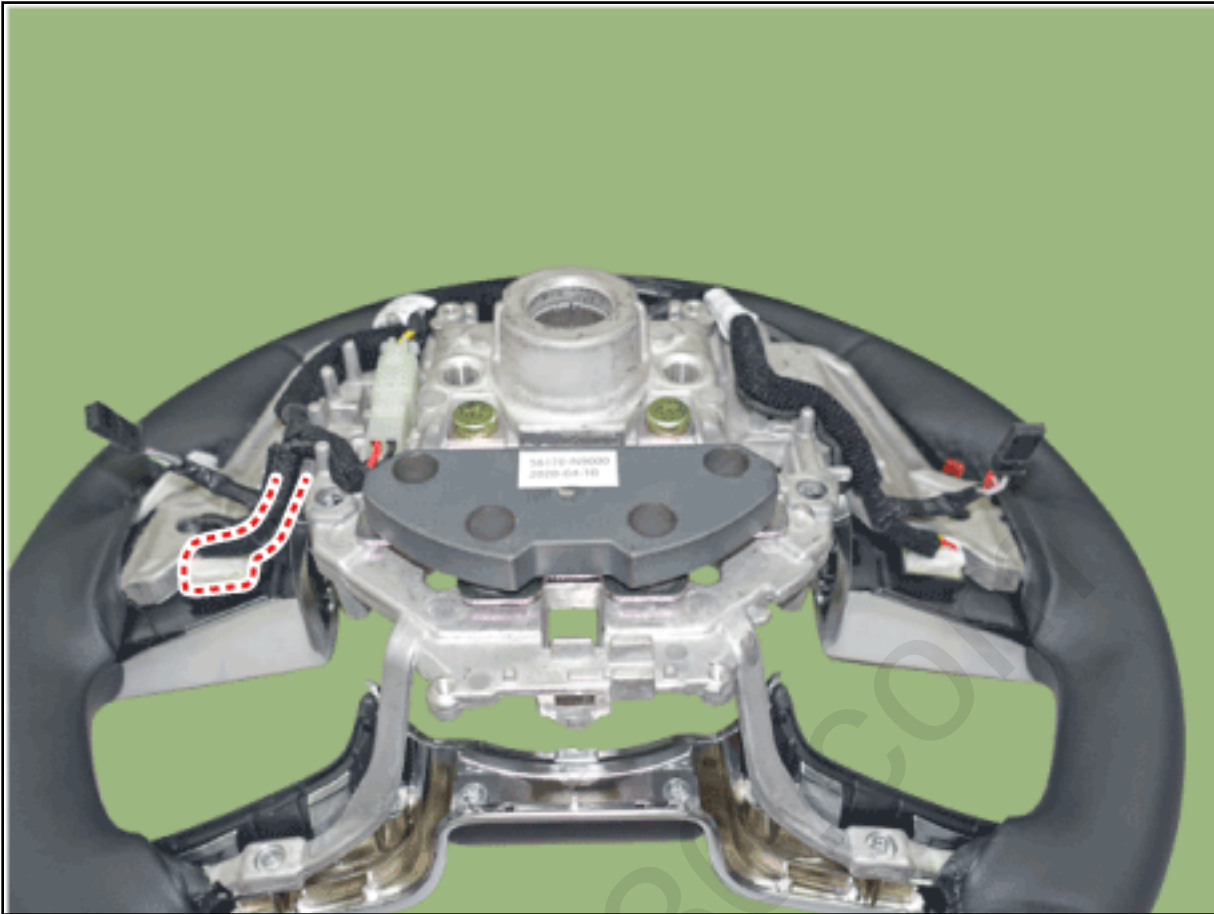


Connector	
	
Pin NO	Description
1	Trip switch (+)
2	Cruise switch (+)
3	Illumination (+)
4	-
5	Illumination (-)
6	Trip switch (-)
7	Paddle shift (Down)
8	Paddle shift (Up)



Inspection

1. Check for resistance between terminals in right switch position.



[Trip/Cruise]

Switch	Connector terminal	Resistance ($\pm 3\%$)
CANCEL	2 ~ 6	610 Ω
SET (-)	2 ~ 6	910 Ω
RES (+)	2 ~ 6	1.38 k Ω
Cruise ON/OFF	2 ~ 6	2.13 k Ω
Cruise & MSLA ON/OFF	2 ~ 6	3.63 k Ω
Smart Cruise	2 ~ 6	7.93 k Ω
Paddle shift (Down)	1 ~ 7	390 Ω
Trip Group	1 ~ 6	610 Ω
Trip Up	1 ~ 6	910 k Ω
Trip Down	1 ~ 6	1.38 k Ω

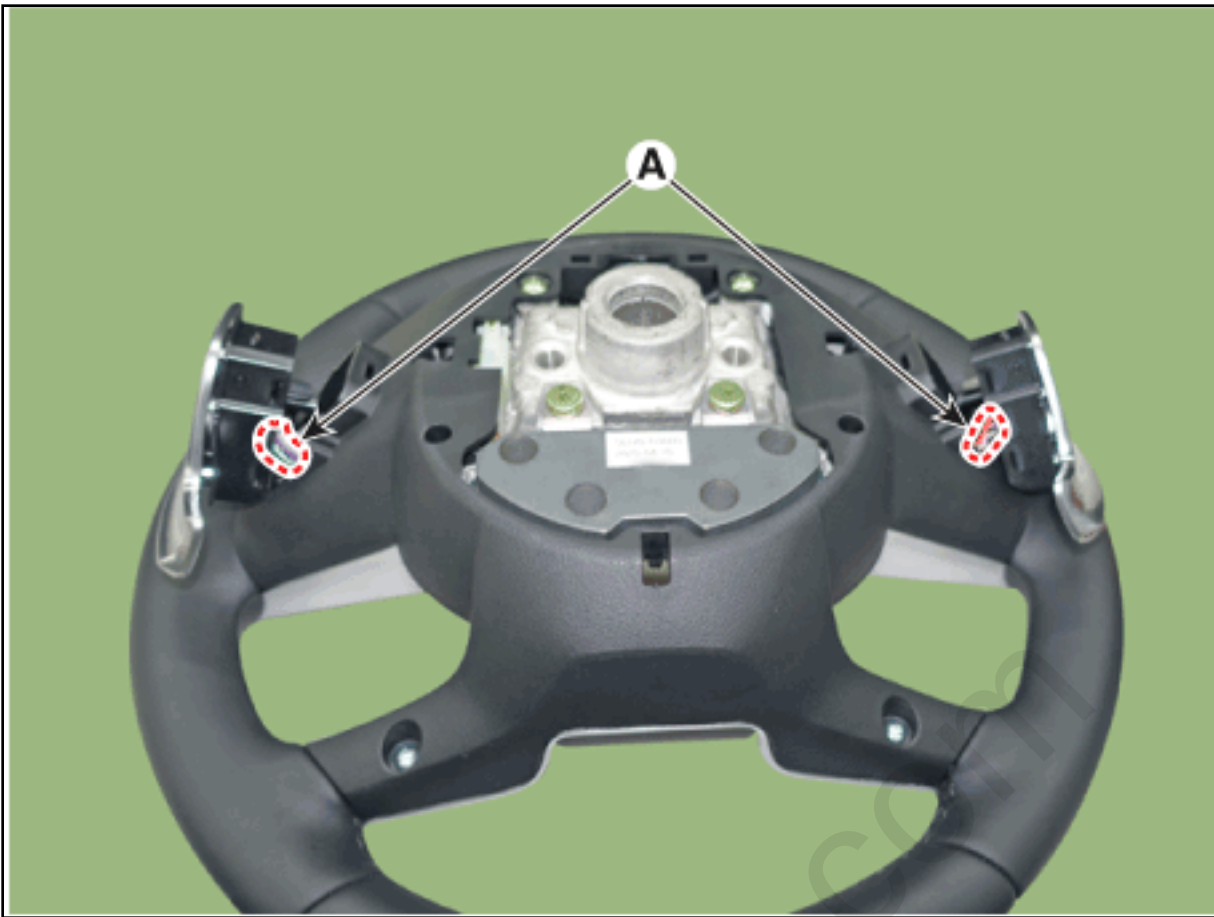
Trip OK	1 ~ 6	2.13 k Ω
LFA	1 ~ 6	7.93 k Ω

Removal

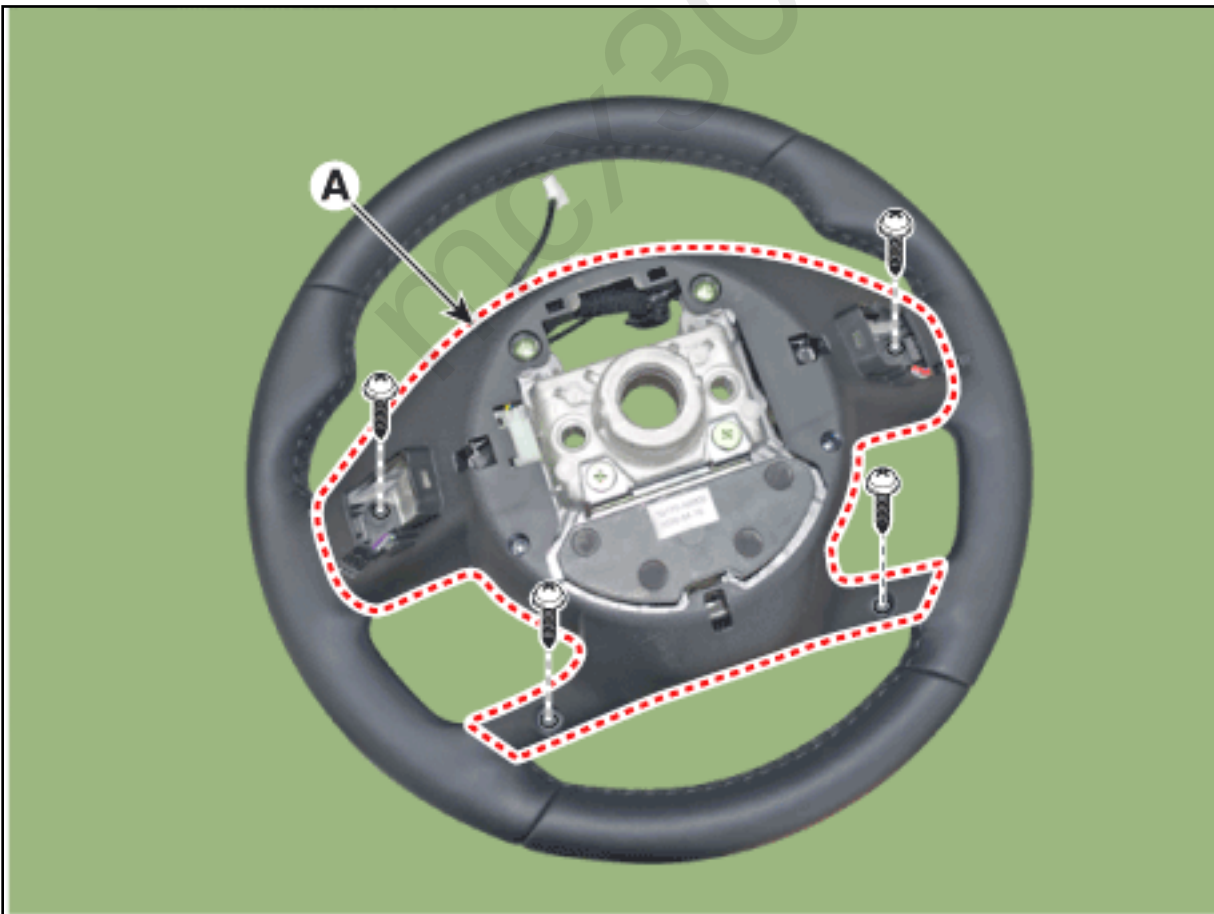
1. Disconnect the negative (-) battery terminal.
2. Remove the steering wheel.
(Refer to Steering System - "Steering Wheel")
3. Remove the paddle shift lever (A).



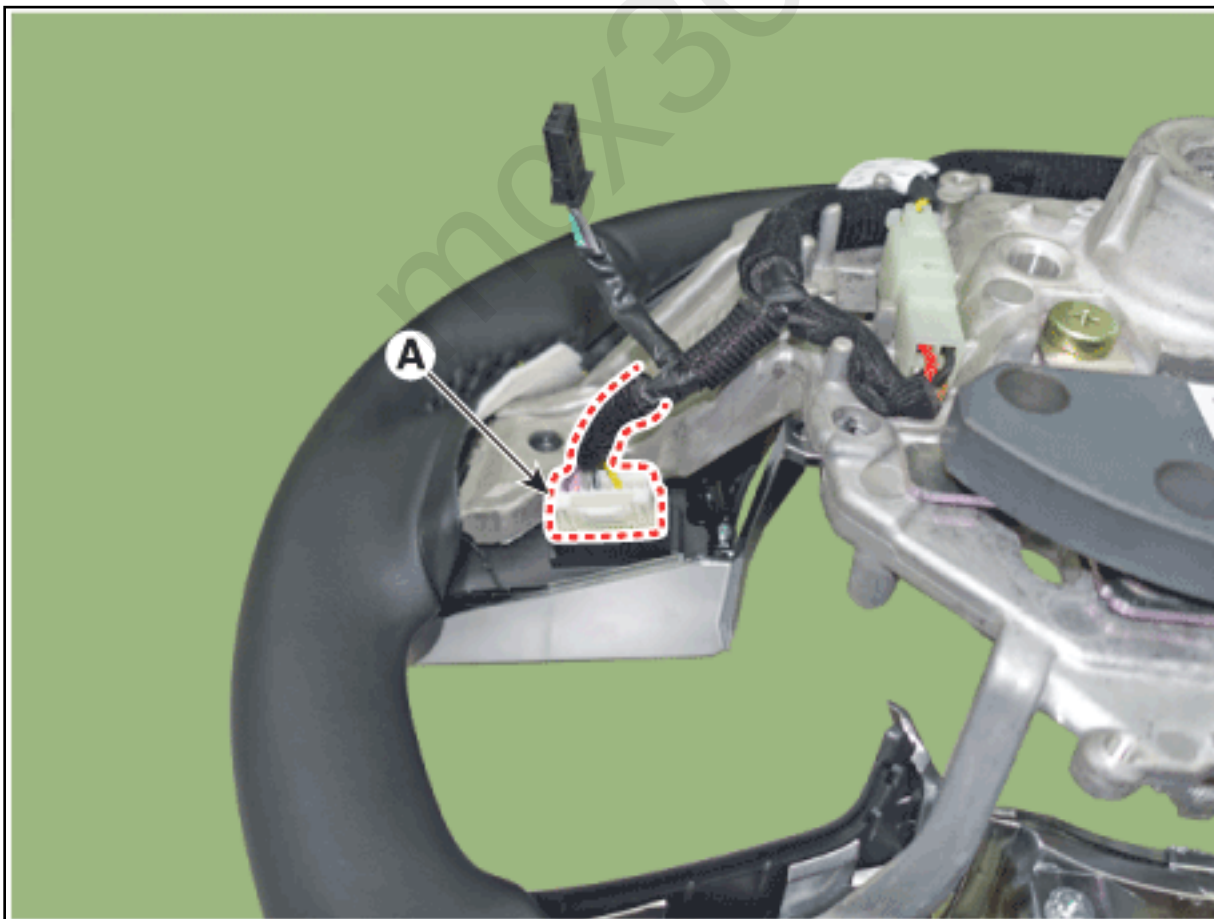
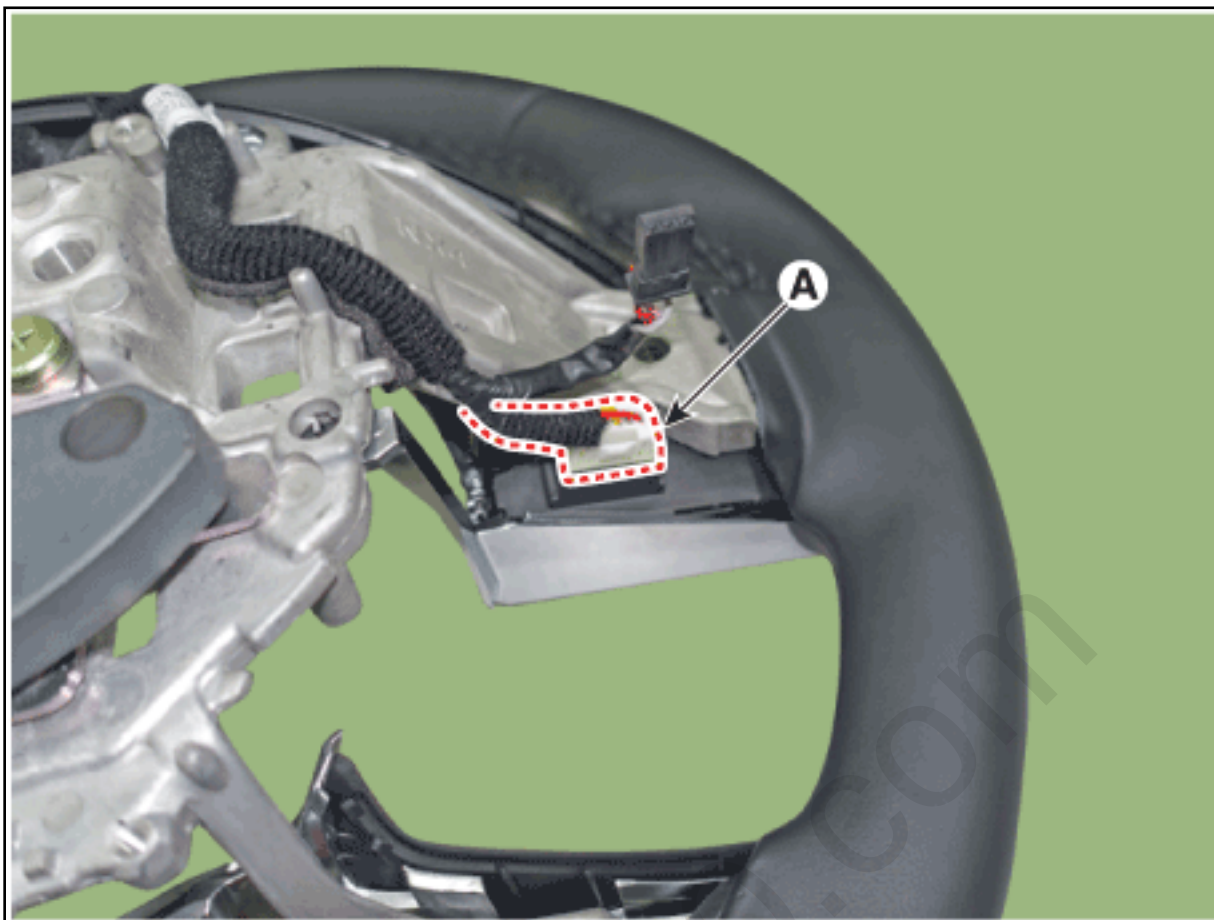
4. Disconnect paddle shift lever connector (A).



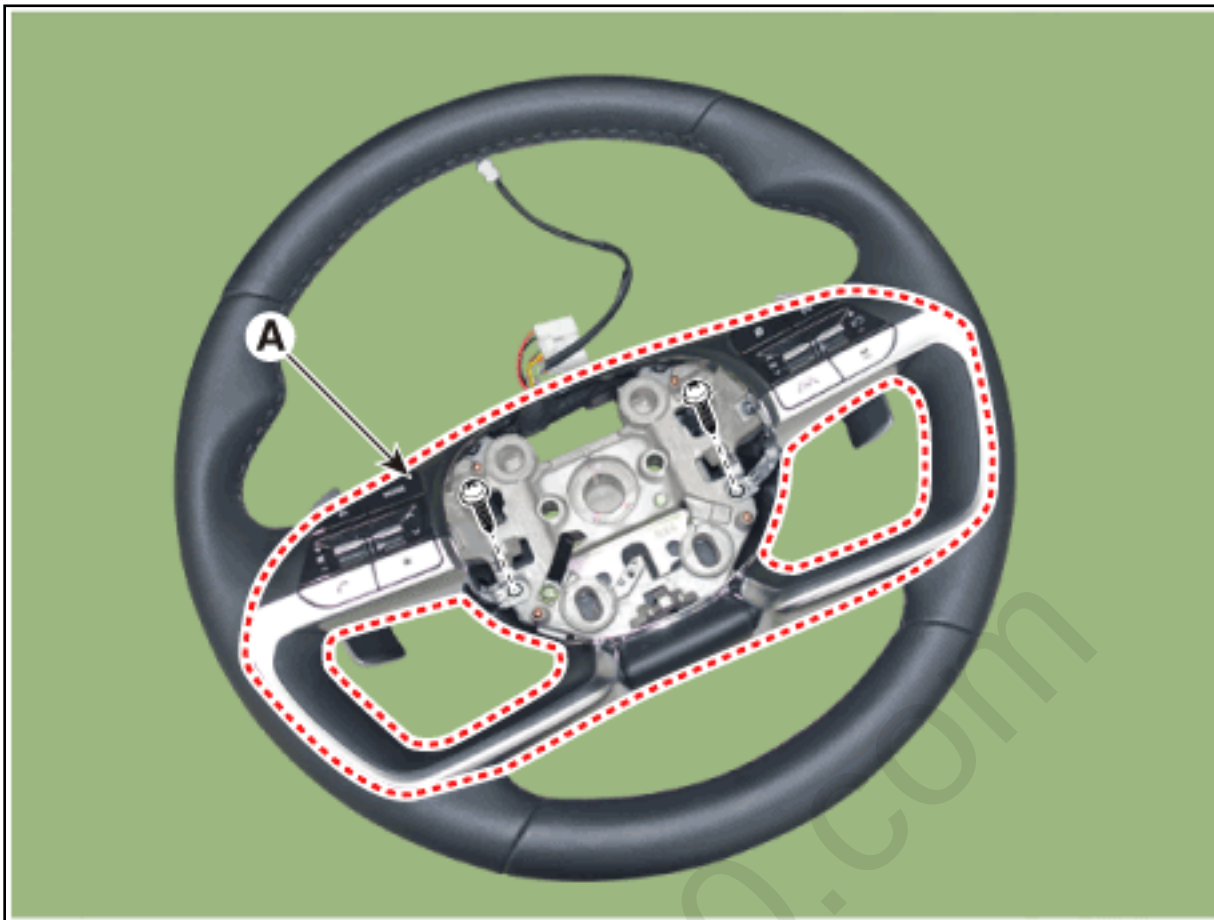
5. Remove the steering wheel cover (A) after loosening mounting screws.



6. Disconnect remote control switch connector (A) after loosening mounting screws.



7. Remove the remote control switch (A) after loosening mounting screws.



Installation

1. Install the remote control switch on the steering wheel.
2. Install the steering wheel lower cover.
3. Install the paddle shift lever.
4. Install the steering wheel.
5. Connect the negative (-) battery terminal.



- Make sure that the cables and connectors are plugged in properly.
- Check the AVN system for normal operation.