

TOYOTA CAMRY / AURION REPAIR MANUAL

# **NEW CAR FEATURES**

**AURION GSV40 RHD**

**NEW MODEL OUTLINE**

**ENGINE**

**CHASSIS**

**BODY**

**BODY ELECTRICAL**

**APPENDIX**

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# Foreword

To assist you in your sales and service activities, this manual explains the main characteristics of the Aurion, in particular providing a technical explanation of the construction and operation of new mechanisms and new technology used.

Some drawings and pictures used in this publication are for illustration purposes. They may not be the same as that on the actual vehicle.

Applicable model: GSV40R

This manual is divided into 3 sections.

1. **New Model Outline** - Explanation of the product to give a general understanding of its features.
2. **Technical Description** - Technical explanation of the construction and operation of each new system and components.
3. **Appendix** - Major technical specifications of the vehicle.

**CAUTION, NOTICE, REFERENCE** and **NOTE** are used in the following ways:

CAUTION	A potentially hazardous situation which could result in injury to people may occur if the instructions on “what to do” or “not do” are ignored.
NOTICE	Damage to the vehicle or components may occur if the instructions on “what to do” or “not do” are ignored.
REFERENCE	Explains the theory behind mechanisms and techniques.
NOTE	Notes or comments not included under the above 3 titles.

For detail service specifications and repair procedures, refer to the Repair Manual CD: Pub. SC02N1EQ

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# NEW MODEL OUTLINE

## **EXTERIOR APPEARANCE**

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## ***EXTERIOR APPEARANCE***

### **Front View**



02KMO01TE

### **Rear View**



02KMO02TE

**MODEL CODE****GSV40R – JETNKQ**

1

2

3

4

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1	BASIC MODEL CODE
	GSV40: With 2GR-FE Engine

5	GEAR SHIFT TYPE
	T: 6-Speed Automatic, Floor

2	STEERING WHEEL POSITION
	L: Left-Hand Drive R: Right-Hand Drive

6	GRADE
	D: AT-X - includes NZ N: Prodigy – includes SPI (Touring - NZ) G: Presara - includes NZ S: Sportivo SX6- includes NZ V: Sportivo ZR6- includes NZ

3	MODEL NAME
	J: Aurion

7	ENGINE SPECIFICATION
	K: DOHC and EFI

4	BODY TYPE
	E: 4-Door Sedan

8	DESTINATION
	Q: Australia, New Zealand, SPI V: GCC Countries, Iran

**MODEL LINE-UP**

Destination	Engine	Grade	Transaxle
			U660E
Australia	2GR-FE	AT-X	GSV40R-JETDKQ
		Prodigy	GSV40R-JETNKQ
		Presara	GSV40R-JETGKQ
		Sportivo SX6	GSV40R-JETSKQ
		Sportivo ZR6	GSV40R-JETVKQ
New Zealand	2GR-FE	AT-X	GSV40R-JETDKQ
		Touring	GSV40R-JETNKQ
		Presara	GSV40R-JETGKQ
		Sportivo SX6	GSV40R-JETSKQ
		Sportivo ZR6	GSV40R-JETVKQ
South Pacific Islands	2GR-FE	Prodigy	GSV40R-JETNKQ

## ***EXTERIOR***

### ***Front View***

- The vehicle front design is characterised by the unique U-shaped lines. The contrast created by the combination of concave and convex shapes gives the surface a sense of solidity and sharpness.
- Through the combination of clear outer lenses and the extensions, the headlights have given visual impact. Either halogen bulbs or discharge bulbs are used depending on the vehicle grade. Models with intelligent AFS are also available.

Parking Light      High Beam Headlight



Low Beam  
Headlight

Front Turn  
Signal Light



Fog Lights

A99T8895

02KM003TE

### ***Radiator Grille***

Chrome Plating around the outer perimeter

Material Colour



AT-X grille

**AT-X**

Chrome Plating around  
the outer perimeter and  
across the horizontal  
bars

Material Colour



Presara grille

**Prodigy (Touring - NZ) & Presara**

Black Mesh

Body Colour

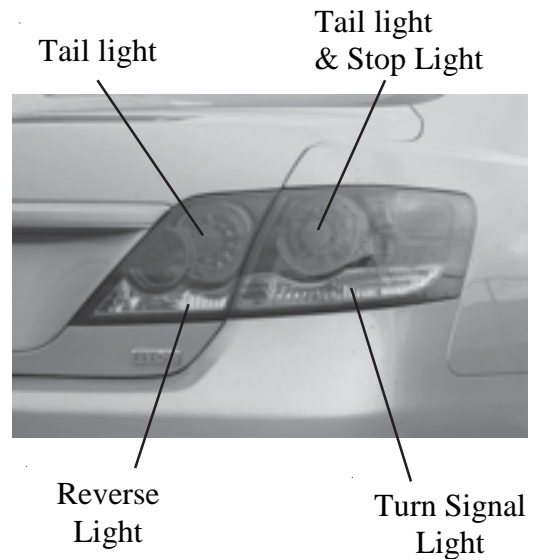


Sportivo\_grille1

**Sportivo SX6 & ZR6**

## **Rear View**

- The luggage door and rear bumper design is characterised by the unique U-shaped lines.
- With its impressive cylindrical designs, the rear combination light creates a sophisticated look. The taillight & stop light have been designed using LEDs (Light Emitting Diodes) to reduce power consumption.



02KMO05TE

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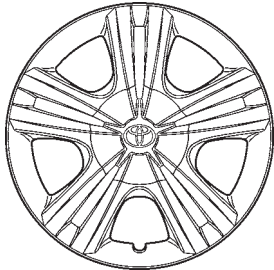

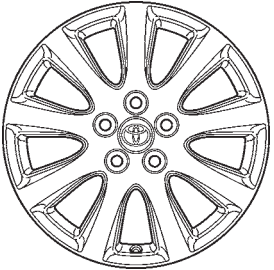
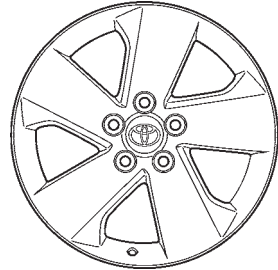
## **Side View**

The curved front corner of the engine hood is designed to emphasise the dignity of the vehicle, and the side protection mouldings give an accent to the side design.



02KMO07TE

**Tyre & Disc Wheel**

Tyre	Size	P215/60R16 V95	P215/60R16
Disc Wheel	Size	16 x 6.5 JJ	16 x 6.5 J
	Material	Steel with Full Cap	Aluminium with Centre Ornament
Full cap / Wheel Design		 02KMO09Y	 VIC-DP-030
Tyre	Size	P215/55R17 93V	P215/55R17 93V
Disc Wheel	Size	17 x 7 J	17 x 7 J
	Material	Aluminium with Centre Ornament	Aluminium with Centre Ornament
Wheel Design		 02KMO08Y	 02KMO10Y



## **Sporty Exterior**

In order to accentuate the sporty looking exterior, the following exclusive parts have been provided for Sportivo grade models.

- (1) Front Under Spoiler
- (2) Radiator Grille
- (3) Rear Spoiler
- (4) Rear Under Spoiler
- (5) Rocker Molding
- (6) Disc Wheel



02kMO58TE



02kMO59TE

**Exterior Colour List**

Colour No.	Colour Name	Colour No.	Colour Name
061	White (Diamond White)	580	Yellow Mica Metallic (Aurora Gold)
1D4	Silver Metallic (Silver Ash)	6U7	Green Mica Metallic (Cyber Green)
209	Black Mica (Ink)	8M7	Light Blue Metallic (Ice Blue)
4N3	Beige Mica Metallic (Titan Silver)	8T0	Blue Mica Metallic (Caribbean Blue)
3R3	Red Mica Metallic (Red Earth)	—	—

# INTERIOR

## Instrument Panel

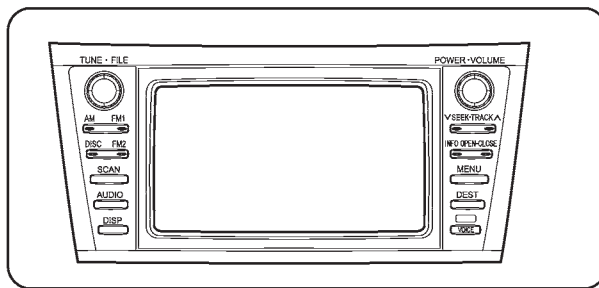
The interior design features a smooth and continuous line flowing from the centre cluster, through the instrument panel upper, to the door trims. By designing the combination meter and seats to the details, a high-class appearance has been achieved.



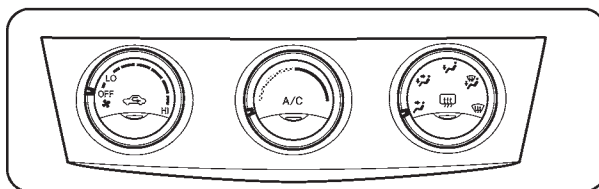
02KMO11TE

## Centre Cluster

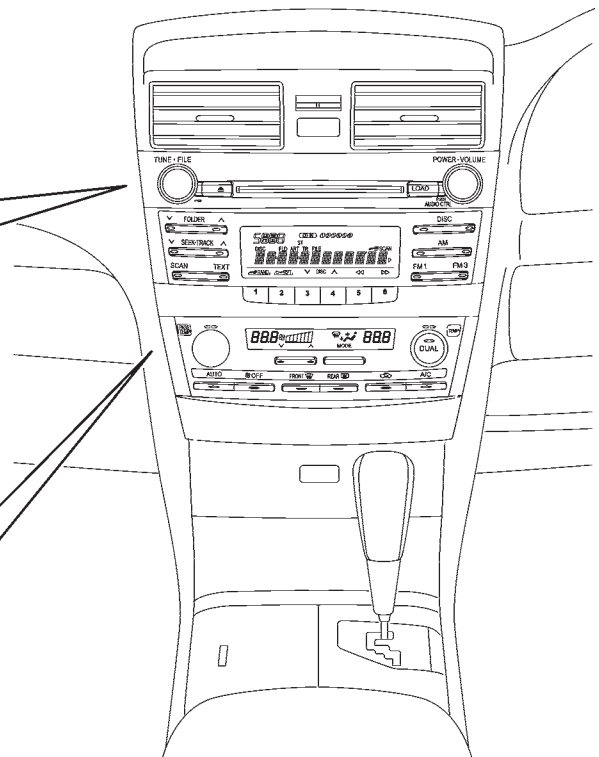
- The centre cluster has been designed to be fresh and clear. By making the LCD display larger and putting the display and the switches closer together, both ease of use and freshness have been achieved.
- Light is emitted by the entire panel at night, creating a fresh atmosphere.



**Navigation with AV System**



**Heater Control Panel  
for Manual Air Conditioner System**



02KMO35TE

## **Combination Meter**

- 2 different large 4-meter optitron display type combination meters are used. A multi-information display is available on all grades excluding AT-X.
- The Multi-information display shows outside temperature, driving range, average fuel consumption since refueling, time driven since engine start and average speed since engine start.



ATX Dash

### **Optitron Display Type Combination Meter for AT-X**



02KMO36Y

### **Optitron Display Type Combination Meter for Prodigy (Touring - NZ), Presara, Sportivo SX6 & ZR6**

## Welcome Function

When the driver starts the engine, the graduated illumination sequence of the combination meter, audio and heater control panel gives the impression of the driver being welcomed aboard. This function is available only for models with the optitron display type combination meter with multi-information display.

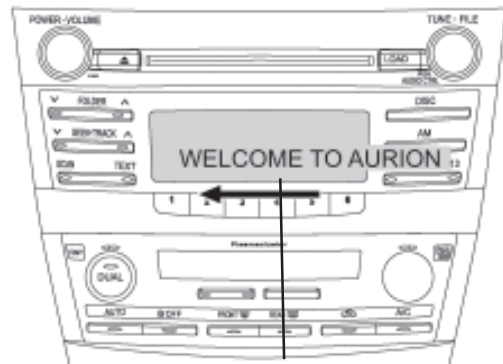
(1) 0.7 seconds after engine start



(2) Approximately 2 seconds after engine start



(3) Approximately 3 seconds after engine start



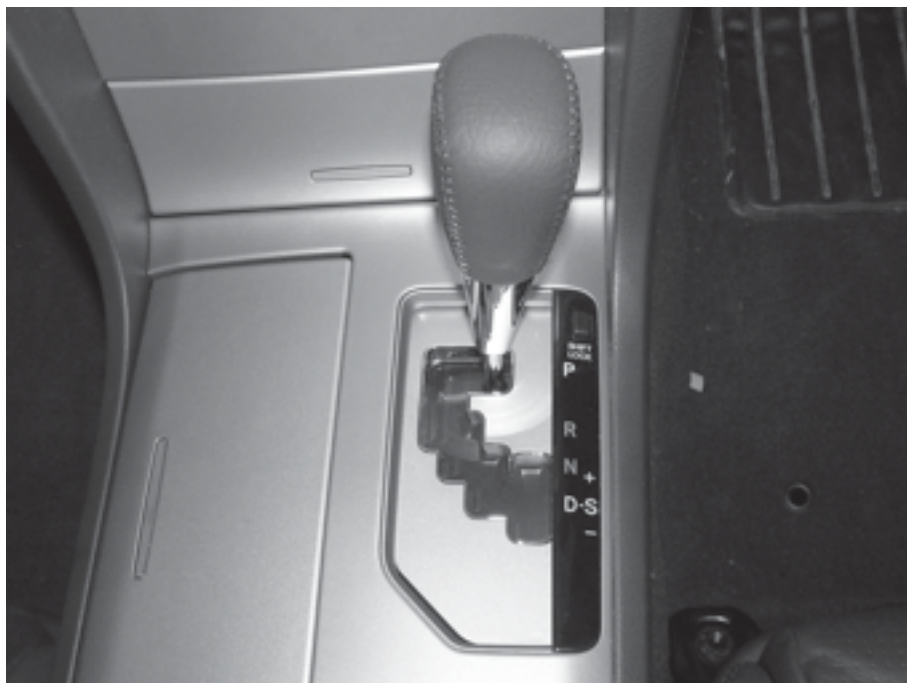
Horizontal Scrolling Display



02KMO37Y

**Shift Lever**

The Aurion has a gate type 6 speed multi-mode Transmission.


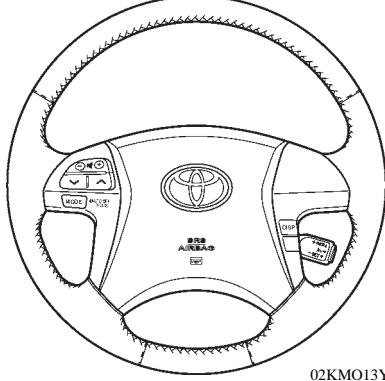
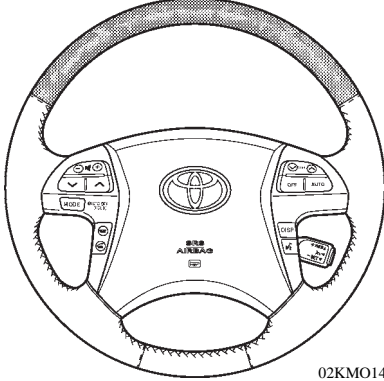
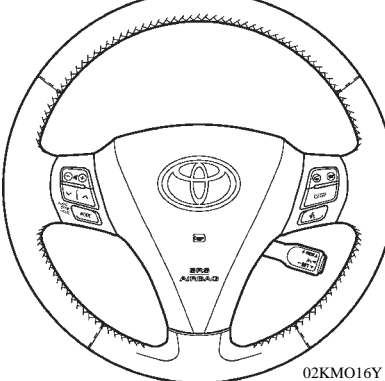


P7120028

**Multi-mode 6 speed Automatic Transaxle Lever**

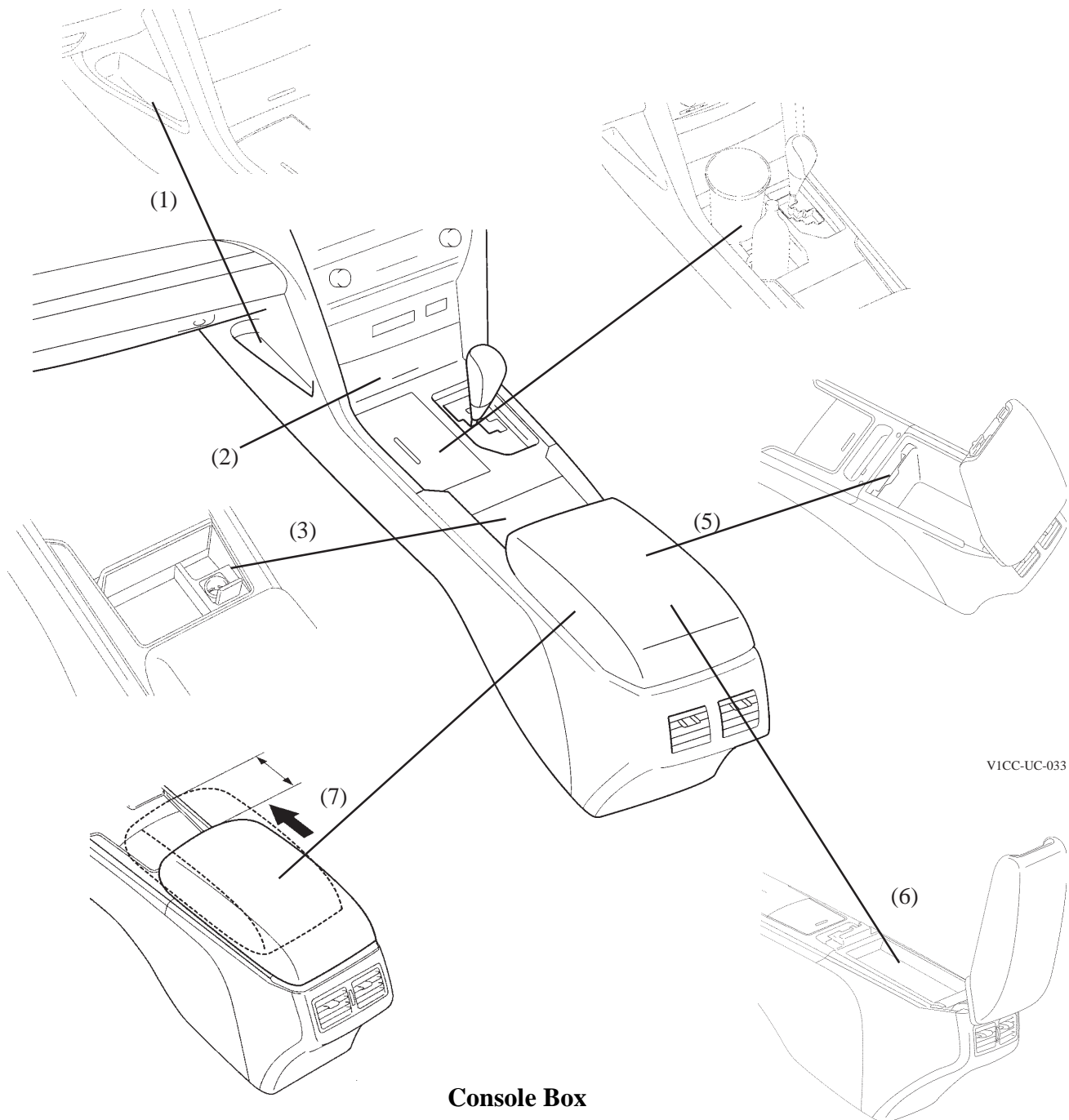
## **Steering Wheel**

- There are four types of steering wheels available; 4-spoke urethane type, 4-spoke leather-wrapped, 4-spoke leather-wrapped with wood-grain and 3-spoke leather-wrapped.
- A newly designed steering switch pad is used to give a more integrated and attractive appearance.
  - Audio controls are standard across the range.
  - A display switch is mounted on the right side of the steering wheel and is used to operate the Multi-function Display.
  - Bluetooth hands-free telephone and voice-recognition switches are fitted on Presara and available on Sportivo ZR6.
  - Air Conditioning control switches are mounted the Presara steering wheel.
- The cruise control switch is incorporated in the steering wheel for ease of operation.

Design	4-Spoke Urethane	4-Spoke Leather-wrapped
		
	4-Spoke Leather-wrapped and Wood-grain	3-Spoke Leather-wrapped
		

## **Console Box**

- A storage pocket for items such as mobile phones and wallets has been provided beside the front console (1).
- A cigarette lighter and an ashtray have been built into the front box (2).
- A storage box for small articles, with an internal 12V power supply (3).
- Two drink cup holders with a lid, which can hold large-sized drink cups (4).
- The rear console box has a large capacity including a card holder(5) and a storage tray (6) has been provided for keeping small articles. The console box lid can be used as an armrest (7), and can slide 100mm to find the desired position.



**Console Box**



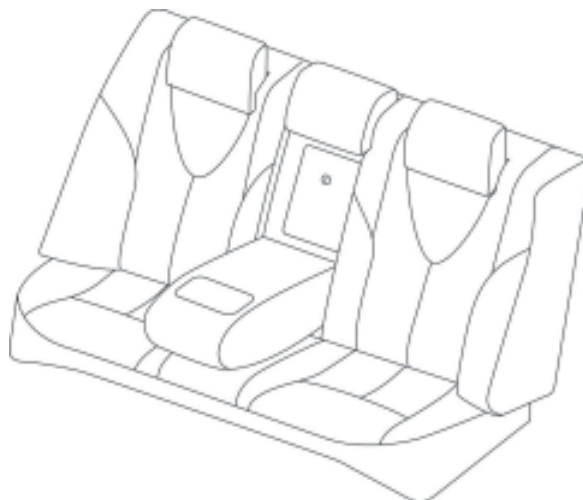
**Rear Seat**

- A single fixed seat with a trunk-through structure is standard.
- An adjustable centre rear headrest is fitted to all grades.
- The seats are defined by the fabric stitching as shown below.



VICC-IN-032

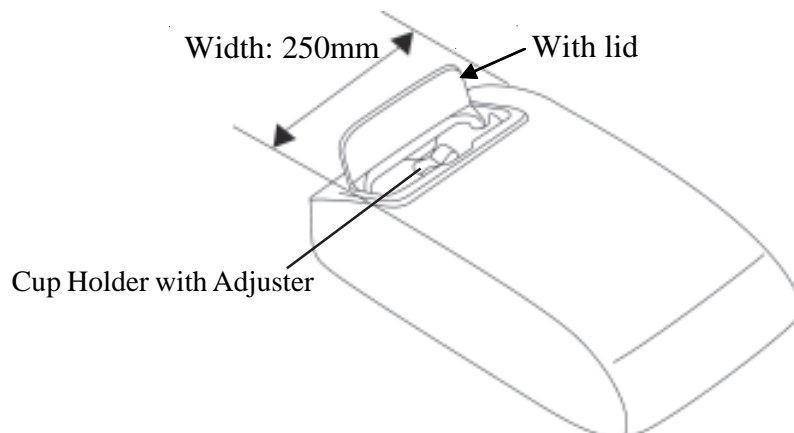
Single Fixed rear Seat for AT-X, Prodigy (Touring - NZ) and Presara



Single Fixed rear Seat for Sportivo SX6 and ZR6

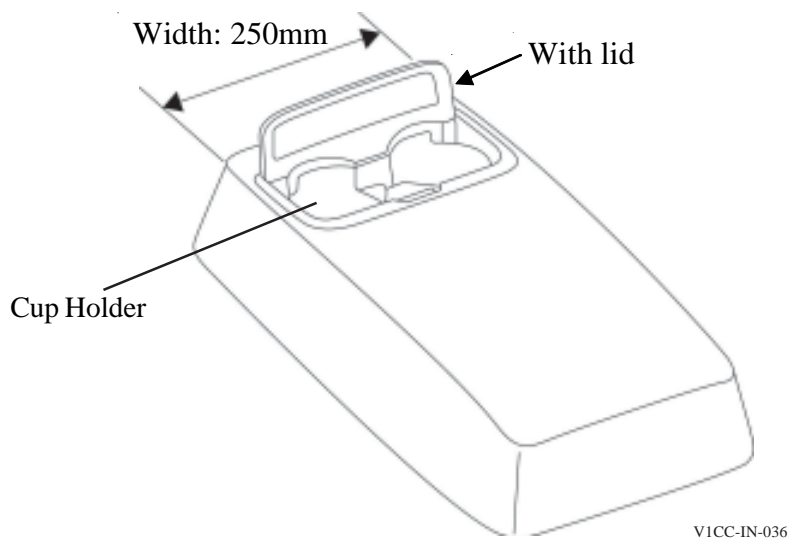
## **Rear Seat Armrest**

- A large rear seat centre arm rest is available
- The armrest features a cup holder that can accommodate two large-sized cups
- The cup holder has a lid that enhances appearance when not in use (Sportivo grades only)
- The armrest has been made 20 mm higher for greater ease of use



V1CC-IN-034\_1

Armrest for AT-X, Prodigy (Touring - NZ) and Presara only



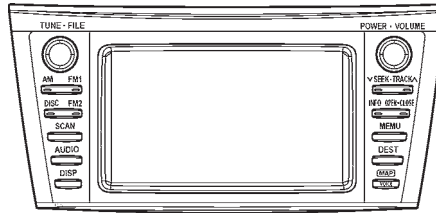
V1CC-IN-036

Armrest for Sportivo grades only

## EQUIPMENT

### Navigation with AV System

- Through the use of the GPS (Global Positioning System) and the map data in a DVD (Digital Versatile Disc), the navigation with AV (Audio Visual) system analyses the position of the vehicle and indicates that position on the map that is displayed on the screen. Additionally, it provides voice instructions to guide the driver along the route to reach the destination that has been selected.
- The display, which consists of a wide 7.0-inch LCD (Liquid Crystal Display) screen with a pressure sensitive touch panel, is easier to use.



### Audio System

- The large and varied original LCD panels and large switched have been provided for each audio head unit, improving visibility and ease of use.
- By implementing new DSP (Digital Signal Processor) technology with psychoacoustic theory, less distorted, clear, powerful sound quality has been achieved.

### —REFERENCE—

#### *Psychoacoustic Theory:*

*Psychoacoustic theory is technology that exploits human perceptions (sensory illusions). Through the implementation of this technology, without changing the speaker sizes or locations, listeners can sense deeper bass sound (1) and feel as if the speakers were located at eye level, despite them being located in low positions like door speakers (2).*

*(1) Bass Sound Reproduction Principle: Since olden times, when pipe organs are built in churches, due to the difficulty of housing long resonating pipes for very low tones, a technique has been used which reproduces low tones through the utilization of two short pipes.*

*When two pipes, of which the frequencies are 100Hz and 150Hz, are sounded simultaneously to reproduce a note at 50Hz, human brains discern four different notes at 100Hz, 150Hz, 250Hz (100Hz + 150Hz) and 50Hz (150Hz - 100Hz). Among these, human brains perceive the frequency difference of 50Hz most strongly.*

*By electrically generating differential components from fundamental notes for very low tones and emitting them through speakers, the human brains sense the deep bass sound despite it being not emanated from the speakers.*

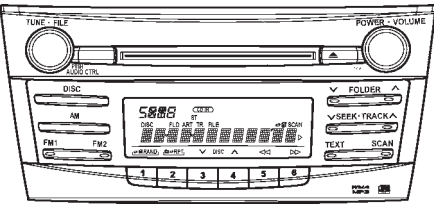
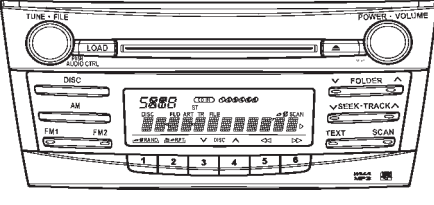
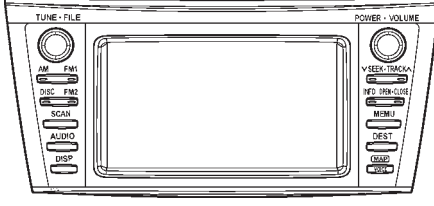
*(2) Virtual Sound Source Layout: When the theory of HRTFs (Head Related Transfer Functions) is employed in the vertical direction, human brains perceive the source of sounds emitted from the speakers in the lower positions as if it was at windshield level.*

*HRTFs are acoustic transfer functions from the sound source to the ears.*

*It is said that humans detect the location of sound sources through time differences and physical reflective interference; the horizontal direction is recognized through the time difference between the sound reception of the left and right ears, and the vertical direction is discerned through the reflective interference caused by the head and earlobes.*

*Sound sources can be virtually reproduced by incorporating the HRTFs into amplifiers and emitting the sound through speakers.*

**Audio Head Unit**

Grade	Design	Specifications
AT-X (incl. NZ*)	 <p>02KMO44Y</p>	<ul style="list-style-type: none"> <li>• AM/FM Tuner</li> <li>• CD (MP3, WMA Compatible*<sup>1</sup>)</li> <li>• DSP*<sup>2</sup>/ASL*<sup>3</sup></li> <li>• 4-Speaker System</li> <li>• Maker: Fujitsu Ten</li> </ul>
Prodigy (Touring - NZ), Sportivo SX6 & ZR6 (incl. NZ*)	 <p>02KMO45Y</p>	<ul style="list-style-type: none"> <li>• AM/FM Tuner</li> <li>• In-Dash 6-CD Changer (MP3, WMA Compatible*<sup>1</sup>)</li> <li>• DSP*<sup>2</sup>/ASL*<sup>3</sup></li> <li>• 6-Speaker System</li> <li>• Maker: Fujitsu Ten</li> </ul>
Presara (incl. NZ*)	 <p>02KMO51Y</p>	<ul style="list-style-type: none"> <li>• AM/FM Tuner</li> <li>• In-Dash 4-CD Changer (MP3, WMA Compatible*<sup>1</sup>)</li> <li>• DSP*<sup>2</sup>/ASL*<sup>3</sup> Function</li> <li>• 6-Speaker System</li> <li>• Maker: Fujitsu Ten</li> </ul>

\*1: Compatible with the compressed sound and music files complying with MP3 (MPEG Audio Layer-3) standard and WMA (Windows Media Audio)

\*2: Digital Sound Processor

\*3: Automatic Sound Leveliser

NZ\*: New Zealand

## ***Bluetooth Hands-free Telephone with Navigation System***

The integrated navigation system has a Bluetooth hands-free telephone feature. This enables hands free operation of some Bluetooth compatible phones without cable or special connections.

There is a conversation microphone located in the overhead console with the voice recognition and telephone switches are located on the steering wheel.

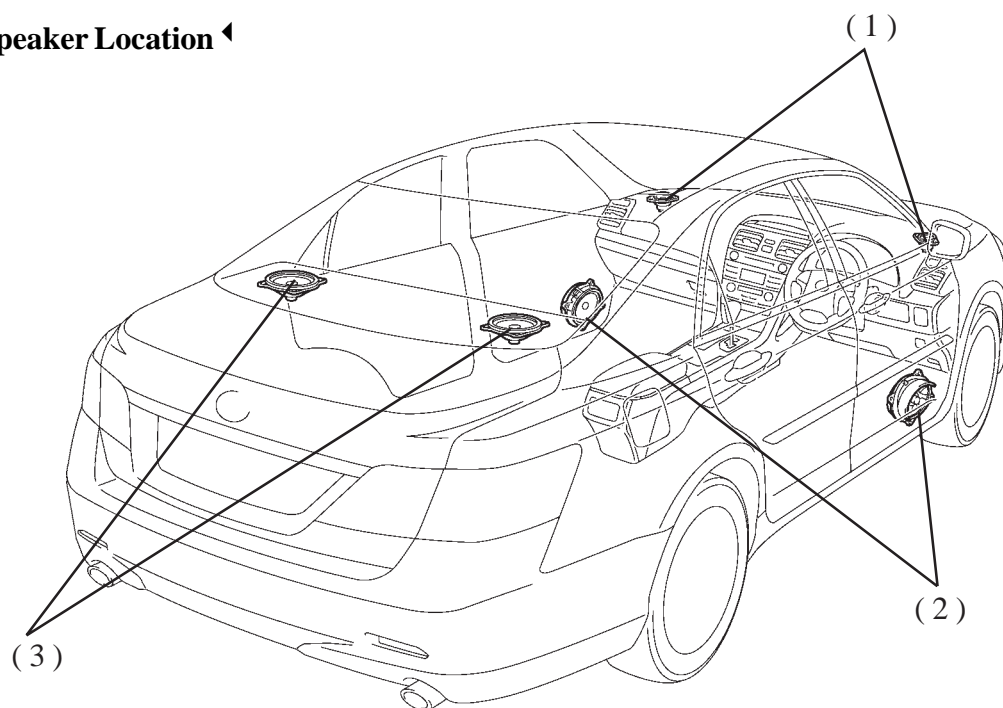
The integrated navigation system display (on some compatible phones) has some of following Bluetooth hands-free telephone functions;

<b>Function</b>	<b>Description</b>
Dialling function	The number is entered into the display screen and dialed
Phonebook dial function	The driver can select and dial a number from the phonebook list sent from the mobile phone to the head unit and displayed on the display screen. The phonebook can accommodate up to 1,000 entries
Outgoing call log dialing	The system records the last five phone numbers dialed. The Bluetooth hands-free function can be used to select one of these numbers to dial
Incoming call log dialing	The system records the last five incoming phone numbers. The Bluetooth hands-free function can be used to select one of these numbers to dial
One-touch dial	A maximum of 17 preset phone numbers can be dialed with a single touch
Voice dialing	The voice dialing feature enables calls to be placed by saying the phone numbers of one of 20 pre-recorded entries
Navigation system info dialing	Calls can be made using phone numbers registered in the navigation system's database of facilities and services
Receiving calls	Calls can be received hands-free by simply touching the switch on the display screen or the telephone switch (off-hook) on the steering wheel
	The display screen will display name and phone number info only for contacts registered in the phonebook. When they are not registered, only phone numbers will be displayed
Other features	Dial tone sending
	Switching between hands-free calling and normal telephone use
	Volume setting
	Screen display changes

### **Special note:**

The above features may not be available when used in conjunction with some mobile phones.

Due to continual mobile phone software updates we are unable to list compatible phones.

**Speaker****▸ Speaker Location ◀**

02KMO39Y

**▸ Speaker Specifications ◀**

Location	Speaker Type	Caliber	Impedance	Input Rated (Max)
(1)	Front Tweeter × 2	65 mm	4 Ω	17.5 W
(2)	Front Midrange × 2	150×225mm	4 Ω	20 W
(3)	Rear Full Range × 2	150×225mm	4 Ω	20 W

## **Smart Entry and Start System**

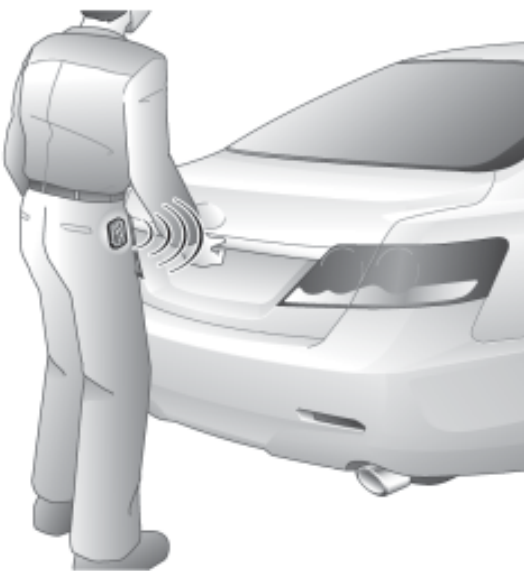
The smart entry and start system provides a key with a bi-directional communication function. Accordingly, by enabling the certification ECU to recognise the presence of the key within the detection area, this system can lock or unlock the doors, or start the engine without the use of the key, as long as the user has the key in his/her possession.



02KMO47Y

**Door Unlock**

02KMO48Y

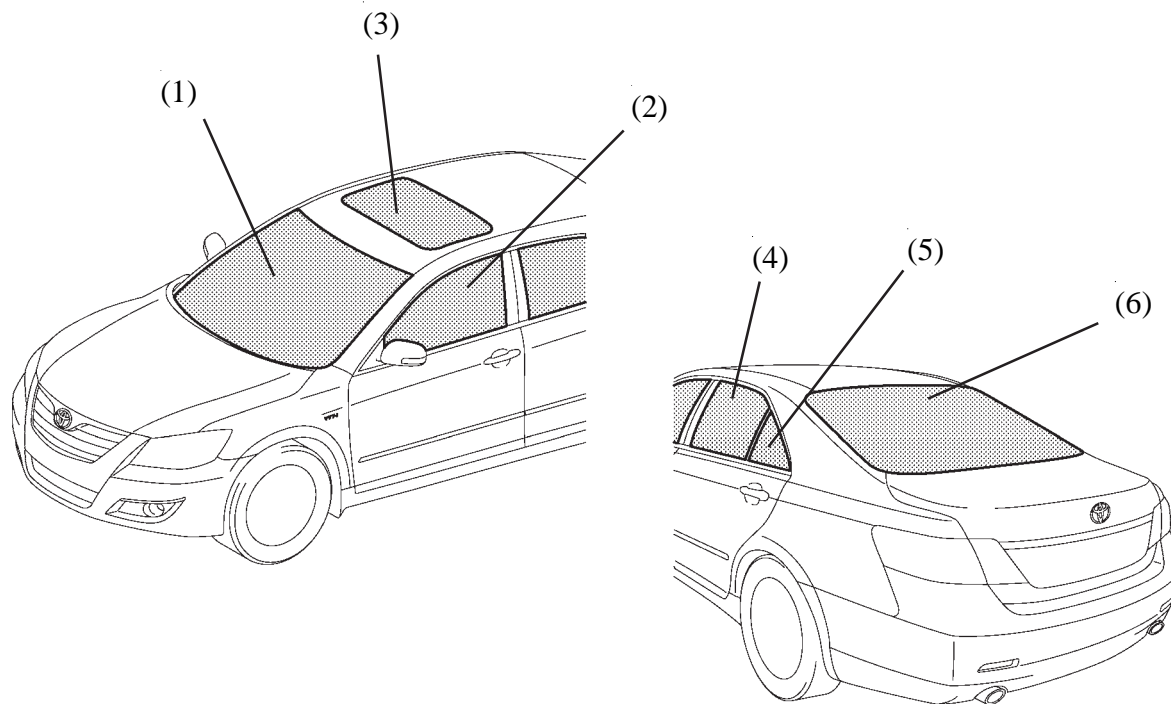
**Door Lock**

02KMO49Y

**Trunk Open**

02KMO50Y

**Engine Start**

**Glass**

02KMO43TE

Glass Portion		Colour	Glass Type	Visible Light Penetration Rate
(1)	Windshield	Green with Dark Shade	Laminate	75% or more
(2)	Front Door	Green	Tempered	70% or more
(3)	Moon Roof Panel	Grey	Tempered	20 %
(4)	Rear Door	Green	Tempered	70% or more
(5)	Rear Door Quarter	Green	Tempered	70% or more
(6)	Back Window	Green	Tempered	70% or more

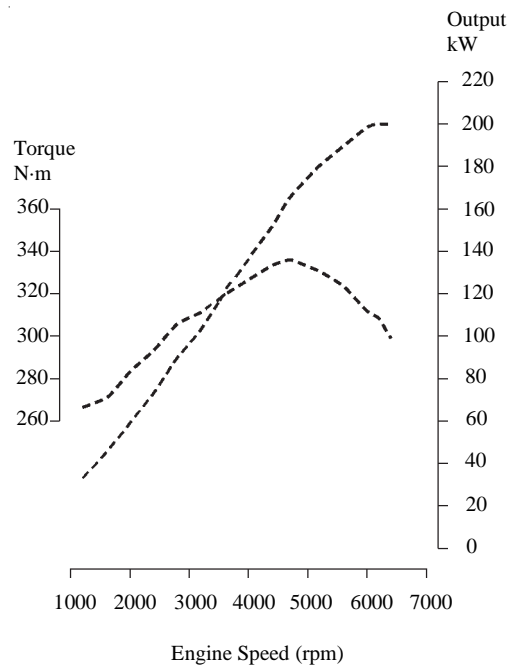


# PERFORMANCE

## Power Train

### Engine

Type	2GR-FE	
No. of Cylinders & Arrangement	6-Cylinder, V Type	
Valve Mechanism	24-Valve DOHC, Chain Drive (with Dual VVT-i)	
Displacement	3456 cm <sup>3</sup>	
Max. Output	EEC	200kW @ 6200rpm
Max. Torque	EEC	336N·m @ 4700rpm

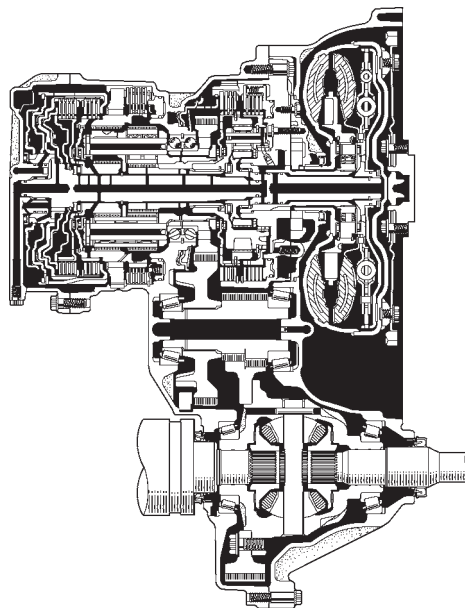


02KRG07Y\_1

**Transaxle**

Type		6-Speed Automatic
		U660E
Gear Ratio	1st	3.300
	2nd	1.900
	3rd	1.420
	4th	1.000
	5th	0.713
	6th	0.608
	Reverse	4.148
Differential Gear Ratio		3.685*

\*: Counter gear ratio included



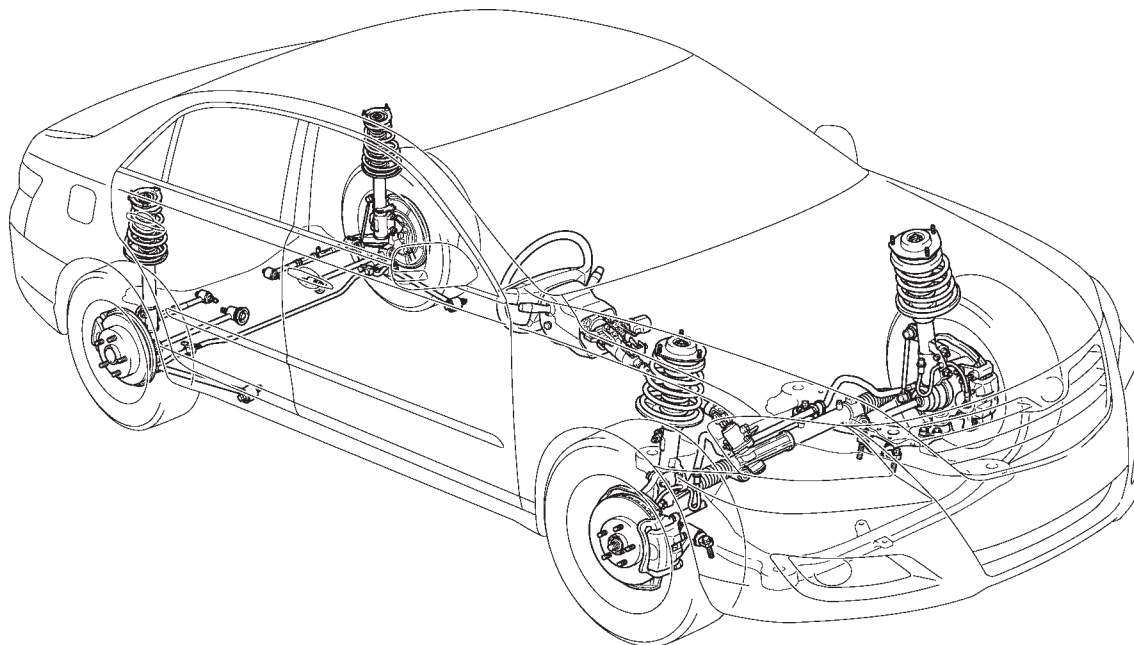
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**U660E Automatic Transaxle**

## **Chassis**

### **Suspension**

Front Suspension	Rear Suspension
MacPherson Strut Type Independent Suspension	Dual Link MacPherson Strut Type Independent Suspension



02KMO27Y

### **Steering**

Steering Type	Engine Speed Sensing Hydraulic Type Power Steering
Gear Type	Rack & Pinion

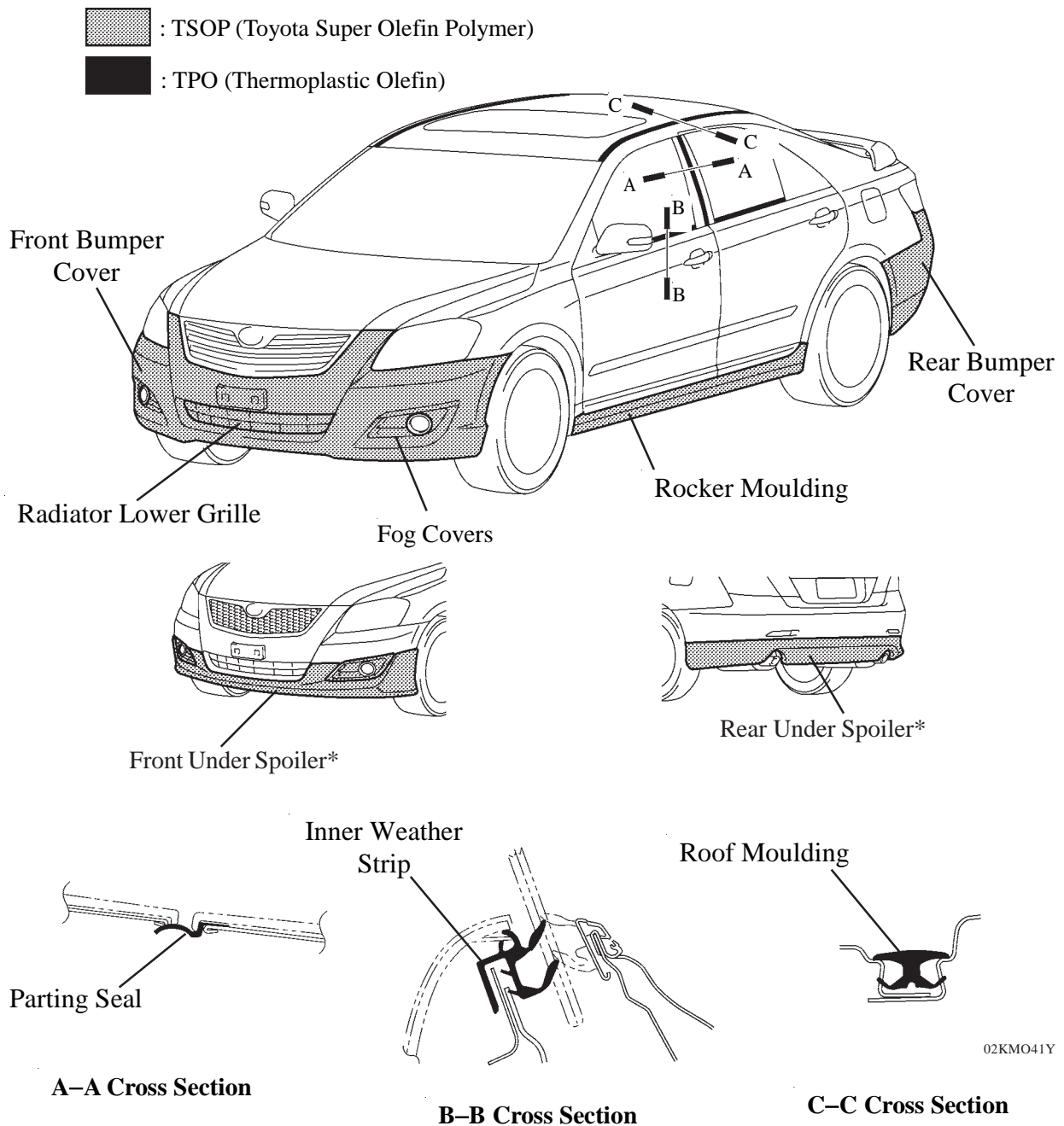
### **Brake**

Front Brake Type	Ventilated Disc
Front Rotor Size (D x T) mm	296 x 28
Rear Brake Type	Solid Disc
Rear Rotor Size (D x T) mm	286 x 10
Parking Brake	Foot Pedal Type with foot release
Brake Control System	• ABS with EBD, Brake Assist, TRC and VSC

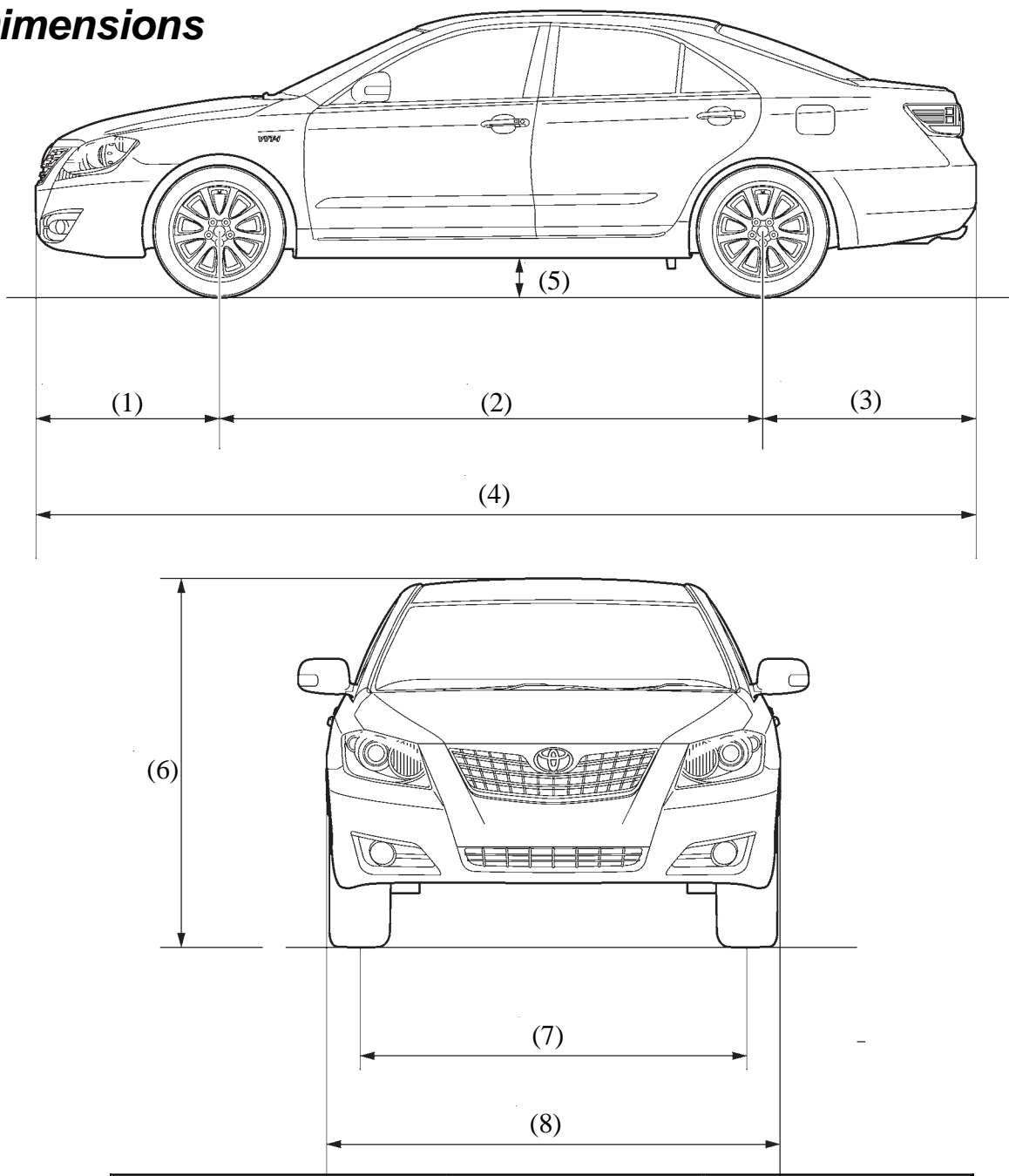
## ENVIRONMENT and RECYCLING

### Adoption of TSOP & TPO

TSOP (Toyota Super Olefin Polymer), TPO (Thermoplastic Olefin), which have superior recyclability, are actively utilised while the use of chlorine has been reduced as much as possible.



## Dimensions



02KMO42TE

Height		Normal	Normal + Height up*
(1)	Front Overhang	965mm	
(2)	Wheel Base	2775mm	
(3)	Rear Overhang	1085mm	
(4)	Overall Length	4825mm	
(5)	Minimum Running Ground Clearance	150mm	165mm
(6)	Overall Height	1470mm	1485mm
(7)	Tread	Front	1575mm
		Rear	1565mm
(8)	Overall Width	1820mm	

\*: Option SPI

## EQUIPMENT LIST

The equipment list hereafter is predominately for Australian vehicles, however some slight variations occur to model grades for other markets.

•: Standard O: Option -: Not available

Aurion / Grade		AT-X	Prodigy (Touring – NZ)	Presara	Sportivo SX6	Sportivo ZR6
Exterior	Boot Spoiler Wing type	O	-	-	•	•
	Body Colour outside door handles	•	•		•	•
	Chrome outside door handles	-	-	•	-	-
	Sportivo Body Kit	-	-	-	•	•
	Mud Guard	Black	•	-	-	-
		Colour	-	•	•	•
	Side Protection Moulding	Colour	-	-	•	•
		Colour with Chrome Plating	•	•	-	-
Chassis	ABS with EBD, BA (Electrical), VSC & TRC		•	•	•	•
	16 x 6.5JJ Steel Wheels		•	-	-	-
	215/60R16 tyres (95V)		•	•	-	-
	215/55R17 tyres (93V)		-	-	•	•
	16 x 6.5J Alloy Wheels		O	•	-	-
	17 x 7J Alloy Wheels		-	-	•	•
	Spare Wheel Steel		•	•	-	-
	Spare Wheel Alloy		-	-	•	•
	Gate type auto shift lever with shift lock		•	•	•	•
	PKB Pedal Type		•	•	•	•
	Steering Wheel	4 Spoke Urethane	•	-	-	-
		4 Spoke Leather	-	•	-	-
		4 Spoke Leather & Wood-grain	-	-	•	-
		3 Spoke Leather	-	-	-	•
	Steering System	Engine Speed Sensing Hydraulic Type	•	•	•	•
		Manual Tilt & Telescopic Mechanism	•	•	•	•
Body / Interior	Overhead Sunglasses holder		•	•	•	•
	Lockable glove box		•	•	•	•
	Front Seat	Normal	•	•	•	-
		Sports	-	-	-	•
	Seat Cover Material	Leather	-	•	•	-
		Fabric	•	-	-	•
	Fixed Rear Seat with Arm Rest incl. Cup Holders and Lockable Trunk through Door		•	•	•	•

●: Standard O: Option -: Not available

Aurion / Grade			AT-X	Prodigy (Touring – NZ)	Presara	Sportivo SX6	Sportivo ZR6
Body/ Interior	Front Seat Belt, 3-point ELR with Force Limiting Pre-tensioners		●	●	●	●	●
	Front seat belt height adjustment		●	●	●	●	●
	Rear Seat Belt, 3-point ELR + ALR x 3		●	●	●	●	●
	Front Console Box	Metallic	●	●	-	●	●
		Woody	-	-	●	-	-
	Rear Console box with sliding armrest		●	●	●	●	●
	Card holder in the centre console		●	●	●	●	●
	Front & Rear cup holders		●	●	●	●	●
Body Electrical	Alloy Sports pedals		-	-	-	●	●
	Audio	CD AM/FM 6 Speaker (MP3)	●	-	-	-	-
		6 CD AM/FM 6 Speaker (MP3)	-	●	-	●	●
		AVN Navigation 6 Speaker (W/ Bluetooth)	-	-	●	-	O
	Audio controls on steering wheel		●	●	●	●	●
	Cruise Control		●	●	●	●	●
	Auto Headlights		●	●	●	●	●
	Power Remote Central Locking and boot release		●	●	●	●	●
	Smart Entry & Start System		-	-	●	-	●
	Engine Immobiliser		●	●	●	●	●
	Alarm (incl. panic)		●	●	●	●	●
	Variable intermittent wipers		●	●	-	●	●
	Rain Sensing Wipers		-	-	●	-	-
	Clock incorporating a Speed alert (3 setting)		●	●	●	●	●
	Front Driver & Passenger side and curtain Airbag		●	●	●	●	●
	Power Windows Front & Rear with One Touch Auto Up & Down for Driver		●	●	●	●	●

●: Standard O: Option -: Not available

Aurion / Grade		AT-X	Prodigy (Touring – NZ)	Presara	Sportivo SX6	Sportivo ZR6
Body Electrical	Power mirrors	●	●	●	●	-
	Power mirrors with reverse-linked Function & Memory	-	-	●	-	-
	Int. Rear view mirror	Day night	●	-	●	●
		Electro-Chromatic	-	●	-	-
	Front Map lights	●	●	●	●	●
	Illumination Entry System	●	●	●	●	●
	LED High Mount Stop Light	●	●	●	●	●
	Multi-Information Display with control switch on steering wheel	-	●	●	●	●
	Outside Temperature displayed	●	●	●	●	●
	Sliding Roof	-	O	●	O	O
	Vanity mirrors illuminated	-	O	●	O	O
	Front Fog lights	-	●	●	●	●
	Rear map Lamps	-	O	●	O	O
	All Power Drivers seat	●	●	●#	●	●
	All Power Passenger Front Seat	-	●	●	-	●
	Manual Passenger Front Seat	●	-	-	●	-
	Power Rear Sunshade	-	-	●	-	-
	Headlight	Sports (projector low, halogen high)	-	-	●	●
		Standard (projector low, halogen high)	●	●	-	-
		HID with Intelligent AFS	-	-	●	-
		Automatic level	-	-	●	-
	Headlight Cleaner	-	-	●	-	-
	Toyota Link System <b>excl. NZ</b>	-	-	●	-	-
	Rear View Monitor System	-	-	●	-	-
	Toyota Park Assist System	4 corners (front & rear)	-	●	●	●
		2 Centre rear	-	●	●	●
	Air Conditioning system	Manual	●	-	●	-
		Automatic with Dual Zone (Left & Right)	-	●	-	●
	Clean Air Filter	●	●	●	●	●

#: with memory function



# ENGINE

## **2GR-FE Engine**

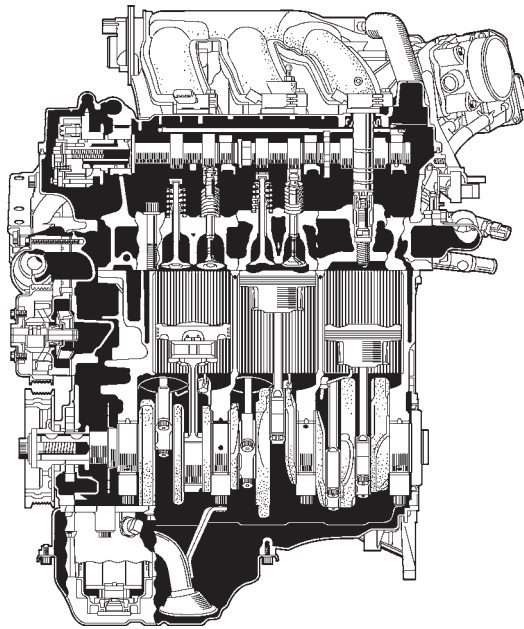
<i>Description.....</i>	<i>EG-2</i>
<i>Features of 2GR-FE Engine.....</i>	<i>EG-4</i>
<i>Engine Proper.....</i>	<i>EG-6</i>
<i>Valve Mechanism.....</i>	<i>EG-13</i>
<i>Lubrication System.....</i>	<i>EG-16</i>
<i>Cooling System.....</i>	<i>EG-19</i>
<i>Intake and Exhaust System.....</i>	<i>EG-21</i>
<i>Fuel System.....</i>	<i>EG-26</i>
<i>Ignition System.....</i>	<i>EG-28</i>
<i>Charging System.....</i>	<i>EG-30</i>
<i>Starting System.....</i>	<i>EG-32</i>
<i>Engine Mount.....</i>	<i>EG-34</i>
<i>Serpentine Belt Drive System.....</i>	<i>EG-36</i>
<i>Engine Control System.....</i>	<i>EG-37</i>

# ENGINE

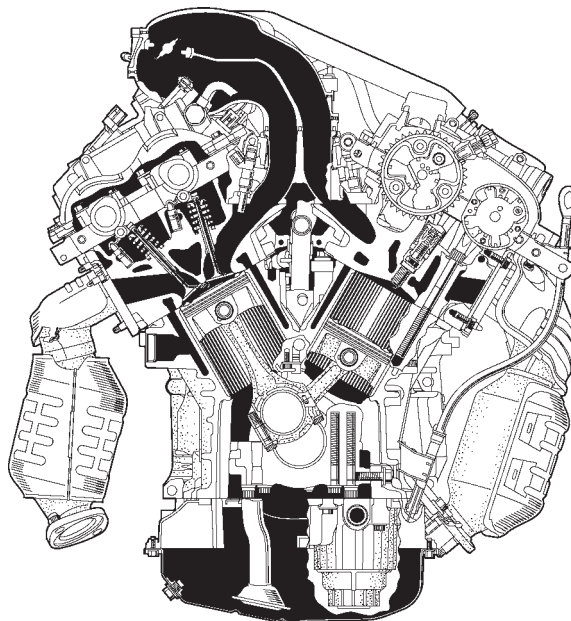
## 2GR-FE ENGINE

### ✱ DESCRIPTION

The 2GR-FE engine on the Aurion is a newly developed, V6 3.5-litre, 24-valve DOHC engine. This engine uses the Dual VVT-i (Dual Variable Valve Timing-intelligent) system, DIS (Direct Ignition System), ACIS (Acoustic Control Induction System), and ETCS-i (Electronic Throttle Control System-intelligent). These control functions achieve improved engine performance, fuel economy, and reduced exhaust emissions.



285EG01



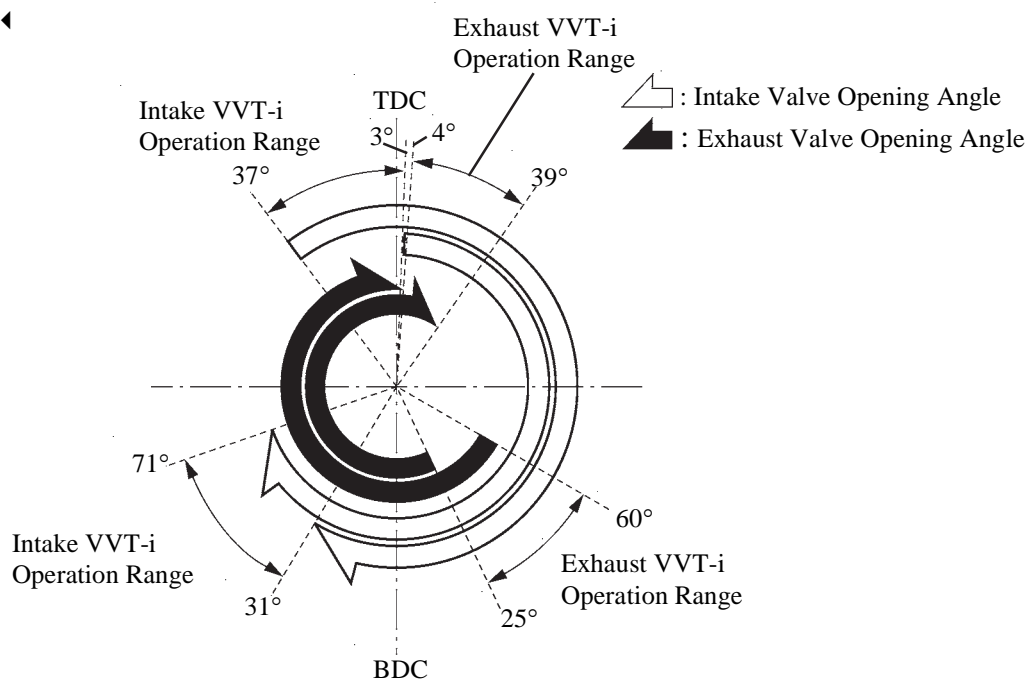
285EG02

### Engine Specifications

No. of Cyls. & Arrangement		6-Cylinder, V Type	
Valve Mechanism		24-Valve DOHC, Chain Drive (with Dual VVT-i)	
Combustion Chamber		Pentroof Type	
Manifolds		Parallel-Flow	
Fuel System		EFI	
Ignition System		DIS	
Displacement		cm <sup>3</sup>	3456
Bore X Stroke		mm	94.0 X 83.0
Compression Ratio		10.8 : 1	
Max. Output		EEC	200 kW @ 6200 rpm
Max. Torque		EEC	336 N·m @ 4700 rpm
Valve Timing	Intake	Open	37° BTDC to 3° ATDC
		Close	31° to 71° ABDC
	Exhaust	Open	60° to 25° BBDC
		Close	4° to 39° ATDC
Firing Order		1 – 2 – 3 – 4 – 5 – 6	
Oil Grade		API grade SL "Energy-Conserving", SM "Energy-Conserving" or ILSAC	
Research Octane Number		91 or higher	
Emission Regulation		EURO IV	
Engine Service Mass* <sup>1</sup> (Reference)		kg	163

\*<sup>1</sup>: Weight shows the figure with the oil and engine coolant fully filled.

### Valve Timing



## FEATURES OF 2GR-FE ENGINE

The 2GR-FE engine has achieved the following performance through the use of the items listed below.

- (1) High performance and reliability
- (2) Low noise and vibration
- (3) Lightweight and compact design
- (4) Good serviceability
- (5) Clean emission and fuel economy

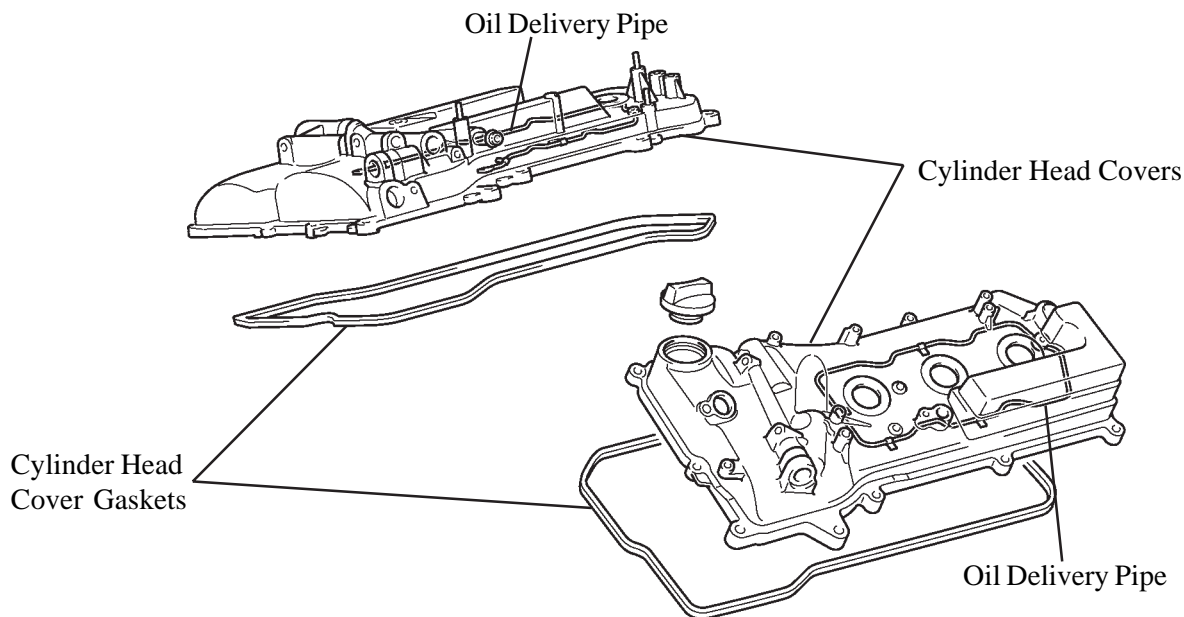
Item		(1)	(2)	(3)	(4)	(5)
Engine Proper	A steel laminate type cylinder head gasket is used.	○				
	An upright intake port is used.	○		○		
	A taper squish shape is used for combustion chamber.	○				○
	A cylinder block made of aluminium alloy is used.			○		
	The skirt portion of the piston is applied with resin plating to reduce friction.	○	○			○
	An oil pan No.1 made of aluminium alloy is used.		○	○		
Valve Mechanism	The Dual VVT-i system is used.	○				○
	A hydraulic lash adjuster is used.	○	○		○	
	A timing chain and chain tensioner are used.		○	○	○	
	Roller rocker arms are used.	○				○
Lubrication System	An oil filter with a replaceable element is used.				○	
Cooling System	The engine coolant is used the TOYOTA Genuine SLLC (Super Long Life Coolant).				○	
Intake and Exhaust System	The link-less type throttle body is used.			○	○	
	The intake air chamber made of plastic is used.			○		
	A stainless steel exhaust manifold is used.			○		○
	A ceramic type TWC (Three-Way Catalytic Converter) is used.					○
Fuel System	The fuel delivery pipe made of plastic is used.			○		
	A compact 12-hole type injector is used.	○				○
	Quick connectors are used to connect the fuel hose with the fuel pipe.				○	
Ignition System	The DIS makes ignition timing adjustment unnecessary.	○			○	○
	The long-reach type spark plugs are used.	○				
Charging System	A segment conductor type alternator is used.	○		○		
	An alternator pulley with a clutch is used.					○
Starting System	The PS (Planetary reduction-Segment conductor motor) type starter is used.			○		

Item		(1)	(2)	(3)	(4)	(5)
Engine Mount	An active control engine mount is used.		○			
Serpentine Belt Drive System	A serpentine belt drive system is used.			○	○	
Engine Control System	The MRE (Magnetic Resistance Element) type VVT sensors are used.	○				
	The ETCS-i is used.	○				○
	The ACIS is used.	○				○
	The cranking holding function is used. (Only for models with smart entry and start system)	○				
	The air intake control system is used.	○	○			
	Evaporative emission control system is used.					○

## ✱ ENGINE PROPER

### 1. Cylinder Head Cover

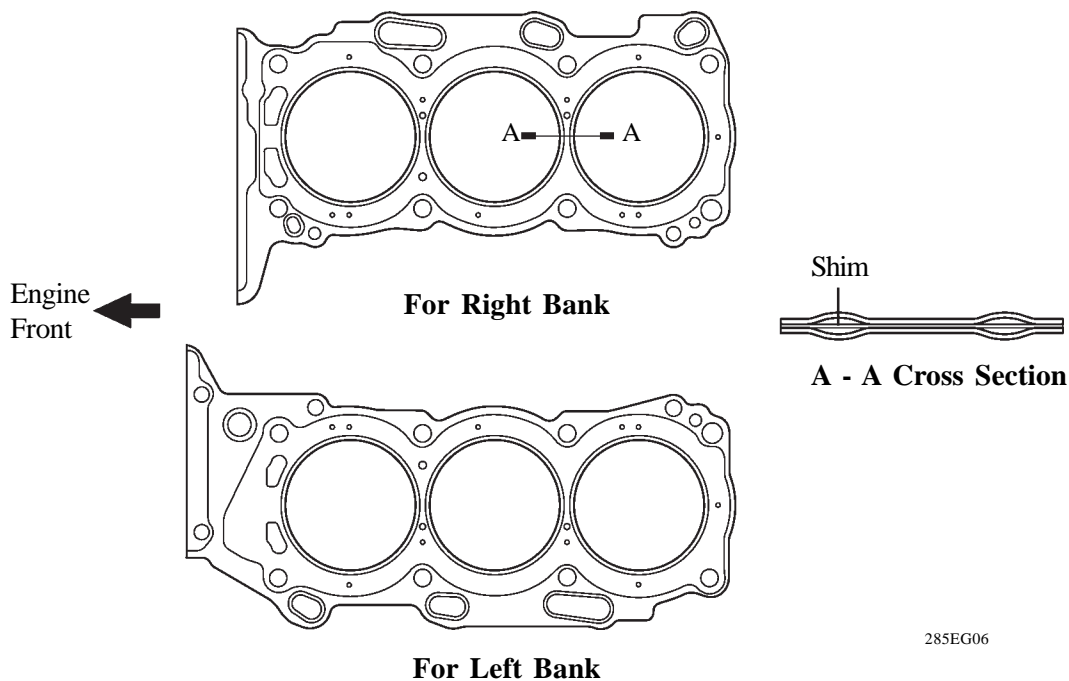
- Lightweight yet high-strength aluminium cylinder head covers are used.
- An oil delivery pipe is installed inside the cylinder head cover. This ensures lubrication to the sliding parts of the roller rocker arm, improving reliability.



285EG05

### 2. Cylinder Head Gasket

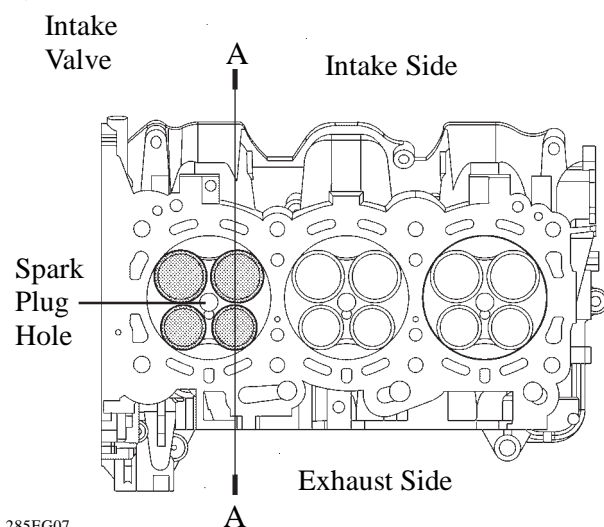
A steel-laminate type cylinder head gasket is used. A shim is used around the cylinder bore of the gasket to help enhance sealing performance and durability.



285EG06

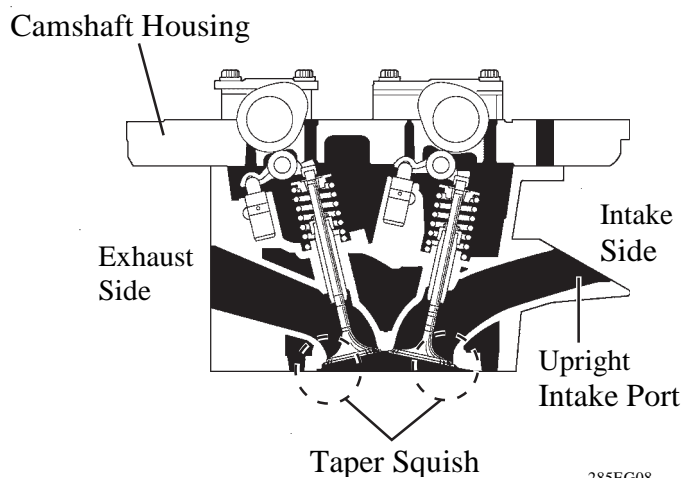
### 3. Cylinder Head

- The cylinder head structure has been simplified by separating the cam journal portion (camshaft housing) from the cylinder head.
- The cylinder head, which is made of aluminium, contains a pentroof-type combustion chamber. The spark plug is located in the centre of the combustion chamber in order to improve the engine's anti-knocking performance.
- The intake ports are on the inside and the exhaust ports on the outside of the left and right banks respectively.
- Upright intake ports are used to improve the intake efficiency.
- A taper squish combustion chamber is used to improve anti-knocking performance and intake efficiency. In addition, engine performance and fuel economy have been improved.
- The siamese type intake port is used to reduce the overall surface area of the intake port walls. This prevents the fuel from adhering onto the intake port walls, thus reducing HC exhaust emissions.



285EG07

View from Back Side

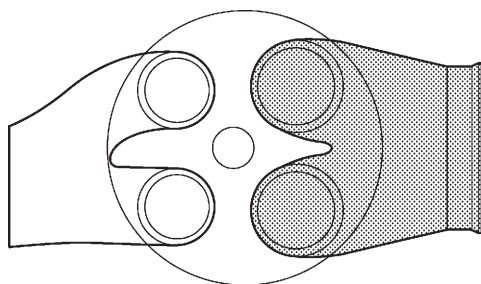


285EG08

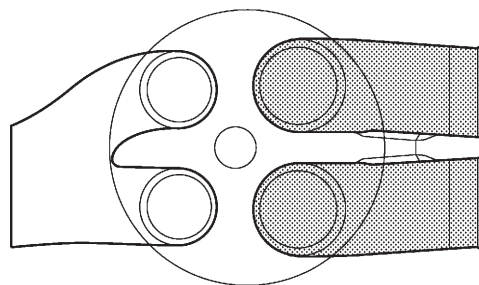
A - A Cross Section

#### — REFERENCE —

Siamese Type

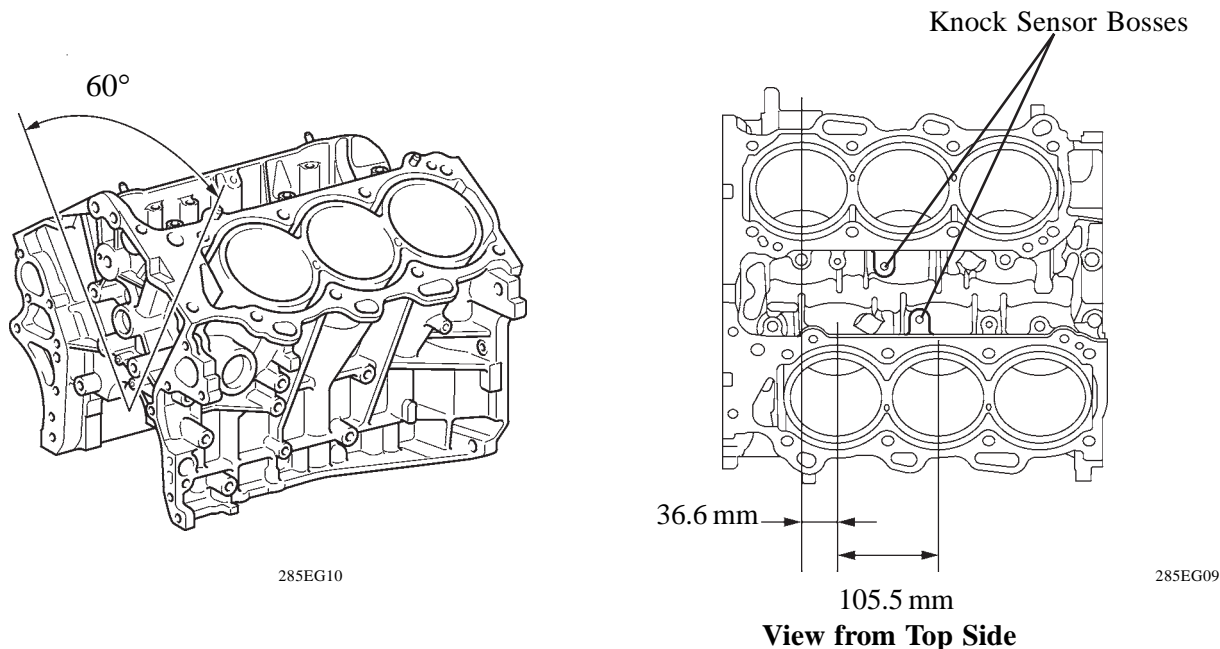


Independent Type

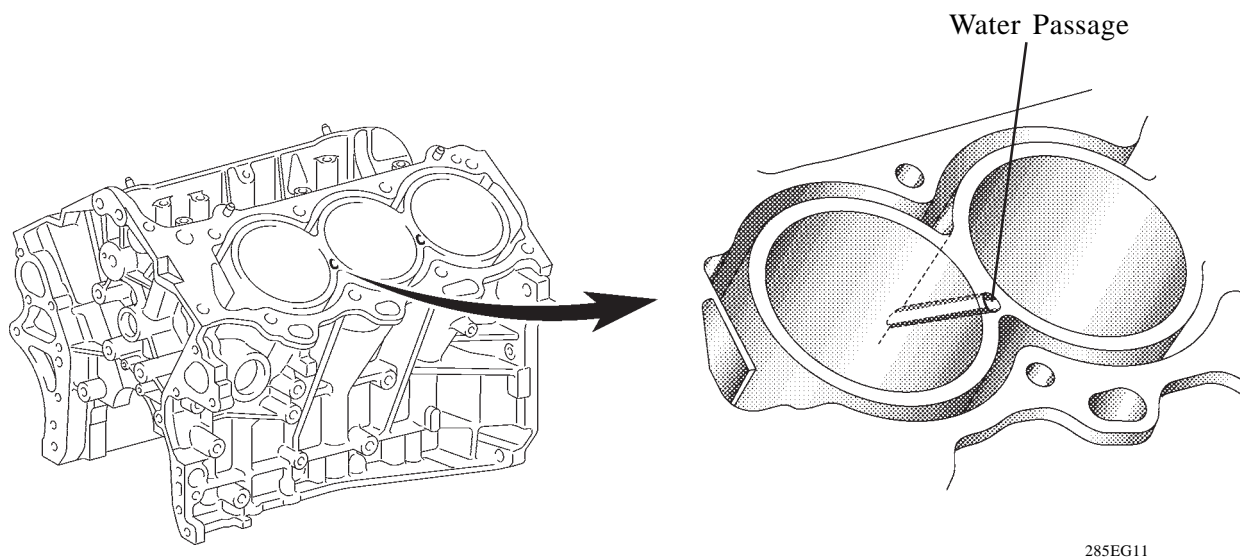


## 4. Cylinder Block

- The cylinder block is made of aluminium alloy, so it is lightweight.
- The cylinder block has a bank angle of  $60^\circ$ , a bank offset of 36.6 mm and a bore pitch of 105.5 mm, resulting in a compact block in its length and width even for its displacement.
- Installation bosses of the two knock sensors are located on the inner side of left and right banks.

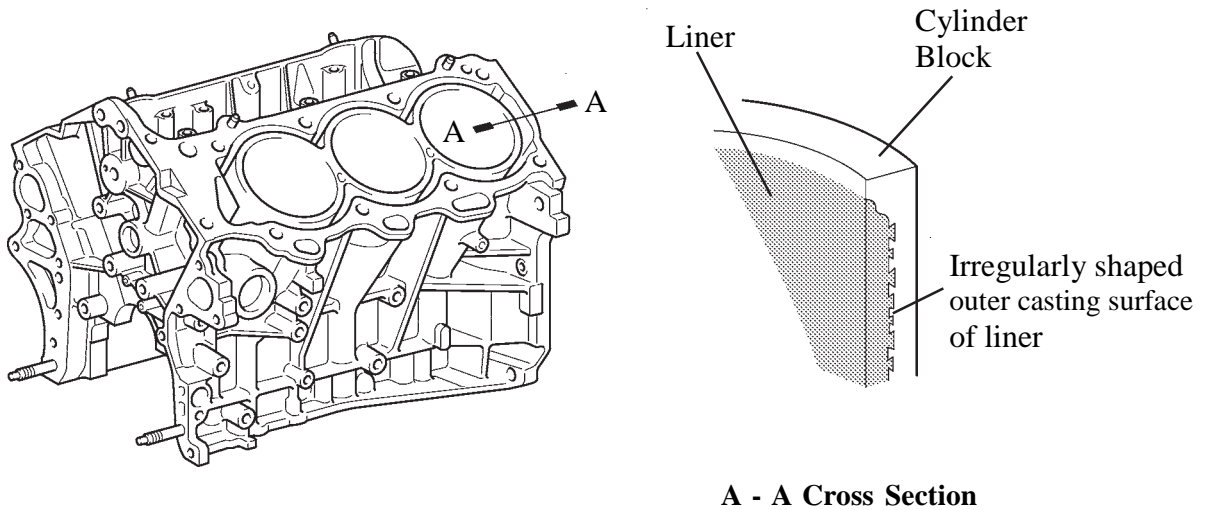


- A water passage has been provided between the cylinder bores. By allowing the engine coolant to flow between the cylinder bores, this construction enables the temperature of the cylinder walls to be kept uniform.



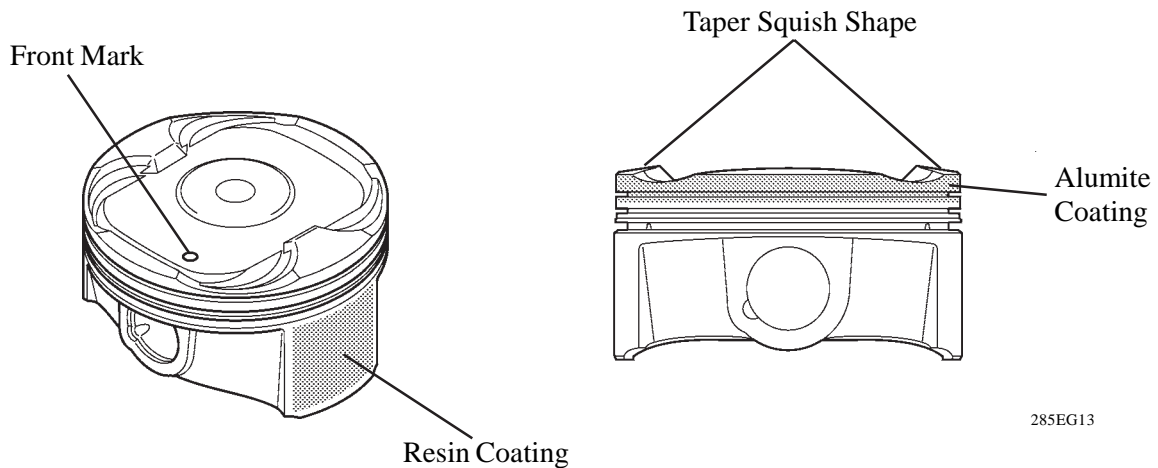


- A compact block has been achieved by producing the thin cast-iron liners and cylinder block as a unit. It is not possible to bore the block with this liner.
- The liners are the spiny-type, which have been manufactured so that their casting exterior forms a large irregular surface in order to enhance the adhesion between the liners and the aluminium cylinder block. The enhanced adhesion helps improve heat dissipation, resulting in a lower overall temperature and heat deformation of the cylinder bores.



## 5. Piston

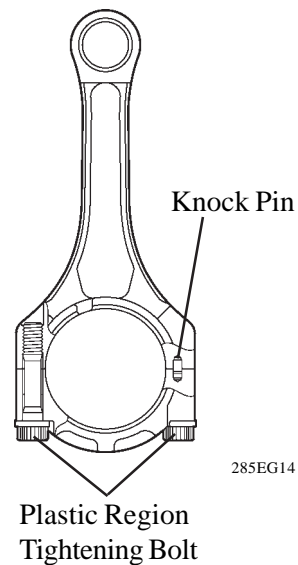
- The piston is made of aluminium alloy.
- The piston head portion uses a taper squish shape to accomplish fuel combustion efficiency.
- The piston skirt is coated with resin to reduce the friction loss.
- The groove of the top ring is coated with alumite to ensure abrasion resistance.
- By increasing the machining precision of the cylinder bore diameter, the outer diameter of the piston is made into one size.



285EG13

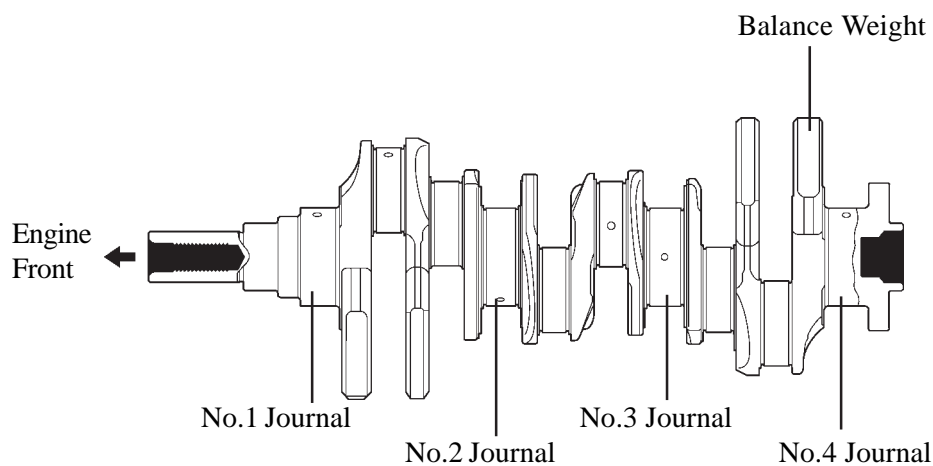
## 6. Connecting Rod and Connecting Rod Bearing

- Connecting rods that have been forged for high strength are used for weight reduction.
- Knock pins are used at the mating surfaces of the bearing caps of the connecting rod to minimise the shifting of the bearing caps during assembly.
- The connecting rods and caps are made of high-strength steel for weight reduction.
- Nutless-type plastic region tightening bolts are used on the connecting rods for a lighter design.
- An aluminium bearing is used for the connecting rod bearings.
- The connecting rod bearings are reduced in width to reduce friction.



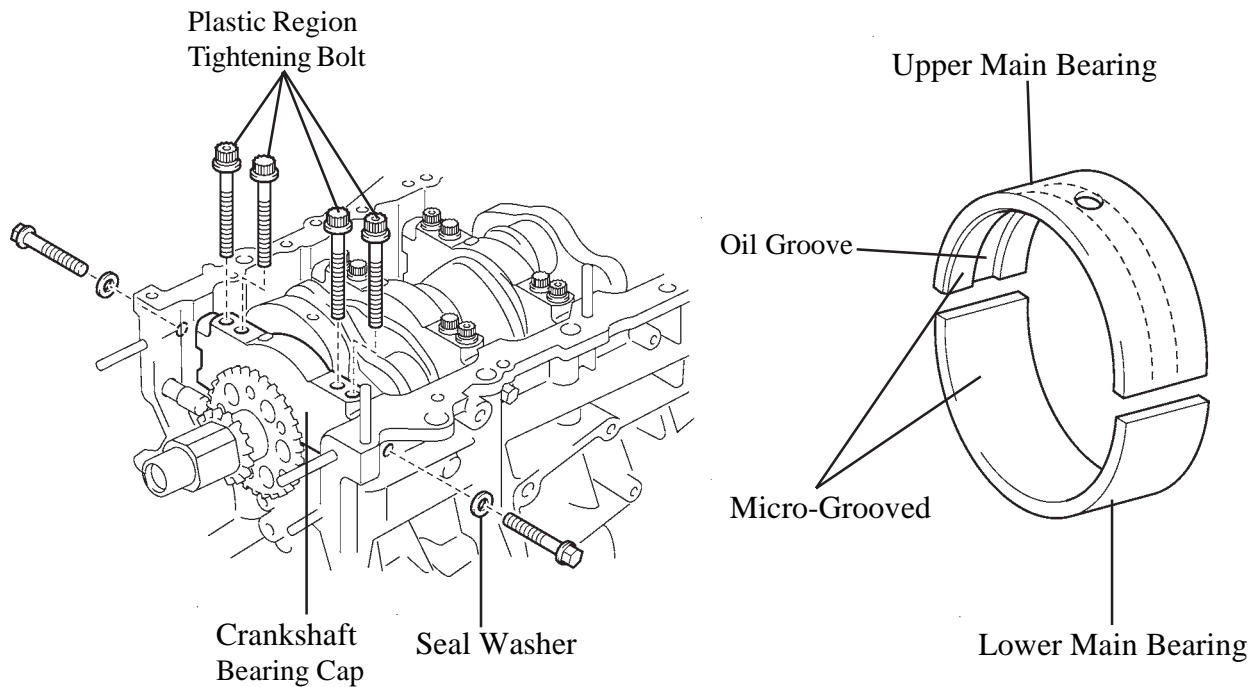
## 7. Crankshaft

- A crankshaft made of forged steel, which excels in rigidity and wear resistance, is used.
- The crankshaft has 4 journals and 5 balance weights.



## 8. Crankshaft Bearing and Crankshaft Bearing Cap

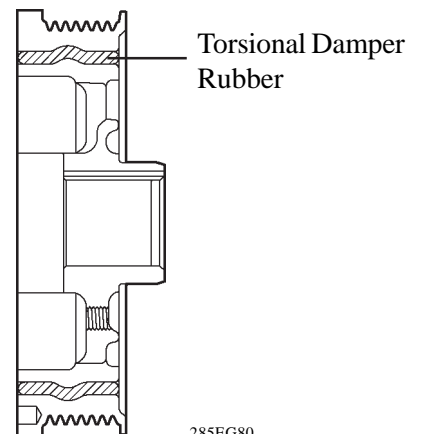
- The crankshaft bearing is made of aluminium alloy.
- Similar to the connecting rod bearings, the lining surface of the crankshaft bearings is micro-grooved to realise an optimal amount of oil clearance. As a result, cold-engine cranking performance is improved and engine vibration is reduced.
- The upper main bearing has an oil groove around its inside circumference.
- The crankshaft bearing caps are tightened using 4 plastic-region tightening bolts for each journal. In addition, each cap is tightened laterally to improve its reliability.



285EG81

## 9. Crankshaft Pulley

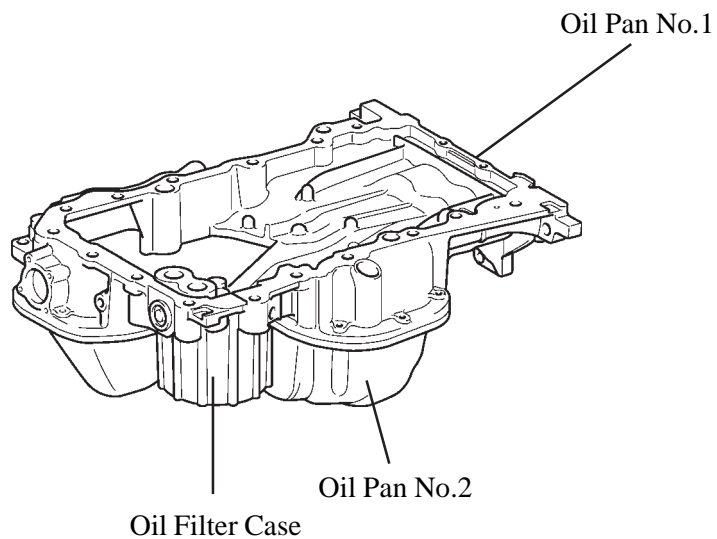
The rigidity of the crankshaft pulley with its built-in torsional damper rubber reduces noise.



285EG80

## 10. Oil Pan

- The oil pan No.1 material is made of aluminium alloy.
- The oil pan No.2 material is made of steel.
- The oil pan No.1 is secured to the cylinder block and the transmission housing and is increasing rigidity.
- The oil filter case is integrated with the oil pan No.1.



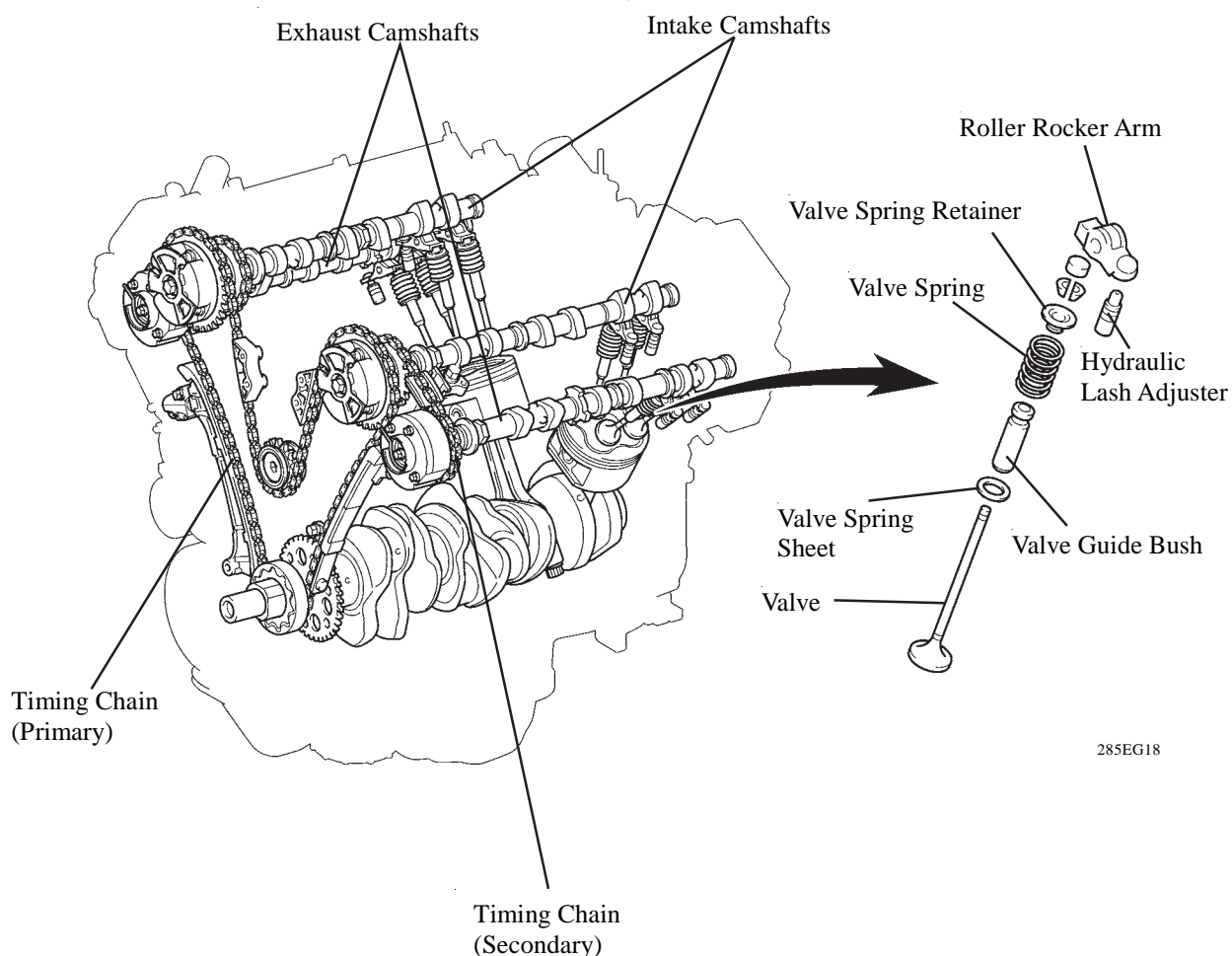
285EG16

**Models without Oil Cooler**

## ✱ VALVE MECHANISM

### 1. General

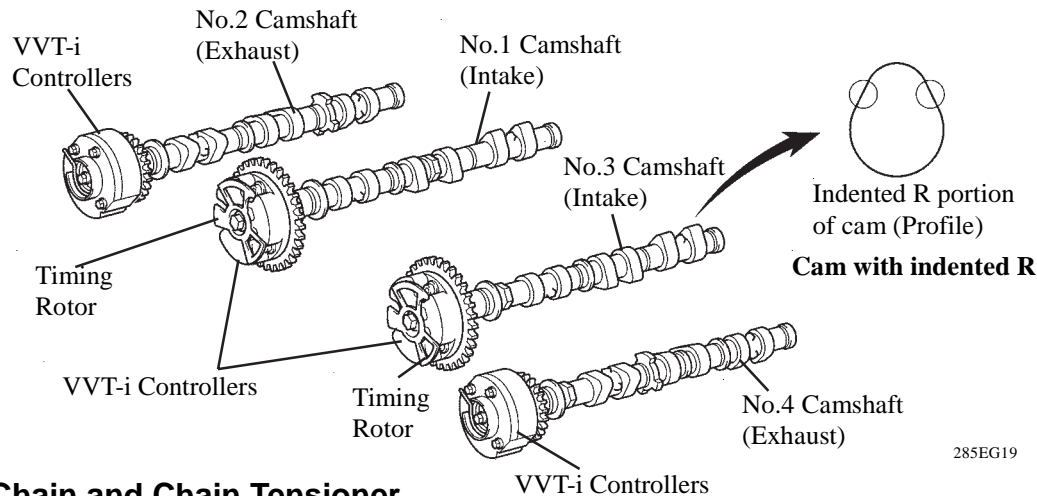
- Each cylinder of this engine has 2 intake valves and 2 exhaust valves. Intake and exhaust efficiency is increased due to the larger total port areas.
- This engine uses roller rocker arms with built-in needle bearings. This reduces the friction that occurs between the cams and the areas (roller rocker arms) that push the valves down, thus improving fuel economy.
- A hydraulic lash adjuster, which maintains a constant zero valve clearance through the use of oil pressure and spring force, is used.
- The intake camshafts are driven by the crankshaft via the primary timing chain. The exhaust camshafts are driven by the intake camshaft of the respective bank via the secondary timing chain.
- This engine uses a dual VVT-i (Variable Valve Timing-intelligent) system, which controls the intake and exhaust camshafts to provide optimal valve timing according to driving conditions. With this adoption, lower fuel consumption, higher engine performance, and fewer exhaust emissions have been achieved. For details of dual VVT-i control, refer to page EG-57.



285EG18

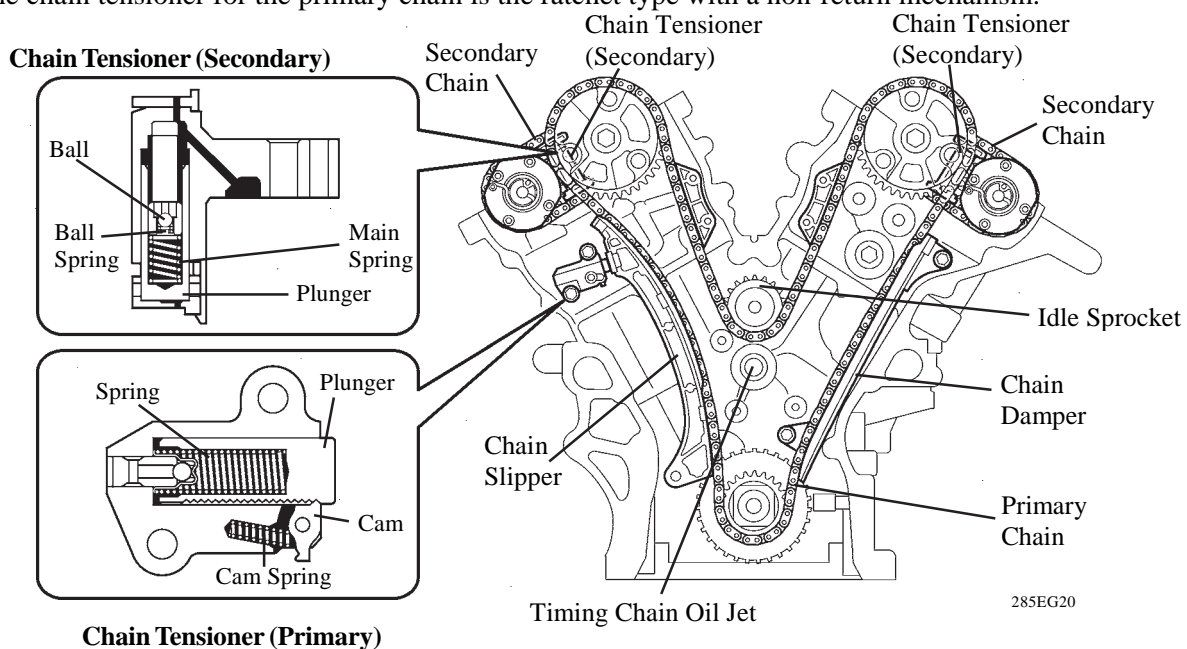
## 2. Camshaft

- The camshafts are made of cast iron alloy.
- An oil passage is provided on the intake and exhaust camshaft in order to supply engine oil to the VVT-i system.
- A VVT-i controller has been installed on the front of the intake and exhaust camshaft to vary the timing of the intake and exhaust valves.
- Together with the use of the roller rocker arm, the cam profile has been designed with an indented R (radius). This results in increased valve lift when the valve begins to open and finishes closing, helping to achieve enhanced output performance.



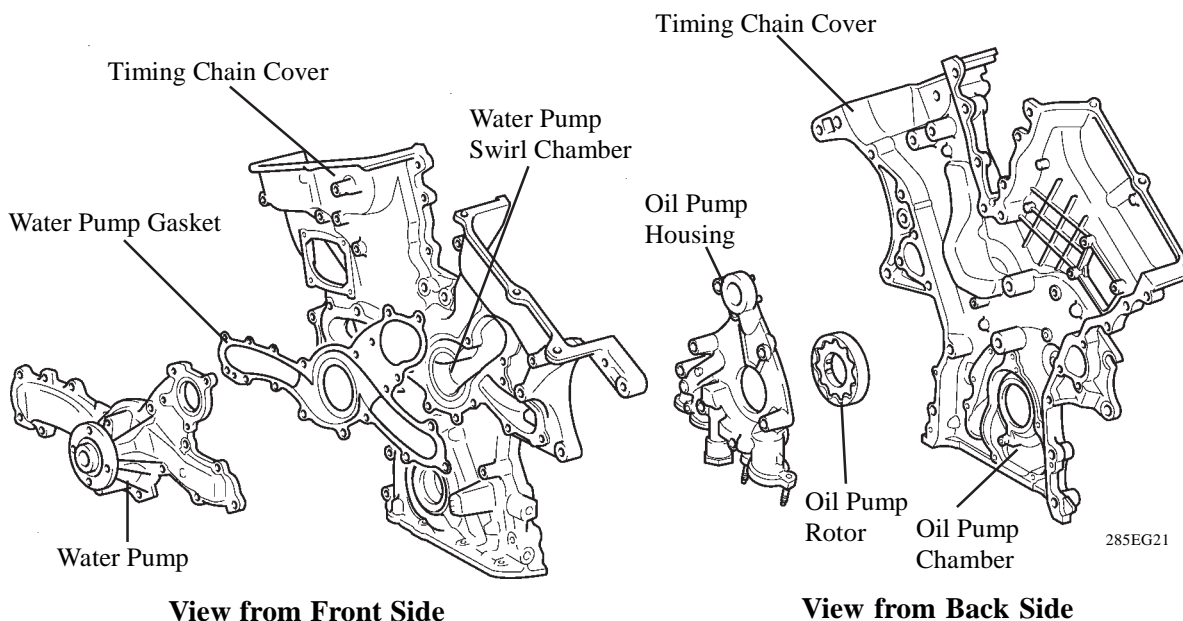
## 3. Timing Chain and Chain Tensioner

- Both the primary and secondary timing chains use roller chains with a pitch of 9.525mm.
- The timing chain is lubricated by an oil jet.
- The primary chain uses one timing chain tensioner and each of the secondary chains for the right and left banks uses one timing chain tensioner.
- Both the primary and secondary chain tensioners use a spring and oil pressure to maintain proper chain tension at all times. They suppress noise generated by the timing chains.
- The chain tensioner for the primary chain is the ratchet type with a non-return mechanism.



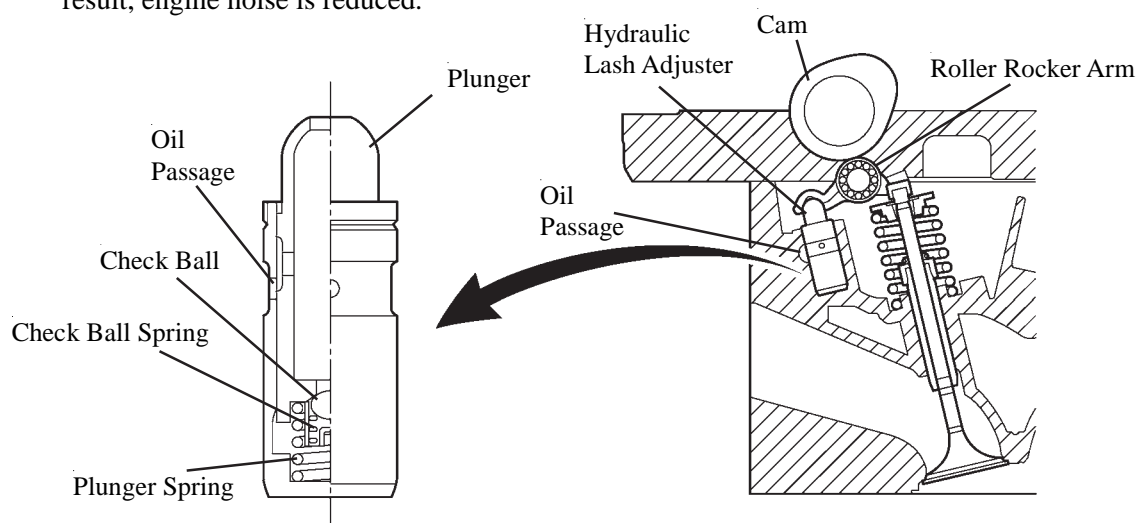
#### 4. Timing Chain Cover

The timing chain cover has an integrated construction consisting of the cooling system (water pump and water passage) and the lubrication system (oil pump and oil passage). Thus, the number of parts has been reduced to reduce weight.



#### 5. Hydraulic Lash Adjuster

- The hydraulic lash adjuster, which is located at the fulcrum of the roller rocker arm, consists primarily of a plunger, plunger spring, check ball, and check ball spring.
- The engine oil that is supplied by the cylinder head and the built-in spring actuate the hydraulic lash adjuster. The oil pressure and the spring force that act on the plunger push the roller rocker arm against the cam, in order to adjust the valve clearance that is created during the opening and closing of the valve. As a result, engine noise is reduced.



#### Service Tip

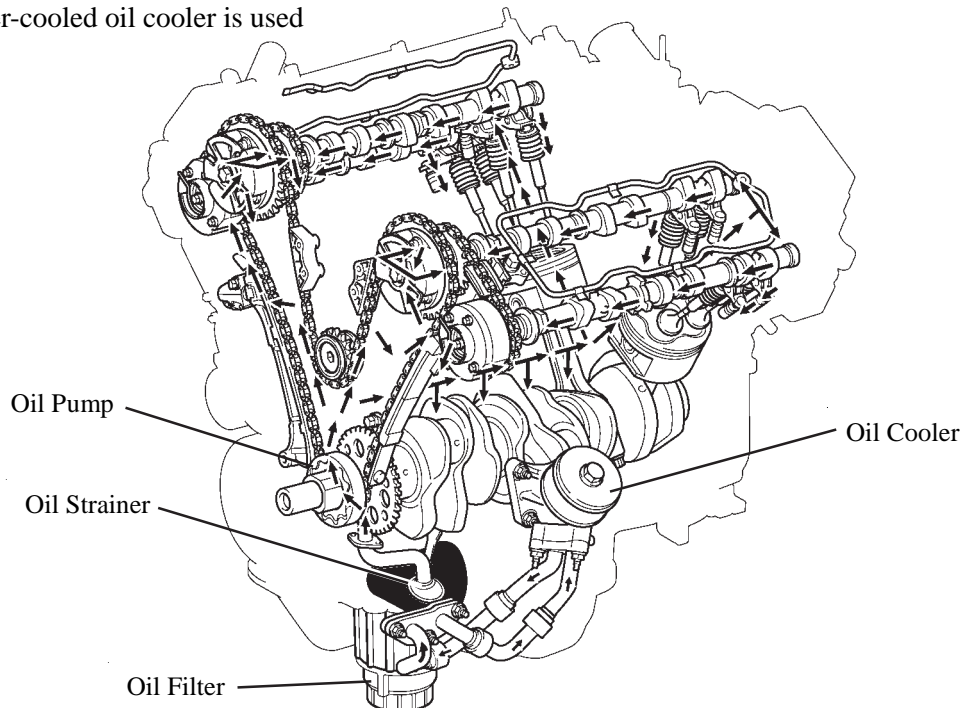
Valve clearance adjustment is not necessary because a hydraulic lash adjuster is used in this model.



## LUBRICATION SYSTEM

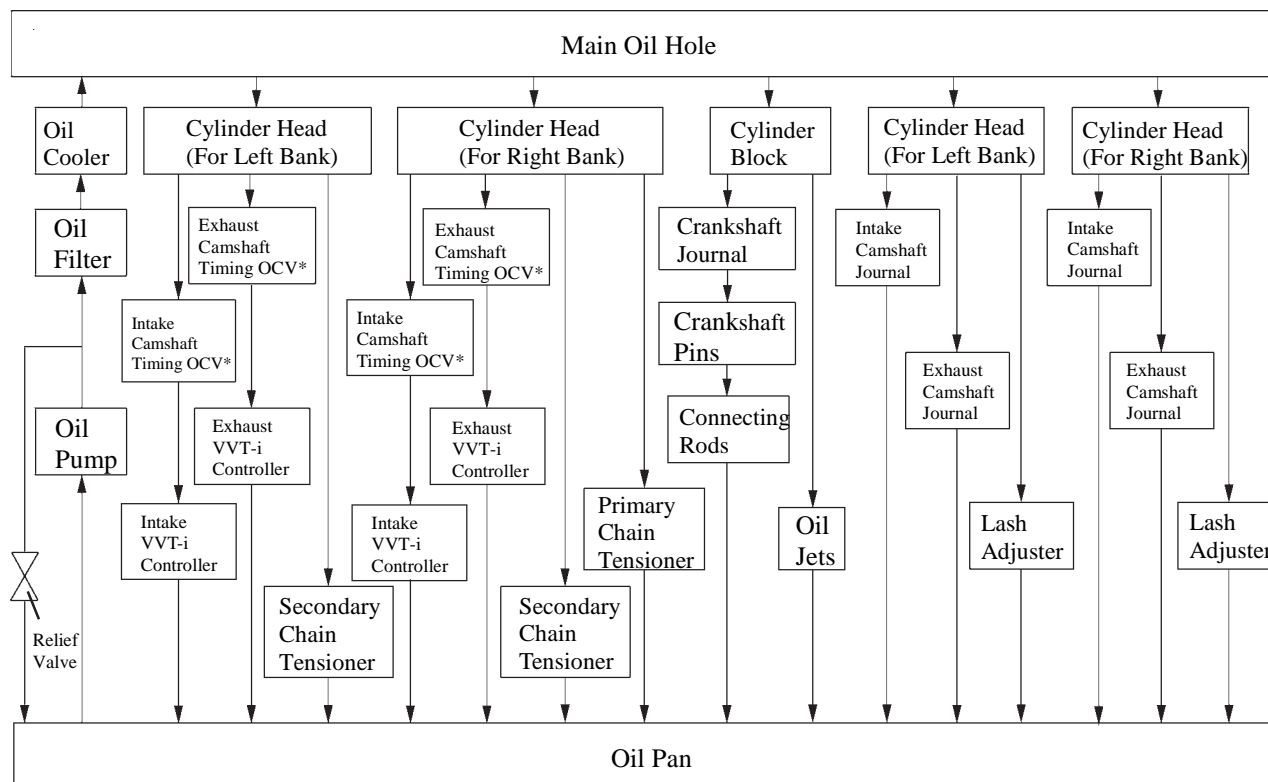
### 1. General

- The lubrication circuit is fully pressurized and all oil passes through an oil filter.
- A cycloid rotor type oil pump is used.
- A water-cooled oil cooler is used



02KEG41TE

### ► Oil Circuit ◀



\*: Oil Control Valve

0270EG28C

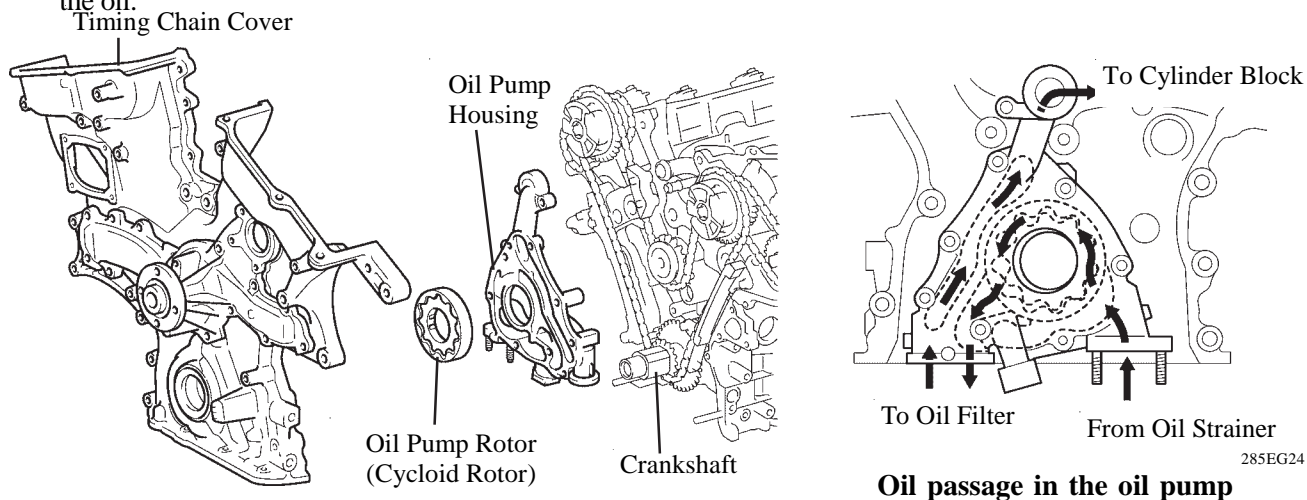


### ► Oil Capacity ◀

	2GR-FE with Oil Cooler
Dry	6.8 Litres
with Oil Filter	6.1 Litres
without Oil Filter	5.7 Litres

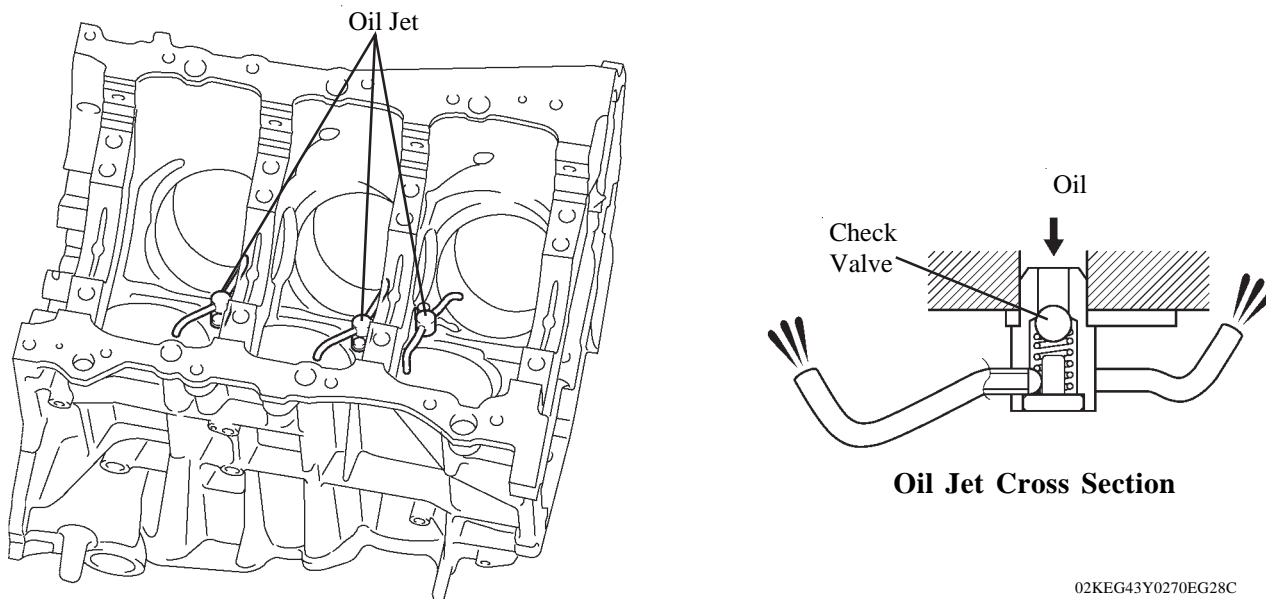
## 2. Oil Pump

- A compact cycloid rotor type oil pump directly driven by the crankshaft is used.
- This oil pump uses an internal relief method which circulates relief oil to the suction passage in the oil pump. This aims to minimise oil level change in the oil pan, reduce friction, and reduce air mixing rate in the oil.



## 3. Oil Jet

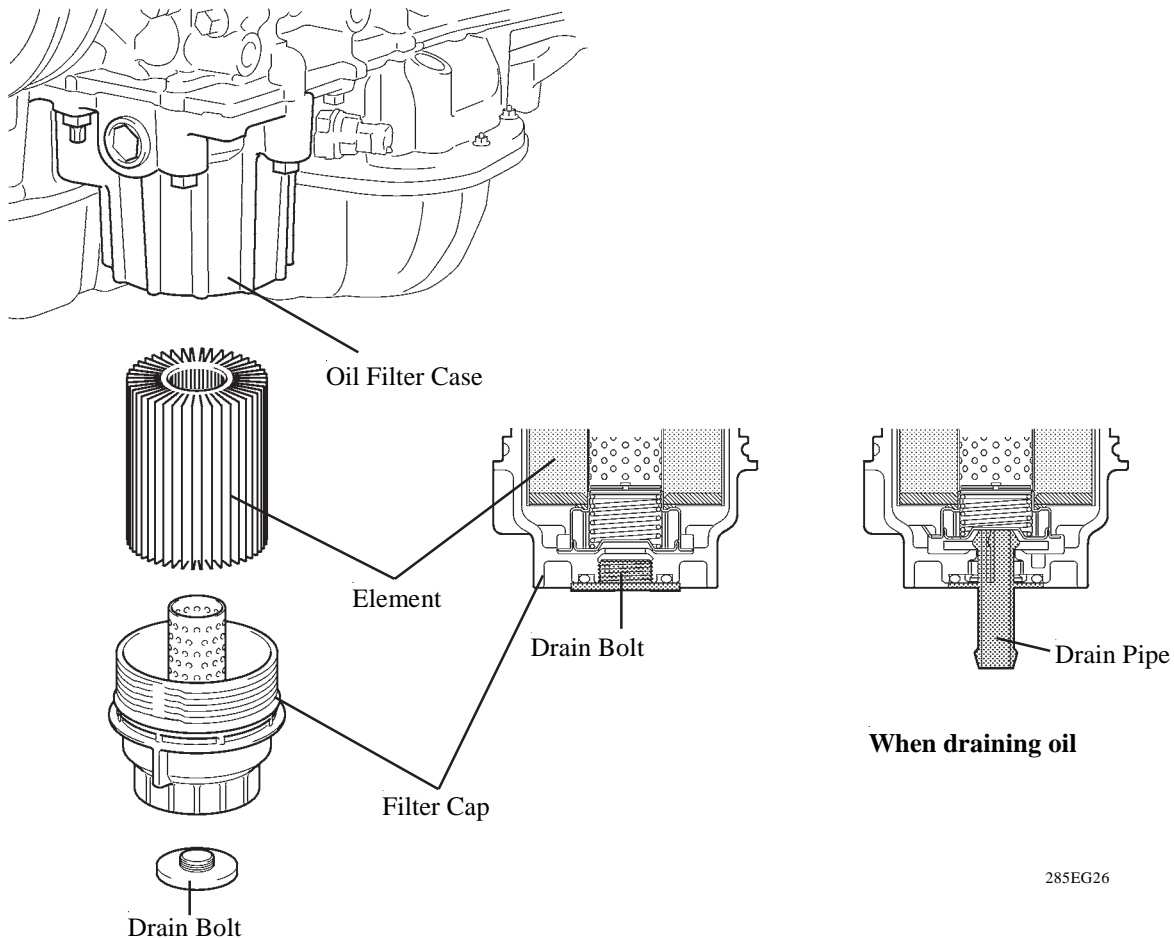
- Oil jets for cooling and lubricating the pistons have been provided in the cylinder block, in the centre of the right and left banks.
- These oil jets contain a check valve to prevent oil from being fed when the oil pressure is low. This prevents the overall oil pressure in the engine from dropping.



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#### 4. Oil Filter

- A newly developed oil filter with a replaceable element is used. The element uses a high-performance filter paper to improve filtration performance. It is also combustible for environmental protection.
- An aluminium alloy filter cap is used to extend its life.
- This oil filter has a structure which can drain the oil remaining in the oil filter. This prevents oil from spattering when replacing the element and allows the technician to work without touching hot oil.



285EG26

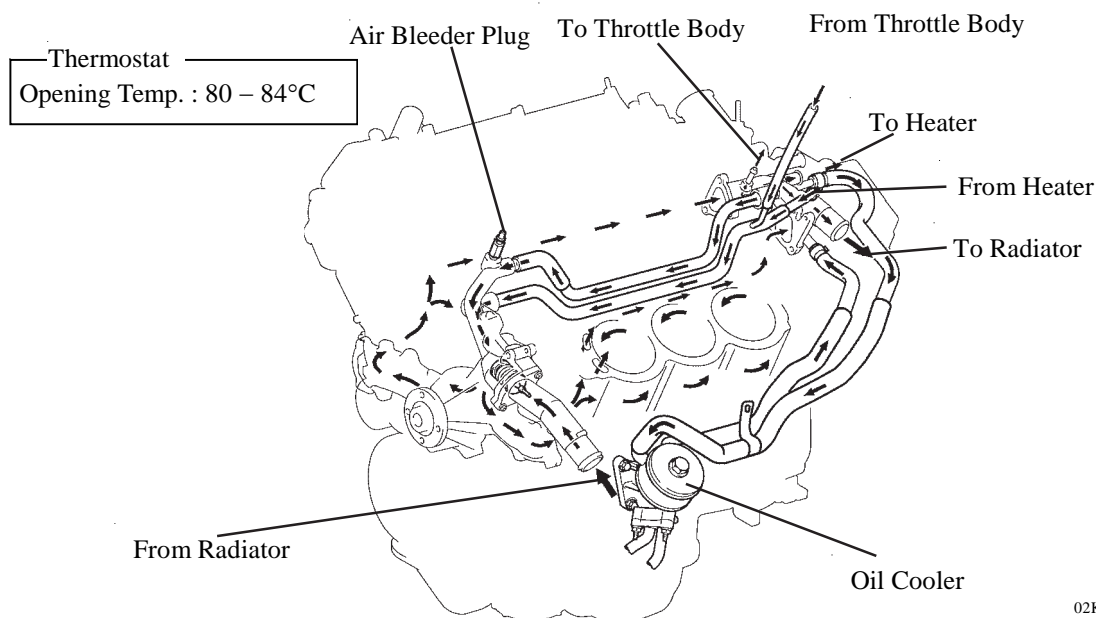
#### Service Tip

- The oil in the oil filter can be drained by removing the drain bolt and inserting the drain pipe supplied with the element into the oil filter. For details, refer to the Aurion Repair Manual.
- The engine oil maintenance interval for a model that has an oil filter with a replaceable element is the same as that for the conventional model.

## ❁ COOLING SYSTEM

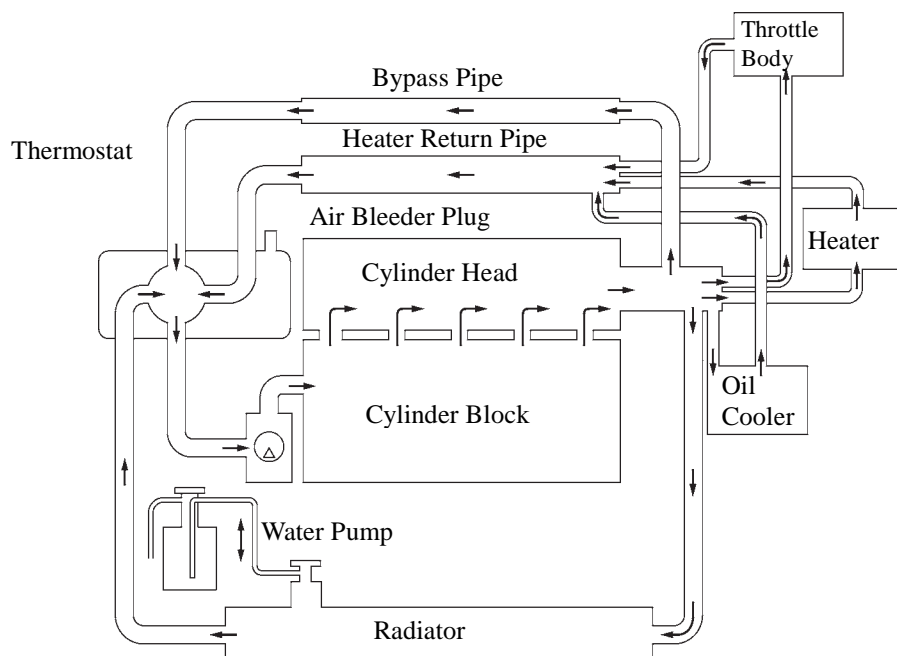
### 1. General

- The cooling system is a pressurised forced circulation system with open air type reserve tank.
- A thermostat with a bypass valve is located on the water inlet housing to maintain suitable temperature distribution in the cooling system.
- A cooling fan control system in which the engine ECU optimally controls cooling fan speed is used. For details, see page EG-67.
- An air bleeder plug is provided on the water inlet assembly to improve the efficiency of changing the engine coolant. For details, refer to the Aurion Repair Manual.
- The engine coolant uses TOYOTA genuine SLLC (Super Long Life Coolant).



02KEG42TE

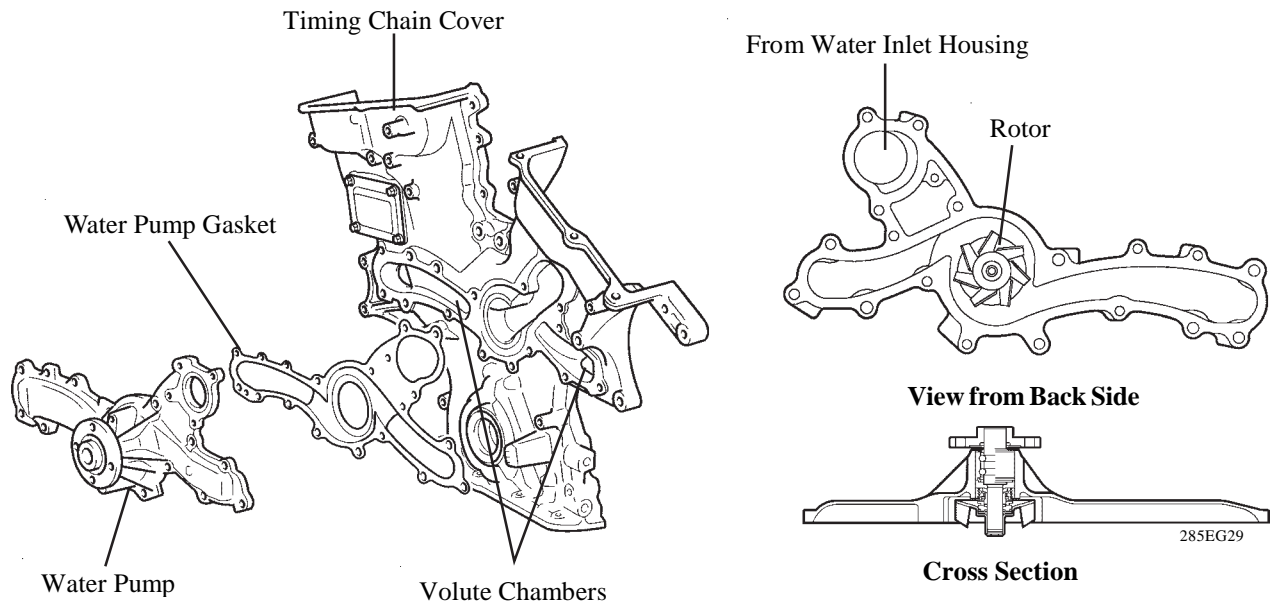
### ▶ Water Circuit ◀



02KEG40Y

2. Water Pump

- The water pump has two volute chambers, and circulates coolant uniformly to the left and right banks of the cylinder block.
- A rust-resistant water pump rotor made of stainless steel is used.



3. Engine Coolant

- TOYOTA genuine SLLC (Super Long Life Coolant) is used. Maintenance interval is as shown in the table below:

Type		TOYOTA Genuine SLLC or the Following*
Maintenance Intervals	First Time	150,000
	Subsequent	Every 75,000 km
Colour		Pink

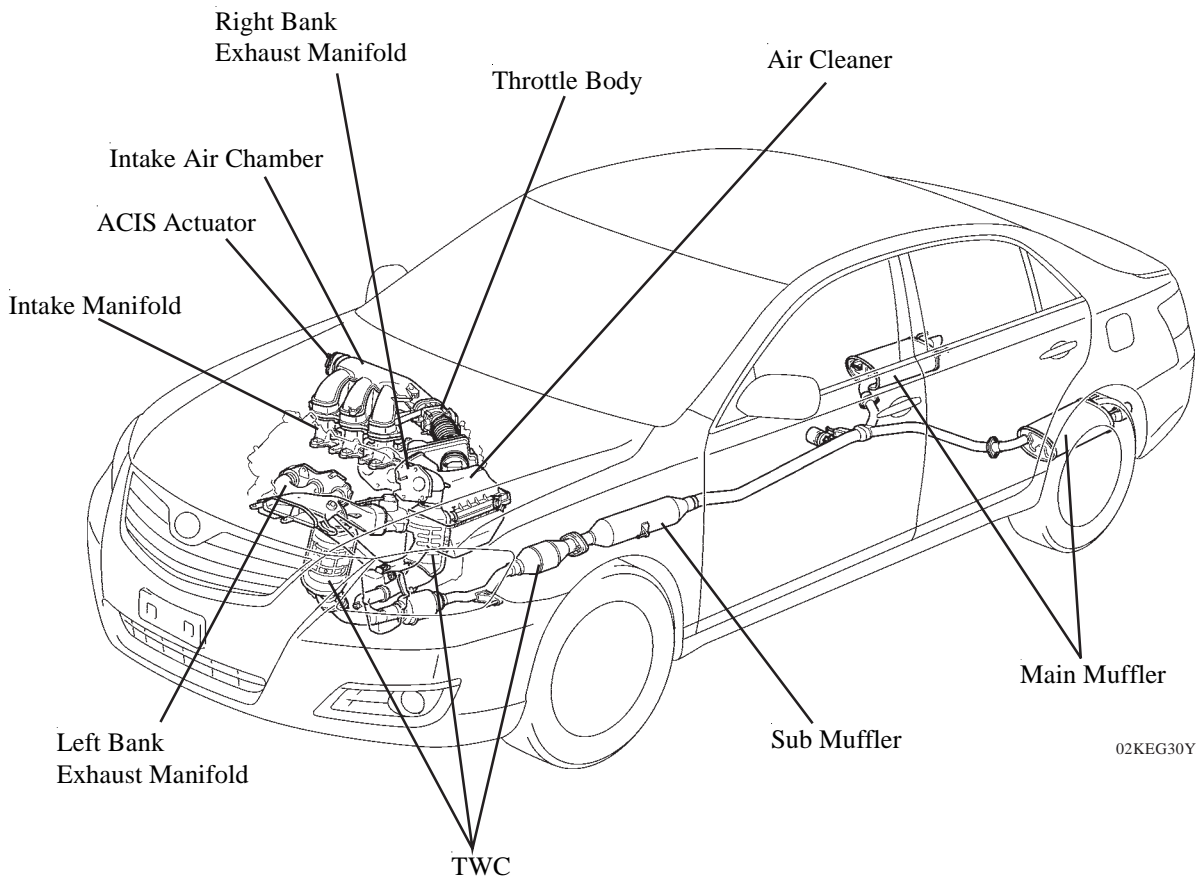
\*: Similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology. (Coolant with hybrid organic acid technology consists of the combination of low phosphates and organic acids.)

- SLLC is pre-mixed (50 % coolant and 50 % deionized water), so no dilution is needed when adding or replacing SLLC in the vehicle.
- The new maintenance interval (every 75,000 km) can be applied to vehicles initially filled with LLC (red-coloured), if SLLC (pink-coloured) is used when the engine coolant is changed.

## ✿ INTAKE AND EXHAUST SYSTEM

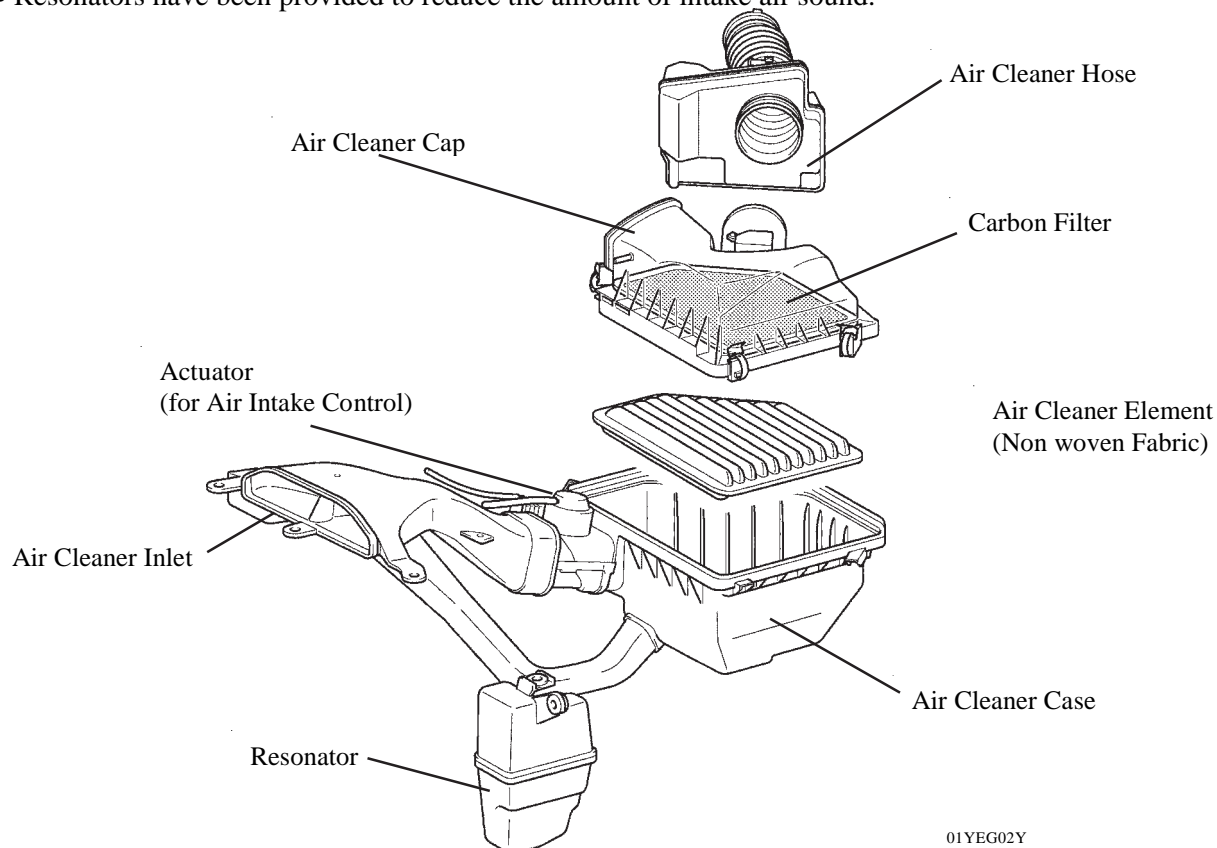
### 1. General

- The link-less type throttle body is used and it realises excellent throttle control.
- The adoption of the ETCS-i has realised excellent throttle control. For details, refer to page EG-55.
- The intake air chamber made of plastic is used.
- A stainless steel exhaust manifold and exhaust pipe are used.
- ACIS has improved the engine performance. For details, see page EG-63.
- The air intake control system is used to reduce engine noise. For details, see page EG-65.



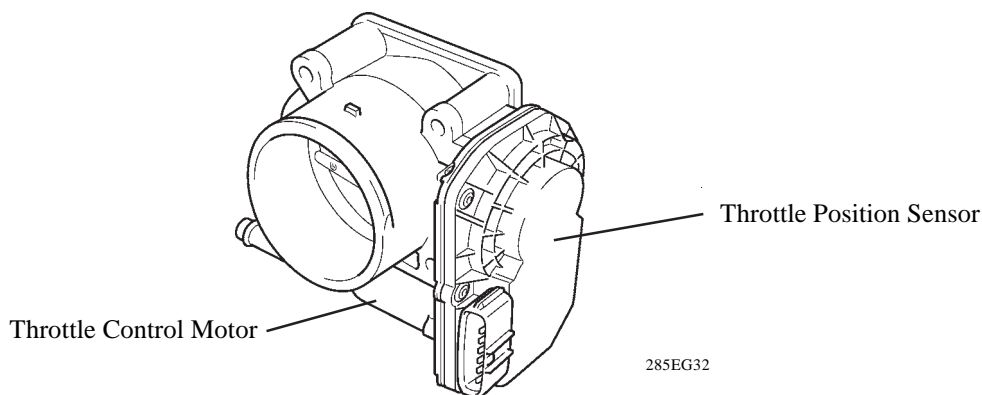
## 2. Air Cleaner

- A non-woven, full-fabric type air cleaner element is used.
- A carbon filter, which adsorbs the HC that accumulates in the intake system when the engine is stopped, is used in the air cleaner case in order to reduce evaporative emissions. This filter is maintenance-free.
- Along with the use of the air intake control system, an air intake control valve is provided on the air cleaner case.
- Resonators have been provided to reduce the amount of intake air sound.



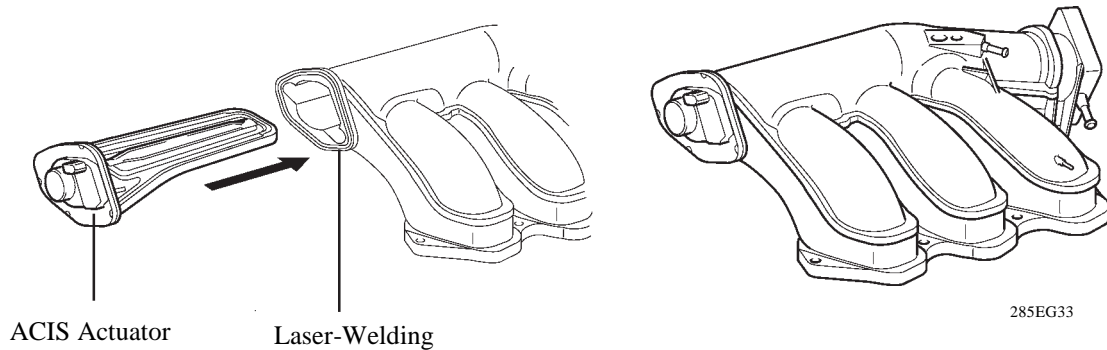
## 3. Throttle Body

- A link-less type throttle body in which the throttle position sensor and the throttle control motor are integrated is used. It realises excellent throttle valve control.
- In the throttle control motor, a DC motor with excellent response and minimal power consumption is used. The engine ECU performs the duty ratio control of the direction and the amperage of the current that flows to the throttle control motor in order to regulate the throttle valve angle.



#### 4. Intake Air Chamber

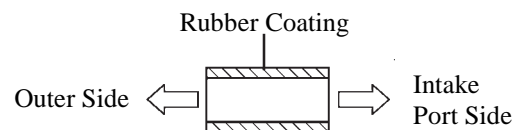
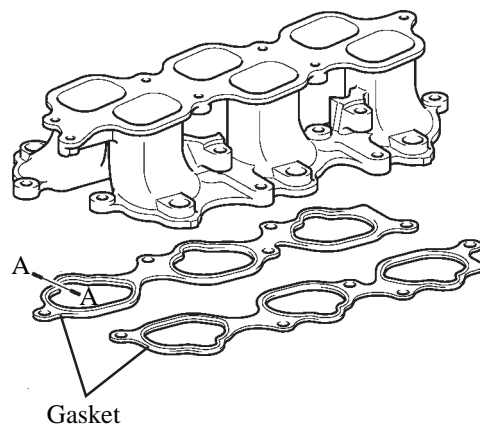
- The intake air chamber is made of plastic to realise lightweight.
- The air intake chamber consists of upper and lower section and contains an intake air control valve. This valve is activated by ACIS and is used to alter the intake pipe length to improve the engine performance in all speed range. For details, see page EG-63.
- The ACIS actuator has used an electric actuator and is laser-welded onto the intake air chamber. Many of the components are made of plastic for weight reduction.



#### — REFERENCE —

##### *Laser-Welding:*

*In laser-welding, a laser-absorbing material (for the intake air chamber) is joined to a laser-transmitting material (for the ACIS actuator). Laser beams are then irradiated from the laser-transmitting side. The beams penetrate the laser-transmitting material to heat and melt the surface of the laser-absorbing material. Then, the heat of the laser-absorbing material melts the laser-transmitting material and causes both materials to become welded.*

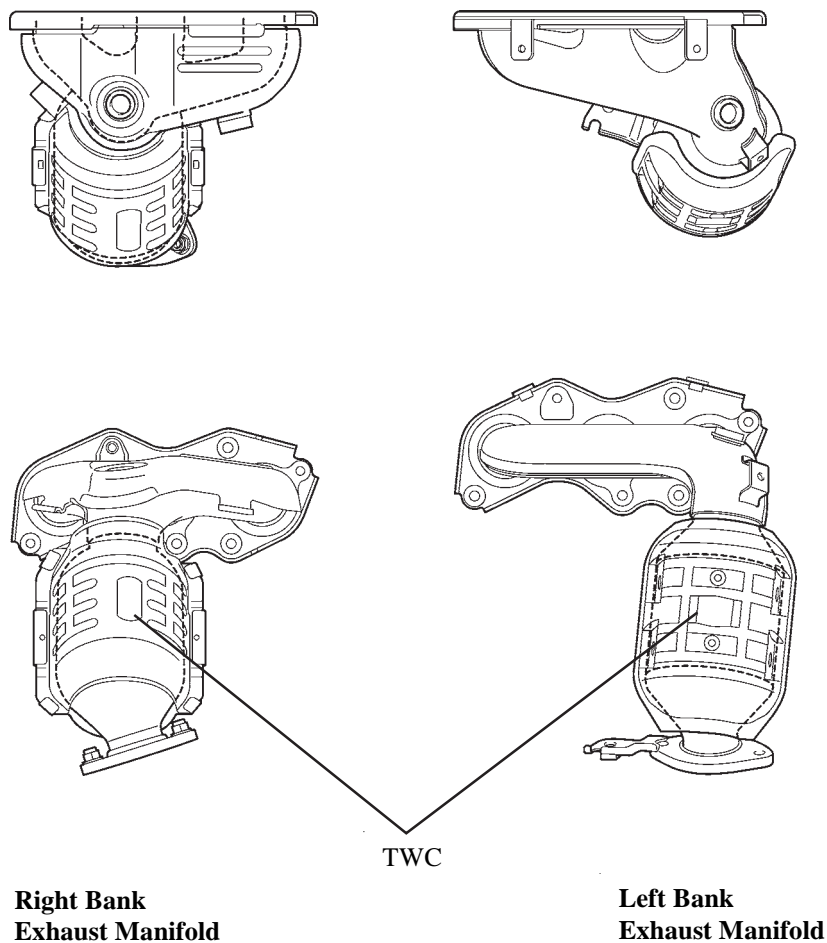


**A A Cross Section**

285EG34

## 6. Exhaust Manifold

- A stainless steel exhaust manifold with an integrated TWC is used for warm-up of the TWC and for weight reduction.
- A ceramic type TWC is used. This TWC is incorporated on each of the right and left banks.
- This TWC enables to improve exhaust emissions by optimising the cells density and the wall thickness.

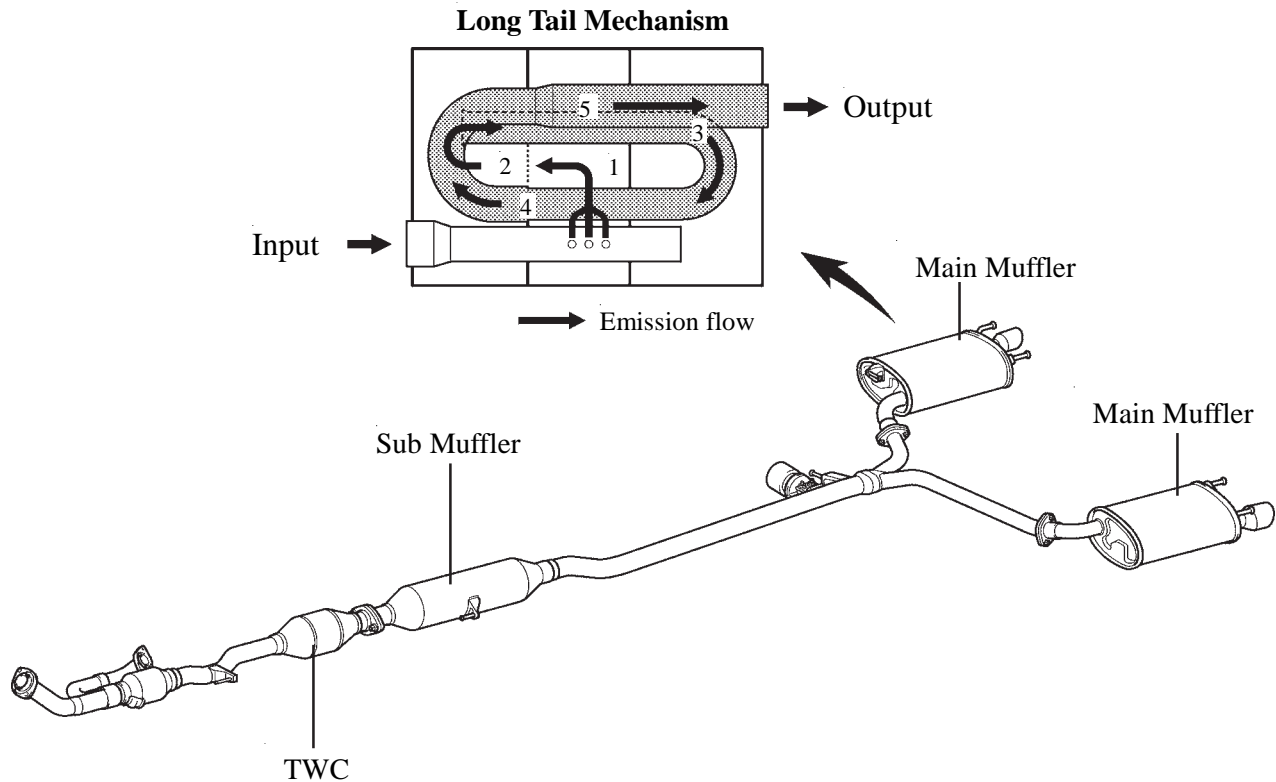


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## 7. Exhaust Pipe

- The exhaust pipe is made of stainless steel for improved rust resistance.
- A ceramic type TWC is used.
- A dual main muffler is used to ensure engine performance and reduce exhaust noise.
- A long tail mechanism is used in the main muffler to aim at reducing exhaust noise while the engine is running in the low speed range.

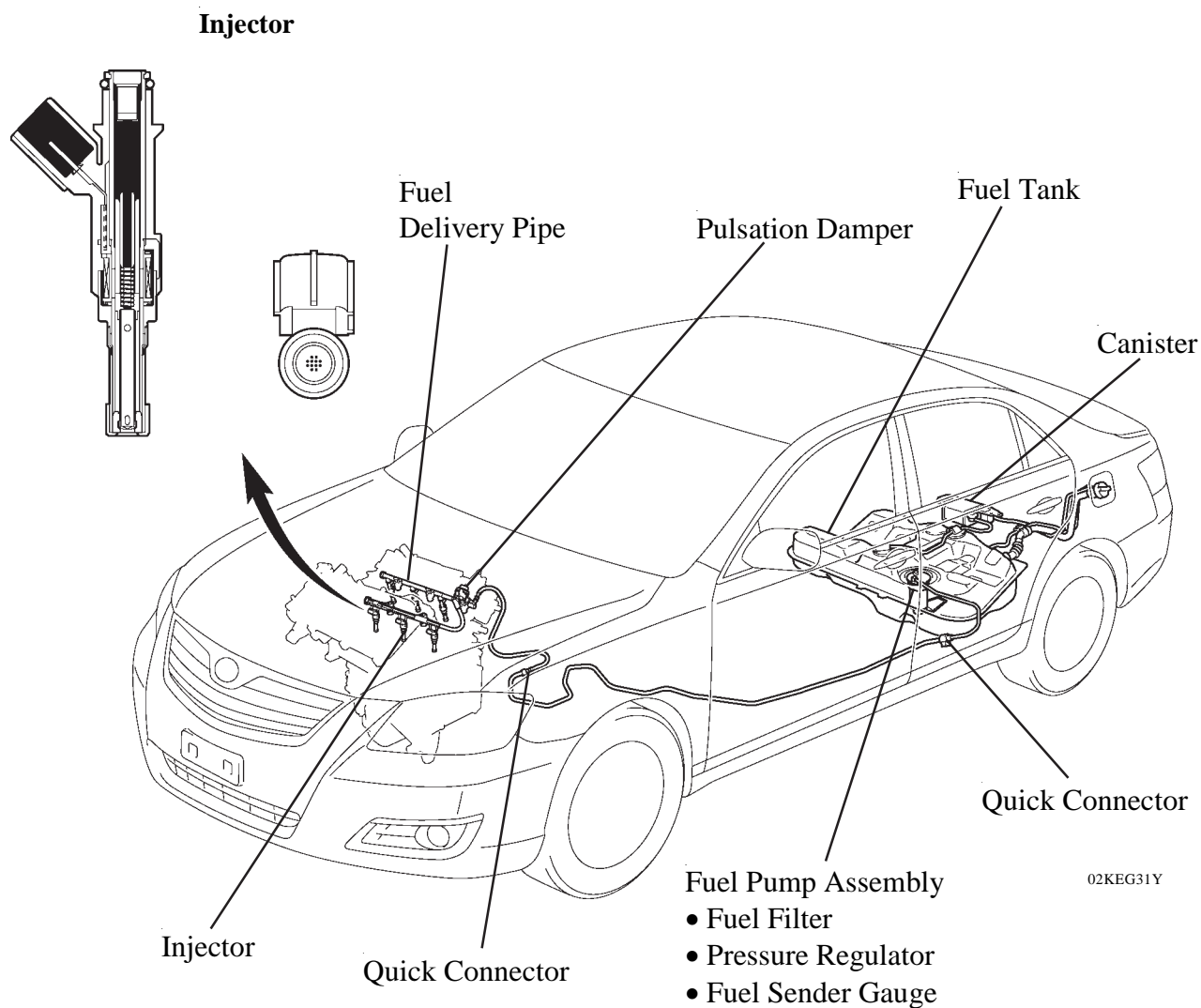


025EG19Y

## FUEL SYSTEM

### 1. General

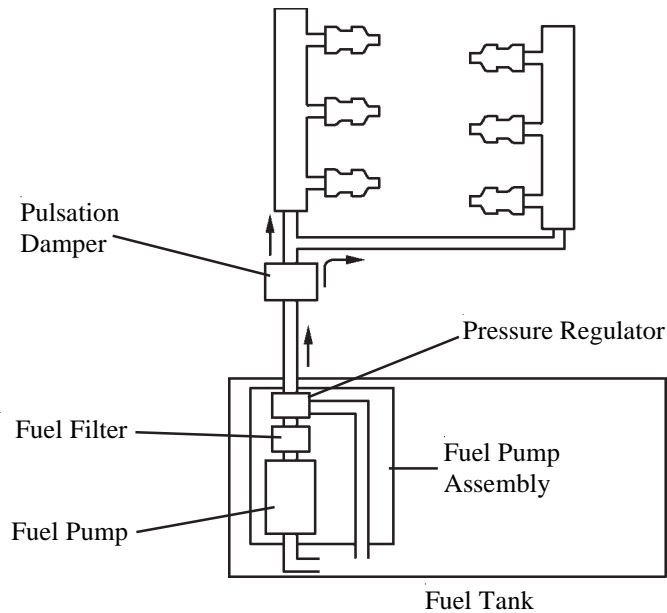
- The fuel return less system is used to reduce evaporative emissions.
- A fuel cut control is used to stop the fuel pump when the SRS airbag is deployed in a frontal or side collision. For details, see page EG-66.
- The fuel delivery pipe made of plastic is used.
- A quick connector is used to connect the fuel pipe with the fuel hose for excellent serviceability.
- A compact 12-hole type injector is used to increase atomization of the fuel.
- A compact fuel pump in which a fuel filter, pressure regulator, and fuel sender gauge is integrated in the fuel pump assembly is used.



02KEG31Y

## 2. Fuel Return less System

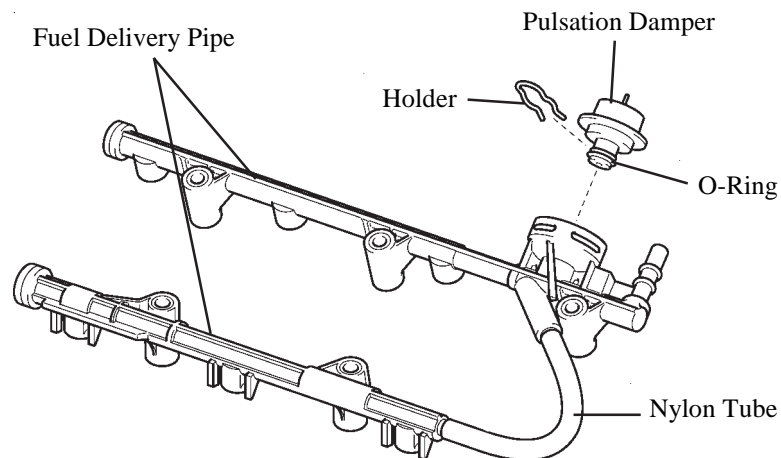
This system is used to reduce the evaporative emission. As shown below, integrating the fuel filter, pressure regulator, and fuel sender gauge with fuel pump assembly, it is possible to discontinue the return of fuel from the engine area and prevent temperature rise inside the fuel tank.



208EG117

## 3. Fuel Delivery Pipe

- The fuel delivery pipe made of plastic is used to realise lightweight.
- The right and left fuel delivery pipes are connected by a nylon tube.
- The pulsation damper is sealed with an O-ring and secured with a holder.



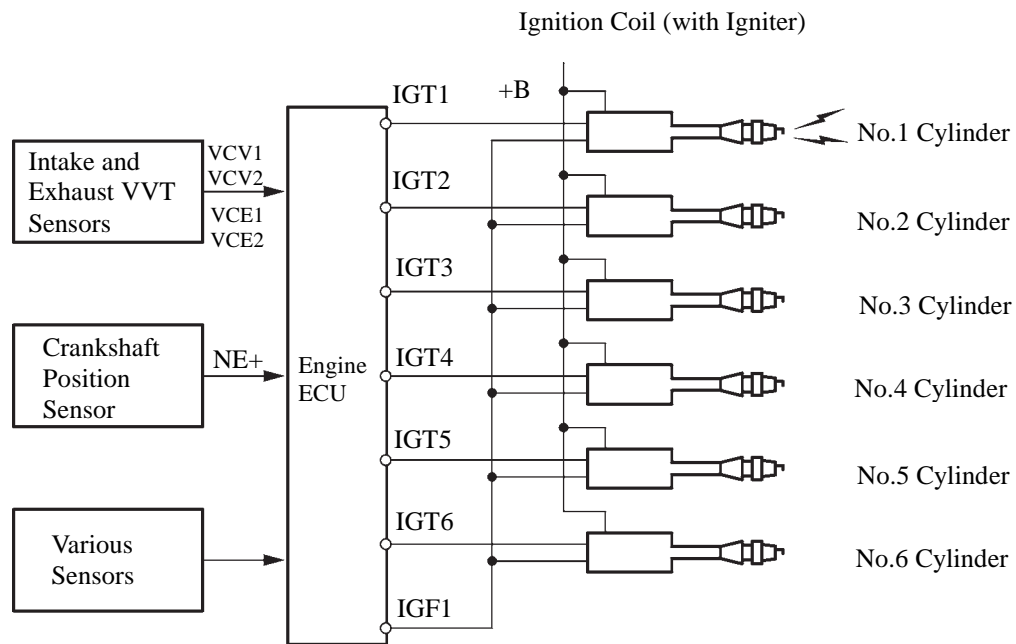
285EG38

## ✱ IGNITION SYSTEM

### 1. General

A DIS (Direct Ignition System) is used. The DIS improves the ignition timing accuracy, reduces high-voltage loss, and enhances the overall reliability of the ignition system by eliminating the distributor.

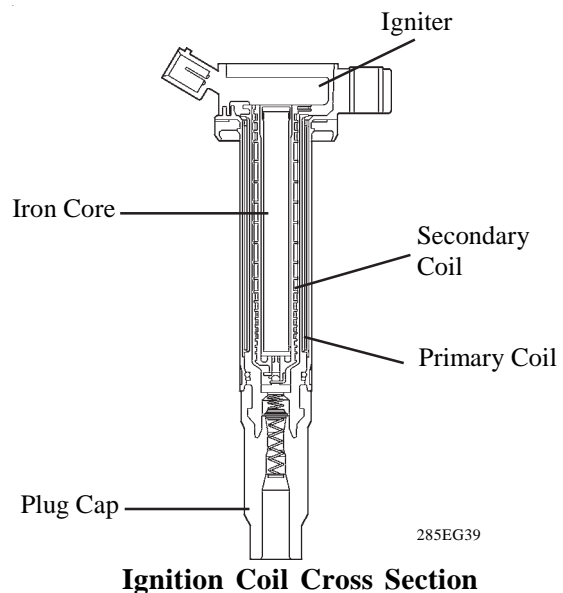
The DIS is an independent ignition system which has one ignition coil (with igniter) for each cylinder.



238EG68

### 2. Ignition Coil

The DIS provides 6 ignition coils, one for each cylinder. The spark plug caps, which provide contact to spark plugs, are integrated with an ignition coil. Also, an igniter is enclosed to simplify the system.

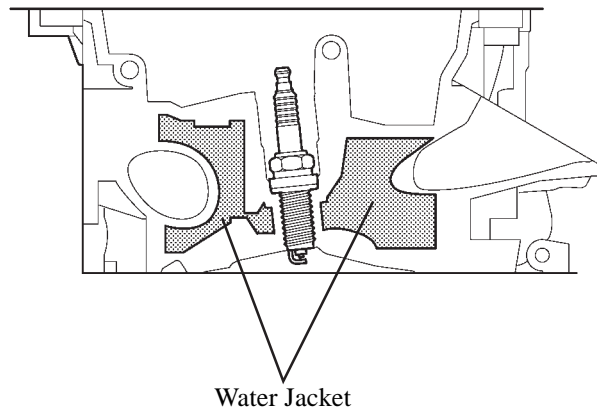
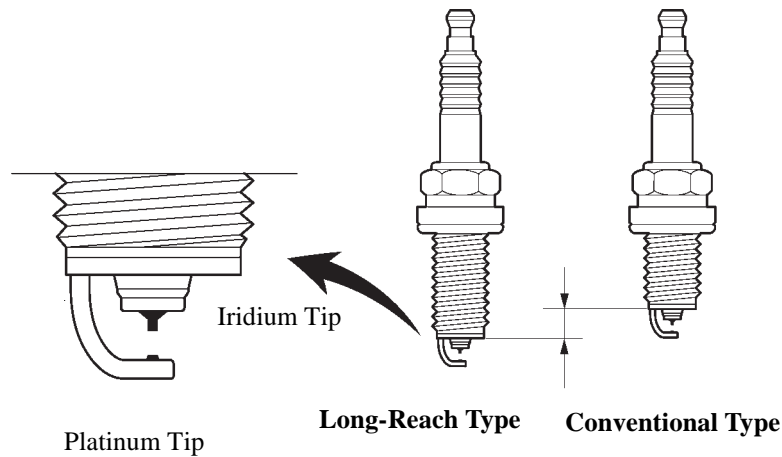


285EG39

**Ignition Coil Cross Section**

### 3. Spark Plug

- Long-reach type spark plugs are used. This type of spark plugs allows the area of the cylinder head to receive the spark plugs to be made thick. Thus, the water jacket can be extended near the combustion chamber, which contributes to cooling performance.
- Iridium-tipped spark plugs are used to achieve a 90,000 km maintenance interval. By making the centre electrode of iridium, the superior ignition performance as platinum-tipped spark plugs is achieved and durability has been increased.



285EG40

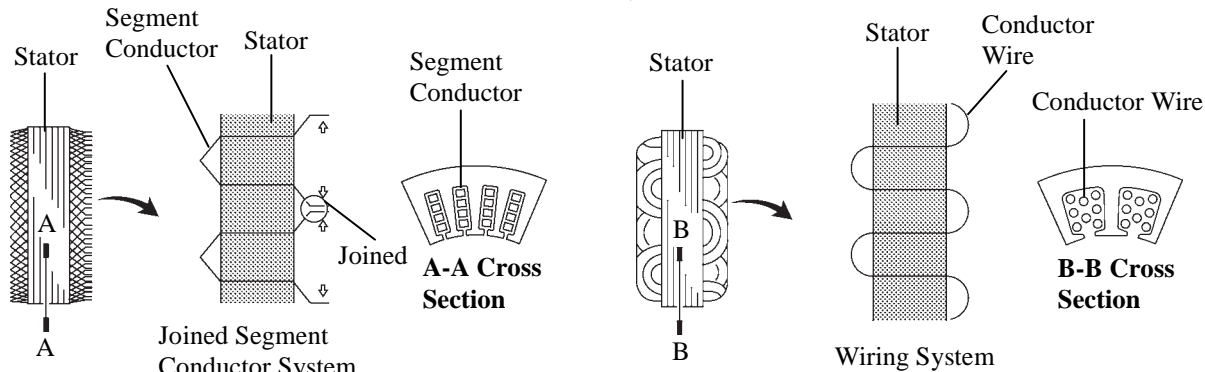
#### ► Specifications ◀

Maker	DENSO
Type	FK20HR11
Plug Gap	1.0 - 1.1 mm

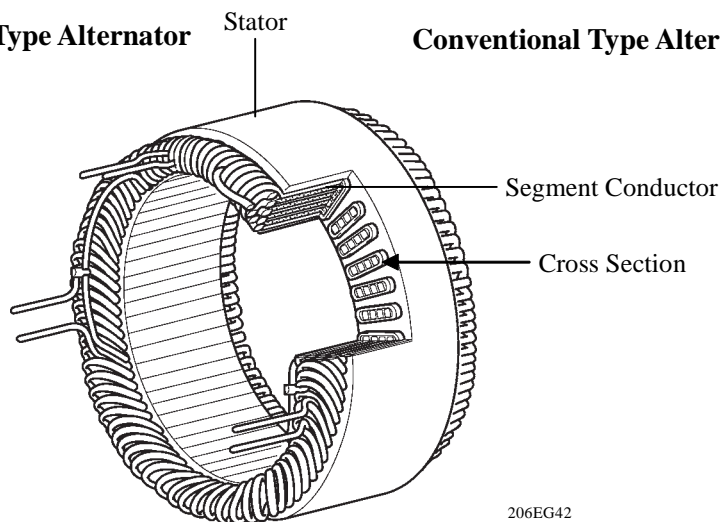
## ✱ CHARGING SYSTEM

### 1. General

- Instead of the conventional type alternator, a compact and lightweight segment conductor type alternator (SE0 type) that generates a high amperage output (100 A) in a highly efficient manner is used.
- This alternator uses a joined segment conductor system, in which multiple segment conductors are welded together to the stator. Compared to the conventional winding system, the electrical resistance is reduced due to the shape of the segment conductors, and their arrangement helps to make the alternator more compact.



**Segment Conductor Type Alternator**      **Conventional Type Alternator**

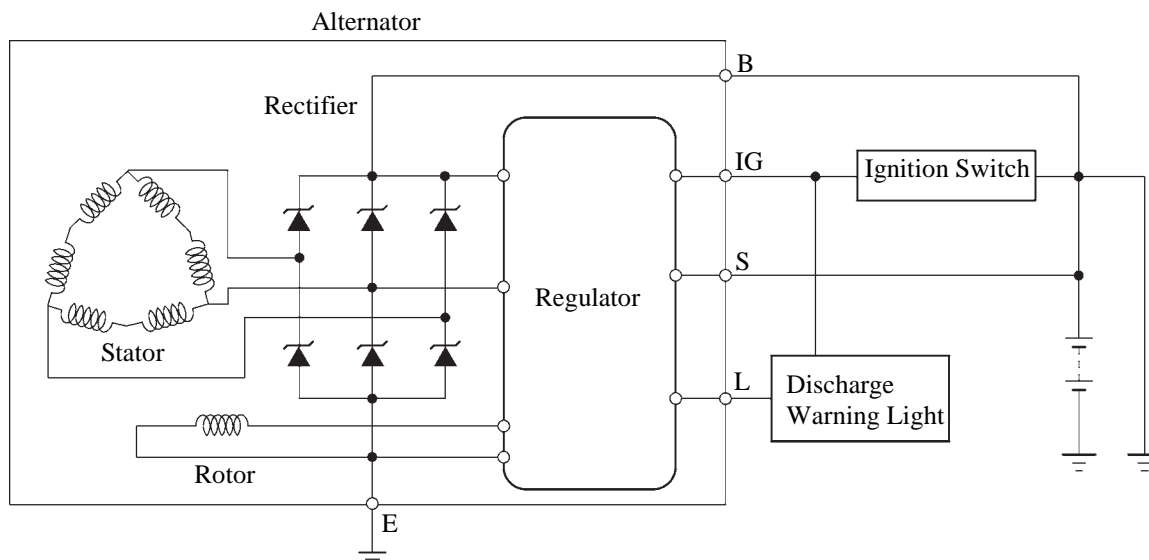


**Stator of Segment Conductor Type Alternator**

Type	SE0
Rated Voltage	12V
Output Rated	100 A

## ▸ Wiring Diagram ◀

- An alternator pulley with a clutch is used.

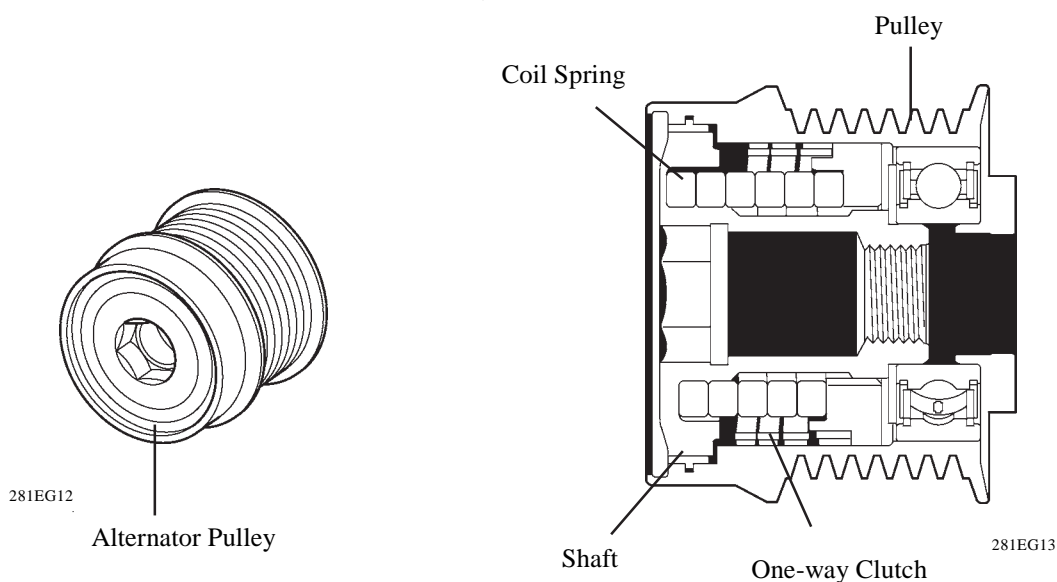


### Service Tip

Although the charging circuit of a conventional alternator is checked through the F terminal, this check cannot be performed on the Segment Conductor type alternator through the use of the F terminal because the F terminal has been eliminated. For details, refer to the Aurion Repair Manual.

## 2. Alternator Pulley

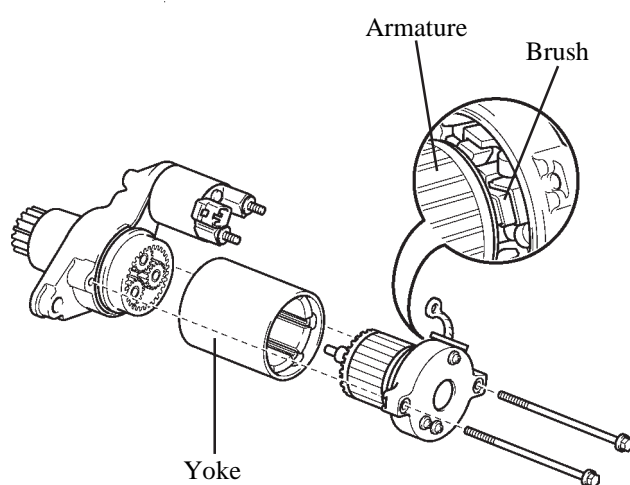
A one-way clutch is set to the alternator pulley. Operation of the one-way clutch cancels alternator pulley inertia and helps to prevent slipping of the V-ribbed belt. This realises a low tension V-ribbed belt that achieves reduced friction.



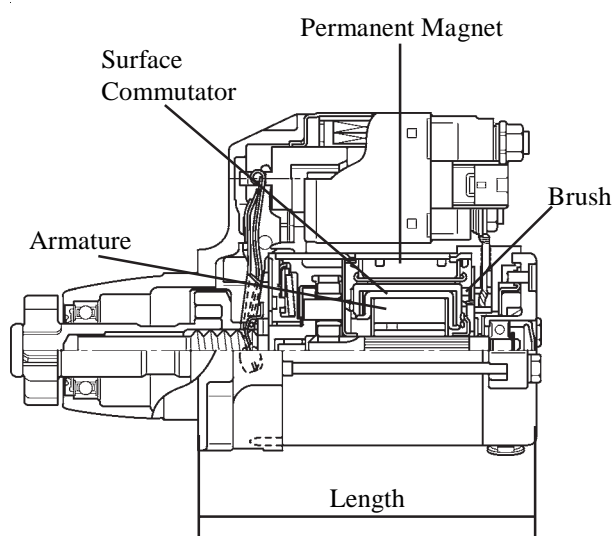
## ✿ STARTING SYSTEM

### 1. General

- A compact and lightweight PS (Planetary reduction - Segment conductor motor) type starter (PS1.7 type) is used as standard equipment on all models.
- The PS starter contains an armature that uses square-shaped conductors and its surface functions as a commutator, resulting in improved output torque and overall length reduction.
- In place of the field coil used in the conventional starter, the PS starter uses two types of permanent magnets: main magnets and interpolar magnets. The main magnets and interpolar magnets have been efficiently arranged to increase the magnetic flux and to shorten the length of the yoke.



206EG18



206EG19

### ► Specifications ◀

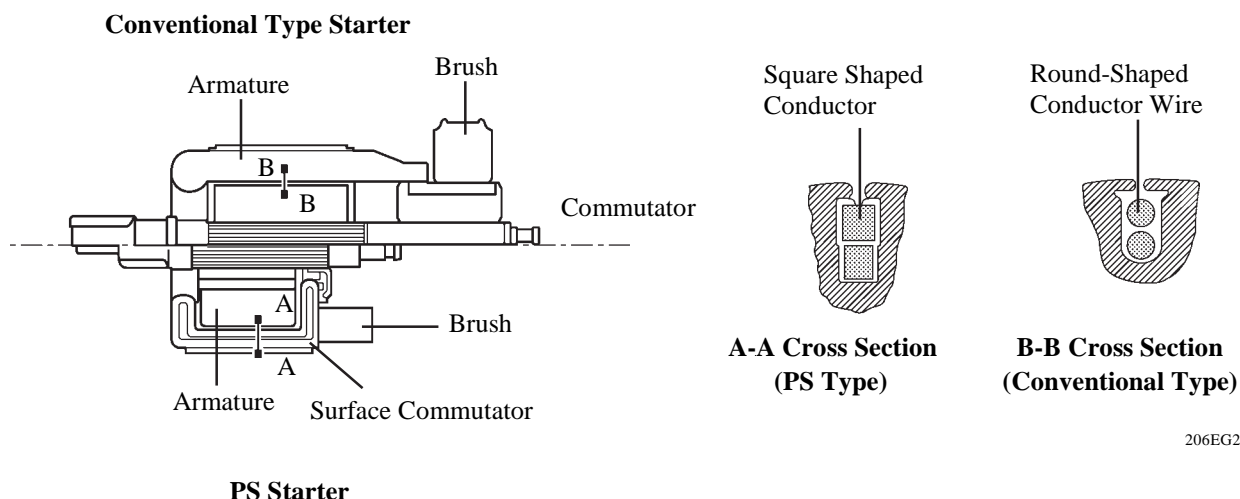
Type	PS1.7
Length	128 mm
Weight	2950 g
Rating Voltage	12V
Rating Output	1.7 kW
Rotating Direction	Counter clockwise*

\*: Viewed from Pinion Side



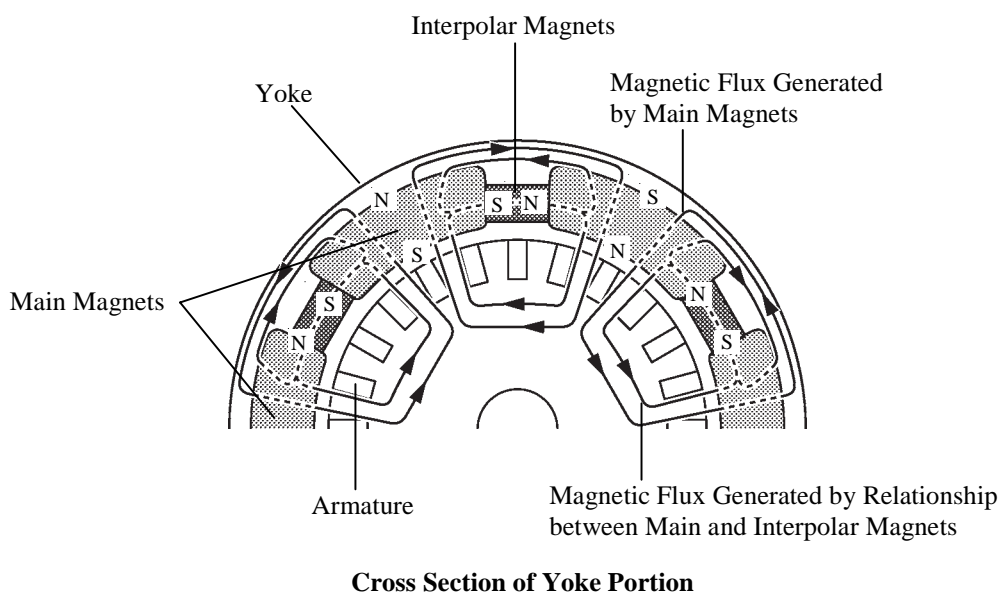
## 2. Construction

- Instead of the round-shaped conductor wires used in the conventional starter, the PS type starter uses square-shaped conductors. In this type of construction, square-shaped conductors can achieve the same conditions as those achieved by winding numerous round-shaped conductor wires, but without increasing the mass. As a result, the output torque is increased, and the armature coil is more compact.
- Because the surface of the square-shaped conductors that are used in the armature coil functions as a commutator, the overall length of the PS type starter has been shortened.



206EG20

- Instead of the field coils used in the conventional starter, the PS type starter uses two types of permanent magnets: the main magnets and the interpolar magnets. The main and interpolar magnets are arranged alternately inside the yoke. This allows the magnetic flux generated between the main and interpolar magnets to be added to the magnetic flux generated by the main magnets. In addition to increasing the amount of magnetic flux, this construction shortens the overall length of the yoke.

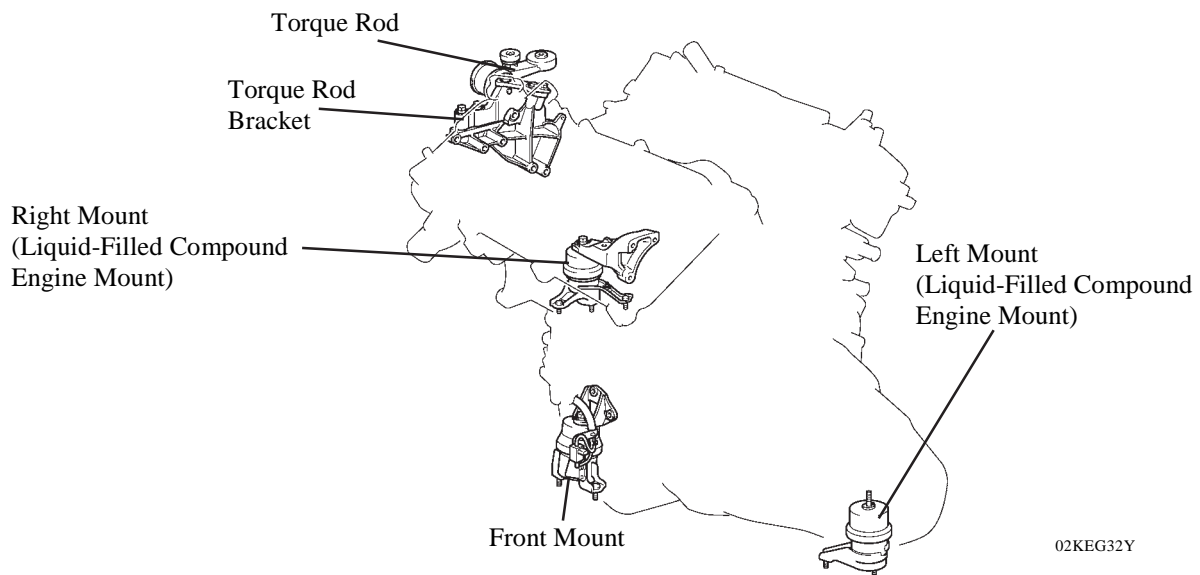


264EG14

## ✱ ENGINE MOUNT

### 1. General

- A 3-point support on the front sub-frame is used.
- An active control engine mount is used on the front engine mount and a liquid-filled compound engine mount is used on the right and left engine mounts to realise low noise and vibration and to achieve high levels of both riding comfort and drivability.
- The Aurion uses a vacuum type active control engine mounts.

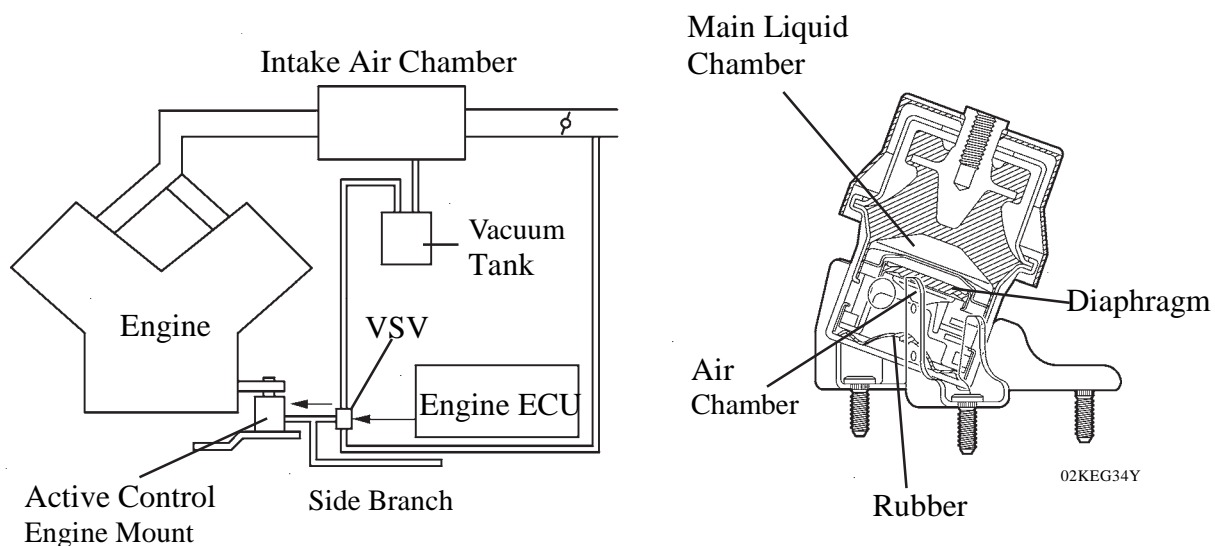


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**Vacuum Type Active Control Engine Mount**

## 2. Vacuum Type Active Control Engine Mount

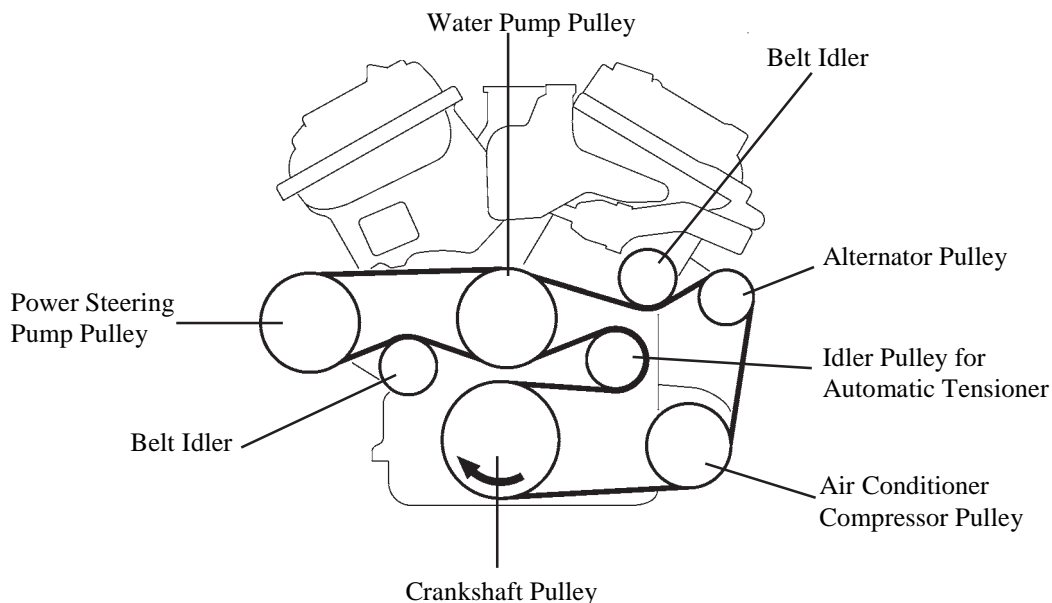
- The vacuum type active control engine mount is used to reduce engine vibration and noise during idling.
- Signals that are synchronized to the engine speed are sent by the engine ECU to the VSV and the engine vacuum is utilised to vary the pressure of the intake air chamber in the active control engine mount. As a result, the diaphragm vibrates, and using the liquid as a medium, the rubber mount vibrates. This vibration of the engine mount acts to cancel out the engine vibration during idle, thus reducing the vibration and noise at idle. The engine mount's damping force to generate vibrations is adjusted through the effects of the orifice and the side branch.



## SERPENTINE BELT DRIVE SYSTEM

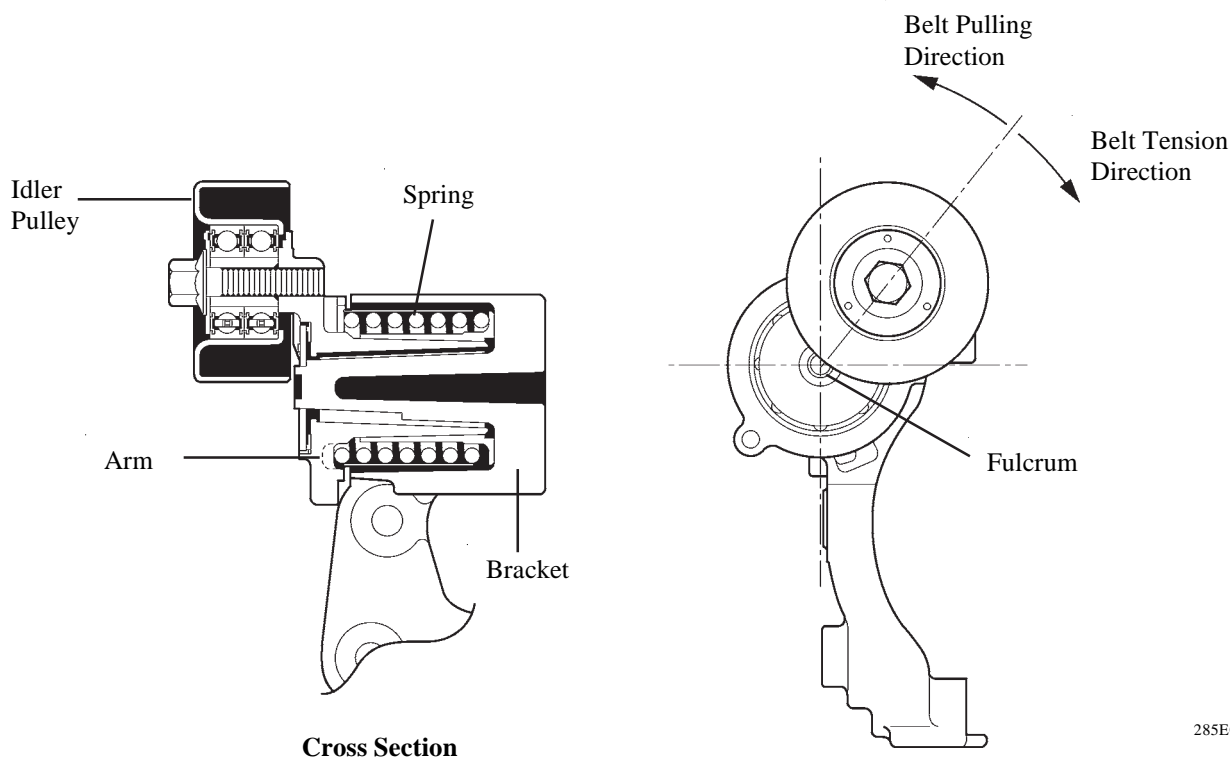
### 1. General

- Accessory components are driven by a serpentine belt consisting of a single V-ribbed belt. It reduces the overall engine length, weight and number of engine parts.
- An automatic tensioner eliminates the need for tension adjustment.



### 2. Automatic Tensioner

The tension of the V-ribbed belt is properly maintained by the tension spring that is enclosed in the automatic tensioner.



## ✱ ENGINE CONTROL SYSTEM

### 1. General

The engine control system of the 2GR-FE engine has the following features.

System	Outline
EFI (Electronic Fuel Injection)	<ul style="list-style-type: none"> <li>• An L-type EFI system directly detects the intake air mass with a hot wire type air flow meter.</li> <li>• The fuel injection system is a sequential multi-port fuel injection system.</li> <li>• Fuel injection takes two forms: Synchronous injection, which always takes place with the same timing in accordance with the basic injection duration and an additional correction based on the signals provided by the sensors. Non-synchronous injection, which takes place at the time an injection request based on the signals provided by the sensors, is detected, regardless of the crankshaft position.</li> <li>• Synchronous injection is further divided into group injection during a cold start, and independent injection after the engine is started.</li> </ul>
ESA (Electronic Spark Advance)	<ul style="list-style-type: none"> <li>• Ignition timing is determined by the engine ECU based on signals from various sensors. The engine ECU corrects ignition timing in response to engine knocking.</li> <li>• This system selects the optimal ignition timing in accordance with the signals received from the sensors and sends the (IGT) ignition signal to the igniter.</li> </ul>
ETCS-i (Electronic Throttle Control System-intelligent) [See page EG-55]	Optimally controls the throttle valve opening in accordance with the amount of accelerator pedal effort and the condition of the engine and the vehicle.
Dual VVT-i (Dual Variable Valve Timing-intelligent) [See page EG-57]	Controls the intake and exhaust camshafts to optimal valve timing in accordance with the engine condition.
ACIS (Acoustic Control Induction System) [See page EG-63]	The intake air passages are switched according to the engine speed and throttle valve opening angle to provided high performance in all speed ranges.
Air Intake Control System [See page EG-65]	The intake air duct is divided into two areas, and the engine ECU controls the air intake control valve and the actuator that are provided in one of the areas to reduce the amount of engine noise.
Fuel Pump Control [See page EG-66]	<ul style="list-style-type: none"> <li>• Fuel pump operation is controlled by signals from the engine ECU.</li> <li>• The fuel pump is stopped, when the SRS airbag is deployed in a frontal, side, and rear of side collision.</li> </ul>

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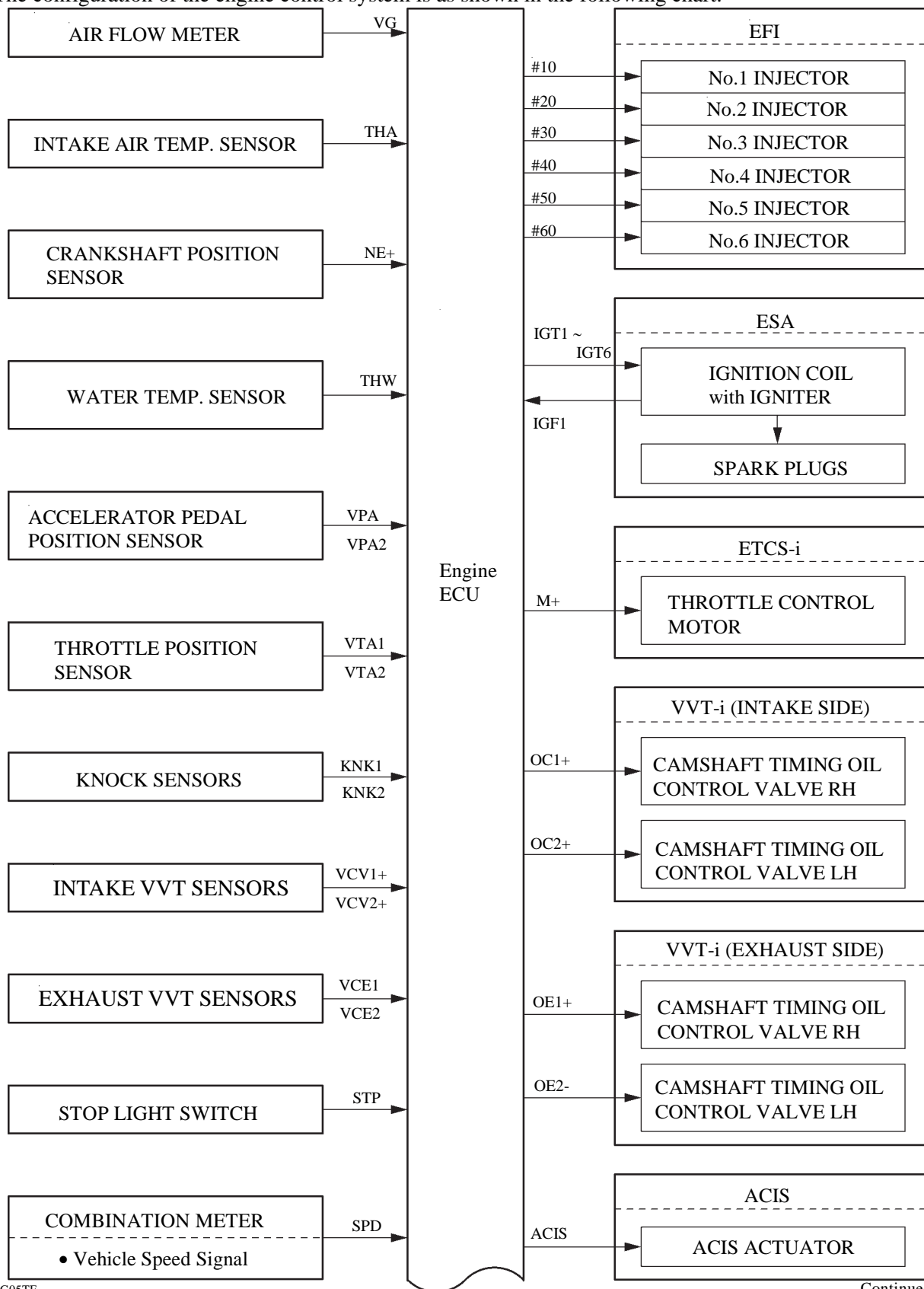
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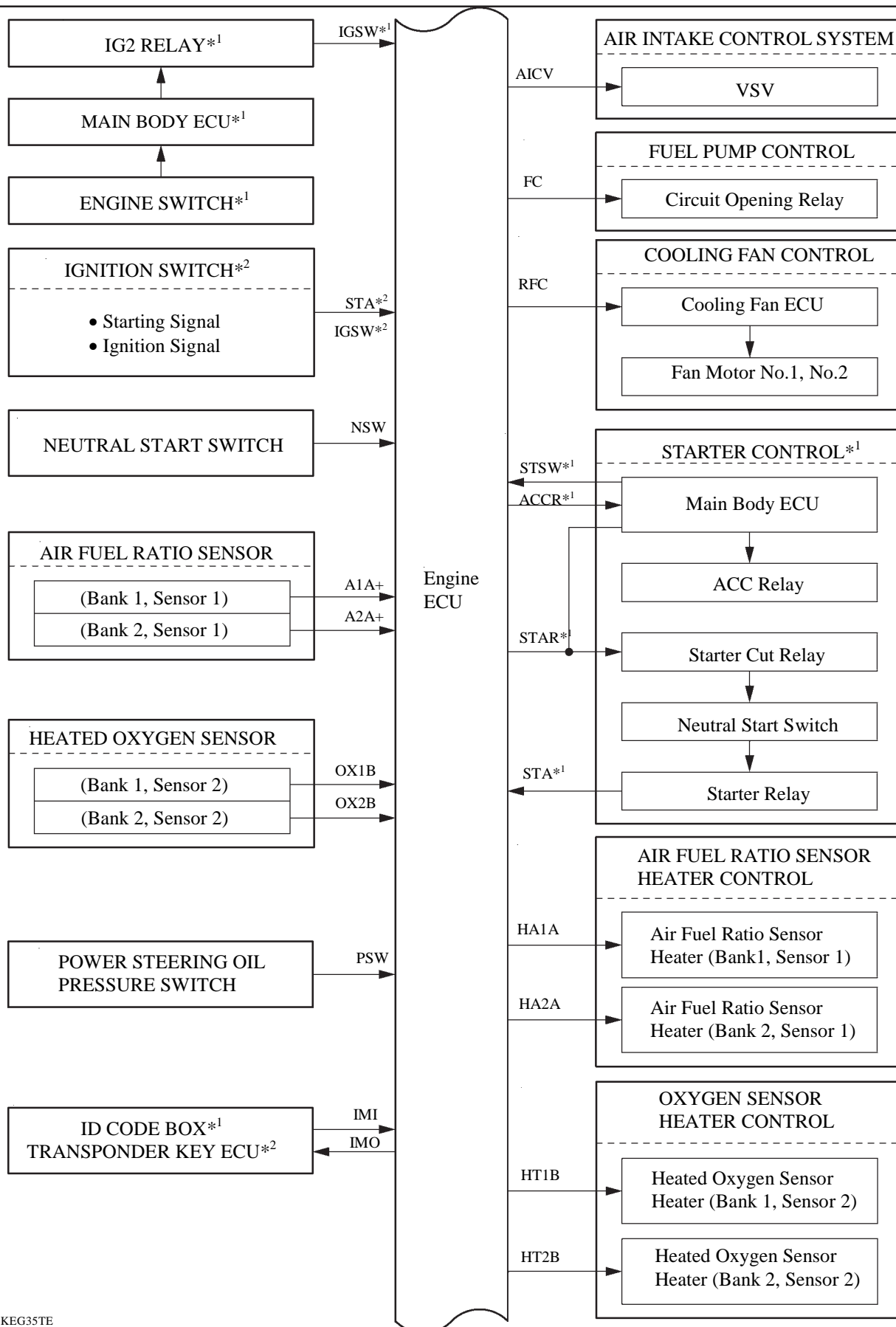
System	Outline
Air Conditioner Cut-off Control	By turning the air conditioner compressor ON or OFF in accordance with the engine condition, drivability is maintained.
Cooling Fan Control [See page EG-67]	The Cooling Fan ECU linearly controls the speed of the fans in accordance with the engine coolant temperature, vehicle speed, engine speed, and air conditioner operating conditions. As a result, the cooling performance is improved.
Starter Control* (Cranking Hold Function) [See page EG-69]	<ul style="list-style-type: none"> <li>Once the engine switch is pushed, while the brake pedal is depressed, this control continues to operate the starter until the engine started.</li> </ul>
Air Fuel Ratio Sensor and Oxygen Sensor Heater Control	Maintains the temperature of the air fuel ratio sensor or oxygen sensor at an appropriate level to increase accuracy of detection of the oxygen concentration in the exhaust gas.
Evaporative Emission Control	The engine ECU controls the purge flow of evaporative emission (HC) in the canister in accordance with engine conditions.
Active Control Engine Mount [See page EG-34]	The damping characteristic of the front engine mount is controlled variably to reduce idling vibration.
Engine Immobiliser	Prohibits fuel delivery and ignition if an attempt is made to start the engine with an invalid key.
Diagnosis [See page EG-71]	When the engine ECU detects a malfunction, the engine ECU diagnoses and memorises the failed section.
Fail-Safe [See page EG-71]	When the engine ECU detects a malfunction, the engine ECU stops or controls the engine according to the data already stored in the memory.

\*: Only for models with smart entry and start system

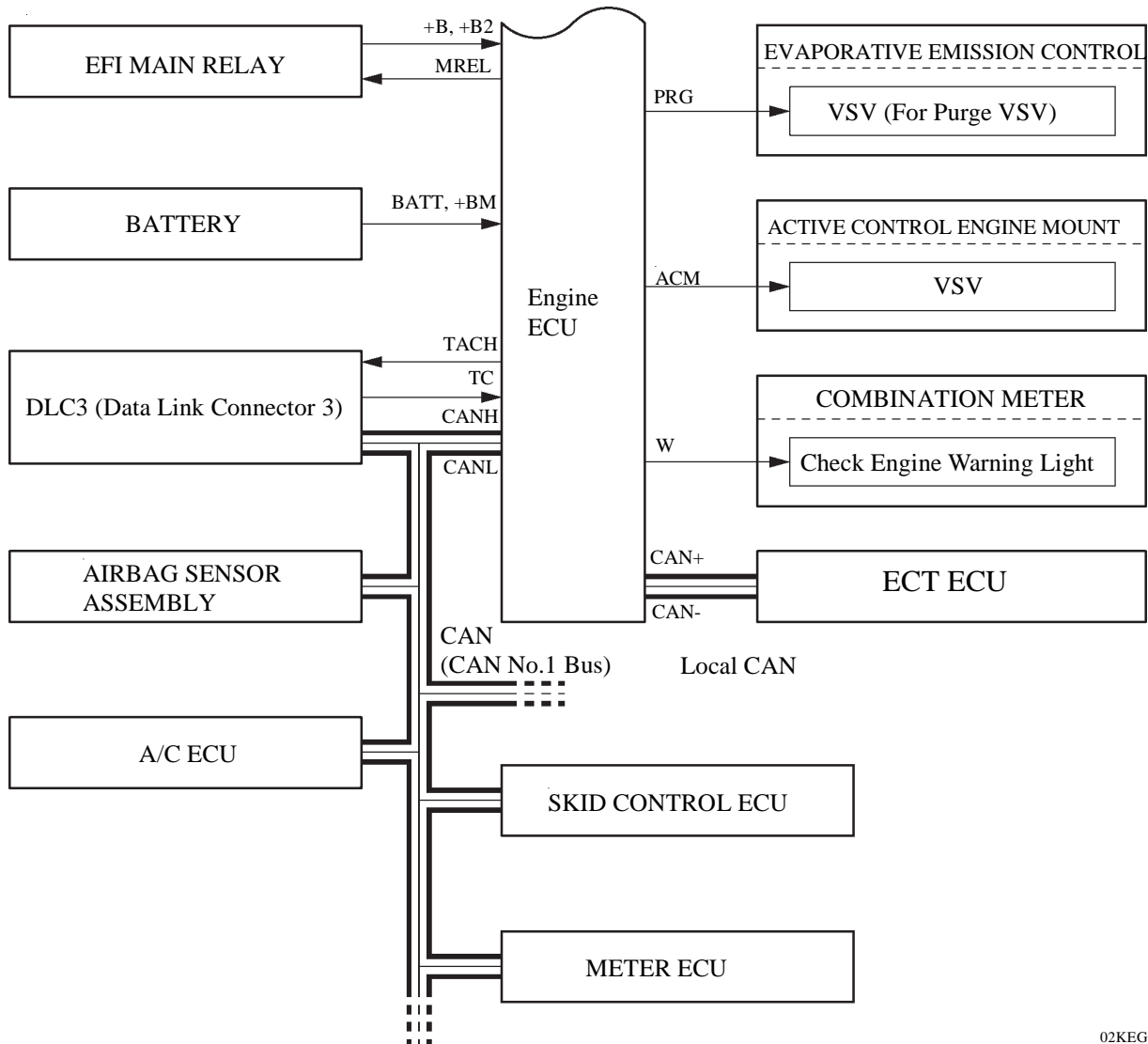
## 2. Construction

The configuration of the engine control system is as shown in the following chart.







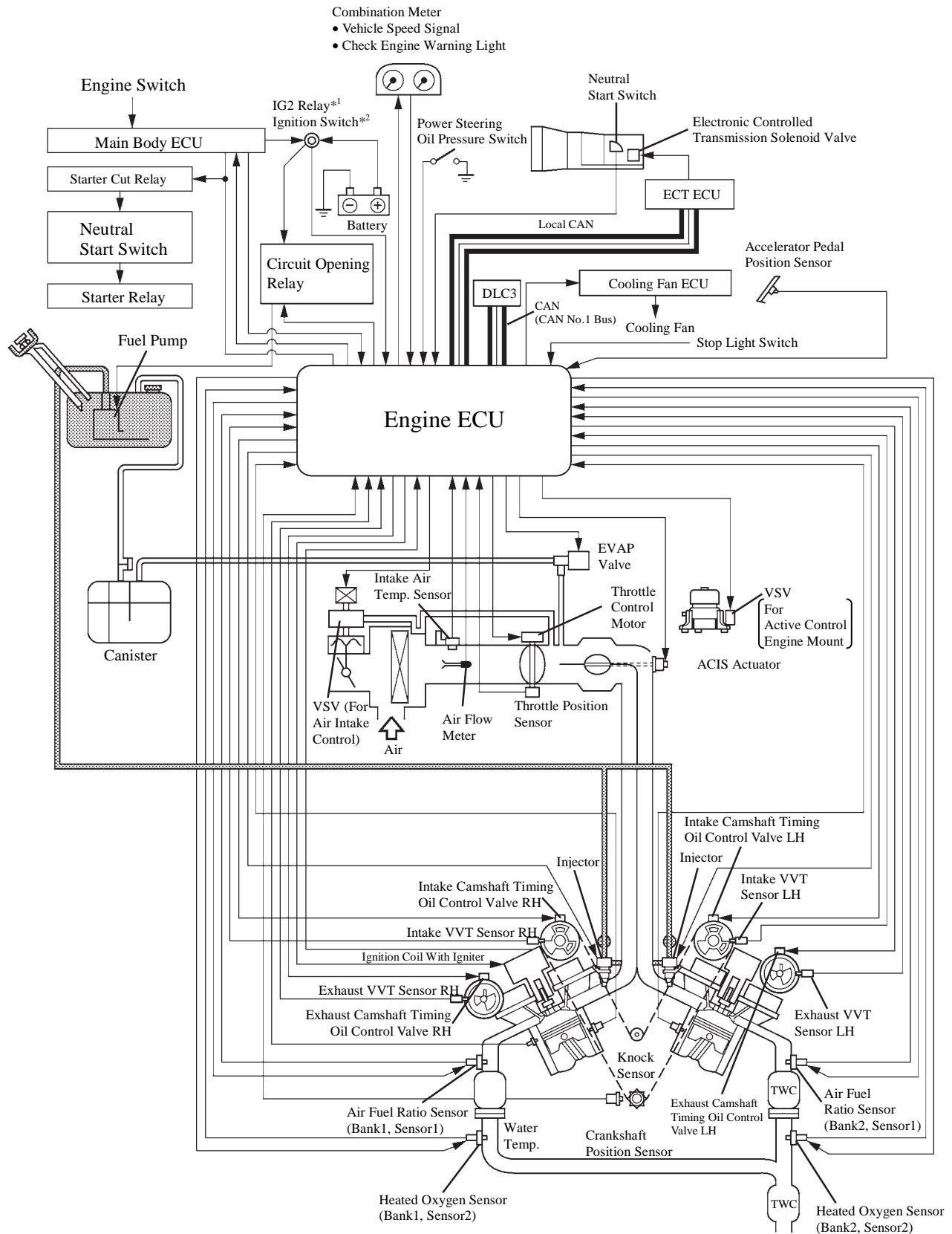


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\*1: Only for models with smart entry and start system

\*2: Only for models without smart entry and start system

### 3. Engine Control System Diagram



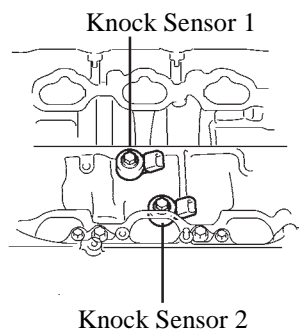
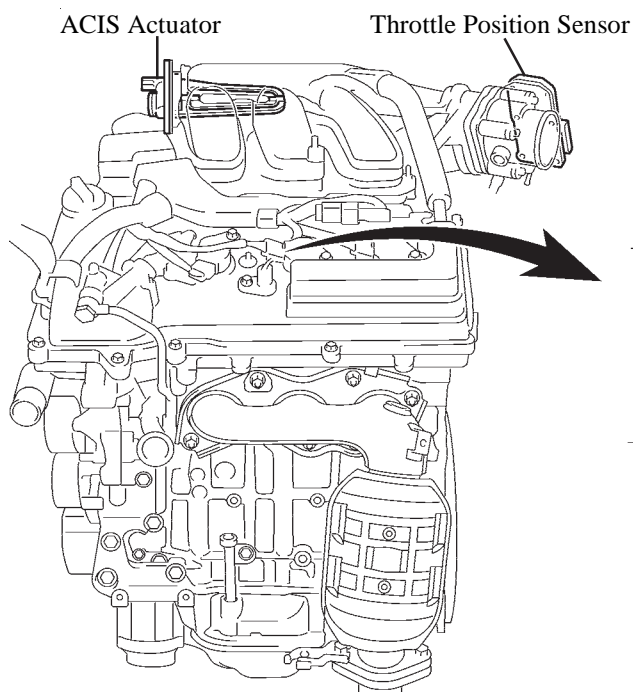
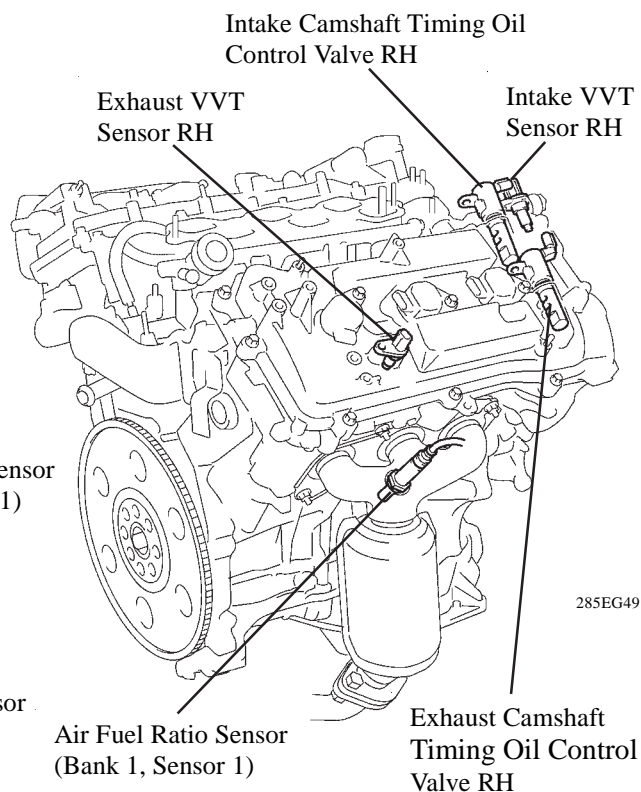
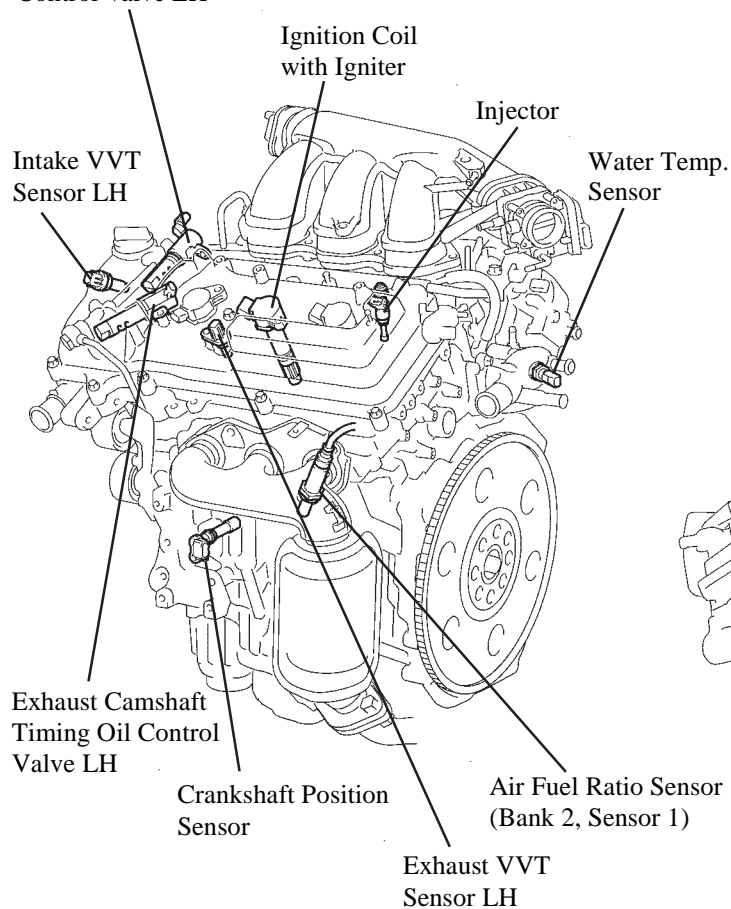
\*<sup>1</sup>: Only for models with smart entry and start system

\*<sup>2</sup>: Only for models without smart entry and start system

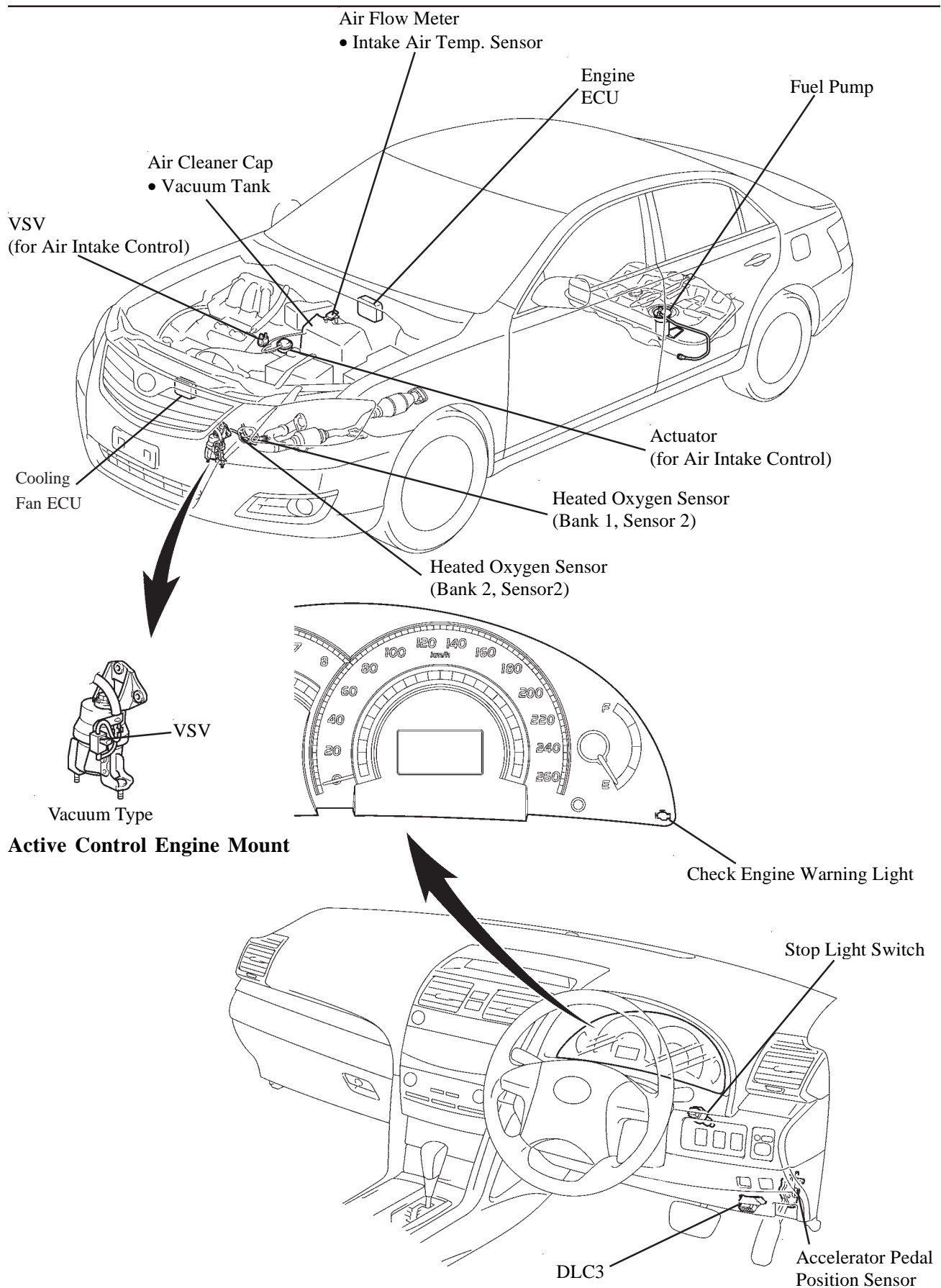
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## 4. Layout of Main Components

Intake Camshaft Timing Oil  
Control Valve LH



285EG50



## 5. Main Component of Engine Control System

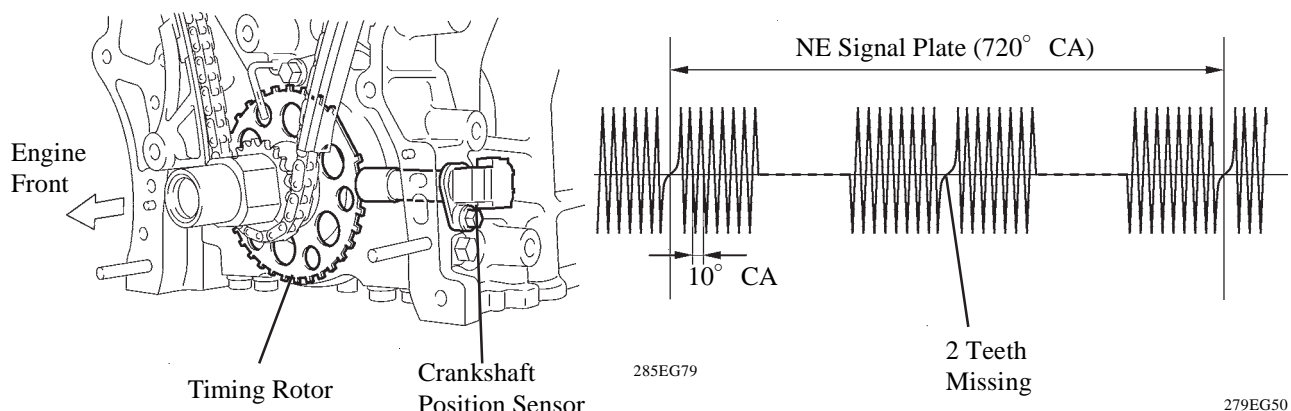
### General

The main components of the 2GR-FE engine control system are as follows:

Components	Outline	Qty	Function
Engine ECU	32-bit CPU	1	The engine ECU optimally controls the EFI ESA and ISC to suit the operating conditions of the engine in accordance with the signals provided by the sensors.
Oxygen Sensor (Bank 1, Sensor 2) (Bank 2, Sensor 2)	Cup Type with Heater	2	<ul style="list-style-type: none"> <li>This sensor detects the oxygen concentration in the exhaust emission by measuring the electromotive force which is generated in the sensor itself.</li> </ul>
Air Fuel Ratio Sensor (Bank 1, Sensor 1) (Bank 2, Sensor 1)	Planar Type with Heater	2	<ul style="list-style-type: none"> <li>As with the oxygen sensor, this sensor detects the oxygen concentration in the exhaust emission. However, it detects the oxygen concentration in the exhaust emission linearly.</li> </ul>
Air Flow Meter	Hot-wire Type	1	<ul style="list-style-type: none"> <li>This sensor has a built-in hot-wire to directly detect the intake air mass.</li> </ul>
Crankshaft Position Sensor (Rotor Teeth)	Pick-up Coil Type (36-2)	1	This sensor detects the engine speed and performs the cylinder identification.
Intake VVT Sensor LH, RH (Rotor Teeth)	MRE Type (3)	2	This sensor performs the cylinder identification.
Exhaust VVT Sensor LH, RH (Rotor Teeth)	MRE Type (3)	2	This sensor performs the cylinder identification.
Water Temperature Sensor	Thermistor Type	1	This sensor detects the engine coolant temperature by means of an internal thermistor.
Intake Air Temperature Sensor	Thermistor Type	1	This sensor detects the intake air temperature by means of an internal thermistor.
Knock Sensor 1,2	Built-in Piezoelectric Type (Flat Type)	2	This sensor detects an occurrence of the engine knocking indirectly from the vibration of the cylinder block caused by the occurrence of engine knocking.
Throttle Position Sensor	No-contact Type	1	<ul style="list-style-type: none"> <li>This sensor detects the throttle valve opening angle.</li> </ul>
Accelerator Pedal Position Sensor	No-contact Type	1	<ul style="list-style-type: none"> <li>This sensor detects the amount of pedal effort applied to the accelerator pedal.</li> </ul>
Injector	12-Hole Type	6	The injector is an electromagnetically-operated nozzle which injects fuel in accordance with signals from the engine ECU.

## Crankshaft Position Sensor

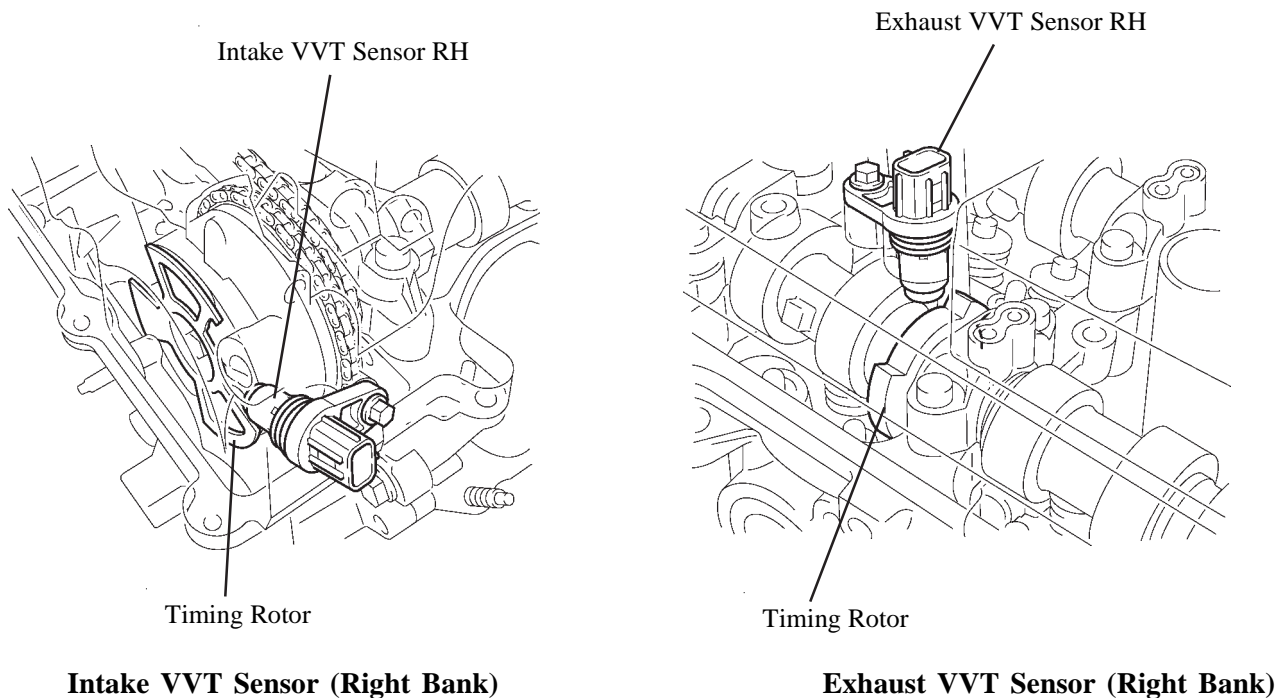
The timing rotor of the crankshaft consists of 34 teeth, with 2 teeth missing. The crankshaft position sensor outputs the crankshaft rotation signals every  $10^\circ$ , and the missing teeth are used to determine the top-dead-centre.



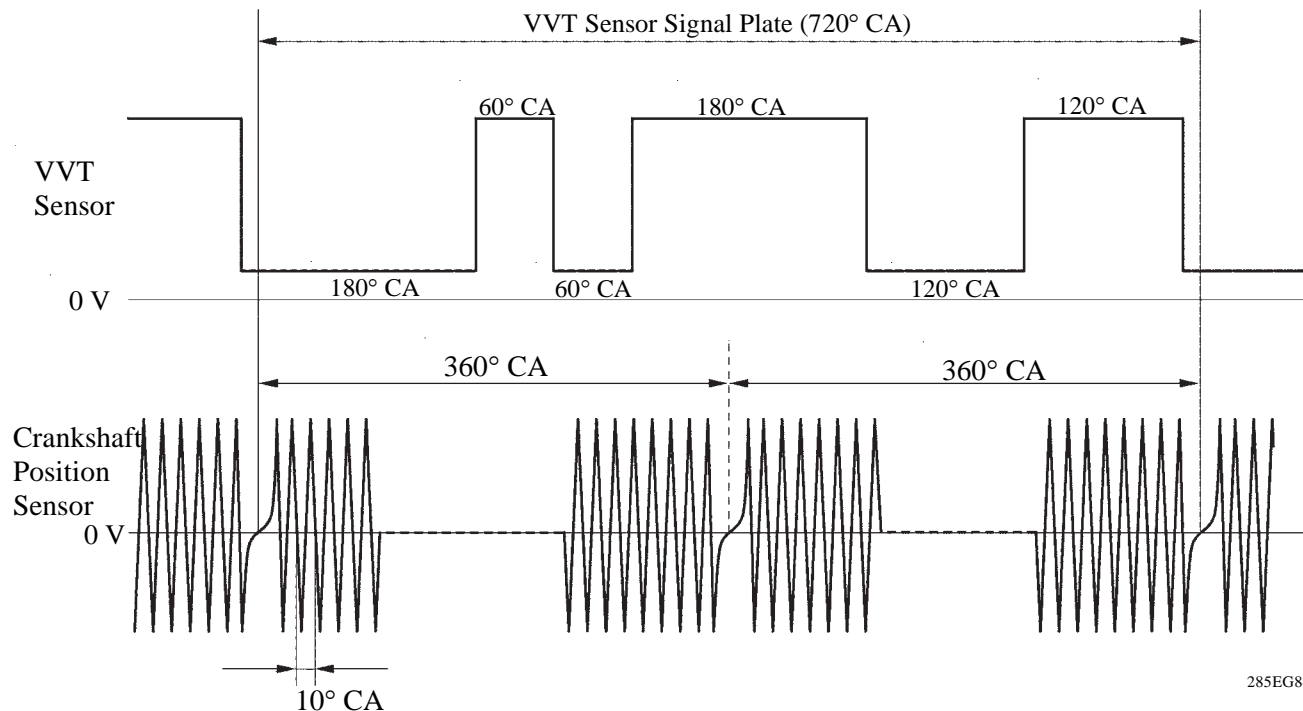
## Intake and Exhaust VVT Sensors

### 1) General

The MRE (Magnetic Resistance Element) type intake and exhaust VVT sensors are used. To detect the camshaft position, a timing rotor that is secured to the camshaft in front of the VVT controller is used to generate 6 (3 Hi Output, 3 Lo Output) pulses for every 2 revolutions of the crankshaft.



## ► Sensor Output Waveforms ◀



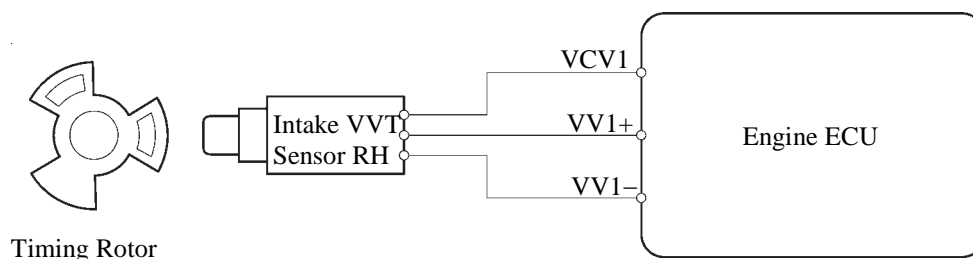
285EG84

### 2) MRE Type VVT Sensor

- The MRE type VVT sensor consists of an MRE, a magnet and a sensor. The direction of the magnetic field changes due to the different shapes (protruded and non-protruded portions) of the timing rotor, which passes by the sensor. As a result, the resistance of the MRE changes, and the output voltage to the engine ECU changes to Hi or Lo. The engine ECU detects the camshaft position based on this output voltage.
- The differences between the MRE type VVT sensor and the pickup coil type VVT sensor used on the conventional model are as follows.

Item	Sensor Type	
	MRE	Pick-up Coil
Signal Output	Constant digital output starts from low engine speeds.	Analog output changes with the engine speed.
Camshaft Position Detection	Detection is made by comparing the NE signals with the Hi/Lo output switch timing due to the protruded/non-protruded portions of the timing rotor, or made based on the number of the input NE signals during Hi/Lo outputs.	Detection is made by comparing the NE signals with the change of waveform that is output when the protruded portion of the timing rotor passes.

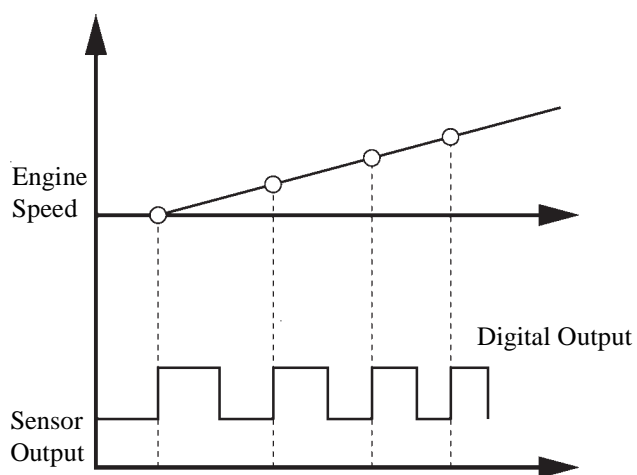
# ▶ Wiring Diagram ◀



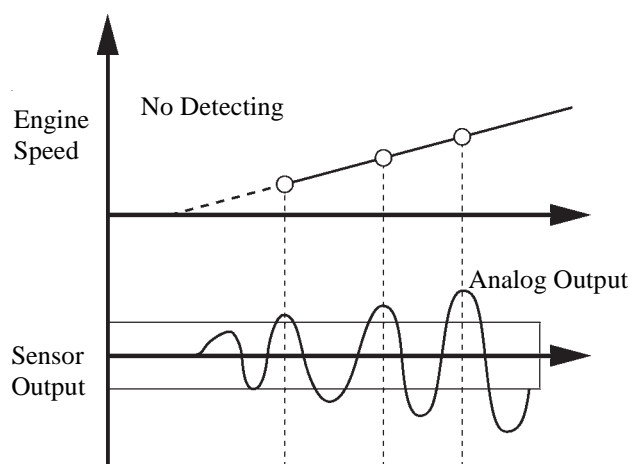
271EG160

**Intake VVT Sensor RH**

# ▶ MRE Type and Pick-up Coil Type Output Waveform Image Comparison ◀



**MRE Type**



**Pick-up Coil Type**



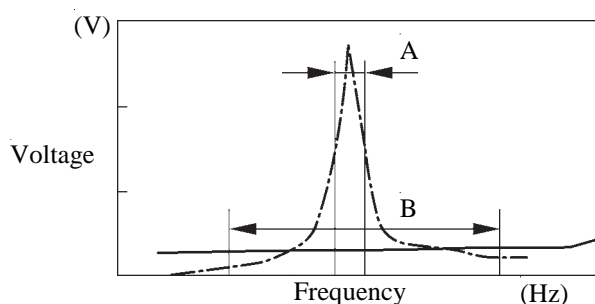
## Knock Sensor (Flat Type)

### 1) General

In the conventional type knock sensor (resonant type), a vibration plate, which has the same resonance point as the knocking frequency of the engine, is built in and can detect the vibration in this frequency band. On the other hand, a flat type knock sensor (non-resonant type) has the ability to detect vibration in a wider frequency band from about 6 kHz to 15 kHz, and has the following features:

- The engine knocking frequency will change a bit depending on the engine speed. The flat type knock sensor can detect vibration even when the engine knocking frequency is changed. Thus the vibration detection ability is increased compared to the conventional type knock sensor, and a more precise ignition timing control is possible.

— · — : Conventional Type  
 — : Flat Type



A: Detection Band of  
Conventional Type

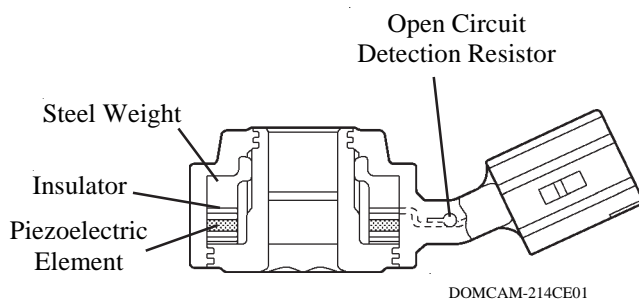
B: Detection Band of  
Flat Type

Characteristic of Knock Sensor

DOMCAM-214CE04

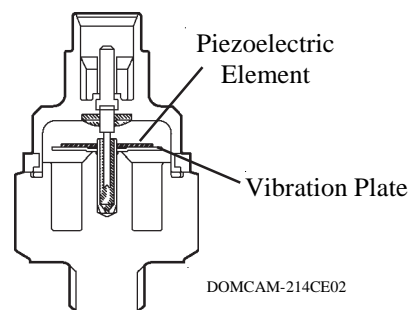
### 2) Construction

- The flat type knock sensor is installed on the engine through the stud bolt installed on the cylinder block. For this reason, a hole for the stud bolt is running through in the centre of the sensor.
- Inside of the sensor, a steel weight is located on the upper portion and a piezoelectric element is located under the weight through the insulator.
- The open/short circuit detection resistor is integrated.



Flat Type Knock Sensor  
(Non-Resonant Type)

DOMCAM-214CE01

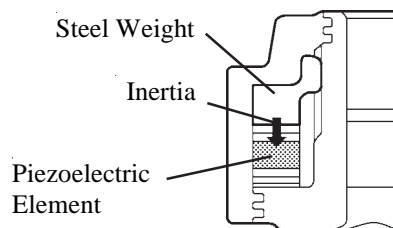


Conventional Type Knock Sensor  
(Resonant Type)

DOMCAM-214CE02

### 3) Operation

The knocking vibration is transmitted to the steel weight and its inertia applies pressure to the piezoelectric element. The action generates electromotive force.

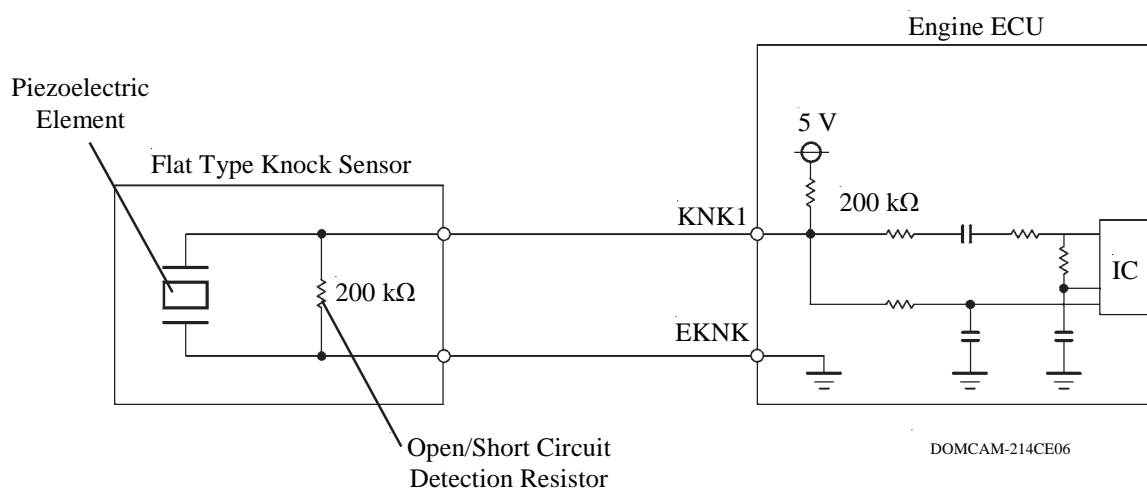


DOMCAM-214CE08

### 4) Open/Short Circuit Detection Resistor

During the ignition is ON, the open/short circuit detection resistor in the knock sensor and the resistor in the engine ECU keep the voltage at the terminal KNK1 of engine constant.

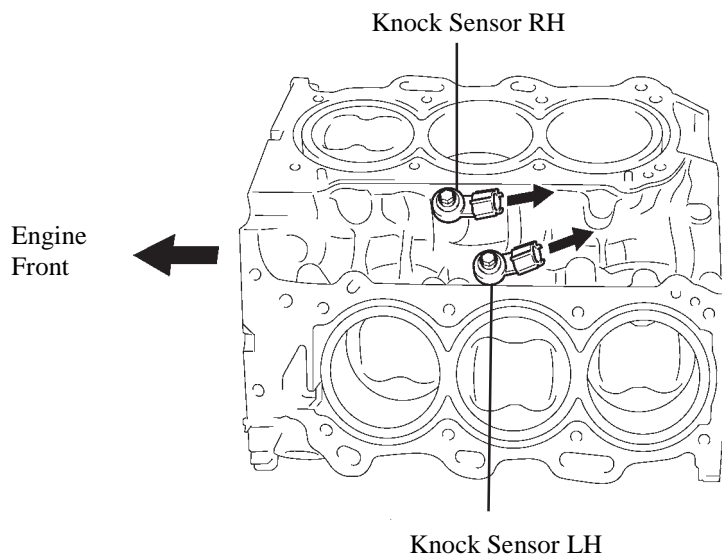
An IC (Integrated Circuit) in the engine ECU is always monitoring the voltage of the terminal KNK1. If the open/short circuit occurs between the knock sensor and the engine ECU, the voltage of the terminal KNK1 will change and the engine ECU detects the open/short circuit and stores DTC (Diagnostic Trouble Code).



DOMCAM-214CE06

### Service Tip

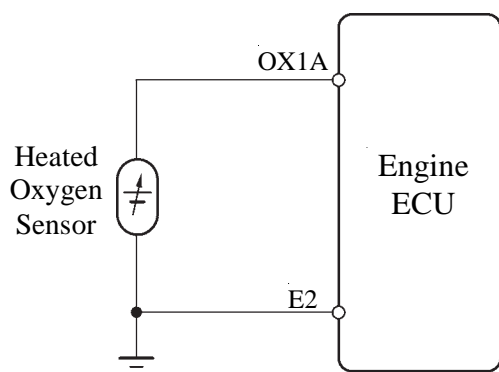
These knock sensors are mounted in the specific directions and angles as illustrated. To prevent the right and left bank connectors from being interchanged, make sure to install each sensor in its prescribed direction.



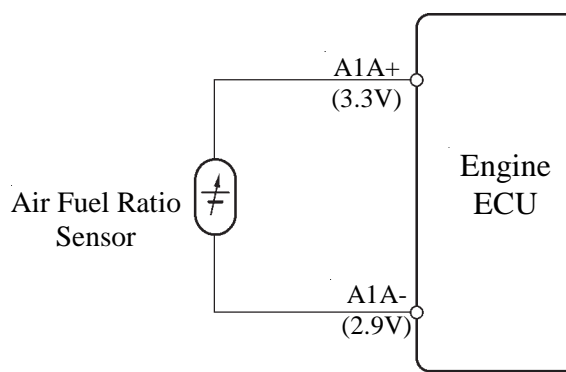
## Heated Oxygen Sensor and Air Fuel Ratio Sensor

### 1) General

- The heated oxygen sensor and the air fuel ratio sensor differ in output characteristics.
- The output voltage of the heated oxygen sensor changes in accordance with the oxygen concentration in the exhaust gas. The engine ECU uses this output voltage to determine whether the present air-fuel ratio is richer or leaner than the stoichiometric air-fuel ratio.
- Approximately 0.4V is constantly applied to the air-fuel ratio sensor, which outputs an amperage that varies in accordance with the oxygen concentration in the exhaust gas. The engine ECU converts the changes in the output amperage into voltage in order to linearly detect the present air-fuel ratio.

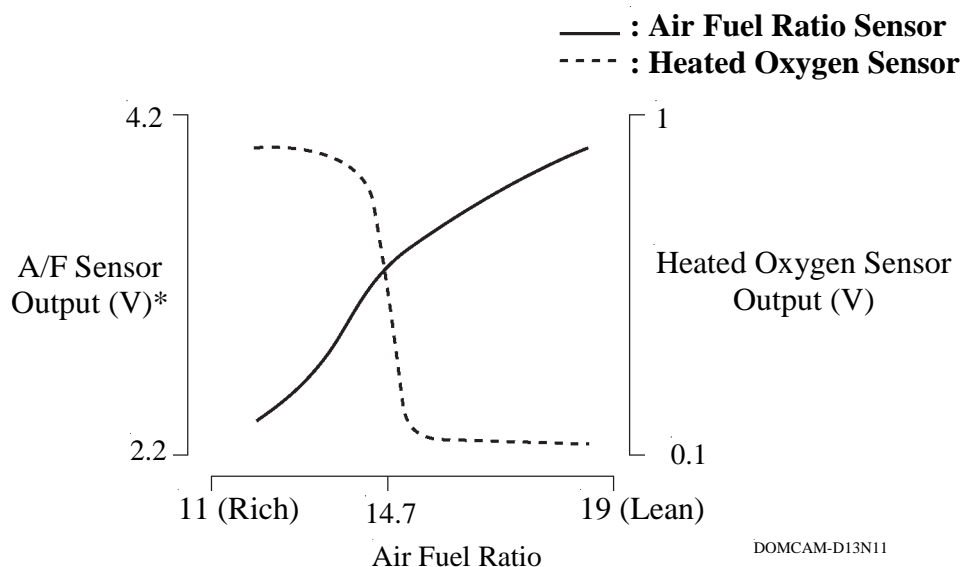


**Heated Oxygen Sensor Circuit**



**Air Fuel Ratio Sensor Circuit**

DOMCAM-271EG44

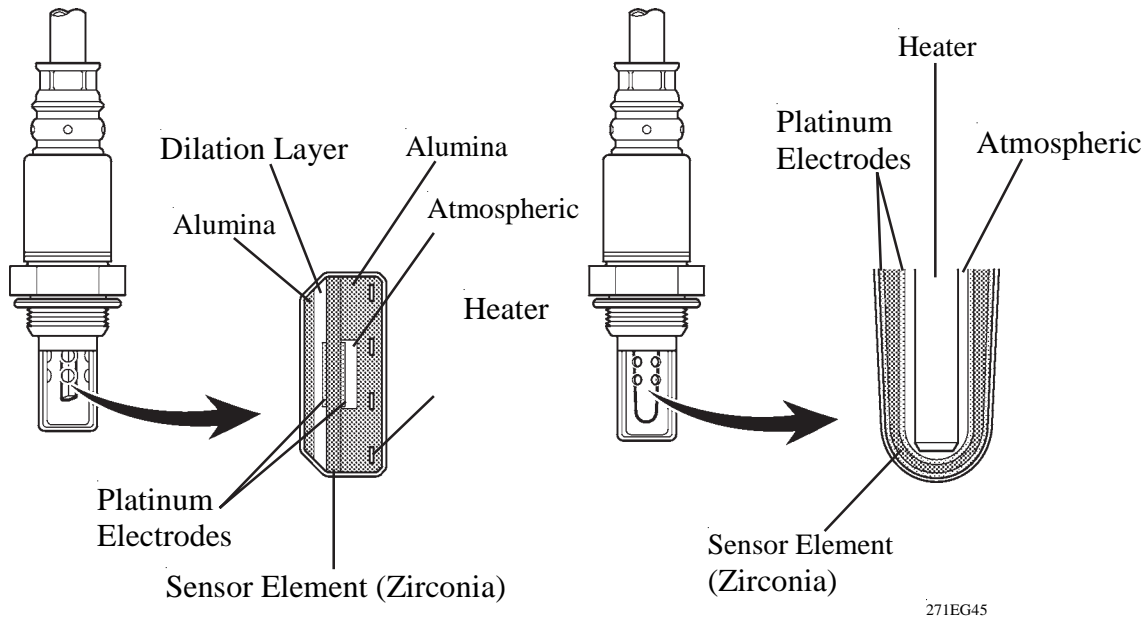


DOMCAM-D13N11

\*: This calculation value is used internally in the engine ECU, and is not an engine ECU terminal voltage.

## 2) Construction

- The basic construction of the heated oxygen sensor and the air-fuel ratio sensor is the same. However, they are divided into the cup type and the planar type, according to the different types of heater construction that are used.
- The cup type sensor contains a sensor element that surrounds a heater.
- The planar type sensor uses alumina, which excels in heat conductivity and insulation, to integrate a sensor element with a heater, thus improving the warm-up performance of the sensor.



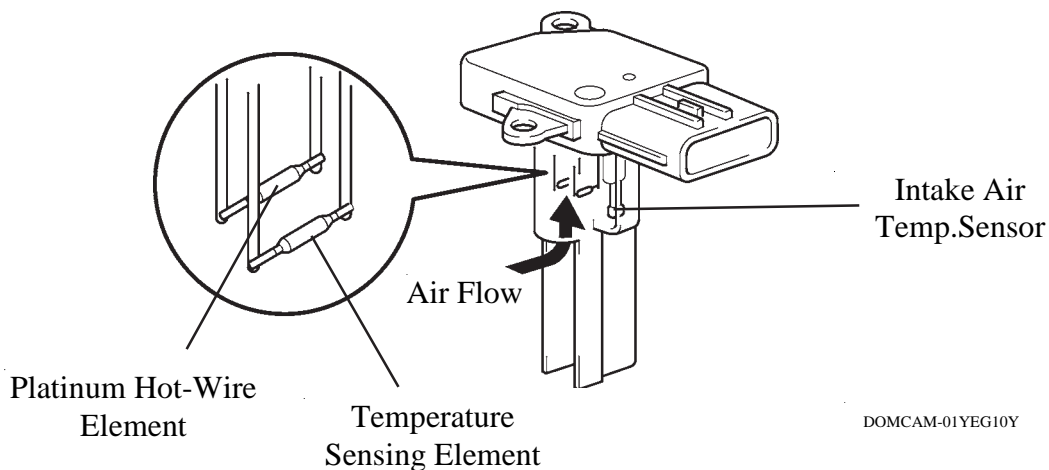
271EG45

**Planar Type Air Fuel Ratio Sensor**

**Cup Type Heated Oxygen Sensor**

## Air Flow Meter

- This air flow meter, which is a plug-in type, allows a portion of the intake air to flow through the detection area. By directly measuring the mass and the flow rate of the intake air, the detection precision is improved and the intake air resistance is reduced.
- This air flow meter has a built-in intake air temperature sensor.

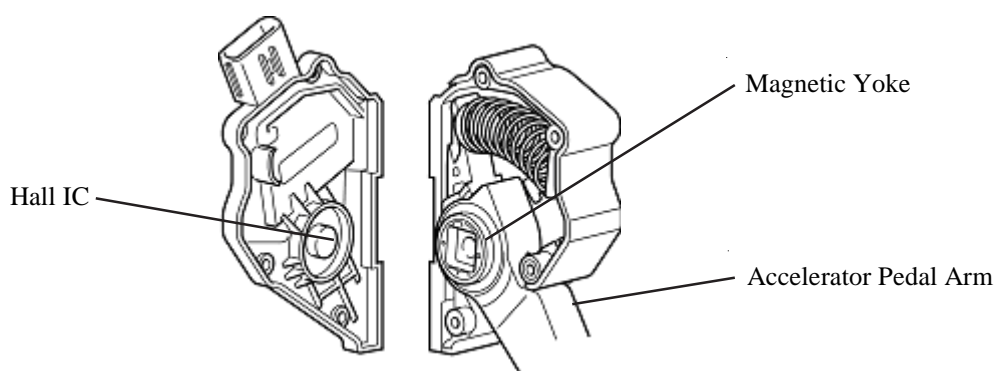


DOMCAM-01YEG10Y

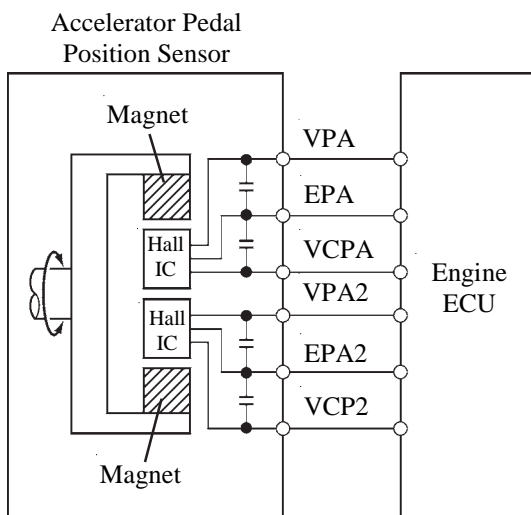
## Accelerator Pedal Position Sensor

This no-contact type accelerator pedal position sensor uses a Hall IC, which is mounted on the accelerator pedal arm.

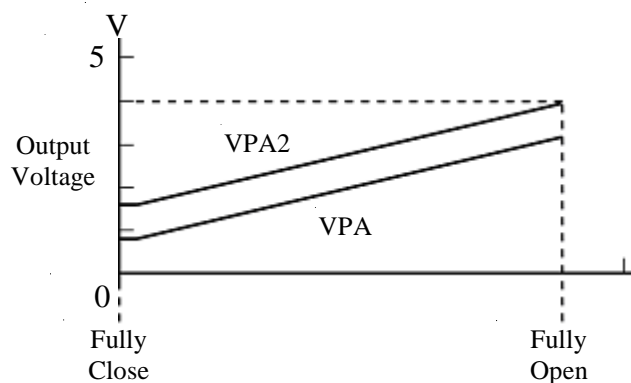
- The magnetic yoke is mounted at the base of the accelerator pedal arm. This yoke rotates around the Hall IC in accordance with the amount of effort that is applied to the accelerator pedal. The Hall IC converts the changes in the magnetic flux that occur into electrical signals, and outputs them in the form of accelerator pedal position signals to the engine ECU.
- The Hall IC contains two circuits, one for the main signal, and one for the sub signal. It converts the accelerator pedal position (angle) into electric signals that have differing characteristics and outputs them to the engine ECU.



DOMCAM-0140EG125C



DOMCAM-228TU24



Accelerator Pedal Position (Angle)

DOMCAM-0140EG126C

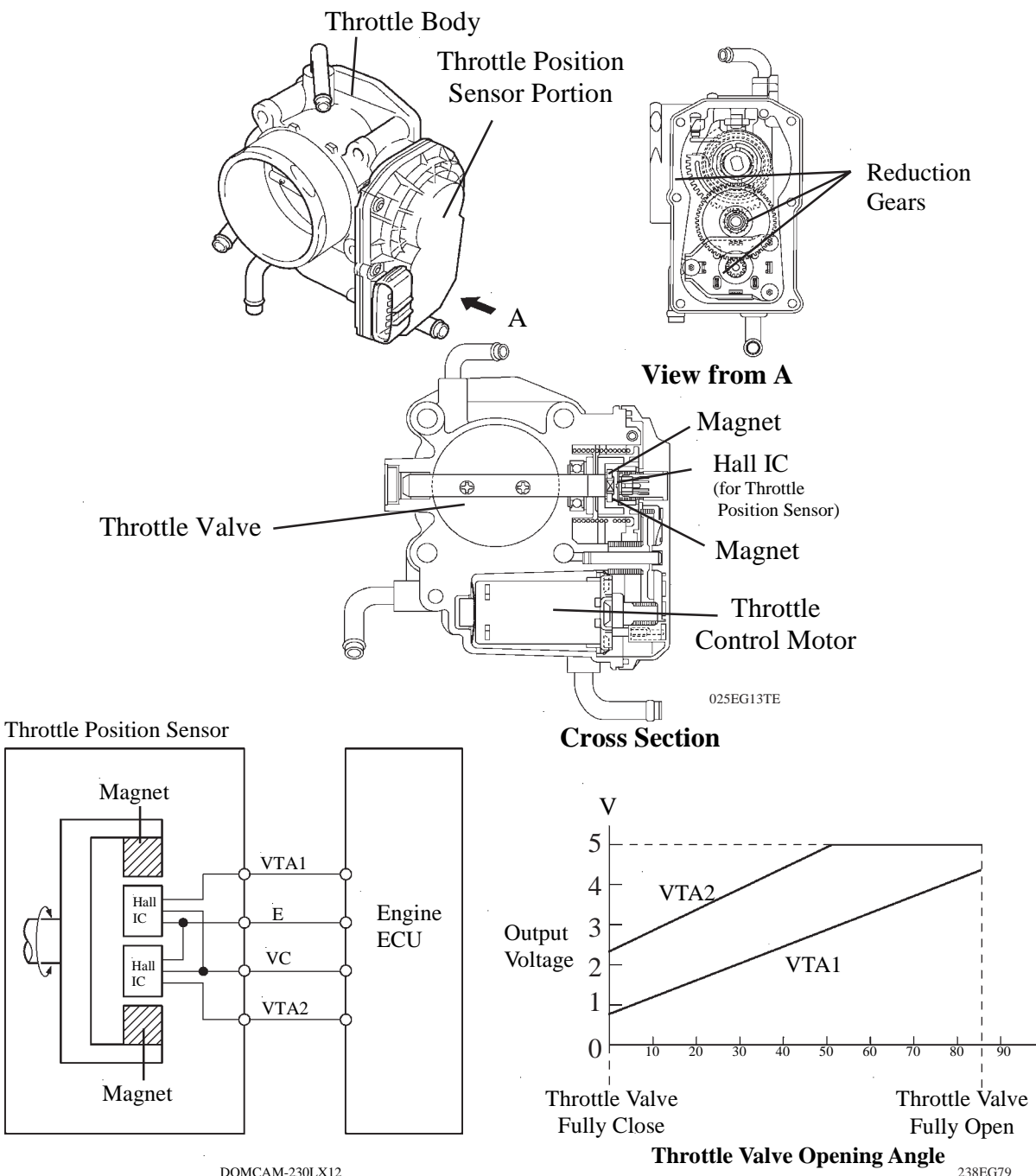
### Service Tip

The inspection method differs from a conventional accelerator pedal position sensor because this sensor uses a Hall IC. For details, refer to the Aurion Repair Manual.

## Throttle Position Sensor

The no-contact type throttle position sensor uses a Hall IC, which is mounted on the throttle body.

- The Hall IC is surrounded by a magnetic yoke. The Hall IC converts the changes that occur in the magnetic flux at that time into electrical signals and outputs them in the form of a throttle valve intention to the engine ECU.
- The Hall IC contains circuits for the main and sub signals. It converts the throttle valve opening angles into electric signals with two differing characteristics and outputs them to the engine ECU.



### Service Tip

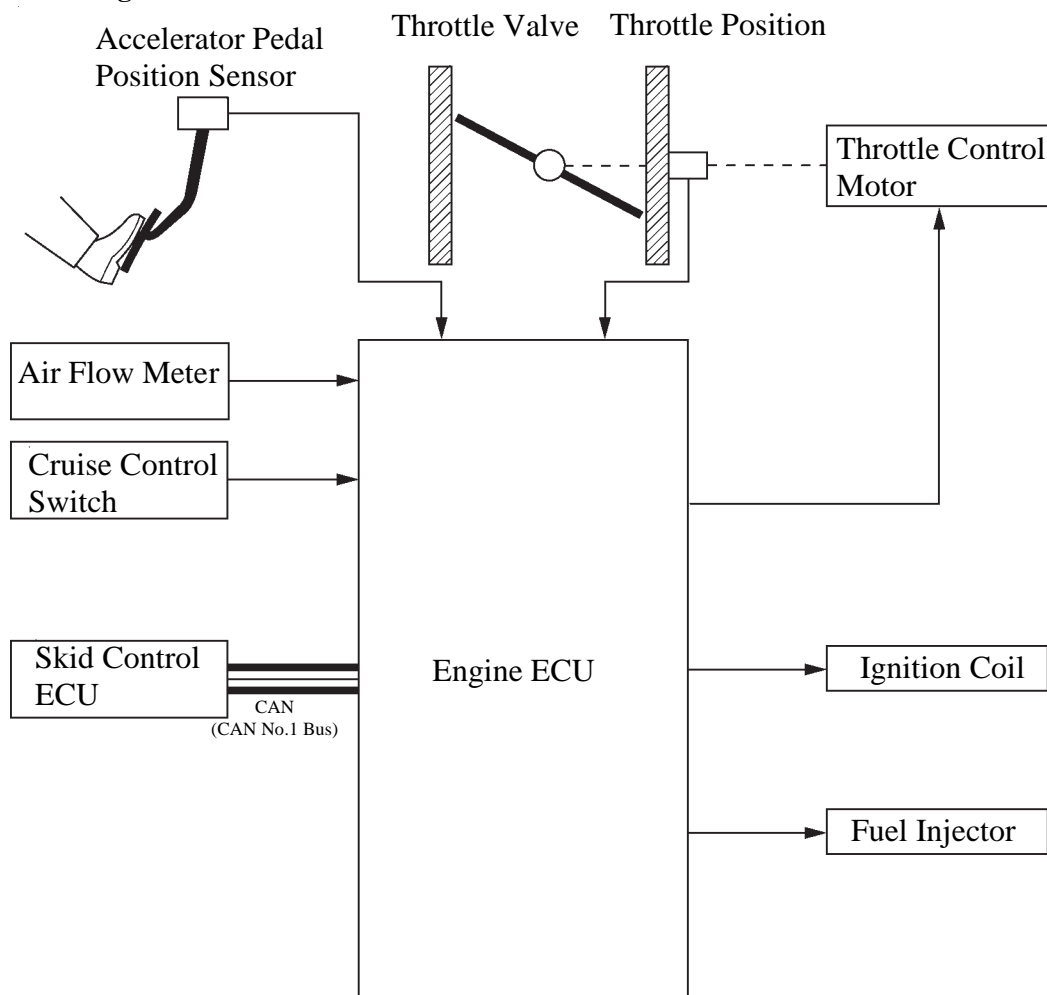
The inspection method differs from a conventional accelerator pedal position sensor because this sensor uses a Hall IC. For details, refer to the Aurion Repair Manual.

## 6. ETCS-i (Electronic Throttle Control System-intelligent)

### General

- In the conventional throttle body, the throttle valve angle is determined invariably by the amount of the accelerator pedal effort. In contrast, ETCS-i uses the engine ECU to calculate the optimal throttle valve angle that is appropriate for the respective driving condition and uses a throttle control motor to control the angle.
- In case of an abnormal condition, this system transfers to the limp mode. For details, see page EG-72.

### ▶ System Diagram ◀



01YEG11Y

### Control

#### 1) General

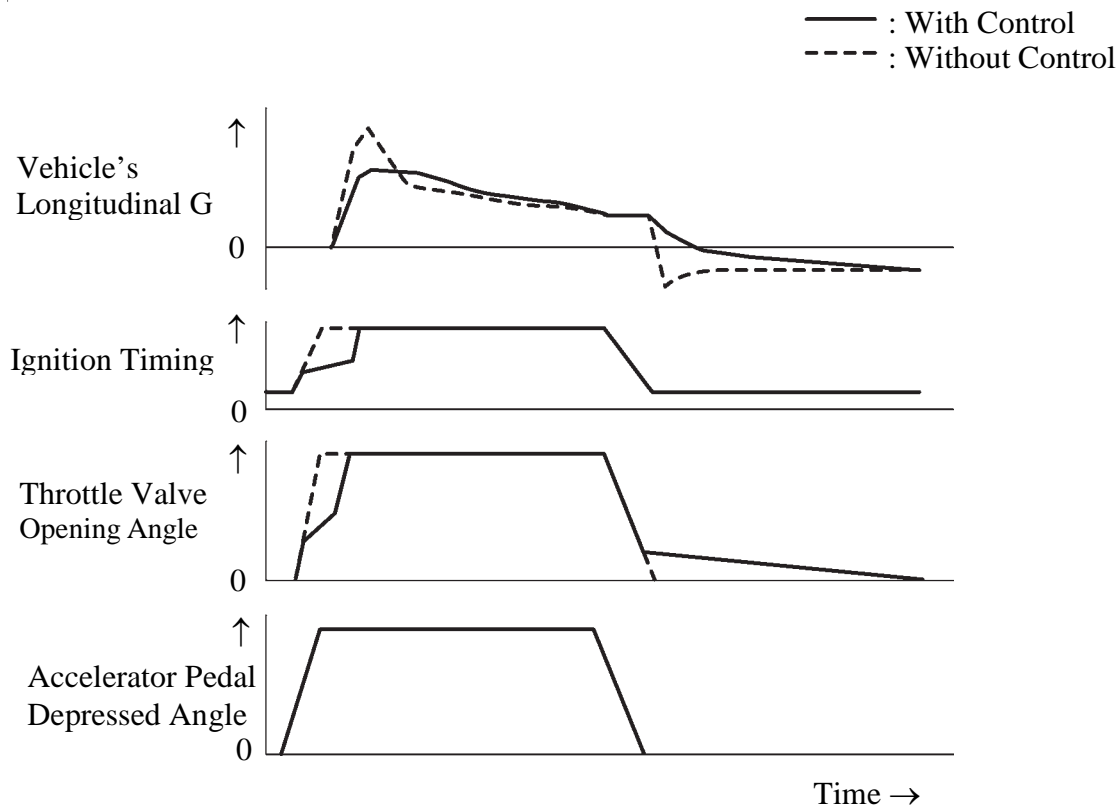
The ETCS-i consists of the following six functions:

- Normal Throttle Control (Non-linear Control)
- ISC (Idle Speed Control)
- TRC (Traction Control)
- VSC (Vehicle Stability Control)
- Cruise Control

## 2) Normal Throttle Control (non-linear control)

Controls the throttle to an optimal throttle valve angle that is appropriate for the driving condition such as the amount of the accelerator pedal effort and the engine speed in order to realise excellent throttle control and comfort in all operating ranges.

### ▸ Conceptual Diagrams of Engine Control During Acceleration and Deceleration ◀



## 3) Idle Speed Control

The engine ECU controls the throttle valve in order to constantly maintain an ideal idle speed.

## 4) TRC Throttle Control

As part of the TRC system, the throttle valve is closed by a demand signal from the skid control ECU if an excessive amount of slippage is created at a driving wheel, thus facilitating the vehicle in ensuring excellent vehicle stability and driving force.

## 5) VSC Coordination Control

In order to bring the effectiveness of the VSC system control into full play, the throttle valve angle is controlled by effecting a coordination control with the skid control ECU.

## 6) Cruise Control

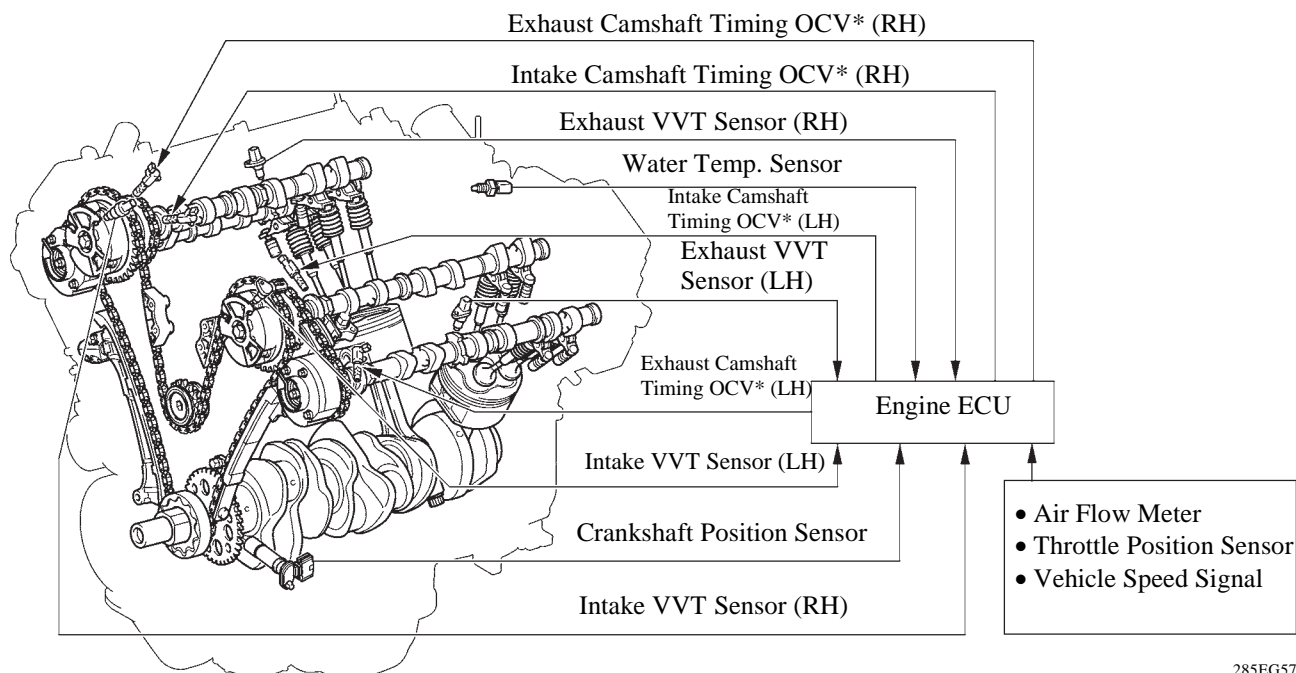
An engine ECU with an integrated cruise control ECU directly actuates the throttle valve for operation of the cruise control.



## 7. Dual VVT-i (Variable Valve Timing-intelligent) System

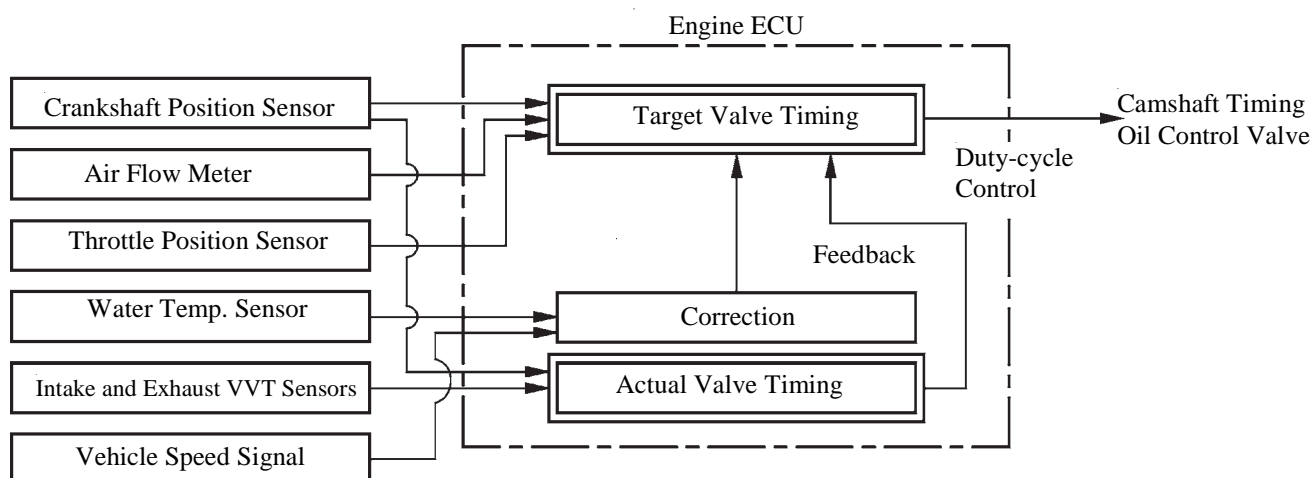
### General

- The dual VVT-i system is designed to control the intake and exhaust camshafts within a range of 40° and 35° respectively (of Crankshaft Angle) to provide valve timing that is optimally suited to the engine condition. This improves torque in all the speed ranges as well as increasing fuel economy, and reducing exhaust emissions.



\*: Oil Control Valve

- By using the engine speed, intake air volume, throttle position and engine coolant temperature, the engine ECU calculates optimal valve timing for each driving condition and controls the camshaft timing oil control valve. In addition, the engine ECU uses signals from the camshaft position sensor and the crankshaft position sensor to detect the actual valve timing, thus providing feedback control to achieve the target valve timing.



**Effectiveness of the VVT-i System**

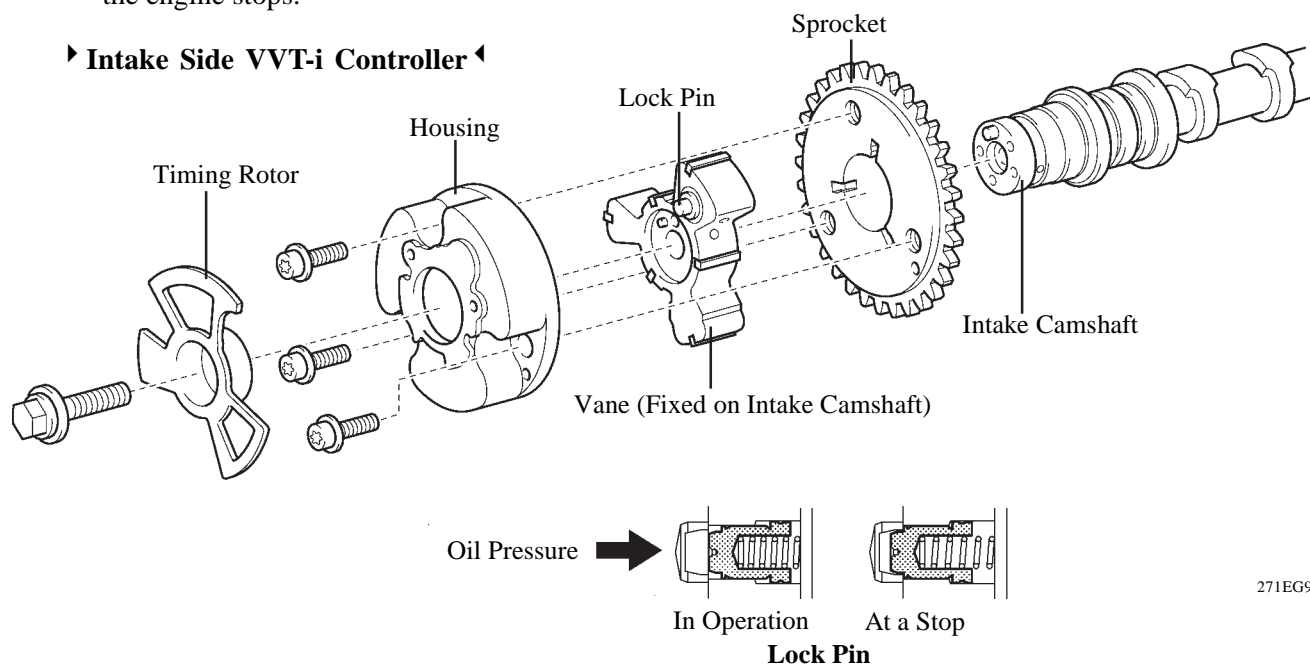
Operation State	Objective	Effect
During Idling	<p>Eliminating overlap to reduce blow back to the intake side.</p> <p>285EG59</p>	<ul style="list-style-type: none"> <li>• Stabilised idling rpm</li> <li>• Better fuel economy</li> </ul>
At Light Load	<p>Eliminating overlap to reduce blow back to the intake side.</p> <p>285EG60</p>	Ensured engine stability
At Medium Load	<p>Increasing overlap increases internal EGR, reducing pumping loss.</p> <p>285EG61</p>	<ul style="list-style-type: none"> <li>• Better fuel economy</li> <li>• Improved emission control</li> </ul>
In Low to Medium Speed Range with Heavy Load	<p>Advancing the intake valve close timing for volumetric efficiency improvement.</p> <p>285EG62</p>	Improved torque in low to medium speed range
In High Speed Range with Heavy Load	<p>Retarding the intake valve close timing for volumetric efficiency improvement.</p> <p>285EG63</p>	Improved output
At Low Temperatures	<p>Eliminating overlap to reduce blow back to the intake side.</p> <p>285EG59</p>	<ul style="list-style-type: none"> <li>• Stabilised fast idle rpm</li> <li>• Better fuel economy</li> </ul>
<ul style="list-style-type: none"> <li>• Upon Starting</li> <li>• Stopping the Engine</li> </ul>	<p>Eliminating overlap to minimise blow back to the intake side.</p> <p>285EG59</p>	Improved start ability

## Construction

### 1) VVT-i Controller

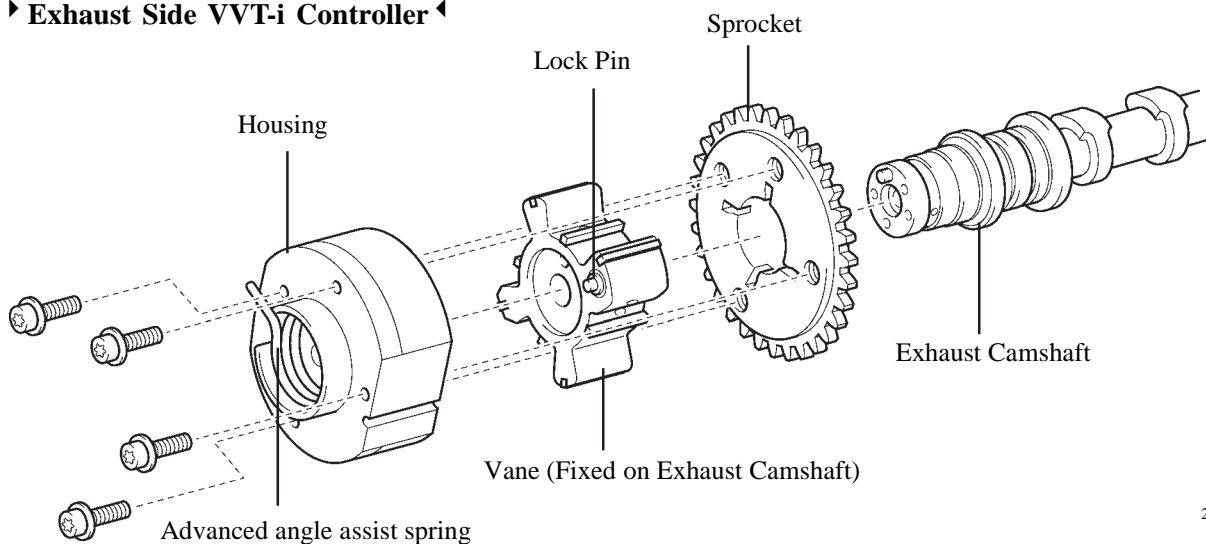
- This controller consists of the housing driven from the timing chain and the vane coupled with the intake and exhaust camshafts.
- The intake side has used a VVT-i controller with 3 vanes, and the exhaust side has used one with 4 vanes.
- When the engine stops, the intake side VVT-i controller is locked on the most retarded angle side by the lock pin, and the exhaust side controller is locked on the most advanced angle side. This ensures excellent engine start ability.
- The oil pressure sent from the advance or retard side path at the intake and exhaust camshaft causes rotation in the VVT-i controller vane circumferential direction to vary the intake valve timing continuously.
- An advanced angle assist spring is provided on the exhaust side VVT-i controller. This helps to apply torque in the advanced angle direction so that the vane lock pin securely engages with the housing when the engine stops.

#### ► Intake Side VVT-i Controller ◀



271EG93

#### ► Exhaust Side VVT-i Controller ◀

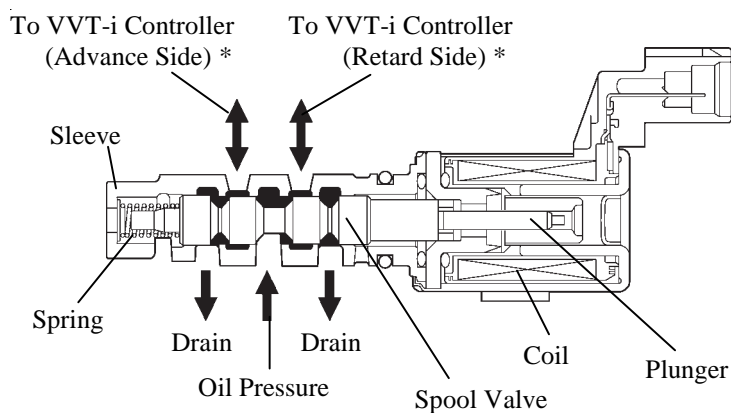


281EG47

## 2) Camshaft Timing Oil Control Valve

This camshaft timing oil control valve controls the spool valve using duty-cycle control from the engine ECU. This allows hydraulic pressure to be applied to the VVT-i controller advance or retard side. When the engine is stopped, the camshaft timing oil control valve is in the most retard position.

### ▶ Intake Camshaft Timing Oil Control Valve ◀



238EG62

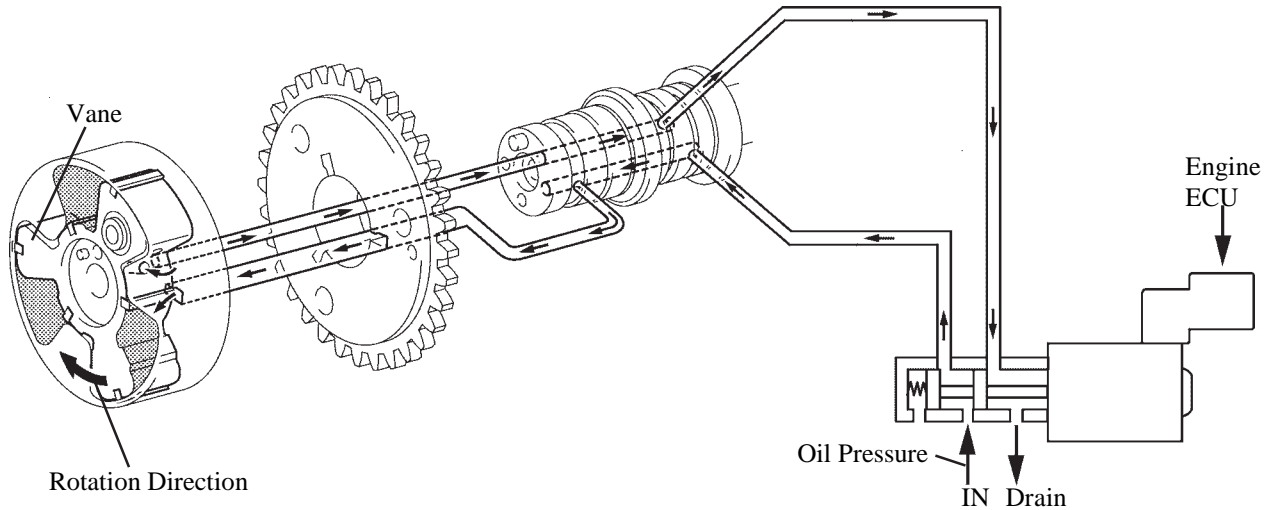
\*: The advance and retard sides of the exhaust side oil control valve are reverse of the intake side.

## Operation

### 1) Advance

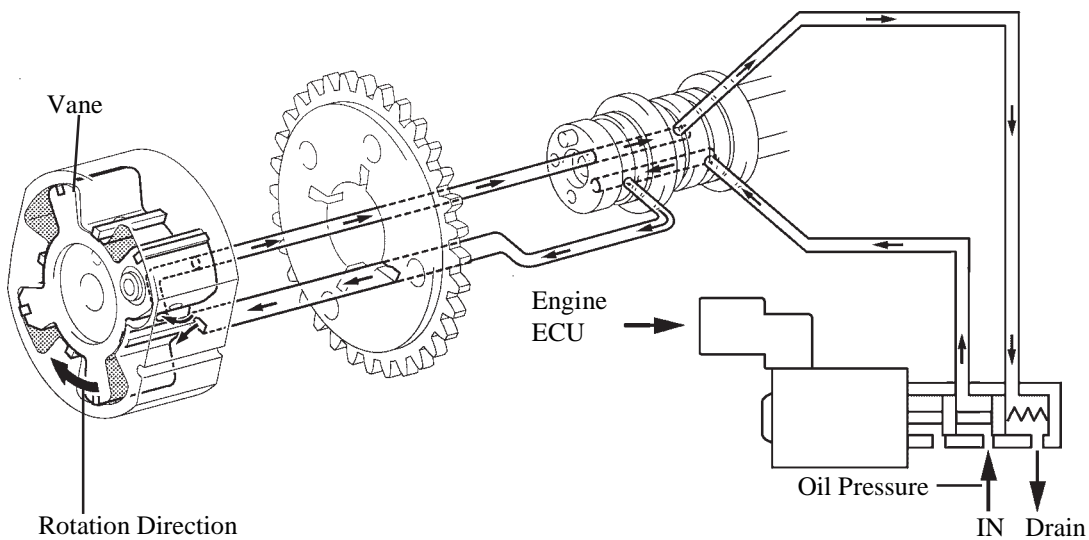
When the camshaft timing oil control valve is positioned as illustrated below by the advance signals from the engine ECU, the resultant oil pressure is applied to the timing advance side vane chamber to rotate the camshaft in the timing advance direction.

#### ▸ Intake Side ◀



238EG63

#### ▸ Exhaust Side ◀

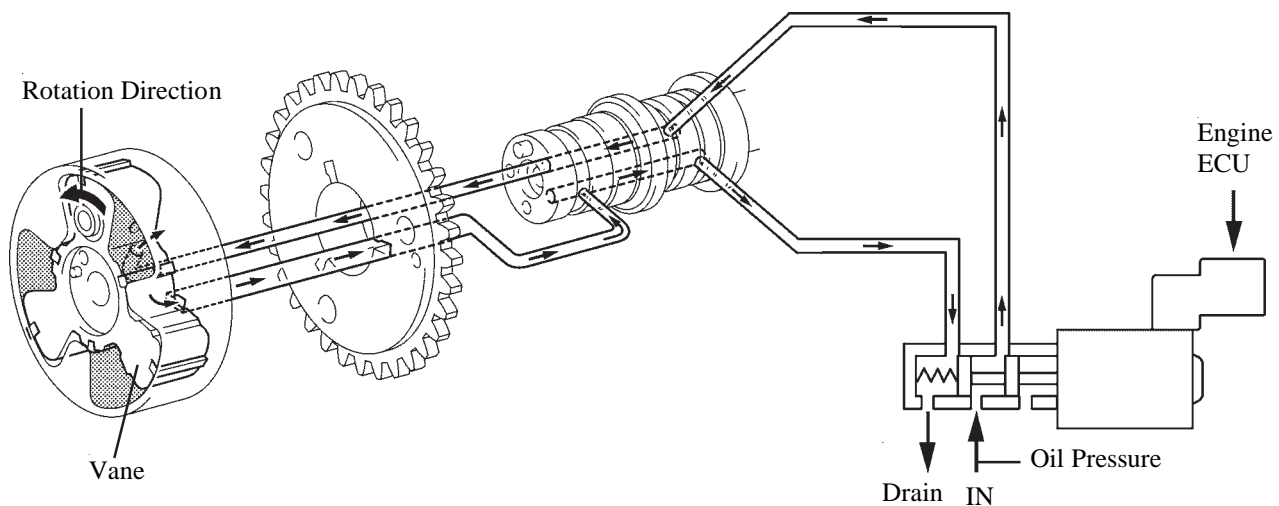


281EG48

## 2) Retard

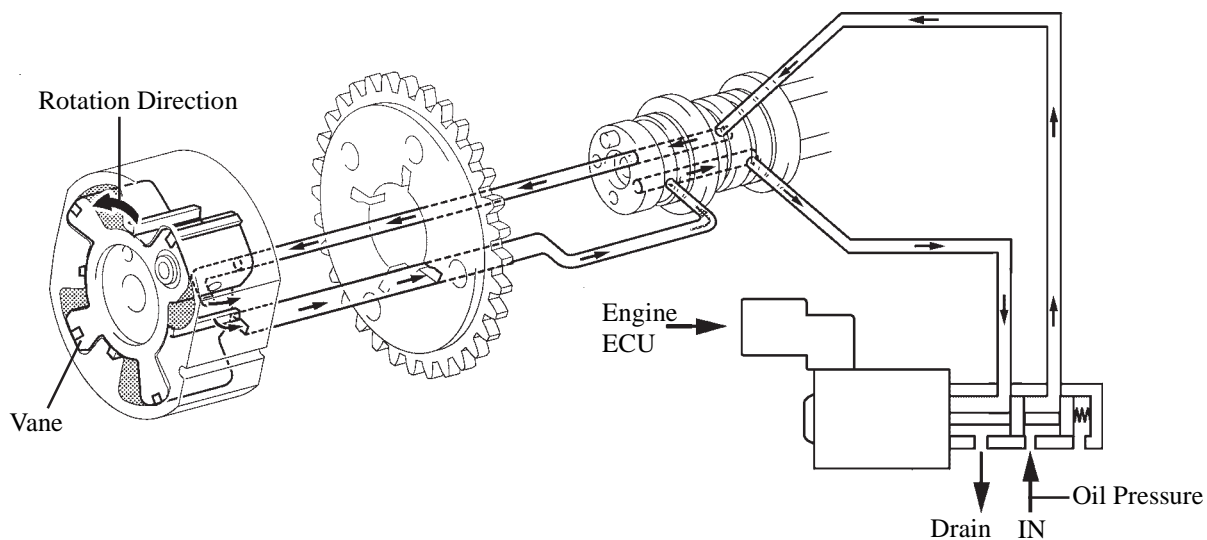
When the camshaft timing oil control valve is positioned as illustrated below by the retard signals from the engine ECU, the resultant oil pressure is applied to the timing retard side vane chamber to rotate the camshaft in the timing retard direction.

### ► Intake Side ◀



238EG64

### ► Exhaust Side ◀



281EG49

## 3) Hold

After reaching the target timing, the valve timing is held by keeping the camshaft timing oil control valve in the neutral position unless the travelling state changes.

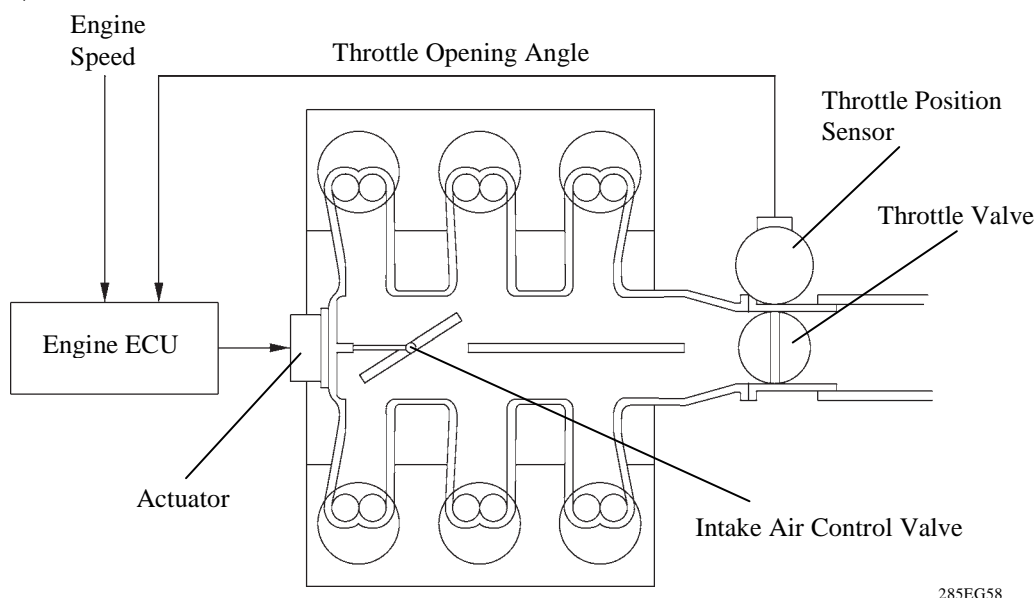
This adjusts the valve timing at the desired target position and prevents the engine oil from running out when it is unnecessary.

## 8. ACIS (Acoustic Control Induction System)

### General

The ACIS is realised by using a bulkhead to divide the intake manifold into 2 stages, with an intake air control valve in the bulkhead being opened and closed to vary the effective length of the intake manifold in accordance with the engine speed and throttle valve opening angle. This increases the power output in all ranges from low to high speed.

### ▸ System Diagram ◀



285EG58

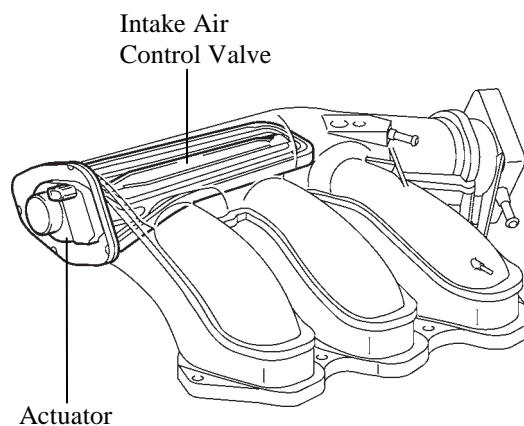
### Construction

#### 1) Intake Air Control Valve

The intake air control valve, which is provided in the intake air chamber, open and close to change the effective length of the intake manifold in 2 stages.

#### 2) Actuator (Motor)

The actuator activates the intake air control valve based on signals from the engine ECU.



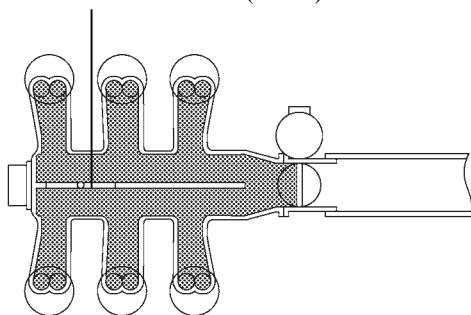
285EG64

## Operation

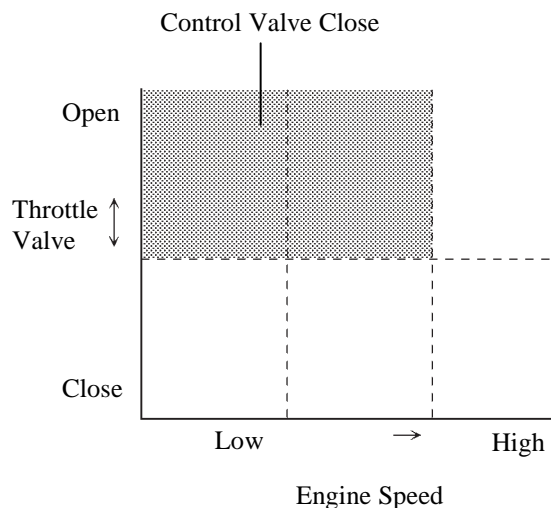
### 1) When the Intake Air Control Valve Closes

While the engine is running at middle speed under high load, the engine ECU controls the actuator to close the control valve. As a result, the effective length of the intake manifold is lengthened and the intake air efficiency, in the medium speed range, is improved due to the dynamic effect of the intake air, thereby increasing power output.

Intake Air Control Valve (Close)



 : Effective Intake Manifold Length

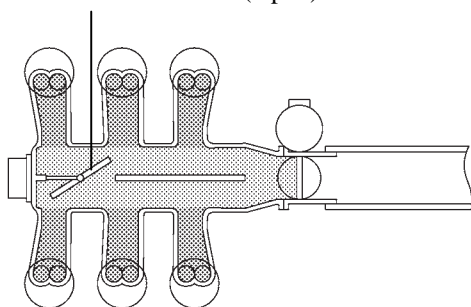


285EG65

### 2) When the Intake Air Control Valve Open

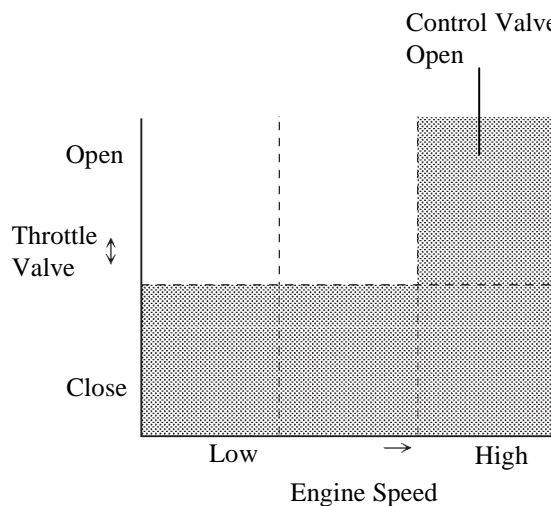
Under any condition except when the engine is running at middle speed under high load, the engine ECU controls the actuator to open the control valve. When the control valve is open, the effective length of the intake air chamber is shortened and peak intake efficiency is shifted to the low-to-high engine speed range, thus providing greater output at low-to-high engine speeds.

Intake Air Control Valve (Open)



 : Effective Intake Manifold Length

 : Effective Intake Air Chamber Length



285EG66



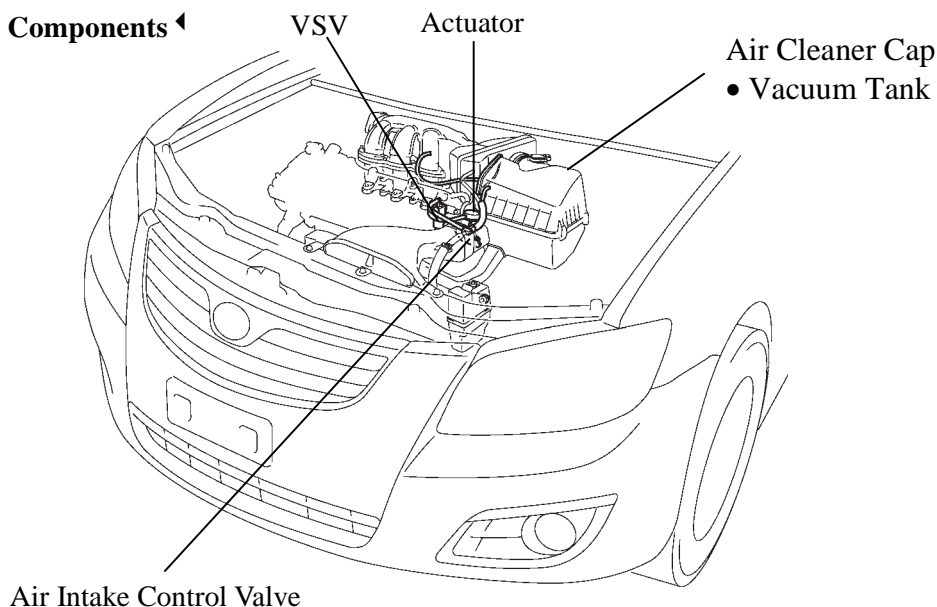
## 9. Air Intake Control System

### General

The system has a dual path design for air intake. An air intake control valve and actuator control the air flow path.

As a result, a reduction in intake noise in the low-speed range and an increase in the power output in the high-speed range is realised.

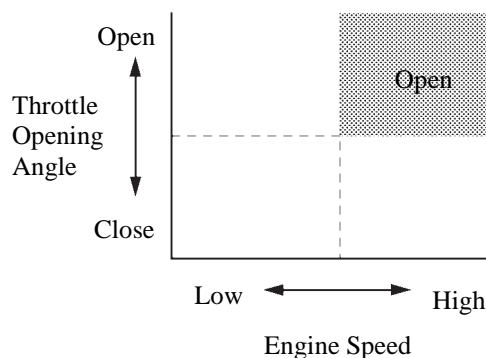
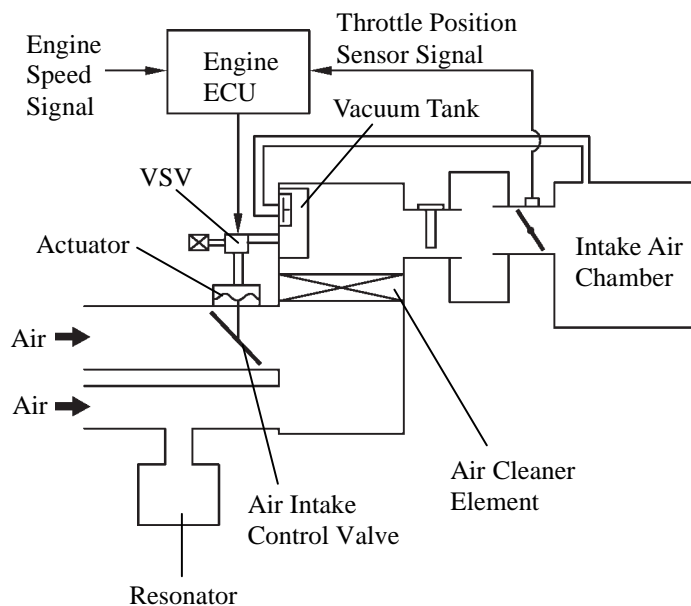
#### ► Layout of Components ◀



02KEG39Y

### Operation

- When the engine is operating in the low- to mid-speed range, this control operates the air intake control valve to close one side of the air cleaner inlet. As a result, the intake area has been minimised and the intake noise is reduced.
- When the engine is operating in the high-speed range, this control operates the air intake control valve to open both sides of the air cleaner inlet. As a result, the intake area has been maximised and the intake efficiency is improved.

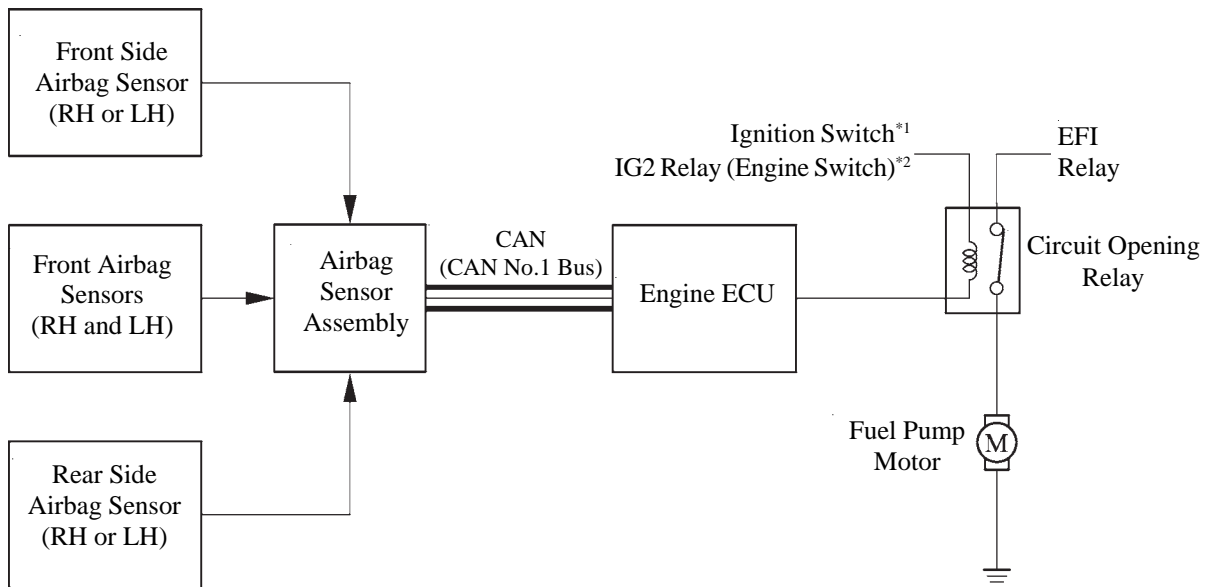


**Air Intake Control Valve Condition**

285EG68

## 10. Fuel Pump Control

A fuel cut control is used to stop the fuel pump once when any of the SRS airbags is deployed. In this system, the airbag deployment signal from the airbag sensor assembly is detected by the engine ECU, and it turns OFF the circuit opening relay. After the fuel cut control has been activated, turning the ignition switch\*<sup>1</sup> (engine switch\*<sup>2</sup>) from OFF to ON cancels the fuel cut control, and the engine can be restarted.



02HEG20TE

\*<sup>1</sup>: Only for models without smart entry and start system

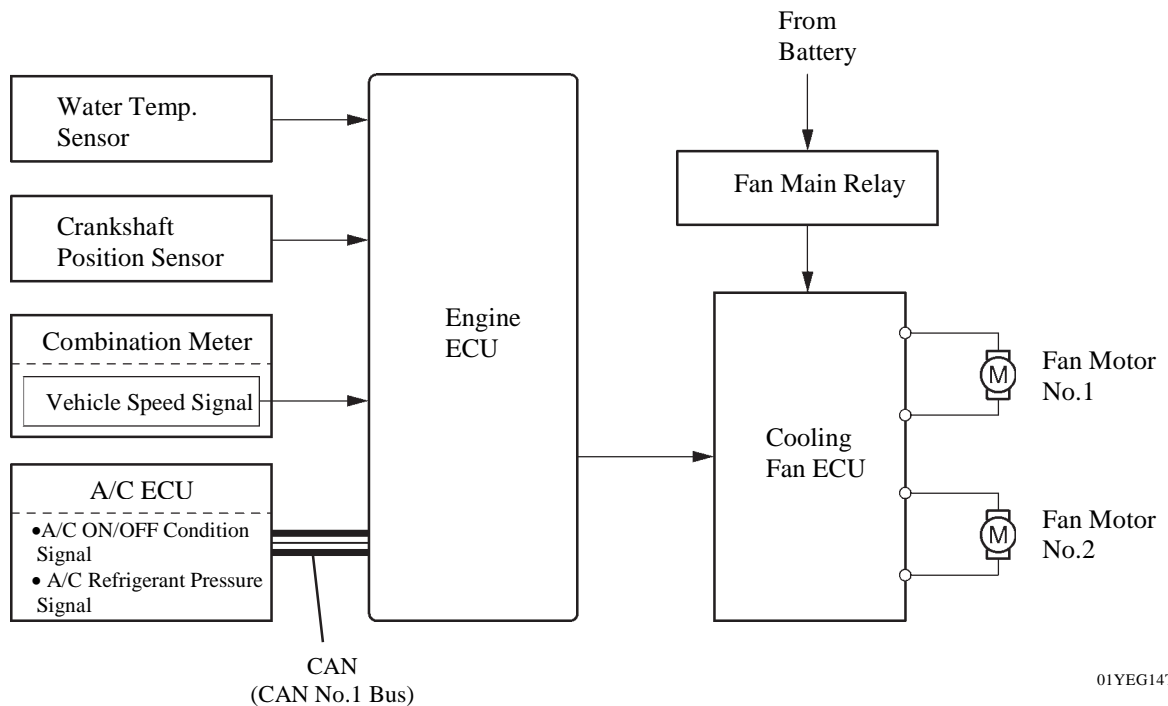
\*<sup>2</sup>: Only for models with smart entry and start system

## 11. Cooling Fan Control System

### General

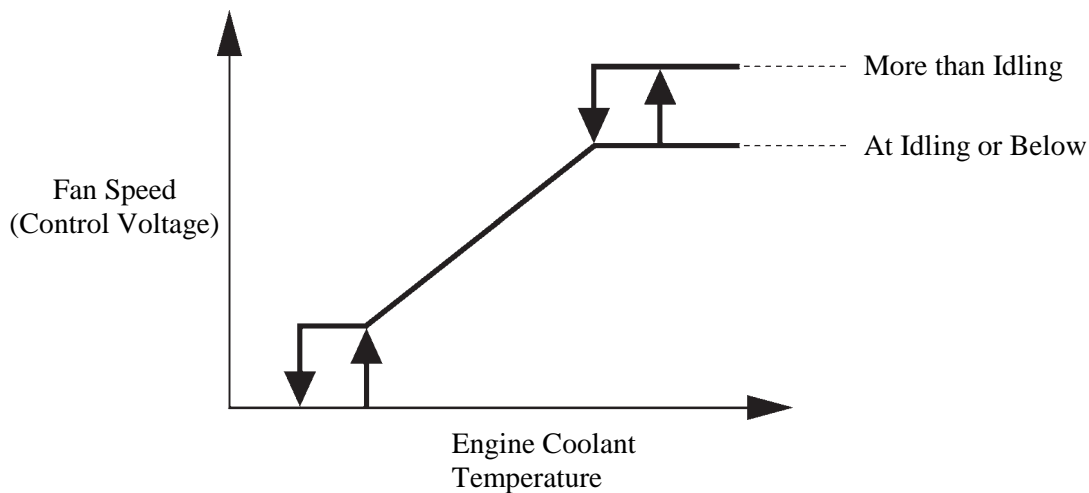
A cooling fan control system is used. To achieve an optimal fan speed in accordance with the engine coolant temperature, vehicle speed, engine speed, and air conditioner operating conditions, the engine ECU calculates the proper fan speed and sends the signals to the cooling fan ECU. Upon receiving the signals from the engine ECU, the cooling fan ECU actuates the fan motors.

### ▸ Wiring Diagram ◀



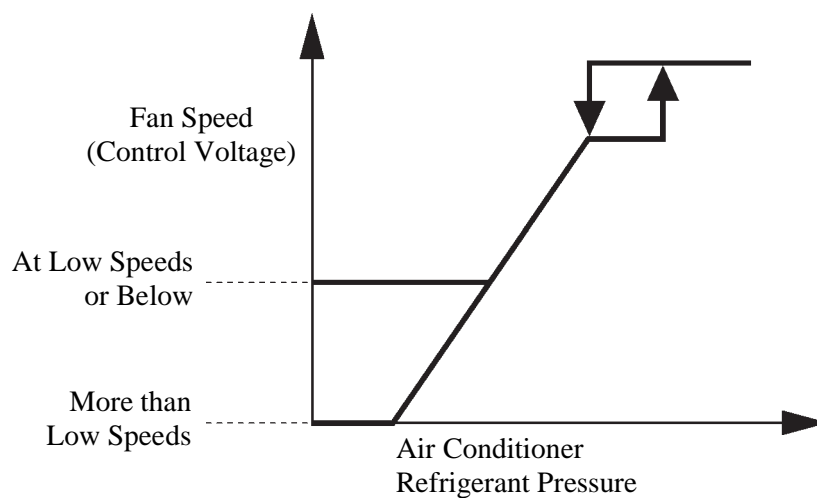
## Operation

- The engine ECU controls the cooling fan speed in accordance with the value of the engine coolant temperature, as shown in the graph below. When the engine coolant temperature is higher than a specific value, the control differs depending on whether the engine speed is at idling and below or more.



025EG14TE

- The engine ECU controls the cooling fan speed in accordance with the value of the air conditioner refrigerant pressure, as shown in the graph below. When the air conditioner refrigerant pressure is higher than a specific value, the control differs depending on whether the engine speed is at low speeds and below or more.



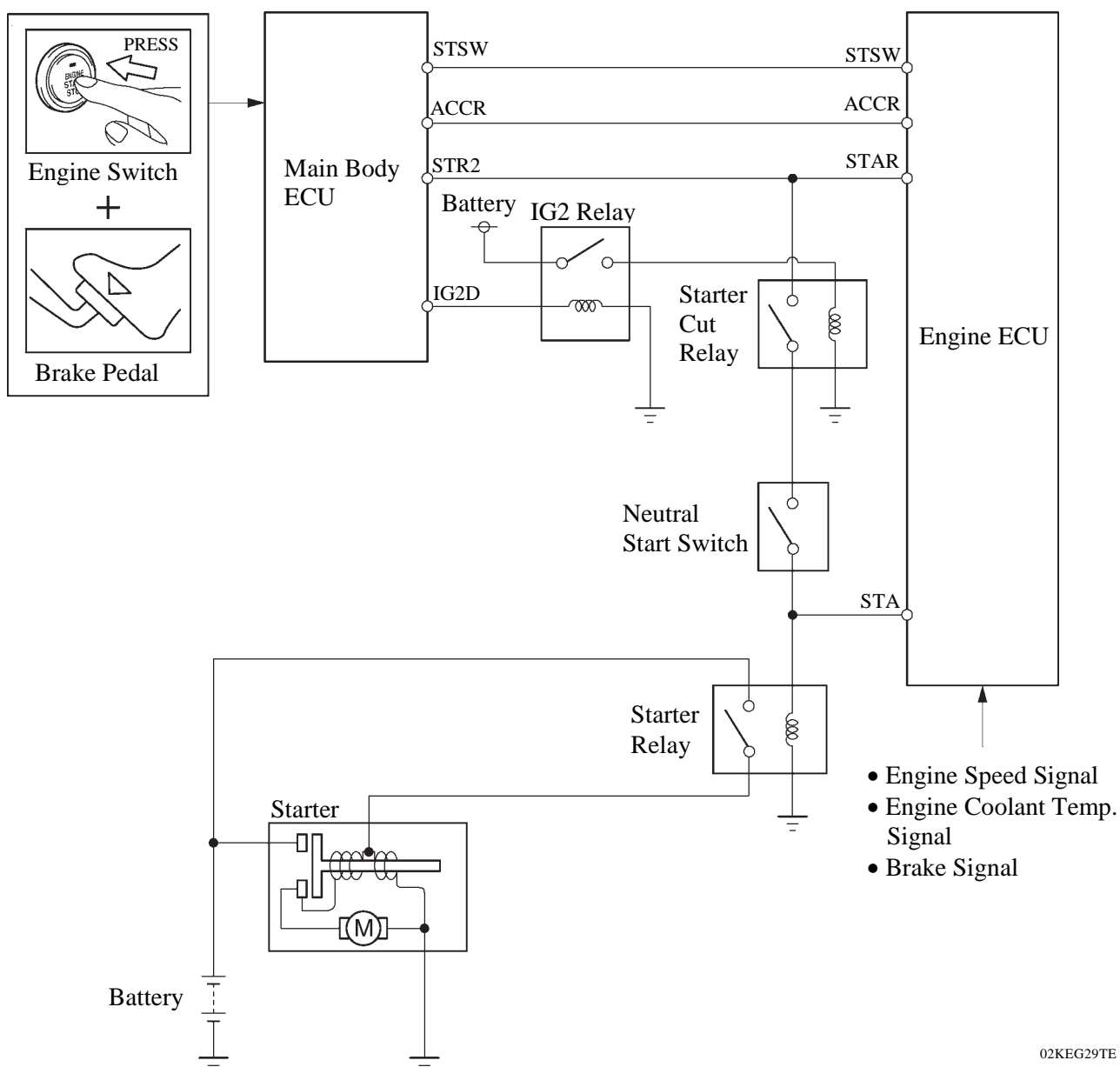
025EG15TE

## 12. Cranking Hold Function

## General

- Once the engine switch is pressed, this function continues to operate the starter until the engine has started, provided that the brake pedal is depressed. This prevents starting failure and the engine from being cranked after it has started.
- When the engine ECU detects a start signal from the main body ECU, this system monitors the engine speed (NE) signal and continues to operate the starter until it has determined that the engine has started. Furthermore, even if the engine ECU detects a start signal from the main body ECU, this system will not operate the starter if the engine ECU has determined that the engine has already started.

### ► System Diagram ◀

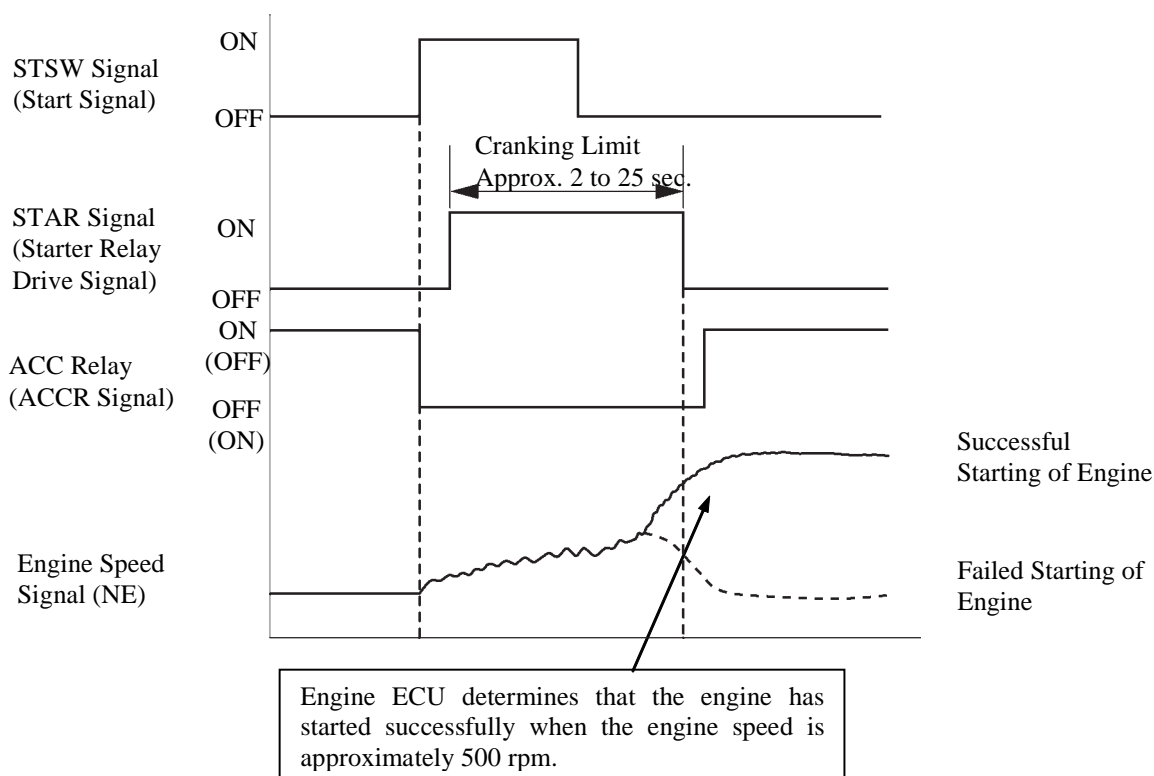


## Operation

- As indicated in the below timing chart, when the engine ECU detects a STSW signal (start signal) from the main body ECU, the engine ECU outputs STAR signal (starter relay drive signal) through the starter cut relay to the starter relay and actuates the starter. The engine ECU also outputs ACCR signal (ACC-cut request signal) to the main body ECU. Thus, the main body ECU will not energize the ACC relay. If the engine is already running, the engine ECU stops the output of the STAR signal to the starter relay and the output of the ACCR signal to the main body ECU. Thus, the starter operation stops and the main body ECU energises the ACC relay.
- After the starter operates and the engine speed becomes higher than approximately 500 rpm, the engine ECU determines that the engine has started and stops the output of the STAR signal to the starter relay and the output of ACCR signal to the main body ECU. Thus, the starter operation stops and the main body ECU energises the ACC relay.
- If the engine has any failure and does not start, the starter operates as long as its maximum continuous operation time and stops automatically. The maximum continuous operation time is approximately 2 seconds through 25 seconds depending on the water temperature condition. When the engine water temperature is extremely low, it is approximately 25 seconds and when the engine is warmed up sufficiently, it is approximately 2 seconds.
- This system cuts off the current that powers the accessories while the engine is cranking to prevent the accessory illumination from operating intermittently due to the unstable voltage that is associated with the cranking of the engine.
- This system has following protections.
  - While the engine is running normally, the starter does not operate.
  - Even if the driver keeps pressing the engine switch, the engine ECU stops the output of the STAR and ACCR signals when the engine speed becomes higher than 1200 rpm. Thus, the starter operation stops and the main body ECU energises the ACC relay.
  - In case the driver keeps pressing the engine switch and the engine does not start, the engine ECU stops the output of the STAR and ACCR signals after 30 seconds have elapsed. Thus, the starter operation stops and the main body ECU energises the ACC relay.
  - Thus, the main body ECU will stop the operation of the starter.
  - In case the engine ECU cannot detect an engine speed signal while the starter is operating, the engine ECU will immediately stop the output of the STAR and ACCR signals. Thus, the starter operation stops and the main body ECU energises the ACC relay.

Timing chart next page /...

### ▶ Timing Chart ◀



## 13. Diagnosis

- When the engine ECU detects a malfunction, the engine ECU makes a diagnosis and memorizes the failed section. Furthermore, the check engine warning light in the combination meter illuminates or blinks to inform the driver.
- The engine ECU will also store the DTC (Diagnostic Trouble Code) of the malfunctions. The DTC can be accessed by using the intelligent tester II.
- For details, see the Aurion Repair Manual.

### Service Tip

- The engine ECU of the Aurion uses the CAN protocol for diagnostic communication. Therefore, an intelligent tester II is required for accessing diagnostic data. For details, see the Aurion Repair Manual.
- To clear the DTC that is stored in the engine ECU, use an intelligent tester II, disconnect the battery terminal or remove the EFI No.1 fuse and ETCS fuse for 1 minute or longer.

## 14. Fail-Safe

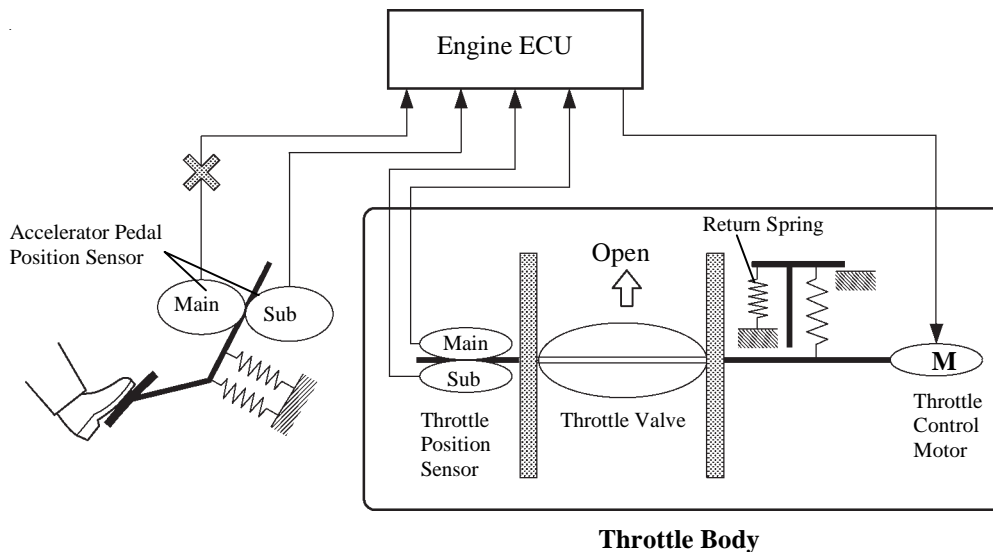
### General

When a malfunction is detected at any of the sensors, there is a possibility of an engine or other malfunction occurring if the engine ECU were to continue to control the engine control system in the normal way. To prevent such a problem, the fail-safe function of the engine ECU either relies on the data stored in memory to allow the engine control system to continue operating, or stops the engine if a hazard is anticipated. For details, refer to the Aurion Repair Manual.

## Fail-safe of Accelerator Pedal Position Sensor

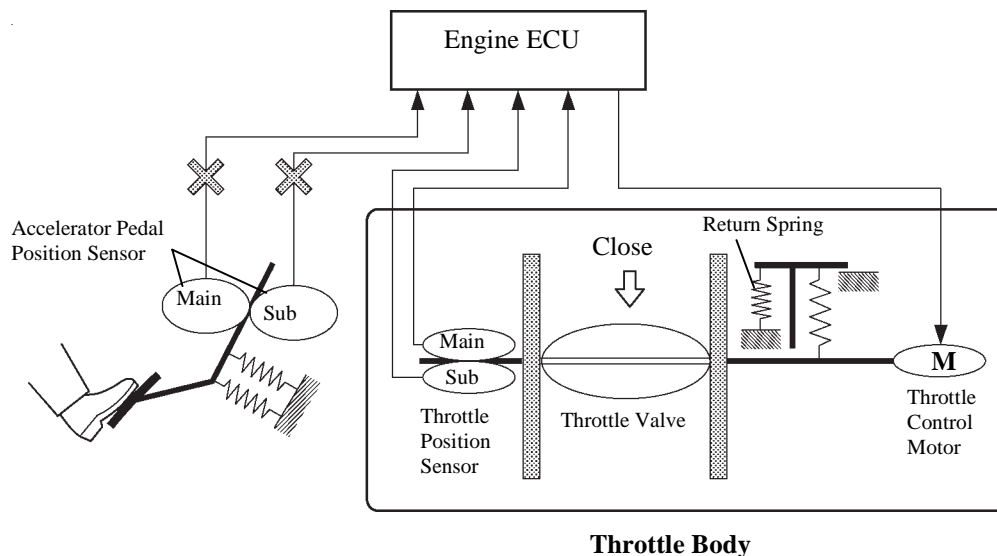
The accelerator pedal position sensor comprises two (Main, Sub) sensor circuits.

- If a malfunction occurs in either of the sensor circuits, the engine ECU detects the abnormal signal voltage difference between these two sensor circuits and switches into the limp mode. In the limp mode, the remaining circuit is used to calculate the accelerator pedal opening, in order to operate the vehicle under limp mode control.



D13N08

- If both circuits malfunction, the engine ECU detects the abnormal signal voltage from these two sensor circuits and discontinues the throttle control. At this time, the vehicle can be driven within its idling range.



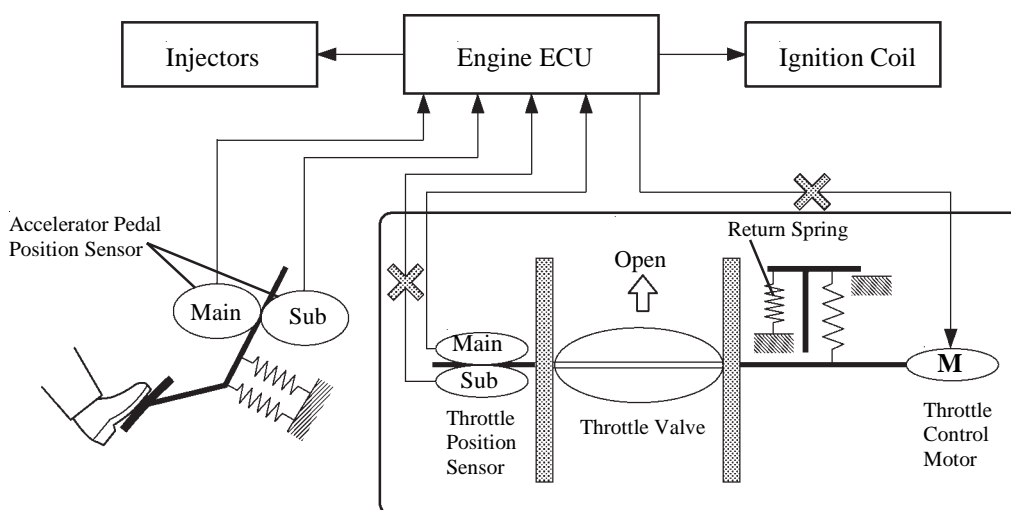
D13N09



## Fail-safe of Throttle Position Sensor

The throttle position sensor comprises two (Main, Sub) sensor circuits.

- If a malfunction occurs in either of the sensor circuits, the engine ECU detects the abnormal signal voltage difference between these two sensor circuits, cuts off the current to the throttle control motor, and switches to the limp mode.
- Then, the force of the return spring causes the throttle valve to return and stay at the prescribed opening. At this time, the vehicle can be driven in limp mode while the engine output is regulated through the control of the fuel injection and ignition timing in accordance with the accelerator opening.
- The same control as above is effected if the engine ECU detects a malfunction in the throttle control motor system.



**Throttle Body**

D13N10

# CHASSIS

## **U660E AUTOMATIC TRANSAXLE**

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## **BRAKE**

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## **STEERING**

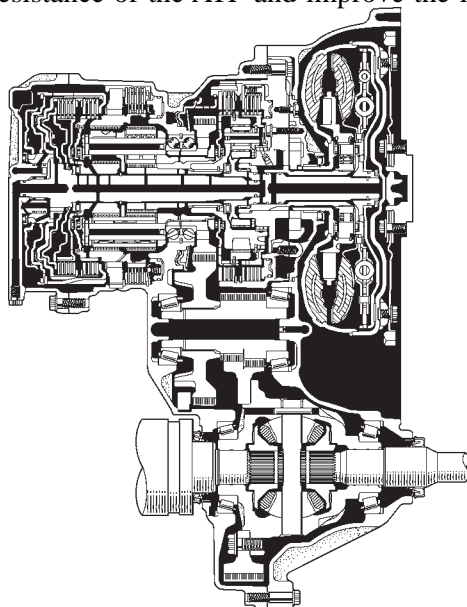
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# CHASSIS

## U660E AUTOMATIC TRANSAXLE

### DESCRIPTION

- A newly developed U660E automatic transaxle is used on the 2GR-FE engine models. This automatic transaxle is a compact, lightweight and high-capacity 6-speed Super ECT (Electronically Controlled Transaxle).
- ATF WS is used to reduce the resistance of the ATF and improve the fuel economy. For detail, refer to page CH-5.



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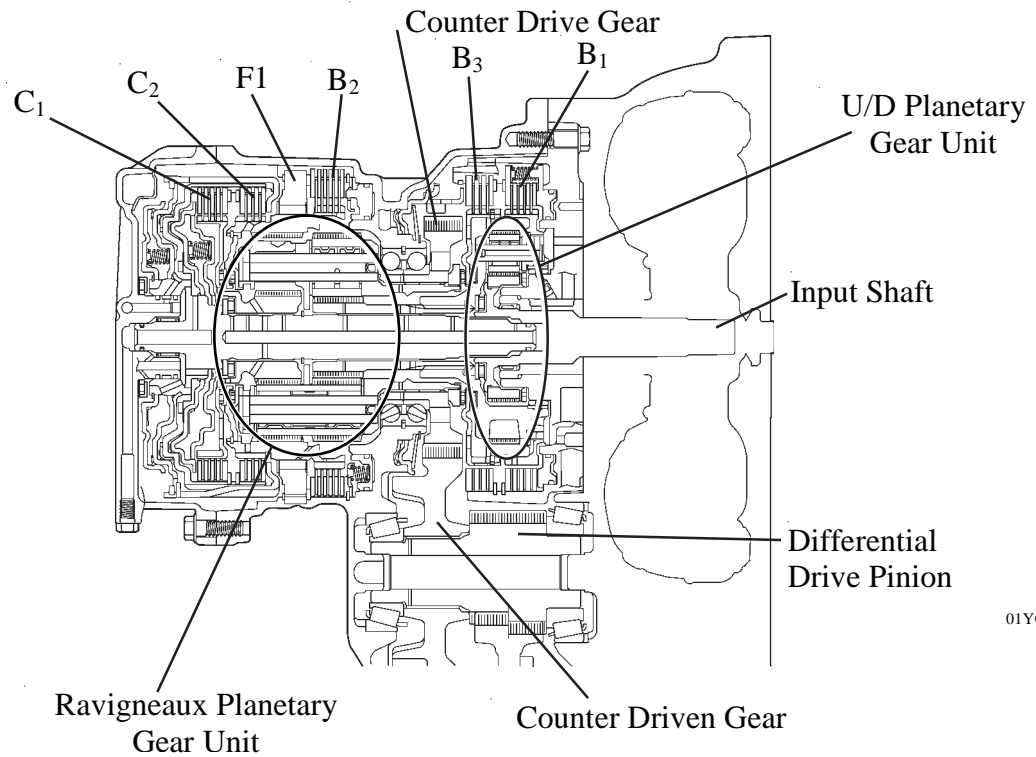
### Specifications

Gear Ratio	1st	3.300
	2nd	1.900
	3rd	1.420
	4th	1.000
	5th	0.713
	6th	0.608
	Reverse	4.148
Differential Gear Ratio		3.685 <sup>*1</sup>
Fluid Capacity <sup>*2</sup> Litres		6.57
Fluid Type		Toyota Genuine ATF WS
Weight (Reference) <sup>*3</sup> kg		94.4

\*1: Counter gear ratio included

\*2: Differential included

\*3: Weight shows the figure with the fluid filled to the maximum level.



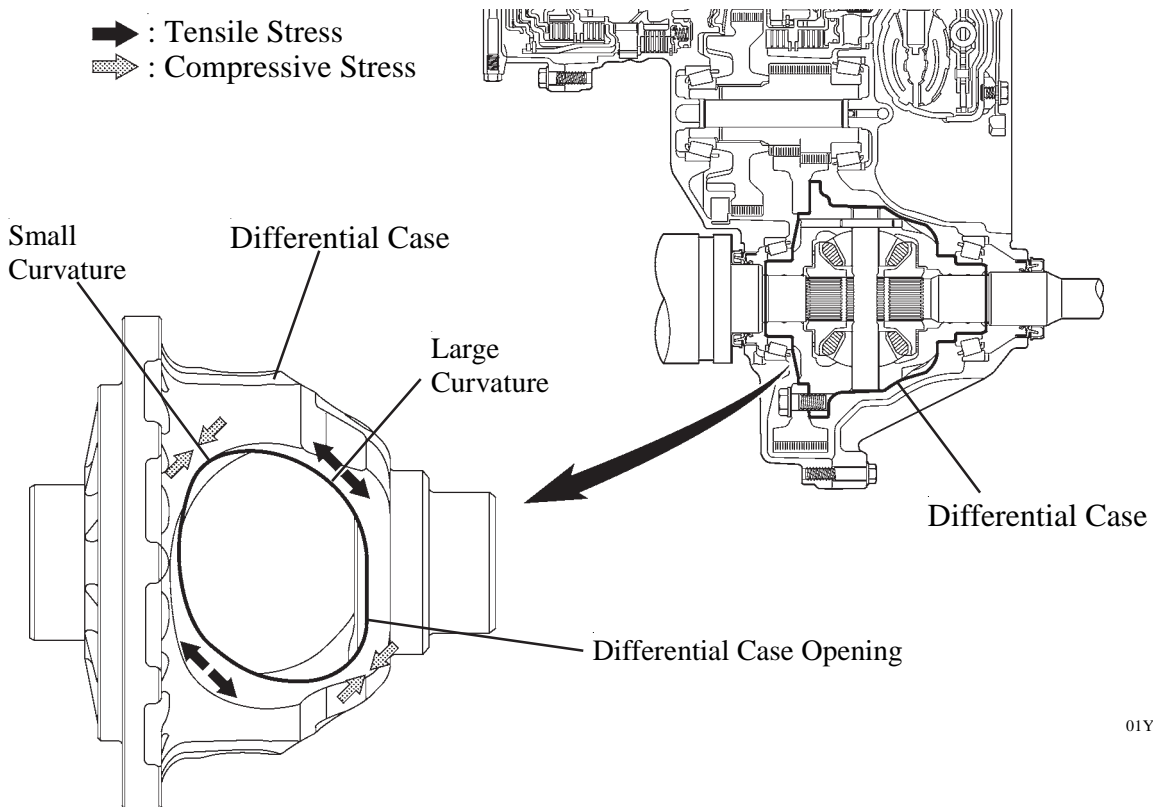
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### ▸ Specifications ◀

C <sub>1</sub>	No.1 Clutch	The No. of Discs	4
C <sub>2</sub>	No.2 Clutch		3
B <sub>1</sub>	No.1 Brake		4
B <sub>2</sub>	No.2 Brake		5
B <sub>3</sub>	No.3 Brake		3
F <sub>1</sub>	No.1 One- Way Clutch	The No. of Sprags	20
Ravigneaux Planetary Gear Unit	The No. of Front Sun Gear Teeth		30
	The No. of Rear Sun Gear Teeth		27
	The No. of Long Pinion Gear Teeth		20
	The No. of Short Pinion Gear Teeth		22
	The No. of Ring Gear Teeth		69
U/D Planetary Gear Unit	The No. of Sun Gear Teeth		66
	The No. of Pinion Gear Teeth		21
	The No. of Ring Gear Teeth		110
Counter Gear	The No. of Drive Gear Teeth		44
	The No. of Driven Gear Teeth		47

## ✱ DIFFERENTIAL CASE

The curvature of the differential case opening, where tensile stress is concentrated during driving, is enlarged, in order to moderate the stress concentration and enhance the differential gear tolerant torque. As a result, use of the lightweight 2-pinion differential gears is possible.

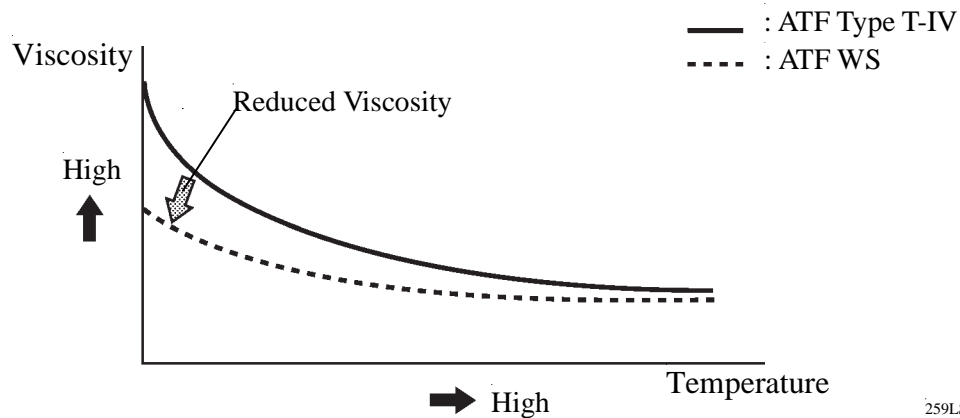


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**Stresses Applied to Differential Case Opening  
during Driving**

## ✱ ATF (AUTOMATIC TRANSMISSION FLUID) WS

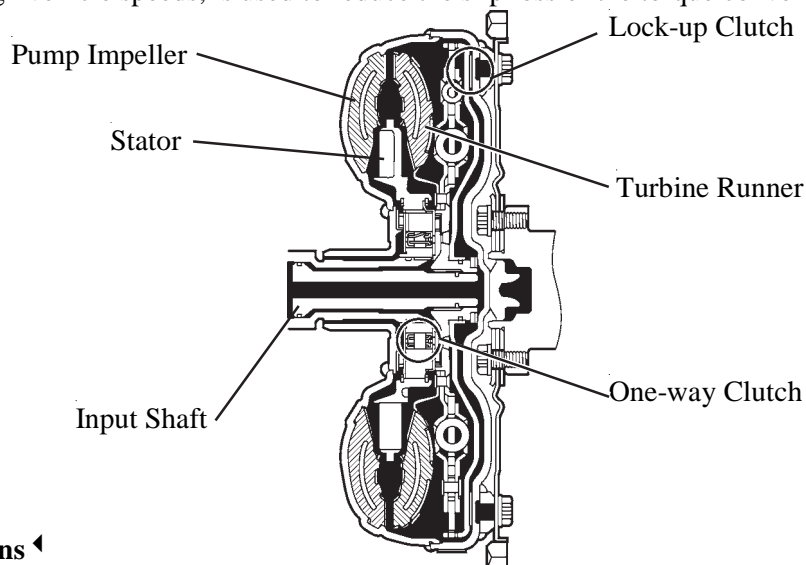
- ATF WS is used to reduce the resistance of the ATF and improve the fuel economy by reducing its viscosity in the practical operating temperature range. At higher fluid temperatures, the viscosity is the same as that of ATF Type T-IV, which ensures the durability of the automatic transaxle.
- ATF WS and other types of ATF (ATF Type T-IV, D-II) are not interchangeable.



259LSK03

## ✿ TORQUE CONVERTER

- A compact, lightweight and high-capacity torque converter is used.
- In order to make the torque converter more compact and shorten its total length, the pump impeller and turbine runner have been flattened, and the structure of the one-way clutch has been simplified.
- This torque converter has optimally designed fluid passages and impeller configuration resulting in substantially enhanced transmission efficiency to ensure better starting, acceleration and fuel economy.
- Furthermore, a hydraulically operated lock-up mechanism, which enables the lock-up (flex lock-up) operation at low to high vehicle speeds, is used to reduce the slip loss of the torque converter.

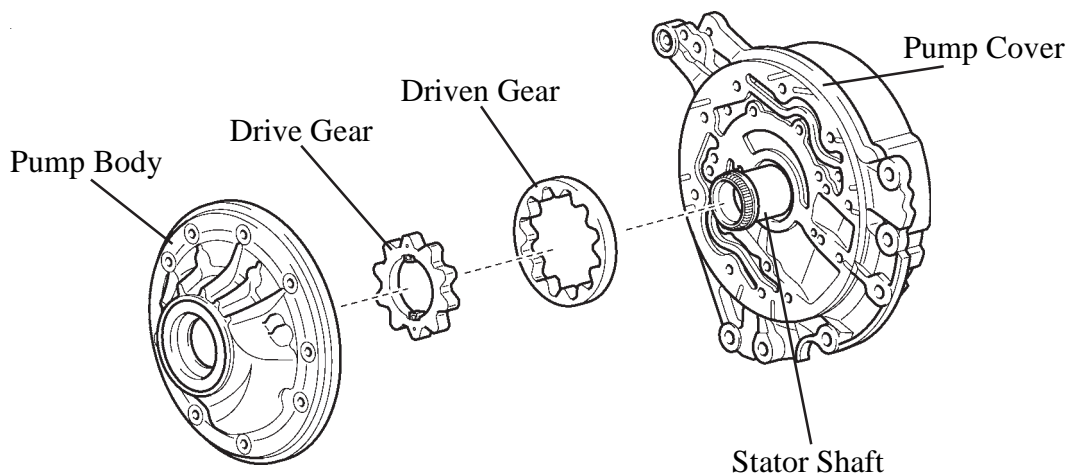


### ► Specifications ◀

Torque Converter Type	3-Element, 1-Step, 2-Phase
Stall Torque Ratio	1.8

## ✿ OIL PUMP

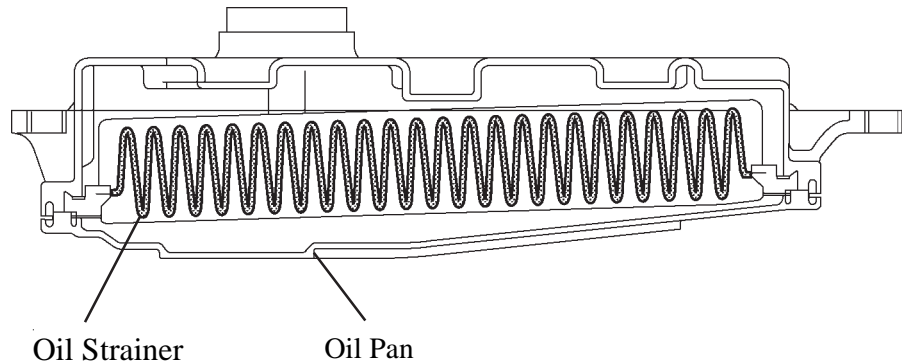
- The oil pump is operated by the torque converter. It lubricates the planetary gear units and supplies operating fluid pressure for hydraulic control.
- The pump cover is made of aluminium to reduce weight.



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## ✱ OIL STRAINER

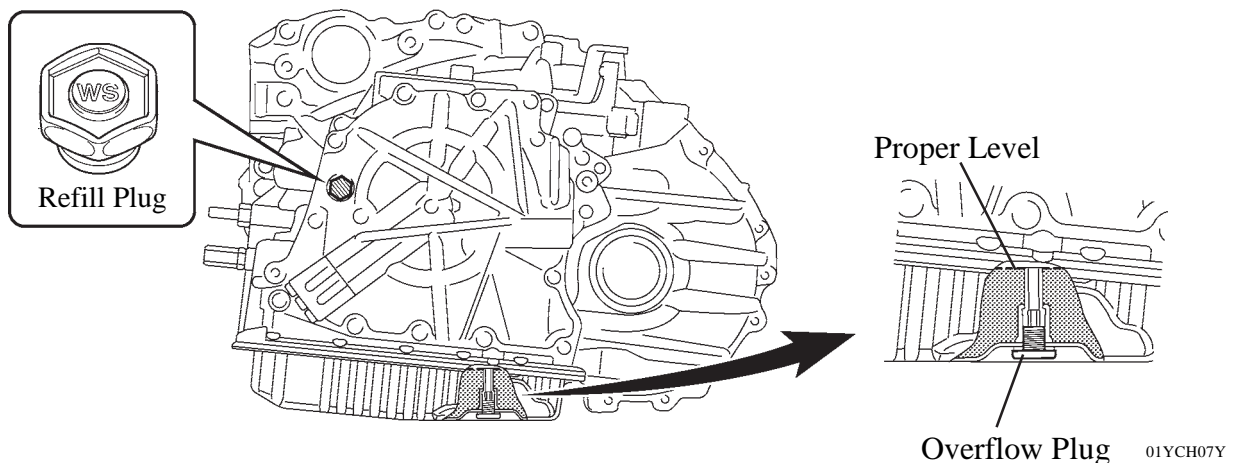
A felt type oil strainer is used because it is; lightweight, provides excellent filtering ability, more reliable and free from maintenance.



01YCH06Y

## ✱ ATF FILLING PROCEDURES

- The ATF filling procedure is changed in order to improve the accuracy of the ATF level when the transaxle is being repaired or replaced. As a result, the oil filler tube and the oil level gauge used for a conventional automatic transaxle are discontinued, eliminating the need to inspect the fluid level as a part of routine maintenance.
- This filling procedure employs a refill plug, overflow plug, ATF temperature sensor, and shift indicator light "D". After the transaxle is refilled with ATF, remove the overflow plug and drain the extra ATF at the proper ATF temperature. Thus, the appropriate ATF level can be obtained. For details about the ATF filling procedure, refer to the Service Tip on the next page.



01YCH07Y



**Service Tip****ATF Filling procedure using SST (09843-18040)**

When a large amount of ATF needs to be filled (i.e. after removal and installation of oil pan or torque converter), perform the procedure from step 1.

When a small amount of ATF is required (i.e. removal and installation of oil cooler tube, repair of a minor oil leak), perform the procedure from step 7.

- 1) Raise the vehicle while keeping it level.
- 2) Remove the refill plug and overflow plug.
- 3) Fill the transaxle with WS type ATF through the refill plug hole until it overflows from the overflow plug hole.
  - ATF WS must be used to fill the transaxle.
- 4) Reinstall the overflow plug.
- 5) Add the specified amount of ATF (specified amount is determined by the procedure that was performed) and reinstall the refill plug.

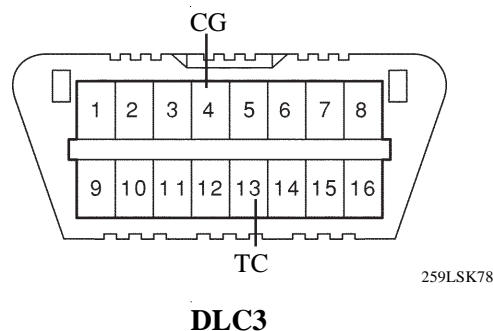
**Example:**

Procedure	Litres
Removal and installation of transaxle oil pan (including oil drainage)	2.9
Removal and installation of transaxle valve body	3.3
Replacement of torque converter	4.9

- 6) Lower the vehicle
- 7) Use the SST (09843-18040) to make shorts between the TC and CG terminals of the DLC3 connector:
- 8) Start the engine and allow it to idle.
  - A/C switch must be turned off.
- 9) Move the shift lever from the P position to the S mode position and slowly selects each gear S1 – S6. Then move the shift lever back to the P position.
- 10) Move the shift lever to the D position, and then quickly move it back and forth between N and D (at least once every 1.5 seconds) for at least 6 seconds. This will activate oil temperature detection mode.

**Standard: The shift position indicator light “D” remains illuminated for 2 seconds and then goes off.**

- 11) Return the shift lever to the P position and disconnect the TC terminal.
- 12) Idle the engine to raise the ATF temperature.



Continued \....

- 13) Immediately after the shift position indicator “D” light turns on, lift the vehicle up.
- The shift position indicator light “D” will indicate the ATF temperature according to the following table.

ATF Temp.	Lower than Optimal Temp.	Optimal Temp.	Higher than Optimal Temp.
Shift Position Indicator Light “D”	OFF	ON	Blinking

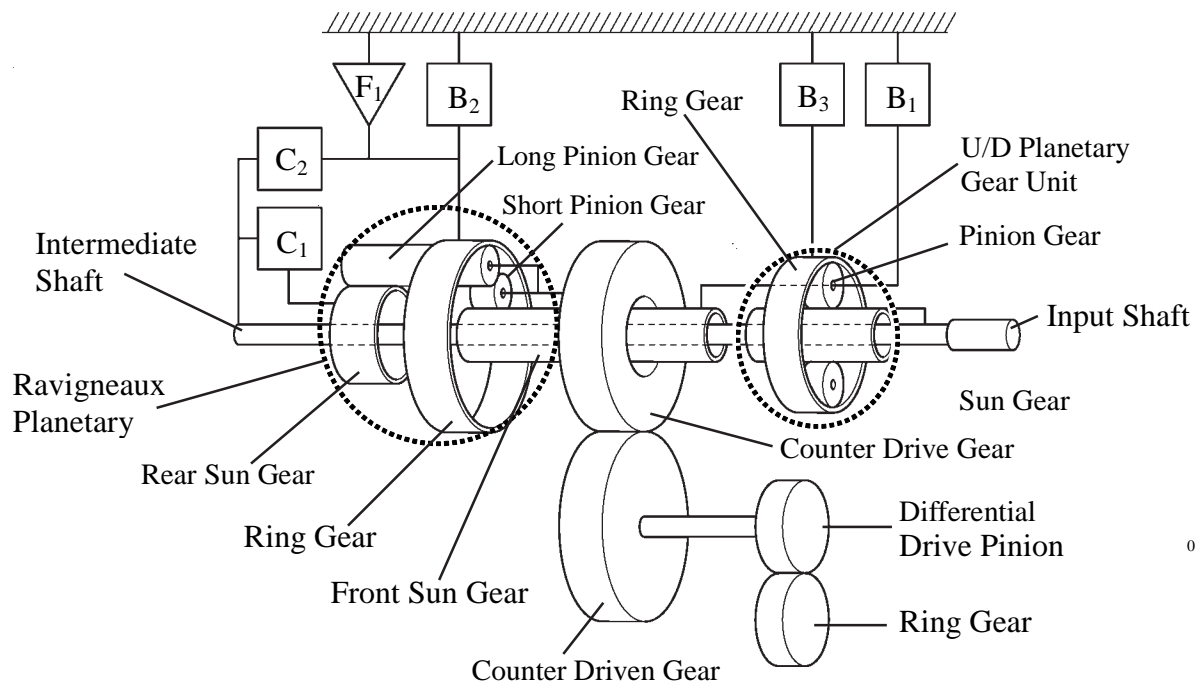
- 14) Remove the overflow plug and adjust the oil quantity.
- If the ATF overflows, go to step 17, and if the ATF does not overflow, go to step 15.
- 15) Remove the refill plug.
- 16) Add ATF through the refill plug hole until it flows out from the overflow plug hole.
- 17) When the ATF flow slows to a trickle, install the overflow plug and a new gasket.
- 18) Reinstall the refill plug (if the refill plug was removed).
- 19) Lower the vehicle.
- 20) Turn the ignition switch (engine switch) OFF to stop the engine.

For details about the ATF Filling procedures, see the Aurion Repair Manual.

## ✱ PLANETARY GEAR UNIT

### 1. Construction

- The 6-speed configuration has been achieved by using 2 planetary gear units, creating a 6-speed automatic transaxle.
- A Ravigneaux type planetary gear unit is used as the rear gear unit. The gear unit consists of pairs of sun gears (front and rear) and planetary pinion gears (long and short) with different diameters within a single planetary gear.
- The centrifugal fluid pressure cancelling mechanism is used.
- The shapes of the grooves in the clutches and brake linings have been optimised in order to reduce drag during clutch and brake operation.



### 2. Function of Components

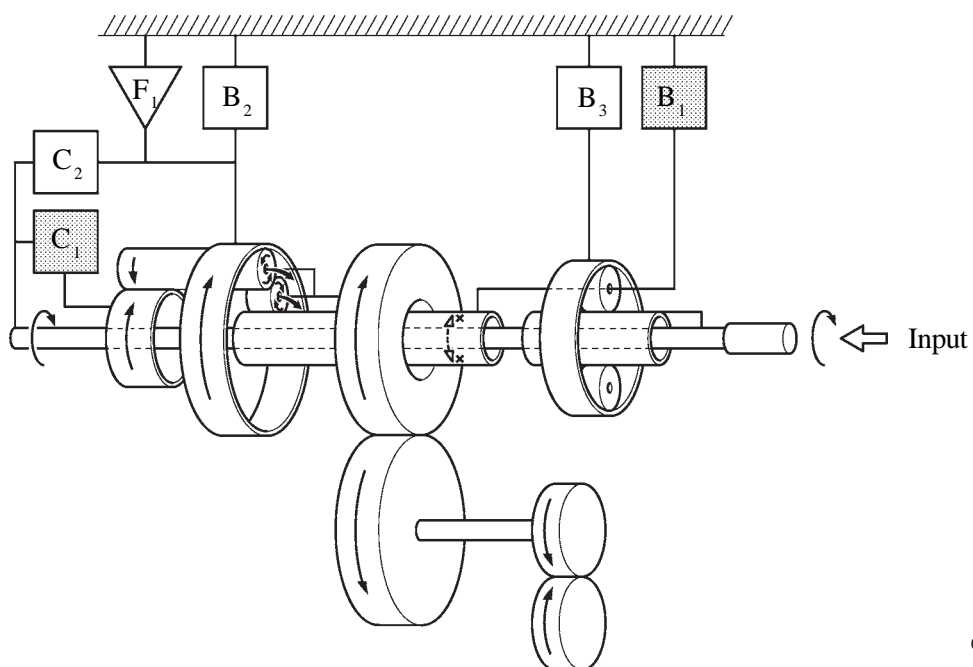
Component		Function
C <sub>1</sub>	No.1 Clutch	Connects intermediate shaft and Ravigneaux planetary rear sun gear.
C <sub>2</sub>	No.2 Clutch	Connects intermediate shaft and Ravigneaux planetary ring gear.
B <sub>1</sub>	No.1 Brake	Prevents Ravigneaux planetary front sun gear and U/D planetary carrier from turning either clockwise or counter clockwise.
B <sub>2</sub>	No.2 Brake	Prevents Ravigneaux planetary ring gear from turning either clockwise or counter clockwise.
B <sub>3</sub>	No.3 Brake	Prevents U/D planetary ring gear from turning either clockwise or counter clockwise.
F <sub>1</sub>	No.1 One-Way Clutch	Prevents Ravigneaux planetary ring gear from turning counter clockwise.
Planetary Gears		These gears change the route through which driving force is transmitted, in accordance with the operation of each clutch and brake, in order to increase or reduce the input and output speeds.

**3. Transaxle Power Flow**

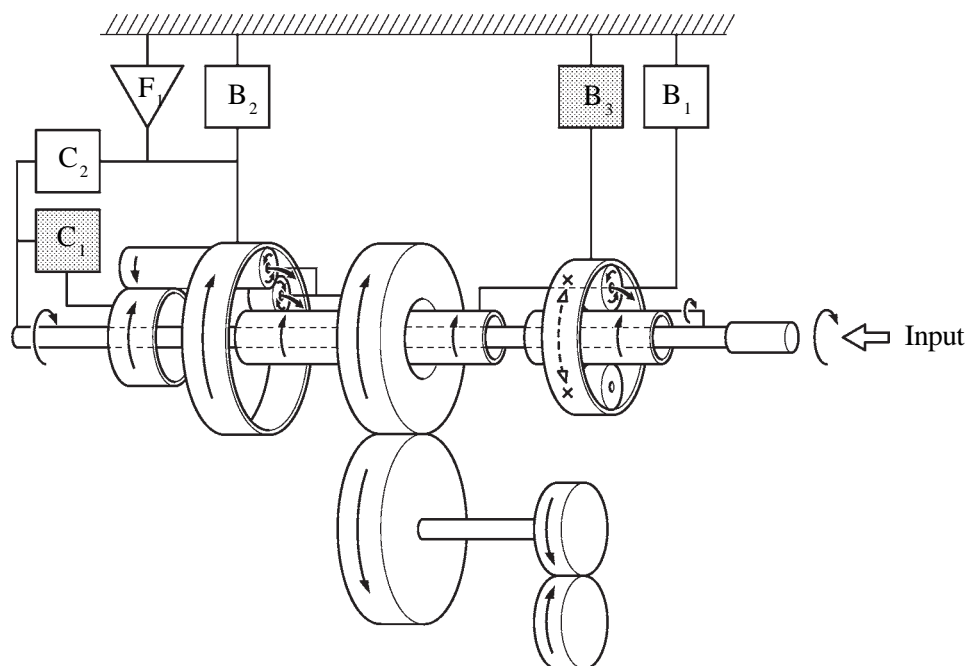
Shift Lever Position	Gear	Solenoid Valve						Clutch		Brake			One-way Clutch
		SL	SL1	SL2	SL3	SL4	SLU	C <sub>1</sub>	C <sub>2</sub>	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	F <sub>1</sub>
P	Park		○										
R	Reverse	●				○					○	○	
N	Neutral		○										
D, S6	1st		○					○					○
	2nd	○	○		○		Δ	○		○			
	3rd	○	○			○	Δ	○				○	
	4th	○	○	○			Δ	○	○				
	5th	○		○		○	Δ		○			○	
	6th	○		○	○		Δ		○	○			
S5	1st		○					○					○
	2nd	○	○		○		Δ	○		○			
	3rd	○	○			○	Δ	○				○	
	4th	○	○	○			Δ	○	○				
	5th	○		○		○	Δ		○			○	
S4	1st		○					○					○
	2nd	○	○		○		Δ	○		○			
	3rd	○	○			○	Δ	○				○	
	4th	○	○	○			Δ	○	○				
S3	1st		○					○					○
	2nd		○		○			○		○			
	3rd		○			○		○				○	
S2	1st		○					○					○
	2nd		○		○			○		○			
S1	1st		○				○	○			○		○

○: ON    Δ: In accordance with flex lock-up    ●: ON while engaging, OFF after engaged

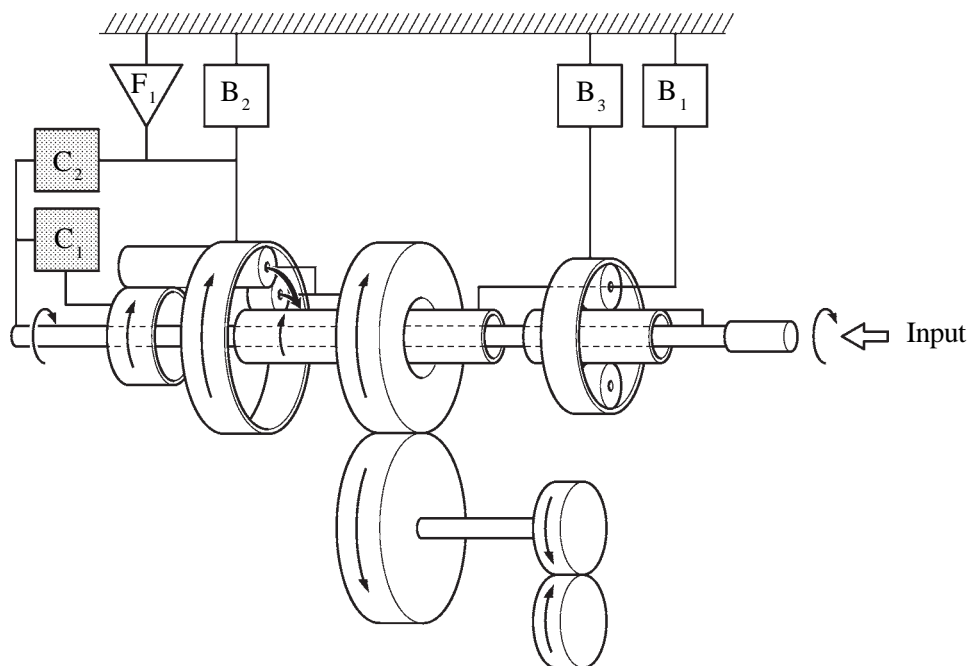
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**2nd Gear (D Position or S Mode)**

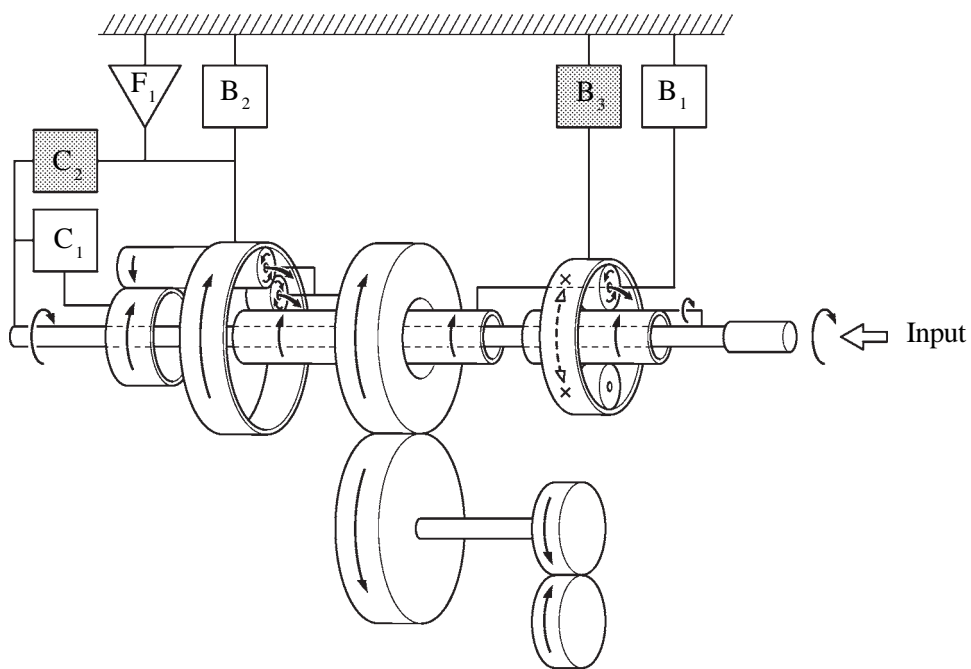
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**3rd Gear (D Position or S Mode)**

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**4th Gear (D Position or S Mode)**

01YCH12Y

**5th Gear (D Position or S Mode)**

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### 6th Gear (D Position or S Mode)



### Reverse Gear (R Position)





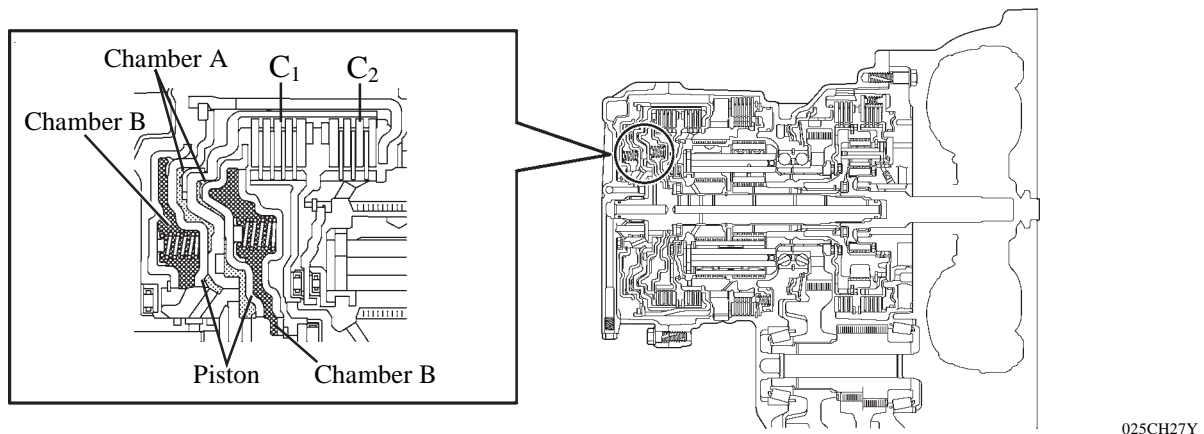
#### 4. Centrifugal Fluid Pressure Cancelling Mechanism

This mechanism is applied to C<sub>1</sub> and C<sub>2</sub> clutches when shifting between the 1st to 6th gears. The basic construction and operation of the mechanism are the same as those used on U241E.

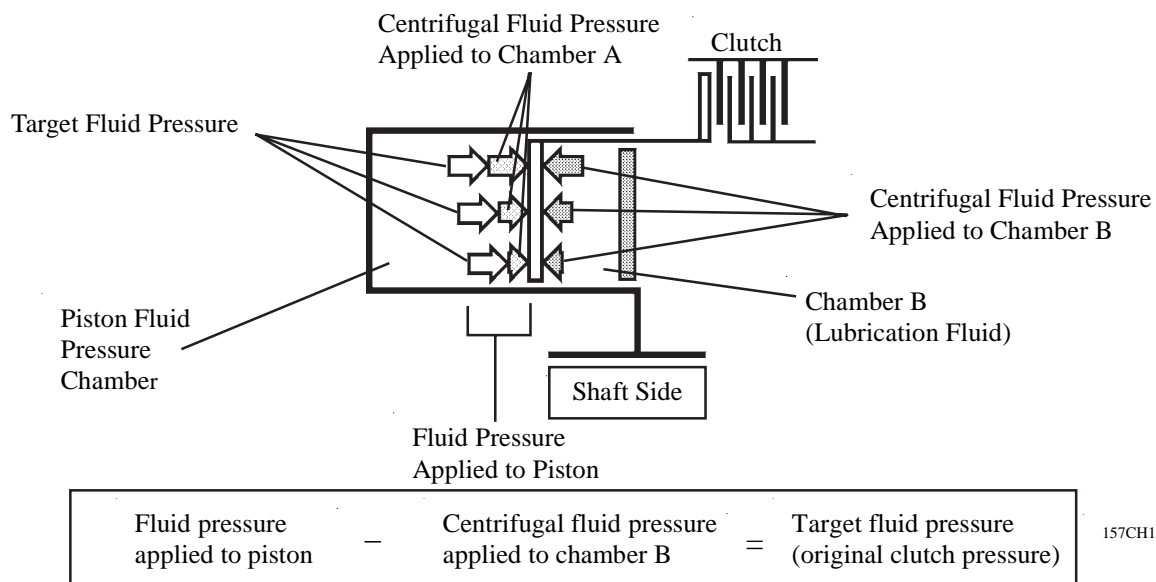
There are two reasons for improving the conventional clutch mechanism:

- To prevent the generation of pressure by the centrifugal force that is applied to the fluid in piston fluid pressure chamber (hereafter referred to as “chamber A”) when the clutch is released, a check ball is provided to discharge the fluid. Therefore, before the clutch could be subsequently applied, it took time for the fluid to fill the chamber A.
- During shifting, in addition to the original clutch pressure that is controlled by the valve body, the pressure that acts on the fluid in chamber A also exerts influence, which is dependent upon revolution fluctuations.

To address these two needs for improvement, a cancelling fluid pressure chamber (hereafter referred to as “chamber B”) has been provided opposite chamber A.



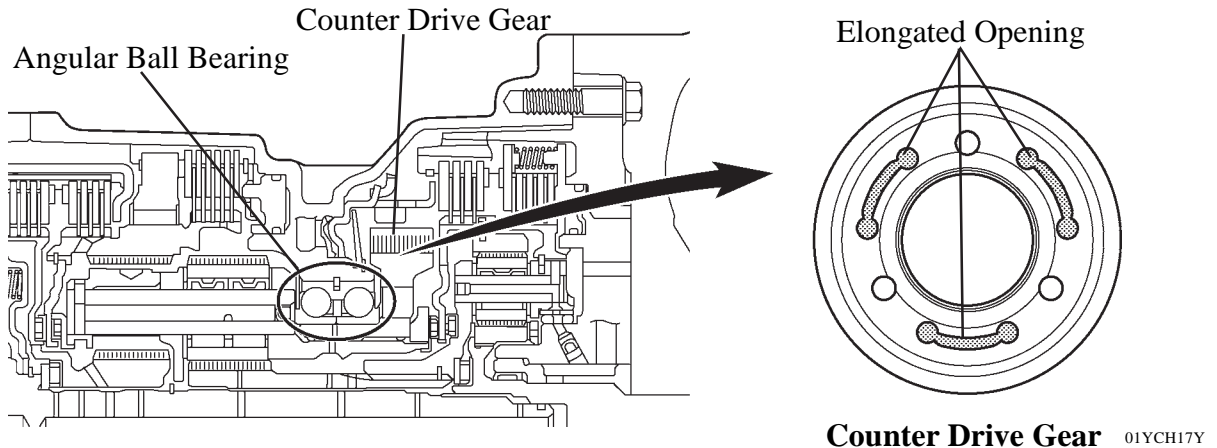
By utilising lubrication fluid such as that of the shaft, an equal centrifugal force is applied, thus cancelling the centrifugal force that is applied to the piston itself. Accordingly, it is not necessary to discharge the fluid through the use of a check ball, and a highly responsive and smooth shifting characteristic has been achieved.



157CH17

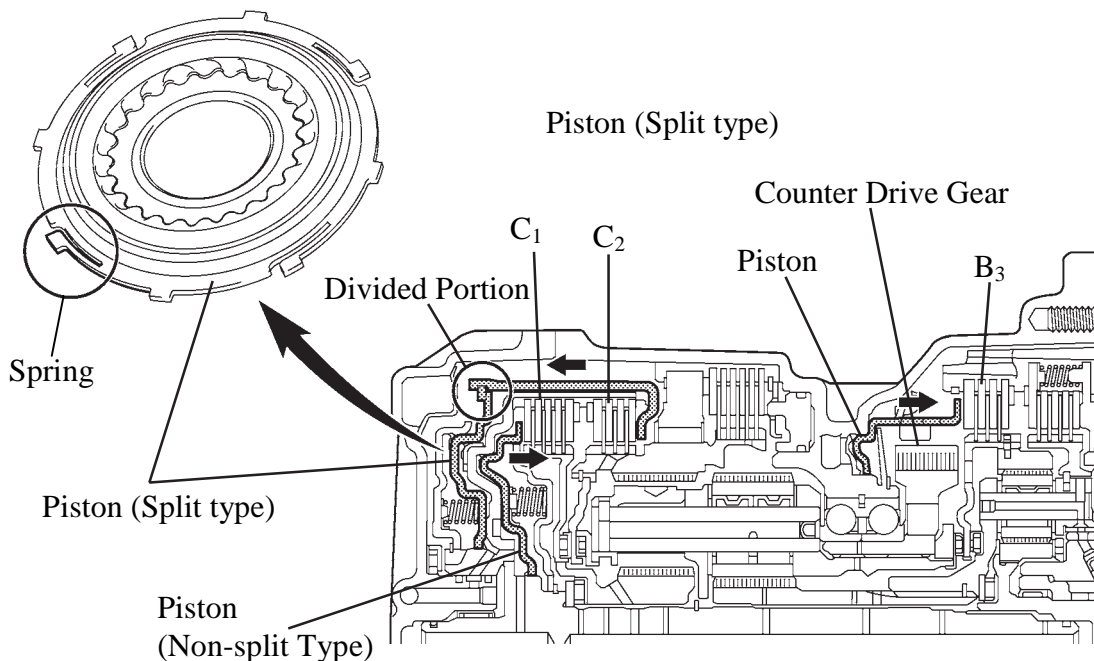
## 5. Counter Drive Gear

- Angular ball bearings are used to support the counter drive gear and the Ravigneaux planetary gear unit, reducing the rolling resistance and noise.
- By providing three elongated openings in the counter drive gear, the vibration conduction characteristic of the gear has been optimised. As a result, both gear noise and weight reductions have been achieved.



## 6. Clutch and Brake Pistons

- Two types of pistons are used; a non-split piston that acts in the push direction for the No.1 clutch ( $C_1$ ) operation, and a split piston that acts in the pull direction for the No.2 clutch ( $C_2$ ) operation. These two types of pistons contribute to making the entire clutch structure compact.
- When the split piston operates, clutch drag occurs due to rattling cause by the divided portion of the piston. However, by fitting springs on the piston circumference, such rattling is restrained and the occurrence of clutch drag is minimised.
- By setting the piston for the No.3 brake ( $B_3$ ) operation around the counter drive gear, the brake structure has been made more compact.

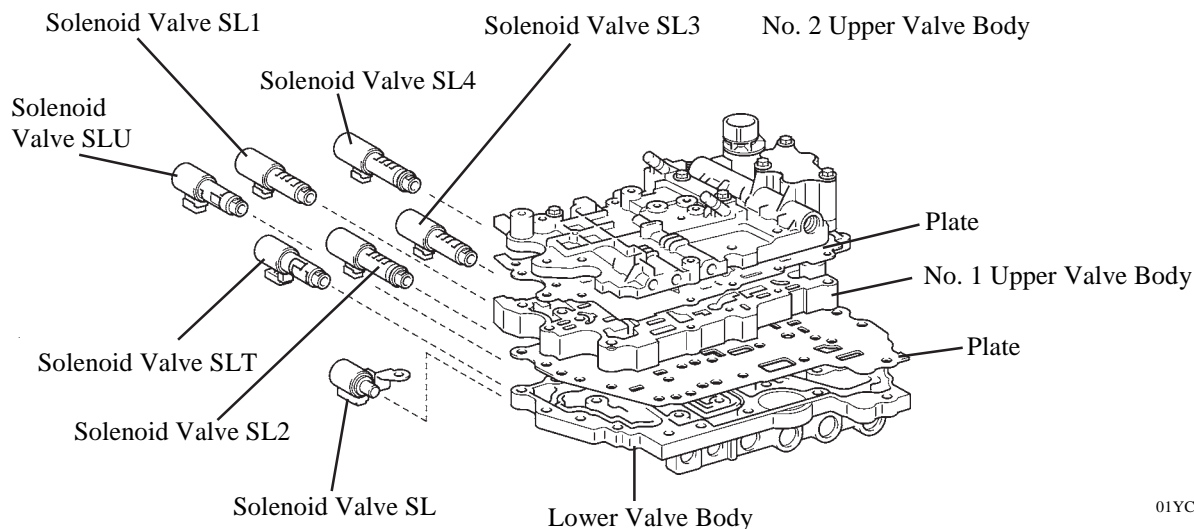


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## ★ VALVE BODY UNIT

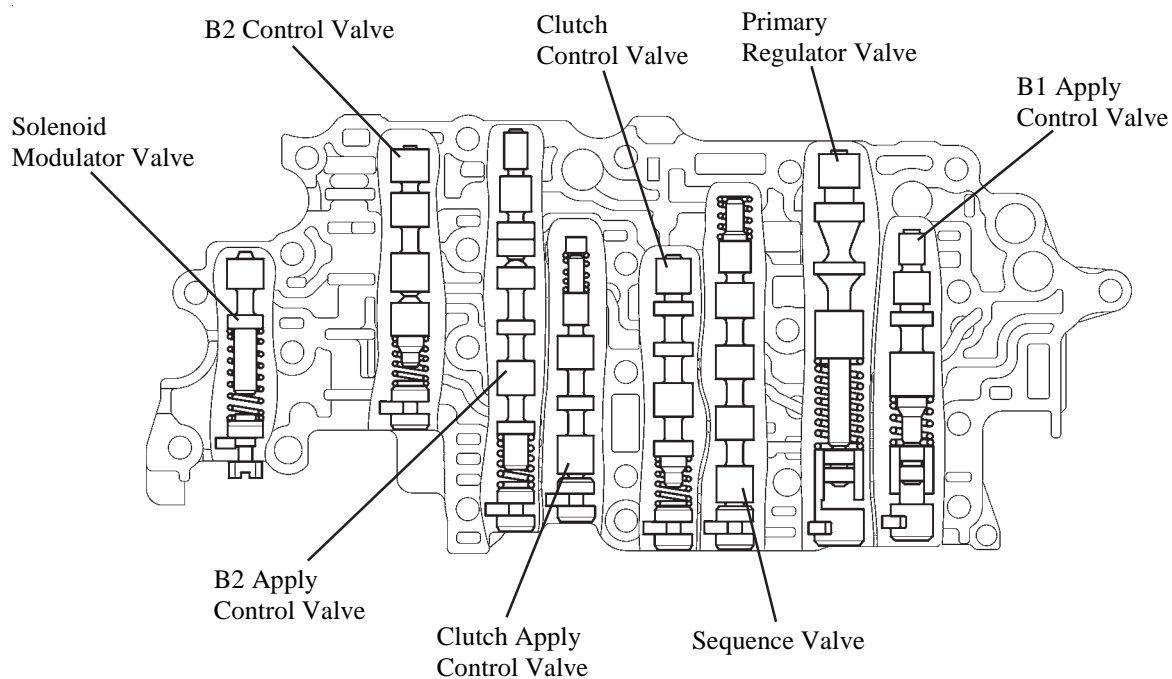
### 1. General

The valve body unit consists of the No.1 upper, No.2 upper and lower valve bodies and 7 solenoid valves (SL1, SL2, SL3, SL4, SLU, SLT, SL).



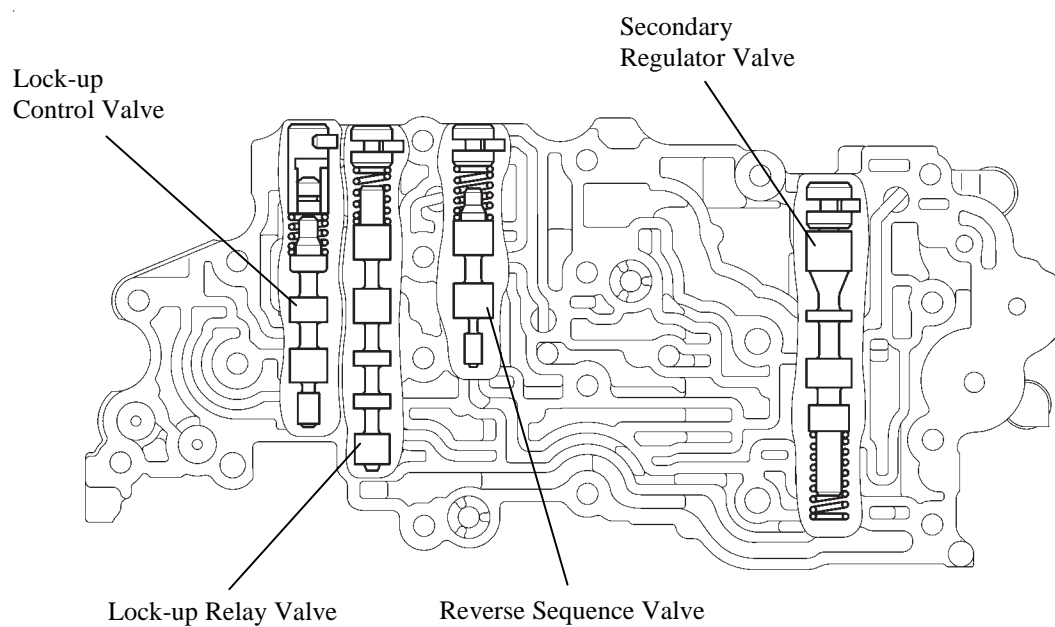
01YCH37TE

### ► No.1 Upper Valve Body ◀

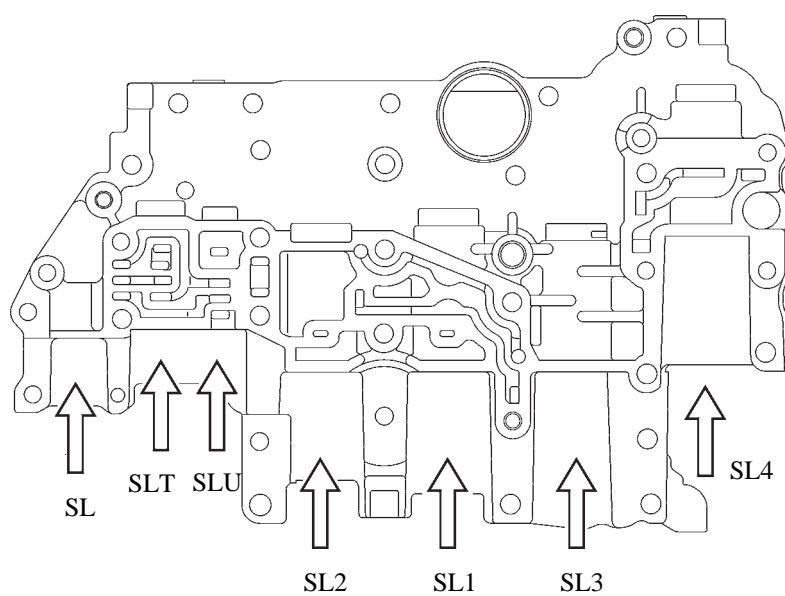


01YCH38TE

## ▶ No.2 Upper Valve Body ◀



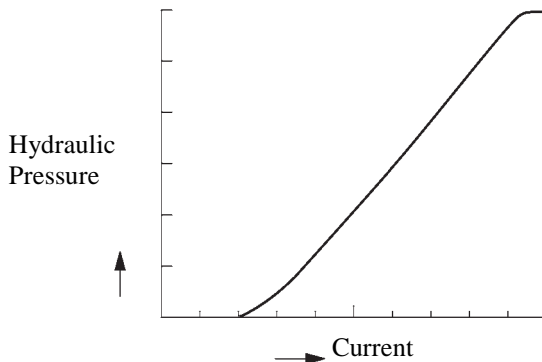
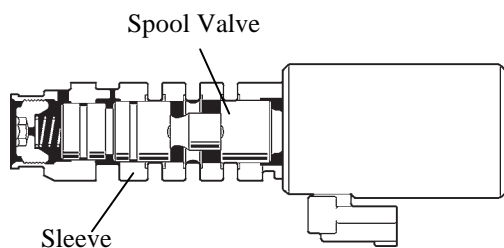
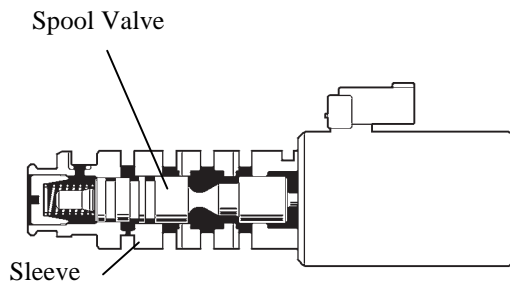
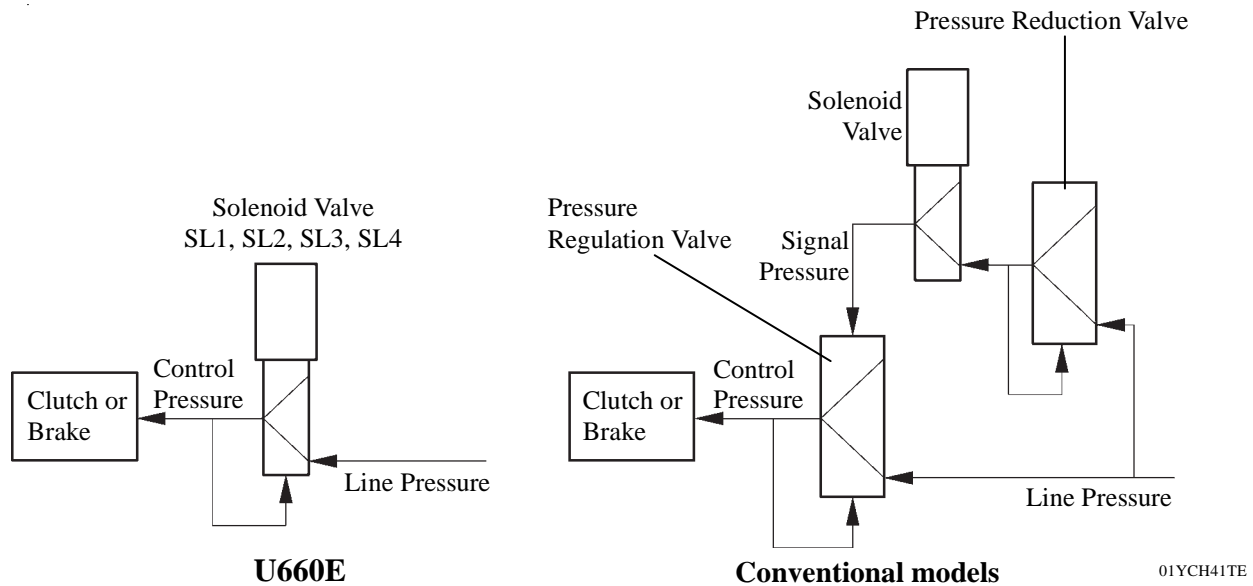
## ▶ Lower Valve Body ◀



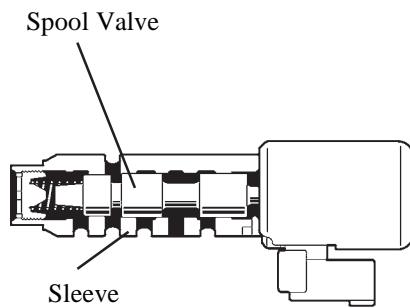
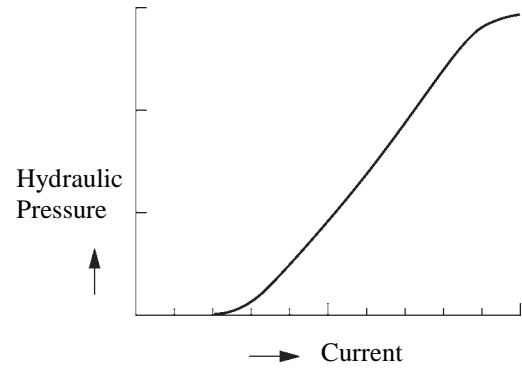
## 2. Solenoid Valves

### Solenoid Valves SL1, SL2, SL3, SL4, SLU and SLT

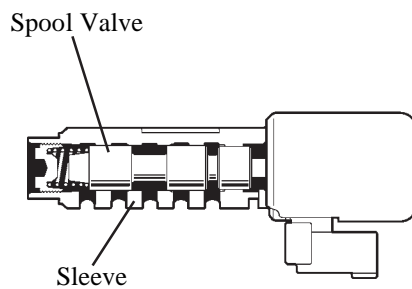
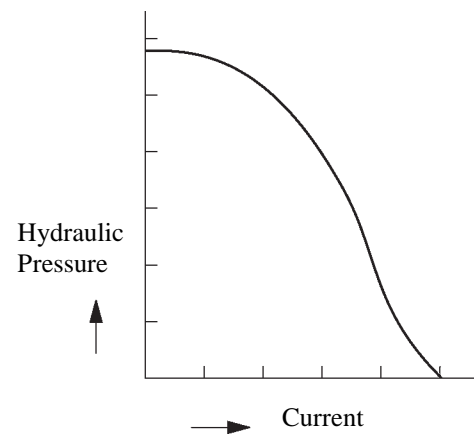
- In order to provide a hydraulic pressure that is proportional to the current that flows to the solenoid coil, solenoid valves SL1, SL2, SL3, SL4, SLU and SLT linearly control the line pressure and clutch and brake engagement pressure based on the signals from the ECT ECU.
- Solenoid valves SL1, SL2, SL3 and SL4 are large flow linear solenoid valves that can supply more pressure than conventional ones. These solenoid valves control engagement elements by directly regulating the line pressure without using the pressure regulation valve or the pressure reduction valve. Thus, the number of valves and the length of the valve body fluid passage have been reduced, the shifting response has been increased and the shift shock has been minimised.



01YCH19Y

**Solenoid Valve SLU**

01YCH20Y

**Solenoid Valve SLT**

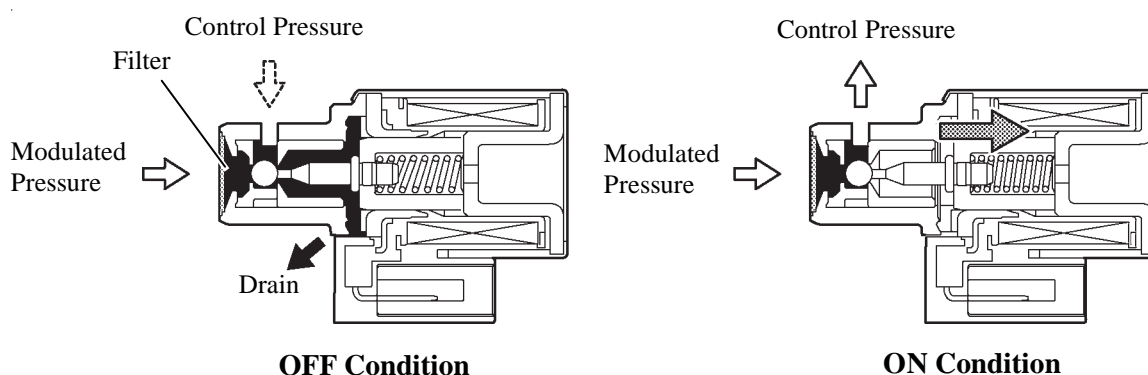
01YCH21Y

### ► Function of Solenoid Valves ◀

Solenoid Valve	Function
SL1	C <sub>1</sub> clutch pressure control
SL2	C <sub>2</sub> clutch pressure control
SL3	B <sub>1</sub> brake pressure control
SL4	B <sub>3</sub> brake pressure control
SLU	<ul style="list-style-type: none"> <li>• Lock-up clutch pressure control</li> <li>• B<sub>2</sub> brake pressure control</li> </ul>
SLT	Line pressure control

## Solenoid Valve SL

- Solenoid valve SL uses a three-way solenoid valve.
- A filter is provided at the tip of the solenoid valve to further improve operational reliability.



01YCH22Y

### ► Function of Solenoid Valve ◀

Solenoid Valve	Type	Function
SL	3-way	<ul style="list-style-type: none"> <li>• Switches the lock-up relay valve.</li> <li>• Switches the B<sub>2</sub> apply control valve and the reverse sequence valve.</li> </ul>

## ✱ ELECTRONIC CONTROL SYSTEM

### 1. General

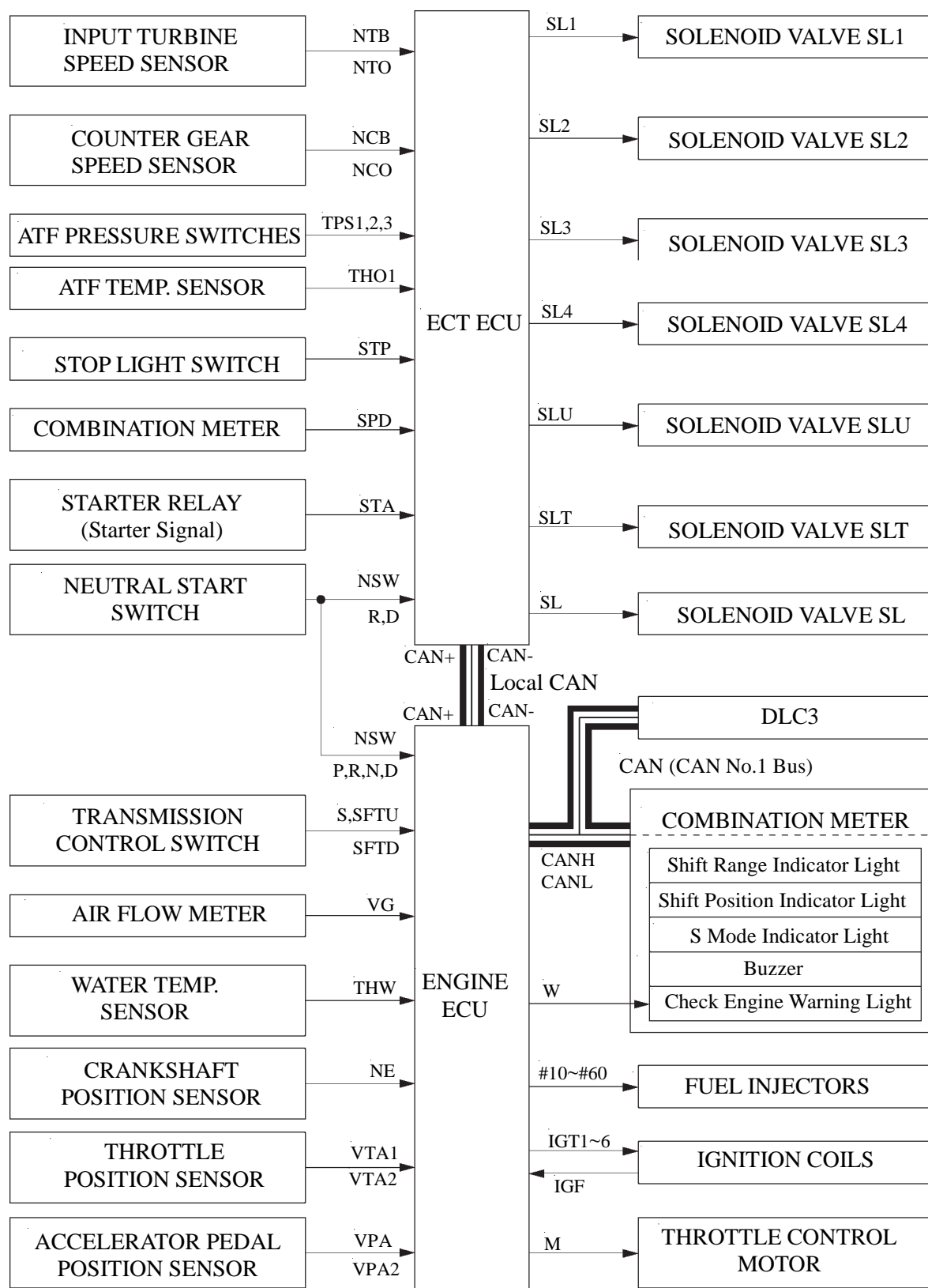
The electronic control system of the U660E automatic transaxle consists of the control listed below.

System	Outline
Shift Timing Control	The ECT ECU supplies current to 6 solenoid valves (SL1, SL2, SL3, SL4, SL and/or SLU) based on signals from each sensor to shift the gear.
Clutch to Clutch Pressure Control (See page CH-30)	Controls the pressure that is applied directly to the C <sub>1</sub> , C <sub>2</sub> clutches and B <sub>1</sub> , B <sub>3</sub> brakes by actuating the shift solenoid valves (SL1, SL2, SL3 and SL4) in accordance with ECT ECU signals.
Line Pressure Optimal Control (See page CH-31)	Actuates solenoid valve SLT to control the line pressure in accordance with information from the ECT ECU and the operating conditions of the transaxle.
Power train Cooperative Control (See page CH-32)	Controls both the shift control and engine output control in an integrated way, achieving excellent shift characteristics and drivability.
Lock-up Timing Control (See page CH-33)	The ECT ECU supplies current to shift solenoid valves SL and SLU based on signals from each sensor and engages or disengages the lock-up clutch.
Flex Lock-up Clutch Control (See page CH-34)	Controls solenoid valves SLU and SL, provides an intermediate mode between the ON/OFF operation of the lock-up clutch, and increases the operating range of the lock-up clutch to improve fuel economy.
Coast Downshift Control (See page CH-35)	The ECT ECU performs downshift control so that fuel cut control can continue for as long as possible during deceleration.
AI (Artificial Intelligence) -SHIFT (See page CH-36)	Based on the signals from various sensors, the ECT ECU determines the road condition and the intention of the driver. Thus, the shift pattern is automatically regulated to an optimal level, improving drivability.
Multi-mode Automatic Transmission (See page CH-38)	The ECT ECU appropriately controls the automatic transaxle in accordance with the range position selected while the shift lever is in the S mode position.
Diagnosis (See page CH-40)	When the ECT ECU detects a malfunction, the ECT ECU makes a diagnosis and memorizes the malfunctioning part.
Fail-safe (See page CH-40)	Even if a malfunction is detected in the sensors or solenoids, the ECT ECU activates fail-safe control to prevent the vehicle's drivability from being significantly affected.

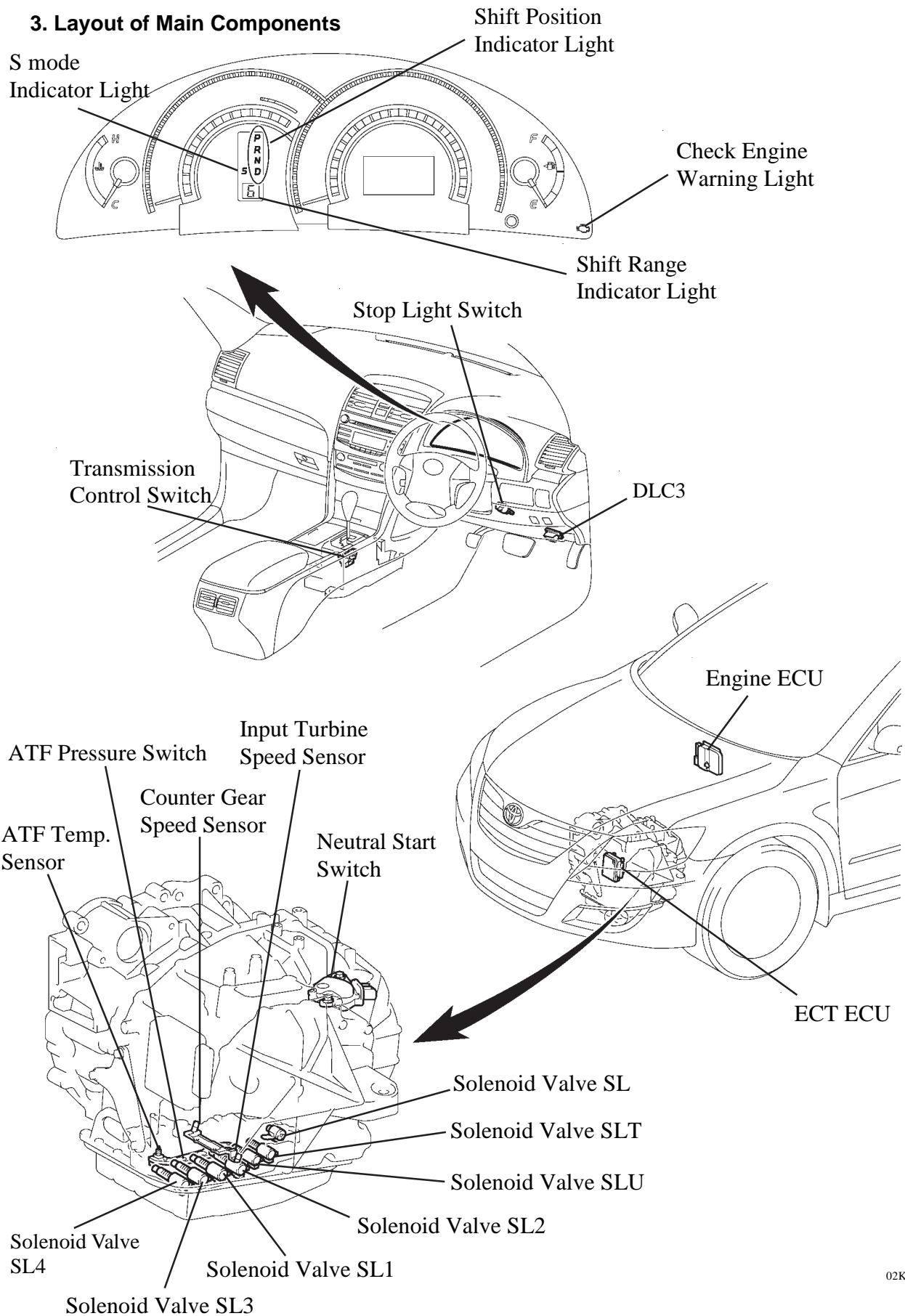


## 2. Construction

The configuration of the electronic control system in the U660E automatic transaxle is as shown in the following chart.



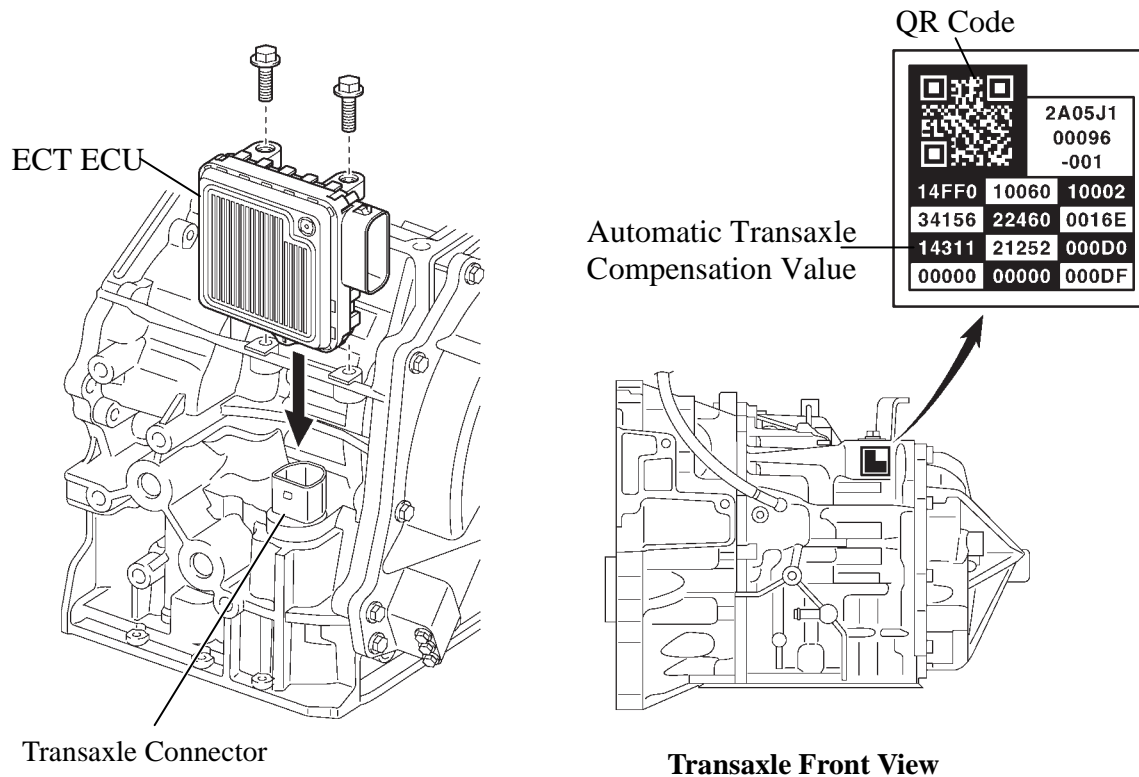
### 3. Layout of Main Components



## 4. Construction and Operation of Main Components

### ECT ECU

- The ECT ECU has been isolated from the engine ECU and directly fitted to the transaxle. Thus, the wiring harness has been shortened allowing the weight to be reduced. All the solenoid valves and sensors used for automatic transaxle control are directly connected to the ECT ECU through the connector located in front of the automatic transaxle.
- The ECT ECU maintains communication with the engine ECU through the CAN (Controller Area Network). Thus, engine control is effected in coordination with ECT control.
- A label, on which the automatic transaxle compensation values and QR (Quick Response) code are printed, is attached on the top of the automatic transaxle. The label contains encoded automatic transaxle property information. When the automatic transaxle is replaced, allow the ECT ECU to learn the automatic transaxle property information by inputting the automatic transaxle compensation values into the ECT ECU using an intelligent tester II. In this way, the shift control performance immediately after replacement of the automatic transaxle is improved. For details, see the Aurion Repair Manual.
- The QR code, which requires a special scan tool, is used at the vehicle assembly plant.



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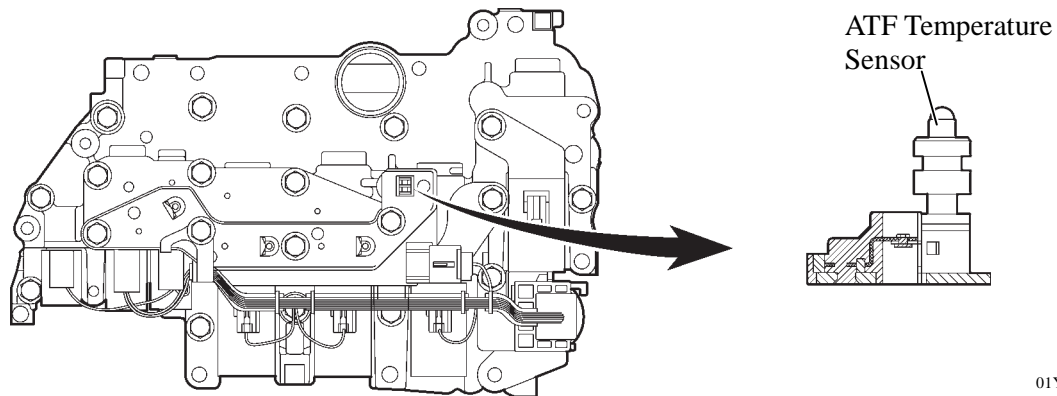
### - REFERENCE -

What are QR (Quick Response) Codes?

- QR code, a matrix symbology consisting of an array of nominally square cells, allows omni-directional, high-speed reading of large amounts of data.
- QR codes encode many types of data such as numeric, alphanumeric, kanji, kana and binary codes. A maximum of 7,089 characters (numeric) can be encoded.
- QR codes (2D code) contain information in the vertical and horizontal directions, whereas bar codes only contain data in one direction. QR codes (2D code) hold considerably greater volumes of information than bar codes.

### ATF Temperature Sensor

- The ATF temperature sensor is installed in the valve body for direct detection of the fluid temperature.
- The ATF temperature sensor is used for the revision of clutch and brake pressures to maintain a smooth shift quality every time.

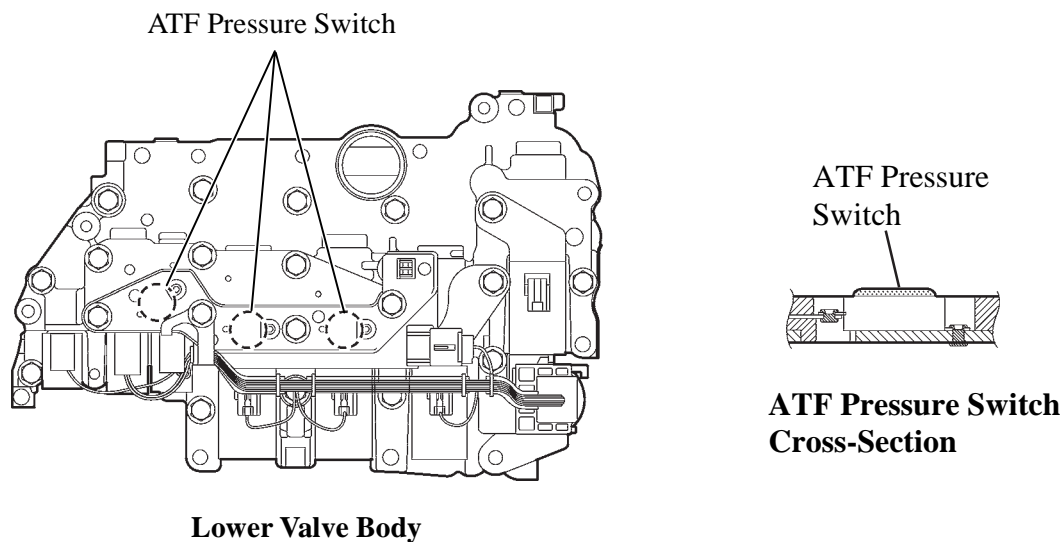


01YCH44TE

**Lower Valve Body**

### ATF Pressure Switch

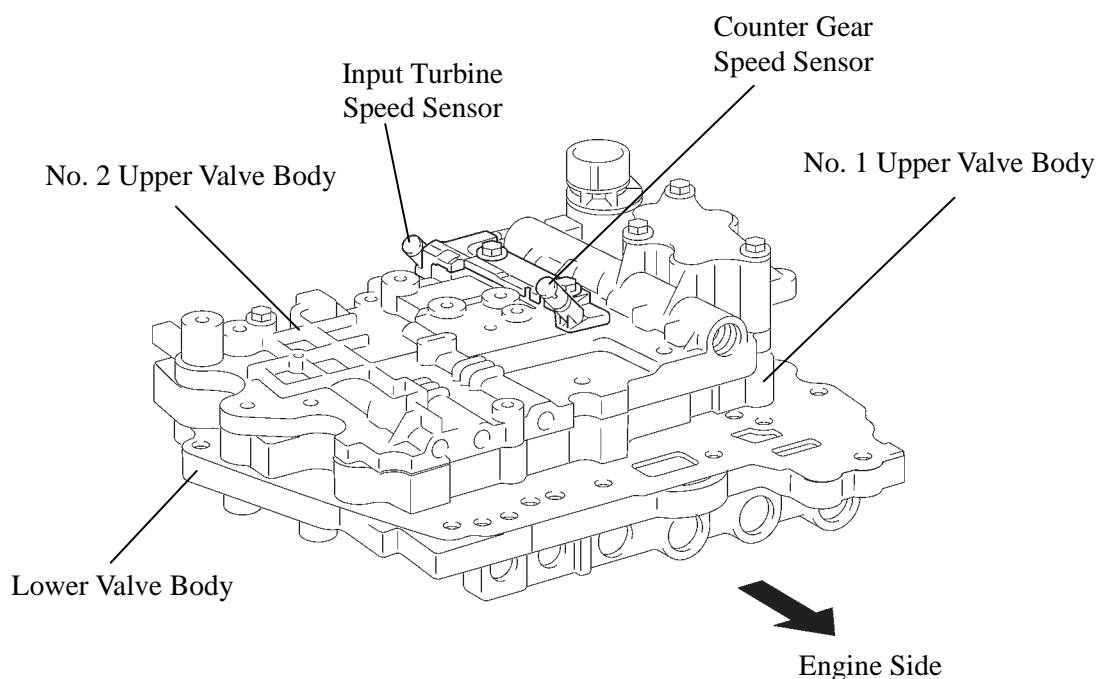
- The ATF pressure switches are located in the output fluid passages of SL1, SL2 and SLU, and turn ON/OFF in accordance with the solenoid valve output fluid pressure.
- The ECT ECU detects malfunctions in solenoid valves SLU and SL used in lock-up control in accordance with the ON/OFF signals from ATF pressure switch 3 located in the SLU output fluid passage.
- When any of SL1 to SL4 malfunctions, the ECT ECU determines the appropriate fail-safe operation to be actuated in accordance with the ON/OFF signals from ATF pressure switches 1 and 2 located in the SL1 and SL2 output fluid passages.



01YCH45TE

## Speed Sensors

- The U660E automatic transaxle uses an input turbine speed sensor (for the NT signal) and a counter gear speed sensor (for the NC signal). Thus, the ECT ECU can detect the timing of the shifting of the gears and appropriately control the engine torque and hydraulic pressure in response to the various conditions. These speed sensors are the Hall type.
- The input turbine speed sensor detects the input speed of the transaxle. The No.2 clutch piston is used as the timing rotor for this sensor.
- The counter gear speed sensor detects the speed of the counter gear. The counter drive gear is used as the timing rotor for this sensor.
- The Hall type speed sensor consists of a magnet and Hall IC. The Hall IC converts the changes in the magnetic flux density that occur through the rotation of the timing rotor into electric signal, and outputs the signal to the ECT ECU.



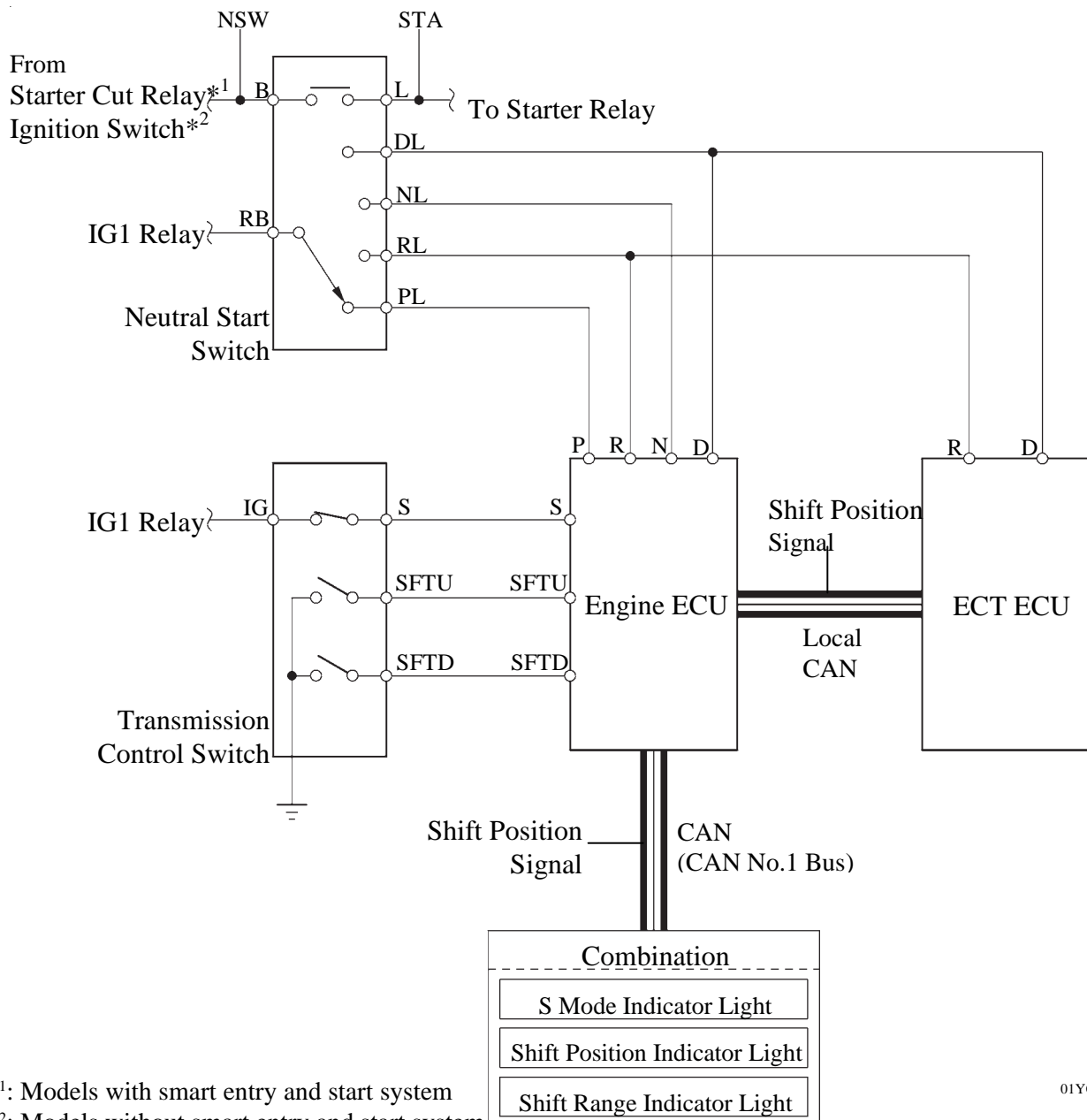
01YCH24TE

## Transmission Control Switch and Neutral Start Switch

The ECT ECU and engine ECU use these switches to detect the shift lever position.

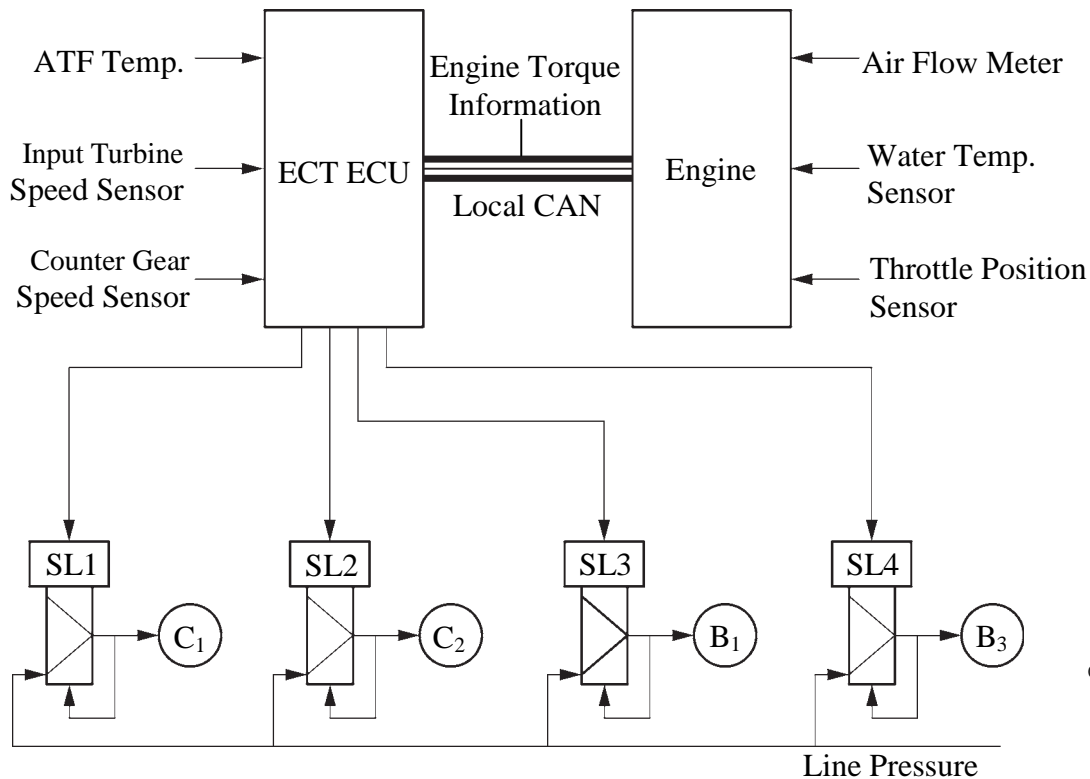
- The neutral start switch sends the P, R, N and D position signals to both the engine ECU and ECT ECU. The engine ECU transmits signals to the combination meter for the shift position indicator light (P, R, N and D) in response to the signal it receives from the switch.
- The transmission control switch is installed inside the shift lever assembly. Switch terminal S is used to detect whether the shift lever is in the D position or S mode position, and terminals SFTU and SFTD are used to detect the operating conditions of the shift lever (front [+ position] or rear [- position]) if S mode is selected. By transmitting signals to the engine ECU, the transmission control switch turns on both the shift range indicator light and S mode indicator light when the shift lever is moved to the S mode position, and indicates the selected range position through shift range indicator light.

### ▶ Wiring Diagram ◀



### 5. Clutch to Clutch Pressure Control

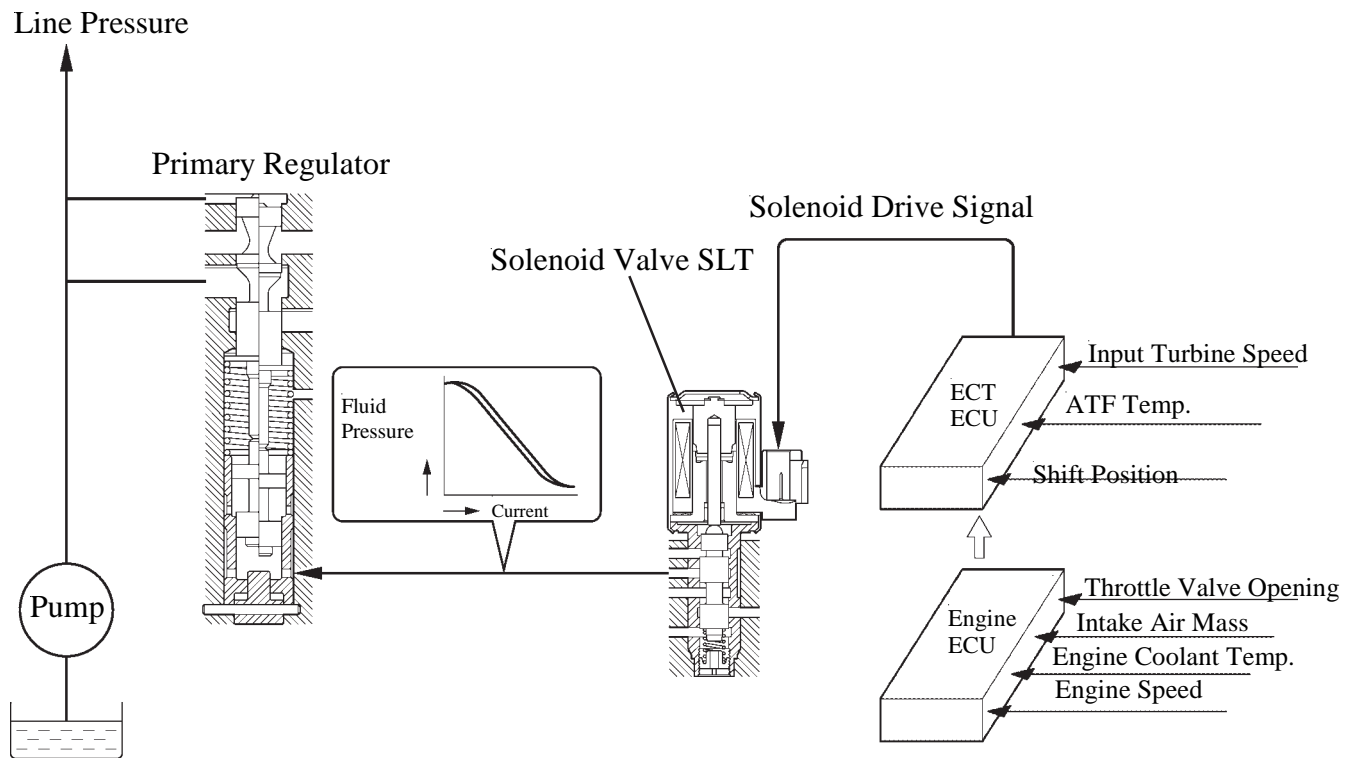
- Clutch to clutch pressure control is used for shift control. As a result, shift control in the 2nd gear or above is possible without using the one-way clutch, and the automatic transaxle has been made lightweight and compact.
- Using the fluid pressure circuit, which enables the clutches and brakes ( $C_1$ ,  $C_2$ ,  $B_1$  and  $B_3$ ) to be controlled independently, and the high flow SL1, SL2, SL3 and SL4 linear solenoid valves, which directly control the line pressure, the ECT ECU controls each clutch and brake accordingly with the optimum fluid pressures and timings in accordance with the information transmitted by the sensors, and then shifts the gears. As a result, highly responsive and excellent shift characteristics have been realised.



01YCH26TE

## 6. Line Pressure Optimal Control

The line pressure is controlled by using solenoid valve SLT. Through the use of solenoid valve SLT, the line pressure is optimally controlled in accordance with the engine torque information, as well as with the internal operating conditions of the torque converter and the transaxle. Accordingly, the line pressure can be accurately controlled in accordance with the engine output, traveling condition, and the ATF temperature, thus realising smooth shift characteristics and optimising the workload of the oil pump.



01YCH27Y

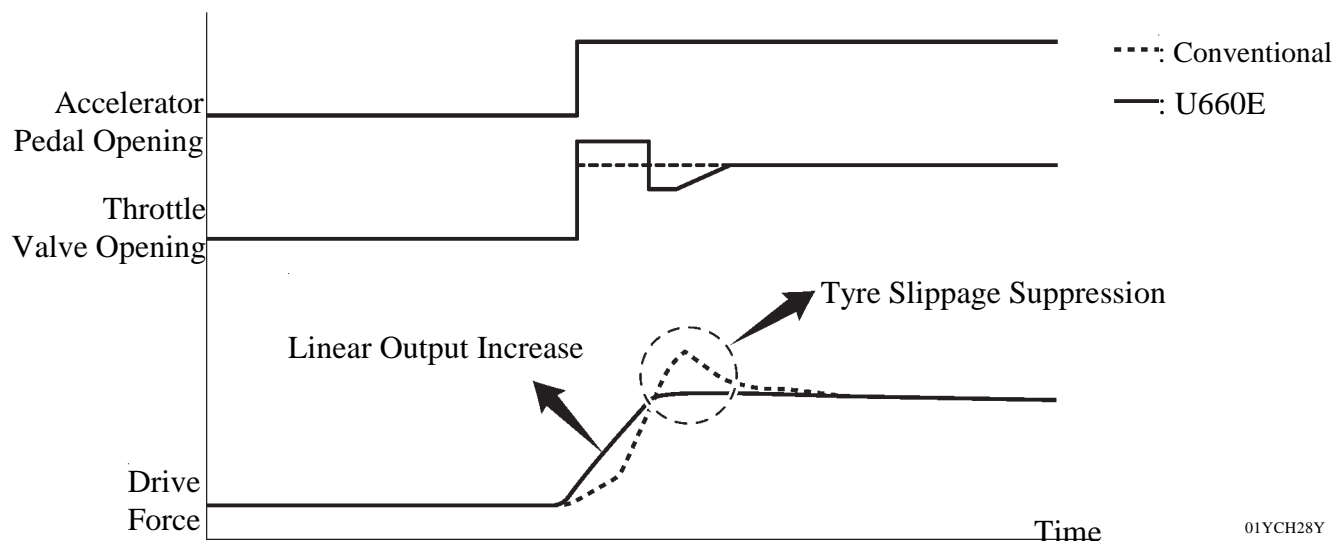
\*: This diagram illustrates the fundamentals of line pressure control. The valve shapes differ from the actual ones.



## 7. Power Train Cooperative Control

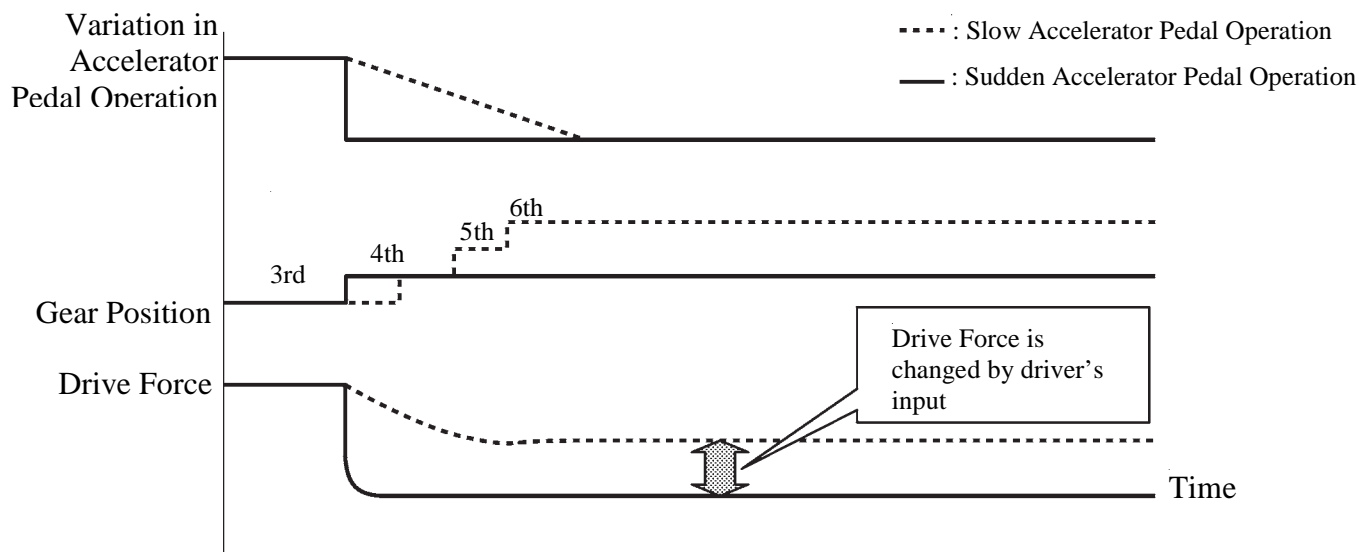
### Throttle Control at Launch

By controlling the engine output in cooperative control with ETCS-i (Electronic Throttle Control System-intelligent) when the vehicle is launched, excellent launch performance (improved response and suppression of tyre slippage) is ensured.



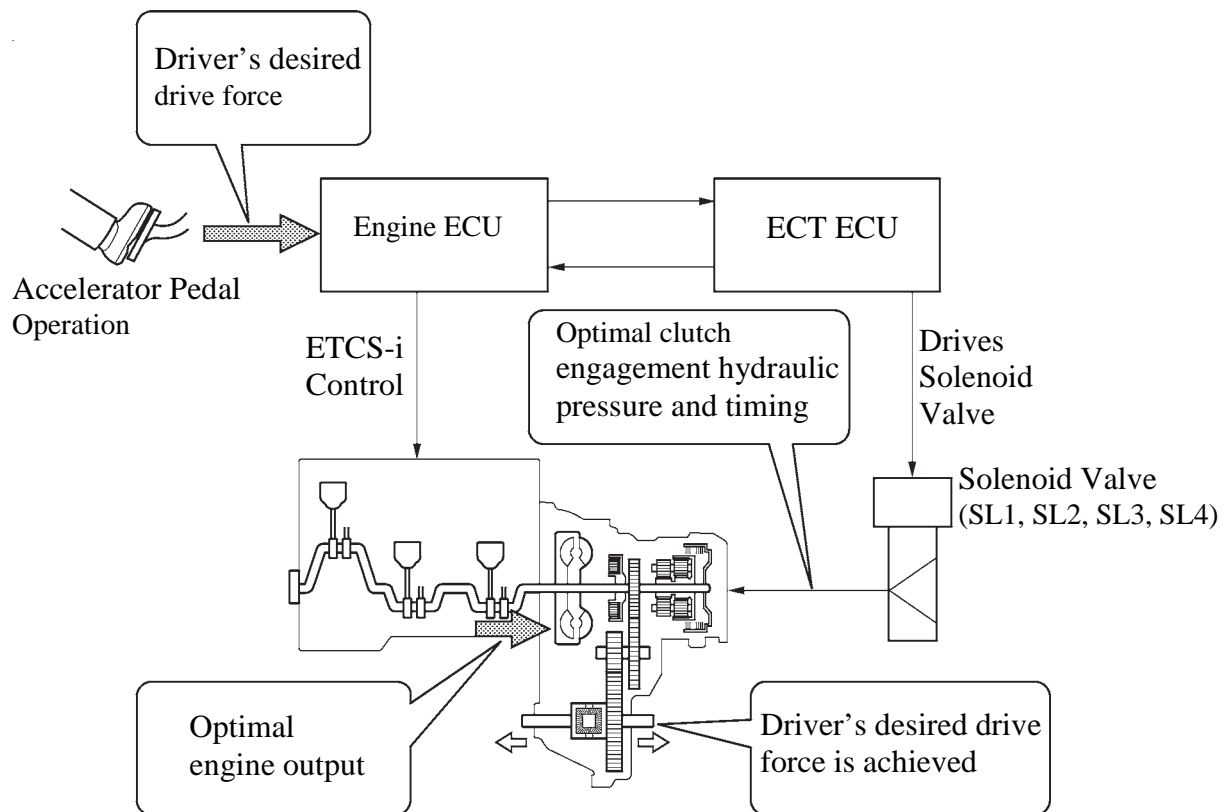
### Deceleration Force Control

The ECT ECU determines the gear position when the accelerator pedal is OFF (released completely) in accordance with the operation of the accelerator pedal (released suddenly or slowly) during deceleration. In this way, preventing unnecessary up shifts and downshifts when the accelerator pedal is OFF and ensuring smooth acceleration when the vehicle needs to accelerate again.



## Transient Shifting Control

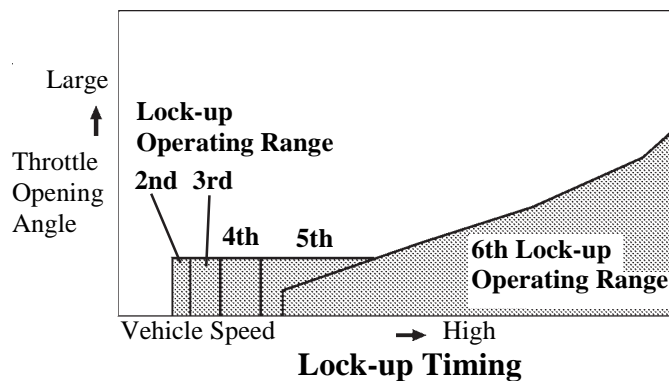
Through cooperative control with ETCS-i (Electronic Throttle Control System-intelligent) and ESA (Electronic Spark Advance), and electronic control of the engagement and release speed of the clutch and brake hydraulic pressures, excellent response and shift shock reduction have been achieved.



01YCH30Y

## 8. Lock-up Timing Control

The ECT ECU operates the lock-up timing control in order to improve the fuel consumption while in the 2nd gear or above with the shift lever in the D, S6, S5, and S4 range.



### Lock-up Operation

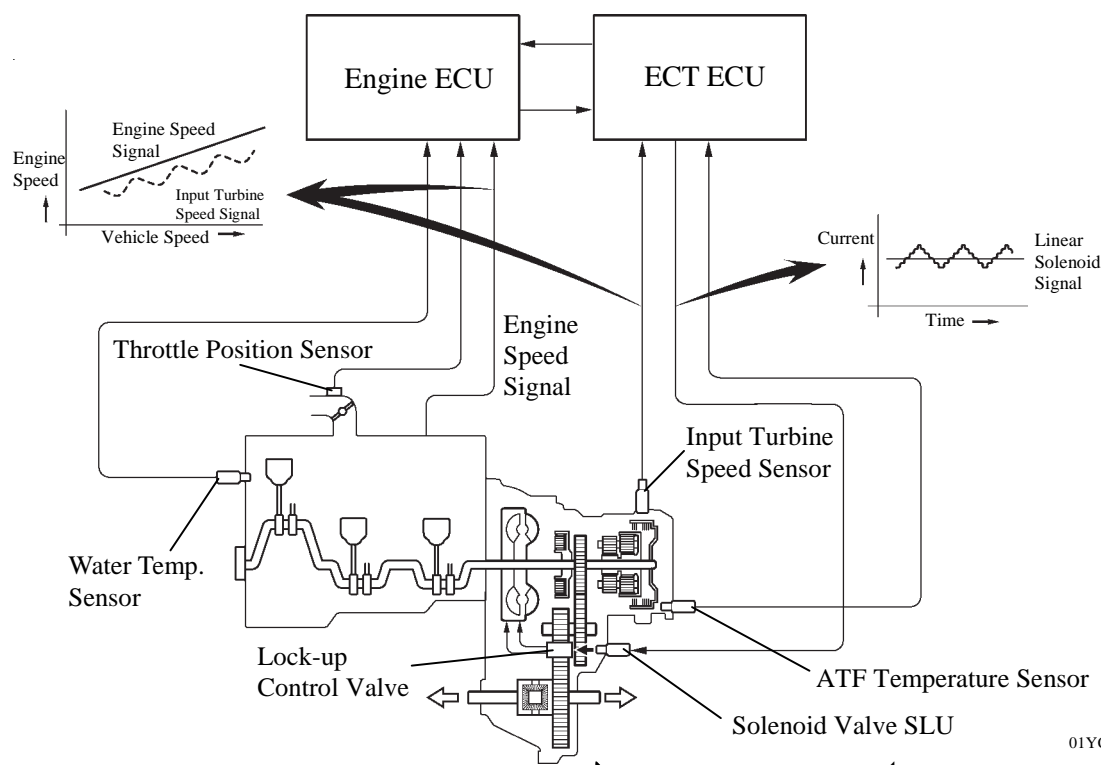
Gear	Position or Range		
	D or S6	S5	S4
1st	×	×	×
2nd	○	○	○
3rd	○	○	○
4th	○	○	○
5th	○	○	—
6th	○	—	—

○: Operates ×: Does not operate —: Not applicable

01YCH31Y

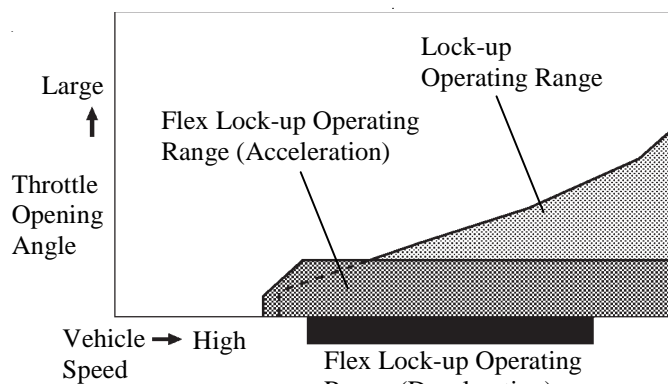
## 9. Flex Lock-up Clutch Control

- In addition to the conventional lock-up timing control, flex lock-up clutch control is used.
- This flex lock-up clutch control regulates solenoid valve SLU as an intermediate mode between the ON and OFF operations of the lock-up clutch.
- During acceleration, flex lock-up clutch control operates when the gear position is the 2nd or higher and the shift lever is in the D, S6, S5 or S4 range position. During deceleration, it operates when the gear position is the 4th or higher and the shift lever is in the D, S6, S5 or S4 range position.
- During acceleration, the partition control of the power transmission between the lock-up clutch and torque converter greatly boosts the transmission efficiency in accordance with the driving conditions, improving the fuel economy.
- During deceleration, the lock-up clutch is made to operate. Therefore the fuel-cut area is expanded and fuel economy is improved.
- By allowing flex lock-up clutch control to continue operating during gearshift, the smooth torque transmission has been obtained. As a result, the fuel economy and drivability have been improved.



01YCH32Y

### Flex Lock-up Operation



Flex Lock-Up Timing in 6th Gear

Gear	Position or Range		
	D, S6	S5	S4
1st	×	×	×
2nd	○	○	○
3rd	○	○	○
4th	○*	○*	○*
5th	○*	○*	—
6th	○*	—	—

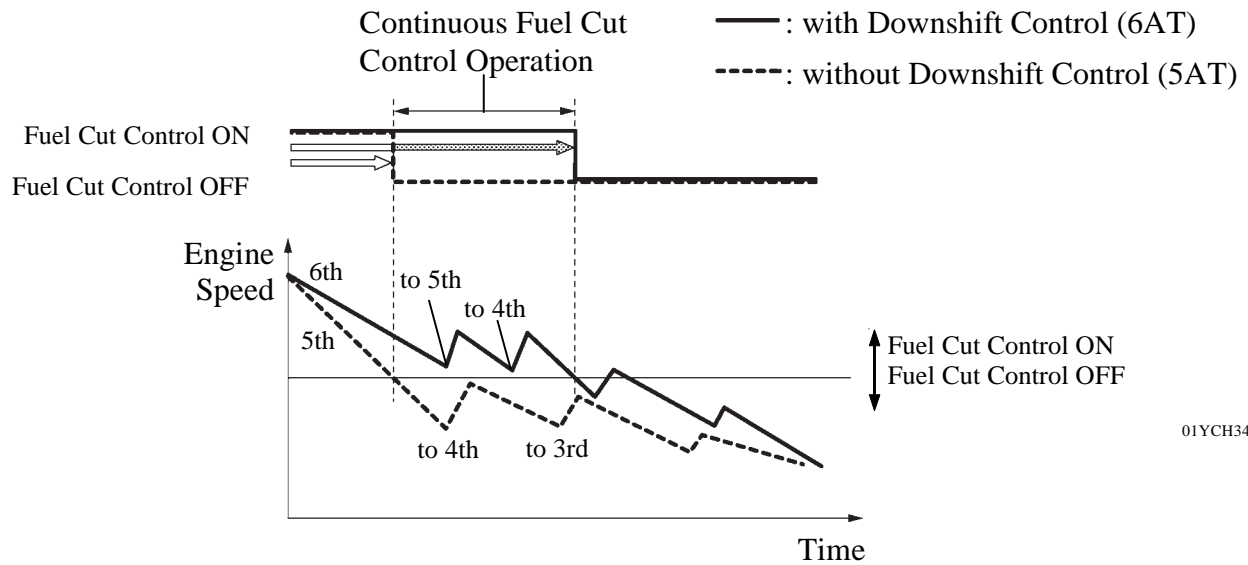
○: Operates ×: Does not operate —: Not applicable

\*: Flex Lock-up Clutch Control also operates when the vehicle is decelerated.

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## 10. Coast Downshift Control

- The ECT ECU performs downshift control to restrain the engine speed from decreasing, and keeps fuel cut control operating for as long as possible. In this way, the fuel economy is improved.
- In this control, the transaxle downshifts from 6th to 5th and then 5th to 4th before fuel cut control ends when the vehicle is decelerated in the 6th gear, so that fuel cut control continues operating.

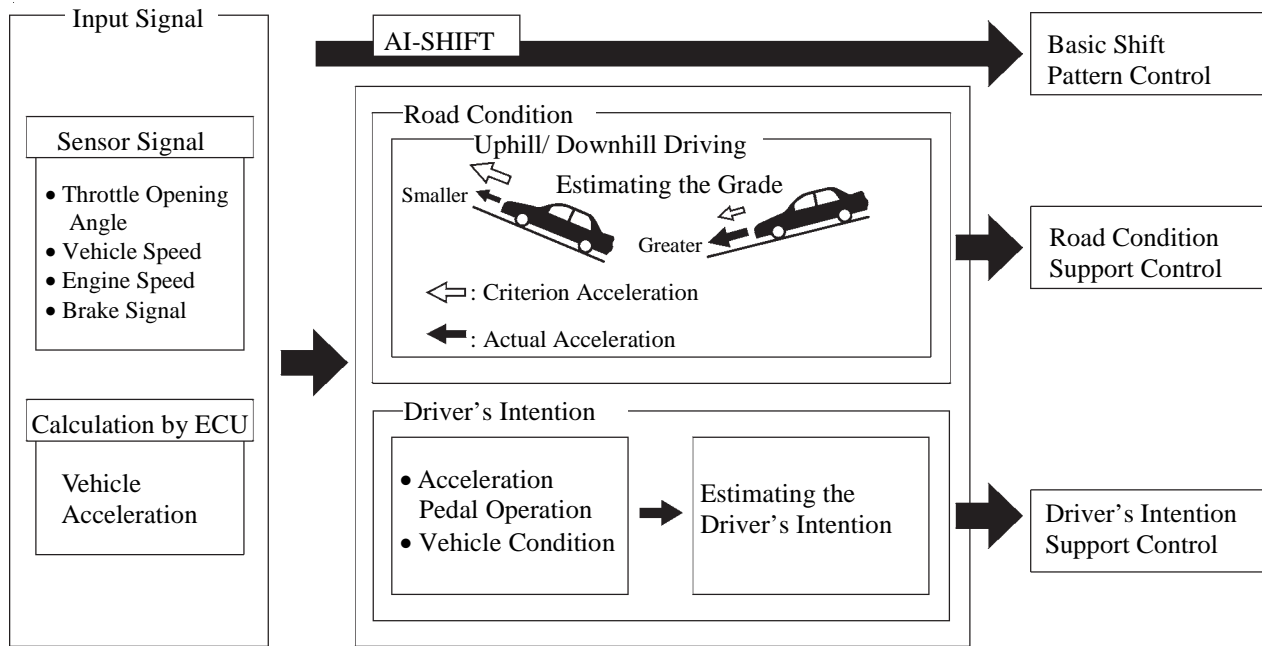


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## 11. AI (Artificial Intelligence)- Shift Control

### General

AI- SHIFT control enables the ECT ECU to estimate the road conditions and the driver's intention in order to automatically control the shift pattern in the optimal manner. As a result, a comfortable ride has been achieved.

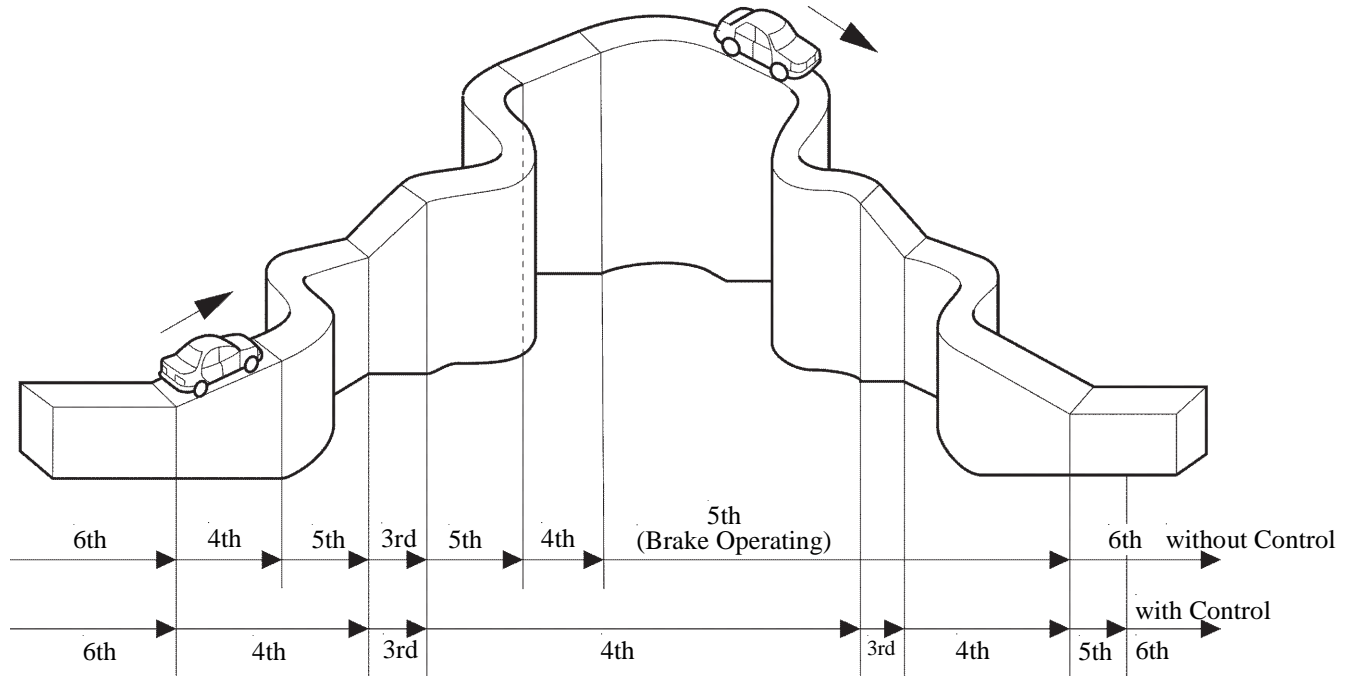


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### Road Condition Support Control

Under road condition support control, ECT ECU determines the throttle valve opening angle and the vehicle speed whether the vehicle is being driven uphill or downhill.

To achieve the optimal drive force while driving uphill, this control prevents the transaxle from up shifting to the 5th or 6th gear. To achieve the optimal engine brake effect while driving downhill, this control automatically downshifts the transaxle to the 5th or 4th or 3rd gear.



040SC13C

### Driver's Intention Support Control

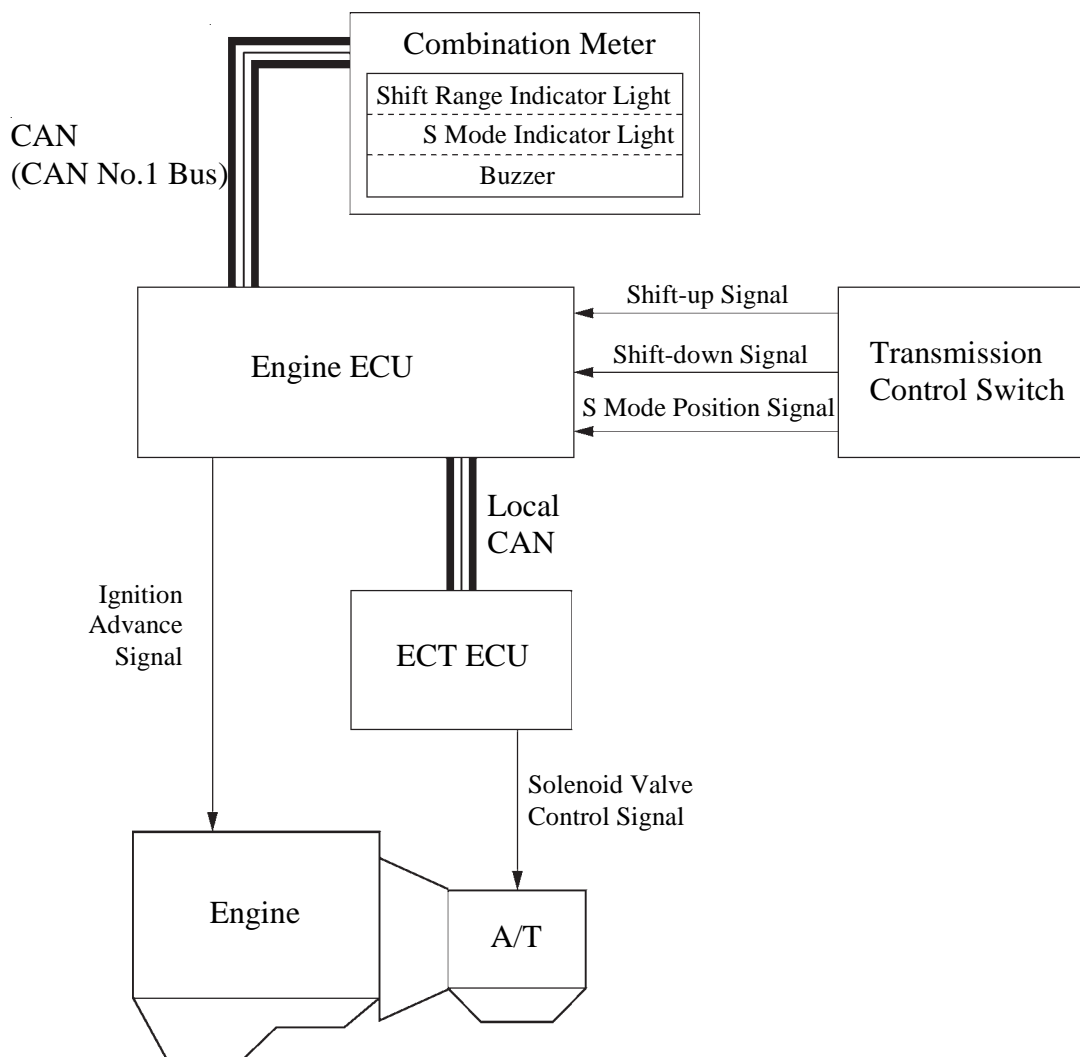
Estimates the driver's intention based on the accelerator operation and vehicle condition to switch to a shift pattern that is well-suited to each driver, without the need to operate the shift pattern select switch used in the conventional models.

## 12. Multi-mode Automatic Transmission

### General

By moving the shift lever to the front (“+” position) or to the rear (“-” position), the driver can select the desired shift range position. Thus, the driver is able to shift gears with a manual-like feel.

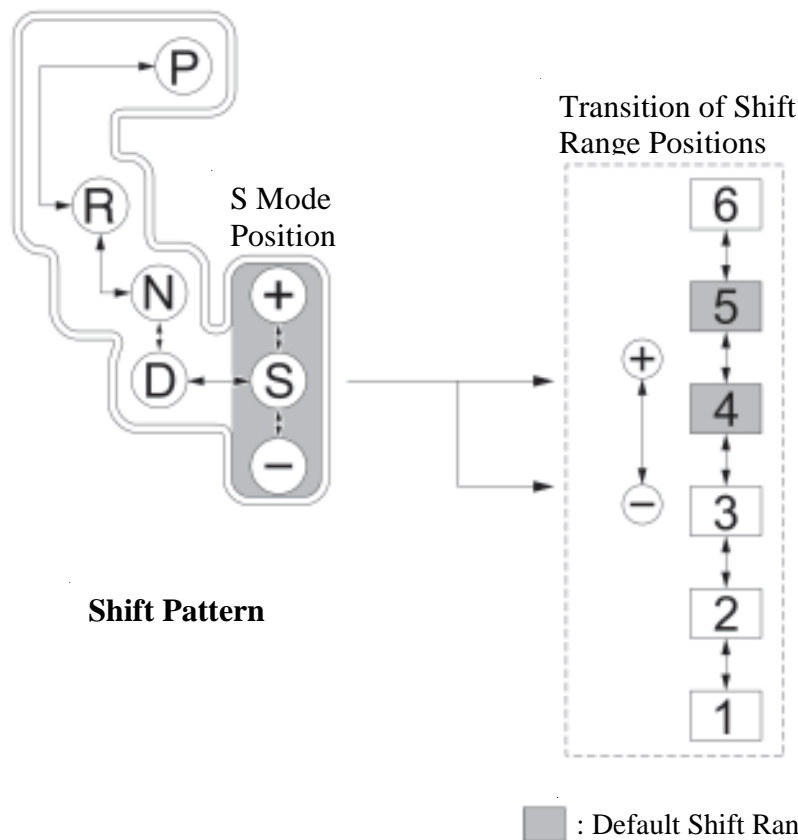
- This multi-mode automatic transmission is designed to allow the driver to switch the gear ranges; not for manually selecting single gears.
- An S mode indicator light, which illuminates when the S mode position is selected and a shift range indicator light, which indicates the range position, have been provided in the combination meter.
- When the vehicle is being driven at a prescribed speed or higher, any attempt to shift down the range by through the operation of the shift lever will not be executed, in order to protect the mechanism of the automatic transaxle. In this case, the engine ECU sounds the buzzer in the combination meter twice to alert the driver.



01YCH35Y

## Operation

- The driver selects the S mode position by engaging the shift lever. At this time, the shift range position selects the 4th or 5th range according to the vehicle speed. (During AI-Shift control, the shift range that has the currently controlled gear position as the maximum usable gear position is displayed.) Then, the shift range positions change one at a time, as the driver moves the shift lever to the front (“+” position) or to the rear (“-” position).
- Under this control, the ECT ECU effects optimal shift control within the usable gear range that the driver has selected. As with an ordinary automatic transmission, it shifts to the 1st gear when the vehicle is stopped.
- When the shift lever is in the S mode position, the S mode indicator light in the combination meter illuminates. The shift range indicator light indicates the state of the shift range position that the driver has selected.



030SC29Ca

Shift Range Indicator Light Indication	Shift Range	Usable Gear
6	6	6th ↔ 5th ↔ 4th ↔ 3rd ↔ 2nd ↔ 1st
5	5	5th ↔ 4th ↔ 3rd ↔ 2nd ↔ 1st
4	4	4th ↔ 3rd ↔ 2nd ↔ 1st
3	3	3rd ↔ 2nd ↔ 1st
2	2	2nd ↔ 1st
1	1	1st



### 13. Diagnosis

- When the ECT ECU detects a malfunction, the ECT ECU makes a diagnosis and memorises the information related to the fault. Furthermore, the check engine warning light in the combination meter illuminates or blinks to inform the driver of the malfunction.
- At the same time, the DTC (Diagnosis Trouble Code) are stored in the memory. The DTC stored in the ECT ECU are output to an intelligent tester II connected to the DLC3 via the engine ECU.
- For details, see the Aurion Repair Manual.

### 14. Fail-safe

This function minimises the loss of operation when any abnormality occurs in a sensor or solenoid.

#### ► Fail-safe Control List ◀

Malfunction Part	Function
Input Turbine Speed Sensor	Shifting to only either the 1st or 3rd gears is allowed.
Counter Gear Speed Sensor	<ul style="list-style-type: none"> <li>• The counter gear speed is detected through the signals from the skid control ECU (speed sensor signals).</li> <li>• Shifting between the 1st to 4th gears is allowed.</li> </ul>
ATF Temp. Sensor	Shifting between the 1st to 4th gears is allowed.
ECT ECU Power Supply (Voltage is Low)	When the vehicle is being driven in 6th gear, the transaxle is fixed in 6th gear. When being driven in any of the 1st to 5th gears, the transaxle is fixed in 5th gear.
CAN Communication	Shifting to only either the 1st or 3rd gears is allowed.
Knock Sensor	Shifting between the 1st to 4th gears is allowed.
Solenoid Valve SL1, SL2, SL3 and SL4	The current to the failed solenoid valve is cut off and operating the other solenoid valves with normal operation performs shift control. (Shift controls in fail-safe mode are described in the table on the next page. For details, refer to Fail-Safe Control List)

### ▶ Solenoid Valve Operation when Normal ◀

○: ON    ✕: OFF

Gear Position		1st	2nd	3rd	4th	5th	6th
Solenoid Valve	SL1	○	○	○	○	✕	✕
	SL2	✕	✕	✕	○	○	○
	SL3	✕	○	✕	✕	✕	○
	SL4	✕	✕	○	✕	○	✕

### ▶ Fail-safe Control List ◀

Gear Position in Normal Operation		1st	2nd	3rd	4th	5th	6th
SL1	OFF Malfunction (without Fail-safe Control)	1st→N	2nd→N	3rd→N	4th→N	5th	6th
	ON Malfunction (without Fail-safe Control)* <sup>1</sup>	1st	2nd	3rd	4th	5th→4th	6th→4th
	Fail-safe Control during OFF Malfunction	Fixed in 3rd or 5th* <sup>2</sup>					
	Fail-safe Control during OFF Malfunction (ATF Pressure Switches 1 or 2 Malfunctions)	Fixed in 3rd or 5th* <sup>2</sup>					
SL2	OFF Malfunction (without Fail-safe Control)	1st	2nd	3rd	4th→1st	5th→N	6th→N
	ON Malfunction (without Fail-safe Control)* <sup>1</sup>	1st→4th	2nd→4th	3rd→4th	4th	5th	6th
	Fail-safe Control during OFF Malfunction	1st	2nd	3rd	3rd* <sup>3</sup>	3rd* <sup>3</sup>	3rd* <sup>3</sup>
	Fail-safe Control during OFF Malfunction (ATF Pressure Switches 1 or 2 Malfunctions)	Fixed in 2nd or 3rd* <sup>3</sup>					
SL3	OFF Malfunction (without Fail-safe Control)	1st	2nd→1st	3rd	4th	5th	6th→N
	ON Malfunction (without Fail-safe Control)* <sup>1</sup>	1st→2nd	2nd	3rd	4th	5th	6th
	Fail-safe Control during OFF Malfunction	1st	3rd	3rd	4th	5th	5th* <sup>3</sup>
	Fail-safe Control during OFF Malfunction (ATF Pressure Switches 1 or 2 Malfunctions)	Fixed in 3rd* <sup>3</sup>					
SL4	OFF Malfunction (without Fail-safe Control)	1st	2nd	3rd→1st	4th	5th→N	6th
	ON Malfunction (without Fail-safe Control)* <sup>1</sup>	3rd	3rd	3rd	4th	5th	5th
	Fail-safe Control during OFF Malfunction	1st* <sup>4</sup>	2nd* <sup>4</sup>	4th* <sup>4</sup>	4th* <sup>4</sup>	6th	6th
	Fail-safe Control during OFF Malfunction (ATF Pressure Switches 1 or 2 Malfunctions)	Fixed in 2nd* <sup>3</sup>					

\*<sup>1</sup>: Fail-safe control is not actuated when the ON malfunction occurs.

\*<sup>2</sup>: If malfunctions already exist in any of the P, R or N range positions and a malfunction is detected when the gear is shifted to the 1st gear, the gear position is fixed in the 5th gear. After that, if any of the P, R or N range positions is selected, the gear is fixed in the 3rd gear position.

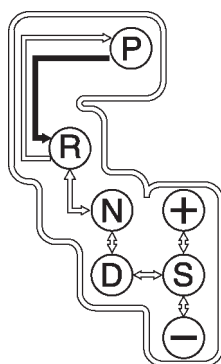
\*<sup>3</sup>: The gear is fixed in the neutral position until the vehicle speed reaches a certain speed that enables the transaxle to be shifted.

\*<sup>4</sup>: Shifting to the 5th and 6th gears is prohibited.

## \* SHIFT CONTROL MECHANISM

### 1. General

- A gate type shift lever is used in conjunction with the 6-speed automatic transaxle. With the gate type lever, the shift lever button and the overdrive switch of the straight type shift lever are discontinued. Similar functions are achieved through a single-shift operation (fore-aft and side-to-side).
- The shift control cable with a length adjustment mechanism is used.
- Shift pattern is provided with the S mode position on the side of the D position.
- A shift lock system is used.



↓ : The shift lever can be moved only with the power source IG-ON position and the brake pedal depressed.

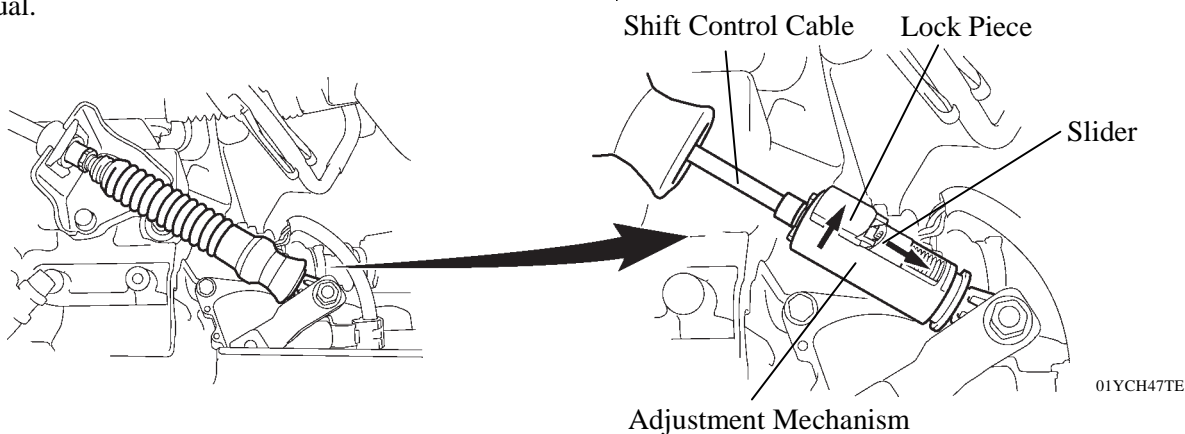
↕ : The shift lever can be moved at anytime.

02KCH21TE

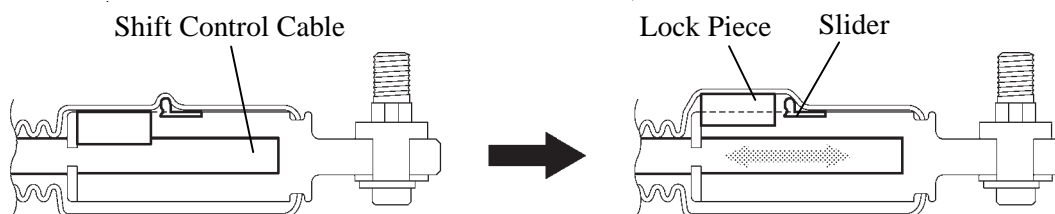
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### Service Tip

The shift control cable is fixed by the lock piece of the adjustment mechanism. Adjustment of the shift control cable is possible by releasing the lock piece from the cable. For details, see the Aurion Repair Manual.



01YCH47TE



Adjustment Mechanism Cross Section

01YCH48TE

## 2. Shift Lock System

### General

The shift lock system function setting is as follows:

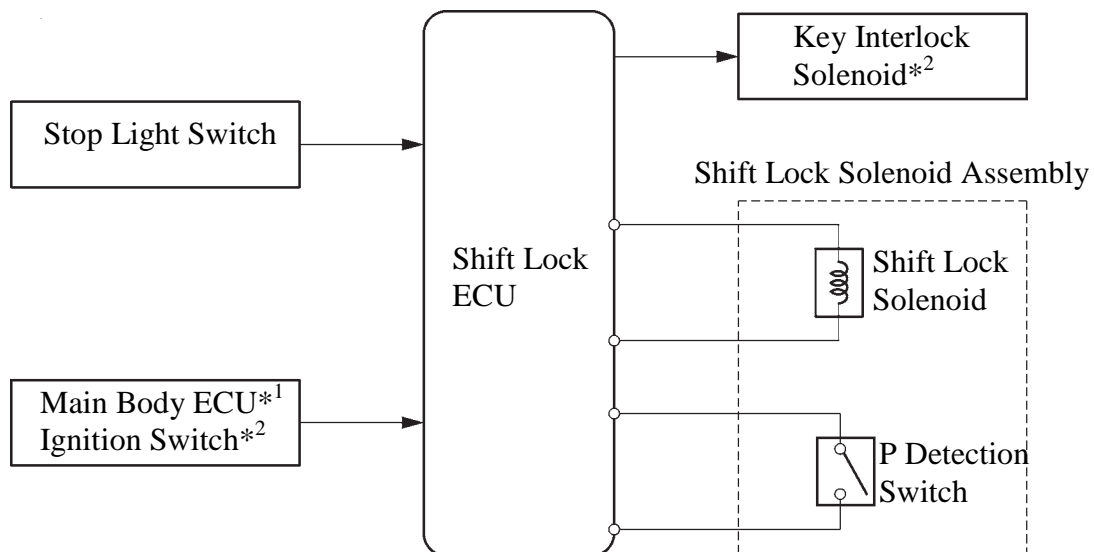
Function	Without Smart Entry and Start System	With Smart Entry and Start System
Key Interlock	○	—
Shift Lock	○	○

- The key interlock device prevents the key from being pulled out after the ignition switch is turned OFF, unless the shift lever is moved to the P position. Thus, the driver is urged to park the vehicle in the P position.
- The shift lock mechanism prevents the shift lever from being shifted to any position other than the P position, unless the ignition switch is ON (unless the IG-ON mode is selected)\*<sup>1</sup>, and the brake pedal is depressed. This mechanism helps to prevent unintentional acceleration.
- The shift lock system mainly consists of the shift lock ECU, shift lock solenoid, key interlock solenoid\*<sup>2</sup> and shift lock override button.
- The shift lock solenoid has a built-in P detection switch.

\*<sup>1</sup>: Models with smart entry and start system

\*<sup>2</sup>: Models without smart entry and start system

### ▸ System Diagram ◀

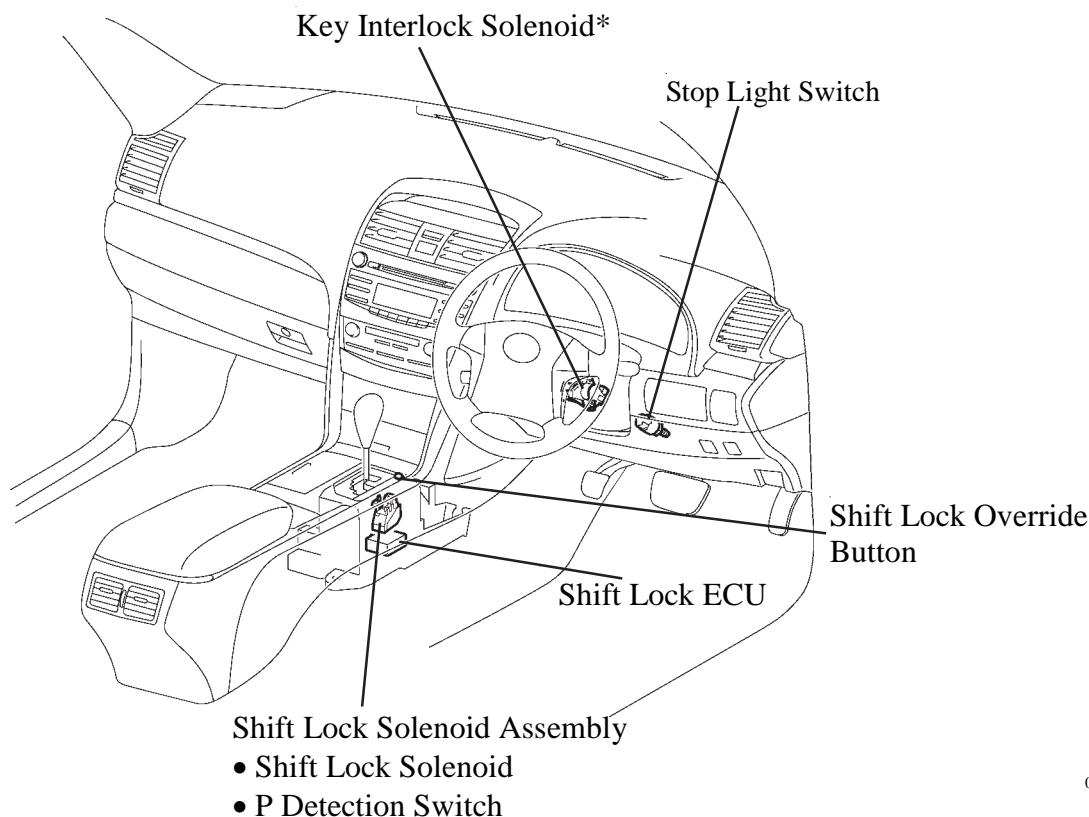


025CH20TE

\*<sup>1</sup>: Models with smart entry and start system

\*<sup>2</sup>: Models without smart entry and start system

## Layout of Main Components

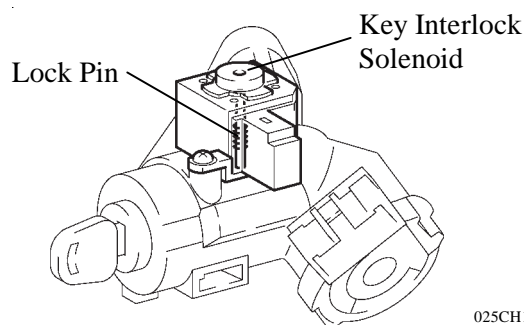


02KCH48TE

\*: Models without smart entry and smart system

## Key Interlock Solenoid

The activation of the key interlock solenoid that is mounted on the upper column bracket moves the lock pin to restrict the movement of the key cylinder. Therefore, if the shift lever is shifted to any position other than “P”, the ignition key cannot be moved from “ACC” to the “LOCK” position.



025CH19TE

## System Operation

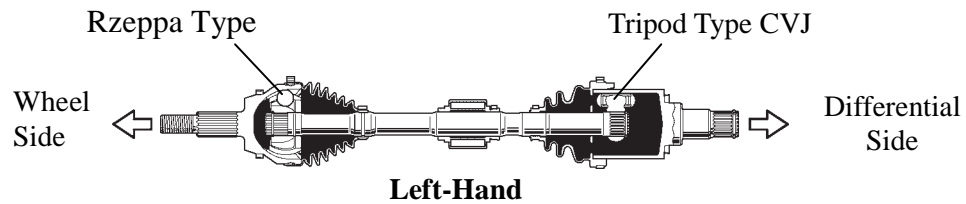
- Models with smart entry and start system: The shift lock ECU uses the P detection switch to detect the shift lever position, and receives inputs from the stop light switch and the main body ECU. Upon receiving these signals, the shift lock ECU turns ON the shift lock solenoid in order to release the shift lock.
- Models without smart entry and start system: The shift lock ECU uses the P detection switch to detect the shift lever position, and receives inputs from the stop light switch and the ignition switch. Upon receiving these signals, the shift lock ECU turns ON the key interlock solenoid and the shift lock solenoid in order to release the key interlock and shift lock.
- A shift lock override button, which manually overrides the shift lock mechanism, is used.

## DRIVE SHAFT

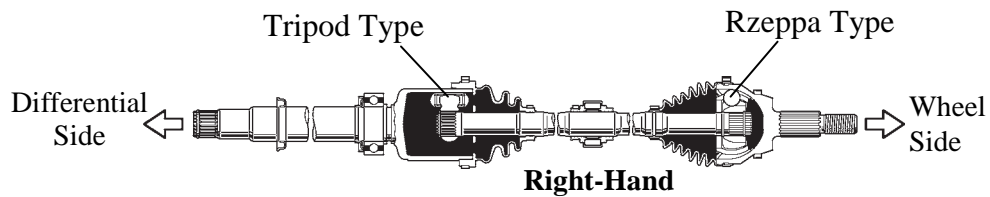


### DESCRIPTION

The drive shaft uses a tripod type CVJ (Constant Velocity Joint) on the differential side, and Rzeppa type CVJ on the wheel side.



01YCH51Y



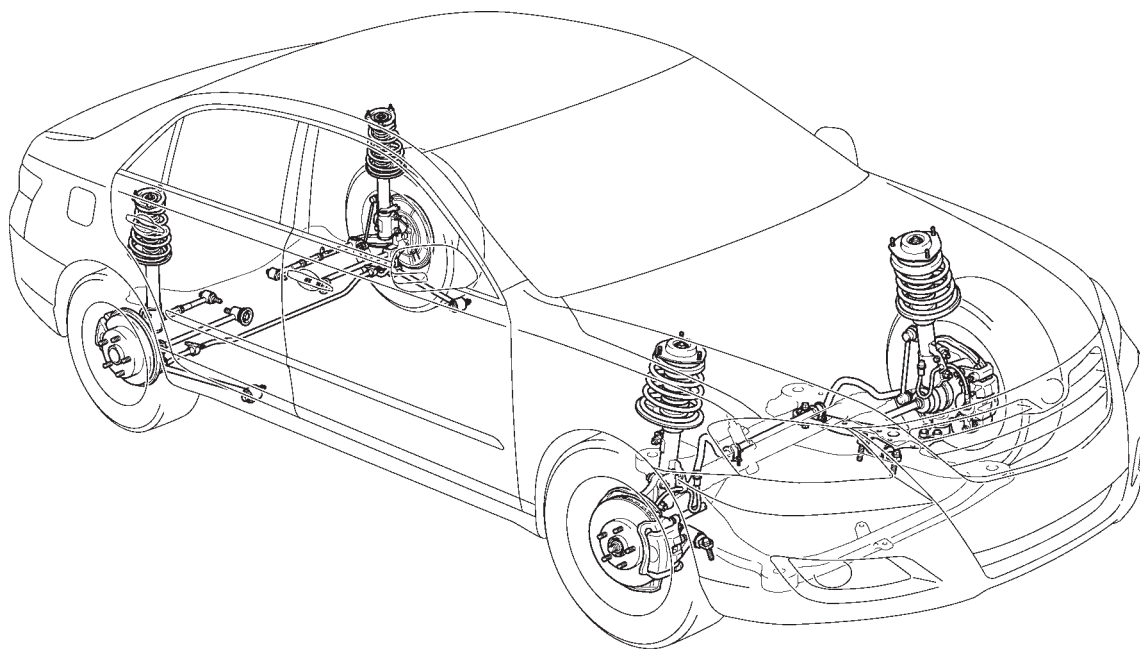
01YCH52Y

## SUSPENSION AND AXLE

### ✿ SUSPENSION

#### 1. General

- MacPherson strut type independent suspension is used for the front.
- Dual link MacPherson strut type independent suspension is used for the rear.



#### ► Specifications ◀

Front Wheel Alignment	Type	MacPherson Strut
	Tread* <sup>1</sup>	mm 1,575
	Caster* <sup>1</sup>	degrees 2°45' * <sup>3</sup> 2°50'
	Camber* <sup>1</sup>	degrees -0°40' -0°45' * <sup>3</sup>
	Toe-in* <sup>1</sup>	mm 0
	King Pin Inclination* <sup>1</sup>	degrees 12°20'
Rear Wheel Alignment	Type	Dual Link MacPherson Strut
	Tread* <sup>1</sup>	mm 1,565
	Camber* <sup>1</sup>	degrees 1°05' * <sup>2</sup> 1°22' 1°27' * <sup>3</sup>
	Toe-in* <sup>1</sup>	mm 3±2

\*<sup>1</sup>: Unloaded Vehicle Condition

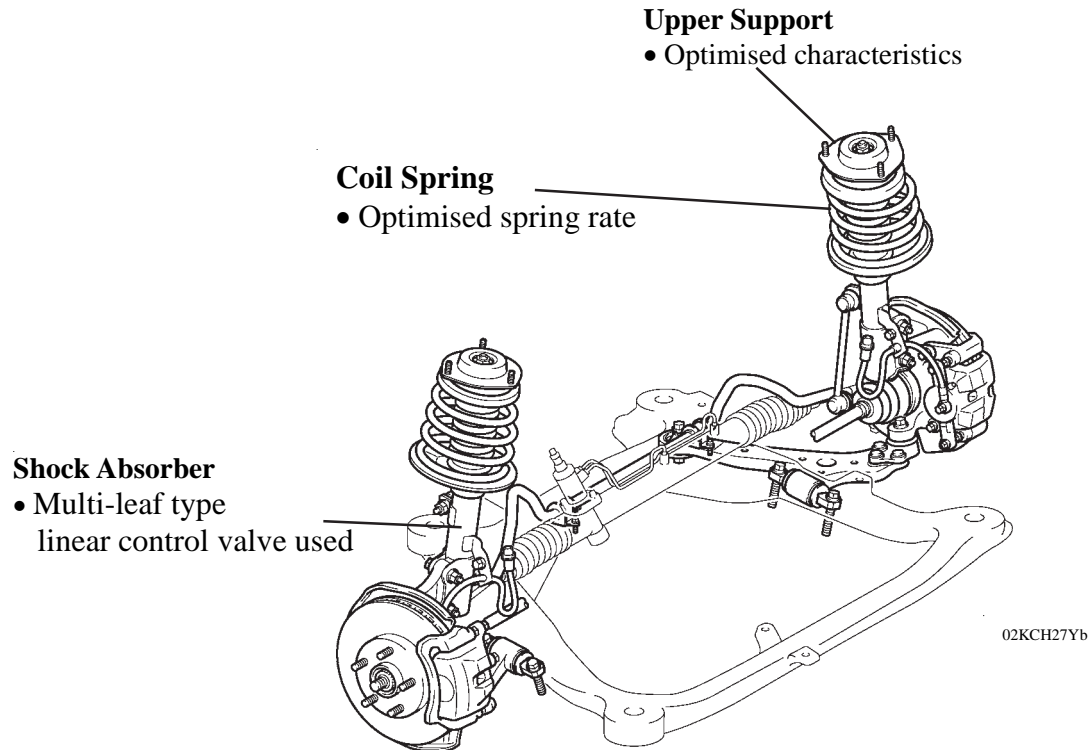
\*<sup>2</sup>: Rough Road Package

\*<sup>3</sup>: Sportivo grade

## 2. Front Suspension

### General

Through the optimal location of components, and the use of Nachlauf geometry, the front suspension provides excellent riding comfort and controllability.

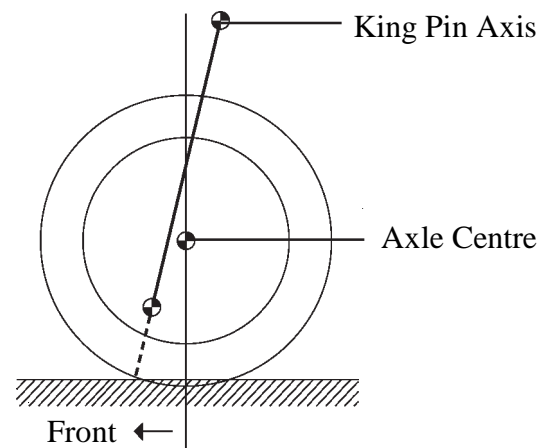


### Service Tip

To prevent hazardous conditions, make sure to empty the gas from the shock absorber before discarding a low-pressure (N<sub>2</sub>) gas sealed shock absorber. For details, see the Aurion Repair Manual.

### Nachlauf Geometry

The front suspension uses the Nachlauf geometry in which the king pin axis is located ahead of the axle centre. As a result, excellent straight-line stability and steering feel has been improved.



181CH22

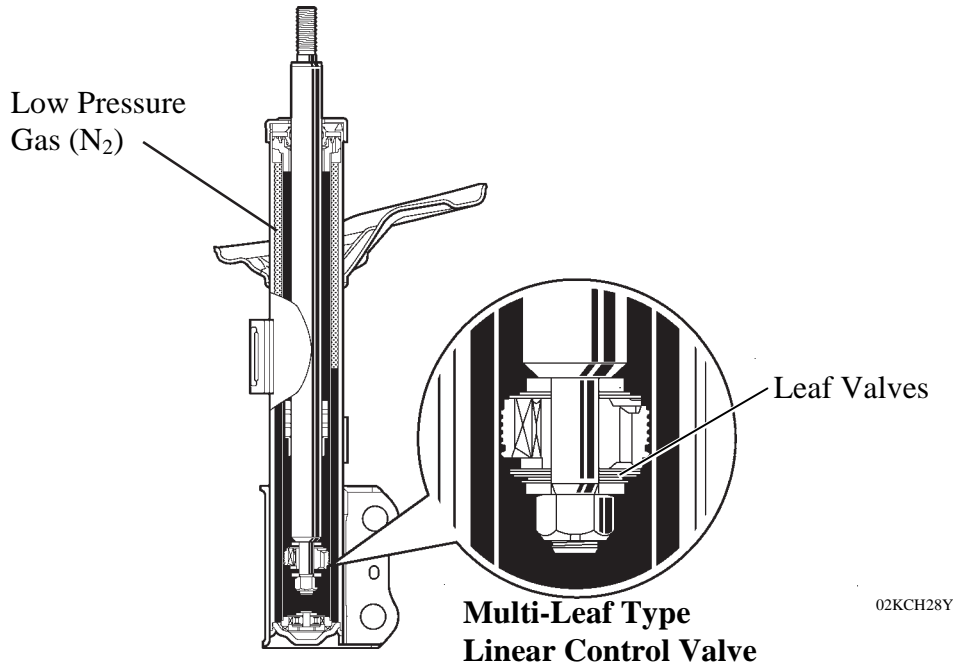


## Shock Absorber

### 1) General

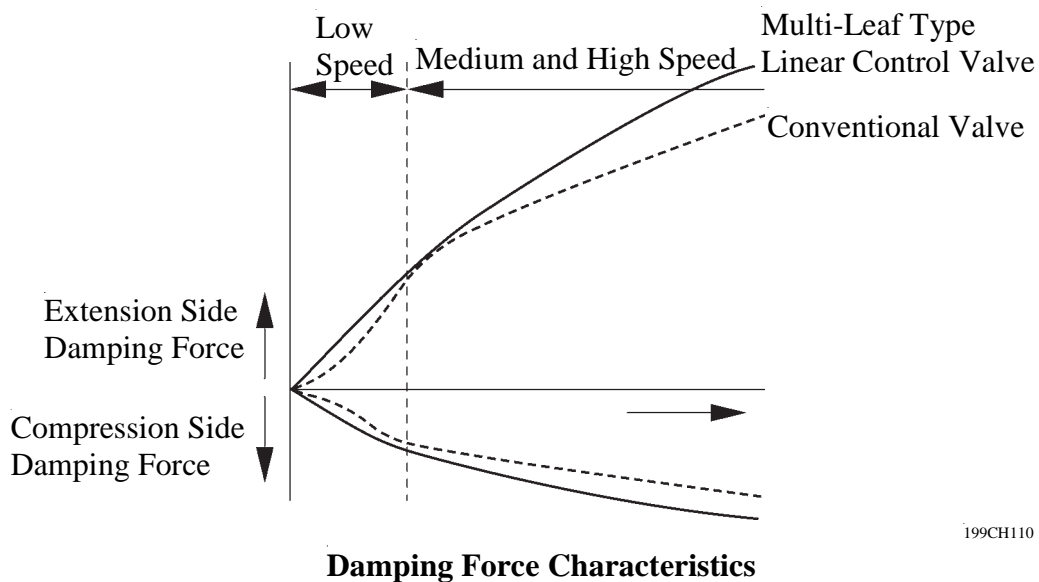
The two functions listed below are used for the shock absorber to realise both driving stability and riding comfort.

- A low-pressure ( $N_2$ ) gas sealed type construction is used to suppress cavitation.
- A multi-leaf type linear control valve is used to attain linear damping force characteristics.



### 2) Construction of Multi-Leaf type Linear Control Valve

The multi-leaf type linear control valve has a structure consisting of several layered leaf valves with different diameters. Through use of the multi-leaf type linear control valve, changes in the damping force are made constant at low piston speeds, thus realising excellent riding comfort and controllability.

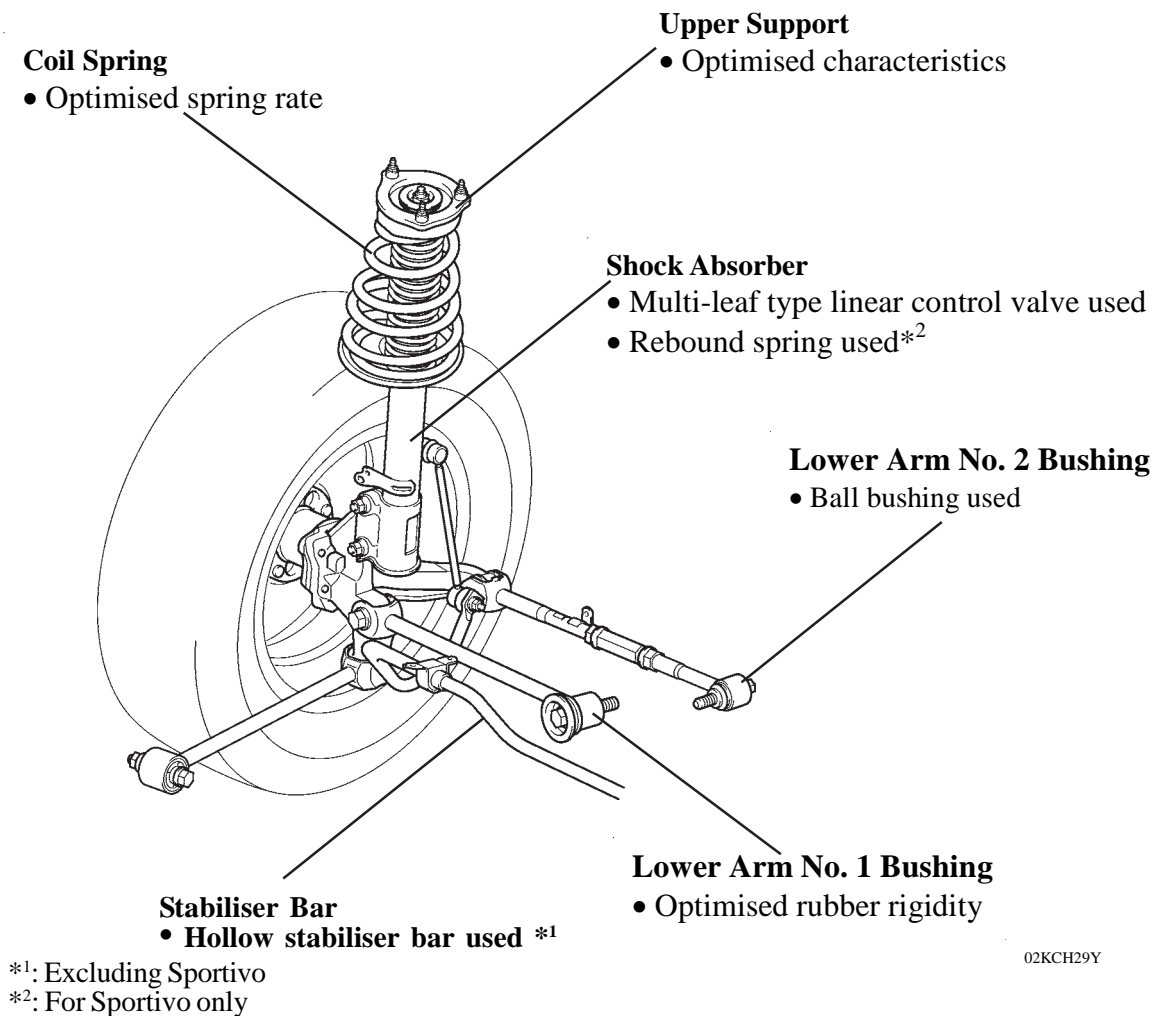


199CH110

### 3. Rear Suspension

#### General

Excellent stability and controllability have been realised by optimising the suspension geometry and allocation of components.



#### Service Tip

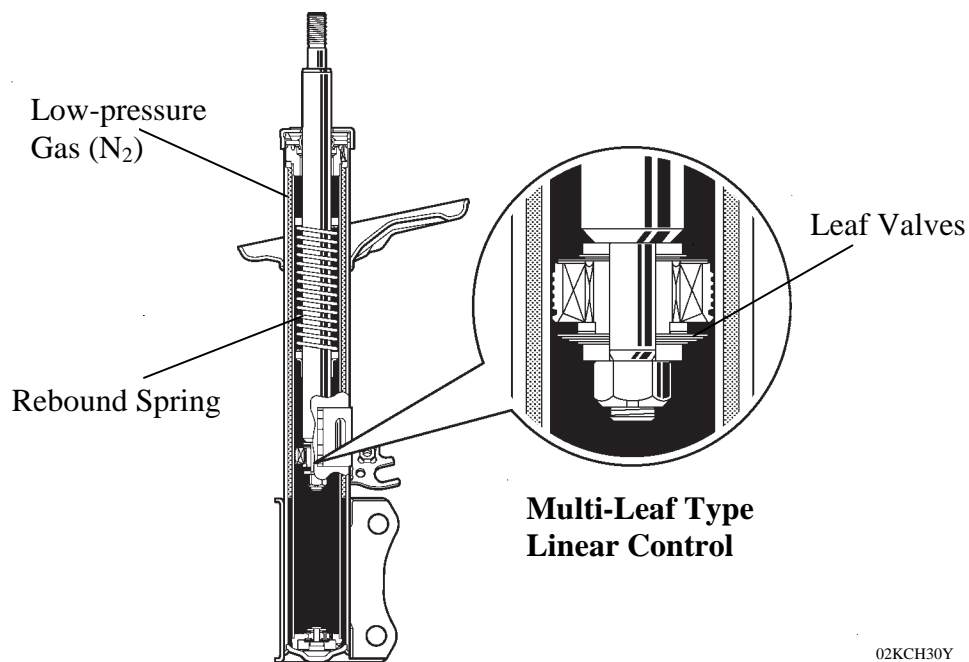
To prevent hazardous conditions, make sure to empty the gas from the shock absorber before discarding a low-pressure (N<sub>2</sub>) gas sealed shock absorber. For details, see the Aurion Repair Manual.

## Shock Absorber

### 1) General

The three functions listed below are used for the shock absorber to realise both driving stability and riding comfort.

- A low-pressure ( $N_2$ ) gas sealed type construction is used to suppress cavitation.
- A multi-leaf type linear control valve is used to attain linear damping force characteristics. For details, refer to Front Suspension section on page CH-48.
- A rebound spring is used on Sportivo grade models to improve vehicle stability during cornering.

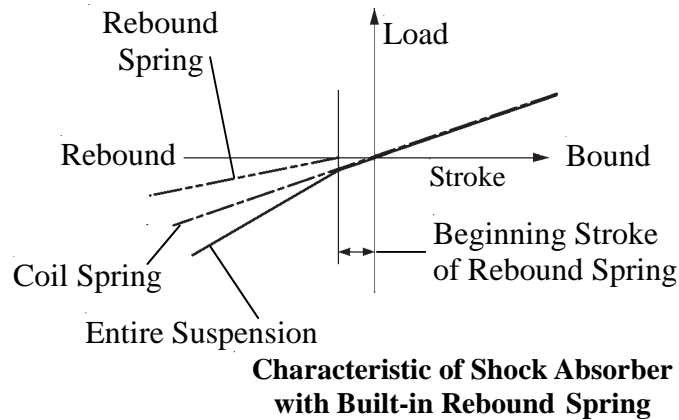


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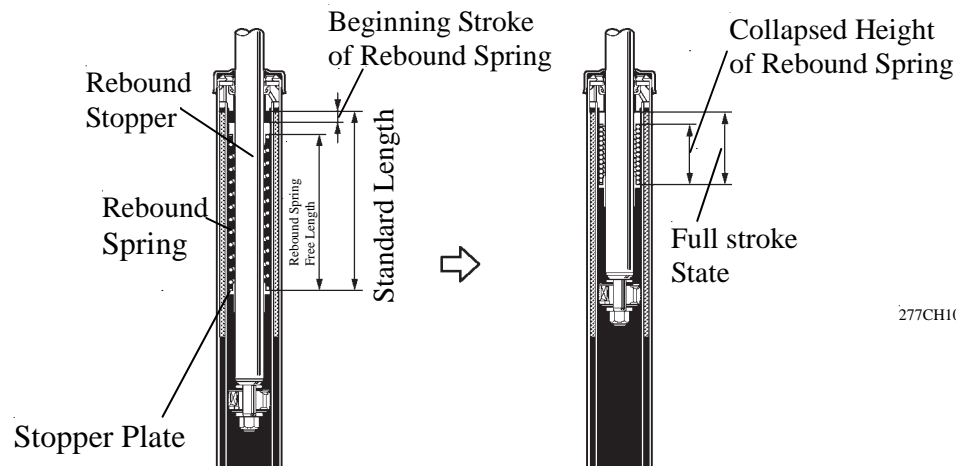
**Sportivo Grades**

## 2) Rebound Spring

The function of the built-in rebound spring is to combine with the function of the coil spring in order to restrain the elongation of the entire suspension during rebounds. Consequently, only the function of the coil spring is applied when the suspension stroke is small during normal driving, in order to realise a soft and comfortable ride. However, when the inner wheel makes large rebounds, such as when the vehicle is cornering, the functions of both the rebound spring and the coil spring are combined in order to reduce the elongation of the entire suspension. As a result, the vehicle has excellent manoeuvrability and stability.

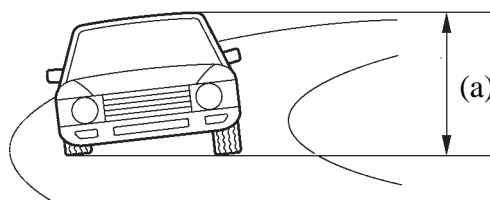


185CH16

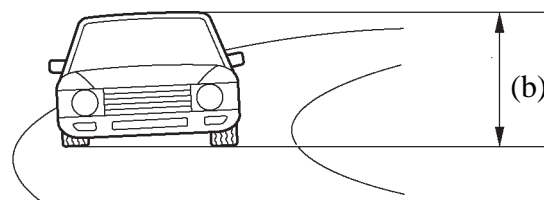


277CH107

### ► During Cornering ◀



**Without Rebound Spring**



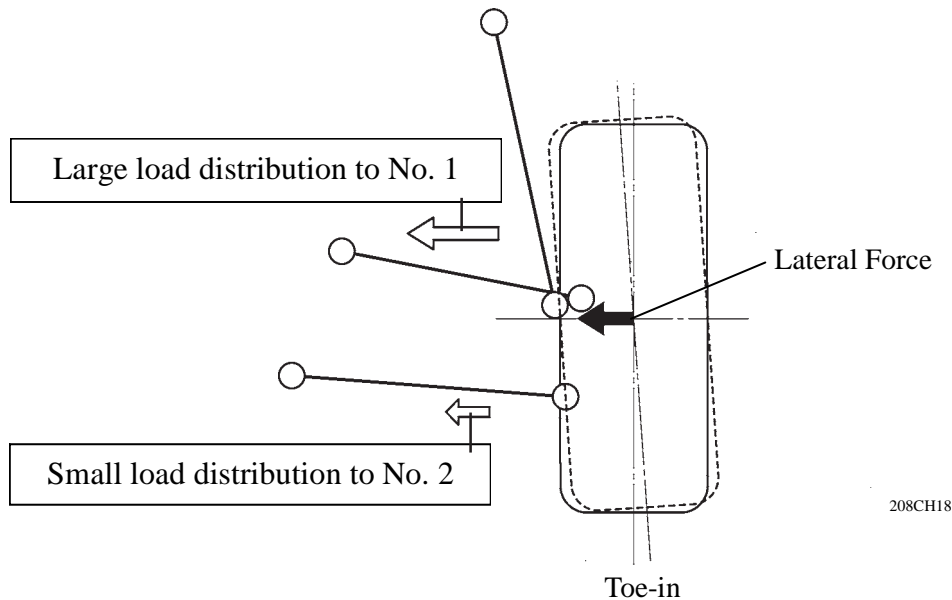
**With Rebound Spring**

$$(a) > (b)$$

02KCH58Y

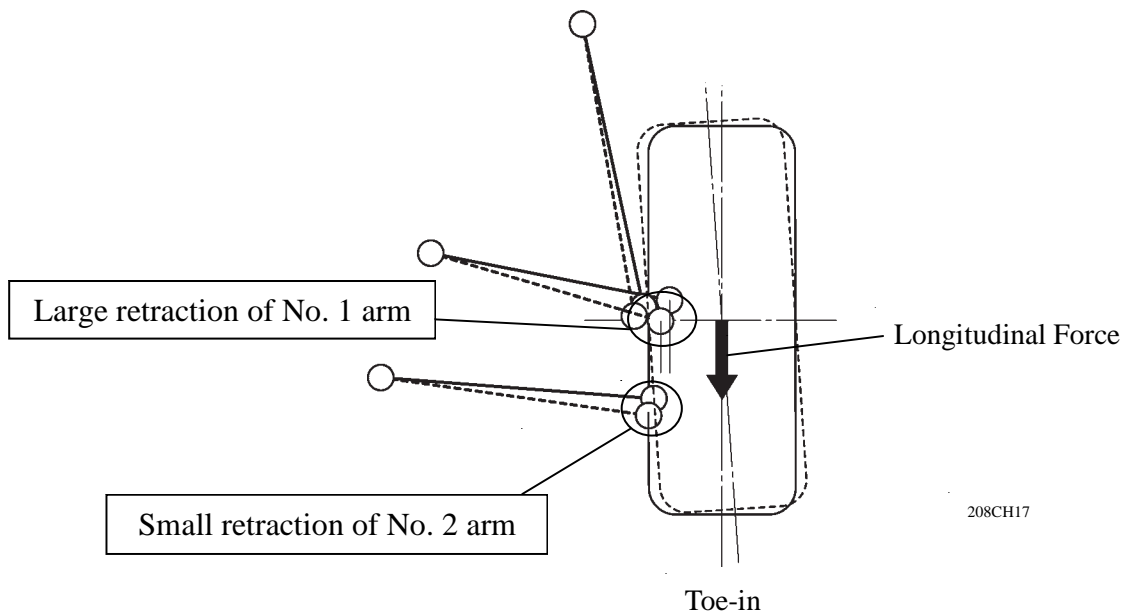
## Cornering Geometry

When a lateral force is generated, the load becomes distributed to the No. 1 and No. 2 suspension arms. The illustration shown below indicates the lateral force distribution on suspension arms of the right side rear wheel during left cornering. This causes the wheels to toe-in, in order to ensure the proper stability of the rear suspension.



## Braking Geometry

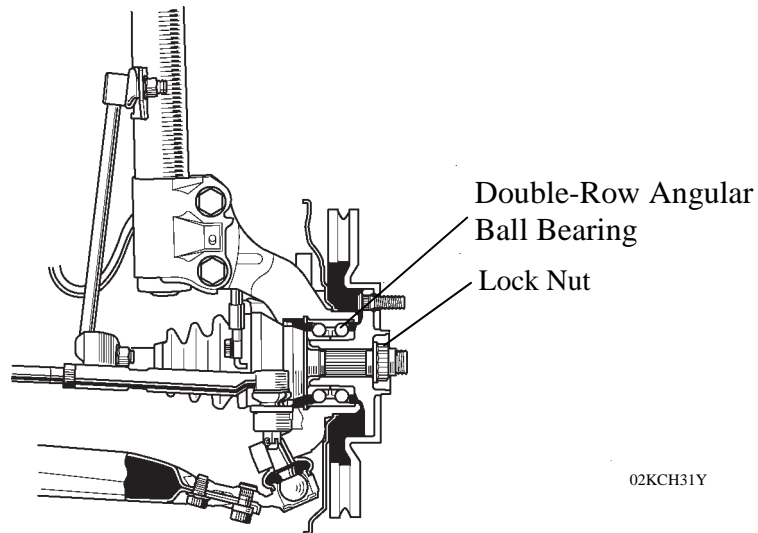
When the longitudinal force is generated, the displacement locus of the No. 1 and No. 2 suspension arms will toe-in as shown below, in order to ensure the stability of the vehicle.



## ✱ AXLE

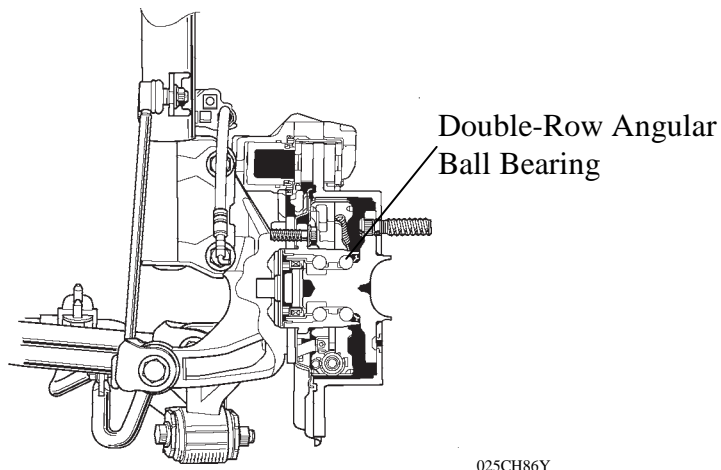
### 1. Front Axle

- The front axle uses compact and highly rigid double-row angular ball bearings. The bearings and the axle hub have been integrated to ensure high rigidity, thus realising excellent driving and braking stability.
- A lock nut (12-point) is used and staked in order to ensure that the axle hub is properly secured. Once removed, this nut cannot be reused.



### 2. Rear Axle

A compact and highly rigid double-row angular ball bearing is used on the front axle. The double-row angular ball bearing and the axle hub have been integrated to ensure high rigidity, thus realising excellent driving stability and braking stability.



## BRAKE

### ✱ DESCRIPTION

#### 1. General

- Models with the brake control system consisting of ABS with EBD, Brake Assist, TRC and VSC use an electrical type brake assist, which effects brake assist control through the brake actuator.
- The Aurion has a brake system with the following specifications:

Front Brake Type	Ventilated Disc
Rear Brake Type	Solid Disc
Brake Control System	ABS with EBD, Brake Assist, TRC and VSC
Parking Brake Type	Pedal

#### ► Specifications ◀

Master Cylinder	Type	Tandem (Plunger type)
	Diameter mm	22.22
Brake Booster	Type	Single, Tie Rod Type
	Size in.	10
Front Disc Brake	Caliper Type	PBR63
	Wheel Cylinder Dia. mm	63.5
	Rotor Size (D×T)* mm	296 × 28
	Pad Material	NF107
Rear Disc Brake	Caliper Type	PBR38R
	Wheel Cylinder Dia. mm	38.1
	Rotor Size (D×T)* mm	286 × 10
	Pad Material	NF111
Parking Brake	Type	Banksia
	Drum Inner Dia. mm	190.0
Brake Actuator Supplier	For ABS with EBD, Brake Assist, TRC and VSC	Bosch

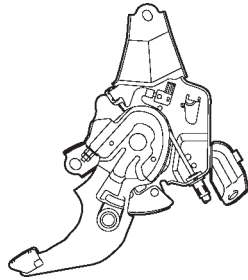
\*: D: Outer Diameter, T: Thickness

#### Service Tip

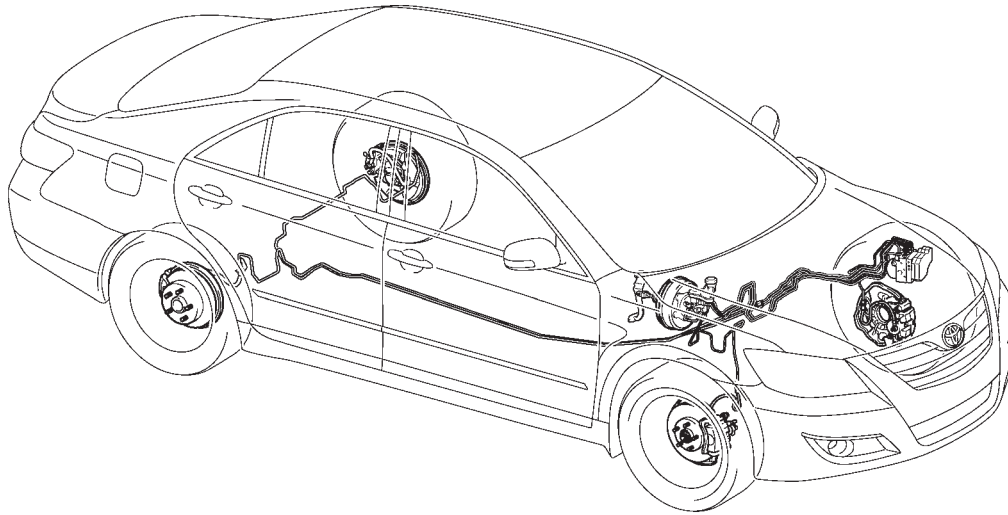
- To ensure the performance and reliability of the plunger type master cylinder, it must not be disassembled. If it malfunctions, replace the entire assembly.
- Before removing the plunger type master cylinder from the brake booster, discharge the vacuum from the brake booster. Otherwise, the piston of the master cylinder may be left inside the brake booster. For details, see the Aurion Repair Manual.

## 2. Component of Brake System

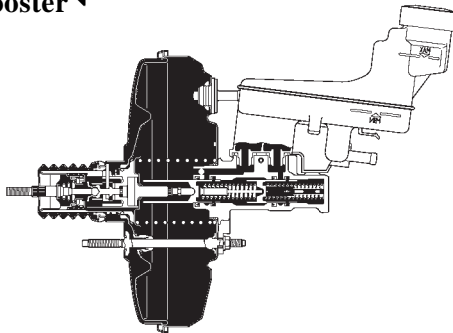
### ▶ Parking Brake ◀



Lever Type



### ▶ Master Cylinder and Brake Booster ◀



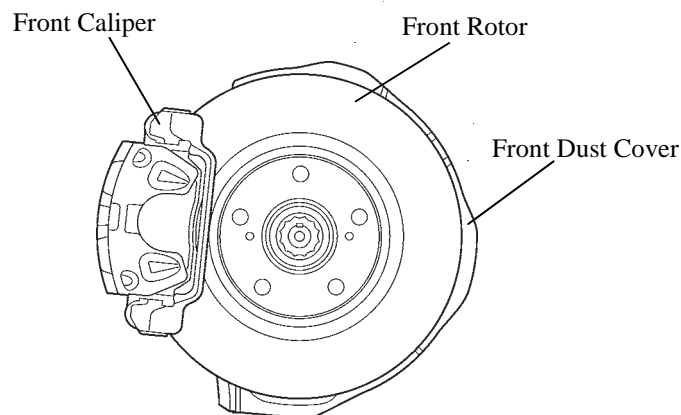
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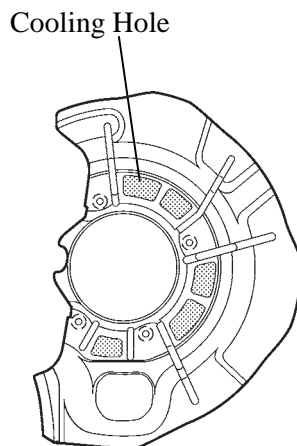
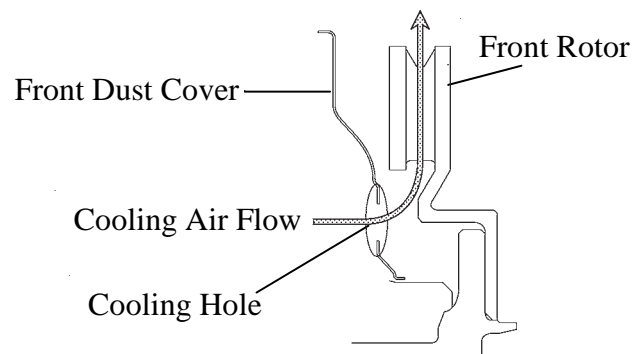


## FRONT BRAKE

- The diameter of the front rotor is 296mm. The front rotor is the ventilated type that excels in heat dissipation to ensure reliability.
- The shape of the front dust cover has been optimised to efficiently direct cool air to the ventilated disc, thus ensuring excellent cooling performance.



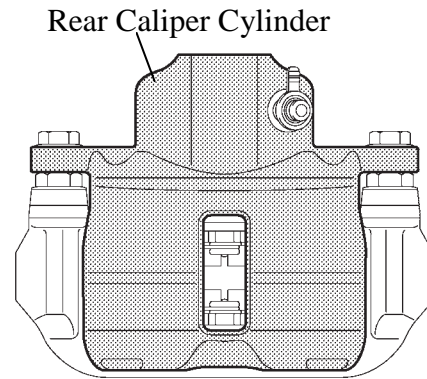
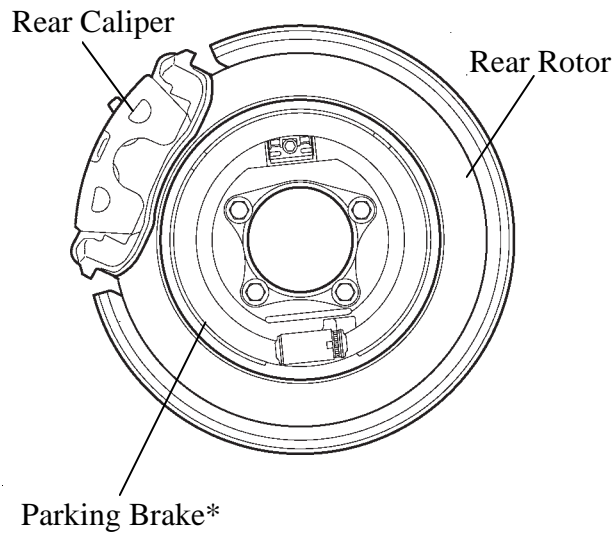
02KCH59TE

**Front Dust Cover****Cross Section**

02KCH60TE

## ❁ REAR BRAKE

- The diameter of the rear rotor is 286 mm. It has a drum in disc type parking brake.
- For weight reduction, a rear caliper cylinder made of aluminium is used.



**Rear Caliper**

\*: Inside view of the parking brake drum



**Rear Caliper & Disc**

## ✱ BRAKE CONTROL SYSTEM (ABS with EBD, Brake Assist, TRC and VSC)

### 1. General

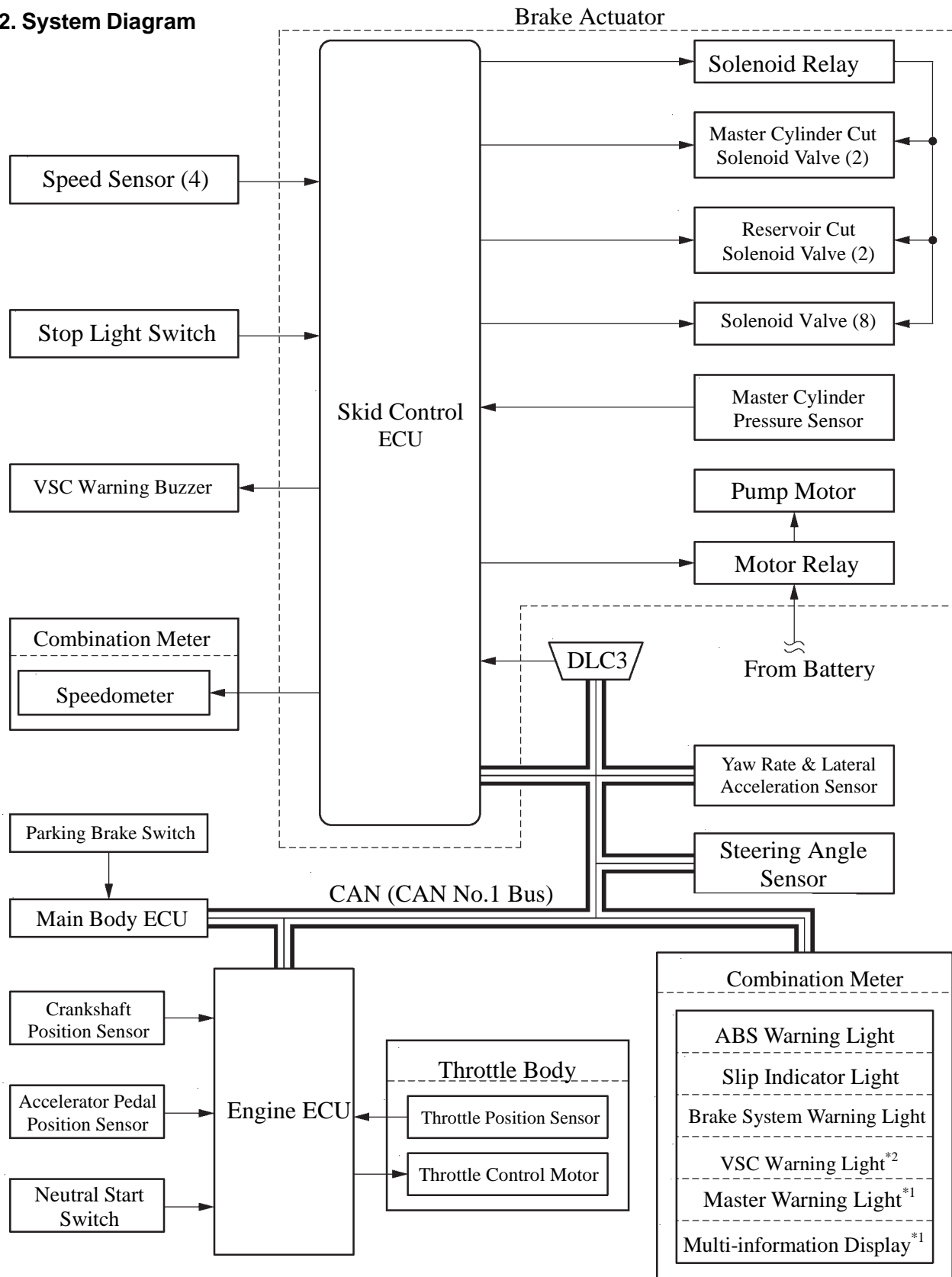
The brake control system (ABS with EBD, brake assist, TRC and VSC) of Aurion has the following functions:

Function	Outline
ABS (Anti-lock Brake System)	The ABS helps prevent the wheels from locking when the brakes are applied firmly or when braking on a slippery surface.
EBD (Electronic Brake force Distribution)	The EBD control utilises ABS, realising the proper brake force distribution between front and rear wheels in accordance with the driving conditions. In addition, during cornering braking, it also controls the brake forces of right and left wheels, helping to maintain the vehicle behaviour.
Brake Assist (Electrical Type)	The primary purpose of the brake assist is to provide an auxiliary brake force to assist the driver who cannot generate a large brake force during emergency braking, thus helping draw the vehicle's brake performance.
TRC (Traction Control)	The TRC system helps prevent the drive wheels from slipping if the driver presses the accelerator pedal excessively when starting off or accelerating on a slippery surface.
VSC (Vehicle Stability Control)	The VSC system helps prevent the vehicle from slipping sideways as a result of strong front wheel skid or strong rear wheel skid during cornering.

#### Service Tip

When brake control system is activated, the brake pedal could shudder, which is a normal occurrence of the system in operation and should not be considered a malfunction.

## 2. System Diagram



\*1: Excluding AT-X Grade

\*2: AT-X Grade Only

### 3. Outline of EBD Control

#### General

The distribution of the brake force, which was performed mechanically in the past, is now performed under electrical control of the skid control ECU, which precisely controls the braking force in accordance with the vehicle's driving conditions.

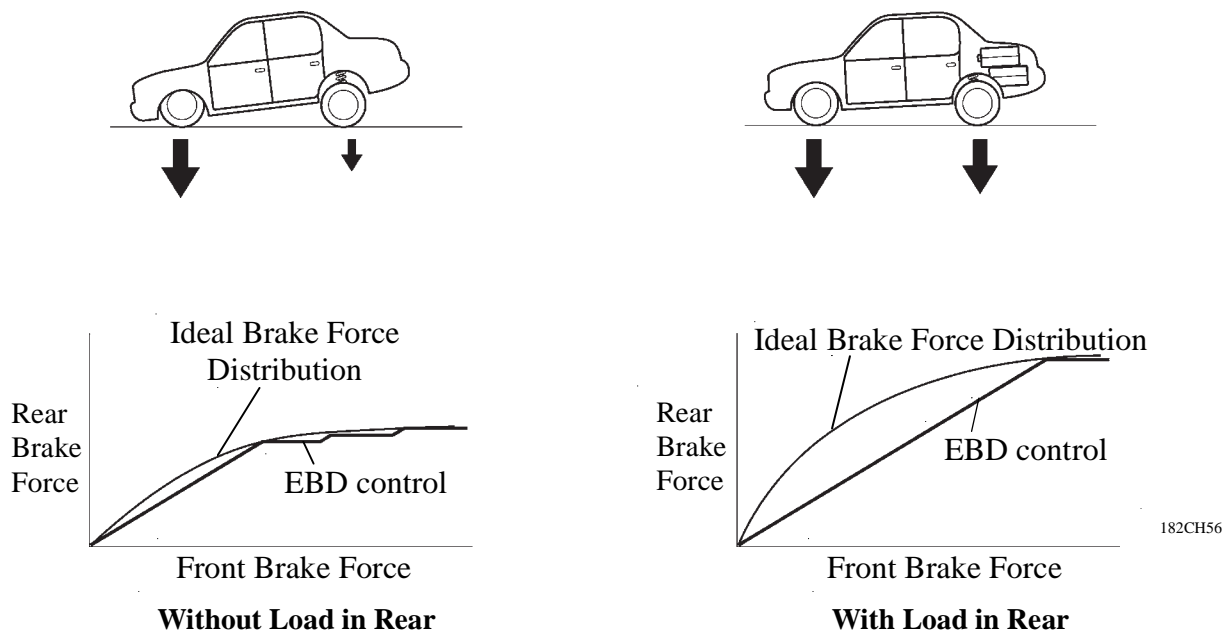
#### Front/ Rear Wheels Brake Force Distribution

If the brakes are applied while the vehicle is moving straight forward, the transfer of the road reduces the load that is applied to the rear wheels. The skid control ECU determines this condition by way of the signals from the wheel speed sensors, and the brake actuator regulates the distribution of the brake force of the rear wheels to optimally control.

For example, the amount of the brake force that is applied to the rear wheels during braking varies whether or not the vehicle is carrying a load. The amount of the brake force that is applied to the rear wheels also varies in accordance with the extent of the deceleration.

Thus, the distribution of the brake force to the rear is optimally controlled in order to effectively utilise the braking force of the rear wheels under these conditions.

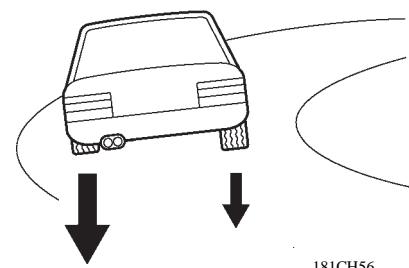
#### ► EBD Control Concept ◀



#### Right/Left Wheels Brake Force Distribution (During Cornering Braking)

When the brakes are applied while the vehicle is cornering, the load that applied to the inner wheel decreases and the outer wheel increases.

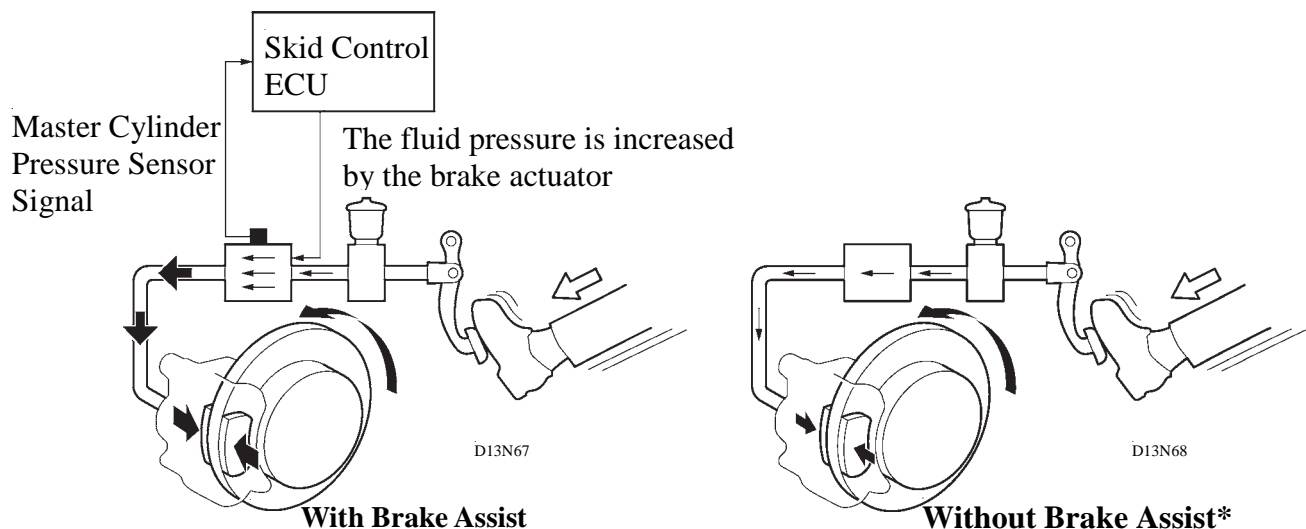
The skid control ECU determines this condition by way of the signals from the wheel speed sensors, and the brake actuator regulates the brake force in order to optimally control the distribution of the brake force to the inner wheel and outer wheel.



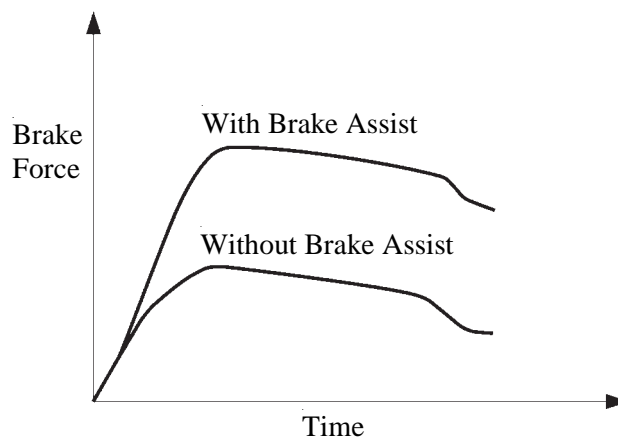
#### 4. Outline of Brake Assist

- The brake assist in combination with ABS help to improve the vehicle's brake performance.
- The brake assist interprets a quick push of the brake pedal as emergency braking and supplements the brake power applied if the driver has not stepped hard enough on the brake pedal. In emergencies, some drivers, especially inexperienced ones, often panic and do not apply sufficient pressure on the brake pedal.
- A key feature of brake assist system is that the timing and the degree of braking assistance are designed to help ensure that the driver does not discern anything unusual about the braking operation. When the driver intentionally eases up on the brake pedal, the system reduces the amount of assistance it provides.
- Based on the signals from the master cylinder pressure sensor, the skid control ECU calculates the speed and the amount of the brake pedal application and then determines the intention of the driver to make an emergency braking. If the skid control ECU determines that the driver intends the emergency braking, the system activates the brake actuator to increase the brake fluid pressure, which increases the braking force.

► In case that the driver's depressing force is small when applying emergency braking ◀



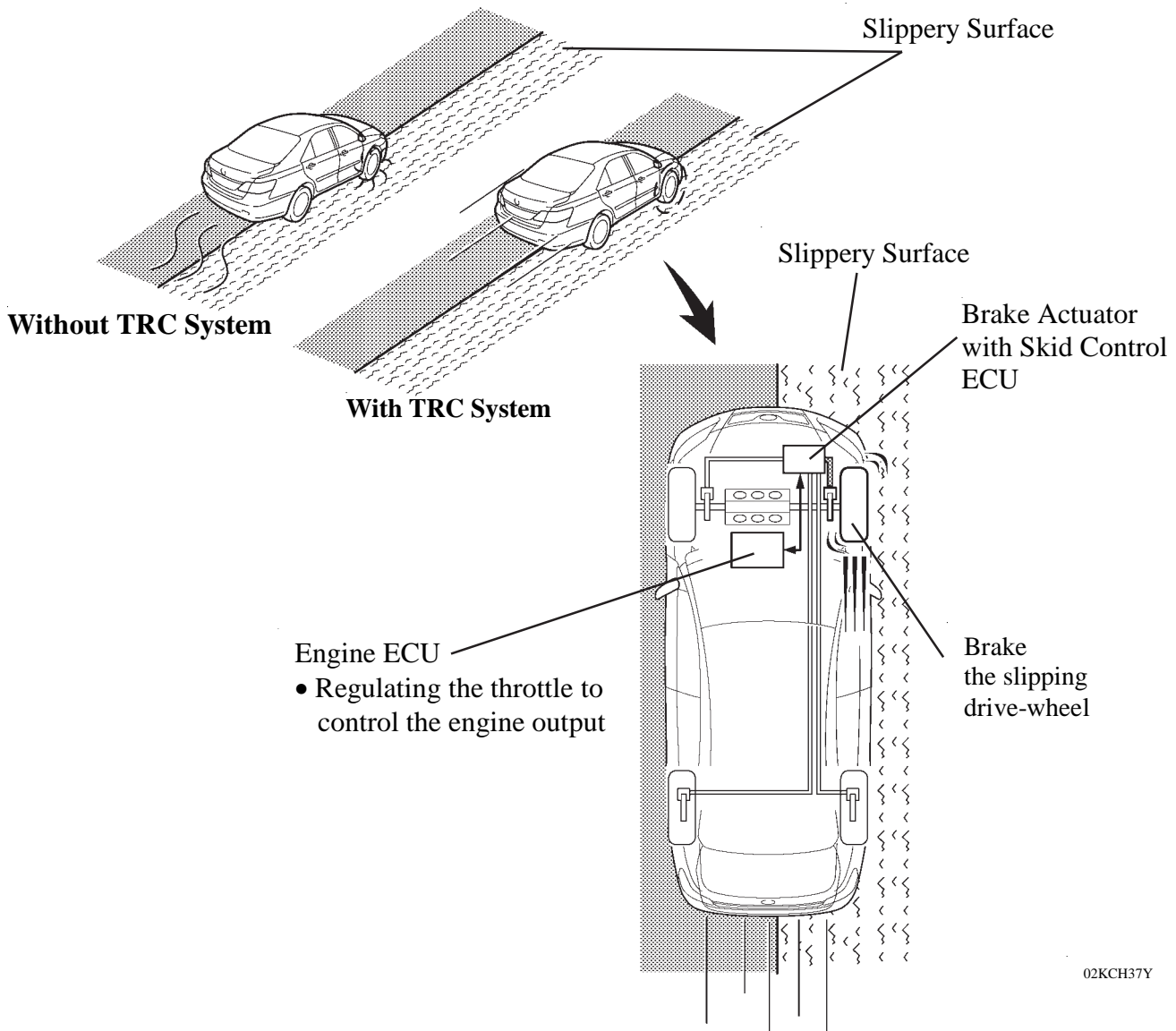
\*: The basic performance of the brake is the same as of the models with the brake assist system



## 5. Outline of TRC Function

- If the driver presses the accelerator pedal aggressively when initially acceleration or when accelerating on a slippery surface, the drive wheels could slip due to the excessive amount of torque that is generated. By applying hydraulic brake control to the drive wheels and regulating the throttle to control the engine output, the TRC helps minimise the slippage of the drive wheels, thus generating the drive force that is appropriate for the road surface conditions.
- For example, a comparison may be made between two vehicles, one with the TRC function and the other without. If the driver of each vehicle operates the accelerator pedal in a rough manner while driving over a surface with different surface friction characteristics, the drive wheel on the slippery surface could slip as illustrated. As a result, the vehicle could become unstable. However, when the vehicle is equipped with the TRC function, the skid control ECU instantly determines the state of the vehicle and operates the brake actuator in order to apply the brake of the slipping drive wheel. Furthermore, the engine ECU receives the signals from the skid control ECU and regulates the throttle in order to control the engine output. Thus, this function can constantly maintain a stable vehicle posture.

### ▶ Driving condition on road with different surface friction characteristics ◀



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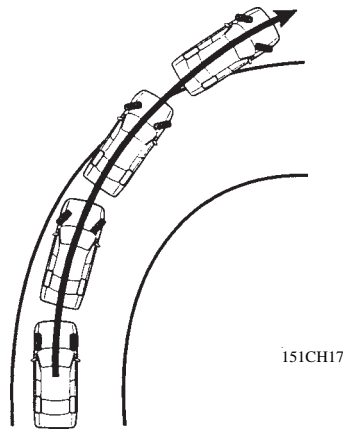
## 6. Outline of VSC Function

### General

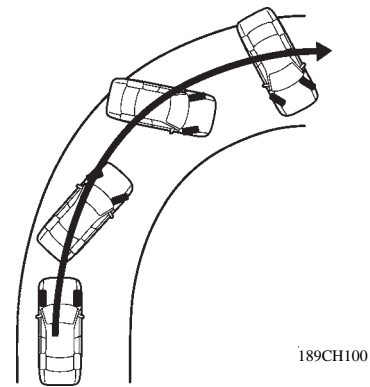
The followings are two examples that can be considered as circumstances in which the tires exceed their lateral grip limit.

The VSC function is designed to help control the vehicle behaviour by controlling the motive force and the brakes at each wheel when the vehicle is under one of the conditions indicated below.

- When the front wheels lose grip in relation to the rear wheels (front wheel skid tendency).
- When the rear wheels lose grip in relation to the front wheels (rear wheel skid tendency).



**Front Wheel Skid Tendency**



**Rear Wheel Skid Tendency**

### Method for Determining the Vehicle Condition

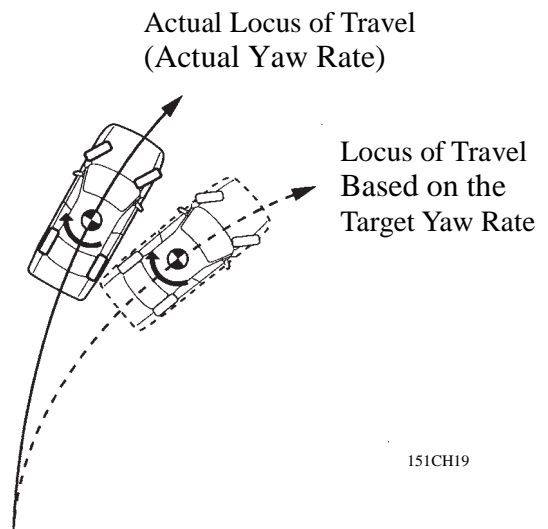
To determine the condition of the vehicle, sensors detect the steering angle, vehicle speed, vehicle's yaw rate, and the vehicle's lateral acceleration, which are then calculated by the skid control ECU.

#### 1) Determining Front Wheel Skid

Whether or not the vehicle is in the state of front wheel skid is determined by the difference between the target yaw rate and the vehicle's actual yaw rate.

When the vehicle's actual yaw rate is smaller than the yaw rate (a target yaw rate that is determined by the vehicle speed and steering angle) that should be rightfully generated when the driver operates the steering wheel, it means the vehicle is making a turn at a greater angle than the locus of travel.

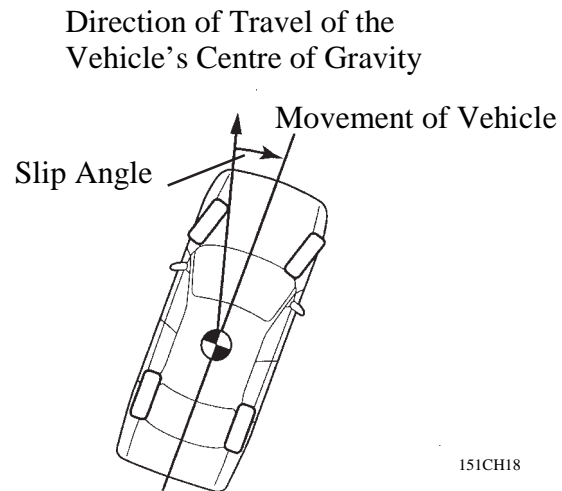
Thus, the skid control ECU determines that there is a large tendency to front wheel skid.





## 2) Determining Rear Wheel Skid

Whether or not the vehicle is in the state of rear wheel skid is determined by the values of the vehicle's slip angle and the vehicle's slip angular velocity (time-dependent changes in the vehicle's slip angle). When the vehicle's slip angle is large, and the slip angular velocity is also large, the skid control ECU determines that the vehicle has a large rear wheel skid tendency.



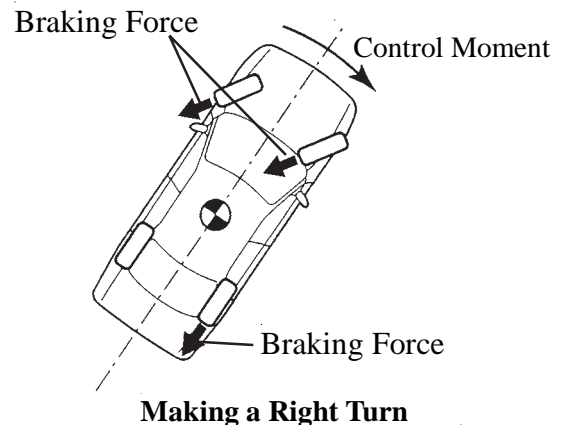
## Method for VSC Operation

When the Skid Control ECU determines that the vehicle exhibits a tendency to front wheel skid or rear wheel skid, it decreases the engine output and applies the brake of a front or rear wheel to control the vehicle's yaw moment.

The basic operation of the VSC is described below. However, the control method differs depending on the vehicle's characteristics and driving conditions.

### 1) Dampening a Strong Front Wheel Skid

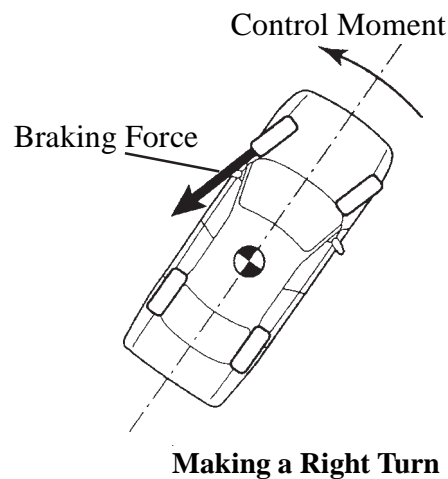
When the skid control ECU determines that there is a large front wheel skid tendency, it counteracts in accordance with the extent of that tendency. The skid control ECU controls the engine output and applies the brakes of the front wheels and rear wheel of the inner circle of the turn in order to help restrain the front wheel skid tendency.



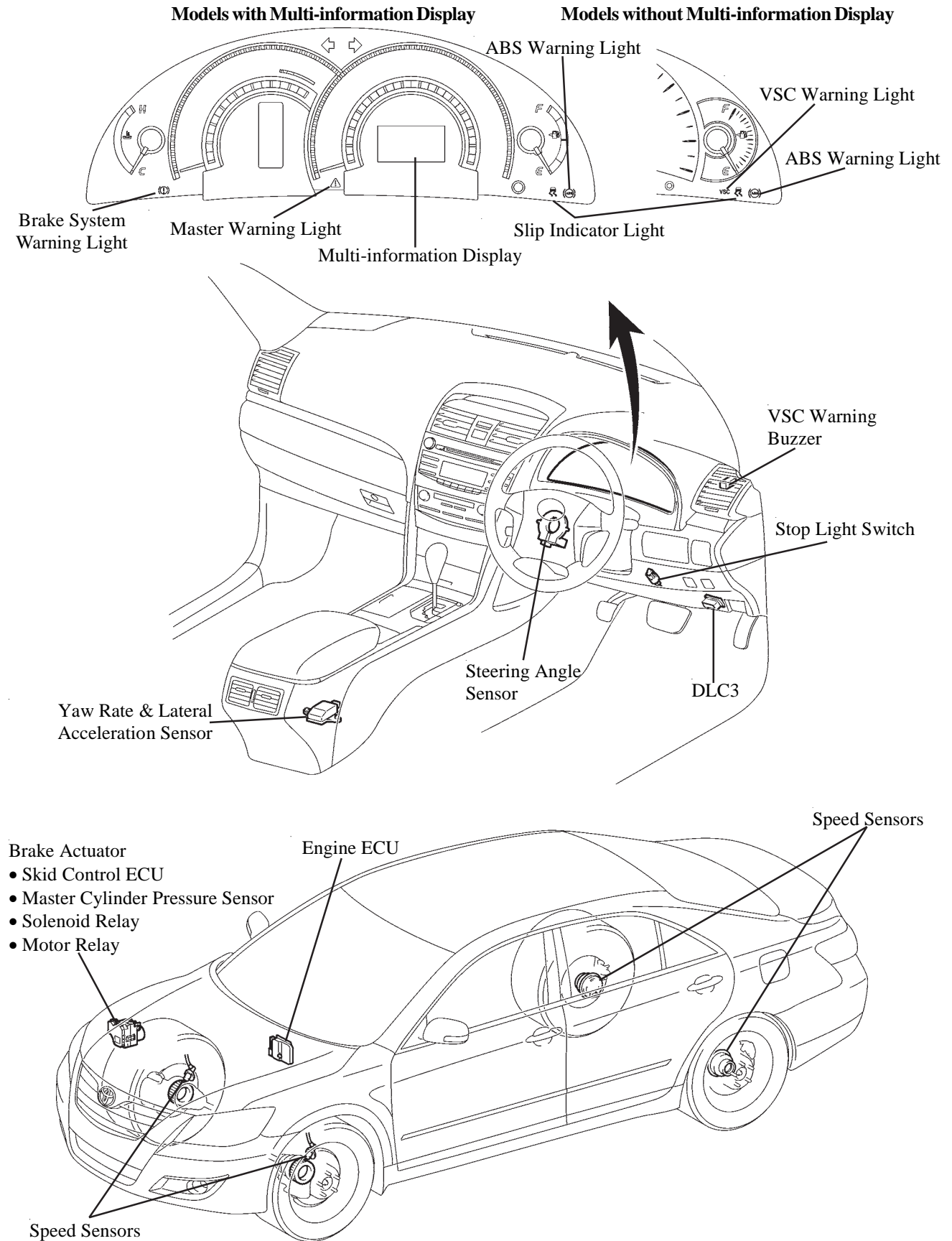
### 2) Dampening a Strong Rear Wheel Skid

When the skid control ECU determines that there is a large rear wheel skid tendency, it counteracts in accordance with the extent of that tendency. It applies the brakes of the front wheel of the outer circle of the turn, and generates an outward moment of inertia in the vehicle, in order to restrain the rear wheel skid tendency. Along with the reduction in the vehicle speed caused by the braking force, the excellent vehicle's stability is ensured.

In some cases, the skid control ECU applies the brake of the rear wheels, as necessary.



## 7. Layout of Main Components



## 8. Function of Main Components

Component		Function
Combination Meter	ABS Warning Light	Lights up to alert the driver when the skid control ECU detects the malfunction in the ABS, EBD or Brake Assist system.
	Slip Indicator Light	<ul style="list-style-type: none"> <li>• Blinks to inform the driver when the TRC system or the VSC system is operated.</li> </ul>
	Brake System Warning Light	<ul style="list-style-type: none"> <li>• Lights up together with ABS warning light to alert the driver when the skid control ECU detects the malfunction in the EBD control.</li> <li>• Lights up to inform the driver when the parking brake is ON or the brake fluid level is low.</li> </ul>
	VSC Warning Light* <sup>1</sup>	Lights up to alert the driver when the skid control ECU detects the malfunction in the TRC or VSC system.
	Master Warning Light* <sup>2</sup>	Lights up to alert the driver when the skid control ECU detects the malfunction in the TRC or VSC system.
	Multi-information Display* <sup>2</sup>	Displays a warning message to alert the driver when the skid control ECU detects a malfunction in the TRC or VSC system.
Engine ECU		<ul style="list-style-type: none"> <li>• Sends the throttle valve angle signal, accelerator pedal position signal, engine speed signal, and shift lever position signal to the skid control ECU.</li> <li>• Receives the signal of throttle control request from the skid control ECU.</li> </ul>
Parking Brake Switch		Detects when the parking brake lever is pulled up.
Speed Sensors		Detects the wheel speed of each 4 wheels.
Stop Light Switch		Detects the brake pedal depressing signal.
Brake Actuator		Changes the fluid path based on the signals from the skid control ECU during the operation of the ABS with EBD & brake assist & TRC & VSC system, in order to control the fluid pressure that is applied to the wheel cylinders.
	Master Cylinder Pressure Sensor	Assembled in the brake actuator and detects the master cylinder pressure.
	Skid Control ECU	Judges the vehicle driving condition based on signals from each sensor, and sends brake control signal to the brake actuator.
	Solenoid Relay	Supply power to the solenoid valves.
	Motor Relay	Supply power to the pump motor in the brake actuator.
VSC Warning Buzzer		Emits an intermittent sound to inform the driver that the skid control ECU detects the strong front skid tendency or strong rear skid tendency.
Yaw Rate & Lateral Acceleration Sensor		<ul style="list-style-type: none"> <li>• Detects the vehicle's yaw rate.</li> <li>• Detects the vehicle's lateral acceleration.</li> </ul>
Steering Angle Sensor		Detects the steering direction and angle of the steering wheel.

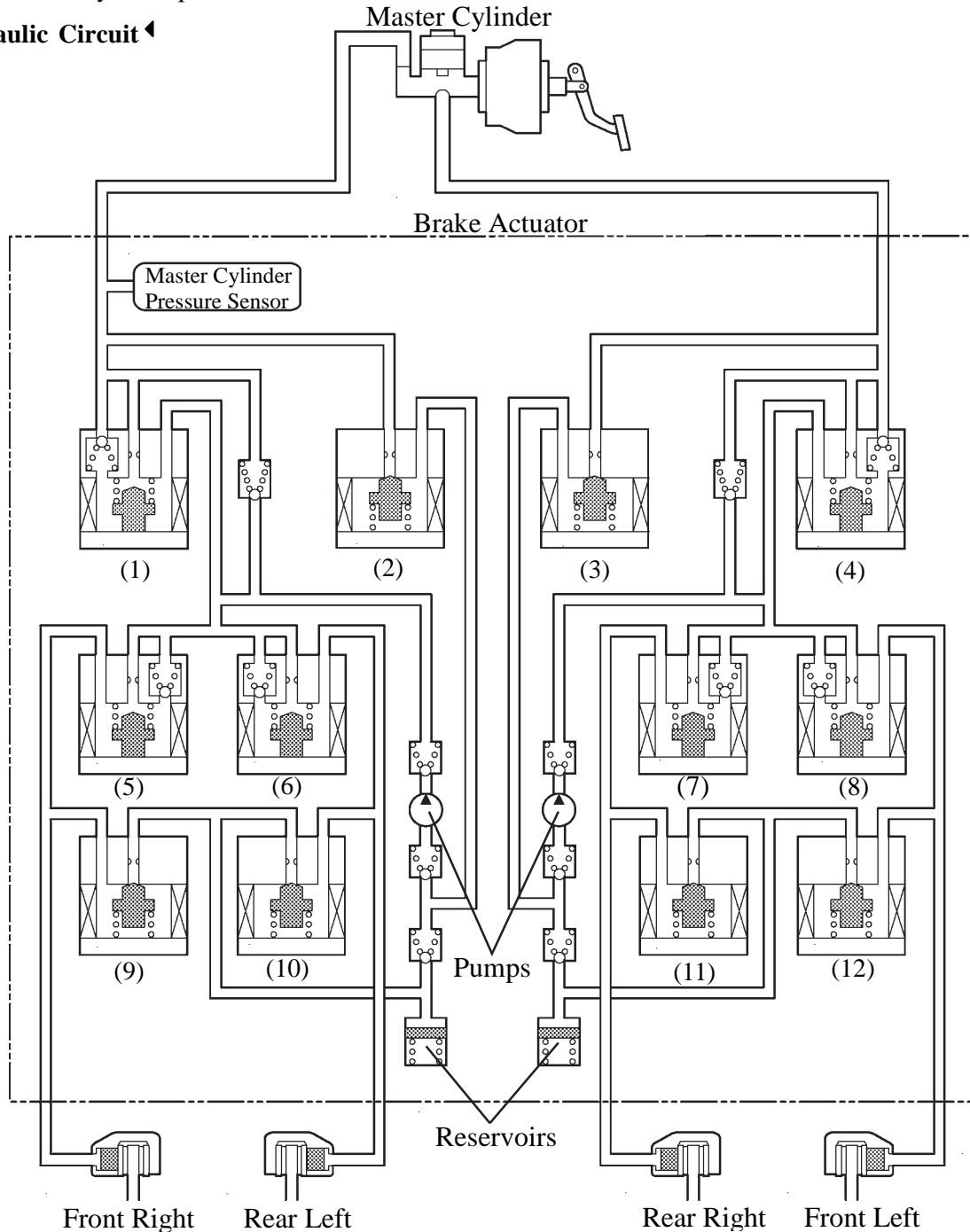
\*<sup>1</sup>: Models without multi-information display

\*<sup>2</sup>: Models with multi-information display

## 9. Brake Actuator

- The brake actuator consists of the actuator portion, skid control ECU, relays.
- The Bosch brake actuator consists of 12 solenoid valves, 1 pump motor, 2 pumps, 2 reservoirs and 1 master cylinder pressure sensor.

### ► Hydraulic Circuit ◄



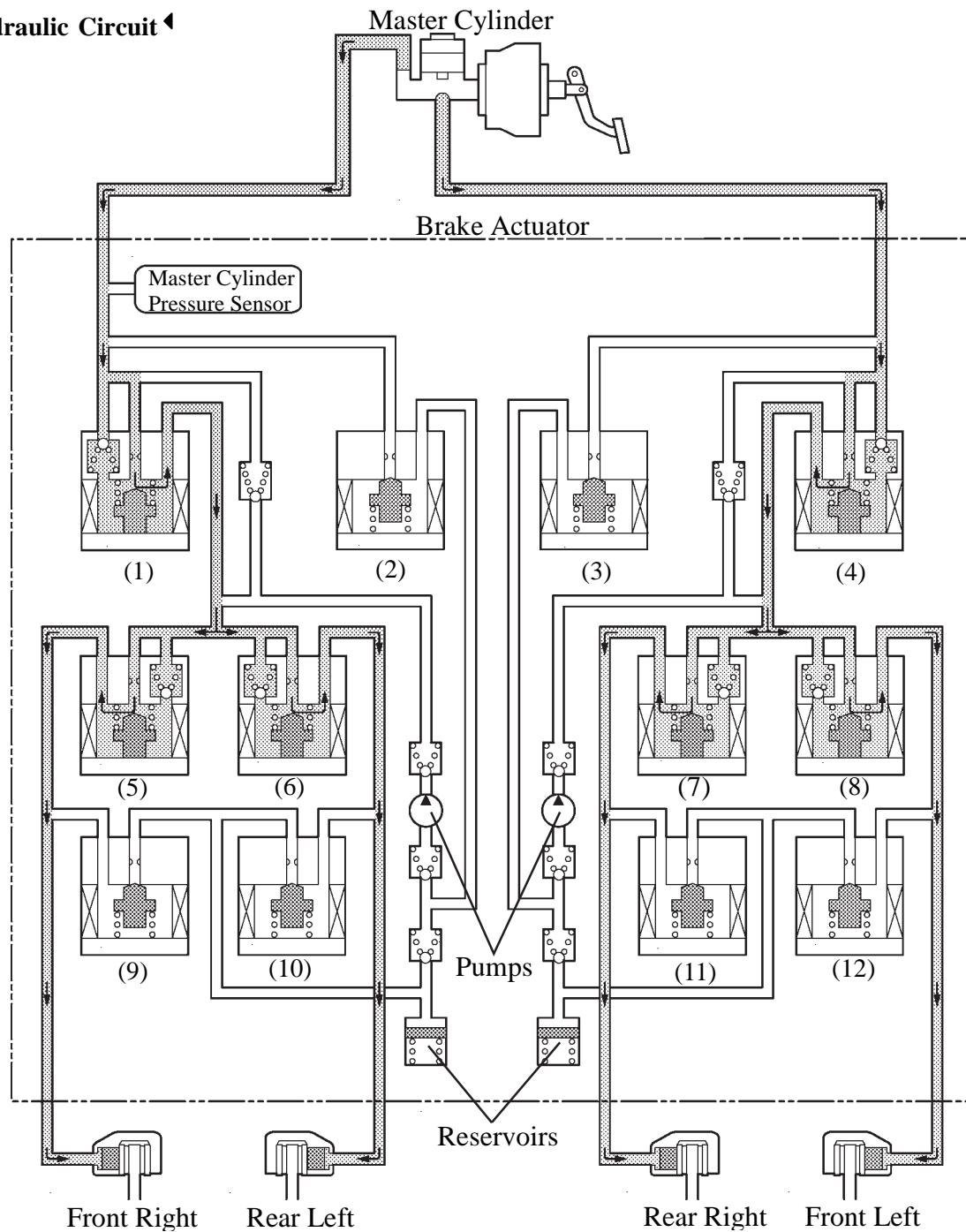
Component	
(1), (4)	Master Cylinder Cut Solenoid Valve
(2), (3)	Reservoir Cut Solenoid Valve
(5), (6), (7), (8)	Pressure Holding Valve
(9), (10), (11), (12)	Pressure Reduction Valve

## 10. System Operation

### Normal Braking Operation

During normal braking, all solenoid valves are remained OFF.

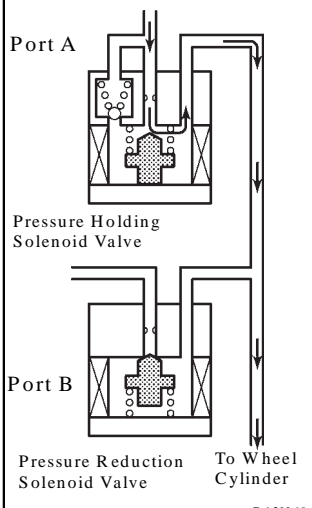
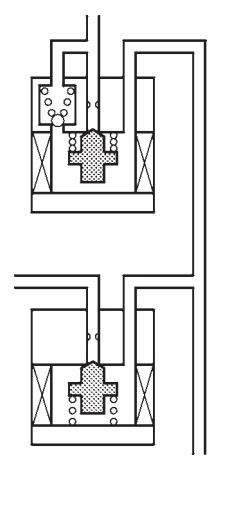
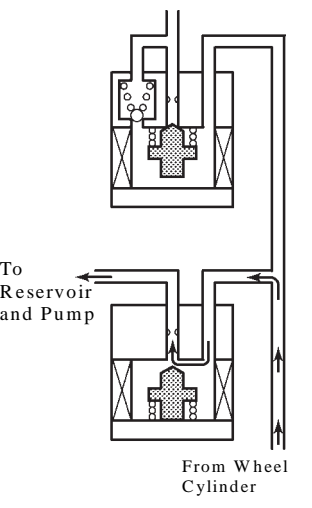
#### ► Hydraulic Circuit ◀



025CH75Y

**ABS with EBD Operation**

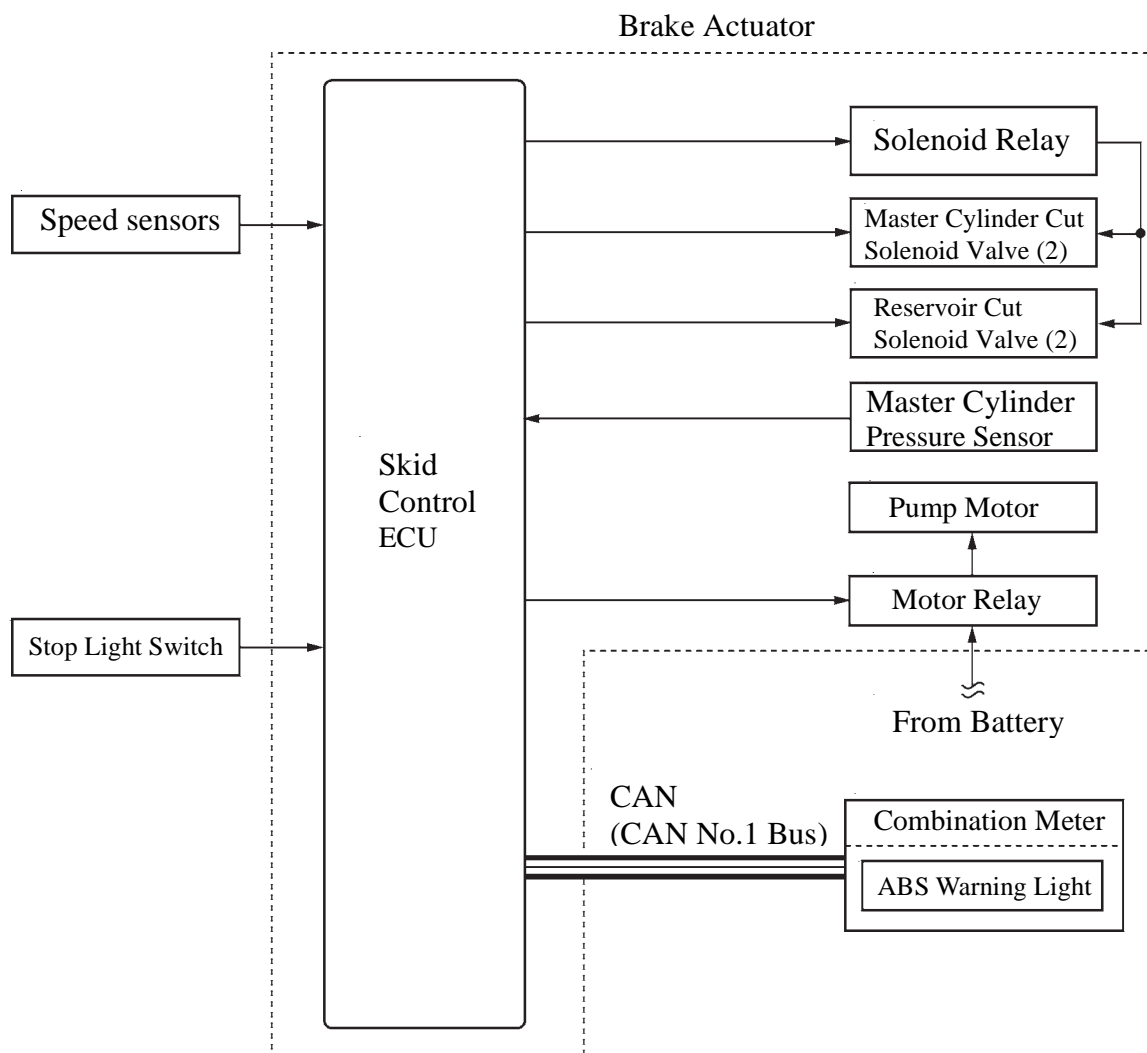
Based on the signals received from the 4 wheel speed sensors and yaw rate & lateral acceleration sensor, the skid control ECU calculates each wheel speed and deceleration, and checks wheel slipping condition. According to the slipping condition, the ECU controls the pressure holding solenoid valve and pressure reduction solenoid valve in order to adjust the fluid pressure of each wheel cylinder in the following three modes: pressure reduction, pressure holding, and pressure increase modes.

Not Activated	Normal Braking	—	—
Activated	Increase Mode	Holding Mode	Reduction Mode
Hydraulic Circuit	 <p>Port A</p> <p>Pressure Holding Solenoid Valve</p> <p>Port B</p> <p>Pressure Reduction Solenoid Valve</p> <p>To Wheel Cylinder</p> <p>D13N69</p>	 <p>D13N70</p>	 <p>To Reservoir and Pump</p> <p>From Wheel Cylinder</p> <p>D13N71</p>
Pressure Holding Valve (Port A)	OFF (Open)	ON (Close)	←
Pressure Reduction Valve (Port B)	OFF (Close)	←	ON (Open)
Wheel Cylinder Pressure	Increase	Hold	Reduction

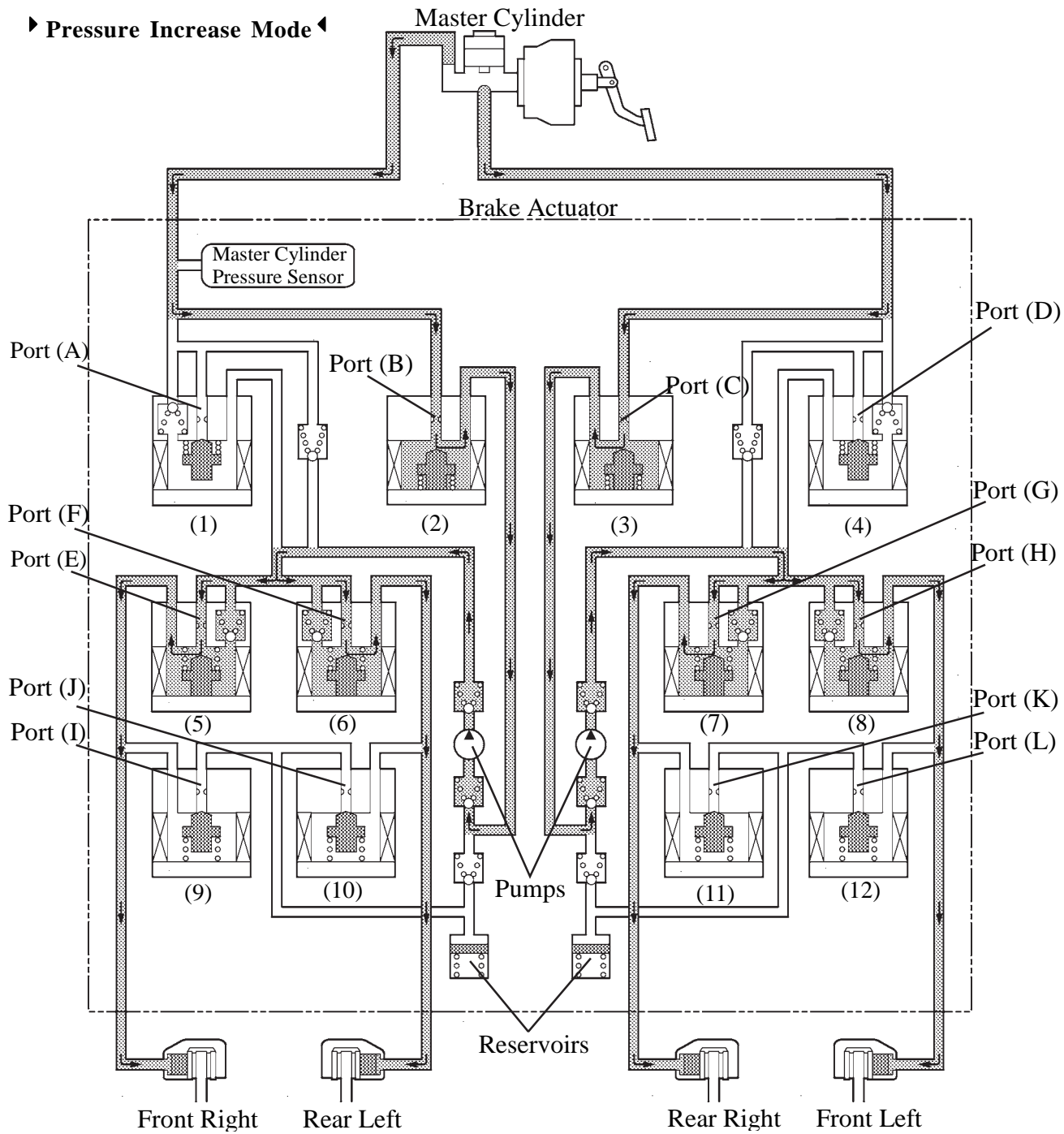
## Brake Assist Operation

- In the event of emergency braking, the skid control ECU detects the driver's intention based on the speed of the pressure increase in the master cylinder determined by the pressure sensor signal. If the ECU judges the need for the additional brake assist, the fluid pressure is generated by the pump in the actuator and directed to the wheel cylinder to apply a greater fluid pressure than the master cylinder.
- Also in the following cases, the skid control ECU provides brake assist.
- The brake assist system is activated; each solenoid operates as shown in the table on the next page.

### ► System Diagram ◀



025CH44P



**Brake Assist Activated**

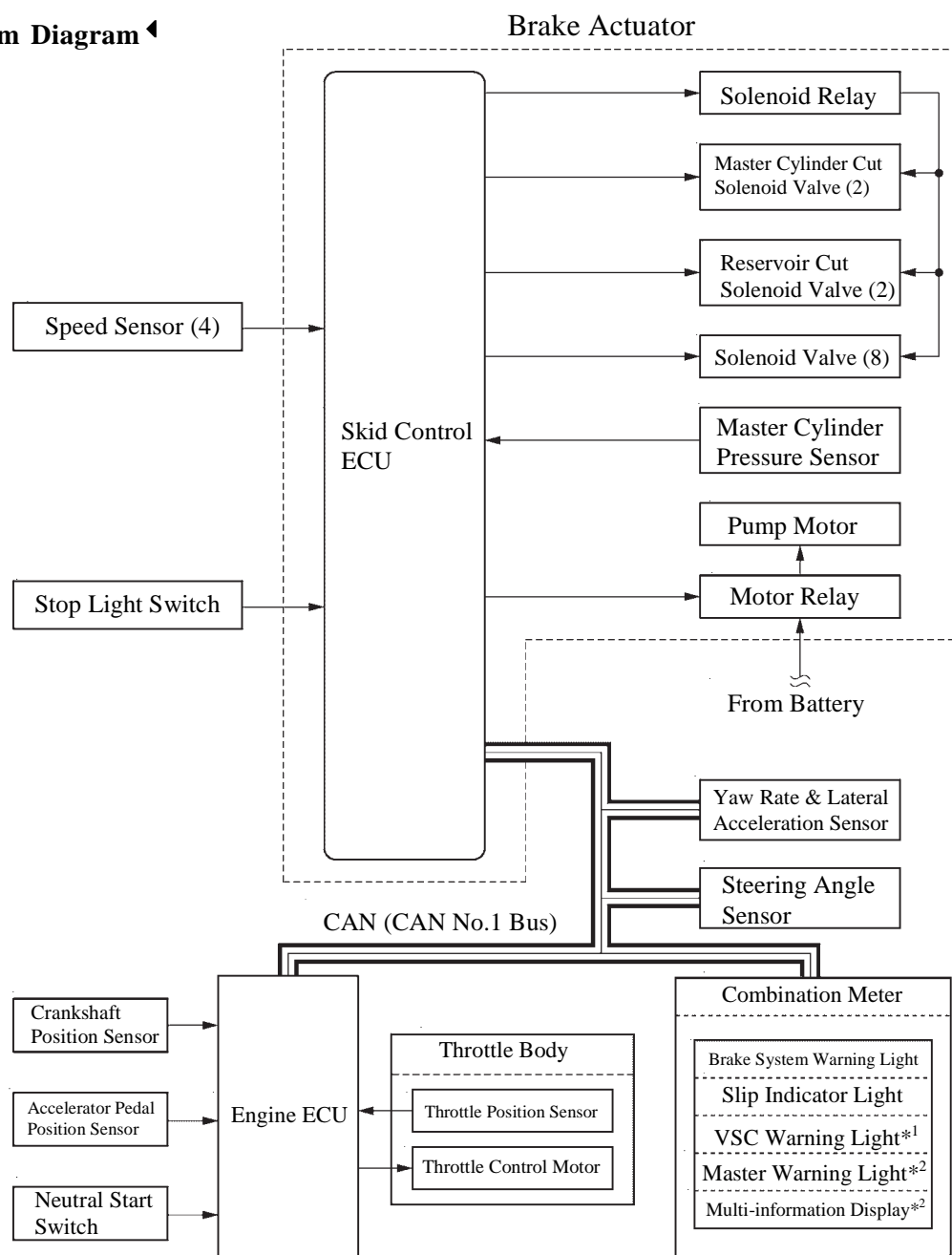
Item		Brake Assist Not Activated	Brake Assist Activated
(1), (4)	Master Cylinder Cut Solenoid Valve	OFF (Open)	ON (Close)
	Port: (A), (D)		
(2), (3)	Reservoir Cut Solenoid Valve	OFF (Close)	ON (Open)
	Port: (B), (C)		
(5), (6), (7), (8)	Pressure Holding Valve	OFF (Open)	←
	Port: (E), (F), (G), (H)		
(9), (10), (11), (12)	Pressure Reduction Valve	OFF (Close)	←
	Port: (I), (J), (K), (L)		



## TRC Operation

- The fluid pressure generated by the pump is regulated by the master cylinder cut solenoid valve to the required pressure. Thus, the wheel cylinders of the drive wheels are controlled in the following 3 modes: pressure reduction, pressure holding, and pressure increase modes, to control the slippage of the drive wheels.
- The diagram below shows the hydraulic circuit in the pressure increase mode when the TRC is activated.
- The pressure holding solenoid valve and the pressure reduction solenoid valve are turned ON/OFF according to the ABS operation pattern described earlier on page CH-71.
- The TRC is activated; each solenoid operates as shown in the table on the next page.

### System Diagram

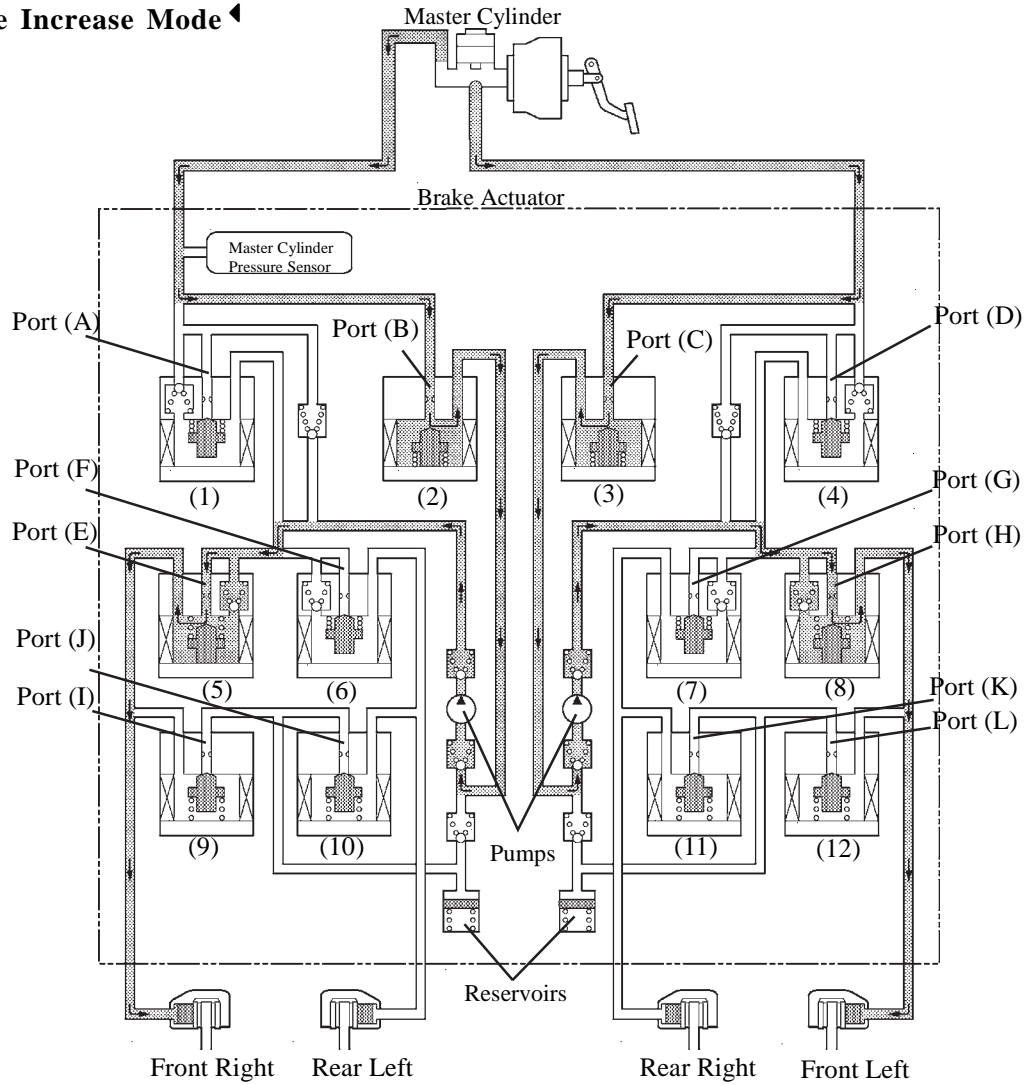


\*1: Models without Multi-information Display

\*2: Models with Multi-information Display

02KCH39TE

# ▶ Pressure Increase Mode ◀



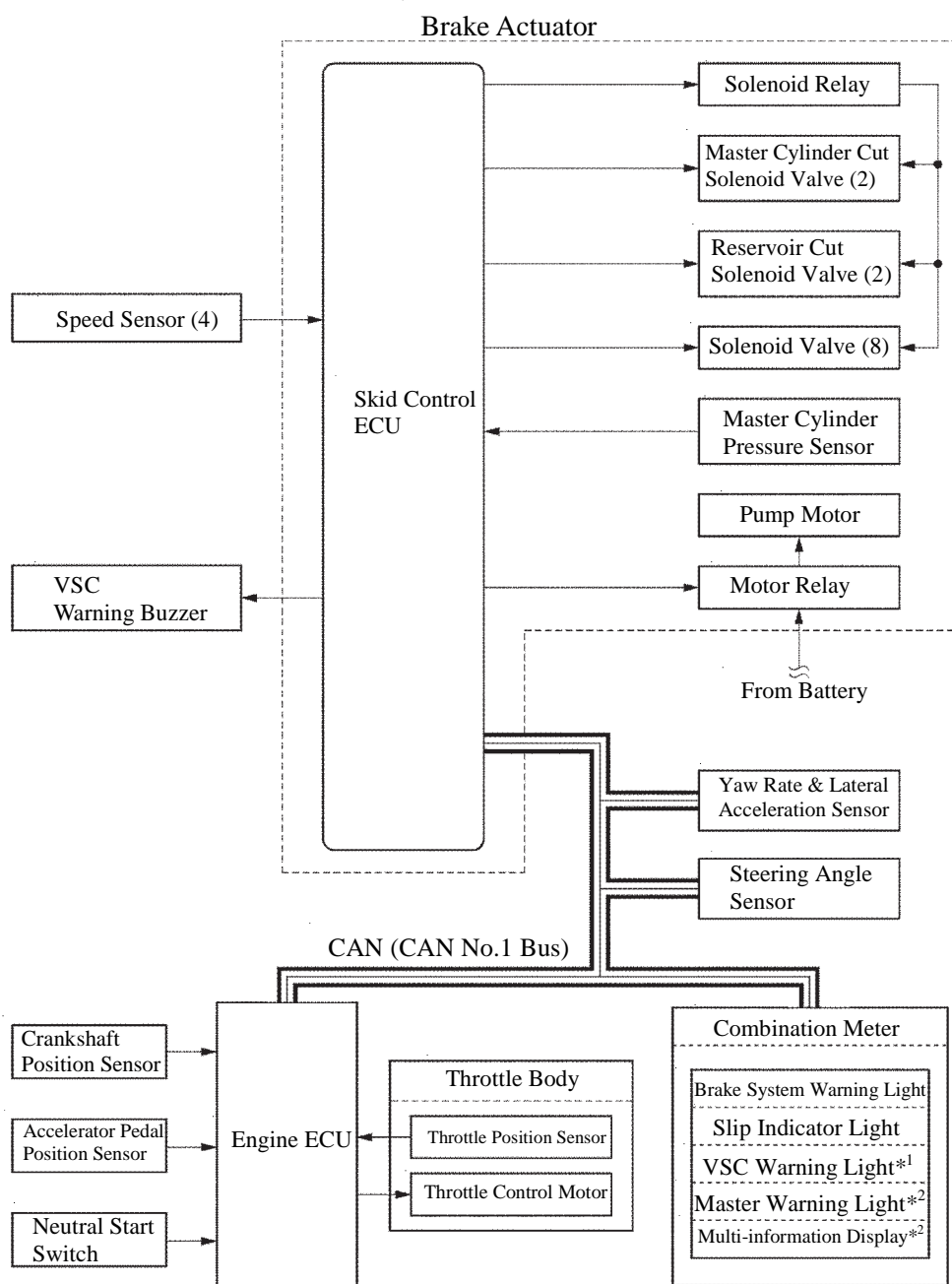
Item			TRC not Activated	TRC Activated		
				Increase Mode	Hold Mode	Reduction Mode
(1), (4)	Master Cylinder Cut Solenoid Valve		OFF/ Open	ON/ Close	←	←
	Port: (A), (D)					
(2), (3)	Reservoir Cut Solenoid Valve		OFF/ Close	ON/ Open	←	←
	Port: (B), (C)					
Front Brake	(5), (8)	Pressure Holding Valve	OFF/ Open	←	ON/ Close	←
		Port: (E), (H)				
	(9), (12)	Pressure Reduction Valve	OFF/ Close	←	←	ON/ Open
		Port: (I), (L)				
	Wheel Cylinder Pressure		—	Increase	Hold	Reduction
Rear Brake	(6), (7)	Pressure Holding Valve	OFF/ Open	ON/ Close	←	←
		Port: (F), (G)				
	(10), (11)	Pressure Reduction Valve	OFF/ Close	←	←	←
		Port: (J), (K)				
	Wheel Cylinder Pressure		—	—	—	—

## VSC Operation

### 1) General

The VSC operation, by way of solenoid valves, controls the fluid pressure that is generated by the pump and applies it to the brake wheel cylinder of each wheel in the following 3 modes: pressure reduction, pressure holding, and pressure increase modes. As a result, the tendency to front wheel skid or rear wheel skid is controlled.

### ▸ System Diagram ◀



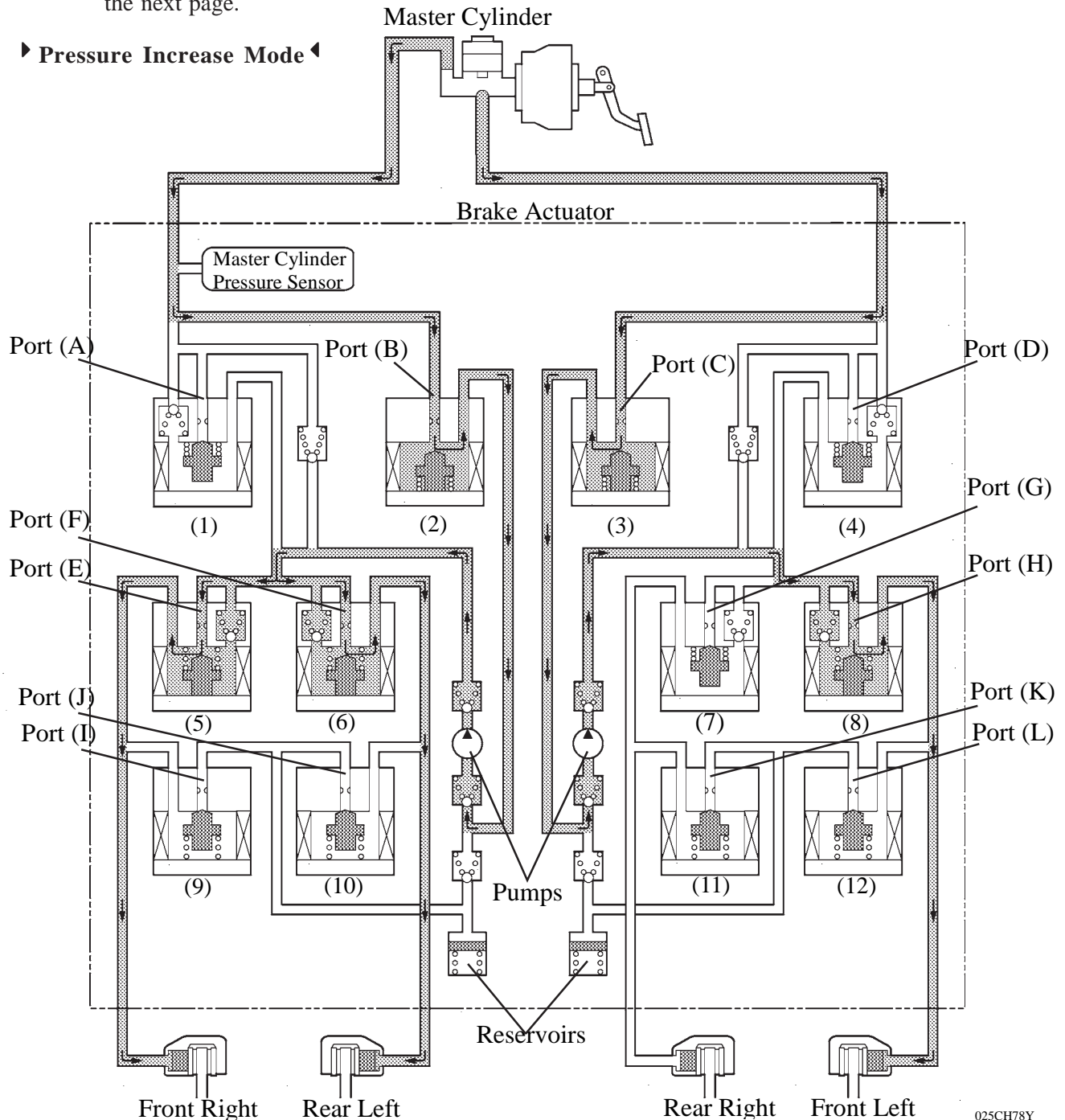
02KCH40TE

\*<sup>1</sup>: Models without Multi-information Display\*<sup>2</sup>: Models with Multi-information Display

## 2) Front Wheel Skid Restraining Control (Turn to the Right)

In the front wheel skid restraining control, the brakes of the front wheels and the rear wheel of the inner circle of the turn are applied. Also, depending on whether the brake is ON or OFF and the condition of the vehicle, there are circumstances in which the brake might not be applied to the wheels even if those wheels are targeted for braking.

- The diagram below shows the hydraulic circuit in the pressure increase mode, as it controls the front wheel skid condition while the vehicle makes a right turn.
- In other operating modes, the pressure holding valve and the pressure reduction valve are turned ON/OFF according to the ABS with EBD operation pattern.
- The front wheel skid restraining control is activated; each solenoid operates as shown in the table on the next page.



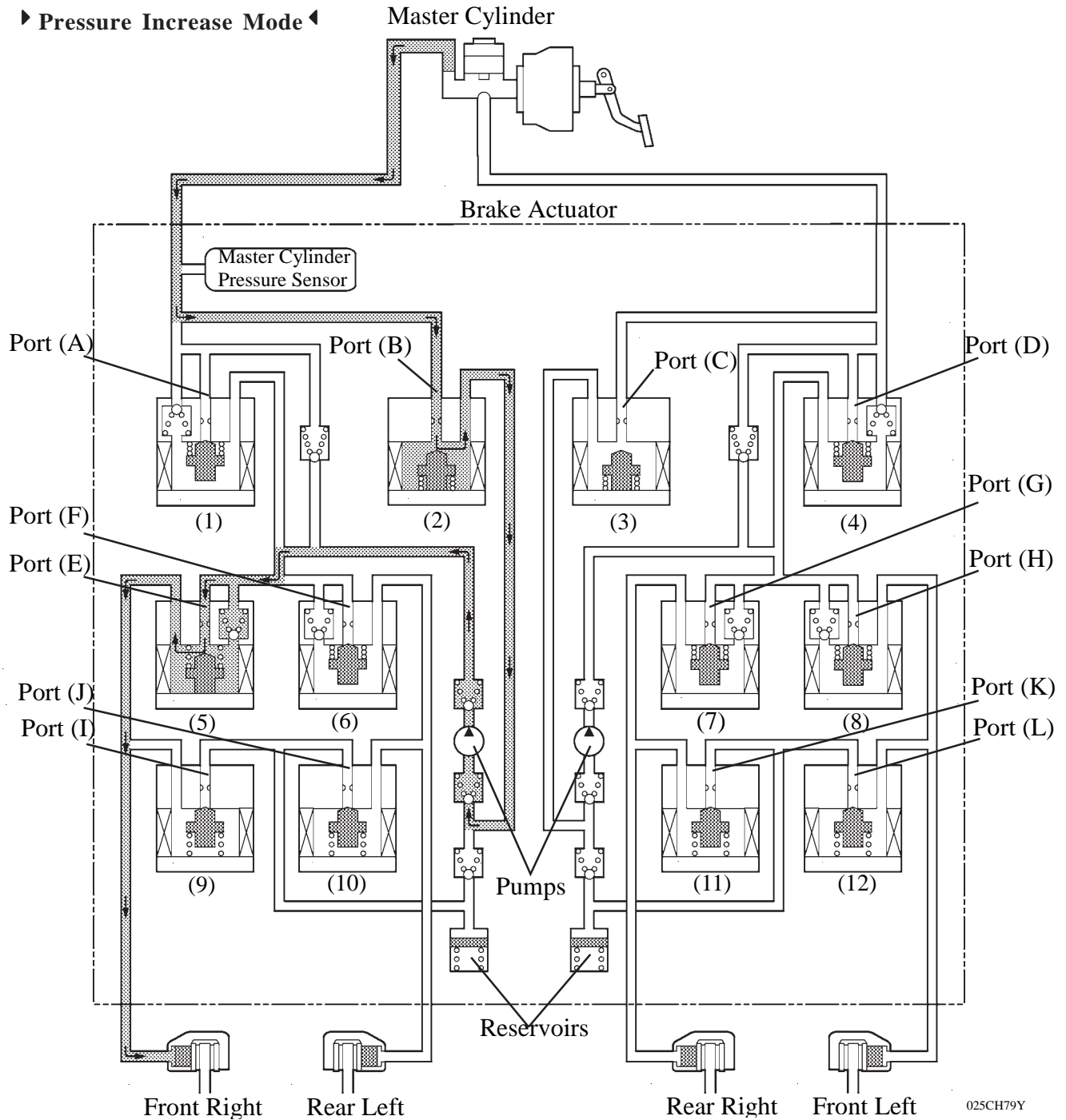
Item			VSC not Activated	VSC Activated			
				Increase Mode	Hold Mode	Reduction Mode	
(1), (4)	Master Cylinder Cut Solenoid Valve		OFF/ Open	ON/ Close	←	←	
	Port: (A), (D)						
(2), (3)	Reservoir Cut Solenoid Valve		OFF/ Close	ON/ Open	←	←	
	Port: (B), (C)						
Front Brake	(5), (8)	Pressure Holding Valve	OFF/ Open	←	ON/ Close	←	
		Port: (E), (H)					
	(9), (12)	Pressure Reduction Valve	OFF/ Close	←	←	ON/ Open	
		Port: (I), (L)					
	Wheel Cylinder Pressure		—	Increase	Hold	Reduction	
Rear Brake	(6)	Pressure Holding Valve (Rear Right)	OFF/ Open	←	ON/ Close	←	
		Port: (F)					
	(7)	Pressure Holding Valve (Rear Left)	OFF/ Open	ON/ Close	←	←	
		Port: (G)					
	(10)	Pressure Reduction Valve (Rear Right)	OFF/ Close	←	←	ON/ Open	
		Port: (J)					
	(11)	Pressure Reduction Valve (Rear Left)	OFF/ Close	←	←	←	
		Port: (K)					
	Wheel Cylinder Pressure		Right	—	Increase	Hold	Reduction
			Left	—	—	—	—

### 3) Rear Wheel Skid Restraining Control (Turn to the Right)

In rear wheel skid restraining control, the brake of the front wheel of the outer circle of the turn is applied. Also, depending on whether the brake is ON or OFF and the condition of the vehicle, there are circumstances in which the brake might not be applied to the wheels even if those wheels are targeted for braking.

- The diagram below shows the hydraulic circuit in the pressure increase mode, as it controls the rear wheel skid condition while the vehicle make a right turn.
- In other operating modes, the pressure holding valve and the pressure reduction valve are turned ON/OFF according to the ABS with EBD operating pattern.
- The rear wheel skid restraining control system is activated; each solenoid operates as shown in the table on the next page.

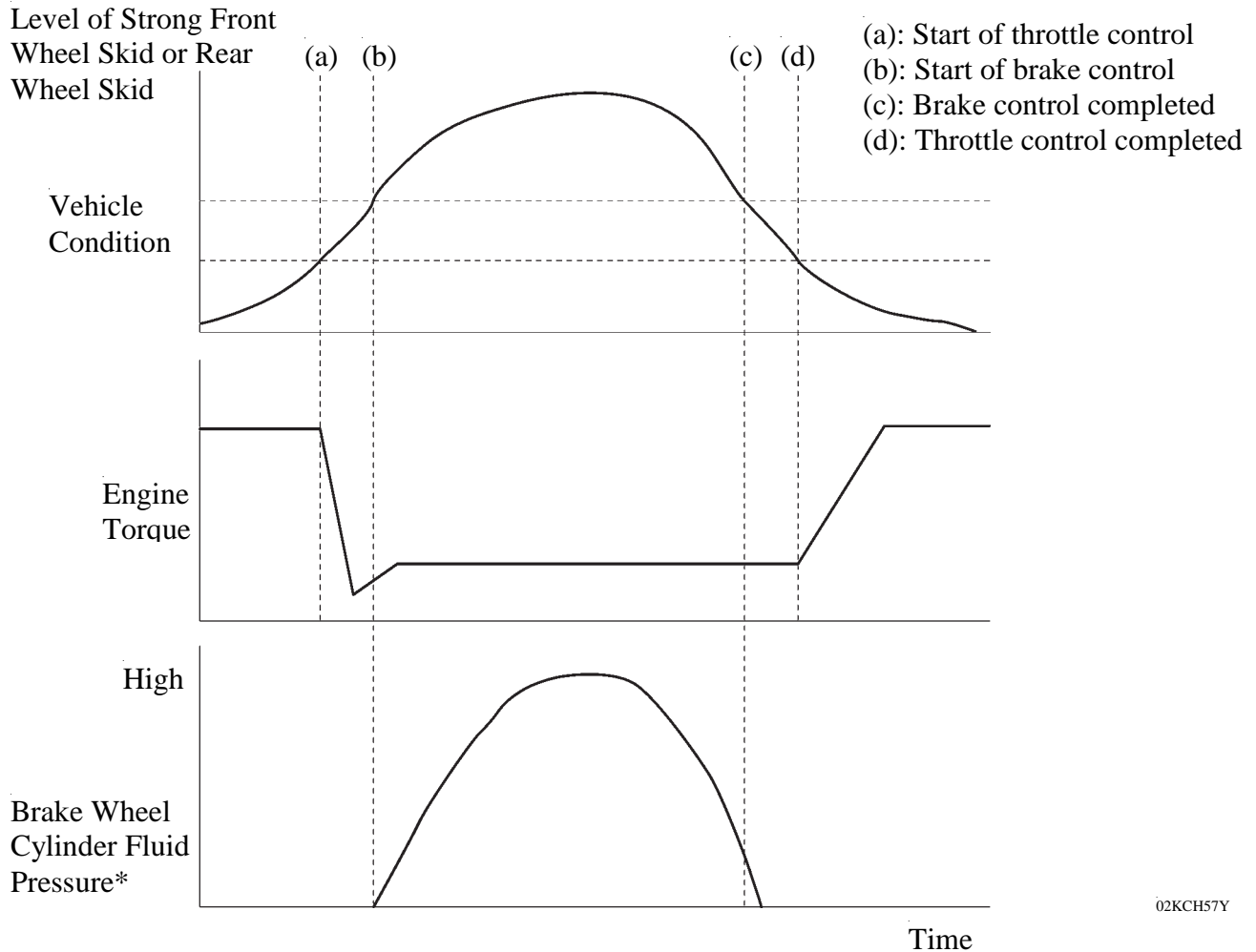
#### ► Pressure Increase Mode ◀



Item			VSC not Activated	VSC Activated		
				Increase Mode	Hold Mode	Reduction Mode
(1), (4)	Master Cylinder Cut Solenoid Valve		OFF/ Open	ON/ Close	←	←
	Port: (A), (D)					
(2), (3)	Reservoir Cut Solenoid Valve		OFF/ Close	ON/ Open	←	←
	Port: (B), (C)					
Front Brake	(8)	Pressure Holding Valve (Front Right)	OFF/ Open	ON/ Close	←	←
		Port: (H)				
	(5)	Pressure Holding Valve (Front Left)	OFF/ Open	←	ON/ Close	←
		Port: (E)				
	(12)	Pressure Reduction Valve (Front Right)	OFF/ Close	←	←	←
		Port: (L)				
	(9)	Pressure Reduction Valve (Front Left)	OFF/ Close	←	←	ON/ Open
		Port: (I)				
	Wheel Cylinder Pressure		Right	—	—	—
			Left	—	Increase	Hold
Rear Brake	(6)	Pressure Holding Valve (Rear Right)	OFF/ Open	ON/ Close	←	←
		Port: (F)				
	(7)	Pressure Holding Valve (Rear Left)	OFF/ Open	ON/ Close	←	←
		Port: (G)				
	(10)	Pressure Reduction Valve (Rear Right)	OFF/ Close	←	←	←
		Port: (J)				
	(11)	Pressure Reduction Valve (Rear Left)	OFF/ Close	←	←	←
		Port: (K)				
	Wheel Cylinder Pressure		Right	—	—	—
			Left	—	Increase	Hold

## Engine Output Control

During a VSC operation, the skid control ECU outputs a VSC operation signal to the engine ECU. Upon receiving this signal, the engine ECU effects throttle control to regulate the engine output.



02KCH57Y

\*: The wheel cylinder that activates varies depending on the condition of the vehicle.

## Initial Check

Each time the power source is IG-ON\*, and the vehicle reaches a speed of approximately 6 km/h or more, the skid control ECU performs an initial check. The functions of each solenoid valve and pump motor in the brake actuator are checked in sequence.

\*: The power source condition can be changed by operating the engine switch on models with the smart entry and start system, and the ignition switch on models without the smart entry and start system.



## 11. Service Mode

- A new service mode has been created for Aurion. In this mode, VSC & TRC functions are forcibly turned OFF, either through the operation of an intelligent tester II or by operating the parking brake and the brake pedal together. Please refer to the following service tip for information regarding changing the service mode.

### Service Tip

#### Transition to the service mode (VSC & TRC OFF mode).

The VSC & TRC systems can be turned off by following the procedures below:

- *When using the parking brake and brake pedal:*
  - 1) Check that the ignition is OFF\* and the shift lever is in position P.
  - 2) Start the engine .
  - 3) Operate the following steps 4 to 8 within 30 seconds of starting the engine.
  - 4) Turn the parking brake switch on.
  - 5) Depress and release the brake pedal twice.
  - 6) Turn the parking brake switch on and off twice while depressing the brake pedal.
  - 7) Depress and release the brake pedal twice while the parking brake switch is on.  
**Notice:** Steps 6 and 7 should each be performed within 15 seconds.
  - 8) Check that the slip indicator light is on. If not, repeat the procedure from the step 1.
  - 9) The brake control system can be returned to the normal mode by turning the Ignition ON\* from OFF\*.
- *When using the intelligent tester II:*
  - 1) Check that the ignition switch is OFF\* and the shift lever is in position P.
  - 2) Connect the intelligent tester II to the DLC3 and switch on.
  - 3) Start the engine .
  - 4) Operate the intelligent tester II to send signals of memory change function.
  - 5) The brake control system can be returned to the normal mode by turning the Ignition ON\* from OFF\*.


For details of the transition to service mode, see the Aurion Repair Manual.

\*: The power source condition can be changed by operating the engine switch on models with the smart entry and start system, and the ignition switch on models without the smart entry and start system.

## 12. Diagnosis

### General

If the skid control ECU detects a malfunction in the brake control system (ABS with EBD, brake assist, TRC and VSC), the ABS or brake or VSC system warning light that corresponds to the function for which the malfunction has been detected illuminates, as indicated in the table below, to alert the driver of the malfunction.

Item	○: Illuminate      Δ: Indicate				
	ABS	EBD	Brake Assist	TRC	VSC
ABS Warning Light	○	○	○	—	—
Brake System Warning Light	—	○	—	—	—
VSC Warning Light* <sup>1</sup>	○* <sup>3</sup>	○* <sup>3</sup>	○* <sup>3</sup>	○	○
Master Warning Light* <sup>2</sup>	○* <sup>3</sup>	○* <sup>3</sup>	○* <sup>3</sup>	○	○
Multi-information Display* <sup>2</sup> 	○* <sup>3</sup>	○* <sup>3</sup>	○* <sup>3</sup>	Δ	Δ

\*<sup>1</sup>: Models without multi-information display

\*<sup>2</sup>: Models with multi-information display

\*<sup>3</sup>: Failure in the ABS, EBD, and brake assist systems prohibits operation of the TRC, VSC systems. Accordingly, the VSC or master warning lights will be illuminated and the warning message will appear on the multi-information display.

- At the same time, the DTC (Diagnostic Trouble Code) are stored in the memory. The DTC can be read by connecting SST (09843-18040) between the Tc and CG terminals of the DLC3, and observing the blinking of the ABS warning light or the observing the diagnostic code indicated on the multi-information display, connecting an intelligent tester II.
- This system has a sensor signal check (test mode) function. This function is activated by connecting the SST (09843-18040) between the Ts and CG terminal of the DLC3 or by connecting an intelligent tester II. The ABS warning light and VSC warning light blinks at a 0.25-second interval. This check function performs deceleration sensor check, yaw rate sensor check, master cylinder pressure sensor check, and speed sensor check.

### ▶ Display example of the multi-information display ◀



02KCH51TE

Normal system code is displayed



02KCH52TE

DTC is displayed

- If the skid control ECU detects a malfunction during a sensor signal check (test mode), it stores the DTC in its memory. These DTC can be read during a sensor check operation by connecting the SST (09843-18040) to the Tc and CG terminals of the DLC3 and observing the blinking of the ABS warning light or observing the diagnostic code indicated on the multi-information display, or connecting an intelligent tester II.

For details of the DTC that are stored in skid control ECU memory and the DTC that are output through the sensor signal check (test mode) functions, see the Aurion Repair Manual.

### **Diagnosis of CAN**

- If a malfunction occurs on a CAN communication line, the skid control ECU is connected to the CAN communication lines and it will store the DTC (Diagnostic Trouble Code) in its memory.
- There are 2-digit DTC and 5-digit DTC for CAN communications related to the brake control system (ABS with EBD, brake assist, TRC and VSC).
  - 2-digit DTC can be read by connecting the SST (09843-18040) to Tc and CG terminals of the DLC3, and observing the diagnostic code indicated on the VSC warning light (models without multi-information display) or multi-information display (models with multi-information display) in the combination meter.
  - 5-digit DTC can be read by connecting an intelligent tester II to the DLC3.

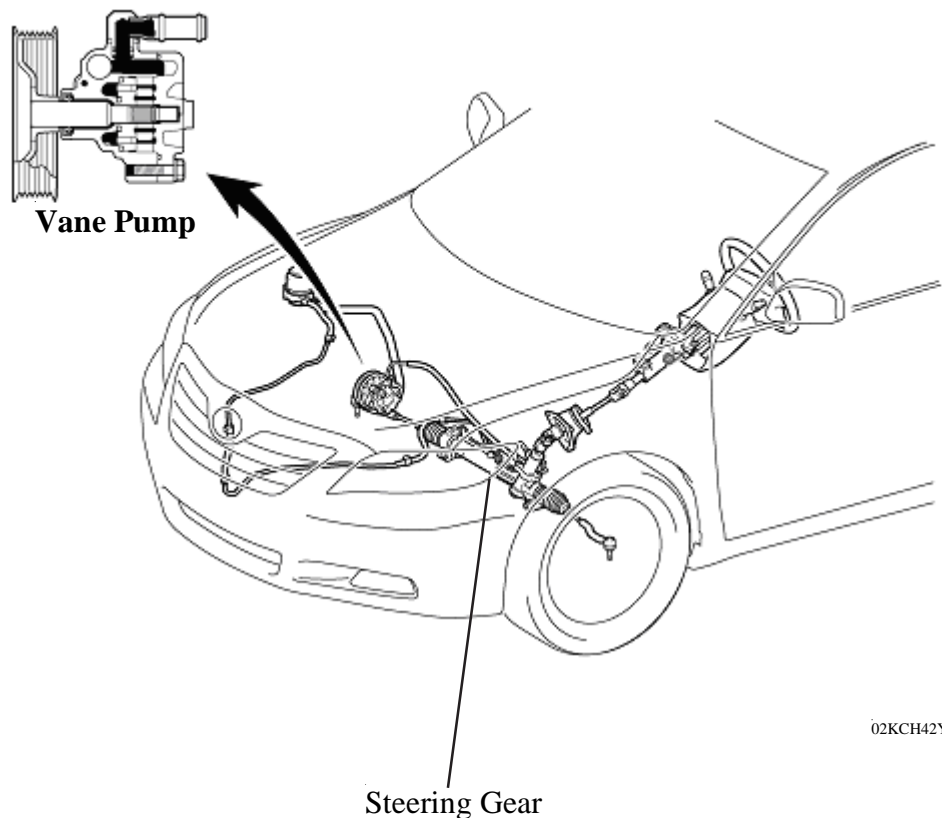
### **Fail-Safe**

- In the event of a malfunction in the ABS and/or brake assist controls, the skid control ECU prohibits the ABS, brake assist, TRC and VSC operations.
- In the event of a malfunction in the EBD control, the skid control ECU prohibits the EBD operation. Even in this case, usual braking performance excluding the brake control system (ABS with EBD, brake assist, TRC and VSC) is secured.
- In the event of a malfunction in the TRC and/or VSC, the skid control ECU prohibits TRC and VSC operations.
- If a communication malfunction occurs between the skid control ECU, the steering angle sensor, the yaw rate & lateral acceleration sensor, or engine ECU, the skid control ECU stops the TRC and VSC.
- When the engine ECU detects the DTC, it will disable the TRC and VSC.

## STEERING

### DESCRIPTION

- A rack and pinion type steering gear with an engine speed sensing type power steering is used on all models.
- The pressure return type vane pump is used which makes the discharge pressure flow volume return at middle and high speed, thus ensuring a fine steering feeling.
- The steering column uses an energy absorbing mechanism.



### Tilt & Power Telescopic Steering Column

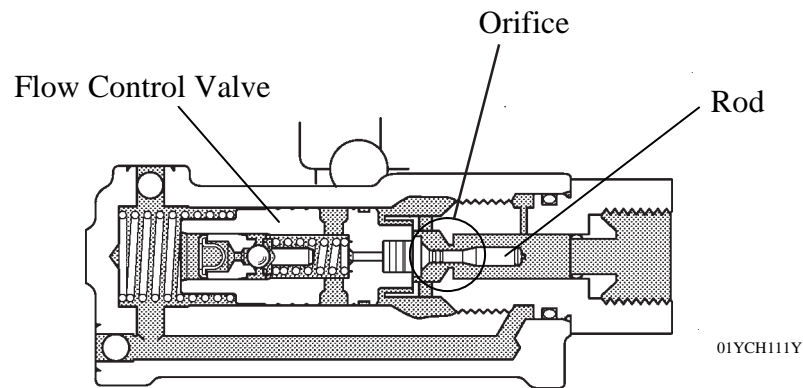
#### Specifications

Gear Ratio (Overall)		15.9
No. of Turns Lock to Lock		3.20
Rack Stroke	mm	156.0
Fluid Type		ATF Type DEXRON® II or III

## ✱ POWER STEERING VANE PUMP

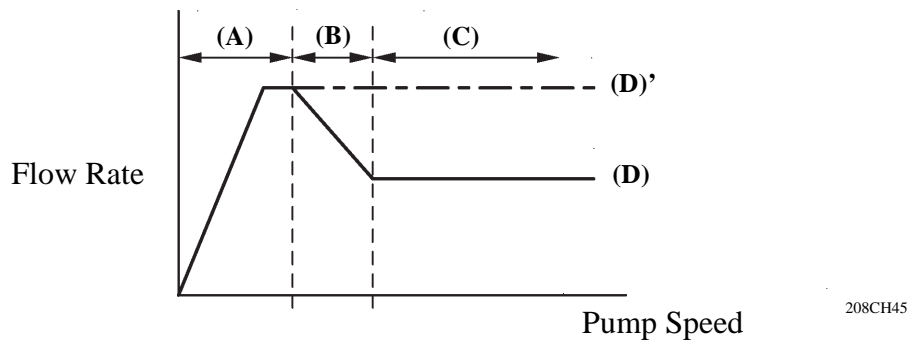
### 1. Construction

The rod type flow control valve, which adjusts flow rate according to the pump speed and load by moving the inside rod to change the opening area of the orifice, is used in this pump.



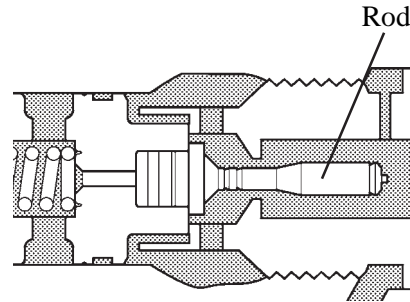
### 2. Operation

#### ► Flow Rate Characteristics ◀



**At Low Pump Speed Range (A)**

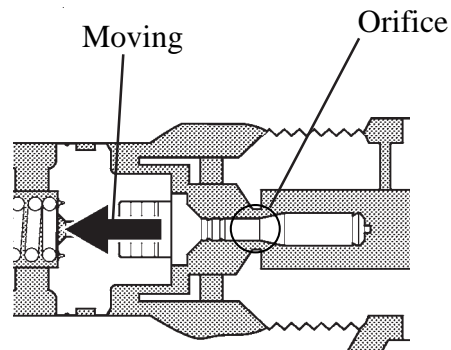
The flow rate increases proportionally to the pump speed.



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**At Middle Pump Speed Range without Steering (B)**

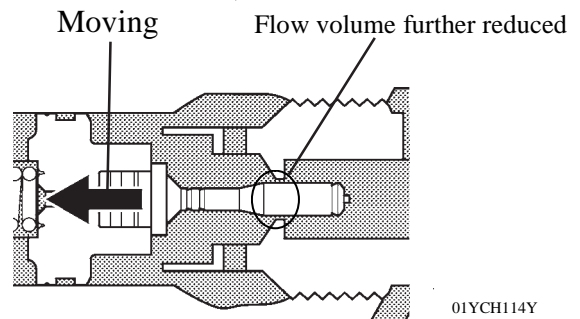
The flow control valve moves to the left, the flow rate is decreased due to the reduction in the orifice area, which is related to the rod shaft diameter at each position.



01YCH113Y

**At High Pump Speed Range without Steering (C)**

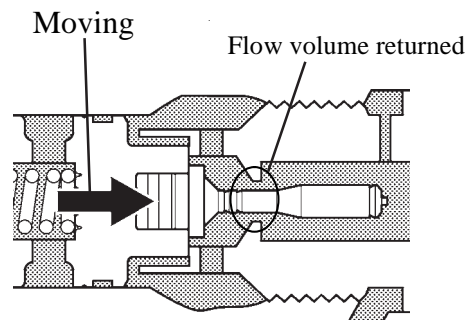
As the flow control valve moves further to the left, the flow rate is further reduced at the maximum rod shaft diameter.



01YCH114Y

**During Pressure Loading (D → D')**

When operating the steering in the middle or high pump speed range, the pressure inside the vane pump is increased causing the flow control to move back to the right, which results in an increase in the flow rate.

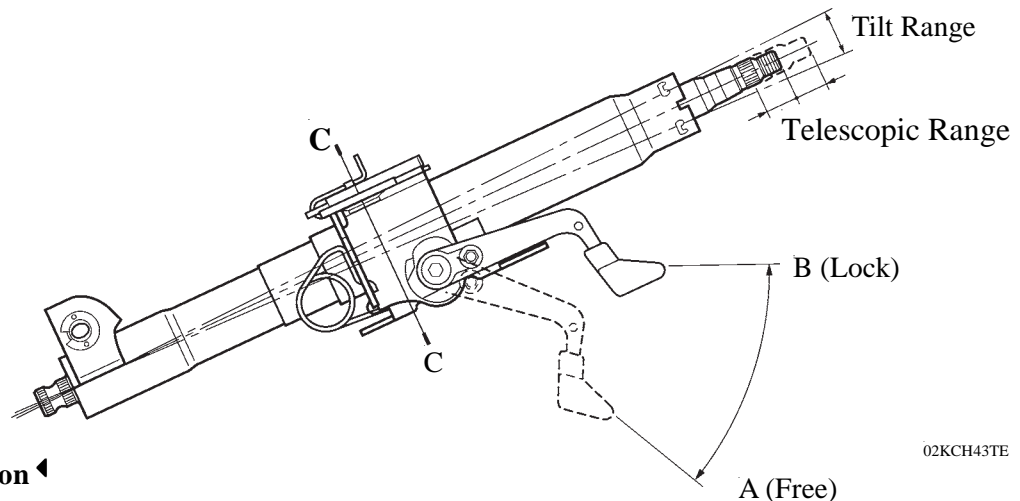


01YCH115Y

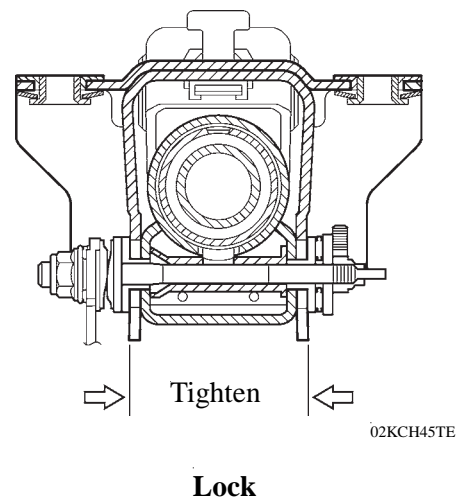
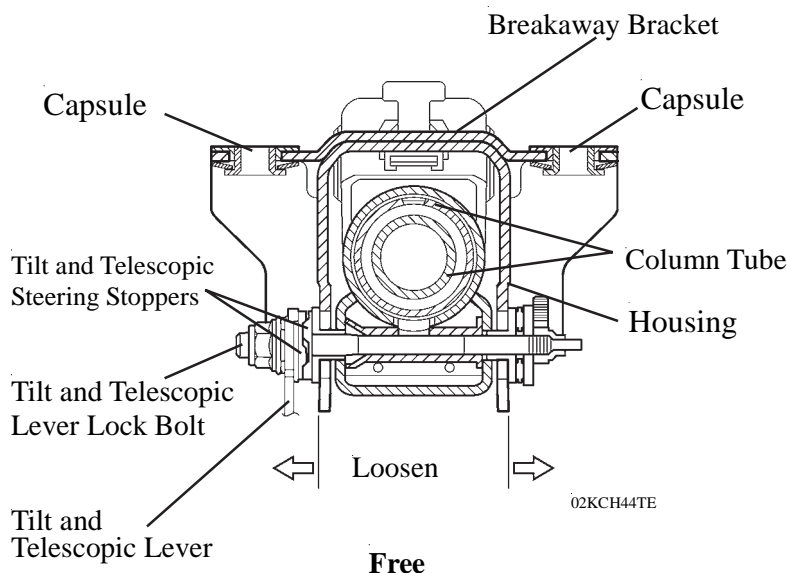
## STEERING COLUMN

### 1. Manual tilt and Telescopic Steering Column

- The manual tilt and telescopic mechanism consists mainly of a tilt lever, steering column tube, breakaway bracket, tilt lever lock bolt, and tilt steering stoppers.
- The tilt lever controls the tilt and the telescope motion.
- With the tilt adjustment range of  $3.2^\circ$  (step less) and the telescopic adjustment range of 40 mm, the steering column can be adjusted to a position selected by the driver.
- When the tilt and telescopic mechanism is in its locked state, the tilt lever at position B causes the cam of the tilt and telescopic steering stoppers to tighten the steering column tube.
- When the tilt and telescopic mechanism is in its free state, the tilt lever at position A causes the cam of the tilt and telescopic steering stoppers to loosen the steering column tube.



#### ► C – C Cross Section ◄



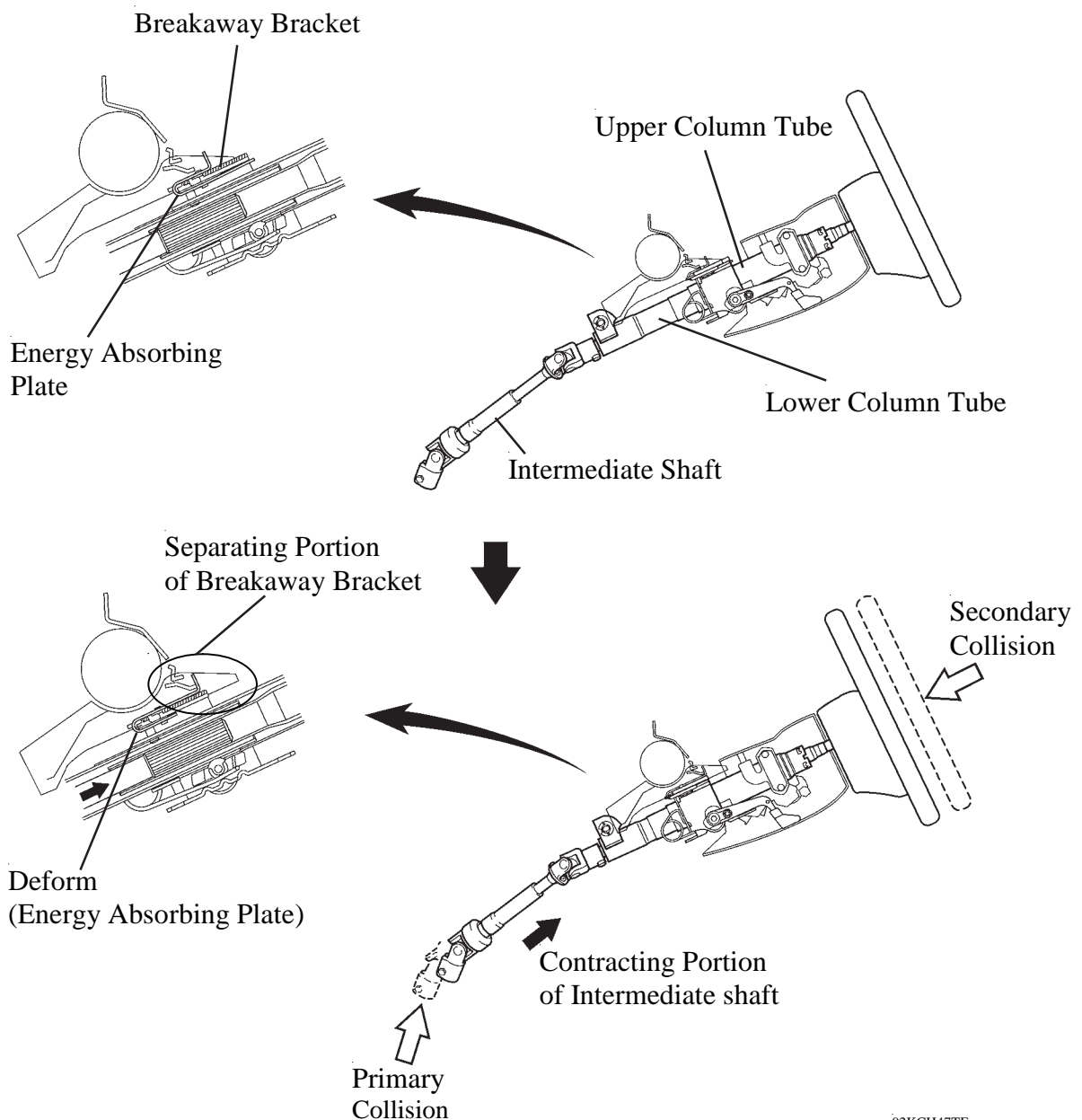
**Drawings for Illustration Purposes Only**

### 3. Energy Absorbing Mechanism

#### Manual Tilt and Telescopic Steering Column

- The energy absorbing mechanism consists mainly of a breakaway bracket, breakaway capsule, energy absorbing plate, upper column tube and lower column tube.
- When an impact is transmitted to the steering wheel during a collision (secondary collision), the steering wheel and the steering wheel pad help absorb the impact. In addition, the breakaway bracket and the reinforcement separate, and the upper and lower column tubes contract.
- At this time, the energy absorbing plate becomes deformed to help absorb the impact of the secondary collision.

#### ► Energy Absorbing Mechanism ◀



Drawings for Illustration Purposes Only

02KCH47TE



# BODY

## **BODY STRUCTURE**

<i>Lightweight and Highly Rigid Body.....</i>	<i>BO-2</i>
<i>Safety Features.....</i>	<i>BO-5</i>
<i>Rust-resistant Body.....</i>	<i>BO-10</i>
<i>Low Vibration and Low Noise Body.....</i>	<i>BO-12</i>
<i>Aerodynamics.....</i>	<i>BO-16</i>

## **ENHANCEMENT OF PRODUCT APPEAL**

<i>Parts with Low Repair Cost.....</i>	<i>BO-18</i>
<i>Washer Nozzle.....</i>	<i>BO-18</i>
<i>Wiper Arm &amp; Blade.....</i>	<i>BO-19</i>
<i>Child Restraint System.....</i>	<i>BO-20</i>
<i>Seat Belt.....</i>	<i>BO-21</i>

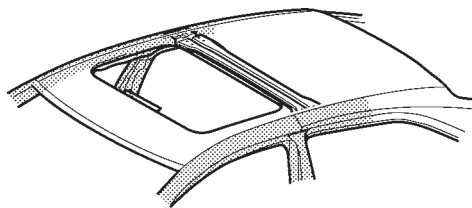
# BODY


## BODY STRUCTURE

### ✱ LIGHTWEIGHT AND HIGHLY RIGID BODY

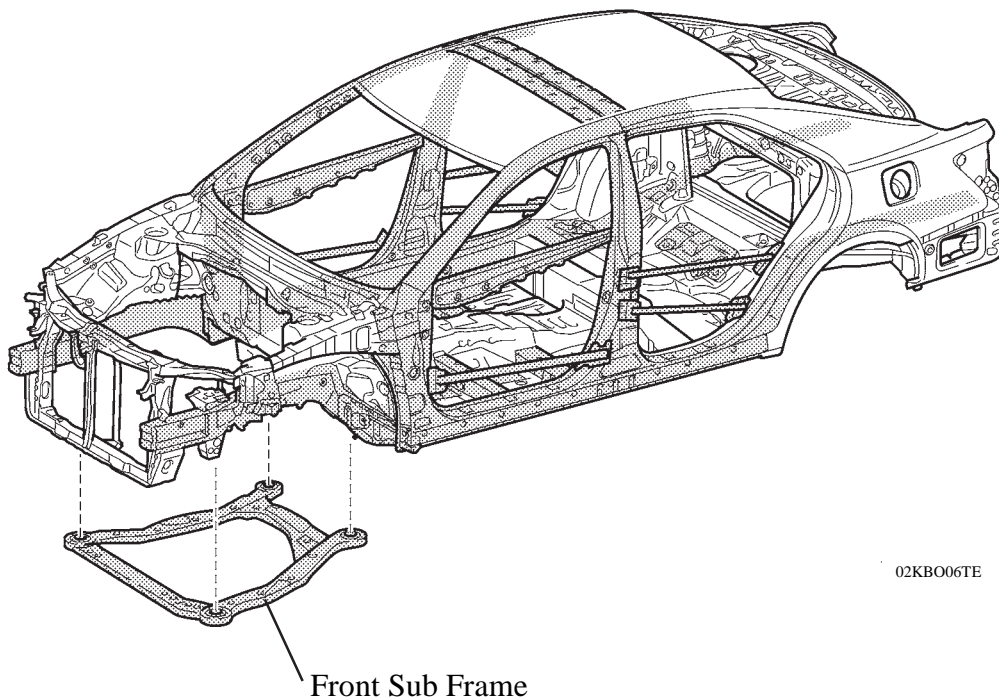
#### 1. High Strength Sheet Steel

High strength sheet steel is used in order to ensure body rigidity and realise a lightweight body.



 : High Strength Sheet Steel

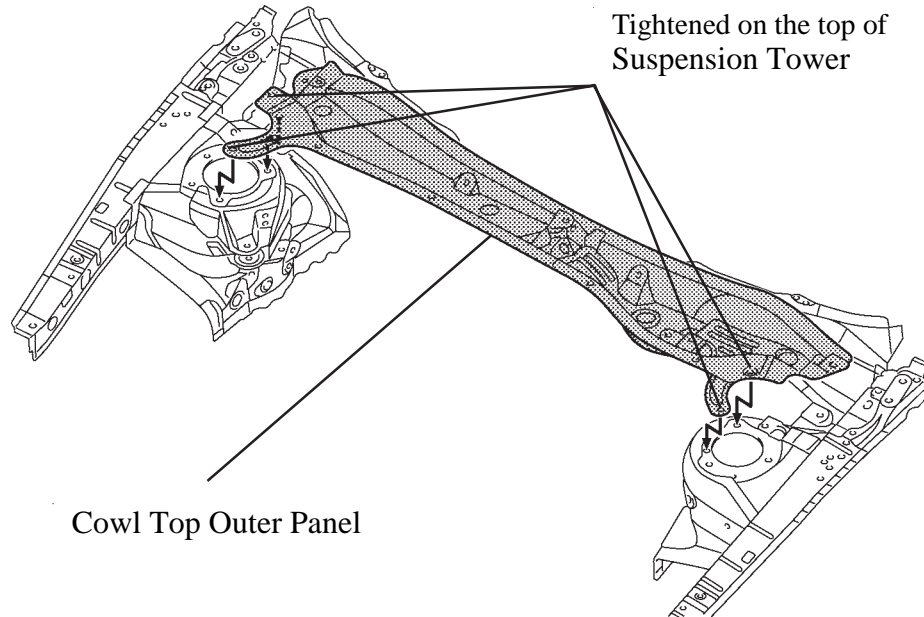
#### Models with Sliding Roof



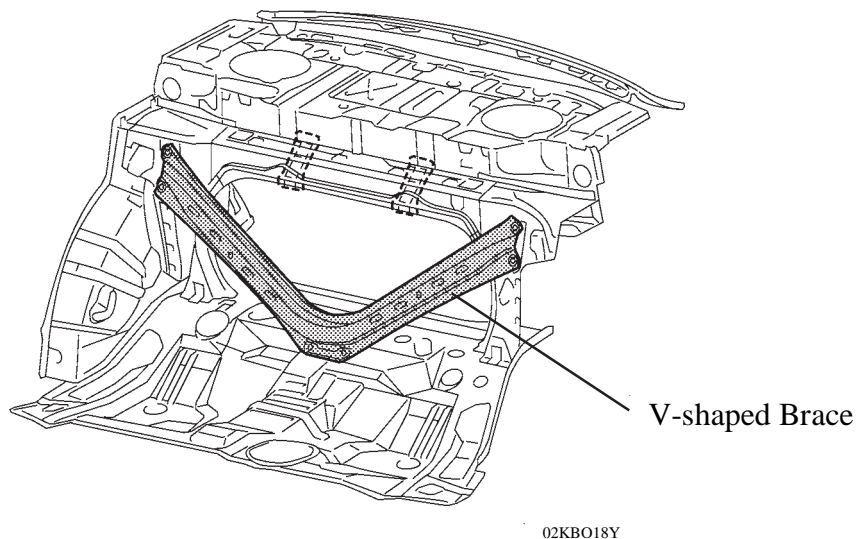
02KBO06TE

## 2. Brace

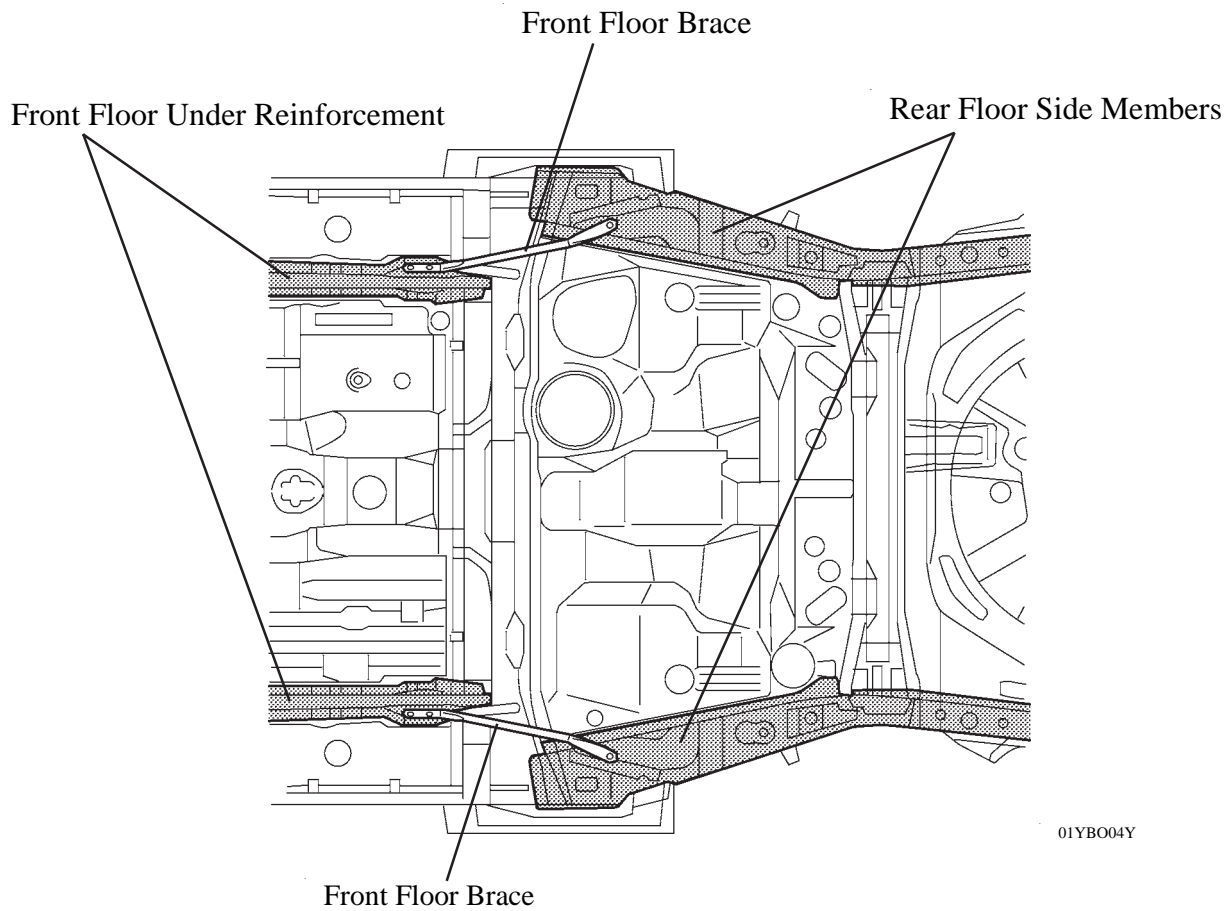
- Excellent manoeuvrability and stability has been achieved by providing a cowl top outer panel for the front suspension tower.



- A V-shaped brace is located behind the rear seat and is fitted between the rear suspension towers and the floor. As a result, the body rigidity has been enhanced and excellent manoeuvrability and stability have been achieved.



- On Sportivo grades, high body rigidity has been achieved through the use of front floor braces arranged between the front floor under reinforcement and rear floor side members.



**View from Bottom Side**

## ★ SAFETY FEATURES

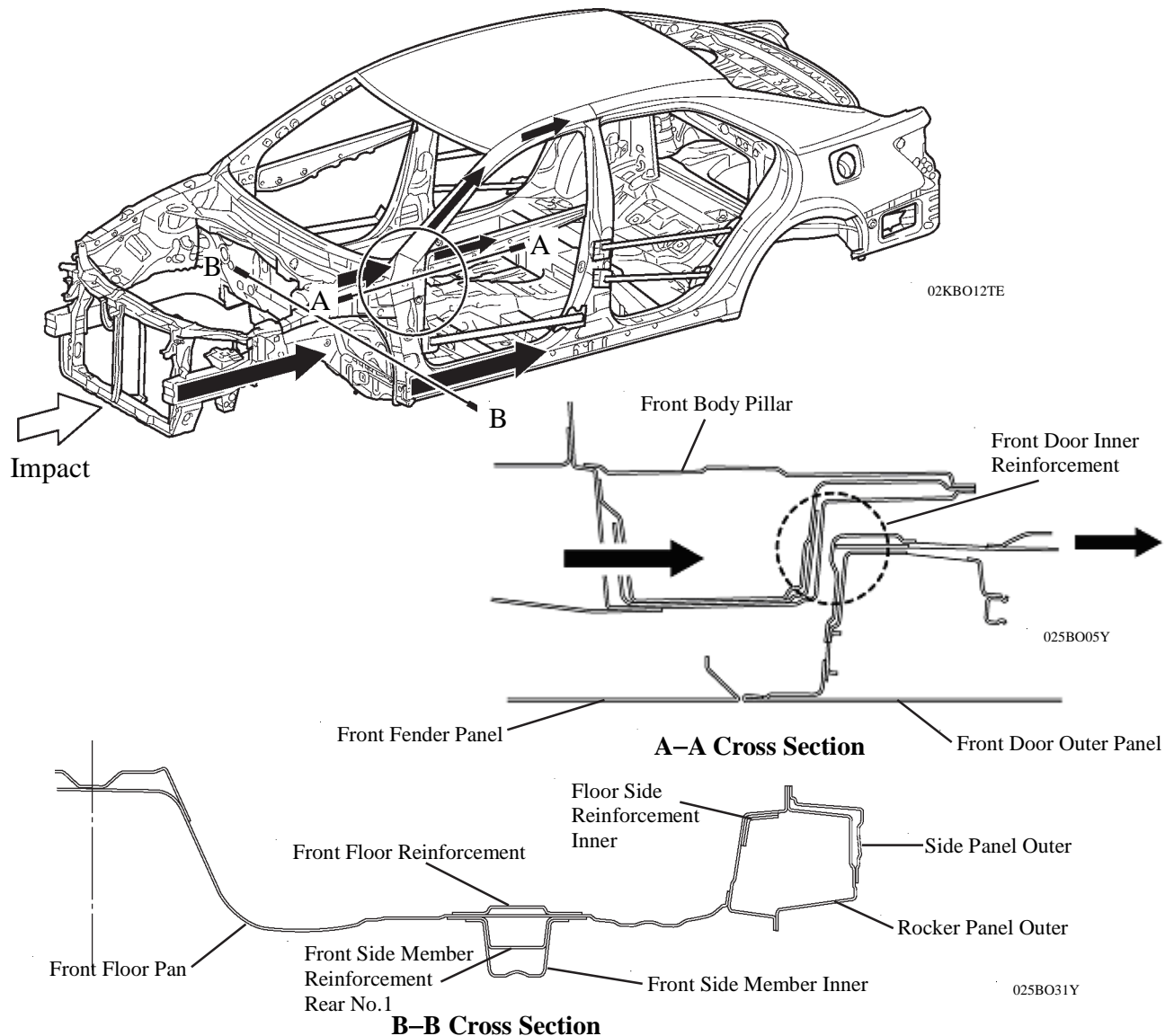
### 1. General

The impact absorbing structure of the Aurion minimises cabin deformation by effectively helping to absorb the impact energy in the event of a front, side or rear collision. This provides high-performance occupant protection.

### 2. Impact Absorbing Structure for Front Collision

An optimal arrangement of the basic frame and reinforcements helps to minimise cabin deformation in the event of a collision.

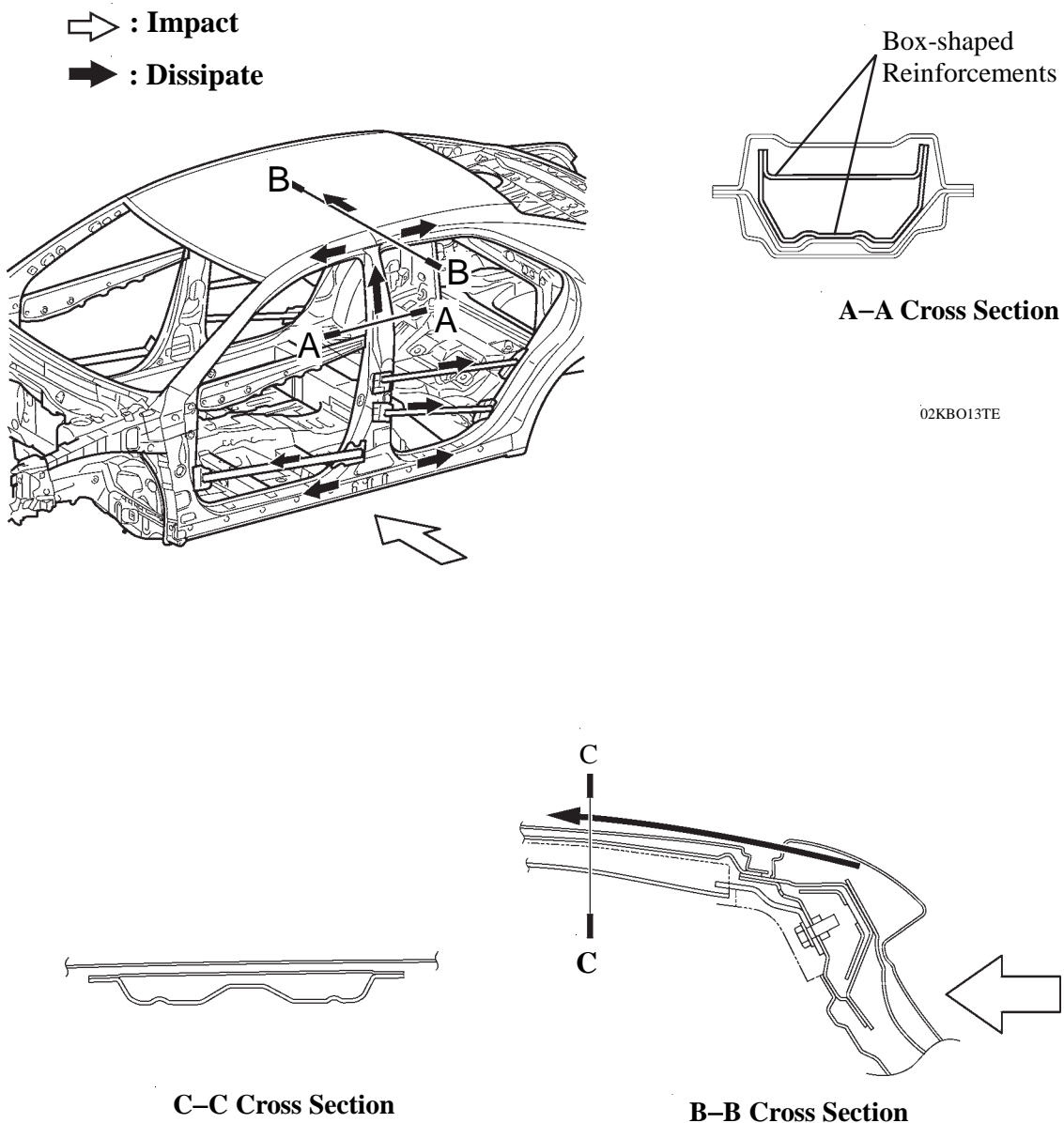
- The body disperses the impact force in the event of an offset frontal collision.
- The body strengthens inner door reinforcements and reduces the gap between the door inner panel and the pillar. This communicates impact load to the door belt line reinforcement, reducing the load on the pillar in the event of an offset frontal collision.
- The floor side of the front side member and the inside of the floor side member reinforcements have been used, minimising the cabin deformation.



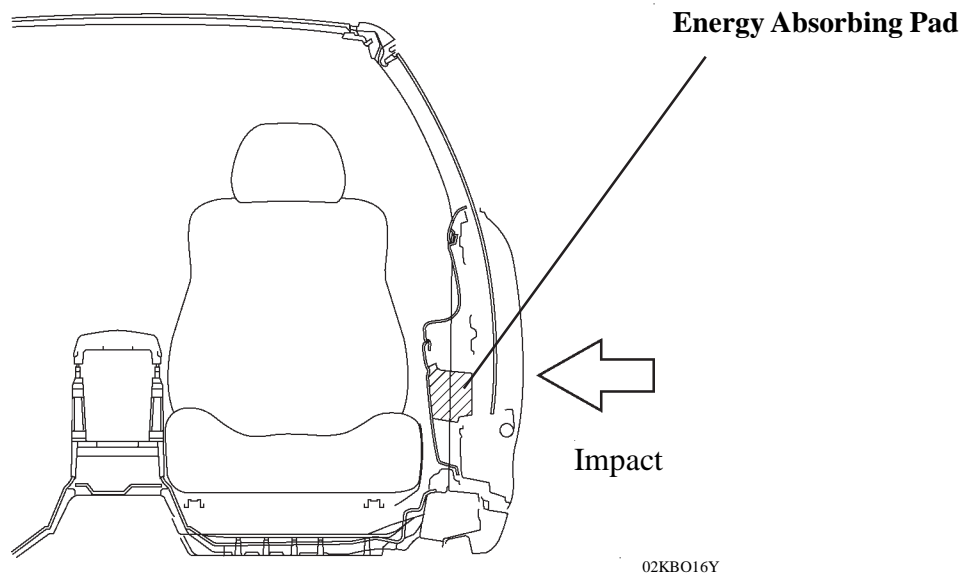
### 3. Impact Absorbing Structure for Side Collision

The impact energy of a side collision directed to the cabin area is dispersed throughout the body via the pillar reinforcements, side impact protection beams, and roof reinforcement, thus helping minimise the impact energy finally directed to the cabin.

- In order to obtain optimal bearing force, high strength sheet steel is employed in the centre pillar reinforcement as described on page BO-2, furthermore, box-shaped reinforcement is used inside the centre pillar (A-A cross section).
- High strength sheet steel is used in the roof reinforcement. In addition, the structure has been made to bear impact loads with both side rails (B-B cross section). This reduces the intrusion of the roof rail into the cabin in the event of a side collision.

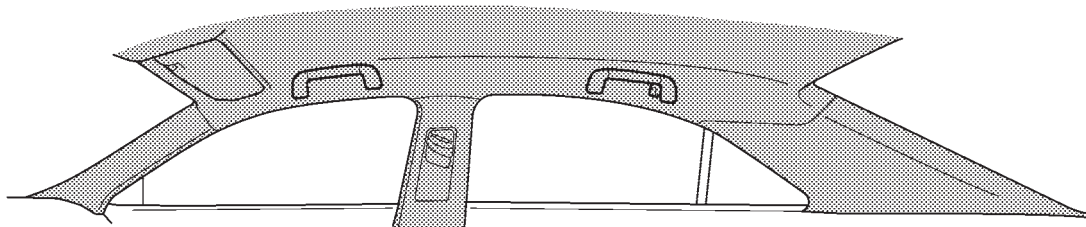


- Energy absorbing pads have been included in the door trims in order to reduce the impact on the chests and pelvises of occupant at the time of a side collision.



- A head impact protection structure is used. With this type of construction, if the occupant's head hits against the roof side rail or pillar due to a collision, the inner panels of the roof side rail, roof area and pillar collapse to help reduce the impact.

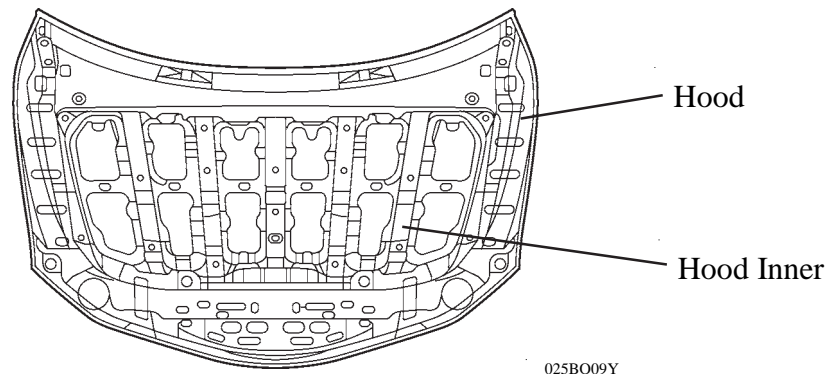
 : Head Impact Protection Structure



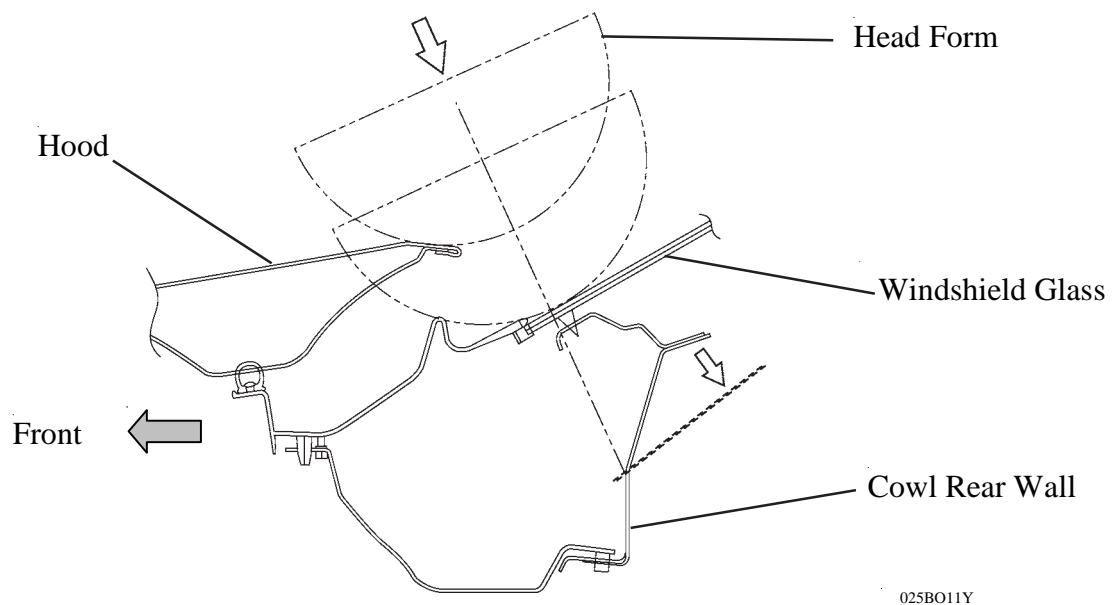
025BO08Y

#### 4. Reducing Pedestrian Head Injury

- A longitudinal frame is used as the principle structure of the hood inner, giving uniform rigidity to the hood surface.



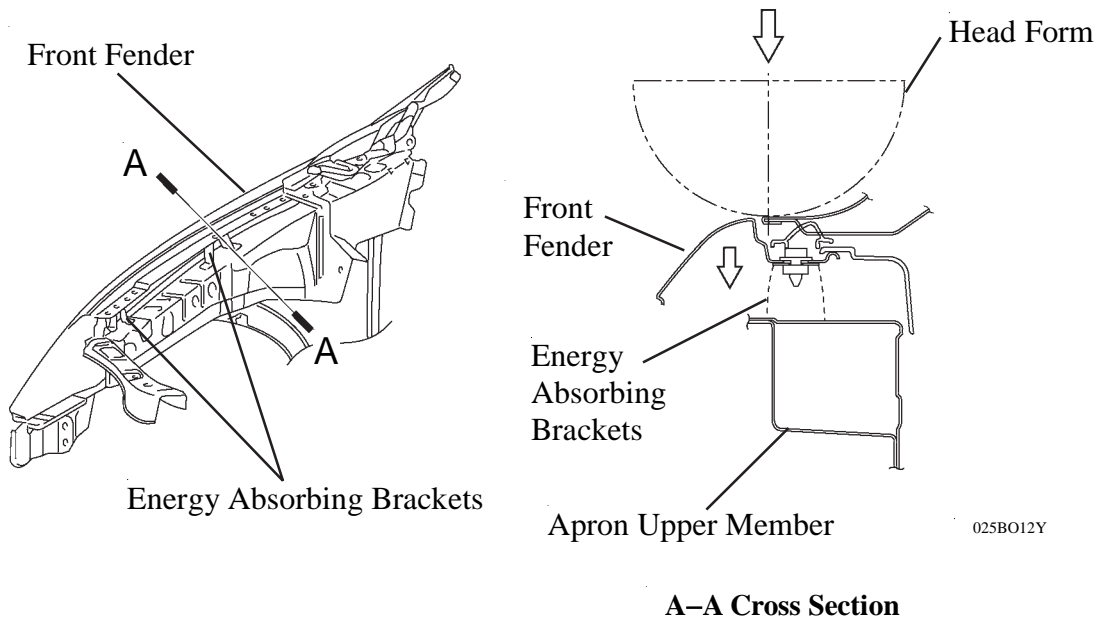
- The rear wall of the cowl has been opened, so that it can easily collapse in the direction of an impact. Thus, a completely collapsible structure has been achieved.



**Cross Section at Lower Portion of Windshield Glass**



- Energy absorbing brackets are used in the joint portion of the front fender. Thus, a certain deformation stroke in the event of a head form collision has been ensured, reducing the impact.



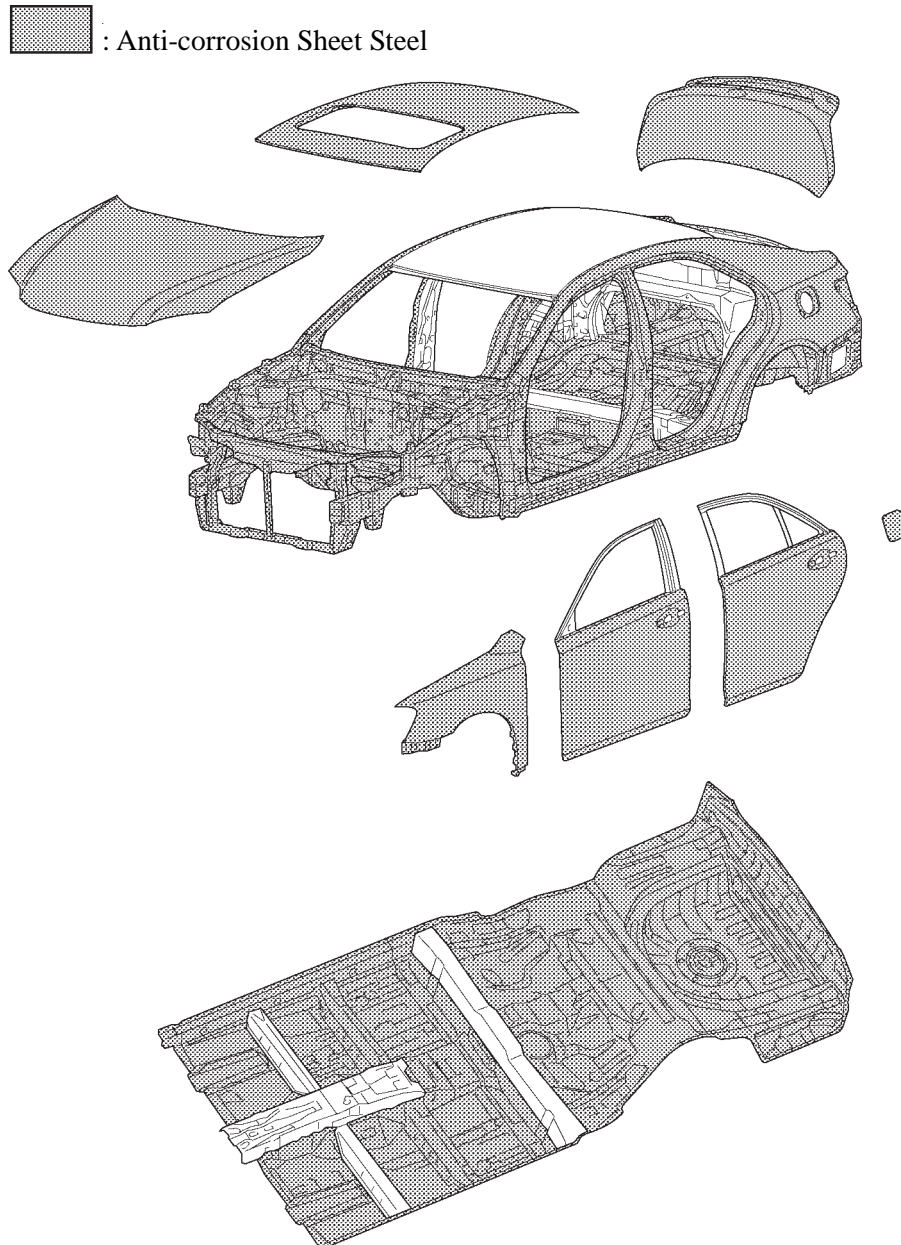
## ✱ RUST-RESISTANT BODY

### 1. General

Rust-resistant performance is enhanced extensively through the use of anti-corrosion sheet steel, as well as by an anti-corrosion treatment that includes the application of anti-rust wax, sealer and anti-chipping paint to easily corroded parts such as the hood and doors.

### 2. Anti-corrosion Sheet Steel

Anti-corrosion sheet steel is used as shown in the following illustration.



02KBO19Y

### 3. Wax and Sealer


Wax is applied to edge of the hood, door lower portion, door hinge and fuel filler lid hinge to improve rust-resistant performance. Sealer is applied to hemmed portions of the hood, door panels and luggage door.

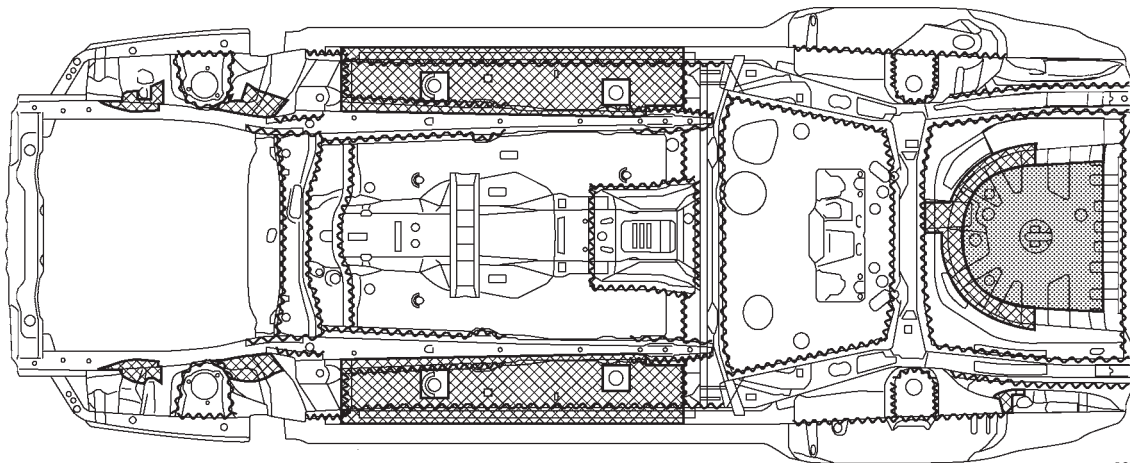
#### 4. Under Coat

Acrylic acid resin is applied to the under side of the body, inside the rear wheel housing and other parts that are susceptible to stone chipping damage, thus improving the rust-resistant performance of these areas.

~~~~~ : Edge Seal

 : Acrylic Acid Resin Coating

 : Acrylic Acid Resin Coating (Excluding Sportivo grades grade)

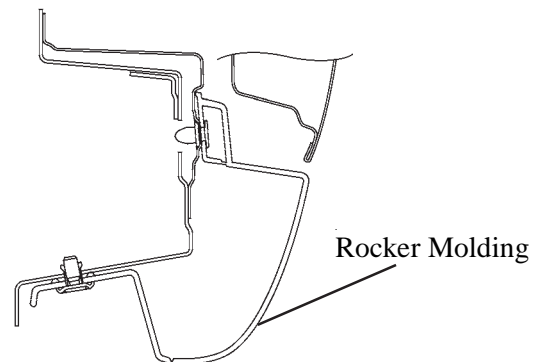
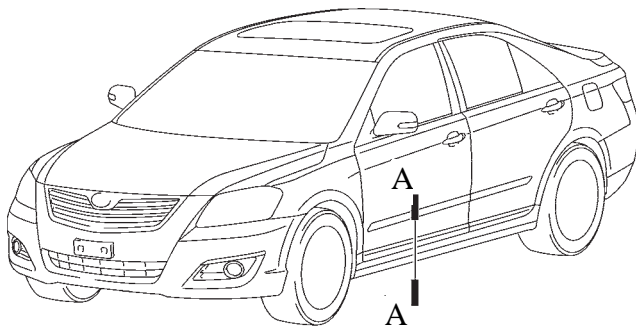


View from Bottom Side

02KBO15Y

#### 5. Anti-chipping Application

Large rocker mouldings are fitted to the lower side of the vehicle, which is liable to suffer from stone-chipping in order to ensure chip resistance.



02KBO11Y

A-A Cross Section

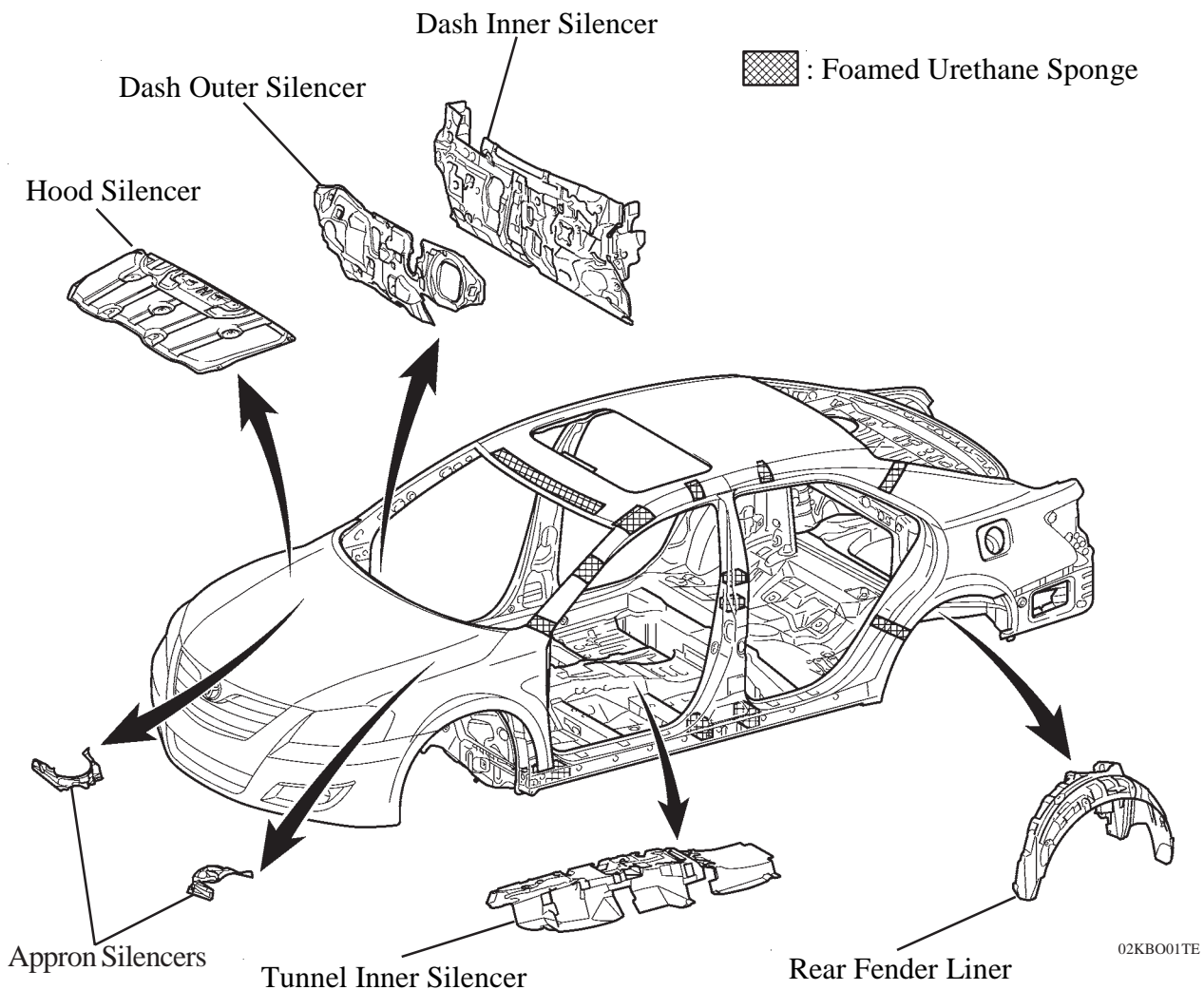
## ✱ LOW VIBRATION AND LOW NOISE BODY

### 1. General

Effective application of vibration damping and noise suppressant materials reduces engine and road noise.

### 2. Sound Absorbing and Vibration Damping Materials

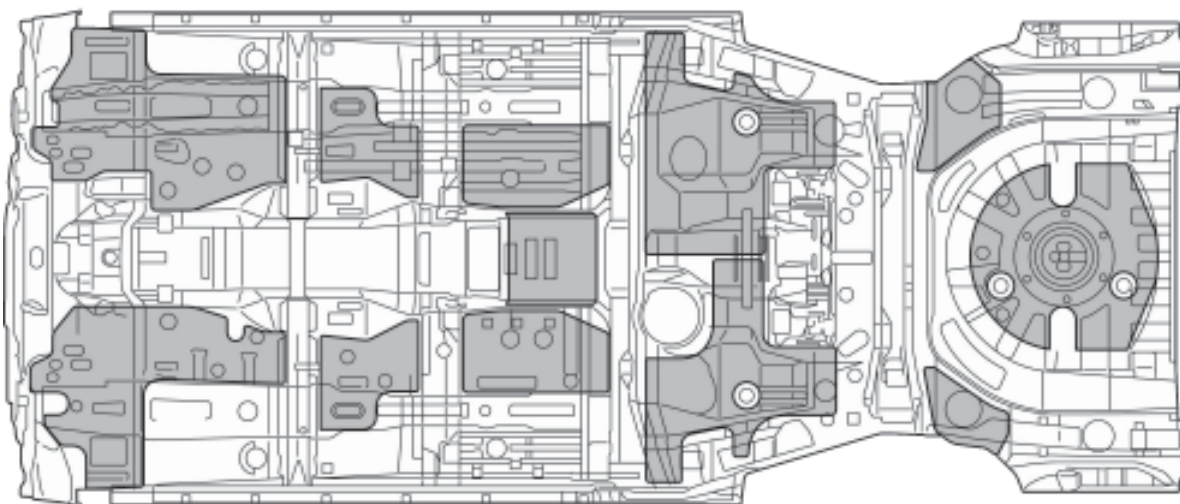
- Foamed urethane sponge and foamed sealing material are applied onto the roof panel and pillars to reduce wind and road noise.
- A large-size dash inner silencer, dash outer silencer, hood silencer, apron silencers and tunnel inner silencer are used to reduce engine and road noise and improve quietness inside the passenger compartment.
- The rear fender liner, which is made of non woven felt, is fitted inside the rear wheelhouse in order to minimise grit, water and road noises.



- The positions in which the asphalt sheets adhere to the floor have been optimised in order to reduce muffled sound and road noise, and therefore achieve a quiet ride.



: Used on all models

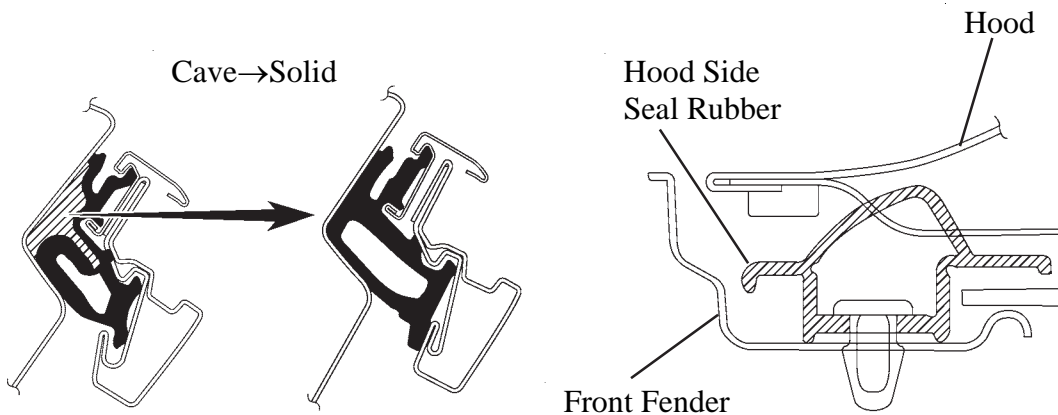
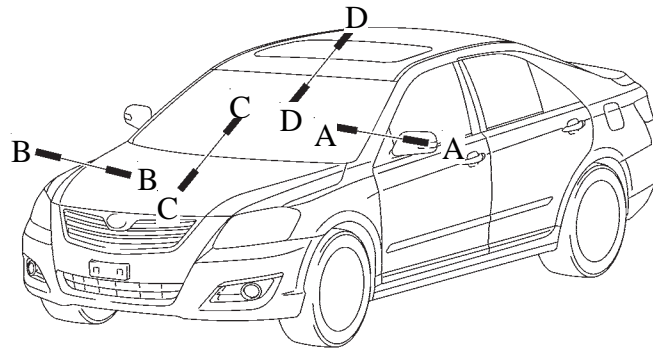


02KBO04Yb

**View from Top Side**

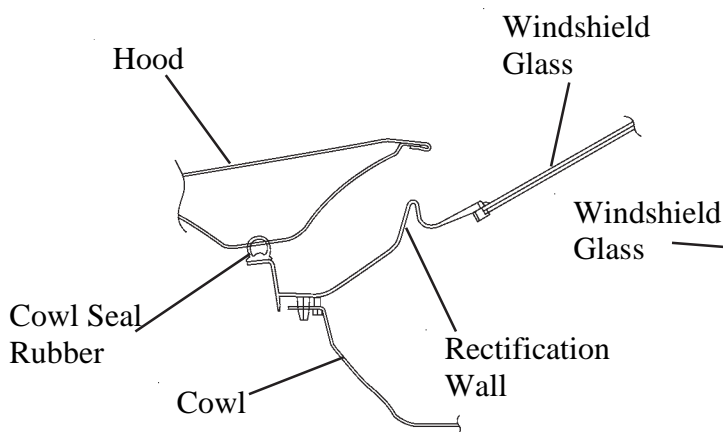
### 3. Reducing Wind Noise

- A structure that blocks the airflow is used in a portion of the door weather strip (at the front corner) in order to reduce wind noise (A-A cross section).
- The air turbulence has been eliminated through the use of the hood side seal rubber (B-B cross section).
- By streamlining the joins between the hood and windshield glass (C-C cross section) and between windshield glass and the roof (D-D cross section), air turbulence has been minimised.

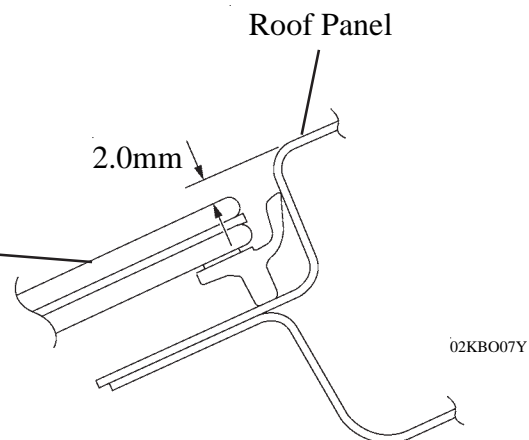


A-A Cross Section

B-B Cross Section

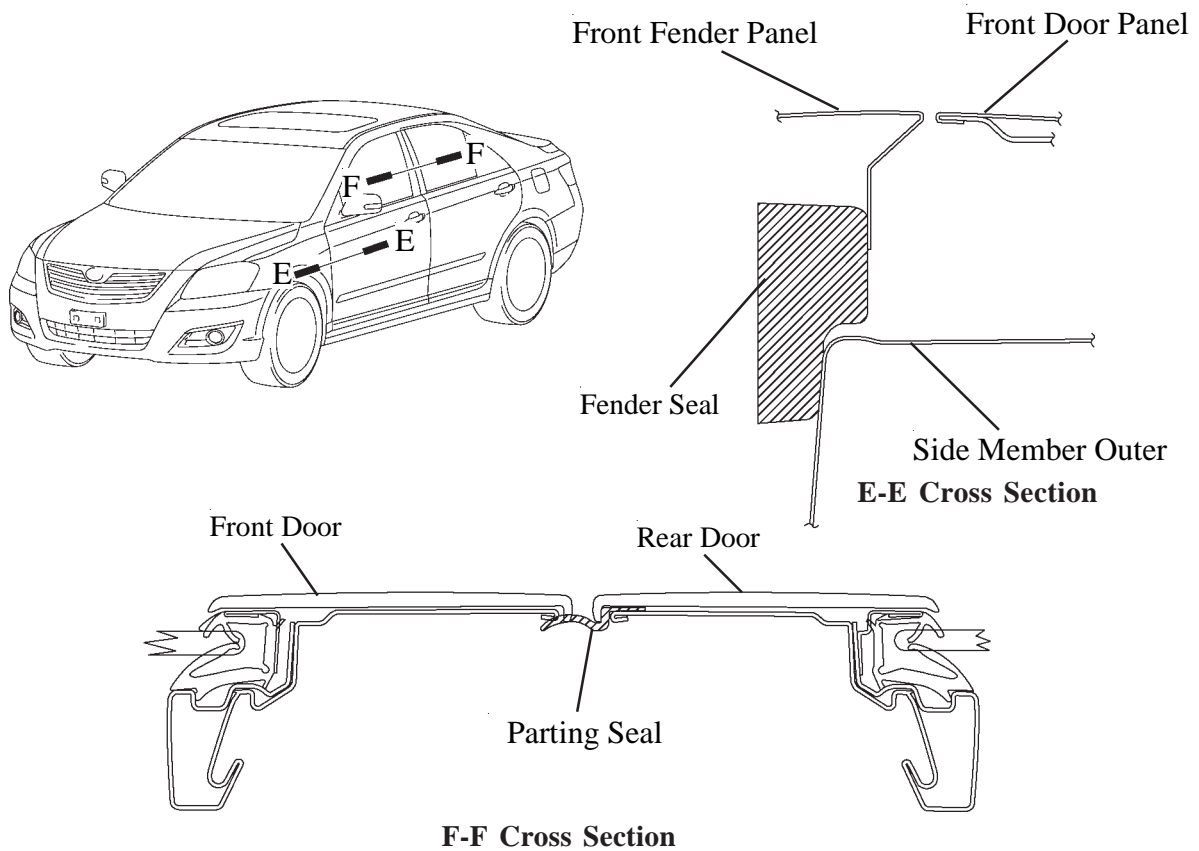


C-C Cross Section



D-D Cross Section

- Fender seals made of foamed resin are used between the front fender and the side member outer to prevent air from blowing through. (E-E cross section)
- Parting seals made of flexible resin are employed between the front and rear doors to eliminate air turbulence (F-F cross sections).

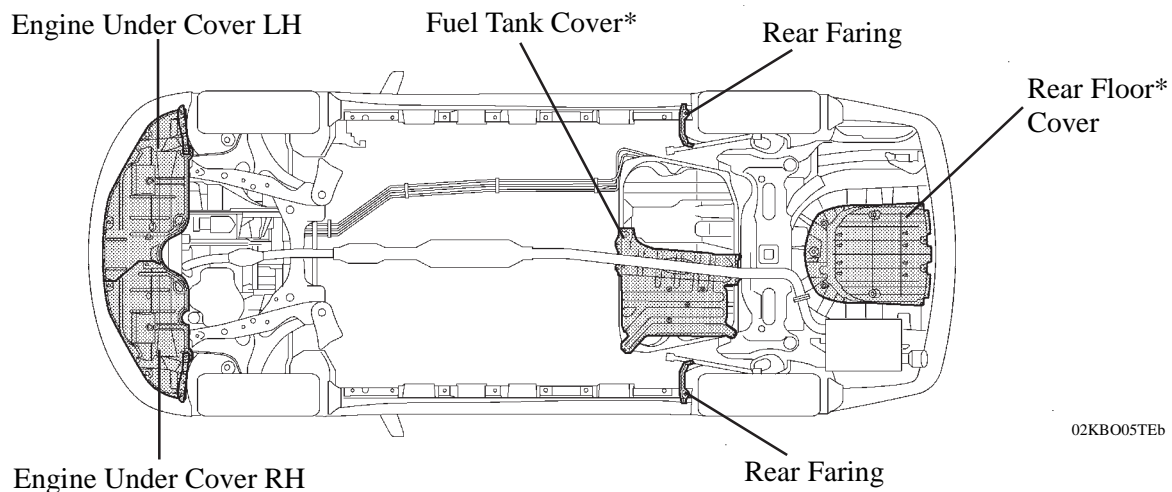


02KB008Y



## ✳ AERODYNAMICS

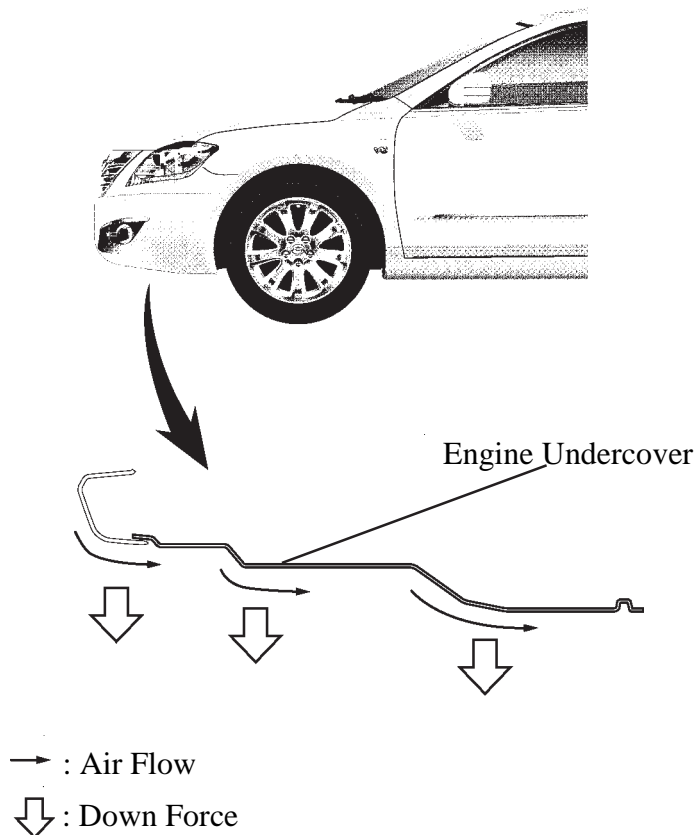
In order to achieve excellent steering stability and fuel economy, various rectifying parts have been used to regulate the airflow under the floor and the aerodynamic performance has been improved by flattening the underside of the vehicle.



\*: Sportivo grades

### View from Bottom Side

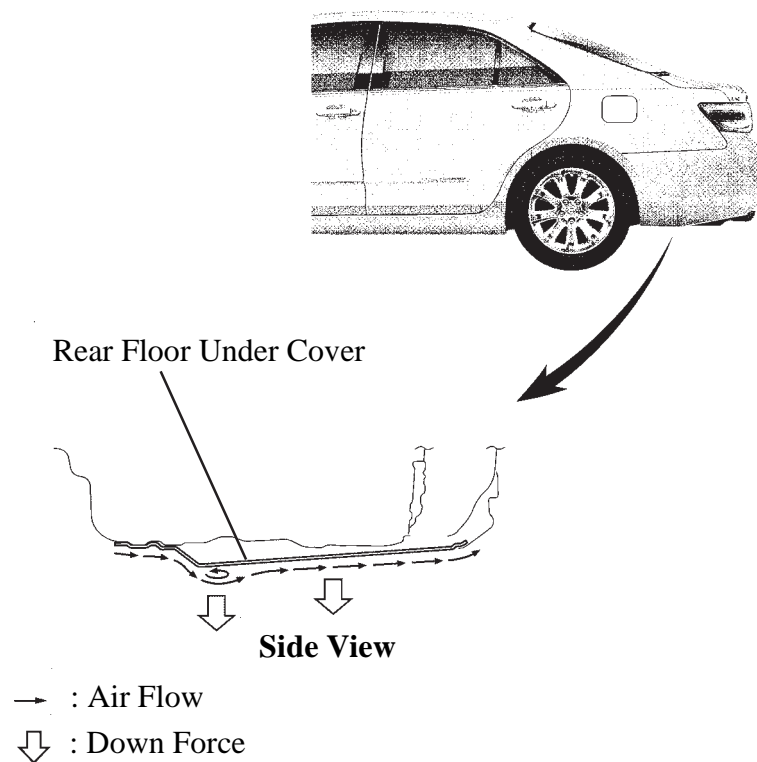
- The engine undercover has been formed into a step shape to increase the velocity of the air flowing underneath the vehicle. This creates a vacuum and suppresses the lift force, thus excellent manoeuvrability and stability is achieved.



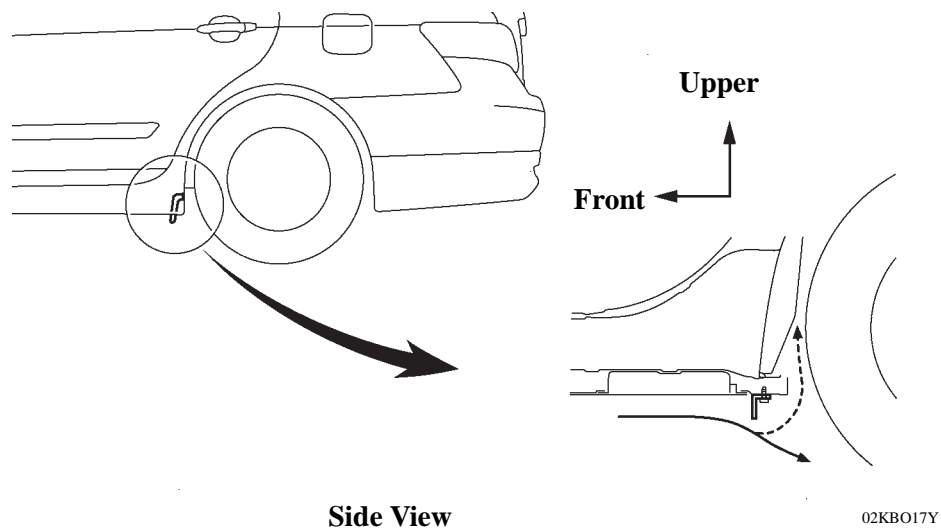
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- Excellent manoeuvrability and stability have been achieved by providing a rear floor under cover that is shaped to generate rectification and swirl effects on the rear floor



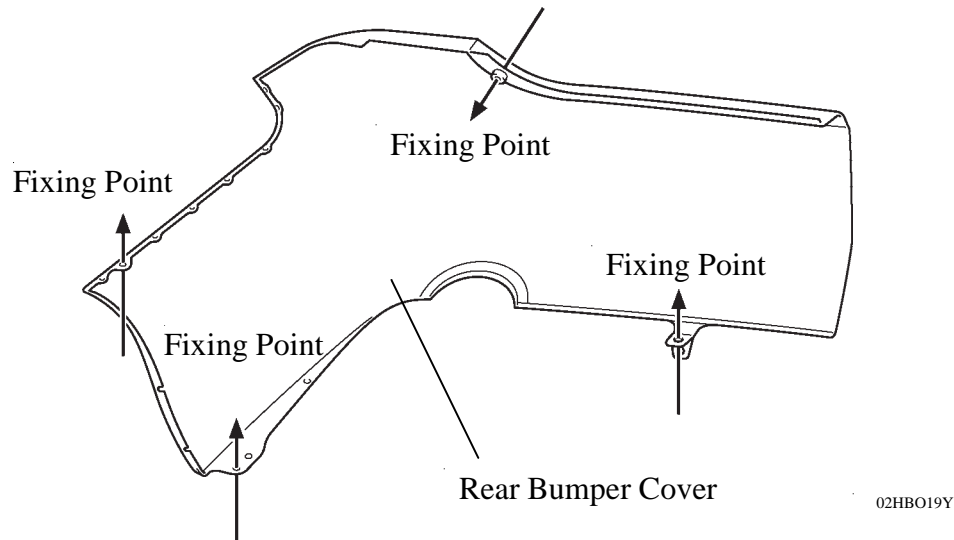
- The airflow disturbance has been reduced by using a rear faring to direct the airflow outside the tyre house, thus minimising the air resistance and improving the fuel economy.



## ENHANCEMENT OF PRODUCT APPEAL

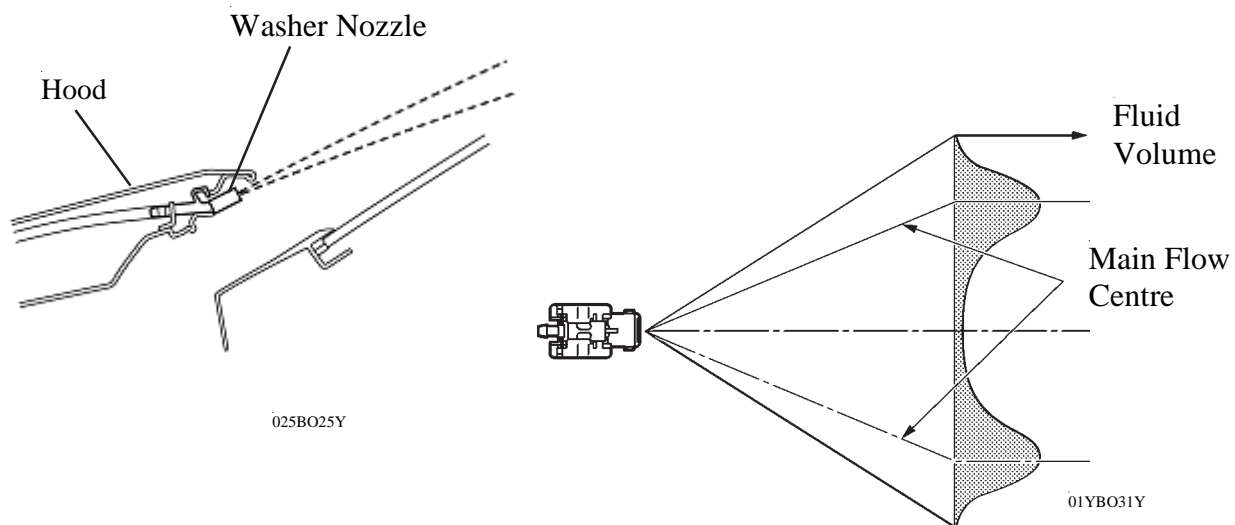
### ✱ PARTS WITH LOW REPAIR COST

- By reducing the number of fixing points, from 18 to 8, used for installing the rear bumper cover onto the vehicle body, repair time has been shortened.



### ✱ WASHER NOZZLE

Spray type washer nozzles are located under the engine hood to ensure good appearance. These nozzles can spray windshield washer fluid over a wide area by spraying it in a fan shape. The washer fluid volume has been reduced so as not to hinder the driver's view when washer system is operated.



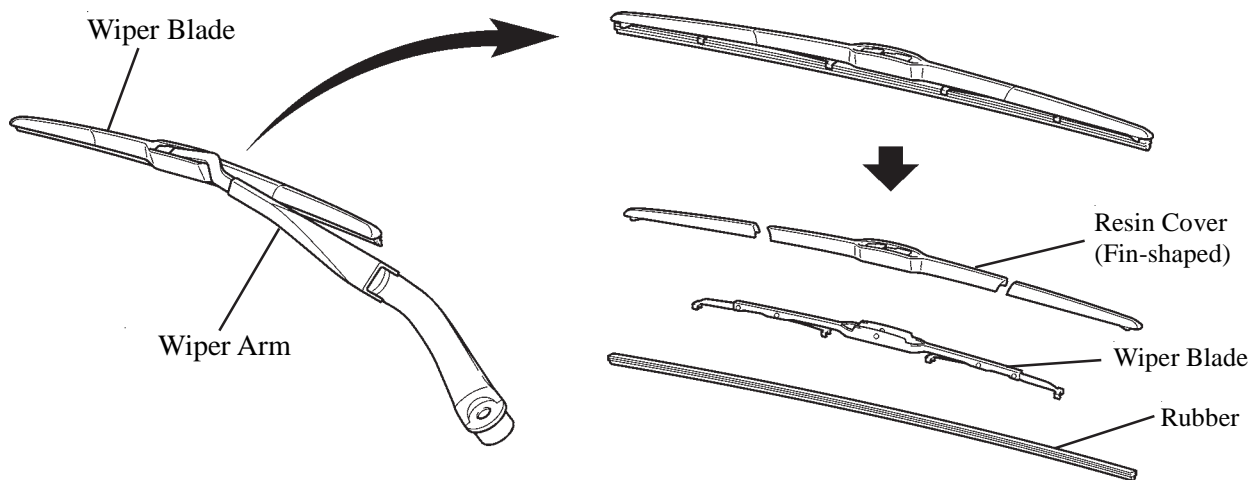
#### Service Tip

Spray type washer nozzles cannot be adjusted because of their structure. Do not attempt to adjust the nozzles as it could damage them.

If adjustment is necessary, adjust the nozzles after replacing them with those selected from five part numbers with different spray angles. For details, see the Aurion Repair Manual .

## ❁ WIPER ARM & BLADE

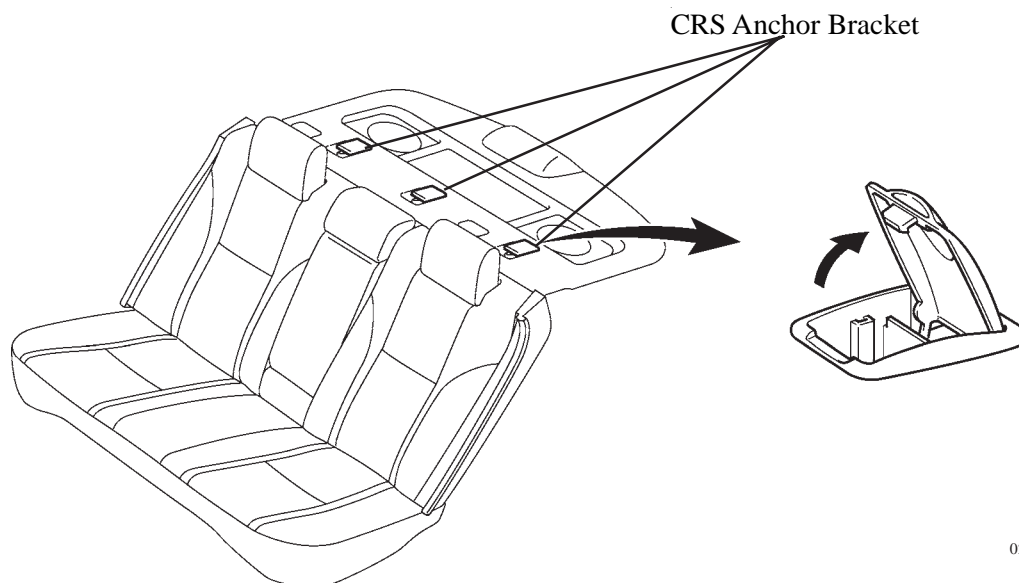
The unified construction of the wiper blade and arm is used. A fin-shaped resin cover is used for the entire wiper blade. This ensures the effectiveness of the wipers even when travelling at high speeds.



025B026Y

## ✱ CHILD RESTRAINT SYSTEM

Three CRS anchor brackets for securing a child seat are provided above the package tray trim.



02KBO20Y

## ✱ SEAT BELT

### 1. General

The following types of seat belts are provided.

| Seat Position                              | Seat Belt Type    | Remarks                                                                        |
|--------------------------------------------|-------------------|--------------------------------------------------------------------------------|
| Driver                                     | 3-point ELR       | Electrical Sensing Type<br>Pre-tensioner, Force Limiter and<br>Tension Reducer |
| Front Passenger                            | 3-point ELR       | Electrical Sensing Type<br>Pre-tensioner & Force Limiter                       |
| Rear Passengers<br>(Right, Left & Centre ) | 3-point ELR & ALR | —                                                                              |

ELR - Emergency Locking Retractor

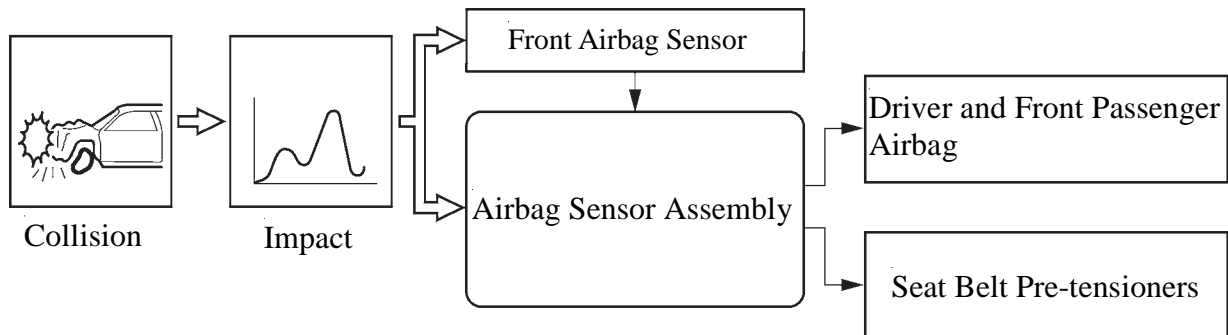
ALR - Automatic Locking Retractor

### 2. Pre-tensioner and Force Limiter

In accordance with the ignition signal from the airbag sensor assembly, the seat belt pre-tensioner activates simultaneously with the deployment of SRS airbag for the driver and front passenger.

In the beginning of the collision if the tension of the seat belt applied to the occupant reaches a predetermined level, the force limiter activates to control the force.

#### ► Front Airbag Operation ◀



02KBO14TE

# BODY ELECTRICAL

## **MULTIPLEX COMMUNICATION**

|                                                 |       |
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| CAN.....                                        | BE-7  |
| Customised Body Electronics System.....         | BE-12 |

## **POWER DISTRIBUTOR**

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|                                          |       |
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| Headlight Beam Level Control System..... | BE-22 |
| Intelligent AFS.....                     | BE-26 |
| Illuminated Entry System.....            | BE-32 |
| Automatic Light Control System.....      | BE-36 |
| Light Turn-off System.....               | BE-37 |
| Headlight Cleaner System.....            | BE-38 |

## **METER**

|                        |       |
|------------------------|-------|
| Combination Meter..... | BE-40 |
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## **WIPER AND WASHER**

|                                                        |       |
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| Washer-linked Wiper with Drip-prevention Function..... | BE-54 |

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| System Diagram.....                     | BE-57 |
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| Mode Position and Damper Operation..... | BE-61 |
| Air Outlets and Airflow Volume.....     | BE-63 |
| Construction and Operation.....         | BE-64 |
| System Control.....                     | BE-75 |

## **NAVIGATION WITH AV SYSTEM**

|                                 |       |
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## **HANDS-FREE SYSTEM**

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| Bluetooth Hands-Free System..... | BE-84 |
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## **TOYOTA PARKING ASSIST SYSTEM**

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| Construction and Operation..... | BE-95 |

## **REAR VIEW MONITOR SYSTEM**

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| Area Displayed on Screen.....                          | BE-101 |
| Precaution for Rear View Monitor System Operation..... | BE-101 |

## **POWER WINDOW SYSTEM**

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| Description.....               | BE-102 |
| Layout of Main Components..... | BE-104 |
| Jam Protection Function.....   | BE-105 |

## **DOOR LOCK CONTROL SYSTEM**

|                                |        |
|--------------------------------|--------|
| Description.....               | BE-106 |
| Layout of Main Components..... | BE-109 |

## **WIRELESS DOOR LOCK REMOTE**

### **CONTROL SYSTEM**

|                                |        |
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| Description.....               | BE-110 |
| System Diagram.....            | BE-111 |
| Layout of Main Components..... | BE-112 |
| Function.....                  | BE-113 |

## **SMART ENTRY AND START SYSTEM**

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|---------------------|--------|
| Description.....    | BE-115 |
| Actuation Area..... | BE-116 |
| Start Function..... | BE-117 |
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## **THEFT DETERRENT SYSTEM**

|                                |        |
|--------------------------------|--------|
| Description.....               | BE-159 |
| System Diagram.....            | BE-160 |
| Layout of Main Components..... | BE-161 |
| Function.....                  | BE-162 |
| System Operation.....          | BE-163 |

## **ENGINE IMMOBILISER SYSTEM**

|                  |        |
|------------------|--------|
| Description..... | BE-165 |
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## **SRS AIRBAG SYSTEM**

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| Diagnosis.....                                     | BE-176 |

**SEAT BELT REMINDER SYSTEM**

|                      |        |
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**CRUISE CONTROL SYSTEM**

|                               |        |
|-------------------------------|--------|
| Description.....              | BE-179 |
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**REAR VIEW MIRROR**

|                                          |        |
|------------------------------------------|--------|
| Description.....                         | BE-184 |
| Automatic Glare-Resistant EC Mirror..... | BE-185 |

**POWER SEAT SYSTEM**

|                  |        |
|------------------|--------|
| Description..... | BE-187 |
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**MEMORY SYSTEM**

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| Description.....                    | BE-189 |
| Layout of Main Component.....       | BE-191 |
| Seat ECU.....                       | BE-192 |
| Seat Position Detection Method..... | BE-192 |

**REAR WINDOW DEFOGGER SYSTEM**

|                                |        |
|--------------------------------|--------|
| Description.....               | BE-193 |
| Layout of Main Components..... | BE-194 |

**REAR SUNSHADE SYSTEM**

|                                |        |
|--------------------------------|--------|
| Description.....               | BE-195 |
| Layout of Main Components..... | BE-196 |

**SLIDING ROOF SYSTEM**

|                  |        |
|------------------|--------|
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| Function.....    | BE-198 |

**TRUNK OPENER**

|                                |        |
|--------------------------------|--------|
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| Layout of Main Components..... | BE-202 |

**STEERING PAD SWITCH**

|                  |        |
|------------------|--------|
| Description..... | BE-203 |
|------------------|--------|

**TOYOTA LINK (TELEMATICS)**

|                                    |        |
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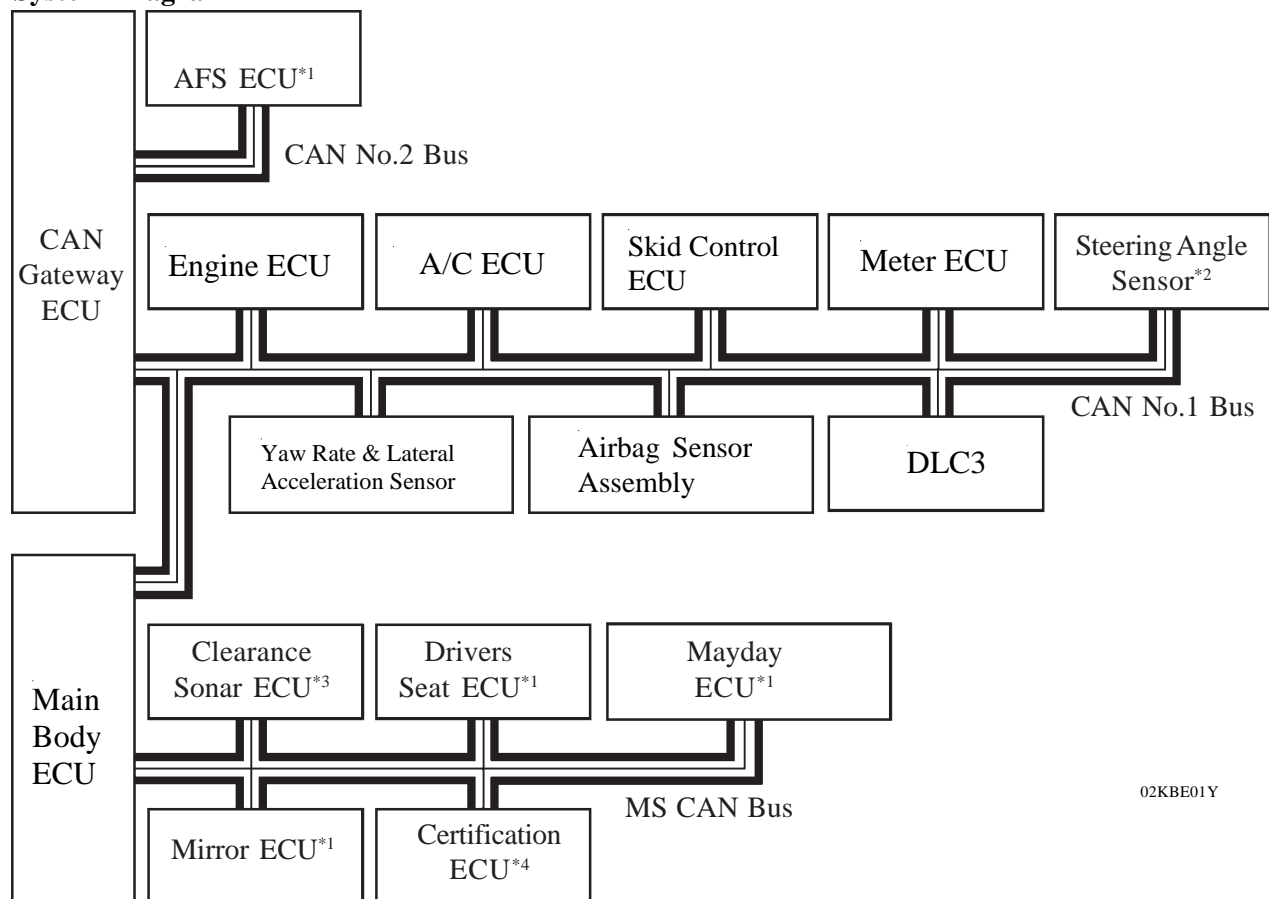
# BODY ELECTRICAL

## MULTIPLEX COMMUNICATION

### DESCRIPTION

- The multiplex communication system of the Aurion uses the CAN (Controller Area Network) to achieve a streamlined wiring harness configuration.
- The CAN (Controller Area Network) is classified into two types according to communication speed. The HS (High Speed)-CAN is used for the power train, chassis and body electrical systems, and the MS (Medium Speed)-CAN is used for the body electrical system.
- The HS-CAN (CAN bus) and the MS-CAN (MS bus). The main body ECU is used to transmit data between the buses.
- Due to the introduction of the CAN system for the power train, chassis and body electrical systems, the BEAN (Body Electronics Area Network) is no longer used on this model.
- A customised body electronics system is used, enabling the control functions of the ECU's to be set using an intelligent tester II. For details, see page BE-12

### System Diagram



02KBE01Y

- \*1: Presara  
 \*2: With VSC  
 \*3: With Clearance Sonar  
 \*4: With Smart Entry and Start System

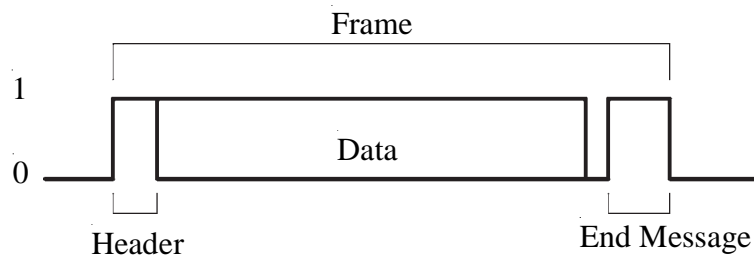


### — REFERENCE —

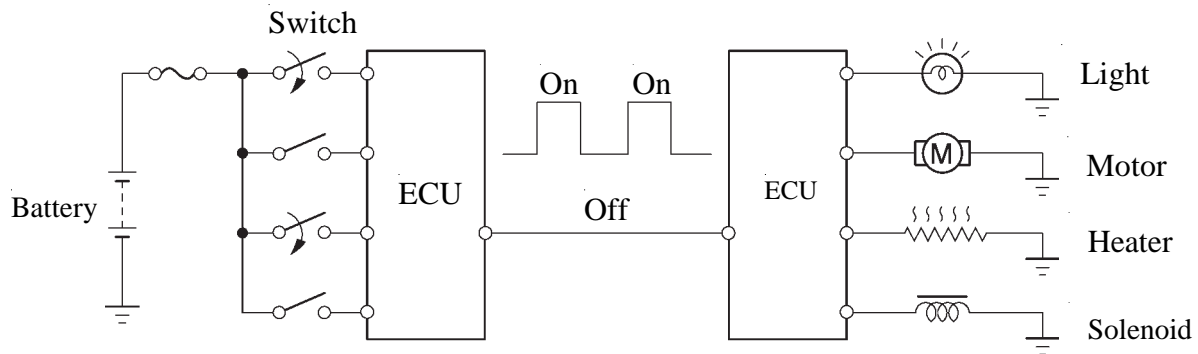
*MPX communication uses serial communication data that consists of bits and frames in order to exchange information among the various ECU's. This allows a reduction of the amount of wiring on the vehicle.*

- A bit is the basic unit of communication that is used to represent information. A bit is represented by binary values of “0” or “1”.
- A frame is a body of data that is transmitted together. A frame contains a header that indicates the beginning, and an end message that indicates the end.

#### ► Conceptual Drawing ◀



240BE03



240BE03

## ✱ DIFFERENCES BETWEEN CAN, AVC-LAN AND BEAN

### 1. General

- The protocols, which are the rules for establishing data communication, differ between the CAN, AVC-LAN\*<sup>1</sup> and BEAN\*<sup>2</sup>. If the ECU's in the networks use different frameworks for their data, such as communication speed, communication wire, and signals, they will be unable to understand each other. Therefore, protocols (rules) must be established among them.
- Compared to the AVC-LAN\*<sup>1</sup> and BEAN\*<sup>2</sup>, the CAN features high-speed data transmission. Therefore, the CAN is able to transmit larger amounts of data faster than the other protocols. This feature makes it possible to transmit data accurately in the power train and chassis control system, which requires large amounts of data to be transmitted in short periods of time.

\*<sup>1</sup>: AVC-LAN is used in the audio-visual system of some other TOYOTA models, but is not on the new Aurion.

\*<sup>2</sup>: The BEAN is used in the body electrical system of some other TOYOTA models, but is not used on the new Aurion.




| Protocol            | CAN<br>(ISO Standard)                                    | AVC-LAN<br>(TOYOTA Original) | BEAN<br>(TOYOTA Original) |
|---------------------|----------------------------------------------------------|------------------------------|---------------------------|
| Communication Speed | 500 kbps*/ HS-CAN<br>250 kbps*/ MS-CAN<br>(Max. 1 M bps) | Max. 17.8 kbps*              | Max. 10 kbps*             |
| Communication Wire  | Twisted-pair Wire                                        | Twisted-pair Wire            | AV Single Wire            |
| Drive Type          | Differential Voltage Drive                               | Differential Voltage Drive   | Single Wire Voltage Drive |
| Data Length         | 1-8 Byte (Variable)                                      | 0-32 Byte (Variable)         | 1-11 Byte (Variable)      |

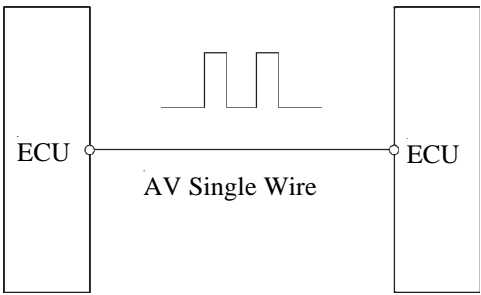
\*: bps: abbreviation for “Bits per Second”, indicating the number of bits that can be transmitted per second.

2. Communication Wire

A twisted-pair wire is used for CAN and AVC-LAN\*<sup>1</sup> communication. A single, AV (Automobile Vinyl) wire is used for BEAN\*<sup>2</sup> communication.

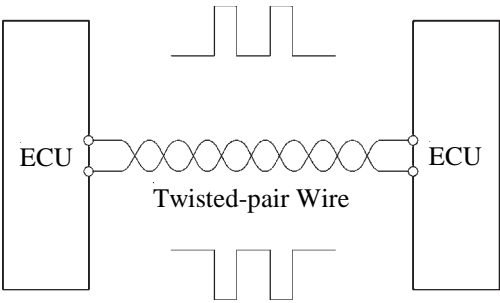
- \*1: AVC-LAN is used in the audio-visual system on some other TOYOTA models, but is not used on the new Aurion.
- \*2: The BEAN is used in the body electrical system of the some other TOYOTA models, but is not used on the new Aurion.

| Communication Wire                                                                                                                                        | Outline                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div>Twisted-pair Wire for CAN</div> <div></div> <div>241BE168</div>     | <div>This communication wire is a pair of twisted lines.</div> <div>Communication is driven by applying voltage of 1.5 to 2.5 V and 2.5 to 3.5 V to the two lines in order to send a single signal.</div> <div>This system, which is called a “Differential Voltage Drive”, reduces noise.</div> |
| <div>Twisted-pair Wire for AVC-LAN</div> <div></div> <div>241BE168</div> | <div>This communication wire is a pair of twisted lines.</div> <div>Communication is driven by applying positive (+) and negative (-) voltages to the two lines in order to send a single signal.</div> <div>This system, which is called a “Differential Voltage Drive”, reduces noise.</div>   |
| <div>AV Single Wire</div> <div></div> <div>240BE09</div>               | <div>This is a lightweight single communication wire that consists of a single core line surrounded by insulation.</div> <div>Voltage is applied to this line in order to drive communication, and this system is called a “Single Wire Voltage Drive”.</div>                                    |



Single Wire Voltage Drive

240BE11



Differential Voltage Drive

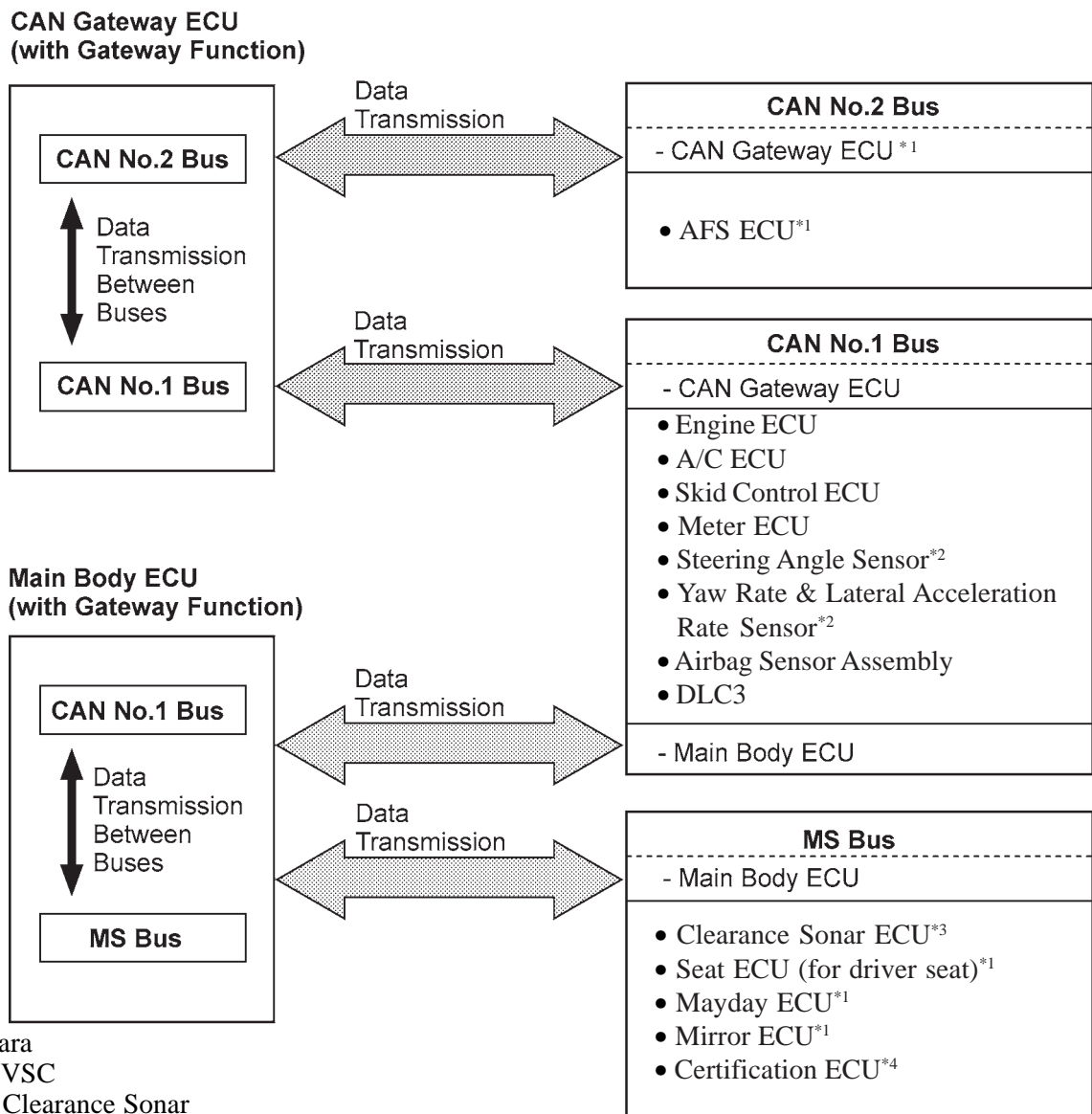
240BE12

## CAN

### 1. General

- The Aurion uses two types of CAN that have different communication speeds: HS-CAN (500kbps) and MS-CAN (250kbps).
- The HS-CAN consists of the CAN No.1 bus and CAN No.2 bus. The terminating resistors of the CAN No.1 bus are built into the engine ECU and meter ECU, and those of CAN No.2 bus are built into the CAN gateway ECU and junction connector (front LH).
- The MS-CAN consists of the MS bus. The terminating resistors of the MS bus are built into the main body ECU and certification ECU. For models without the smart entry and state system, the terminating resistors are built into the junction connector RH II.
- ECUs with the gateway functions are used to transmit data between buses (the CAN gateway ECU is used for data transmission between the CAN No.1 bus and the CAN No.2 bus, and the main body ECU is used between the CAN No.1 bus and the MS bus).

#### ► Image of Data Transmission between Buses ◀



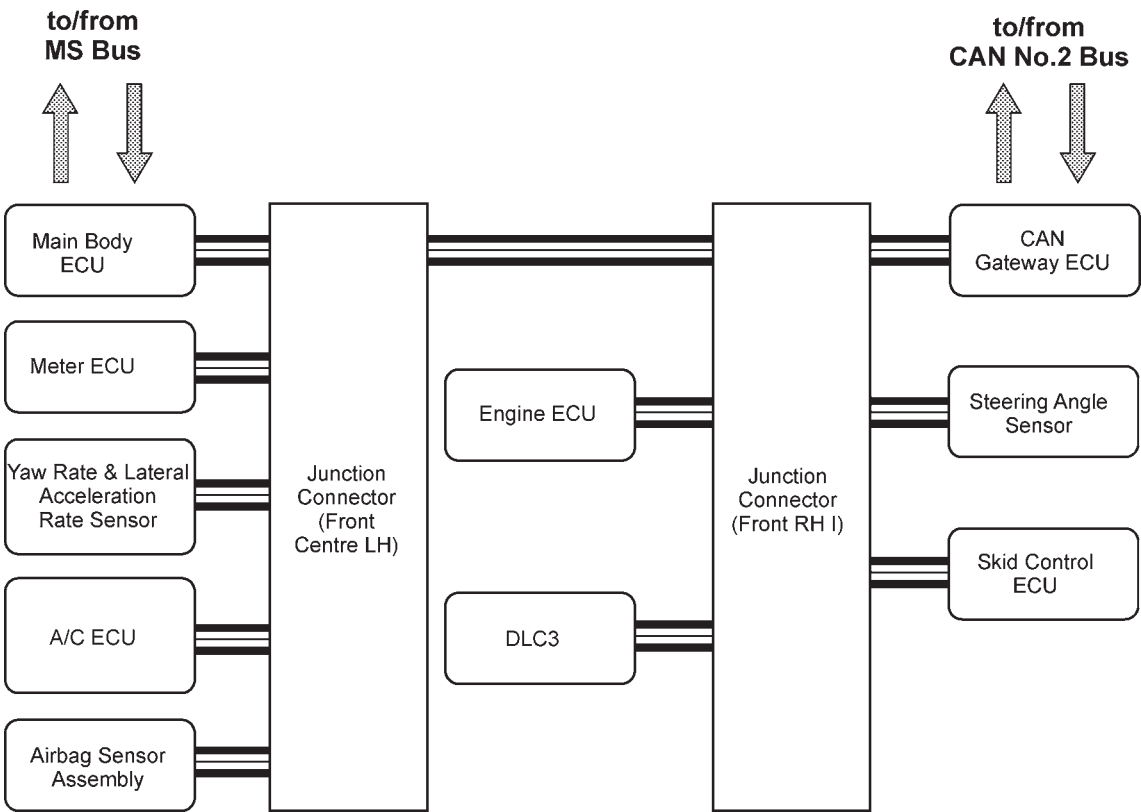
\*1: Presara

\*2: With VSC

\*3: With Clearance Sonar

\*4: With Smart Entry and Start System

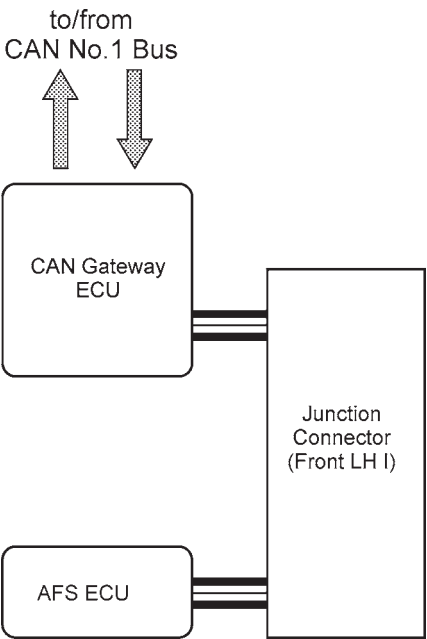
▸ CAN No.1 Bus ◀



01YBE04P

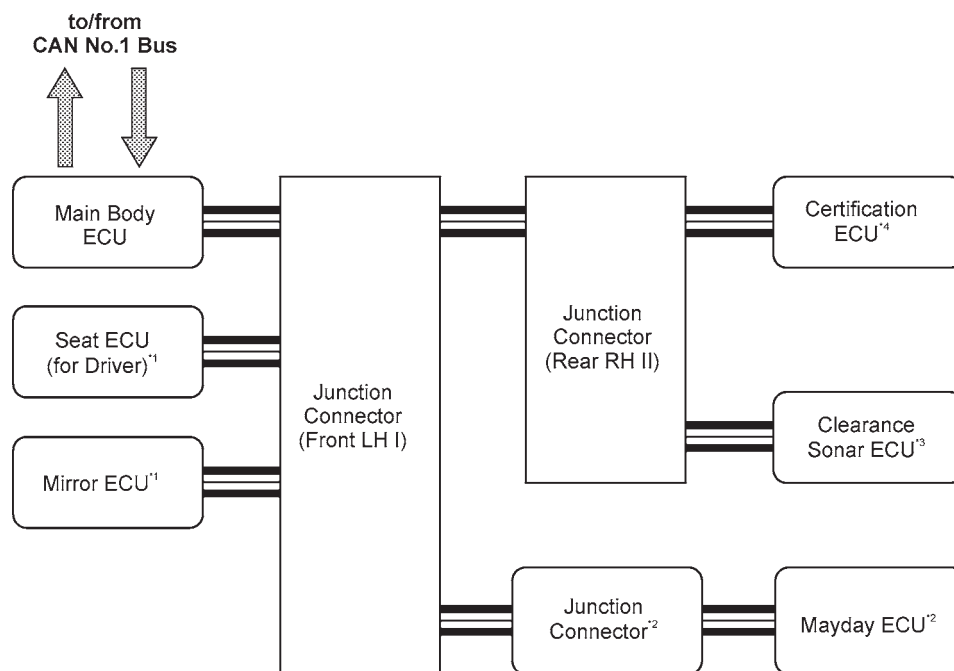
\*: Presara

▸ CAN No.2 Bus (Presara only) ◀



02KBE03Y

► MS Bus ◀



02KBE04Y

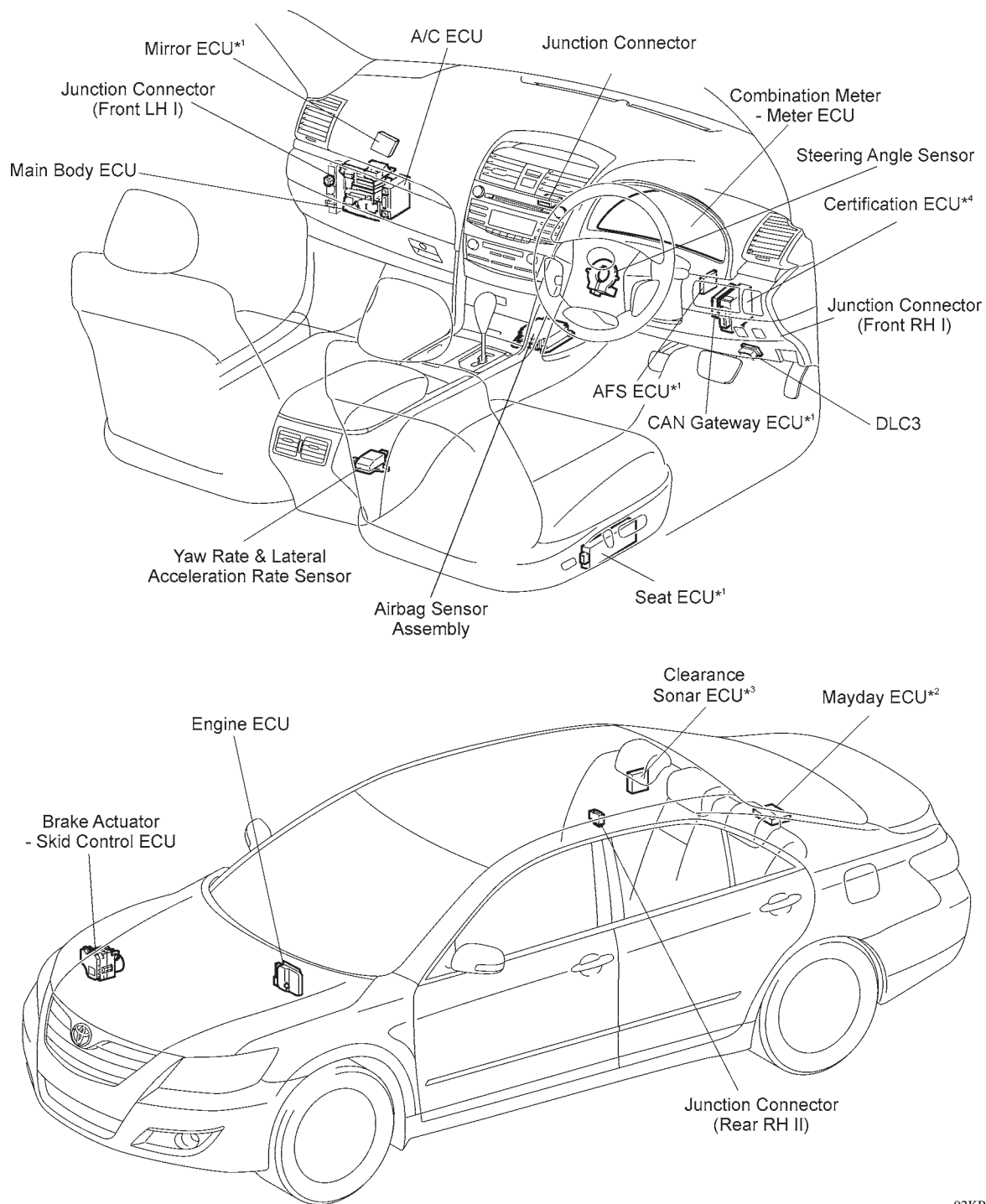
\*<sup>1</sup>: Presara

\*<sup>2</sup>: with Toyota Link only

\*<sup>3</sup>: With Clearance Sonar

\*<sup>4</sup>: With Smart Entry and Start System

## 2. Layout of Main Components



02KBE05TEb

\*<sup>1</sup>: Presara\*<sup>2</sup>: with Toyota Link only\*<sup>3</sup>: With Clearance Sonar\*<sup>4</sup>: With Smart Entry and Start System

© TMCAL

### 3. Diagnosis

- If a malfunction occurs on the CAN communication line, the ECU that is connected to the CAN communication line stores the DTC (Diagnostic Trouble Code) in its memory.
- The 5-digit DTC can be read by connecting an intelligent tester II to the DLC3.
- The DLC3 is equipped with CAN-H and CAN-L terminals for CAN diagnosis. It is possible to determine if there is an open or short in the main wire of the CAN No.1 bus by measuring the resistance value between these terminals. For details, see the Aurion Repair Manual.



## ✱ CUSTOMISED BODY ELECTRONICS SYSTEM

An intelligent tester II can be used to customise the system settings.

| System             | Intelligent Tester II Display Content | Contents                                                                                                                                                                                                         | Default Setting | Available Setting                        |
|--------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------------------------------|
| Wireless Door Lock | Trunk Lid Operation                   | To change the operation method of opening the trunk by the transmitter.                                                                                                                                          | 0.8s PR         | 1 TIME/<br>2 TIMES<br>/ 0.8s PR<br>/ OFF |
|                    | Wireless Control                      | Function to turn ON/OFF of the wireless door lock.                                                                                                                                                               | ON              | ON/OFF                                   |
|                    | Hazard Answer Back                    | Function to turn ON/OFF of the hazard answer back of the wireless door lock.                                                                                                                                     | ON              | ON/OFF                                   |
|                    | Wireless Buzzer Resp                  | Function to turn ON/OFF of the wireless buzzer response function.                                                                                                                                                | ON              | ON/OFF                                   |
|                    | Open Door Warn                        | Function to make the buzzer sound for 10 seconds if the door is open when locking with the wireless door lock.                                                                                                   | ON              | ON/OFF                                   |
|                    | Auto lock time                        | Function to change the time until re-locking after unlocking with the wireless door lock.                                                                                                                        | 30 sec          | 30 sec<br>/60 sec                        |
|                    | Unlock 2 Operation                    | Function to unlock the driver's door by pressing the unlock button of the transmitter once and to unlock all the doors by pressing it twice. In the OFF setting, pressing one time makes all the doors unlocked. | OFF             | ON<br>/OFF                               |
| Door Lock          | Panic function                        | Function to operate the theft deterrent system by keeping pressing the lock button of the transmitter for 1.5 seconds. If there is the panic button, press the panic button instead of the lock button.          | ON              | ON/OFF                                   |
|                    | Unlock Key Twice                      | Function to unlock only the driver's door by doing the key operation once and to unlock all the doors by doing it twice. In the OFF setting, operating the key "UNLOCK" once makes all the doors unlocked.       | OFF             | ON<br>/OFF                               |

| System            | Intelligent Tester II Display Content | Contents                                                                                                                                            | Default Setting | Available Setting                                    |
|-------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------------------------------------------|
| Illuminated Entry | Lighting Time                         | Function to change the lighting time after closing the door. (It will quickly fade out in the event the power source/ignition switch is turned ON.) | 15 sec          | 7.5 sec/<br>15 sec/<br>30 sec                        |
|                   | I/L when ACC OFF                      | Function to light up the interior lights when power source/ignition switch is turned from "ACC" to "OFF".                                           | ON              | ON/OFF                                               |
|                   | I/L ON W/Door Unlock                  | Function to light up the interior lights when unlocking.                                                                                            | ON              | ON/OFF                                               |
| Warning           | Seat Belt Warning                     | Function to change the seat-belt warning buzzer.                                                                                                    | D ON            | D/P ON/<br>D ON/<br>P ON/<br>D/P OFF                 |
|                   | Key Low Battery Warning*              | Setting a warning function for the first time when a key battery becomes weak                                                                       | ON              | ON/OFF                                               |
| Light Control     | Sensitivity                           | To adjust the sensitivity of the lighting illumination.                                                                                             | NORMAL          | LIGHT 2/<br>LIGHT 1/<br>NORMAL/<br>DARK 1/<br>DARK 2 |
|                   | Response Time                         | To change the delay timing of lighting the taillight when going into the tunnel in case that the light control switch is at AUTO position.          | 0.15 sec        | 1.0 sec/<br>0.15 sec                                 |
|                   | Disp EX ON Sen                        | To change the brightness of lowering the lights such as the indicator light of the combination meter, A/C indicator light, clock.                   | NORMAL          | LIGHT 2/<br>LIGHT 1/<br>NORMAL/<br>DARK 1/<br>DARK 2 |
|                   | Disp EX OFF Sen                       | To change the brightness of cancelling the lowering the lights such as the indicator light of the combination meter, A/C indicator light, clock.    | NORMAL          | LIGHT 2/<br>LIGHT 1/<br>NORMAL/<br>DARK 1/<br>DARK 2 |

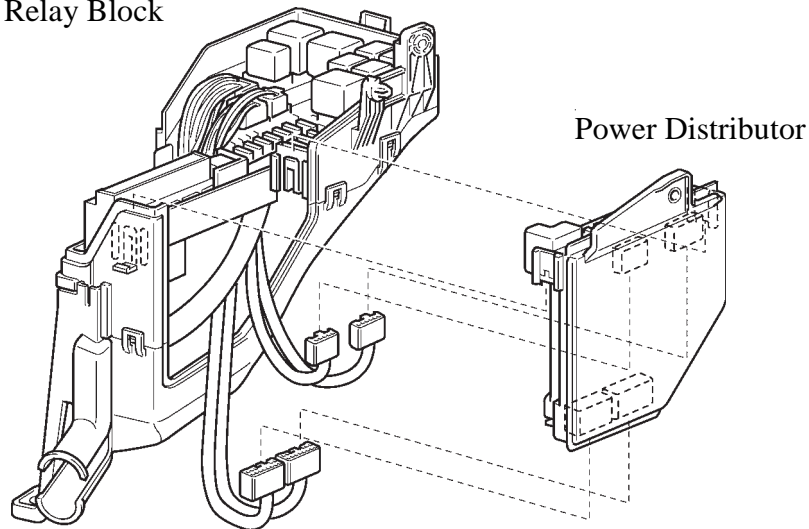
| System | Intelligent Tester II Display Content | Contents                                                                                                                                                                               | Default Setting | Available Setting                               |
|--------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------------------------------|
| A/C    | Set Temperature Shift                 | To control with the shifted temperature against the display temperature.                                                                                                               | NORMAL          | +2 °C/<br>+1 °C/<br>NORMAL /<br>-1 °C/<br>-2 °C |
|        | Air Inlet Mode                        | In case of turning the A/C ON when you desire to make the compartment cool down quickly, this is the function to change the mode automatically to RECIRCULATED mode.                   | AUTO            | MANUAL/<br>AUTO                                 |
|        | Compressor Mode                       | Function to turn the A/C ON automatically by pressing the AUTO button when the blower is ON and the A/C is OFF.                                                                        | AUTO            | MANUAL /<br>AUTO                                |
|        | Compressor/Air Inlet DEF operation    | Function to turn the A/C ON automatically linking with the FRONT DEF button when A/C OFF.                                                                                              | LINK            | NORMAL /<br>LINK                                |
|        | Evaporator Control                    | Function to set the evaporator control to the AUTOMATIC position (AUTO) to save power or to the coldest position (MANUAL) to dehumidify the air and to prevent the windows fogging up. | AUTO            | MANUAL /<br>AUTO                                |
|        | Foot/DEF Auto Mode                    | Function to turn the air flow from FOOT/DEF ON automatically when AUTO MODE is ON.                                                                                                     | ON              | OFF/ON                                          |
|        | Ambient Temperature Shift             | To control with the shifted ambient temperature against the display ambient temperature.                                                                                               | NORMAL          | +2 °C/<br>+1 °C/<br>NORMAL /<br>-1 °C/<br>-2 °C |
|        | Foot/DEF Automatic Blow Up Function   | Function to switch the blower level automatically when the defroster is ON.                                                                                                            | ON              | OFF/ON                                          |

## POWER DISTRIBUTOR

### ● DESCRIPTION

The power distributor is built into the engine room relay block, and uses a small mechanical relay and semiconductor relay for a compact and lightweight design.

Engine Room Relay Block



01YBE09Y

- The components of the power distributor are shown below.

| Component           | Relay                                                                                                                                                                                                                                                                    |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mechanical Relay    | <ul style="list-style-type: none"> <li>• Horn Relay</li> <li>• A/F (Fan) Relay</li> <li>• Security Horn Relay</li> <li>• EFI Relay</li> <li>• Circuit Opening Relay</li> <li>• Headlight Relay (RH)*<sup>1</sup></li> <li>• Headlight Relay (LH)*<sup>1</sup></li> </ul> |
| Semiconductor Relay | <ul style="list-style-type: none"> <li>• Headlight HI Beam Relay</li> <li>• Headlight Relay (RH)*<sup>2</sup></li> <li>• Headlight Relay (LH)*<sup>2</sup></li> </ul>                                                                                                    |

\*<sup>1</sup>: Models with Halogen type headlights

\*<sup>2</sup>: Models with HID type headlights

## LIGHTING

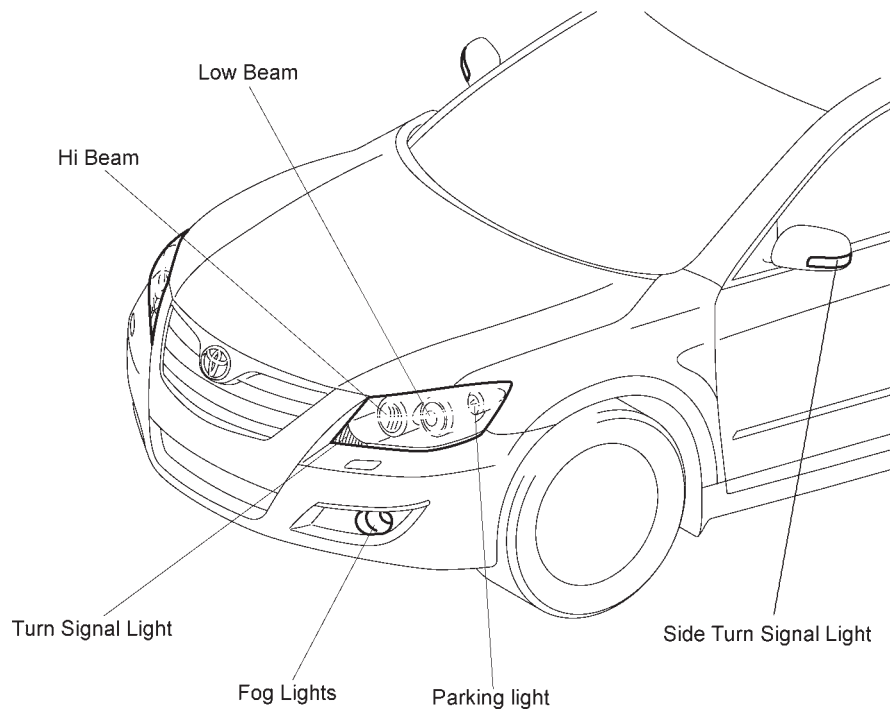
### ✱ DESCRIPTION

#### 1. General

The lighting system includes the following equipment:

| Item                                                                   |           | Grade |                              |         |                 |                 |
|------------------------------------------------------------------------|-----------|-------|------------------------------|---------|-----------------|-----------------|
|                                                                        |           | AT-X  | Prodigy<br>(Touring –<br>NZ) | Presara | Sportivo<br>SX6 | Sportivo<br>ZR6 |
| Front Fog Light                                                        |           | -     | ○                            | ○       | ○               | ○               |
| Headlight                                                              | Halogen   | ○     | ○                            | -       | ○               | ○               |
|                                                                        | HID       | -     | -                            | ○       | -               | -               |
| Headlight<br>Beam Level<br>Control                                     | Automatic | -     | -                            | ○       | -               | -               |
| Intelligent AFS(Provided<br>together with the HID<br>headlight system) |           | -     | -                            | ○       | -               | -               |
| Automatic Light Control<br>System                                      |           | ○     | ○                            | ○       | ○               | ○               |
| Illuminated Entry                                                      |           | ○     | ○                            | ○       | ○               | ○               |
| Light Turn-OFF System                                                  |           | ○     | ○                            | ○       | ○               | ○               |
| Headlight Cleaner                                                      |           | -     | -                            | ○       | -               | -               |

## 2. Front Exterior Light



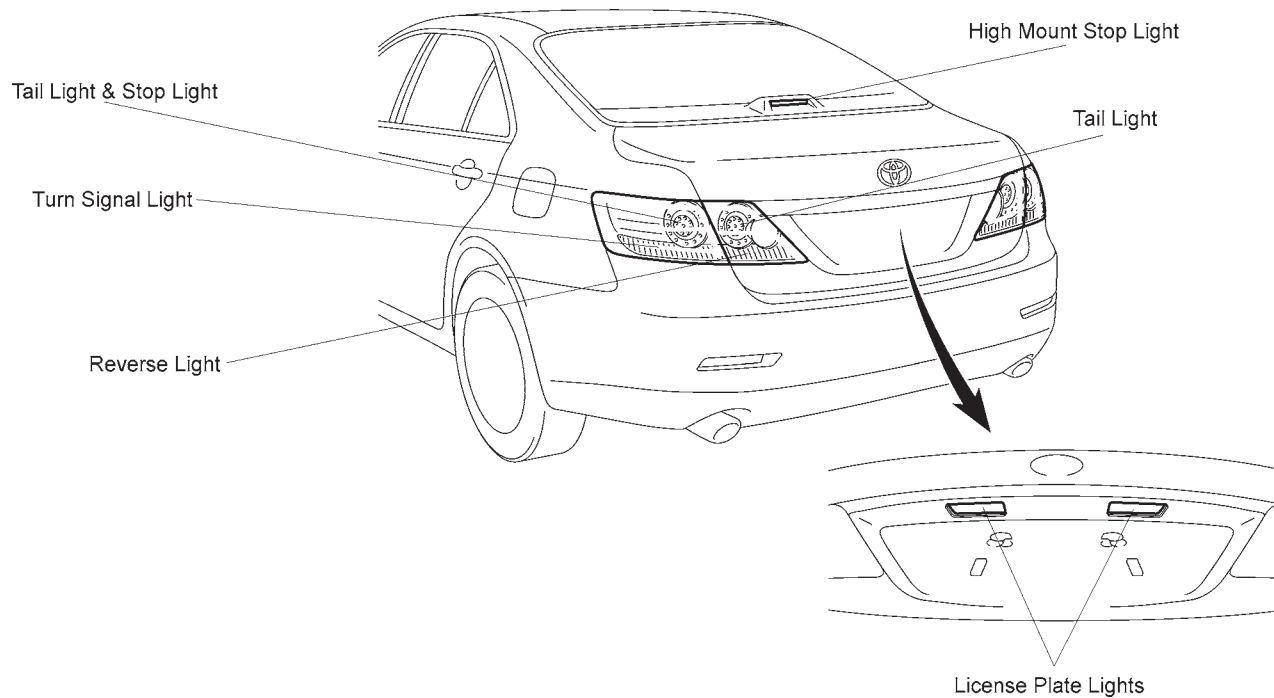
02KBE06TE

### ► Specifications ◀

| Light                  |                          | Type                    | Specification |
|------------------------|--------------------------|-------------------------|---------------|
| Headlight Unit         | Hi Beam                  | Halogen Bulb            | 65 W          |
|                        | Lo Beam (Projector Type) | Halogen Bulb            | 55 W          |
|                        |                          | Discharge Bulb*         | 35 W          |
|                        | Turn Signal Light        | Wedge Base Bulb (Amber) | 21 W          |
|                        | Parking Lights           | Wedge Base Bulb (Clear) | 5 W           |
| Side Turn Signal Light | Outer Rear View Mirrors  | Assembly Unit (Amber)   | 5 W           |
| Fog Lights             |                          | Halogen Bulb            | 55 W          |

\*: Vehicles with HID Headlights. For details, see the equipment list in Model Outline (see page MO-28).

### 3. Rear Exterior Light



02KBE07TE

#### ► Specifications ◀

| Light                 |                         | Type                    | Spec       |
|-----------------------|-------------------------|-------------------------|------------|
| Combination Light     | Tail Light & Stop Light | LED x 2                 | 0.1 / 3.8W |
|                       | Tail Light              | LED x 2                 | 0.1W       |
|                       | Turn Signal Light       | Wedge Base Bulb (Amber) | 21W        |
|                       | Reverse Light           | Wedge Base Bulb (Clear) | 16W        |
| License Plate Lights  |                         | Wedge Base Bulb (Clear) | 5W         |
| High Mount Stop Light |                         | LED x 4                 | 1.0W       |

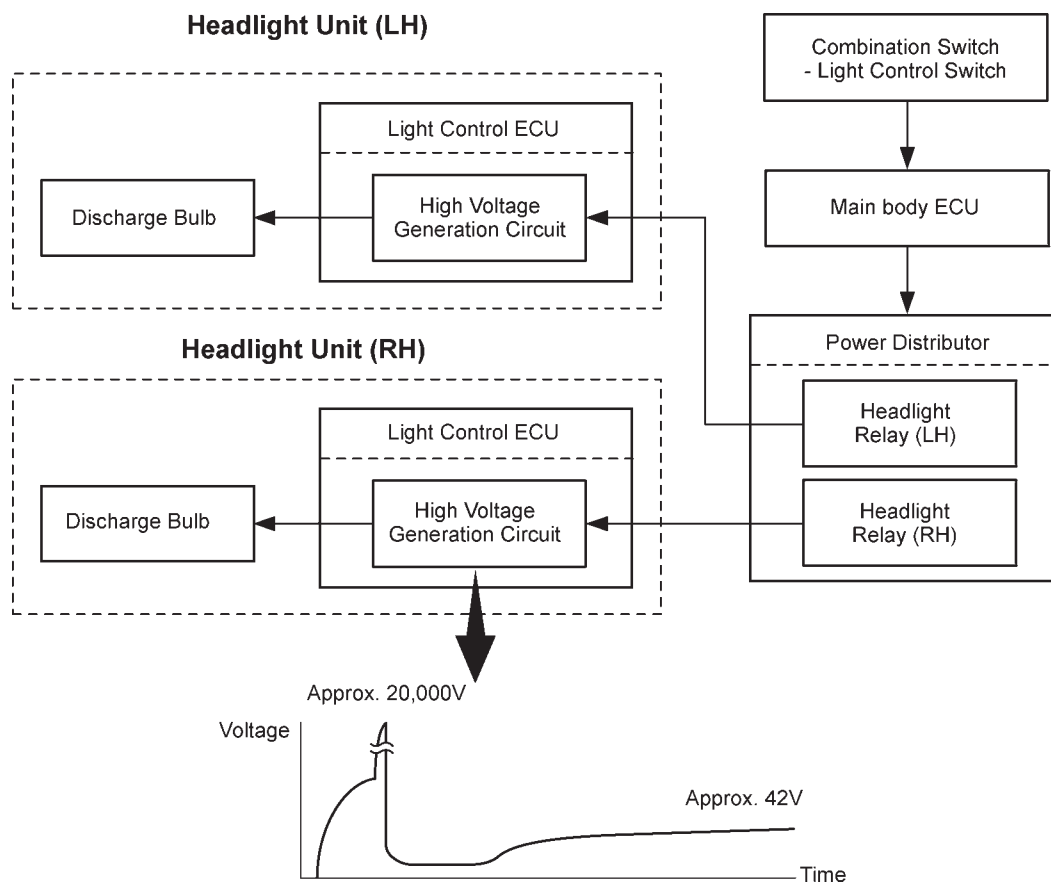
## HID HEADLIGHT SYSTEM

### 1. General

The HID (High Intensity Discharge) headlight system uses discharge bulbs as its light source for the Lo beam. Discharge bulbs are superior to halogen bulbs.

- Discharge bulbs have the following features.
  - The light emitted by the bulb is close in color to sunlight. The light shines ahead over a broader area and further forward, increasing the area visible to the driver.
  - Less power is consumed.
- This system consists of discharge bulbs and light control ECUs.
- The Light control ECU transforms the voltage that is input from the battery to a high voltage of up to 20,000V and applies it to the discharge bulbs in order to illuminate them.
- A fail-safe function is provided as a countermeasure against the high voltage that is generated in case a problem occurs in the headlight system.

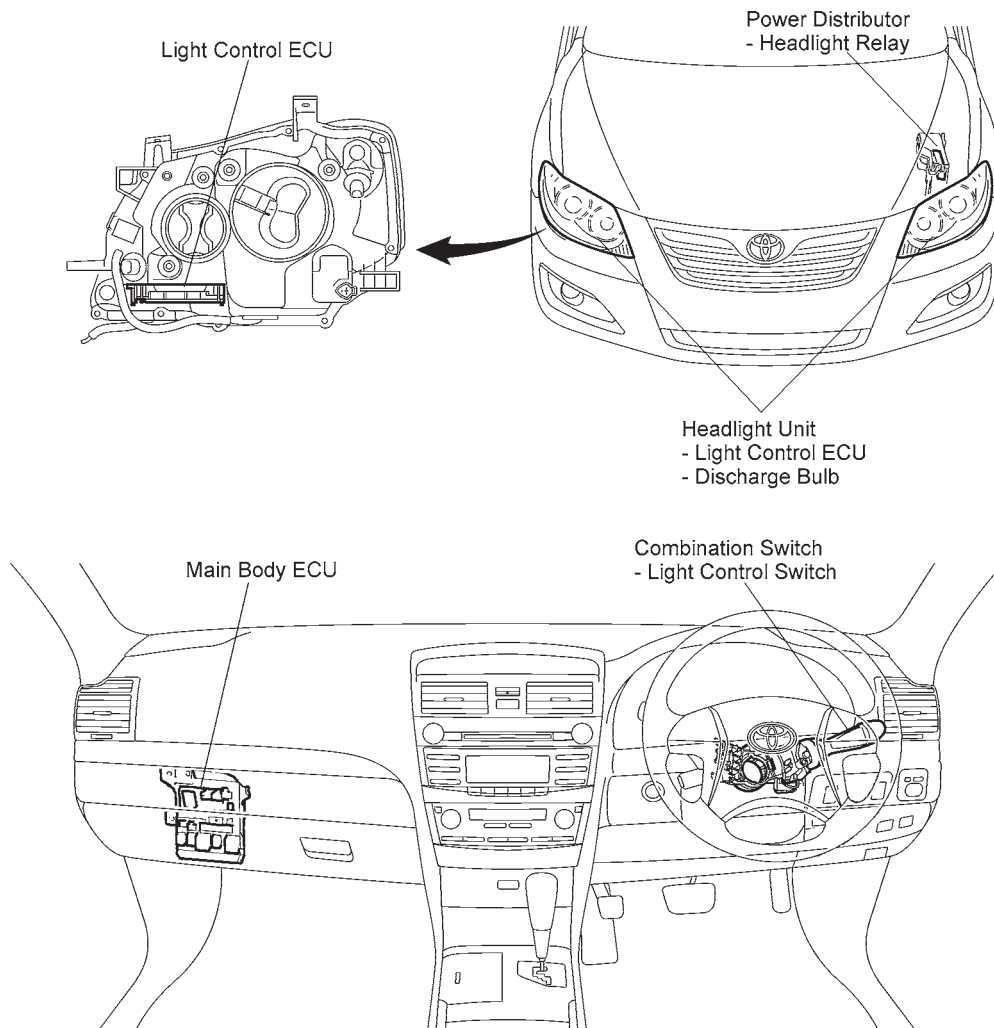
#### ► System Diagram ◀



01YBE12P



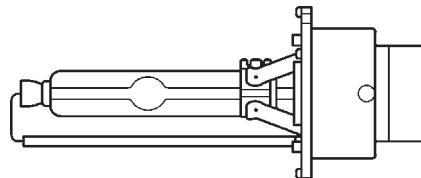
## 2. Layout of Main Components



02KBE08TE

## 3. Discharge Bulb

Instead of the filament contained in an incandescent bulb, a discharge bulb contains an arc tube, which is filled with xenon gas, and metal halide.



240BE29

#### 4. Fail-Safe Function

The light control ECU executes the fail-safe actions listed below in accordance with the problem that has been detected.

| Problem                                                                       | Outline                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Detection of Abnormal Input Voltage                                           | If the voltage that is input to the light control ECU deviates from the normal operating voltage (9 – 16 volts), the light control ECU stops illuminating the headlights. It resumes illuminating the headlights once the voltage reverts to the operating voltage range.<br>However, if the input voltage decreases after the headlights have illuminated, the headlights will remain illuminated until the input voltage is insufficient to light the bulbs. |
| Detection of Abnormal Output (Open Circuit or Short Circuit) or Flashing Bulb | If an abnormal condition (open or short) occurs in the voltage that is output by the light control ECU, or if the bulb flashes, the light control ECU stops illuminating the headlights and maintains this state until the power is reinstated. Power is reinstated by turning the headlight control switch from OFF to ON.                                                                                                                                    |
| Detection of Bulb Open                                                        | If a bulb is not inserted in its socket, the light control ECU stops generating a high voltage until a bulb is inserted correctly and the power is reinstated. The power is reinstated by turning the headlight control switch from OFF to ON or turning the ignition switch from OFF to ON.                                                                                                                                                                   |

#### 5. Precautions for HID Headlight System

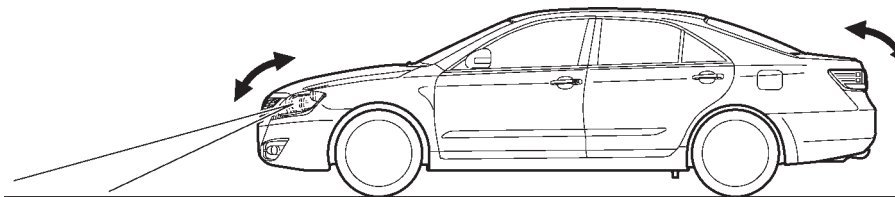
- When the HID headlights illuminate, a high voltage (approximately 20,000V) is applied momentarily to the bulb sockets, which could lead to a serious accident. Never connect the tester to the high voltage socket of the HID headlights for measurement, as this may lead to a serious accident because of the high voltage.
- Whenever inspecting the HID headlight system, make sure that no water or rain is present in order to prevent electric shocks, the light control switch is OFF, the battery terminal is removed, and the connector of the light control ECU is disconnected.
- Whenever operating the HID headlights, make sure it is only after assembly has been completed and never operate them without bulbs installed.
- Do not operate the HID headlights using any power source other than the vehicle's.
- When there is a defect in a HID headlight or any shock has been applied to it, replace the bulb with a new one.
- A discharge bulb reaches a high temperature when it is illuminated. For this reason, the life of the bulb could be shortened if any oil comes in contact with the glass portion of the bulb. Do not touch the glass portion of a bulb with bare hands.

## ✿ HEADLIGHT BEAM LEVEL CONTROL SYSTEM

### 1. Automatic Headlight Beam Level Control (Models with intelligent AFS)

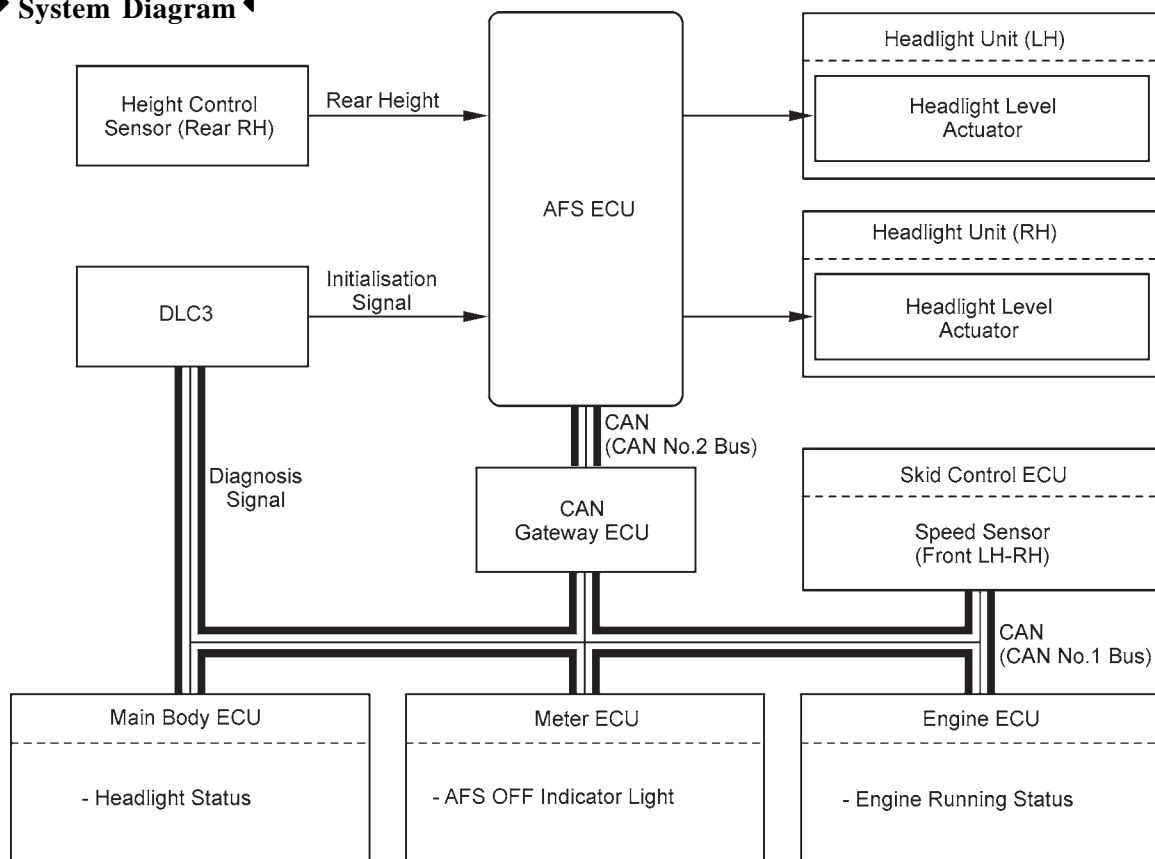
#### General

- The automatic headlight beam level control system, which is controlled by the AFS ECU, is used on models with intelligent AFS.
- When the headlights are on, the automatic headlight beam level control system operates the headlight level actuator in accordance with movement of the vehicle.
- The automatic headlight beam level control system mainly consists of the AFS ECU, rear height control sensor, and two headlight level actuators.
- The AFS ECU calculates changes in the vehicle posture based on signals from the height control sensor (rear RH) and each ECU.
- The ECU then controls the headlight level actuator based on this information, in order to change the headlight reflector angle.



02KBE10TE

#### ► System Diagram ◀

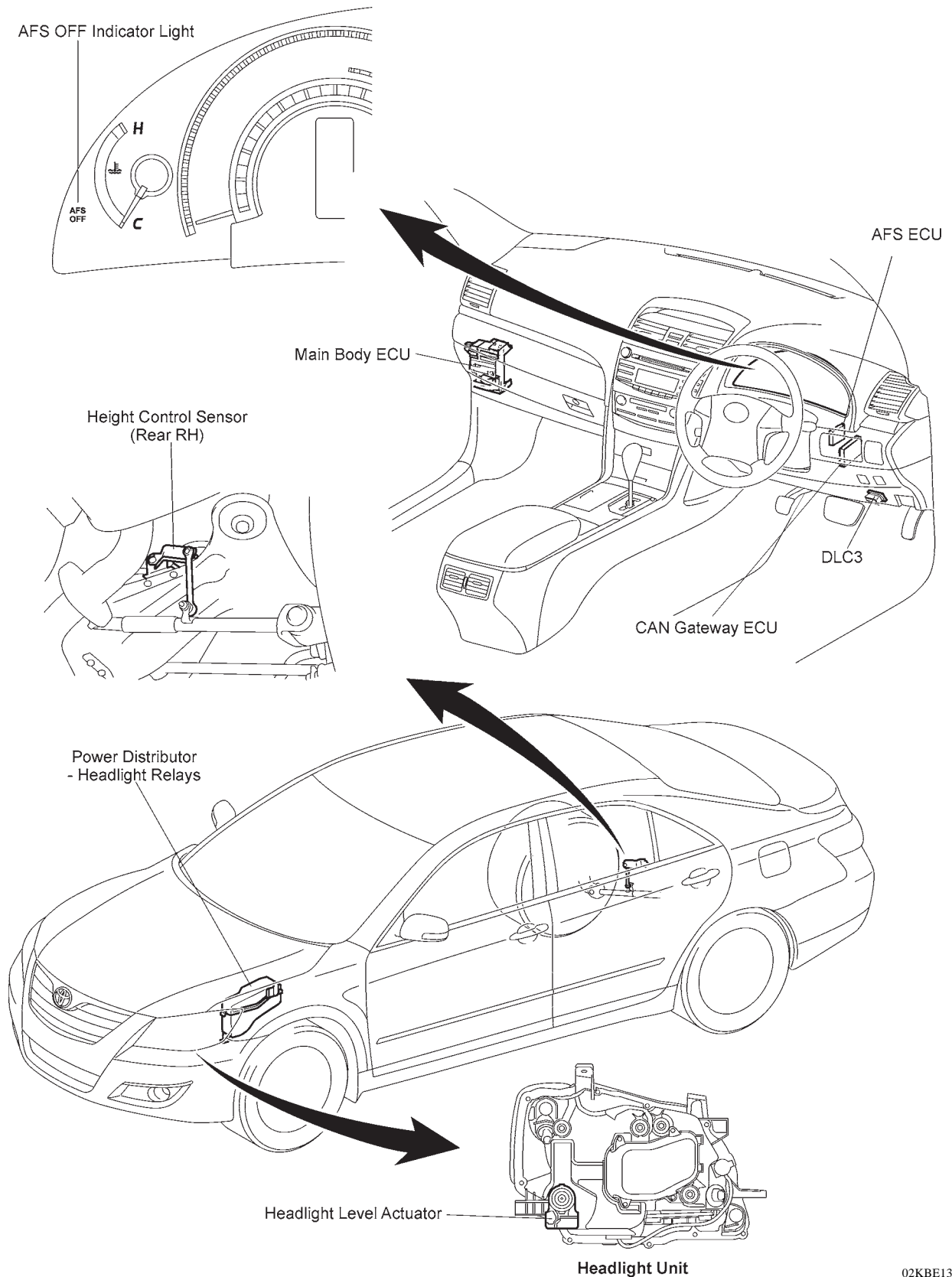


02KBE12Y

#### Service Tip

If the AFS ECU is replaced, or the rear height control sensor is removed, the AFS ECU must be initialised. For details, see the Aurion Repair Manual.

## 2. Layout of Main Components



02KBE13TE

### 3. Function of Main Components

| Component                       |                          | Outline                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AFS ECU                         |                          | <ul style="list-style-type: none"> <li>• Calculates changes in the vehicle posture based on the signals from the height control sensor and each ECU.</li> <li>• Based on the detected value, this ECU outputs a control signal to the headlight level actuator.</li> <li>• This ECU provides initial set control, fail-safe function and diagnosis function.</li> </ul> |
| Headlight Unit                  | Headlight Level Actuator | <ul style="list-style-type: none"> <li>• Based on the signals received from the AFS ECU, the actuators move the reflectors in the headlights to vary the Lo beam.</li> <li>• These actuators use a step motor to precisely regulate the angle of the reflectors.</li> </ul>                                                                                             |
| Height Control Sensor (Rear RH) |                          | The height control sensor detects the amount of variation in the vehicle height, and outputs this information in the form of a signal to the AFS ECU.                                                                                                                                                                                                                   |
| Skid Control ECU                |                          | Transmits the speed sensor signal (Front LH and RH) to the AFS ECU.                                                                                                                                                                                                                                                                                                     |
| Engine ECU                      |                          | Transmits the engine running status signal to the AFS ECU.                                                                                                                                                                                                                                                                                                              |
| Main Body ECU                   |                          | Transmits the headlight status signal.                                                                                                                                                                                                                                                                                                                                  |
| Combination Meter (Meter ECU)   | AFS OFF Indicator Light  | When the system malfunctions, the meter ECU alerts the driver by flashing the AFS OFF indicator light in accordance with the signal from the AFS ECU.                                                                                                                                                                                                                   |

### 4. Initial Set Control

When the engine is started, the AFS ECU drives the headlight level actuator, moves the headlight reflector to the lower limit position and returns it to the proper position. The AFS ECU thus assesses the position of the headlight for reference control.

## 5. Fail-Safe

If the AFS ECU detects a malfunction in the automatic headlight beam level control system or intelligent AFS, it will take the actions indicated in the table below.

| Trouble Area                             | Condition                                                                                                                                                                                                                                                                              | AFS OFF Indicator Light |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| Headlight Swivel Actuator Malfunction    | Continues to control until a position of 0.65° less than the current position is reached.                                                                                                                                                                                              | Flash                   |
| Steering Angle Sensor Signal Malfunction | Continues to control.                                                                                                                                                                                                                                                                  | Flash                   |
| Speed Sensor Signal Malfunction          | <ul style="list-style-type: none"> <li>Continues to control using the normal speed sensor signal if one signal fails.</li> <li>Judges that the vehicle speed is 0 km/h and continues to control if both speed sensor signals fail.</li> </ul>                                          | Flash                   |
| Height Control Sensor Signal Malfunction | <ul style="list-style-type: none"> <li>Stops the operation after returning to the initial position (If failure at higher than initial position).</li> <li>Stops the operation in the current condition (If failure at lower than initial position).</li> </ul>                         | Flash                   |
| Headlight Level Actuator Malfunction     | Normal Side Headlight Level Actuator: <ul style="list-style-type: none"> <li>Stops the operation after returning to the initial position (If failure at higher than initial position).</li> <li>Stops in the current condition (If failure at lower than initial position).</li> </ul> | Flash                   |
|                                          | Abnormal Side Headlight Level Actuator: <ul style="list-style-type: none"> <li>Stops in its current position.</li> </ul>                                                                                                                                                               |                         |
| Communication Signal Malfunction         | Skid Control ECU: <ul style="list-style-type: none"> <li>Judges that the vehicle speed is 0 km/h and continues to control.</li> </ul>                                                                                                                                                  | Flash                   |
|                                          | Steering Angle Sensor: <ul style="list-style-type: none"> <li>Normally controls the system.</li> </ul>                                                                                                                                                                                 | Flash                   |

## 6. Diagnosis

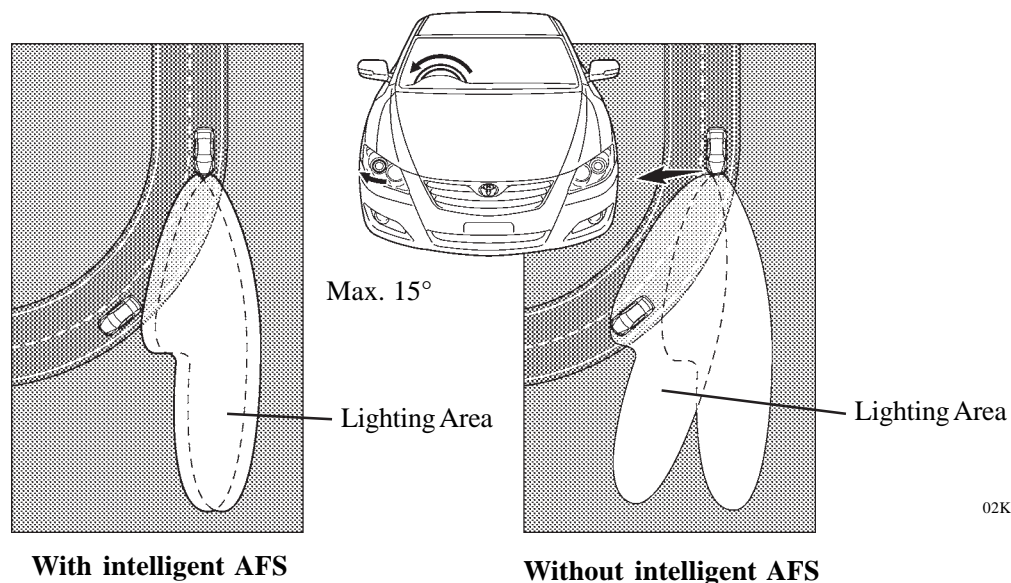
If the AFS ECU detects a malfunction in the automatic headlight beam level control system, the AFS ECU flashes the AFS OFF indicator light. At the same time, the DTC (Diagnostic Trouble Codes) are stored in memory. The DTC can be read by use of the intelligent tester II. For details, see the Aurion Repair Manual.

## ✿ INTELLIGENT AFS (Adaptive Front-lighting System)

### 1. General

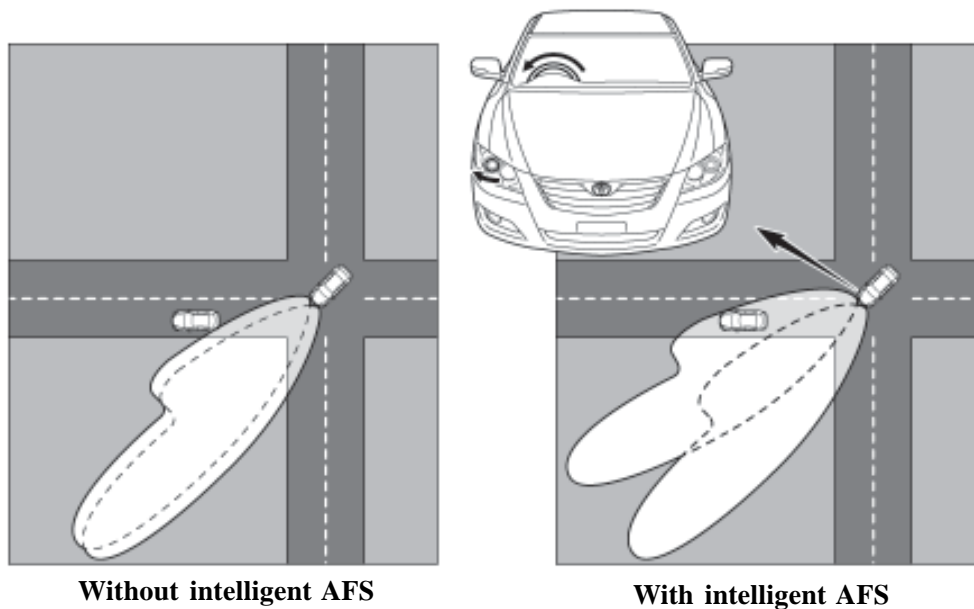
- An intelligent AFS (Adaptive Front-lighting System) is used in order to ensure a wide Lo beam lighting area and realise excellent visibility during turns by moving the Lo beam.
- The intelligent AFS of the Aurion uses medium-to-high speed control and low speed control. In the medium-to-high speed control, the system calculates the target lighting angle based on the steering angle and vehicle speed and changes the swivel angle of the low-beam headlights individually. During the low speed control, the system calculates the target lighting angle based on the steering angle and changes the swivel angle of the low-beam headlight on the side facing into the turn.

#### ▶ Medium-to-High Speed Control ◀



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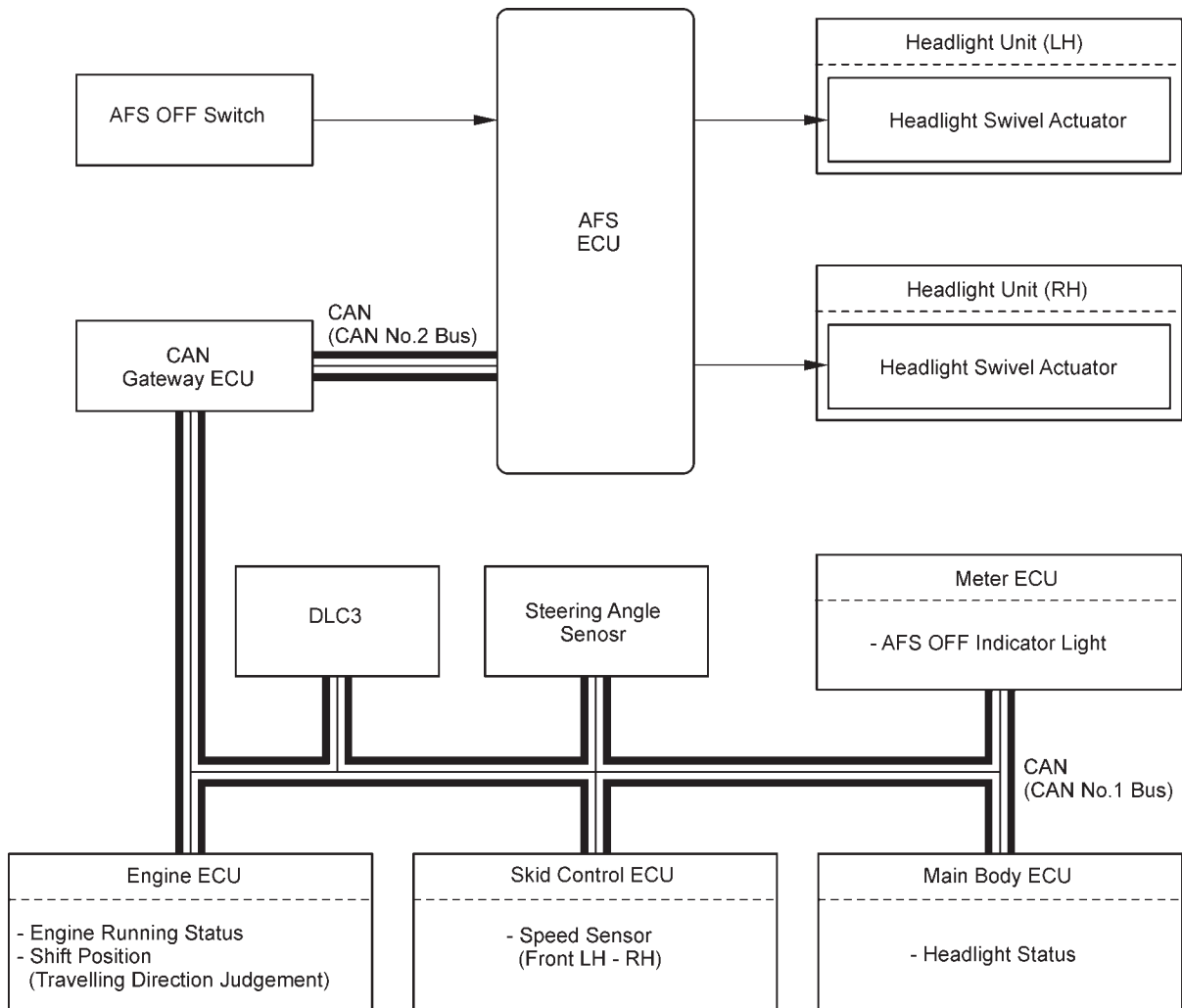
#### ▶ Low Speed Control ◀



02KBE15Y

## 2. System Diagram

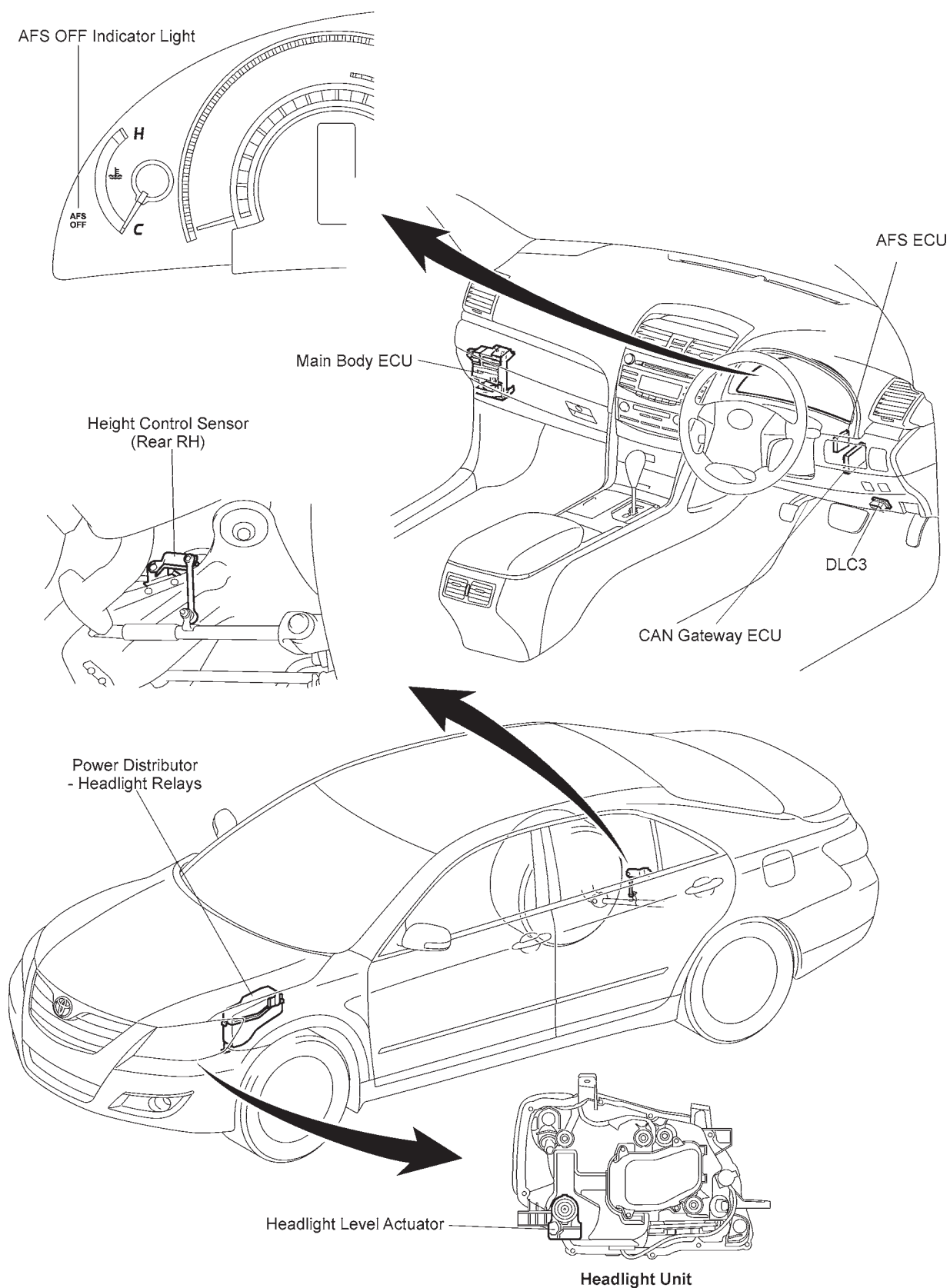
- This system consists of two headlight units (for Lo beam), the AFS ECU, two headlight swivel actuators, the steering angle sensor and the front speed sensors. The AFS ECU controls this system.
- The AFS ECU also controls the automatic headlight beam level control system. For details, see page BE-22.



02KBE16Y



### 3. Layout of Main Components



02KBE13TE

#### 4. Function of Main Components

| Component                     |                            | Outline                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AFS ECU                       |                            | The AFS ECU receives various signals, calculates the target lighting angle, and actuates the headlight swivel actuator.                                                                                                                                                                                                                                |
| Headlight Unit                | Head Light Swivel Actuator | <ul style="list-style-type: none"> <li>• Driven by the AFS ECU, the actuator moves the Lo beam left or right to the angle calculated by the AFS ECU.</li> <li>• A step motor is used for the headlight swivel actuator. The AFS ECU determines the Lo beam angle based on the number of steps (position) of the step motor.</li> </ul>                 |
| Steering Angle Sensor         |                            | Detects the steering angle and direction and outputs this signal to the AFS ECU.                                                                                                                                                                                                                                                                       |
| AFS OFF Switch                |                            | Pressing this switch, disables the operation of the intelligent AFS.                                                                                                                                                                                                                                                                                   |
| Skid Control ECU              |                            | Transmits the speed sensor signal (Front LH and RH) to the AFS ECU.                                                                                                                                                                                                                                                                                    |
| Engine ECU                    |                            | <ul style="list-style-type: none"> <li>• Transmits the engine running status signal to the AFS ECU.</li> <li>• Transmits the shift position signal to the AFS ECU. The AFS ECU determines whether the vehicle is moving forward or backward from this signal.</li> </ul>                                                                               |
| Main Body ECU                 |                            | Transmits the headlight status signal.                                                                                                                                                                                                                                                                                                                 |
| Combination Meter (Meter ECU) | AFS OFF Indicator Light    | <ul style="list-style-type: none"> <li>• When the system malfunctions, the meter ECU flashes the AFS OFF indicator light based on the signal from the AFS ECU to alert the driver.</li> <li>• When the AFS OFF switch is on, the AFS ECU illuminates the AFS OFF indicator light to inform the driver that the system does not operational.</li> </ul> |

## 5. System Control

### General

- The AFS ECU calculates the target lighting angle of the Lo beam by receiving the steering angle and the vehicle speed. Then, it actuates the headlight swivel actuator in order to attain the target lighting angle.
- The operation angle of the headlights is detected through the position (number of steps) of the step motor in the headlight swivel actuator.
- On the Aurion, the swivel angle control is switched between the medium-to-high speed and the low speed controls in accordance with the steering angle and vehicle speed.

### Low Speed Control

- The AFS ECU performs the low speed control when all the following conditions are fulfilled.
  - Engine is running.
  - Vehicle is moving forward at a speed of 10 km/h or more.
  - Steering angle is 6° or more.
  - Headlight Lo beam is operating.
  - AFS ON/OFF condition is ON.
- The AFS ECU calculates the swivel angle from the steering angle and drives the headlight swivel actuator on the side facing into the turn to illuminate the road ahead during cornering.

#### ▸ Swivel Angle Range ◀

| Driving Condition | Headlight Unit    |                    |
|-------------------|-------------------|--------------------|
|                   | Left              | Right              |
| Right Turn        | 0° Fixed          | 0° to 10° to Right |
| Left Turn         | 0° to 15° to Left | 0° Fixed           |

### Medium-to-High Speed Control

- The AFS ECU performs the medium-to-high speed control when all the following conditions are fulfilled.
  - Engine is running.
  - Vehicle is moving forward at a speed of 30 km/h or more.
  - Steering angle is 7.5° or more.
  - Headlight Lo beam is operating.
  - AFS ON/OFF condition is ON.
- Based on the steering angle and vehicle speed, the AFS ECU calculates the swivel angle of the Lo beam headlights so that the headlights can illuminate the position which the vehicle will reach after 3 seconds, and drives both headlight swivel actuators to illuminate the road ahead during cornering.

#### ▸ Swivel Angle Range ◀

| Driving Condition | Headlight Unit    |                    |
|-------------------|-------------------|--------------------|
|                   | Left              | Right              |
| Right Turn        | 0° Fixed          | 0° to 10° to Right |
| Left Turn         | 0° to 15° to Left | 0° Fixed           |

## Initial Set Control

When the engine is started, the AFS ECU drives the headlight swivel actuator, moves the projector headlight to the operation limit in the direction toward the vehicle center and returns it to the proper position. The AFS ECU thus assesses the position of the headlight for reference control.

## Fail-Safe

If the AFS ECU detects a malfunction in the intelligent AFS or automatic headlight beam level control system, it will take the actions indicated in the table below.

| Trouble Area                                | Condition<br>(Fail-Safe Control for Intelligent AFS)                                                 | AFS OFF<br>Indicator<br>Light |
|---------------------------------------------|------------------------------------------------------------------------------------------------------|-------------------------------|
| Headlight Swivel<br>Actuator Malfunction    | Normal Side Headlight Swivel Actuator:<br>• Stops operating after returning to the initial position. | Flash                         |
|                                             | Abnormal Side Headlight Swivel Actuator:<br>• Stops in its current position.                         |                               |
| Steering Angle Sensor<br>Signal Malfunction | Stops operating after returning to the initial position.                                             | Flash                         |
| Speed Sensor Signal<br>Malfunction          | Stops operating after returning to the initial position.                                             | Flash                         |
| Height Control Sensor<br>Signal Malfunction | Stops operating after returning to the initial position.                                             | Flash                         |
| Headlight Level<br>Actuator Malfunction     | Stops operating after returning to the initial position.                                             | Flash                         |
| Communication Signal<br>Malfunction         | Main Body ECU:<br>• Stops operating after returning to the initial position.                         | Flash                         |
|                                             | Engine ECU:<br>• Stops operating after returning to the initial position.                            | Flash                         |
|                                             | Skid Control ECU:<br>• Stops operating after returning to the initial position.                      | Flash                         |
|                                             | Steering Angle Sensor:<br>• Stops operating after returning to the initial position.                 | Flash                         |

## Diagnosis

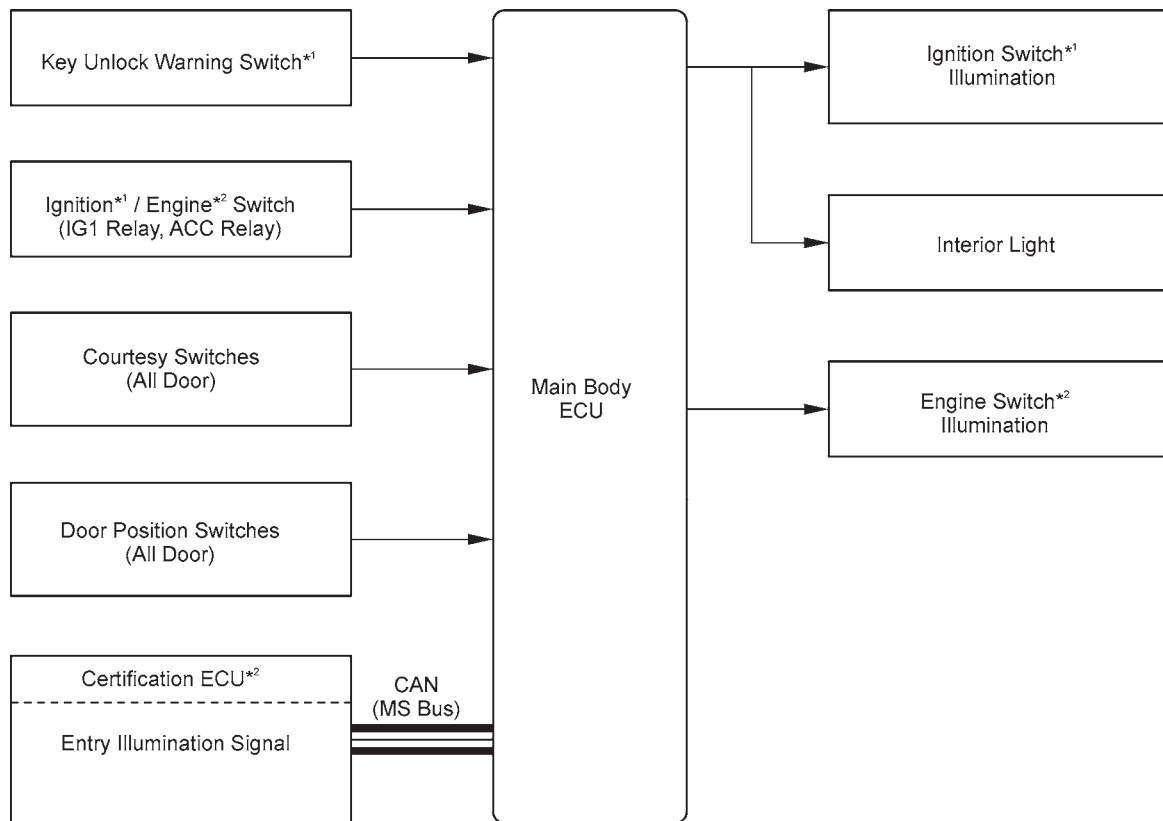
If the AFS ECU detects a malfunction in the intelligent AFS, the AFS ECU flashes the AFS OFF indicator light in order to alert the driver. At the same time, the DTC (Diagnostic Trouble Codes) are stored in the memory. The DTC can be read by using the intelligent tester II. For details, see the Aurion Repair Manual.

## ✿ ILLUMINATED ENTRY SYSTEM

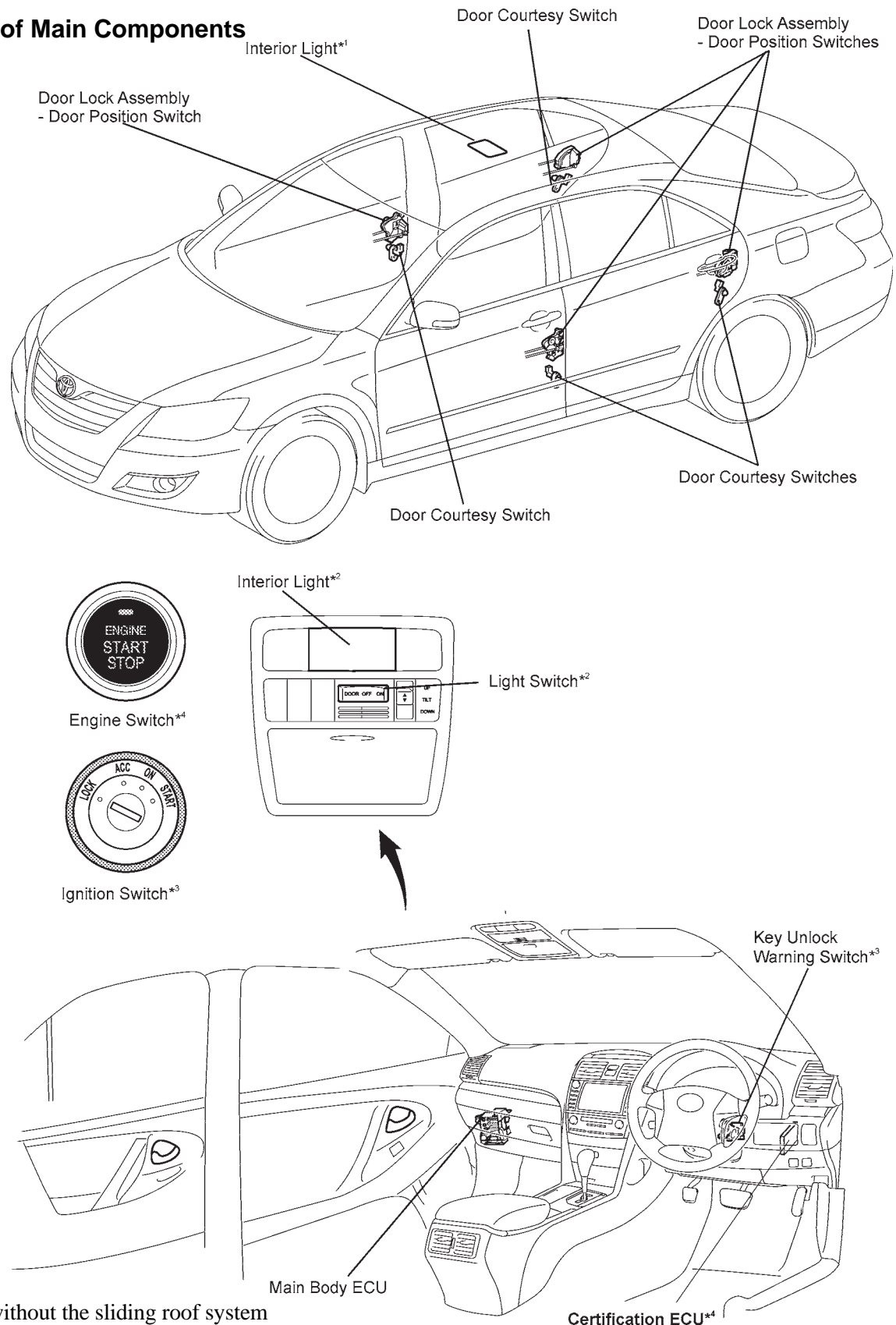
### 1. General

- The illuminated entry system of the Aurion controls 2 kinds of light: interior light and ignition switch.
- The interior light is operated when the light switch is in the DOOR position.

#### ► System Diagram ◀



## 2. Layout of Main Components



\*<sup>1</sup>: Models without the sliding roof system

\*<sup>2</sup>: Models with the sliding roof system

\*<sup>3</sup>: Models without smart entry and start system

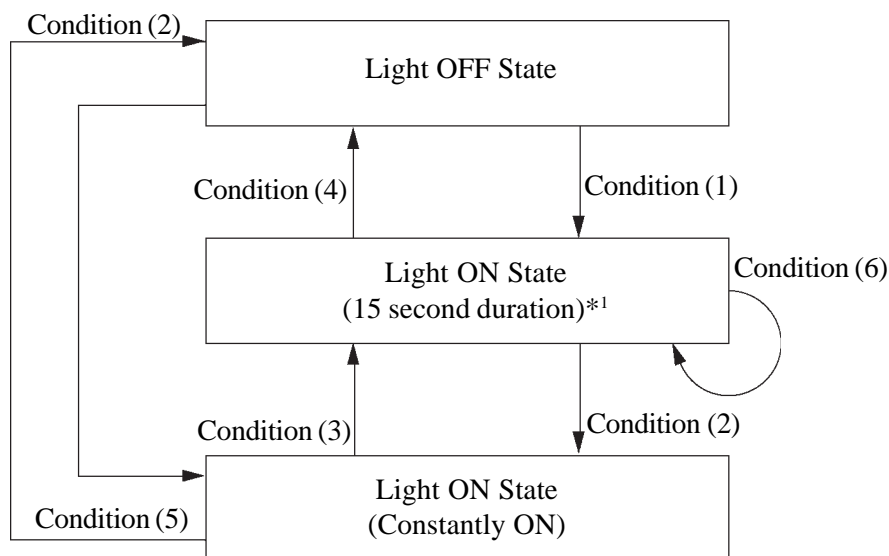
\*<sup>4</sup>: Models with smart entry and start system

### 3. Interior Light Control

- The interior light control (interior light and ignition switch illumination<sup>\*1</sup>/engine switch illumination<sup>\*2</sup>) consists primarily of the fade-in/fade-out function and timer illumination function.
- The interior light control activates as described in the diagram below when one of items is in the respective state.
- This control is controlled by the main body ECU.

<sup>\*1</sup>: Models without the smart entry and start system

<sup>\*2</sup>: Models with the smart entry and start system



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| Condition     | Item                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Condition (1) | <ul style="list-style-type: none"> <li>• With power source<sup>*2</sup> OFF and all doors closed, any door is unlocked.</li> <li>• With all doors closed, power source<sup>*2</sup> is changed from ACC to OFF.</li> <li>• With power source OFF and all doors closed, key enters any actuation area around the doors. (Only for models with smart entry and start system)</li> </ul> |
| Condition (2) | <ul style="list-style-type: none"> <li>• Any door is open.</li> </ul>                                                                                                                                                                                                                                                                                                                 |
| Condition (3) | <ul style="list-style-type: none"> <li>• With power source<sup>*2</sup> OFF and all doors are closed, any door is unlocked.</li> </ul>                                                                                                                                                                                                                                                |
| Condition (4) | <ul style="list-style-type: none"> <li>• Power source<sup>*2</sup> is ACC or ON.</li> <li>• More than 15 seconds have elapsed since the Light ON State (15 second duration)*1.</li> <li>• With power source<sup>*2</sup> OFF and all doors closed, all doors are locked.</li> </ul>                                                                                                   |
| Condition (5) | <ul style="list-style-type: none"> <li>• With power source<sup>*2</sup> ACC or ON, all doors are closed or locked.</li> </ul>                                                                                                                                                                                                                                                         |
| Condition (6) | <ul style="list-style-type: none"> <li>• With power source OFF and all doors closed, key enters any actuation area around the doors. (Only for models with smart entry and start system)</li> <li>• With power source<sup>*2</sup> OFF and all doors locked, any door is unlocked.</li> </ul>                                                                                         |

<sup>\*1</sup>: The function setting can be changed using the customised body electronics system. For details, refer to Customised Body Electronics System section on page BE-13.

<sup>\*2</sup>: The power source condition can be changed by operating the engine switch on models with the smart entry and start system, and the ignition switch on models without the smart entry and start system.

#### **4. Battery Saving Control**

When the following two conditions have been met, battery saving control turns off the lights illuminated by the illuminated entry controls. Battery saving control is controlled by the main body ECU.

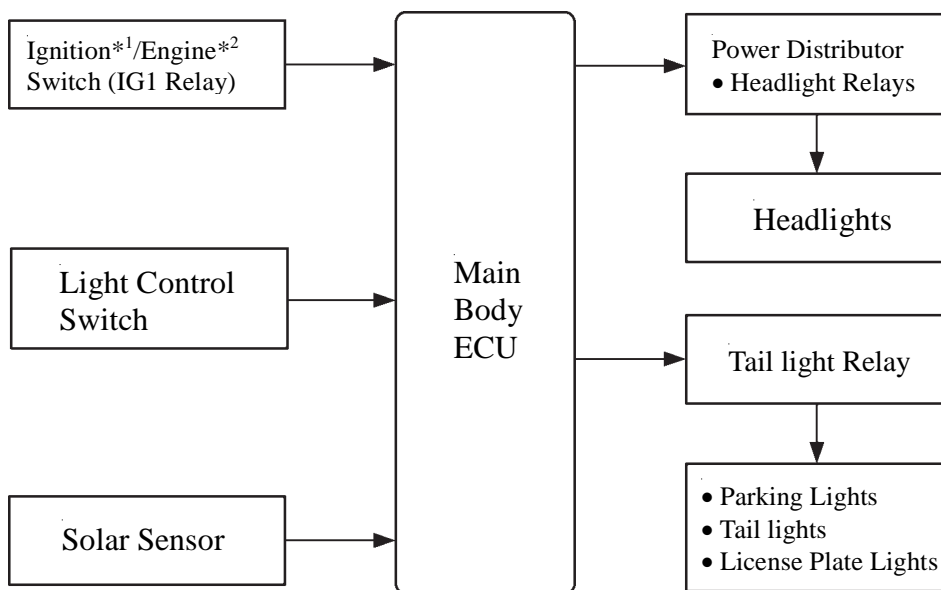
- The power source is OFF (models with smart entry and start system), or the ignition key is not in the ignition key cylinder (models without smart entry and start system).
- There is no change in the condition of the doors for 20 minutes.



## AUTOMATIC LIGHT CONTROL SYSTEM

- When the light control switch is in the AUTO position, the automatic light control system detects ambient light levels and controls the headlights and taillights (parking lights, taillights and license plate lights), or either of them.
- Ambient light levels are detected by the light control sensor that is integrated in the air conditioner system's solar sensor.
- The main body ECU controls this system.

### ▶ System Diagram ◀



01YBE23P

\*1: Models without the smart entry & start system

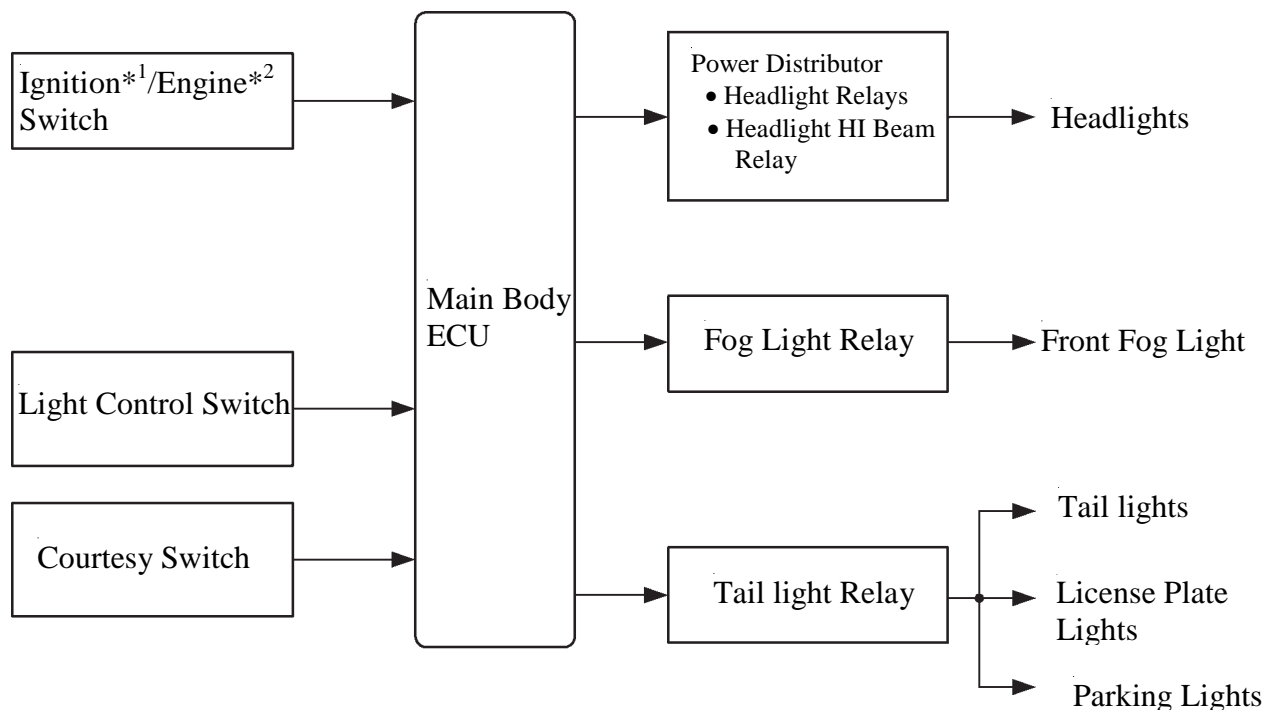
\*2: Models with the smart entry & start system

## LIGHT TURN-OFF SYSTEM

- The light turn-off system is used to prevent the driver from leaving the vehicle with the headlights, fog lights, parking lights, taillights, or license plate lights on.
- When all of the following conditions are met, the exterior lights turn off.
  - Power source\* changes from IG-ON to OFF or ACC.
  - The light control switch is in any position except OFF.
  - The fog light switch is ON(Only for models with fog lights).
  - The driver's door is opened after the being closed.

\*: The power source condition can be changed by operating the engine switch on models with the smart entry and start system, and the ignition switch on models without the smart entry and start system.

### System Diagram



\*1: Models without the smart entry and start system

\*2: Models with the smart entry and start system

01ZBE13Pb

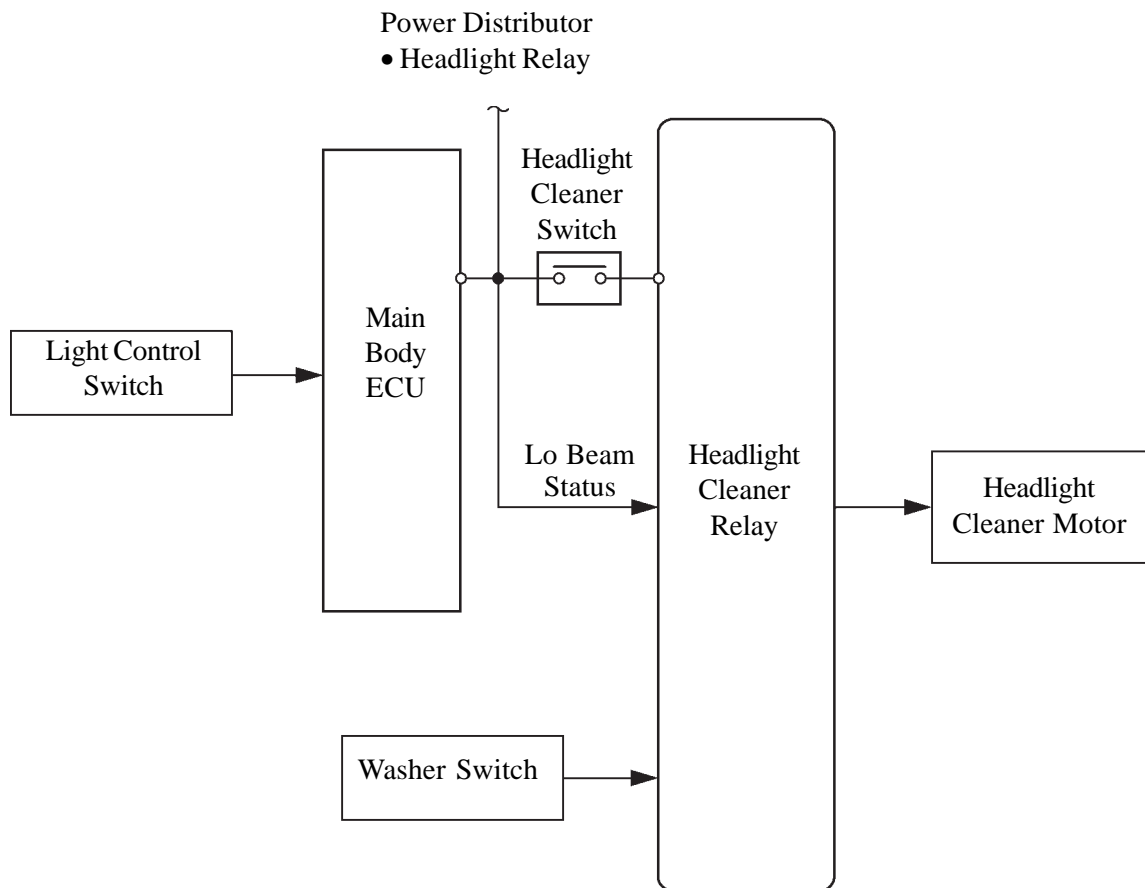
## ✿ HEADLIGHT CLEANER SYSTEM

### 1. General

- The headlight cleaner system sprays washer fluid onto the headlight lenses to clean them.
- The headlight cleaner relay controls this system.
- The headlight cleaner system operates as follows:

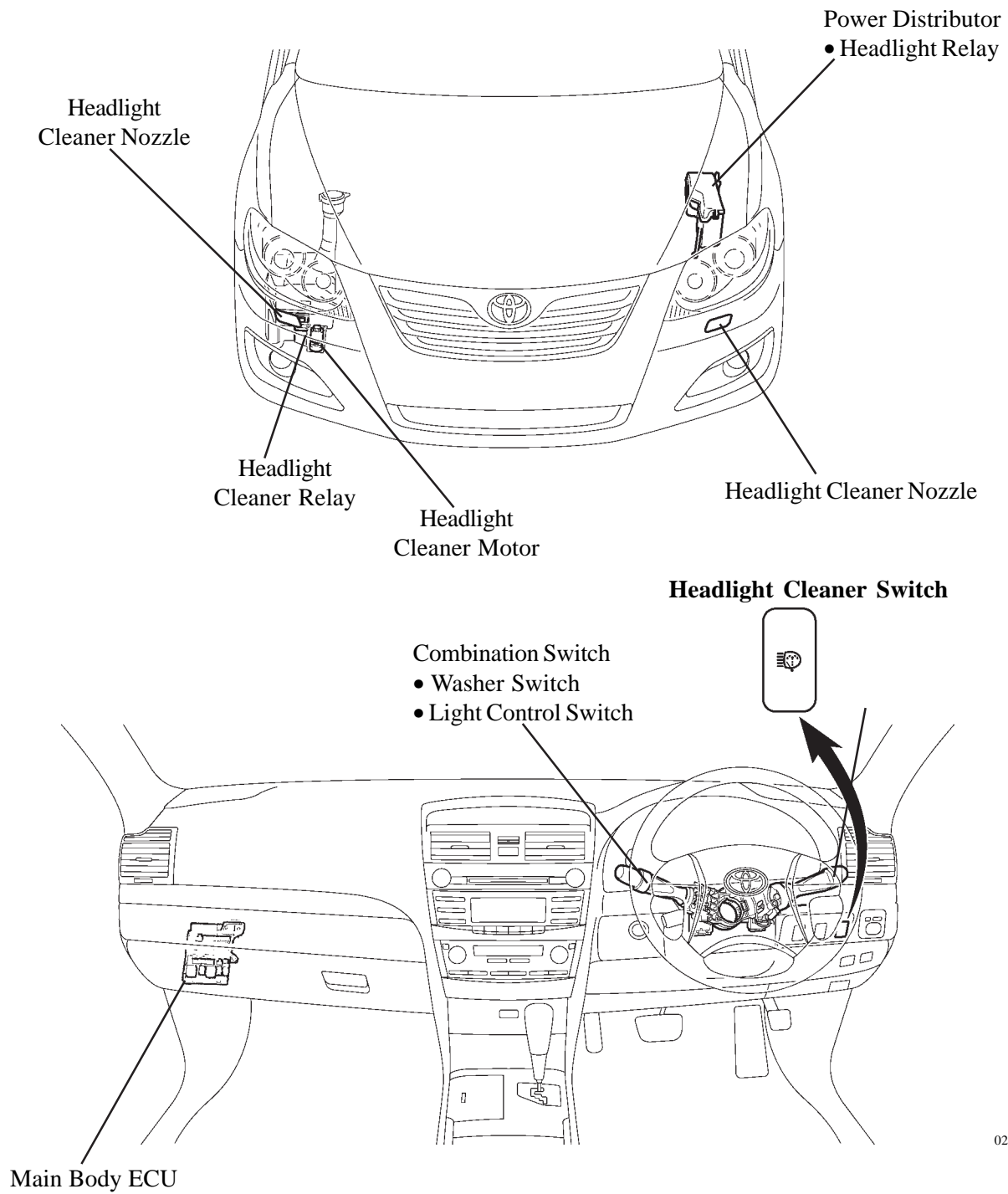
| Headlight<br>Lo Beam | Headlight Cleaner Switch | Washer Switch   |                             |
|----------------------|--------------------------|-----------------|-----------------------------|
|                      | ON                       | ON (First Time) | ON<br>(Second Time or more) |
| Turn ON              | Activated                | Activated       | Not Activated               |
| Turn OFF             | Activated                | Not Activated   | Not Activated               |

### ▸ System Diagram ◀



026BE14P

## 2. Layout of Main Components



02KBE20TE

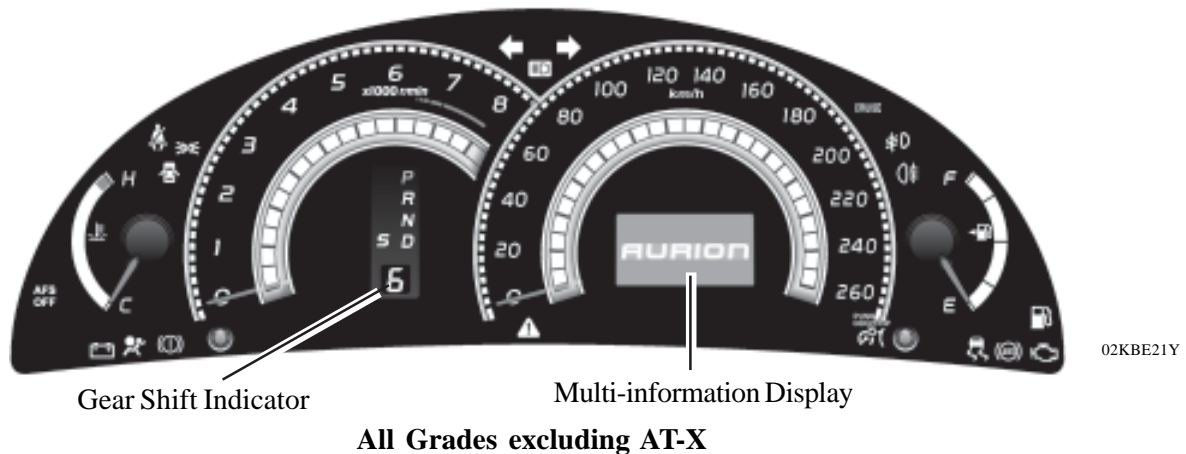
## METER

### COMBINATION METER

#### 1. General

- An optitron display type combination meter is used as standard on all grades excluding AT-X.
- An analog type combination meter is used on AT-X grade.
- A meter ECU and buzzer are enclosed in the combination meter. This ECU maintains communication with other ECUs through the CAN (Controller Area Network).
- Illumination control, which turns on the combination meter illumination at different time intervals when the power source\* is switched to IG-ON, has been provided.
- A step-motor type movement is used to actuate the indicators of the speedometer, the fuel gauge, the engine coolant temperature gauge and the tachometer.

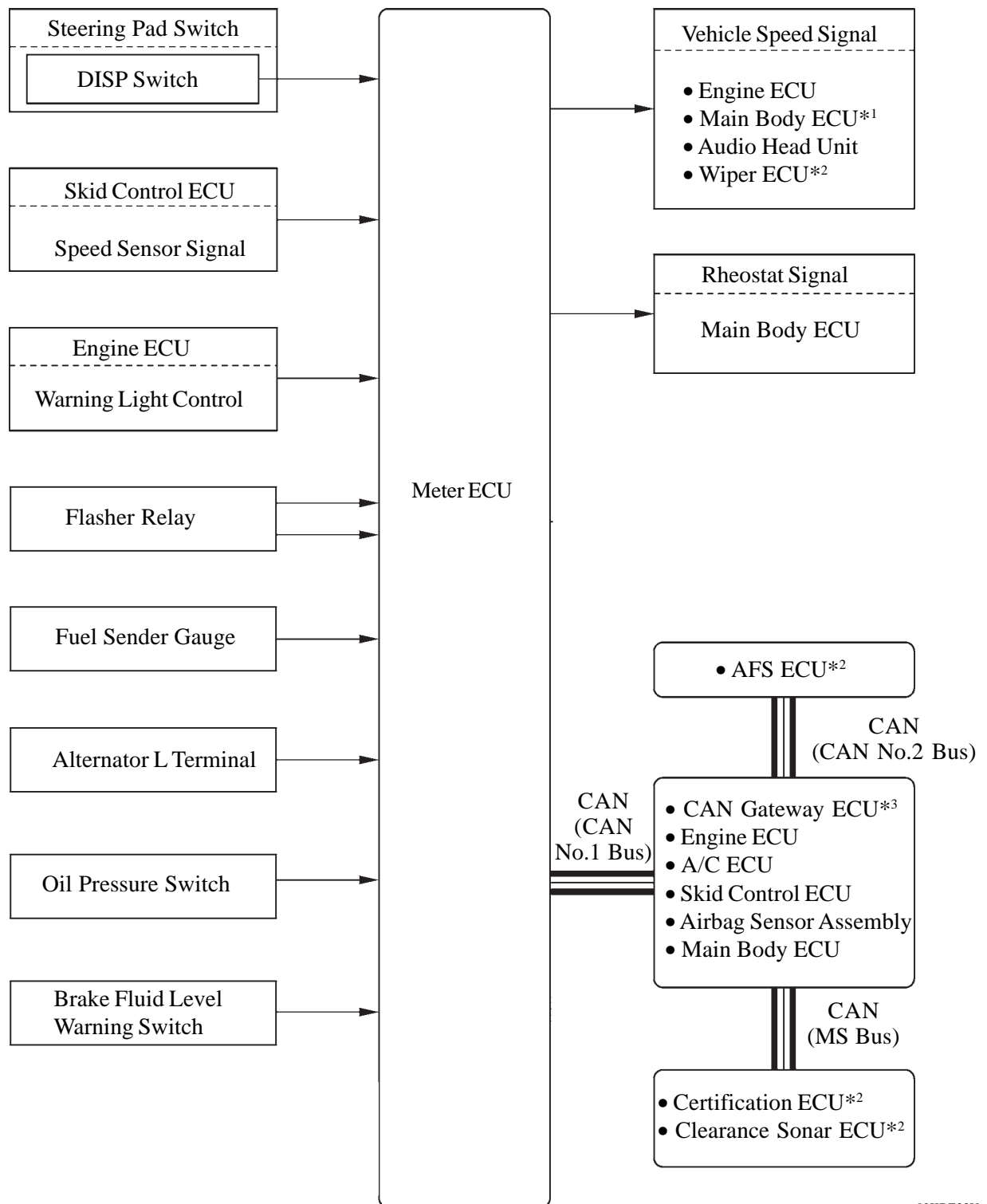
\*: The power source condition can be changed by operating the engine switch on models with the smart key system, and the ignition switch on models without the smart key system.



#### Service Tip

If the LEDs malfunction, the entire combination meter assembly must be replaced. Refer to the Aurion Repair Manual.

## 2. System Diagram



02KBE23Y

\*<sup>1</sup>: Only for models with the smart entry and start system.

\*<sup>2</sup>: Specifications vary depending on Grade. For details, see the equipment list in Model Outline Section.

\*<sup>3</sup>: Only for models with the intelligent AFS

► Input and output communication signals of the meter ECU ◀

| Protocol              | ECU                               | Input Signal to meter ECU                                                                                                                                                                                                                                                                                                                                                                           | Output Signal from meter ECU |
|-----------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| CAN<br>(CAN No.1 Bus) | Engine ECU                        | <ul style="list-style-type: none"> <li>• Engine speed</li> <li>• Engine coolant temperature</li> <li>• Fuel injection volume</li> <li>• Starter condition</li> <li>• Shift position</li> <li>• S mode indicator</li> <li>• Current range position</li> <li>• Buzzer sounding request</li> <li>• Indicator light control</li> <li>• Diagnosis (Cruise)</li> <li>• Engine type information</li> </ul> | -                            |
|                       | A/C ECU                           | Outside temperature                                                                                                                                                                                                                                                                                                                                                                                 | Vehicle speed                |
|                       | Airbag Sensor Assembly            | <ul style="list-style-type: none"> <li>• Warning light control</li> <li>• Seat belt remainder control (D)</li> <li>• Diagnosis</li> </ul>                                                                                                                                                                                                                                                           | Vehicle speed                |
|                       | Skid Control ECU                  | <ul style="list-style-type: none"> <li>• Warning light control</li> <li>• Indicator light control</li> <li>• Vehicle Speed</li> <li>• Diagnosis</li> </ul>                                                                                                                                                                                                                                          | -                            |
|                       | Main Body ECU                     | <ul style="list-style-type: none"> <li>• Lighting status</li> <li>• Parking brake switch</li> <li>• Courtesy switch</li> <li>• Buzzer sounding request</li> <li>• Auto dimmer signal</li> <li>• Unlock Warning Switch</li> <li>• Warning display control</li> <li>• Diagnosis</li> </ul>                                                                                                            | Vehicle Speed                |
| CAN<br>(CAN No.2 Bus) | AFS ECU* <sup>1</sup>             | <ul style="list-style-type: none"> <li>• Indicator light control</li> </ul>                                                                                                                                                                                                                                                                                                                         | -                            |
| CAN<br>(MS Bus)       | Certification ECU* <sup>2</sup>   | <ul style="list-style-type: none"> <li>• Warning display control</li> <li>• Buzzer sounding request</li> </ul>                                                                                                                                                                                                                                                                                      | -                            |
|                       | Clearance Sonar ECU* <sup>1</sup> | <ul style="list-style-type: none"> <li>• Warning display control</li> </ul>                                                                                                                                                                                                                                                                                                                         | Vehicle speed                |

\*1: Specifications vary depending on the vehicle grade.

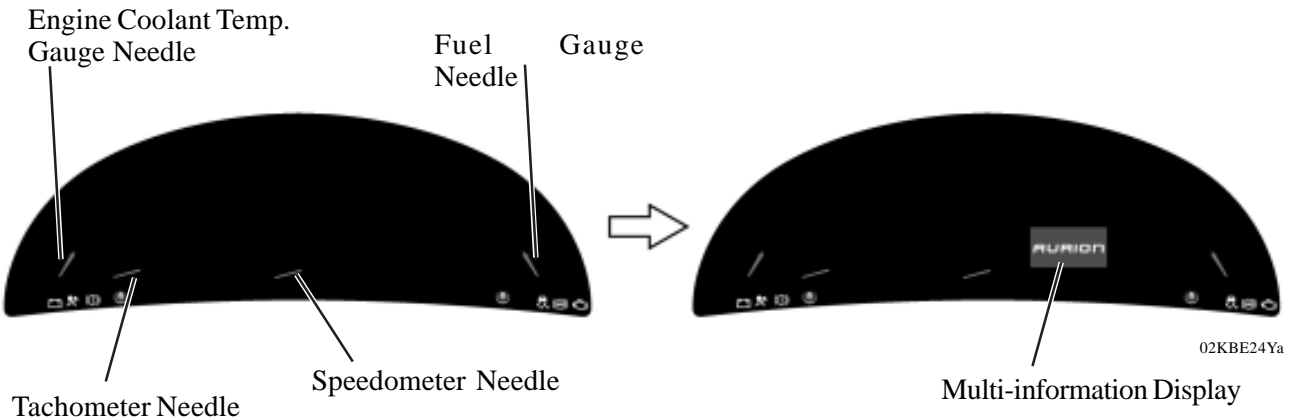
\*2: With Smart Entry and Start System.

For details, see the equipment list in the Model Outline (page MO-28).

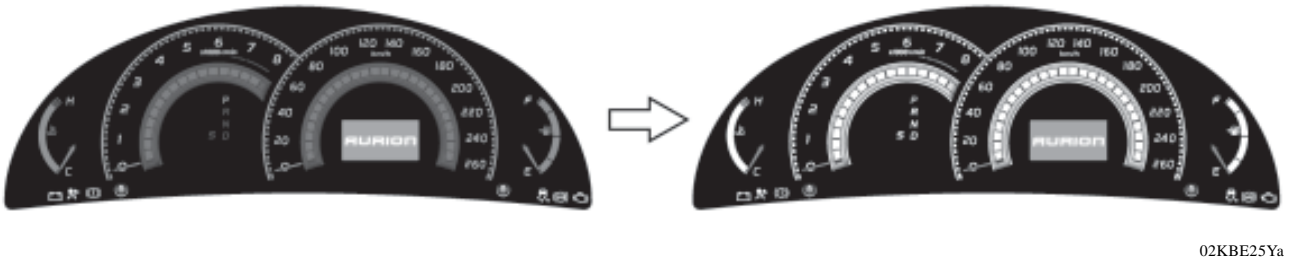
### 3. Illumination Control

- When the power source is switched to IG-ON, the illumination control operates as follows (1, 2). However, all illuminations turn off while the engine is cranked.
- When the power source is switched to OFF, the illumination control is as follows (3).

1) The needles of the speedometer, tachometer, fuel gauge and engine coolant temperature gauge are illuminated and “Aurion” appears on the multi-information display.



2) After the multi-information display illuminates, the meter illumination gradually fades in.



3) All illuminations other than the multi-information display go off, and “Aurion” appears on the multi-information display. Then the “Aurion” disappears and the multi-information display turns off.



02KBE26Ya



#### 4. Multi-information Display (Excluding AT-X Grade)

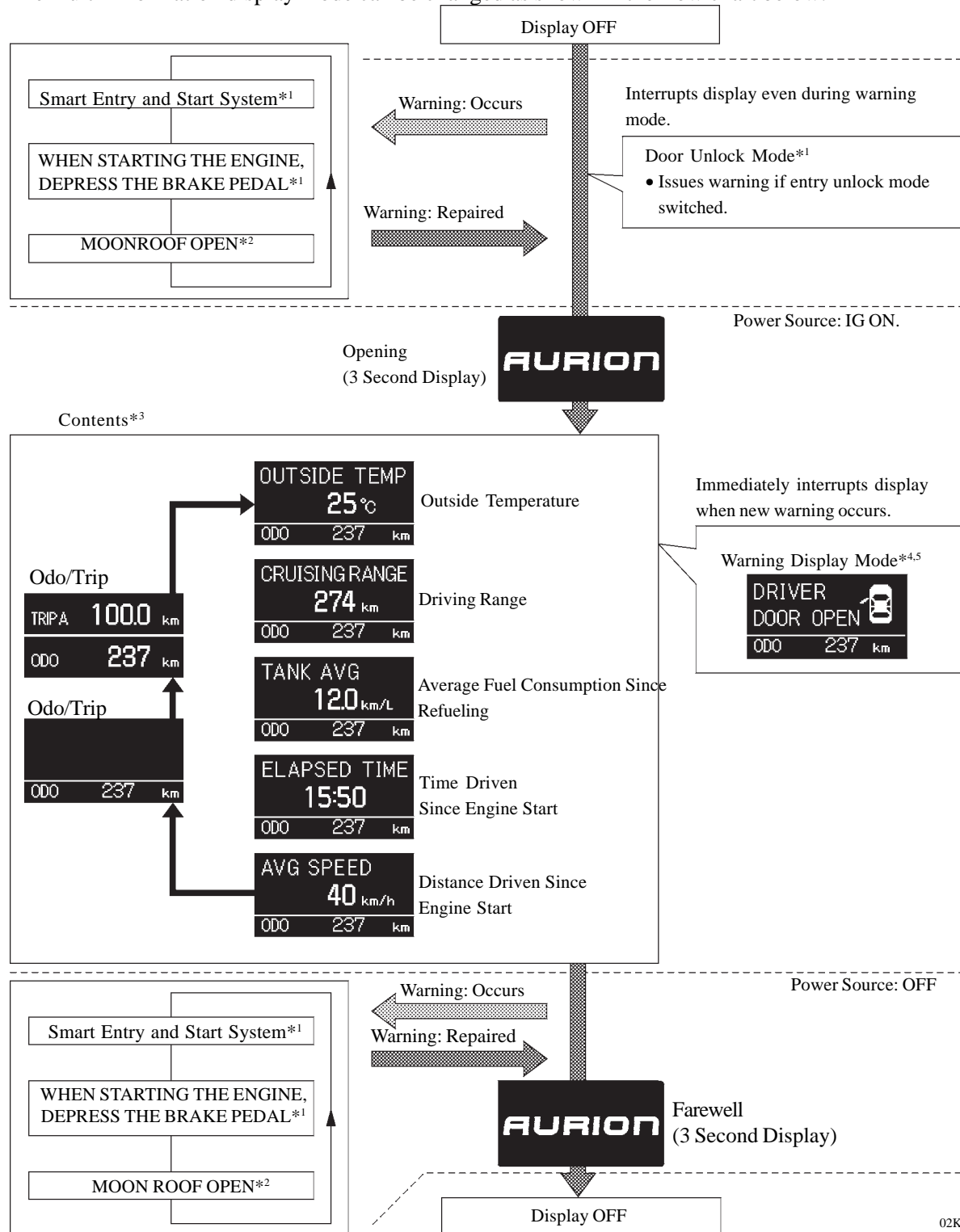
##### General

- The multi-information display has three modes:

| Mode                                   | Outline                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cruise Information<br>(See page BE-46) | <ul style="list-style-type: none"><li>• Five types of information can be displayed.</li><li>• The display can be switched by using the DISP switch.</li><li>• Optitron display type combination meter: outside temperature, driving range, average fuel consumption since refueling, time driven since engine start, and average speed since engine start.</li></ul> |
| Warning<br>(See page BE-47)            | Interrupts the multi-information display immediately when a warning occurs.                                                                                                                                                                                                                                                                                          |
| Diagnosis<br>(See page CH-81)          | DTC (Diagnostic Trouble Code) for the brake control system (TRC and VSC) can be displayed.                                                                                                                                                                                                                                                                           |

## Flow of The Multi-information Display Indication

The multi-information display mode can be changed as shown in the flow chart below:



02KBE27TE

\*1: Only for models with the smart entry and start system

\*2: Only for models with the sliding roof system

\*3: The first screen to be displayed is the same as that displayed when the power source was last turned OFF.

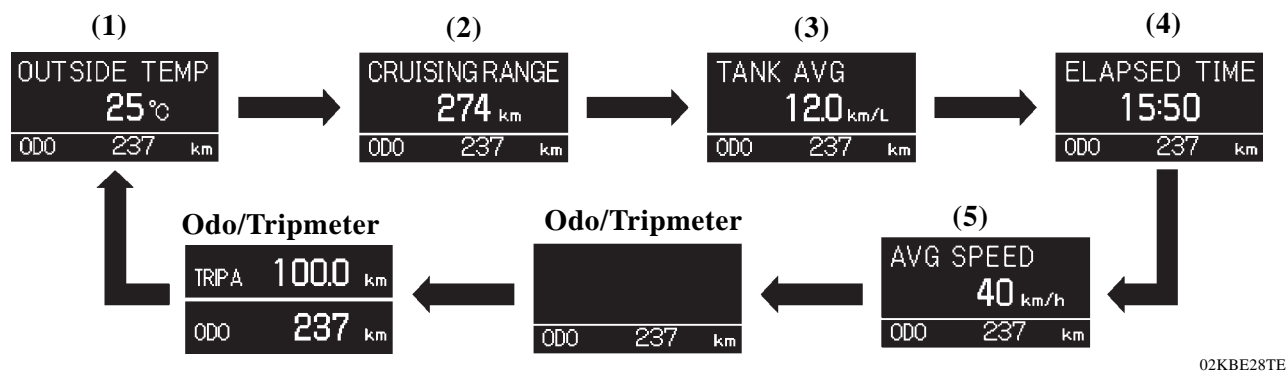
\*4: If multiple new warnings occur, they are automatically displayed at 2 second intervals.

\*5: If the display is changed from warning display mode to another mode, it automatically returns to warning display mode after 6 seconds.

Cruise Information Mode

The cruise information is displayed in the following order, changing each time the DISP switch is pressed. However, pressing the DISP switch for approximately 1 second or more changes the display to the outside temperature indication.

▸ Models with the Multi-information Display Type Combination Meter ◀


























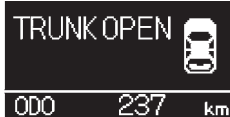


02KBE28TE




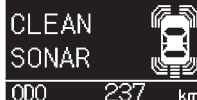
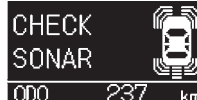
| Information | Outline                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1)         | Displays the outside temperature in accordance with the outside temperature sensor signal from the A/C ECU.                                                                                                                                                                                                                                                                                                                      |
| (2)         | <ul style="list-style-type: none"><li>• Displays the range, calculated by the combination meter which continuously monitors and stores fuel consumption data and the residual fuel volume when IG-ON has been selected.</li><li>• Updated every 1 seconds.</li></ul>                                                                                                                                                             |
| (3)         | <ul style="list-style-type: none"><li>• Displays the value calculated by the combination meter based on the distance driven since refuelling and the fuel consumption volume, which is calculated from the fuel injection signals from the No.1 injector.</li><li>• The combination meter determines the vehicle has been refuelled through the signal from the fuel sender gauge.</li><li>• Updated every 10 seconds.</li></ul> |
| (4)         | <ul style="list-style-type: none"><li>• Displays the length of time has elapsed since engine start.</li><li>• Updated every 60 seconds.</li></ul>                                                                                                                                                                                                                                                                                |
| (5)         | <ul style="list-style-type: none"><li>• Displays the average speed calculated by the combination meter based on the length of time and the distance driven since engine start.</li><li>• Updated every 10 seconds.</li></ul>                                                                                                                                                                                                     |

## Warning Mode

### General

- When a warning is necessary, the warning display interrupts the multi-information display.
- The master warning light may illuminate or flash and the buzzer may sound depending on the item in the multi-information display.

| Warning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Detail                                                                                                                             | Warning                                                                                                                                                                                                                                                                                                                 | Detail                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| <br> : Flash<br>Buzzer: Sound<br>025BE19P                                                                                                                                                                                                                                                                                                                                                                                | The key is not inside the vehicle.<br>(On models with smart entry and start system)                                                | <br> : Flash<br>Buzzer: Sound<br>025BE20P                                                                                                            | The driver door is opened with the shift lever in any position other than P.<br>(On models with smart entry and start system) |
| <br> : Flash<br>025BE21P                                                                                                                                                                                                                                                                                                                                                                                                 | Steering lock has not been released.<br>(On models with smart entry and start system)                                              | <br> : Flash<br>025BE22P                                                                                                                             | Steering lock is malfunctioning.<br>(On models with smart entry and start system)                                             |
| <br>Buzzer: Sound<br>025BE23P                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | The power source is switched from OFF to ACC twice with the brake pedal released.<br>(On models with smart entry and start system) | <br> : Illuminate<br>Buzzer: Sound<br>025BE24P                                                                                                      | TRC and VSC are malfunctioning.                                                                                               |
| <br> : Flash<br>Buzzer: Sound<br>025BE25P                                                                                                                                                                                                                                                                                                                                                                            | Key battery is low.<br>(On models with smart entry and start system)                                                               | <br> : Flash<br>Buzzer: Sound<br>025BE26P                                                                                                        | Parking brake is still engaged with the vehicle having reached a speed of 5 km/h.                                             |
| <br><br><br><br> : Flash*<br> : Illuminate<br>Buzzer: Sound*<br>025BE27P | Any door is open.<br>*: The vehicle having reached a speed of 5 km/h.                                                              | <br> : Flash*<br>Buzzer: Sound*<br>02KBE112TE                                                                                                    | Engine hood is open.<br>*: The vehicle having reached a speed of 5 km/h.                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                    | <br> : Flash*<br> : Illuminate<br>Buzzer: Sound*<br>02HBE84TE | Luggage compartment door is open.<br>*: The vehicle having reached a speed of 5 km/h.                                         |

| Warning                                                                                                                                                                               | Detail                                                                                        | Warning                                                                                                                                                    | Detail                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
|  <p>! : Flash<br/>         Buzzer: Sound<br/>         025BE30P</p>                                   | Engine oil pressure is low.                                                                   |  <p>! : Flash<br/>         Buzzer: Sound<br/>         025BE31P</p>        | Engine coolant temperature is high.                 |
|  <p>Displayed for 8 sec.<br/>         ! : Flash<br/>         Buzzer: Sound<br/>         025BE33P</p> | The sliding roof is open and the driver door is open.<br>(On models with sliding roof system) |  <p>! : Illuminate<br/>         Buzzer: Sound<br/>         02KBE117TE</p> | Toyota parking assist is dirty or covered with ice. |
|  <p>! : Illuminate<br/>         Buzzer: Sound<br/>         02KBE116TE</p>                            | Toyota parking assist is malfunctioning.                                                      |                                                                                                                                                            |                                                     |

## 4. Buzzer

### General

The table below shows the warning and reminder functions of the buzzer.

| Function | Item                                                                                                                                                               |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Warning  | <ul style="list-style-type: none"><li>• Multi-information Display Warning Mode Indication (See page BE-47)</li><li>• Shift Down Warning (See page CH-38)</li></ul> |
| Reminder | <ul style="list-style-type: none"><li>• Key Reminder (See page BE-144)</li><li>• Seat Belt Reminder (See page BE-81)</li></ul>                                     |

## WIPER AND WASHER

### ● DESCRIPTION

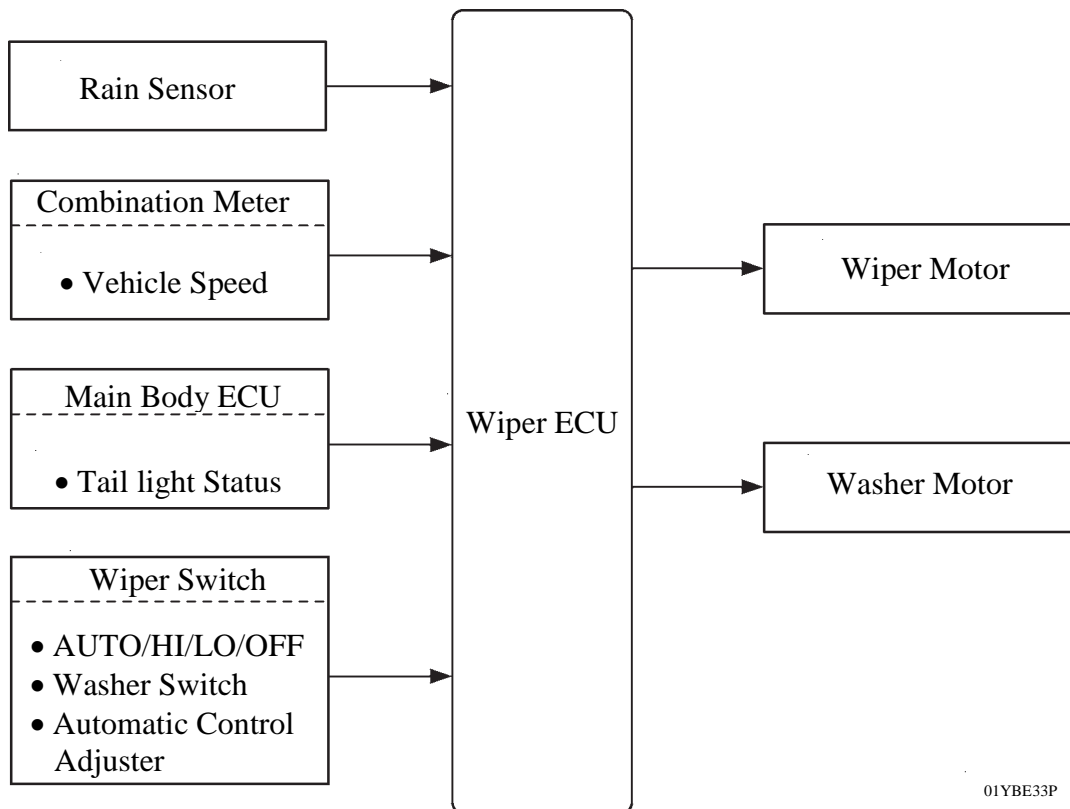
- A wiper system with a rain sensing function is available as standard equipment. Settings vary depending on model grade. For details, see the equipment list in Model Outline (page MO-28).
- This system has the following functions.

| Function |                                          | Outline                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wiper    | Rain Sensing                             | Controls the wiping interval and speed in accordance with the amount of rain, vehicle speeds and taillight signals when the wiper switch is in the AUTO position.                                                                                                                                                                                                                                                                                                                                                                                                  |
|          | Forced Wiping                            | When any one of the following conditions is met while wiping is controlled by the rain sensing function, the wiper ECU forcibly operates the wipers once. <ul style="list-style-type: none"> <li>• The wiper switch is turned from OFF to AUTO when the power source is IG-ON.</li> <li>• The vehicle starts off.</li> <li>• The automatic control adjuster is turned to the + direction (to boost the sensitivity).</li> </ul>                                                                                                                                    |
|          | Fail-safe                                | When the wiper motor malfunctions, the wiper ECU terminates both the rain sensing function and the wiper operation.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|          |                                          | When the rain sensor malfunctions, the wiper ECU sets the wiper interval depending on the vehicle speed and the automatic adjuster position, as follows: <ul style="list-style-type: none"> <li>• While stationary: Approx. 4 to 13 sec, in accordance with the automatic control adjuster position.</li> <li>• At low speeds*<sup>1</sup>: Approx. 3 to 11 sec, in accordance with the automatic control adjuster position.</li> <li>• At normal speeds*<sup>2</sup>: Approx. 2 to 10 sec, in accordance with the automatic control adjuster position.</li> </ul> |
|          | Washer-linked Wiper with Drip-prevention | To prevent the fluid from dripping after the washer has been operated, this function operates the wipers once after they have operated in unison with the washer.                                                                                                                                                                                                                                                                                                                                                                                                  |

\*<sup>1</sup>: Approximately 6 to 23 km/h during acceleration. Approximately 4 to 16 km/h during deceleration.

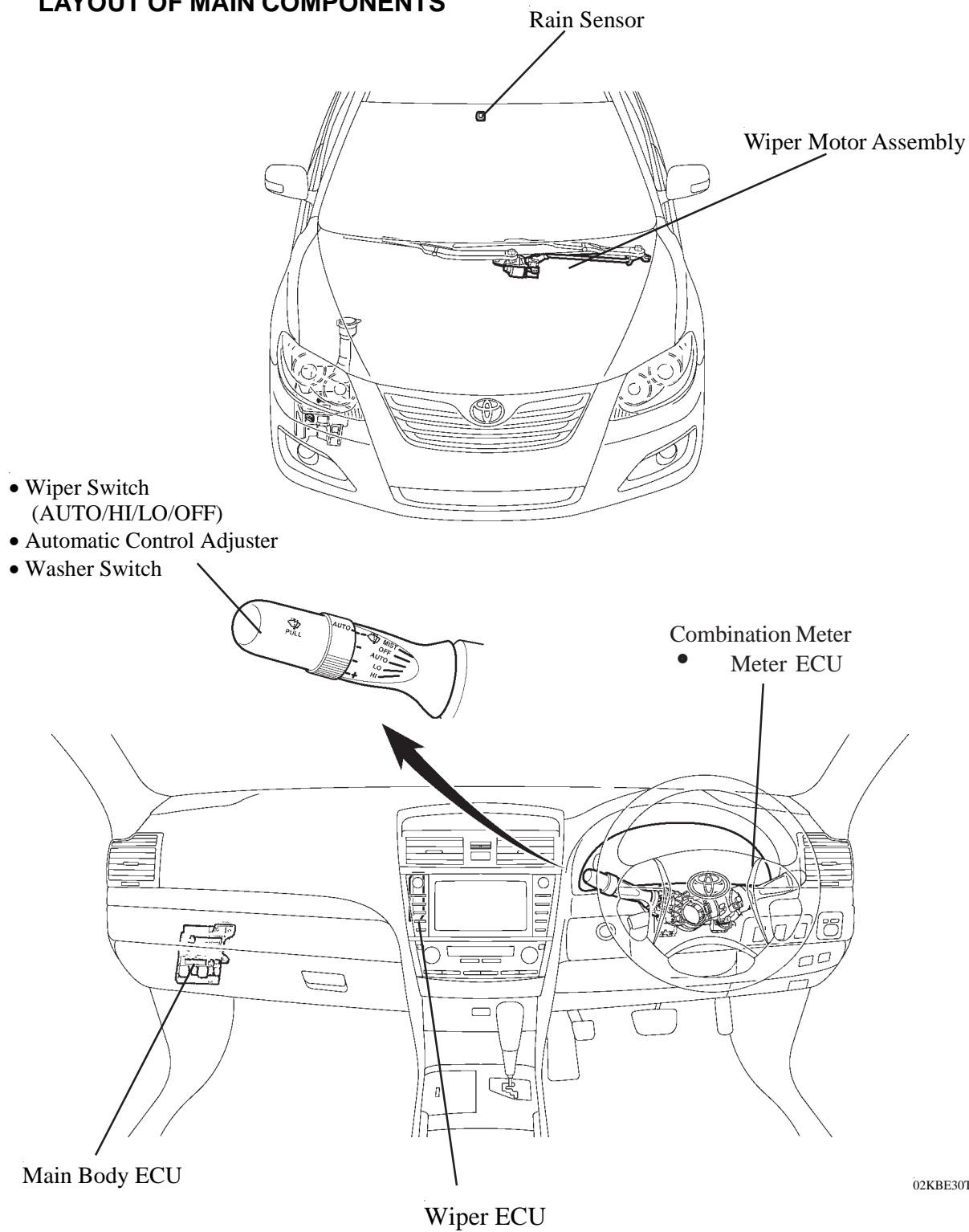
\*<sup>2</sup>: Approximately 23 km/h or more during acceleration. Approximately 16 km/h or more during deceleration.

## ▸ System Diagram ◀

**Wiper and Washer**



## ✱ LAYOUT OF MAIN COMPONENTS



02KBE30TE

## ✱ RAIN SENSING FUNCTION

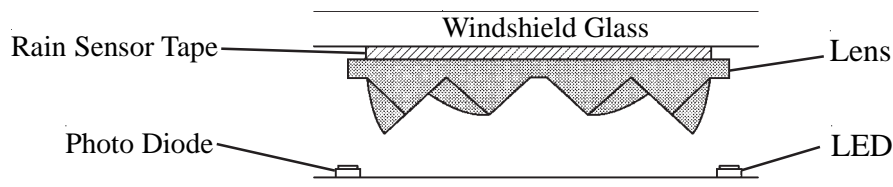
### 1. General

- The rain sensing function controls the wiping interval and speed in accordance with the amount of rain that strikes the windshield when the wiper switch is in the AUTO position.
- The wiper ECU controls the wiper operation by calculating the optimal wiping interval and speed in accordance with the following information:
  - Rainfall data transmitted by the rain sensor
  - Taillight status signals transmitted by the main body ECU (whether it is day or night)
  - Vehicle speed signals transmitted by the combination meter
  - Set values regarding the system sensitivity transmitted by the automatic control adjuster

### 2. Rain Sensor

#### General

The rain sensor consists of two LEDs (Light Emitting Diodes) that emit infrared rays, a photo diode that can receive those rays, a lens and rain sensor tape.



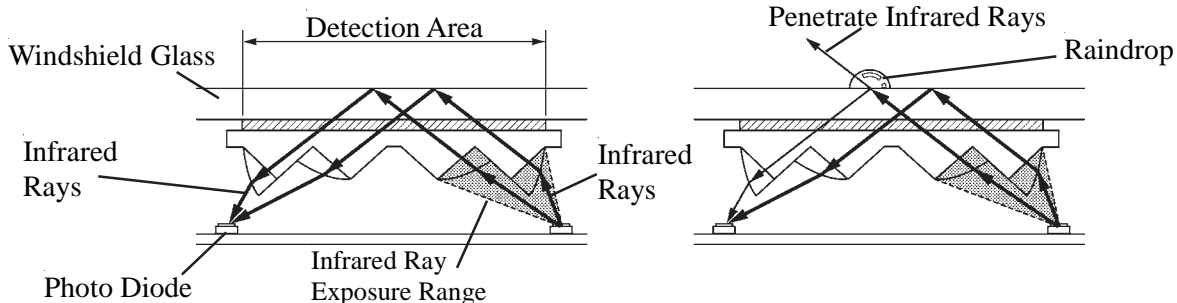
**Rain Sensor Cross-section Image**

#### Service Tip

If the rain sensor tape has been peeled off during a windshield glass replacement, be sure to affix new rain sensor tape. Failure to do so will lead to a system malfunction.

#### Operation

- If no rain is present in the detection area, the infrared rays emitted by the LED are all reflected by the outer surface of the windshield glass and are received by the photo diode.
- If rain is present in the detection area, a portion of the emitted infrared rays passes through the windshield glass due to the change in the difference between the refractive indexes of the glass and the area outside the windshield (the refractive difference between air and water). The ability of the windshield glass to reflect light back inside is reduced by the presence of the rain. This change in the internal reflection due to the presence of the water reduces the proportion of the infrared rays that are received by the photo diode. The extent of this reduction is used to determine the amount of rain falling on the windshield.



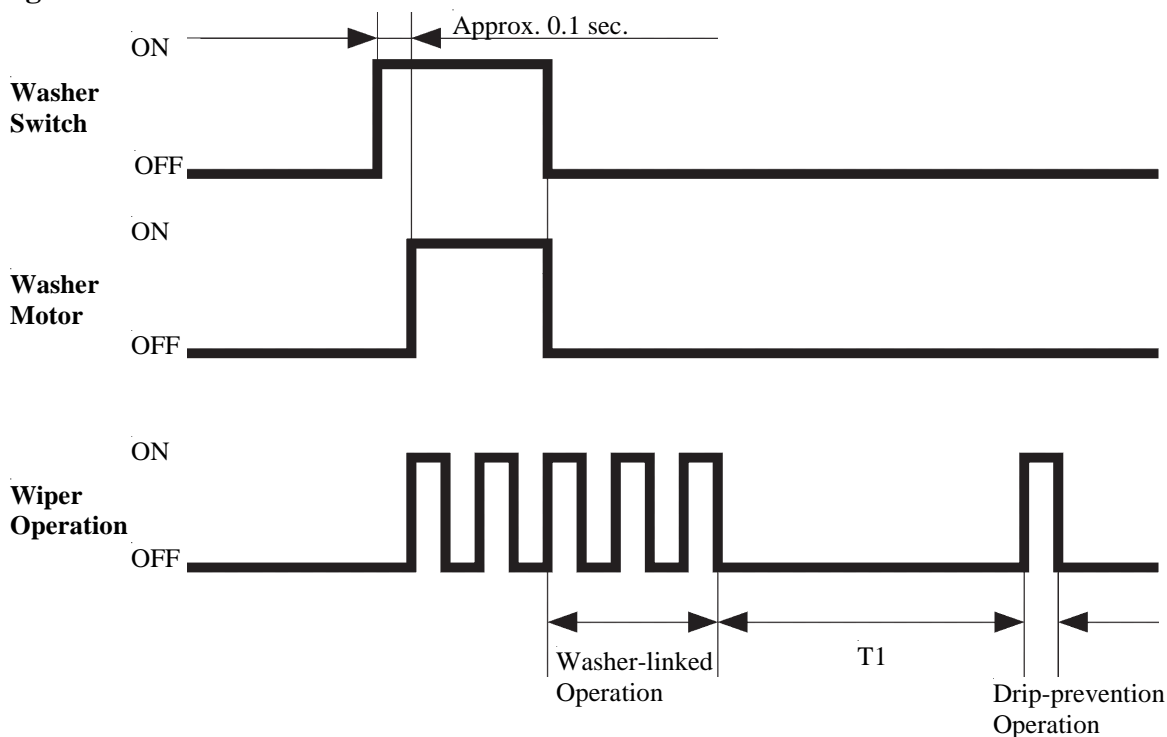
01YBE50Yb

## ✱ WASHER-LINKED WIPER WITH DRIP-PREVENTION FUNCTION

When the wiper switch is set to OFF or AUTO and the washer switch is turned ON for approximately 0.1 seconds or more, the wipers start in LO at the same time as the washer fluid is sprayed.

- The wipers operate three times in LO after the washer switch is turned OFF.
- As shown in the following diagram, after the end of this operation, the wipers operate once more. They do so after an interval time determined by the vehicle speed, so that any washer fluid drips are wiped away.

### ► Timing Chart ◀



$T1$ : From the interval time table

0140BE226C

### ► Interval Time Table ◀

| Vehicle Speed<br>km/h | Interval Time  |
|-----------------------|----------------|
| Approx. 0 to 59       | Approx. 3 sec. |
| Approx. 60 to 79      | Approx. 5 sec. |
| Approx. 80 to 119     | Approx. 7 sec. |
| Approx. 120 to 159    | Approx. 5 sec. |
| Approx. 160 to 169    | Approx. 3 sec. |
| Approx. 170 or more   | No operation   |

## AIR CONDITIONER

### ✱ DESCRIPTION

- A manual air conditioner or automatic air conditioner using left/right independent temperature control and neural network is available as standard on the Aurion. The type of air conditioner available varies depending on the destination and model. For details, see the equipment list in Model Outline (page MO-28).
- The air conditioner has the following features:

| Features         | Outline                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Automatic A/C | Manual A/C |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|
| High Performance | Neural network control is used so passengers can control the air conditioner accurately for maximum comfort.                                                                                                                                                                                                                                                                                                                                                      | ○             | —          |
|                  | FACE mode for the rear seat is installed to blow warm air and ensure excellent heating performance.                                                                                                                                                                                                                                                                                                                                                               | ○             | ○          |
|                  | An Air Conditioner Filter is used.                                                                                                                                                                                                                                                                                                                                                                                                                                | ○             | ○          |
|                  | The blower control has seven levels for precise control.                                                                                                                                                                                                                                                                                                                                                                                                          | ○             | ○          |
| Lightweight      | A BUS connector with a built-in IC is used in a lightweight wire harness design with a reduced number of wires.<br>The use of this connector means that pulse pattern type servo motors are used.                                                                                                                                                                                                                                                                 | ○             | ○          |
| Compact          | A blower motor with a built-in blower motor controller is used in a compact construction.                                                                                                                                                                                                                                                                                                                                                                         | ○             | ○          |
| Others           | The following parts are used to ensure high cooling performance while realising a compact and lightweight construction. <ul style="list-style-type: none"> <li>• Semi-centre Location A/C Unit</li> <li>• RS (Revolutionary super-slim Structure) Evaporator</li> <li>• SFA (Straight Flow Aluminium)-II Heater Core</li> <li>• MF (Multi-Flow)-IV Sub -cool Condenser</li> <li>• Continuously Variable Capacity Type Compressor with magnetic clutch.</li> </ul> | ○             | ○          |

## PERFORMANCE AND SPECIFICATION

### 1. Performance

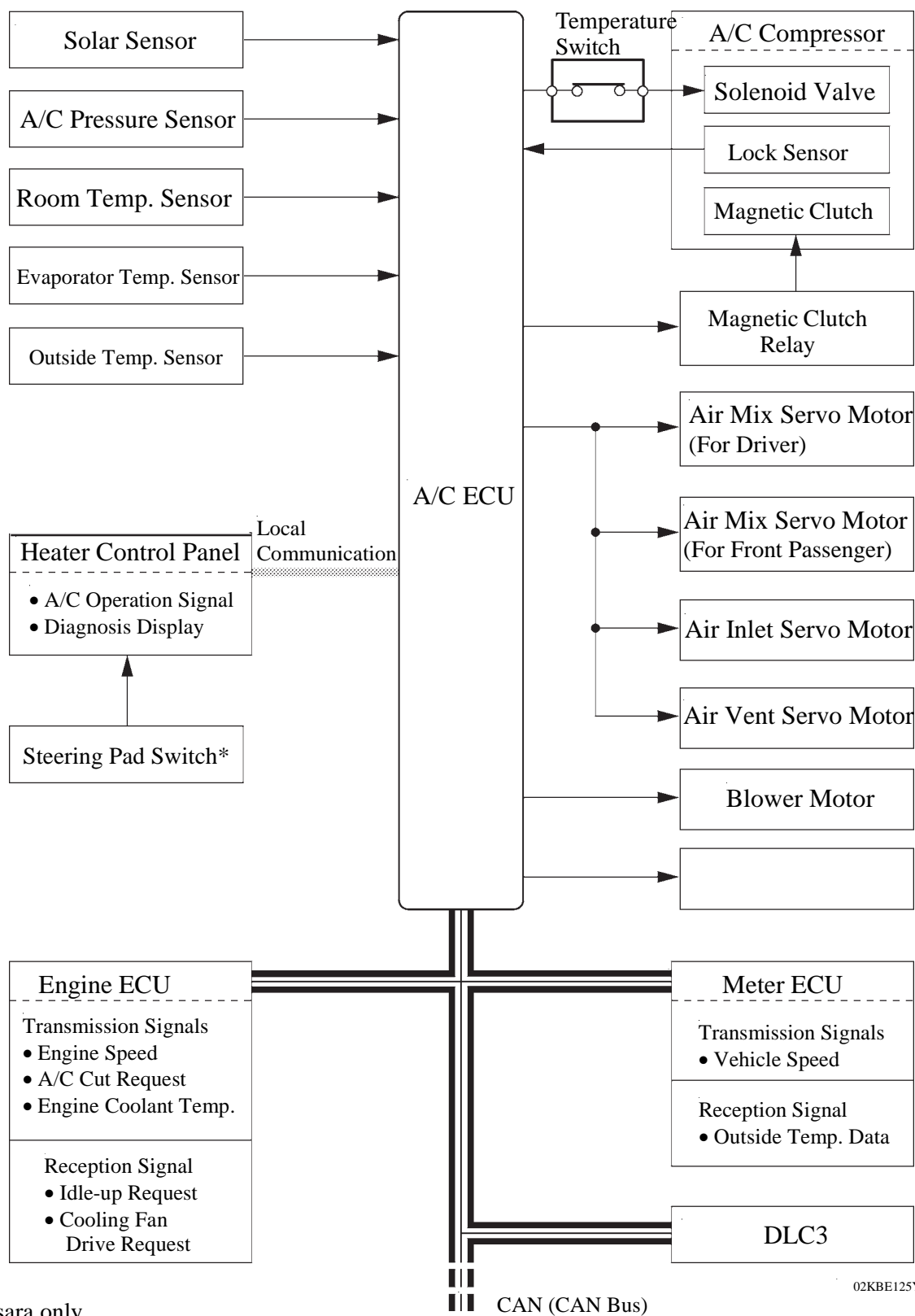
|                 |                                   | Avalon (MCX10) | Aurion (GSV40) |
|-----------------|-----------------------------------|----------------|----------------|
| Heater          | Heat Output W                     | 5580           | 6000           |
|                 | Air Flow Volume m <sup>3</sup> /h | 420            | 360            |
|                 | Power Consumption W               | 220            | Maximum 210    |
| Air Conditioner | Cooling Capacity W                | 5320           | 6100           |
|                 | Air Flow Volume m <sup>3</sup> /h | 530            | ←              |
|                 | Power Consumption W               | Maximum 260    | ←              |

### 2. Specifications

|                             |             |                    | Avalon (MCX10)                | Aurion (GSV40)                          |
|-----------------------------|-------------|--------------------|-------------------------------|-----------------------------------------|
| Ventilation and Heater Core | Heater Core | Type               | SFA (Straight Flow Aluminium) | SFA (Straight Flow Aluminium) -II       |
|                             |             | Size W×H×L mm      | 160 × 220 × 32                | 201.5 × 150 × 27                        |
|                             |             | Fin Pitch mm       | 1.8                           | 1.5                                     |
|                             | Blower      | Motor Type         | A80FS12.5T                    | K70 BMM                                 |
|                             |             | Fan Type           | Sirocco                       | Semi Sirocco                            |
|                             |             | Fan Size Dia.×H mm | 150 × 75                      | 165 × 70                                |
| Air Conditioner             | Condenser   | Type               | 3-Passage Serpentine Type     | MF (Multi-Flow) -IV                     |
|                             |             | Size W×H×L mm      | 686 × 435.2 × 22              | 720 × 370.2 × 16                        |
|                             |             | Fin Pitch mm       | 4.5                           | 3.15                                    |
|                             | Evaporator  | Type               | Drawn Cup Type                | RS (Revolutionary super-slim Structure) |
|                             |             | Size W×H×L mm      | 260 × 252 × 90                | 266.3 × 251 × 38                        |
|                             |             | Fin Pitch mm       | 4.0                           | 2.6                                     |
|                             | Compressor  | Type               | 10PA17                        | 6SBU16                                  |
|                             |             | Pulley             | Magnetic Clutch               | Magnetic Clutch                         |
|                             | Refrigerant | Type               | HFC 134a                      | ←                                       |
|                             |             | Charge Volume g    | 580 ±50                       | 500 ±50                                 |

# ● **SYSTEM DIAGRAM**

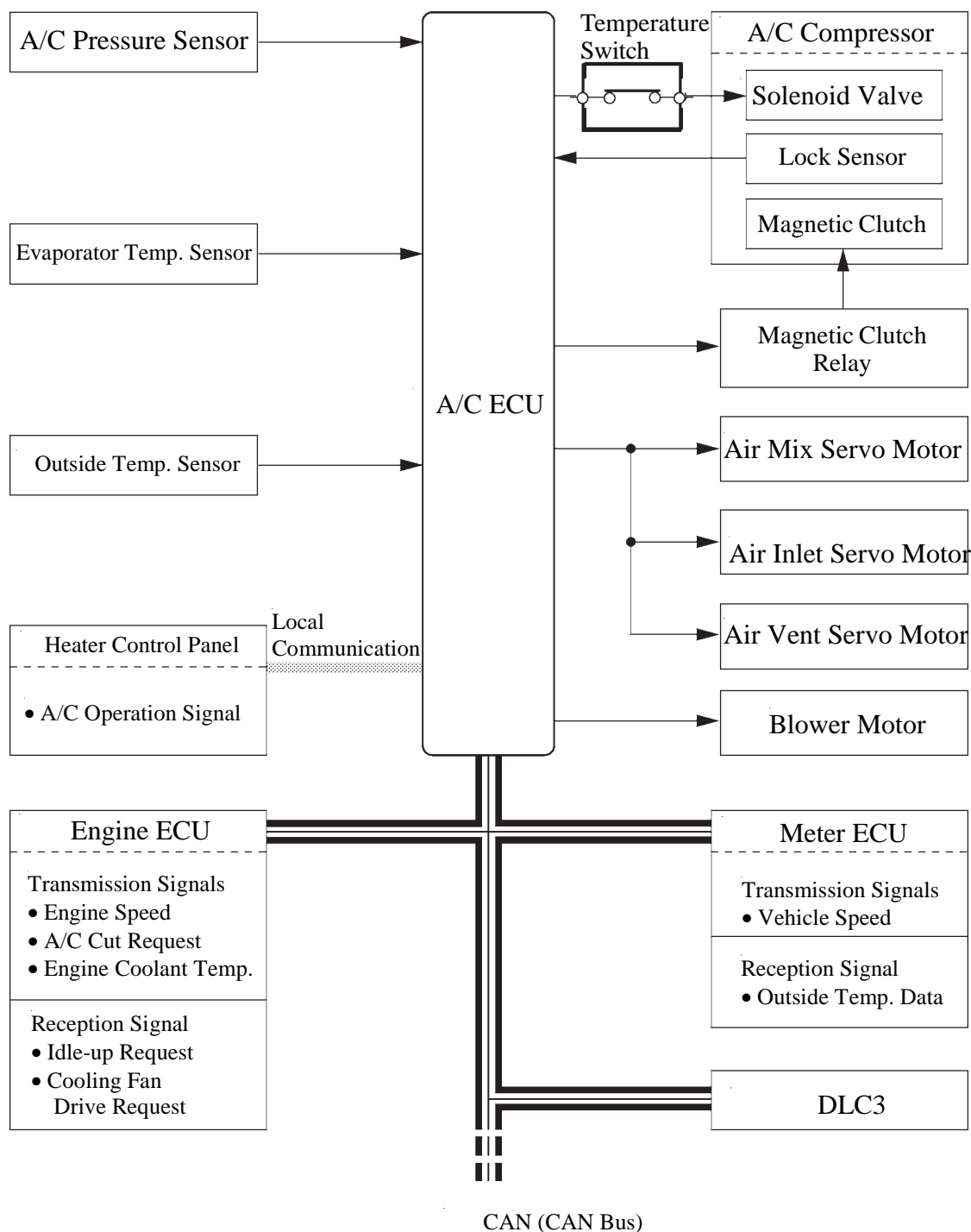
## ▶ **Automatic Air Conditioner** ◀



02KBE125Yb

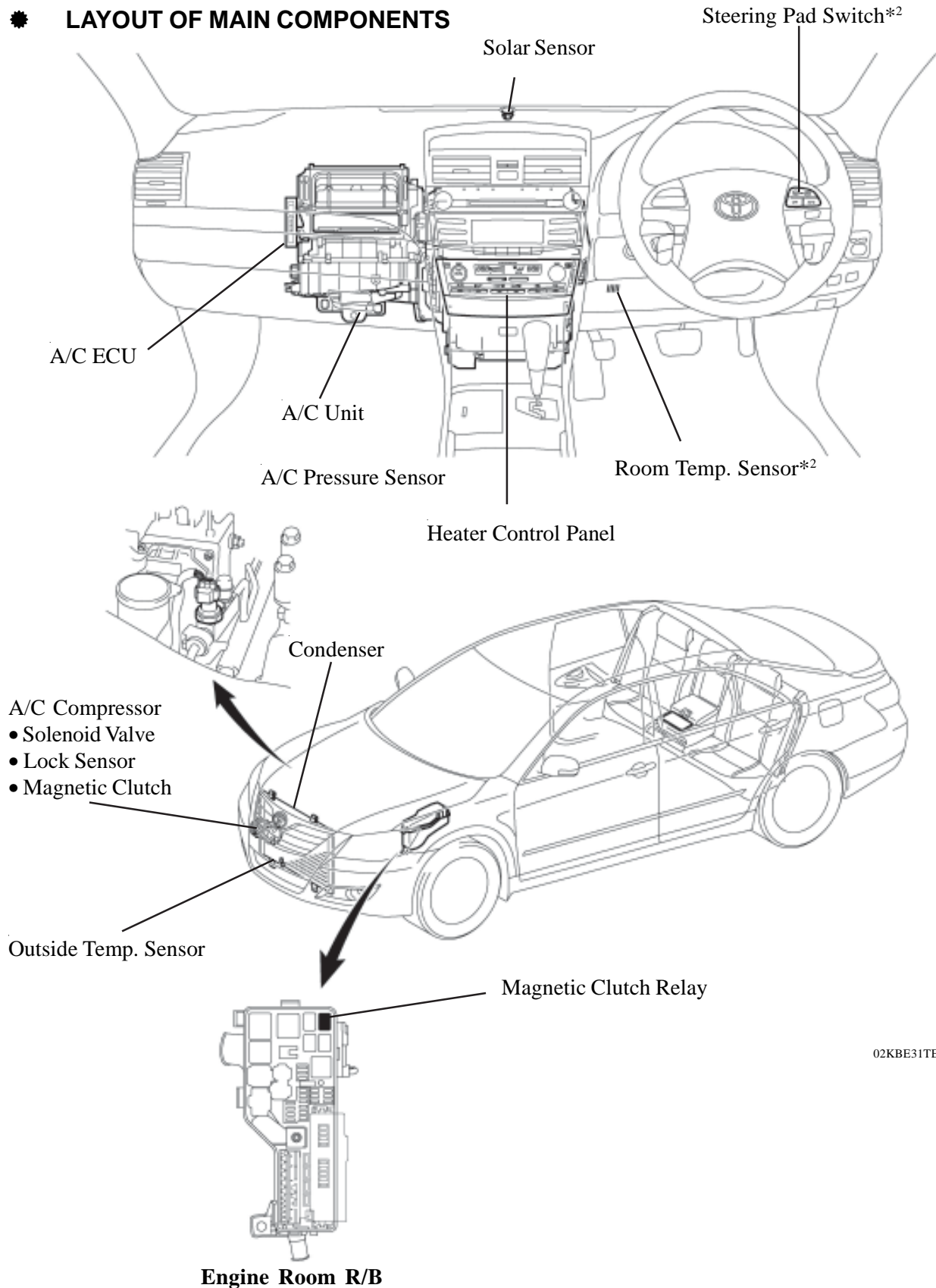
\*: Presara only

# ▶ Manual Air Conditioner ◀



02KBE126Yb

# ● **LAYOUT OF MAIN COMPONENTS**

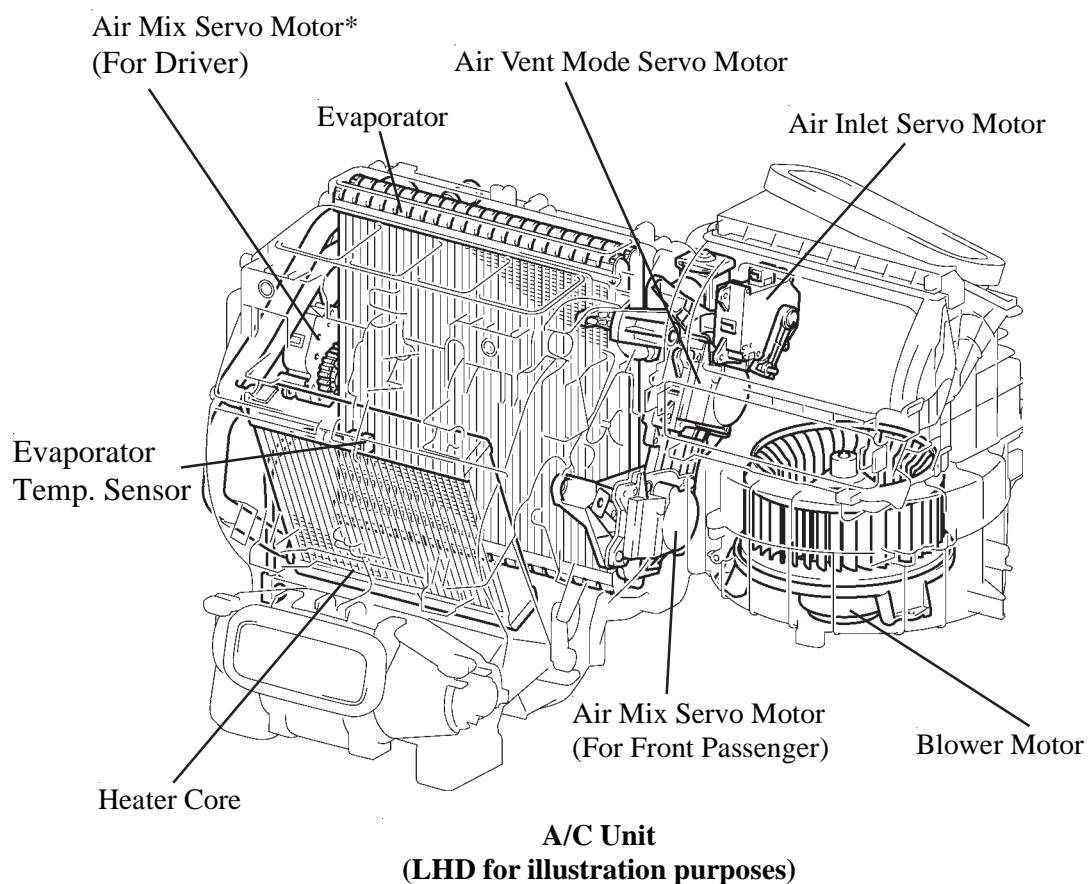


02KBE31TE

\*<sup>1</sup>: Only for models with automatic air conditioner

\*<sup>2</sup>: Presara only





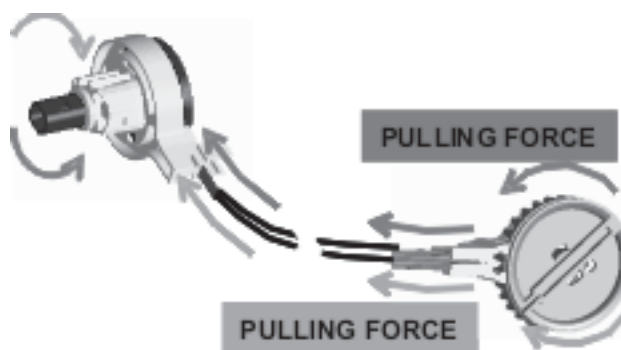
\*: Only for models with the automatic air conditioner

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### Servo Module

Servo Module contains both Servo motors and Linkage for the Air Mix and the Air Distribution controls.

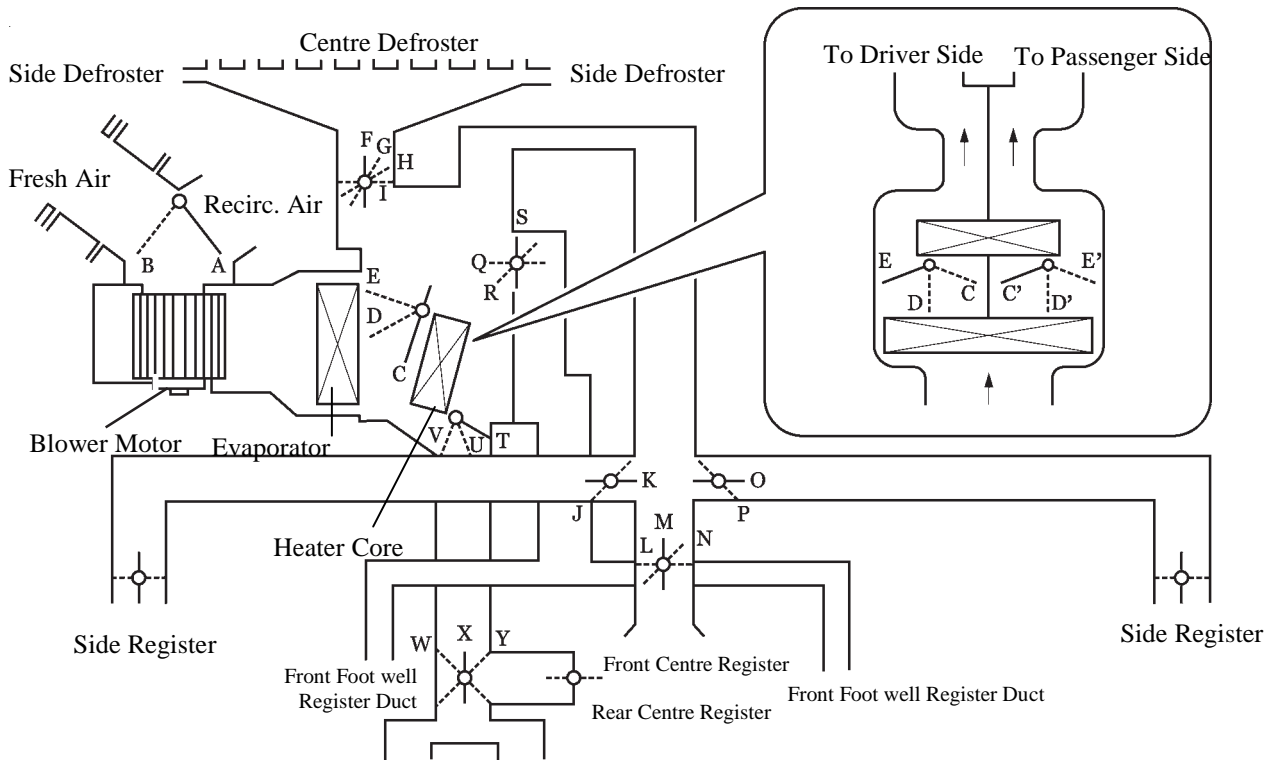


### Pull Pull Control Cable

Pull Pull Cable is used to connect the linkage on the Servo Module to the Rear Duct Control.

## ● **MODE POSITION AND DAMPER OPERATION**

### **1. Automatic Air Conditioner**

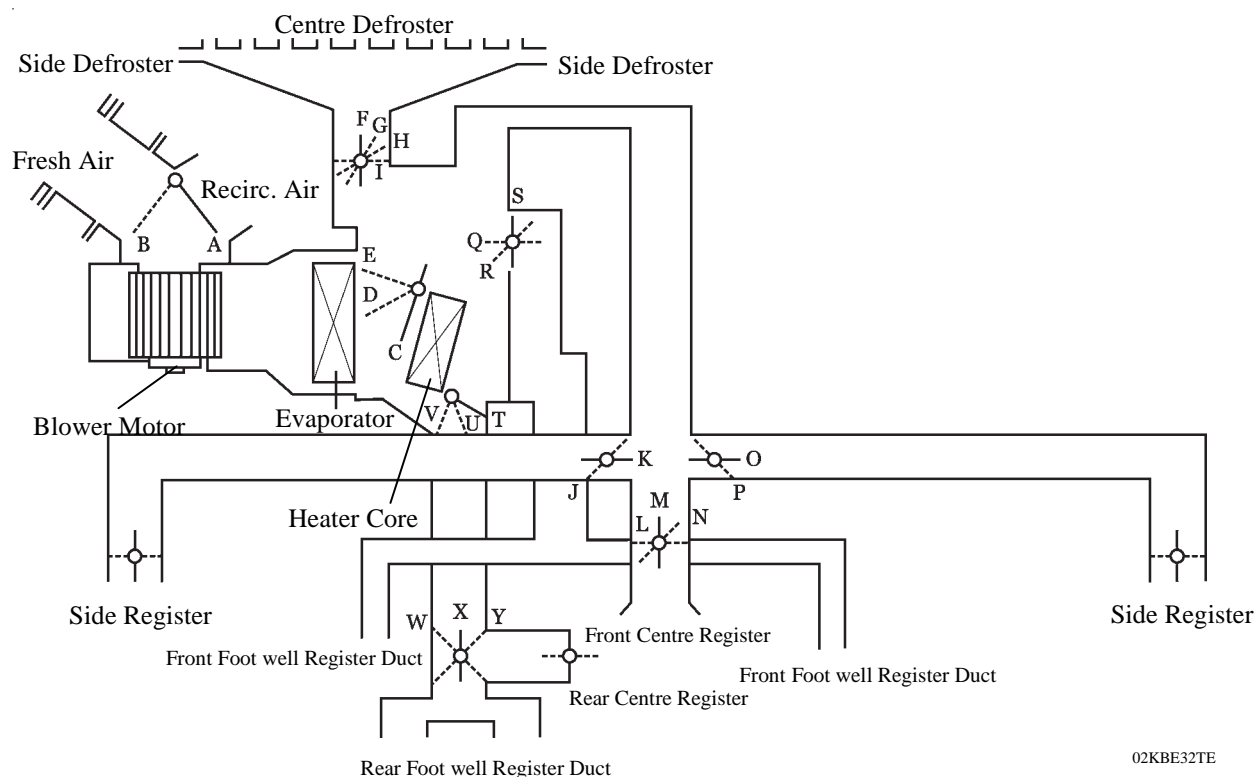


#### ► **Function of Main Damper** ◀

02HBE35TE

| Control Damper           | Operation Position                | Damper Position                          | Operation                                                                                                                                                                                    |
|--------------------------|-----------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Air Inlet Control Damper | FRESH                             | A                                        | Brings in fresh air.                                                                                                                                                                         |
|                          | RECIRC                            | B                                        | Recirculates internal air.                                                                                                                                                                   |
| Air Mix Control Damper   | MAX COLD to MAX HOT Temp. Setting | C – D – E<br>(C' – D' – E')<br>T – U – V | Varies the mixture ratio of the fresh air and the recirculated air in order to regulate the temperature continuously from HOT to COLD.                                                       |
| Mode Control Damper      | DEF<br>187BE28                    | F, J, L, P, S, Y                         | Defrosts the windshield through the centre defroster, side defroster, and side register.                                                                                                     |
|                          | FOOT / DEF<br>187BE27             | G, J, L, P, Q, X                         | Defrosts the windshield through the centre defroster, side defroster, side register, and rear centre register, while air is also blown out from the front and rear foot well register ducts. |
|                          | FOOT<br>187BE26                   | H, J, L, P, Q, X                         | Air blows out of the foot well register duct, and side register. In addition, air blows out slightly from the centre defroster and side defroster.                                           |
|                          | BI-LEVEL<br>187BE25               | I, K, N, O, R, X                         | Air blows out of the front and rear centre registers, side register and front and rear foot well register ducts.                                                                             |
|                          | FACE<br>187BE24                   | I, K, M, O, S, W                         | Air blows out of the front and rear centre registers, and side register.                                                                                                                     |

## 2. Manual Air Conditioner

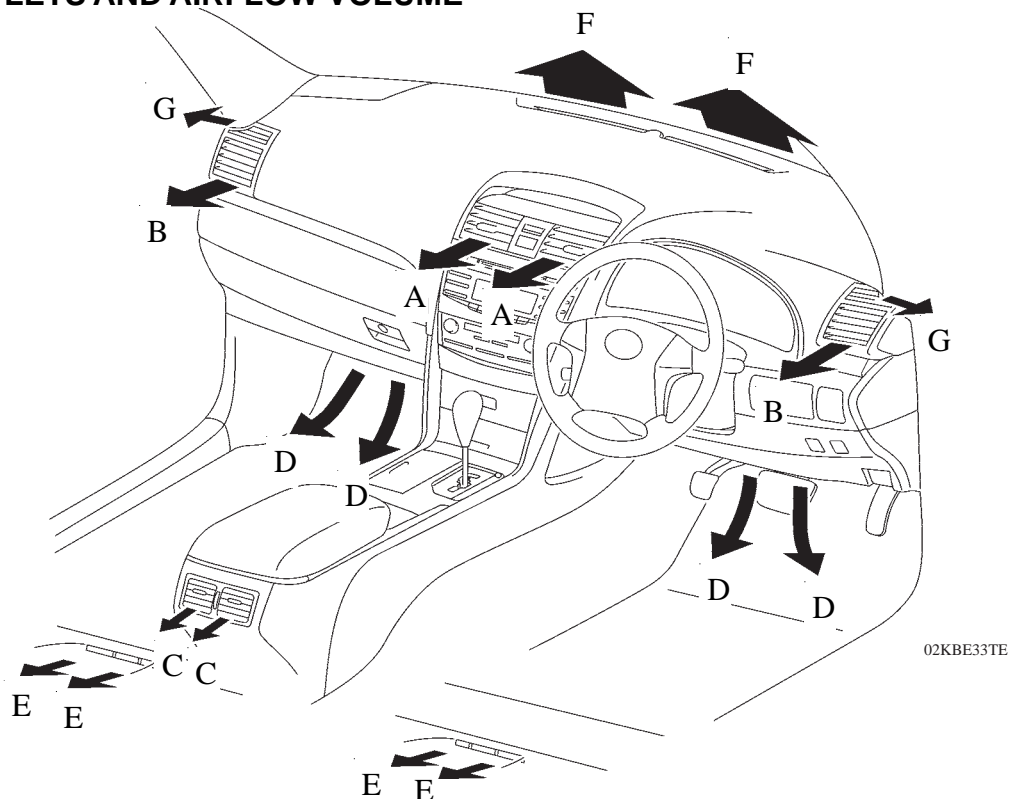


02KBE32TE

### ► Function of Main Damper ◀

| Control Damper           | Operation Position                | Damper Position        | Operation                                                                                                                                                              |
|--------------------------|-----------------------------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Air Inlet Control Damper | FRESH                             | A                      | Brings in fresh air.                                                                                                                                                   |
|                          | RECIRC                            | B                      | Recirculates internal air.                                                                                                                                             |
| Air Mix Control Damper   | MAX COLD to MAX HOT Temp. Setting | C – D – E<br>T – U – V | Varies the mixture ratio of the fresh air and the recirculated air in order to regulate the temperature continuously from HOT to COLD.                                 |
| Mode Control Damper      | DEF<br>187BE28                    | F, J, L, P, S, Y       | Defrosts the windshield through the centre defroster, side defroster, and side register.                                                                               |
|                          | FOOT / DEF<br>187BE27             | G, J, L, P, Q, X       | Defrosts the windshield through the centre defroster, side defroster, and side register, while air is also blown out from the front and rear foot well register ducts. |
|                          | FOOT<br>187BE26                   | H, J, L, P, Q, X       | Air blows out of the foot well register duct, and side register. In addition, air blows out slightly from the centre defroster and side defroster.                     |
|                          | BI-LEVEL<br>187BE25               | I, K, N, O, R, X       | Air blows out of the front centre register, side register and front and rear foot well register ducts.                                                                 |
|                          | FACE<br>187BE24                   | I, K, M, O, S, W       | Air blows out of the front centre register and side register.                                                                                                          |

# AIR OUTLETS AND AIRFLOW VOLUME



| INDICATION | MODE                 | SELECTION |        | FACE |      |    | FOOT |    | DEF |      |
|------------|----------------------|-----------|--------|------|------|----|------|----|-----|------|
|            |                      |           |        | CTR  | SIDE | RR | FR   | RR | CTR | SIDE |
|            |                      | AUTO      | MANUAL | A    | B    | C  | D    | E  | F   | G    |
|            | FACE                 | ○         | ○      | ●    | ●    | ●  | —    | —  | —   | —    |
|            | B/L-U* <sup>1</sup>  | ○         | ○      | ●    | ●    | ●  | ○    | ○  | —   | —    |
|            | B/K-L* <sup>2</sup>  | ○         | —      | ○    | ○    | ○  | ●    | ●  | —   | —    |
|            | FOOT-F* <sup>3</sup> | ○         | —      | —    | ○    | ○  | ●    | ○  | ○   | ○    |
|            | FOOT-R* <sup>4</sup> | ○         | ○      | —    | ○    | ○  | ●    | ●  | ○   | ○    |
|            | FOOT-D* <sup>5</sup> | ○         | —      | —    | ○    | ○  | ○    | ○  | ○   | ○    |
|            | F/D                  | ○         | ○      | —    | ○    | ○  | ●    | ●  | ○   | ○    |
|            | DEF                  | ○         | ○      | —    | ○    | —  | —    | —  | ●   | ●    |

The size of the circle ○ indicates the proportion of airflow volume.

\*<sup>1</sup>: Greater airflow volume at the upper area.

\*<sup>2</sup>: Greater airflow volume at the lower area.

\*<sup>3</sup>: Greater airflow volume at the front.

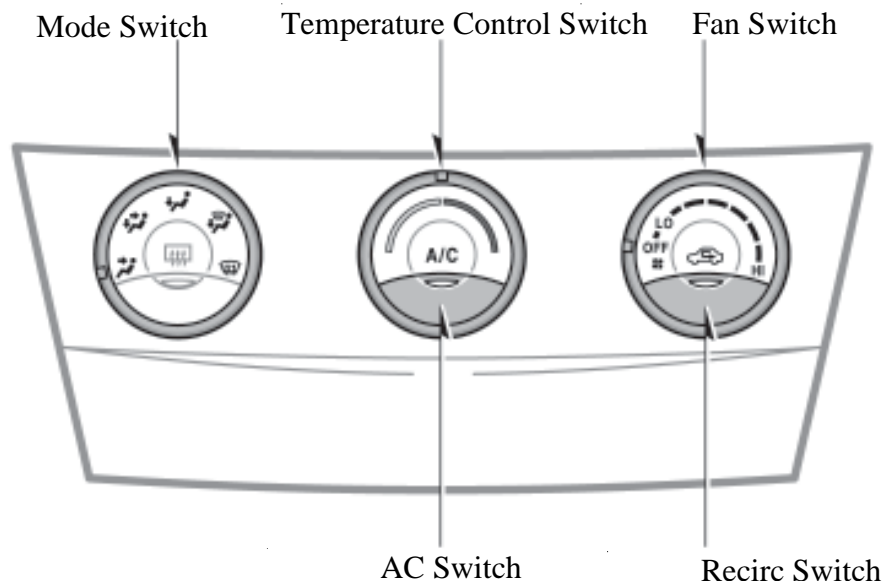
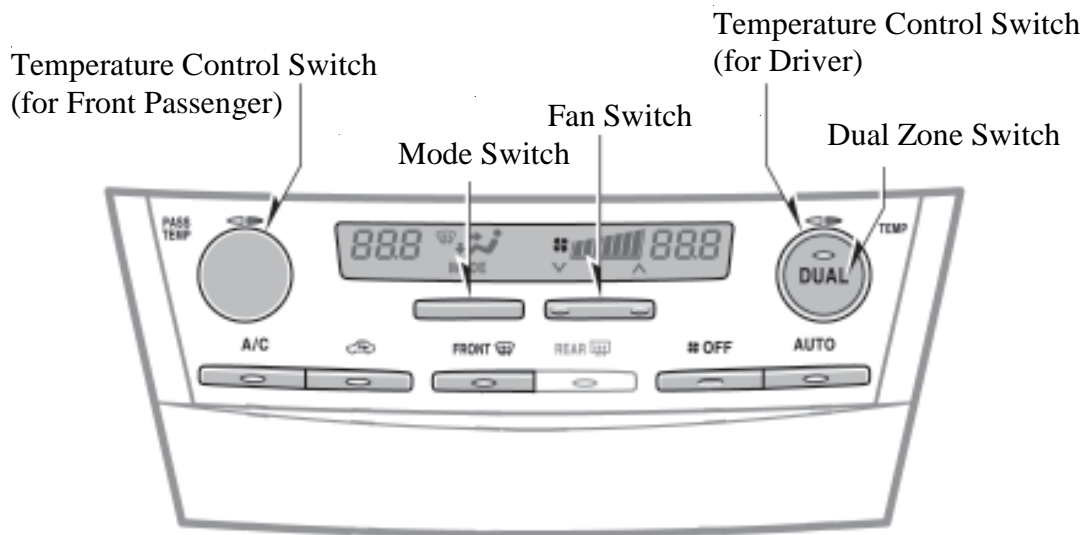
\*<sup>4</sup>: Greater airflow volume at the rear.

\*<sup>5</sup>: Greater airflow volume at the defroster.

## ✱ CONSTRUCTION AND OPERATION

### 1. Heater Control Panel

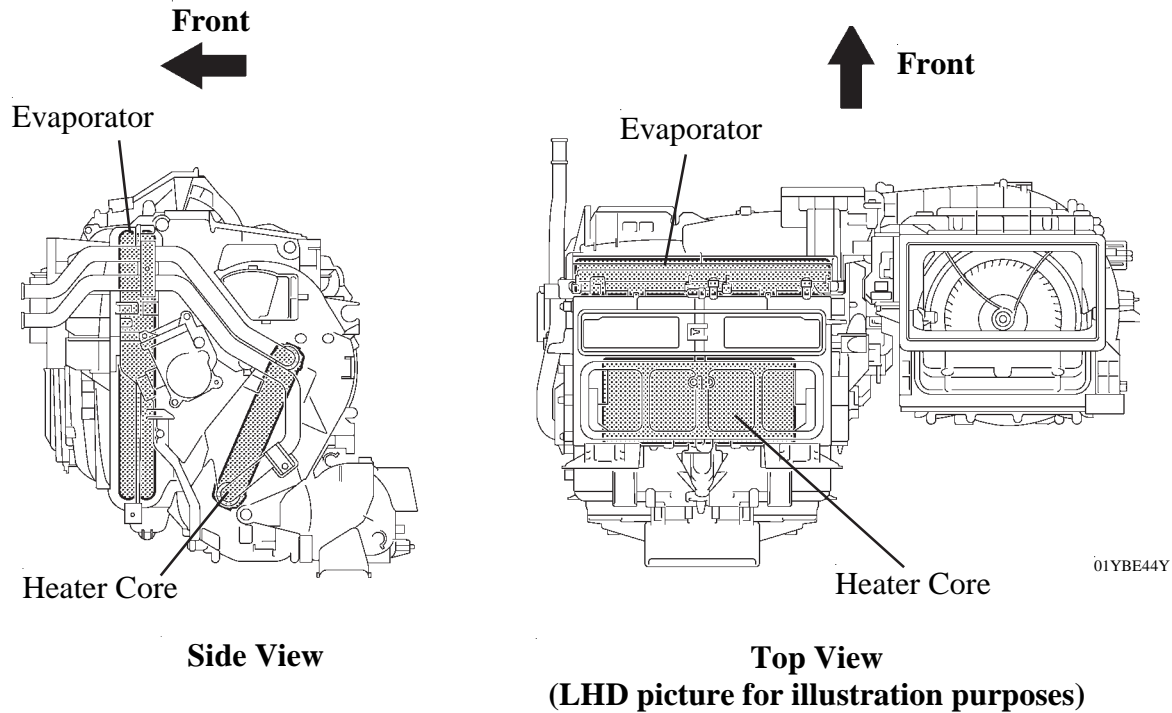
- 2 types of heater control panel are used on Aurion, differing between models with the automatic air conditioner and those with the manual air conditioner.
- On models with the automatic air conditioner, the air conditioner status is displayed on an LCD (Liquid Crystal Display) panel.
- On models with the automatic air conditioner, as part of the right/left independent temperature control, the temperature control switches for the driver and the front passenger have been located closer to the respective seats for enhanced ease of use.
- On Presara models, some A/C operations (AUTO operation, A/C OFF and driver side temperature setting) can be performed using the steering pad switches (AUTO, OFF and TEMP) on the steering wheel. For details, refer to Steering Pad Switch (page BE-203)



## 2. Air Conditioner Unit

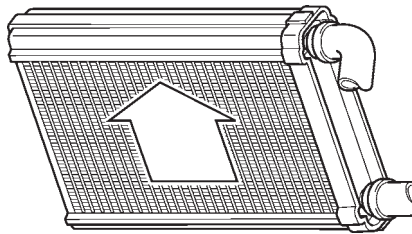
### General

A semi-centre location air conditioner unit, in which the evaporator and heater core are placed in the vehicle's longitudinal direction, is used. As a result, the air conditioner unit has been made compact and lightweight.



### Heater Core

A compact, lightweight, and highly efficient SFA (Straight Flow Aluminium)-II type heater core is used.

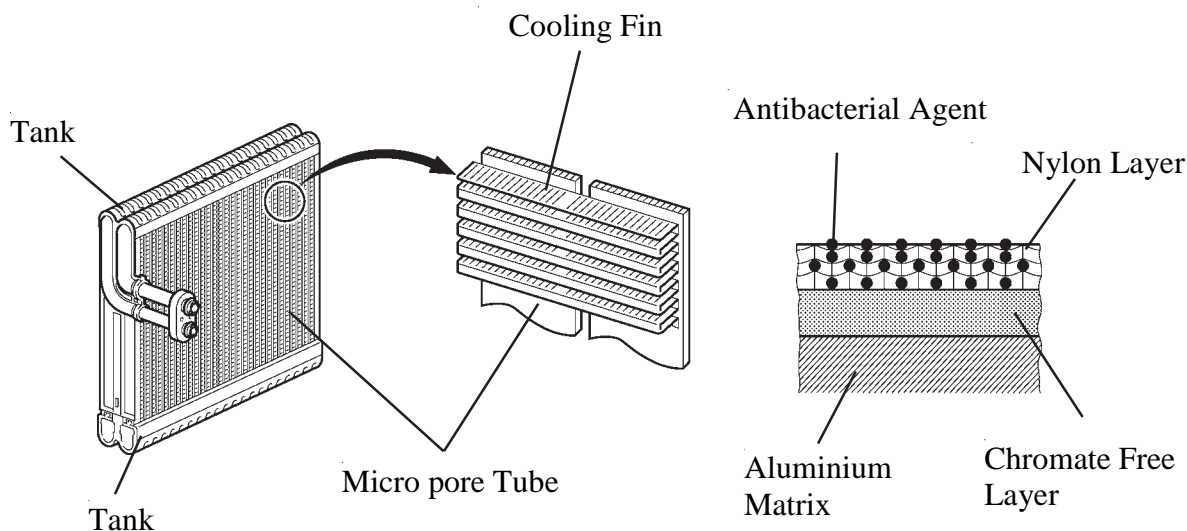


### Evaporator

A semi-centre location air conditioner unit, in which the evaporator and heater core are placed in the vehicle's longitudinal direction, is used. As a result, the air conditioner unit has been made compact and lightweight.

- A revolutionary super-slim structure evaporator is used.
- By placing the tanks at the top and the bottom of the evaporator unit and adopting a micro pore tube construction, the following effects have been realised:
  - a) The heat exchanging efficiency has been improved.
  - b) The temperature distribution has been made more uniform.
  - c) The evaporator has been made thinner: 58 mm → 38 mm

- The evaporator body has been coated with a type of resin that contains an antibacterial agent in order to minimise the source of foul odor and the propagation of bacteria. The substrate below this coating consists of a chromate-free layer to help protect the environment.



### Evaporator Temp. Sensor

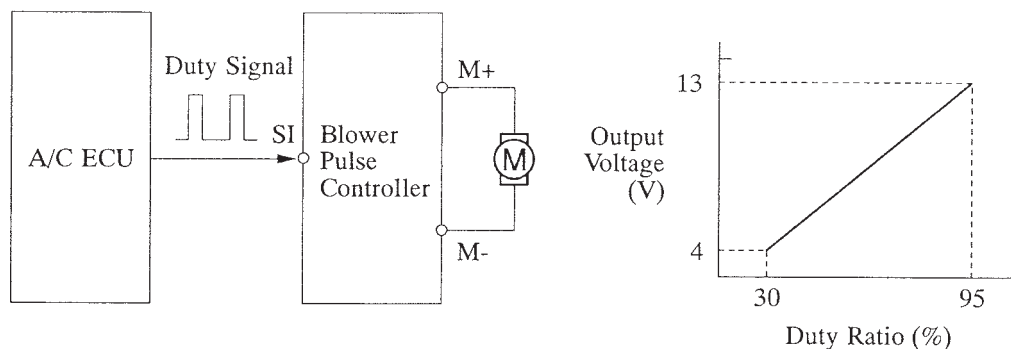
The evaporator temp. sensor detects the temperature of the cool air immediately past the evaporator by measuring resistance changes, and outputs it to the A/C ECU.

### Blower Motor

The blower motor has an in-built blower controller, and is controlled with the duty control from the A/C ECU.

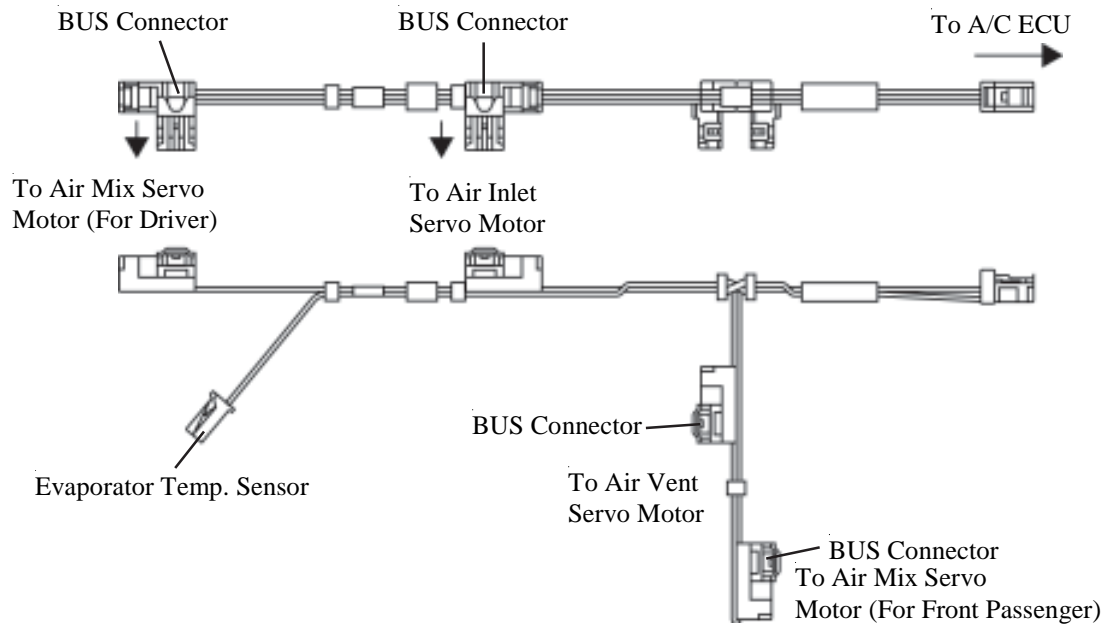
### Blower Pulse Controller

The blower pulse controller control the voltage that is output to the blower motor in accordance with the duty cycle signals that are input by the A/C ECU.



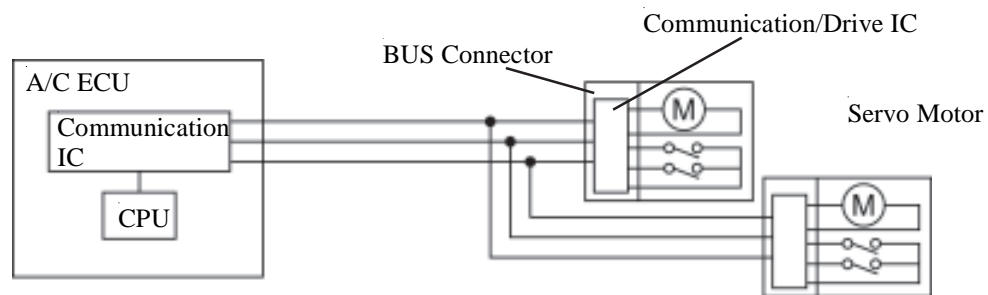
## BUS Connector

- A BUS connector is used in the wire harness connection that connects the servo motor to the A/C ECU.



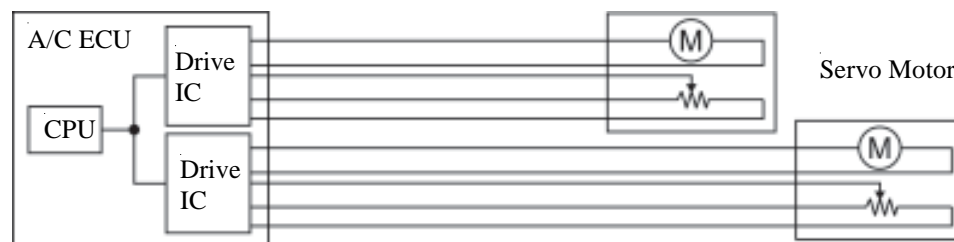
285BE43

- The BUS connector has a built-in communication/drive IC which communicates with each servo motor connector, actuates the servo motor, and has a position detection function. This enables bus communication for the servo motor wire harness, for a more lightweight construction and a reduced number of wires.



**With BUS Connector**

285BE44



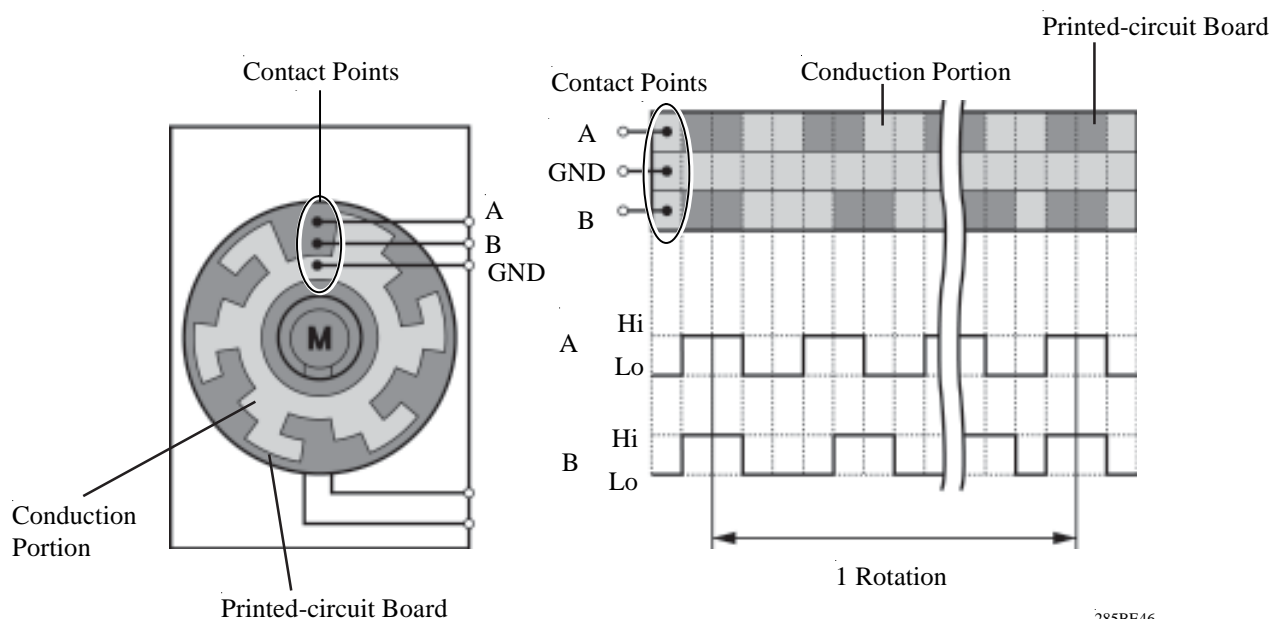
**Without BUS Connector**

285BE45



## Servo Motor

The pulse pattern type servo motor consists of a printed circuit board and servo motor. The printed circuit board has three contact points, and transmits to the A/C ECU two ON-OFF signals for each change in the pulse phase. The smart connector detects the damper position and movement direction with this signal.



285BE46

**NOTE:** When one of the following operations is conducted, the A/C ECU automatically performs the initialisation to detect the original positions of the servo motors. Although either the front DEF indicator\*<sup>1</sup> or the rear DEF indicator\*<sup>2</sup> on the heater control panel blinks during the initialisation, this does not indicate a malfunction.

- After the battery terminal has been disconnected, the power source\*<sup>3</sup> is switched to IG-ON or the engine is started\*<sup>4</sup>.
- The engine starts and stops repeatedly in a short period of time.
- The engine starts when the battery voltage is low.

\*<sup>1</sup>: Models with the automatic air conditioner

\*<sup>2</sup>: Models with the manual air conditioner

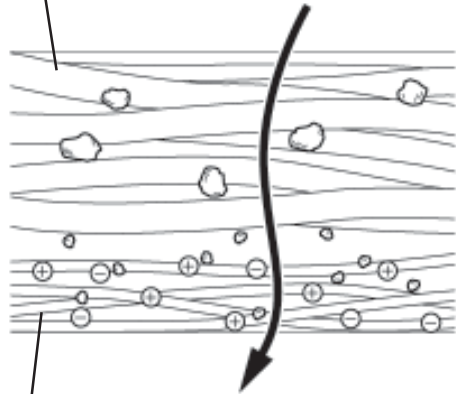
\*<sup>3</sup>: The power source condition can be changed by operating the engine switch on models with the smart entry and start system, and the ignition switch on models without the smart entry and start system.

\*<sup>4</sup>: Only for models without the smart entry and start system

## Air Conditioner Air Filter

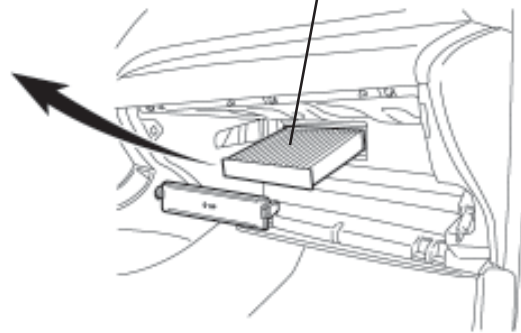
- A Pollen-removal type Air Conditioner air filter is used.
- The filter is made of polyester. Thus, it can be disposed of easily as a non hazardous combustible material, a feature that is provided in consideration of the environment.

Large Foreign Object  
Filter Layer



Electret Layer  
(Microscopic foreign object filtration)

Air Filter



025BE47Y

### Service Tip

The replacement interval of the filter varies:

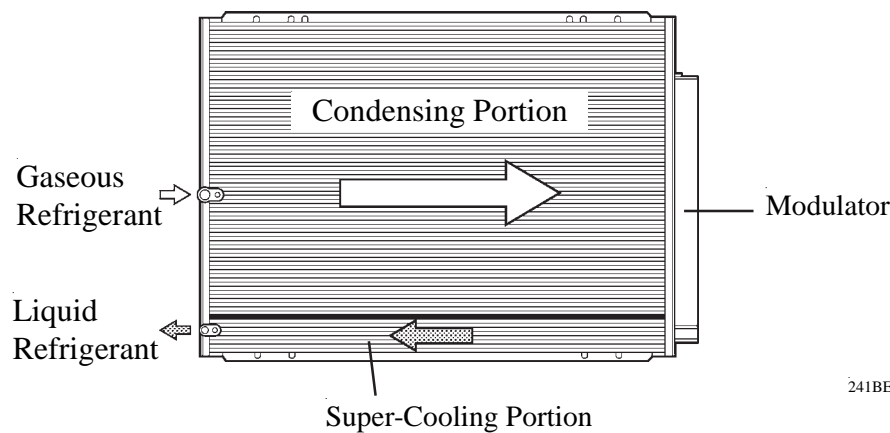
| Cleaning Interval [km] |                 | Replacement Interval [km] |                 |
|------------------------|-----------------|---------------------------|-----------------|
| Normal Condition       | Dusty Condition | Normal Condition          | Dusty Condition |
| 15,000                 | 7,500           | 90,000                    | 45,000          |

However, observation of these guidance lines should depend on the usage conditions (or environment).

### 3. Condenser

- An MF (Multi-Flow) type condenser is used. The condenser consists of two cooling portions; a condensing portion and a super-cooling portion, which are integrated together with a gas-liquid separator (modulator). This condenser uses a sub-cool cycle that offers excellent heat-exchange performance.
- In the sub-cool cycle, after the refrigerant passes through the condensing portion of the condenser, both the liquid refrigerant and the gaseous refrigerant that could not be liquefied are cooled again in the super-cooling portion. Thus, the refrigerant is sent to the evaporator in an almost completely liquefied state.

Note: For condenser fan control refer to EG-67.

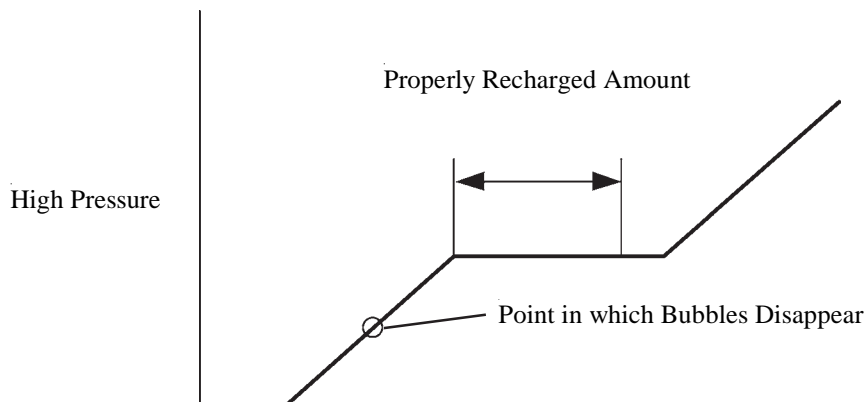


241BE166

#### Service Tip

The point at which the air bubbles disappear in the refrigerant of the sub-cool cycle is lower than the proper amount of refrigerant with which the system must be filled. Therefore, if the system is recharged with refrigerant based on the point at which the air bubbles disappear, the amount of refrigerant would be insufficient. As a result, the cooling performance of the system will be affected. If the system is overcharged with refrigerant, this will also lead to a reduced performance.

For the proper method of verifying the amount of the refrigerant and for instructions on how to recharge the system with refrigerant, see the Aurion Repair Manual.

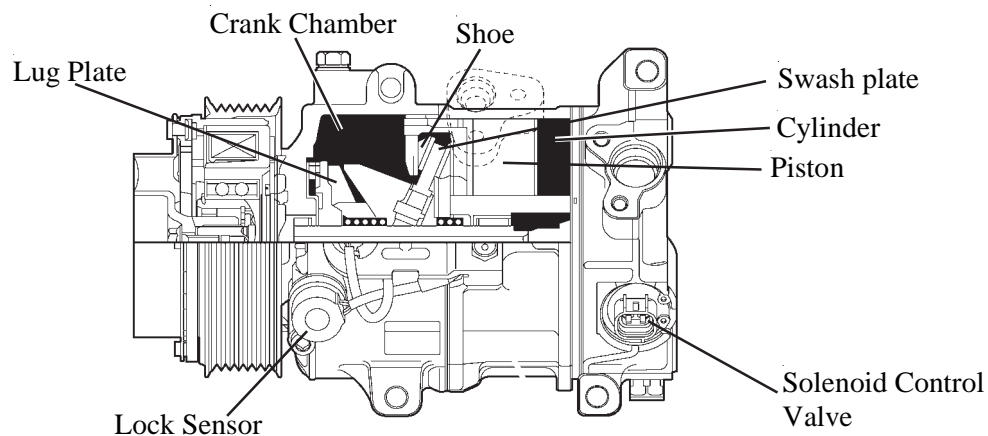


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## 4. A/C Compressor

### General

- The A/C compressor is a continuously variable capacity type, of which the capacity can be varied in accordance with the cooling load of the air conditioner.
- The A/C compressor is a continuously variable capacity type, of which the capacity can be varied in accordance with the cooling load of the air conditioner.
- This compressor consists of the A/C pulley, shaft, lug plate, swash plate, piston, shoe, crank chamber, cylinder, and solenoid valve.
- The A/C pulley with built-in magnetic clutch and the lock sensor that detects whether the magnetic clutch is locked are installed.
- A solenoid valve that adjusts the suction pressure so that the compressor capacity can be controlled as desired is provided.
- The internal valve is installed to improve the A/C compressor durability at high speeds and under heavy thermal load conditions. The internal valve is integrated into the solenoid valve.



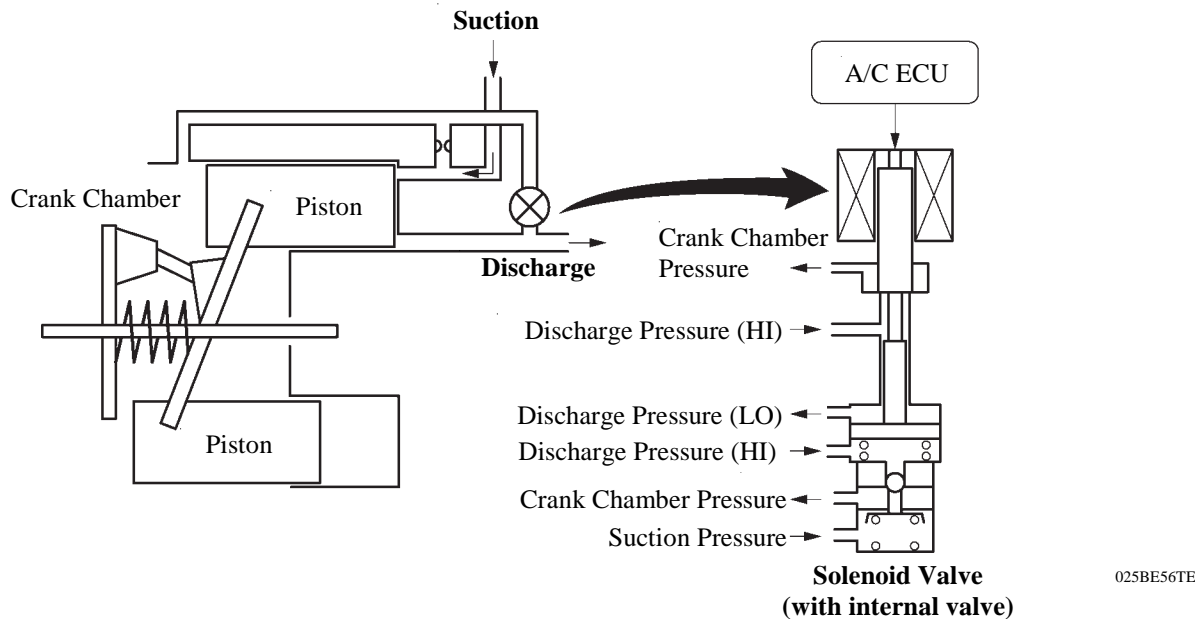
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### Lock Sensor

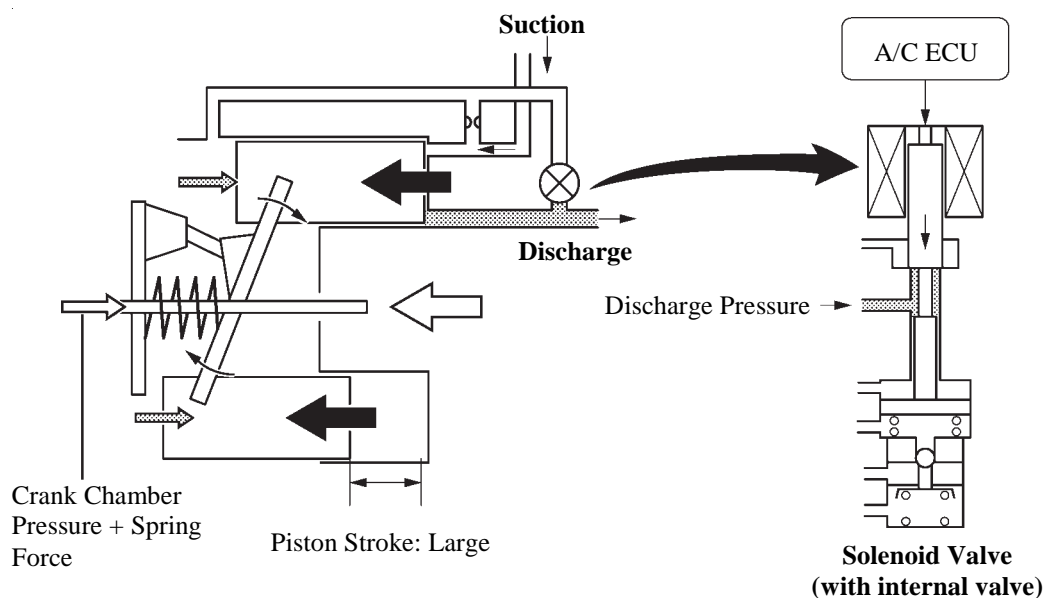
The lock sensor sends A/C pulley speed signals to the A/C ECU. The A/C ECU determines whether the magnetic clutch is locked or not by using those signals and engine speed signals.

## Solenoid Valve Operation

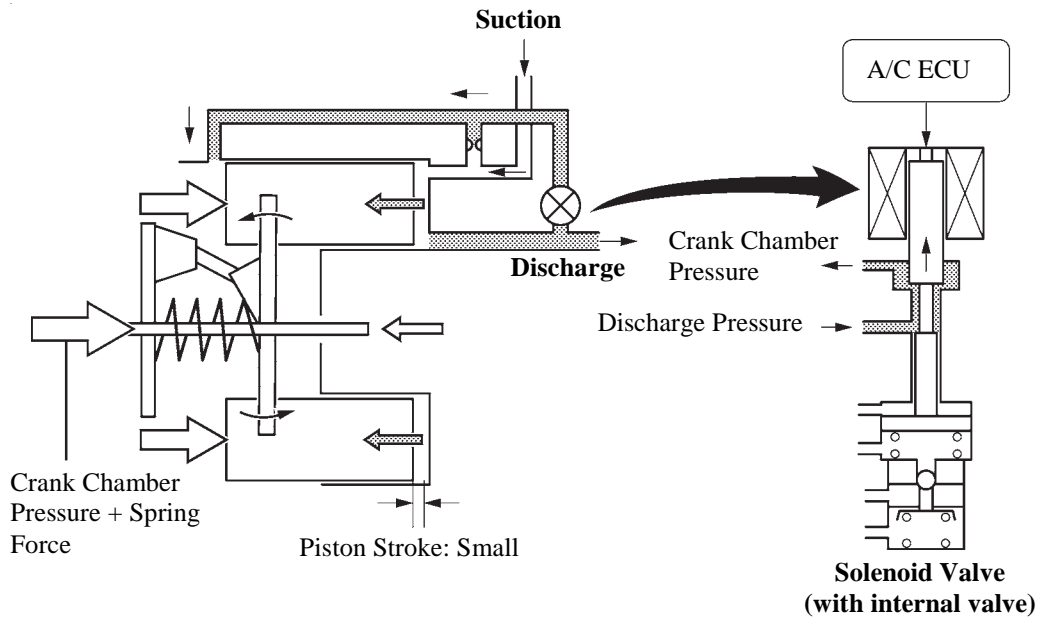
- The crank chamber is connected to the discharge passage. A solenoid valve is provided between the discharge passage (LO pressure) and the discharge passage (HI pressure).
- The solenoid valve operates under duty cycle control in accordance with the signals from A/C ECU.



- When the solenoid valve closes (the solenoid coil is energised), a difference in pressure is created and the pressure in the crank chamber decreases. Then, the pressure that is applied to the right side of the piston becomes greater than the pressure that is applied to the left side of the piston. This compresses the spring and tilts the swash plate. As a result, the piston stroke length increases and the discharge capacity increases.



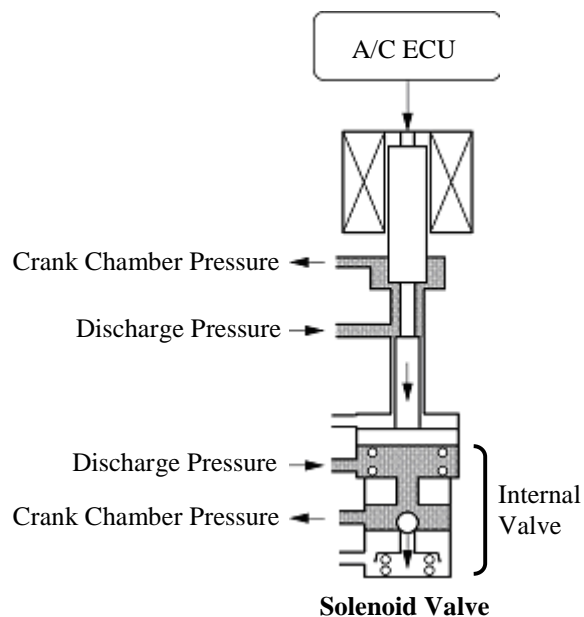
- When the solenoid valve opens (the solenoid coil is not energised), the difference in pressure disappears. Then, the pressure that is applied to the left side of the piston becomes the same as the pressure that is applied to the right side of the piston. Thus, the spring elongates and eliminates the tilt of the swash plate. As a result, there is no piston stroke and the discharge capacity is reduced.



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### Internal Valve Operation

The internal valve operates when the A/C compressor speed has increased rapidly, the A/C compressor speed is high, or when the thermal load has suddenly changed. As a result, the A/C compressor capacity is reduced, increasing the durability of the A/C compressor.



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## 5. A/C Pressure Sensor

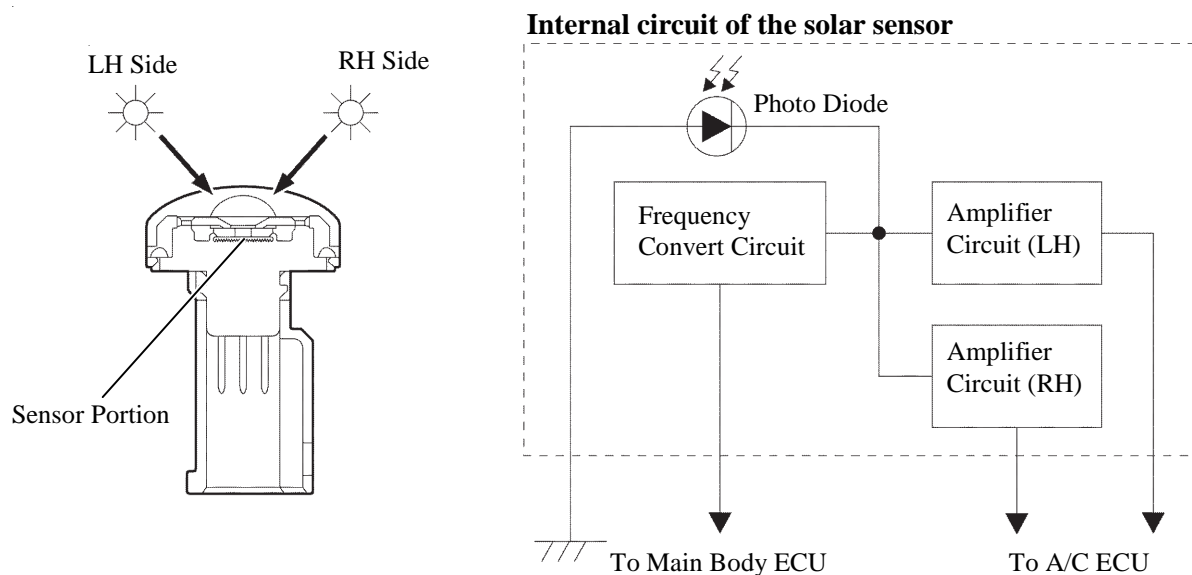
The A/C pressure sensor detects the refrigerant pressure and outputs it to the A/C ECU in the form of voltage changes.

## 6. Room Temp. Sensor and Outside Temp. Sensor

- The room temperature sensor detects the room temperature based on changes in the resistance of its built-in thermistor and sends a signal to the A/C ECU. This sensor is used on models with automatic air conditioner.
- The outside temperature sensor detects the outside temperature based on changes in the resistance of its built-in thermistor and sends a signal to the A/C ECU.

## 7. Solar Sensor

- The solar sensor consists of a photo diode, two amplifier circuits for the solar sensor, and a frequency converter circuit for the light control sensor. This sensor is used on models with automatic air conditioner.
- A solar sensor detects (in the form of changes in the current that flows through the built-in photo diode) the changes in the amount of sunlight from the LH and RH sides (2 directions) and outputs these sunlight strength signals to the A/C ECU.



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## SYSTEM CONTROL

### 1. General

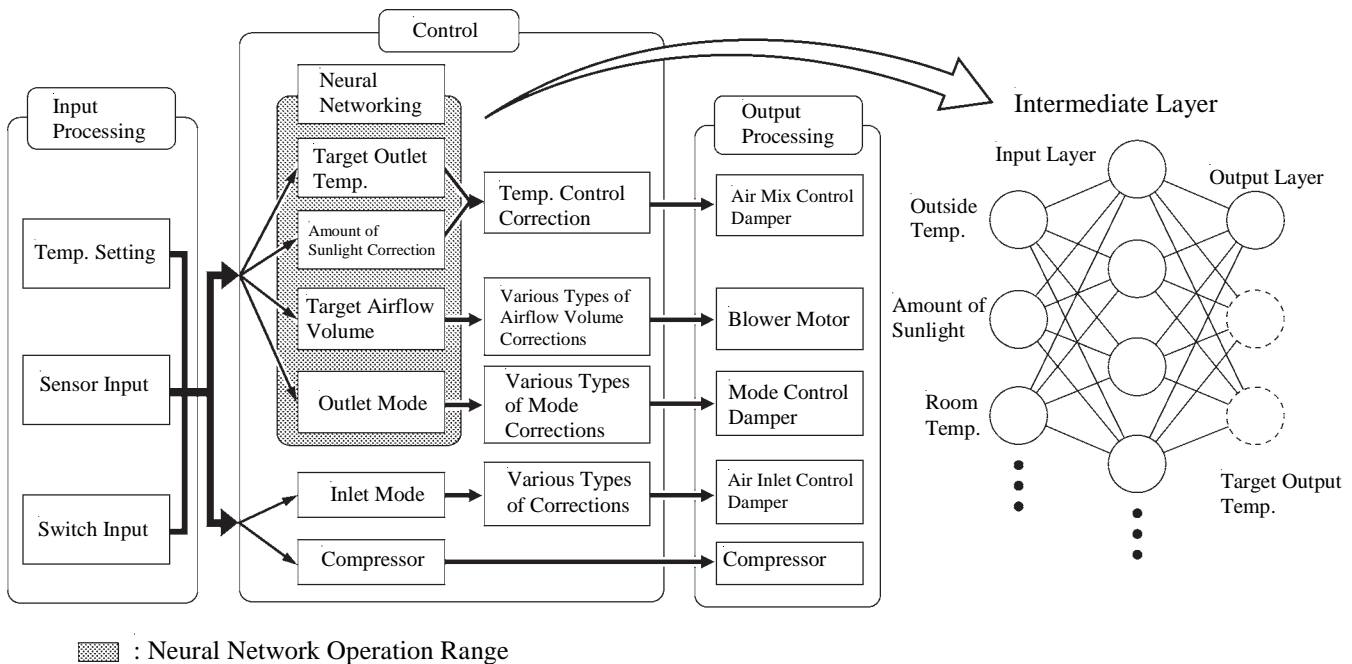
The air conditioner system has the following controls.

| Control                                           | Outline                                                                                                                                                                                                                                                                                                                          | Automatic A/C | Manual A/C |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|
| Neural Network Control<br>[See page BE-76]        | This control is capable of effecting complex control by artificially simulating the information processing method of the nervous system of living organisms in order to establish a complex input/output relationship that is similar to a human brain.                                                                          | ○             | —          |
| Manual Control                                    | The A/C ECU controls the damper positions (air inlet control damper, air mix control damper and mode control damper) and blower speed in accordance with the positions of the switches (temperature control switch, blower switch, mode select switch and air inlet control switch).                                             | —             | ○          |
| Outlet Air Temp. Control                          | Based on the temperature set at the temperature control switch, the neural network control calculates the outlet air temperature based on the input signals from various sensors.                                                                                                                                                | ○             | —          |
|                                                   | The temperature settings for the driver and front passenger are controlled independently in order to provide separate vehicle interior temperatures for the right and left sides of the cabin. Thus, an air conditioner that accommodates the occupants' preferences has been realised.                                          | ○             | —          |
| Blower Control                                    | Controls the blower motor in accordance with the airflow volume that has been calculated by the neural network control based on the input signals from various sensors.                                                                                                                                                          | ○             | —          |
| Air Outlet Control                                | Automatically switches the air outlets in accordance with the outlet mode that has been calculated by the neural network control based on the input signals from various sensors.                                                                                                                                                | ○             | —          |
|                                                   | In accordance with the engine coolant temperature, outside air temperature, amount of sunlight, required blower, outlet temperature, and vehicle speed conditions, this control automatically switches the blower outlet to FOOT / DEF mode to prevent the windows from becoming fogged when the outside air temperature is low. | ○             | —          |
| Air Inlet Control                                 | Automatically controls the air inlet control damper to achieve the calculated required outlet air temperature.                                                                                                                                                                                                                   | ○             | —          |
| Compressor Control                                | Through the calculation of the target evaporator temperature based on various sensor signals, the A/C ECU optimally controls the discharge capacity by regulating the opening extent of the A/C compressor solenoid valve.                                                                                                       | ○             | ○          |
|                                                   | The A/C ECU compares the A/C pulley speed signals, which are transmitted by the lock sensor located on the A/C compressor, with the engine speed signals, which are transmitted by the ECM (crankshaft position sensor). When the A/C ECU determines that the A/C pulley is locked, it turns off the magnetic clutch.            | ○             | ○          |
| Rear Window Defogger Control<br>[See page BE-193] | Switches the rear defogger and outside rear view mirror heaters on for 15 minutes to 60 minutes when the rear defogger button is pressed. Switches them off if the button is pressed again while they are operating.                                                                                                             | ○             | ○          |
| Outside Temperature Indication Control            | Calculates the outside temperature using signals transmitted by the outside temperature sensor. Calculated values are corrected by the A/C ECU and then indicated on the multi-information display.                                                                                                                              | ○             | ○          |
| Self-Diagnosis<br>[See page BE-76]                | A DTC (Diagnostic Trouble Code) is stored in the memory when the A/C ECU detects a problem with the air conditioner system.                                                                                                                                                                                                      | ○             | ○          |



## 2. Neural Network Control

- In previous automatic air conditioner systems, the A/C ECU determined the required outlet air temperature and blower air volume in accordance with the calculation formula that has been obtained based on information received from the sensors. However, because the senses of a person are rather complex, a given temperature is sensed differently, depending on the environment in which the person is situated. For example, a given amount of solar radiation can feel comfortably warm in a cold climate, or extremely uncomfortable in a hot climate. Therefore, as a technique for effecting a higher level of control, a neural network is used in the automatic air conditioner system. With this technique, the data that has been collected under varying environmental conditions is stored in the A/C ECU. The A/C ECU can then effect control to provide enhanced air conditioner comfort.
- The neural network control consists of neurons in an input layer, intermediate layer, and output layer. The input layer neurons process the input data of the outside temperature, the amount of sunlight, and the room temperature based on the outputs of the switches and sensors, and output them to the intermediate layer neurons. Based on this data, the intermediate layer neurons adjust the strength of the links among the neurons. The sum of these is then calculated by the output layer neurons in the form of the required outlet temperature, solar correction, target airflow volume, and outlet mode control volume. Accordingly, the A/C ECU controls the servo motors and blower motor in accordance with the control volumes that have been calculated by the neural network control.



## 3. Self-Diagnosis

- The A/C ECU has a self-diagnosis function. It stores any operation failures in the air conditioner system memory in the form of DTC (Diagnostic Trouble Code).
- There are two methods for reading DTC. One is to use an intelligent tester II, and the other is to read DTC indicated on the heater control panel display (Only for models with automatic air conditioner).
- For details, see the Aurion Repair Manual.

## NAVIGATION WITH AV SYSTEM

### DESCRIPTION

- The navigation with AV system is used for the Aurion. The settings vary in accordance with the destinations and grade. For details, see the equipment list in Model Outline (see page MO-28).
- The design of the screen has been improved in the navigation with AV system in order to improve its visibility. Furthermore, new functions have been added for improved convenience.
- A hands-free function for Bluetooth-compatible mobile phones is used. (see Bluetooth Hands-Free System section on page BE-84).
- The major specifications of the navigation with AV system are shown in the table below:

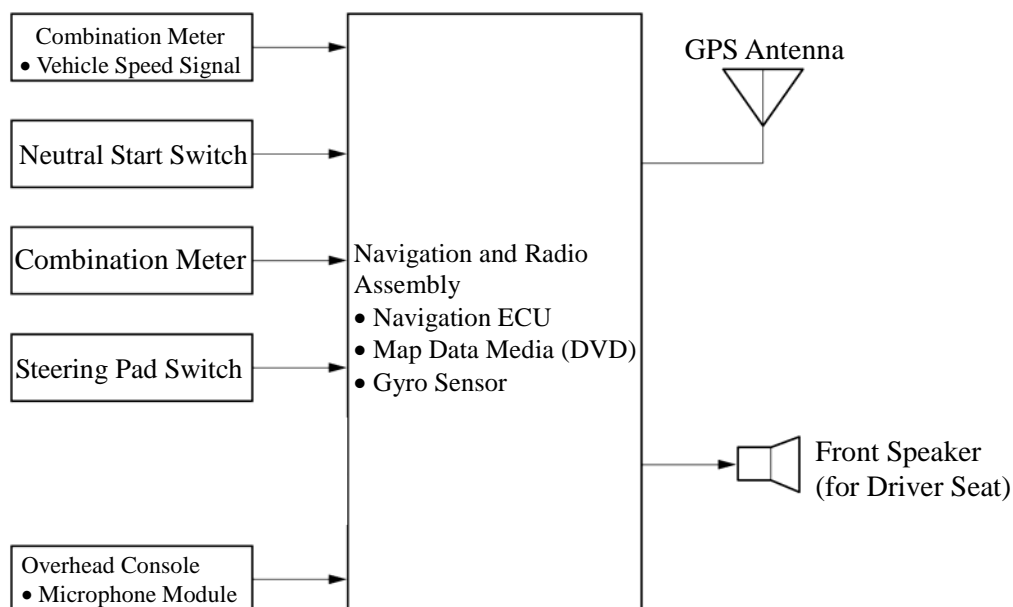
### Specifications

|                                              |                                |                             |
|----------------------------------------------|--------------------------------|-----------------------------|
| Display                                      | 7.0-inch wide LCD              |                             |
|                                              | Pressure Sensitive Touch Panel |                             |
|                                              | Manufactured by Fujitsu Ten    |                             |
| Navigation System                            | GPS                            |                             |
| Languages Supported                          | Voice Guidance                 | English                     |
| Map Data Media                               | DVD                            |                             |
| Bluetooth Hands-Free System (see page BE-84) |                                |                             |
| Navigation ECU                               | Manufactured by Fujitsu Ten    |                             |
|                                              | Gyro Sensor                    | Piezoelectric Ceramic Piece |

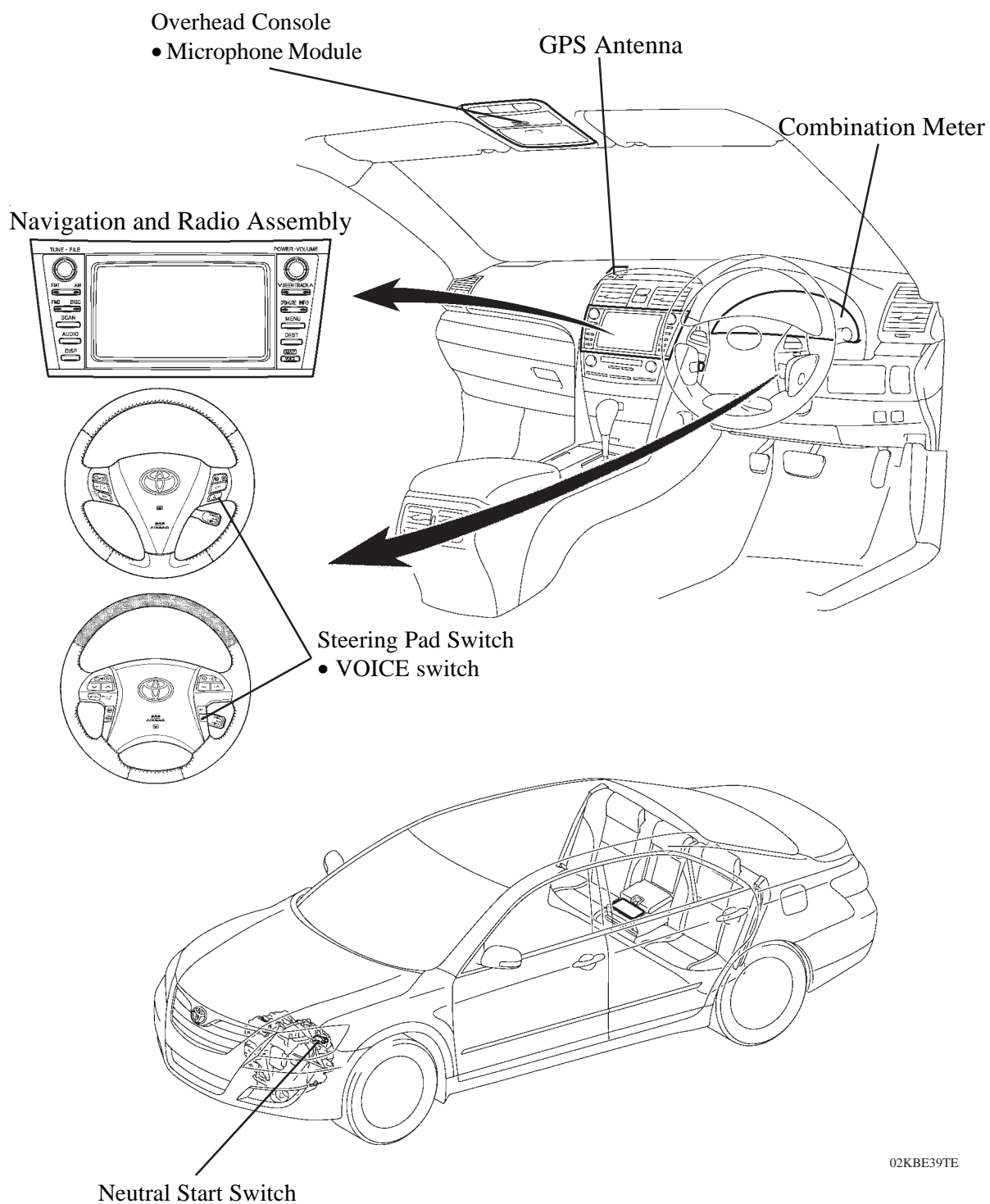


Bluetooth is a trademark owned by Bluetooth SIG, Inc.

### System Diagram



## ★ LAYOUT OF MAIN COMPONENTS



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## ✱ CONSTRUCTION AND OPERATION

### 1. General

The main functions of the navigation system are listed below:

| Function                           | Outline                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Navigation Screen Display          | <ul style="list-style-type: none"> <li>• Enlargement / reduction, rotation and movement of map.</li> <li>• Indication of current position and direction of travel.</li> <li>• Correction of current position.</li> <li>• Setting change and indication of route.</li> <li>• Voice guidance.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                |
| Audio/ Video System                | Displays the following operations: <ul style="list-style-type: none"> <li>• Radio Operation</li> <li>• CD Changer Operation</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Telephone Operation Screen Display | When a Bluetooth-compatible mobile telephone is registered on the navigation and radio assembly, the driver can make and receive calls or talk hands-free on the mobile telephone by operating the switches on the screen or the steering pad.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Maintenance Information            | Can be used to inform the driver of inspection or replacement timing of the following items based on the calendar function and vehicle speed signal.<br><b>Engine Oil:</b> Replace engine oil<br><b>Oil Filter:</b> Replace engine oil filter<br><b>Rotation:</b> Rotate tires<br><b>Tyres:</b> Replace tyres<br><b>Battery:</b> Replace battery<br><b>Brake Pad:</b> Replace brake linings<br><b>Wipers:</b> Replace wiper blades<br><b>LLC:</b> Replace engine coolant<br><b>Brake Oil:</b> Replace brake fluid<br><b>ATF:</b> Replace ATF<br><b>Service:</b> Scheduled maintenance<br><b>Air Filter:</b> Replace air filter<br><b>Personal:</b> New information items can be created separately from provided ones |
| Calendar with Memo                 | It is possible to enter memos for particular dates on the calendar.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Help Screen                        | The help screen can show the command list and operation guide.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Screen Adjustment                  | The brightness or contrast of the screen can be adjusted to suit the brightness of surroundings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Screen Setting                     | The following screen settings are available:<br><b>Automatic transition:</b> Enables automatic return to the navigation screen from the audio screen.<br><b>Switch colour:</b> Colour of touch-screen button can be selected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

| Function                 | Outline                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Delete Personal Data     | <p>The following personal data can be deleted or returned to their default settings:</p> <ul style="list-style-type: none"> <li>• Maintenance conditions</li> <li>• Maintenance information “off” setting</li> <li>• Memory points</li> <li>• Areas to avoid</li> <li>• Previous points</li> <li>• Route trace</li> <li>• User selection settings</li> <li>• Phone book data</li> <li>• Dialed numbers and received calls</li> <li>• Speed dial</li> <li>• Bluetooth phone data</li> <li>• Security code</li> </ul> |
| Beep Setting             | Beep sound off                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Select Language          | The language of the touch-screen buttons, pop-up messages and the voice guidance can be changed.                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Diagnosis Screen Display | <ul style="list-style-type: none"> <li>• Service Check Menu</li> <li>• Display Check</li> <li>• Navigation Check</li> <li>• Bluetooth TEL Check</li> </ul>                                                                                                                                                                                                                                                                                                                                                          |

## 2. Navigation Screen Display

- Based on the map data on the DVD, signals from GPS satellites, signals from the built-in gyro sensor, and signals from the vehicle's speed sensor, the vehicle's present position, direction of travel, and driven distance are calculated and displayed on the navigation display.
- The functions of the navigation screen display are shown below:

|             | Item                                                   | Function                                                                                                   |
|-------------|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| Map Display | Linear Touch Scroll                                    | Enables smooth scrolling by connecting the touch points on the screen.                                     |
|             | On-route Scroll                                        | Scrolls the centre of the cursor forward and backward along the route.                                     |
|             | Heading Up                                             | Displays the map so that the direction of the route progression heads up the screen during route guidance. |
|             | Map Colour Change                                      | Depending on the position of the headlight switch, the screen changes to day mode or night mode.           |
|             | Front Wide                                             | Displays a map in the direction of travel of the vehicle in an enlarged form. (Heading up only)            |
|             | Step-less Scale Display                                | Changes the scale of the map from the basic 13 steps to an even finer display.                             |
|             | Direct Scale Change                                    | Directly selects and displays the map scale.                                                               |
|             | Multi-step Scale Display                               | Changes and displays the map scale in 13 stages.                                                           |
|             | Split-view Display                                     | Displays different modes on a screen that is split into two views.                                         |
|             | Points-of-Interest Display                             | Displays selected types of marks on the map.                                                               |
|             | Taillight-interlocked Map Colour Change                | Changes the display colour of the map screen when the taillights are turned ON.                            |
|             | Road Number Sign Board Display                         | Displays the road number on the map.                                                                       |
|             | Compass Mode Screen                                    | Displays the direction of travel and detailed data of the present location.                                |
|             | Map Coverage Info Screen                               | Displays the map area that is recorded on the DVD.                                                         |
|             | Street Name Indication on Scrolled Map                 | Displays the street name and the city name even when the map screen is being scrolled.                     |
|             | Building Tenant Information (for foot print map areas) | Displays information on the tenants in the building.                                                       |
|             | Arrival Time                                           | Displays the expected time of arrival at the destination.                                                  |
|             | Route Trace                                            | Displays the route on the map.                                                                             |

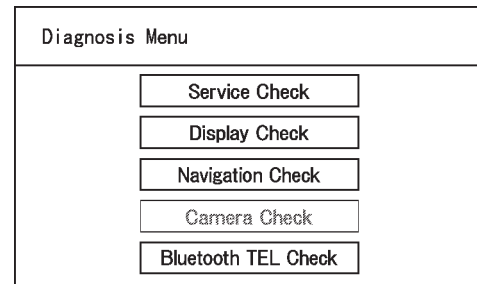
| Item               |                                               | Function                                                                                            |
|--------------------|-----------------------------------------------|-----------------------------------------------------------------------------------------------------|
| Destination Search | Last Destination Memory                       | Stores 20 locations of coordinates, names and times that have been set as destinations in the past. |
|                    | Hybrid Points-of-interest Search              | Narrows the search by names of the points-of-interest, category, and areas.                         |
|                    | Points-of-interest Pinpoint Display           | Pinpoints and displays the positions of points-of-interest.                                         |
|                    | House Number Search                           | Searches for a house number.                                                                        |
|                    | Special Memory Point                          | Sets a pre-registered point as a destination point while driving.                                   |
|                    | Nearest Point-of-interest Search List Display | Searches nearest points-of-interest and displays a list.                                            |
|                    | Intersection Search                           | By specifying two streets, the point at which they intersect is set as the destination point.       |
|                    | Emergency Search                              | Performs a specific search for hospitals, police stations and car dealers.                          |
|                    | Motorway Entrance / Exit Search               | Searches for the destination by the name of the street that connects to a Motorway entrance/exit.   |
|                    | Coordinate search                             | User can input destination by its coordinates.                                                      |
|                    | Telephone number search                       | Searches a facility by its telephone number.                                                        |
| Route Search       | POI, brand icon indication                    | Displays icons for points of interest.                                                              |
|                    | Multiple Destination Setting                  | Sets multiple destinations. It can also rearrange the sequence of the destinations.                 |
|                    | Route Search                                  | Searches for multiple routes.                                                                       |
|                    | Search Condition Designation                  | Searches for the recommended, shortest, and other routes.                                           |
|                    | Regulated Road Consideration                  | Performs search while considering regulated roads.                                                  |
|                    | Avoidance Area                                | Avoids a designated area when searching for a route.                                                |
| Guidance           | Motorway mode screen                          | Displays information on facilities in the vicinity of the Motorway exits and entrances.             |
|                    | Destination Direction Arrow Display           | Uses arrows along the road to display the direction of the destination during route guidance.       |
|                    | Off-Route Arrow Display                       | Uses arrows to display the direction of the destination during off-route driving.                   |
|                    | Rotary Guidance                               | Guidance that renders the entry and exit into a rotary as a single branching point.                 |
|                    | Right or Left Turn Guidance                   | Voice guidance to instruct the direction of travel to be taken.                                     |
|                    | Motorway Direction of Travel Guidance         | Voice guidance to instruct the direction of travel to take on the Motorway.                         |
|                    | Distance Display Destination                  | Displays the distance from the present location to the destination.                                 |
|                    | Motorway Branch Type Specimen Guidance        | Type specimen for guidance to a Motorway branch.                                                    |
|                    | Intersection Zoom-in Display                  | Zoom-in display when approaching an intersection.                                                   |
|                    | Turn List Display                             | Displays a turn list on the right side of the two-screen display.                                   |
|                    | Calendar                                      | Anniversary or appointment dates can be input and displayed.                                        |
|                    | Function Help                                 | Explains the functions of the switches on the main screens, such as the destination and menu.       |

### 3. Diagnosis Screen Display

The navigation system is equipped with a self-diagnosis function and can display the diagnosis menus shown on the right.

The diagnosis menu contains the following four items.

- a) Service Check Menu
- b) Display Check
- c) Navigation Check
- d) Bluetooth TEL Check



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For details on the procedure required to enter the diagnosis menu screen, see the Aurion Repair Manual.



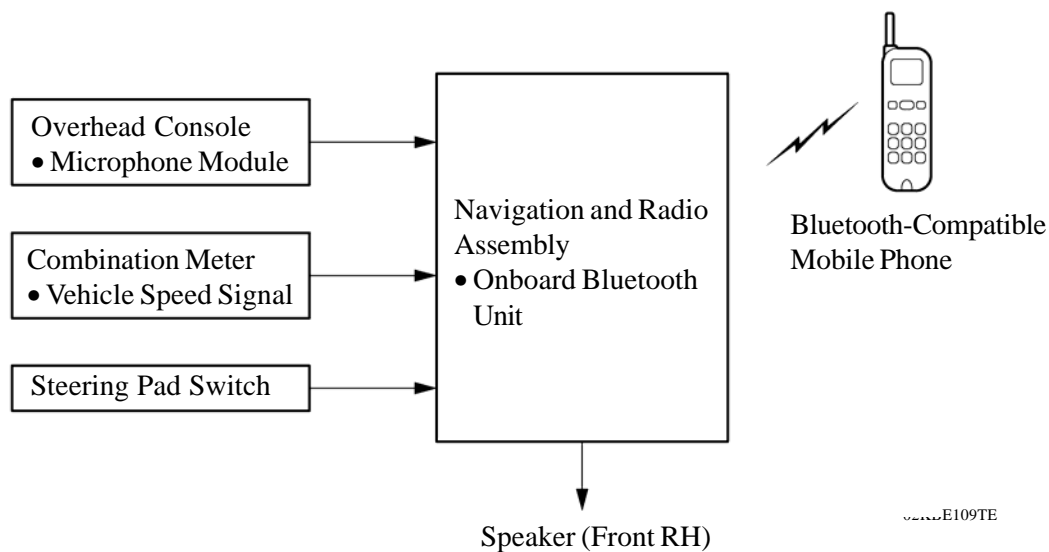
## HANDS-FREE SYSTEM

### ✱ BLUETOOTH HANDS-FREE SYSTEM

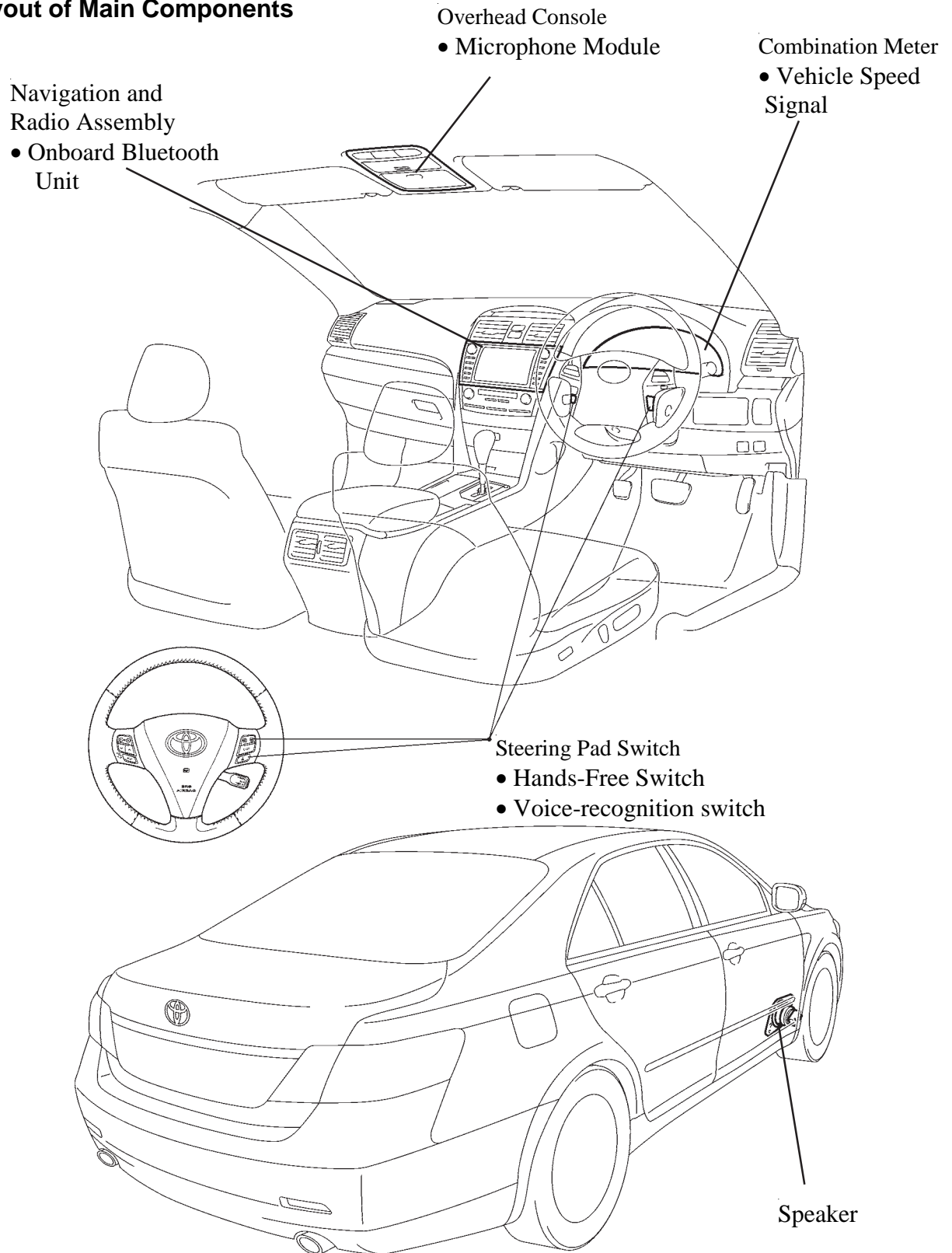
#### 1. General

- A Bluetooth hands-free system has been provided for Aurion. Equipment varies in accordance with the destinations and vehicle grade. For details, see the equipment list in Model Outline (see page MO-28).
- Bluetooth is a short-distance, high-speed wireless data communication system that uses the 2.4GHz frequency band prescribed by the Bluetooth SIG (Special Interest Group).
- This system enables drivers to place or receive phone calls using a mobile phone without releasing their hands from the steering wheel.
- The Bluetooth hands-free system can be operated by touching icons indicated on the navigation and radio assembly.

#### 2. System Diagram



### 3. Layout of Main Components



#### 4. Hands-Free Functions

The Bluetooth hands-free system has the following functions. However, for safety, some functions may not be selectable when the vehicle is being driven.

| Function                                                         |                                                 | Outline                                                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Call with Bluetooth phone                                        | By dial                                         | The user can call by inputting a telephone number.                                                                                                                                                                                                                                             |
|                                                                  | By phonebook                                    | The user can call by using the phonebook data that have been transferred from the user’s Mobile phone. The user can register up to 1000 numbers in the phonebook.                                                                                                                              |
|                                                                  | By dialled numbers                              | The user can call by selecting a previously dialled number. The system remembers up to five dialled numbers. If more than five numbers have been dialled, the oldest number will no longer be remembered.                                                                                      |
|                                                                  | By received calls                               | The user can call by selecting the telephone number of a received call. When a call is received, the system will remember the last five numbers. If more than five calls have been received, the oldest number will no longer be remembered.                                                   |
|                                                                  | By speed dial*                                  | The user can call by using registered telephone numbers that the user selects from the phonebook, dialled numbers or received calls.                                                                                                                                                           |
|                                                                  | By voice recognition (Dialling by name)         | The user can call by giving a name registered in the phonebook.                                                                                                                                                                                                                                |
|                                                                  | By voice recognition (Dialling by phone number) | The user can call by giving a desired number.                                                                                                                                                                                                                                                  |
|                                                                  | By POI (Point of Interest) call                 | The user can call by operating a switch when “Call” is displayed on the screen of the navigation system.                                                                                                                                                                                       |
| Receive call with Bluetooth phone                                |                                                 | When a call is received, the receive screen is displayed with a sound.                                                                                                                                                                                                                         |
| Talk on the Bluetooth phone                                      |                                                 | While user is talking on the phone, the talking screen is displayed.                                                                                                                                                                                                                           |
| Change the settings of the Bluetooth phone                       | Registering the speed dial                      | The user can register the desired telephone number from the phonebook, dialled numbers or received calls. Up to 17 speed-dial numbers can be registered.                                                                                                                                       |
|                                                                  | Setting the volume                              | The user can set the volume.                                                                                                                                                                                                                                                                   |
|                                                                  |                                                 | Automatic volume settings for high speed:<br>When the vehicle speed is over 80 km/h (50 mph), the volume automatically increases by 3 dB from the volume set by the user.<br>When the vehicle speed decreases to 70 km/h (44 mph) or lower, the volume returns to the previous volume setting. |
|                                                                  |                                                 | Initialising the settings:<br>The user can initialise the settings.                                                                                                                                                                                                                            |
|                                                                  | Setting the screen                              | Receiving call display:<br>The user can select the receiving call display.                                                                                                                                                                                                                     |
|                                                                  |                                                 | Auto answer:<br>When a call is received, the display automatically changes to the talking screen and user can start to talk on the phone (without touching any switch) after a preset time.                                                                                                    |
|                                                                  |                                                 | The Bluetooth connection status at start up:<br>When the user turns the power source to ACC or IG-ON and the Bluetooth is automatically connected, the connection check is displayed.                                                                                                          |
| Initialising the settings: The user can initialise the settings. |                                                 |                                                                                                                                                                                                                                                                                                |

\*: The user can operate it while driving.

(Continued)

| Function                                   |                       | Outline                                                                                                                                                                                                                                                        |
|--------------------------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Change the setting of the Bluetooth phone  | Setting the phonebook | Registering phone number:<br>The user can register phone numbers in the phonebook.                                                                                                                                                                             |
|                                            |                       | Transferring a telephone number:<br>The user can transfer the telephone numbers from the user's Bluetooth phone to the system. Up to 1,000 pieces of data (up to 2 numbers per entry) can be registered in the phonebook.                                      |
|                                            |                       | Registering the phonebook data:<br>The user can register the phonebook data.                                                                                                                                                                                   |
|                                            |                       | Editing the name:<br>If no name has been inputted, the number is displayed.                                                                                                                                                                                    |
|                                            |                       | Editing the phone number:<br>The user can register a phone number in "TEL1" and "TEL2" separately. Up to 2 numbers per phonebook entry can be registered.                                                                                                      |
|                                            |                       | Selecting the group:<br>The user can set a group for a contact. It will then be easier for the user to find this contact when needed, by using the grouping display.                                                                                           |
|                                            |                       | Setting the voice recognition:<br>The user can set the voice recognition. Up to 20 numbers can be registered to allow voice recognition.                                                                                                                       |
|                                            |                       | Adding data to the phonebook:<br>The user can add data to the phonebook.                                                                                                                                                                                       |
|                                            |                       | Editing the data: The user can edit the registered data.                                                                                                                                                                                                       |
|                                            |                       | Deleting the data: The user can delete the data.                                                                                                                                                                                                               |
|                                            |                       | Deleting all the phone data: The user can delete all the phone data.                                                                                                                                                                                           |
|                                            |                       | Registering group names: The user can register 20 groups                                                                                                                                                                                                       |
|                                            |                       | Selecting group icons: The user can select the desired icon.                                                                                                                                                                                                   |
|                                            |                       | Editing a group name:<br>The user can input the name with the software keyboard.                                                                                                                                                                               |
|                                            |                       | Deleting a group name:<br>The user can delete the group names individually or all at once.                                                                                                                                                                     |
|                                            |                       | Deleting the log data:<br>The user can delete the log data individually or all at once.                                                                                                                                                                        |
| Change the settings of the Bluetooth phone | Setting the security  | By setting the security, the user can prevent people from using some functions of the hands-free system. It is useful when the user leaves the car with a hotel or valet parking or the user doesn't want others to see the data that the user has registered. |
|                                            |                       | Changing the security code:<br>The security code is 4 digits and the default is "0000". Choose a new code that is hard for other people to guess.                                                                                                              |
|                                            |                       | Phone book lock: The user sets the phonebook lock.                                                                                                                                                                                                             |
|                                            |                       | Initialising the security code: The user can initialise the settings.                                                                                                                                                                                          |

(Continued)

| Function              |                                                               | Outline                                                                                                                                                                                                                                                                       |
|-----------------------|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Set a Bluetooth phone | Enter the Bluetooth phone                                     | In order to use the hands-free function of a Bluetooth phone, it is necessary to register it in the audio head unit. Once a phone is registered, the hands-free function becomes available automatically.<br>The user can register up to 6 Bluetooth phones.                  |
|                       | Select the Bluetooth phone                                    | When two or more registered Bluetooth phones are in the cabin, it is necessary to select which phone to use to prevent the lines from being crossed. Only the selected phone is available for use as a hands-free phone. The phone registered last is automatically selected. |
|                       | Indicate and change Bluetooth information                     | The user can set, change and initialise the information of the Bluetooth phone displayed on the screen.                                                                                                                                                                       |
|                       | Deleting a Bluetooth phone                                    | A registered Bluetooth phone can be unregistered from the multi display.                                                                                                                                                                                                      |
|                       | Displaying the information of the Bluetooth phone user delete | The user can display the information about a Bluetooth phone before deleting it and can ensure that the correct telephone will be deleted.                                                                                                                                    |

## TOYOTA PARKING ASSIST SYSTEM

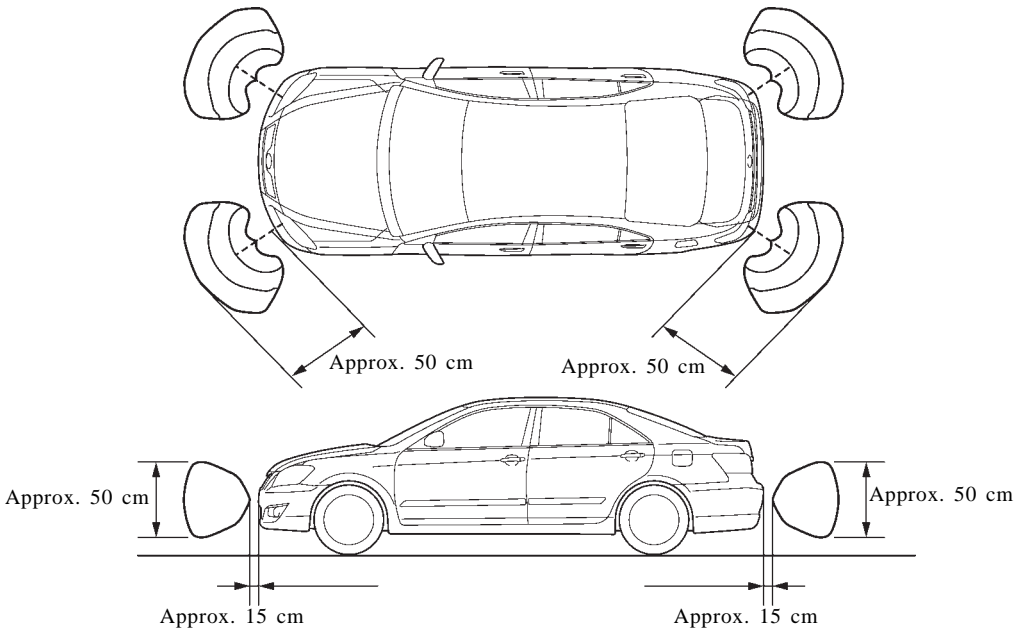
### ✱ DESCRIPTION

- There are 2 types of Toyota parking assist systems used on Aurion: 4 sensor type (front and rear corners) and 6 sensor type (front corners, rear corners and rear centre). The specifications vary in accordance vehicle grades. For details, see the equipment list in Model Outline (see page MO-28).
- The Toyota parking assist system uses ultrasonic sensors to detect any obstacles at the corners, the front, or the rear of the vehicle.
- The Toyota parking assist system (4 sensor type and 6 sensor type) then informs the driver of the approximate distance between the sensors and the obstacles as well as their positions by displaying them on the multi-information display in the combination meter and by sounding a buzzer.
- The Aurion uses local communication lines among the ultrasonic sensors and the clearance sonar ECU, reducing the number of wire harnesses.
- The operating condition of each Toyota parking assist system differs according to its installation position as shown in the table below:

| Installation Position | Operating Conditions                                                                                                                                                                                                                              |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Front Corner          | <ul style="list-style-type: none"> <li>• Power source* is IG-ON.</li> <li>• Toyota parking assist system switch is ON.</li> <li>• Shift position is except P.</li> <li>• Sensor stops operating when vehicle speed is 10 km/h or more.</li> </ul> |
| Rear Corner           | <ul style="list-style-type: none"> <li>• Power source* is IG-ON.</li> <li>• Toyota parking assist system switch is ON.</li> <li>• Shift position is R.</li> </ul>                                                                                 |
| Rear Centre           | <ul style="list-style-type: none"> <li>• Power source* is IG-ON.</li> <li>• Toyota parking assist system switch is ON.</li> <li>• Shift position is R.</li> </ul>                                                                                 |

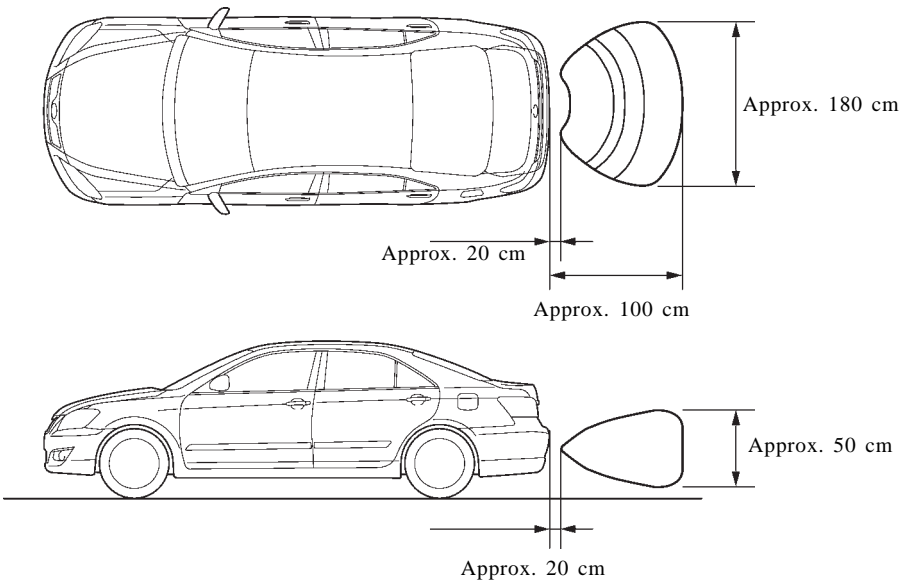
\*: The power source condition can be changed by operating the engine switch on models with the smart entry and start system, and the ignition switch on models without the smart entry and start system.

✱ DETECTION AREA



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Corner Area

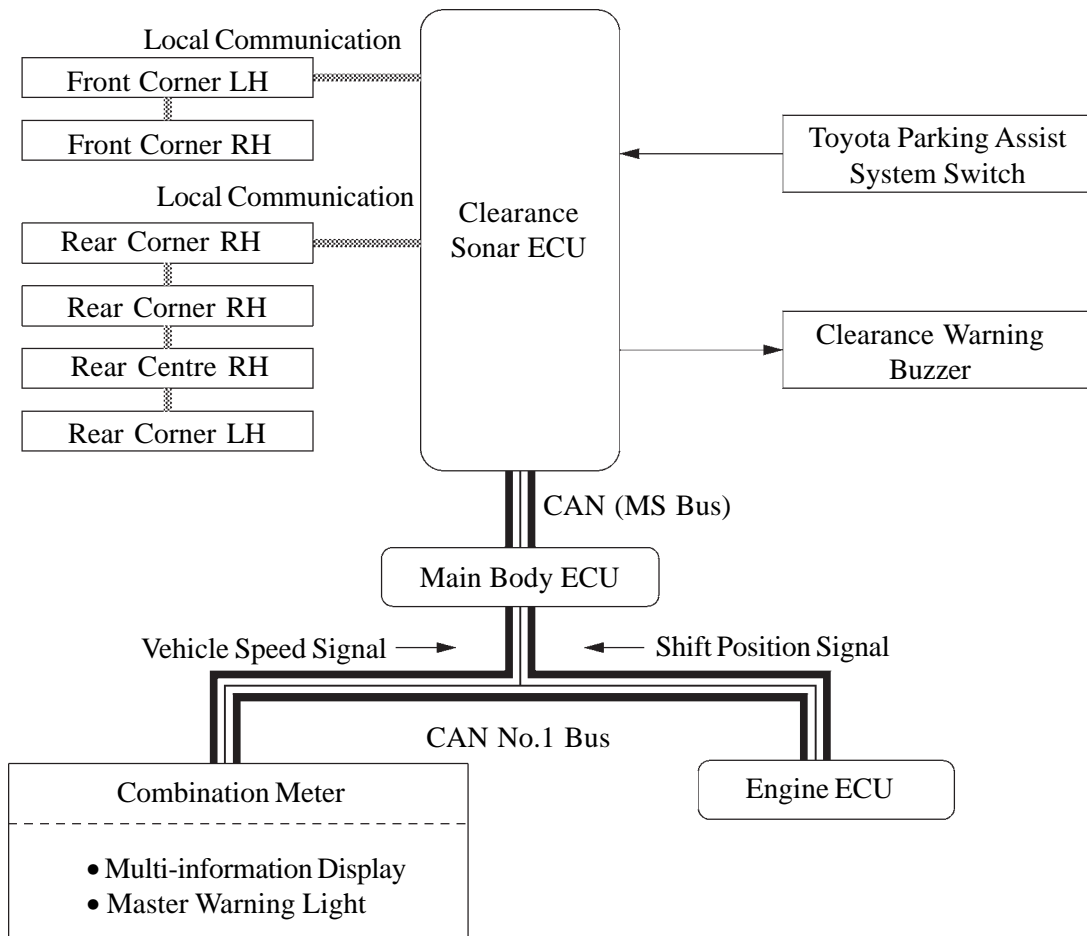


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Rear Centre Area

## SYSTEM DIAGRAM

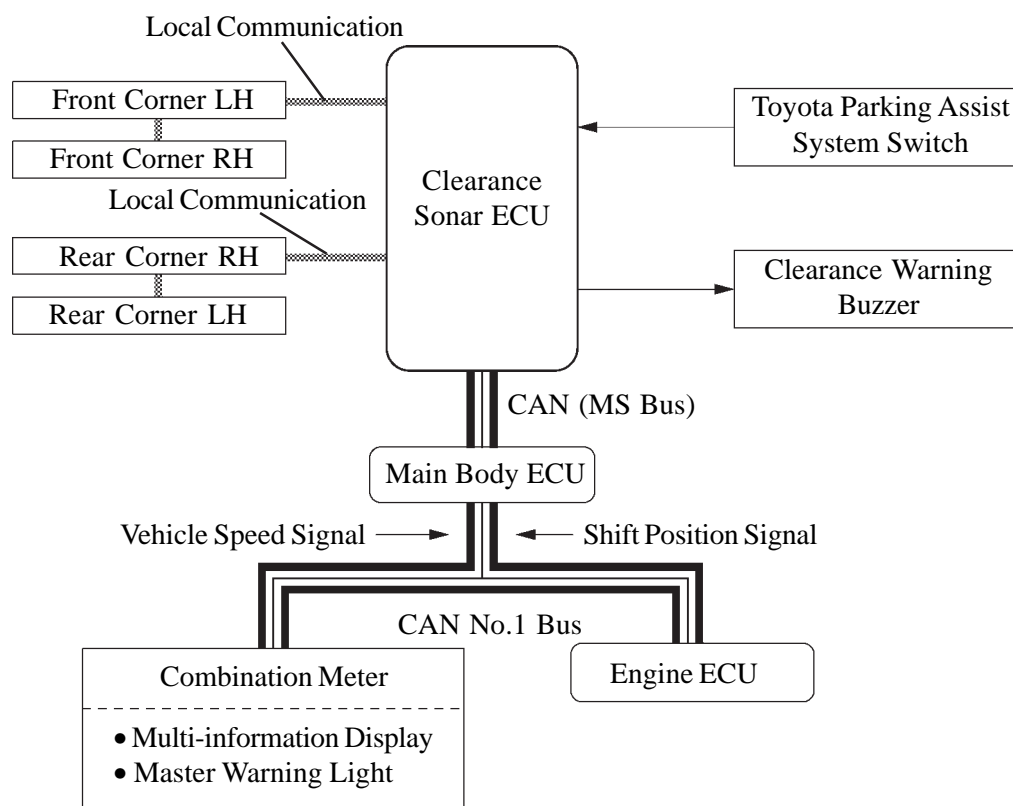
### 6 Sensor Type



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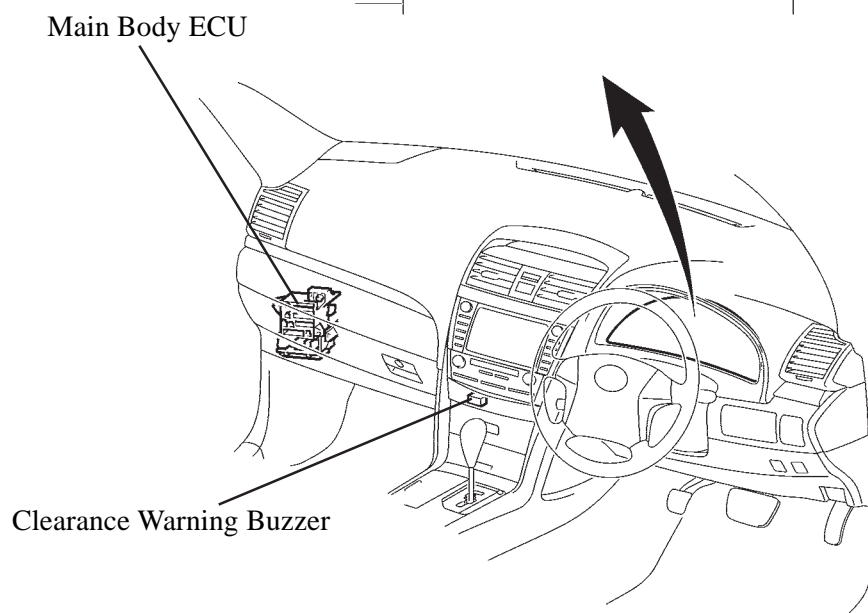
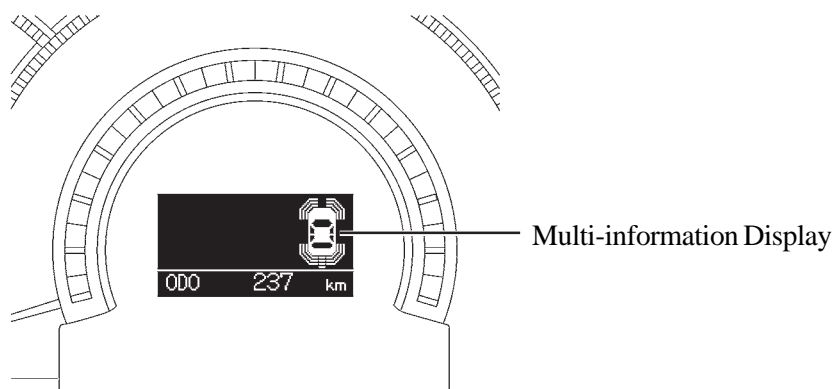
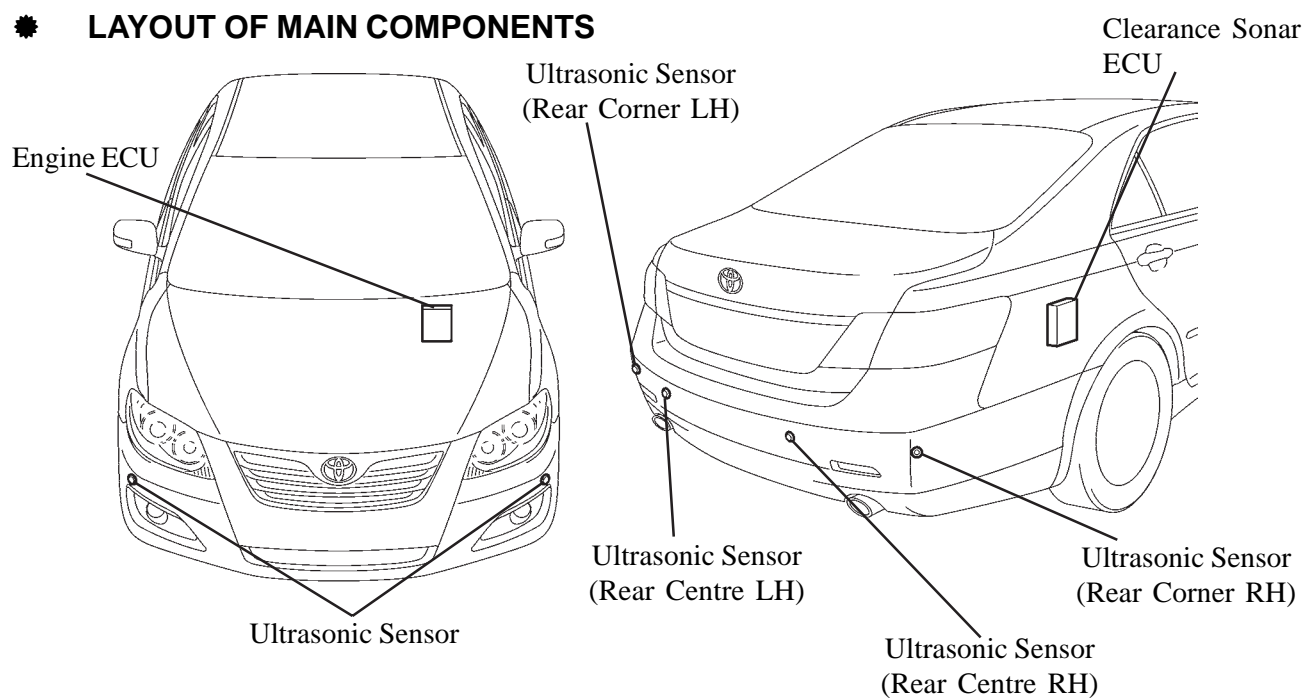


## ▶ 4 Sensor Type ◀



02KBE45Y

# ● LAYOUT OF MAIN COMPONENTS



Models with 6 Sensor Type

02KBE47TE

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## FUNCTION OF MAIN COMPONENTS

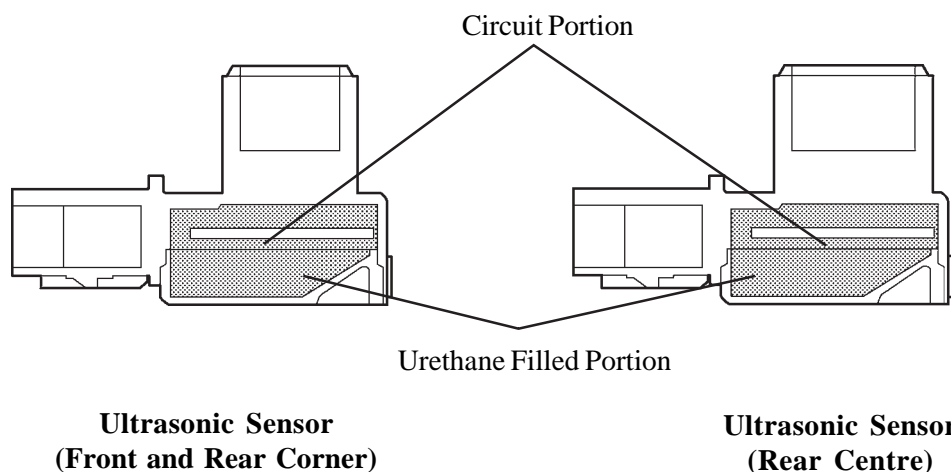
| Component                           |                           | Function                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ultrasonic Sensor                   |                           | Detects the approximate distance between the vehicle and an obstacle and transmits the signal to the clearance sonar ECU.                                                                                                                                                                                                                                                  |
| Clearance Warning Buzzer            |                           | Sounds a buzzer to warn the driver according to the distance to the obstacle.                                                                                                                                                                                                                                                                                              |
| Combination Meter*                  | Multi-information Display | <ul style="list-style-type: none"> <li>• Displays the location of the obstacle and the approximate distance between the vehicle and the obstacle.</li> <li>• Informs the driver if the ultrasonic sensors malfunction, or if they freeze or become dirty.</li> <li>• Transmits the vehicle speed signal to the clearance sonar ECU via the clearance sonar ECU.</li> </ul> |
|                                     | Master Warning Light      | Illuminates when the multi-information display indicates that the ultrasonic sensors are malfunctioning or frozen.                                                                                                                                                                                                                                                         |
| Toyota Parking Assist System Switch |                           | Operating this switch allows the operation of the Toyota parking assist system to be enabled or disabled.                                                                                                                                                                                                                                                                  |
| Clearance Sonar ECU                 |                           | <ul style="list-style-type: none"> <li>• Judges the approximate distance between the vehicle and an obstacle based on signals from the ultrasonic sensors. Output signals are sent to the multi-information display.</li> <li>• Sounds the buzzer.</li> </ul>                                                                                                              |
| Main Body ECU*                      |                           | Receives signals from the combination meter and engine ECU and transmits those signals to the clearance sonar ECU.                                                                                                                                                                                                                                                         |
| Engine ECU*                         |                           | Transmits the shift position signal to the clearance sonar ECU via the main body ECU.                                                                                                                                                                                                                                                                                      |

\*: Only for models with 4 sensor type and 6 sensor type

## ✱ CONSTRUCTION AND OPERATION

### 1. Ultrasonic Sensor

- The ultrasonic sensors are provided with a distance calculation function in order to digitize the signals between the clearance sonar ECU and the ultrasonic sensor. As a result, the number of wiring harnesses has been reduced.
- There are two different types of ultrasonic sensors, for the front and rear corners\*<sup>1</sup> and the rear centre\*<sup>2</sup>. Each ultrasonic sensor consists of a sensor portion that transmits and receives ultrasonic waves and a pre-amplifier that amplifies them. The distance calculation circuit calculates the distance between the vehicle and the obstacle based on the received ultrasonic waves. The ultrasonic sensors transmit the calculated distance signals to the clearance sonar ECU.
- The circuit portion is filled with urethane to prevent water from entering.



### 2. Clearance Warning Buzzer

- Depending on the detection distance and the detection area, the sound pattern of the clearance warning buzzer will vary.

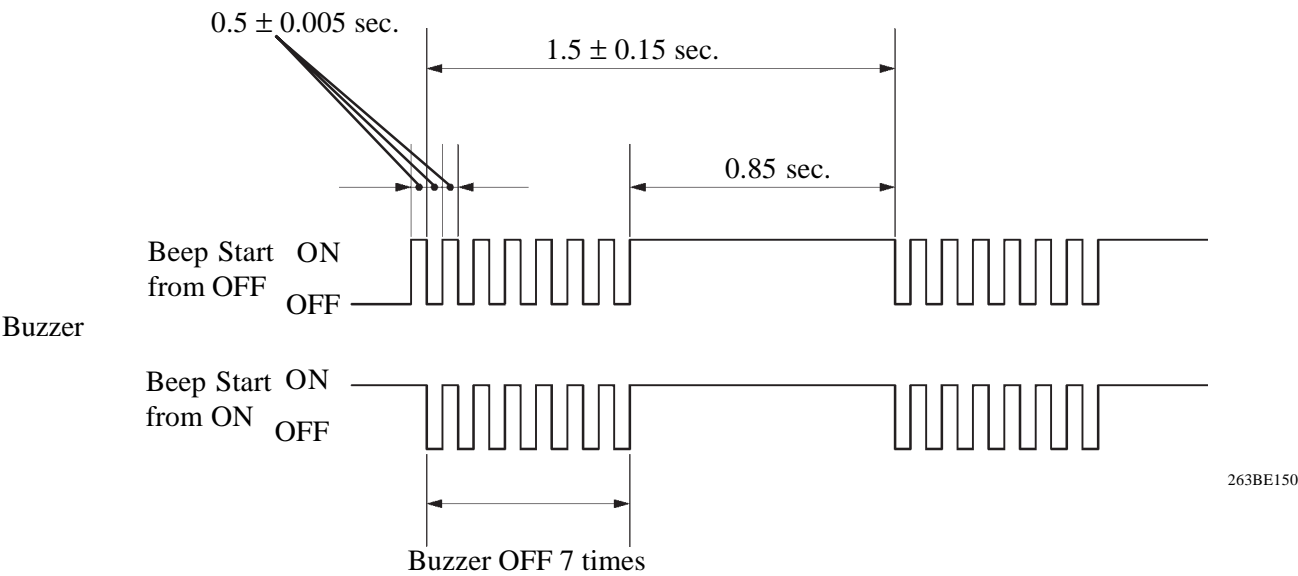
| Detection Area | Detection Distance<br>cm |                            | Buzzer Sound Pattern ON/ OFF Time<br>(sec.) |
|----------------|--------------------------|----------------------------|---------------------------------------------|
| Corner         | Long                     | $50 \pm 5$ to $37.5 \pm 4$ | 0.15/ 0.15                                  |
|                | Middle                   | $37.5 \pm 5$ to $25 \pm 3$ | 0.075/ 0.075                                |
|                | Short                    | $25 \pm 3$ or less         | Continuous Sound/ 0                         |
| Rear Centre    | Longest                  | $150 \pm 15$ to $60 \pm 6$ | 0.15/ 0.15                                  |
|                | Long                     | $60 \pm 6$ to $45 \pm 5$   | 0.15/ 0.15                                  |
|                | Middle                   | $45 \pm 5$ to $35 \pm 4$   | 0.075/ 0.075                                |
|                | Short                    | $35 \pm 4$ or less         | Continuous Sound/ 0                         |

- When the front and rear sensors detect obstacles at the same time, the buzzer sounds as follows.

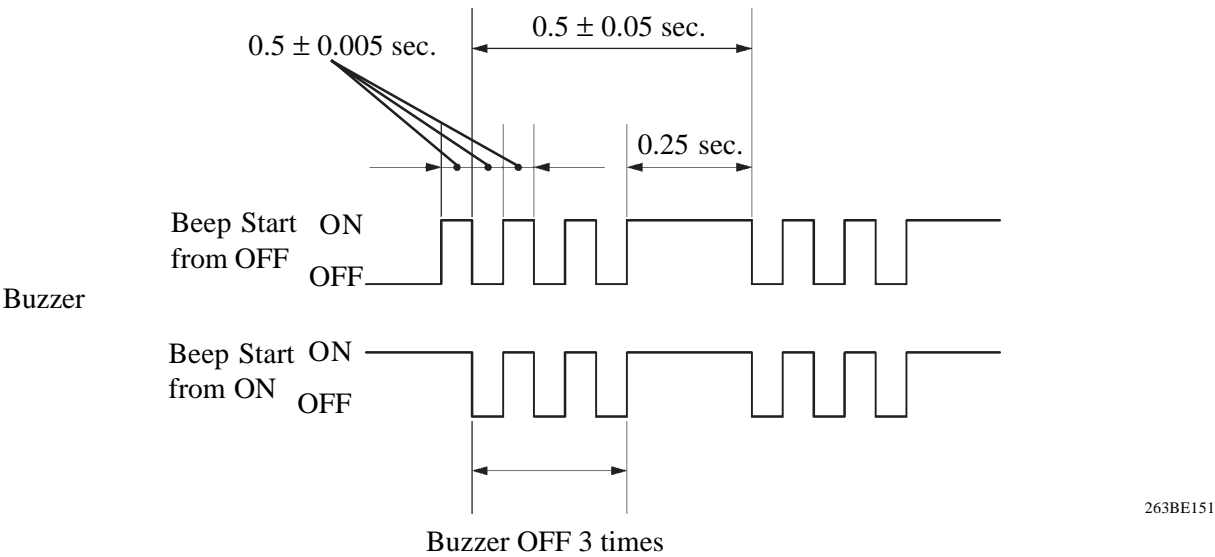
Buzzer Frequency (sec.)

| Front<br>Rear | Short               | Middle          | Long            | Not detected        |
|---------------|---------------------|-----------------|-----------------|---------------------|
| Short         | Buzzer Timing 2     | Buzzer Timing 1 | Buzzer Timing 1 | Continuous Sound/ 0 |
| Middle        | Buzzer Timing 1     | 0.15            | 0.15            | 0.15                |
| Long          | Buzzer Timing 1     | 0.15            | 0.3             | 0.3                 |
| Longest       | Buzzer Timing 1     | 0.15            | 0.3             | 0.8                 |
| Not detected  | Continuous Sound/ 0 | 0.15            | 0.3             | None                |

► Buzzer Timing 1 ◀

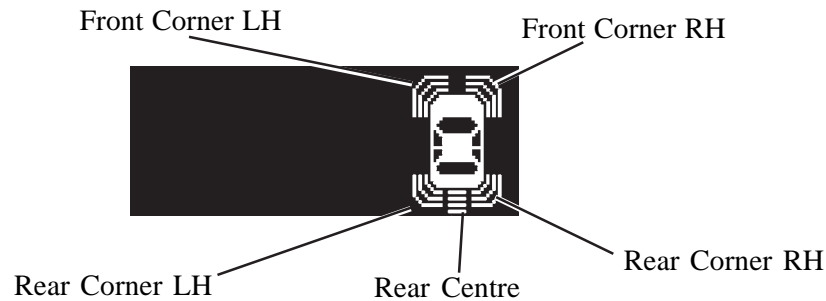









► Buzzer Timing 2 ◀



### 3. Multi-information Display

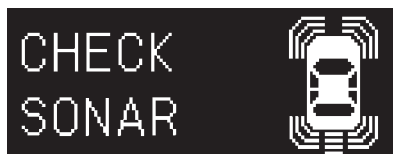
- The items displayed by the multi-information display are the location of the obstacle, the approximate distance between the vehicle and the obstacle, and warning messages relating to sensor malfunction, sensor freezing, or presence of dirt on the sensor. When any warning messages are displayed, the master warning light illuminates and the clearance warning buzzer sounds.
- The multi-information warning display is provided only for models with 4 and 6 sensor types.
- The number of lines shown on the display changes based on the actual distance and flashes when the distance is short.



| Detection Area | Detection Distance                    | Multi-information Display Condition                                                 |                                 |
|----------------|---------------------------------------|-------------------------------------------------------------------------------------|---------------------------------|
| Corner         | Long<br>$50 \pm 5$ to $37.5 \pm 4$    |    | Line: Illuminates<br>02KBE50TE  |
|                | Middle<br>$37.5 \pm 5$ to $25 \pm 3$  |  | Line: Illuminates<br>02KBE101TE |
|                | Short<br>$25 \pm 3$ or less           |  | Line: Flashes<br>02KBE102TE     |
| Rear Centre    | Longest<br>$150 \pm 15$ to $60 \pm 6$ |  | Line: Illuminates<br>02KBE103TE |
|                | Long<br>$60 \pm 6$ to $45 \pm 5$      |  | Line: Illuminates<br>02KBE104TE |
|                | Middle<br>$45 \pm 5$ to $35 \pm 4$    |  | Line: Illuminates<br>02KBE105TE |
|                | Short<br>$35 \pm 4$ or less           |  | Line: Flashes<br>02KBE106TE     |

02KBE49TE

## ▶ Warning Message ◀

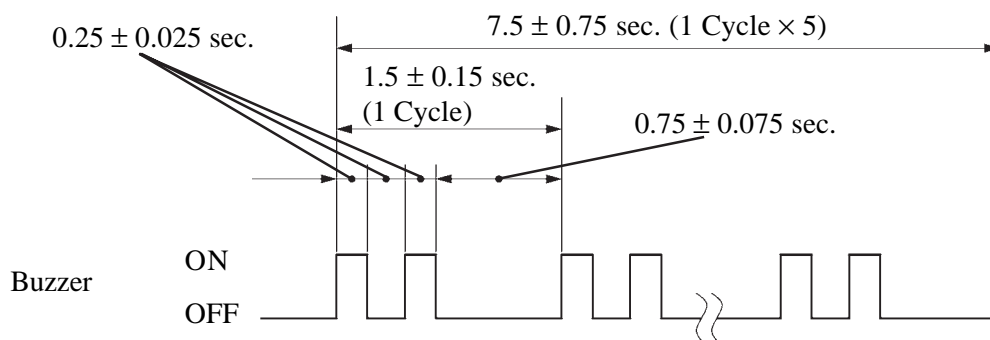


Ultrasonic Sensor Malfunction Warning

Ultrasonic Sensor Freeze/  
Contamination Warning

02KBE110TE

## ▶ Buzzer Timing ◀



02KBE111Y

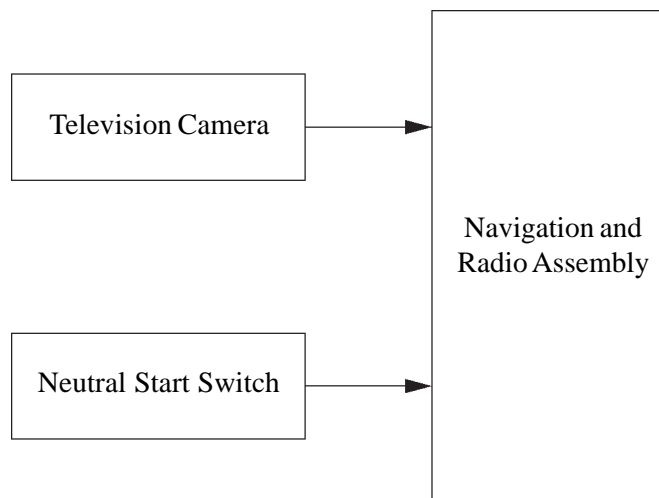
## REAR VIEW MONITOR SYSTEM

### ✱ DESCRIPTION

- To assist the driver in parking the vehicle by monitoring the rear view, the rear view monitor system has a television camera mounted on the luggage compartment door to display a view of the area behind the vehicle on the navigation and radio assembly.
- The settings of this system vary in accordance with the destinations and engine types. For details, see the equipment list in Model Outline (see page MO-28).
- This system consists of the television camera and the navigation and radio assembly.
- This system operates when all the conditions given below have been met.
  - Power source\* is IG-ON.
  - The shift lever is shifted to reverse.
- If the driver moves the shift lever to a position other than reverse, or switches the modes on the navigation and radio assembly, the rear view display will stop and change to the display of another mode.

\*: The power source condition can be changed by operating the engine switch on models with the smart entry and start system, and the ignition switch on models without the smart entry and start system.

### ► System Diagram ◀



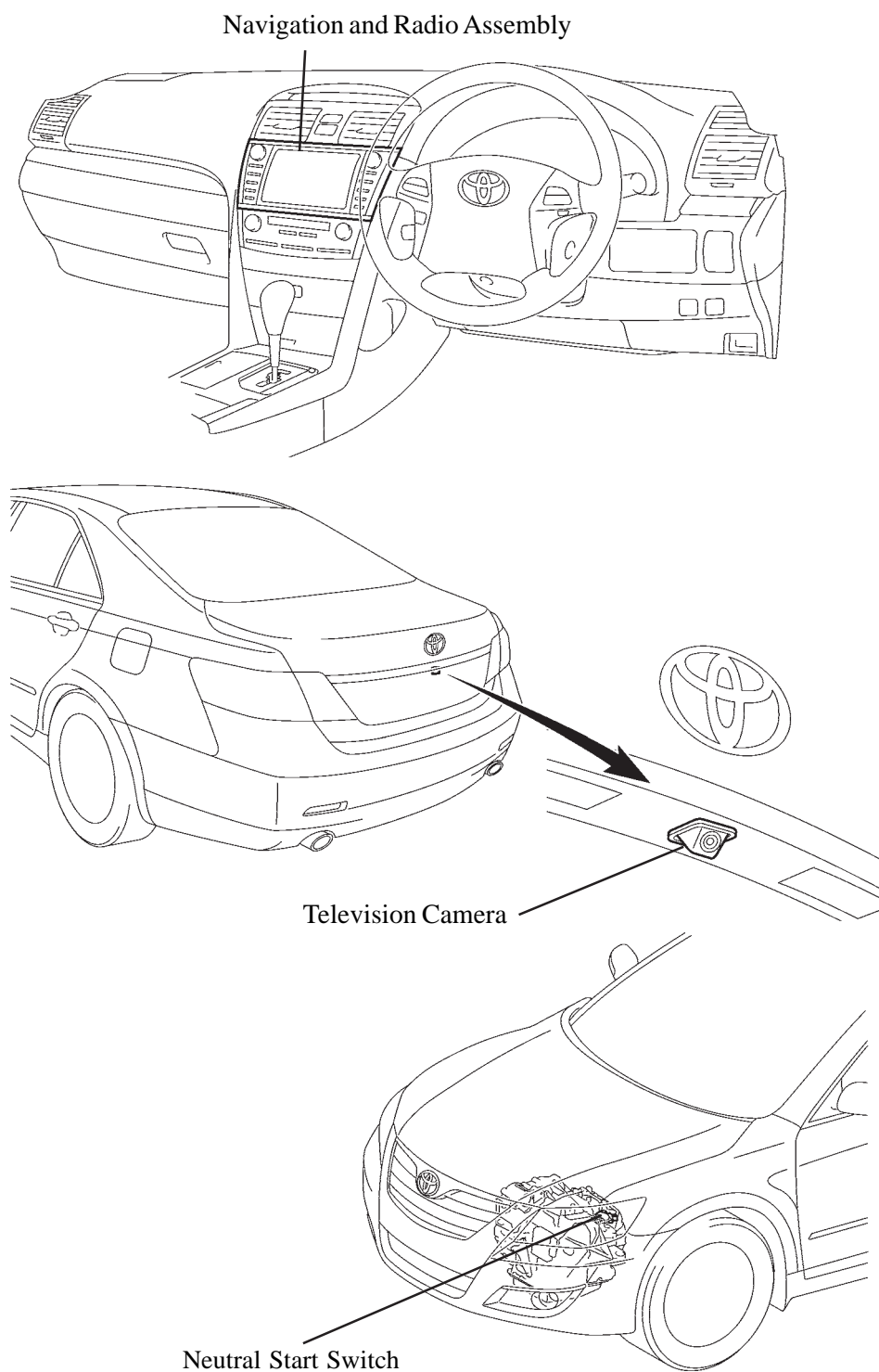
01NBE95Y

### CAUTION

- Do not rely entirely on the rear view monitor system. Use caution, just as you would when backing up any vehicle.
- Never back up while looking only at the screen. The image on the screen may differ from the actual conditions. If you back up while looking only at the screen, you may hit an object or have an accident. When backing up, be sure to check by looking behind and all around the vehicle, both directly and using the mirrors, before proceeding.



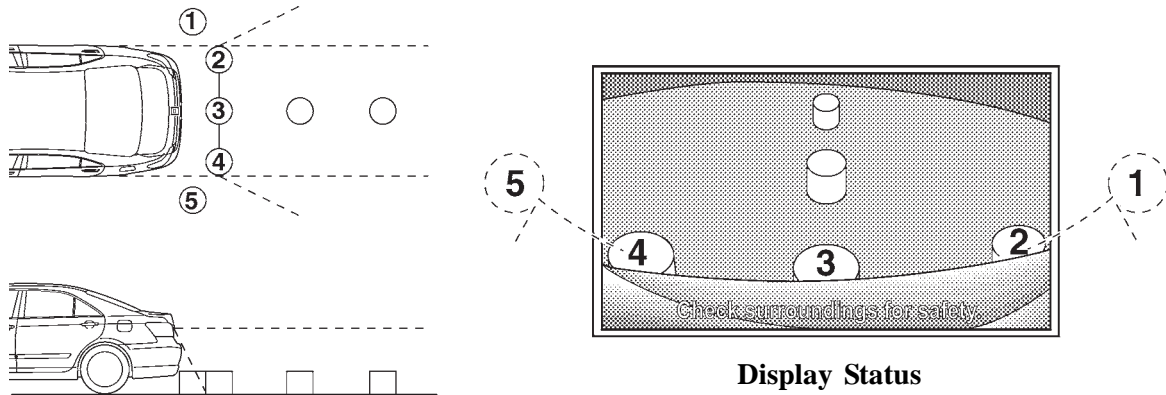
## ● LAYOUT OF MAIN COMPONENTS



02KBE107TE

## ● AREA DISPLAYED ON SCREEN

- On the multi display, objects on the right of the vehicle appear on the right side of the display panel, and objects on the left of the vehicle appear on the left side of the display panel.
- The television camera uses a wide-angle lens. The perceived distance from images that appear on the screen differs from the actual distance.



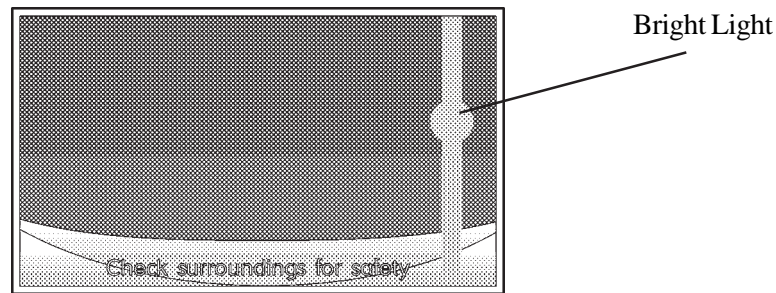
02KBE108Y

**NOTE:** • The area displayed on screen may vary according to the vehicle status or road conditions.

- The area covered by the television camera is limited. The television camera does not show objects close to either corner of the bumper or show the area under the bumper.

## ● PRECAUTION FOR REAR VIEW MONITOR SYSTEM OPERATION

- In the following cases, it may become difficult to see items in the image on the screen, but this does not indicate a malfunction.
  - In the dark (for example, at night)
  - When the temperature near the lens is very high or low
  - When water droplets are present on the television camera, or when humidity is high (for example, when it rains)
  - When foreign matter (for example, mud or salt) is present on the television camera lens
  - When the sun or the beam of headlights shines directly into the television camera lens
  - When scratches or dirt are present on the television camera lens
- If a bright light (for example, sunlight reflected off the vehicle body) is picked up by the television camera, the smear effect\*, a phenomenon experienced by a CCD camera, may occur.



01YBE174TE

## –REFERENCE–

### Display States

\*: Smear effect

A phenomenon that occurs when a bright light is received by a television camera; and transmitted to a screen, the light source will appear to have a vertical streak above and below it.

## POWER WINDOW SYSTEM

### ✱ DESCRIPTION

- The power window motor with built-in ECU on the driver side door has the one-touch auto up-and-down and jam protection functions only for the driver side door.
- The power window motor without built-in ECU for all doors has the one-touch auto down functions only for the driver side door.
- The power window system has the following functions:

| Function                                    | Outline                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Manual up-and-down<br>(All Doors)           | This function causes the driver door window to open or close while the power window switch is being pulled halfway up or pushed halfway down. Windows other than the driver door window can be opened or closed by fully pulling up or fully pushing down the switch. The window stops as soon as the switch is released.                                                                                                                                                           |
| One-touch auto up-and-down<br>(Driver Door) | The one-touch auto up-and-down function enables the window to be fully opened or closed with a single touch of the power window switch.                                                                                                                                                                                                                                                                                                                                             |
| Jam Protection<br>(Driver Door)             | A jam protection function automatically stops the power window and moves it downward if a foreign object gets jammed in the window during one-touch auto-up operation.                                                                                                                                                                                                                                                                                                              |
| Remote Control<br>(All Doors)               | The power window master switch can control the up-and-down operations of the windows.                                                                                                                                                                                                                                                                                                                                                                                               |
| Window Lock                                 | Power window operation of the 3 passenger windows is disabled when the window lock switch is pressed.                                                                                                                                                                                                                                                                                                                                                                               |
| Key Off Operation                           | This function makes it possible to operate the power windows for approximately 43 seconds after the power source is turned to OFF, if the driver door or the front passenger door is not opened.                                                                                                                                                                                                                                                                                    |
| Diagnosis                                   | When the power window ECU detects the following conditions, the self-diagnosis function switches the ECU to failsafe mode. The illumination (LED) of the power window master switch flashes to inform the user. <ul style="list-style-type: none"> <li>• An abnormality in the Hall IC that detects the position, speed and direction of the window.</li> <li>• An error in the window detection position and the upper limit position recorded in the power window ECU.</li> </ul> |
| Fail-Safe                                   | If the Hall IC in the power window ECU malfunctions, some power window functions will be prohibited by the failsafe mode: <ul style="list-style-type: none"> <li>• Power windows can be operated using the power window switches within 40 seconds of failsafe mode being entered.</li> <li>• Each power window operates when the corresponding power window switch is fully pushed down or pulled up and held in that position.</li> </ul>                                         |

**Service Tip**

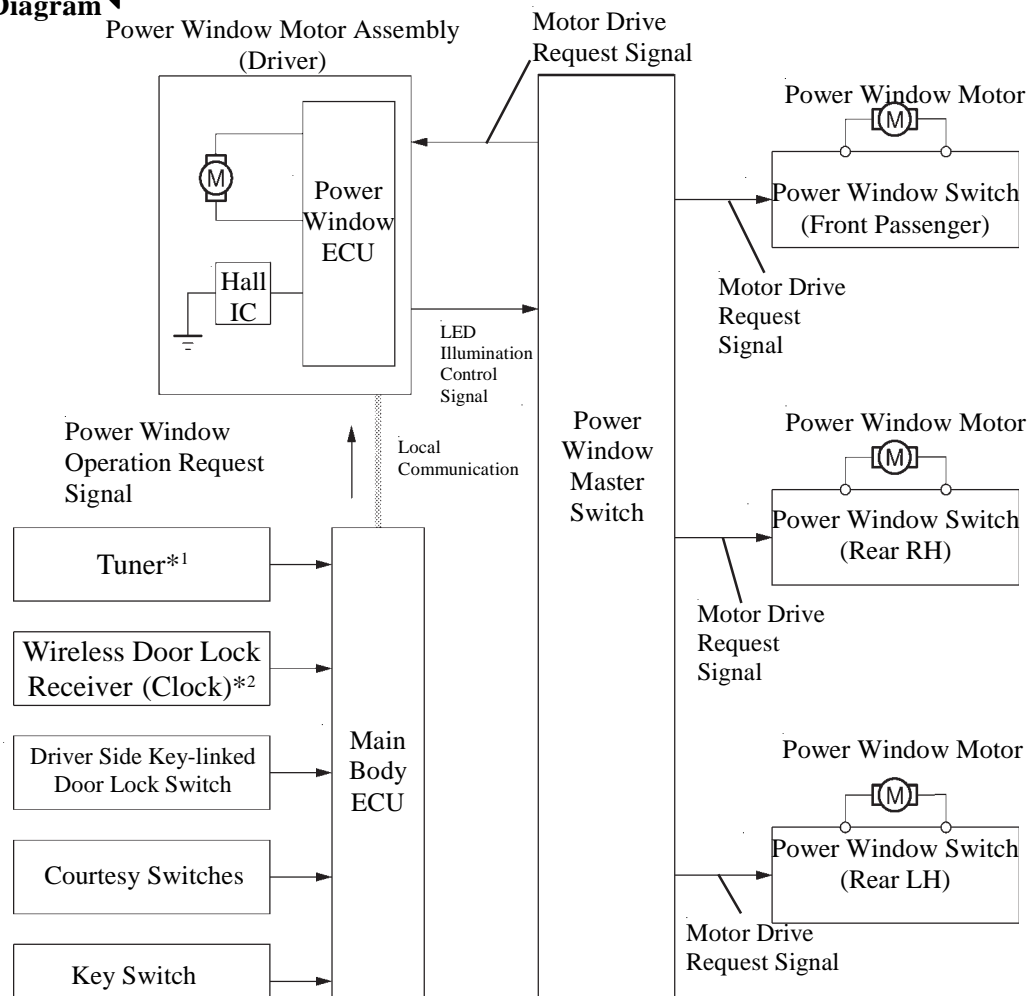
The power window motor assembly with a jam protection function stores the initial position of each door window. The memory is not cleared if battery terminals, fuses or power window motor assembly connectors are disconnected. However, after the power window motor assembly and power window regulator assembly are replaced, the stored initial position data must be cleared and the initialisation of the power window motor assembly must be performed. When necessary, perform the initialisation as follows:

**Initial Position Memory Erasure Procedure**

- Turn the power supply off (for example, remove a power window motor assembly connector or fuse) while the power window motor is operating.
- Check that the power window switch illumination blinks after the power source is turned on.

**Initialisation procedure**

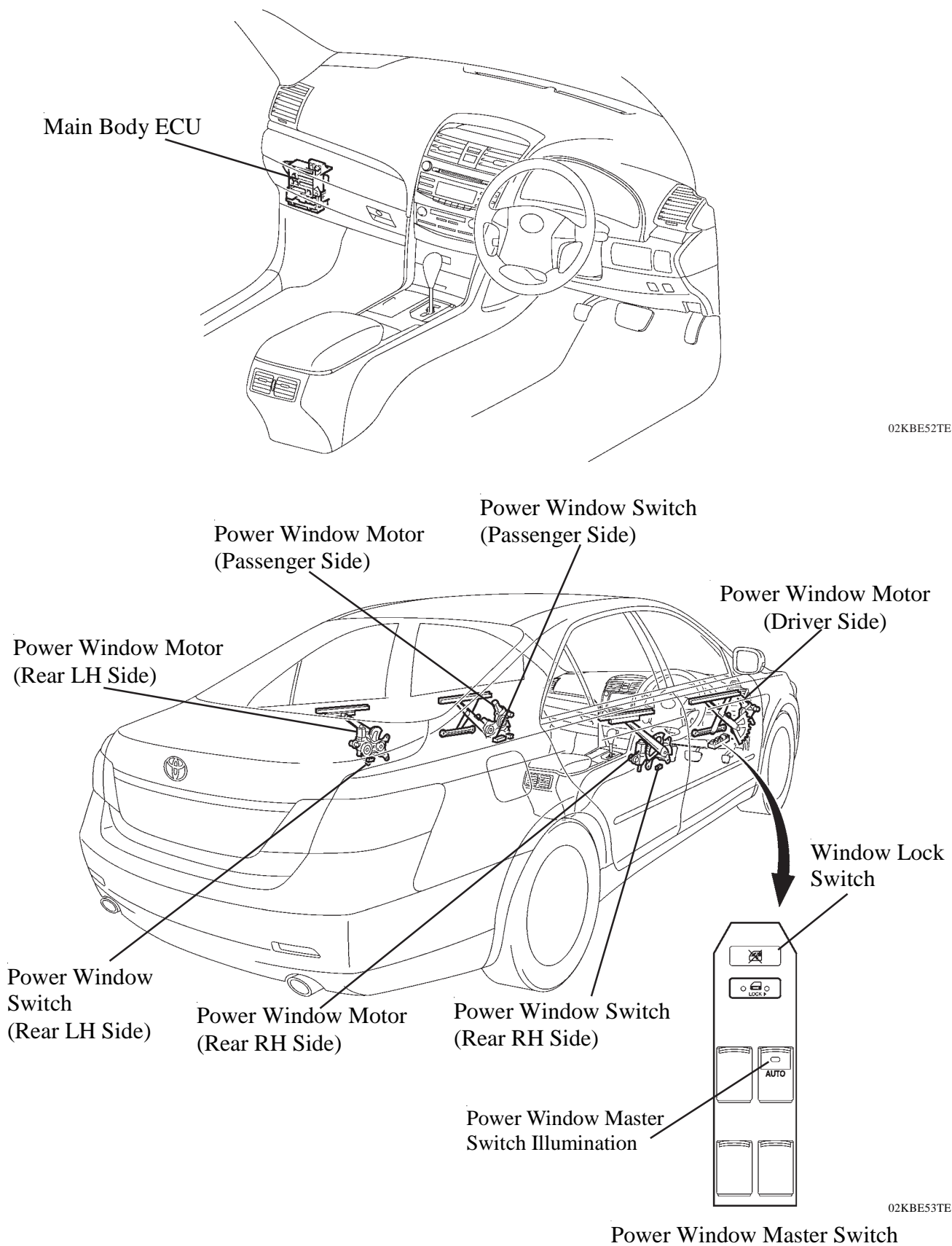
- Pull up the power window switch to the AUTO UP position and hold it until the window is fully closed.
- Hold the power window switch in the AUTO UP position for at least 1 second after the window is fully closed.
- Make sure that the window opens and closes automatically using the one touch function. For details, see the Aurion Repair Manual.

**System Diagram**

02KBE57Y

**Driver door with jam protection function**

## ★ LAYOUT OF MAIN COMPONENTS



02KBE52TE

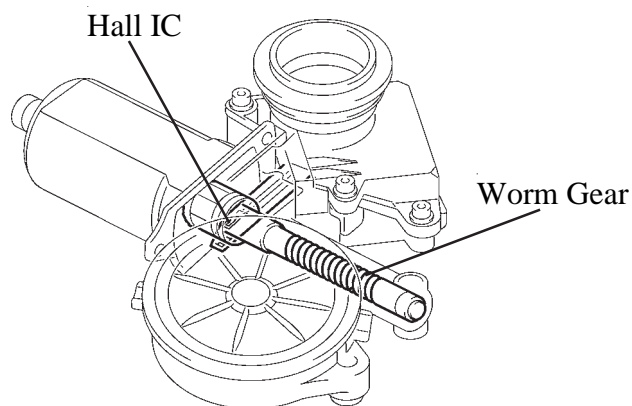
02KBE53TE

## ✱ JAM PROTECTION FUNCTION

- A jam protection function automatically stops the power window and moves it downward if a foreign object gets jammed in the door window during one-touch auto up operation.
- The operation of the jam protection function is described below.

| Door window distance from fully closed position | Operation                                                                        |
|-------------------------------------------------|----------------------------------------------------------------------------------|
| 200 mm or more                                  | Down operation of 50 mm or one second.                                           |
| 200 mm or less                                  | Down operation until door window operation of 200 mm is reached or five seconds. |

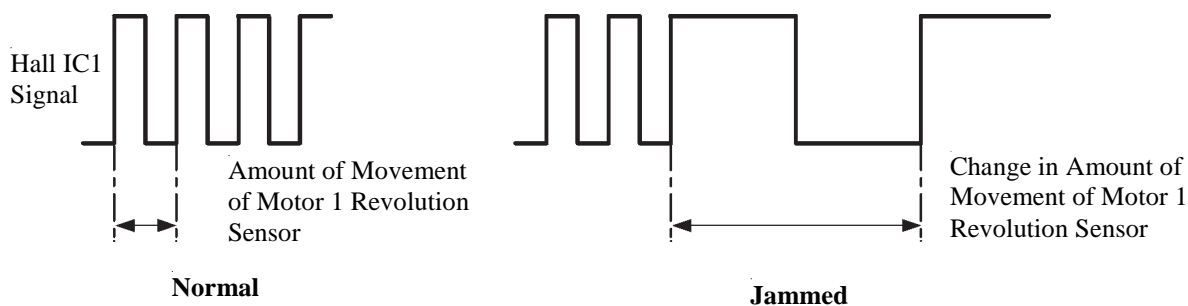
- The worm gear and Hall IC in the power window motor assembly are used to enable the power window jam protection.



01YBE60TE

- The Hall IC converts the changes in the magnetic flux that occur through the rotation of the worm gear into pulse signals and outputs them to the power window ECU.
- To control the jam protection function, the ECU determines the amount of movement and jamming of the window glass based on the pulse signals from the Hall IC.

### ▶ Judgment of Movement and Jamming ◀



232BE34

## DOOR LOCK CONTROL SYSTEM



### DESCRIPTION

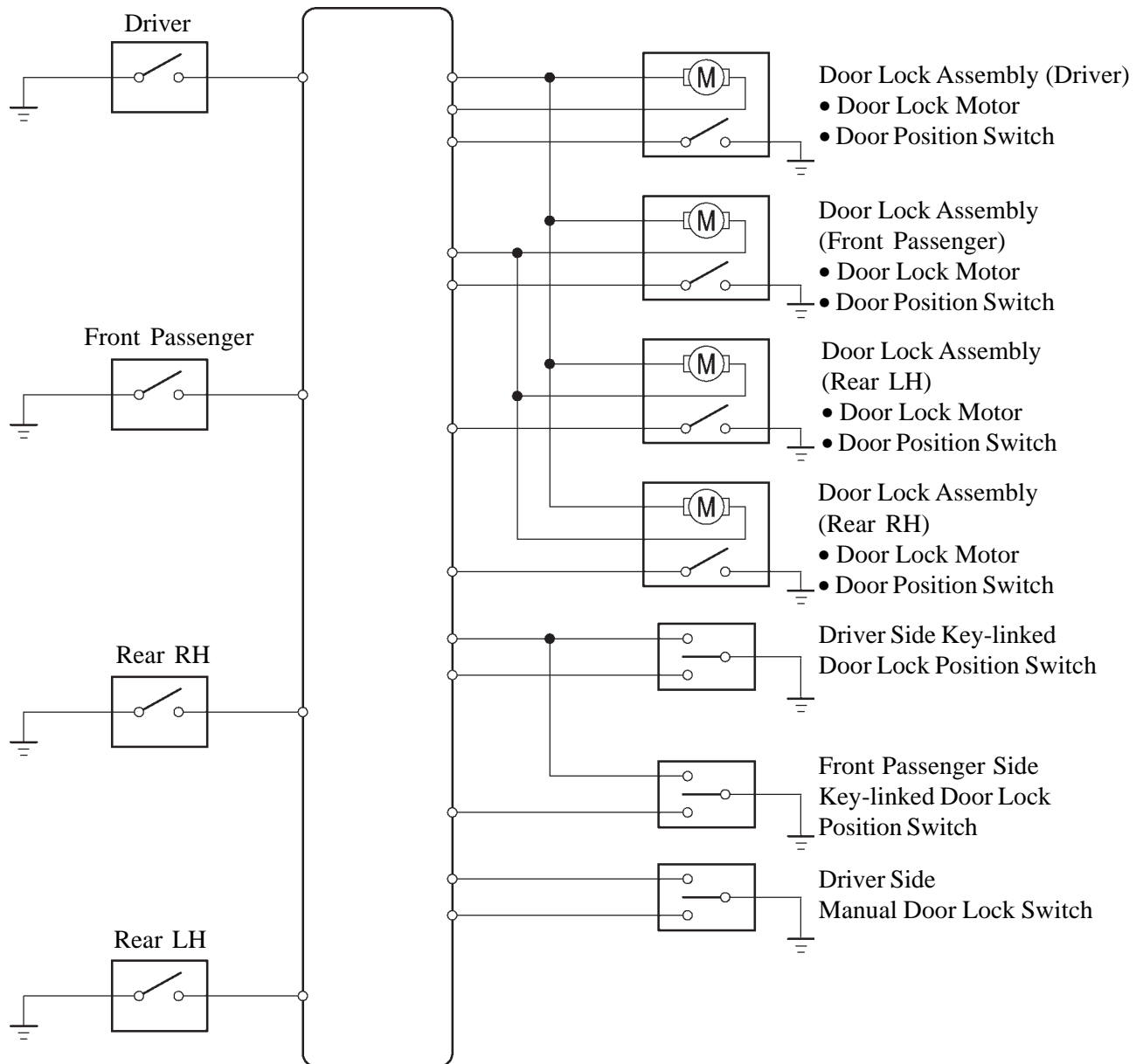
The door lock control system has the following functions:

| Function                             | Outline                                                                                                                                                                              |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Manual unlock prohibition function   | Performing the door lock operation with a transmitter (wireless remote) or a key prohibits the unlock operation by the door lock control switch (door mounted interior lock switch). |
| One-motion open                      | When the door is locked, this function enables the door to be unlocked by merely pulling the inside handle lever of the door.                                                        |
| Key-linked lock and unlock function  | This function, which is linked with the door key cylinder, can lock or unlock all the doors when a lock or unlock operation is effected using the mechanical key.                    |
| 2-step unlock function* <sup>1</sup> | This function is provided to unlock the driver's door by turning the key cylinder first and to unlock remaining doors by turning it a second time.                                   |
| Key confine prevention function      | When the key is inserted into the ignition key cylinder, if the door lock operation is performed with the driver's door open, all the doors are unlocked.                            |

\*<sup>1</sup>: The 2-step unlock function is initially set to OFF. The setting functions can be changed using the customised body electronics system. For details, refer to Customised Body Electronics System section on page BE-12.

► System Diagram ◀

Courtesy Switches



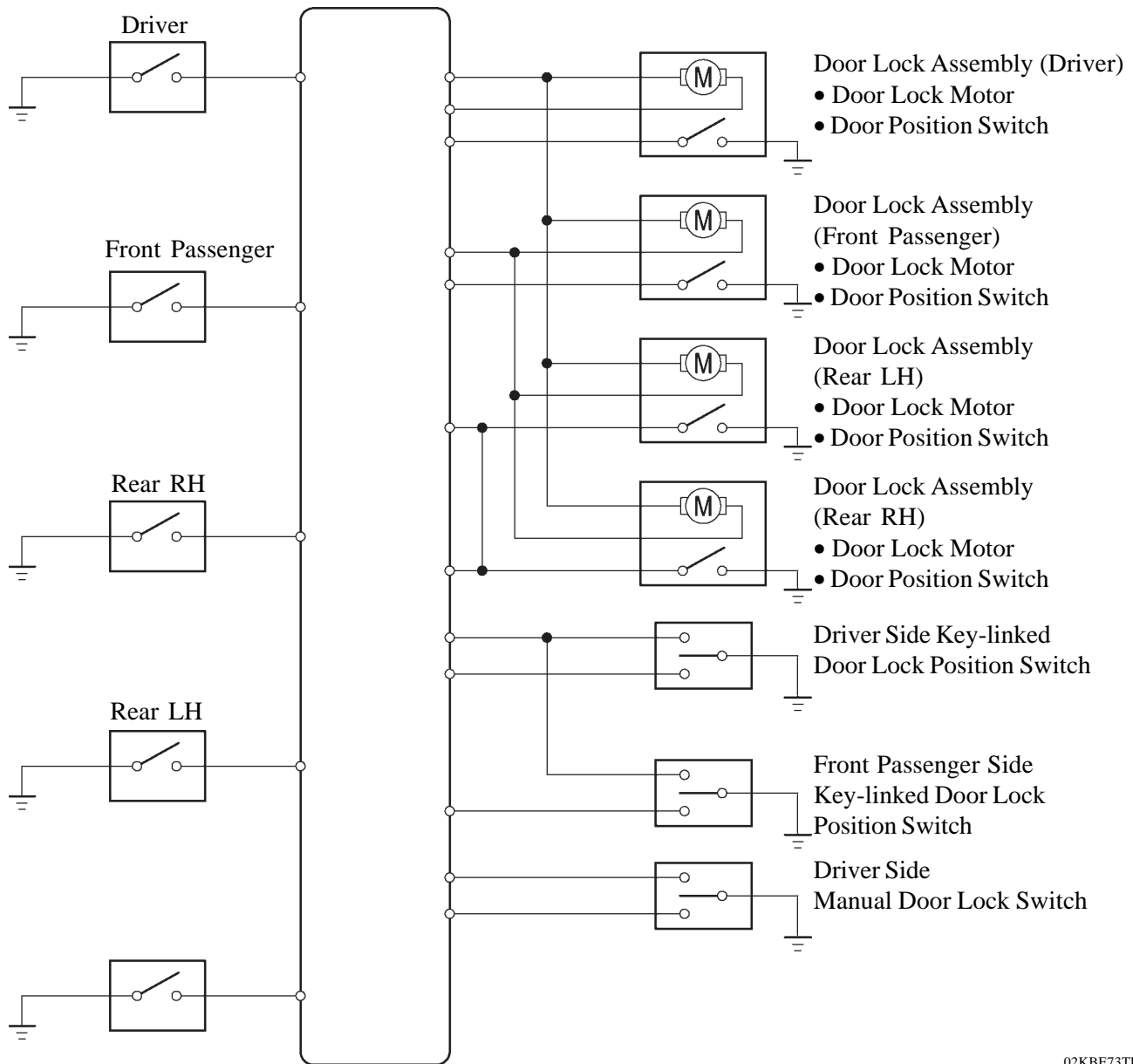
With Smart Entry and Start System

02KBE72TE

(Continued)



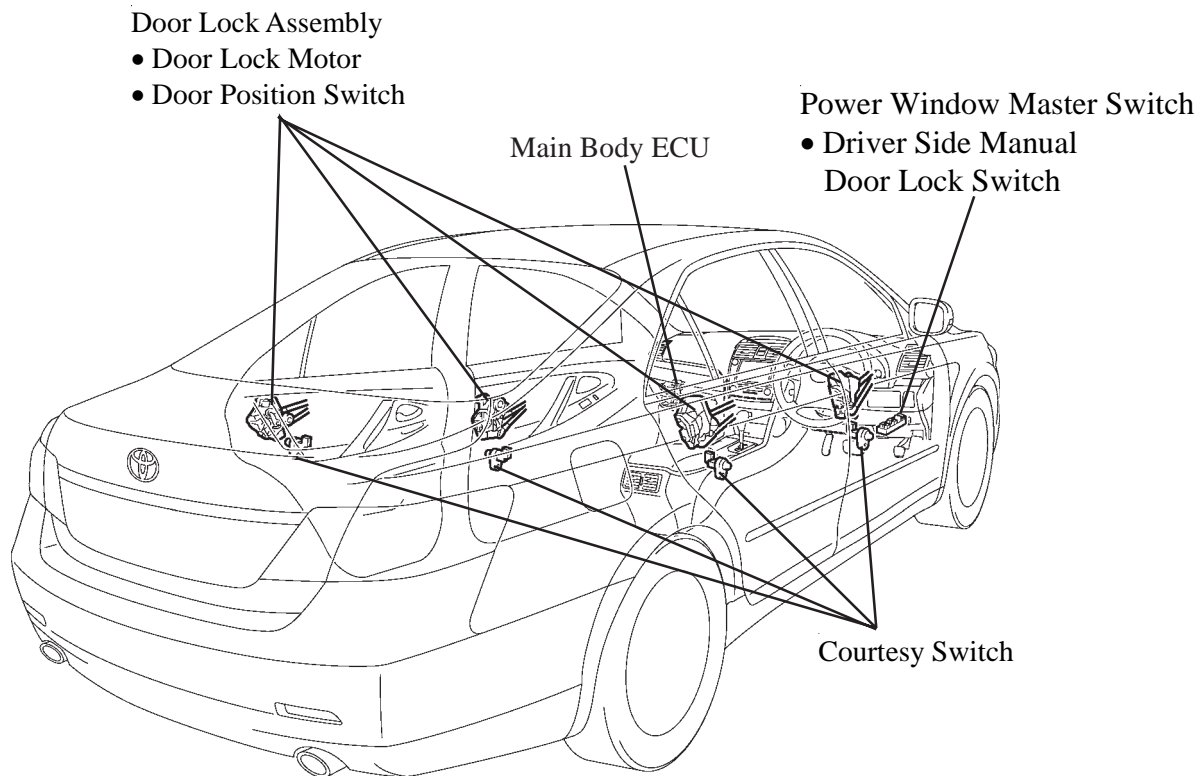
## Courtesy Switches



02KBE73TE

**Without Smart Entry and Start System**

## ✱ LAYOUT OF MAIN COMPONENTS



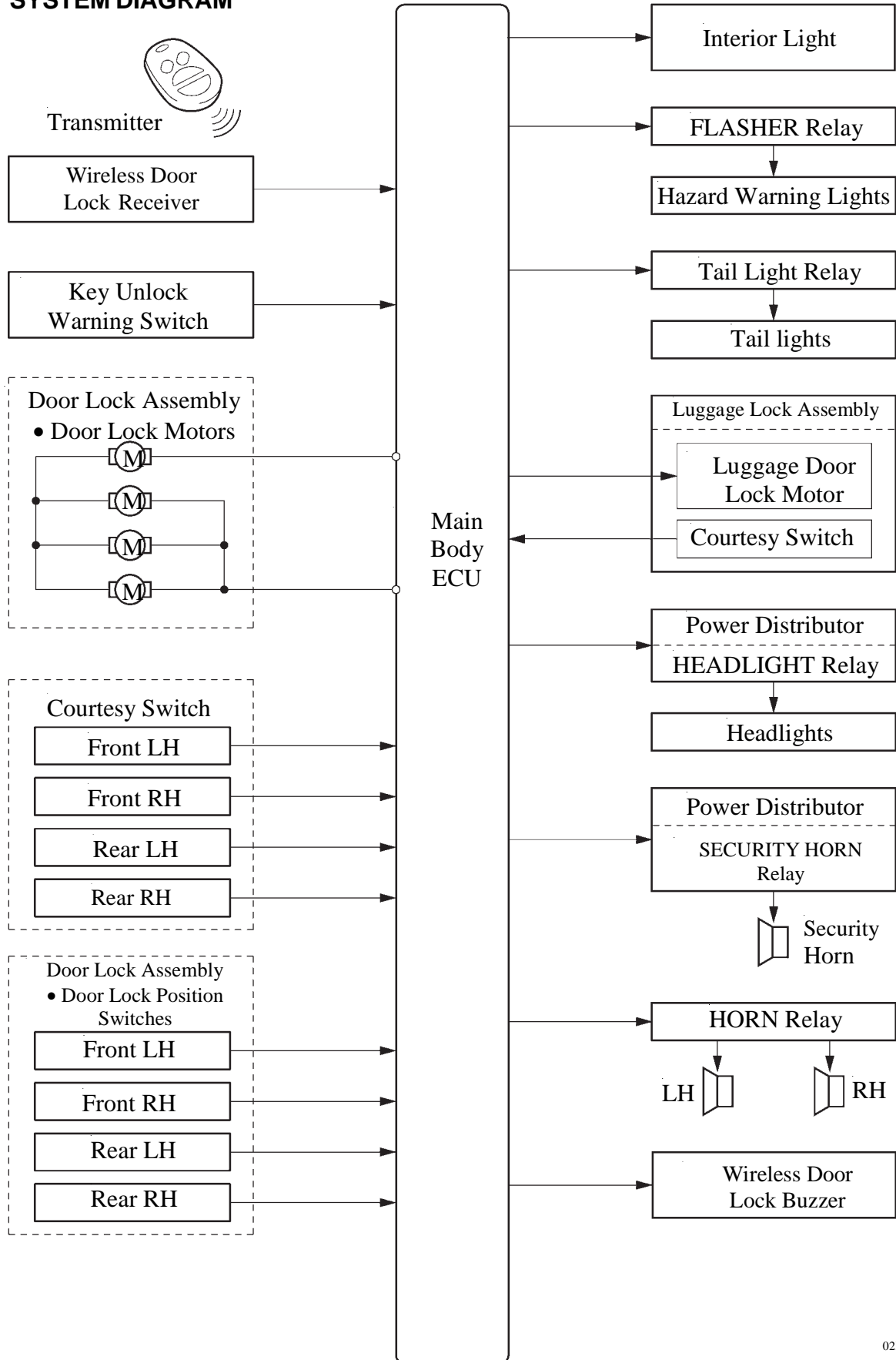
02KBE55TEb

## WIRELESS DOOR LOCK REMOTE CONTROL SYSTEM

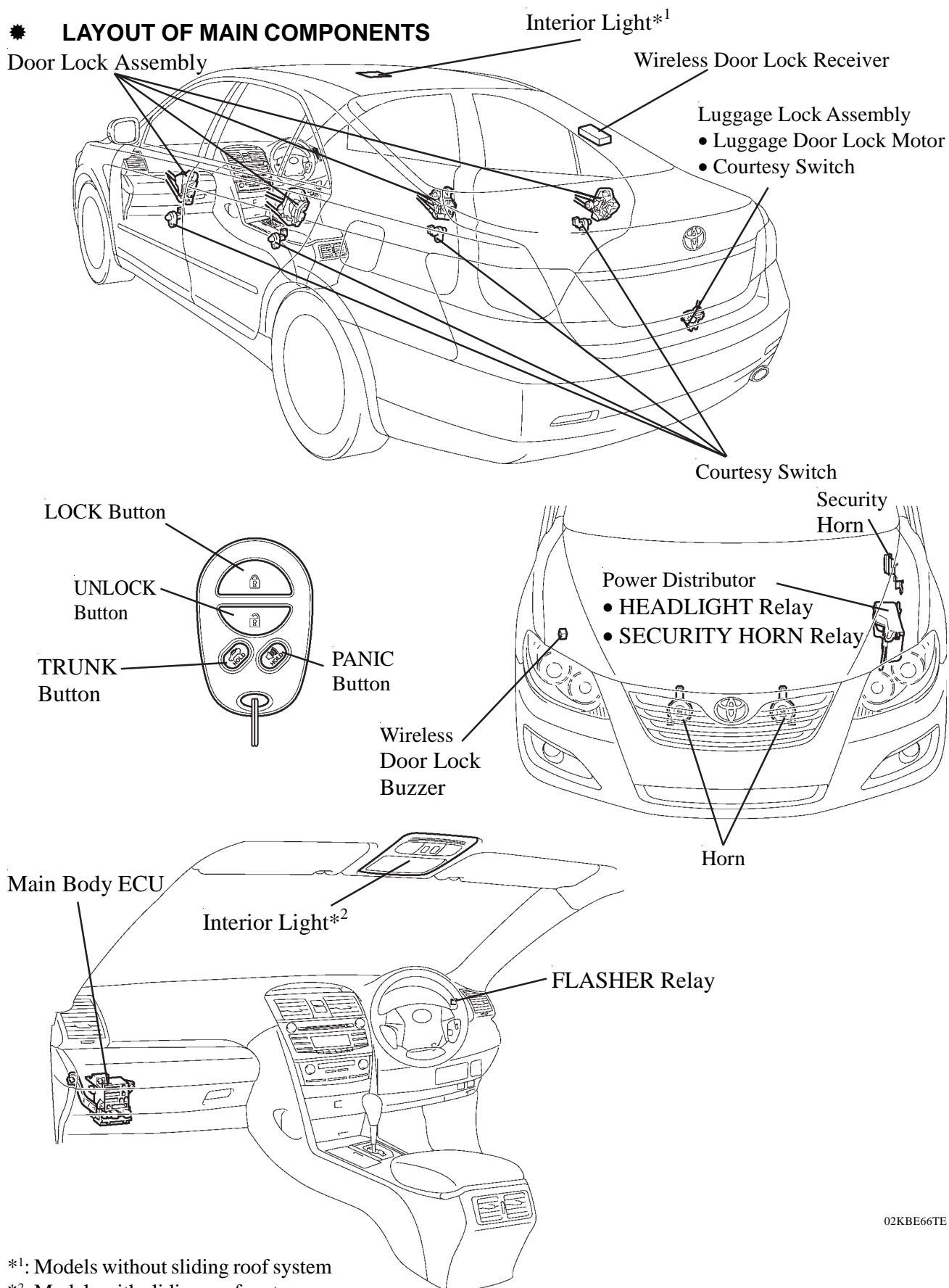
### ✱ DESCRIPTION

- The wireless door lock remote control system is used as standard on all grades without smart entry and start system.
- This system is controlled mainly by the main body ECU on models without the smart entry and start system and by the certification ECU on models with the smart entry and start system. For details about this system on models with smart entry and start system, refer to Entry Function Operation in Smart Entry and Start System. (See page BE-115).
- This system is controlled mainly by the main body ECU.
- This system is a convenient system for locking and unlocking all the doors from a distance. It has the following features:
  - The wireless door lock receiver performs the code identification process and sends the lock or unlock signal to the main body ECU. Then the main body ECU effects the door lock control.
  - A transmitter without a key is used, and it incorporates the following four buttons: LOCK, UNLOCK, TRUNK and PANIC.

● **SYSTEM DIAGRAM**



● **LAYOUT OF MAIN COMPONENTS**



02KBE66TE

\*<sup>1</sup>: Models without sliding roof system

\*<sup>2</sup>: Models with sliding roof system

## **FUNCTION**

### **1. General**

The wireless door lock remote control system has the following functions:

| Function                                           | Outline                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All Doors Lock                                     | Pressing the LOCK button on the transmitter locks all doors.                                                                                                                                                                                                                                                                    |
| All Doors Unlock                                   | Pressing the UNLOCK button on the transmitter unlocks all doors.                                                                                                                                                                                                                                                                |
| All Doors Unlock (2-step Unlock)* <sup>1</sup>     | Pressing the UNLOCK button on the transmitter once unlocks the driver's door. If the UNLOCK button is pushed again within 3 seconds, all doors unlock.                                                                                                                                                                          |
| Trunk Opener* <sup>2</sup>                         | Keeping the TRUNK button on the transmitter pressed for longer than about 0.6 seconds opens the boot lid.                                                                                                                                                                                                                       |
| Answer Back* <sup>2</sup>                          | <ul style="list-style-type: none"> <li>• The hazard lights flash once when locking and twice when unlocking, to inform that the operation has been completed.</li> <li>• The wireless door lock buzzer sounds once when locking, and sounds twice when unlocking, to inform that the operation has been completed.</li> </ul>   |
| Panic Alarm                                        | Keeping the PANIC button of the key pressed for longer than about 1 second causes the following alarms to activate. <ul style="list-style-type: none"> <li>• Sounds the horns, security horn.</li> <li>• Flashes the hazard warning lights, head lights, and tail lights.</li> <li>• Illuminates the interior light.</li> </ul> |
| Automatic Lock* <sup>2</sup>                       | If none of the doors are opened within 30 seconds of being unlocked by the wireless door lock remote control, all the doors are locked again automatically.                                                                                                                                                                     |
| Repeat                                             | If a door is not locked in response to the locking operation of the key, the main body ECU outputs a lock signal after the unlock operation.                                                                                                                                                                                    |
| Illuminated Entry* <sup>2</sup>                    | When all the doors are locked, pressing the UNLOCK button causes the interior lights to illuminate simultaneously with the unlock operation.                                                                                                                                                                                    |
| Transmitter Recognition Code Registration Function | Enables the registering (writing or storing) of 4 types of transmitter recognition codes in the EEPROM that is contained in the integration relay.                                                                                                                                                                              |

\*<sup>1</sup>: The 2-step unlock function is initially set to OFF. The setting function can be changed using the customised body electronics system.

\*<sup>2</sup>: The setting function can be changed using the customised body electronics system.

For details, refer to Customised Body Electrical System section on page BE-12.

## 2. Transmitter Recognition Code Registration Function

The table below shows the 4 special code ID registration function modes through which up to 4 different codes can be registered. The codes are electrically registered (written to and stored) in the EEPROM. For details of the recognition code registration procedure, refer to the Aurion Repair Manual.

| Mode          | Function                                                                                                                                                                                            |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rewrite Mode  | Erases all previously registered codes and registers only the newly received codes. This mode is used whenever a wireless door lock receiver is replaced.                                           |
| Add Mode      | Adds a newly received code while preserving any previously registered codes. This mode is used when adding a new key. If the number of codes exceeds 4, the oldest registered code is erased first. |
| Confirm Mode  | Confirms how many codes are currently registered. When adding a new code, this mode is used to check how many codes already exist.                                                                  |
| Prohibit Mode | To delete all the registered codes and to prohibit the wireless door lock function. This mode is used when transmitters are lost.                                                                   |

## SMART ENTRY AND START SYSTEM

### ✱ DESCRIPTION

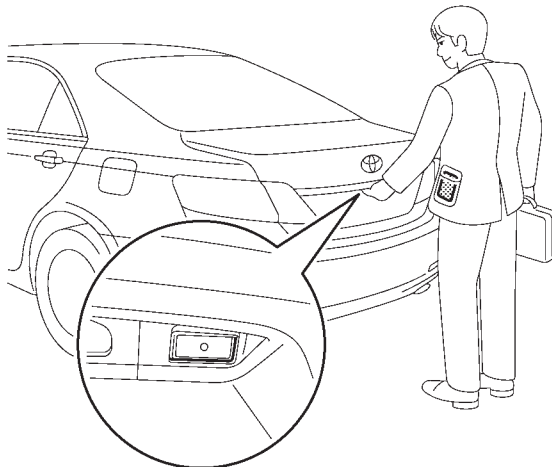
- The system settings vary depending on the destinations and engine types. For details, see the equipment list in Model Outline (see page MO-28).
- The smart entry and start system not only has a wireless door lock remote control function and engine immobiliser function, but by carrying the key the following functions (entry function and push button start function) are also possible without having to use a key or transmitter button. It is an extremely convenient system.
  - The engine can be started by simply pressing the engine switch while depressing the brake pedal (Push Button Start Function)
  - Door unlock / lock (Entry Unlock / Entry Lock Functions)
  - The trunk can be opened (Trunk Open Function)
  - Wireless door lock control function.



**Entry Unlock / Lock Functions**



**Start Function**



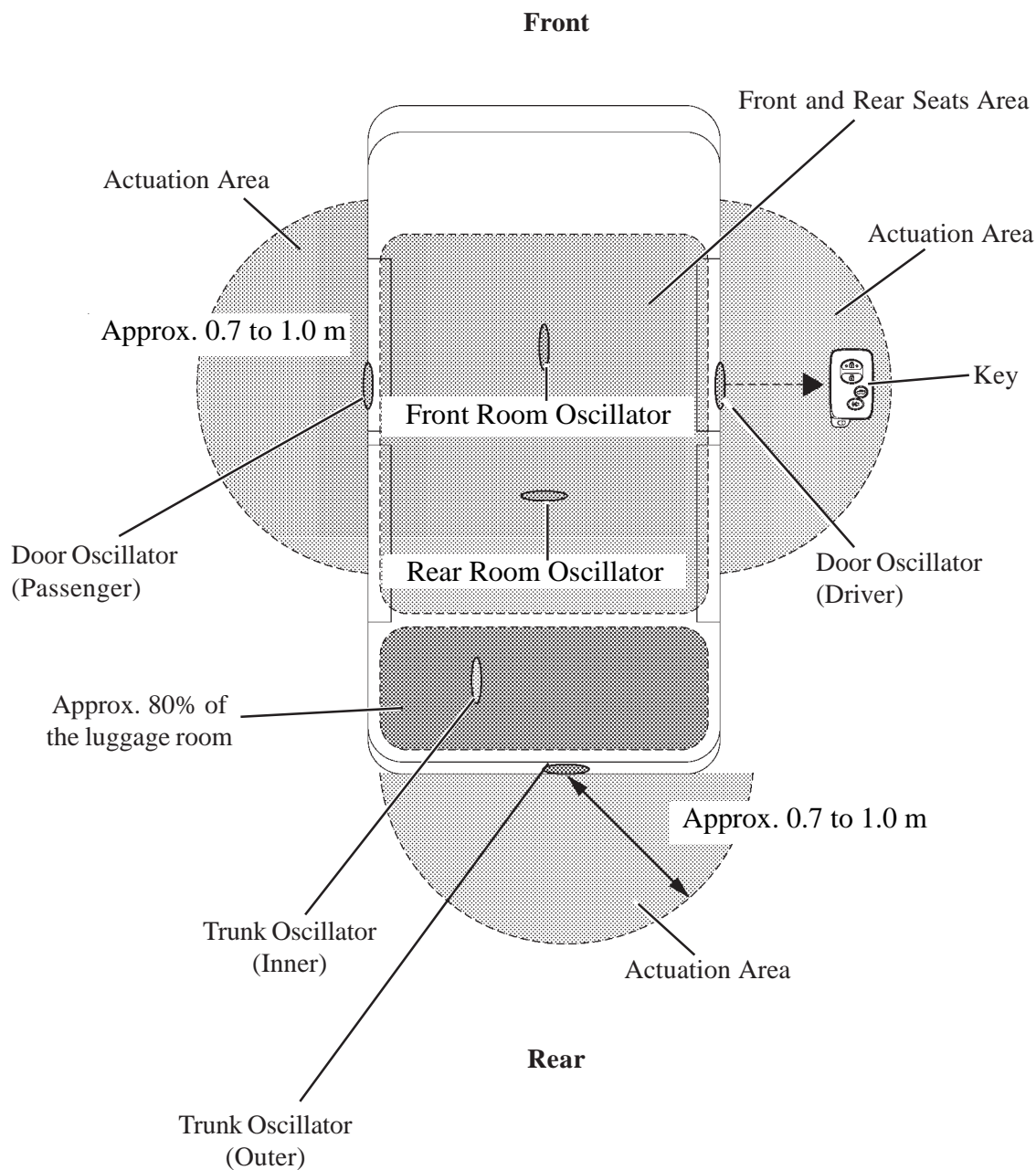
**Trunk Open Function**



## ACTUATION AREA

The special functions of the smart entry and start system only work when the key is in the actuation area formed by the eight oscillators.

- The front and rear room oscillators form the actuation area of the push button start function.
- Front door oscillators and inner and outer trunk oscillators form the actuation area of the entry function.



02KBE90TE

## ✱ START FUNCTION

### 1. General

- While the ignition key must be inserted into the ignition key cylinder and turned from OFF to the START position in order to start the engine on models without the smart entry and start system, models on which the smart entry and start system is installed start the engine when the push-type engine switch is pressed while the brake pedal is depressed and a key is carried by the driver.
- This function has different power source control patterns to suit the state of the brake pedal and shift lever position. For details, see page BE-123.
- Along with the adoption of the start function, an engine cranking hold function is used. For details, see page EG-69.



**With Smart Entry and Start System**

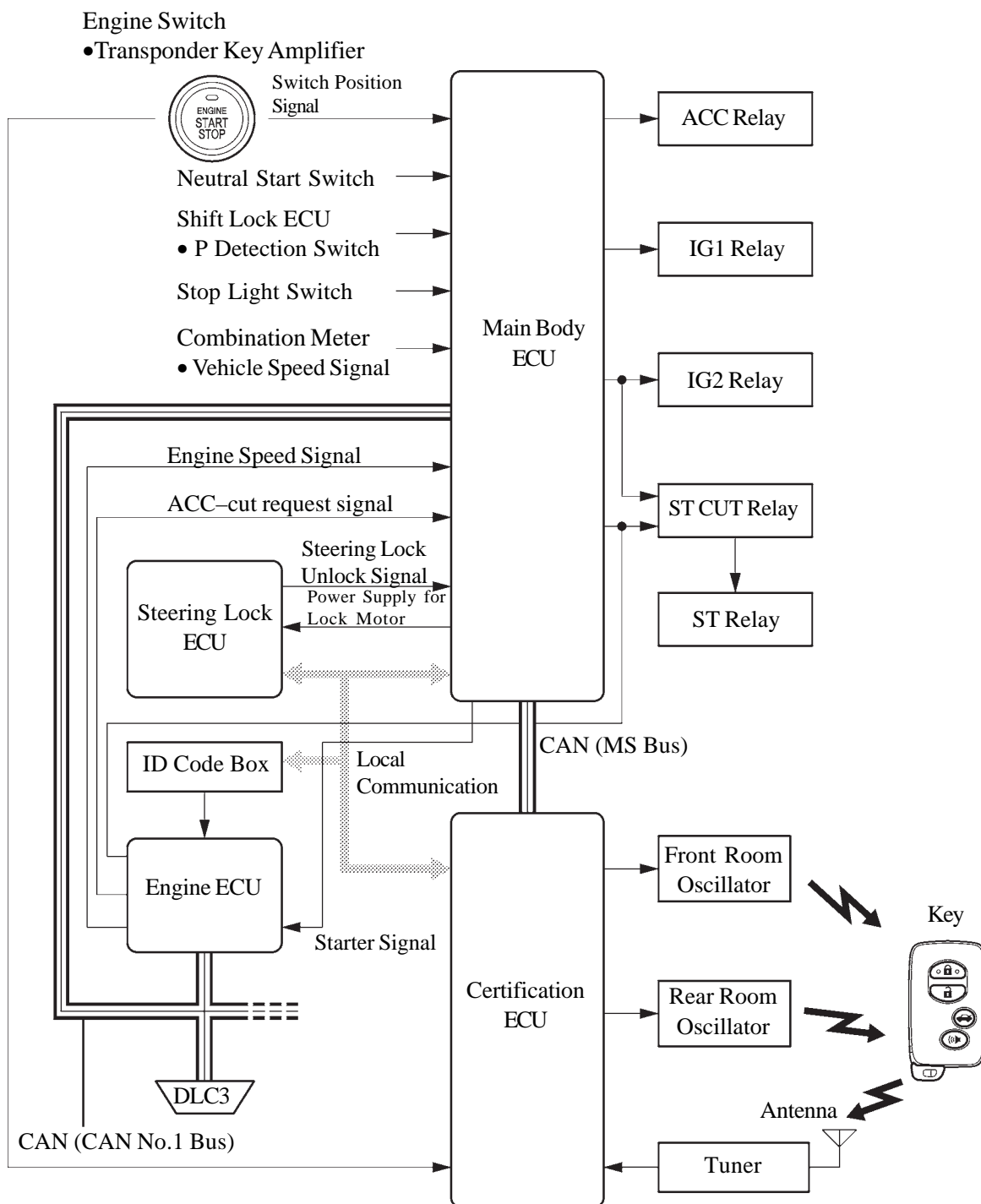


**Without Smart Entry and Start System**

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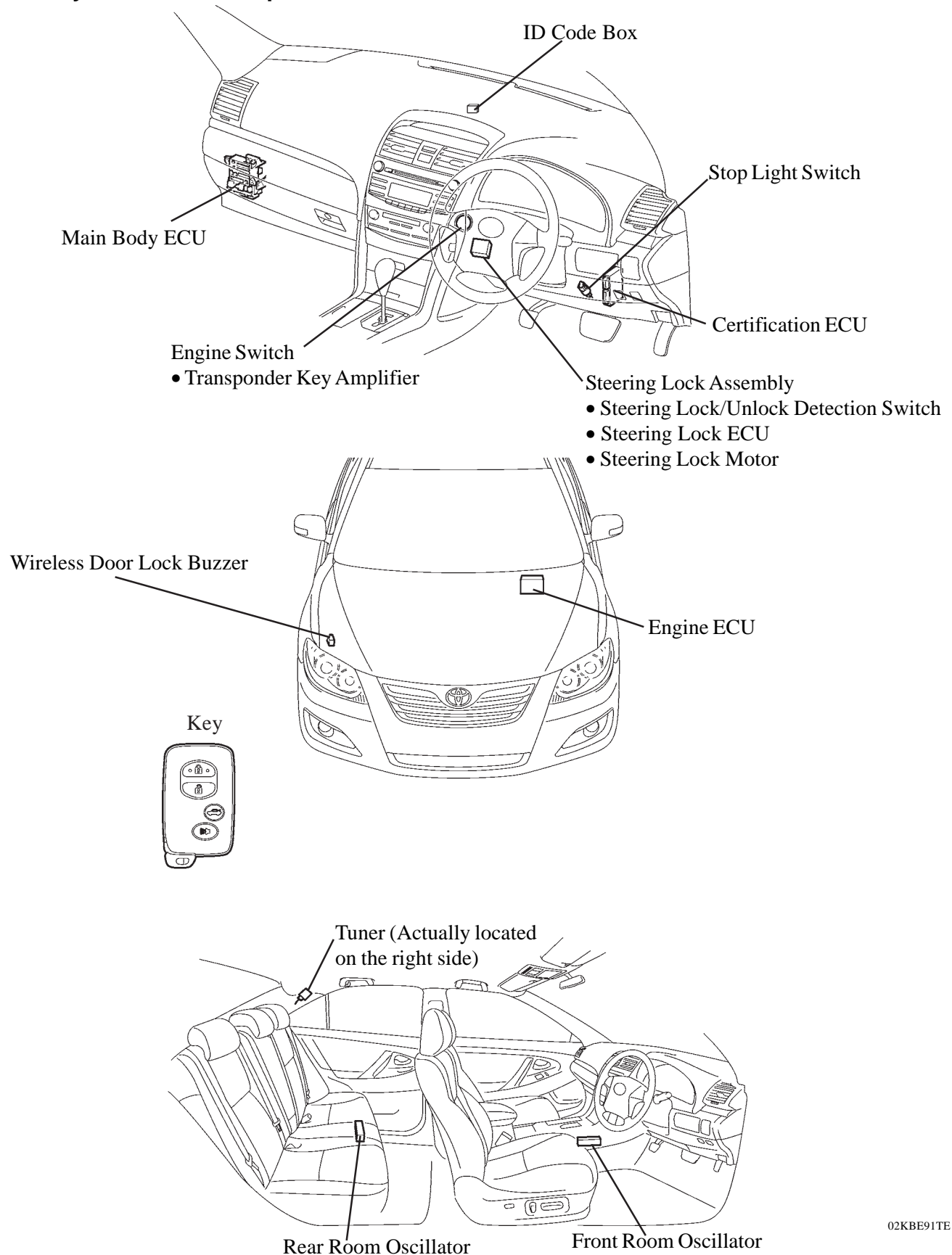
## 2. System Diagram

The main body ECU controls the push button start function. The system diagram below shows the components that relate to this function.



02KBE155TE

### 3. Layout of Main Components



02KBE91TE

#### 4. Function of Main Components

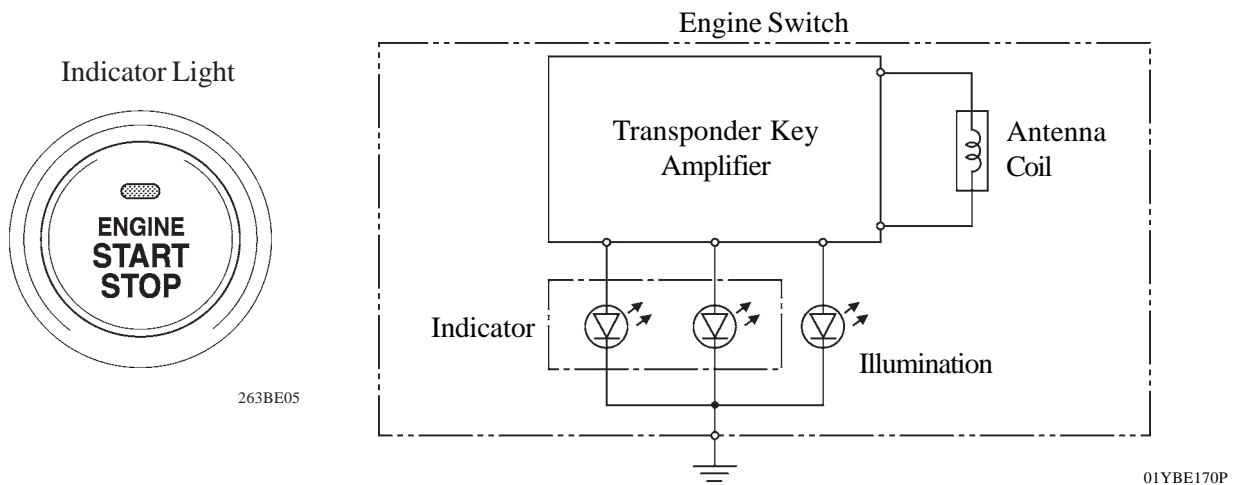
| Component                                    |                           | Function                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Engine Switch<br>• Transponder Key Amplifier |                           | <ul style="list-style-type: none"> <li>• Transmits the engine switch signal to the main body ECU.</li> <li>• Informs the driver of any power source or system abnormality through the illumination stage of the indicator light.</li> <li>• Receives the ID code and transmits it to the certification ECU when the key battery is too weak to respond to the tuner based on the room oscillators.</li> </ul> |
| Key                                          |                           | Receives the signals from the oscillators and returns the ID code to the tuner. For details, see page BE-133.                                                                                                                                                                                                                                                                                                 |
| Room Oscillator<br>• Front and Rear          |                           | Receives a request signal from the certification ECU and forms the actuation area in the vehicle interior.                                                                                                                                                                                                                                                                                                    |
| Tuner                                        |                           | Receives the ID code from the key and transmits it to certification ECU.                                                                                                                                                                                                                                                                                                                                      |
| Main Body ECU                                |                           | <ul style="list-style-type: none"> <li>• Switches the power source among four modes (OFF, ACC, IG-ON, START) in accordance with the shift position and the state of the stop light switch.</li> <li>• Controls the smart entry and start system in accordance with the signals received from the switches and each ECU.</li> </ul>                                                                            |
| Certification ECU                            |                           | Certifies the ID code received from the tuner and transmits the certification results to the ID code box and steering lock ECU.                                                                                                                                                                                                                                                                               |
| Stop Light Switch                            |                           | Outputs the state of the brake pedal to main body ECU.                                                                                                                                                                                                                                                                                                                                                        |
| ID Code Box                                  |                           | Receives the steering unlock or engine immobiliser disengage/engage signals from the certification ECU, certifies them, and transmits each disengage/engage signal to the steering lock ECU or engine ECU.                                                                                                                                                                                                    |
| Steering Lock ECU                            |                           | Receives the steering unlock/lock signal from ID code box, and activates the steering lock motor.                                                                                                                                                                                                                                                                                                             |
| Engine ECU                                   |                           | <ul style="list-style-type: none"> <li>• Receives the engine start request signal from the main body ECU, turns ON the ST relay, and starts the engine.</li> <li>• Receives the signal from the ID code box and performs engine ignition and injection.</li> </ul>                                                                                                                                            |
| Combination Meter                            | Multi-information Display | Informs the driver of malfunctions in the smart entry and start system.                                                                                                                                                                                                                                                                                                                                       |
|                                              | Master Warning Light      | Illuminates simultaneously with a buzzer sound to inform the driver of malfunctions in the smart entry and start system.                                                                                                                                                                                                                                                                                      |

## 5. Construction and Operation

### Engine Switch

The engine switch consists of a momentary type switch, two colour (Amber, Green) LEDs, and transponder key amplifier.

- The amber and green LEDs are for the indicator light.
- The driver can determine the present power source and check whether the engine can start or not in accordance with the illumination state of the indicator light.
- When the main body ECU detects an abnormality with the smart entry and start system, it makes the amber indicator light flash. If the engine is stopped in this state, it might not be possible to restart it.

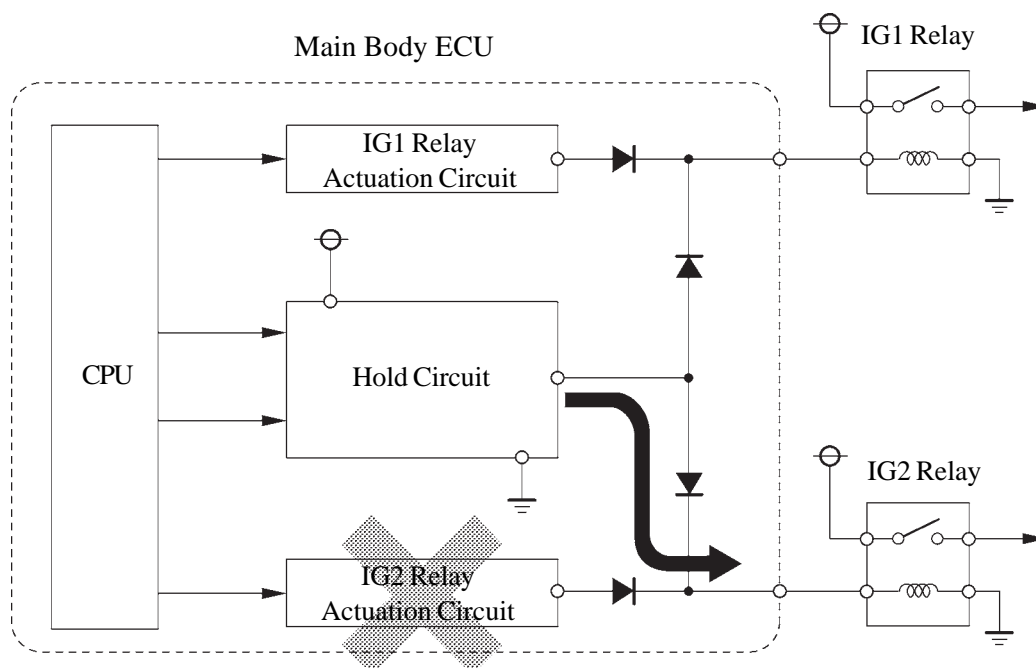


### Indicator Light Condition

| Power Source Condition                   | Indicator Light Condition      |                                                      |
|------------------------------------------|--------------------------------|------------------------------------------------------|
|                                          | Brake pedal released           | Brake pedal depressed with shift lever in "P" or "N" |
| OFF                                      | OFF                            | ON (Green)                                           |
| ACC, IG-ON                               | ON (Amber)                     | ON (Green)                                           |
| Engine Running                           | OFF                            | OFF                                                  |
| Steering lock not unlocked               | Flashes (Green) for 15 seconds | Flashes (Green) for 15 seconds                       |
| Smart Entry and Start System Malfunction | Flashes (Amber) for 15 seconds | Flashes (Amber) for 15 seconds                       |

## Main Body ECU

- Main body ECU consists of the IG1 relay and IG2 relay actuation circuits, CPU, and hold circuit.
- The hold circuit is installed to prevent the power supply to the relays from being cut off when an abnormality occurs in IG1 relay and / or IG2 relay actuation circuits while driving.



263BE138

### Service Tip

The main body ECU constantly stores the present power source state in its memory. Therefore, if the power to main body ECU is interrupted due to the removal of the battery, the main body ECU restores the power source after the battery is reconnected.

For this reason, if the battery is removed when the engine switch is in a state other than OFF, the power will be restored to the vehicle at the same time the power is restored to main body ECU (by reconnecting the battery).

Therefore, before removing the battery, be sure to turn the engine switch OFF.

## 6. Start Function Operation




























































### General

The start function has different power source patterns to suit the brake pedal state and shift lever position.

| Pattern | Brake Pedal | Shift Lever               | Power Source Pattern                                                                                                            |
|---------|-------------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| A       | Depressed   | P or N Position           | When the engine switch is pushed once.<br>• OFF → IG ON (after the engine is started)                                           |
| B       | Released    | P Position                | The power source mode changes repeatedly in the following sequence when the engine switch is pushed:<br>OFF → ACC → IG ON → OFF |
| C       |             | Any position other than P | The power source mode changes repeatedly in the following sequence when the engine switch is pushed : OFF → ACC → IG ON → ACC   |
| D       | —           | P Position                | When the engine switch is pushed in the IG-ON condition.<br>• IG ON (engine is started or not started) → OFF                    |
| E       | —           | Any position other than P | When the engine switch is pushed in the IG-ON condition.<br>• IG ON (engine is started or not started) → ACC                    |



### ► Transition of Power Source ◀

| Shift Position |              | P                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                       |                                                                                   | N                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                            | Any position other than P or N                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                             |
|----------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pattern        |              | B or D                                                                                                                                                                                                                                                | A or D                                                                                                                                                                                                                                                | -                                                                                 | C or E                                                                                                                                                                                                                                                | A or E                                                                                                                                                                                                                                                     | C or E                                                                                                                                                                                                                                                      | -                                                                                                                                                                                                                                                           |
| Engine Switch  |              | Push                                                                                                                                                                                                                                                  | Push                                                                                                                                                                                                                                                  | -                                                                                 | Push                                                                                                                                                                                                                                                  | Push                                                                                                                                                                                                                                                       | Push                                                                                                                                                                                                                                                        | Push                                                                                                                                                                                                                                                        |
| Brake          |              | -                                                                                                                                                                                                                                                     | Depressed                                                                                                                                                                                                                                             | -                                                                                 | -                                                                                                                                                                                                                                                     | Depressed                                                                                                                                                                                                                                                  | -                                                                                                                                                                                                                                                           | Depressed                                                                                                                                                                                                                                                   |
| Hour           |              | -                                                                                                                                                                                                                                                     | -                                                                                                                                                                                                                                                     | After 1 hour                                                                      | -                                                                                                                                                                                                                                                     | -                                                                                                                                                                                                                                                          | -                                                                                                                                                                                                                                                           | -                                                                                                                                                                                                                                                           |
| Power Source   | OFF          |    |                                                                                     |  |                                                                                                                                                                      |    |    |                                                                                       |
|                | ACC          |                                                                                                                                                                      |                                                                                     |                                                                                   |    |    |    |    |
|                | IG           |                                                                                     |    |                                                                                   |    |    |    |    |
|                | Engine Start |                                                                                                                                                                      |    |                                                                                   |                                                                                                                                                                      |    |                                                                                       |                                                                                       |

 : Transition

 : Only when the key certification is OK

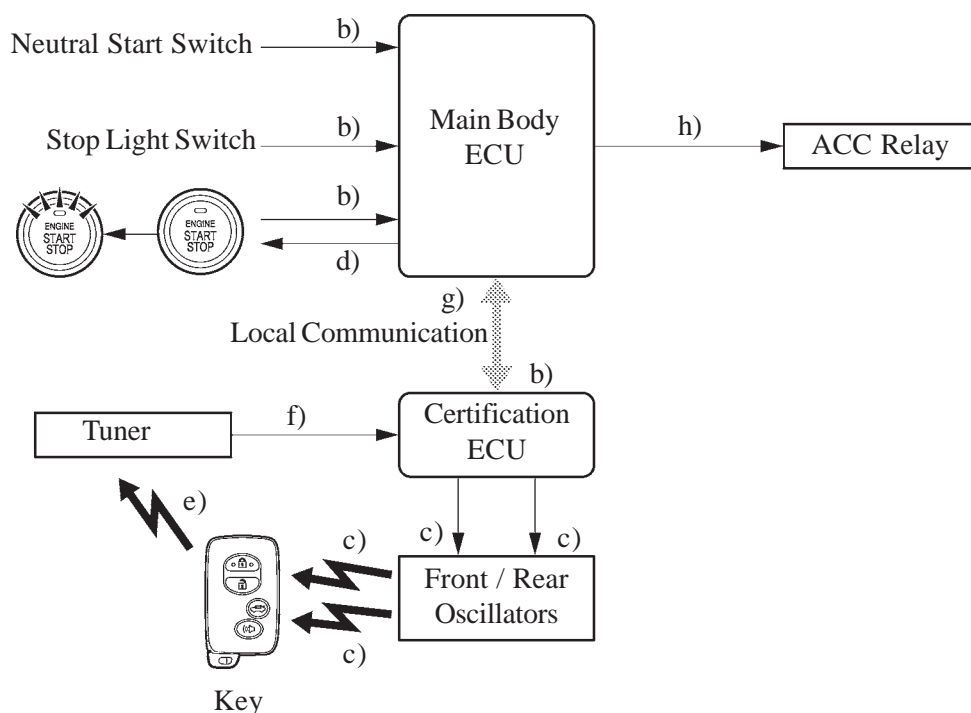
 : Only when the vehicle is stopped

### NOTE:

- Normally, the operation of the engine switch is disabled while the vehicle is being driven. However, in an emergency, the driver can stop the engine while the vehicle is in motion by pressing the engine switch for approximately 3 seconds or more to turn the power source from IG ON to ACC.
- If no signals are transmitted to the main body ECU due to malfunctions in the stop light switch, the engine may not start when the engine switch is pressed with the brake pedal depressed. In such cases, performing the following procedure may enable the engine to start: 1) press the engine switch to turn the power source from OFF to ACC, and 2) press the engine switch again and hold it for 15 seconds or more.
- The above two operations must be applied only in emergency situations. Under normal conditions, the engine must not be stopped by pressing the engine switch during driving or started without depressing the brake pedal when the shift lever is in any position other than P or N.

**Pattern A: OFF → IG-ON (after the engine is started)**

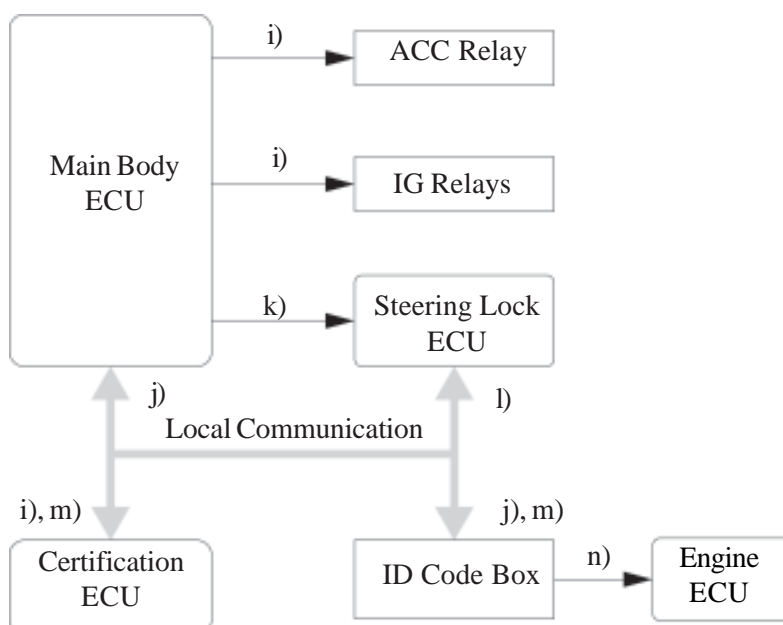
| Step | System Operation                                                                                                                                                                                                                                                                                                                                                             |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a)   | The driver holds the key and enters the vehicle.                                                                                                                                                                                                                                                                                                                             |
| b)   | When the driver presses the engine switch once with the following conditions satisfied, the main body ECU recognises the engine switch signal and transmits the key certification request to the certification ECU. <ul style="list-style-type: none"> <li>• Shift position is “P” or “N”.</li> <li>• Brake pedal depressed.</li> <li>• Power source is at “OFF”.</li> </ul> |
| c)   | The certification ECU receives the certification request and transmits a request signal to the front / rear oscillators. These oscillators then transmit the request signal.                                                                                                                                                                                                 |
| d)   | The brake pedal is depressed, so the main body ECU turns ON the green indicator light of the engine switch.                                                                                                                                                                                                                                                                  |
| e)   | The moment the key receives the request signal, it transmits its ID code to the tuner. The signal includes the response code.                                                                                                                                                                                                                                                |
| f)   | The tuner receives this code and transmits it to the certification ECU.                                                                                                                                                                                                                                                                                                      |
| g)   | The certification ECU judges and certifies the ID code, and transmits a key certification OK signal to the main body ECU.                                                                                                                                                                                                                                                    |
| h)   | After receiving the key certification OK signal, the main body ECU turns ON the ACC relay.                                                                                                                                                                                                                                                                                   |



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(Continued)

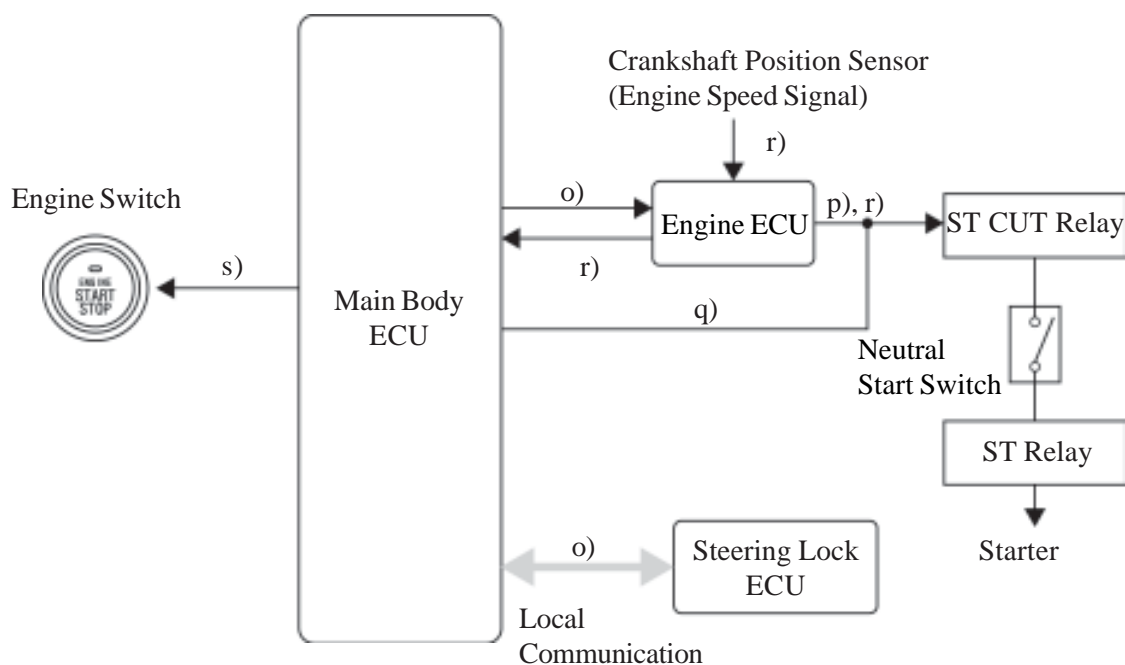
| Step | System Operation                                                                                                                                                                     |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| i)   | The main body ECU turns ON the ACC relay, and then turns ON the IG relays.                                                                                                           |
| j)   | The certification ECU checks that the power source has switched from OFF to IG-ON, and transmits a steering unlock signal to the main body ECU and ID code box.                      |
| k)   | The main body ECU receives this signal and supplies power to the steering lock ECU.                                                                                                  |
| l)   | The steering lock ECU receives the steering unlock signal via the ID code box, and releases the steering lock.                                                                       |
| m)   | After checking the steering unlock condition, the certification ECU transmits an engine immobiliser disengage signal to the ID code box.                                             |
| n)   | The ID code box certifies the disengage signal of the certification ECU, transmits the engine immobiliser disengage signal to the engine ECU, and disengages the engine immobiliser. |



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(Continued)

| Step | System Operation                                                                                                                                                                                                                                                                                         |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| o)   | After checking that the steering is in the unlocked condition, the main body ECU transmits a starter request (STSW) signal to the engine ECU.                                                                                                                                                            |
| p)   | The engine ECU receives this signal, outputs an ST relay (STAR) signal, and actuates the starter. (For details see the cranking hold function on page EG-69.)                                                                                                                                            |
| q)   | The engine ECU and main body ECU both output the starter relay signal in order to actuate the starter. Both the engine ECU and main body ECU output the signal in order to prevent situations where the starter may fail to operate, such as when the battery voltage supplied to the engine ECU is low. |
| r)   | When the engine ECU judges from the engine speed that engine start is completed, it stops the starter relay (STAR) signal, and stops the starter.                                                                                                                                                        |
| s)   | The main body ECU receives this signal, checks that engine start is completed, and turns OFF the indicator light of the engine switch.                                                                                                                                                                   |



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**Pattern B: OFF → ACC → IG ON → OFF****1) OFF → ACC**

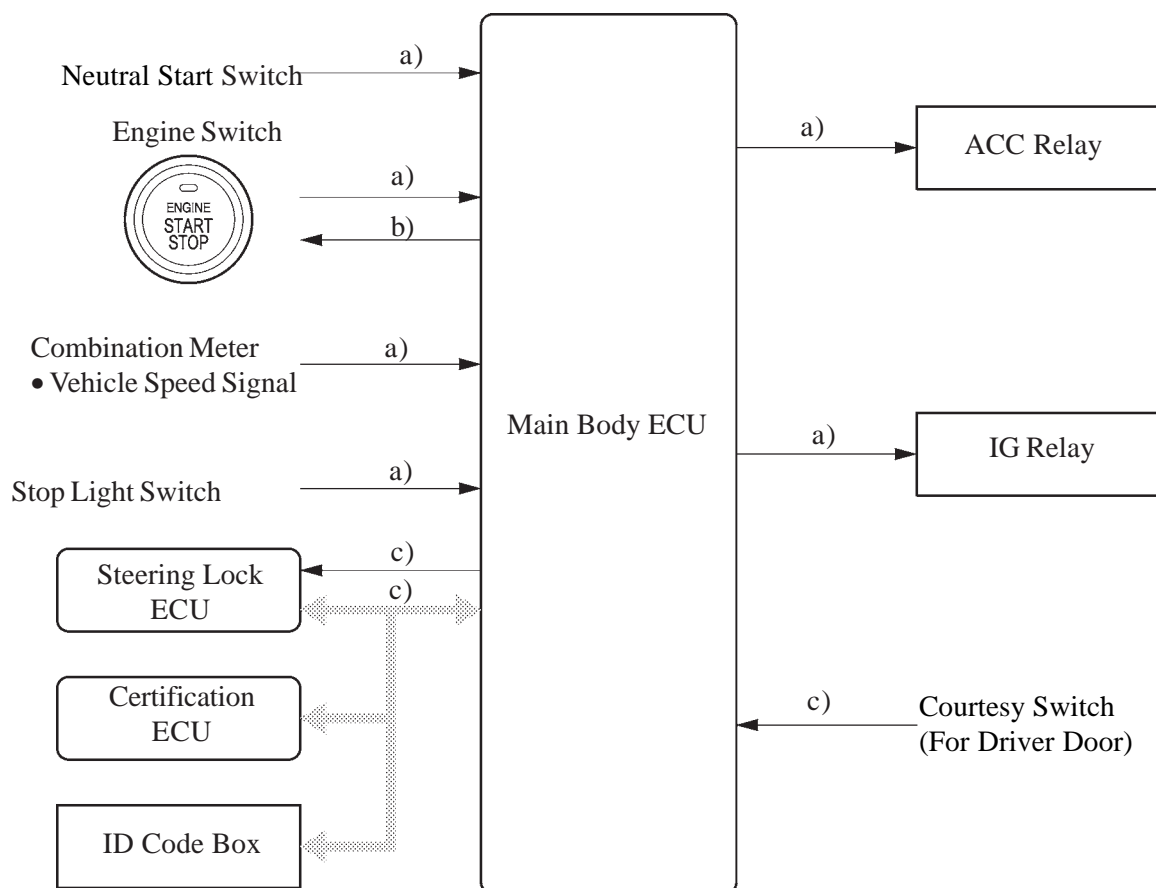
| Step | System Operation                                                                                                                                                                                                                                                                                                                                                     |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a)   | The driver has the key in their possession and enters the vehicle.                                                                                                                                                                                                                                                                                                   |
| b)   | When the driver presses the engine switch once with the following conditions satisfied, the main body ECU recognises the engine switch signal and transmits the key certification request to the certification ECU. <ul style="list-style-type: none"> <li>• Shift position is “P”.</li> <li>• Brake pedal is released.</li> <li>• Power source is “OFF”.</li> </ul> |
| c)   | Due to the brake pedal not being depressed, the main body ECU will turn ON the amber indicator light of the engine switch.                                                                                                                                                                                                                                           |
| d)   | The rest of the system operation is the same as <b>d) to h) in pattern “A”</b> . For details, see page BE-125.                                                                                                                                                                                                                                                       |

**2) ACC → IG ON**

| Step | System Operation                                                                                                                                                    |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a)   | When the power source is at “ACC” and the driver pressed the engine switch again, the main body ECU recognises the engine switch signal and turns ON the IG relays. |
| b)   | The rest of the system operation is the same as <b>j) to n) in pattern “A”</b> . For details, see page BE-125.                                                      |

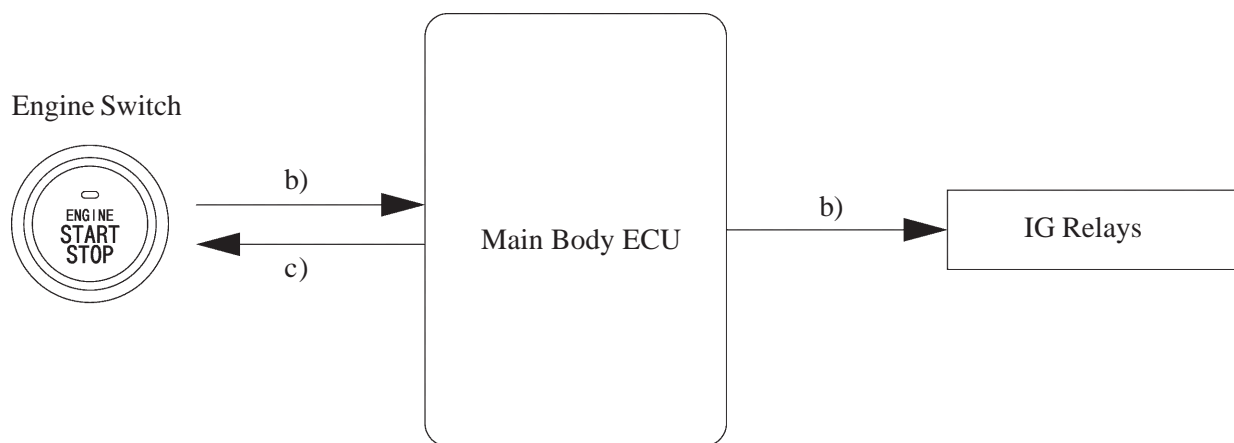
**3) IG ON → OFF**

| Step | System Operation                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a)   | When the engine switch is pressed once with the following conditions satisfied, the main body ECU recognises the engine switch signal and turns OFF the ACC and IG relays. <ul style="list-style-type: none"> <li>• Shift position is “P”.</li> <li>• Brake pedal is released.</li> <li>• Vehicle speed is 0 km/h (0 mph).</li> <li>• Power source is in “IG-ON” mode.</li> </ul>                                                                                   |
| b)   | When the power source is switched from IG-ON to OFF, the main body ECU turns OFF the indicator light of the engine switch.                                                                                                                                                                                                                                                                                                                                          |
| c)   | When the driver’s door is opened, the main body ECU receives a signal from the courtesy switch (for driver door). The certification ECU monitors the courtesy switch signal and transmits the steering lock signal to the main body ECU and ID code box accordingly. Then, the main body ECU receives this signal and supplies power to the steering lock ECU. The steering lock ECU receives the steering lock signal via the ID code box, and locks the steering. |



**Pattern C: OFF → ACC → IG ON → ACC**

| Step | System Operation                                                                                                                                                                                                                                                                                                                                                                                 |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a)   | The system operations for the power source “OFF → ACC → IG ON” are the same as those in pattern B. For details, see page BE-148.                                                                                                                                                                                                                                                                 |
| b)   | When the engine switch is pressed once with the following conditions satisfied, the main body ECU recognises the engine switch signal and turns OFF the IG relays. <ul style="list-style-type: none"> <li>• Shift position is in any position except “P”.</li> <li>• Brake pedal is released.</li> <li>• Vehicle speed is 0 km/h (0 mph).</li> <li>• Power source is in “IG-ON” mode.</li> </ul> |
| c)   | Even after the power source switches from IG ON to ACC, the indicator light of the engine switch will remain illuminated in amber.                                                                                                                                                                                                                                                               |



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**Pattern D: IG ON → OFF**

This system operation is the same as IG ON → OFF for pattern “B”. For detail, see page BE-148.

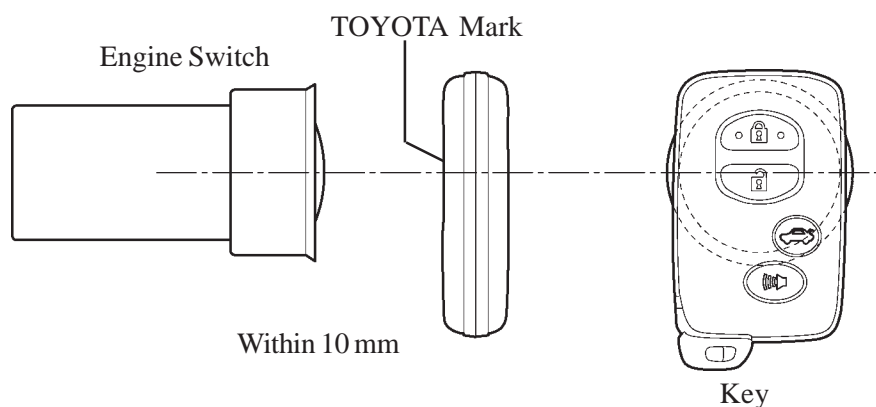
**Pattern E: IG ON → ACC**

This system operation is the same as pattern “C”. For details, see page BE-130. However, the indicator light of the engine switch will illuminate as follows:

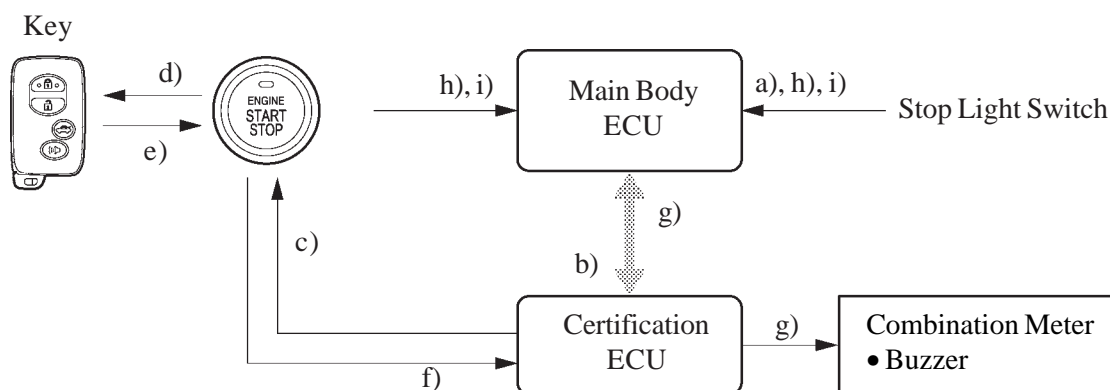
- When the power source is switched from IG-ON to ACC, the main body ECU makes the amber indicator light of the engine switch continue to illuminate.
- When the power source is switched from engine running to OFF, the main body ECU turns OFF the indicator light of the engine switch.

**When key battery is low**

| Step | System Operation                                                                                                                                                                                                                 |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a)   | To operate the smart entry and start system when the key battery is low, hold the key against the engine switch as shown below while depressing the brake pedal.                                                                 |
| b)   | The main body ECU receives the stop light switch signal and transmits a key certification request signal to the certification ECU.                                                                                               |
| c)   | The certification ECU does not receive an ID code response from the tuner, so it actuates the transponder key amplifier built into the engine switch.                                                                            |
| d)   | The transponder key amplifier outputs an engine immobiliser radio wave to the key.                                                                                                                                               |
| e)   | The key receives the radio wave, and returns a radio wave response to the transponder key amplifier.                                                                                                                             |
| f)   | The transponder key amplifier combines the key ID codes with the radio wave response, and transmits it to the certification ECU.                                                                                                 |
| g)   | The certification ECU judges and verifies the ID code, and transmits a key certification OK signal to the main body ECU. The buzzer in the combination meter sounds at the same time.                                            |
| h)   | After the buzzer sounds, if the engine switch is pressed within five seconds while the brake pedal is depressed, the power source switches to start the engine running, the same as with normal smart entry and start operation. |
| i)   | After the buzzer sounds, if the engine switch is pressed within five seconds while the brake pedal is released, the power source will be switched to ACC or IG-ON, the same as with normal smart entry and start operation.      |



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## 7. Diagnosis

The main body ECU and certification ECU can detect malfunctions in the smart entry and start system when the power source is in the IG-ON mode.

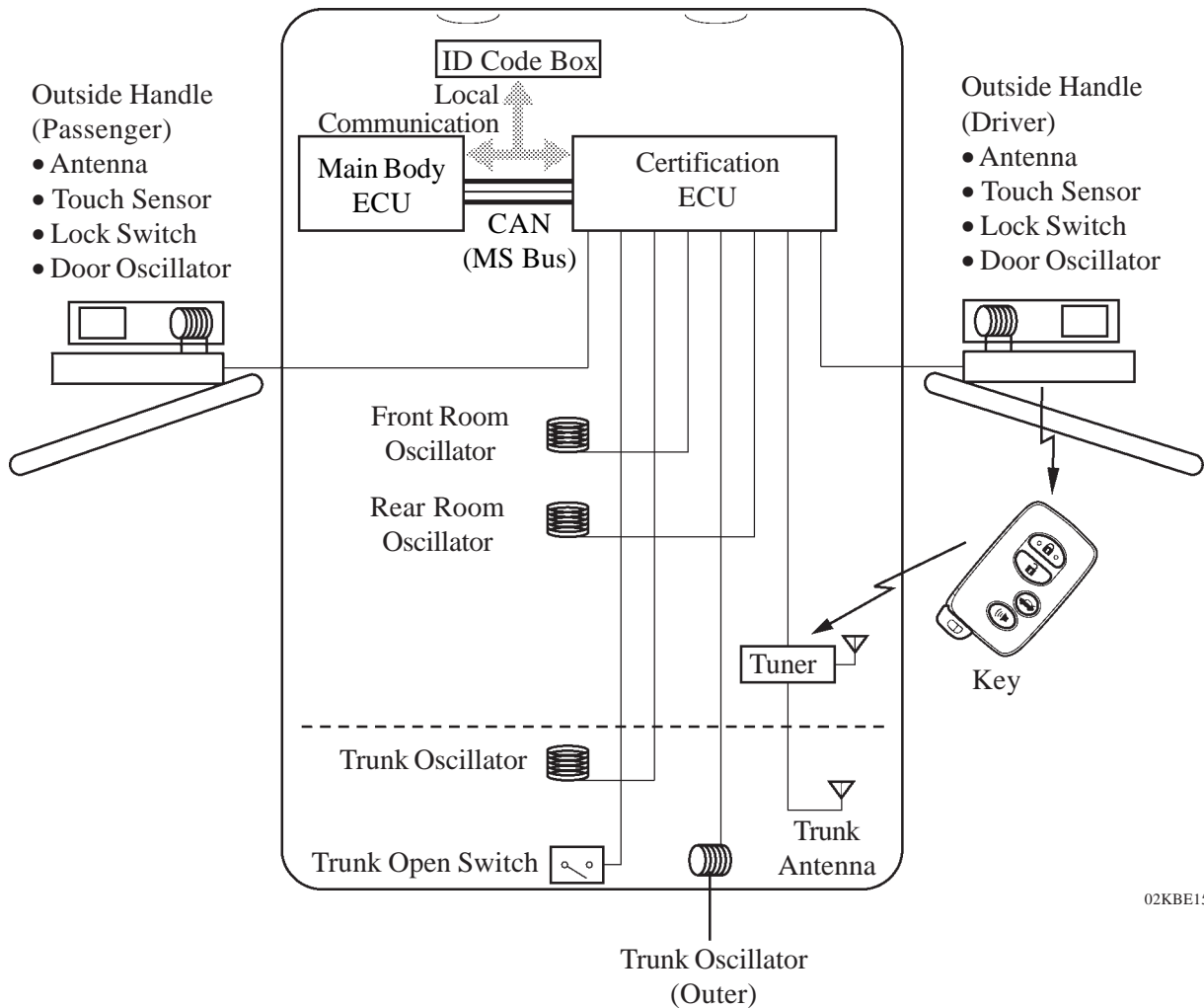
When the ECUs detect a malfunction, the amber indicator light of the engine switch flashes to warn the driver. At the same time, the ECUs may store 5-digit DTCs (Diagnostic Trouble Codes) in their memories depending on the malfunction.

- The indicator light warning continues for 15 seconds even after the power source is switched to OFF.
- The DTC can be read by connecting an intelligent tester II to the DLC3.
- The smart entry and start system may not operate successfully if a malfunction occurs.

## ✱ ENTRY FUNCTION

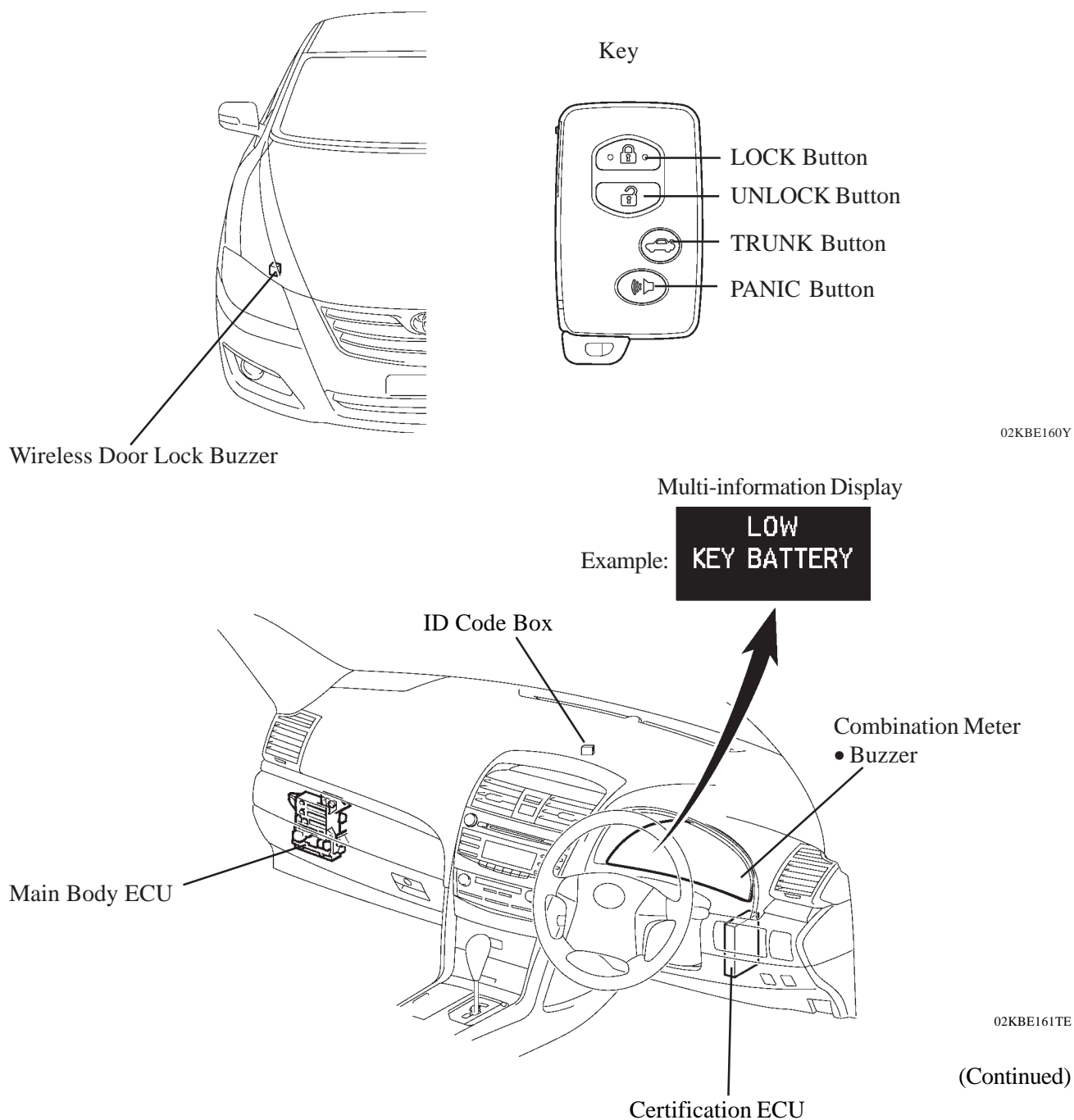
### 1. System Diagram

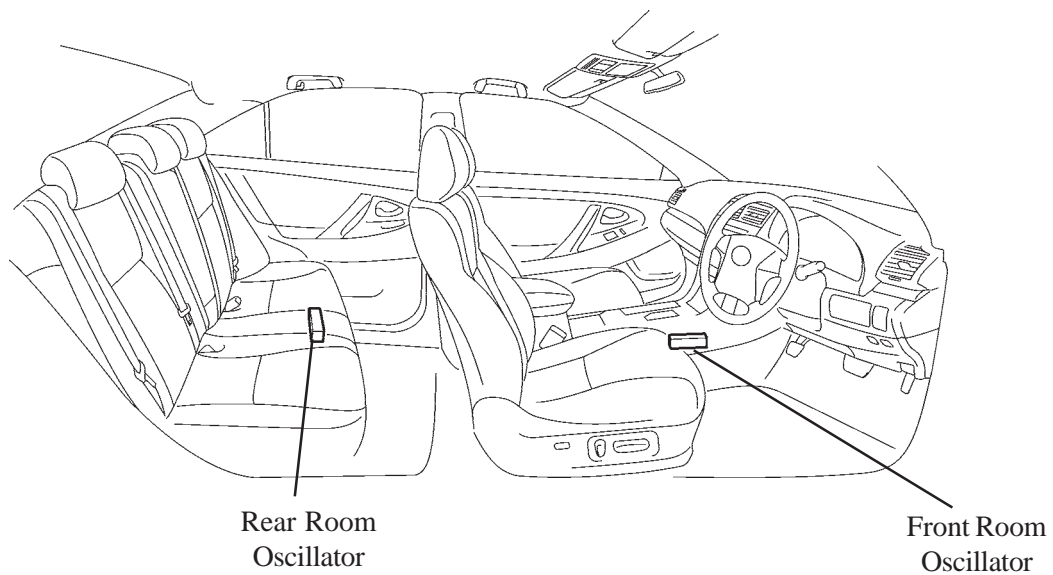
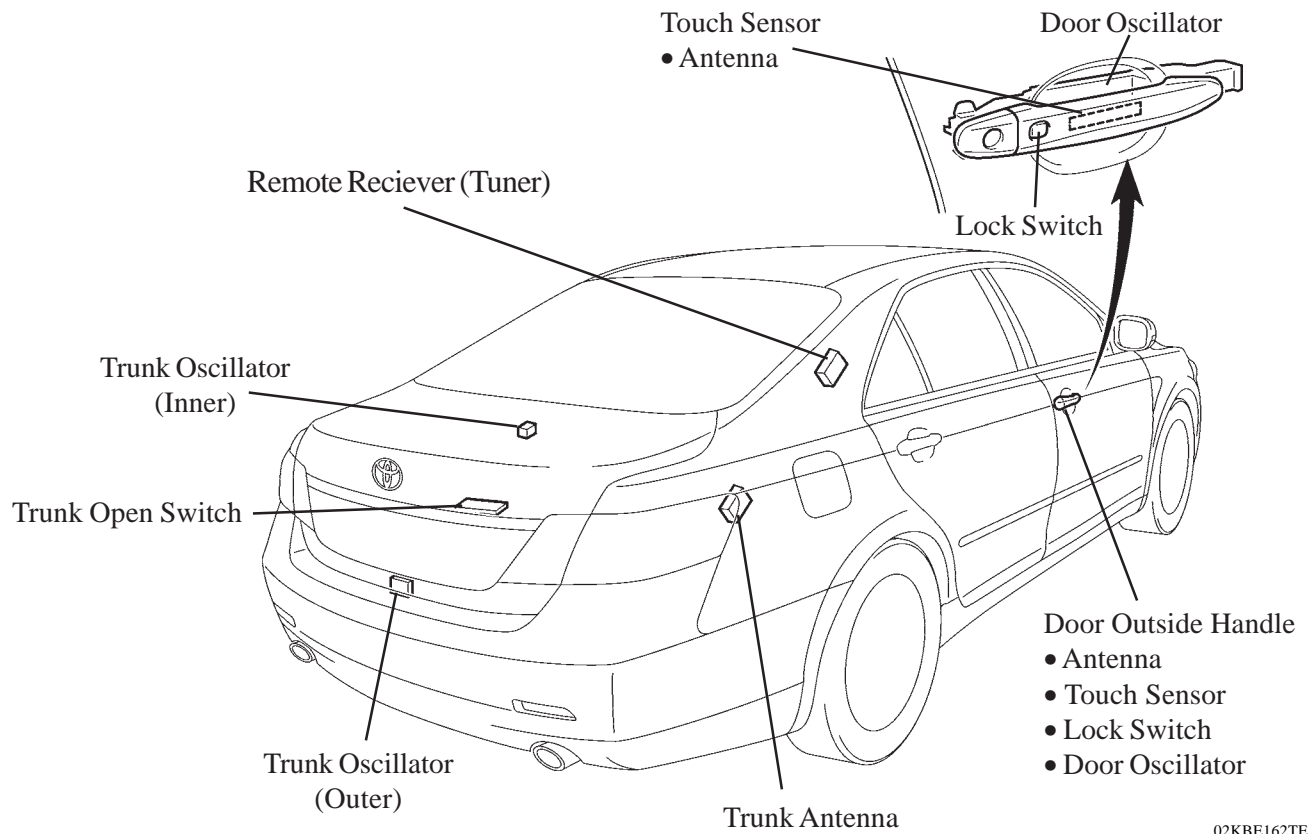
The certification ECU controls the entry function. The system diagram below shows the main components that relate to the function.



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## 2. Layout of Main Components





### 3. Function of Main Components

| Component                                   |                           | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Key                                         |                           | The key consists of a mechanical key, the transmitter for the wireless door lock remote control, the transceiver for the smart entry and start system and a transponder chip for the engine immobiliser control.                                                                                                                                                                                                                                                                                                                                |
| Certification ECU                           |                           | Controls the smart entry and start system in accordance with the signals from each oscillator, various switches, ECUs and the key. <ul style="list-style-type: none"> <li>• Judges and certifies the ID code from the tuner.</li> <li>• Transmits the engine immobiliser deactivation signal to the ID code box.</li> <li>• Transmits steering unlock signals to the steering lock ECU.</li> </ul>                                                                                                                                              |
| Main Body ECU                               |                           | Controls the smart entry and start system in accordance with the signals from the various switches, ECUs and combination meter. <ul style="list-style-type: none"> <li>• Transmits the key certification request signal to the certification ECU in accordance with the engine switch signal, and turns the relays ON and OFF.</li> <li>• Receives the request signal from the certification ECU and actuates the door lock motor to unlock or lock the door.</li> <li>• Transmits the condition each door to the certification ECU.</li> </ul> |
| ID Code Box                                 |                           | Receives and certifies the engine immobiliser deactivation signal transmitted from the certification ECU, and sends it to the engine ECU.                                                                                                                                                                                                                                                                                                                                                                                                       |
| Outside Handle (Driver and Front Passenger) | Antenna                   | Transmits the request signals.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                             | Touch Sensor              | Detects when a person touches the inside of an outer door handle.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                             | Lock Switch               | Transmits door lock request signals to the certification ECU.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                             | Door Oscillator           | Receives the request signal from the certification ECU, and creates an actuation area around front door.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Room Oscillator<br>• Front and Rear         |                           | Receives the request signal from the certification ECU, and forms the actuation area in the vehicle interior.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Trunk Oscillator<br>• Inner                 |                           | Receives the request signal from the certification ECU, and forms the actuation area in the trunk.                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Trunk Oscillator<br>• Outer                 |                           | Receives the request signal from the certification ECU, and forms the actuation area around the trunk lid.                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Tuner                                       |                           | <ul style="list-style-type: none"> <li>• Receives the ID code from the key in the actuation area and transmits it to certification ECU.</li> <li>• Receives the ID code from the key in the trunk and transmits it to certification ECU.</li> </ul>                                                                                                                                                                                                                                                                                             |
| Trunk Antenna                               |                           | Receives the ID code from the key in the luggage room and transmits it to the tuner.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Trunk Open Switch                           |                           | Transmits a trunk lid open request signal to certification ECU.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Wireless Door Lock Buzzer                   |                           | Sounds as an answerback for entry lock or unlock to inform the driver.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Combination Meter                           | Multi-information Display | When the certification ECU detects human error, it warns the driver by sounding the wireless door lock buzzer and the buzzer in the combination meter, and by illuminating a warning on the multi-information display and the master warning light, in accordance with the request signal from the certification ECU.                                                                                                                                                                                                                           |
|                                             | Master Warning Light      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                             | Buzzer                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

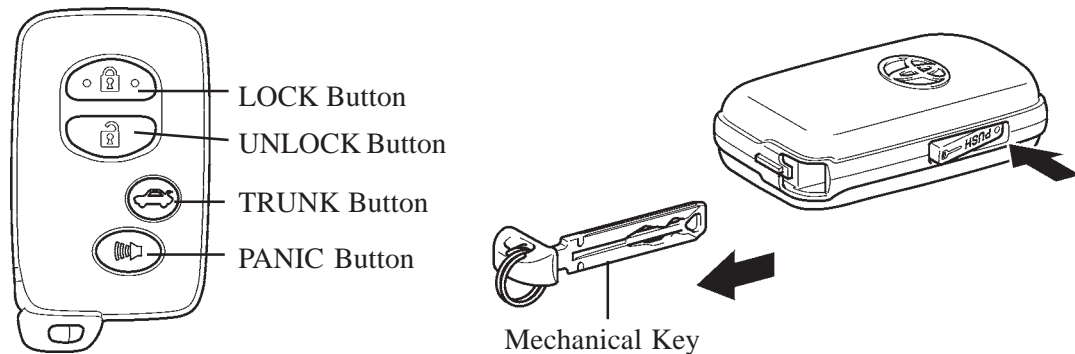
## 4. Construction and Operation

### Key

The key consists of a mechanical key, a transmitter for the wireless door lock remote control and a transceiver for the smart entry and start system, and a transponder chip for the engine immobiliser control.

- The transceiver function of the key receives the signals from the oscillators and returns the ID code to the tuner.
- The transmitter function for the wireless door lock remote control has a LOCK button, UNLOCK button, TRUNK button, and PANIC button.
- The transponder chip in the key for the engine immobiliser control returns a signal to the engine switch as a response to the radio wave it received from the engine switch.
- This mechanical key operates the driver door lock cylinder, glove box lock cylinder and trunk storage extension lock cylinder but cannot be used to start the engine.

A total of four keys can be registered. For details, see the Aurion Repair Manual.



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### Oscillator (Driver and Front Passenger Door, Front and Rear Rooms, Trunk Inner, Trunk Outer)

Each oscillator functions based on a request signal received from the certification ECU, and creates a key actuation area that is used to detect the presence of a key.

The actuation area formed by the front door oscillator and trunk outer oscillator is approximately 0.7 to 1.0 m from the outside handle of the front doors, or the centre of the rear bumper.

- The actuation area of front door oscillator is formed by transmitting a request signal every 0.25 second while the engine switch is OFF and each door is locked. In this way it detects the proximity of a key. When locking the door using the lock switch on the outer door handle, the actuation area is formed when the lock switch is pressed.
- The actuation area of the trunk outer oscillator is formed when the trunk open switch is ON. It is formed twice to allow the key to be verified.
- The actuation area of the front and rear room oscillator is formed when the driver door is opened or closed, when the start button is pressed, when a warning is activated, or when the lock switch is ON.
- The actuation area of the trunk inner oscillator forms when the trunk lid is closed or the trunk open switch is pressed, and is formed twice to allow the key to be verified.

## 5. Entry Function Operation

### General

The entry function has the following functions.

| Function                                               | Outline                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mechanical Key<br>(See page BE-137)                    | The key consists of a mechanical key, a transmitter for the wireless door lock remote control and a transceiver for the smart entry and start system, and a transponder chip for the engine immobiliser control.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Wireless Door Lock Remote Control<br>(See page BE-139) | This function is a convenient system for locking and unlocking all the doors or trunk, at a distance. The operation is same as wireless door lock remote control system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Entry Illumination<br>(See page BE-13)                 | When a key enters the actuation area of front door oscillators, the front interior light, and engine switch illumination illuminate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Entry Unlock<br>(See page BE-140)                      | When a key is located in the actuation area front door oscillators, the door will unlock after the inside of an outside door handle is touched.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Entry Unlock Mode Switching<br>(See page BE-141)       | Allows selection of one of two modes that can be operated with the entry unlock function. <ul style="list-style-type: none"> <li>• Driver Door Mode</li> <li>• All Door Mode</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Entry Lock<br>(See page BE-142)                        | When a key is located in the actuation area of either front door oscillator and the power source is OFF, the door can be locked by merely pressing the lock switch on the outside door handle.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Trunk Open<br>(See page BE-143)                        | When a key is in the actuation area of the trunk outer oscillator, the trunk can be opened by merely pressing the trunk open switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Prevention of Key Confinement<br>(See page BE-144)     | <ul style="list-style-type: none"> <li>• Prevents the confinement of the key in the vehicle by the door being locked with the outside door handle while the key is still inside the vehicle.</li> <li>• If the trunk lid is closed while the key is still in the luggage compartment, the warning buzzer sounds. If the trunk open switch is operated the trunk lid can be opened.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Warning<br>(See page BE-146)                           | <p>When any of the situations below occur, the smart entry and start system causes the certification ECU to sound the buzzer in the combination meter and the wireless door lock buzzer, and indicate a warning on the multi-information display in order to the alert the driver.</p> <ul style="list-style-type: none"> <li>• An exit warning if the shift lever is in a position other than P and the power source is a mode other than OFF.</li> <li>• An exit warning if the shift lever is in P and the power source is a mode other than OFF.</li> <li>• A warning if the occupant leaves with the key in inappropriate circumstances.</li> <li>• A warning if the entry lock button on the door handle is operated while the key is inside the vehicle.</li> </ul> <p>When any of the situations below occur, the smart entry and start system causes the certification ECU to sound the buzzer in the combination meter and indicate a warning on the multi-information display in order to the alert the driver.</p> <ul style="list-style-type: none"> <li>• A warning if the engine switch is operated while the key is outside the actuation area.</li> <li>• A warning if the key battery is weak.</li> </ul> |

Continued \...

| Function                                   | Outline                                                                                                                                                                                                                                                             |
|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Battery Saving<br>(See page BE-157)        | If the key remains within the actuation area of the front door oscillators, the system maintains periodic communication with key. Therefore, if the vehicle remains parked in that state for a long time, the key battery and the vehicle battery could be drained. |
| Key Cancel<br>(See page BE-158)            | The following key functions can be cancelled by following certain procedures. <ul style="list-style-type: none"> <li>• Entry unlock / lock</li> <li>• Trunk open</li> <li>• Prevention of key confinement</li> <li>• Warning</li> </ul>                             |
| Key Code Registration<br>(See page BE-158) | A total of four keys can be registered.<br>Enables the registering (writing and storing) of transmitter recognition codes in the EEPROM that is contained in the certification ECU.                                                                                 |

### Wireless Door Lock Remote Control Function

The wireless door lock remote control function has the following functions:

| Function                                        | Outline                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All Doors Lock                                  | Pressing the LOCK button of the transmitter (key) locks all doors.                                                                                                                                                                                                                                                                                                                                   |
| All Doors Unlock                                | Pressing the UNLOCK button of the transmitter (key) unlocks all doors.                                                                                                                                                                                                                                                                                                                               |
| All Doors Unlock (2-step Unlock) * <sup>1</sup> | Pressing the UNLOCK button on the transmitter once unlocks the driver's door. If the UNLOCK button is pushed again within 3 seconds, all doors unlock.                                                                                                                                                                                                                                               |
| Trunk Opener* <sup>2</sup>                      | Keeping the TRUNK button of the transmitter pressed longer than about 1 second opens the trunk lid.                                                                                                                                                                                                                                                                                                  |
| Answer Back* <sup>2</sup>                       | When all doors are locked, the hazard light flashes and buzzer sounds once. When all doors are unlocked, the hazard light flashes and buzzer sounds twice* <sup>2</sup> , in order to indicate that the operation has been completed.                                                                                                                                                                |
| Panic Alarm                                     | Keeping the PANIC button of the transmitter pressed longer than about 1 of a second causes the following functions of the alarm to activate. <ul style="list-style-type: none"> <li>• Sounds the horn, security horn.</li> <li>• Flashes the hazard lights, headlights, and tai lights.</li> <li>• Illuminates the interior light (If the interior light switch is in the DOOR position).</li> </ul> |
| Automatic Lock* <sup>2</sup>                    | If none of the doors are opened within 30 seconds of being unlocked by the wireless door lock remote control, all the doors will be locked again automatically.                                                                                                                                                                                                                                      |
| Door Ajar Warning* <sup>1</sup>                 | If any door is open or ajar, pressing the LOCK button of the transmitter will cause the wireless door lock buzzer to sound for about ten seconds.                                                                                                                                                                                                                                                    |
| Repeat                                          | If a door is not locked in response to the locking operation of the transmitter, the certification ECU will output a lock signal after approximately 1 second.                                                                                                                                                                                                                                       |
| Illuminated Entry                               | When all the doors are locked, pressing the UNLOCK button causes the interior lights to illuminate simultaneously with the unlock operation.                                                                                                                                                                                                                                                         |
| Security                                        | Sends an operation signal as a rolling code.                                                                                                                                                                                                                                                                                                                                                         |

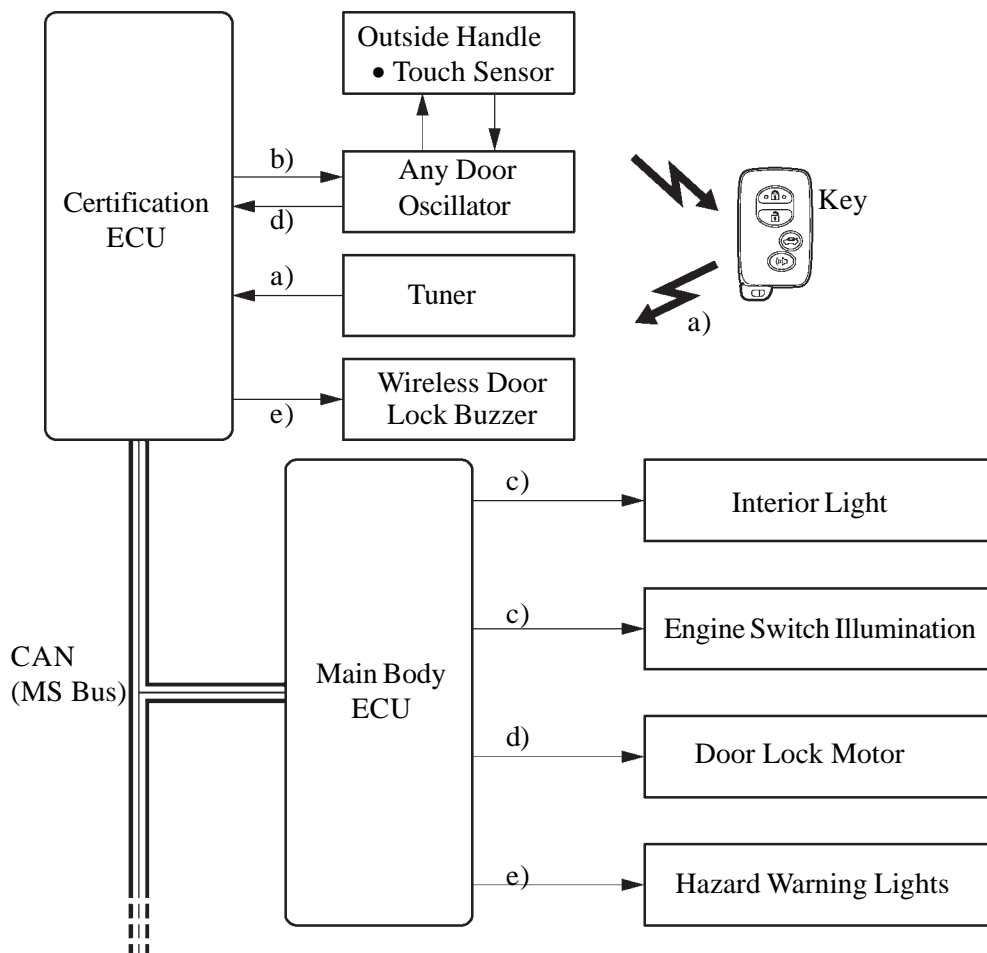
\*<sup>1</sup>: The 2-step unlock function is initially set to OFF. The setting function can be changed using the customised body electronics system. For details, refer to Customised Body Electrical System section on page BE-12.

\*<sup>2</sup>: The function setting can be changed using the customised body electronics system. For details, refer to Customised Body Electronics System section on page BE-12.



## Entry Unlock

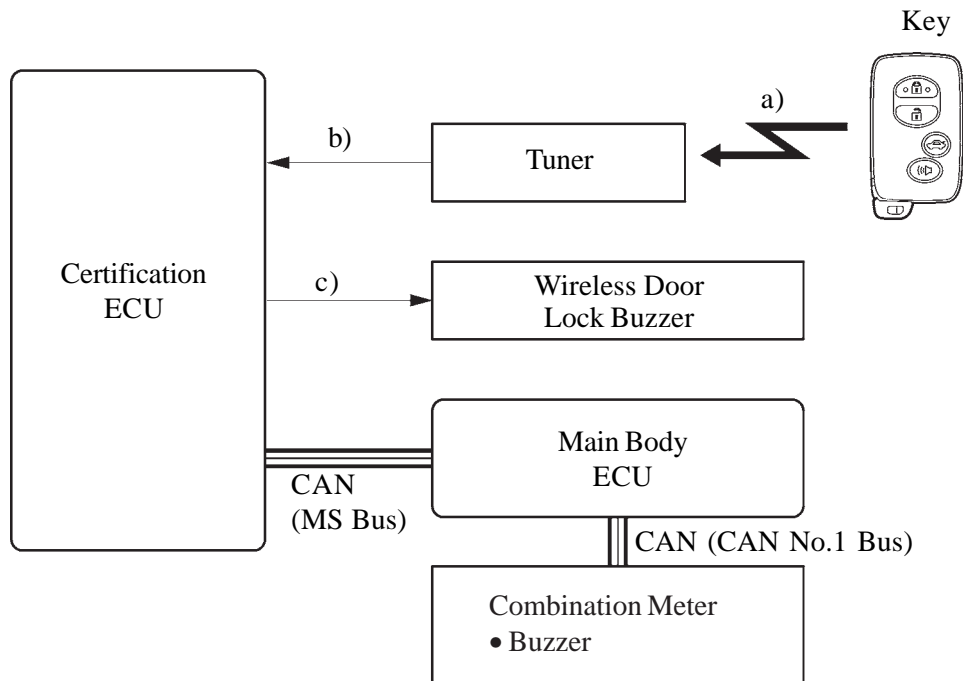
- When a key enters any actuation area of the door oscillators, the certification ECU judges and certifies the key ID code received from the tuner.
- After the key certification OK is confirmed, the certification ECU transmits an unlock stand-by signal to the touch sensor of the relevant door.
- At the same time, the certification ECU transmits the lighting signals to the interior lights (engine switch illumination and interior light), and turns ON these illuminations (Entry Illumination Function).
- If the touch sensor is touched under the above condition, the certification ECU transmits a door unlock signal to the main body ECU, and unlocks the door.
- The certification ECU sounds the wireless door lock buzzer twice and main body ECU blinks the hazard warning lights twice through the flasher as an answerback for entry unlock.





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### Entry Unlock Mode Switching

- When the power source is OFF, press the lock button and one of the other three buttons on the key at the same time for approximately 5 seconds while the key is in the actuation area.
- The certification ECU receives this signal from the tuner and switches the entry unlock mode.
- The certification ECU sounds the wireless door lock buzzer and the buzzer of the combination meter to inform the user that the mode has been switched.
- If the entry unlock mode needs to be switched again, press the lock button and one of the other three buttons on the key at the same time for approximately 5 seconds after the LED of the key goes off.



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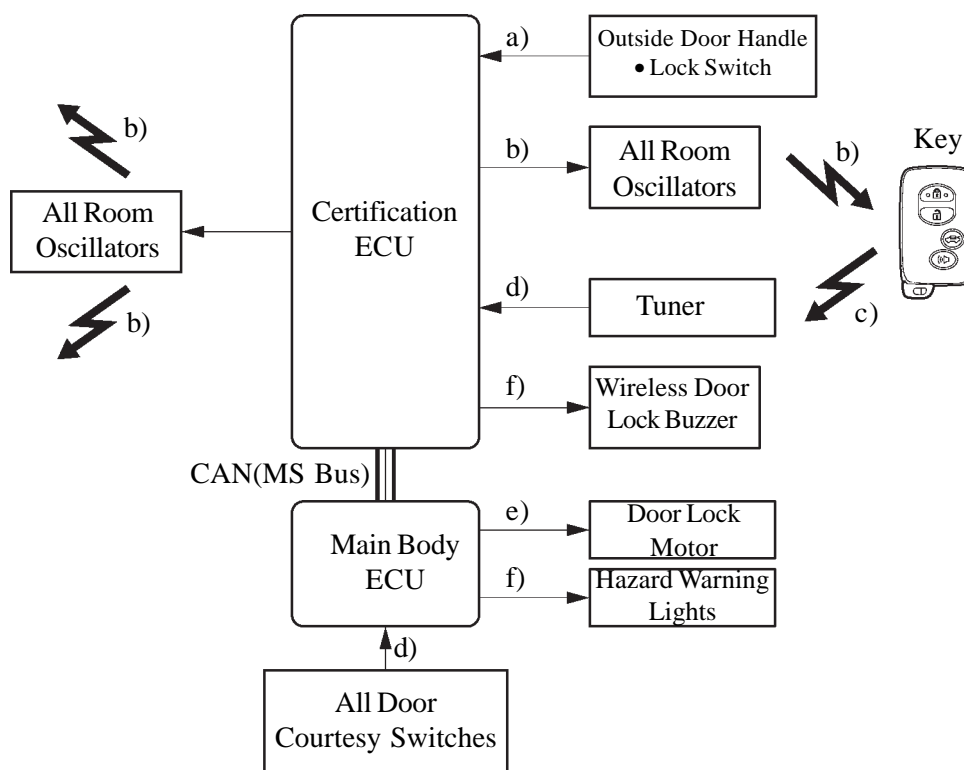
| Mode                     | Wireless Door Lock Buzzer                                                                                      | Buzzer in Combination Meter |
|--------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------------|
| Driver Door (Customised) |  <p>Sounds three times</p> | Sounds once                 |
| All Doors (Default)      |  <p>Sounds once</p>         | Sounds once                 |

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**NOTE:** This function only switches the entry unlock mode of the smart entry and start system. It is not applied to the unlock function using the wireless door lock remote control.

## Entry Lock Function

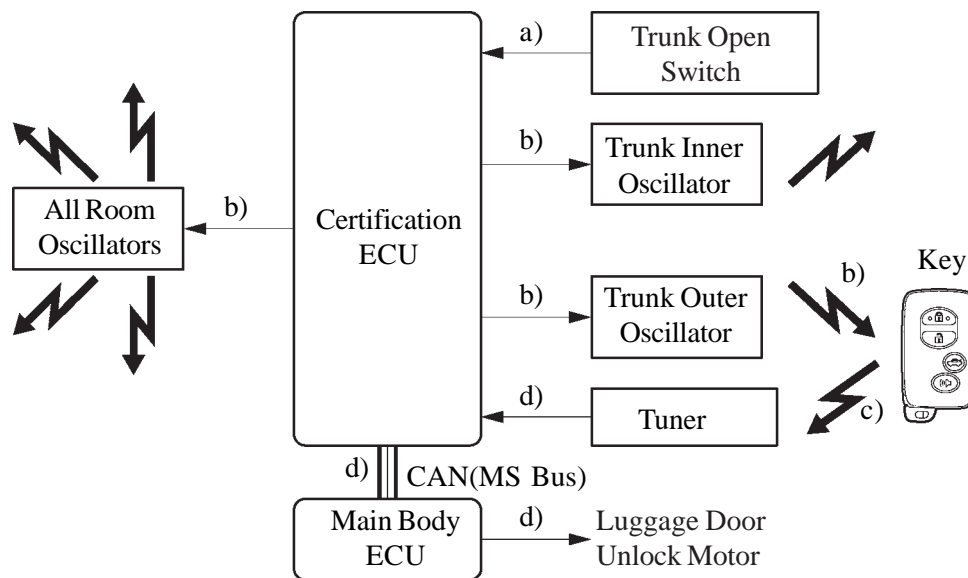
- This door lock signal is transmitted to the certification ECU when the driver (who has the key in their possession), exits the vehicle and presses the lock switch on the outside door handle.
- The certification ECU transmits a request signal for all door and room oscillators to form actuation areas.
- The key receives this signal and returns the ID code to the tuner.
- The certification ECU judges and certifies the ID code from the tuner. It then checks the location of the key and, if all the doors are closed, the ECU transmits a door lock signal to the main body ECU.
- The main body ECU receives this signal and actuates the door lock motors to lock the doors.
- The main body ECU blinks the hazard warning lights once through the flasher relay, and the certification ECU sounds the wireless door lock buzzer once as an answer back for the entry lock function.



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### Trunk Open Function

- This signal is transmitted to the certification ECU when the driver (who has the key in their possession) pushes the trunk open switch on the outside of the trunk lid.
- The certification ECU transmits a request signal for all the room, trunk inner and outer oscillators to form actuation areas.
- The key receives this signal and returns the ID code to the tuner.
- The certification ECU judges and certifies the ID code, and checks the location of the key. The ECU transmits a trunk open signal to the main body ECU.
- The main body ECU receives this signal and actuates the luggage door unlock motor to open the trunk.



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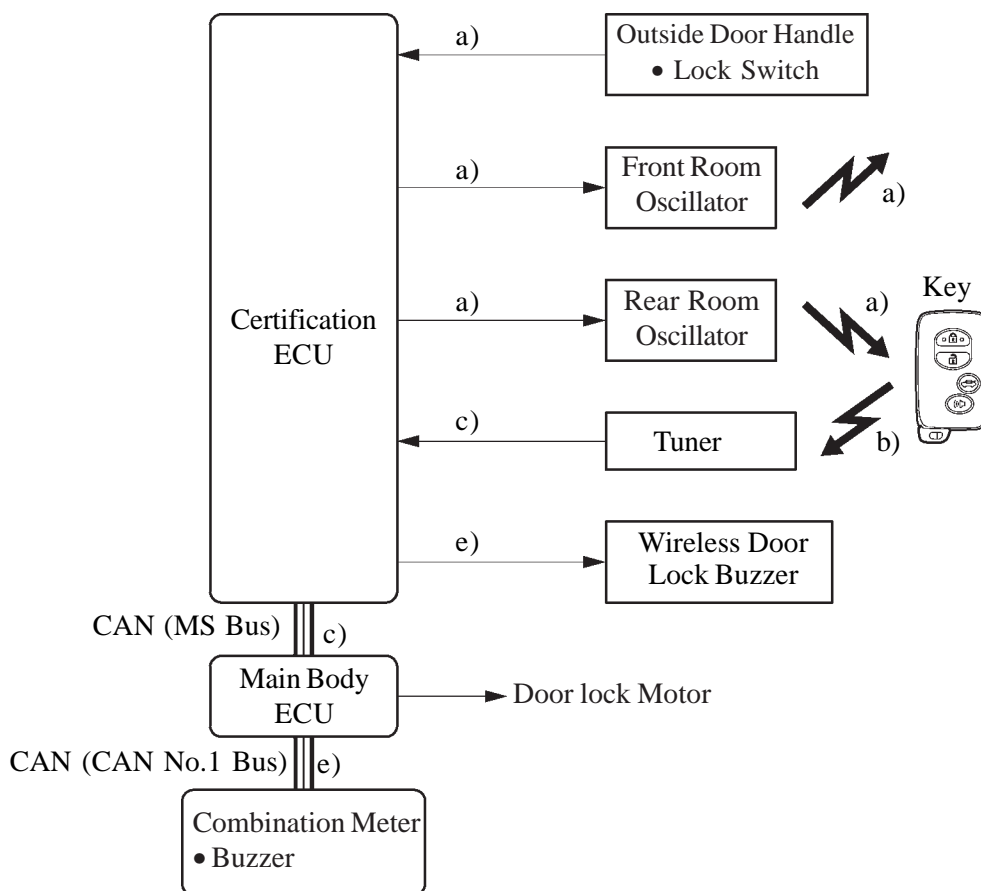
## Prevention of Key Confinement

### 1) General

This function has two system operations: inside room (cabin) and inside luggage compartment.

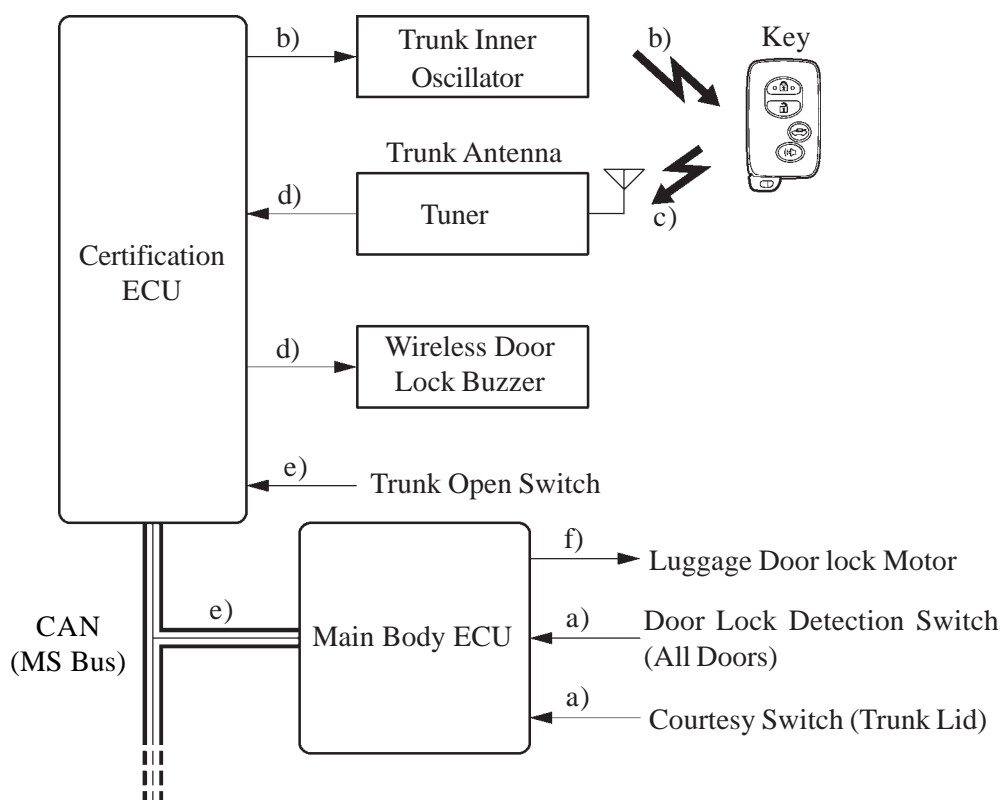
### 2) Inside Room

- When the door is locked with the outside door handle while the key is still inside the vehicle, the certification ECU receives this signal and transmits a request signal for the front and rear room oscillators to form a actuation area.
- The key receives this signal and returns the ID code to the tuner.
- The certification ECU judges and certifies the ID code, and checks the location of the key. The ECU transmits a door unlock signal to the main body ECU.
- The main body ECU receives the signal and operates each door lock motor to unlock the doors.
- The certification ECU sounds the wireless door lock buzzer and the buzzer of the combination meter as an answerback for the unlock function that was performed.



### 3) Inside Luggage Room

- a) When the trunk lid is closed while the key is still inside the luggage room and all doors are locked, the certification ECU recognizes that a trunk lid close condition has occurred based on signals from the main body ECU.
- b) The certification ECU receives this signal, and transmits a request signal for the trunk inner oscillator to form an actuation area.
- c) The key receives this signal and returns the ID code to the tuner.
- d) The certification ECU judges and certifies the ID code, and checks the location of the key. The ECU sounds the wireless door lock buzzer for 2 seconds to inform the driver.
- e) If the trunk open switch is turned ON (pressed) while the key is inside the luggage room, the certification ECU sends another request signal for the trunk inner oscillator to form an actuation area. The ECU judges and certifies the key and checks its location, before transmitting a trunk open signal to the main body ECU.
- f) The main body ECU receives the signal and operates the luggage door lock motor to open the trunk.



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**Warning****1) General**

When any of the situations below occur, the smart entry and start system causes the certification ECU to sound a buzzer in the combination meter and the wireless door lock buzzer, and illuminate the multi-information display in order to alert the driver.

| Situation | Condition                                                                                                                               |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------|
| A         | The engine is left running and the shift lever is in a position other than P when the driver gets out of the vehicle. (See page BE-147) |
| B         | The key is left in the vehicle. (See page BE-149)                                                                                       |
| C         | The engine is left running and the shift lever is in the P position when the driver gets out of the vehicle. (See page BE-150)          |
| D         | A door is ajar. (See page BE-151)                                                                                                       |
| E         | The engine is left running when a passenger gets out of the vehicle holding the key. (See page BE-152)                                  |
| F         | The key is not within the actuation areas. (See page BE-153)                                                                            |
| G         | The key is left in the cabin. (See page BE-153)                                                                                         |
| H         | The key is left in the luggage room. (See page BE-154)                                                                                  |
| I         | The key battery is weak. (See page BE-154)                                                                                              |
| J         | Steering lock does not release. (See page BE-155)                                                                                       |
| K         | The steering lock mechanism is malfunctioning. (See page BE-155)                                                                        |
| L         | The main body ECU is malfunctioning. (See page BE-156)                                                                                  |
| M         | An engine start method is displayed. (See page BE-157)                                                                                  |

**2) Situation: A**

There are two patterns for situation A.

- Pattern 1: When the engine is left running and the shift lever is in a position other than P, the driver opens the door and attempts to get out of the vehicle.
- Pattern 2: Under the conditions of pattern 1, the driver closes the door and attempts to leave the vehicle holding the key.

In these situations, the following control is performed:

**Pattern 1.**

|                                  |                           |                                                                                                                                                                                                                                                                                                       |
|----------------------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Possible Effects without Warning |                           | Sudden vehicle start, Vehicle theft, Vehicle roll-away                                                                                                                                                                                                                                                |
| Warning Condition                |                           | <p>The warning is activated when all of the following conditions are met:</p> <ul style="list-style-type: none"> <li>• Power source is in a mode other than OFF.</li> <li>• Shift lever is in any position except P.</li> <li>• Vehicle speed is 0 km/h.</li> <li>• Driver door is opened.</li> </ul> |
| Combination Meter                | Buzzer                    | Continuous sound                                                                                                                                                                                                                                                                                      |
|                                  | Multi-information Display | —                                                                                                                                                                                                                                                                                                     |
|                                  | Master Warning Light      | —                                                                                                                                                                                                                                                                                                     |
| Wireless Door Lock Buzzer        |                           | —                                                                                                                                                                                                                                                                                                     |
| Engine Switch Indicator Light    |                           | —                                                                                                                                                                                                                                                                                                     |
| Warning Stop Condition           |                           | <p>The warning is stopped when one of the following conditions is met:</p> <ul style="list-style-type: none"> <li>• Power source is OFF.</li> <li>• Shift lever is in the "P" position.</li> <li>• Vehicle speed is above 0 km/h.</li> </ul>                                                          |



**Pattern 2.**

|                                  |                           |                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Possible Effects without Warning |                           | Sudden vehicle start, Vehicle theft, Vehicle roll-away                                                                                                                                                                                                                                                                                               |
| Warning Condition                |                           | <p>The warning is activated when all of the following conditions are met:</p> <ul style="list-style-type: none"> <li>• Shift lever is in any position except P.</li> <li>• Power source is in a mode other than OFF.</li> <li>• Vehicle speed is 0 km/h.</li> <li>• Key is not in the vehicle.</li> <li>• Driver door is opened → closed.</li> </ul> |
| Combination Meter                | Buzzer                    | Continuous sound                                                                                                                                                                                                                                                                                                                                     |
|                                  | Multi-information Display | <p>The following warnings are alternately displayed:</p> <div> <div>SHIFT TO<br/>P RANGE<br/>025BE99P</div> <div>KEY IS NOT<br/>DETECTED<br/>025BE100P</div> </div>                                                                                                                                                                                  |
|                                  | Master Warning Light      | Flash                                                                                                                                                                                                                                                                                                                                                |
| Wireless Door Lock Buzzer        |                           | Sounds continuously                                                                                                                                                                                                                                                                                                                                  |
| Engine Switch Indicator Light    |                           | —                                                                                                                                                                                                                                                                                                                                                    |
| Warning Stop Condition           |                           | <ul style="list-style-type: none"> <li>• Key is in the vehicle.</li> </ul>                                                                                                                                                                                                                                                                           |
|                                  |                           | <ul style="list-style-type: none"> <li>• The wireless door lock buzzer stops.</li> <li>• Multi-information Display:</li> </ul> <div> <div>SHIFT TO<br/>P RANGE<br/>025BE99P</div> </div>                                                                                                                                                             |
|                                  |                           | <ul style="list-style-type: none"> <li>• Vehicle speed is above 0 km/h (0 mph).</li> </ul>                                                                                                                                                                                                                                                           |
|                                  |                           | <ul style="list-style-type: none"> <li>• The wireless door lock buzzer stops.</li> <li>• Multi-information Display:</li> </ul> <div> <div>KEY IS NOT<br/>DETECTED<br/>025BE100P</div> </div>                                                                                                                                                         |
|                                  |                           | <ul style="list-style-type: none"> <li>• Power source is OFF.</li> </ul>                                                                                                                                                                                                                                                                             |
|                                  |                           | All warning operations stop.                                                                                                                                                                                                                                                                                                                         |

**3) Situation: B**

There are two patterns for situation B.

- Pattern 1: When the driver's door is open, the driver changes the power source mode to ACC and attempts to leave the vehicle.
- Pattern 2: When the driver's door is open, the driver changes the power source mode from ON to OFF and attempts to leave the vehicle.

In these situations, the following control is performed:

**Pattern 1. and Pattern 2.**

| Possible Effects without Warning |                           | Vehicle theft                                                                                                                                                                                                                                                                               |
|----------------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Warning Condition                |                           | <p>The warning is activated when one of the following conditions is met:</p> <ul style="list-style-type: none"> <li>• Power source is in ACC mode and the driver door is opened.</li> <li>• Power source is in OFF mode the steering is unlocked, and the driver door is opened.</li> </ul> |
| Combination Meter                | Buzzer                    | Continues to sound at short and even intervals                                                                                                                                                                                                                                              |
|                                  | Multi-information Display | —                                                                                                                                                                                                                                                                                           |
|                                  | Master Warning Light      | —                                                                                                                                                                                                                                                                                           |
| Wireless Door Lock Buzzer        |                           | —                                                                                                                                                                                                                                                                                           |
| Engine Switch Indicator Light    |                           | —                                                                                                                                                                                                                                                                                           |
| Warning Stop Condition           |                           | <p>The warning is stopped when one of the following conditions is met:</p> <ul style="list-style-type: none"> <li>• Power source is in ON mode.</li> <li>• Driver door is closed.</li> <li>• Power source is in OFF mode and the steering is locked</li> </ul>                              |


**4) Situation: C**

There are two patterns for situation C.

- Pattern 1: When the engine is left running and the shift lever is in the P position, the driver closes the driver's door and attempts to leave the vehicle while holding the key.
- Pattern 2: Under the conditions of pattern 1, the driver presses the lock switch on the door outside handle.

In these situations, the following control is performed:

**Pattern 1.**

|                                  |                           |                                                                                                                                                                                                                                                                                           |
|----------------------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Possible Effects without Warning |                           | Vehicle theft, Engine cannot be restarted, Discharged battery                                                                                                                                                                                                                             |
| Warning Condition                |                           | <p>The warning is activated when all of the following conditions are met:</p> <ul style="list-style-type: none"> <li>• Shift lever is P.</li> <li>• Power source is in a mode other than OFF.</li> <li>• Key is not in the vehicle.</li> <li>• Driver door is opened → closed.</li> </ul> |
| Combination Meter                | Buzzer                    | Sounds once                                                                                                                                                                                                                                                                               |
|                                  | Multi-information Display |                                                                                                                                                                                                          |
|                                  | Master Warning Light      | Flash                                                                                                                                                                                                                                                                                     |
| Wireless Door Lock Buzzer        |                           | Sounds three times                                                                                                                                                                                                                                                                        |
| Engine Switch Indicator Light    |                           | —                                                                                                                                                                                                                                                                                         |
| Warning Stop Condition           |                           | <p>The warning is stopped when one of the following conditions is met:</p> <ul style="list-style-type: none"> <li>• Power source is OFF</li> <li>• Key is in the vehicle.</li> </ul>                                                                                                      |

**Pattern 2.**

|                                  |                           |                                                                                                                                                                                                                                                                                                                          |
|----------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Possible Effects without Warning |                           | Vehicle theft, Discharged battery                                                                                                                                                                                                                                                                                        |
| Warning Condition                |                           | <p>The warning is activated when all of the following conditions are met:</p> <ul style="list-style-type: none"> <li>• Shift lever is P.</li> <li>• Power source is in a mode other than OFF.</li> <li>• All doors are closed.</li> <li>• The key is outside the vehicle (within one of the actuation areas).</li> </ul> |
| Combination Meter                | Buzzer                    | —                                                                                                                                                                                                                                                                                                                        |
|                                  | Multi-information Display | —                                                                                                                                                                                                                                                                                                                        |
|                                  | Master Warning Light      | —                                                                                                                                                                                                                                                                                                                        |
| Wireless Door Lock Buzzer        |                           | Sounds for 2 seconds                                                                                                                                                                                                                                                                                                     |
| Engine Switch Indicator Light    |                           | —                                                                                                                                                                                                                                                                                                                        |
| Warning Stop Condition           |                           | <p>The warning is stopped when one of the following conditions is met:</p> <ul style="list-style-type: none"> <li>• The power source is OFF and the key is not within the actuation areas.</li> <li>• Key is in the vehicle.</li> </ul>                                                                                  |

**5) Situation: D**

The lock switch on the door outside handle is pressed to perform entry lock with a door open.


In this situation, the following control is performed:

|                                  |                           |                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Possible Effects without Warning |                           | Vehicle theft                                                                                                                                                                                                                                                                                                                                                                                 |
| Warning Condition                |                           | <p>The warning is activated when all of the following conditions are met:</p> <ul style="list-style-type: none"> <li>• Power source is OFF.</li> <li>• Any doors are opened.</li> <li>• Entry lock button on the outer door handle is operated.</li> </ul>                                                                                                                                    |
| Combination Meter                | Buzzer                    | —                                                                                                                                                                                                                                                                                                                                                                                             |
|                                  | Multi-information Display | —                                                                                                                                                                                                                                                                                                                                                                                             |
|                                  | Master Warning Light      | —                                                                                                                                                                                                                                                                                                                                                                                             |
| Wireless Door Lock Buzzer        |                           | Sounds continuously                                                                                                                                                                                                                                                                                                                                                                           |
| Engine Switch Indicator Light    |                           | —                                                                                                                                                                                                                                                                                                                                                                                             |
| Warning Stop Condition           |                           | <p>The warning is stopped when one of the following conditions is met:</p> <ul style="list-style-type: none"> <li>• Power source is in a mode other than OFF</li> <li>• All doors are closed.</li> <li>• Wireless door lock remote function is unlocked.</li> <li>• Entry unlock is operated</li> <li>• 10 seconds have elapsed since the wireless door lock buzzer was activated.</li> </ul> |

**6) Situation: E**

When the engine is left running, a passenger leaves the vehicle holding the key.


In this situation, the following control is performed:

|                                  |                           |                                                                                                                                                                                                                                                                                                              |
|----------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Possible Effects without Warning |                           | Engine cannot be restarted                                                                                                                                                                                                                                                                                   |
| Warning Condition                |                           | <p>The warning is activated when all of the following conditions are met:</p> <ul style="list-style-type: none"> <li>• Power source is in a mode other than OFF.</li> <li>• Door except driver door is opened → closed.</li> <li>• Vehicle speed is 0 km/h.</li> <li>• Key is not in the vehicle.</li> </ul> |
| Combination Meter                | Buzzer                    | Sounds once                                                                                                                                                                                                                                                                                                  |
|                                  | Multi-information Display | <br>025BE100P                                                                                                                                                                                                               |
|                                  | Master Warning Light      | Flash                                                                                                                                                                                                                                                                                                        |
| Wireless Door Lock Buzzer        |                           | Sounds 3 times                                                                                                                                                                                                                                                                                               |
| Engine Switch Indicator Light    |                           | —                                                                                                                                                                                                                                                                                                            |
| Warning Stop Condition           |                           | <p>The warning is stopped when one of the following conditions is met:</p> <ul style="list-style-type: none"> <li>• Power source is OFF.</li> <li>• Vehicle speed is above 0 km/m.</li> <li>• Key is in the vehicle.</li> </ul>                                                                              |

**7) Situation: F**

When the key is not in the cabin or the key battery is dead, the driver attempts to start the engine or change the power mode to ON.

In this situation, the following control is performed:

|                                  |                           |                                                                                                                                                                                                                                            |
|----------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Possible Effects without Warning |                           | Confuses the user                                                                                                                                                                                                                          |
| Warning Condition                |                           | The warning is activated when all of the following conditions are met: <ul style="list-style-type: none"> <li>• Engine switch is pushed.</li> <li>• Key is not in the vehicle.</li> </ul>                                                  |
| Combination Meter                | Buzzer                    | Sounds once                                                                                                                                                                                                                                |
|                                  | Multi-information Display |                                                                                                                                                          |
|                                  | Master Warning Light      | Flash                                                                                                                                                                                                                                      |
| Wireless Door Lock Buzzer        |                           | —                                                                                                                                                                                                                                          |
| Engine Switch Indicator Light    |                           | —                                                                                                                                                                                                                                          |
| Warning Stop Condition           |                           | Check if the key is in the detection area.<br>If the key is in the detection area, press the wireless door lock switch and confirm that the indicator comes on. If the indicator does not come on, replace the key battery with a new one. |

**8) Situation: G**

The lock switch on the door outside handle is pressed to perform entry lock with the key left in the cabin.

In this situation, the following control is performed:

|                                  |                           |                                                                                                                                                                                                                                                                                    |
|----------------------------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Possible Effects without Warning |                           | Vehicle theft                                                                                                                                                                                                                                                                      |
| Warning Condition                |                           | The warning is activated when all of the following conditions are met: <ul style="list-style-type: none"> <li>• Power source is OFF.</li> <li>• All doors are closed.</li> <li>• Key is in the vehicle.</li> <li>• Lock switch on the door outside handle switch is ON.</li> </ul> |
| Combination Meter                | Buzzer                    | —                                                                                                                                                                                                                                                                                  |
|                                  | Multi-information Display | —                                                                                                                                                                                                                                                                                  |
|                                  | Master Warning Light      | —                                                                                                                                                                                                                                                                                  |
| Wireless Door Lock Buzzer        |                           | Sounds for 2 seconds                                                                                                                                                                                                                                                               |
| Engine Switch Indicator Light    |                           | —                                                                                                                                                                                                                                                                                  |
| Warning Stop Condition           |                           | The key is removed from the cabin and the lock switch on the door outside handle is pressed again.                                                                                                                                                                                 |

**9) Situation: H**

The luggage door is closed with the key left in the luggage room.


In this situation, the following control is performed:

| Possible Effects without Warning |                           | Key Confinement                                                                                                                                                                                                      |
|----------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Warning Condition                |                           | The warning is activated when all of the following conditions are met: <ul style="list-style-type: none"> <li>• Vehicle speed is 0 km/h.</li> <li>• All doors are closed.</li> <li>• Trunk lid is closed.</li> </ul> |
| Combination Meter                | Buzzer                    | —                                                                                                                                                                                                                    |
|                                  | Multi-information Display | —                                                                                                                                                                                                                    |
|                                  | Master Warning Light      | —                                                                                                                                                                                                                    |
| Wireless Door Lock Buzzer        |                           | Sounds for 2 seconds                                                                                                                                                                                                 |
| Engine Switch Indicator Light    |                           | —                                                                                                                                                                                                                    |
| Warning Stop Condition           |                           | The luggage room is opened using the trunk open function and the key is removed from the luggage room.                                                                                                               |

**10) Situation: I**

The vehicle is driven using a key that has a low battery.


In this situation, the following control is performed:

| Possible Effects without Warning |                           | Smart entry and start system does not function                                                                                                                                                                                                                                  |
|----------------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Warning Condition                |                           | The warning is activated when all of the following conditions are met: <ul style="list-style-type: none"> <li>• Power source switches to OFF after being left in IG-ON for over 20 minutes.</li> <li>• Key battery voltage is low.</li> <li>• Key is in the vehicle.</li> </ul> |
| Combination Meter                | Buzzer                    | Sounds once                                                                                                                                                                                                                                                                     |
|                                  | Multi-information Display |                                                                                                                                                                                              |
|                                  | Master Warning Light      | Flash                                                                                                                                                                                                                                                                           |
| Wireless Door Lock Buzzer        |                           | —                                                                                                                                                                                                                                                                               |
| Engine Switch Indicator Light    |                           | —                                                                                                                                                                                                                                                                               |
| Warning Stop Condition           |                           | The key battery is replaced with a new one.                                                                                                                                                                                                                                     |

**11) Situation: J**

Steering lock cannot be released.


In this situation, the following control is performed:

| Possible Effects without Warning |                           | Steering usability function                                                                                                                                 |
|----------------------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Warning Condition                |                           | The steering lock cannot be released, thus the engine is prevented from starting.                                                                           |
| Combination Meter                | Buzzer                    | —                                                                                                                                                           |
|                                  | Multi-information Display |  025BE102P<br>Displayed for 15 seconds (and then automatically turned off) |
|                                  | Master Warning Light      | Flash                                                                                                                                                       |
| Wireless Door Lock Buzzer        |                           | —                                                                                                                                                           |
| Engine Switch Indicator Light    |                           | The green indicator blinks at 1-second intervals (goes off automatically in 15 seconds).                                                                    |
| Warning Stop Condition           |                           | The engine switch is pressed while the steering wheel is turned left and right, and the steering lock successfully disengages.                              |

**12) Situation: K**

A malfunction of the steering lock ECU is detected.

In this situation, the following control is performed:

| Possible Effects without Warning |                           | Malfunction detection                                                                         |
|----------------------------------|---------------------------|-----------------------------------------------------------------------------------------------|
| Warning Condition                |                           | A malfunction of the steering lock ECU is detected.                                           |
| Combination Meter                | Buzzer                    | —                                                                                             |
|                                  | Multi-information Display |  025BE103P |
|                                  | Master Warning Light      | Flash                                                                                         |
| Wireless Door Lock Buzzer        |                           | —                                                                                             |
| Engine Switch Indicator Light    |                           | The amber indicator blinks at 2-second intervals.                                             |
| Warning Stop Condition           |                           | The steering lock ECU returns to normal.                                                      |



**13) Situation: L**

A malfunction of the main body ECU is detected.


In this situation, the following control is performed:

| Possible Effects without Warning |                           | Malfunction detection                             |
|----------------------------------|---------------------------|---------------------------------------------------|
| Warning Condition                |                           | A malfunction in the main body ECU is detected.   |
| Combination Meter                | Buzzer                    | —                                                 |
|                                  | Multi-information Display | —                                                 |
|                                  | Master Warning Light      | —                                                 |
| Wireless Door Lock Buzzer        |                           | —                                                 |
| Engine Switch Indicator Light    |                           | The amber indicator blinks at 2-second intervals. |
| Warning Stop Condition           |                           | The main body ECU returns to normal.              |

**14) Situation: M**

A warning message appears on the meter when the driver does not follow the proper procedure to start the vehicle.

In this situation, the following control is performed:

| Possible Effects without Warning |                           | Usability function                                                                                                                                                                                                                                                                                                                           |
|----------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Warning Condition                |                           | <p>The warning is activated when all of the following conditions are met:</p> <ul style="list-style-type: none"> <li>• The power source is in a mode other than ON.</li> <li>• Any doors are closed → opened.</li> <li>• The power source is changed from OFF to ACC more than once with the engine off and brake pedal released.</li> </ul> |
| Combination Meter                | Buzzer                    | Sounds once                                                                                                                                                                                                                                                                                                                                  |
|                                  | Multi-information Display |  025BE104P                                                                                                                                                                                                                                                |
|                                  | Master Warning Light      | —                                                                                                                                                                                                                                                                                                                                            |
| Wireless Door Lock Buzzer        |                           | —                                                                                                                                                                                                                                                                                                                                            |
| Engine Switch Indicator Light    |                           | —                                                                                                                                                                                                                                                                                                                                            |
| Warning Stop Condition           |                           | <p>The warning is stopped when one of the following conditions is met:</p> <ul style="list-style-type: none"> <li>• 10 seconds have elapsed since a warning message was displayed.</li> <li>• The engine switch is pushed with the brake pedal depressed.</li> <li>• The power source is OFF.</li> </ul>                                     |

## Battery Saving

### 1) Vehicle Battery Saving Function

In the smart entry and start system, signals are emitted outside the vehicle at a prescribed interval (250 msec.) when the doors are locked. Therefore, the vehicle battery could be drained if the vehicle remains parked for a long time. For this reason, the controls listed below are effected.

| Condition                                  | Control                                                              |
|--------------------------------------------|----------------------------------------------------------------------|
| No response from key for more than 5 days  | Signal transmission interval is extended from 250 msec. to 750 msec. |
| No response from key for more than 14 days | Automatically deactivates the smart entry and start system.          |

#### ► Reinstatement Conditions ◀

- A wireless door lock remote control signal (lock, unlock, or trunk lid open) is input and the ID matches.
- A user carries the key and pushes a lock switch signal for the outside door handle.
- A door is locked or unlocked using the mechanical key.

### 2) Key Battery and Vehicle Battery Saving Function

In the smart entry and start system, if the key is constantly located within the vehicle exterior actuation area of the doors, the system will maintain periodic communication with the key. Therefore, if the vehicle remains parked in that state for a long time, the key battery and the vehicle battery could be drained. For this reason, if this state continues longer than 10 minutes, the smart entry and start system automatically becomes deactivated.

#### ► Reinstatement Conditions ◀

- A wireless door lock remote control signal (lock, unlock, or trunk lid open) is input and the ID matches.
- A user who has the key in their possession pushes a lock switch signal on an outside handle.
- A door is locked or unlocked using the mechanical key.

## Key Cancel

Key cancel is operated when certain operations are performed with the vehicle in the following condition:

- Power source is OFF.
- Driver door is closed.
- Driver door is unlocked.

The operation procedure is as follows:

- 1) Unlock once with the UNLOCK button of the key.
- 2) Open the driver door within 5 seconds.
- 3) Unlock twice with the UNLOCK button of the key within 5 seconds.
- 4) Repeat open → close twice for the driver door within 30 seconds, and open again.  
(Driver Door: Open → Close → Open → Close → Open)
- 5) Unlock twice with the UNLOCK button of the key within 30 seconds.
- 6) Repeat open → close once for the driver door within 30 seconds, and open again.  
(Driver Door: Open → Close → Open)
- 7) Close the driver door within 5 seconds.

When key cancel is activated, the wireless door lock buzzer sounds once.

To return to the original condition, perform the procedures again. When key cancel is returned, the wireless door lock buzzer sounds twice.

## Key Code Registration Function

The table below shows the four special coded ID registration function modes through which up to four different codes can be registered. The codes are electronically registered (written to and stored) in the EEPROM. For details of the recognition code registration procedure, refer to the Aurion Repair Manual.

| Mode     | Function                                                                                                                                                                                                |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rewrite  | Erases all previously registered codes and registers only the newly received codes. This mode is used whenever a transmitter or the integration relay is replaced.                                      |
| Add      | Adds a newly received code while preserving previously registered codes. This mode is used when adding a new transmitter. If the number of codes exceeds 7, the oldest registered code is erased first. |
| Confirm  | Confirms how many codes are currently registered. When adding a new code, this mode is used to check how many codes already exist.                                                                      |
| Prohibit | To delete all the registered codes and to prohibit the wireless door lock function. This mode is used when a transmitter (key) is lost.                                                                 |

## THEFT DETERRENT SYSTEM

### ☀ DESCRIPTION

- The theft deterrent system sounds an alarm when any of the following activates are detected:
  - The vehicle being forcibly entered.
  - The engine hood or trunk lid being opened.
  - A door or trunk lid being unlocked without the key.
  - The battery terminals are removed and reconnected.
- The system consists of door lock control system parts, wireless door lock remote control system parts\*<sup>1</sup>, smart entry and start system parts\*<sup>2</sup>, security horn and security indicator light.
- The main body ECU controls this system.
- The warning methods and timing of the system are listed below.

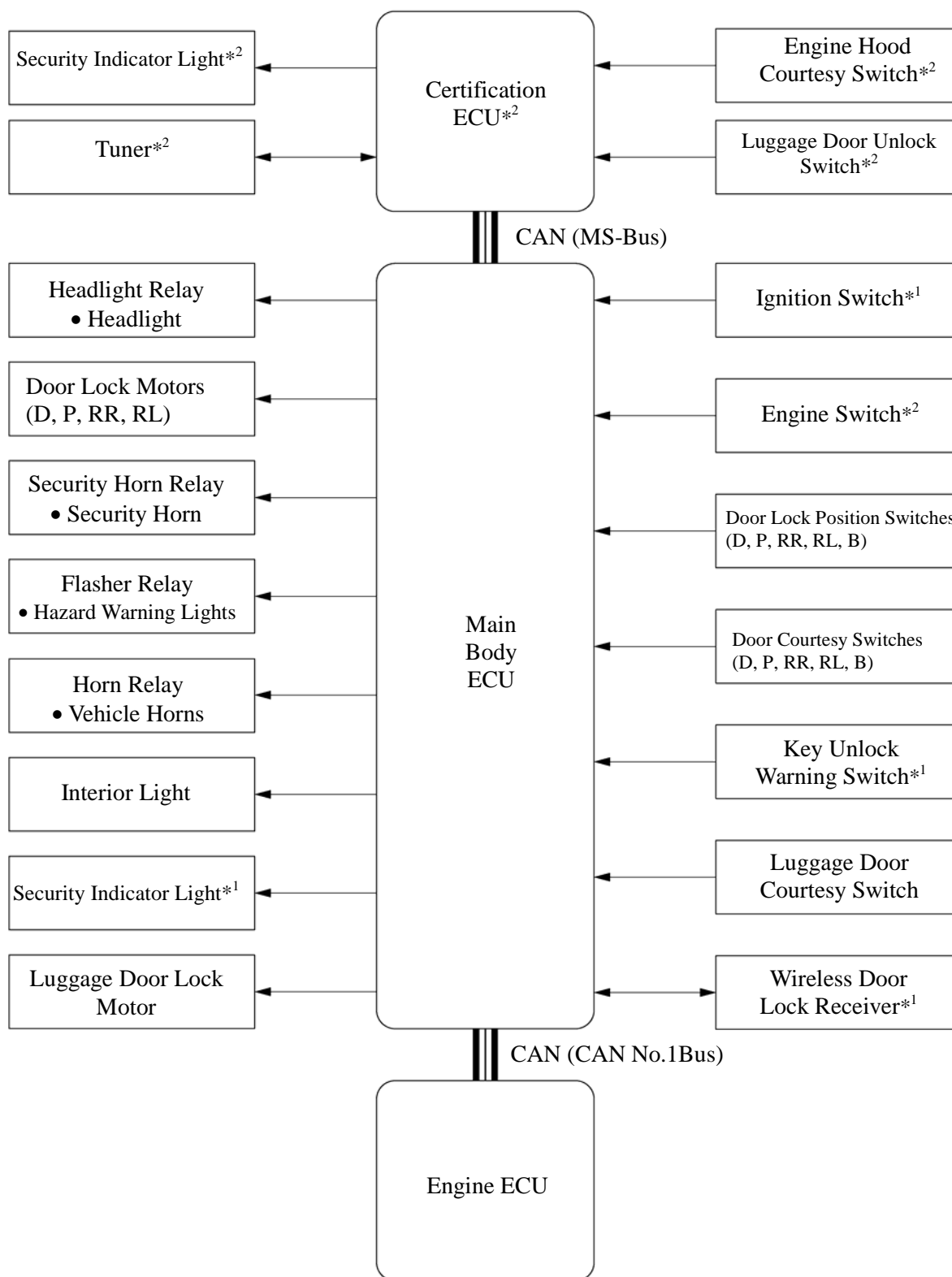
\*<sup>1</sup>: Models without smart entry and start system

\*<sup>2</sup>: Models with smart entry and start system

|                |                 |                                   |
|----------------|-----------------|-----------------------------------|
| Warning Method | Interior Light  | Illuminates                       |
|                | Hazard Light    | Flashing                          |
|                | Head Light      | Flashing                          |
|                | Tail light      | Flashing                          |
|                | Vehicle Horn    | Sound (approx. 0.4 second cycles) |
|                | Security Horn   | Sound (approx. 0.4 second cycles) |
|                | Door Lock Motor | Locking                           |
| Warning Time   |                 | approx. 30 seconds                |



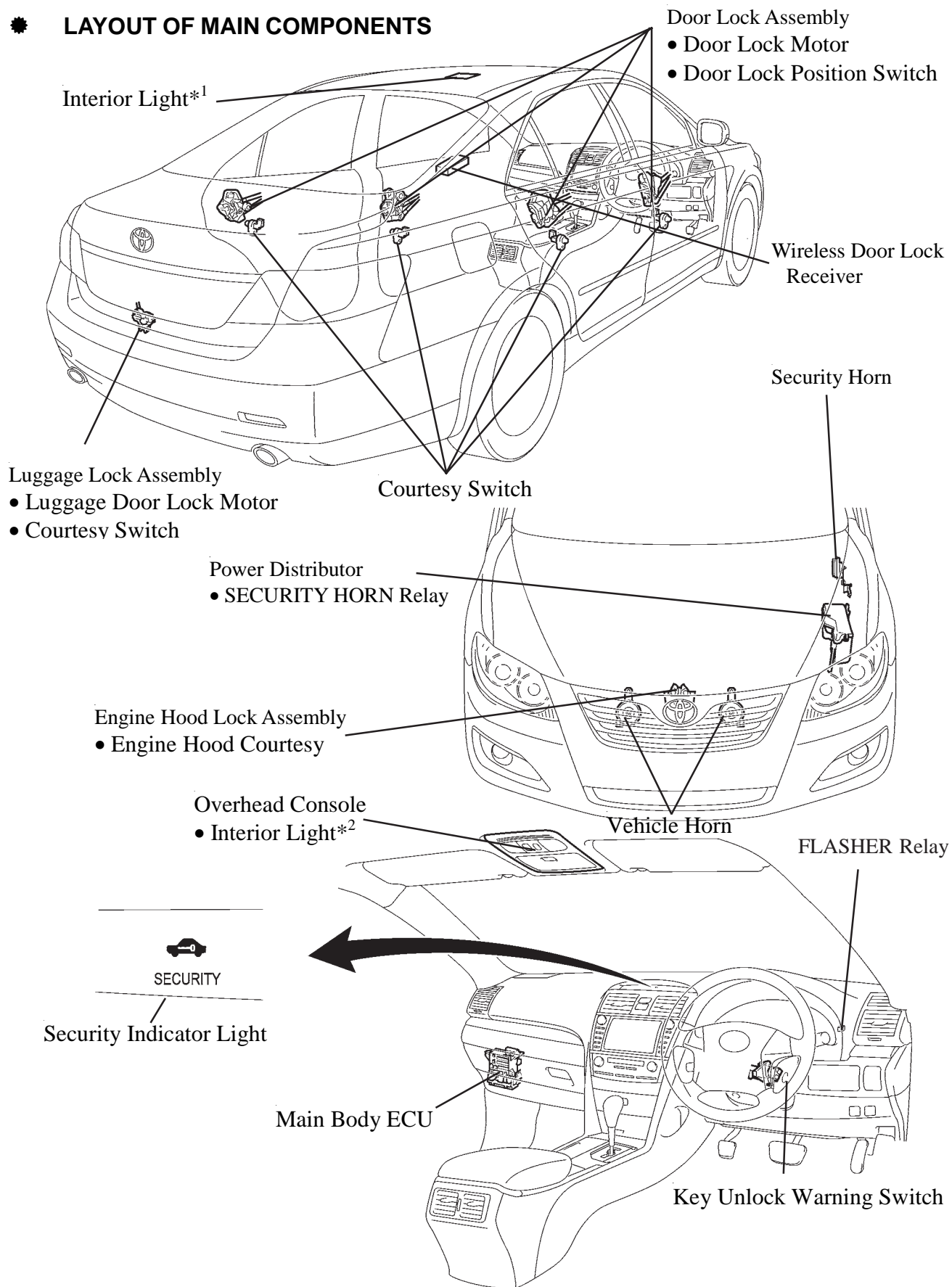
## SYSTEM DIAGRAM



\*<sup>1</sup>: Models without smart entry and start system

\*<sup>2</sup>: Models with smart entry and start system

# ● LAYOUT OF MAIN COMPONENTS



## ✱ FUNCTION

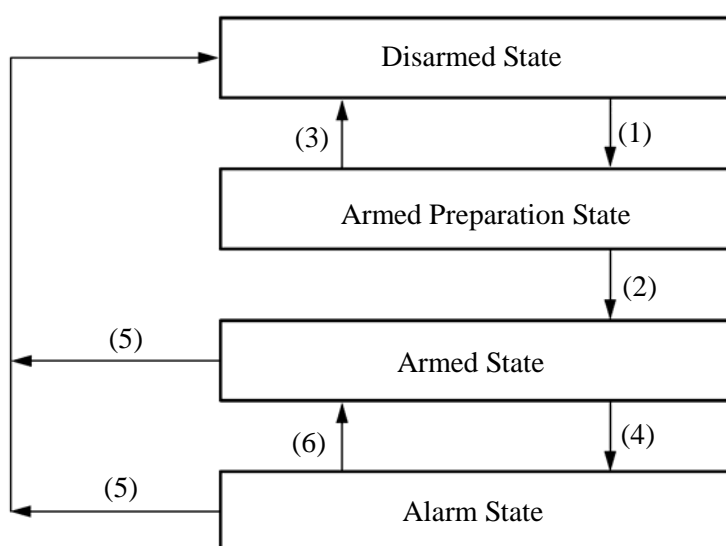
The theft deterrent system has the following function:

| Function           | Outline                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarm              | When the theft deterrent system enters the alarm state, the warning items (interior light, hazard warning lights, head lights, tail lights, and security horn) are operated for approximately 30 seconds.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Vehicle Horn Alarm | When the theft deterrent system enters the alarm state, the vehicle horn is operated for approximately 30 seconds.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Alarm Indicator    | When the state of the theft deterrent system enters the armed preparation or alarm state, the security indicator light is illuminated to inform the user.<br>This indicator is also the engine immobiliser indicator, and it blinks when the engine immobiliser is in an engaged state.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Forced Door Lock   | <p>The main body ECU transmits a door lock signal to all the doors when all the following conditions are satisfied.</p> <ul style="list-style-type: none"> <li>• The theft deterrent system is in the alarm state.</li> <li>• The key is not in the actuation area. *<sup>1</sup></li> <li>• The key is not inserted into the ignition key cylinder. *<sup>2</sup></li> <li>• Either front door is unlocked without using the mechanical key.</li> </ul> <p>The function stops when one of the following conditions is met.</p> <ul style="list-style-type: none"> <li>• All doors are locked (lock function of door lock or transmitter is operated).</li> <li>• The warning ends after approximately 30 seconds.</li> <li>• The key is in the actuation area. *<sup>1</sup></li> <li>• The key is inserted into the ignition key cylinder. *<sup>2</sup></li> </ul> |

## ✱ **SYSTEM OPERATION**

The states of the theft deterrent system are as follows:

| State                   | Description                                                                                    | Theft detection |
|-------------------------|------------------------------------------------------------------------------------------------|-----------------|
| Disarmed State          | The theft deterrent system is not set by the user.                                             | —               |
| Armed Preparation State | The standby state before the theft deterrent system activates when the system has already set. | —               |
| Armed State             | The theft deterrent system is being activated. (Theft can be detected.)                        | ○               |
| Alarm State             | Theft has been detected and the warning operation activates.                                   | ○               |



187BE40

The theft deterrent system activates as described in the diagram below when one of items in the chart occurs in order to cause the system to enter the respective state.

| Condition | Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1)       | <ul style="list-style-type: none"> <li>• There is no ignition key in the ignition key cylinder. *<sup>1</sup></li> <li>• All doors, engine hood and trunk lid are closed.</li> <li>• All doors are locked using the transmitter lock button, the smart entry and start system or mechanical key.</li> </ul>                                                                                                                                                                                                               |
| (2)       | <ul style="list-style-type: none"> <li>• The system state is switched when the doors, engine hood, and trunk lid are all closed and locked, and 30 seconds have elapsed.</li> </ul>                                                                                                                                                                                                                                                                                                                                       |
| (3)       | <p>The system state is switched when one of the following conditions is met.</p> <ul style="list-style-type: none"> <li>• Any door, engine hood, or trunk lid is opened.</li> <li>• Any door is unlocked using the transmitter unlock button the smart entry and start system or mechanical key.</li> <li>• The ignition key is inserted in the ignition key cylinder. *<sup>1</sup></li> <li>• Engine switch is pushed. *<sup>2</sup></li> <li>• A terminal is disconnected from the battery and reconnected.</li> </ul> |

(Continued)



| Condition          | Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (4) * <sup>3</sup> | <p>The system state is switched when one of the following conditions is met.</p> <ul style="list-style-type: none"> <li>• Any door or engine hood is opened.</li> <li>• Any door or trunk lid is unlocked using the transmitter unlock button or the smart entry and start system.</li> <li>• The ignition switch is turned ON without using the ignition key. *<sup>1</sup></li> <li>• A terminal is disconnected from the battery and reconnected. (The vehicle horn and security horn will sound and the hazard warning lights, interior lights, head lights and tail lights will flash as a warning in the alarm state.)</li> </ul> |
| (5)                | <p>The system state is switched when one of the following conditions is met.</p> <ul style="list-style-type: none"> <li>• Any door is unlocked using the transmitter unlock button or Smart Entry and Start System.</li> <li>• The trunk lid is opened using the transmitter trunk button or Smart Entry and Start System.</li> <li>• The engine is started. (The power source is IG ON.)</li> </ul>                                                                                                                                                                                                                                    |
| (6)                | The system state is switched after the alarm time elapses.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

\*<sup>1</sup>: Models without Smart Entry & Start System.

\*<sup>2</sup>: Models with Smart Entry & Start System.

\*<sup>3</sup>: If detection of the apparent theft continues, the warning resumes 5 seconds after the previous warning ends and is repeated a maximum of 10 times.

## ENGINE IMMOBILISER SYSTEM

### ✱ DESCRIPTION

The engine immobiliser system compares the ID code that is registered in the transponder key ECU with the ID code of the transponder chip that is embedded in the ignition key. The system disables if these ID codes match. Thus, the transponder key ECU and the engine ECU communicate with each other to authorise fuel injection and ignition, enabling the engine to start.

- The system is standard equipment on models without the smart entry and start system.
- An engine immobiliser function is provided on models with the smart entry and start system. For details, see page BE-115.

#### Service Tip

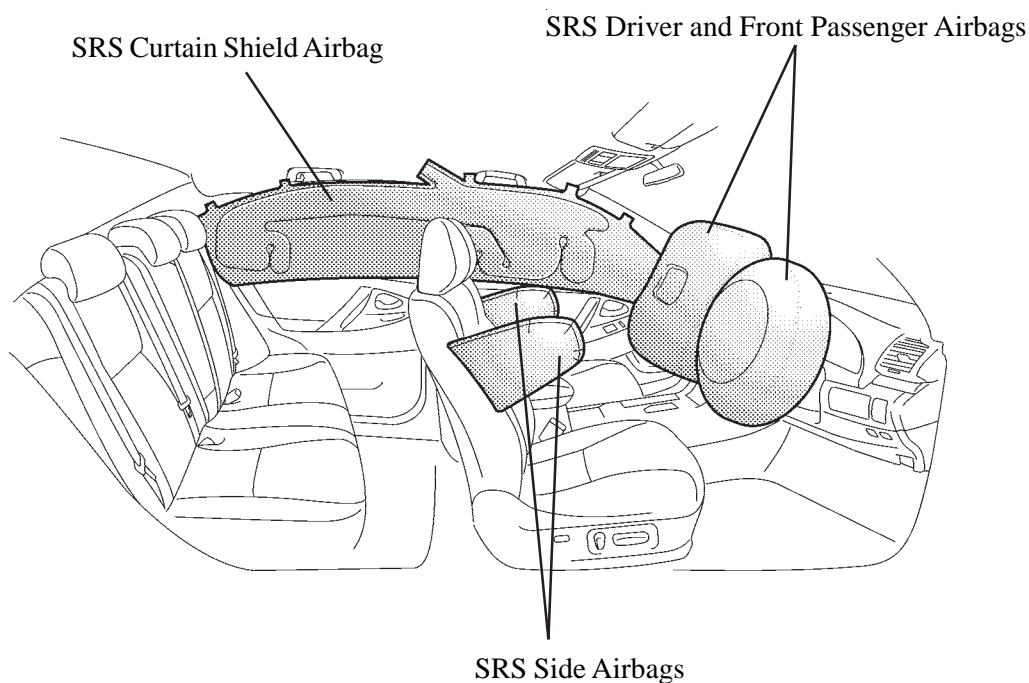
When replacing the transponder key ECU or making a new ignition key, and the key's recognition code must be registered.

- When the transponder key ECU has been replaced, the automatic registration mode begins. At this time, the total number of keys that can be registered is three (master key: two, sub key: one).
- The recognition code of additional keys must be registered. At this time, the total number of keys that can be registered is eight (master key: five, sub key: three).

## SRS AIRBAG SYSTEM

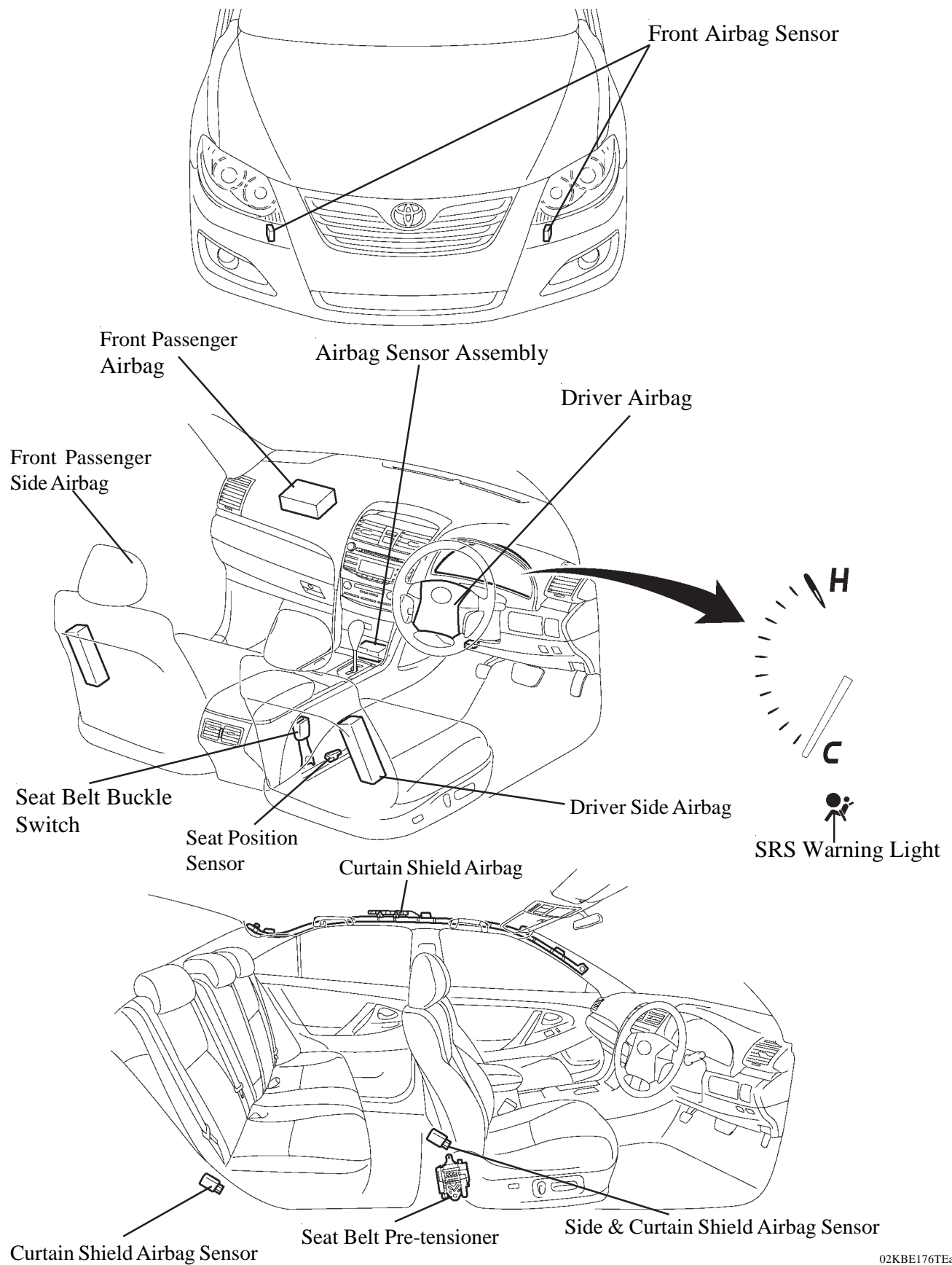
### ✱ DESCRIPTION

- The driver and front passenger SRS (Supplemental Restraint System) airbags supplement the seat belts to help to reduce impacts to the heads and chests of the driver and front passenger in the event of a frontal collision. On some models with driver and passenger airbags, a dual-stage SRS airbag system is used.
- The SRS side and curtain shield airbags help to reduce the shocks to the head and chest of the driver, and the front passenger in the event of a side collision.
- The front passenger airbag door is designed to be invisible. This means that when the airbag inflates, the instrument panel will split along the cleavage line.
- A fuel cut control that stops the fuel pump when any airbags are deployed, is used. For details, see page EG-66.

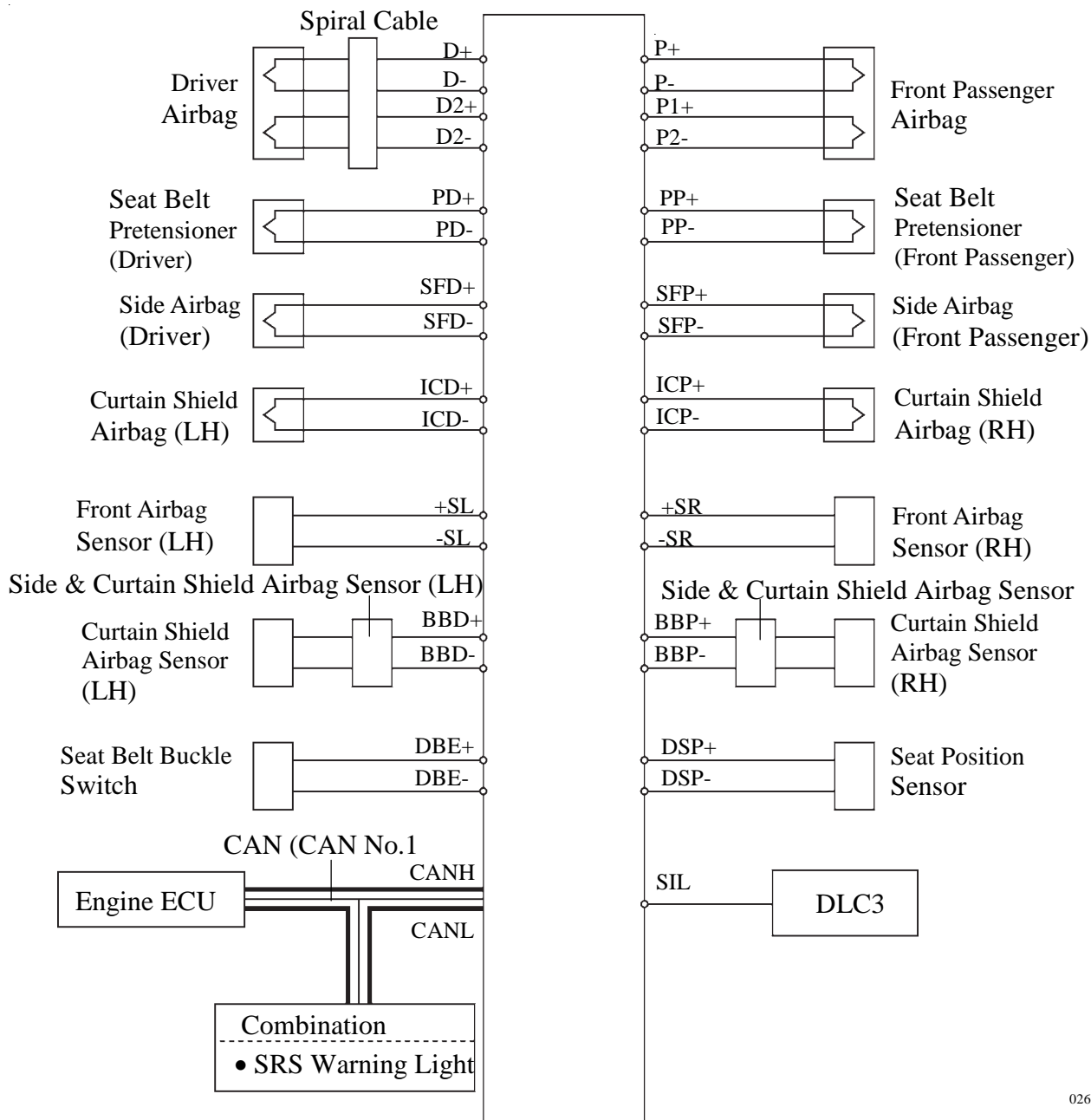


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✱ LAYOUT OF MAIN COMPONENTS



## ✱ WIRING DIAGRAM



026BE36P

Dual-stage SRS Airbag System

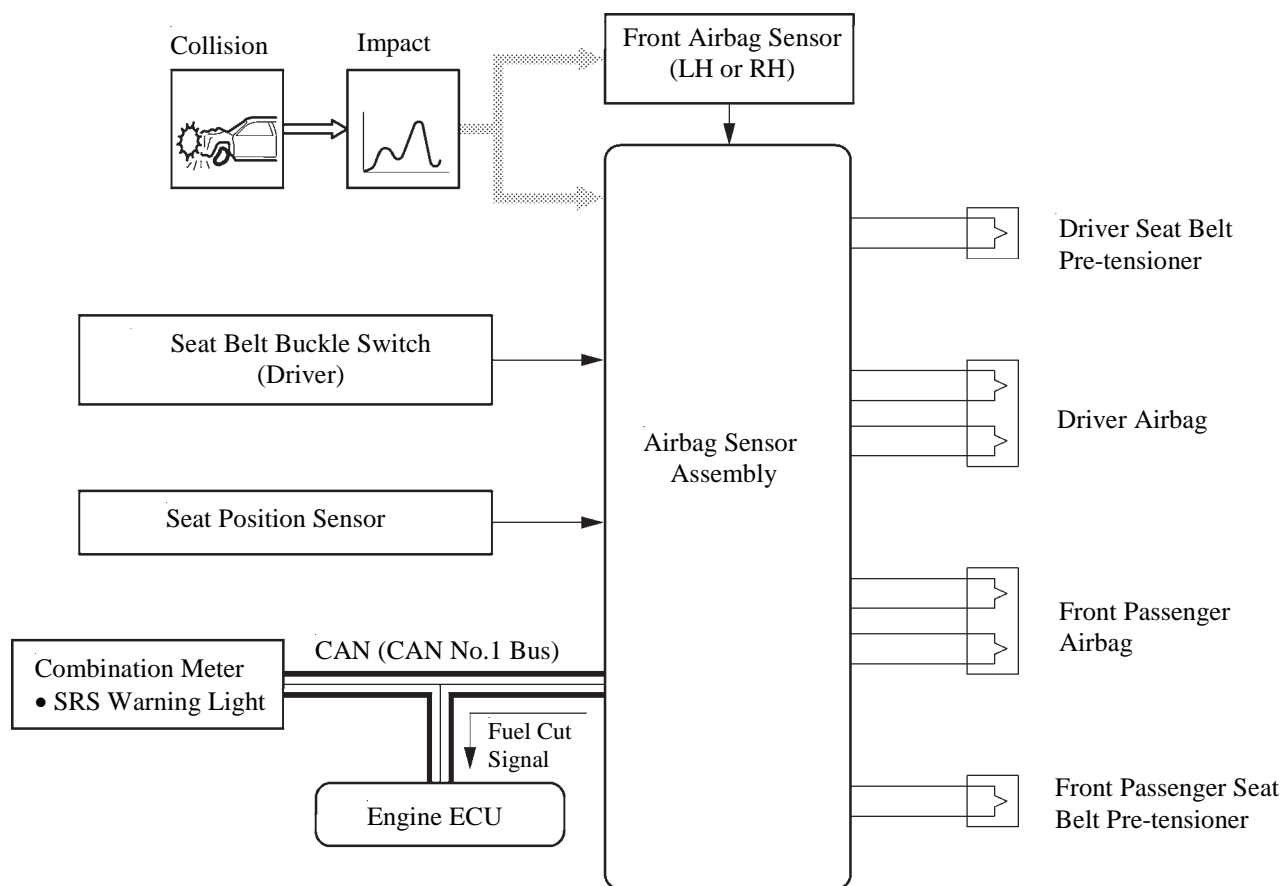
(Continued)

## ✳ AIRBAG FOR FRONTAL COLLISION

### 1. General

- In conjunction with their impact absorbing structure for frontal collisions, the driver and front passenger SRS airbags deploy simultaneously, and are supplements to the seat belts. The driver and front passenger dual-stage SRS airbags have been designed to help reduce injuries to the head and chest in the event of a frontal collision.
- The deceleration sensor is enclosed in the front airbag sensor. Due to the deceleration of the vehicle during a front collision, a distortion is created in the sensor and converted into an electrical signal. Accordingly, the extent of the initial collision can be detected in detail.

### ▶ Front Airbag Operation ◀



026BE37TE

(Continued)

## 2. Dual-stage SRS Airbag System

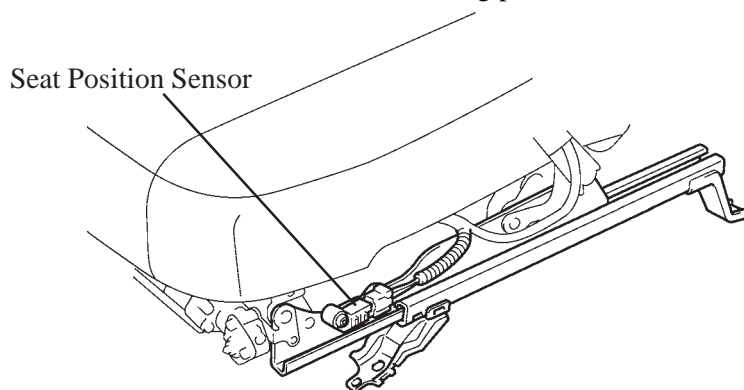
### General

In this system, when the front airbag sensors and airbag sensor assembly detect a front collision, the airbag sensor assembly judges the extent of impact, seat position and whether or not the seat belts are fastened, thus optimising the airbag inflating output by delaying the inflation timing of the 2nd initiator and the 1st initiator.

### Seat Position Sensor

#### 1) General

The seat position sensor is mounted on the upper rail portion of the driver seat rail, and includes a Hall IC and a magnet. This sensor is used to detect the sliding position of the driver seat.

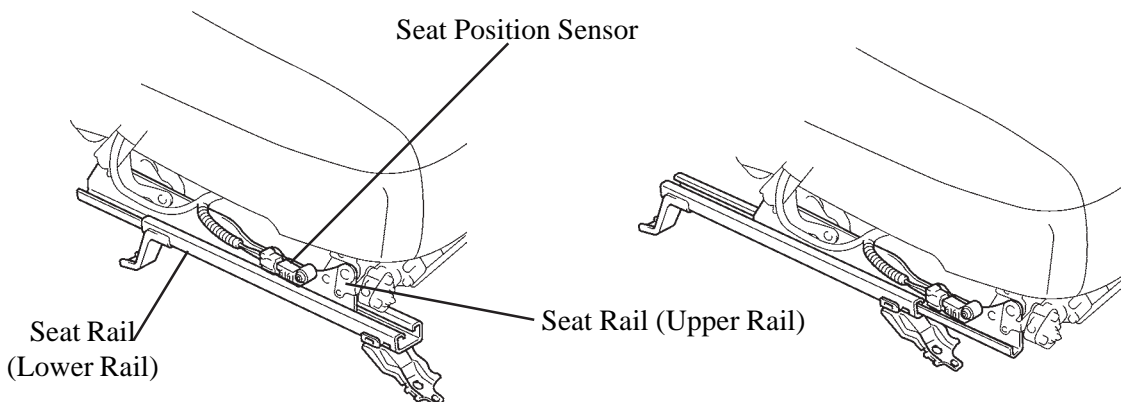


01YBE111Y

#### 2) Operation

When the seat is in the rearward position, the lower rail portion of the seat rail is close to the seat position sensor. When it is in the forward position, the distance between the lower rail portion and the sensor becomes larger.

Thus, the magnetic flux of the magnet inside the seat position sensor varies depending on the seat position. The Hall IC detects this variation and outputs signals to the airbag sensor assembly.

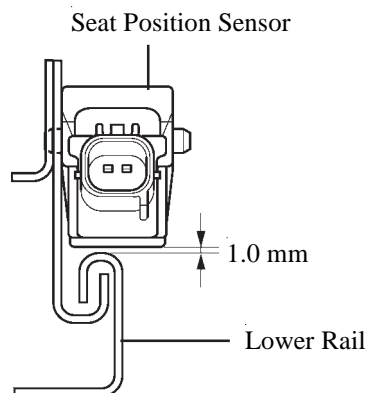


01YBE93Y

**Service Tip**

Follow the procedure indicated below to install the seat position sensor.

- 1) Insert a 1.0 mm feeler gauge between the seat position sensor and the lower rail portion.
  - 2) Tighten the mounting bolt to the specified torque with the seat position sensor pushed down as shown.
- For details, see the Aurion Repair Manual.

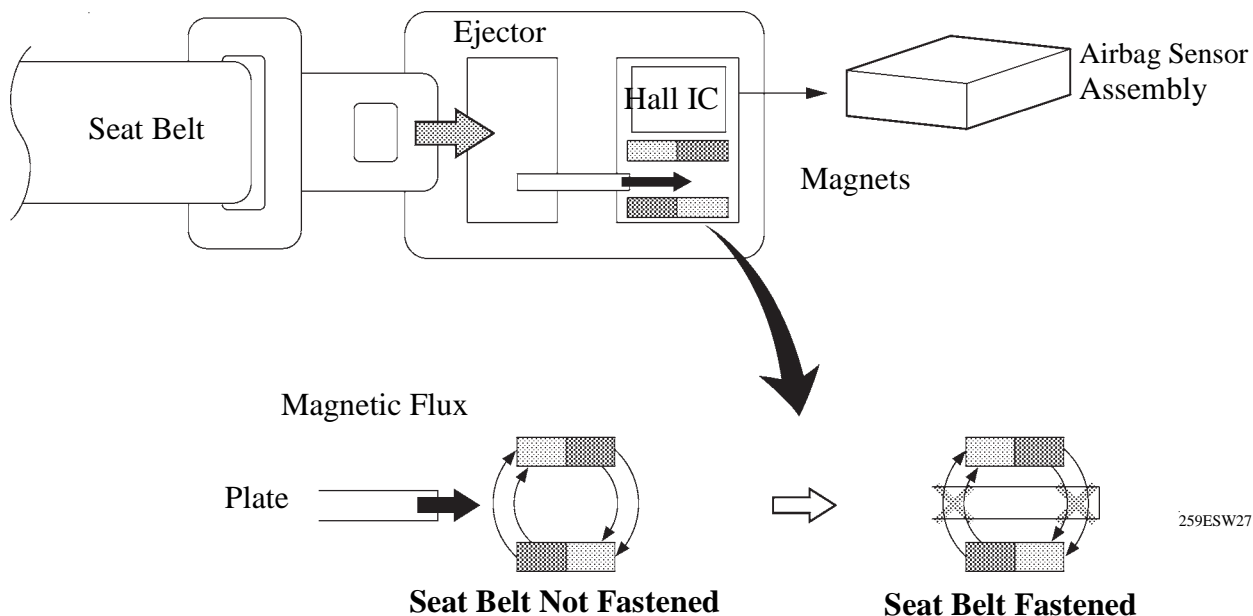


01YBE94Y

**Seat Belt Buckle Switch**

The seat belt buckle switch detects whether or not the seat belt is fastened.

- The non-contact type switch is composed of a Hall IC and two magnets, installed into the front seat inner belt assembly.
- The ejector inside the front seat inner belt assembly and the plate installed to the ejector move when the seat belt is removed or inserted. The movement of the plate changes the magnetic flux density of the magnet.
- The Hall IC detects the changes in the magnetic flux density in accordance with the seat belt removal or insertion, and outputs a signal to the airbag sensor assembly (for driver seat) and occupant classification ECU (for front passenger seat).



259ESW27



### **3. SRS Driver and Front Passenger Airbags**

Dual-stage SRS driver and front passenger airbags contain two sets of initiators and propellants. The airbag sensor assembly helps optimise the airbag inflation speed by controlling the inflation timing of these initiators.

### **4. Front Airbag Sensor**

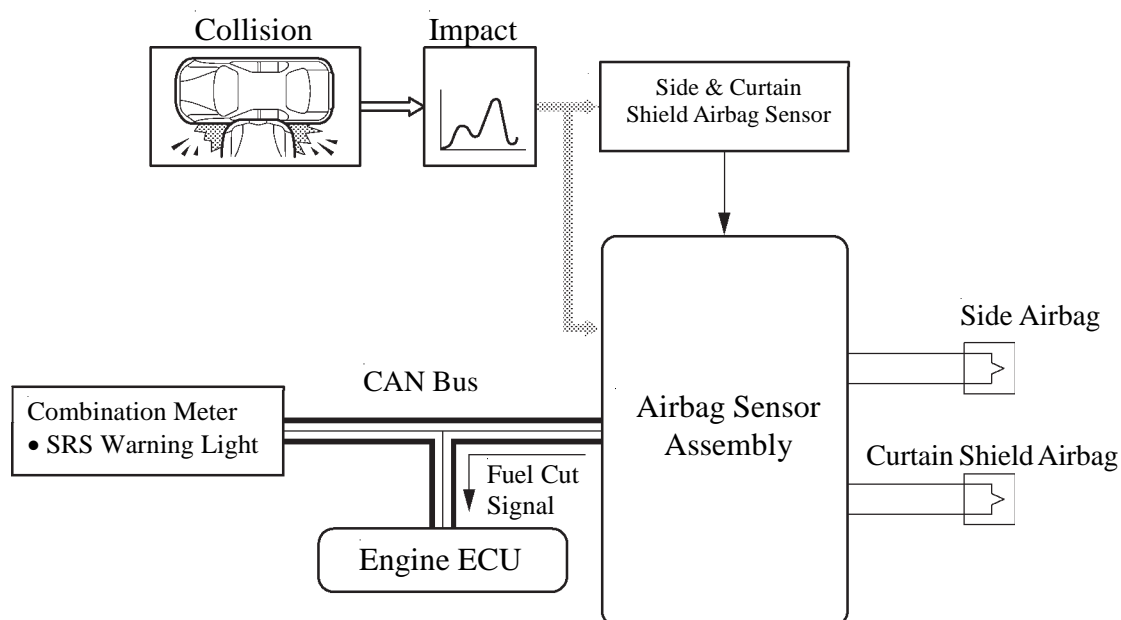
Front airbag sensor uses an electrical type deceleration sensor. Based on the deceleration of the vehicle during a frontal collision, distortion is created in the sensor and converted into an electrical signal. Accordingly, the extent of the initial collision can be accurately detected.

## ☀ AIRBAG FOR SIDE/ REAR OF SIDE COLLISION

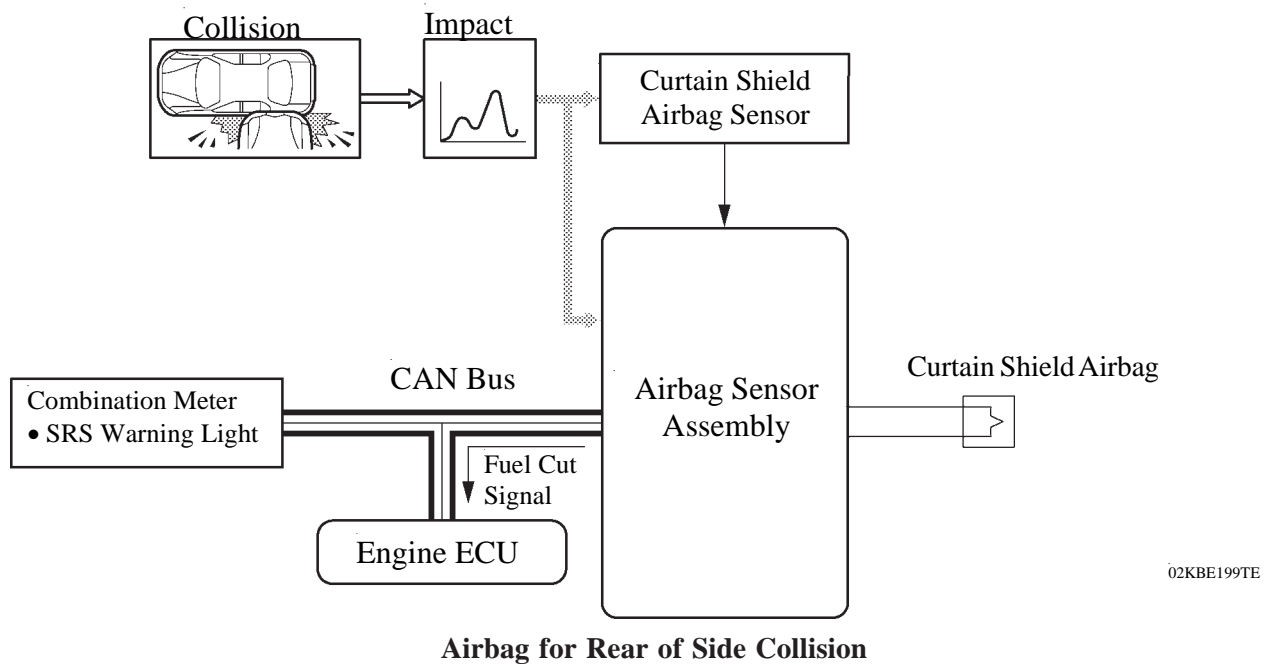
### 1. General

- With the airbag for side collisions, if the side & curtain shield airbag sensor detects an impact, the airbag sensor assembly causes the front side and curtain shield airbags to be deployed simultaneously.
- With the airbag for rear of side collisions, if the curtain shield airbag sensor detects an impact, the airbag sensor assembly causes the curtain shield airbag to be deployed.

### ▶ System Operation ◀



Airbags for Side Collision



## 2. SRS Side Airbag

SRS side airbags are installed in the backs of the driver seat and the front passenger seat. The SRS airbag is a one-piece design, consisting of an inflator, a bag, and a cover.

## 3. SRS Curtain Shield Airbag

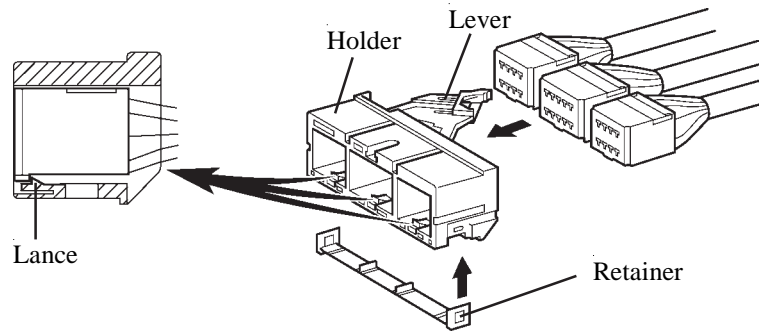
SRS curtain shield airbags are located in the areas that extend from the driver's and front passenger's front pillars to the rear pillars in the rear seat areas. Each SRS airbag is a one-piece design, consisting of an inflator, a bag, and a cover.

## 4. Side & Curtain Shield Airbag Sensors

Side & curtain shield airbag sensor uses an electrical type deceleration sensor. Based on the deceleration of the vehicle during a side or rear of side collision, distortion is created in the sensor and converted into an electrical signal. Accordingly, the extent of the initial collision can be accurately detected.

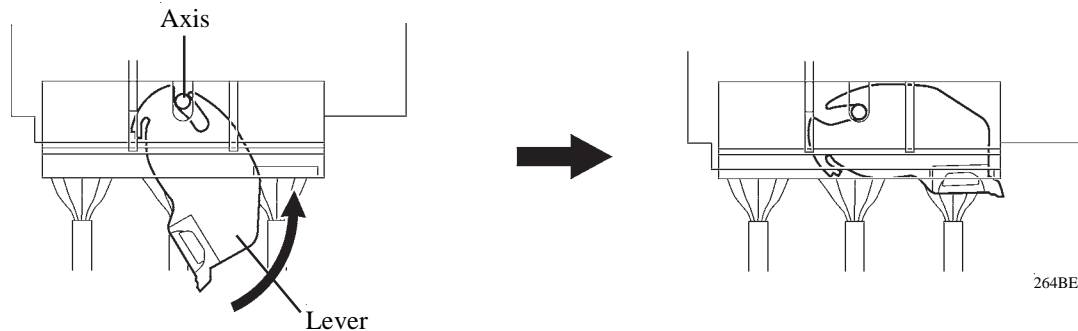
## ✱ IMPROPER CONNECTION PREVENTION LOCK MECHANISM

- This improper connection prevention lock mechanism consists of the airbag sensor assembly and the holder.
- The airbag sensor assembly has a connector lock pin.
- The holder has a lever with a lock groove. The holder and the connectors are locked via a retainer and a lance.



264BE45

- When connecting the holder and connectors to the airbag sensor assembly, the lever is pushed into position end by rotating it around the axis of the connector lock pin in order to lock the holder securely.



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## ✱ AIRBAG SENSOR ASSEMBLY

- It reaches a deploy judgment to deploy the driver's and front passenger's airbags and pre-tensioners based on the signals received from the front airbag sensor and the airbag sensor assembly. In addition, it can reach a deploy judgment to deploy the SRS side airbags and SRS curtain shield airbags based on signals received from the side & curtain shield airbag sensors and curtain shield airbag sensors. Furthermore, it is equipped with a diagnosis function to perform self-diagnosis in case of system malfunctions.
- Each signal is transmitted as follows:

| Target ECU        | Signal                                                                           | Communication path        |
|-------------------|----------------------------------------------------------------------------------|---------------------------|
| Engine ECU        | Fuel Cut Signal                                                                  | CAN communication circuit |
| Combination Meter | SRS Warning Light ON Demand Signal<br>Seat Belt Remainder Light ON Demand Signal | CAN communication circuit |

## ✱ DIAGNOSIS

If the airbag sensor assembly detects a malfunction in the SRS airbag system, the airbag sensor assembly stores the malfunction data in memory, in addition to illuminating the SRS warning light.

- There are 2 types of DTC for the SRS airbag system: 5-digit and 2-digit.
- The 5-digit DTC can be read by connecting an intelligent tester II to DLC3.
- The 2-digit DTC can be read by connecting the SST (09843-18040) to the Tc and CG terminals of the DLC3 and reading the blinking of the SRS warning light.
- If the SRS airbags deploy, the airbag sensor assembly will turn ON the SRS warning light. However, differing from the ordinary diagnosis function, a DTC will not be memorised. The SRS warning light can be turned OFF only by replacing the airbag sensor assembly with a new one.
- For details, refer to see the Aurion Repair Manual.

## SEAT BELT REMINDER SYSTEM

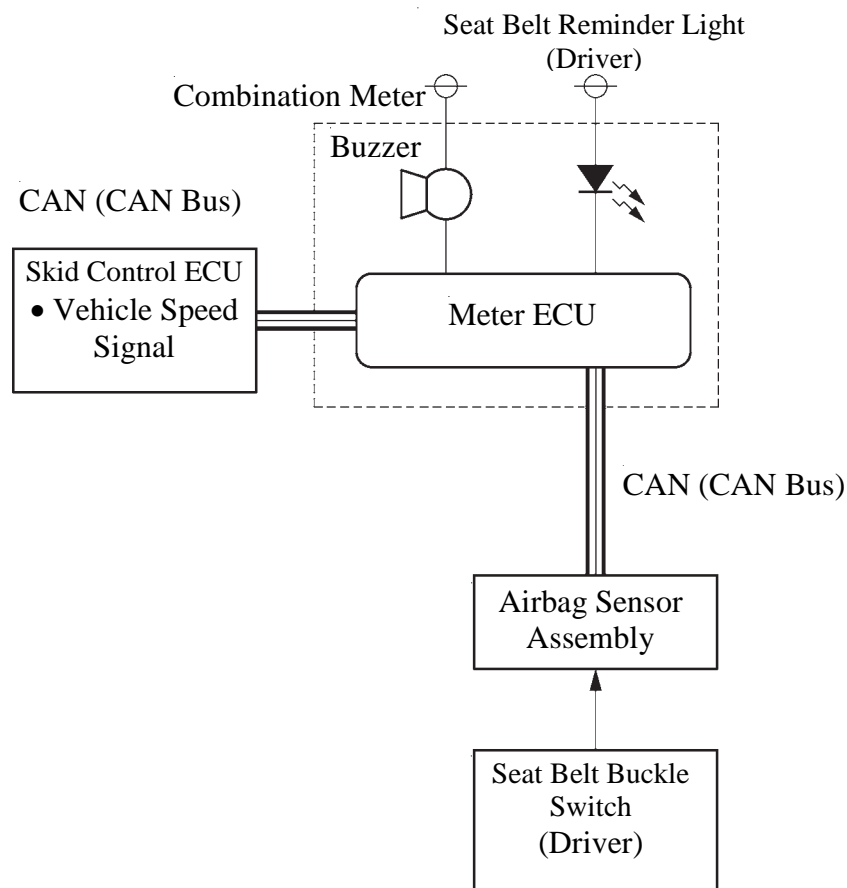
### DESCRIPTION

- If a seat belt is not fastened, this system flashes the seat belt reminder light and sounds the buzzer in the combination meter as a reminder.
- When the ignition\*<sup>1</sup> / engine\*<sup>2</sup> switch is turned ON, this system detects the condition of the drivers' seat belt based on the signal from the seat belt buckle switch.

\*<sup>1</sup>: Models without smart entry and start system

\*<sup>2</sup>: Models with smart entry and start system

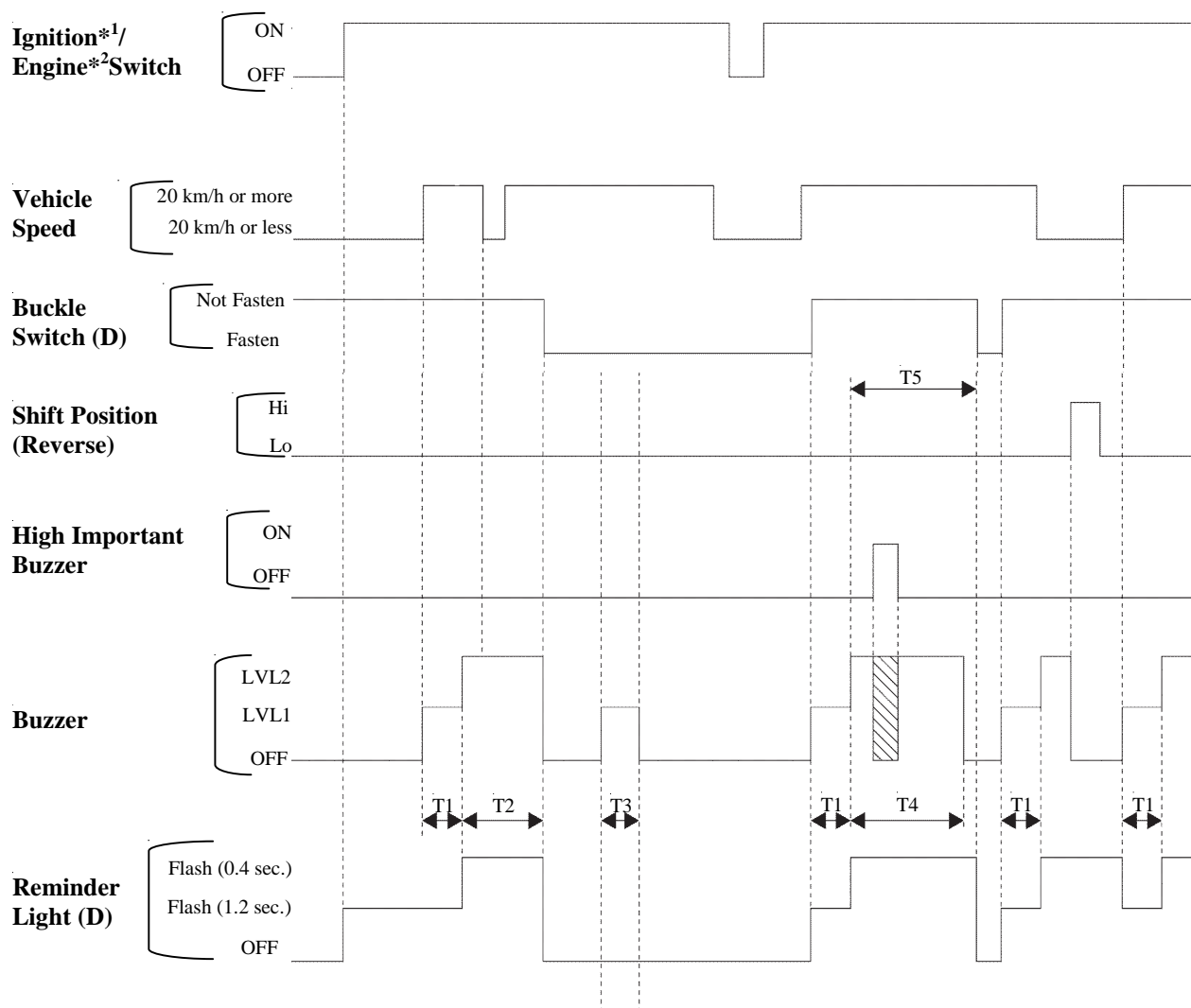
### System Diagram



02KB204TEb

## ☀ REMINDER METHOD

The timing chart of the buzzer and details of the reminder method are shown below.



0150BE50Cb

T1: About 30 sec.                      T4: About 90 sec.  
 T2: About 90 sec. or less    T5: About 90 sec. or more  
 T3: About 30 sec. or less

\*1: Models without smart entry and start system

\*2: Models with smart entry and start system

*Note:*

*If the vehicle speed drops below the setting level for seat belt warning after a buzzer begins to sound, the buzzer will continue to sound.*

## CRUISE CONTROL SYSTEM

### ☀ DESCRIPTION

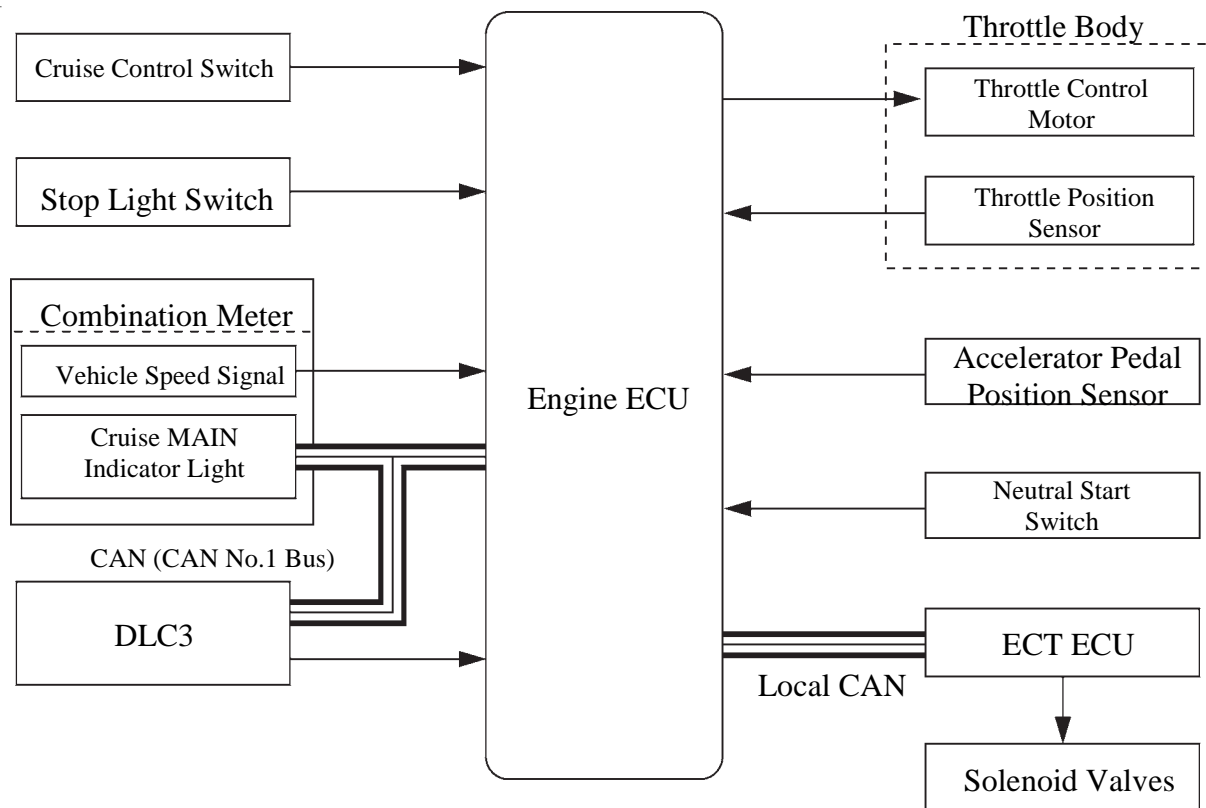
Cruise Control maintains the vehicle speed set by the driver.

#### 1. General

When the system is set to a desired vehicle speed, the throttle valve position is adjusted automatically to maintain the vehicle speed without the driver having to depress the accelerator pedal.

This system effects control through the ETCS-i (Electronic Throttle Control System-intelligent).

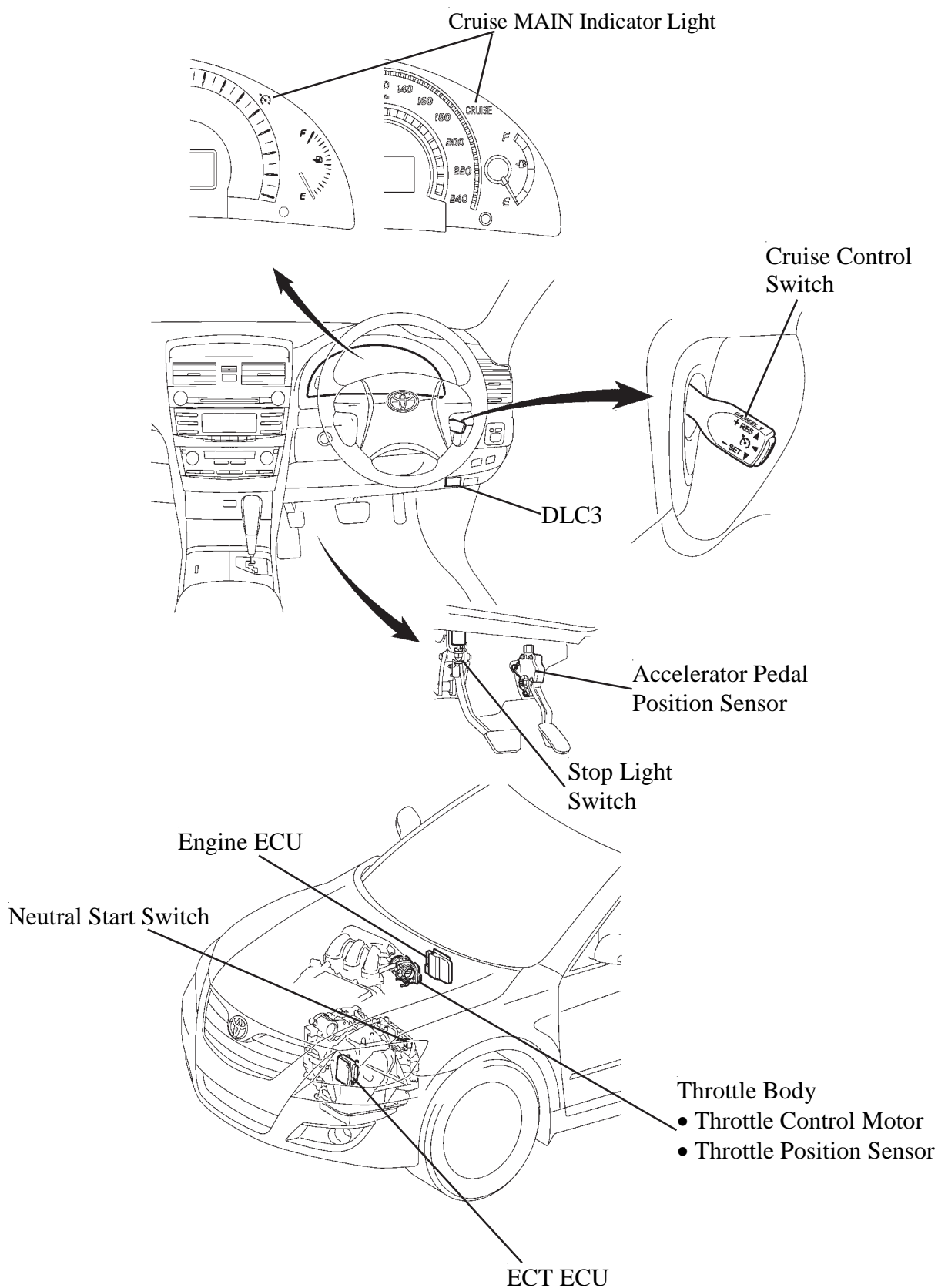
#### ► System Diagram ◀



025BE123P



## 2. Layout of Main Components



### 3. System Control

#### General

The cruise control has the following control.

| Control                 | Outline                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Constant Speed Control  | The engine ECU compares the actual vehicle speed and the set speed and if the vehicle speed is higher than the set speed, it uses the throttle control motor to decrease the throttle opening. If the actual vehicle speed is lower than the set speed, it uses the throttle control motor to increase the throttle opening.                                                                                                                                                                                                                                                      |
| Set Control             | While this system fulfils the following conditions, and the cruise control switch is pressed to the SET/ - side and released when the ON-OFF button on the cruise control switch has been pressed to turn the system on, the engine ECU stores the vehicle speed and maintains the vehicle constantly at that speed. <ul style="list-style-type: none"> <li>• The vehicle is running at a vehicle speed of about 40 km/h or more.</li> </ul>                                                                                                                                      |
| Low Speed Limit Control | The low speed limit is the lowest speed that cruise control can be set at and it is designed to be approx. 40 km/h. The cruise control cannot be set below that speed. If the vehicle speed drops below that speed while running in the cruise control, the cruise control will be cancelled automatically. However the set speed in the memory is kept.                                                                                                                                                                                                                          |
| COAST Switch Control    | While the cruise control switch is held to the SET/ - side, the vehicle speed and the set vehicle speed change as follows. <ul style="list-style-type: none"> <li>• The vehicle decelerates constantly.</li> <li>• The set vehicle speed changes to the speed that the vehicle is travelling at when the COAST switch is released.</li> </ul>                                                                                                                                                                                                                                     |
| Tap Down Control        | When the cruise control switch is pushed momentarily (approx. 0.6 sec.) to the SET/ - side, the vehicle speed and the vehicle setting speed change as follows. <ul style="list-style-type: none"> <li>• The vehicle will decelerate in increments of approx. 1.6 km/h for each time the switch was pressed.</li> <li>• However, if the difference between the actual vehicle speed and the vehicle setting speed is greater than 5 km/h, the vehicle setting speed will change to the speed at which the vehicle was being driven at the time the switch was released.</li> </ul> |
| ACC Switch Control      | When the cruise control switch is pushed to the RES/ + side and held, the vehicle speed and the vehicle setting speed change as follows. <ul style="list-style-type: none"> <li>• The vehicle accelerates constantly.</li> <li>• The set vehicle speed changes to the speed as which the switch is releases.</li> </ul>                                                                                                                                                                                                                                                           |
| Tap Up Control          | When the cruise control switch is pushed momentarily (approx. 0.6 sec.) to the RES/ + side, the vehicle speed and the vehicle setting speed change as follows. <ul style="list-style-type: none"> <li>• The vehicle accelerates in increments of approx. 1.6 km/h for each time the switch was pressed.</li> <li>• However, if the difference between the actual vehicle speed and the vehicle setting speed is greater than 5 km/h, the vehicle setting speed does not change.</li> </ul>                                                                                        |

(Continued)

| Control                  | Outline                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RES Switch Control       | If cruise control is cancelled for any reason other than a malfunction or main switch operation and vehicle speed is more than the low speed limit, the vehicle speed is returned to the speed before the cancellation of cruise operation by setting the cruise control switch to the RES/+ side. The cruise control mode can be resumed even if the vehicle speed drops below the low speed limit, because the speed in the memory is not cleared.                                                                                                                                                                                                                               |
| Shift Down Control       | <b>ECT ECU isolated from engine ECU (U660E Automatic Transaxle):</b><br>When the vehicle is cruising uphill, shift-down control may be performed by the ECT (Electronic Control Transmission). The engine ECU transmits the shift up request signal to the ECT ECU when the engine ECU judges the end of cruising uphill based on the throttle valve angle. If shift-down control is performed during ACC or RES switch control, the engine ECU transmits the shift up request signal to the ECT ECU after ACC or RES switch control is completed.                                                                                                                                 |
| Manual Cancel Control    | When any of the following conditions occur during cruise control driving, the cruise control is cancelled. <ul style="list-style-type: none"> <li>• The stop light switch ON signal is sent to the engine ECU when the brake pedal is depressed.</li> <li>• The CANCEL switch ON signal is sent to engine ECU when the cruise control switch moved to CANCEL side.</li> <li>• The cruise control OFF signal is sent to the engine ECU when the cruise control switch ON-OFF button is pushed off.</li> <li>• The shift lever is moved from the D position to the N position.</li> <li>• The 3rd, 2nd or 1st gear is selected when the shift lever is in the S position.</li> </ul> |
| Automatic Cancel Control | When any of the following conditions occur during cruise control operation, the speed that is set in the memory is cleared and the cruise control is cancelled. <ul style="list-style-type: none"> <li>• Stop light switch open or short circuit</li> <li>• The vehicle speed signal is not input for a predetermined period of time.</li> <li>• ETCS-i malfunction</li> </ul> Furthermore, the cruise MAIN indicator light will blink until the ON-OFF button on the cruise control switch is used to turn the system off, and the operation of the cruise control will be disabled until the ON-OFF button is turned ON again.                                                   |
|                          | When any of the following conditions occur during cruise control driving, the speed that is set in the memory is cleared and the cruise control is cancelled. <ul style="list-style-type: none"> <li>• Stop light switch input signal is abnormal.</li> <li>• Cruise control switch input signal is abnormal.</li> </ul> Furthermore, the cruise MAIN indicator light will blink until the ON-OFF button on the cruise control switch is used to turn the system off, and the operation of the cruise control will be disabled until the ignition <sup>*1</sup> /engine <sup>*2</sup> is turned ON again.                                                                          |

\*1:Models without smart entry and start system

\*2:Models with smart entry and start system

(Continued)

| Control                  | Outline                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Automatic Cancel Control | <p>When any of the following conditions occur during cruise control driving, the cruise control is cancelled.</p> <ul style="list-style-type: none"> <li>• Vehicle speed is below the low speed limit (approx. 40 km/h) or less.</li> <li>• Vehicle speed decreases by 16 km/h or more below the speed at which the cruise control was set.</li> <li>• The VSC is activated.</li> </ul>                                                   |
| Diagnosis                | <p>When the engine ECU does not receive a vehicle speed signal for a predetermined period of time during cruising, or when cruise control is cancelled (automatic cancel) due to a malfunction of the cruise control, stop light switch or vehicle speed signal, the engine ECU immediately blinks the cruise MAIN indicator light due to the malfunction. The contents relating to the malfunction will be stored in the engine ECU.</p> |

## Diagnosis

If a malfunction occurs in the cruise control system, during cruise control operation, the engine ECU actuates the automatic cancel control and blinks the cruise MAIN indicator light to inform the driver of a malfunction. At this time, the engine ECU memorises the malfunction in the form of 5-digit and 2-digit DTC (Diagnostic Trouble Code).

- The 5-digit DTC can be read by connecting an intelligent tester II to the DLC3.
- The 2-digit DTC is output to the cruise MAIN indicator light when the Tc and CG terminals of the DLC3 connector are connected through the use of the SST (09843-18040). Thus, these DTC are obtained by counting the number of blinks of the cruise MAIN indicator light.

## REAR VIEW MIRROR

### ✱ DESCRIPTION

The functions of the rear view mirror vary depending on grades.

For details, see the equipment list in Model Outline (see page MO-28).

| Mirror                   | Function                                              | Outline                                                                                                                                                                                 |
|--------------------------|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inside Rear View Mirror  | Automatic Glare-Resistant EC (Electro Chromic) Mirror | The function can automatically reduce headlight glare from an on-coming vehicle during night time driving.                                                                              |
| Outside Rear View Mirror | Reverse-linked function                               | When the shift lever is shifted into the R position, the outside rear view mirror on the passenger side tilts downward, thus facilitating confirmation of the rear side of the vehicle. |
|                          | Memory System<br>(See page BE-189)                    | The system stores up to 2 mirror positions.                                                                                                                                             |

## ✿ AUTOMATIC GLARE-RESISTANT EC MIRROR

### 1. General

During nighttime driving, if a large difference in intensity exists between the surrounding light and the light reflected off the inside rear view mirror from the headlights behind, an automatic glare-resistant EC (Electro Chromic) mirror automatically reduces the reflection rate of the mirror and thus dampens the glare from the mirror.

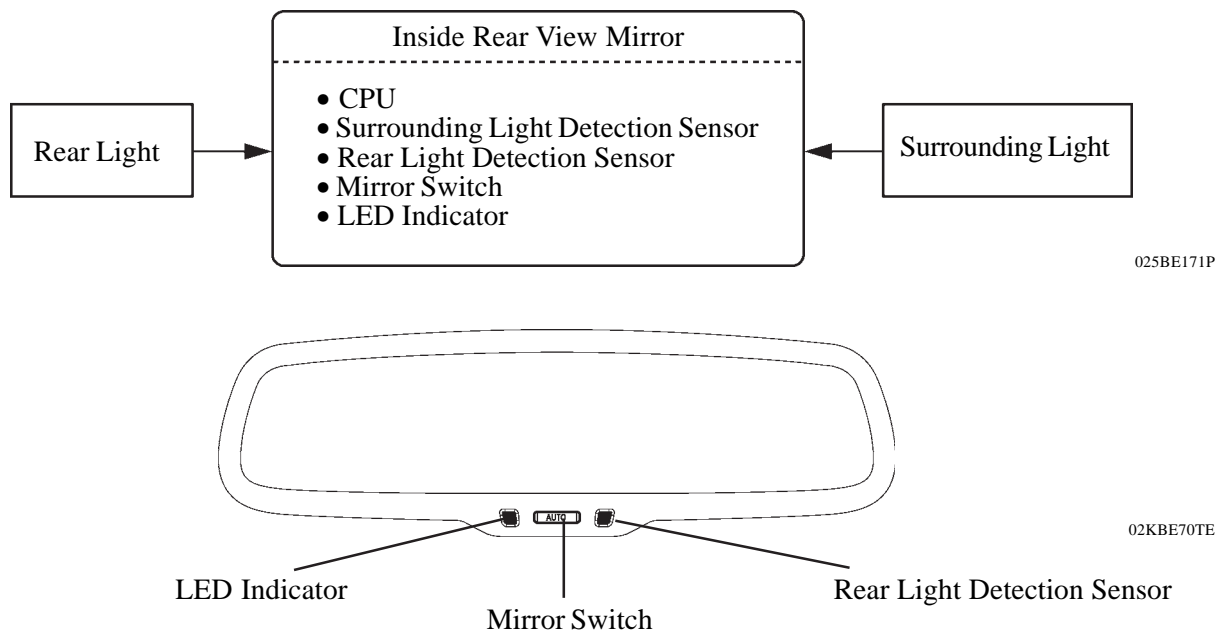
- This system uses 2 sensors (surrounding light detection sensor and rear light detection sensor) that are present in the inside rear view mirror to detect the difference between the intensity of light in the environment, and the light that the inside rear view mirror receives from the rear of the vehicle.

- When the ignition\*<sup>1</sup>/engine\*<sup>2</sup> switch is changed from OFF to IG-ON, this system defaults to AUTO mode.

\*<sup>1</sup>: Models without smart entry and start system

\*<sup>2</sup>: Models with smart entry and start system

### ► System Diagram ◀

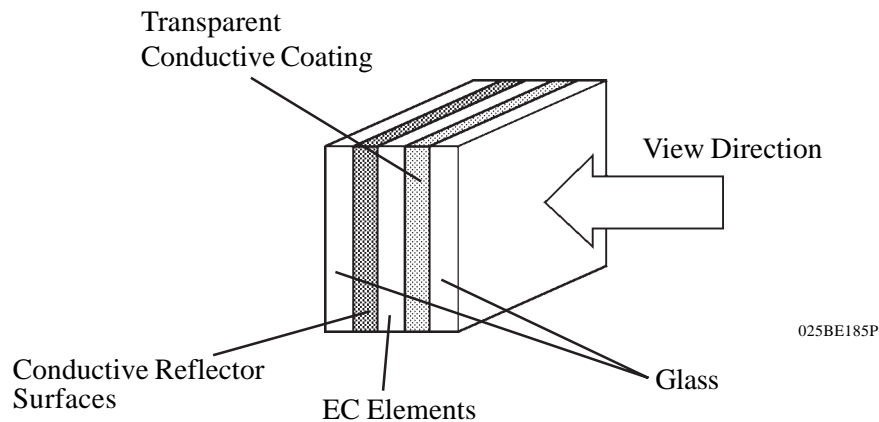


### 2. Function of Components

| Component                          | Function                                                                                             |
|------------------------------------|------------------------------------------------------------------------------------------------------|
| Surrounding Light Detection Sensor | Detects the intensity of the light surrounding the vehicle.                                          |
| Rear Light Detection Sensor        | Detects the intensity of the light that strikes the inside rear view mirror from behind the vehicle. |
| LED Indicator                      | Turns on to inform the driver when AUTO mode is operating.                                           |
| Mirror Switch                      | Changes the mode between AUTO mode / AUTO OFF mode when the Switch pressed less 3 seconds.           |
| EC Mirror Cell                     | Varies the reflection rate of the mirror using the function of EC element.                           |
| CPU                                | Controls the reflection rate in accordance with the signals from the 2 sensors.                      |

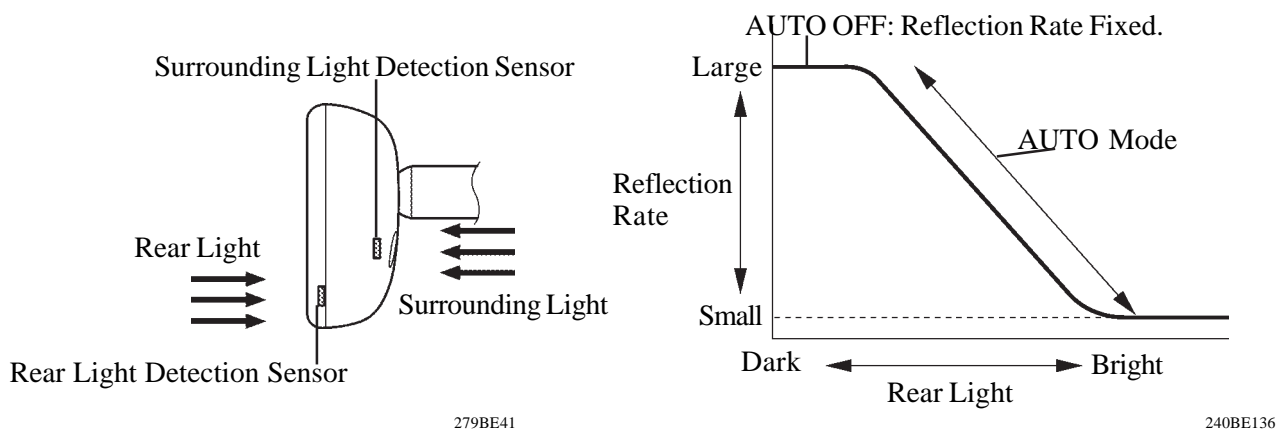
### 3. EC Mirror Cell

The gel type EC elements are placed between a layer of transparent conductive coating, and a layer of conductive reflector surfaces, which are placed between 2 sheets of glass. The EC elements have color coating characteristics. These characteristics are utilized to electronically vary the mirrors reflection rate through the electro-chemical oxidation reduction reaction.



### 4. Reflection Rate Control

This CPU detects the surrounding light using its surrounding light detection sensor, the rear light using its rear light detection sensor, and determines whether it is day or night based on the intensity of the surrounding light. At the same time, the intensity of the glare from the rear is determined through the difference in intensity between the surrounding and rear light. In accordance with the intensity of the rear light, the reflection rate is varied steplessly.

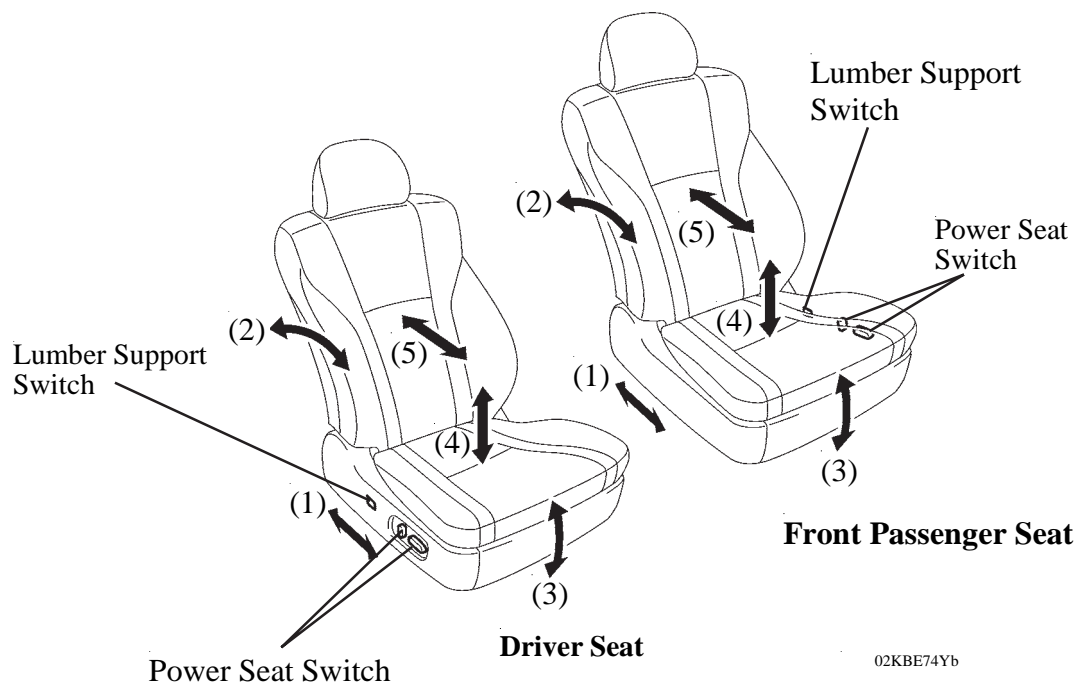


## POWER SEAT SYSTEM

### ✱ DESCRIPTION

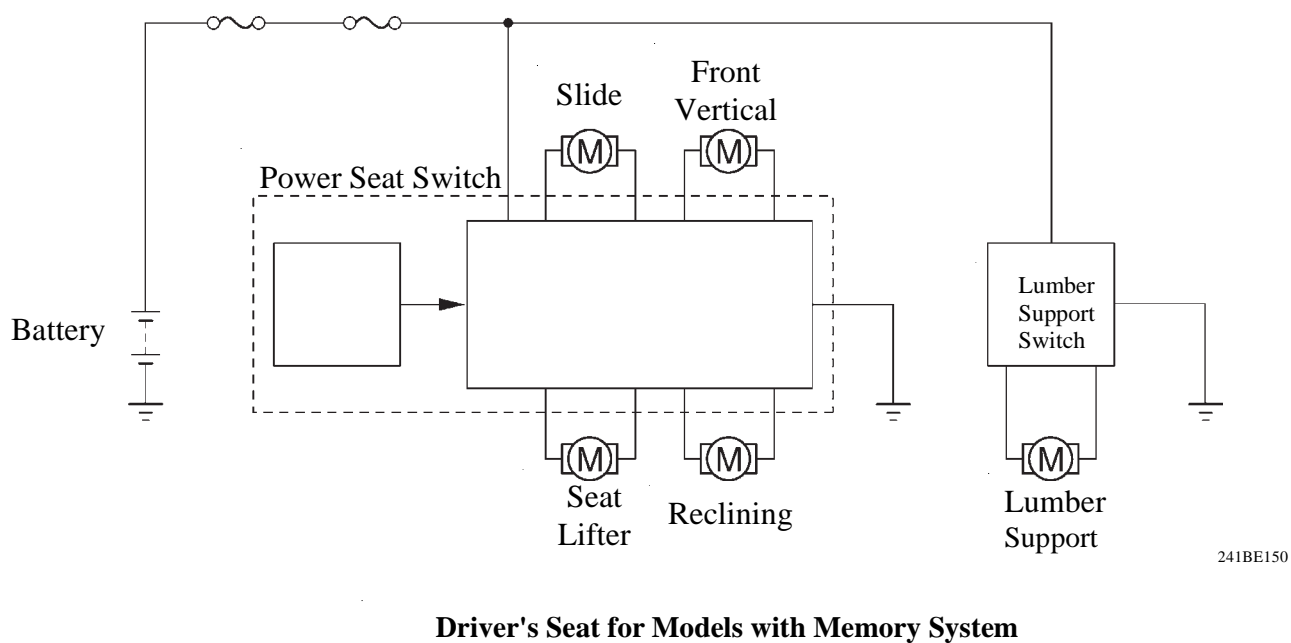
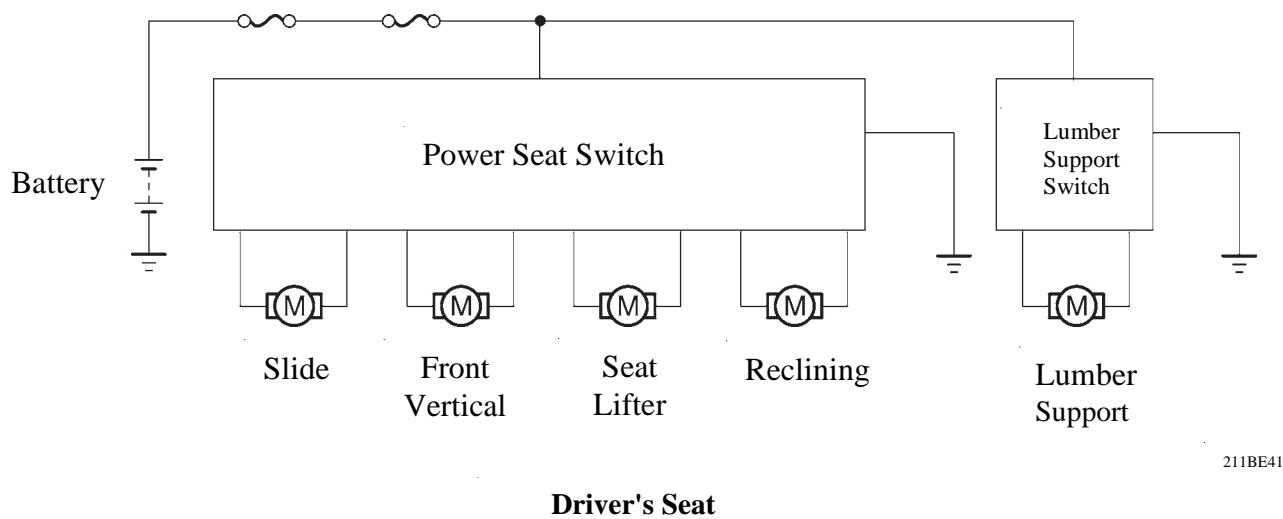
- The settings of the power seat system vary depending on the grade. For details, see the equipment list in model outline (see page MO-28).
- The power seat system for the driver and front passenger seats has the following functions:

| Function |                        | Stroke     |                 |
|----------|------------------------|------------|-----------------|
|          |                        | Driver     | Front Passenger |
| (1)      | Seat Slide             | 260 mm     |                 |
| (2)      | Reclining              | 78 degrees |                 |
| (3)      | Front Vertical         | 24 mm      | -               |
| (4)      | Rear Vertical (Lifter) | 45 mm      | -               |
| (5)      | Lumbar Support         | 21 mm      |                 |





► System Diagram ◀



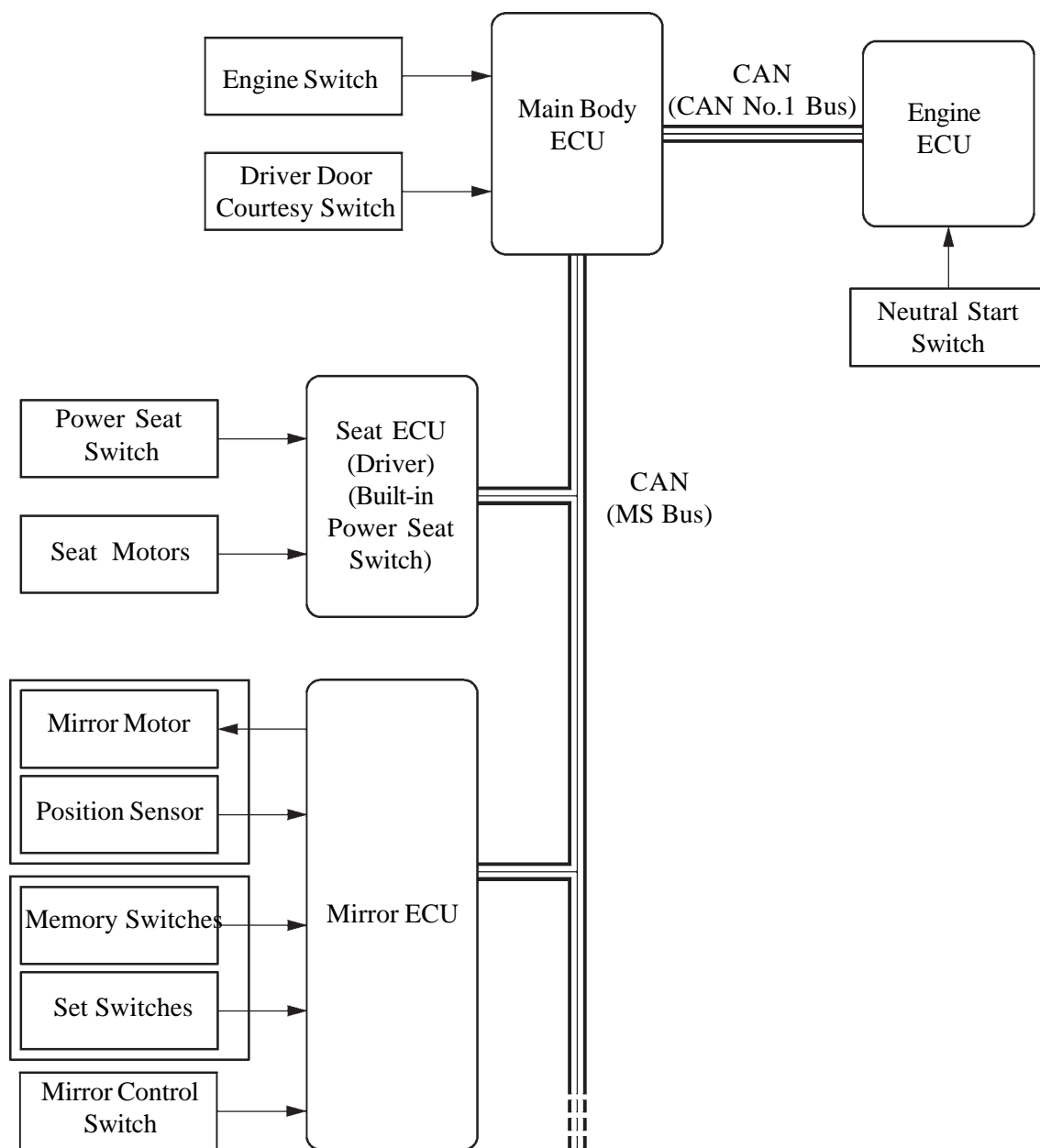
## MEMORY SYSTEM

### ✱ DESCRIPTION

- The settings of the memory system vary depending on model grades. For details, see the equipment list in Model Outline (see page MO-28).
- The memory system can store 2 positions for the driver seat and outside rear view mirror.
- The seat ECU (driver) stores seat slide, front vertical, rear vertical and reclining positions in its memory. The seat ECU is built in to the power seat switch.
- The mirror ECU stores the outside rear view mirror position in its memory.
- The seat ECU (driver) outputs a reproduction signal to each ECU.
- The memory and recall conditions of this system are as follows.

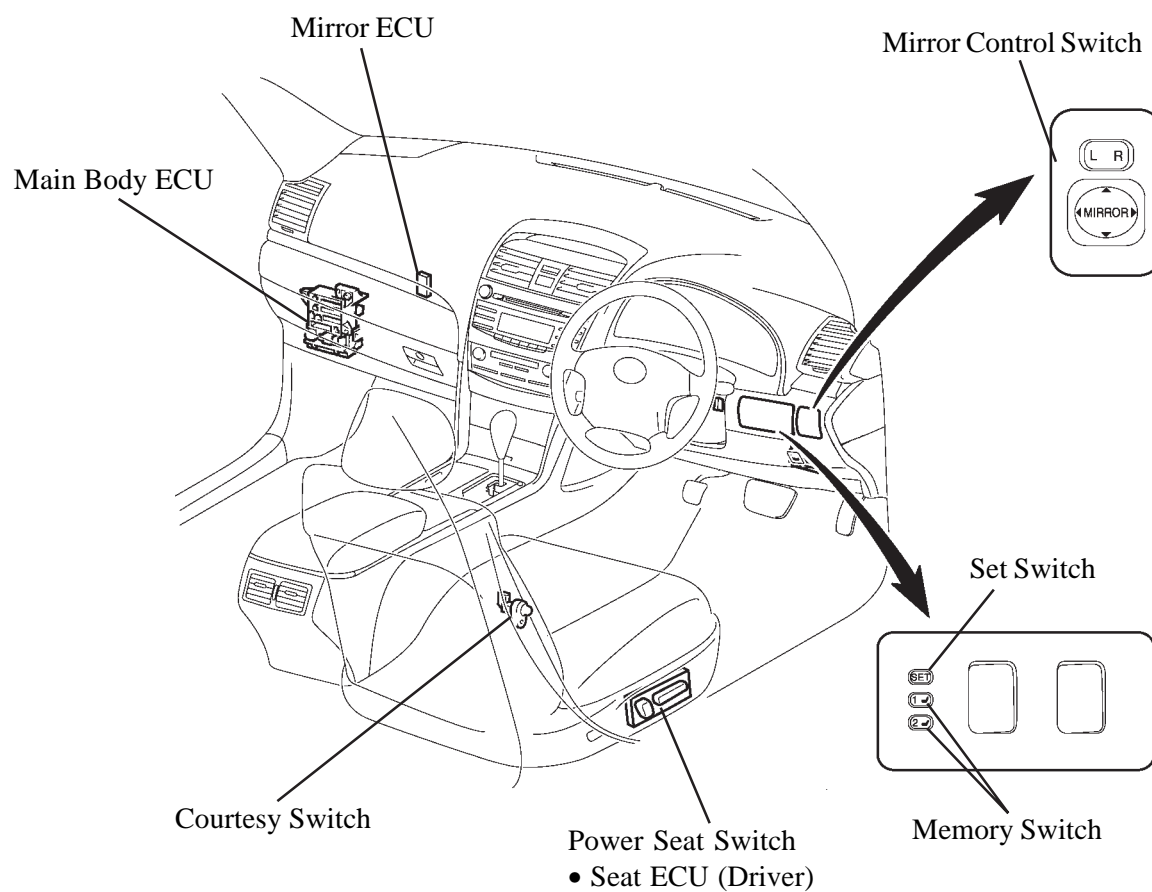
| Function | Condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Memory   | <p>Stores the positions when all conditions below have been met and button 1 or 2 is pushed while the “SET” button is pushed.</p> <ul style="list-style-type: none"> <li>• Power source is “IG-ON”.</li> <li>• Shift position is “P”.</li> </ul> <p>When the memory setting is completed, the buzzer will sound for 0.5 seconds.</p>                                                                                                                                                       |
| Recall   | <p>If button 1 or 2 is pressed when all conditions have been met, the system operates to adjust the positions.</p> <ul style="list-style-type: none"> <li>• Power source is “IG-ON”.</li> <li>• Shift position is “P”.</li> </ul> <p>If button 1 or 2 is pressed when all conditions have been met and within 30 seconds, the system operates to adjust the positions.</p> <ul style="list-style-type: none"> <li>• Power source is “IG-OFF”.</li> <li>• Driver door is opened.</li> </ul> |

## ▸ System Diagram ◀



02KBE65TE

## ★ LAYOUT OF MAIN COMPONENTS



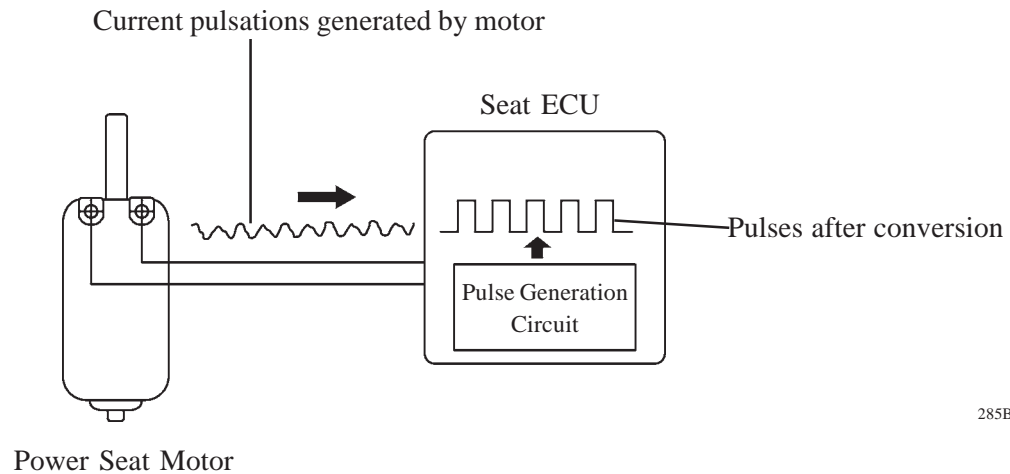
02KBE80TE

## ✱ SEAT ECU (DRIVER)

- The seat ECU (driver) effects the main control of the memory system in order to memorise and recall the driver seat position. In addition, the seat ECU (driver) instructs the mirror ECU, to start memorising or recalling their respective positions.
- The driver seat position and outside rear view mirror position are memorised by their respective ECUs.
- The ECUs exchange the information that is necessary for memory control via the CAN.

## ✱ SEAT POSITION DETECTION METHOD

A pulse generation circuit in seat ECU (driver) converts the driving current pulsations that are generated by the rotation of the motor into pulse signals. These signals are then picked up in order to detect the seat position.



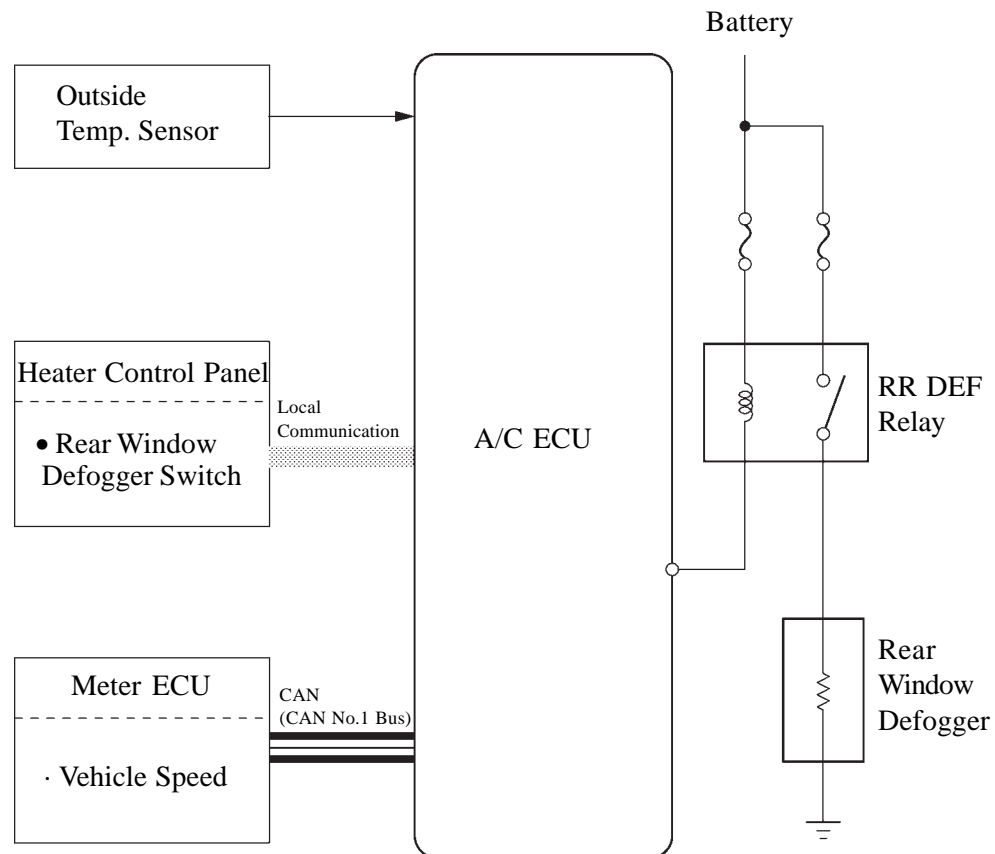
285BE146

## REAR WINDOW DEFOGGER SYSTEM

### ✱ DESCRIPTION

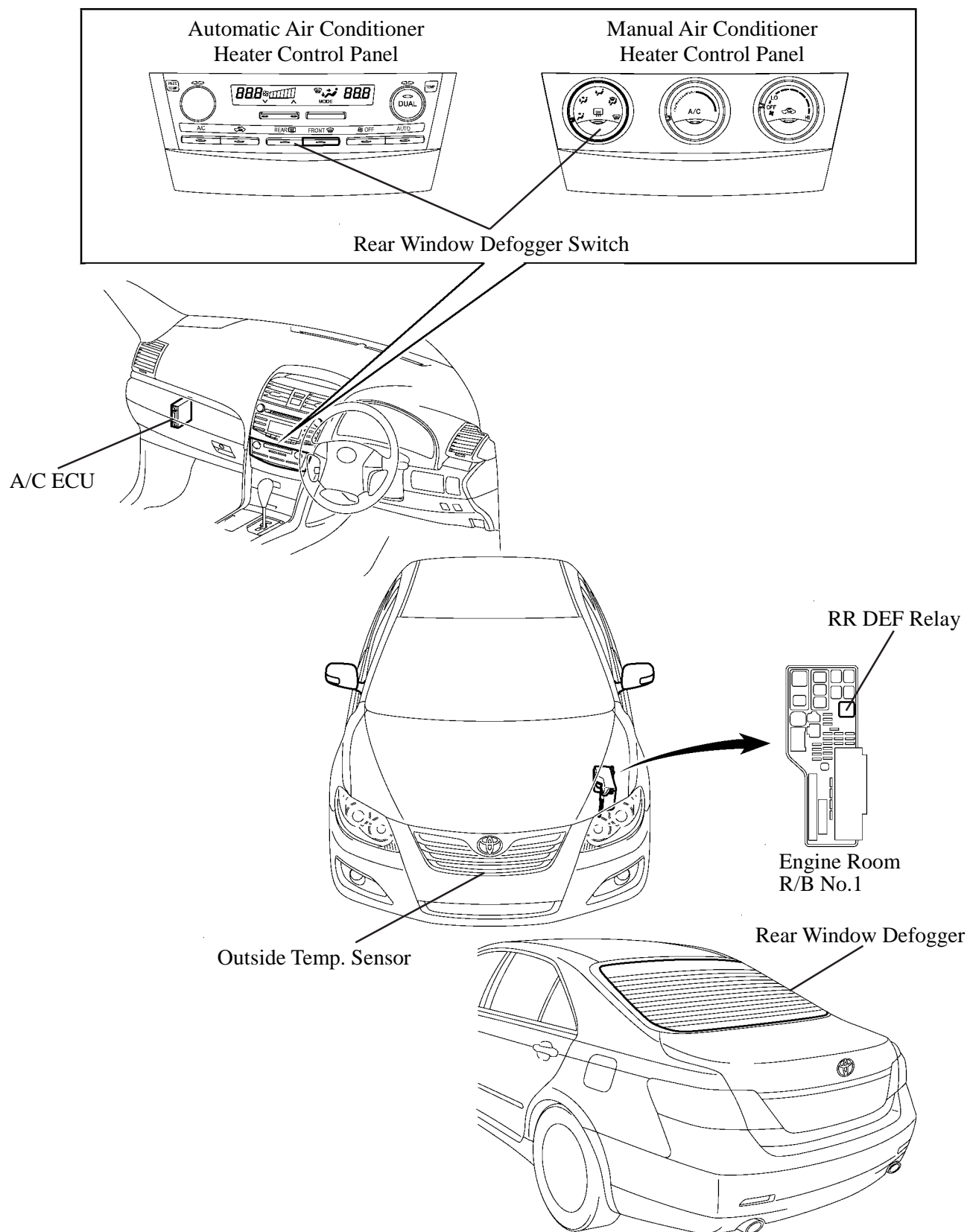
- The rear window defogger system uses the heater wire on the rear window glass to defog the rear window glass.
- This system is standard equipment on all models.
- This system is activated when the power source is turned on and the rear window defogger switch is pushed. This switch is provided with a timer function to turn off the defogger after approx. 15 minutes. The operation period of the timer may extend to approximately 45 minutes depending on the outside air temperature and vehicle speed.

### ▸ System Diagram ◀



026BE72Y

## ★ LAYOUT OF MAIN COMPONENTS



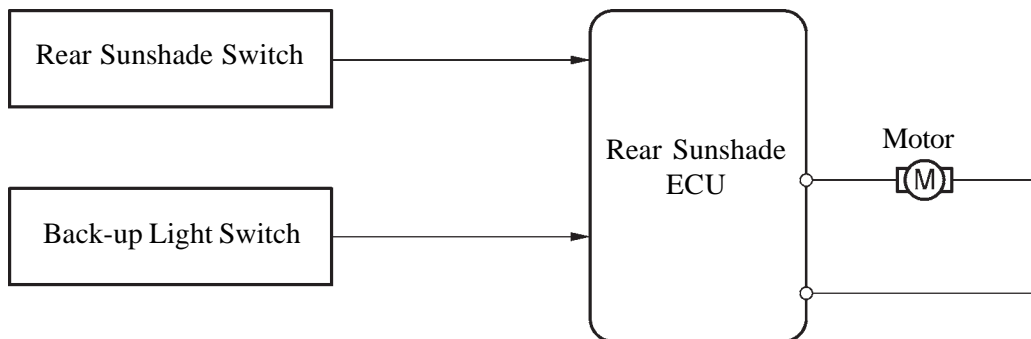
## REAR SUNSHADE SYSTEM

### ✱ DESCRIPTION

An electrically-operated rear sunshade system blocks direct sunlight from entering through the rear window in order to ensure the comfort of the rear seat passengers.

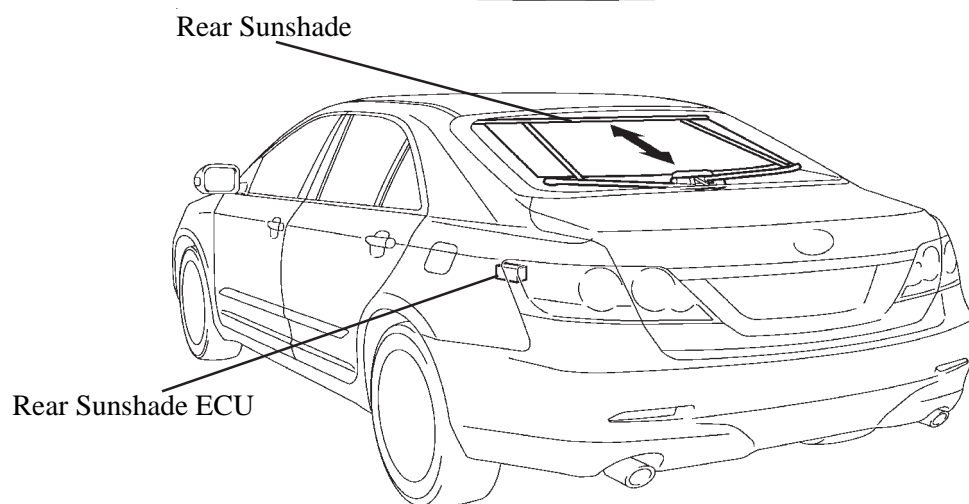
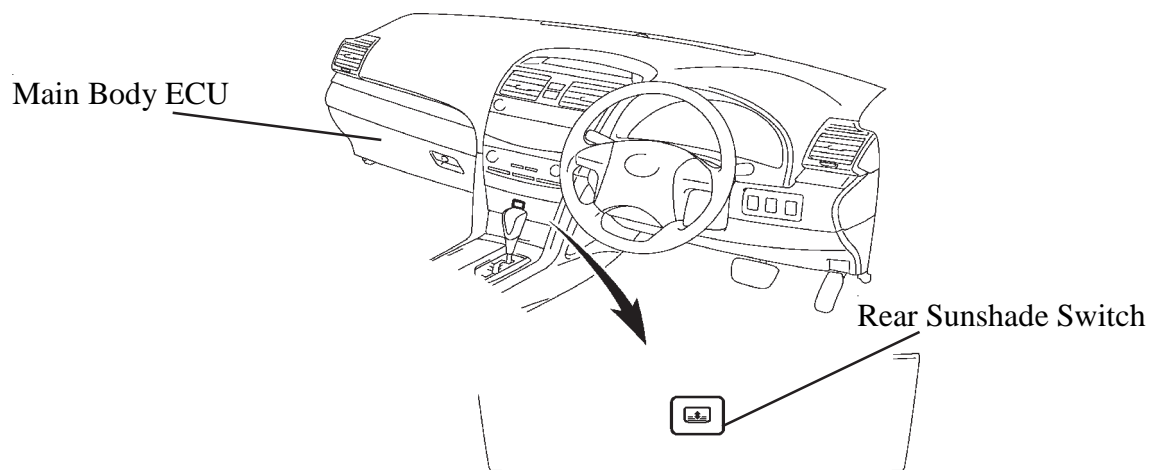
- This system is used as standard equipment on Presara.
- This system is control by the sunshade ECU and has the following functions;

| Function                 | Outline                                                                                   |
|--------------------------|-------------------------------------------------------------------------------------------|
| Manual Up / Down         | Moves the rear sunshade up or down in accordance with the rear sunshade switch operation. |
| Reverse-linked Auto-down | Moves the rear sunshade down automatically in accordance with the reverse signal.         |

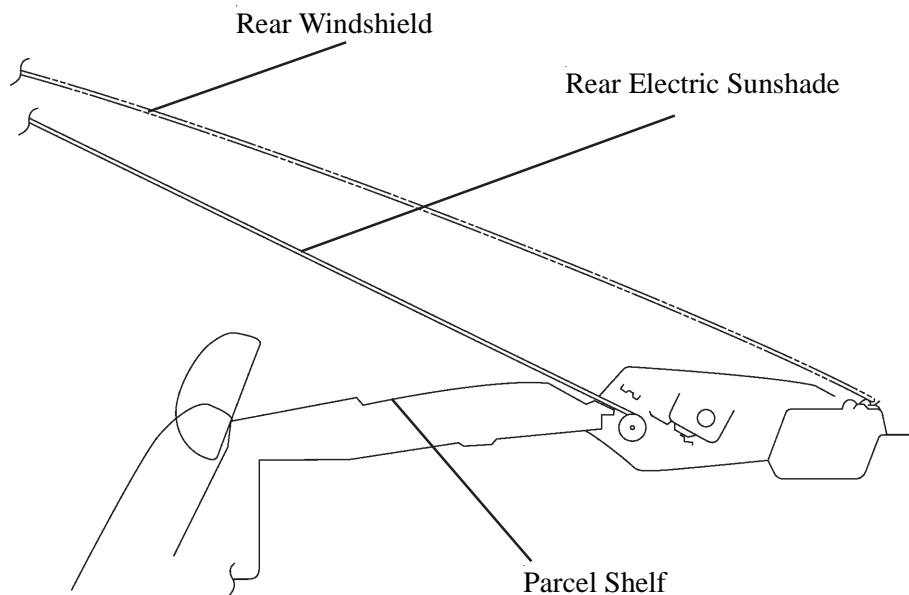


02KBE94Y



**★ LAYOUT OF MAIN COMPONENTS**

02KBE95Y



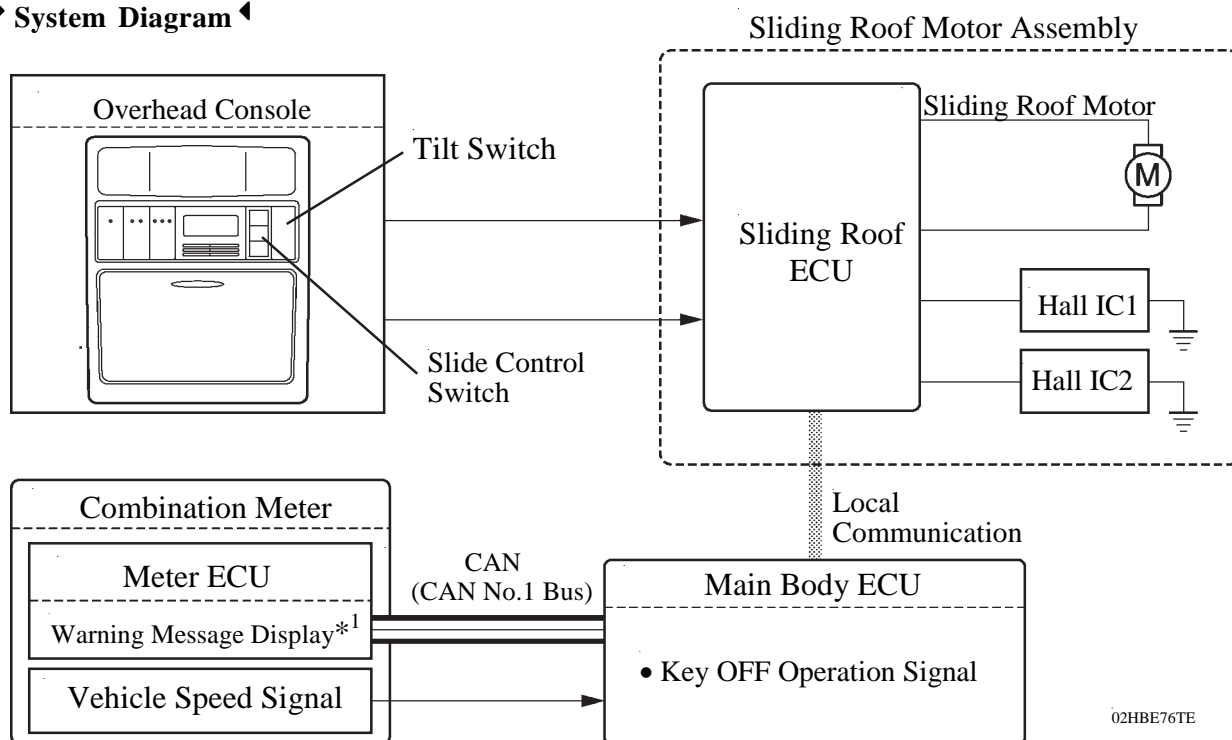
VICC-UC-077

## SLIDING ROOF SYSTEM

### DESCRIPTION

- The sliding roof system available on some grades. For details, see the equipment list in Model Outline (see page MO-28).
- The sliding roof ECU uses 2 type Hall ICs to detect the position of the sliding roof. Sliding roof ECU and the 2 Hall ICs are integrated into the sliding roof motor assembly.

### System Diagram



\*1: Model with multi-information display

### Service Tip

The memory is not cleared if battery terminals are disconnected. However, initialisation is necessary after the sliding roof motor assembly is replaced. Perform the initialisation as follows:

#### Initial Position Memory Erasure Procedure

- Turn the power supply off (for example, remove a power roof motor assembly connector or fuse) while the power sliding roof motor is operating.
- Check to ensure the auto function of the power sliding roof is inoperative.

#### Initialisation procedure

- Keep pressing the TILT UP or SLIDE CLOSE switch until the initialisation completely. This will enable the sliding roof ECU to start initialising and perform the tilt up, tilt down, open, and close operations of the sliding roof in sequence.
- Keep the switch pressed for 1 second after the tilt-up operation is completed.
- The sliding roof ECU performs the tilt down, open, and close operations.
- The initialisation process ends when the close operation is completed.

Keep the tilt-up or slide close switch pressed during initialisation. If the tilt up or close switch is released during initialisation, the system will not be able to complete the initialisation. If this occurs, perform the steps from the beginning again.

## FUNCTION

### 1. General

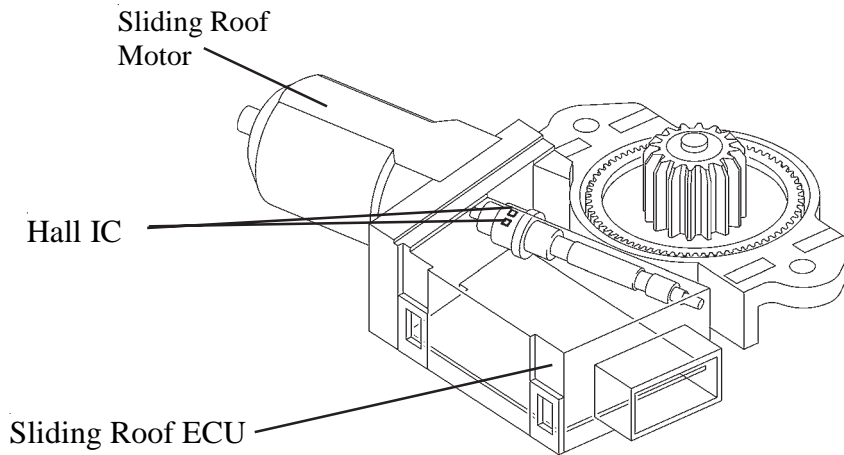
This sliding roof system has the following functions:

| Function                                     | Outline                                                                                                                                                                                                                          |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Manual open-and-close                        | This function causes the sliding roof to open (or close) while the SLIDE OPEN switch (or SLIDE CLOSE switch) is momentarily pressed. The sliding roof stops as soon as the switch is released.                                   |
| One touch auto open-and-close                | This function enables the sliding roof to be fully opened (or closed) by a 0.3 sec. or longer press of the SLIDE OPEN switch (or SLIDE CLOSE switch).                                                                            |
| Manual tilt up-and-down                      | This function causes the sliding roof to tilt up (or tilt down) while the TILT UP switch (or TILT DOWN switch) is momentarily pressed. The sliding roof stops as soon as the switch is released.                                 |
| One touch auto tilt up-and-down              | This function enables the sliding roof to be fully tilted up (or down) by a 0.3 sec. or long press of the TILT UP switch (or TILT DOWN switch).                                                                                  |
| Jam protection                               | The “jam protection” function automatically stops the sliding roof and moves it open half way (or fully tilt up) if a foreign object gets jammed in the sliding roof during close or tilt down operation.                        |
| Key-off operation                            | The "key-off operation" function makes it possible to operate the sliding roof for approximately 43 seconds after the ignition switch is turned to the ACC or OFF position, if the front doors are not opened.                   |
| Sliding roof open warning (See Page BE- 200) | When the power source* is changed from IG-ON to OFF and the driver door is opened with the sliding roof open, the buzzer in the combination meter sounds once. Then, a warning message appears on the multi-information display. |

\*: Power source conditions can be changed by pressing the engine switch on models with the smart entry and start system and by operating the ignition switch on models without the smart entry and start system.

## 2. Jam Protection Function

- The Hall IC converts the changes in the magnetic flux that occur due to the rotation of the worm gear into pulse signals and outputs them to the ECU.

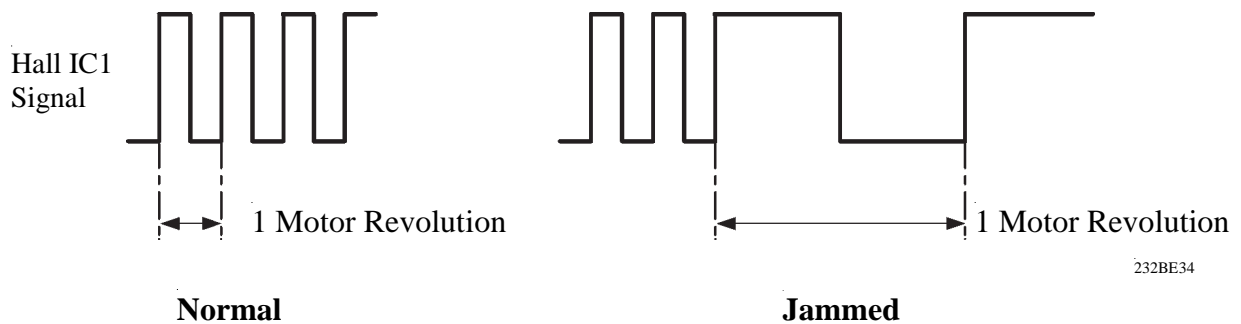


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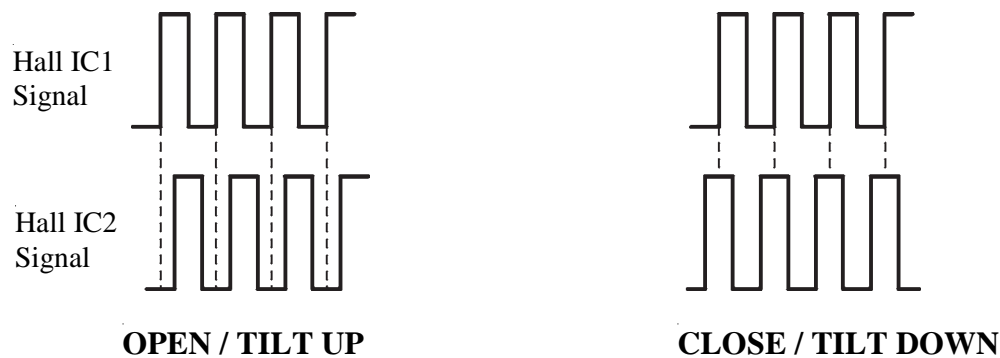
**Sliding Roof Motor Assembly**

- To control the jam protection function, the ECU monitors the amount of movement and judges jamming of the moon roof based on the pulse signals from the Hall IC1, and the moving direction of the moon roof from the phase difference between the pulsed from the Hall IC1 and Hall IC2.

### ▶ Monitoring Amount of Movement Judgment of Jamming ◀



232BE34




232BE35

### 3. Sliding Roof Open Warning

When the power source\* is changed from ON to OFF and the driver door is opened when the sliding roof is open, the sliding roof ECU sounds the buzzer in the combination meter. Then, a warning message appears on the multi-information display.

\*: Power source conditions can be changed by pressing the engine switch on models with the smart entry and start system and by operating the ignition switch on models without the smart entry and start system.

|                        |                           |                                                                                                                                                                                                                                                                                              |
|------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Warning Condition      |                           | The warning is activated if all of the following conditions are met: <ul style="list-style-type: none"> <li>• Sliding roof is not fully closed.</li> <li>• Power source* is “OFF”</li> <li>• Driver door is opened.</li> </ul>                                                               |
| Combination Meter      | Buzzer                    | Sounds once                                                                                                                                                                                                                                                                                  |
|                        | Multi-information Display |                                                                                                                                                                                                            |
|                        | Master Warning Light      | Flash                                                                                                                                                                                                                                                                                        |
| Warning Stop Condition |                           | The warning is stopped when one of the following conditions is met. <ul style="list-style-type: none"> <li>• 8 seconds have elapsed after the warning condition is detected</li> <li>• Power source* is “ON”</li> <li>• Driver door is closed.</li> <li>• Sliding roof is closed.</li> </ul> |

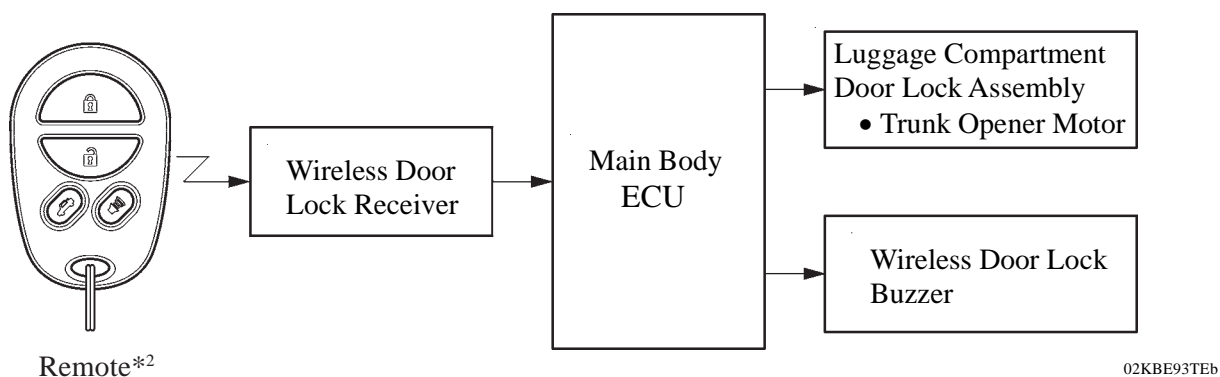
\*: Power source conditions can be changed by pressing the engine switch on models with the smart entry and start system and by operating the ignition switch on models without the smart entry and start system.

## TRUNK OPENER

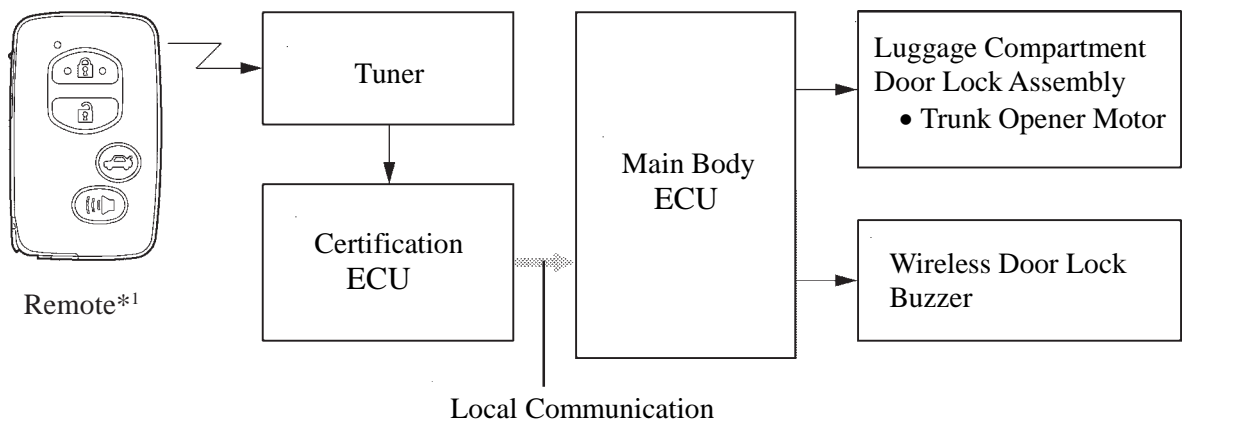
### DESCRIPTION

The trunk opener can be operated through the transmitter or lever. For models equipped with the wireless door lock remote control system, see page BE-110.

#### System Diagram



#### Without Smart Entry and Start System

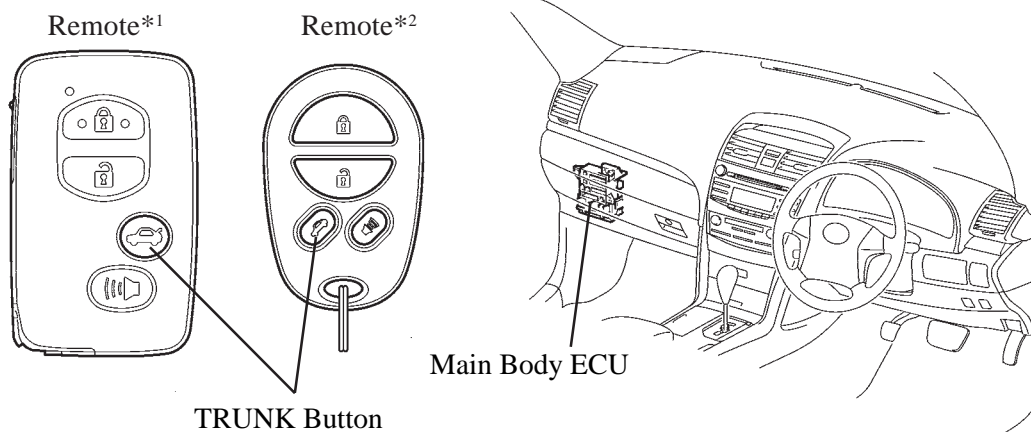


#### With Smart Entry and Start System

\*1: Models with smart entry and start system

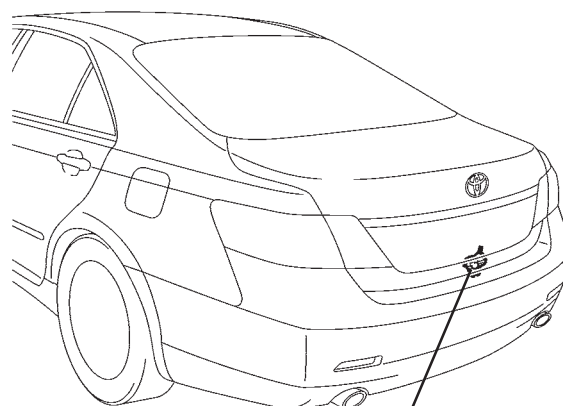
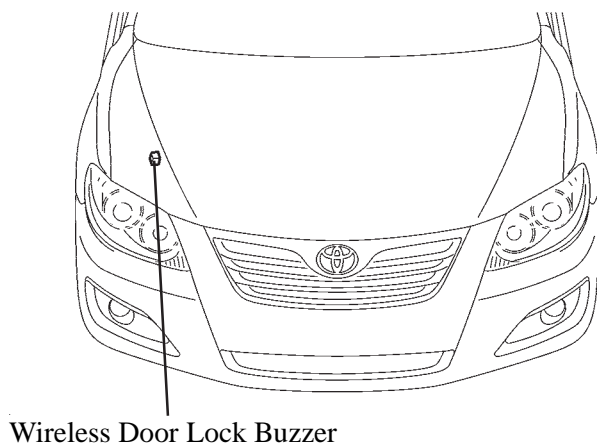
\*2: Models without smart entry and start system

## ★ LAYOUT OF MAIN COMPONENTS



\*<sup>1</sup>: Models with smart entry and start system

\*<sup>2</sup>: Models without smart entry and start system



Luggage Compartment  
Door Lock Assembly  
• Trunk Opener Motor

## STEERING PAD SWITCH

### ★ DESCRIPTION

- The settings of the steering pad switches vary depending on the destinations and optional equipment.
- For systems can be operated by the steering pad switches, refer to the following table.

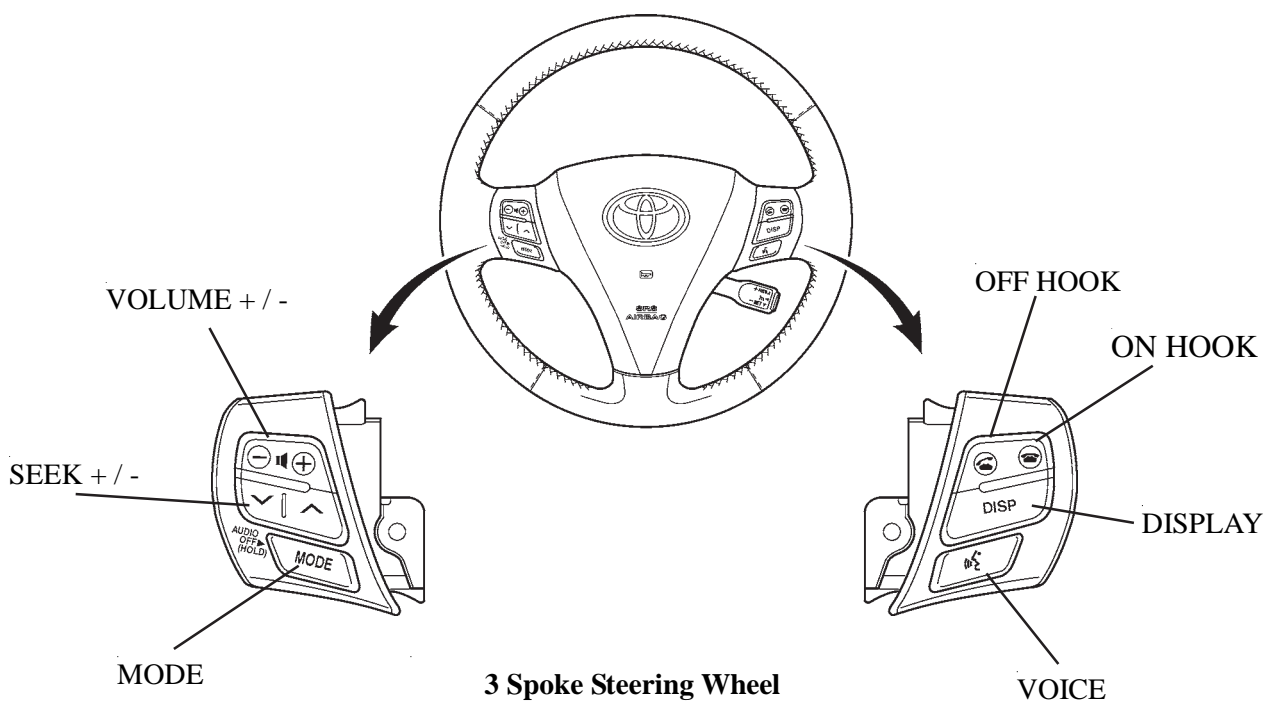
| System                                                      | Switch                                                                                             |
|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Audio                                                       | <ul style="list-style-type: none"> <li>• VOLUME +/-</li> <li>• SEEK +/-</li> <li>• MODE</li> </ul> |
| Multi-information Display (Combination Meter)* <sup>1</sup> | DISP                                                                                               |
| Air Conditioner* <sup>2</sup>                               | <ul style="list-style-type: none"> <li>• TEMP +/-</li> <li>• AUTO/OFF</li> </ul>                   |
| Voice Recognition* <sup>3</sup>                             | VOICE                                                                                              |
| Telephone* <sup>4</sup>                                     | <ul style="list-style-type: none"> <li>• ON HOOK</li> <li>• OFF HOOK</li> </ul>                    |

\*<sup>1</sup>: Models with multi-information display

\*<sup>2</sup>: Presara Grade

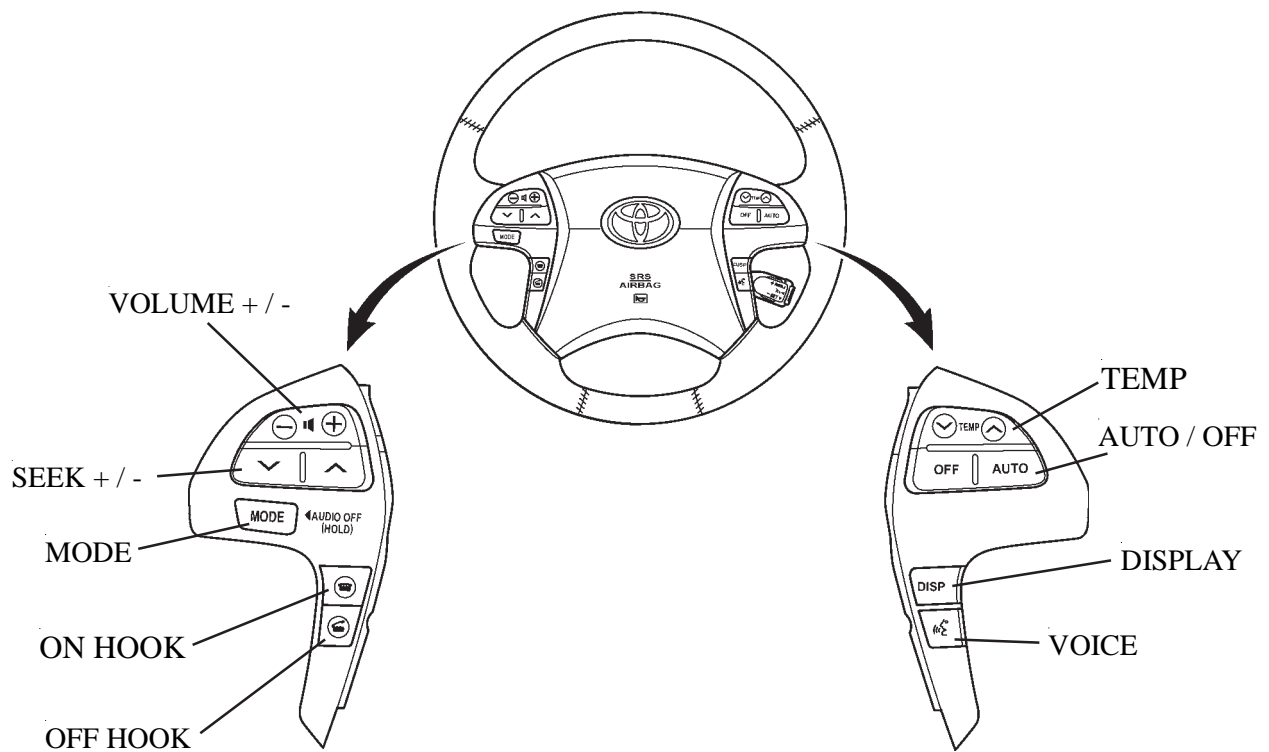
\*<sup>3</sup>: Models with navigation with AV system

\*<sup>5</sup>: Models with Bluetooth® hands-free system



02KBE98Y



**4 Spoke Steering Wheel**

025BE182Y

## TOYOTA LINK (TELEMATICS)



### 1. General

Telematics is a combination of computing and wireless communications which, aided by GPS, delivers voice, data and other information types between a vehicle or occupants and external sources.

The telematics system as a package will be marketed as Toyota Link.

Telematics will be available on Aurion Presara only.

Toyota Link Telematics provides exclusive vehicle communication with a Toyota Link assistance centre using an embedded

GSM Cellular Transceiver. Data, voice and GPS information is combined to provide safety, security and other services to the customer via a Toyota Link assistance centre.

Toyota Link offers the following services:

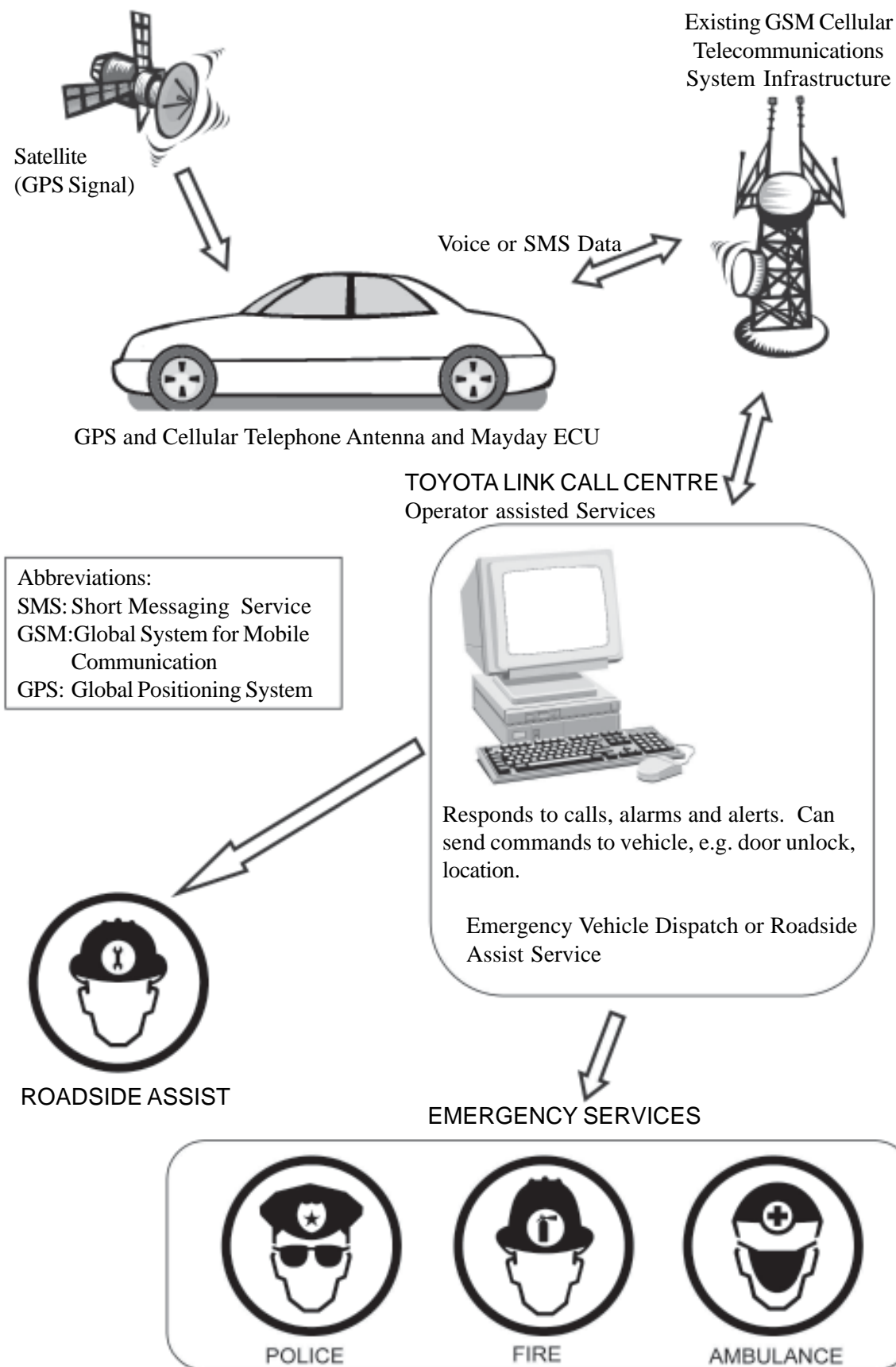
- Emergency operator assist. SOS button
- Accident notification (airbag deployment)
- Airbag diagnostics
- Engine Overheat alert\*
- Remote door unlocking
- Low battery alert
- Unauthorised entry (alarm activated)
- Stolen vehicle tracking
- Stolen vehicle Beacon\*
- Servicing reminders\*
- Roadside assistance
- Volume adjustment via Overhead Console\*
- Vehicle Locate

\*: New feature for Toyota Link

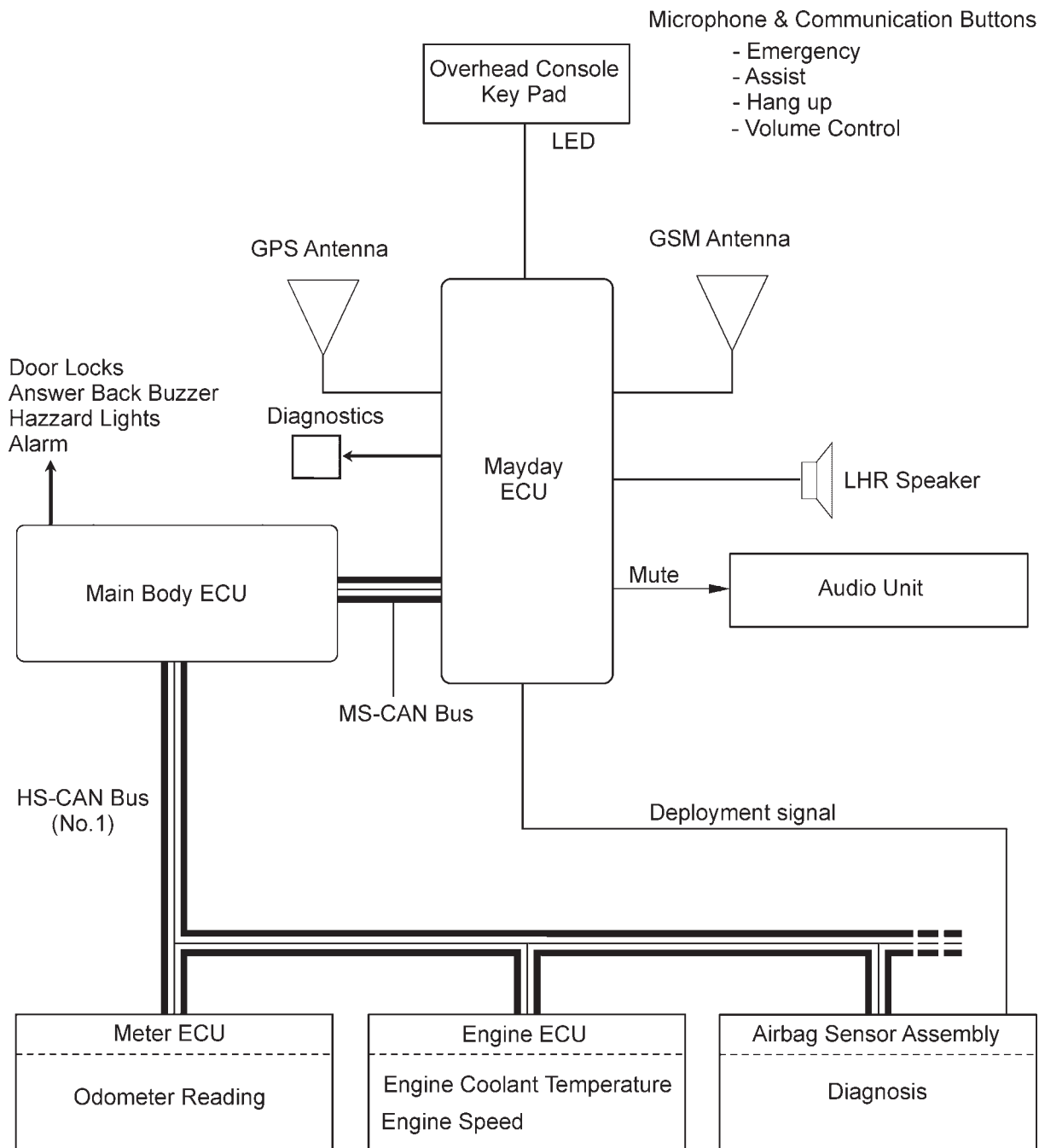
### ► Specification ◄

| ITEM                      | PERFORMANCE                                                                                                                                                                                                                                                                                   |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Telephone system          | GSM dual band cellular phone system                                                                                                                                                                                                                                                           |
| Rated Voltage             | 12V DC                                                                                                                                                                                                                                                                                        |
| Operational Voltage Range | 8 ~ 16V DC                                                                                                                                                                                                                                                                                    |
| Typical operating current | 133mA – (Typical) Active mode, No call, just after ignition OFF (i.e. backup battery chargers disabled) 274mA – (Typical) Active mode, Ignition ON, No Call, 1 backup battery charger enabled. 510mA – (Typical) Active mode, Ignition On, Call active, both backup battery chargers enabled. |
| Standby current           | 37 mA (Typical)                                                                                                                                                                                                                                                                               |
| Sleep current             | 5.0mA (Typical) (at 12V) : All doors locked                                                                                                                                                                                                                                                   |
| Maximum current           | Less than 1A                                                                                                                                                                                                                                                                                  |

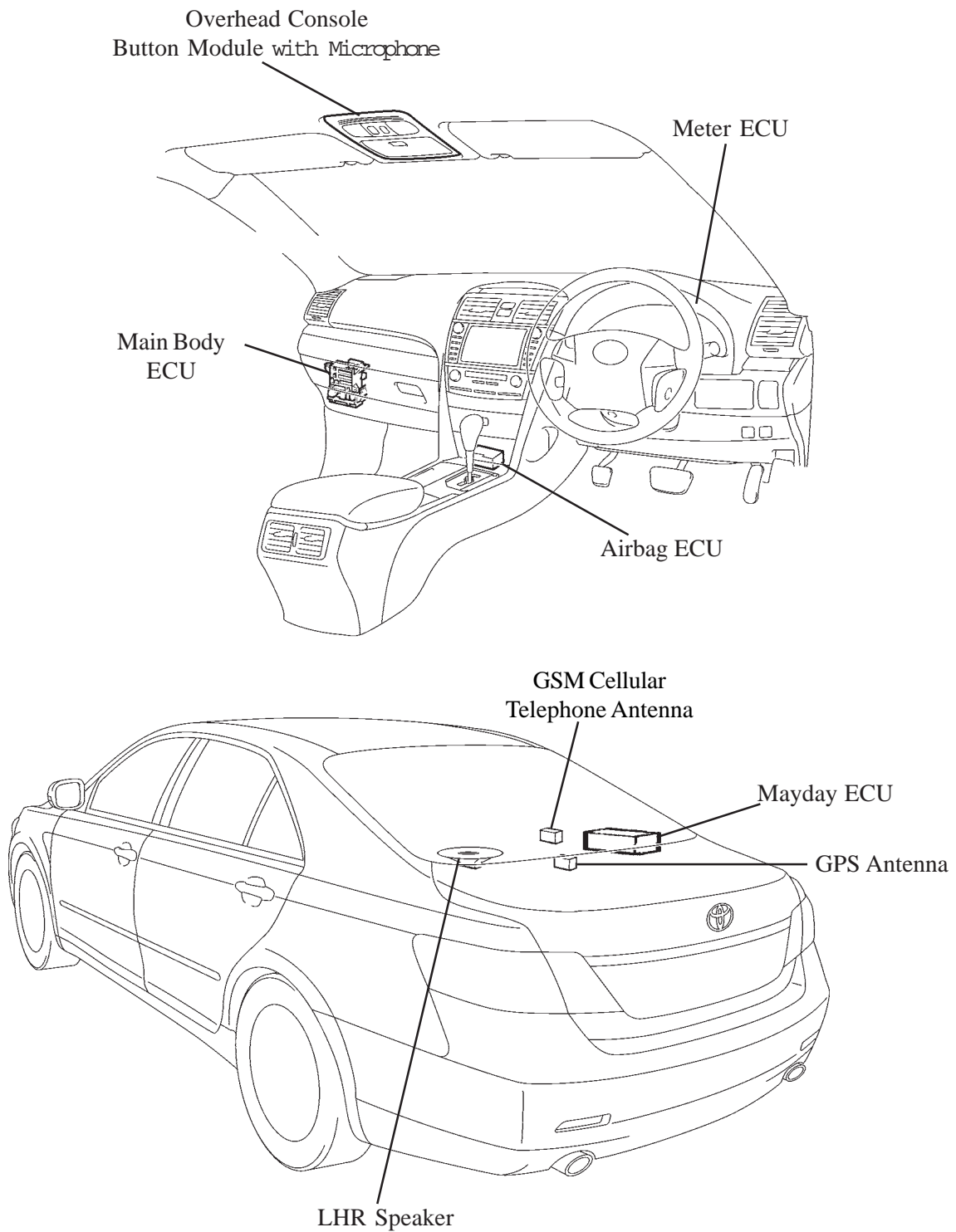
## 2. System Diagram



## 2. Block Diagram



### 3. Layout of Components



## 4. Construction and Operation

Hands-free communication is provided by a overhead console mounted microphone. Toyota Link assistance centre voice communication is through LHR speaker. An internal GSM phone modem (which can only dial the Toyota Link assistance centre) allows data and voice communication. This data includes vehicle position, diagnostics, identification of button press and battery condition. All communication between the vehicle and the Toyota Link assistance centre is managed by the Mayday ECU.

The Toyota Link system consists of the following important components:

- Toyota Link Electronic Control Unit (hereafter referred to as Mayday ECU)
- Toyota Link overhead console button module ( including microphone)
- GSM (cellular telephone) antenna
- GPS antenna
- Airbag ECU
- Telematics speaker
- Wire harness

(A block diagram showing how these units interrelate is shown on page BE-20)



### Mayday ECU

The Mayday ECU is the main controller of all aspects of vehicle telematics. This includes audio and data communication, vehicle positioning, interface to button module (overhead console) and all telephone functions. A telecommunication protocol exists between the Mayday ECU and the Toyota Link assistance centre. The transfer mechanism is SMS via the GSM network.

The Mayday ECU consists of the following:

- In-built GSM phone modem and SIM card for voice and data communications
- Button module interface (switches, LED and microphone)
- GPS receiver input
- Inbuilt back-up battery (nickel cadmium)
- I/O interface for vehicle status and control via MS-CAN Bus and Airbag Sensor Assembly (ECU)
- Diagnostic interface
- Power source related I/O circuits (battery, earth etc.)

The Mayday ECU is located in the luggage area of the vehicle attached beneath the package tray. This location serves to provide protection of the Mayday ECU in the event of accident. It is encapsulated into a bracket and includes wiring and antenna sub-harness.

The Mayday ECU communicates with the vehicle via the MS-CAN Bus and various other ECU's. There is provision for a 3 terminal diagnostic connection using a local LAN protocol. This diagnostic connection allows diagnostic code retrieval, service connection/termination as well as change in mode e.g. Service mode, Pre-Delivery mode.

If supply of power source from a vehicle battery is lost due to a collision, a back-up battery continues to supply power to the Toyota Link telematics service for approximately 45 minutes. The vehicle to the Toyota Link assistance centre communication is controlled by the Mayday ECU using an in-built GSM modem. EGSM is a digital based dual band cellular phone system with following power outputs:

Class 4. 2W @ 900 MHz

Class 1. 1W @ 1800 MHz

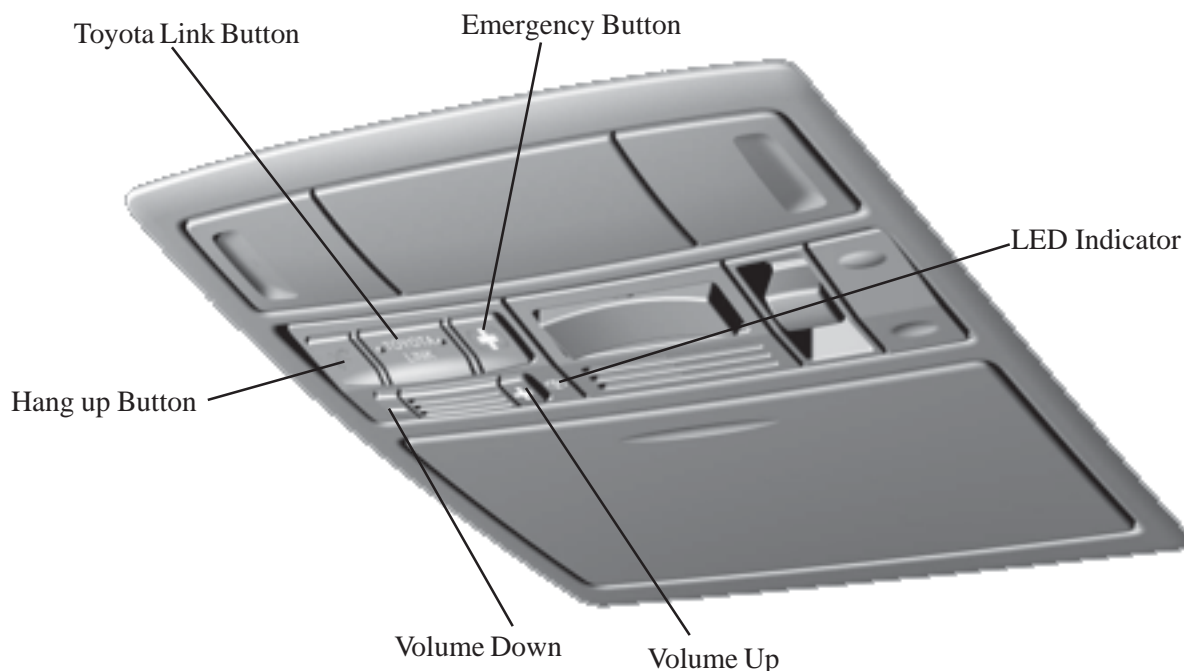
The RF output of the transceiver from the Mayday ECU is connected to the phone antenna through co-axial cable.

Any transceiver communication is subject to the availability of the GSM network. The GSM network status is indicated via the LED contained in the overhead console. (Refer to INDICATION DETAILS section on page BE-211 for further information)

### Toyota Link Buttons - Overhead Console

The button module is built into the overhead console and is the main interface between the customer and Toyota Link assistance centre. The button module includes 3 buttons: Emergency button for connection to Police, Fire, Ambulance; Assist button for connection to Toyota Link assistance centre; Hang-up button to cancel Toyota Link assistance centre instigated calls.

A single multicoloured LED is located in the interface module. 3 colours can be displayed: Red, Amber and Green. A microphone is built into the overhead console. (Refer to the MODES OF OPERATION section on page BE-211 for further information).



## Cellular Phone Antenna

Transmission of voice is via the existing GSM network. Transmission of data is by SMS using the existing GSM network. The antenna is fitted to the package tray and has an integral co-axial cable that connects directly to the Mayday ECU.

## GPS Antenna

This is used for vehicle positioning purposes. The antenna is fitted to the package tray and is separate to the normal Satellite Navigation antenna. The antenna has an integral co-axial cable that connects directly to the Mayday ECU.

## Airbag ECU

A collision detection sensor within the Airbag ECU (Sensor Assembly) outputs a signal directly to the Mayday ECU for accident determination.

This output is referred to as GSW3. 3 types of signal are output from the GSW3 circuit:

- Status OK; — All is normal, Airbag ECU has detected no problems.
- Airbag fault; — The Airbag ECU has detected a fault with one of its sensors. (It is not a complete Airbag diagnostic – only crash sensor inputs). The Airbag warning light will be illuminated in the combination meter.
- Collision detection trigger; — The Airbag has been inflated.

## Wiring

Wiring changes to Floor Wire, Roof Wire, Instrument Panel Wire and Engine Room Main Wire have been made. A 7.5A TELEMATICS fuse has been added to Engine Room Relay Block (next to battery).

## Modes of Operation

The Toyota Link system has 3 different operational modes. Each of these modes will enable or disable specific features. Each mode can be initiated using the Toyota Link Diagnostic Tool (TDT), some can also be activated using the Toyota Link assistance centre. These modes are listed below:

### Active Mode

This is the fully functioning mode and reflects the normal system operation once a customer signs the required contract and initiates the service using the Toyota Link assistance centre. All intended customer features are provided including Toyota Link assistance centre access, LED functions and an audible beep when the ignition is switched on or off.

#### NOTE:

*Prior to the customer signing the agreement and initiating the system set-up using the Toyota-Link button, the system will be in service mode. Upon initiation the Toyota Link assistance centre will change the mode from service to active.*



**Service (Demo) Mode**

This mode will temporarily disable some features of the system, such that routine servicing may be carried out. Routine servicing may consist of items such as battery replacement, where unauthorised entry notification and low battery alert would not be required. Service mode can be enabled via the Toyota Link assistance centre or by a Toyota dealer using TDT, and would leave the system in a state which contacts the Toyota Link assistance centre only in the case of an airbag deployment or when the Toyota Link button is pressed. It will output an audible signal comprised of 5 beeps when the ignition is switch on or off in this mode so that the customer or dealer is aware the system is not fully operational.

There is no alarm, emergency call or low battery function in this mode.

In this mode the delaer can demonstrate some features using the Toyota Link Assistance Centre such as; a vehicle location check or remote unlock function.

**Pre-Delivery Mode**

This mode will temporarily disable features of the system, such that a vehicle cannot initiate mayday calls. Pre-Delivery mode will permit all necessary factory programming (i.e. VIN) and diagnostics to verify the assembly process. No beep will be heard or the LED illuminated in this mode (unless diagnostics are in progress).

## Additional Modes of Operation

### Standby Mode

The Mayday ECU will adopt this mode 2 minutes after the ignition has been switched off and a door is open and shut, or 30 minutes after the ignition is switched off. In this mode, the buttons will be inactive to reduce the current drawn from the battery. The Mayday ECU will be woken from this state by any of the following: an incoming message or call, an ignition event, a door opening, an alarm trigger, or disconnection of the vehicle battery, or any CAN Bus activity.

### Sleep Mode

The Mayday ECU will enter this mode from standby mode 8 hours after the ignition has been switched off, or after 30 minutes in the case of a low battery voltage being detected. In this mode, the buttons will be inactive and the network will only be checked for SMS messages for 2 minutes out of every 15, to further reduce the current drawn from the battery. It will be woken from this state by any of the following: an incoming message detected during the regular network check, an ignition event, a door opening, an alarm trigger, or disconnection of the vehicle battery.

To further reduce the current drawn from the battery, the Toyota Link system will enter a deep sleep mode about 5.5 days after the ignition has been switched off. The customer can select this mode by pressing the Toyota Link button or by a Toyota dealer using the TDT. If the vehicle is to be unattended for a long period of time then this feature should be utilised to preserve battery. With the exception of alarm monitoring and diagnostics, no other system function is available.

## LED Indicators

### Start-up sequence

The following indication sequence occurs after the ignition is turned to 'ON'. This sequence is intended to confirm correct operation of the LED and telematics system. Should the self diagnostics indicate the system is abnormal, the lighting pattern (red solid) outlined in the next section should apply.

This sequence is valid in Active mode and Service mode.

| LED indication                             | Time elapsed after IG SW is turned 'ON' (sec) |
|--------------------------------------------|-----------------------------------------------|
| None During Self Test                      | Approx 1.0s                                   |
| Red                                        | 1.5s                                          |
| Amber                                      | 3.0s                                          |
| Green                                      | 4.5s                                          |
| Resume active or Dealer demonstration mode | On completion of above                        |

## Indication details

Following the start-up sequence after the ignition is turned “ON”, the LED indicator will indicate the following:

| Lighting Pattern                          | Beep patterns                             | Meaning                                      | Definition                                                                                                                                                                          | Applicability of each mode |                |              |
|-------------------------------------------|-------------------------------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------|--------------|
|                                           |                                           |                                              |                                                                                                                                                                                     | Active                     | Service (Demo) | Pre-Delivery |
| Power up                                  | Single beep when ignition switched on     | Tests LED                                    | Confirms LED function prior to subsequent indications                                                                                                                               | O                          | O              | N/A          |
| Red solid                                 | No beep                                   | Self-test failure                            | The Mayday ECU has determined a failure of equipment. Diagnostics indication. (DTC logged)                                                                                          | O                          | O              | N/A          |
| Amber solid                               | No beep                                   | Outside GSM Coverage                         | The Mayday ECU determines vehicle is outside GSM coverage.                                                                                                                          | O                          | O              | N/A          |
| Green flashing (0.5 sec on, 0.75 sec off) | No beep                                   | In the process of telephone communication    | System is normal, and self test has passed. No DTC's logged. Attempting or in the process of voice or data communication, calling or receiving at the time of Emergency/Assistance. | O                          | O              | N/A          |
| Green solid                               | No beep                                   | System is normal                             | System is normal, and self test has passed. No DTC's logged. The GSM service has coverage.                                                                                          | O                          | O              | N/A          |
| All off                                   | No beep                                   | System is inoperative                        | Ignition is “OFF”, system is in a stand-by or sleep state, or service contract has been discontinued.                                                                               | O                          | N/A            | O            |
| Red flashing (0.5 sec on, 0.75 sec off)   | No beep                                   | Call being attempted after self test failure | Call is being attempted (button press or airbag deployment), even though self test has failed, and a DTC has been logged. This is a “best effort” attempt.                          | O                          | O              | N/A          |
| Red/green flashing                        | 5 beeps when ignition switched on, or off | Unit in service mode                         | Alternate Flashing (0.5 sec alternating) (30 second duration after ignition on)                                                                                                     | N/A                        | O              | N/A          |

## SCENARIO DESCRIPTIONS

| Description                                | Button          | Button press / event                                                                                                                                                                                                       | Mayday ECU / system action                                                                                                                                                                                                                                                                                                                                                                                                           | Comment                                                                                                                                 |
|--------------------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 1.<br>Emergency operator assist. (SOS)     | Emergency       | In case of emergency or dangerous situation customer presses emergency button on overhead console.                                                                                                                         | Mayday ECU recognises button press as the emergency button. GPS location data is sent to Toyota Link assistance centre together with the vehicle details. Two-way communication (voice) by means of GSM is established between Toyota Link assistance centre and customer call from the overhead console button.                                                                                                                     | Button Press > 1sec.<br><br><i>The customer cannot terminate this call from the Overhead Console Button.</i>                            |
| 2.<br>Remote door unlocking.               | Nil             | In case of a customer locking keys in the vehicle (e.g. flat battery in remote) or lost keys, they can make a telephone call to Toyota Link assistance centre using fixed line or mobile telephone requesting door unlock. | Customer, using telephone, contacts Toyota Link assistance centre to unlock vehicle and the request is recognised as legitimate. The Mayday ECU receives a message via the GSM network from the Toyota Link assistance centre to unlock vehicle. Upon receipt of request, the doors are unlocked without enabling vehicle alarm. A confirmation message is sent back to Toyota Link assistance centre to advise doors are un-locked. | Time delay will be determined by the GSM network. The Main Body ECU will attempt to re-lock doors after 30s if the door are not opened. |
| 3.<br>Low battery alert. (battery monitor) | Nil (automatic) | Mayday ECU constantly monitors battery charge (voltage) level. If battery is low, a signal is automatically sent to Toyota Link assistance centre.                                                                         | For the following vehicle battery levels: 11.6 to 11.4 volts for more than 30 minutes, 11.4 to 11.0 volts for more than 20 minutes, 11.0 to 2.0 volts for more than 90 seconds, the ECU will notify the Toyota Link assistance centre using the GSM system, (via SMS) and an operator will attempt to make voice contact with the vehicle occupant to advise them of the situation.                                                  |                                                                                                                                         |
| 4.<br>Unauthorised entry. (alarm monitor)  | Nil (automatic) | If vehicle alarm is activated or the vehicle battery is disconnected, a signal is automatically sent to Toyota Link assistance centre.                                                                                     | The Mayday ECU detects vehicle alarm activation by the Main Body ECU and automatically initiates contact with the Toyota Link assistance centre via GSM network (via SMS) advising GPS location data and alarm activated state. There is no LED indication while this takes place. Two-way communication by means of GSM between Toyota Link assistance centre and customer/occupant within vehicle can be conducted.                | Within 10 seconds of alarm activation. NOTE: Customer has 10 seconds to cancel accidental alarm condition                               |

| Description                                          | Button             | Button press / event                                                                                                                          | Mayday ECU / system action                                                                                                                                                                                                                                                                                                                                                                                                                      | Comment                                                                                                                     |
|------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| 5.<br>Accident notification.<br>(air bag deployment) | Nil<br>(automatic) | If air bag deployment occurs in an accident, air bag ECU signal is automatically sent to Toyota Link assistance centre.                       | The Mayday ECU shall detect air bag deployment signal from vehicle air bag ECU and automatically initiate contact with Toyota Link assistance centre via GSM Network (via SMS) advising GPS location data and advising air bag deployment. Two-way communication by means of GSM between Toyota Link assistance centre and customer within vehicle can be conducted.                                                                            |                                                                                                                             |
| 6.<br>Roadside assistance.                           | Assistance         | If vehicle is broken down, the customer can request roadside assistance by pressing 'Toyota Link' button on the overhead Console.             | Mayday ECU recognises as 'Toyota Link' button press. GPS location data is sent to Toyota Link assistance centre (via SMS) together with The vehicle details. Two-way communication by means of GSM is established between Toyota Link assistance centre and customer within vehicle and a patrol vehicle can be despatched.                                                                                                                     |                                                                                                                             |
| 7.<br>Stolen vehicle tracking (see also item 4)      | Nil                | If vehicle is stolen, customer of stolen vehicle can contact Toyota Link assistance centre by fixed line or mobile telephone.                 | When customer contacts Toyota Link assistance centre by telephone, the operator will attempt to establish two-way communication with vehicle and extract GPS location data. The Mayday ECU controls these operations. The vehicle operator does not have the capability of terminating this call from the overhead console button.                                                                                                              | Stolen Vehicle Beacon<br><i>Commands to control the Hazard lights and answer back buzzer will be sent over the CAN bus.</i> |
| 8.<br>Vehicle locate                                 | Nil                | If customer wants to locate his vehicle in a large car park they can contact Toyota Link assistance centre by fixed line or mobile telephone. | Customer, using telephone, contacts Toyota Link assistance centre to locate vehicle and the request is recognised as legitimate. The Mayday ECU is capable of receiving a message via the GSM network from the Toyota Link assistance centre to make vehicle identifiable. Upon receipt of request, the hazard lamps flash at a rate of 1Hz, 50% duty and if required the answer back buzzer will sound for 26 cycles (500ms ON and 250ms OFF). |                                                                                                                             |

| Description                                          | Button                                              | Button press / event                                                          | Mayday ECU / system action                                                                                                                                                                                                                                                        | Comment                                                     |
|------------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| 9.<br>SMS activate<br>change of<br>operating<br>mode | Toyota<br>Link<br>assistance<br>centre<br>initiated |                                                                               | At the request of customer or dealer the Toyota Link assistance centre sends an SMS message to vehicle to change the mode (e.g. change to active mode). The vehicle sends an acknowledgement reply to Toyota Link assistance centre via SMS to indicate successful change in mode |                                                             |
| 10.<br>Volume<br>Adjust                              | Volume +<br>Volume -                                | To adjust Speaker Volume, customer presses Volume button on Overhead Console. | Mayday ECU provides for incremental Volume adjustment in response to Customer button press of Volume + or Volume – buttons on Overhead Console.                                                                                                                                   |                                                             |
| 11.<br>Engine Over-<br>Temperature                   |                                                     | Engine Coolant Temperature becomes excessive.                                 | If the Engine is operating at idle or above and the Engine coolant Temperature exceeds 120° Celsius over a period of 1 minute the Call Centre will be contacted.                                                                                                                  | Speed: >400rpm<br>Temperature:<br>120° Celsius<br>Time: 64s |

## **Toyota Link Assistance**

### **Emergency Operator Assist. - Emergency Button**

The emergency button located on the interface module (overhead console) can be used in an emergency to get operator assistance and Police/Fire/Ambulance assistance.

### **Accident Notification (Airbag Deployment)**

If an airbag is deployed, an operator is automatically contacted. If there is no response, or if requested, emergency services are notified.

### **Airbag Diagnostics**

The status of the airbag system is constantly monitored. If there is a problem with the airbag system an operator is automatically contacted and the customer is advised to go to their nearest dealer.

### **Remote Door Unlocking**

If keys are locked in a vehicle, a car can be unlocked remotely once ownership is validated.

### **Low Battery Alert**

If the battery is low, the system will automatically send an alert. Operator assistance attempted.

### **Unauthorised Entry (Alarm Activated)**

During unauthorised entry, if the person in the car is unable to be identified as the owner, the Police will be alerted.

### **Stolen Vehicle Tracking**

If a car is stolen, it can be located and tracked. The Police will be notified.

### **Stolen Vehicle Beacon**

When a vehicle is reported stolen, it will be contacted by the Toyota Link Assistance Centre. If the ignition is switched on, then a command will be sent to activate the Answer Back Buzzer and hazard lights. Once the stolen vehicle beacon is stopped by time-out, the feature can be restarted remotely, by the Toyota Link Assistance Centre.

### **Roadside Assistance**

Roadside assistance is provided via the 'Toyota Link' button.

### **Vehicle Mileage / Service Reminder**

The Mayday System can provide the vehicle Odometer readings at regular intervals to Toyota Link Assistance Centre.

### **Engine Over-Temperature Alert**

The Mayday System can advise Toyota Link Assistance Centre of potential Engine Overheat Condition.

### **Volume Adjustment**

The Voice Communication loudness can be adjusted using Volume buttons in Overhead Console.

## Diagnosis

The Toyota Link Mayday ECU is equipped with a self – diagnosis system that, in the event of a system fault, provides an alert to the vehicle operator and allows the Toyota dealer Technician to access diagnostic data.

Immediately after the ignition switch is turned ON, the Mayday ECU performs a self–test and if the system detects equipment failure or a system fault, the Overhead Console LED will display red continually and a DTC will be logged.

To access diagnostic data, a Technician will require the TDT (Toyota link Diagnostic Tool) software (CD), a personal computer and the interface cable to connect the PC and Mayday ECU.

The Mayday ECU is provided with a 3 pin diagnostic connector as shown below.

The TDT (Toyota link Diagnostic Tool) allows Technicians to access various functions.

These include the following;

- Modes of operation (active, sleep, service etc)
- Diagnosis (DTC's, data list, snapshot, active test etc)
- System information (vehicle and Mayday ECU identification)
- Set–up (Toyota link Diagnostic Tool configuration)
- Function set (Mayday ECU reset, back–up battery timer reset etc)

### ► Specification ◄



| Conn. No. | DESCRIPTION               |
|-----------|---------------------------|
| 1         | Power for diagnostic unit |
| 2         | Diagnostics               |
| 3         | Earth                     |



# APPENDIX

| Item                               |                               | Area           |                   | Australia                      |                                |                                |
|------------------------------------|-------------------------------|----------------|-------------------|--------------------------------|--------------------------------|--------------------------------|
| Body Type                          |                               |                |                   | Sedan                          |                                |                                |
| Vehicle Grade                      |                               |                |                   | AT-X                           | Prodigy (Touring - NZ)         | Presara                        |
| Model Code                         |                               |                |                   | GSV40R-JETDKQ                  | GSV40R-JETNKQ                  | GSV40R-JETGKQ                  |
| Major Dimensions & Vehicle Weights | Overall                       | Length         | mm                | 4 825                          | 4 825                          | 4 825                          |
|                                    |                               | Width          | mm                | 1 820                          | 1 820                          | 1 820                          |
|                                    |                               | Height         | mm                | 1 470                          | 1 470                          | 1 470                          |
|                                    | Wheel Base                    |                | mm                | 2 775                          | 2 775                          | 2 775                          |
|                                    | Tread                         | Front          | mm                | 1 575                          | 1 575                          | 1 575                          |
|                                    |                               | Rear           | mm                | 1 565                          | 1 565                          | 1 565                          |
|                                    | Room                          | Length         | mm                | 2 130                          | 2 130                          | 2 130                          |
|                                    |                               | Width          | mm                | 1 525                          | 1 525                          | 1 525                          |
|                                    |                               | Height         | mm                | 1 200                          | 1 200, 1 140 <sup>st</sup>     | 1 140                          |
|                                    | Overhang                      | Front          | mm                | 965                            | 965                            | 965                            |
|                                    |                               | Rear           | mm                | 1 085                          | 1 085                          | 1 085                          |
|                                    | Min. Running Ground Clearance |                | mm                | 150                            | 150                            | 150                            |
|                                    | Angle of Approach             |                | degrees           | —                              | —                              | —                              |
|                                    | Angle of Departure            |                | degrees           | —                              | —                              | —                              |
|                                    | Curb Weight                   | Front          | kg                | 970 to 965                     | 975 to 980                     | 990                            |
|                                    |                               | Rear           | kg                | 615 to 625                     | 620 to 630                     | 630 to 635                     |
|                                    |                               | Total          | kg                | 1585 to 1590                   | 1595 to 1610                   | 1620 to 1625                   |
|                                    | Gross Vehicle Weight          | Front          | kg                | 1045                           | 1065                           | 1080                           |
|                                    |                               | Rear           | kg                | 1065                           | 1045                           | 1030                           |
|                                    |                               | Total          | kg                | 2 110                          | 2 110                          | 2 110                          |
| Fuel Tank Capacity                 |                               | Litres         | 70                | 70                             | 70                             |                                |
| Luggage Capacity (VDA)             |                               | m <sup>3</sup> | 0.504             | 0.504                          | 0.504                          |                                |
| Performance                        | Max. Speed                    |                | km/h              | 228                            | 228                            | 228                            |
|                                    | Max. Permissible Speed        | 1st Gear       | km/h              | 60                             | 60                             | 60                             |
|                                    |                               | 2nd Gear       | km/h              | 104                            | 104                            | 104                            |
|                                    |                               | 3rd Gear       | km/h              | 139                            | 139                            | 139                            |
|                                    |                               | 4th Gear       | km/h              | 198                            | 198                            | 198                            |
|                                    |                               | 5th Gear       | km/h              | —                              | —                              | —                              |
|                                    | Min. Turning Radius           | Tyre           | m                 | 5.5                            | 5.5                            | 5.5                            |
| Body                               |                               | m              | 5.9               | 5.9                            | 5.9                            |                                |
| Engine                             | Engine Type                   |                |                   | 2 GR-FE                        | 2 GR-FE                        | 2 GR-FE                        |
|                                    | Valve Mechanism               |                |                   | 24-valve, DOHC with Dual VVT-i | 24-valve, DOHC with Dual VVT-i | 24-valve, DOHC with Dual VVT-i |
|                                    | Bore x Stroke                 |                | mm                | 94.0 x 83.0                    | 94.0 x 83.1                    | 94.0 x 83.2                    |
|                                    | Displacement                  |                | cm <sup>3</sup>   | 3 456                          | 3 456                          | 3 456                          |
|                                    | Compression Ratio             |                |                   | 10.8:1                         | 10.8:1                         | 10.8:1                         |
|                                    | Carburetor Type               |                |                   | EFI                            | EFI                            | EFI                            |
|                                    | Research Octane No.           |                | RON               | 91 or higher                   | 91 or higher                   | 91 or higher                   |
|                                    | Max. Output (EEC)             |                | kW@rpm            | 200 @ 6200                     | 200 @ 6200                     | 200 @ 6200                     |
| Engine Electrical                  | Max. Torque (EEC)             |                | N·m@rpm           | 346 @ 4700                     | 346 @ 4700                     | 346 @ 4700                     |
|                                    | Battery Capacity (5HR)        |                | Voltage & Amp.hr. | 12-48                          | 12-48                          | 12-48                          |
|                                    | Alternator Output             |                | Watts             | 1200                           | 1200                           | 1200                           |
|                                    | Starter Output                |                | kW                | 1.7                            | 1.7                            | 1.7                            |
| Chassis                            | Clutch Type                   |                |                   | —                              | —                              | —                              |
|                                    | Transaxle Type                |                |                   | U660 E                         | U660 E                         | U660 E                         |
|                                    | Gear Ratio                    | In First       |                   | 3.300                          | 3.300                          | 3.300                          |
|                                    |                               | In Second      |                   | 1.900                          | 1.900                          | 1.900                          |
|                                    |                               | In Third       |                   | 1.420                          | 1.420                          | 1.420                          |
|                                    |                               | In Fourth      |                   | 1.000                          | 1.000                          | 1.000                          |
|                                    |                               | In Fifth       |                   | 0.713                          | 0.713                          | 0.713                          |
|                                    |                               | In Sixth       |                   | 0.608                          | 0.608                          | 0.608                          |
|                                    |                               | In Reverse     |                   | 4.148                          | 4.148                          | 4.148                          |
|                                    | Differential Gear Ratio       |                |                   | 3.685 <sup>st</sup>            | 3.685 <sup>st</sup>            | 3.685 <sup>st</sup>            |
|                                    | Brake Type                    | Front          |                   | Ventilated Disc                | Ventilated Disc                | Ventilated Disc                |
|                                    |                               | Rear           |                   | Solid Disc                     | Solid Disc                     | Solid Disc                     |
|                                    | Parking Brake Type            |                |                   | Banksia                        | Banksia                        | Banksia                        |
|                                    | Brake Booster Type and Size   |                |                   | Single,10"                     | Single,10"                     | Single,10"                     |
|                                    | Proportioning Valve Type      |                |                   | —                              | —                              | —                              |
|                                    | Suspension Type               | Front          |                   | MacPherson Strut               | MacPherson Strut               | MacPherson Strut               |
|                                    |                               | Rear           |                   | MacPherson Strut               | MacPherson Strut               | MacPherson Strut               |
| Stabilizer Bar                     | Front                         |                | Standard          | Standard                       | Standard                       |                                |
|                                    | Rear                          |                | Standard          | Standard                       | Standard                       |                                |
| Steering Gear Type                 |                               |                | Rack & Pinion     | Rack & Pinion                  | Rack & Pinion                  |                                |
| Power Steering Type                |                               |                | Hydraulic Type    | Hydraulic Type                 | Hydraulic Type                 |                                |

<sup>st</sup>: With sliding roof<sup>st</sup>: Counter gear ratio included

| Item                               |                               | Area              |                                | Australia                      |                  |
|------------------------------------|-------------------------------|-------------------|--------------------------------|--------------------------------|------------------|
| Body Type                          |                               |                   |                                | Sedan                          |                  |
| Vehicle Grade                      |                               |                   |                                | Sportivo SX6                   | Sportivo ZR6     |
| Model Code                         |                               |                   |                                | GSV40R-JETSKQ                  | GSV40R-JETVKQ    |
| Major Dimensions & Vehicle Weights | Overall                       | Length            | mm                             | 4825                           | 4825             |
|                                    |                               | Width             | mm                             | 1820                           | 1820             |
|                                    |                               | Height            | mm                             | 1470                           | 1470             |
|                                    | Wheel Base                    |                   | mm                             | 2775                           | 2775             |
|                                    | Tread                         | Front             | mm                             | 1575                           | 1575             |
|                                    |                               | Rear              | mm                             | 1565                           | 1565             |
|                                    | Room                          | Length            | mm                             | 2130                           | 2130             |
|                                    |                               | Width             | mm                             | 1525                           | 1525             |
|                                    |                               | Height            | mm                             | 1200, 1140*1                   | 1200, 1140*1     |
|                                    | Overhang                      | Front             | mm                             | 965                            | 965              |
|                                    |                               | Rear              | mm                             | 1085                           | 1085             |
|                                    | Min. Running Ground Clearance |                   | mm                             | 150                            | 150              |
|                                    | Angle of Approach             |                   | degrees                        | —                              | —                |
|                                    | Angle of Departure            |                   | degrees                        | —                              | —                |
|                                    | Curb Weight                   | Front             | kg                             | 975 to 980                     | 980 to 985       |
|                                    |                               | Rear              | kg                             | 625 to 635                     | 635 to 645       |
|                                    |                               | Total             | kg                             | 1600 to 1615                   | 1615 to 1630     |
|                                    | Gross Vehicle Weight          | Front             | kg                             | 1065                           | 1075             |
|                                    |                               | Rear              | kg                             | 1045                           | 1035             |
|                                    |                               | Total             | kg                             | 2110                           | 2110             |
| Fuel Tank Capacity                 |                               | Litres            | 70                             | 70                             |                  |
| Luggage Capacity (VDA)             |                               | m <sup>3</sup>    | 0.504                          | 0.504                          |                  |
| Performance                        | Max. Speed                    |                   | km/h                           | 228                            | 228              |
|                                    | Max. Permissible Speed        | 1st Gear          | km/h                           | 60                             | 60               |
|                                    |                               | 2nd Gear          | km/h                           | 104                            | 104              |
|                                    |                               | 3rd Gear          | km/h                           | 139                            | 139              |
|                                    |                               | 4th Gear          | km/h                           | 198                            | 198              |
|                                    |                               | 5th Gear          | km/h                           | —                              | —                |
|                                    | Min. Turning Radius           | Tyre              | m                              | 5.5                            | 5.5              |
|                                    |                               | Body              | m                              | 5.9                            | 5.9              |
| Engine                             | Engine Type                   |                   | 2GR-FE                         | 2GR-FE                         |                  |
|                                    | Valve Mechanism               |                   | 24-valve, DOHC with Dual VVT-i | 24-valve, DOHC with Dual VVT-i |                  |
|                                    | Bore × Stroke                 |                   | mm                             | 94.0 x 83.3                    | 94.0 x 83.0      |
|                                    | Displacement                  |                   | cm <sup>3</sup>                | 3456                           | 3456             |
|                                    | Compression Ratio             |                   |                                | 10.8:1                         | 10.8:1           |
|                                    | Carburetor Type               |                   |                                | EFI                            | EFI              |
|                                    | Research Octane No.           |                   | RON                            | 91 or higher                   | 91 or higher     |
|                                    | Max. Output (EEC)             |                   | kW@rpm                         | 200 @ 6200                     | 200 @ 6200       |
| Engine Electrical                  | Max. Torque (EEC)             |                   | N·m@rpm                        | 346 @ 4700                     | 346 @ 4700       |
|                                    | Battery Capacity (5HR)        | Voltage & Amp.hr. | 12-48                          | 12-48                          |                  |
| Chassis                            | Alternator Output             |                   | Watts                          | 1200                           | 1200             |
|                                    | Starter Output                |                   | kW                             | 1.7                            | 1.7              |
|                                    | Clutch Type                   |                   |                                | —                              | —                |
|                                    | Transaxle Type                |                   |                                | U660E                          | U660E            |
|                                    | Gear Ratio                    | In First          |                                | 3.3                            | 3.300            |
|                                    |                               | In Second         |                                | 1.9                            | 1.900            |
|                                    |                               | In Third          |                                | 1.42                           | 1.420            |
|                                    |                               | In Fourth         |                                | 1                              | 1.000            |
|                                    |                               | In Fifth          |                                | 0.713                          | 0.713            |
|                                    |                               | In Sixth          |                                | 0.608                          | 0.608            |
|                                    |                               | In Reverse        |                                | 4.148                          | 4.148            |
|                                    | Differential Gear Ratio       |                   |                                | 3.685*2                        | 3.685*2          |
|                                    | Brake Type                    | Front             |                                | Ventilated Disc                | Ventilated Disc  |
|                                    |                               | Rear              |                                | Solid Disc                     | Solid Disc       |
|                                    | Parking Brake Type            |                   |                                | Banksia                        | Banksia          |
|                                    | Brake Booster Type and Size   |                   |                                | Single, 10"                    | Single, 10"      |
|                                    | Proportioning Valve Type      |                   |                                | —                              | —                |
|                                    | Suspension Type               | Front             |                                | MacPherson Strut               | MacPherson Strut |
|                                    |                               | Rear              |                                | MacPherson Strut               | MacPherson Strut |
|                                    | Stabilizer Bar                | Front             |                                | Standard                       | Standard         |
| Rear                               |                               |                   | Standard                       | Standard                       |                  |
| Steering Gear Type                 |                               |                   | Rack & Pinion                  | Rack & Pinion                  |                  |
| Power Steering Type                |                               |                   | Hydraulic Type                 | Hydraulic Type                 |                  |

\*1: With sliding roof

\*2: Counter gear ratio included