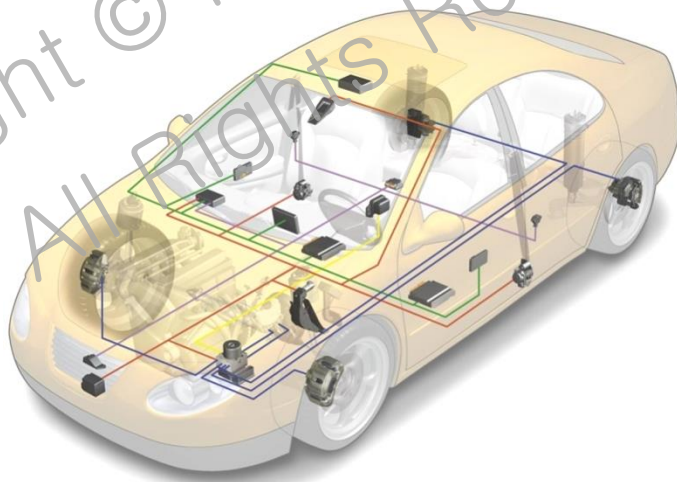

Advanced Smart Cruise Control System



I. System Information

1. Introduction

- The ASCC system operates the convenience feature automatically maintaining the distance by measuring the distance and speed of the lead vehicle with the radar in front of the car. Also, if the lead vehicle is stopped along the rear of the lead vehicle stops, and re-start feature provides at the start with Stop & Go function.

2. System Operation

operation principle

Absence of a lead vehicle

Existing of a lead vehicle

Stopping a lead vehicle

Blinding a lead vehicle

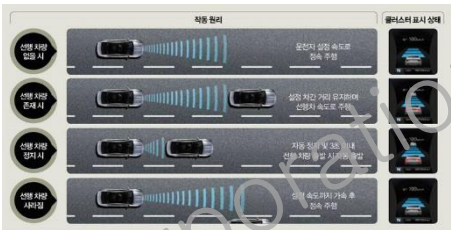
Cluster display state

Cruise control at the driver's setting speed

Driving the lead vehicle traveling speed maintaining a set following distance

When auto stop and starting the lead vehicle within 3 seconds, automatically start.

Accelerate to the target speed and then cruise control.



1) Normal Mode Control

- All of the speed/distance control can perform from 30 to 180 km/h speed range.
- The minimum target speed is 30km/h.
- If the lead vehicle's speed is from 0 to 30km/h, the proper distance can be expected(or calculated/measured).

2) Stop mode Control

- When the lead vehicle is stopped, and then the vehicle would stop at a certain distance.
- If the stop duration is within 3 second, the vehicle automatically start, or not manually the resume/set switch turn on or the accelerator pedal is pressed. If the stopping maintain more than 5 minutes, the ASCC control will be released.

3) Overdrive Control

- Driver's accelerator pedal is pressed, the system will give acceleration priority to the judgment of the driver than the system decision. Then, the driver releasing the accelerator pedal, the target speed gradually slows down.

4) Overtaking Support Control

- The driver turn on the left blinker, the system internally set as the target distance one-step regardless of the display condition. Therefore, a slight acceleration can help to occur soft overtaking.

II. Specific System Structure

1. SCC

1) Function

- Monitoring front road condition(sensing function)
- Driver riding/getting off and monitoring car condition(ECU function)
- Calculating and output of the Required acceleration(ECU function)

2. Switch

1) Function

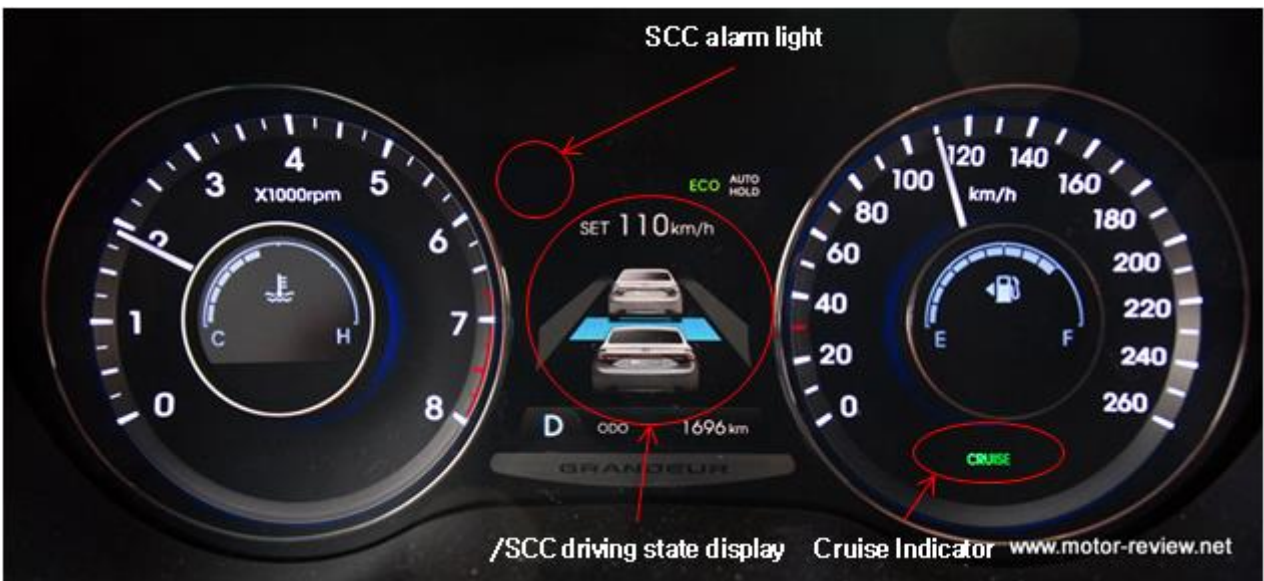
- ACSS system On/Off
- Target speed control
- Target distance control
- Operation ON/OFF
- ASCC-CC switching operation



3. Cluster

1) Function

- System On/Off
- System Alarm
- ASCC Operation State (lead vehicle, Break, Overtake, Stop modes) Display
- ASCC Driver Setting State (Target Speed/Distance) Display
- ASCC Auto-unlock/ Usage Condition Un-satisfaction
- ASCC Hazardous situation (lead vehicle breaking, Stop vehicle alert) Display



4. Instruction of the ASCC control using switch

1) ON/OFF Main Switch

- ON/OFF function
- In case of the Standby mode, "CRUISE" Ramp turn ON

2) 『SET/-』 Switch

- At the Stand by mode, Press SET Switch and then Control start.
 - » The target speed set 30 km/h when the car speed is from 0 to 30 km/h.
 - » When the car speed is over 30 km/h, the target speed is the same as current speed.
- If the SET switch is pressed under control, the target speed will be decreased.
 - » Press short period, the speed decrease 1km/h step. ex) 81→80→79→78
 - » Press long period, the speed decrease at first 1km/h step then 10km/h step. ex) 77→76→70→60

3) 『RES/+』 Switch

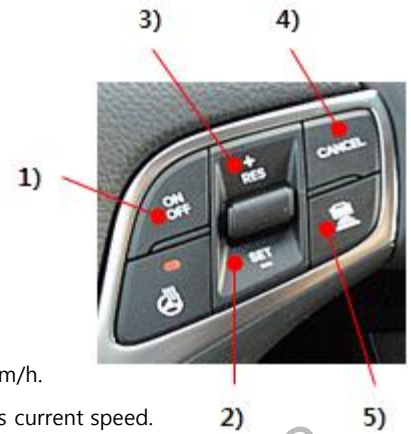
- At Standby mode, Press RES+ switch and then control start.
 - » After the OFF mode changed to Standby mode, the ASCC usage history have to be existed at least once.
- If the RES+ switch is pressed under control, the target speed will be increased.
 - » Press short period, the speed increase 1km/h step. ex) 77→78→79→80→81
 - » Press long period, the speed increase at first 1km/h step then 10km/h step. ex) 66→67→70→80

4) 『CANCEL』 Switch

- Released from the control condition

5) 『Distance setting』 switch

- Set the target headway distance(Initial value is level.4)
- Press the switch, the target headway distance value changed in the following order.
 - » level.4->level.3->level.2->level.1->level.4
 - » In case of the car speed is 90km/h
 - » At level 1 (1sec.), Headway distance is 25m.
 - » At level 2 (1.3sec.), Headway distance is 32.5m
 - » At level 3 (1.6sec.), Headway distance is 40m
 - » At level 4 (2.1sec.), Headway distance is 52.5m
- If press the switch over 2 sec, the ASCC mode is switched the CC mode each other.



Notice:

This Device complies with the FCC Rules [and with Industry Canada licence-exempt RSS standard(s)]. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and*
- (2) This device must accept any interference received, including interference that may cause undesired operation.*

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et*
- (2) This device must accept any interference received, including interference that may cause undesired operation.*

Notice:

Changes or modifications made to this equipment not expressly approved by (manufacturer name) may void the FCC authorization to operate this equipment.

Copyright © Mando Corporation
All Rights Reserved

For FCC

This device complies with the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

- Any changes or modifications not expressly approved by the party responsible for compliance could void the authority to operate equipment.
- This device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter.
- End-users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

FCC RF Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

For IC

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions: (1) This device may not cause interference; and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

IC Radiation Exposure Statement:

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body

◆ Equipment RF Specification

Product name	MRR-20
Kind of product	Automotive Radar
Operating frequency range	76.125 GHz ~ 76.95 GHz
Bandwidth	825 MHz
Type(s) of Modulation (e.g. BPSK, FSK, ASK, ...)	FMCW
Number / Type of Antenna(s)	6(Tx :2 EA, Rx: 4 EA) / patch ANT
Antenna Gain	Tx1: 20 dBi, Tx2: 14 dBi, Rx: 15 dBi
Intended area of use	Automobile
Test sample information	production unit
Wired Interfaces	CAN/LIN Cable Length: 2 m
Power supply:	Battery
Voltages	Vnom : 12 V Vmax : 16 V Vmin : 9 V
Current consumption	400 ~ 600 mA
Dimensions (in cm):	83.6 x 75.6 x 21.2
Weight:	162 g

Equipment Operating Information

- Minimum Operating Temperature : -40°C
- Maximum Operating Temperature : +85°C

"Hereby, MANDO Corp. declares that the radio equipment type Automotive Radar/MRR-20 is in compliance with Directive 2014/53/EU.

*The full text of the EU declaration of conformity is available at the internet address:
<https://www.mando.com/>)"*