

TOYOTA CAMRY / AURION REPAIR MANUAL

NEW CAR FEATURES

CAMRY ACV40 LHD

NEW MODEL OUTLINE

ENGINE

CHASSIS

BODY

BODY ELECTRICAL

APPENDIX

Foreword

To assist you in your sales and service activities, this manual explains the main characteristics of the new CAMRY, 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: ACV40L

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 following Manuals:

Repair Manual	RM02N0EQ
Electrical Wiring Diagram	EM02N0EQ
Body Repair Manual	BM02N0EQ

WARNING

This publication is for internal use by Toyota Dealers for the purpose of training only and must not be given to customers.

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TOYOTA MOTOR CORPORATION AUSTRALIA LIMITED

NEW MODEL OUTLINE

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EXTERIOR APPEARANCE**Front View**

3MO22TE

Rear View

02KMO23TE

MODEL CODE

ACV40L – DEMNKKV

1

2

3

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5

6

7

8

1	BASIC MODEL CODE
	ACV40: With 2AZ-FE Engine

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

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

6	GRADE
	D: GL S: SE N: GLX

3	MODEL NAME
	D: Camry 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

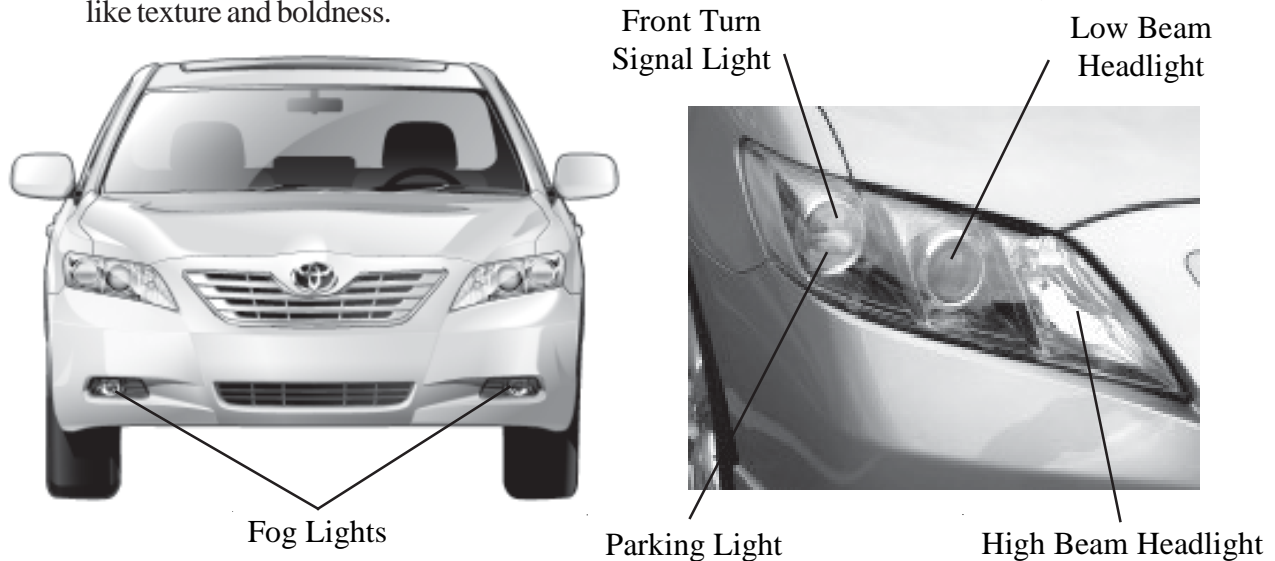
MODEL LINE-UP

Destination	Engine	Grade	Transaxle	
			E354	U250E
GCC	2AZ-FE	GL	ACV40L-DEMDKV	ACV40L-DEADKV
		SE	ACV40L-DEMSKV	ACV40L-DEASKV
		GLX	ACV40L-DEMNVK	ACV40L-DEANKV
Iran	2AZ-FE	GL	ACV40L-DEMDKV	ACV40L-DEADKV

EXTERIOR

Front View

- Dynamic modernism has been produced by providing a solid-looking hood shape from the front grille to the centre of the hood and framing the hood with the left and right fenders.
- The front design, with minimum surface boundaries between the hood, grille, top mark and bumper, stretches out from the impressively projecting top mark.
- The headlights have a long, narrow design, which incorporates two accent lines, producing a crystal-like texture and boldness.



02KMO43TE

DOMCAM-026MO04TE

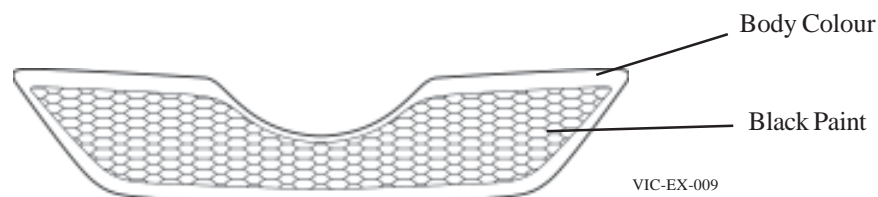
Radiator Grille

There are 2 different designs of Radiator Grilles.



VIC-EX-008

GL / GLX



VIC-EX-009

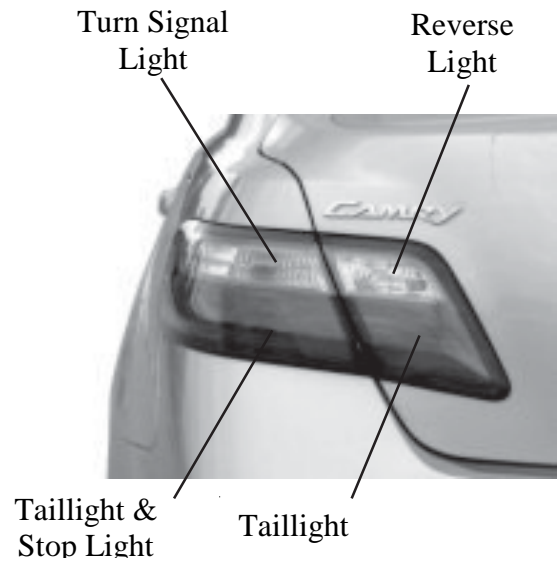
SE

Rear View

- Power and modernity have been produced by providing a solid-looking body shape from the luggage door to the centre of the bumper and framing the luggage door with the left and right fenders.
- The edge of the rear combination light has been extended further into the side of the body, and the inner lens portion is ingot-effect white, expressing modernity and width.



2KMO24TE



DOMCAM-026MO08TE

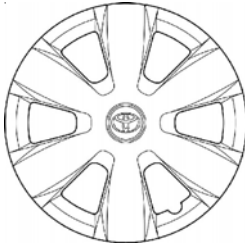
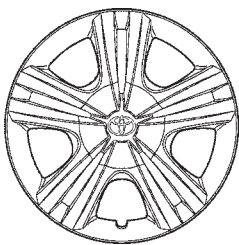

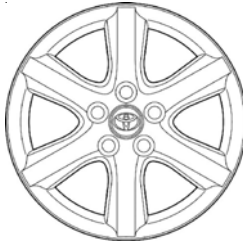
Side View

In order to express a dynamic 3-dimensional form, the extruded front and rear fender shapes have been incorporated into the body design, which is based on straight lines.



02KMO25TE

Tyre & Disc Wheel

Tyre	Size	P215/60R16	P215/60R16
Disc Wheel	Size	16 x 6.5 JJ	16 x 6.5 JJ
	P.C.D.*	114.3mm	114.3mm
	Material	Steel with Full Cap	Steel with Full Cap
Full cap / Wheel Design		GL  025MO12Y	GLX  02KMO09Y
Tyre	Size	P215/55R16	P215/55R17
Disc Wheel	Size	16 x 6.5 J	17 x 7 J
	P.C.D.*	114.3mm	114.3mm
	Material	Aluminium with Centre Ornament	Aluminium with Centre Ornament
Full cap / Wheel Design		GLX Option  025MO14Y	SE  025MO15Y

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

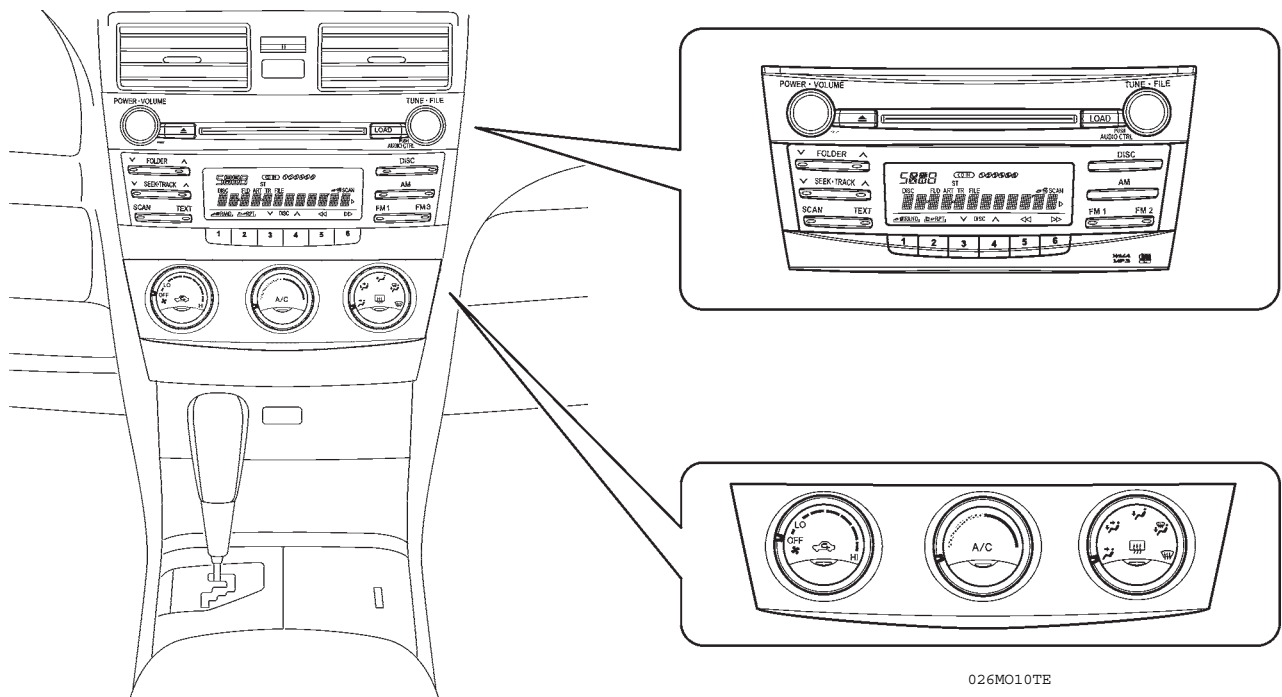
A light, sporty and open feel has been achieved with lines that flow from the centre cluster to both left and right, seemingly floating on the instrument panel lower.



02KMO11TE

Centre Cluster

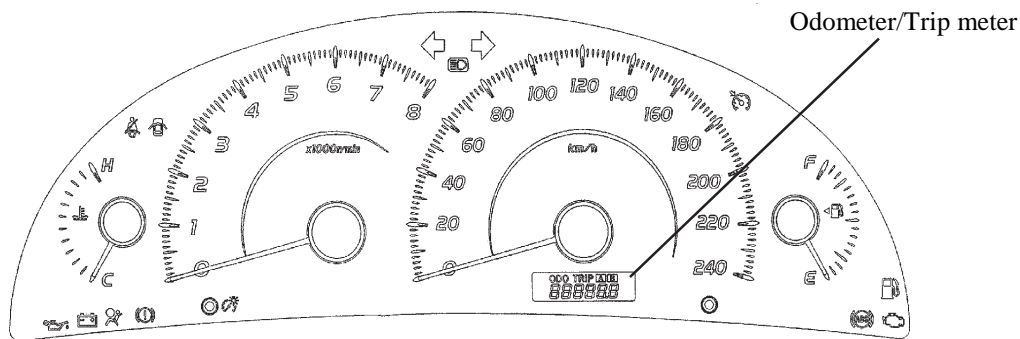
The centre cluster has been designed to be fresh and clear. By making the LCD display larger and putting the display and the switches closer together, both ease of use and freshness have been achieved. Light is emitted by the entire panel at night, creating a fresh atmosphere.



026MO10TE

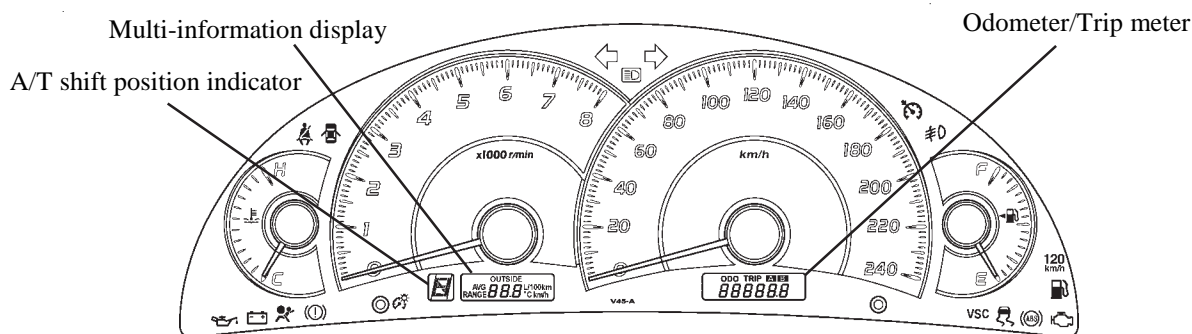
Combination Meter

- Three types of meters are available based on the grade.
- A large 4-meter combination meter is used.
- The multi-information display is provided under the tachometer on the high grade and sports grade models.
 - The multi-information display indicates; outside temperature, possible driving range, average fuel consumption since refuelling, distance driven since engine start and average speed since engine start.



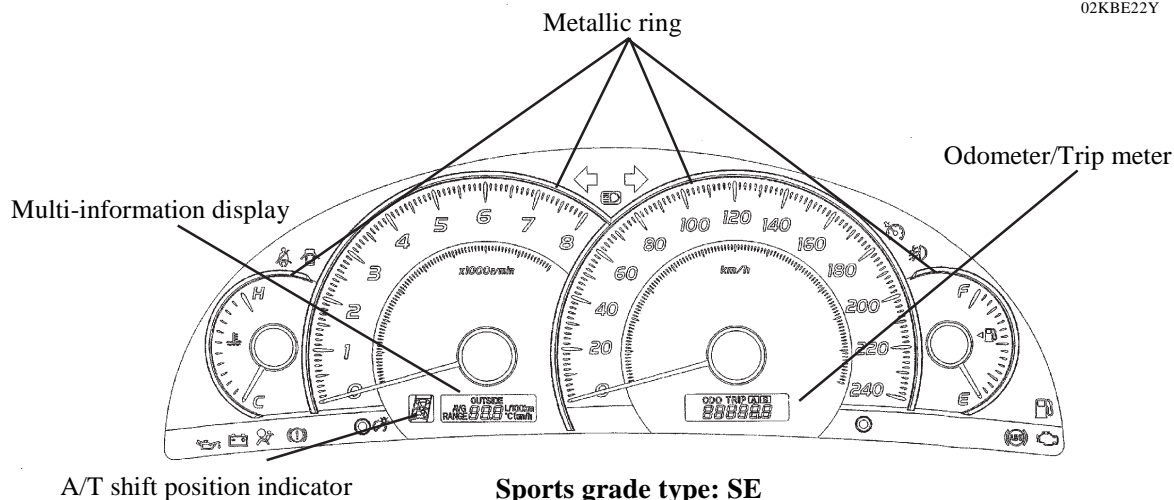
Basic type: GL

DOMCAM-V1CC-IN-058



High grade type: GLX

02KBE22Y



Sports grade type: SE

DOMCAM-V1CC-IN-062

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.

(1) 0.7 seconds after engine start



(2) Approximately 2 seconds after engine start



Horizontal Scrolling Display

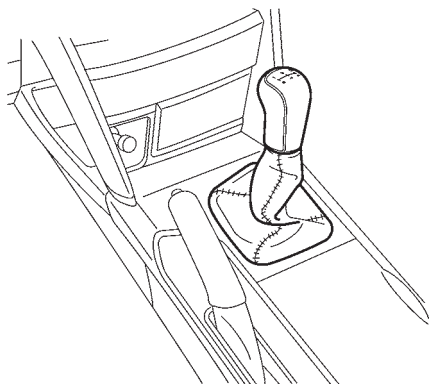
(3) Approximately 3 seconds after engine start



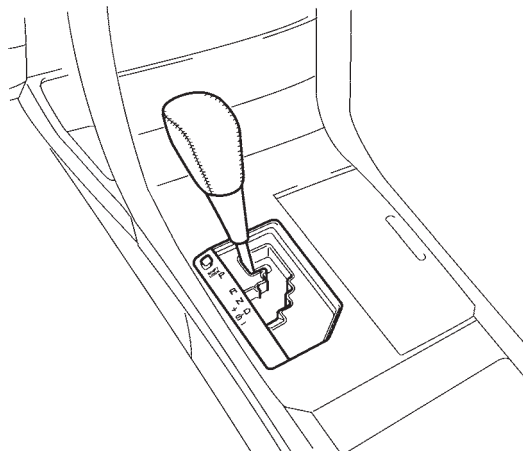
02KMO37Y

Shift Lever

On the new Camry, 2 types of shift lever are available, in accordance with the type of transaxle: Manual transaxle shift lever and a gate type 5-speed automatic transaxle shift lever.



02KMO26TE



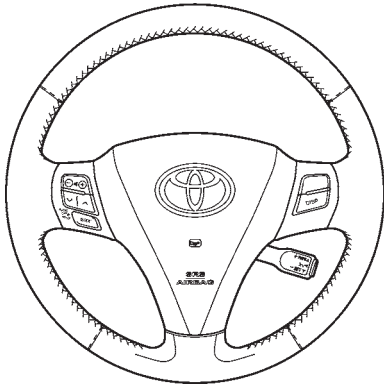
Manual Transaxle Shift Lever

02KMO33TE

**Gate Type 5-speed Automatic
Transaxle Shift Lever**

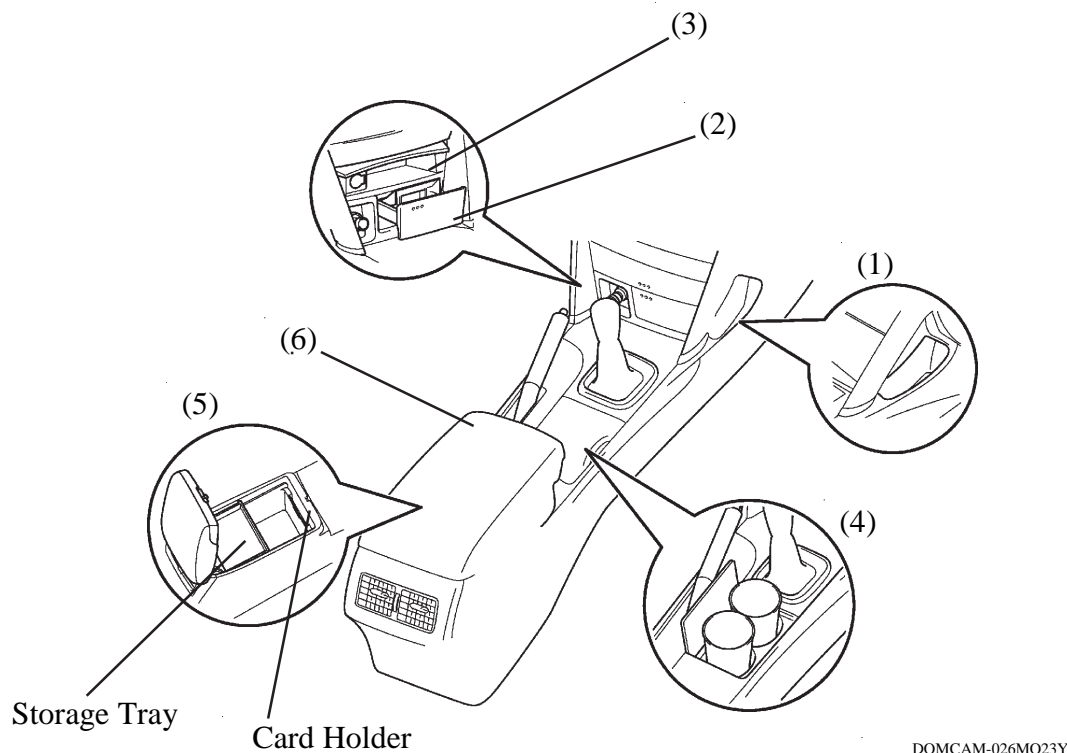
Steering Wheel

- There are three types of steering wheels available; 4-spoke urethane type, 4-spoke leather-wrapped 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 GLX and SE grades (not available on GL grade).
 - A display switch is mounted on the right side of the steering wheel and is used to operate the Multi-function Display (fitted to GLX & SE grades).
- The cruise control switch is incorporated in the steering wheel for ease of operation on some grades. Refer to MO-25 for details.

Design	4-Spoke Urethane	4-Spoke Leather-wrapped
	 02KMO17Y	 02KMO18Yb
	3-Spoke Leather-wrapped	
	 02KMO16Yb	

Console Box

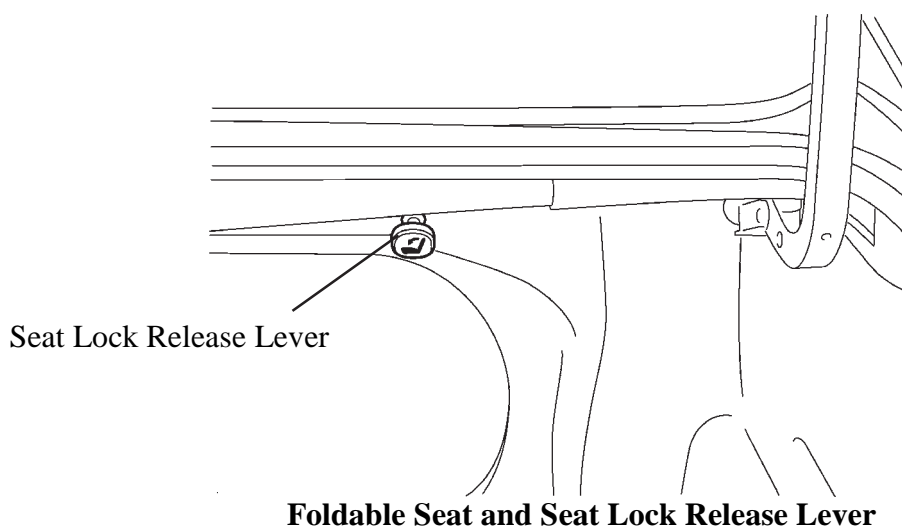
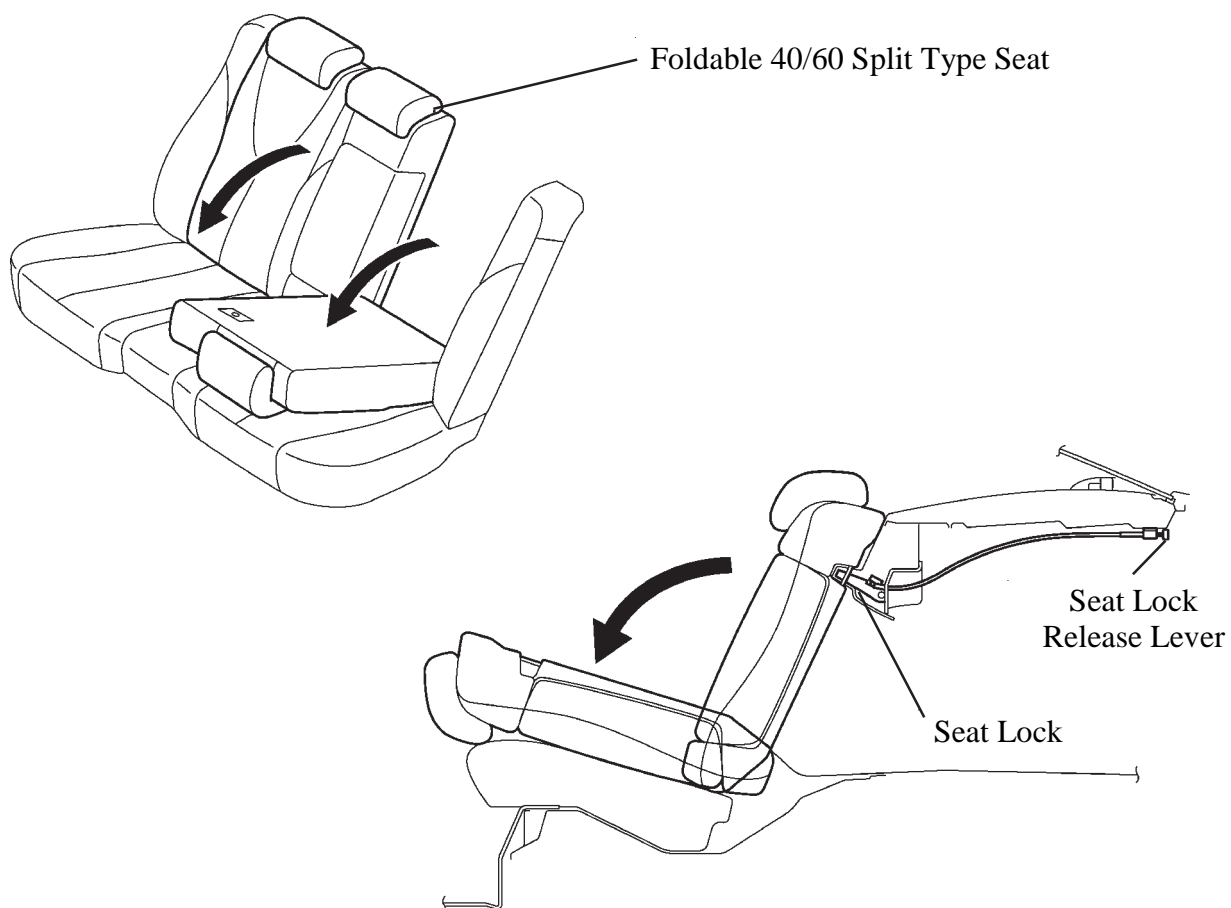
- A storage pocket for items such as mobile phones and wallets has been provided beside the front console (1).
- An ashtray has been built into the front box (2).
- A storage box for small articles with an internal 12V power supply terminal has been provided above the ashtray (3).
- Two drink cup holders, which can hold large sized drink cups with a lid, have been provided on the centre console, behind the shift lever (4).
- The rear console box has a large capacity, card holder and a storage tray has been provided for keeping small articles (5). The console box lid can be used as an armrest (6).



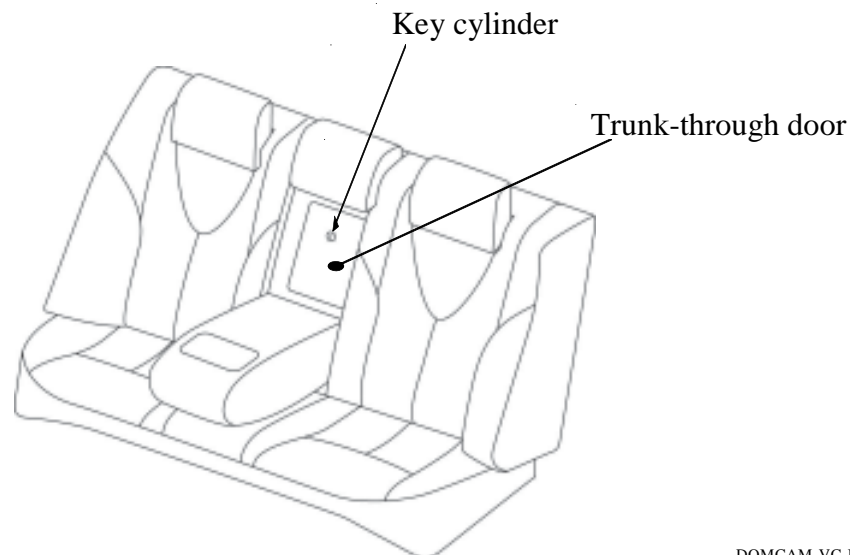
Console Box

Rear Seat

- A fold-down function has been provided for all models excluding SE grade.
- The rear seat lock is now released from the trunk compartment, this has increased boot security when the boot is dead locked.
- An adjustable centre rear headrest is fitted to all grades.



- A fixed rear seat is used on Sportivo grades with a lockable “Trunk-through” door.

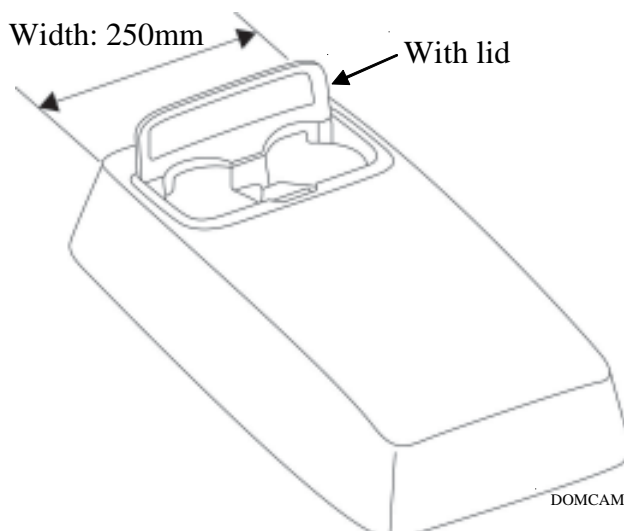


Fixed Rear Seat

DOMCAM-VC-IN-024

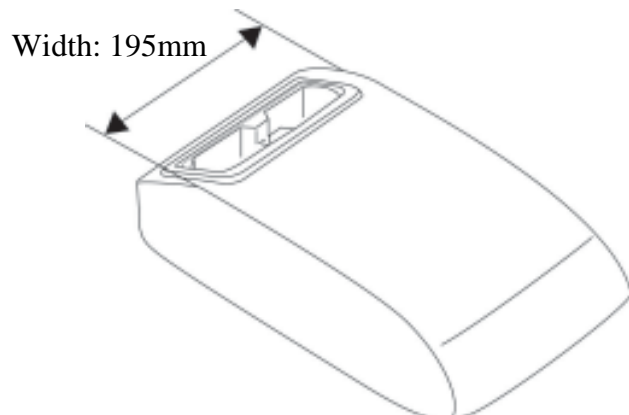
Rear Seat Armrest

- 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 (SE grade only)
- The armrest has been made 20 mm higher for greater ease of use



DOMCAM-V1CC-IN-036

**Armrest for fixed seat
(SE Grade)**



DOMCAM-V1CC-IN-035

**Armrest for 40:60 fold-down seat
(Excluding SE)**

EQUIPMENT

Audio System

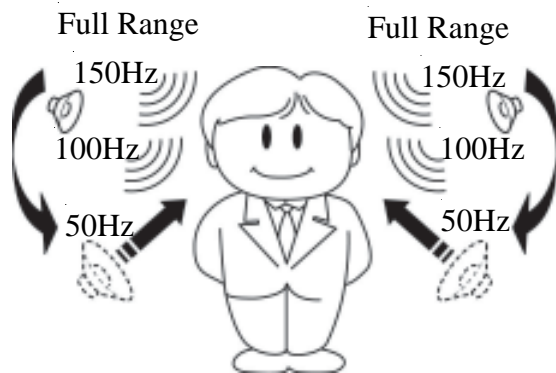
- The large and varied original LCD panels and large switched are provided for each audio head unit, improving visibility and ease of use.
- Psychoacoustics is adopted for all audio systems to achieve space control that portrays rich bass sounds spreading throughout the cabin from low to high volumes. As a result, the depth and power of the sound have been enhanced.
- The CD audio system supports MP3 and WMA (Windows Media Audio) playback.
- The text display during MP3 and WMA playback features ID3 tag version 1.0/1.1 including folder name, file name or MP3 file album name, track number, and artist name.
- A new DSP (Digital Signal Processor) is adopted, which features psychoacoustics. Optimal tuning is used to create clear and powerful audio without distortion.
- The radio tuner features digital processing that further reduces AM/FM noise (multipass and adjacent interference).
- The audio system features an ASL (Automatic Sound Leveliser) that automatically controls volume and frequency characteristics in relation to vehicle speed for greater audio quality.
- A large LCD monitor is adopted for the audio system, and a 7-inch display is adopted for the integrated navigation system. In addition, large switches are adopted for greater visibility and easier operation.
- A “Welcome Display” function is adopted for the audio system. (Except for integrated navigation system)
 - > When the key is switched to ACC or IG, the peripheral accessories including the meters slowly illuminate, and the message “WELCOME TO CAMRY” scrolls across the monitor. (Except for navigation-integrated system)
 - > The surface lights illuminate to give the cabin a luxurious feel.

-REFERENCE-

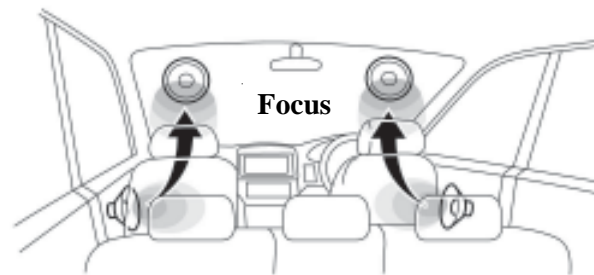
Psychoacoustic theory is technology that exploits human perceptions (sensory illusions). Through the implementation of this technology, without changing the speaker sizes or locations, listeners can sense deeper bass sound and feel as if the speakers were located at eye level, despite them being located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

Psychoacoustics

- Psychoacoustics is acoustic technology that cleverly uses human mentality and illusions. Rather than changing the speaker size or speaker layout, psychoacoustics is used to create a sense of the sound powerfully flowing throughout the cabin.
- The heavy bass playback function broadens the playback range of heavy bass tones and causes the listener to feel the heavy bass tones as if the system was equipped with a woofer.
- The upper position control function causes the sound coming from the speakers positioned near the bottom of the doors to sound as if it is actually coming from the front.

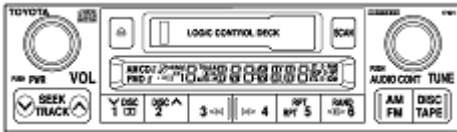
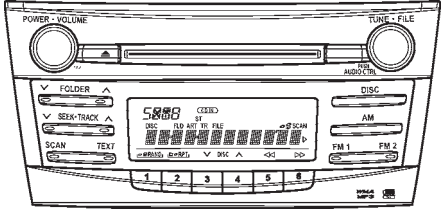
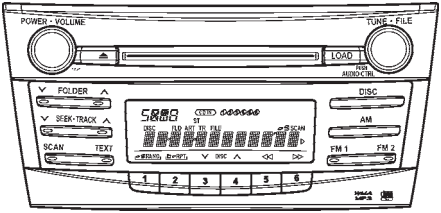
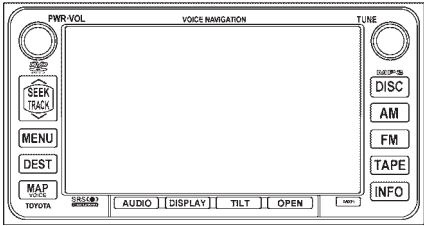



Heavy bass playback function image



Upper position control function image

Audio Head Unit

Grade	Design	Specifications
GL	 <p>271MO61</p>	<ul style="list-style-type: none"> • AM/FM Tuner • Cassette Player • 4-Speaker System • Maker: Fujitsu Ten
GLX Option for GL	 <p>026MO12Y</p>	<ul style="list-style-type: none"> • AM/FM Tuner • CD (MP3, WMA Compatible*¹) • DSP*²/ASL*³ • 4-Speaker System (GL) • 6-Speaker System • Maker: Fujitsu Ten
SE Option for GL & GLX	 <p>026MO13Y</p>	<ul style="list-style-type: none"> • AM/FM Tuner • In-Dash 6-CD Changer (MP3, WMA Compatible*¹) • DSP*²/ASL*³ • 4-Speaker System (GL) • 6-Speaker System • Maker: Fujitsu Ten
Option for GLX & SE	 <p>02KMO46Y</p> <p>SRS  Circle Surround II is the trademark of SRS Labs, Inc. DR019MO34</p>	<ul style="list-style-type: none"> • 6.5-inch Display • AM/FM Tuner • Cassette Player • 6-Speaker System • Maker: Fujitsu Ten

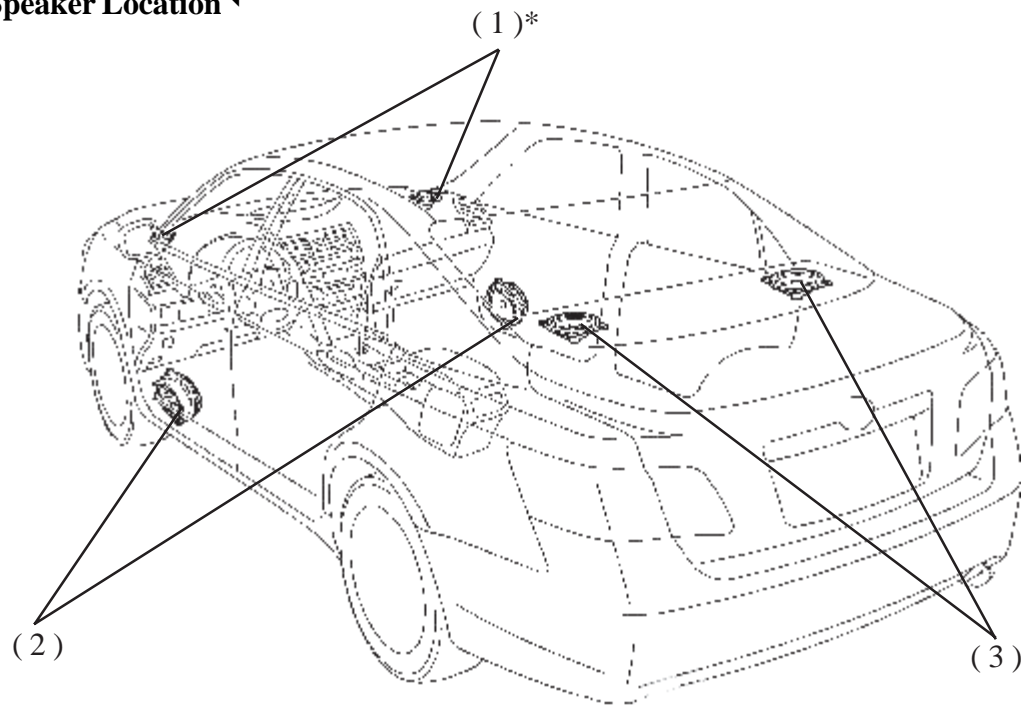
*¹: Compatible with the compressed sound and music files complying with MP3 (MPEG Audio Layer-3) standard and WMA (Windows Media Audio)

*²: Digital Sound Processor

*³: Automatic Sound Leveliser

Speaker

▸ Speaker Location ◀

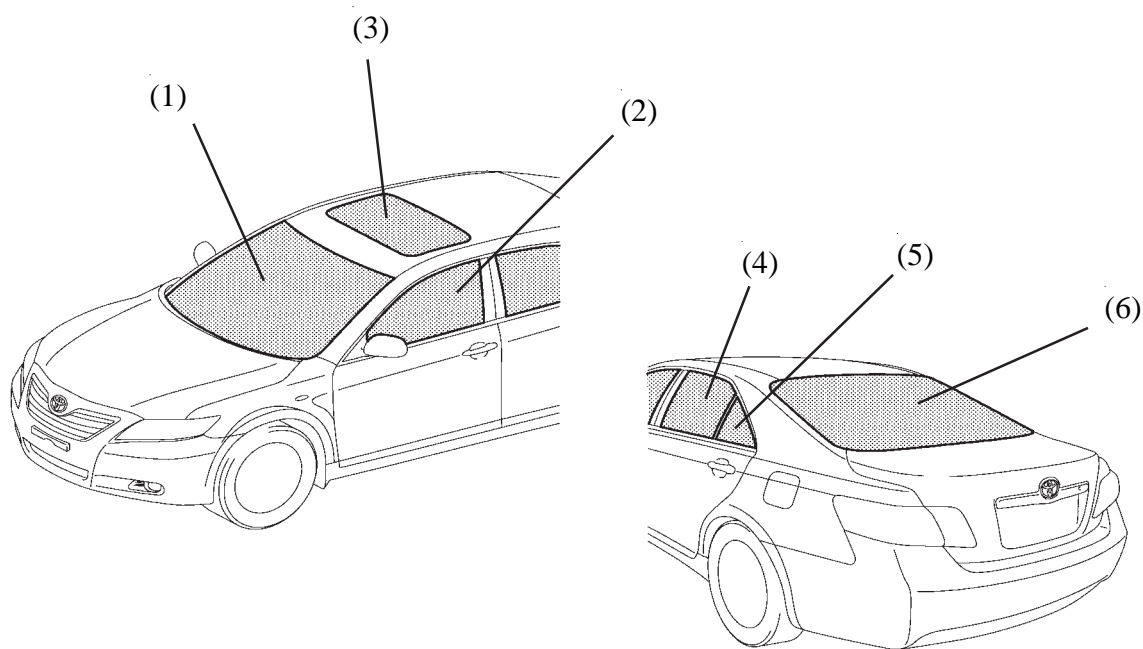


02KMO39Y

▸ 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

* Except for GL grades

Glass

026MO28TE

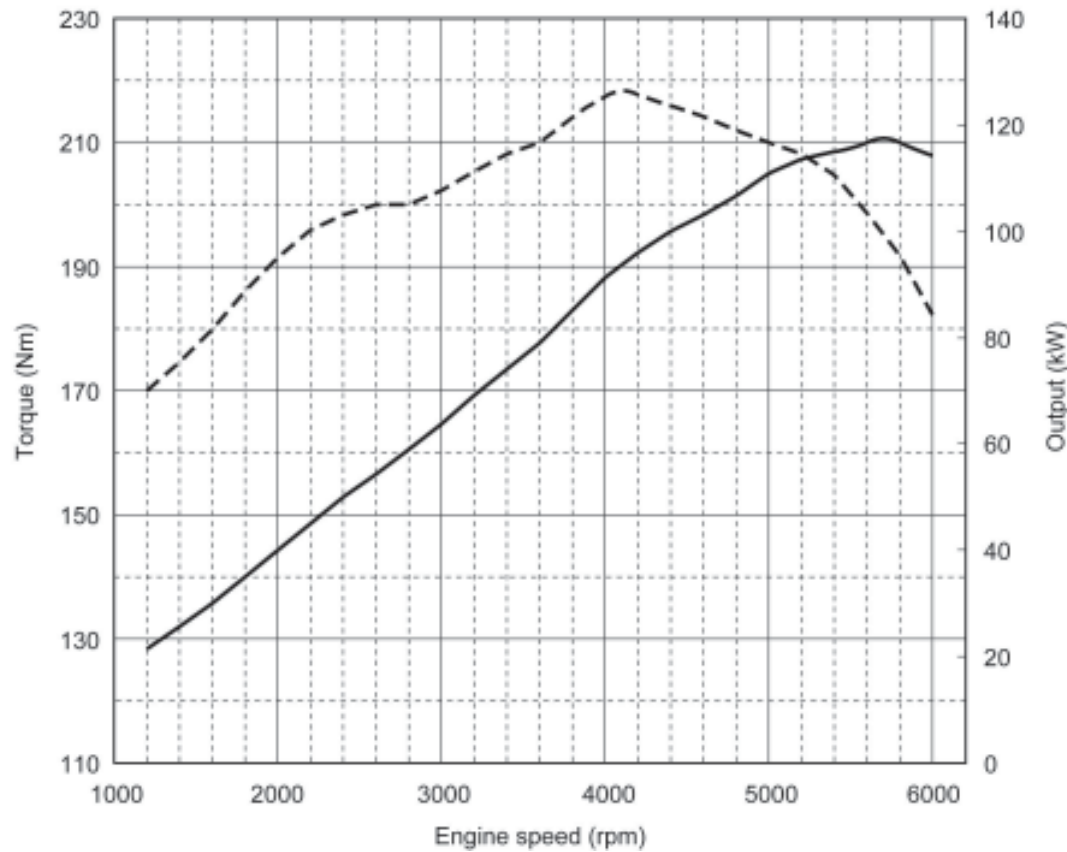
Glass Portion		Colour	Glass Type	Visible Light Penetration Rate
(1)	Windshield	Green with Dark Shade	Laminate	75% or more
(2)	Front Door	Green	Tempered	70% or more
(3)	Moon Roof Panel	Grey	Tempered	20 %
(4)	Rear Door	Green	Tempered	70% or more
(5)	Rear Door Quarter	Green	Tempered	70% or more
(6)	Back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

PERFORMANCE

Power Train

Engine

Type	2AZ-FE
No. of Cylinders & Arrangement	4-Cylinder, In-line
Valve Mechanism	16-Valve DOHC, Chain Drive (with VVT-i)
Displacement	2362 cm ³
Max. Output [EEC]	117kW @5700rpm
Max. Torque [EEC]	218N·m @4000rpm

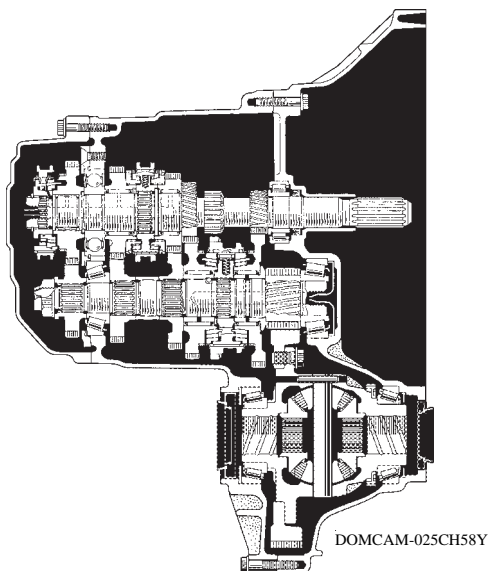
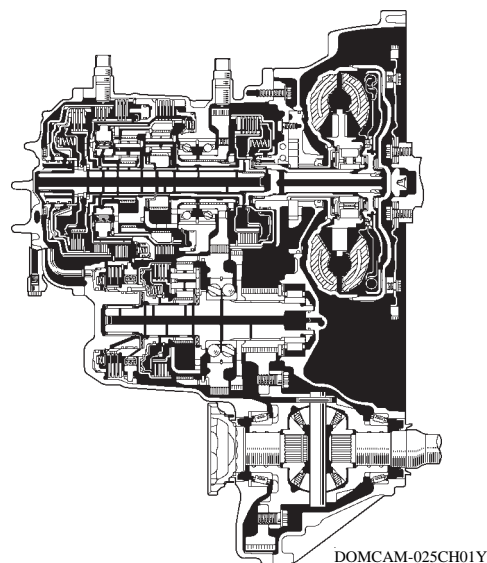


DOMCAM-V1CC-DP-050

Transaxle

Type		5-Speed Manual E354	5-Speed Automatic U250E
Gear Ratio	1st	3.538	3.943*
	2nd	2.045	2.197*
	3rd	1.333	1.413*
	4th	1.028	0.975*
	5th	0.820	0.703*
	Reverse	3.583	3.145*
Differential Gear Ratio		3.944	3.391
Oil grade / Fluid type		API GL-4 or GL-5	Toyota Genuine ATF WS

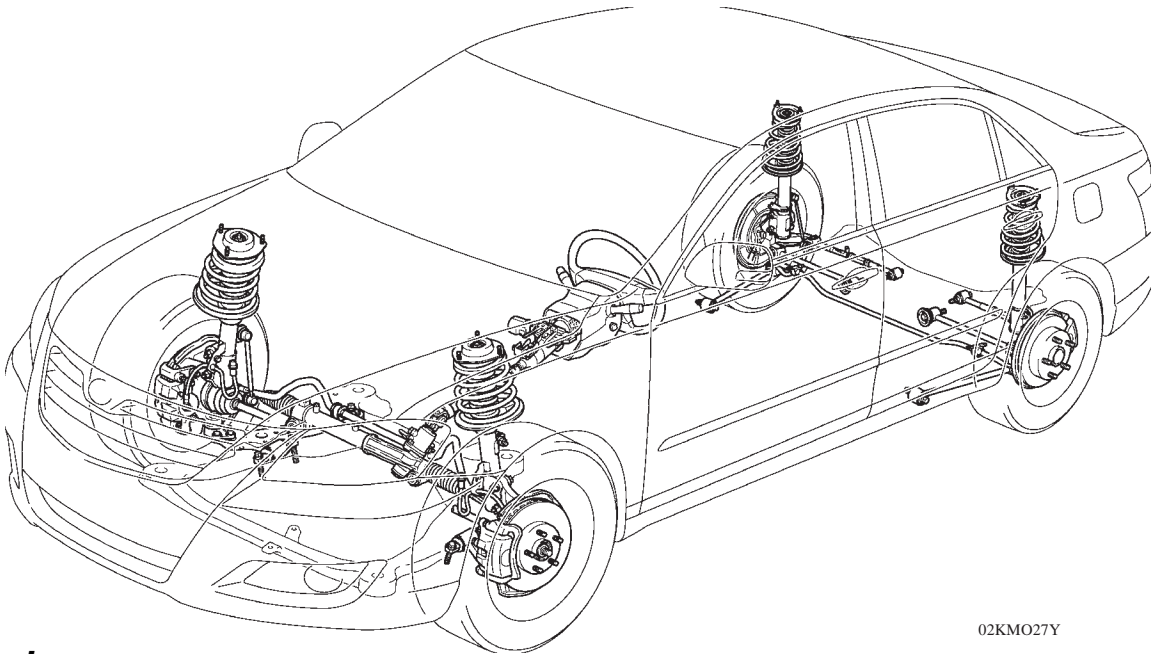
*: Counter gear ratio included

**E354 Manual Transaxle****U250E 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	281 x 10
Parking Brake	<ul style="list-style-type: none"> Centre Lever Type ^{*MT} Foot Pedal Type with Foot Release ^{*AT}
Brake Control System	<ul style="list-style-type: none"> ABS with EBD, Brake Assist (mechanical)

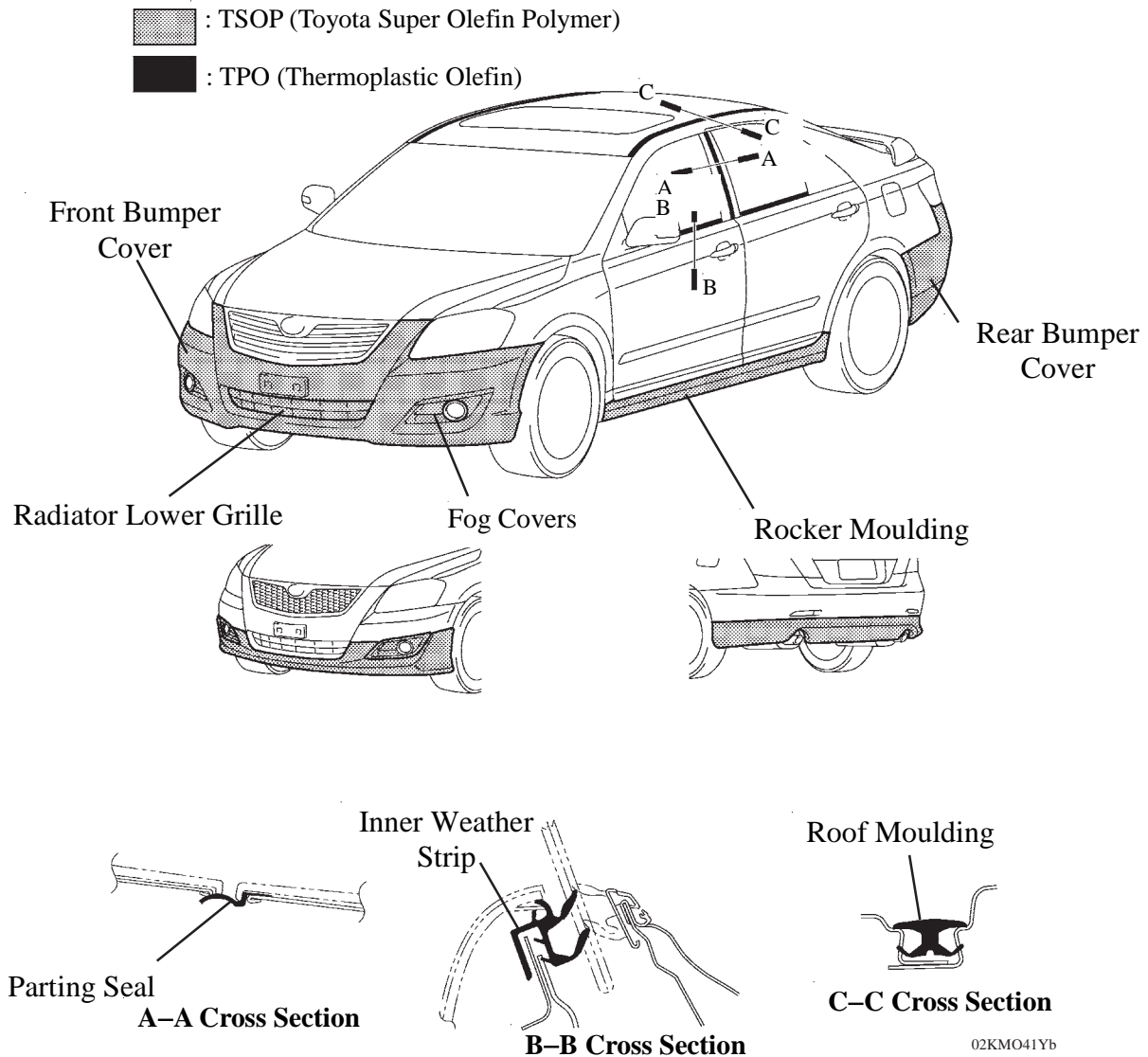
^{*MT}: Manual Transaxle

^{*AT}: Automatic Transaxle

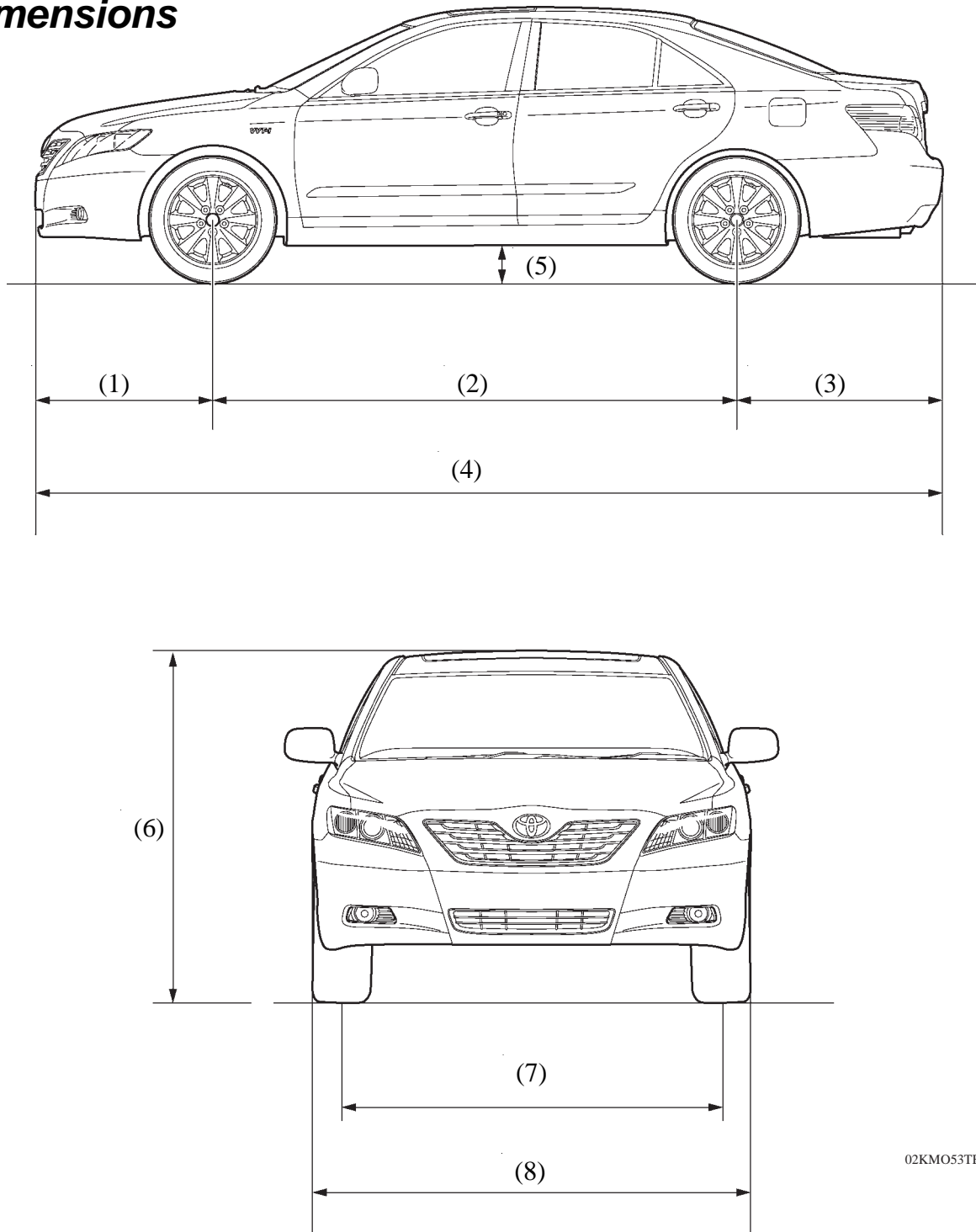
ENVIRONMENT and RECYCLING

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



02KMO53TE

(1)	Front Overhang	955mm	(5)	Minimum Running Ground Clearance	# 160mm
(2)	Wheel Base	2775mm	(6)	Overall Height	# 1460mm
(3)	Rear Overhang	1085mm	(7)	Tread	Front 1575mm
					Rear 1565mm
(4)	Overall Length	4815mm	(8)	Overall Width	1820mm

#: Note Minimum Running Ground Clearance and Overall Height indicated is based on an Unladen Vehicle

EQUIPMENT LIST

●: Standard O: Option -: Not available

Camry / Grade			GL	GLX	SE
Exterior	Radiator Grille	Normal with Chrome Plating	●	●	-
		Sporty	-	-	●
	Front Spoiler		-	-	●
	Rear Spoiler (Lip Type)		-	-	●
	Side Mud Guard	Normal	●	●	-
	Rear Seat Belt	Sporty	-	-	●
	Rear Under Spoiler		-	-	●
	Side Protection Moulding	Colour	-	-	●
		Colour with Chrome Plated	●	●	-
	Mud Guard	Colour	●	●	-
Chassis	Brake Control System	ABS with EBD & BA (mechanical)	●	●	●
	Steering Wheel	4-Spoke Urethane	●	-	-
		4-Spoke Leather	-	●	-
		3-Spoke Leather	-	-	●
	Steering System	Engine Speed Sensing Hydraulic Type	●	●	●
		Manual Tilt & Telescopic Mechanism	●	●	●
	Tyre	215/60R16 tyres (95V)	●	●	-
		215/55R17 tyres (93V)	-	-	●
	Disc Wheel	16 x 6.5JJ Steel Wheels	●	●	-
		16 x 6.5J Alloy Wheels	-	O	●
		17 x 7 Alloy Wheels	-	-	●
		Spare Wheel Steel	●	●	-
		Spare Wheel Alloy	-	O	●
	Gate type Automatic Transaxle shift lever with shift lock		●	●	●
	PKB Lever Type	Manual Transaxle	●	●	●
	PKB Pedal Type	Automatic Transaxle	●	●	●
Body	Seat Cover Material	Fabric	●	●	●
	Front Seat	Normal	●	●	-
		Sporty	-	-	●
	Rear Seat	Foldable 40/60 Split Type	●	●	-
		Fixed with Trunk through Type	-	-	●
	Front Seat Belt	3-Point ELR with Pre-tensioner and Force Limiter	●	●	●
	Rear Seat Belt	3-Point ELR + ALR x 3	●	●	●
	Front seat belt height adjustment		●	●	●
	Front cup holders		●	●	●
	Card holder in the centre console		●	●	●
	Front Console Box	Metallic	●	-	●
		Woody	-	●	-

.../continued
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●: Standard ○: Option -: Not available

Camry / Grade			GL	GLX	SE
Body Electrical	AM/FM Tuner, Cassette Player 4 Speaker		●	-	-
	AM/FM Tuner, CD (MP3) 4 Speaker		○	-	-
	AM/FM Tuner, CD (MP3) 6 Speaker		-	●	-
	AM/FM Tuner In Dash 6 CD Charger (MP3) 6 Speaker		-	○	●
	Steering Wheel Pad Switch		-	●	●
	Cruise Control		○	●	●
	Beam Level Control	Manual	●	●	●
	Headlight	Halogen	●	●	●
	Light Turn-Off System		●	●	●
	High Mount Stop Light		●	●	●
	Illuminated Entry System		●	●	●
	Power Door Lock Control System		●	●	●
	Trunk Opener		○	●	●
	Power Window System	One Touch Auto Down	●	-	-
		One Touch Auto Up and Down with Jam Protection		●	●
	Wiper System (Washer-Linked Wiper Function)		●	●	●
	SRS Driver and passenger Airbag (Dual Stage)		●	●	●
	Engine Immobiliser		●	●	●
	Clock		●	●	●
	Power mirrors (Colour coded)		●	●	●
	Front Map lights		●	●	●
	Multi-Information Display (incl. outside temp.) with control on steering wheel		-	●	●
	Sliding Roof		-	○	○
	Vanity mirrors		●	-	●
	Vanity mirrors illuminated		-	●	○*
	Front Fog lights		-	○	●
	Rear Personal Lamps		-	○*	○*
	Power Drivers seat (incl. lumbar support)		-	●	●
	Manual Drivers seat		●	-	-
	Power Rear Sunshade		-	○	-
	Sports Headlamps (projector low, halogen high)		-	-	●
	Headlamps (projector low, halogen high)		●	●	-
	Manual Air Conditioner System with Pollen Removal Type Filter		●	●	●

*: Option set with moon roof

ENGINE

2AZ-FE Engine

<i>Description.....</i>	<i>EG-2</i>
<i>Features of 2AZ-FE Engine.....</i>	<i>EG-4</i>
<i>Engine Proper.....</i>	<i>EG-5</i>
<i>Valve Mechanism.....</i>	<i>EG-11</i>
<i>Lubrication System.....</i>	<i>EG-15</i>
<i>Cooling System.....</i>	<i>EG-17</i>
<i>Intake and Exhaust System.....</i>	<i>EG-19</i>
<i>Fuel System.....</i>	<i>EG-24</i>
<i>Ignition System.....</i>	<i>EG-26</i>
<i>Charging System.....</i>	<i>EG-27</i>
<i>Starting System.....</i>	<i>EG-29</i>
<i>Serpentine Belt Drive System.....</i>	<i>EG-31</i>
<i>Engine Control System.....</i>	<i>EG-32</i>

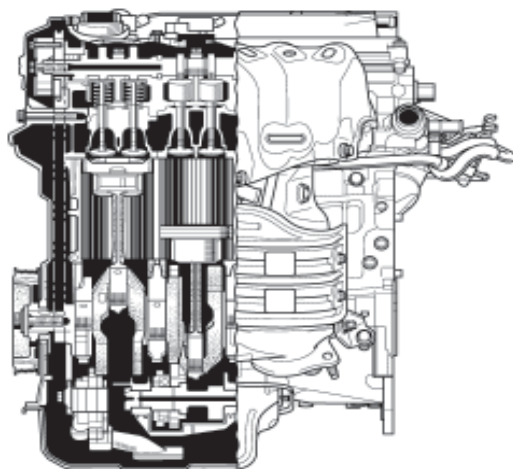
ENGINE

2AZ-FE ENGINE

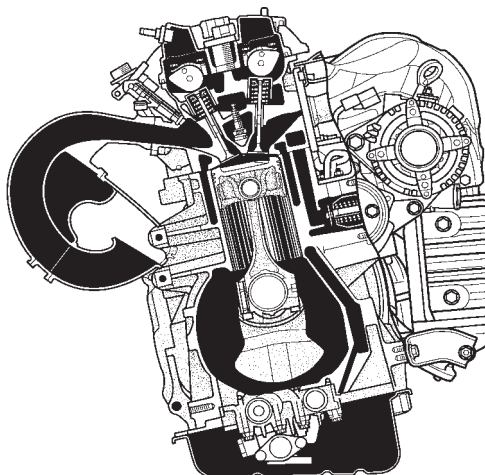
✱ DESCRIPTION

In-line 4-cylinder, 2.4-litre, 16-valve DOHC 2AZ-FE engine is used on the new Camry. This engine uses the VVT-i (Variable Valve Timing-intelligent) system, DIS (Direct Ignition System), ETCS-i (Electronic Throttle Control System-intelligent).

These control functions achieve improved engine performance, fuel economy, and reduced exhaust emissions.



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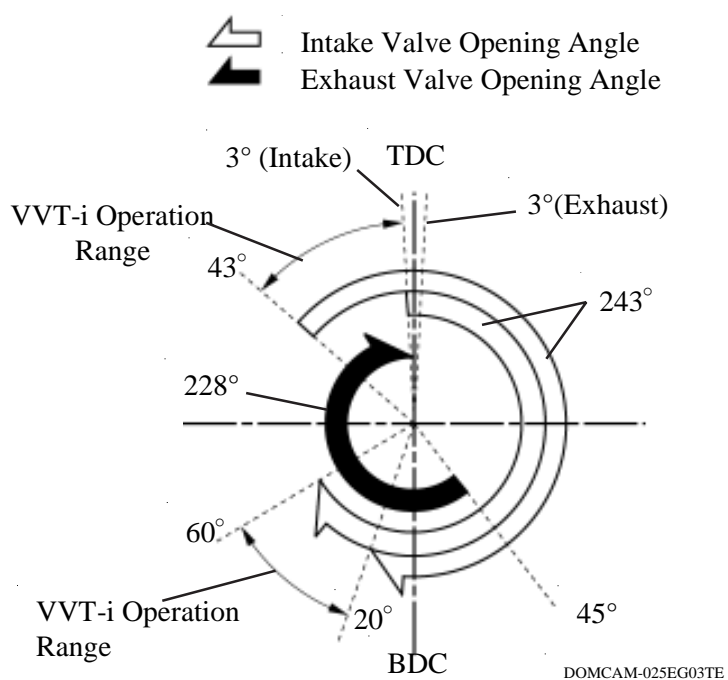


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► Engine Specifications ◀

Model			Previous	New
Engine			2AZ-FE	←
No. of Cyls. & Arrangement			4-Cylinder, In-line	←
Valve Mechanism			16-Valve DOHC, Chain Drive (with VVT-i)	←
Combustion Chamber			Pentroof Type	←
Manifolds			Cross-Flow	←
Fuel System			EFI	←
Ignition System			DIS	←
Displacement		cm ³	2362	←
Bore X Stroke		mm	88.5 X 96.0	←
Compression Ratio			9.6 : 1	←
Max. Output (EEC)			112 kW @ 5600 rpm	117 kW @ 5700 rpm
Max. Torque (EEC)			218 N·m @ 4000 rpm	←
Valve Timing	Intake	Open	46° BTDC ~ 4° ATDC	3° ~ 43° BTDC
		Close	10° ~ 60° ABDC	20° ~ 60° ABDC
	Exhaust	Open	45° BBDC	←
		Close	3° ATDC	←
Firing Order			1 – 3 – 4 – 2	←
Oil Grade			API grade SL "Energy-Conserving", "Energy-Conserving" SM or ILSAC	←
Research Octane Number			91 or higher	
Emission Regulation			EURO II	←
Engine Service Mass (Reference)		kg	159	←

► Valve Timing ◀



FEATURES OF 2AZ-FE ENGINE

The 2AZ-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

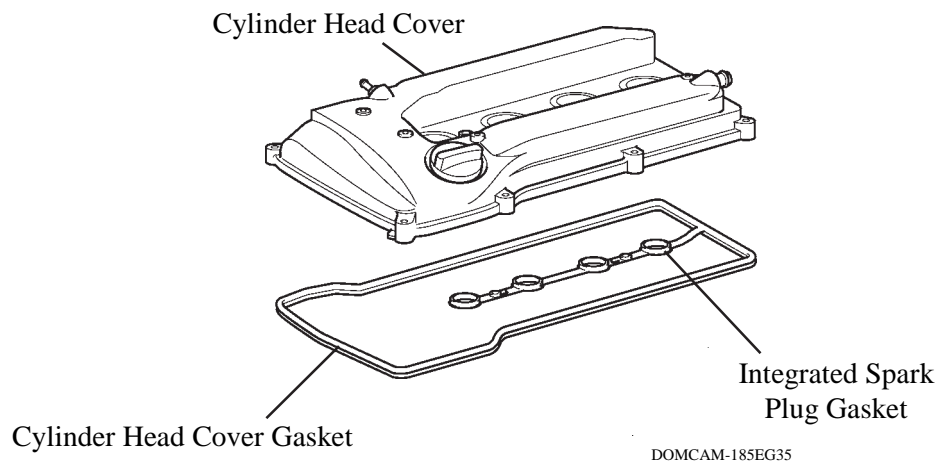
Item		(1)	(2)	(3)	(4)	(5)
Engine Proper	A head cover made of magnesium is used.			○		
	A taper squish shape is used for the piston head.	○				○
	A cylinder block made of aluminium alloy is used.			○		
	A resin gear balance shaft is used.		○	○		
Valve Mechanism	The VVT-i (Variable Valve Timing-intelligent) system is used.	○				○
	A timing chain and chain tensioner are 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 manifold made of plastic is used.			○		
	A 2-way exhaust control system is used.	○	○			
	A ceramic type TWC (Three-Way Catalytic Converter) is used.					○
Fuel System	The fuel return less system is used.			○	○	○
	12-hole type fuel injectors with high atomising performance are used.	○				○
	Quick connectors are used to connect the fuel hose with the fuel pipe.				○	
Ignition System	The DIS (Direct Ignition System) makes ignition timing adjustment unnecessary.	○			○	○
	Iridium-tipped spark plugs are used.	○			○	
Charging System	A segment conductor type alternator is used.	○		○		
Starting System	The PS (Planetary reduction-Segment conductor motor) type starter is used.			○		
Serpentine Belt Drive System	A serpentine belt drive system is used.			○	○	
Engine Control System	The ETCS-i (Electronic Throttle Control System-intelligent) is used.	○				○
	Evaporative emission control system is used.					○

✱ ENGINE PROPER

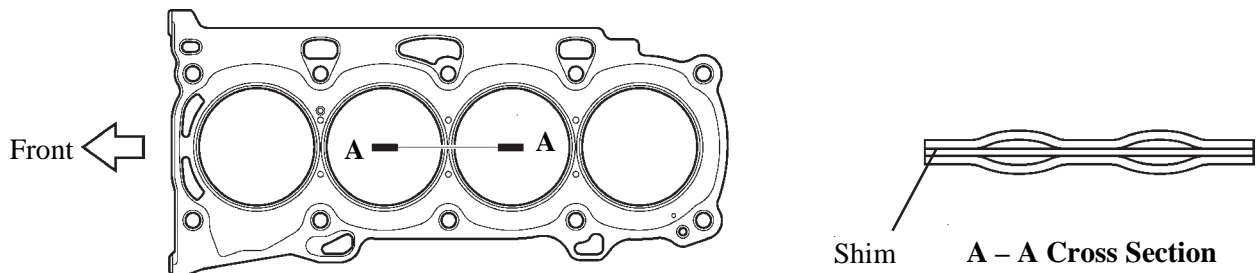
1. Cylinder Head Cover

A lightweight magnesium alloy diecast cylinder head cover used.

- The cylinder head cover gasket and the spark plug gasket have been integrated to reduce the number of parts.



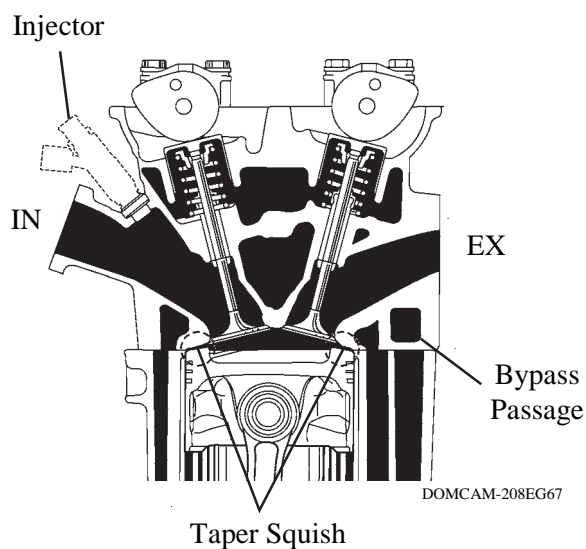
2. Cylinder Head Gasket



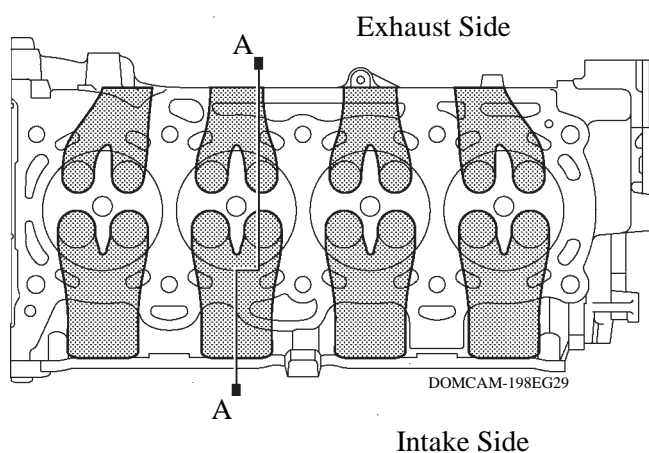
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3. Cylinder Head

- The taper squish combustion chamber is used to realise the engine's knocking resistance and fuel efficiency.
- An upright intake port has been used to achieve a highly efficient intake.
- Installing the injectors in the cylinder head enables the injectors to inject fuel as close as possible to the combustion chamber. This prevents the fuel from adhering to the intake port walls, which reduces HC exhaust emissions.
- The routing of the water bypass jacket in the cylinder head has been optimised for improved cooling performance. In addition, a water bypass passage has been provided below the exhaust ports to reduce the number of parts and to achieve weight reduction.



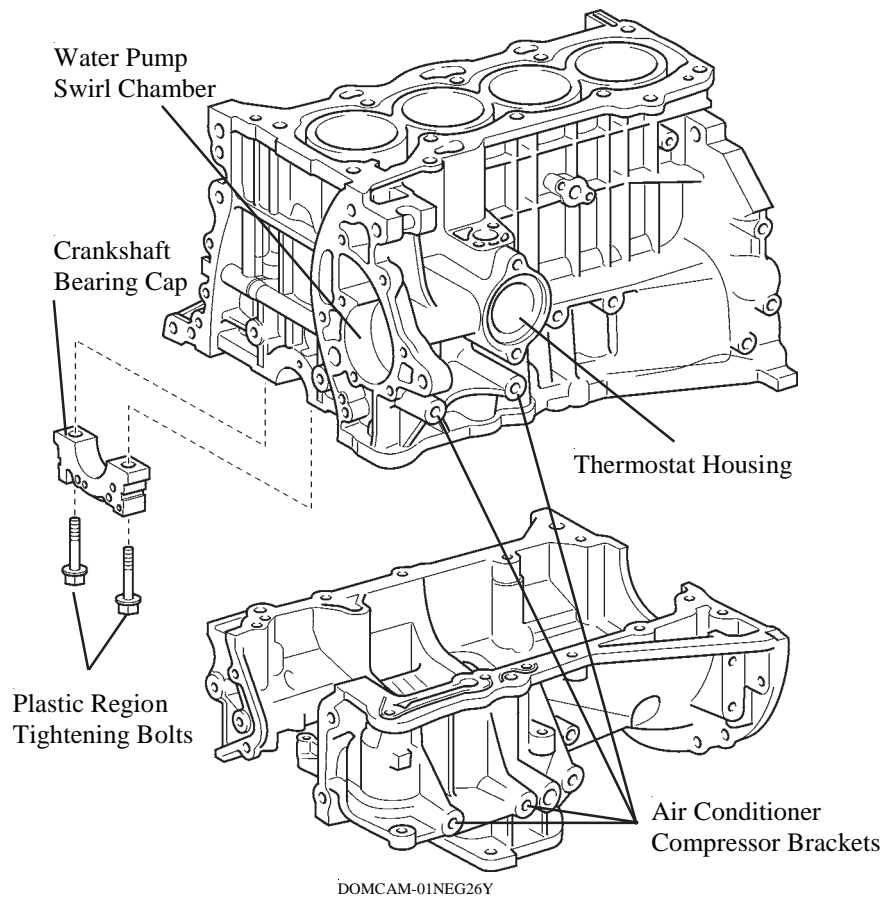
A – A Cross Section



View from the Back Side

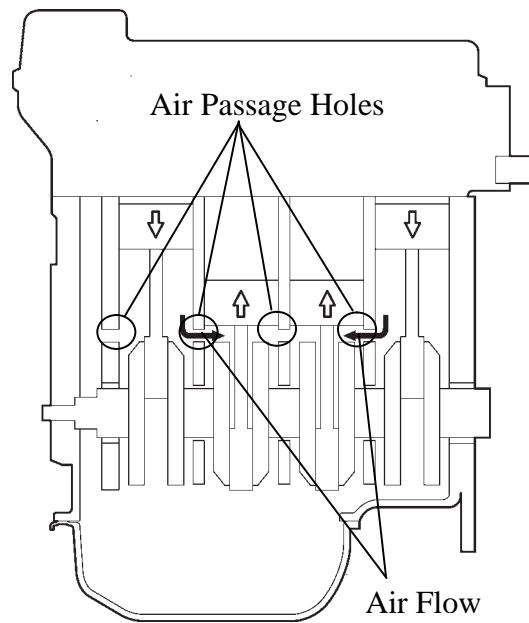
4. Cylinder Block

- Lightweight aluminium alloy is used for the cylinder block.
- By producing the thin cast-iron liners and cylinder block as a unit, compaction is realized.
- Air passage holes are provided in the crankshaft bearing area of the cylinder block. As a result, the air at the bottom of the cylinder flows smoother, and pumping loss (back pressure at the bottom of the piston generated by the piston's reciprocal movement) is reduced to improve the engine's output.
- The oil filter and the air conditioner compressor brackets are integrated into the crankcase. Also, the water pump swirl chamber and thermostat housing are integrated into the cylinder block.



NOTICE

Never attempt to machine the cylinder because it has a thin liner thickness.

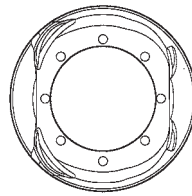
▶ Air Flow During Engine Revolution ◀

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5. Piston

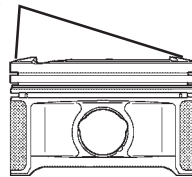
- The piston is made of aluminium alloy and skirt area is compact and lightweight.
- The piston head portion is used a taper squish shape.
- The piston skirt has been coated.
- Full floating type piston pins are used.
- By increasing the machining precision of the cylinder bore diameter, the outer diameter of the piston has been made into one type.

■ : Coating Area



View from the Top Side

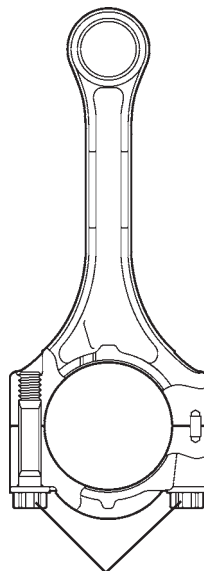
Taper Squish Shape



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6. Connecting Rod

- The connecting rods and caps are made of high strength steel for weight reduction.
- Nut less-type plastic region tightening bolts of the connecting rod are used for a lighter design.

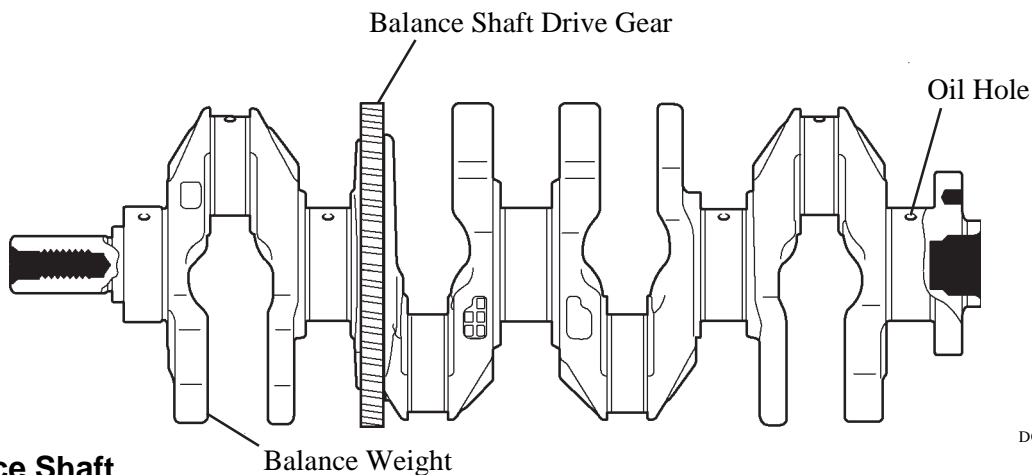


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Plastic Region Tightening Bolts

7. Crankshaft

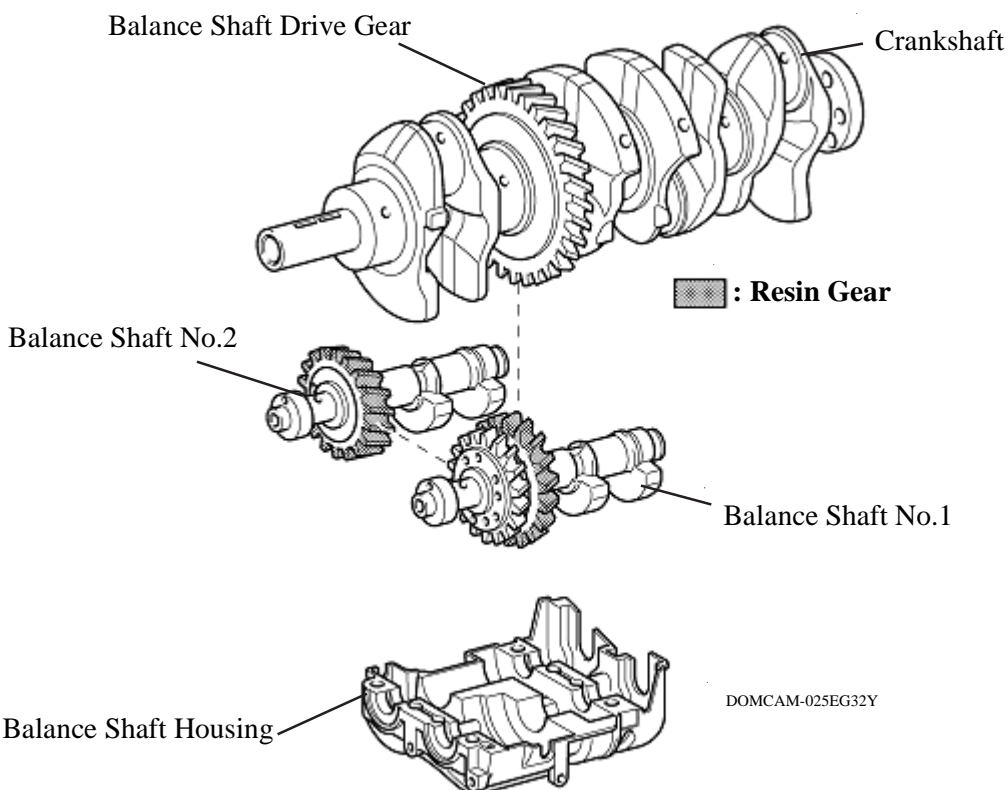
- The crankshaft has 5 journals and 8 balance weights.
- The precision and surface roughness of the pins and journals have been realized to reduce friction.
- The balance shaft drive gear has been installed onto the crankshaft.
- The crankshaft is made of forged steel.



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8. Balance Shaft

- A balance shaft is used to reduce vibrations.
- A direct-drive system is used which makes use of a gear that is installed onto the counterweight of crankshaft.
- In addition, a resin gear is used on the driven side to suppress noise and offer lightweight design.

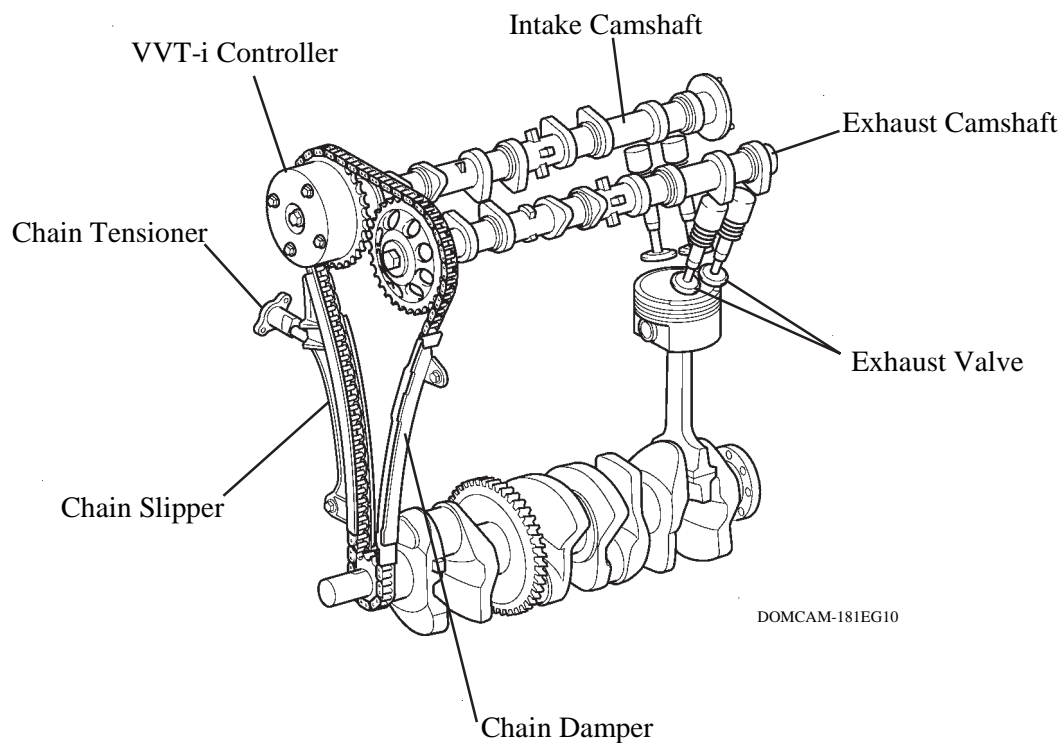


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✱ VALVE MECHANISM

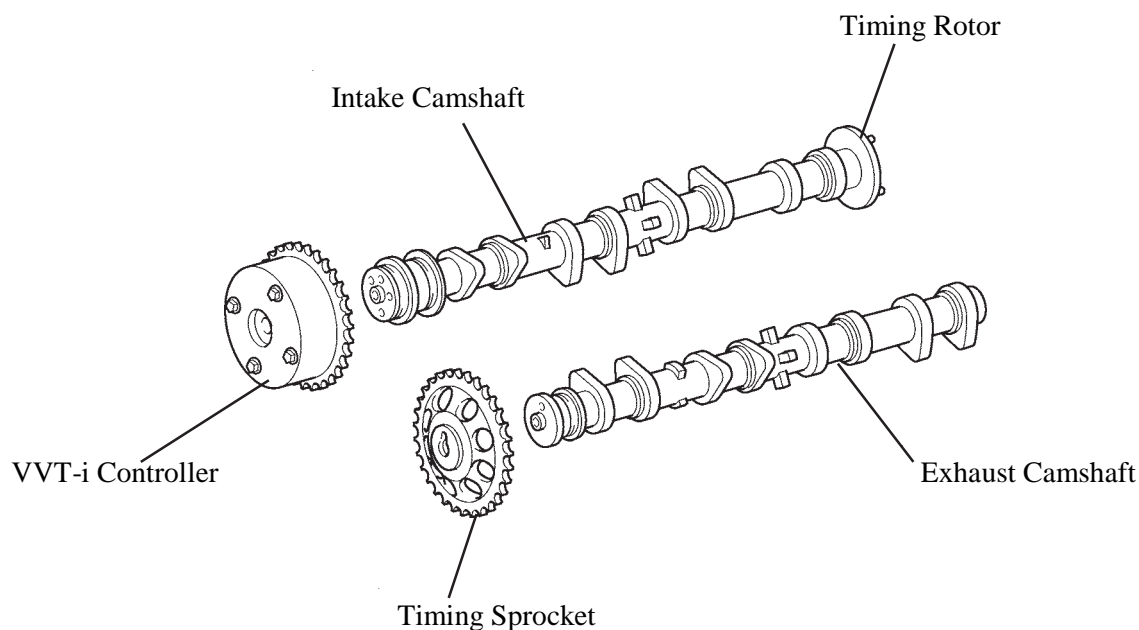
1. General

- Each cylinder is equipped with 2 intake valves and 2 exhaust valves. Intake and exhaust efficiency has been increased due to the larger total port areas.
- The valves are directly opened and closed by 2 camshafts.
- The intake and exhaust camshafts are driven by a chain. The VVT-i system used for the intake camshaft is used to increase fuel economy, engine performance and reduce exhaust emissions.
- The shim less type valve lifter is used.



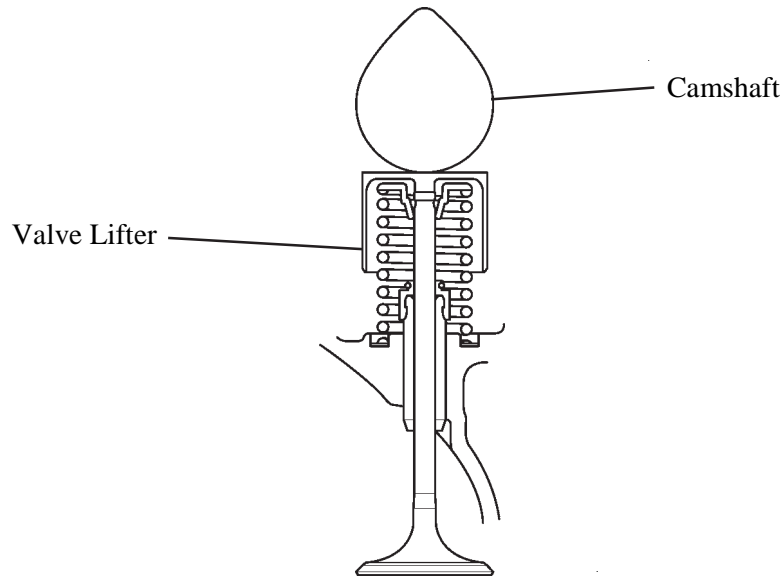
2. Camshaft

- The intake cam profile has been changed in conjunction with the change in valve timing. The new camshaft is adopted to realise excellent fuel economy, engine performance and reduce exhaust emissions.
- The intake camshaft is provided with timing rotor to trigger the camshaft position sensor.
- In conjunction with the adoption of the VVT-i system, an oil passage is provided in the intake camshaft in order to supply engine oil pressure to the VVT-i system.
- A VVT-i controller has been installed on the front of the intake camshaft to vary the timing of the intake valves.



3. Intake and Exhaust Valve

- Intake and exhaust valves with large-diameter valve face have been adopted to improve the intake air and exhaust gas flow.
- Narrow valve stems are used to reduce the intake and exhaust resistance and for weight reduction.



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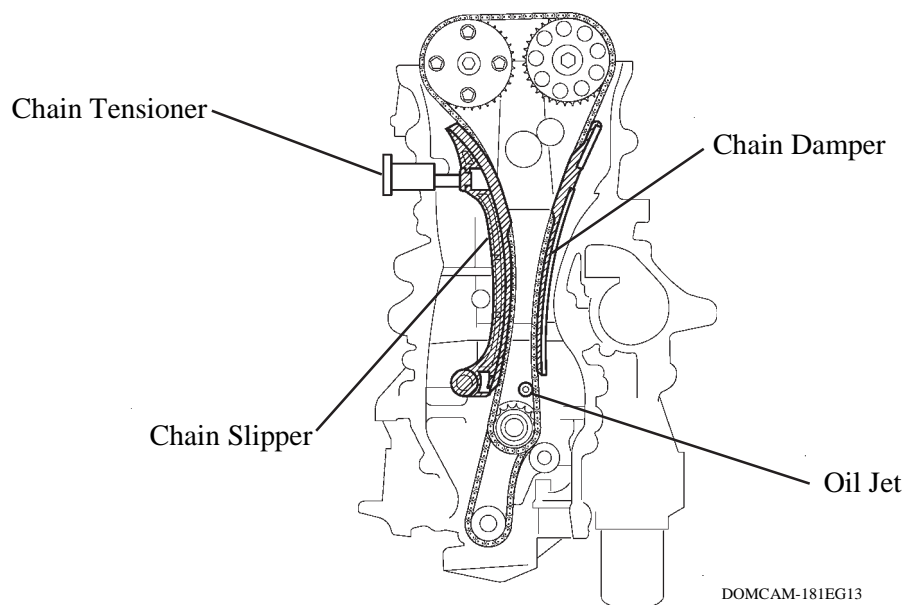
- Along with the increased amount of valve lift, shimless valve lifters that provide a large cam contact surface are used. The adjustment of the valve clearance is accomplished by selecting and replacing the appropriate valve lifters.

Service Tip

The valve lifters are available in 35 sizes with increments of 0.020 mm, from 5.060 mm to 5.740 mm. For details, refer to the Camry Repair Manual 1.

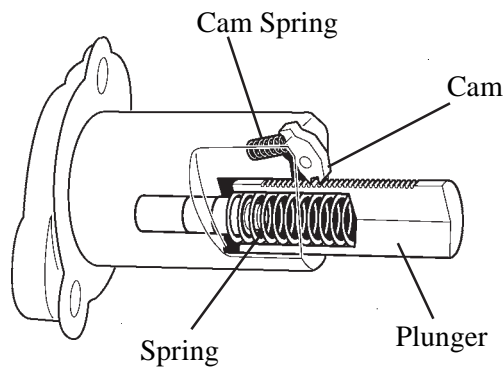
4. Timing Chain

- A roller chain with an 8 mm pitch is used.
- The timing chain is lubricated by an oil jet.



5. Chain Tensioner

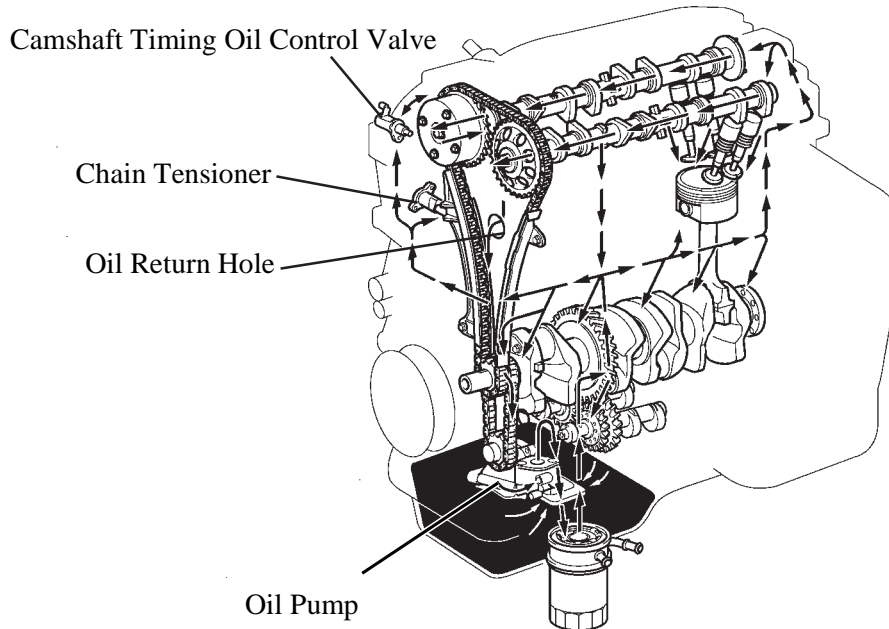
- The chain tensioner uses a spring and oil pressure to maintain proper chain tension at all times. The chain tensioner suppresses noise generated by the chain. A ratchet type non-return mechanism is also used.
- To improve serviceability, the chain tensioner is constructed so that it can be removed and installed from the outside of the timing chain cover.



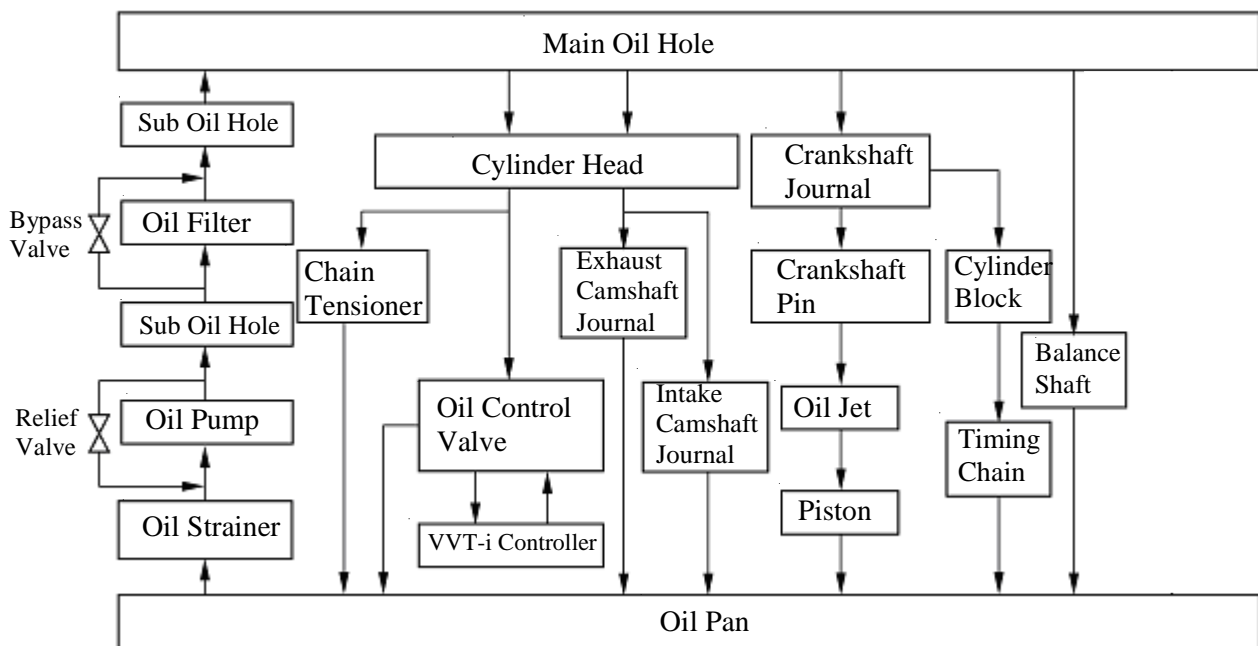
LUBRICATION SYSTEM

1. General

- The lubrication circuit is fully pressurised and oil passes through an oil filter.
- The trochoidal type oil pump is chain-driven by the crankshaft.
- The oil filter is attached downward from the crankcase to improve serviceability.
- Along with the adoption of the VVT-i system, the cylinder head is provided with a VVT-i controller and a camshaft timing oil control valve. This system operates using the engine oil.
- A water-cooled oil cooler has been installed between the crank case and the oil filter.



► Oil Circuit ◀



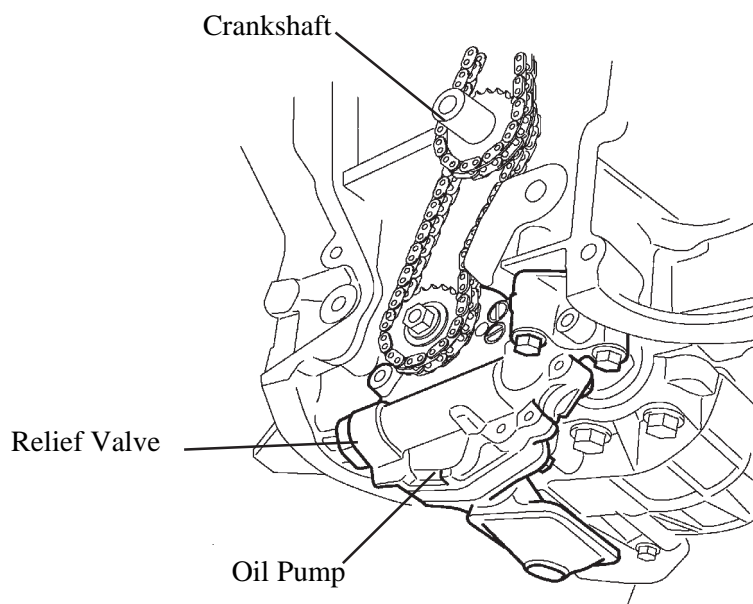
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► Specifications ◀

Oil Capacity	Dry	5.0 litres
	with Oil Filter	4.3 litres
	without Oil Filter	4.1 litres

2. Oil Pump

- The trochoidal type oil pump is chain-driven by the crankshaft, and fits compactly inside the oil pan.
- Friction has been reduced by means of 2 relief holes in the internal relief system.

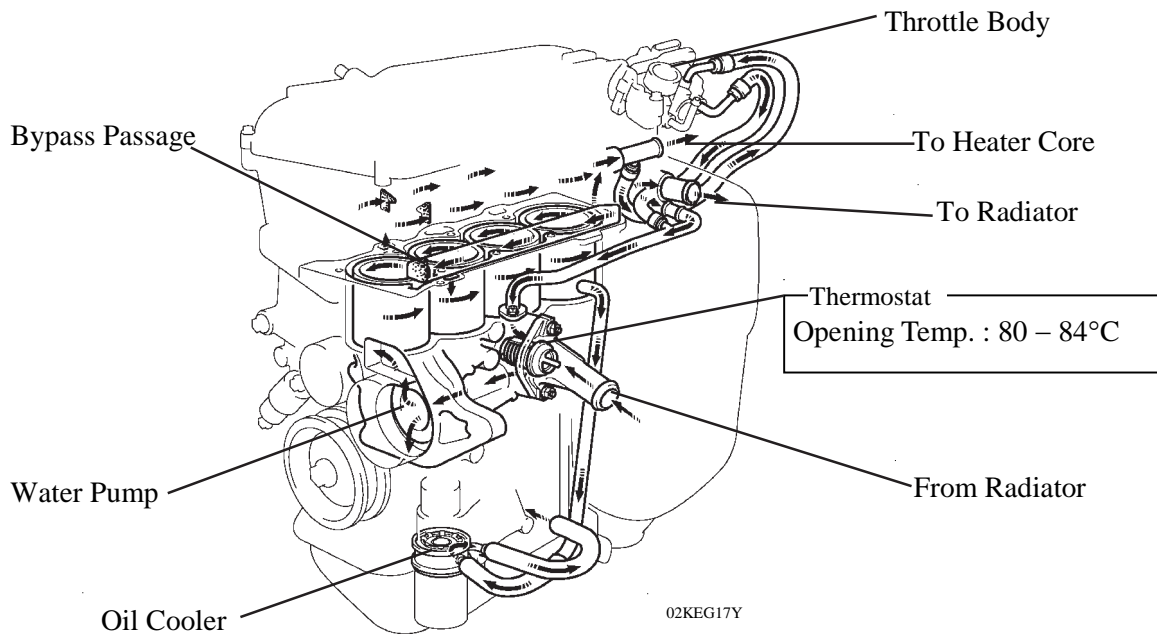


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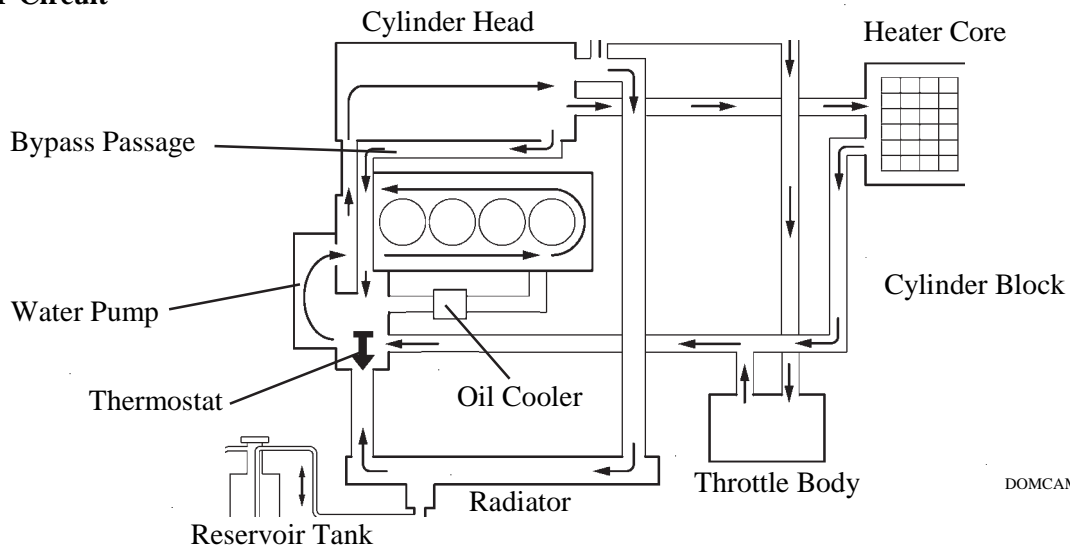
COOLING SYSTEM

1. General

- The cooling system uses a pressurised forced circulation system with open air type reservoir tank.
- A thermostat with a bypass valve is located on the water inlet housing to maintain suitable temperature distribution in the cooling system. This prevents sudden jumps in temperature while the engine is warming up.
- The flow of the engine coolant makes a U-turn in the cylinder block to ensure a smooth flow of the engine coolant. In addition, a bypass passage is enclosed in the cylinder head and the cylinder block.
- Warm engine coolant from the engine is sent to the throttle body to prevent freeze-up.
- TOYOTA Genuine SLLC (Super Long Life Coolant) is used to extend the maintenance interval.



► Water Circuit ◀



2. 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	160,000 km
	Subsequent	Every 80,000 km
Colour		Pink

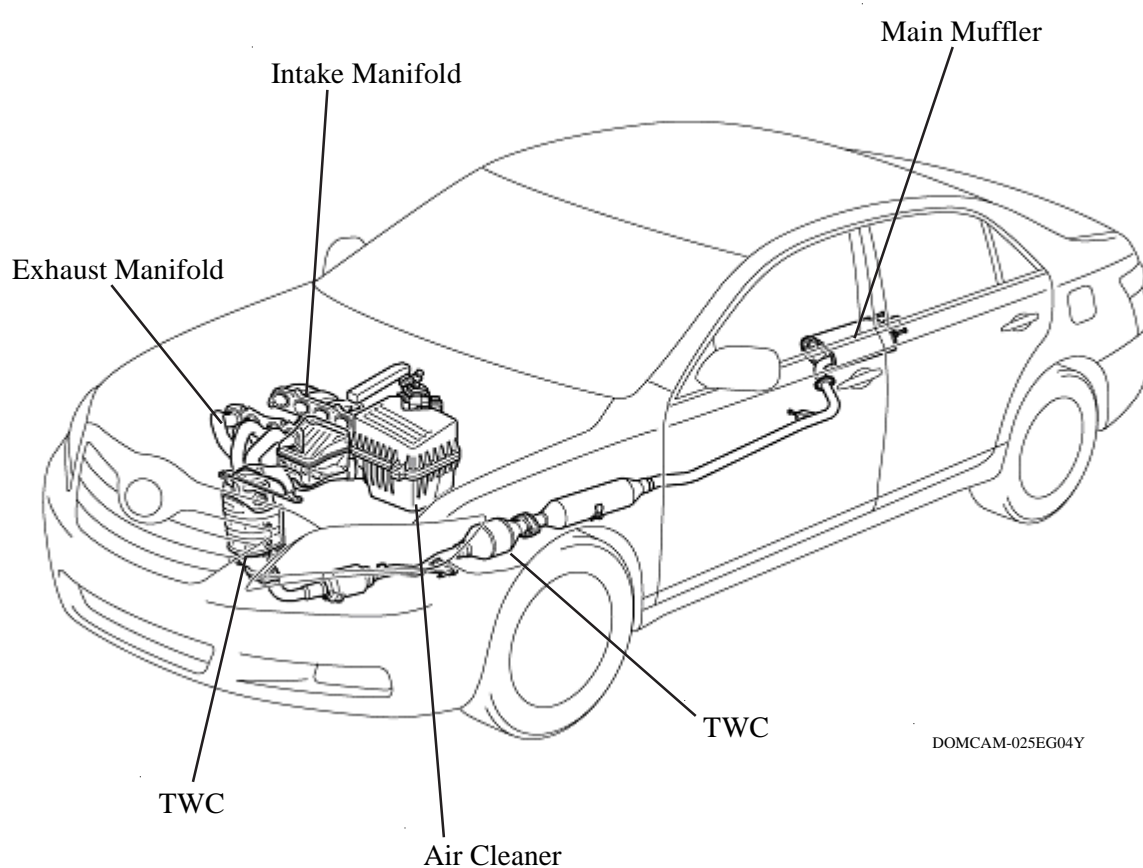
*: Similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology. (Coolant with hybrid organic acid technology consists of the combination of low phosphates and organic acids.)

- SLLC is pre-mixed (50 % coolant and 50 % deionized water), so no dilution is needed when adding or replacing SLLC in the vehicle.
- You can also apply the new maintenance interval (every 80,000 km) to vehicles initially filled with LLC (red-colour), if you use SLLC (pink-colour) for the engine coolant change.

● INTAKE AND EXHAUST SYSTEM

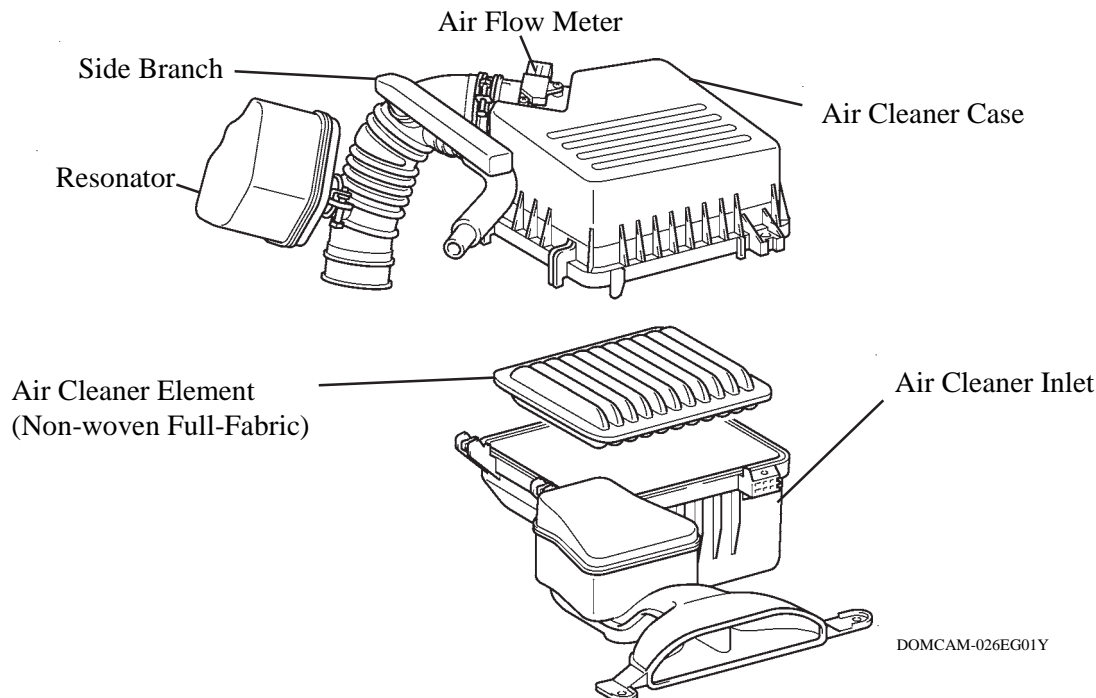
1. General

- The link-less type throttle body is used and it realises excellent throttle control.
- The intake manifold is made of plastic to reduce the weight and the amount of heat transferred from the cylinder head.
- The adoption of the ETCS-i (Electronic Throttle Control System-intelligent) has realised excellent throttle control. For details of throttle body, refer to page EG-46.
- 2-way exhaust control system is provided to reduce noise and vibration in the main muffler.



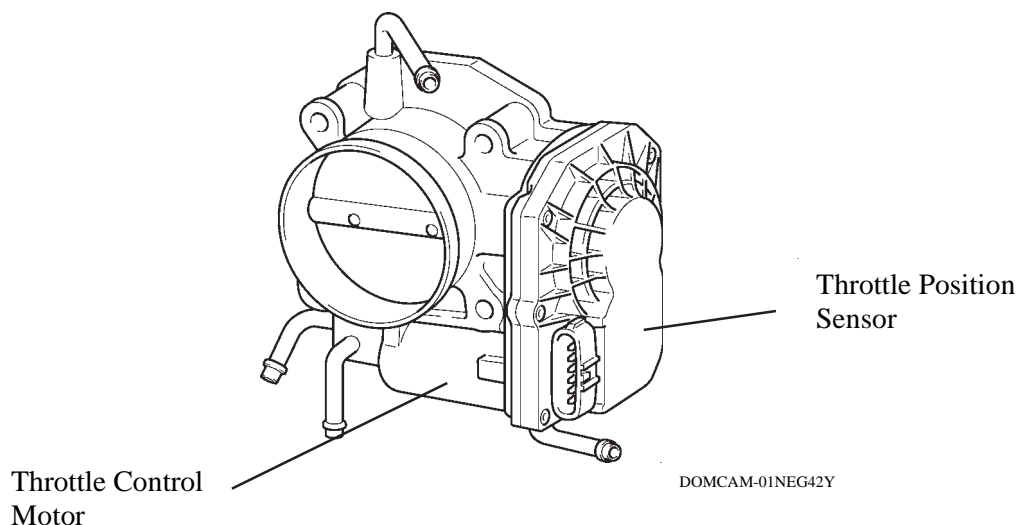
2. Air Cleaner

- A non-woven, full-fabric type air cleaner element is used.
- Resonators have been provided to reduce the amount of intake air sound.



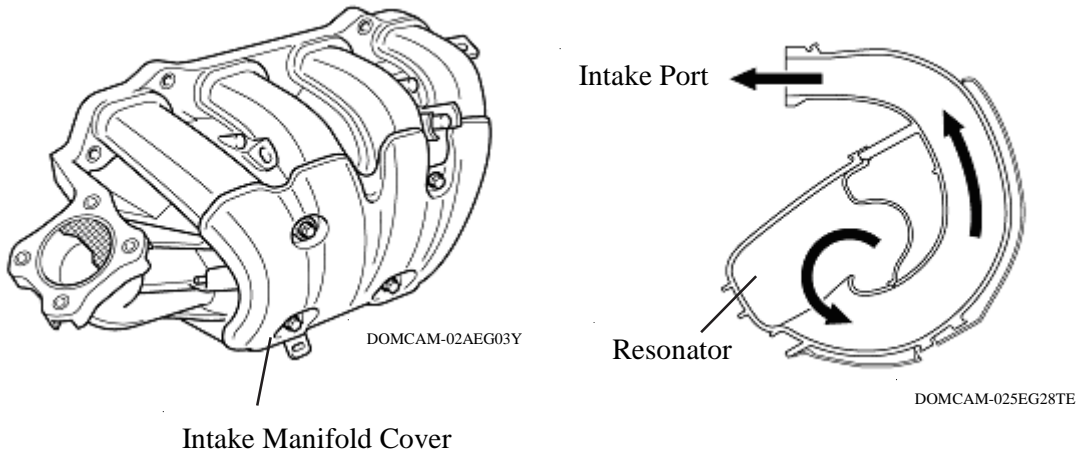
3. Throttle Body

- 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. For details, see page EG-41.
- 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.



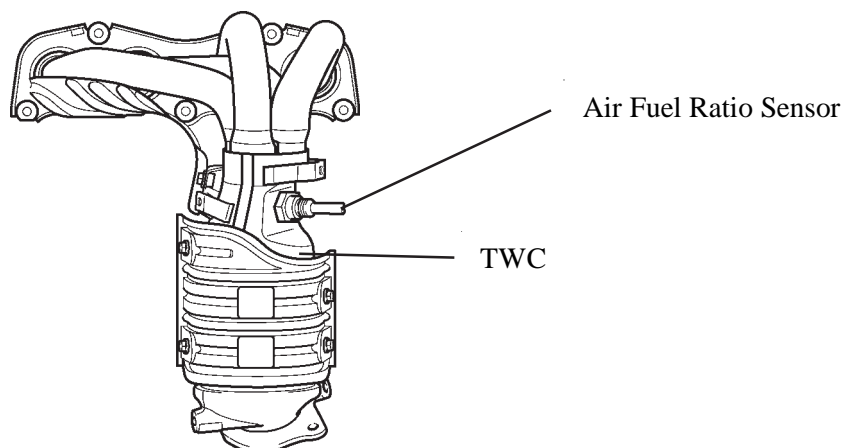
4. Intake Manifold

- The intake manifold is made of plastic to reduce the weight and the amount of heat transferred from the cylinder head. As a result, it has become possible to reduce the intake air temperature and improve the intake volumetric efficiency.
- A resonator is installed inside the air intake chamber which makes use of the intake pulse to improve torque in the mid-speed range.
- The intake manifold cover is used on the intake manifold to reduce intake air noise.



5. Exhaust Manifold

- A stainless steel exhaust manifold is used for improving the warm-up of TWC and for weight reduction.
- The air fuel ratio sensor is used to the exhaust manifold.
- A ceramic type TWC is used. This TWC improves exhaust emissions by optimising the cell density.

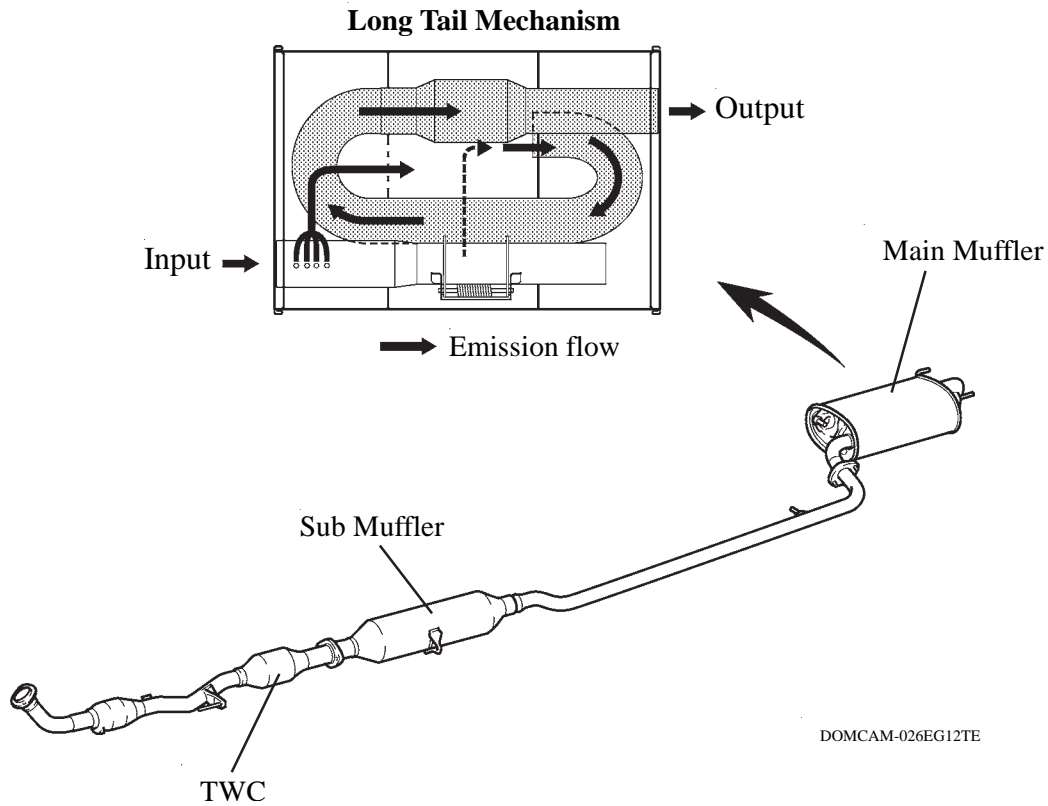


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6. Exhaust Pipe

General

- 2-way exhaust control system is provided to reduce noise and vibration in the main muffler.
- 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.



2-Way Exhaust Control System

- A 2-way exhaust control system is used. This system reduces the back pressure by opening and closing a variable valve that is enclosed in the main muffler, thus varying the exhaust gas pressure.
- The valve opens smoothly in accordance with the operating condition of the engine, thus enabling a quieter operation at lower engine speeds, and reducing back pressure at higher engine speeds.

1) Construction

The control valve is enclosed in the main muffler. When the exhaust gas pressure overcomes the spring pressure, the control valve opens smoothly in accordance with the exhaust gas pressure.

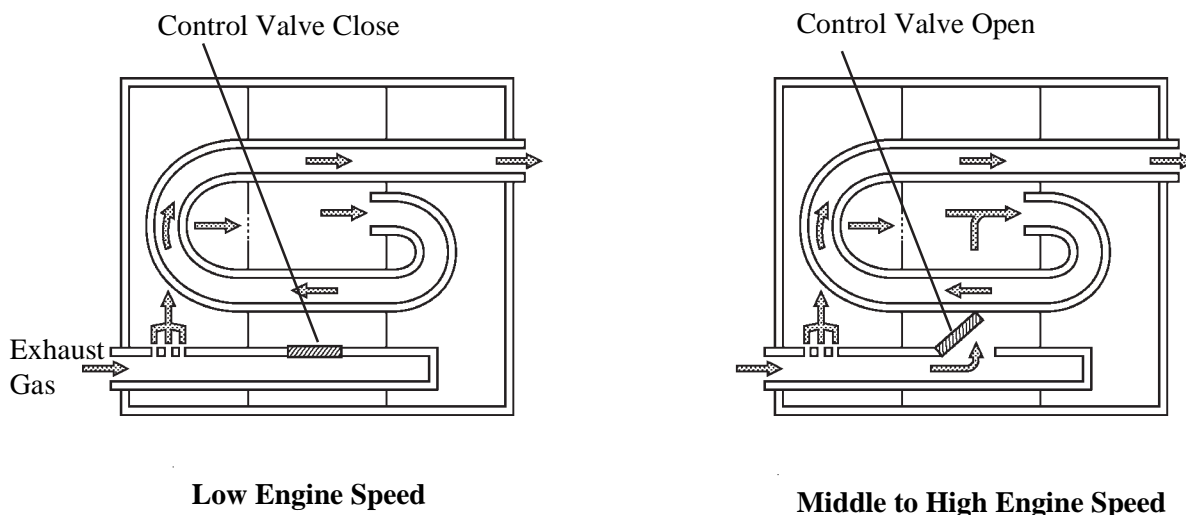
2) Operation

a. When Control Valve is Closed (low engine speed)

Since the pressure in the main muffler is low, the control valve is closed. Hence exhaust gas does not pass the bypass passage, and exhaust noise is decreased in the main muffler.

b. When Control Valve is Open (middle to high engine speed)

The valve opens as the engine speed and the back pressure in the muffler increase. This allows a large volume of exhaust gas to pass the bypass passage, thereby substantially decreasing the back pressure.

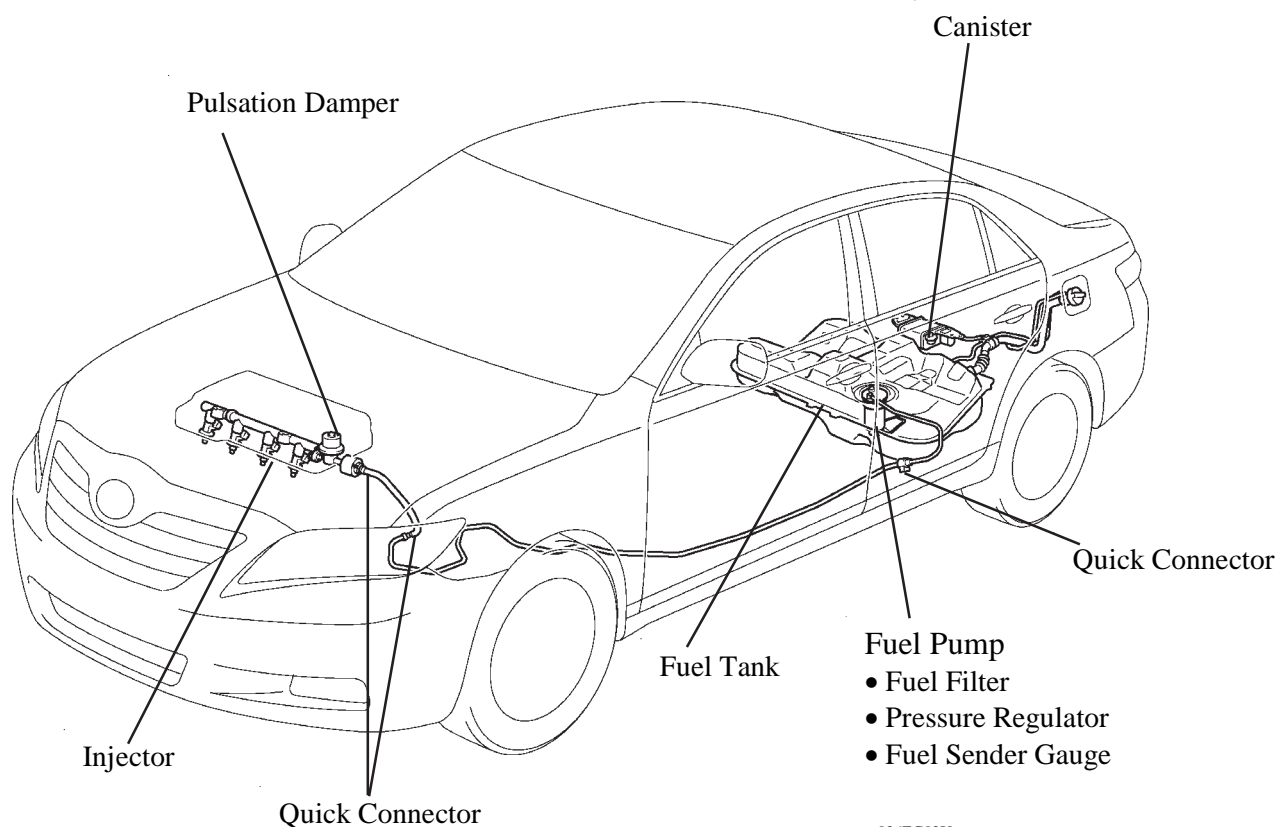


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✱ FUEL SYSTEM

1. General

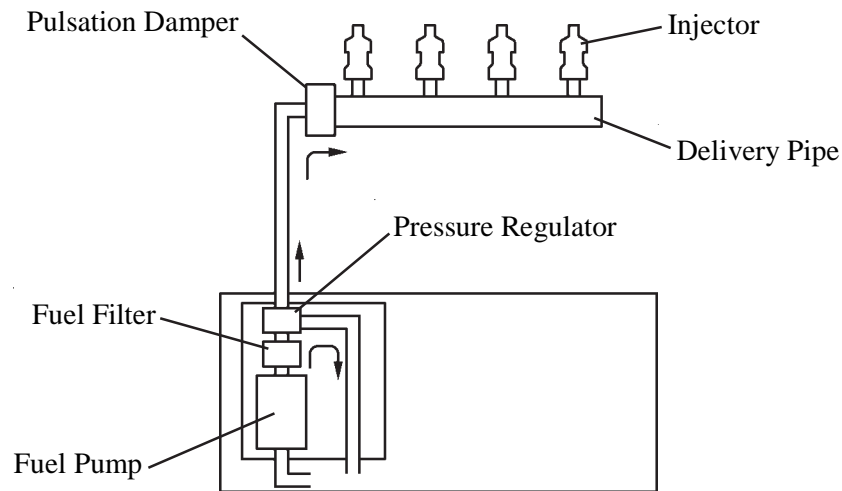
- A fuel return less system is used to reduce evaporative emissions.
- A fuel cut control is used to stop the fuel pump when the SRS airbag is deployed in a frontal or side collision. For details, see page EG-52.
- A compact fuel pump in which a fuel filter, pressure regulator, and fuel sender gauge is integrated in the fuel pump assembly is used.
- A quick connector is used to connect the fuel pipe with the fuel hose for excellent serviceability.
- The aluminium die-cast delivery pipe has been integrated with the pulsation damper.
- A compact 12-hole type injector is used to increase atomisation of the fuel.



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2. Fuel Returnless System

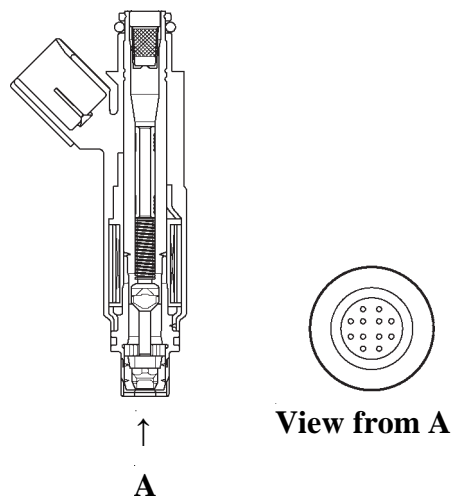
The fuel returnless system is used to reduce the evaporative emission. As shown below, integrating the fuel filter, pressure regulator, and fuel sender gauge with fuel pump assembly makes it possible to discontinue the return of fuel from the engine area and prevent temperature rise inside the fuel tank.



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3. Fuel Injector

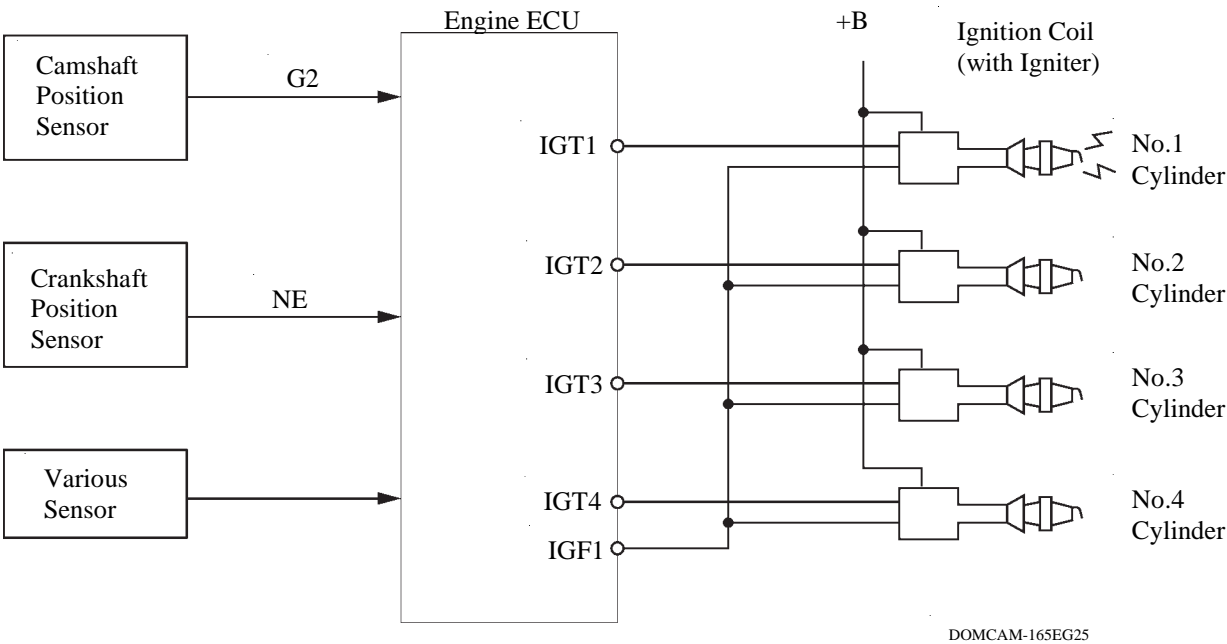
The 12-hole type injector is used to improve the atomisation of fuel.



✱ **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 in this engine is an independent ignition system, which has one ignition coil (with igniter) for each cylinder.

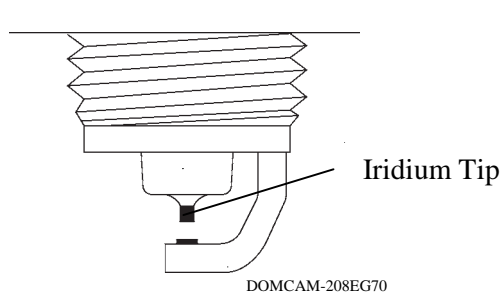


2. Ignition Coil

The DIS provides 4 ignition coils, one for each cylinder. The spark plug caps, which provide contact to the spark plugs, are integrated with an ignition coil. Igniters also form part of this system.

3. Spark Plug

Iridium-tipped spark plugs are used to realise a 100,000 km maintenance-free operation. By making the centre electrode of iridium, the same ignition performance as the platinum-tipped spark plug have been achieved and further improvement of durability has been realised.



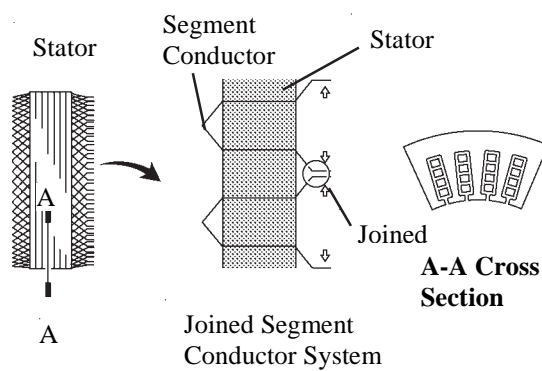
► **Specifications** ◀

DENSO	SK20R11
Plug Gap	1.0 - 1.1 mm

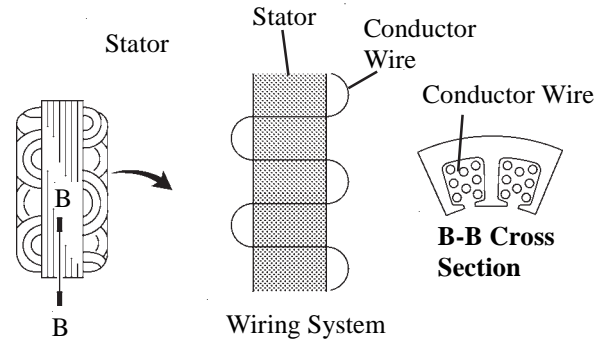
● CHARGING SYSTEM

General

- Instead of the conventional type alternator, a compact and lightweight segment conductor type alternator is used. This type of alternator generates a high amperage output in a highly efficient manner.
- 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.



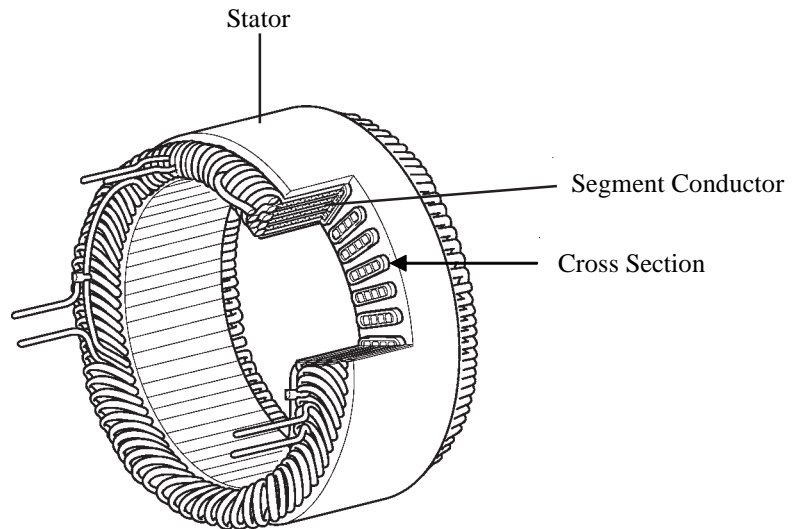
DOMCAM-206EG40



DOMCAM-206EG41

Segment Conductor Type Alternator

Conventional Type Alternator



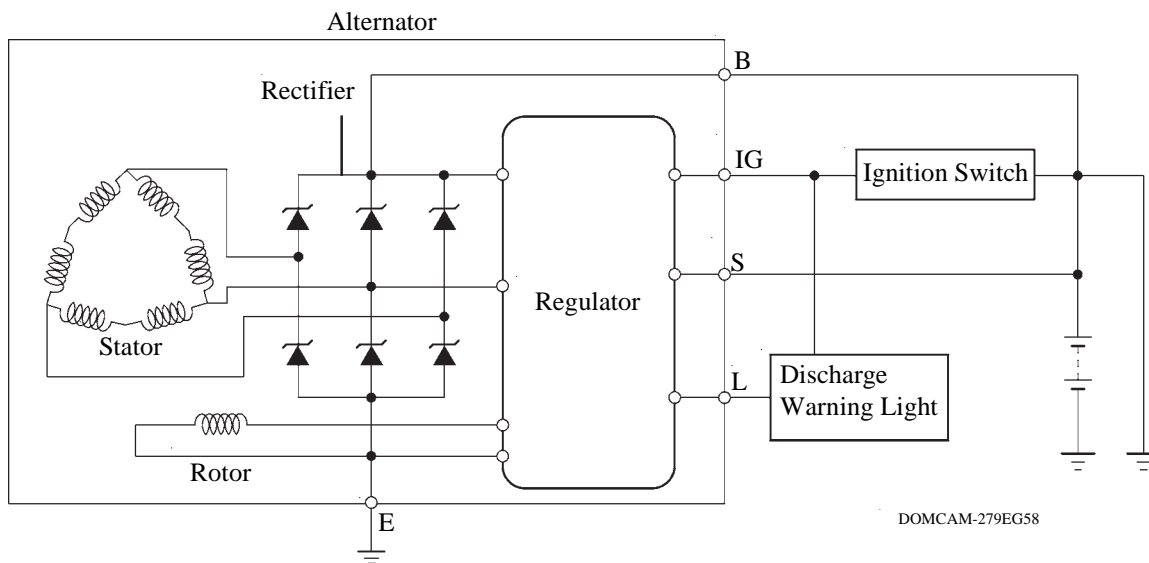
DOMCAM-206EG42

Stator of Segment Conductor Type Alternator

▸ Specifications ◀

Type	SE08A
Rated Voltage	12V
Output Rated	80 A

Wiring Diagram



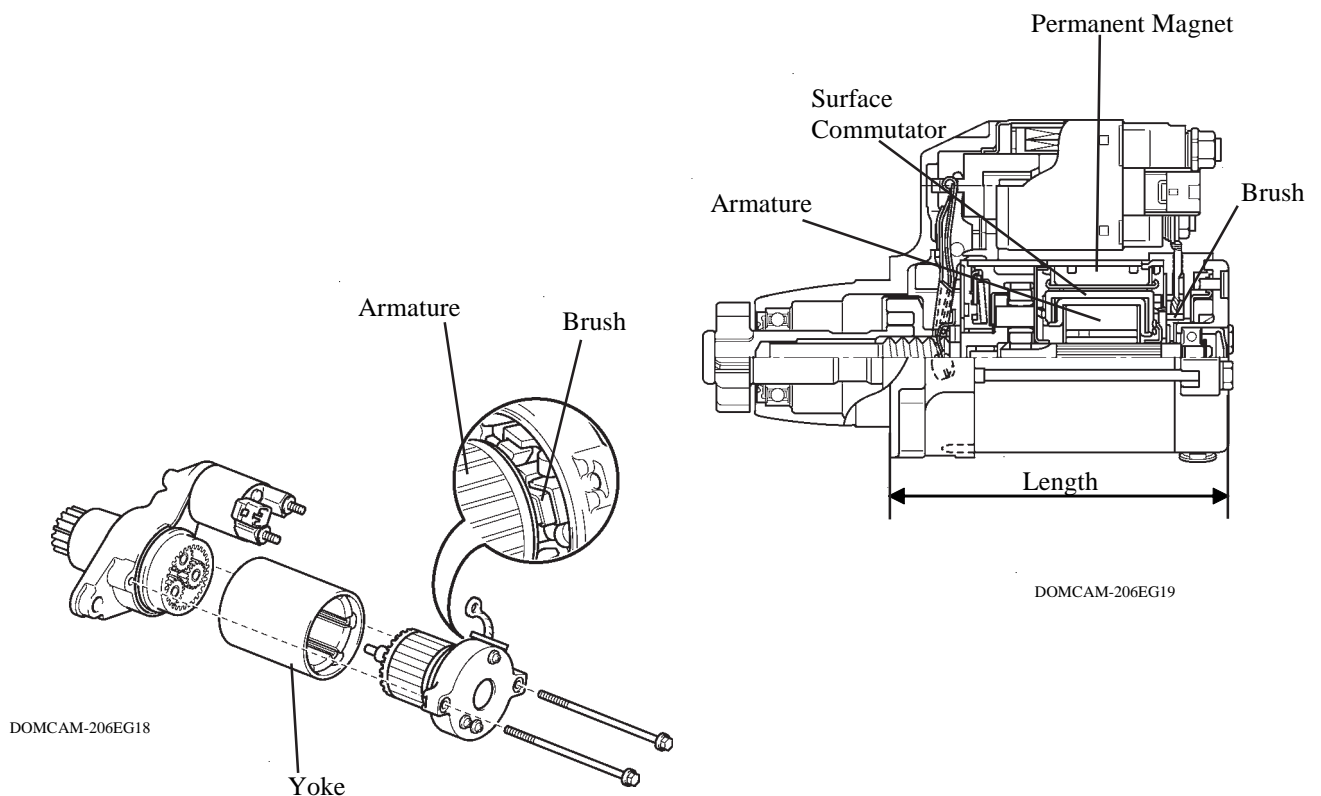
Service Tip

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 Camry Repair Manual.

STARTING SYSTEM

1 General

- A compact and lightweight PS (Planetary reduction-Segment conductor motor) starter is used 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 inter-polar magnets. The main magnets and inter-polar magnets have been efficiently arranged to increase the magnetic flux and to shorten the length of the yoke.



▸ Specifications ◀

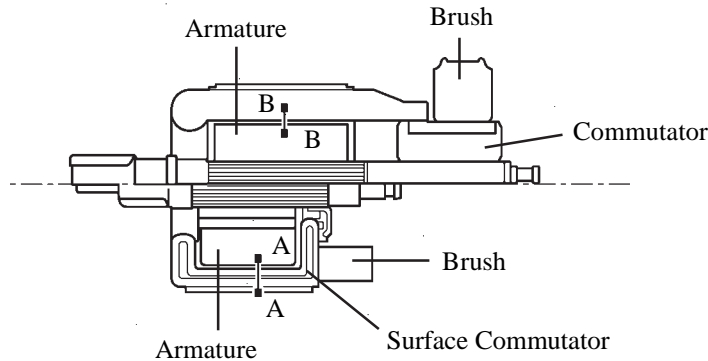
Type	PS Starter (PS1.6)
Length	128 mm
Weight	2950 g
Rating Voltage	12V
Rating Output	1.6 kW
Rotating Direction	Counter clockwise*

*: Viewed from Pinion Side

2 Construction

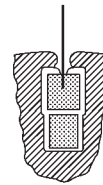
- Instead of the round-shaped conductor wires used in the conventional starter, the PS type starter uses square-shaped conductors. In this type of construction, square-shaped conductors can achieve the same conditions as those achieved by winding numerous round-shaped conductor wires, but without increasing 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.

Conventional Type Starter



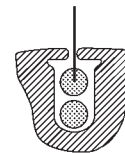
PS Starter

Square Shaped Conductor



**A-A Cross Section
(PS Type)**

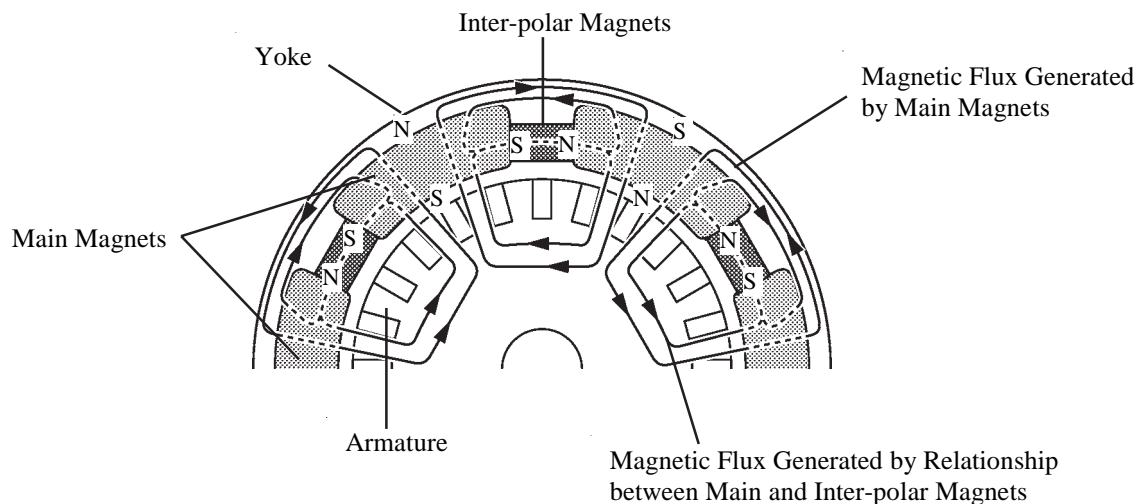
Round-Shaped Conductor Wire



**B-B Cross Section
(Conventional Type)**

DOMCAM-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 inter-polar magnets. The main and inter-polar magnets are arranged alternately inside the yoke. This allows the magnetic flux generated between the main and inter-polar 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.



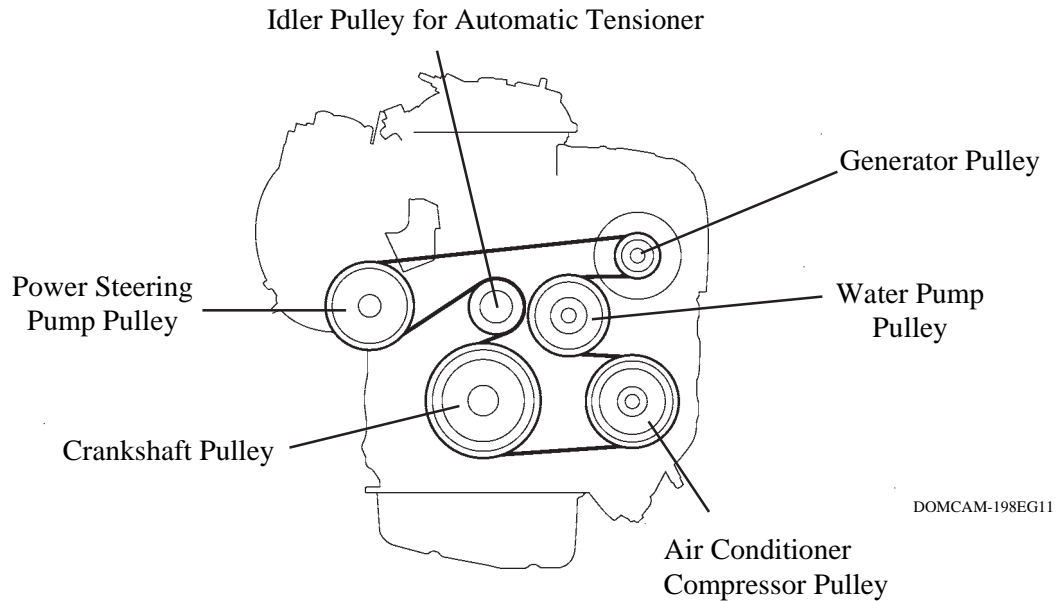
Cross Section of Yoke Portion

DOMCAM-264EG14

SERPENTINE BELT DRIVE SYSTEM

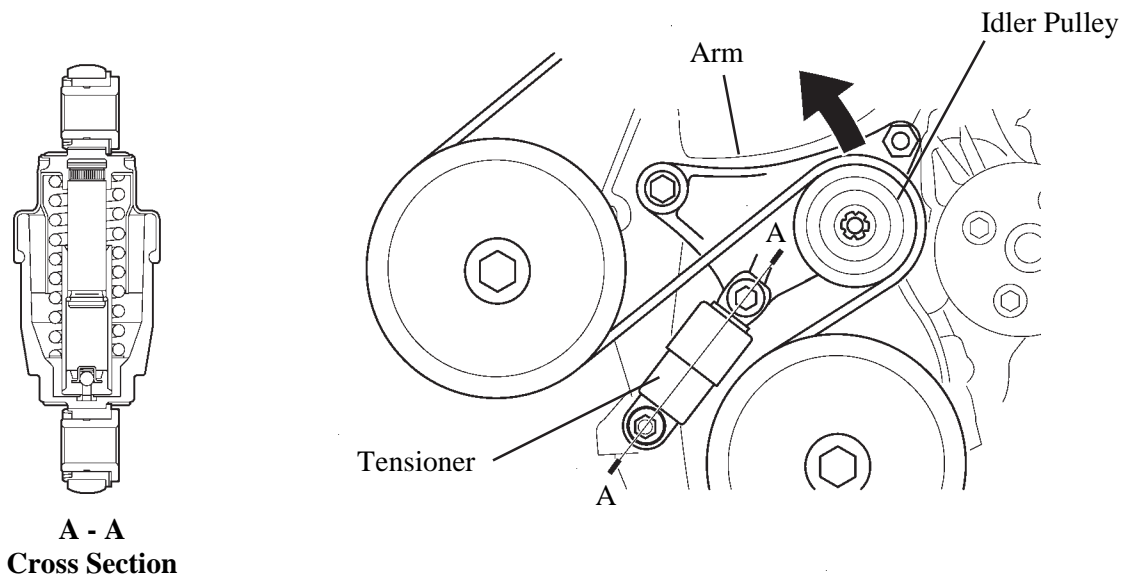
1. General

- 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 automatic tensioner consists of an idler pulley, an arm, and a tensioner. The idler pulley maintains belt tension by the force of the spring that is located in the tensioner.
- Due to the different suppliers used, the tensioner comes in two types, although their basic operation remain the same and they are interchangeable.



✱ ENGINE CONTROL SYSTEM

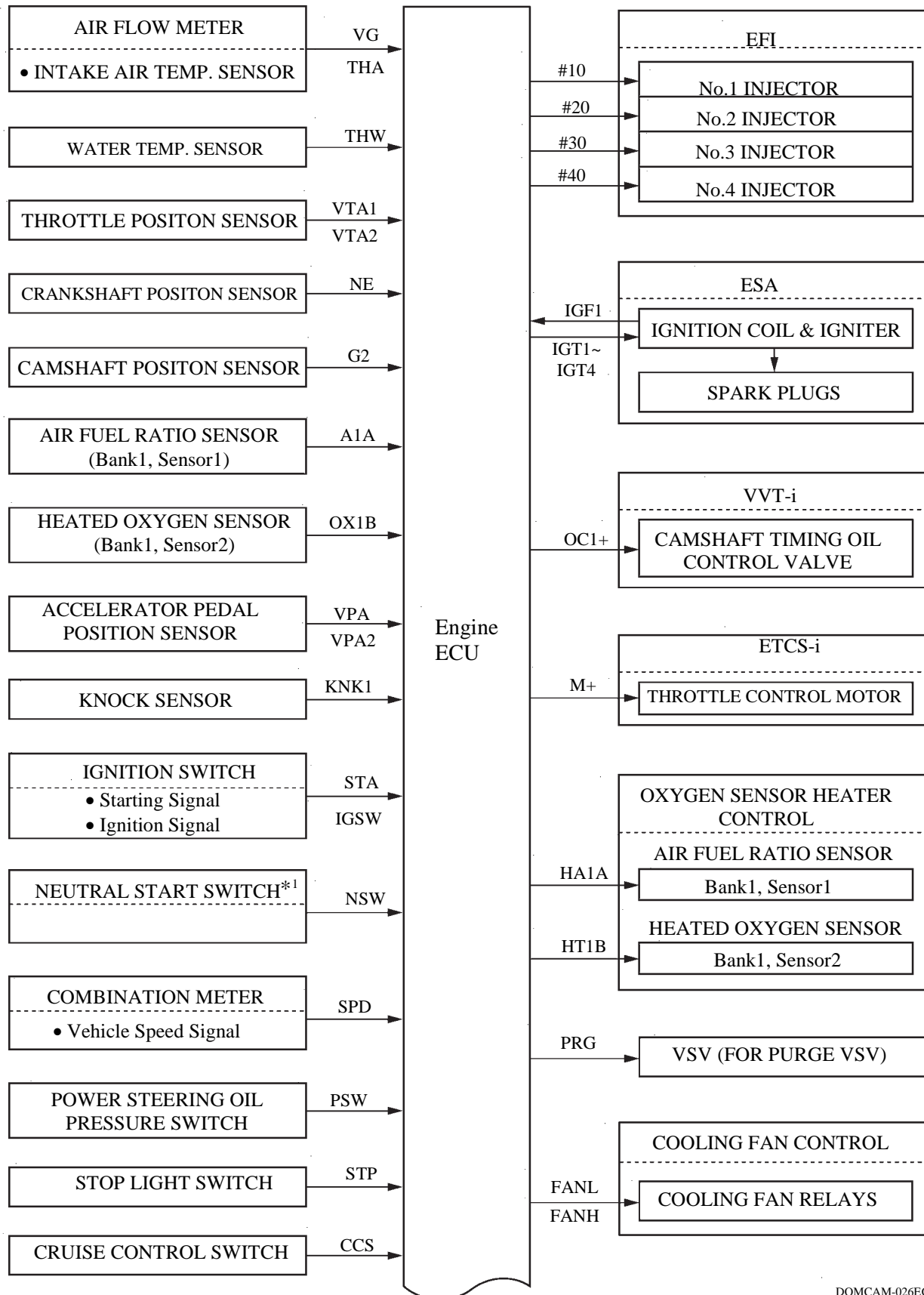
1. General

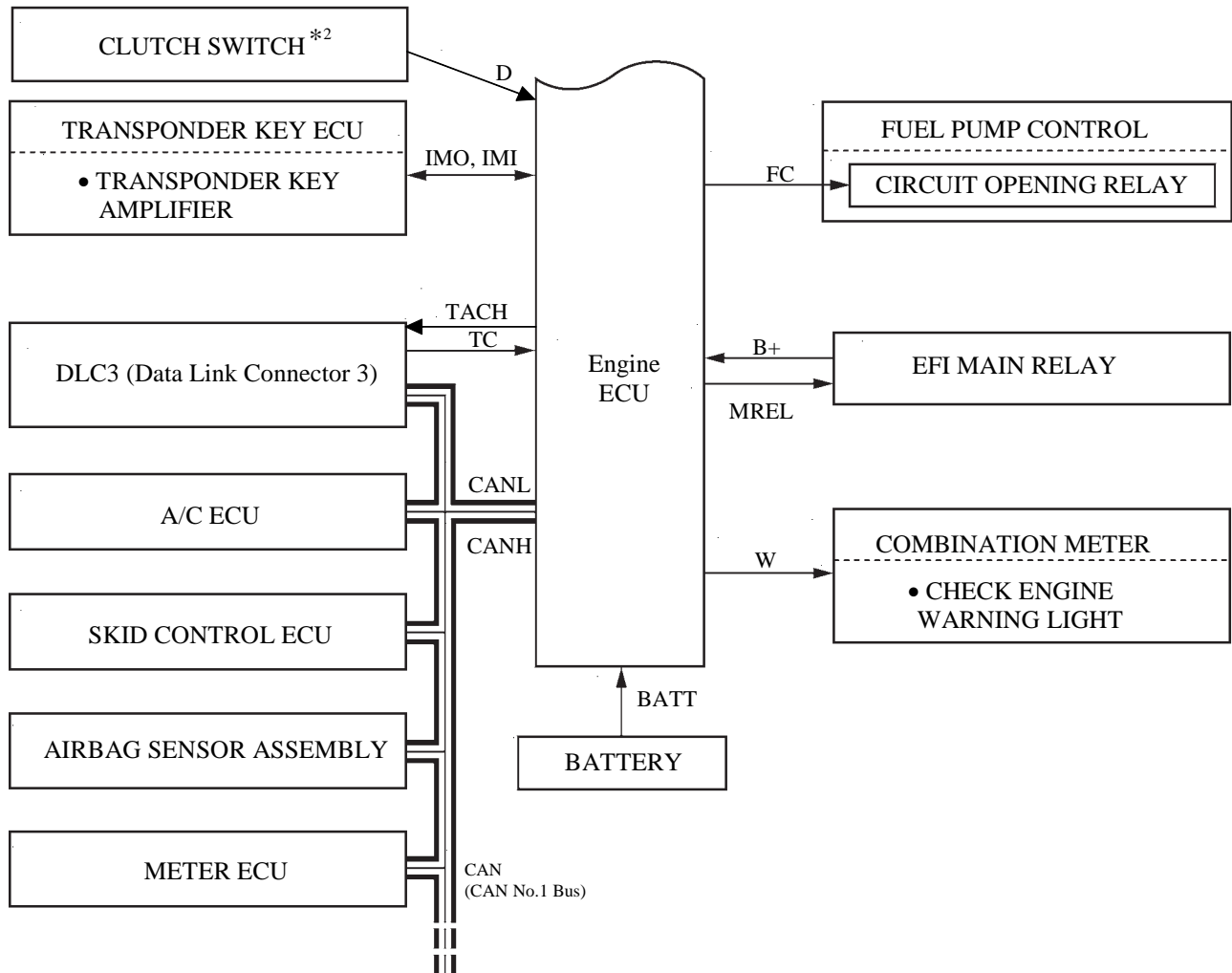
The engine control system of the 2AZ-FE engine has the following features.

System	Outline
EFI - Electronic Fuel Injection	<ul style="list-style-type: none"> • An L-type EFI system directly detects the intake air mass with a hot wire type air flow meter. • The fuel injection system is a sequential multi-port fuel injection system. • 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. • Synchronous injection is further divided into group injection during a cold start, and independent injection after the engine is started.
ESA - Electronic Spark Advance	<ul style="list-style-type: none"> • 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. • 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.
ETCS-i - Electronic Throttle Control System-intelligent	Optimally controls the throttle valve opening in accordance with the amount of accelerator pedal effort and the condition of the engine and the vehicle. [See page EG-46]
VVT-i - Variable Valve Timing-intelligent	Controls the intake camshaft to optimal valve timing in accordance with the engine condition. [See page EG-48]
Fuel Pump Control [See page EG-52]	<ul style="list-style-type: none"> • Fuel pump operation is controlled by signals from the engine ECU. • The fuel pump is stopped, when the SRS airbag is deployed in a frontal, side, and rear of side collision.
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-53]	Cooling fan operation is controlled by signals from the engine ECU based on the water temperature sensor signal and air conditioner operation.
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.
Engine Immobiliser	Prohibits fuel delivery and ignition if an attempt is made to start the engine with an invalid key.
Diagnosis [See page EG-54]	When the engine ECU detects a malfunction, the engine ECU diagnoses and memorises the failed section.
Fail-Safe [See page EG-55]	When the engine ECU detects a malfunction, the engine ECU stops or controls the engine according to the data already stored in the memory.

2. Construction

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



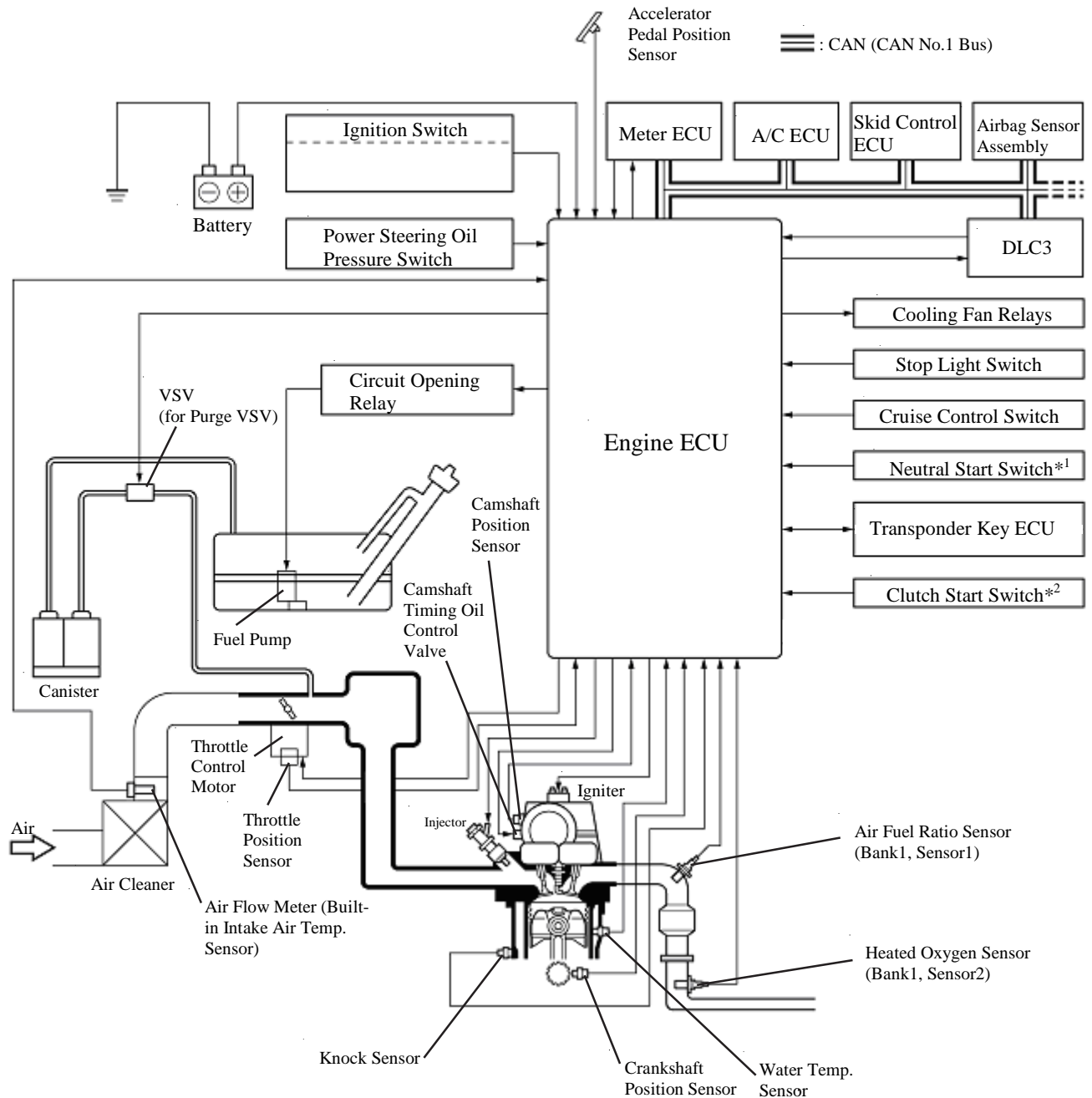


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*1: Automatic transaxle models

*2: Manual transaxle models

3. Engine Control System Diagram

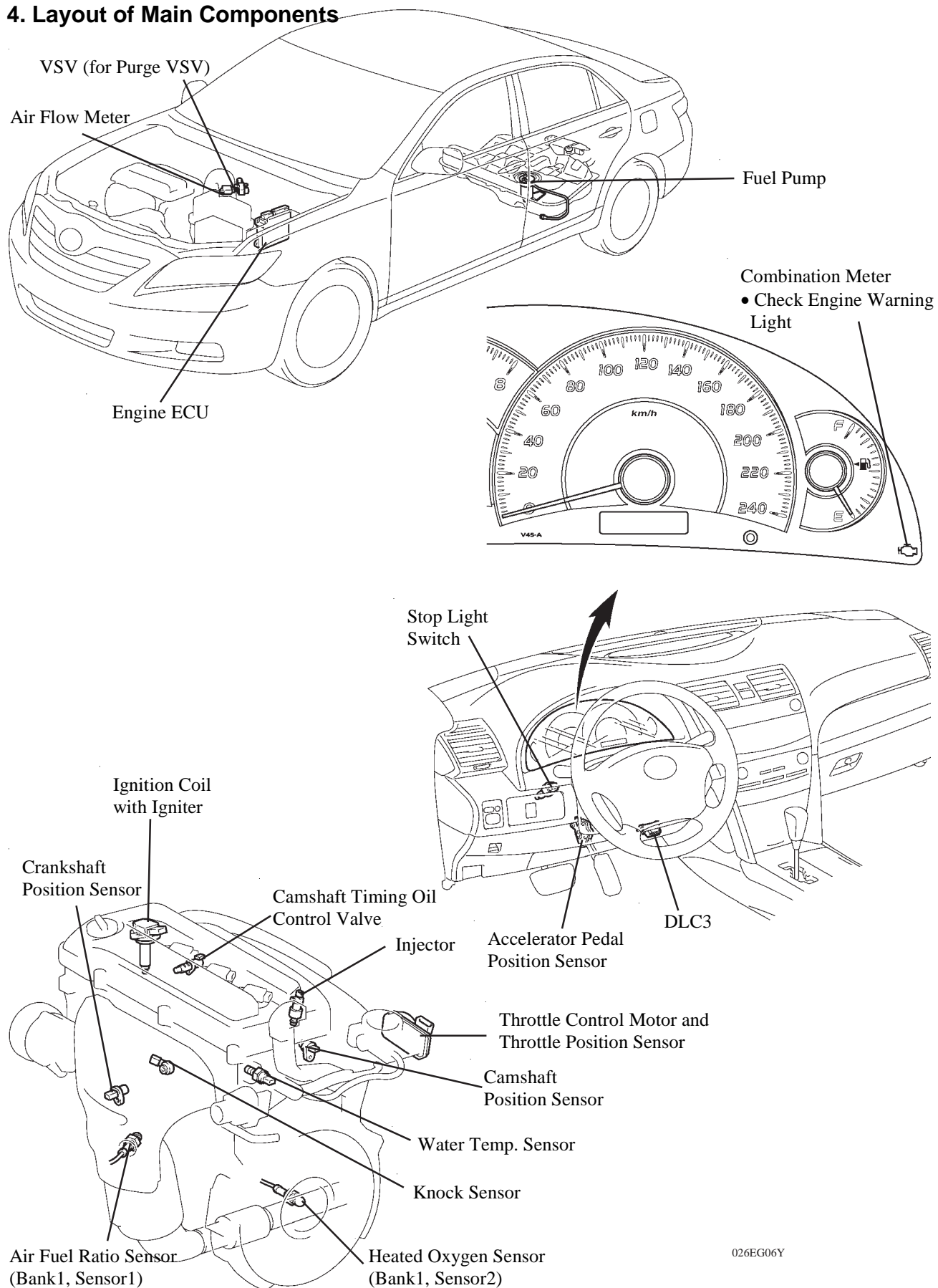


*1: With automatic transaxle model

*2: With manual transaxle model

DOMCAM-026EG05TE

4. Layout of Main Components



026EG06Y

5. Main Component of Engine Control System

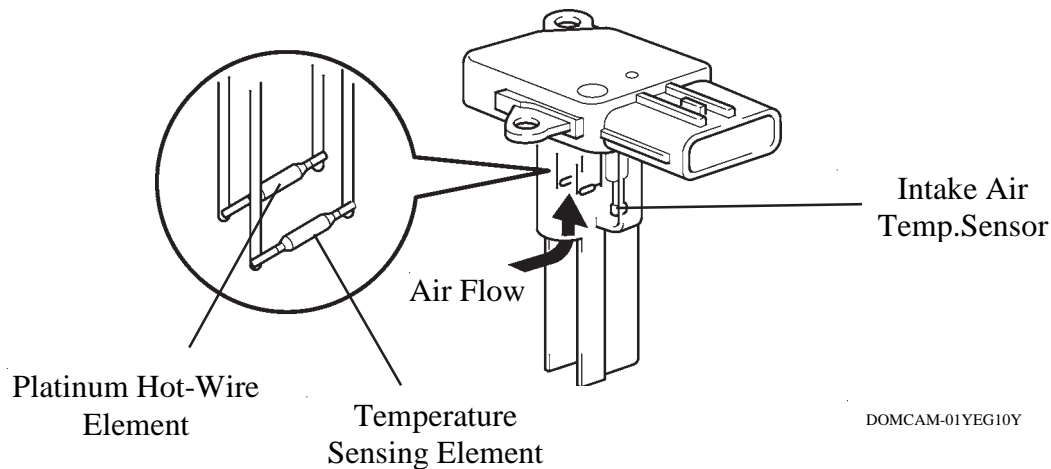
General

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

Components	Outline	Quantity	Function
Engine ECU	32-bit CPU	1	The engine ECU optimally controls the EFI (Electronic Fuel Injection), ESA (Electronic Spark Advance) and ISC (Idle Speed Control) to suit the operating conditions of the engine in accordance with the signals provided by the sensors.
Oxygen Sensor (Bank 1, Sensor 2)	Cup Type with Heater	1	This sensor detects the oxygen concentration in the exhaust emission by measuring the electromotive force which is generated in the sensor itself.
Air Fuel Ratio Sensor (Bank 1, Sensor 1)	Planar Type with Heater	1	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.
Air Flow Meter	Hot-wire Type	1	This sensor has a built-in hot-wire to directly detect the intake air mass.
Crankshaft Position Sensor (Rotor Teeth)	Pick-up Coil Type (36-2)	1	This sensor detects the engine speed and performs the cylinder identification.
Camshaft Position Sensor (Rotor Teeth)	Pick-up Coil Type (3)	1	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	Built-in Piezoelectric Type (Flat Type)	1	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	This sensor detects the throttle valve opening angle.
Accelerator Pedal Position Sensor	No-contact Type	1	This sensor detects the amount of pedal effort applied to the accelerator pedal.
Injector	12-Hole Type	4	The injector is an electromagnetically-operated nozzle which injects fuel in accordance with signals from the engine ECU.

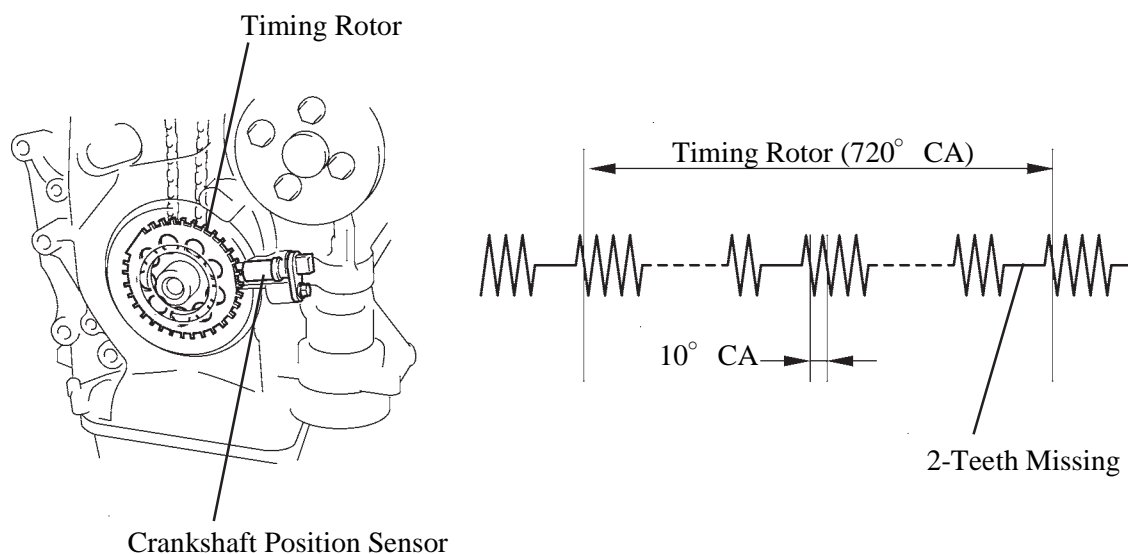
Air Flow Meter

- 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.



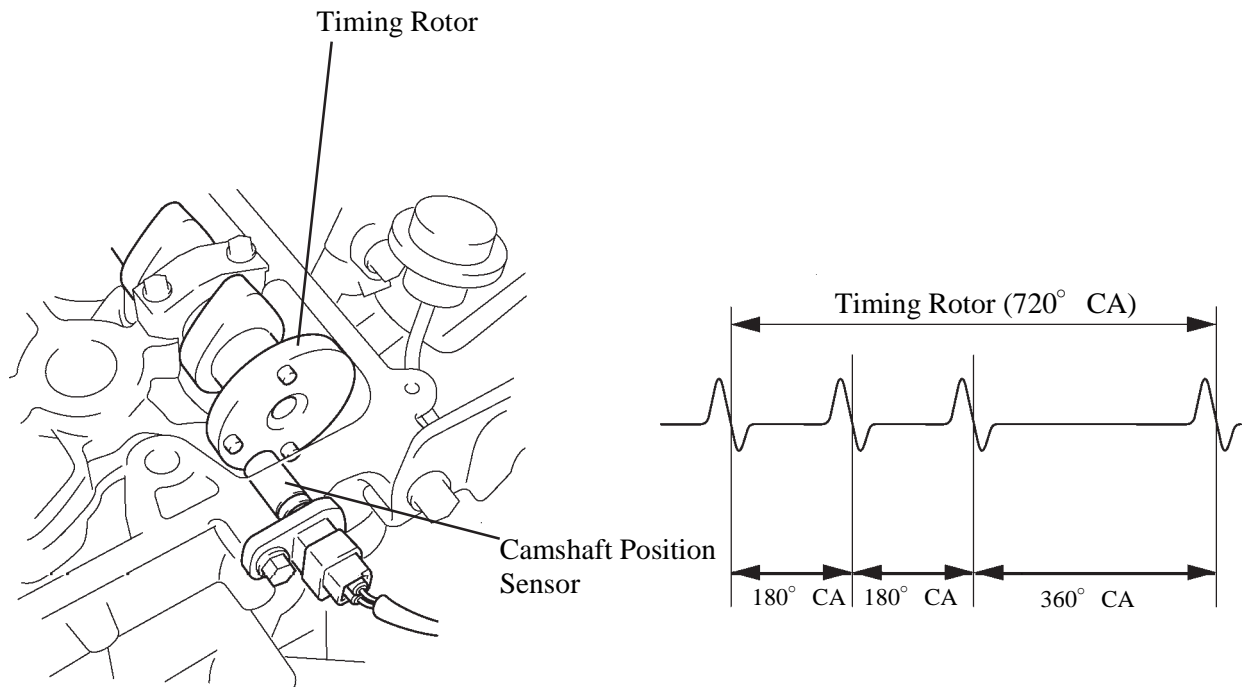
Crankshaft Position Sensor

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° , and the missing teeth are used to determine the top-dead-centre.



Camshaft Position Sensor

The camshaft position sensor is mounted on the left bank of cylinder head. To detect the camshaft position, a protrusion that is provided on the timing pulley is used to generate 1 pulse for every 2 revolution of the crankshaft.

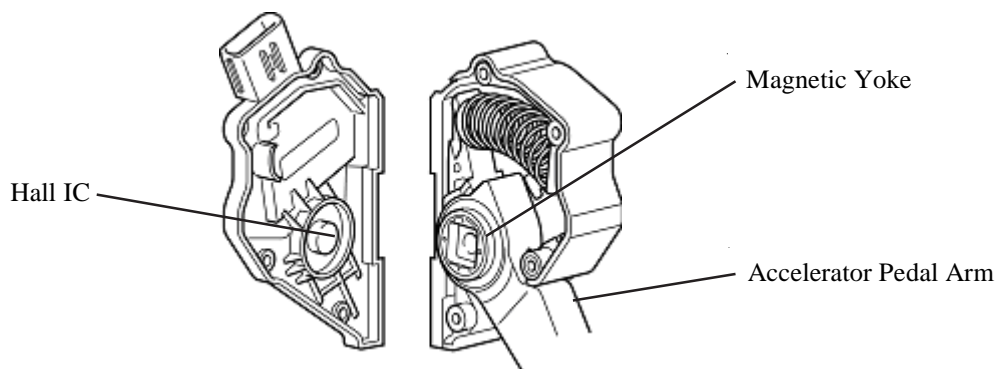


DOMCAM-208EG25

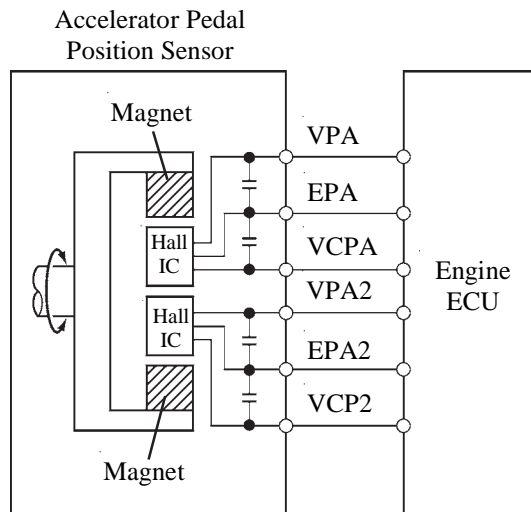
Accelerator Pedal Position Sensor

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

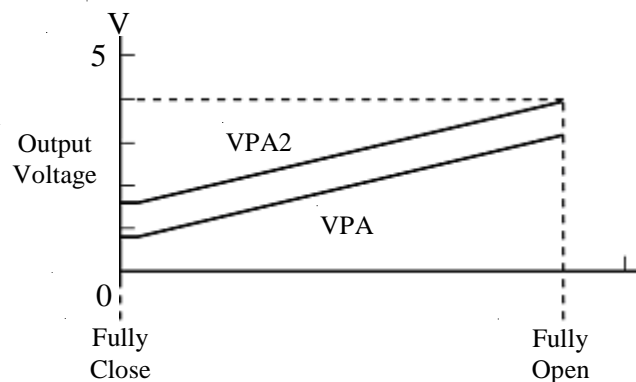
- The magnetic yoke is mounted at the base of the accelerator pedal arm. This yoke rotates around the Hall IC in accordance with the amount of effort that is applied to the accelerator pedal. The Hall IC converts the changes in the magnetic flux that occur into electrical signals, and outputs them in 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.



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Accelerator Pedal Position (Angle)

DOMCAM-0140EG126C

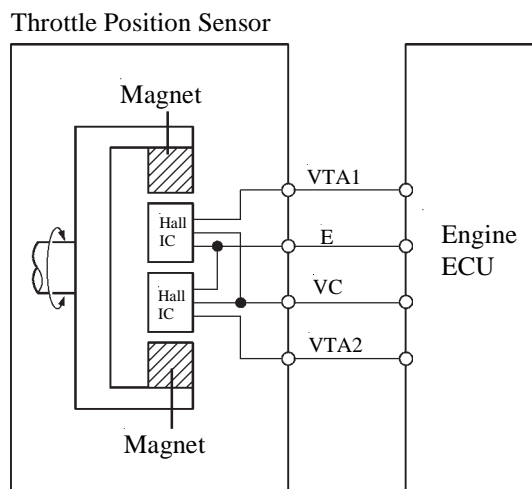
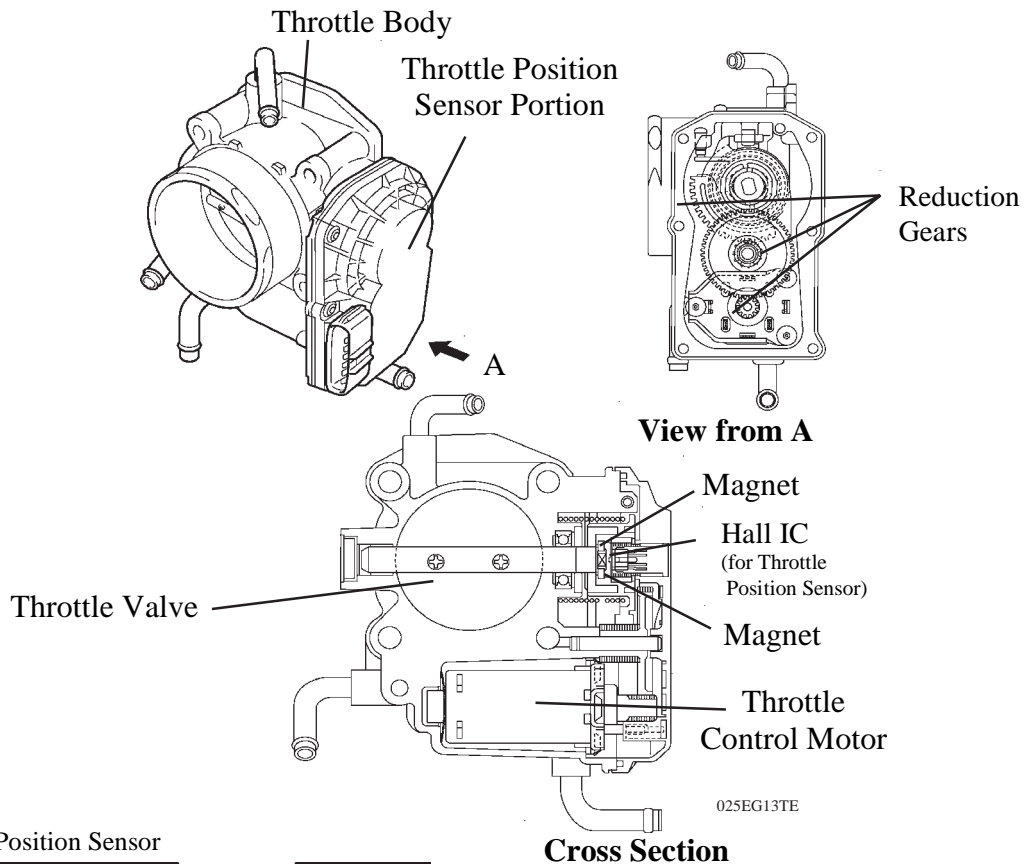
Service Tip

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

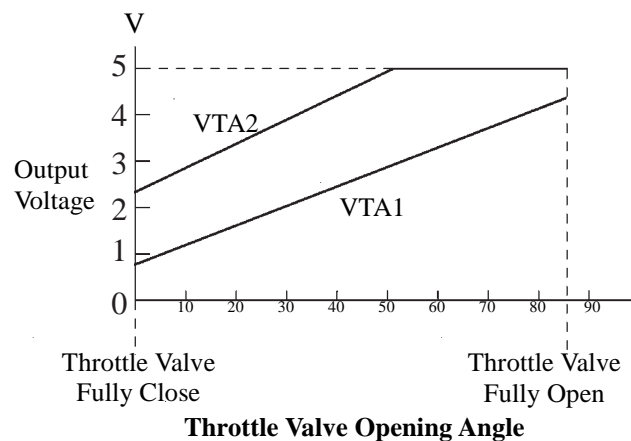
Throttle Position Sensor

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.



DOMCAM-230LX12



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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 Camry Repair Manual .

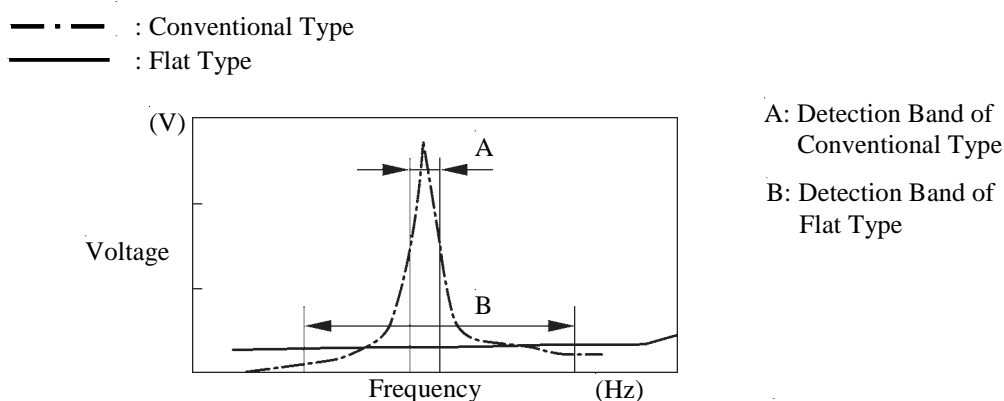
Knock Sensor (Flat Type)

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.

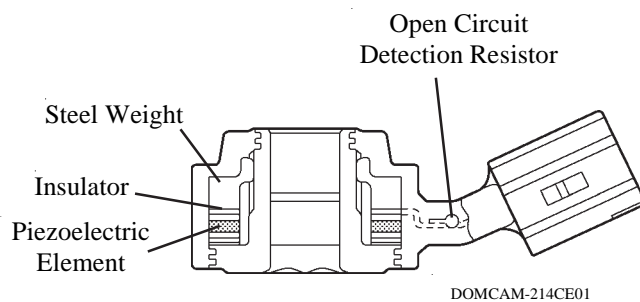


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Characteristic of Knock Sensor

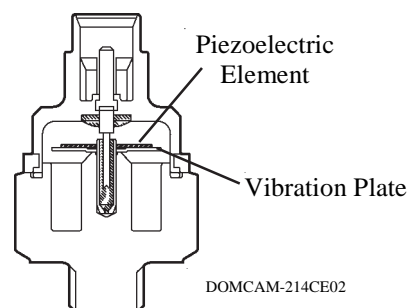
2) Construction

- 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.



DOMCAM-214CE01

Flat Type Knock Sensor
(Non-Resonant Type)

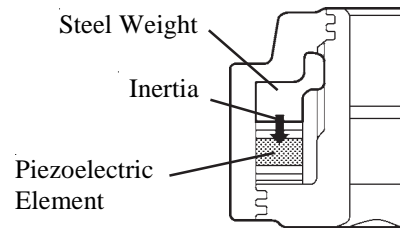


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Conventional Type Knock Sensor
(Resonant Type)

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.

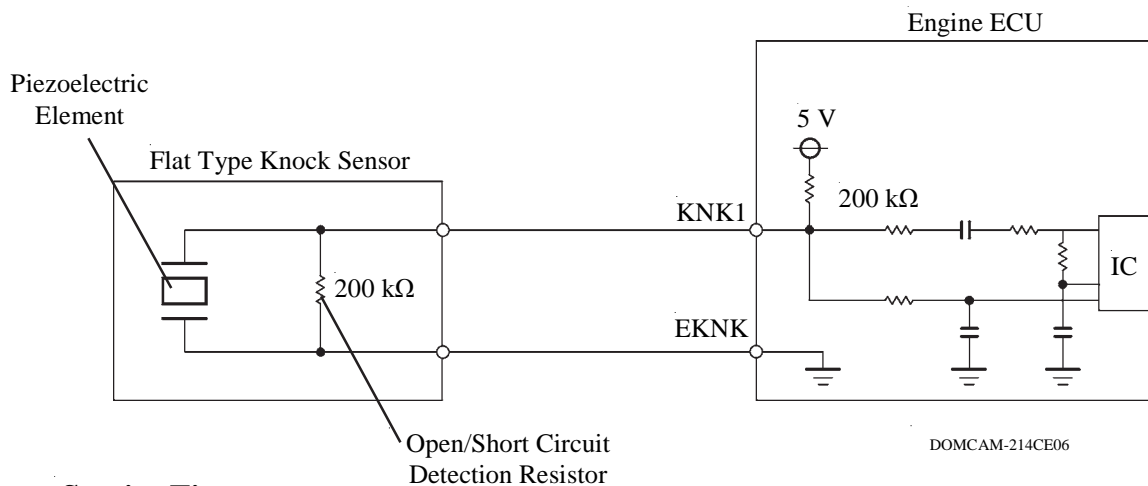


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4) Open/Short Circuit Detection Resistor

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.

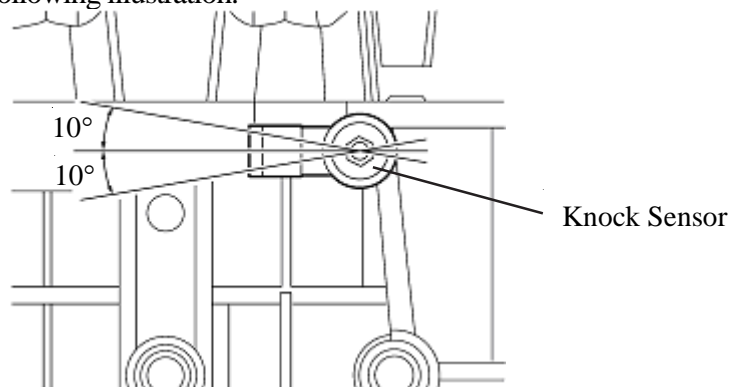
An IC (Integrated Circuit) in the engine ECU is always monitoring the voltage of the terminal KNK1. If the open/short circuit occurs between the knock sensor and the engine ECU, the voltage of the terminal KNK1 will change and the engine ECU detects the open/short circuit and stores DTC (Diagnostic Trouble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



DOMCAM-214CE06

Service Tip

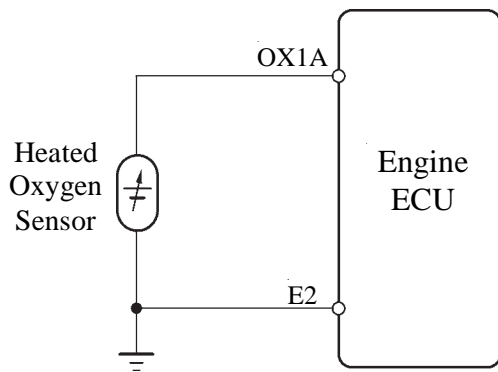
- In accordance with the adoption of open/short circuit detection resistor, the inspection method for the sensor has been changed. For details, refer to Camry Repair Manual.
- To prevent the water accumulation in the connector, make sure to install the flat type knock sensor in the position as shown in the following illustration.



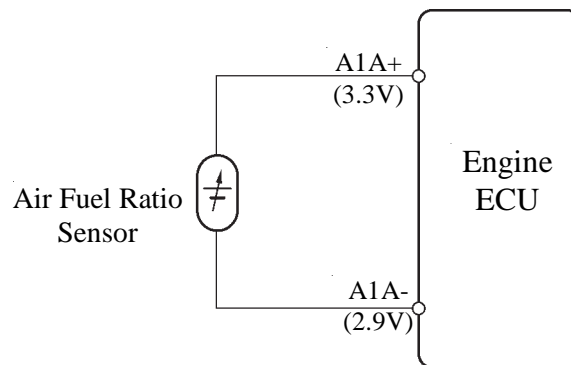
Heated Oxygen Sensor and Air Fuel Ratio Sensor

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.

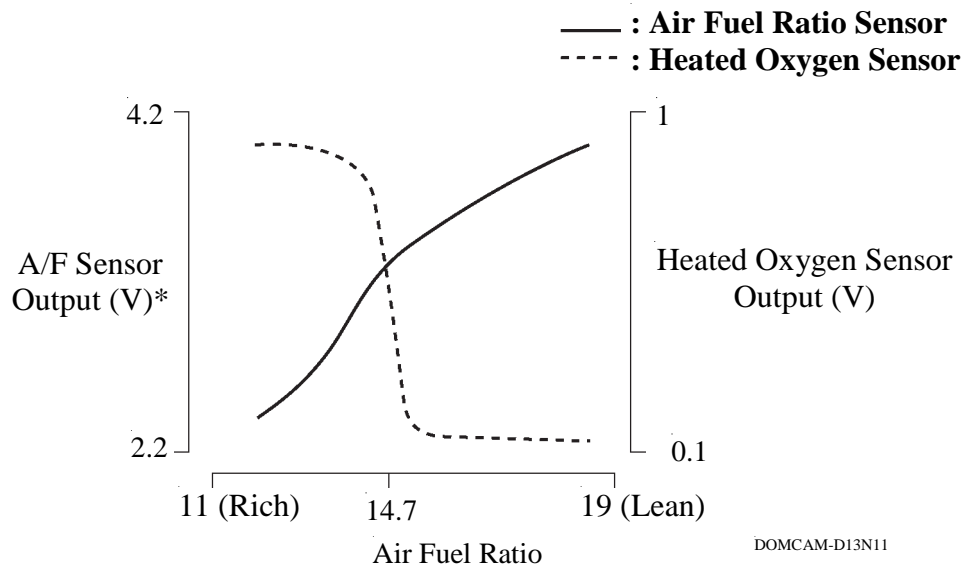


Heated Oxygen Sensor Circuit



Air Fuel Ratio Sensor Circuit

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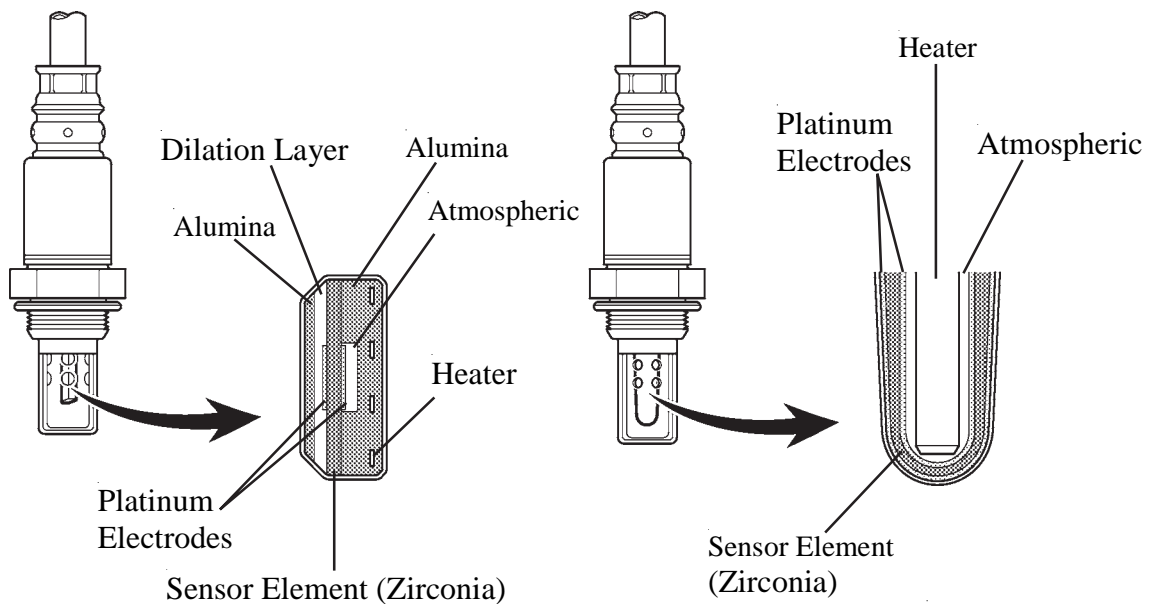


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*: This calculation value is used internally in the engine ECU, and is not an engine ECU terminal voltage.

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

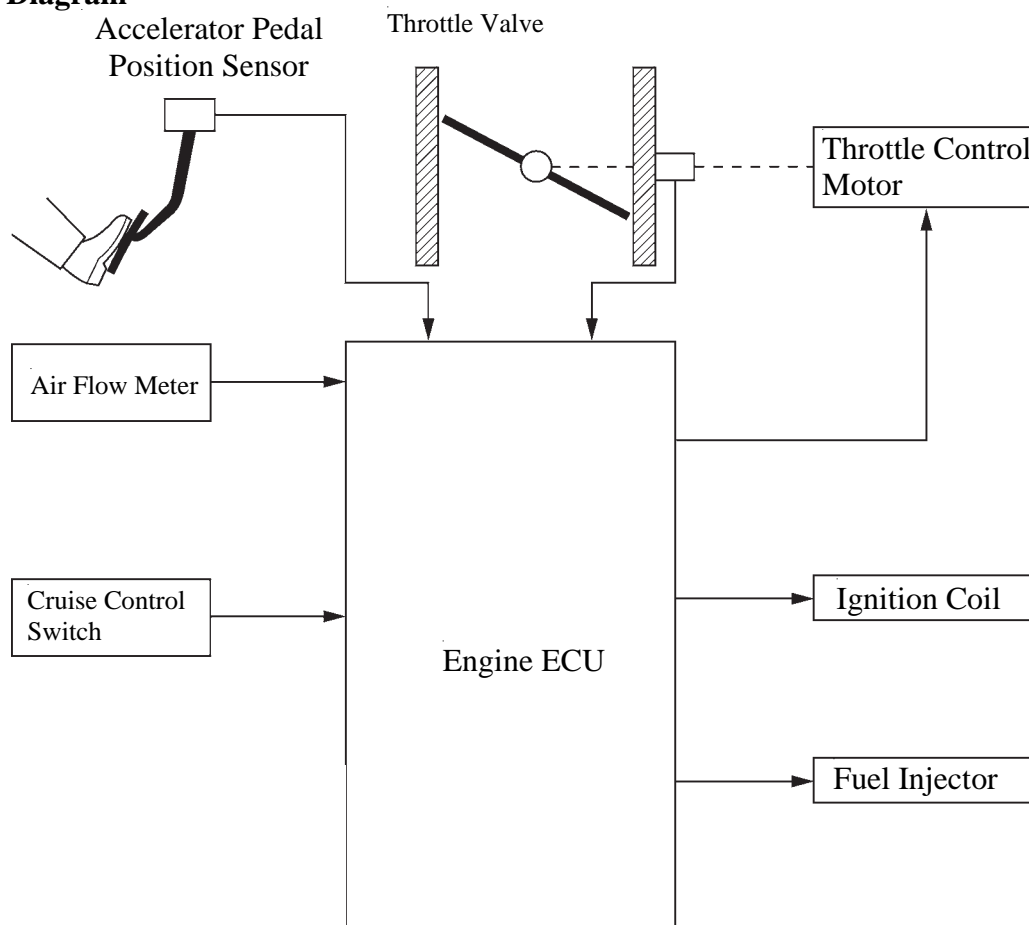
Cup Type Heated Oxygen Sensor

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-59.

▶ System Diagram ◀



Control

1) General

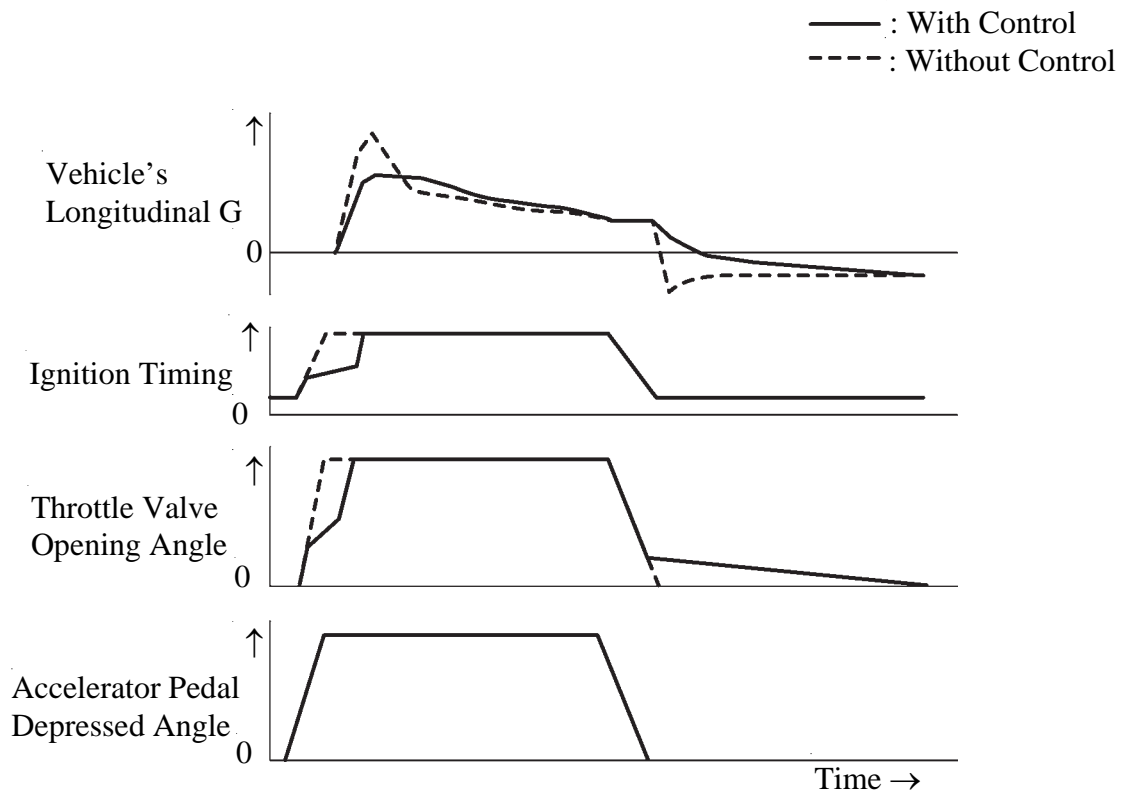
The ETCS-i consists of the following five functions:

- Normal Throttle Control (Non-linear Control)
- ISC (Idle Speed 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 ◀



00MEG38Y

3) Idle Speed Control

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

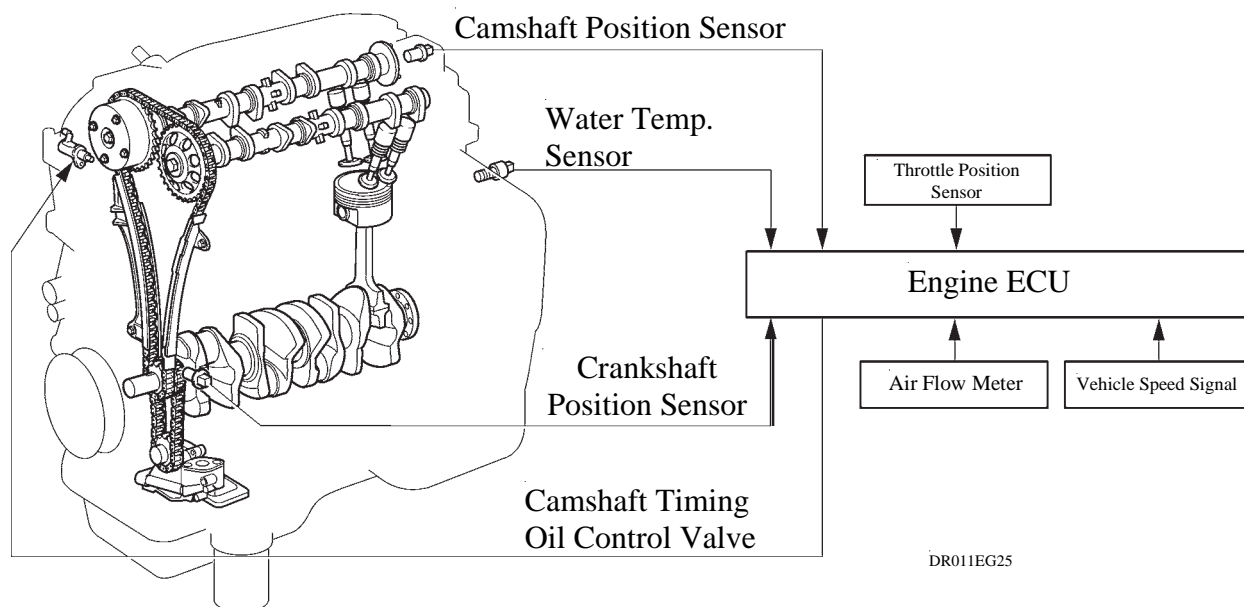
4) Cruise Control

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

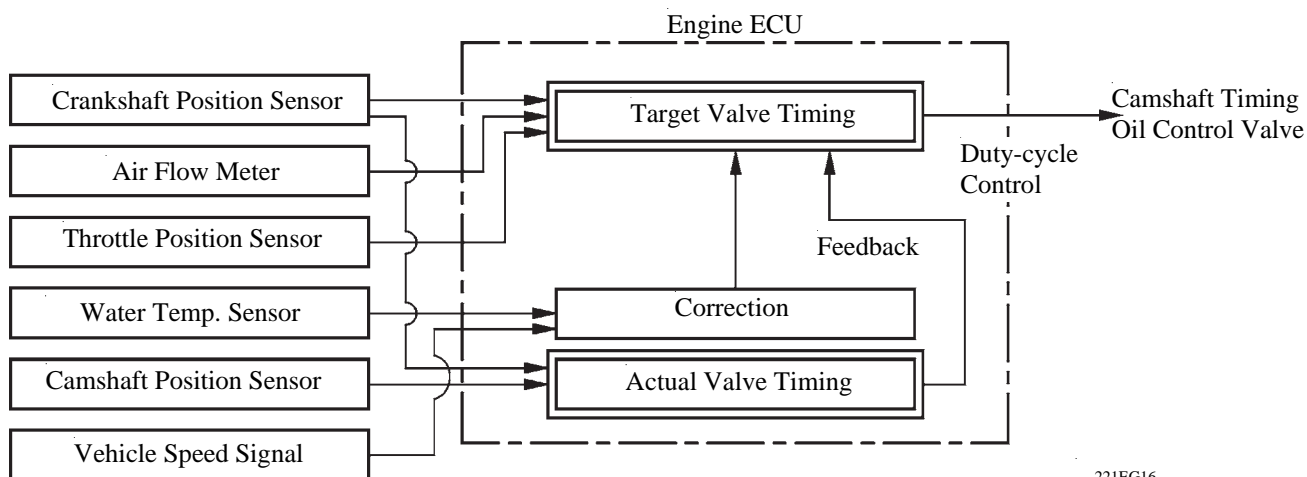
7. VVT-i (Variable Valve Timing-intelligent) System

General

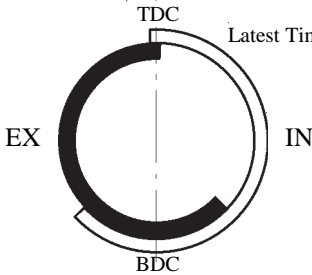
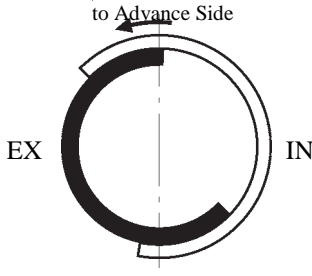
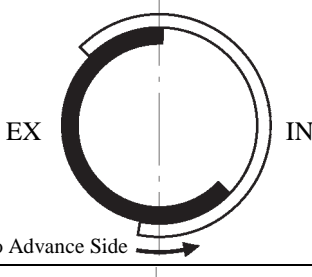
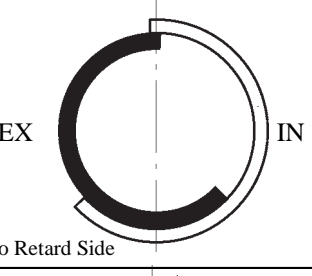
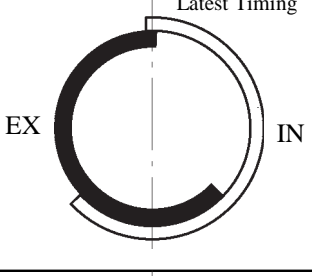
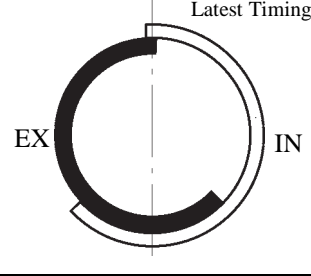
- The VVT-i system is designed to control the intake camshaft within a range of 40° (of Crankshaft Angle) to provide valve timing that is optimally suited to the engine condition. This improves torque in all the speed ranges as well as increasing fuel economy, and reducing exhaust emissions.



- Using the engine speed, intake air volume, throttle position and water temperature, the engine ECU can calculate 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

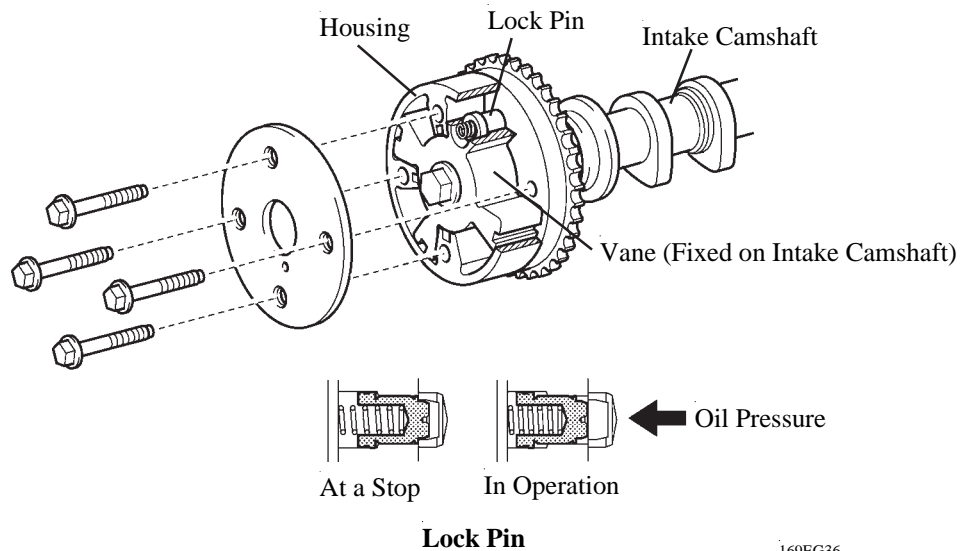
Operation State	Objective	Effect
<ul style="list-style-type: none"> During Idling At Light Load 	 <p>Minimising overlap to prevent blow back to the intake side</p> <p>DOMCAM-DR011EG27</p>	<ul style="list-style-type: none"> Stabilised idling rpm Better fuel economy
At Medium Load	 <p>Increasing overlap to increase internal EGR to reduce pumping loss</p> <p>DOMCAM-DR011EG28</p>	<ul style="list-style-type: none"> Better fuel economy Improved emission control
In Low to Medium Speed Range with Heavy Load	 <p>Advancing the intake valve close timing for volumetric efficiency improvement</p> <p>DOMCAM-DR011EG29</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>DOMCAM-DR011EG27</p>	Improved output
At Low Temp	 <p>Minimising overlap to prevent blow back to the intake side</p> <p>DOMCAM-DR011EG27</p>	<ul style="list-style-type: none"> Stabilised fast idle rpm Better fuel economy
<ul style="list-style-type: none"> Upon Starting Stopping the Engine 	 <p>Minimising overlap to prevent blow back to the intake side</p> <p>DOMCAM-DR011EG27</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 camshaft.
- The oil pressure sent from the advance or retard side path at the intake camshaft causes rotation in the VVT-i controller vane circumferential direction to vary the intake valve timing continuously. When the engine is stopped, the intake camshaft will be in the most retarded state to ensure start ability.

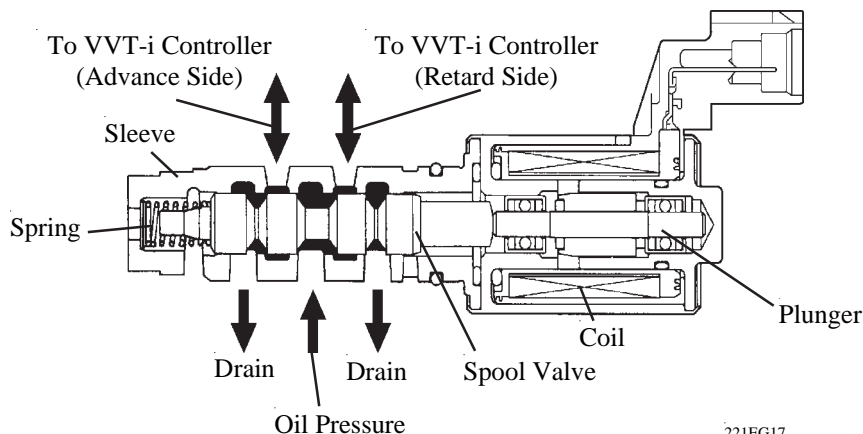
When hydraulic pressure is not applied to the VVT-i controller immediately after the engine has been started, the lock pin locks the movement of the VVT-i controller to prevent a knocking noise.



169EG36

2) Camshaft Timing Oil Control Valve

The camshaft timing oil control valve controls the spool valve position in accordance with the duty control from the engine ECU thus allocating the hydraulic pressure that is applied to the VVT-i controller to the advance and the retard side. When the engine is stopped, the camshaft timing oil control valve is in the most retarded state.

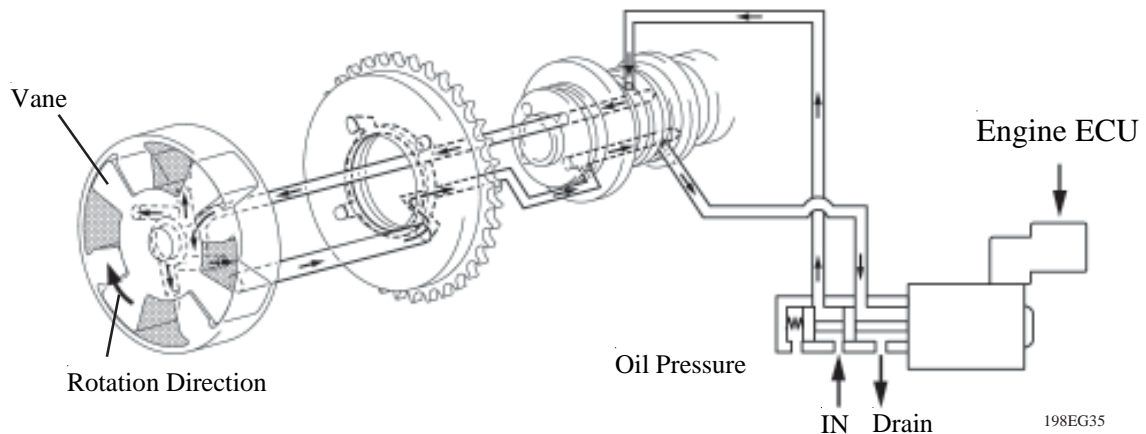


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Operation

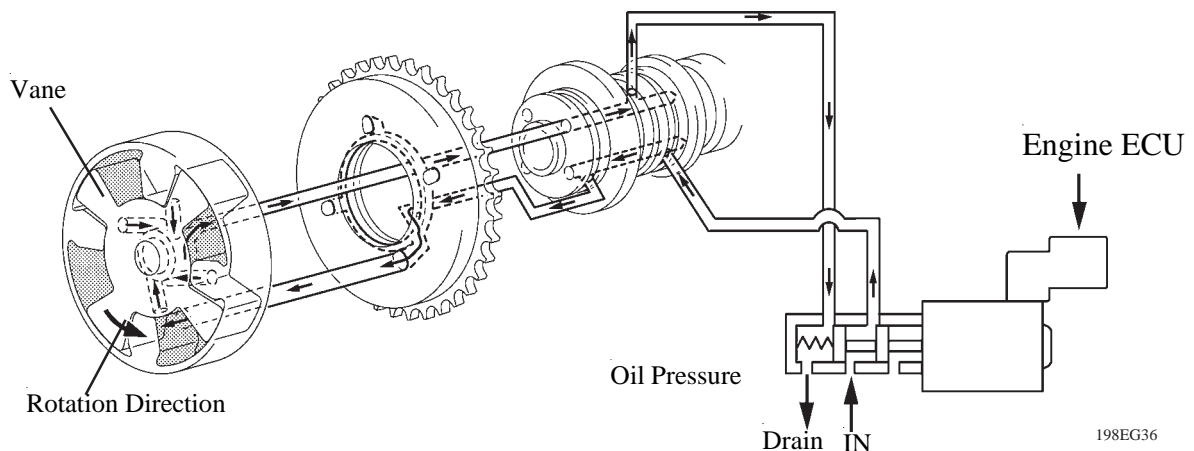
1) Advance

When the camshaft timing oil control valve is positioned as illustrated below by the advance signal 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.



2) Retard

When the camshaft timing oil control valve is positioned as illustrated below by the retard signal 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.



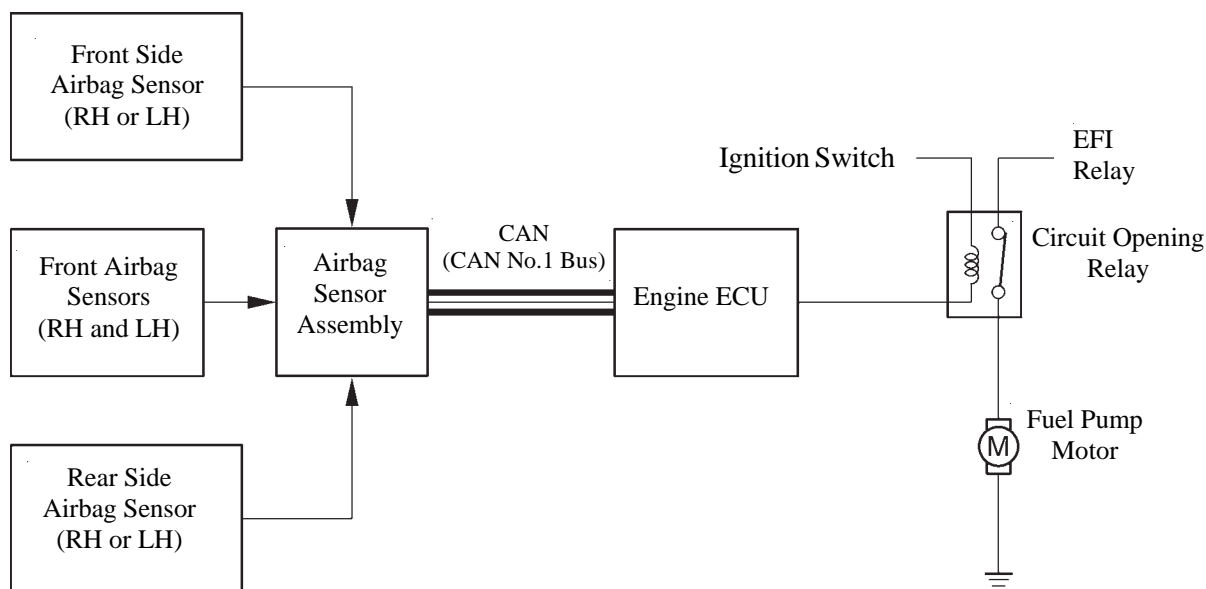
3) Hold

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. 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 from OFF to ON cancels the fuel cut control, and the engine can be restarted.

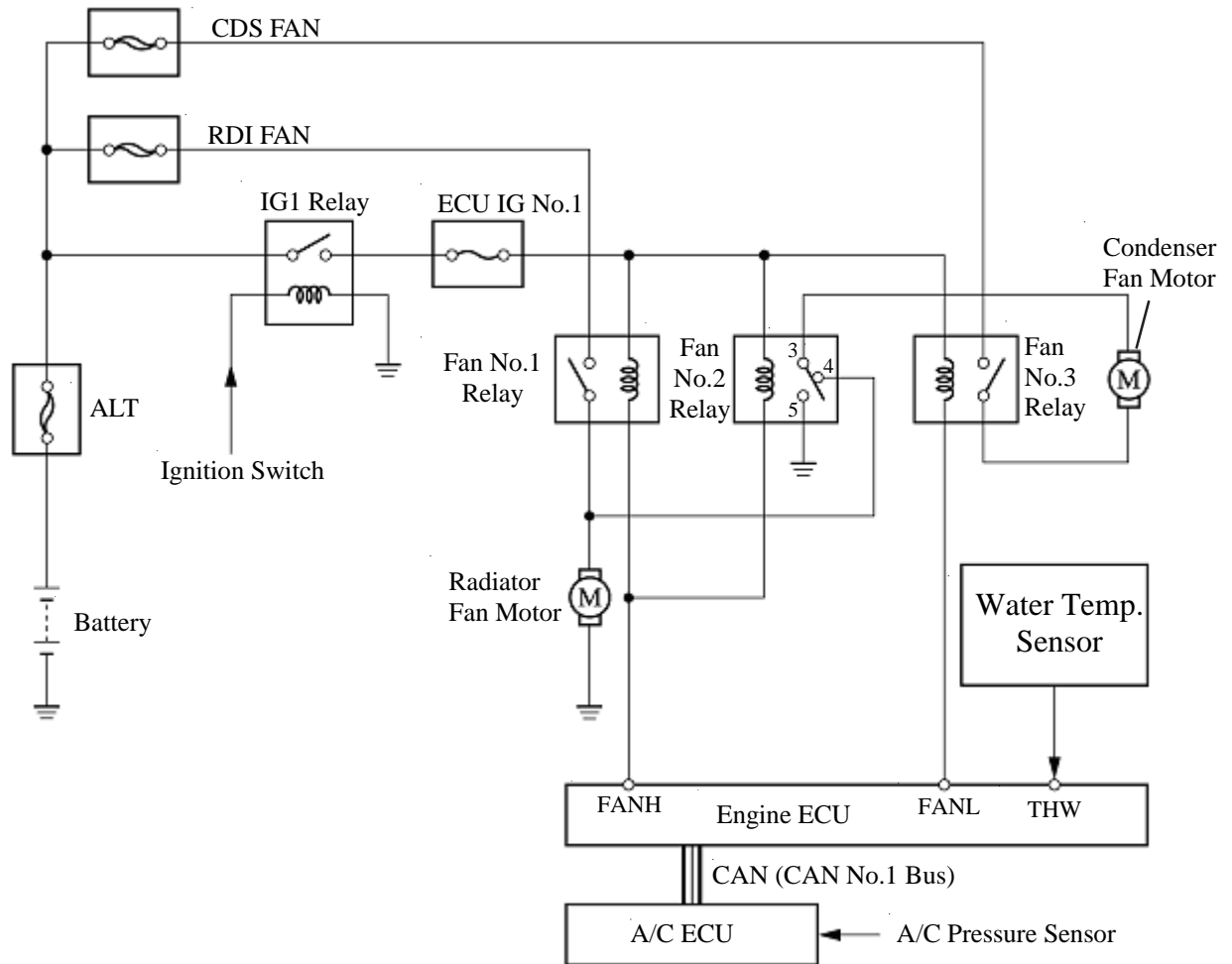


02HEG20TE

9. Cooling Fan Control System

- A cooling fan control system in which the engine ECU controls the cooling fan speed in accordance with the engine coolant temperature and the air conditioner operating condition.
- The engine ECU controls the cooling fan speed based on A/C pressure sensor signals and water temperature sensor signals. The A/C pressure sensor signals are sent from the A/C ECU to the engine ECU via the CAN. This control is accomplished by operating the 2 fan motors in 2 stages at low speed (series connection) and high speed (parallel connection).

► Wiring Diagram ◀



02KEG28TE

► Cooling Fan Operation ◀

Air Conditioner Operating Condition	Engine Coolant Temperature	Relay Operation			Cooling Fan Motor Connection	Cooling Fan Operation
		No.1	No.2	No.3		
OFF	Low	OFF	3 to 4	OFF	OFF	OFF
	High	ON	3 to 5	ON	Parallel	High
A/C Pressure "Low"	Low	OFF	3 to 4	ON	Series	Low
A/C Pressure "High"	Low	ON	3 to 5	ON	Parallel	High
A/C Pressure "Low"	High	ON	3 to 5	ON	Parallel	High
A/C Pressure "High"	High	ON	3 to 5	ON	Parallel	High

10. Diagnosis

- When the engine ECU detects a malfunction, the engine ECU makes a diagnosis and memorises 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 Camry Repair Manual.

Service Tip

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

11. Fail-Safe

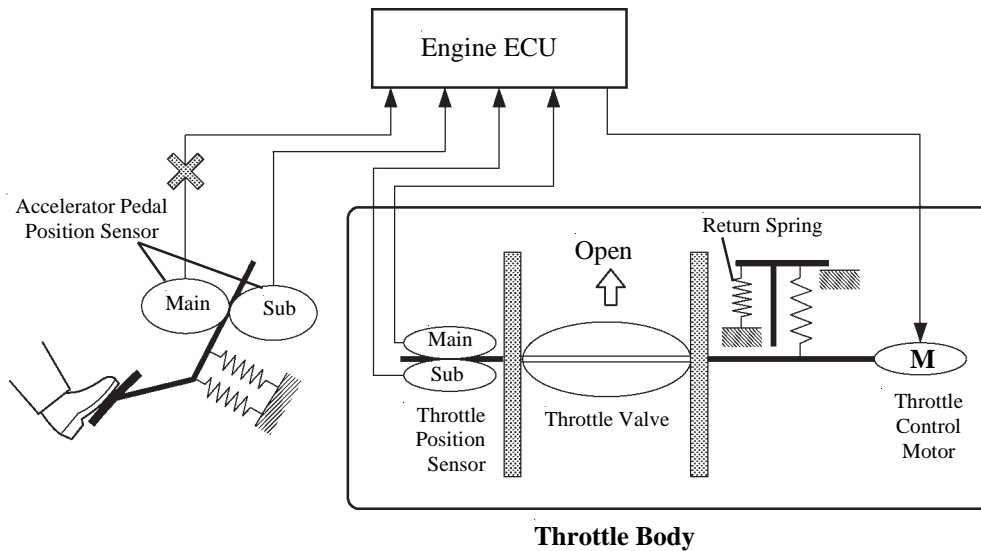
General

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 Camry Repair Manual.

Fail-safe of Accelerator Pedal Position Sensor

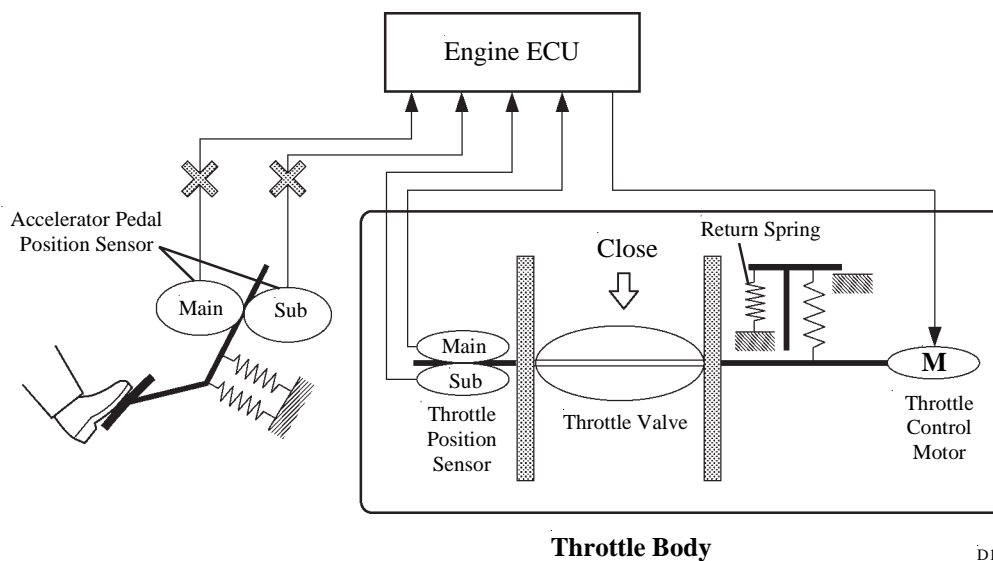
The accelerator pedal position sensor comprises two (Main, Sub) sensor circuits.

- 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.

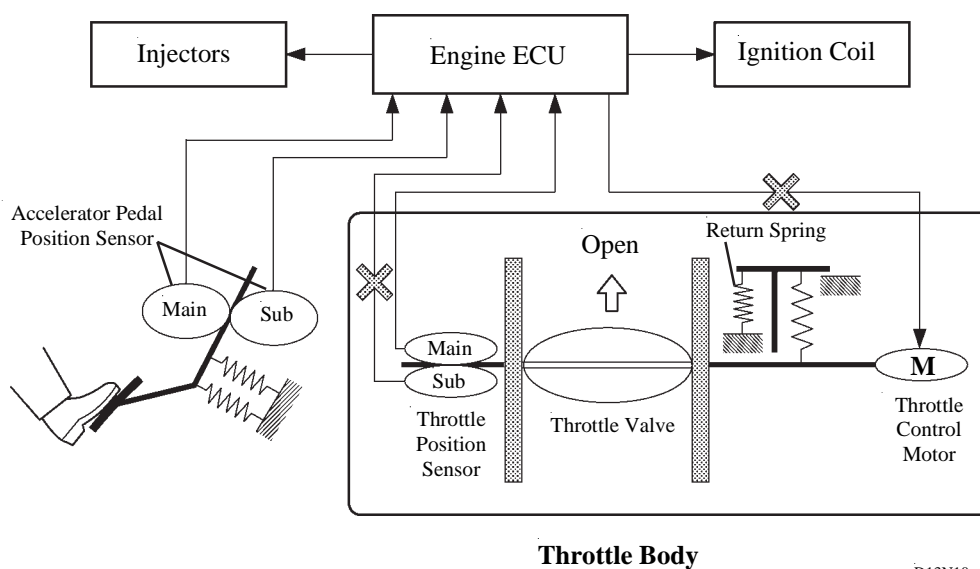


D13N09

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.



CHASSIS

CLUTCH

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E354 MANUAL TRANSAXLE

Description..... CH-3

Shift and Select Mechanism..... CH-4

U250E AUTOMATIC TRANSAXLE

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SUSPENSION AND AXLE

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BRAKE

Description..... CH-45

Front Brake..... CH-47

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STEERING

Description..... CH-59

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Steering Column..... CH-62

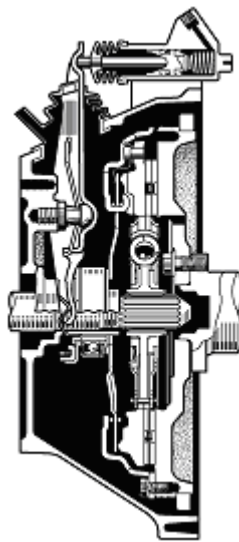
CHASSIS

CLUTCH

DESCRIPTION

The new Camry has a clutch system with the following features.

- A dry type single plate which is operated by hydraulic pressure is used.
- A clutch master cylinder made of plastic is used.
- A clutch disc that uses an organic solvent-free material is used to help protect the environment.
- A clutch accumulator is used to reduce the noise and vibration.
- A turnover mechanism, which reduces clutch pedal effort, is used.



025CH87Y

Specifications

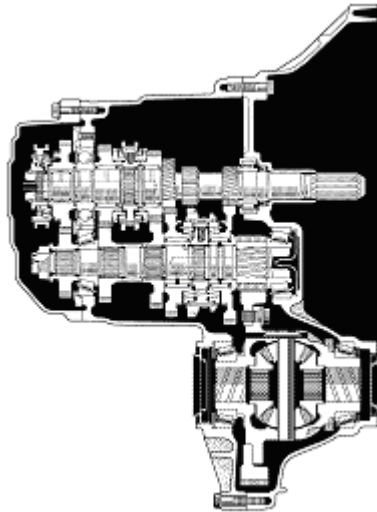
Engine Type		2AZ-FE
Clutch	Type	Dry Type Single Plate Clutch Diaphragm Spring
	Operation	Hydraulic
Clutch Cover	Type	DST (Diaphragm Spring Turnover)
	Size mm	239
	Installed Load N	5900
Clutch Disc	Facing Size* mm	236 × 150 × 3.5
	Facing Area cm ²	260
Master Cylinder	Type	Plunger
	Cylinder Dia. mm	15.87
Release Cylinder	Type	Non-Adjustable
	Cylinder Dia. mm	20.64
Clutch Pedal		Turnover

* Outer Diameter x Inner Diameter x Thickness

E354 MANUAL TRANSAXLE

✱ DESCRIPTION

The 2AZ-FE engine model is used the 5-speed E354 manual transaxle.



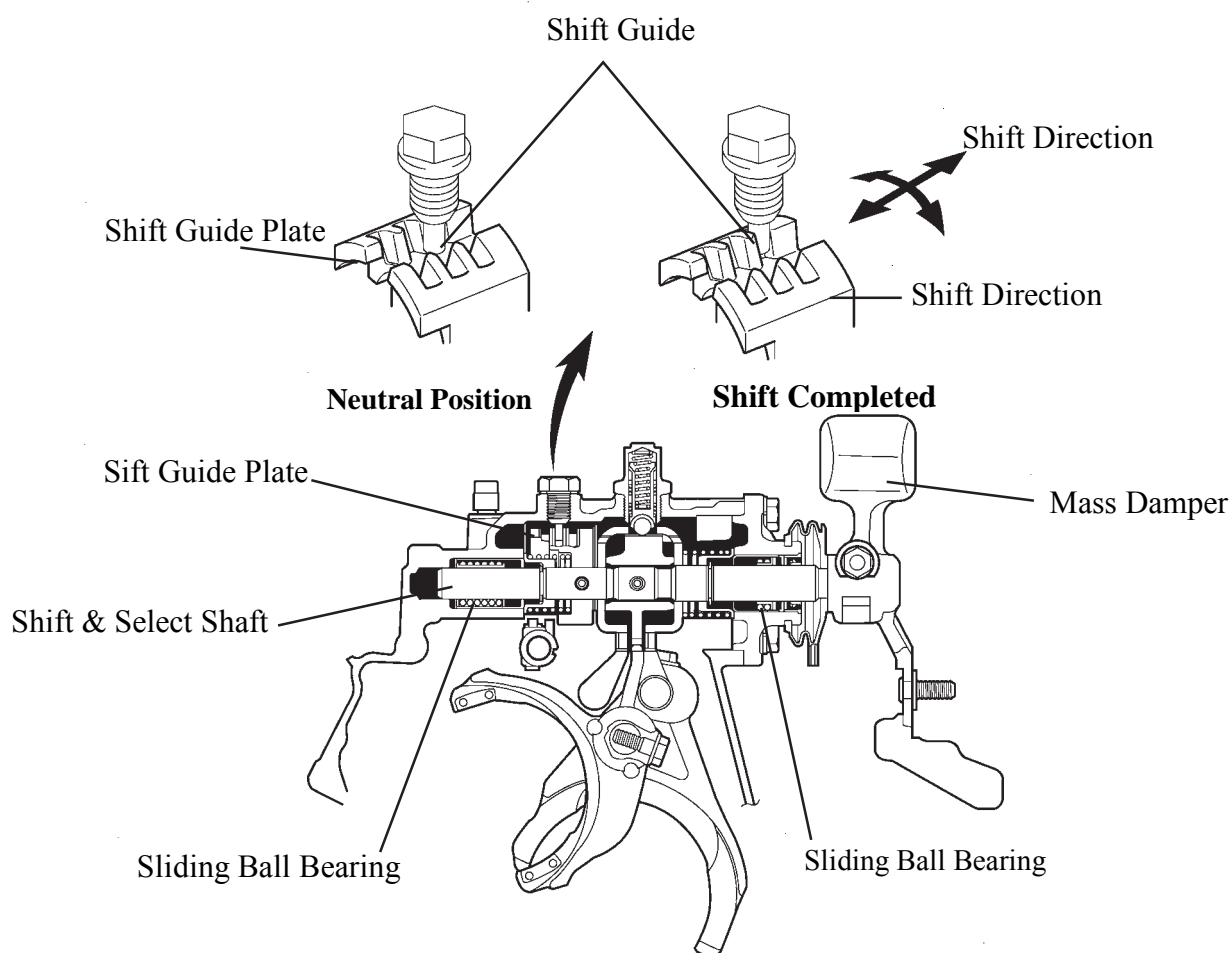
025CH58Y

► Specifications ◀

Gear Ratio	1st	3.538
	2nd	2.045
	3rd	1.333
	4th	1.028
	5th	0.820
	Reverse	3.583
Differential Gear Ratio		3.944
Oil Capacity	Litres	2.5
Oil Viscosity	SAE 75W-90	
Oil Grade	API GL-4 or GL-5	
Dry Weight	kg	44.3

● SHIFT AND SELECT MECHANISM

- An excellent shift feel has been achieved through the use of the mass damper on the shift and select shaft, and sliding ball bearing.
- A shift guide plate is provided on the shift and select shaft. The movement distance of the shift and select shaft in the select direction after the shifting is completed is regulated by the shift guide plate and shift guide pin. This clarifies the position of the shift knob and enables accurate shift operations.

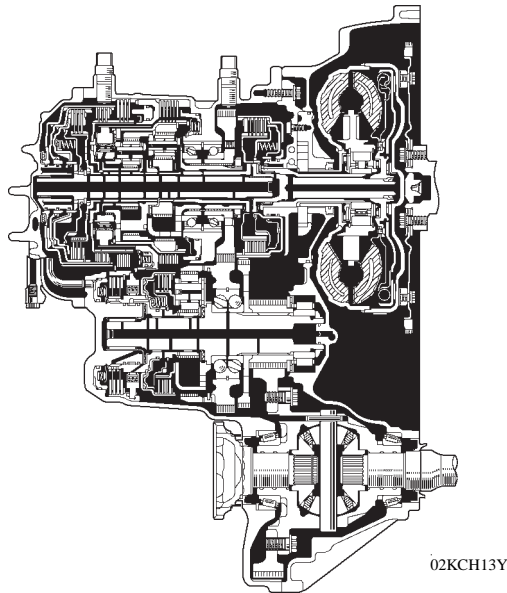


025YCH53Y

U250E AUTOMATIC TRANSAXLE

✱ DESCRIPTION

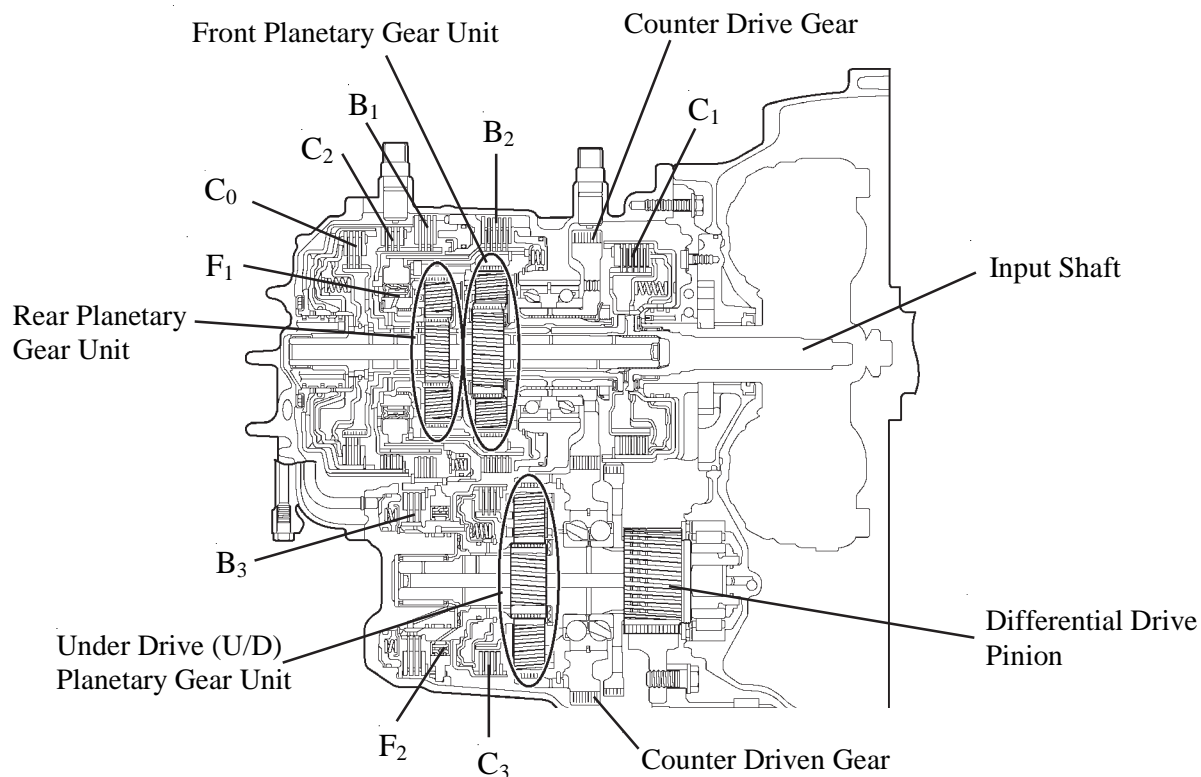
- U250E automatic transaxle is used on the 2AZ-FE engine models. This automatic transaxle is a compact, lightweight and high-capacity 5-speed Super ECT (Electronically Controlled Transaxle).
- ATF WS is used to reduce the resistance of the ATF and improve the fuel economy. For detail, refer to page CH-7.



► Specifications ◀

Gear Ratio (Counter Gear included)	1st	3.943
	2nd	2.197
	3rd	1.413
	4th	0.975
	5th	0.703
	Reverse	3.145
Differential Gear Ratio		3.391
Fluid Capacity (Includes Differential) Litres		8.0
Fluid Type		Toyota Genuine ATF WS
Weight (Reference)* kg		93

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



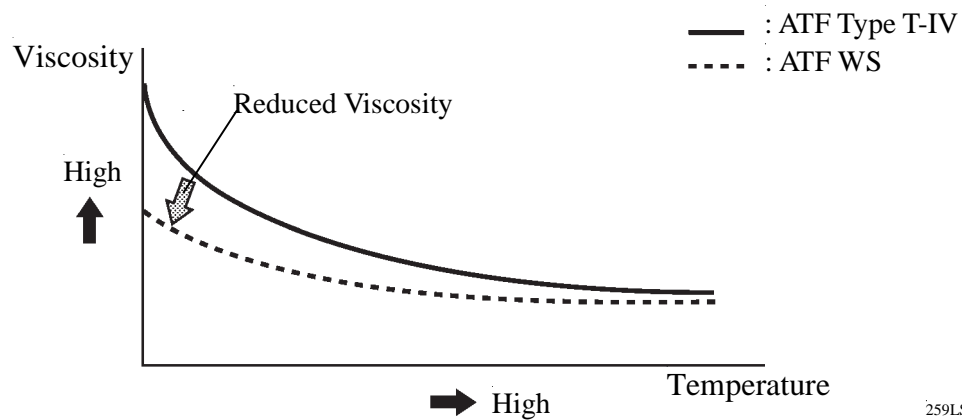
► Specifications ◀

02KCH14Y

C ₁	Forward Clutch	The No. of Discs	5
C ₂	Reverse Clutch		3
C ₃	U/D Direct Clutch		3
C ₀	Direct & O/D Clutch		3
B ₁	2nd & O/D Brake		3
B ₂	1st & Reverse Brake		5
B ₃	U/D Brake		3
F ₁	No. 1 One-way Clutch	The No. of Sprags	22
F ₂	U/D One-way Clutch		15
Front Planetary Gear Unit	The No. of Sun Gear Teeth		43
	The No. of Pinion Gear Teeth		17
	The No. of Ring Gear Teeth		77
Rear Planetary Gear Unit	The No. of Sun Gear Teeth		31
	The No. of Pinion Gear Teeth		19
	The No. of Ring Gear Teeth		69
U/D Planetary Gear Unit	The No. of Sun Gear Teeth		32
	The No. of Pinion Gear Teeth		26
	The No. of Ring Gear Teeth		83
Counter Gear	The No. of Drive Gear Teeth		50
	The No. of Driven Gear Teeth		51

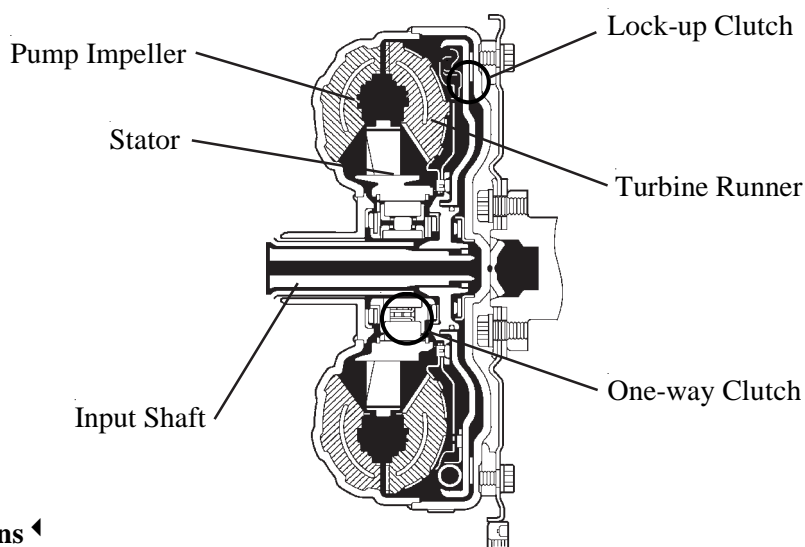
★ ATF (AUTOMATIC TRANSMISSION FLUID) WS

- 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.



● **TORQUE CONVERTER**

- 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 operation at medium to high vehicle speeds, is used to reduce the slip loss of the torque converter.

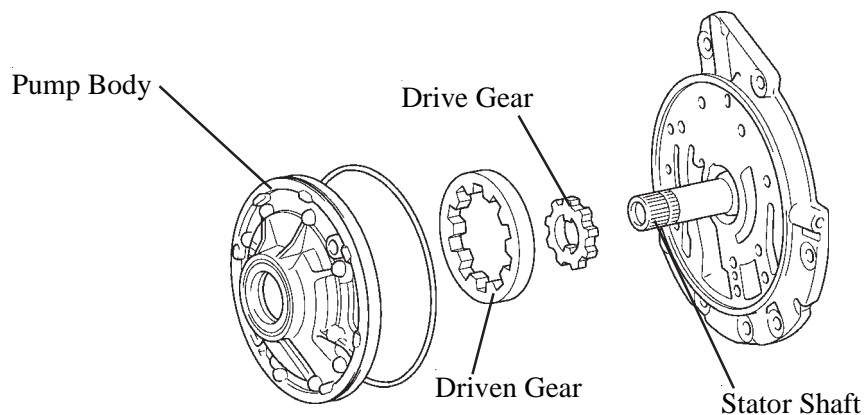


► **Specifications** ◀

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

● **OIL PUMP**

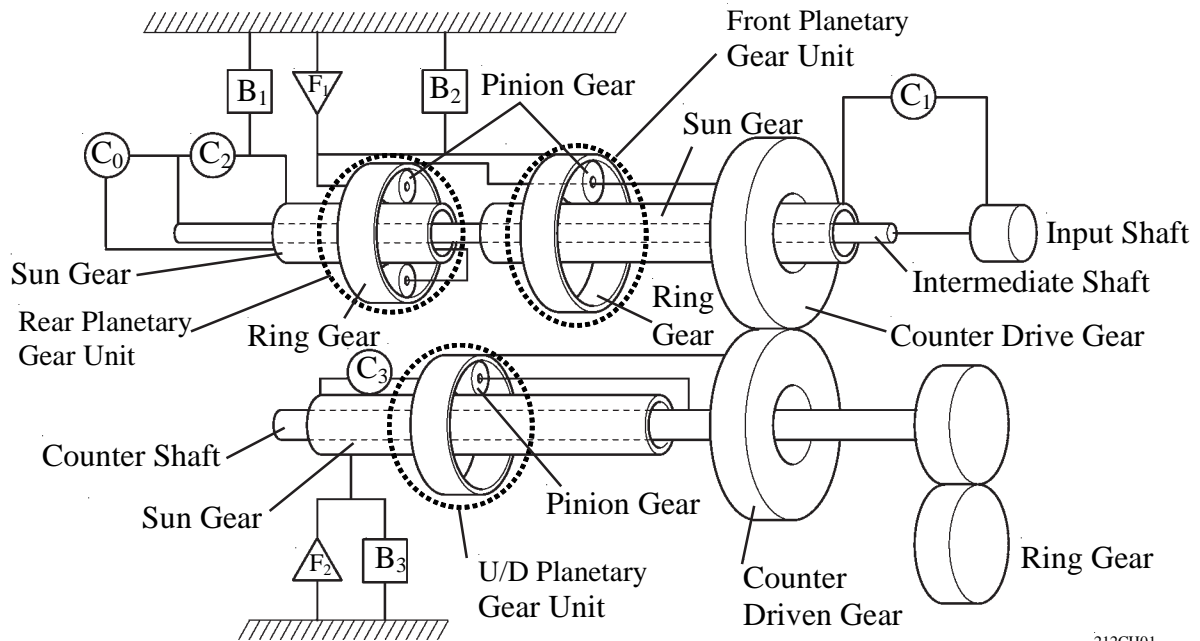
The oil pump is operated by the torque converter. It lubricates the planetary gear units and supplies operating fluid pressure for hydraulic control.



● PLANETARY GEAR UNIT

1. Construction

- The U250E automatic transaxle uses the gear layout in which the front and rear planetary gear units are placed on the input shaft (intermediate shaft), the counter drive and driven gears are placed on the front of the front planetary gear unit, and the U/D planetary gear unit is placed on the counter shaft.
- A centrifugal fluid pressure cancelling mechanism is used.



2. Function of Components

Component		Function
C ₁	Forward Clutch	Connects input shaft and front planetary sun gear.
C ₂	Reverse Clutch	Connects input shaft and rear planetary sun gear.
C ₃	U/D Direct Clutch	Connects U/D planetary sun gear and U/D planetary carrier.
C ₀	Direct & O/D Clutch	Connects input shaft and rear planetary carrier.
B ₁	2nd & O/D Brake	Prevents rear planetary sun gear from turning either clockwise or counter clockwise.
B ₂	1st & Reverse Brake	Prevents rear planetary carrier and front planetary ring gear from turning either clockwise or counter clockwise.
B ₃	U/D Brake	Prevents U/D planetary sun gear from turning either clockwise or counter clockwise.
F ₁	No. 1 One-Way Clutch	Prevents rear planetary carrier and front planetary ring gear from turning counter clockwise.
F ₂	U/D One-Way Clutch	Prevents U/D planetary sun gear from turning 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.

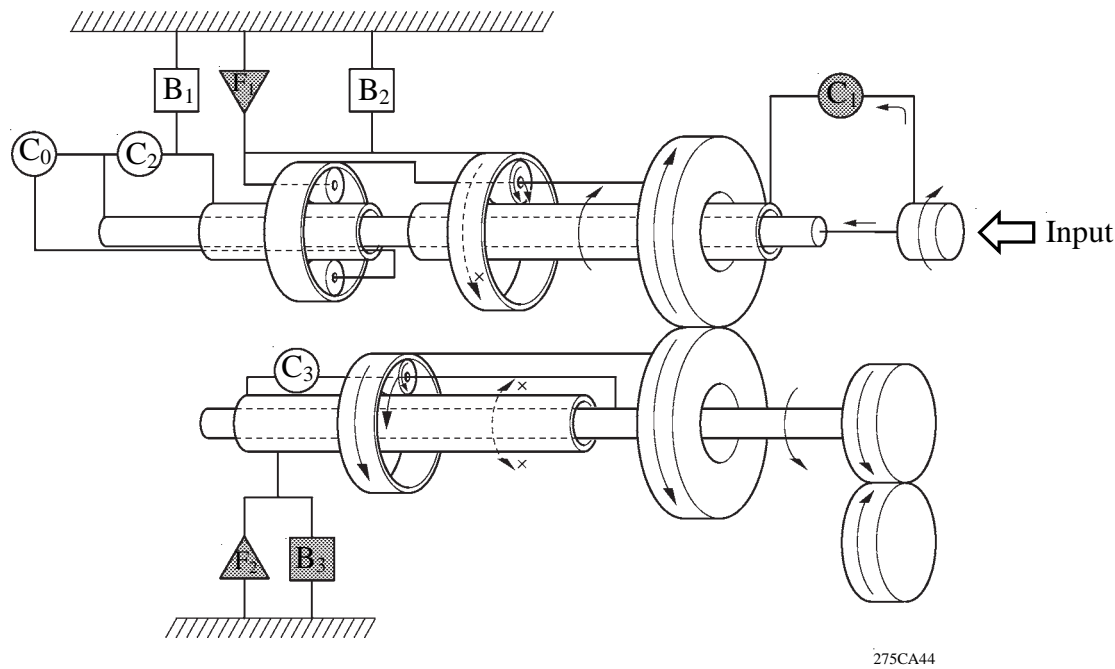
3. Transaxle Power Flow

Shift Lever Position	Gear	Solenoid Valve						Clutch				Brake			One-way Clutch	
		S4	SR	DSL	SL1	SL2	SL3	C ₀	C ₁	C ₂	C ₃	B ₁	B ₂	B ₃	F ₁	F ₂
P	Park				○	○								○		
R	Reverse				○	○				○			○	○		
N	Neutral				○	○								○		
D	1st				○	○			○					○	○	○
	2nd					○			○			○		○		○
	3rd		○		○			○	○					○		○
	4th		○	Δ*		Δ*	○	○				○		○		○
	5th	○	○	Δ		Δ	○	○			○	○				
4	1st				○	○			○					○	○	○
	2nd					○			○			○		○		○
	3rd		○		○			○	○					○		○
	4th		○	Δ		Δ	○	○				○		○		○
3	1st				○	○			○					○	○	○
	2nd					○			○			○		○		○
	3rd		○		○			○	○					○		○
2	1st				○	○			○					○	○	○
	2nd					○			○			○		○		○
L	1st			○	○	○			○				○	○	○	○

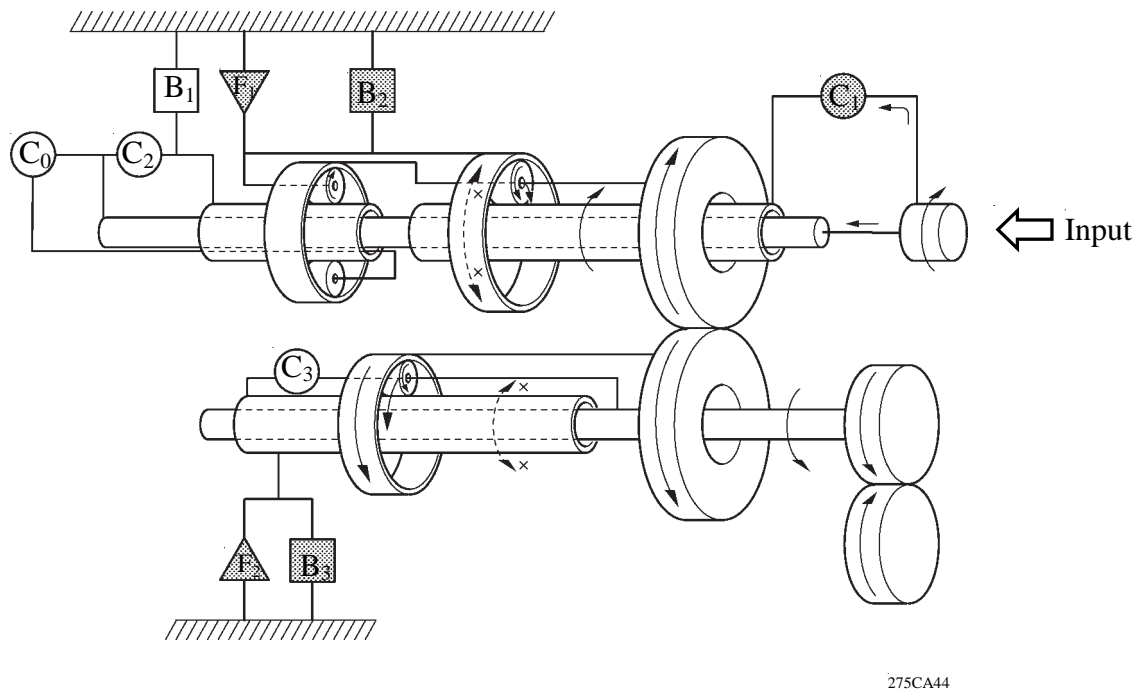
○: ON Δ: Lock-up ON

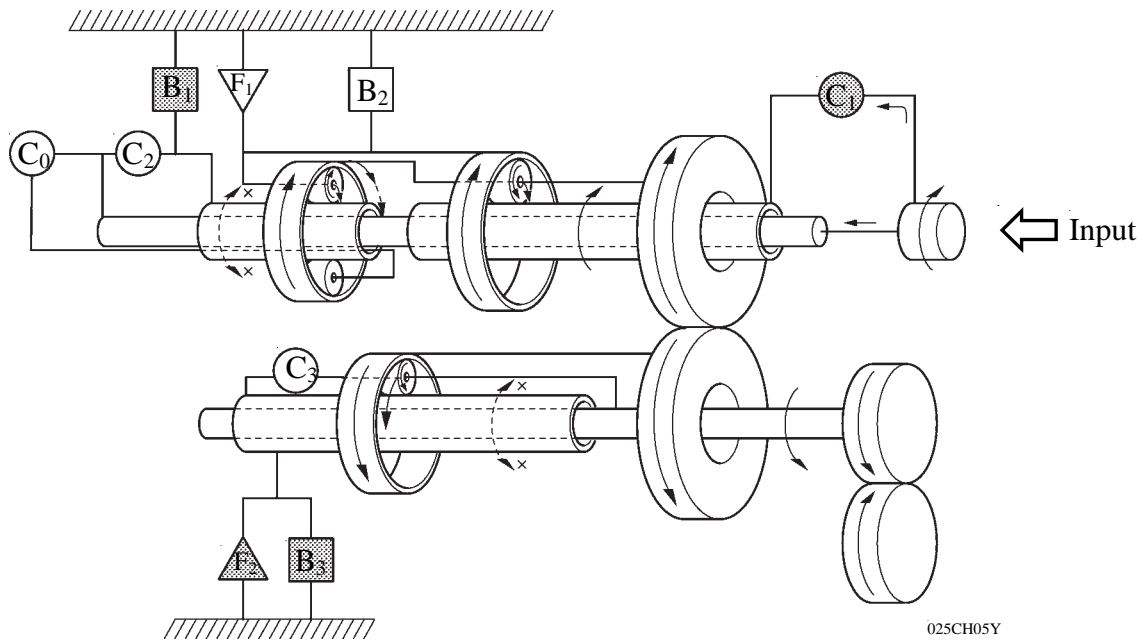
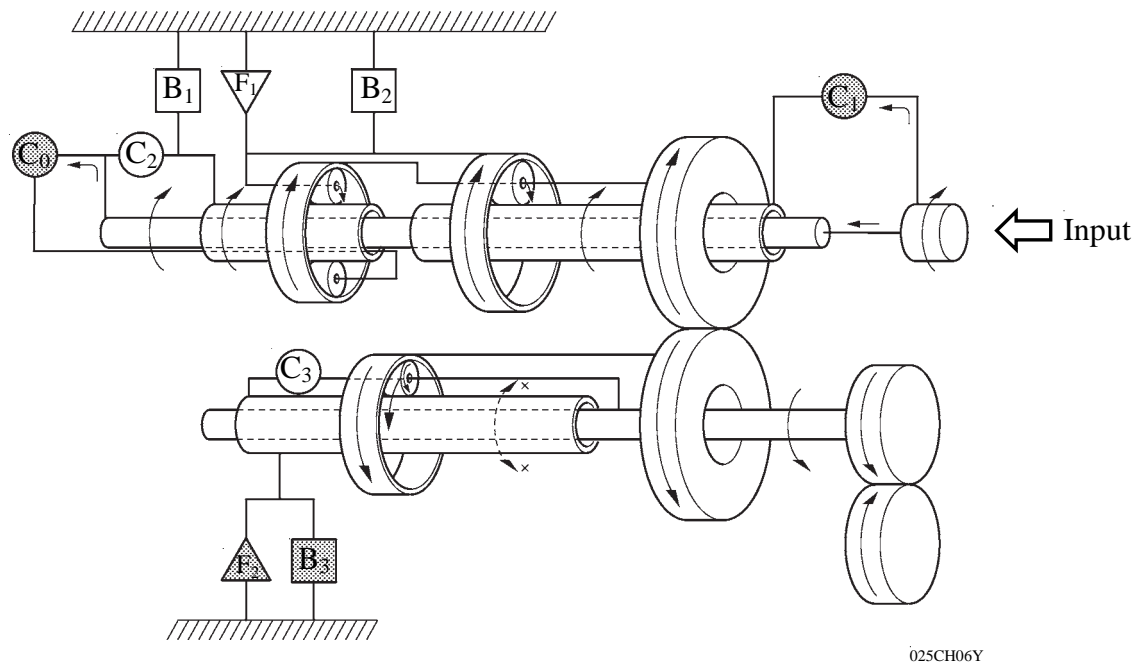
*: Shift control operates only when 5th is prohibited while travelling uphill / downhill.

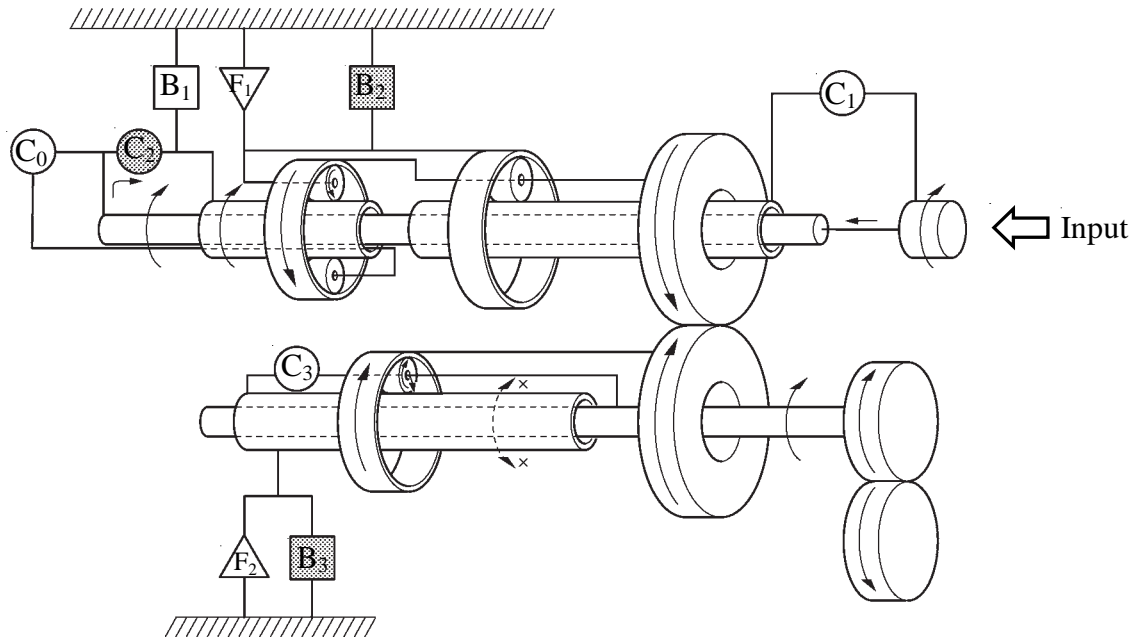
1st Gear (D, 4, 3, 2 Position)



1st Gear (L Position)



2nd Gear (D, 4, 3, 2 Position)**3rd Gear (D, 4, 3 Position)**

Reverse Gear (R Position)

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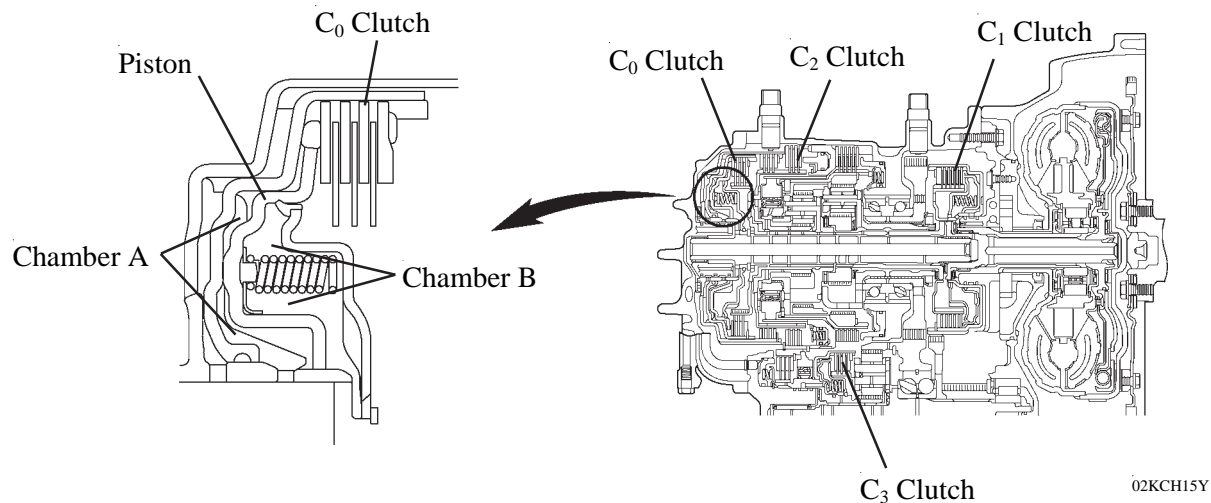
4. Centrifugal Fluid Pressure Cancelling Mechanism

This mechanism is applied to C_0 , C_1 , and C_3 clutches when shifting from 2nd to 3rd, from 3rd to 4th and from 4th to 5th. 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:

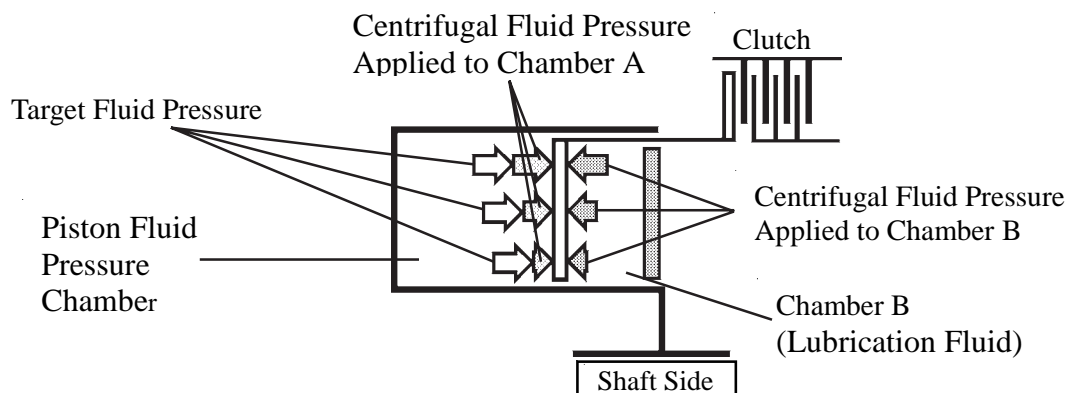
- To prevent the generation of pressure by the centrifugal force that is applied to the fluid in piston fluid pressure chamber (hereafter referred to as “chamber A”) when the clutch is released, a check ball is provided to discharge the fluid. Therefore, before the clutch could be subsequently applied, 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 canceling fluid pressure chamber (hereafter referred to as “chamber B”) has been provided opposite chamber A.



02KCH15Y

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.



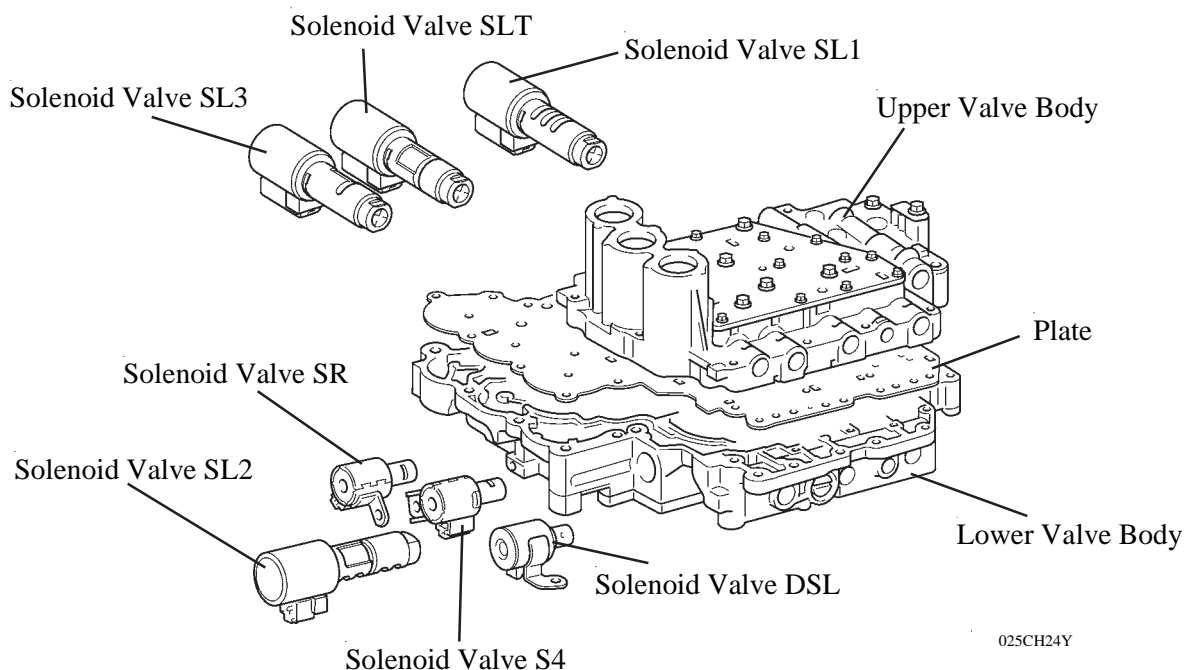
157CH17

Fluid pressure applied to piston	—	Centrifugal fluid pressure applied to chamber B	=	Target fluid pressure (original clutch pressure)
----------------------------------	---	---	---	--

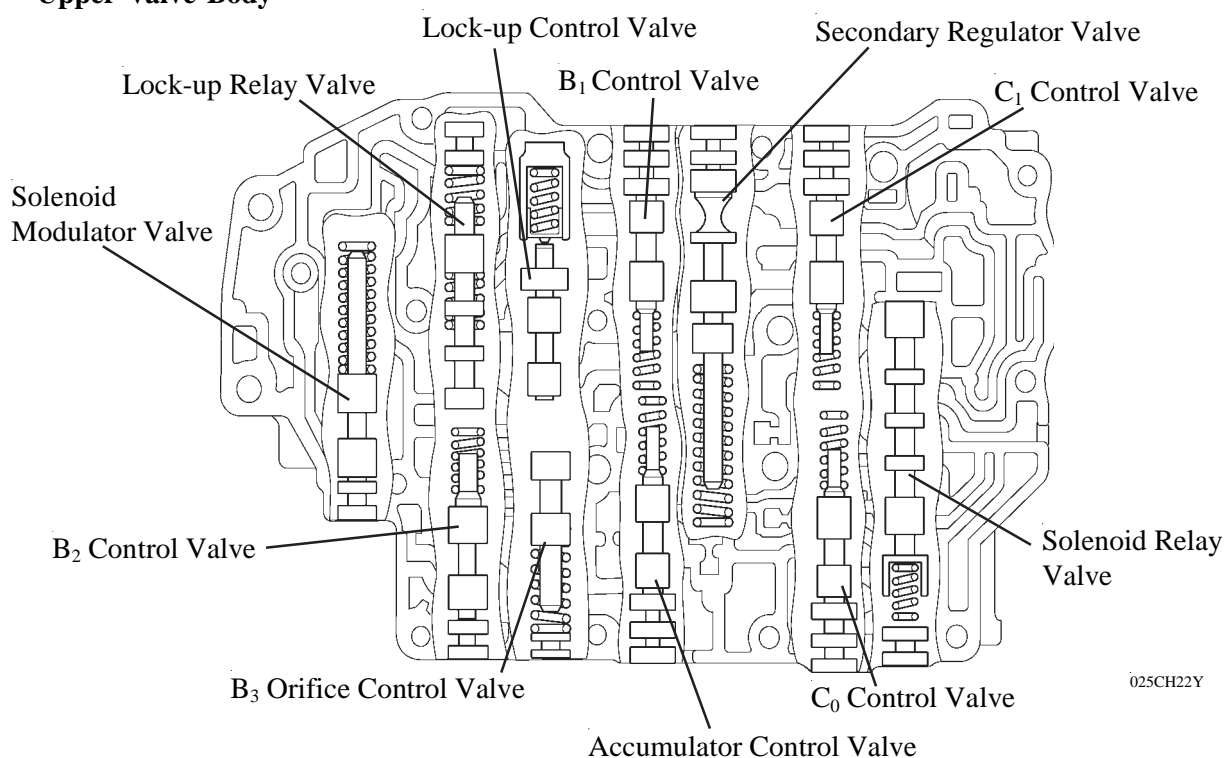
VALVE BODY UNIT

1. General

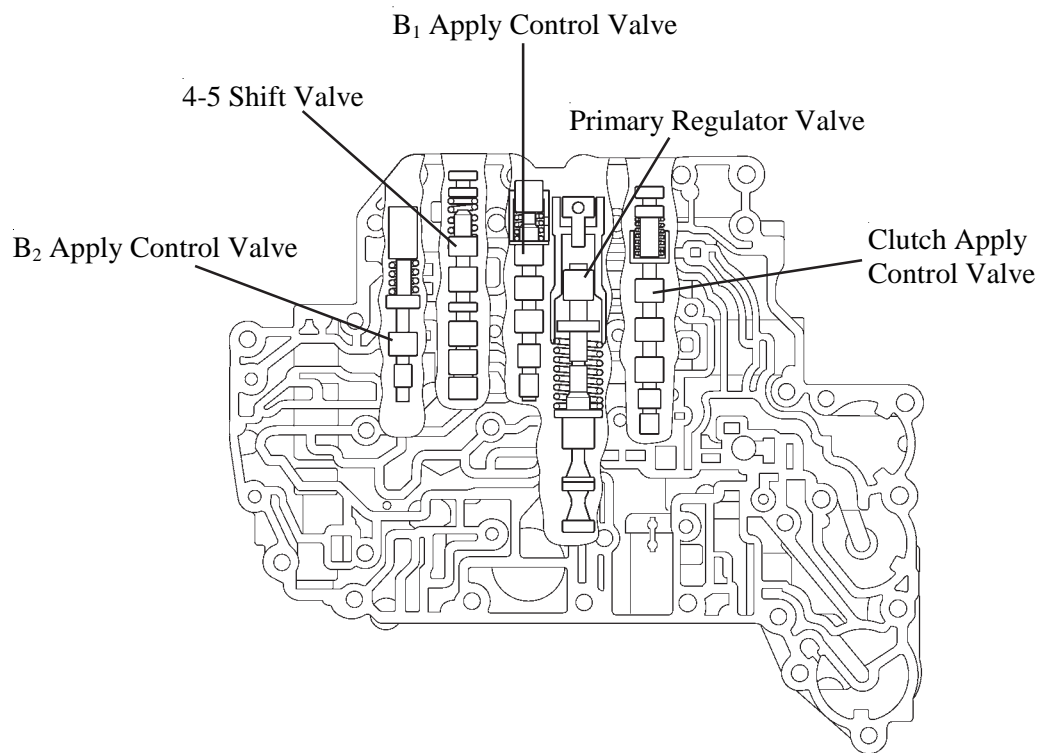
- The valve body consists of the upper and lower valve bodies and 7 solenoid valves (SL1, SL2, SL3, SLT, DSL, S4, SR).
- Apply orifice control, which controls the flow volume to the B₃ brake, is used in this unit.



Upper Valve Body



► Lower Valve Body ◀

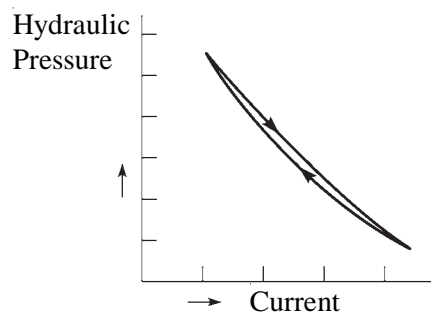
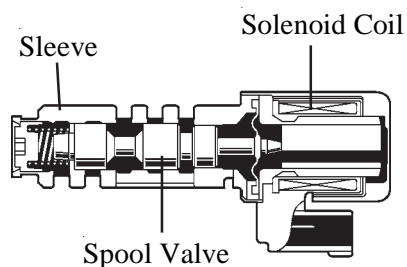


025CH23Y

2. Solenoid Valves

Solenoid Valves SL1, SL2, SL3 and SLT

- In order to provide a hydraulic pressure that is proportion to current that flows to the solenoid coil, the solenoid valves SL1, SL2, SL3, and SLT linearly control the line pressure and clutch and brake engagement pressure based on the signals received from the engine & ECT ECU.
- The solenoid valves SL1, SL2, SL3, and SLT have the same basic structure.



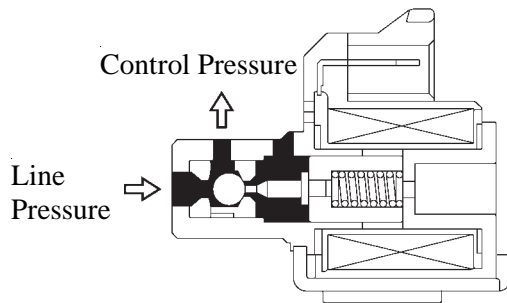
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► Function of Solenoid Valves ◀

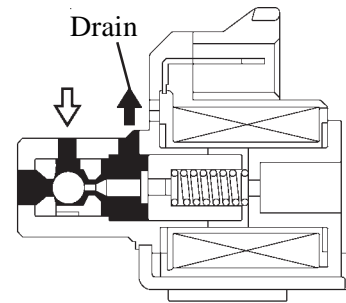
Solenoid Valve	Function
SL1	B ₁ brake pressure control
SL2	<ul style="list-style-type: none"> • C₀ clutch pressure control • Lock-up clutch pressure control
SL3	C ₁ clutch pressure control
SLT	<ul style="list-style-type: none"> • Line pressure control • Secondary pressure control

Solenoid Valve SR, S4 and DSL

- The solenoid valves SR, S4, and DSL use a three-way solenoid valve.



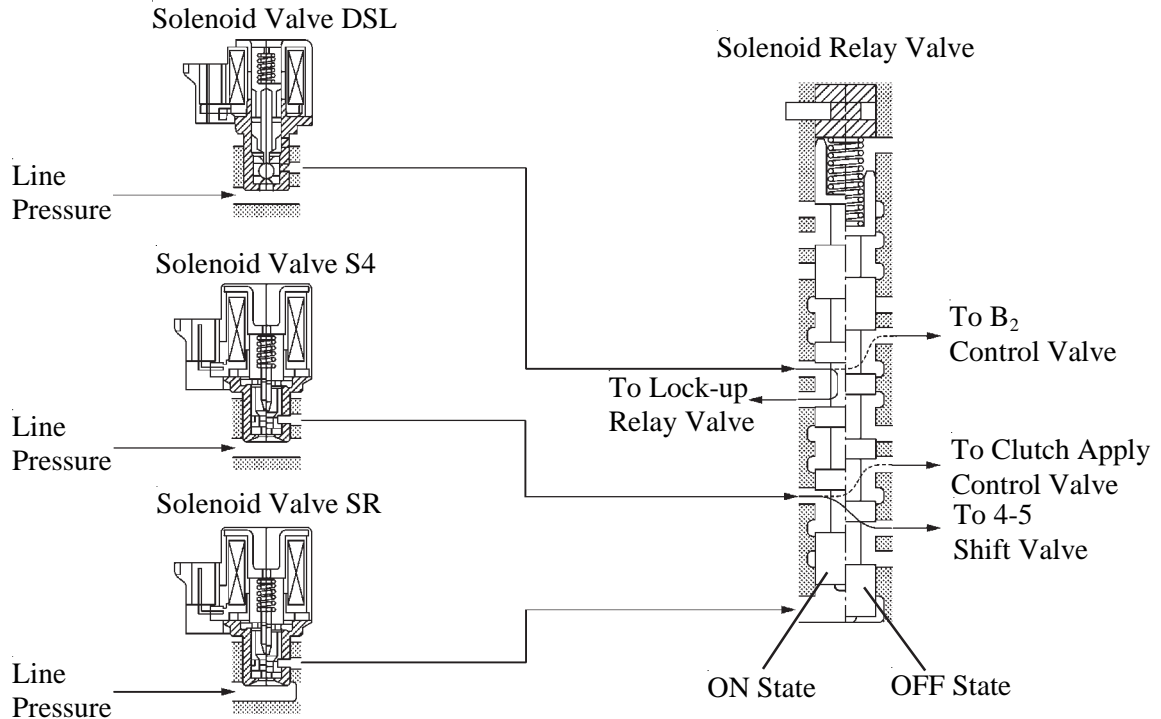
Solenoid Valve ON



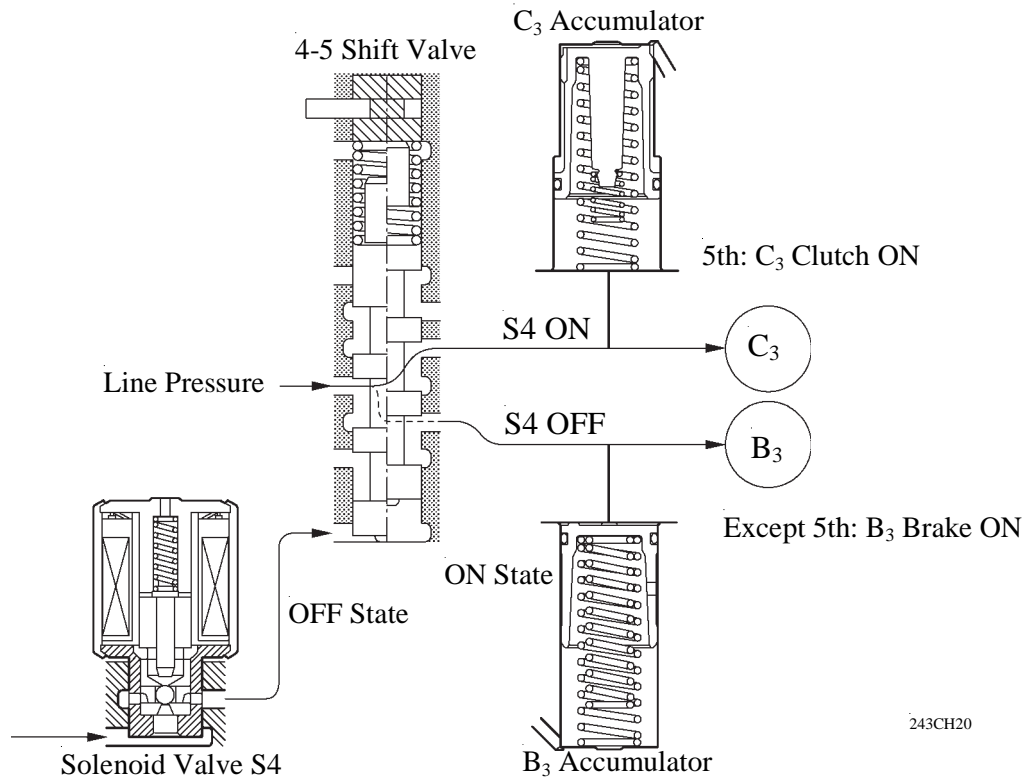
Solenoid Valve OFF

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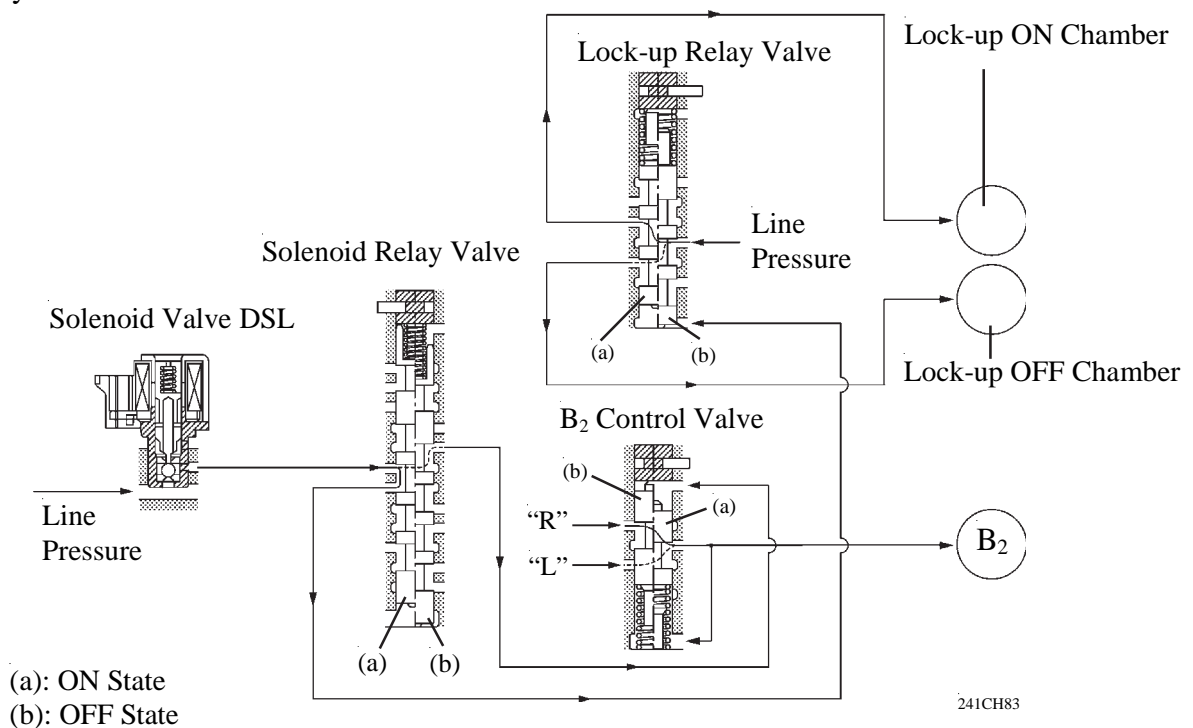
- The solenoid valve SR controls the solenoid relay valve. Accordingly, the fluid passages from the solenoid valve DSL and S4 have been changed.



- The solenoid valve S4, when set to ON, controls the 4-5 shift valve to establish the 5th by changing over the fluid pressure applied to B₃ brake and C₃ clutch.

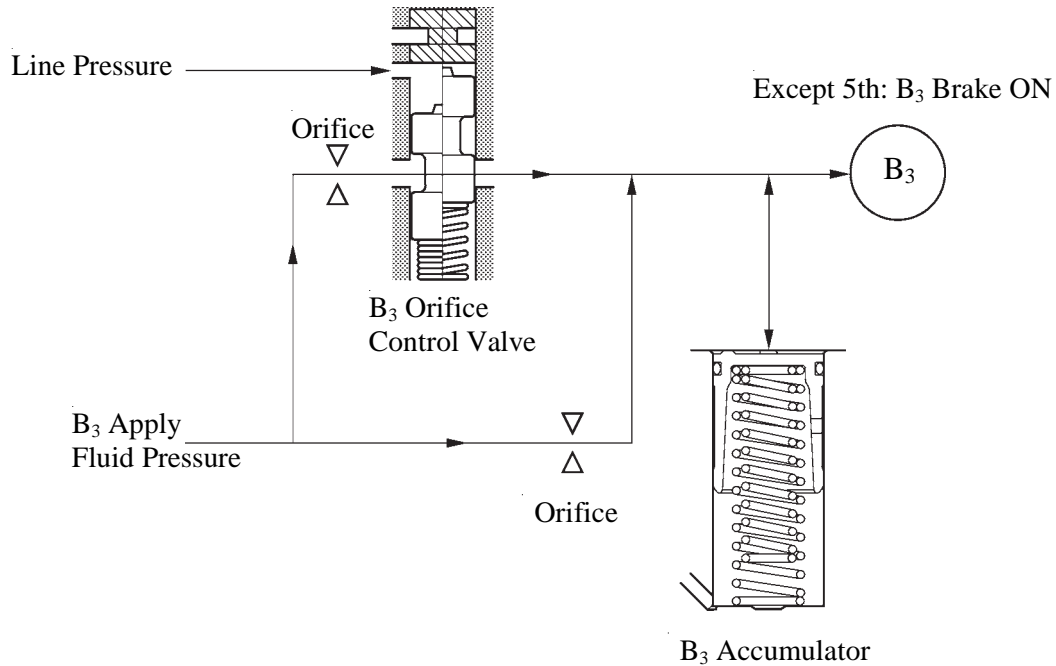


- The solenoid valve DSL controls the B₂ control valve via the solenoid relay valve when the transaxle is shifted in the R or L position. During lock-up, the lock-up relay valve is controlled via the solenoid relay valve.



3. Apply Orifice Control

This control is effected by the B_3 orifice control valve. The B_3 orifice control valve has been provided for the B_3 brake, which is applied when shifting from 5th to 4th. The B_3 orifice control valve is controlled by the amount of the line pressure in accordance with shifting conditions, and the flow volume of the fluid that is supplied to the B_3 brake is controlled by varying the size of the orifice in the control valve.



241CH84

✱ ELECTRONIC CONTROL SYSTEM

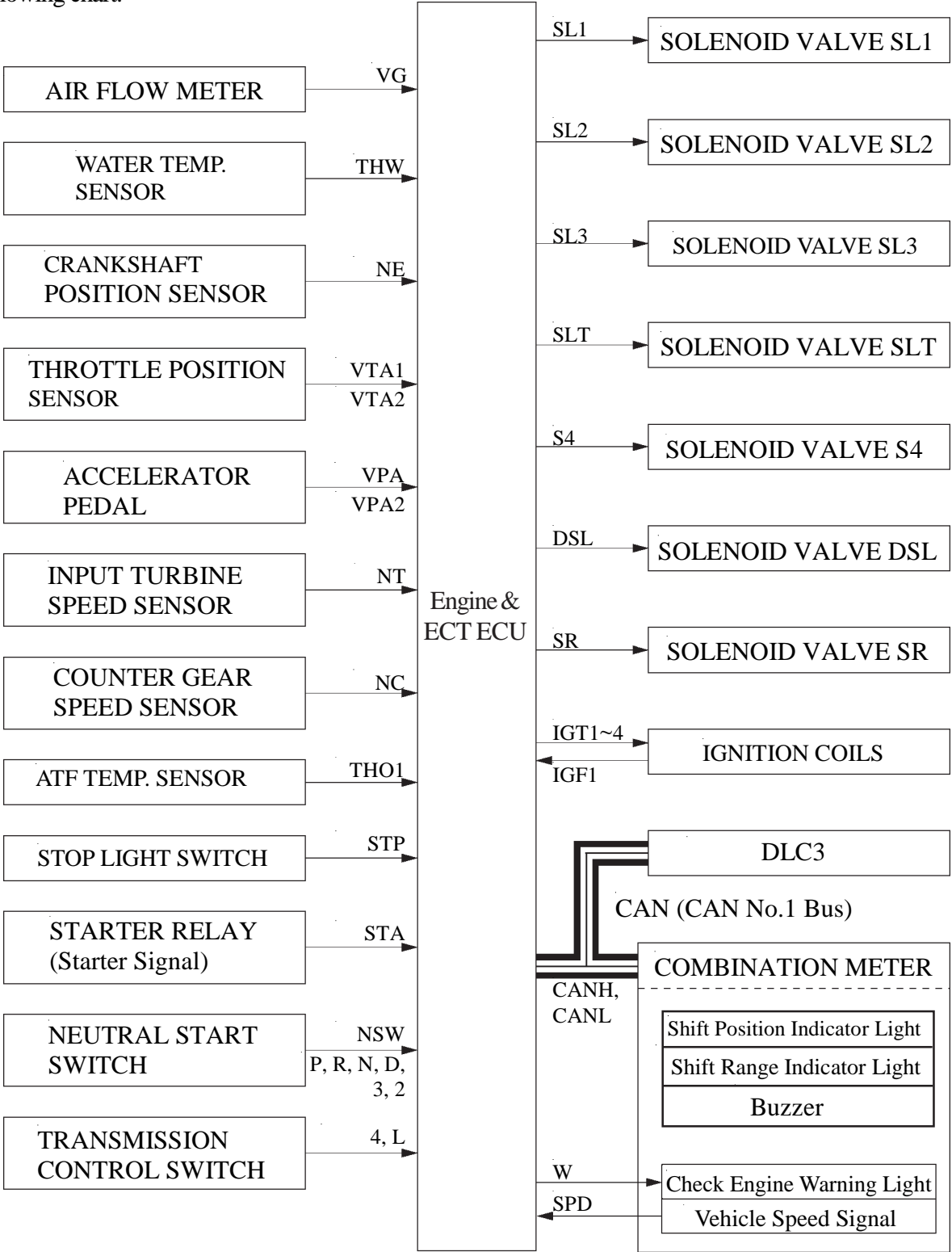
1. General

The electronic control system of the U250E automatic transaxle consists of the control listed below.

System	Outline
Shift Timing Control	The engine & ECT ECU sends current to 3 solenoid valves (SL1, SL2, and SL3) based on signals from each sensor and shifts the gear.
Clutch Pressure Control (See page CH-27)	<ul style="list-style-type: none"> Controls the pressure that is applied directly to B₁ brake, C₀ and C₁ clutches by actuating 3 solenoid valves (SL1, SL2, and SL3) in accordance with engine & ECT ECU signals. 3 solenoid valves (SL1, SL2, and SL3) minutely control the clutch pressure in accordance with the engine output and driving conditions.
Line Pressure Optimal Control (See page CH-29)	Actuates the solenoid valve SLT to control the line pressure in accordance with information from the engine & ECT ECU and the operating conditions of the transaxle.
Shifting Control in Uphill/Downhill Travelling (See page CH-30)	Controls to restrict the 4th or 5th up shift or to provide appropriate engine braking by the engine & ECT ECU to determine whether the vehicle is travelling uphill or downhill.
Lock-up Timing Control	The engine & ECT ECU sends current to the solenoid valves DSL and SL2 based on signals from each sensor and engages or disengages the lock-up clutch.
Engine Torque Control	Retards the engine ignition timing temporarily to improve shift feeling during up or down shifting.
“N” to “D” Squat Control	When the shift lever is shifted from “N” to “D” position, the gear is temporarily shifted to 3rd and then to 1st to reduce vehicle squat.
Diagnosis (See page CH-31)	When the engine & ECT ECU detects a malfunction, the engine & ECT ECU makes a diagnosis and memorizes the malfunctioning part.
Fail-safe (See page CH-31)	Even if a malfunction is detected in the sensors or solenoids, the engine & ECT ECU activates fail-safe control to prevent the vehicle's drivability from being significantly affected.

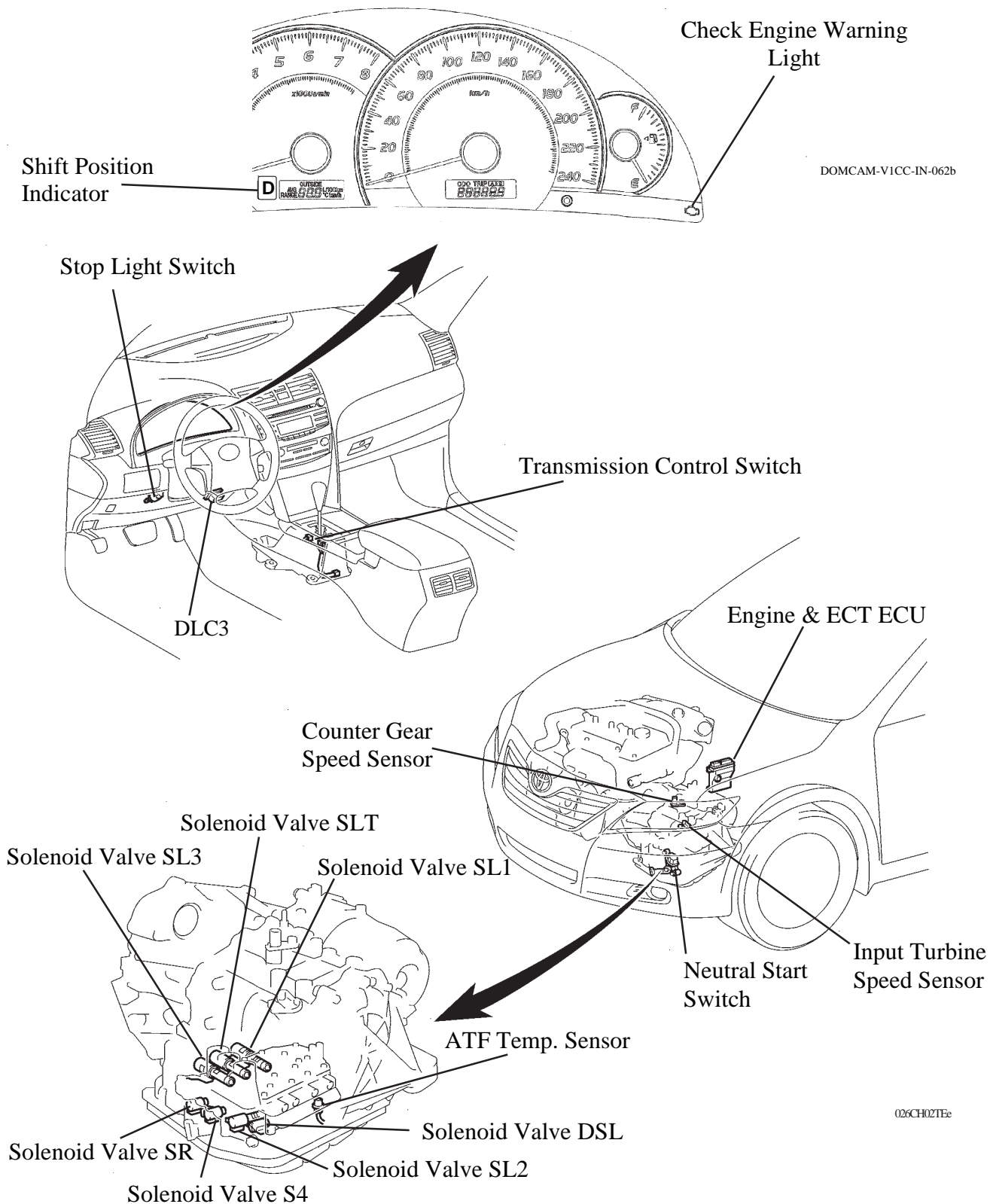
2. Construction

The configuration of the electronic control system in the U250E automatic transaxle is as shown in the following chart.



02KCH16Y

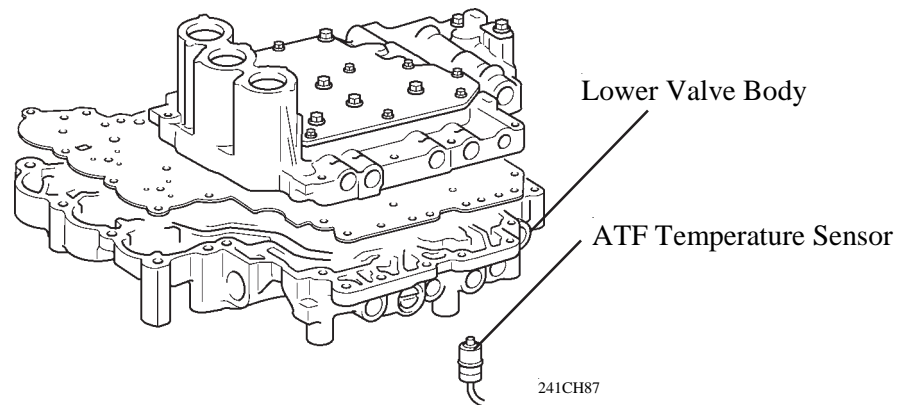
3. Layout of Main Components



4. Construction and Operation of Main Components

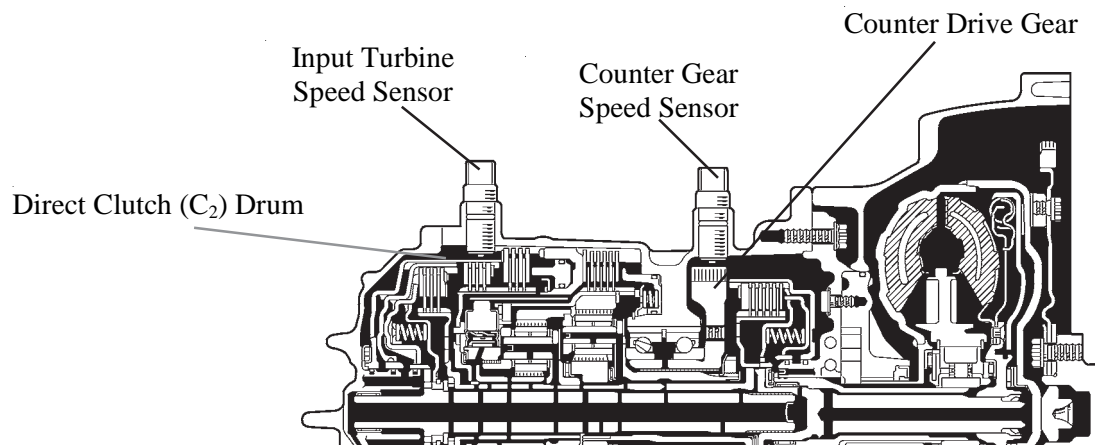
ATF Temperature Sensor

- 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.



Speed Sensors

- The U250E automatic transaxle uses an input turbine speed sensor (for the NT signal) and a counter gear speed sensor (for the NC signal). Thus, the engine & 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 pick-up coil type.
- The input turbine speed sensor detects the input speed of the transaxle. The direct clutch (C_2) drum 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.



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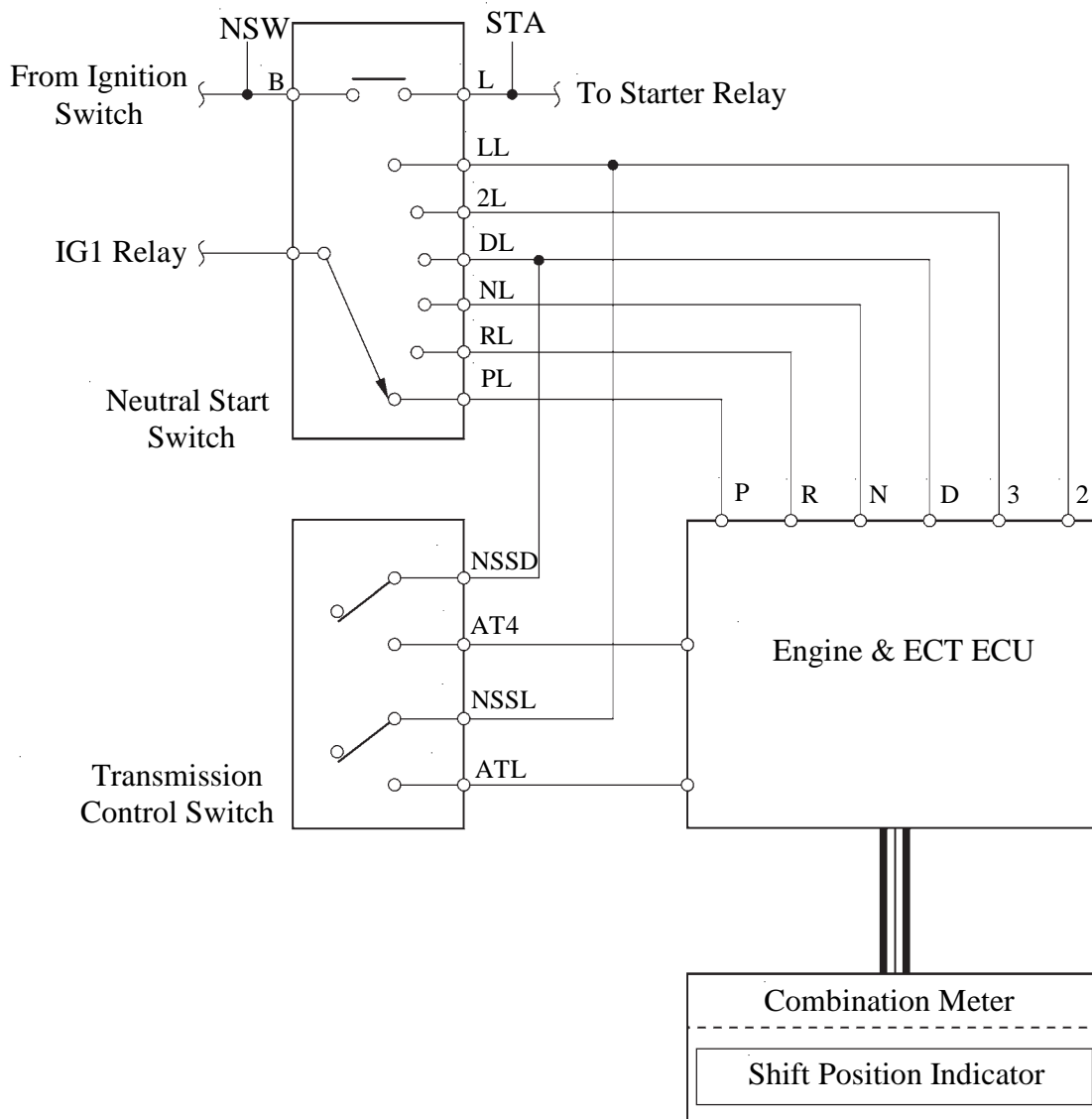
Transmission Control Switch and Neutral Start Switch

1) General

The engine & ECT ECU uses these switches to detect the shift lever position.

- On models with multi-mode automatic transmission, the engine & ECT ECU detects the shift lever positions P, R, N and D using the neutral start switch, and detects S mode shift lever positions (S, SFTU and SFTD) using the transmission control switch provided in the shift lever.
- On models without multi-mode automatic transmission mode, the engine & ECT ECU detects shift lever positions P, R, N, D, 3 and 2 using the neutral start switch, and detects shift lever positions 4 and L using the transmission control switch provided in the shift lever.
- The engine & ECT ECU sends these shift position signals to the combination meter (meter ECU) through CAN communication. The combination meter (meter ECU) controls the shift position indicator light based on these signals.

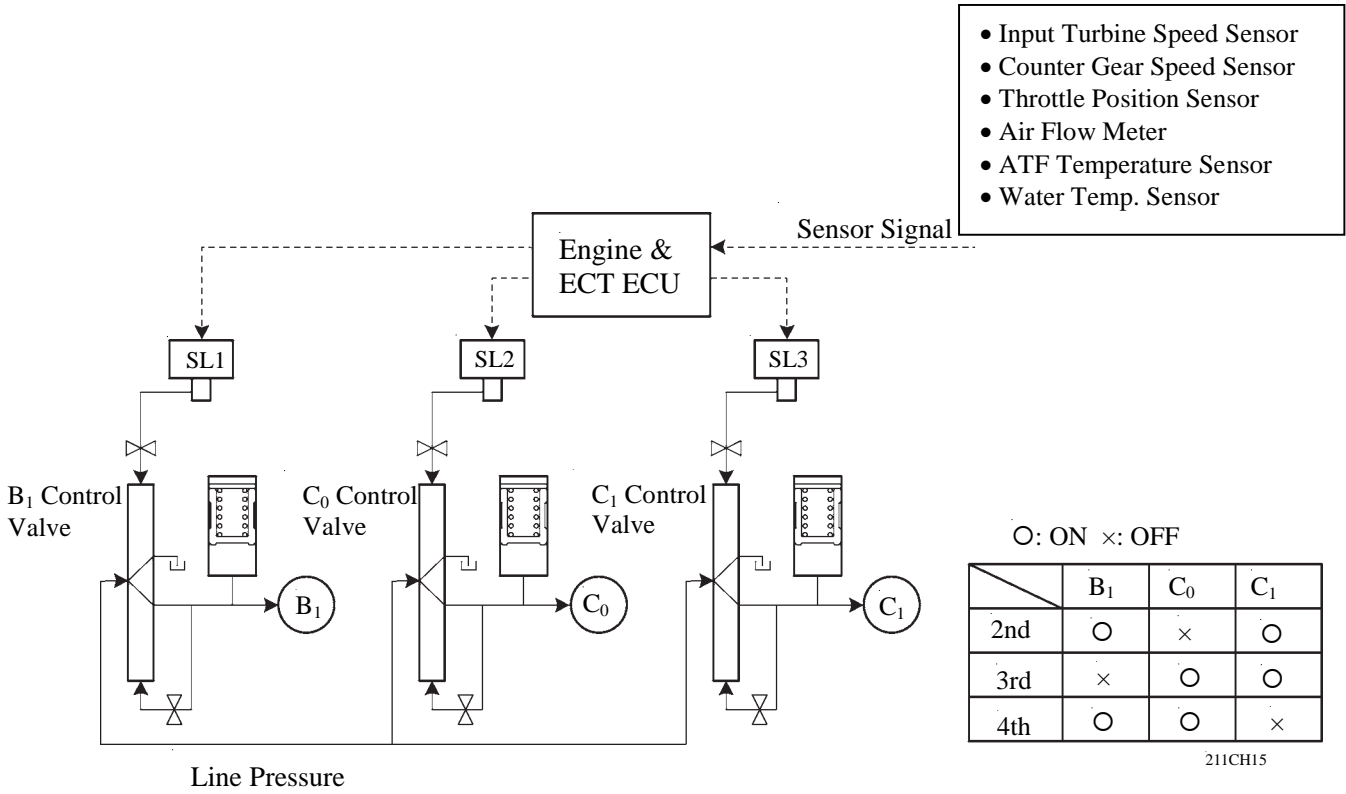
2) Wiring Diagram



5. Clutch Pressure Control

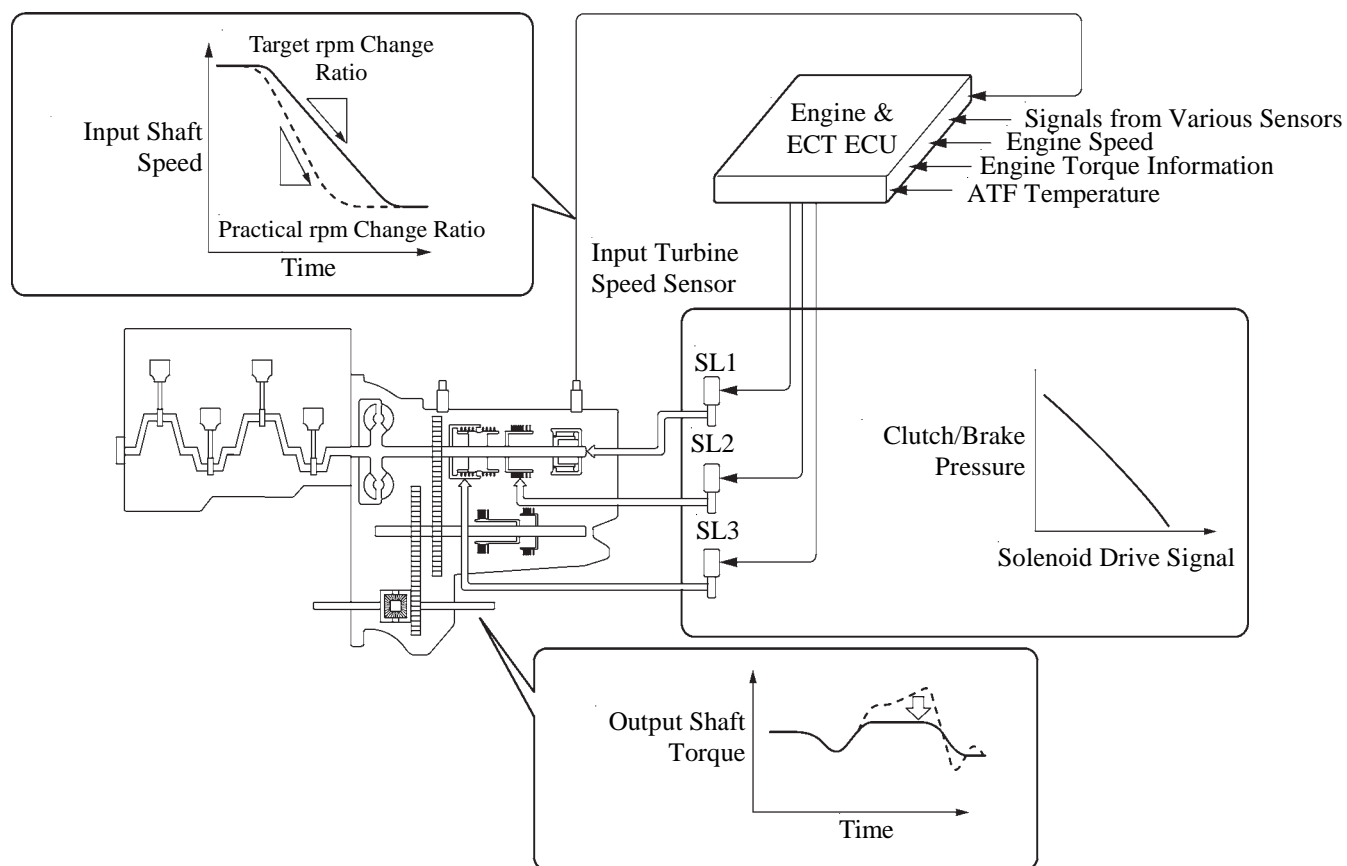
Clutch to Clutch Pressure Control

- This control is used for shifting from the 2nd to 3rd gear, and from the 3rd to 4th gear.
- Solenoid valves actuate SL1, SL2, and SL3 in accordance with the signals from the engine & ECT ECU, and guide this output pressure directly to the control valves B₁, C₀, and C₁ in order to regulate the line pressure that acts on the B₁ brake, C₀ and C₁ clutches. As a result, compact B₁, C₀ and C₁ accumulators without a back pressure chamber have been realised.



Clutch Pressure Optimal Control

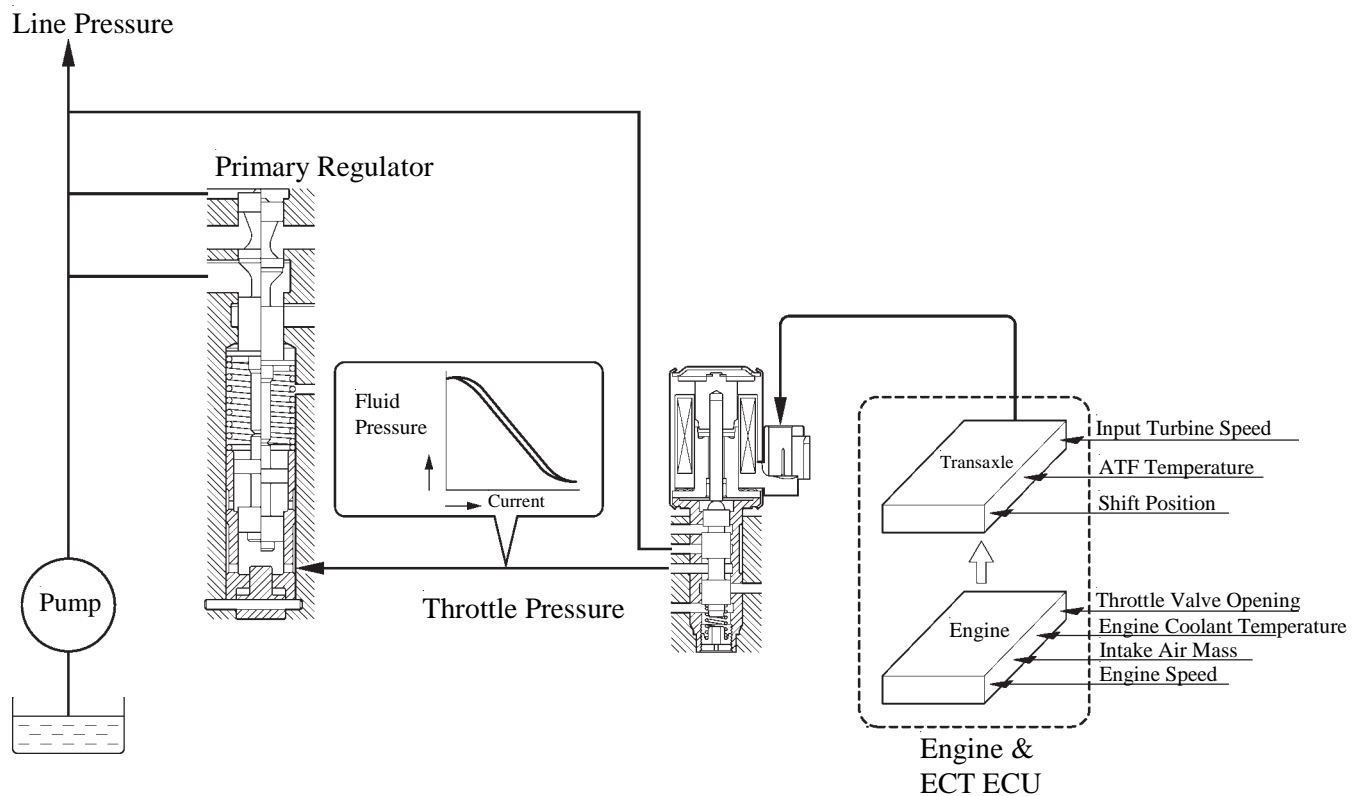
The engine & ECT ECU monitors the signals from various types of sensor such as the input turbine speed sensor, allowing shift solenoid valves SL1, SL2, and SL3 to minutely control the clutch pressure in accordance with engine output and driving conditions. As a result, smooth shift characteristics have been realised.



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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, travelling condition, and the ATF temperature, thus realising smooth shift characteristics and optimising the workload of the oil pump.



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7. Shifting Control in Uphill/Downhill Travelling

General

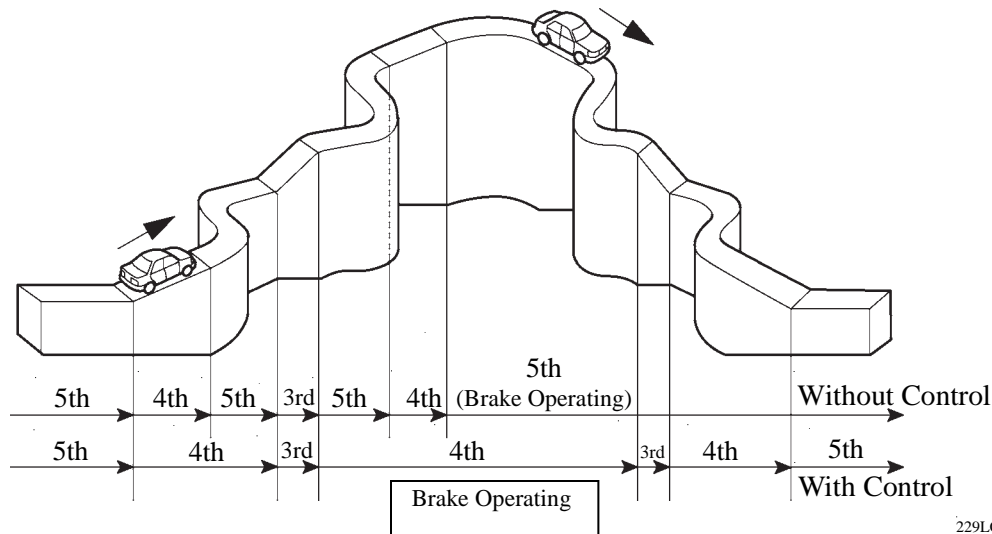
This control helps minimise the shifting of gears when the driver operates the accelerator pedal while driving on a winding road with ups and downs, in order to ensure a smooth drive.

Shift Control in Uphill Travelling

- When the engine & ECT ECU determines uphill travel, it prohibits the transaxle from shifting up into 5th after the transaxle has shifted down below 4th.
- When the engine & ECT ECU determines uphill travel with a steeper grade, it prohibits the transaxle from shifting up into 4th after the transaxle has shifted down below 3rd.

Shift Control in Downhill Travelling

- When the engine & ECT ECU determines downhill travel, it shifts down the transaxle from 5th to 4th in accordance with the brake operation signal that is input when the driver operates the brake pedal.
- When the engine & ECT ECU determines downhill travel with a steeper grade, and a brake operation signal is input again, the engine & ECT ECU shifts the transaxle down from 4th to 3rd.



Uphill/Downhill Judgment

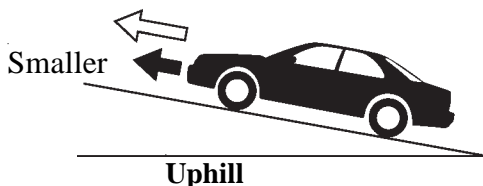
The actual acceleration calculated from the speed sensor signal is compared with the reference acceleration stored in the engine ECT ECU to judge uphill or downhill travelling.

Actual Acceleration < Reference Acceleration

Actual Acceleration > Reference Acceleration

← Reference acceleration

← Actual acceleration



8. Diagnosis

- When the engine & ECT ECU detects a malfunction, the engine & 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 can be read by connecting an intelligent tester II.
- For details, see the Camry Repair Manual.

9. 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
Speed Sensor	During a speed sensor malfunction, the vehicle speed is detected through the signals from the counter gear speed sensor to effect normal control.
Counter Gear Speed Sensor	During a counter gear speed sensor malfunction, 5th up shift is prohibited.
ATF Temp. Sensor	During a ATF temperature sensor malfunction, 5th up shift is prohibited.
Solenoid Valve SL1, SL2, SL3, and S4	The current to the failed solenoid valve is cut off and control is effected by operating other solenoid valves with normal operation. Shift control is effected as described in the table in the next page, depending on the failed solenoid. Even if the engine starts under this condition, the gear position remains where it was before.

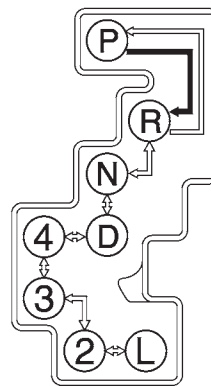
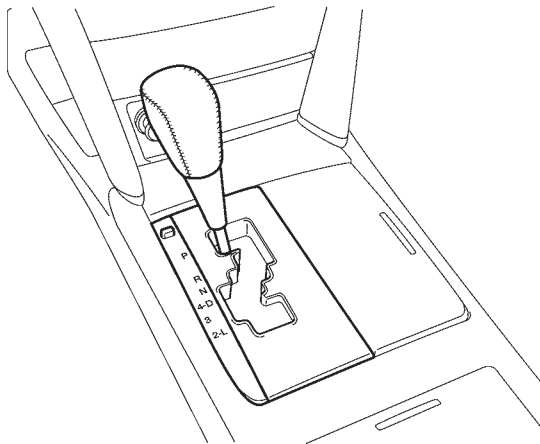
O: ON X: OFF

Normal	Solenoid Valve	SL1	O	X	O	X	X
		SL2	O	O	X	X	X
		SL3	X	X	X	O	O
		S4	X	X	X	X	O
	Gear Position		1st	2nd	3rd	4th	5th
SL1 Malfunction (During driving at 1st or 2nd)	Solenoid Valve	SL1	X				
		SL2	O	O	O	O	O
		SL3	X	X	X	O → X	O → X
		S4	X	X	X	X	O → X
	Gear Position		1st → 2nd	2nd	3rd → 2nd	4th → 2nd	5th → 2nd
SL1 Malfunction (During driving at 3rd)	Solenoid Valve	SL1	X				
		SL2	O → X	O → X	X	X	X
		SL3	X	X	X	O → X	O → X
		S4	X → O	X → O	X → O	X → O	O
	Gear Position		1st → 4th	2nd → 4th	3rd → 4th	4th	5th → 4th
SL1 Malfunction (During driving at 4th or 5th)	Solenoid Valve	SL1	X				
		SL2	O → X	O → X	X	X	X
		SL3	X → O	X → O	X → O	O	O
		S4	X	X	X	X	O
	Gear Position		1st → 4th	2nd → 4th	3rd → 4th	4th	5th
SL2 Malfunction	Solenoid Valve	SL1	O	X → O	O	X → O	X → O
		SL2	X				
		SL3	X	X	X	O → X	O → X
		S4	X → O	X → O	X → O	X → O	O
	Gear Position		1st → 4th	2nd → 4th	3rd → 4th	4th	5th → 4th
SL3 Malfunction	Solenoid Valve	SL1	O	X	O	X → O	X → O
		SL2	O	O	X	X	X
		SL3	X				
		S4	X	X	X	X → O	O
	Gear Position		1st	2nd	3rd	4th	5th → 4th
S4 Malfunction	Solenoid Valve	SL1	O	X	O	X	X
		SL2	O	O	X	X	X
		SL3	X	X	X	O	O
		S4	X				
	Gear Position		1st	2nd	3rd	4th	5th → 4th
SL1, SL2, SL3, and S4 Malfunction	Solenoid Valve	SL1	X				
		SL2	X				
		SL3	X				
		S4	X				
	Gear Position		1st → 4th	2nd → 4th	3rd → 4th	4th	5th → 4th

SHIFT CONTROL MECHANISM

1. General

- A gate type shift lever is used in conjunction with the 5-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.
- A shift lock system is used.

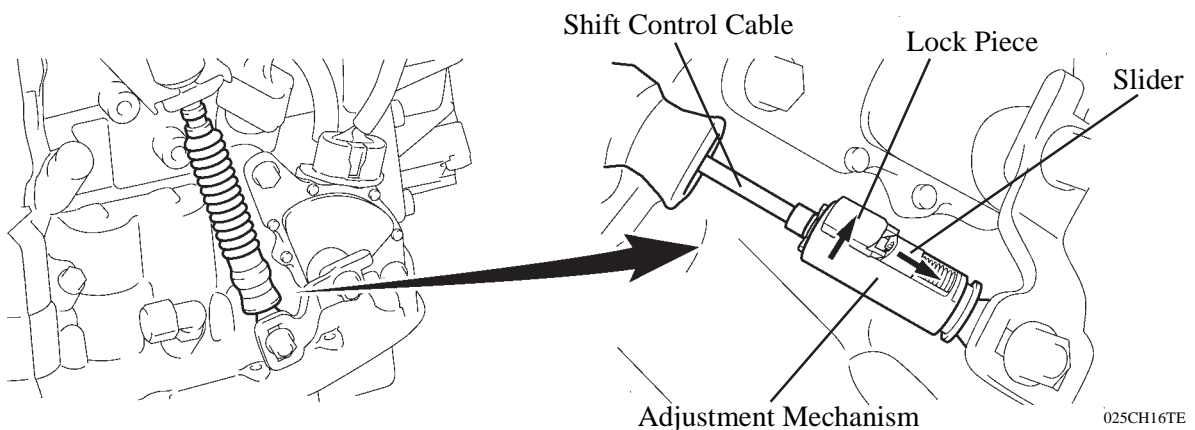


↓ : The shift lever can be moved only with Ignition ON and the brake pedal depressed.

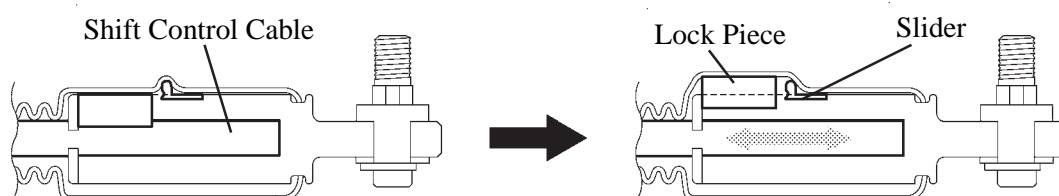
↑↓ : The shift lever can be moved at anytime.

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 Camry Repair Manual.



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Adjustment Mechanism Cross Section

2. Shift Lock System

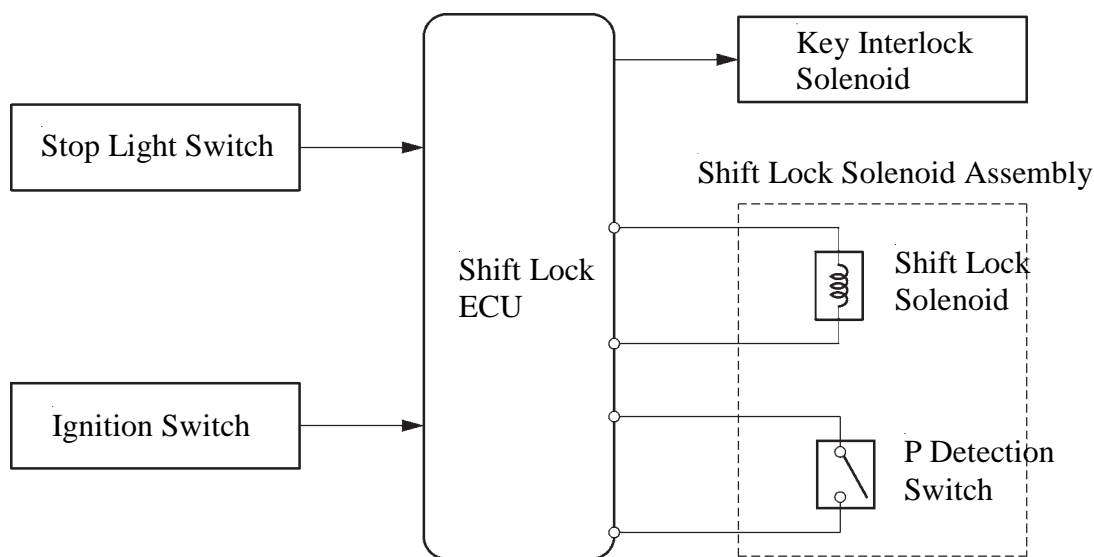
General

The shift lock system function setting is as follows:

Key Interlock	○
Shift Lock	○

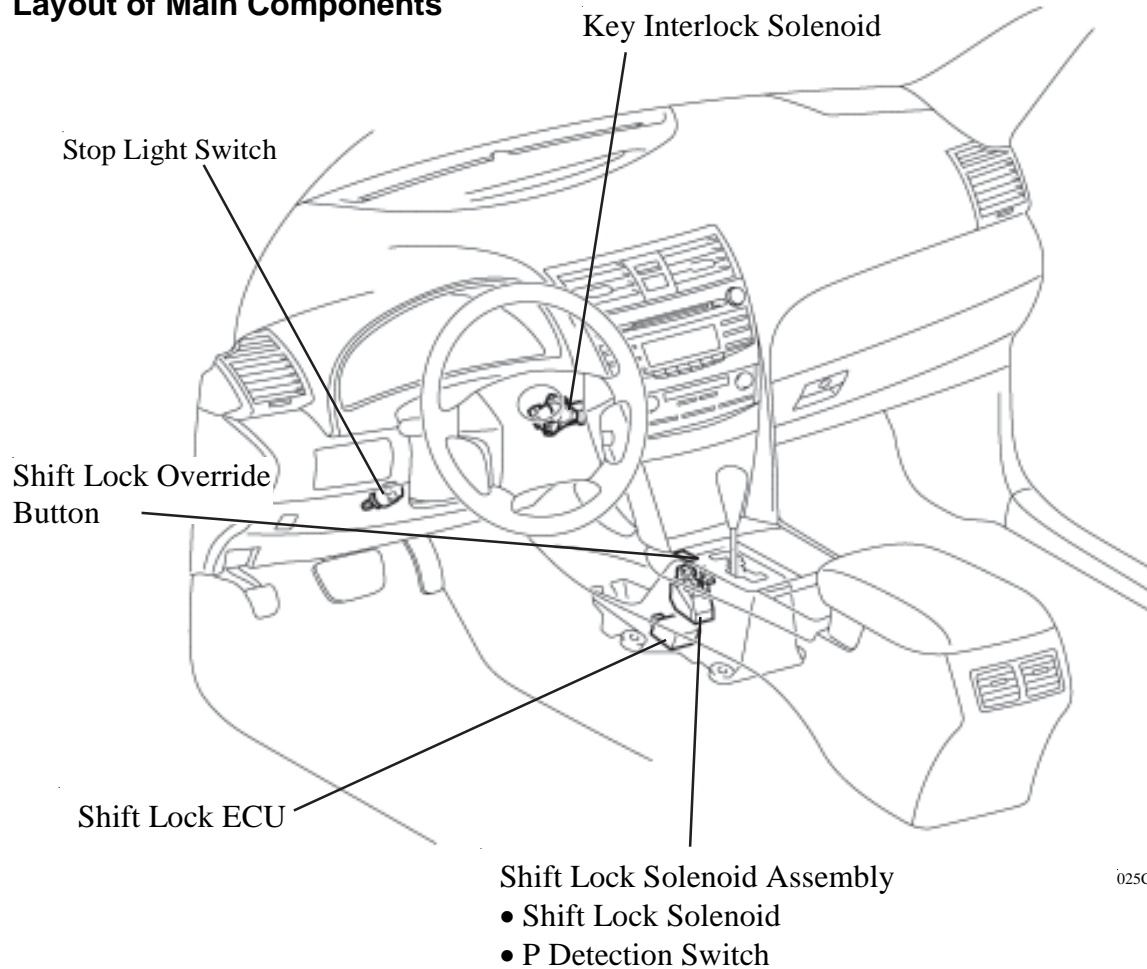
- The key interlock device prevents the key from being pulled out after the ignition switch is turned OFF, unless the shift lever is moved to the P position. Thus, the driver must park the vehicle in the P position.
- The shift lock mechanism prevents the shift lever from being shifted to any position other than the P position, unless the ignition switch is ON, and the brake pedal is depressed. This mechanism helps to prevent unintentional vehicle movement when shifting from the P (park) position.
- The shift lock system mainly consists of the shift lock ECU, shift lock solenoid, key interlock solenoid and shift lock override button.
- The shift lock solenoid has a built-in P detection switch.

► System Diagram ◀



025CH20TE

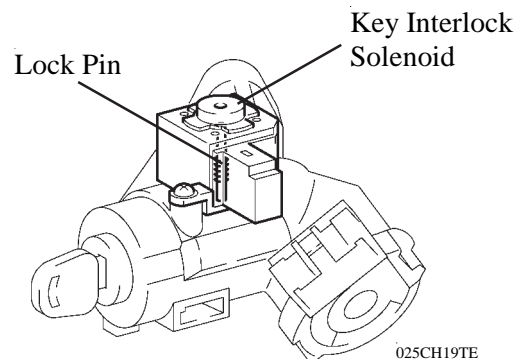
Layout of Main Components



025CH17TE

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

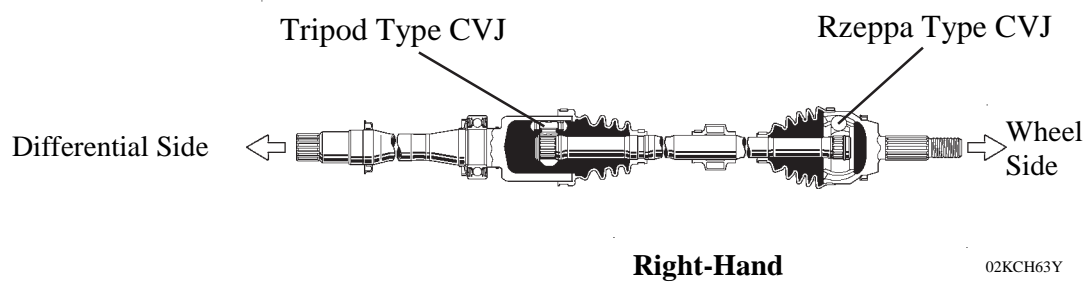
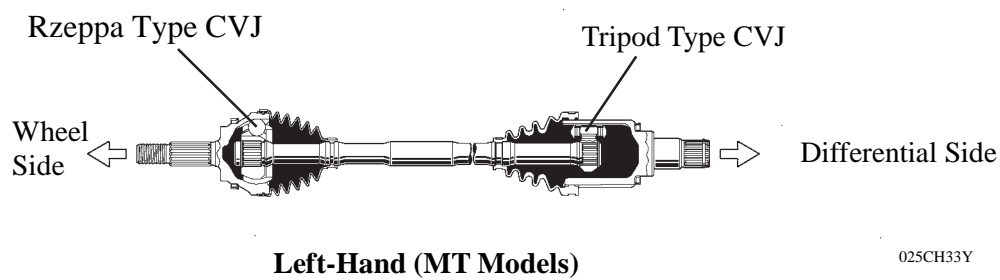
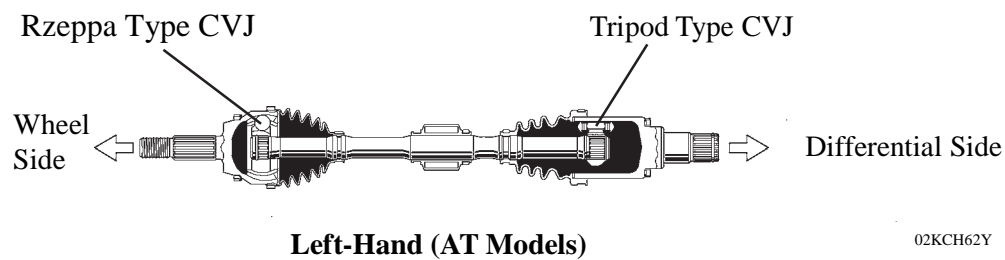
System Operation

- 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 in case of failure.

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.

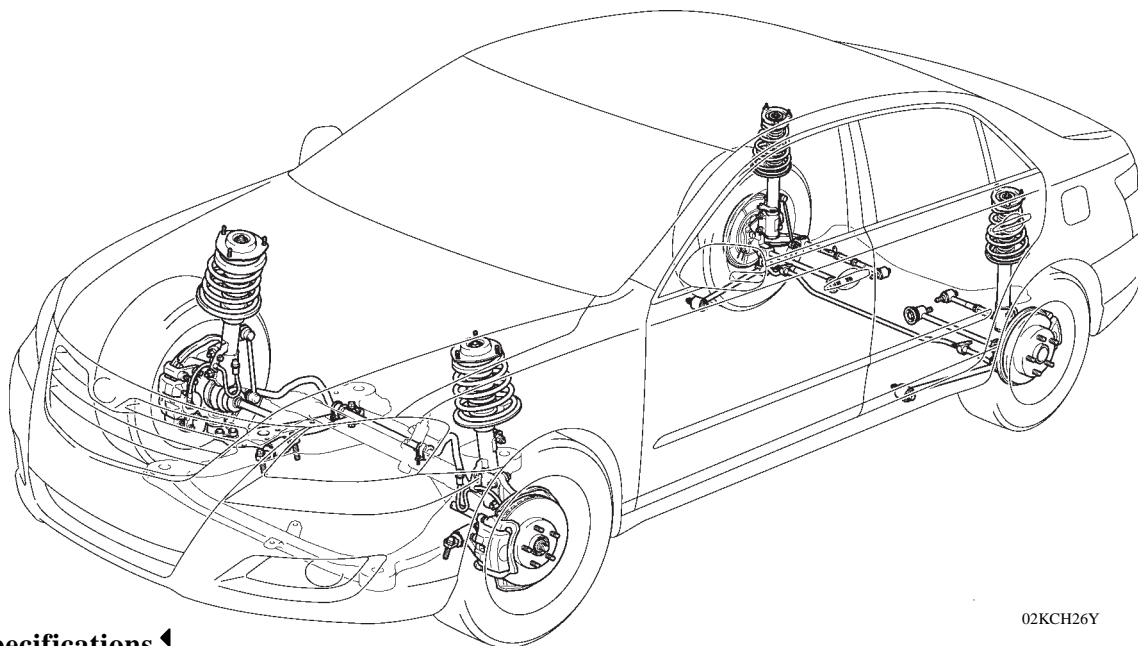


SUSPENSION AND AXLE

✱ 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.



02KCH26Y

► Specifications ◀

Transaxle Type		E354	U250E
Front Wheel Alignment	Type	MacPherson Strut	←
	Tread* ¹ mm	1,575	←
	Caster* ¹ degrees	2°50' * ² 2°55'	2°40' * ² 2°45' 2°50' * ³
	Camber* ¹ degrees	-0°30' * ² -0°40'	-0°35' * ² -0°45'
	Toe-in* ¹ mm	0	←
	King Pin Inclination* ¹ degrees	11°55' * ² 12°10' 12°15' * ³	12°05' * ² 12°20'
Rear Wheel Alignment	Type	Dual Link MacPherson Strut	←
	Tread* ¹ mm	1,565	←
	Camber* ¹ degrees	1°19' 1°25' * ³	←
	Toe-in* ¹ mm	4	←

*¹: Unloaded Vehicle Condition

*²: Rough Road Package

*³: SE grade

2. Front Suspension

General

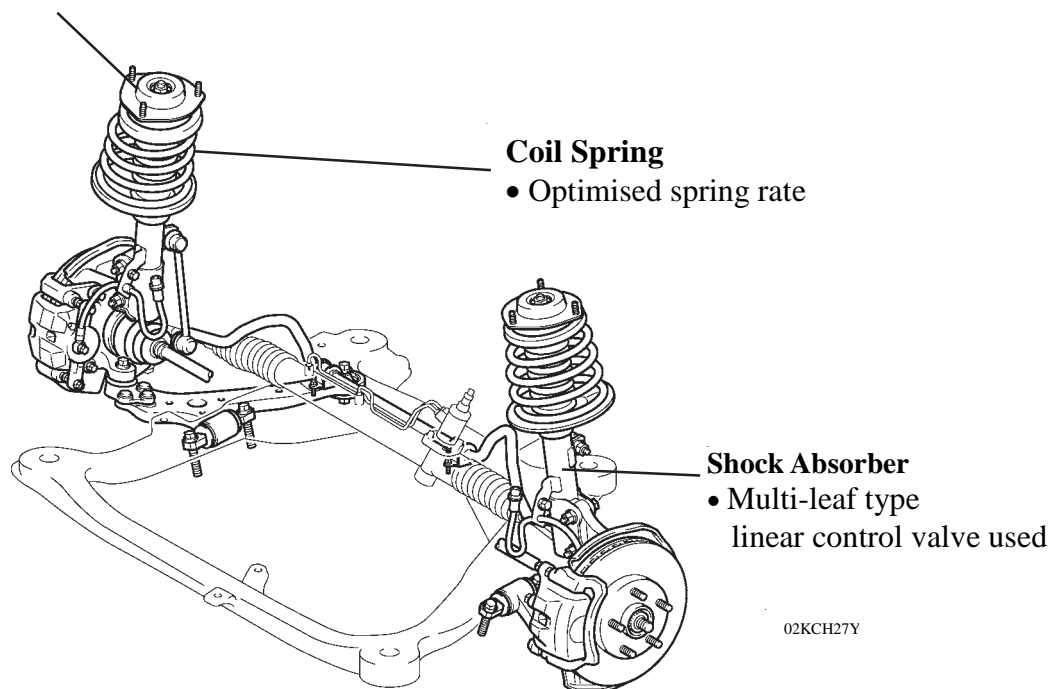
Through the optimal location of components, and the use of Nachlauf geometry, the front suspension provides excellent riding comfort and controllability.

Upper Support

- Optimised characteristics

Coil Spring

- Optimised spring rate



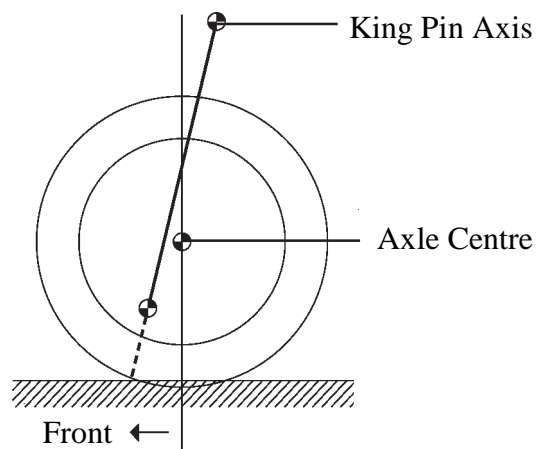
02KCH27Y

Service Tip

To prevent hazardous conditions, make sure to empty the gas from the shock absorber before discarding a low-pressure (N_2) gas sealed shock absorber. For details, see the Camry 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.



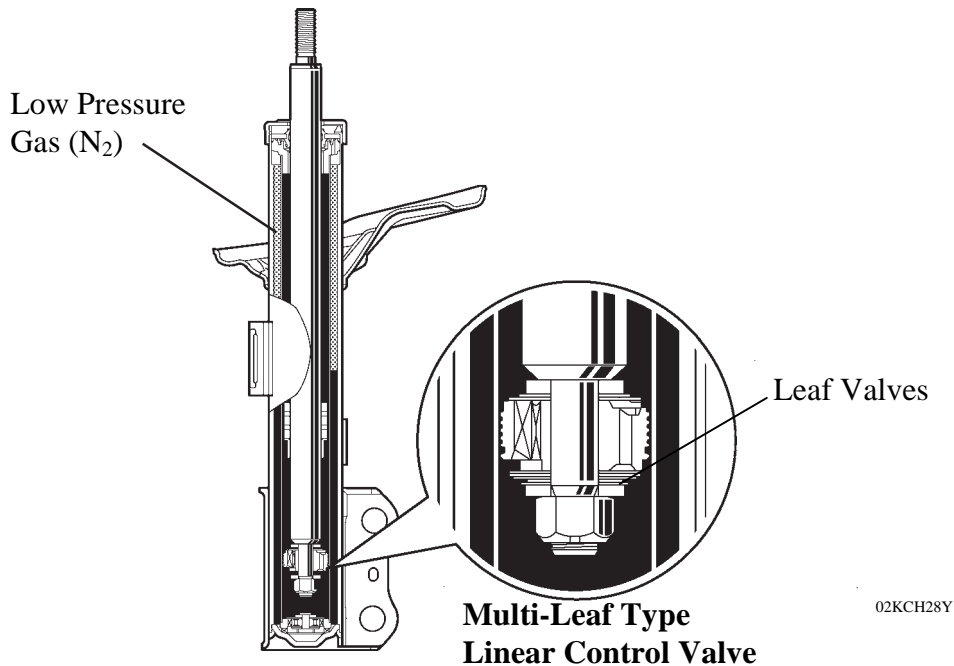
181CH22

Shock Absorber

1) General

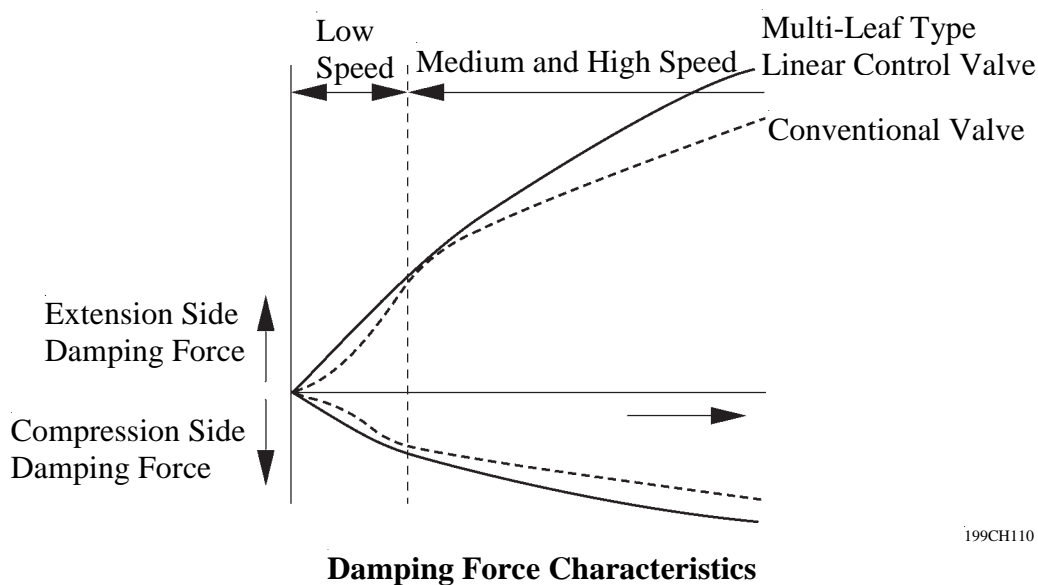
The two functions listed below are used for the shock absorber to realise both driving stability and riding comfort.

- 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

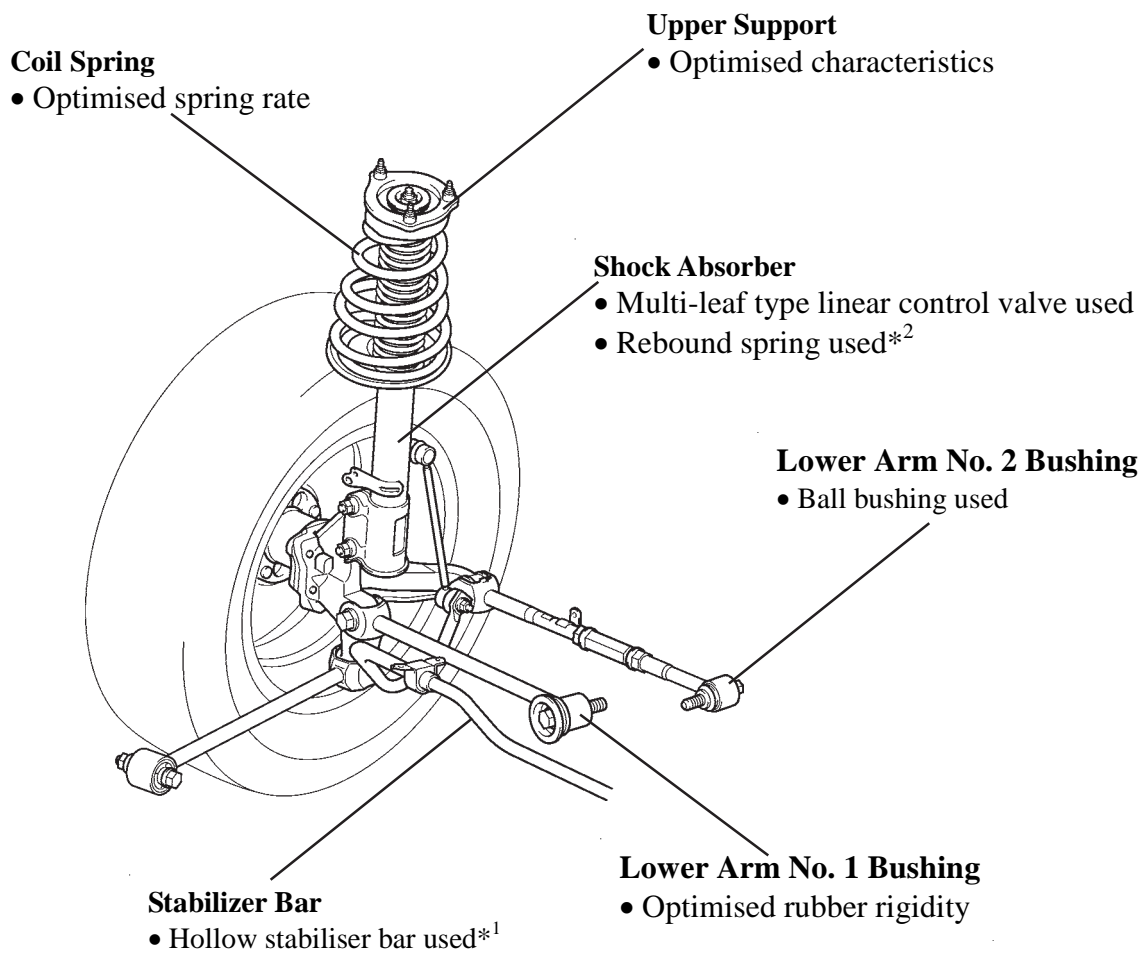
The multi-leaf type linear control valve has a structure consisting of several layered leaf valves with different diameters. Through use of the multi-leaf type linear control valve, changes in the damping force are made constant at low piston speeds, thus realising excellent riding comfort and controllability.



3. Rear Suspension

General

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



02KCH29Y

*¹: Excluding Sportivo

*²: For Sportivo only

Service Tip

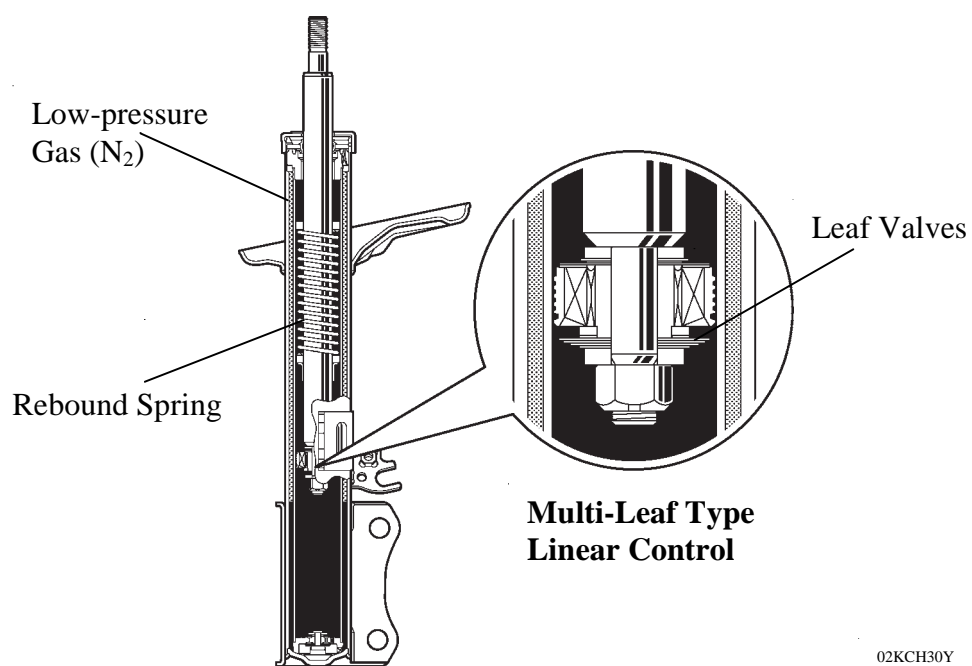
To prevent hazardous conditions, make sure to empty the gas from the shock absorber before discarding a low-pressure (N₂) gas sealed shock absorber. For details, see the Camry Repair Manual.

Shock Absorber

1) General

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

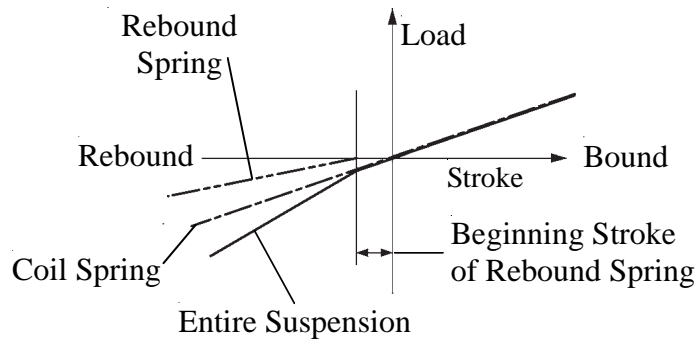
- A low-pressure (N_2) gas sealed type construction is used to suppress cavitation.
- A multi-leaf type linear control valve is used to attain linear damping force characteristics. For details, refer to Front Suspension section on page CH-39.
- A rebound spring is used on Sportivo grade models to improve vehicle stability during cornering.



Sportivo Grades

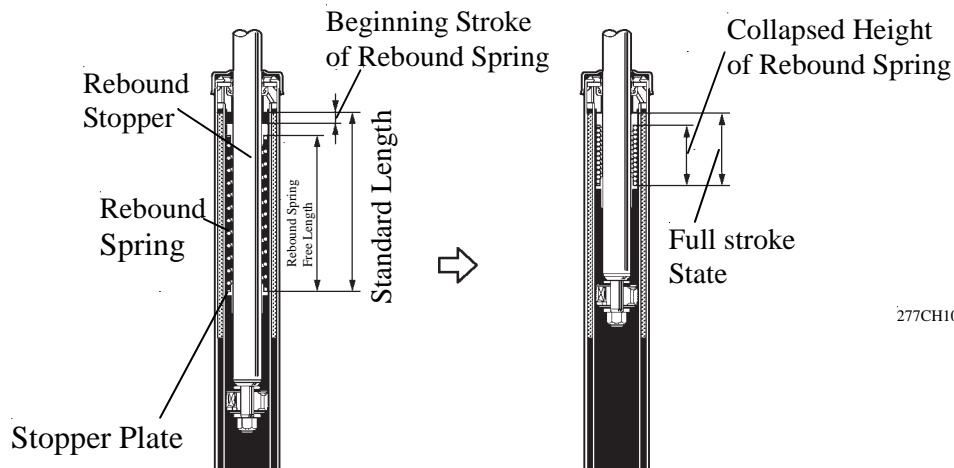
2) Rebound Spring

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.



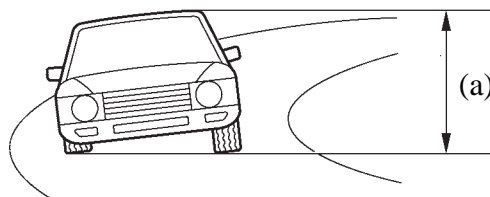
185CH16

Characteristic of Shock Absorber with Built-in Rebound Spring

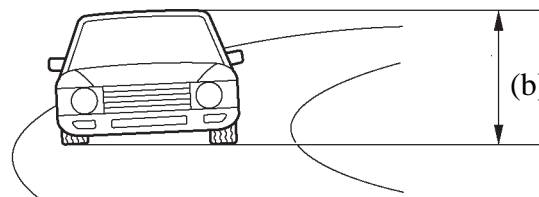


277CH107

► During Cornering ◀



Without Rebound Spring



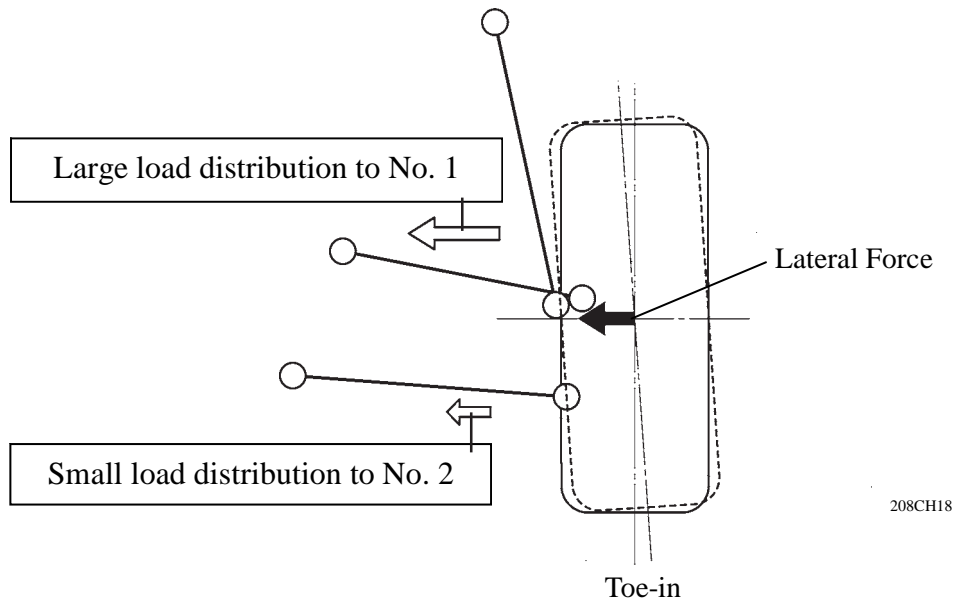
With Rebound Spring

$$(a) > (b)$$

02KCH58Y

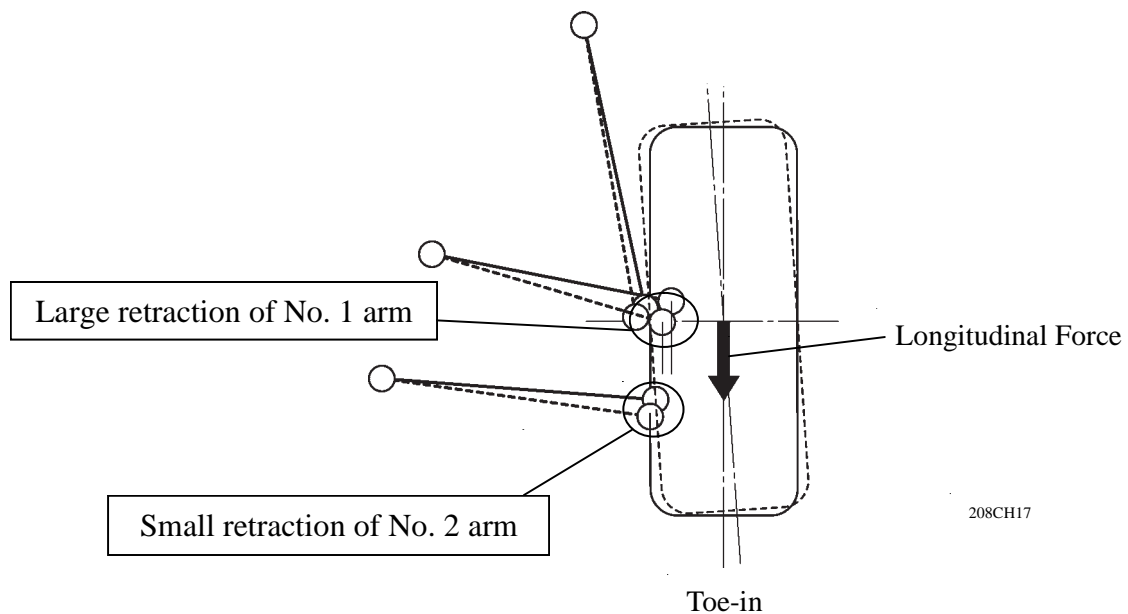
Cornering Geometry

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

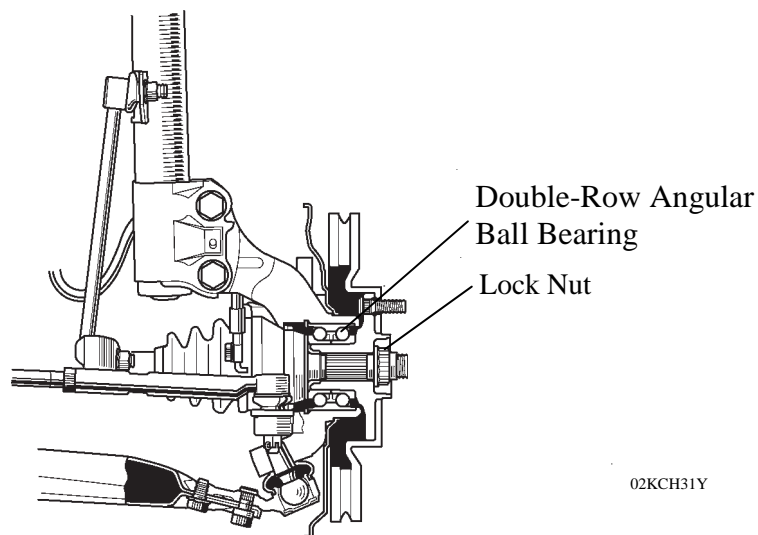
When the longitudinal force is generated, the displacement locus of the No. 1 and No. 2 suspension arms will toe-in as shown below, in order to ensure the stability of the vehicle.



✱ AXLE

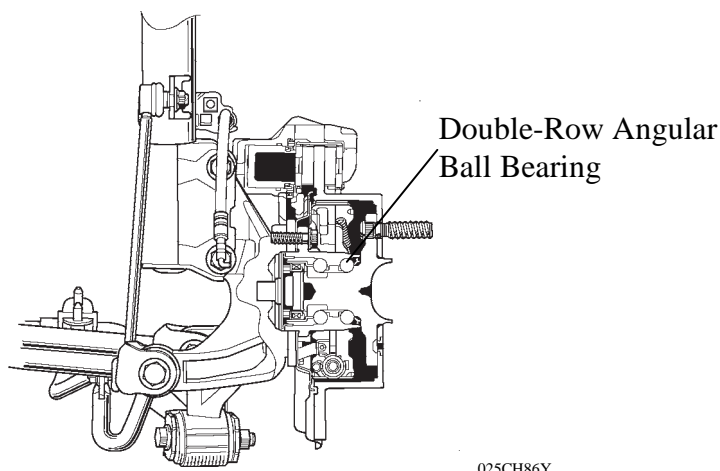
1. Front Axle

- 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 and Brake Assist use a mechanical type brake assist, which is integrated into the brake booster.
- The new Camry 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
Parking Brake Type	Lever Type ^{*1}
	Pedal Type ^{*2}

*1: Manual Transaxle

*2: Automatic Transaxle

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	PE63
	Wheel Cylinder Dia. mm	63.5
	Rotor Size (D×T)* mm	296 × 28
	Pad Material	PN562H
Rear Disc Brake	Caliper Type	PEAL38
	Wheel Cylinder Dia. mm	38.1
	Rotor Size (D×T)* mm	281 × 10
	Pad Material	D6234
Parking Brake	Type	Duo Servo
	Drum Inner Dia. mm	170.0
Brake Actuator Supplier	For ABS with EBD	Bosch

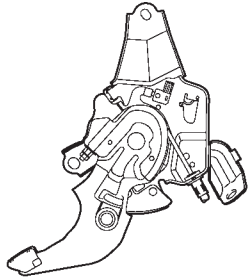
*: D: Outer Diameter, T: Thickness

Service Tip

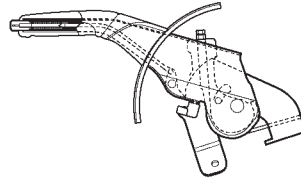
- To ensure the performance and reliability of the plunger type master cylinder, it must not be disassembled. If it malfunctions, replace the entire assembly.
- Before removing the plunger type master cylinder from the brake booster, discharge the vacuum from the brake booster. Otherwise, the piston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

2. Component of Brake System

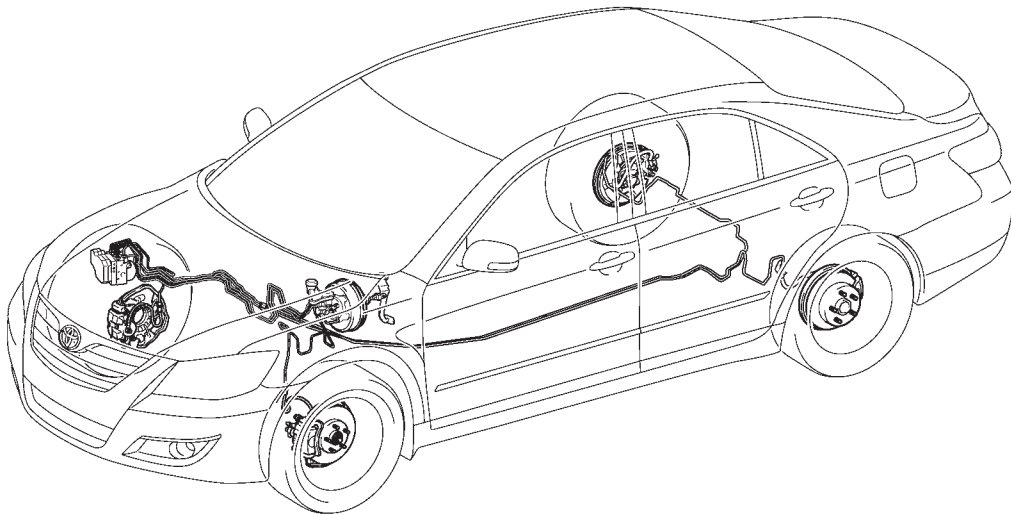
► Parking Brake ◄



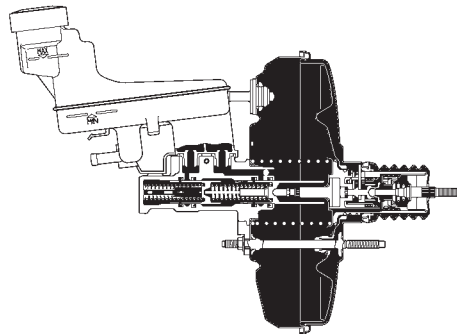
Pedal Type



Lever Type

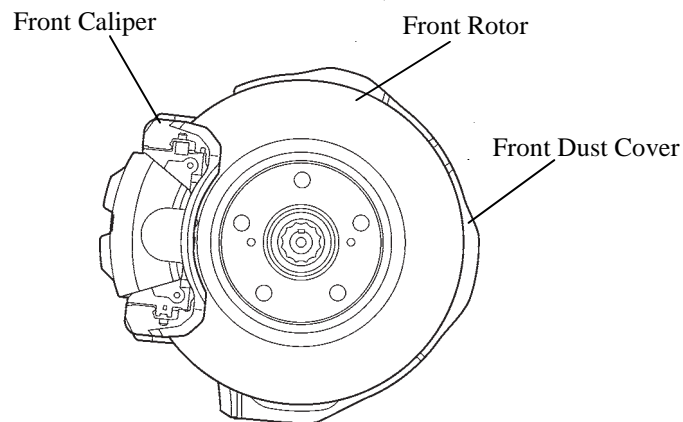


► Master Cylinder and Brake Booster with mechanical brake assist ◄



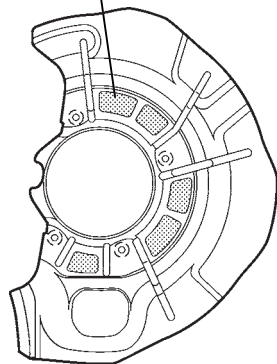
✱ FRONT BRAKE

- 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 optimized to efficiently direct cool air to the ventilated disc, thus ensuring excellent cooling performance.

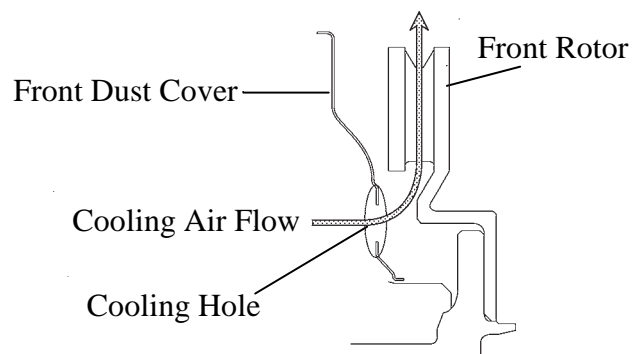


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Cooling Hole



Front Dust Cover

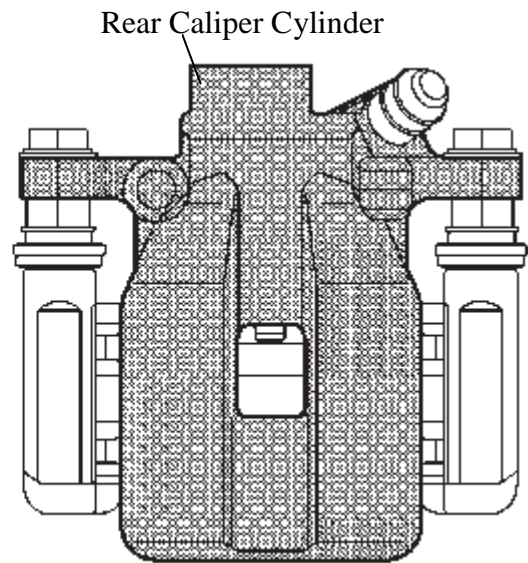
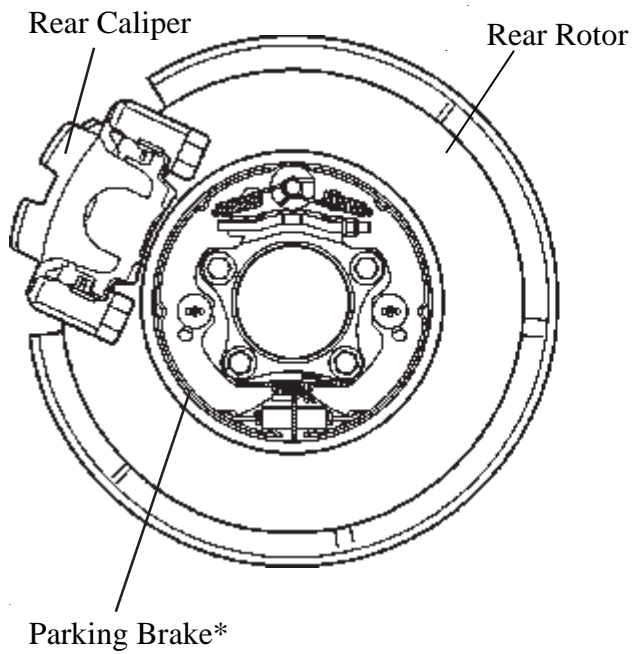


Cross Section

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REAR BRAKE

- The diameter of the rear rotor is 281 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 Brake Caliper & Disc

✿ BRAKE CONTROL SYSTEM (ABS with EBD)

1. General

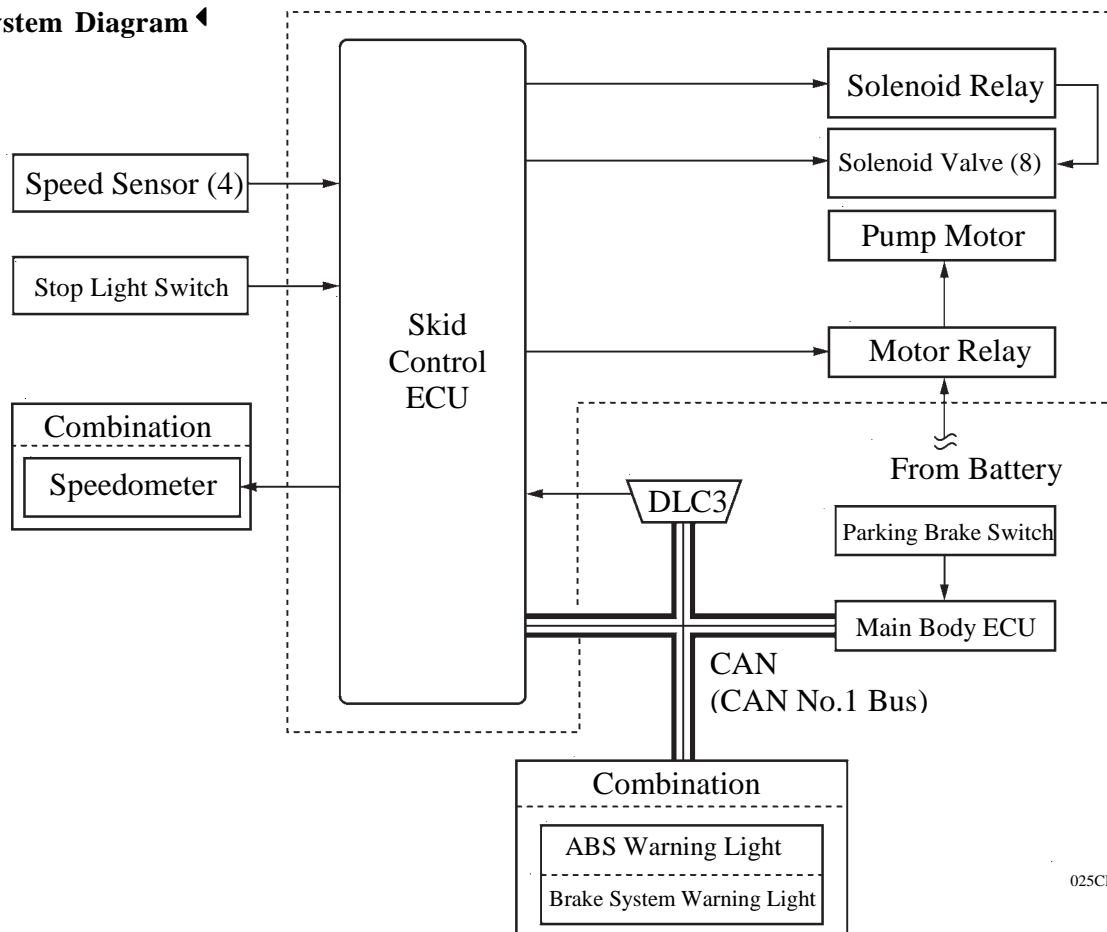
The brake control system (ABS with EBD) of new Camry has the following functions:

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 (Mechanical 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 to realise the vehicle's brake performance.

Service Tip

When the 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 to be a malfunction.

► System Diagram ◀



025CH37P

2. 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.

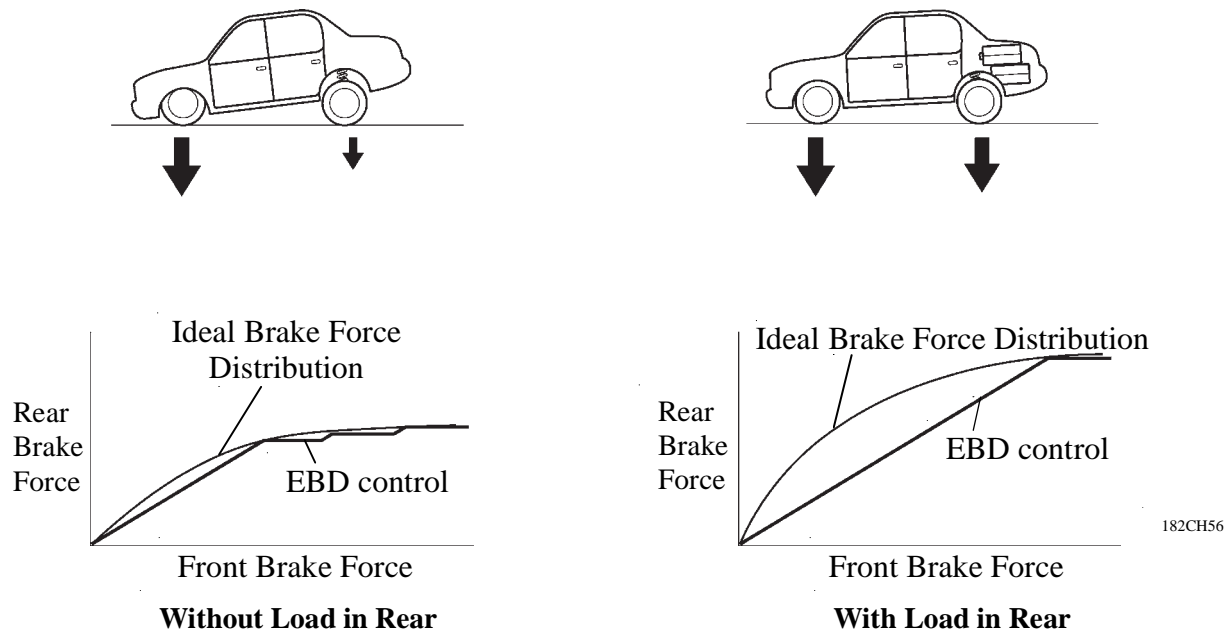
Front/ Rear Wheels Brake Force Distribution

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.

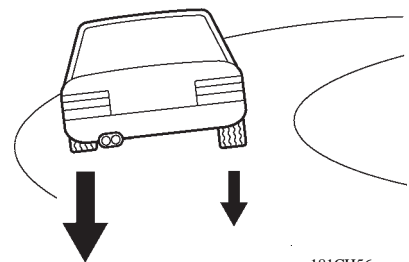
► EBD Control Concept ◀



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.

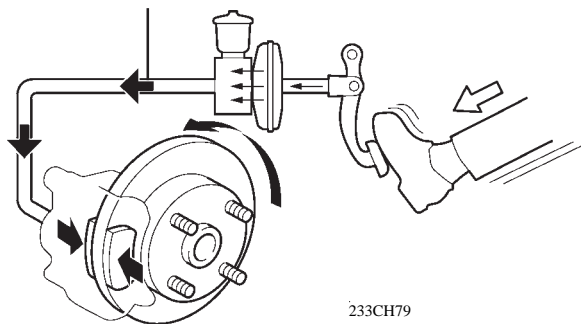


3. Outline of Brake Assist (Mechanical Type)

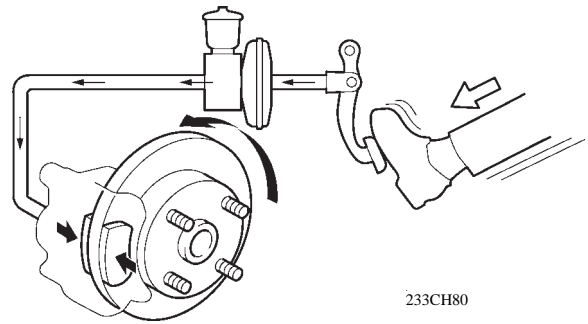
- The brake assist in combination with ABS helps improve the vehicle's brake performance.
- The brake assist interprets a quick push of the brake pedal as emergency braking and supplements the brake power applied if the driver has not stepped hard enough on the brake pedal. In emergencies, the driver, 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 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.
- The mechanical type brake assist uses the brake assist mechanism in the brake booster to mechanically activate the brake booster function in order to increase the brake force. For details, see page CH-54.

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

The fluid pressure is increased
by the brake booster

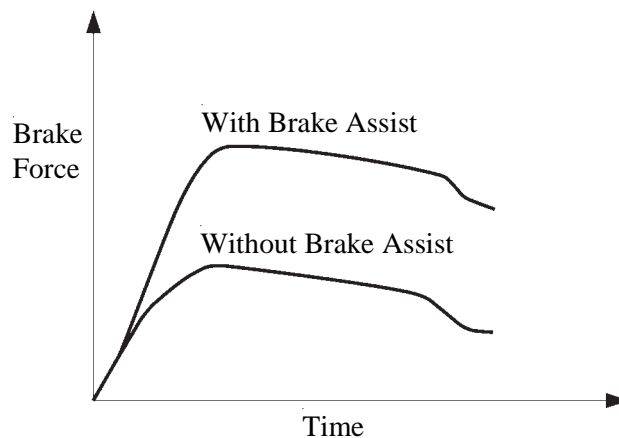


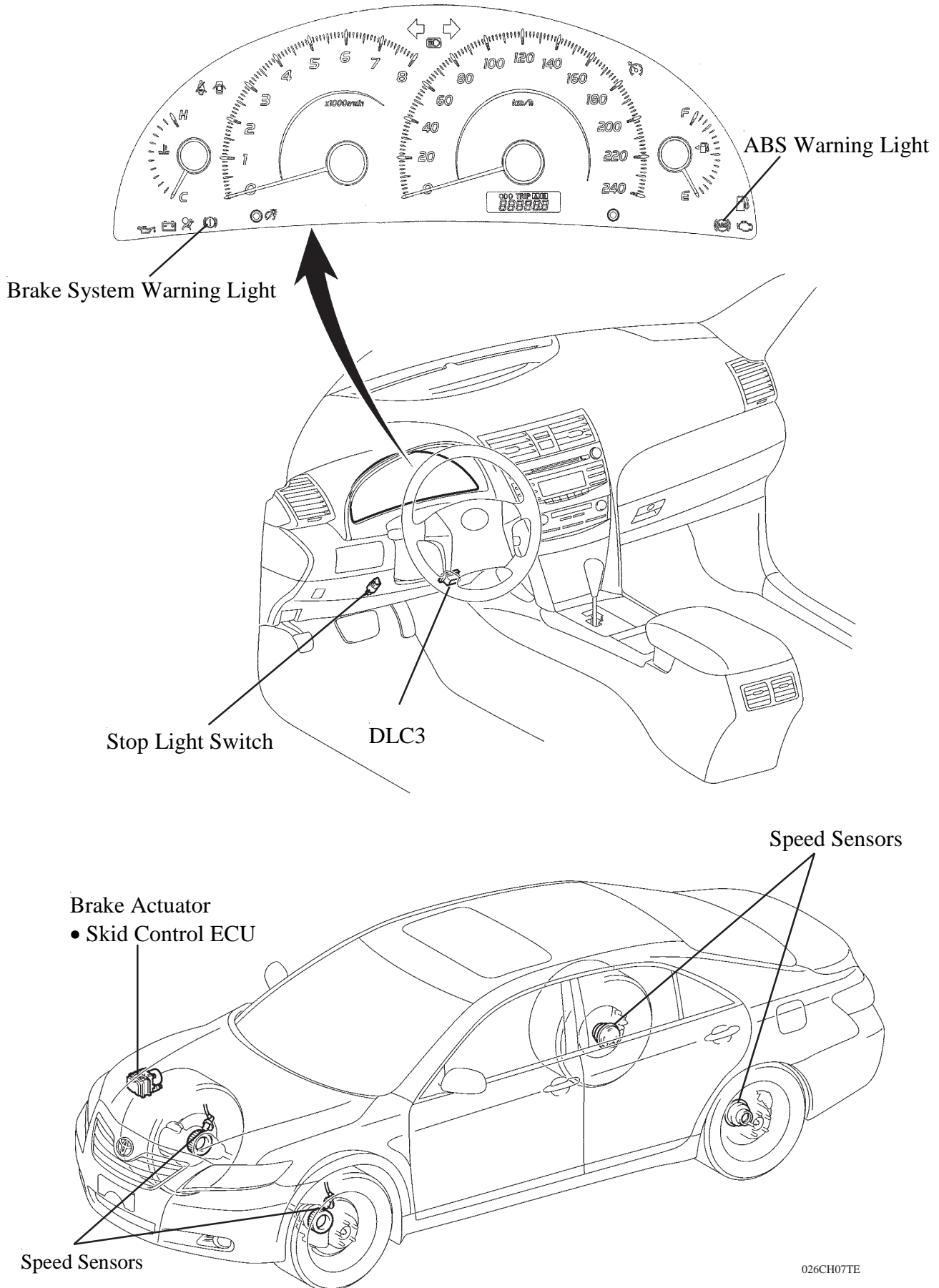
With Brake Assist



Without Brake Assist*

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





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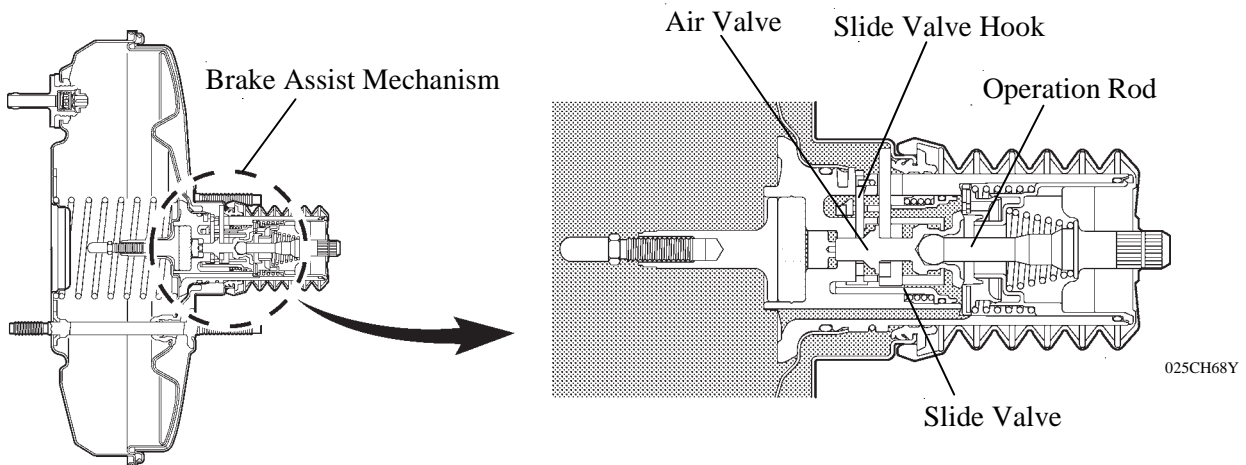
5. Function of Main Components

Component		Function
Combination Meter	Brake System Warning Light	<ul style="list-style-type: none"> • Lights up to alert the driver when a malfunction occurs in the EBD or skid control ECU. • Lights up to alert the driver when the brake fluid level is low. • Lights up to alert the driver when the parking brake is actuated.
	ABS Warning Light	Lights up to alert the driver when the skid control ECU detects a malfunction in the ABS or EBD System.
Brake Fluid Level Warning Switch		Detects the brake fluid level.
Speed Sensors		Detects the wheel speed of each of 4 wheels.
Stop Light Switch		Detects the brake pedal depressing signals.
Parking Brake Switch		Detects the parking brake actuation signals.
Brake Actuator	Actuator Portion	In charge of fluid path based on the signals from the skid control ECU during the operation of the ABS with EBD, in order to control the fluid pressure that is applied to the wheel cylinders.
	Skid Control ECU	Judges the vehicle driving condition based on the signals from each sensor, and sends brake control signals to the brake actuator.
	ABS solenoid relay	Supplies or cuts off power to solenoid valves in the brake actuator.
	ABS motor relay	Supplies or cuts off power to motor in the brake actuator.

6. Brake Booster (with Brake Assist Mechanism)

General

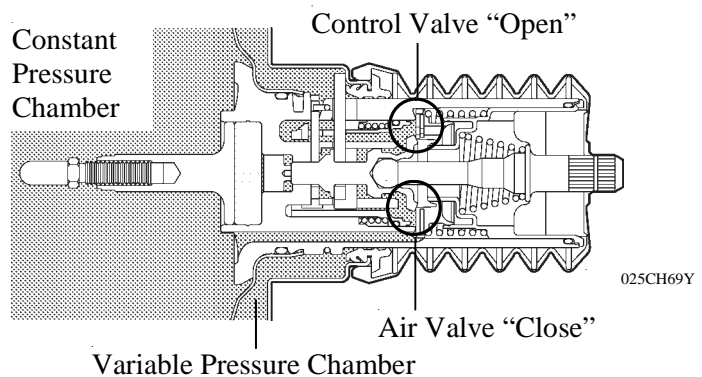
This brake booster consists of the conventional type brake booster to which a brake assist has been added. During a normal brake operation, the function of the brake booster is the same as that of the conventional type. The major difference in construction between this booster and the conventional type one is that the slide valve and the slide valve hook are added in the air valve in this booster.



Operation

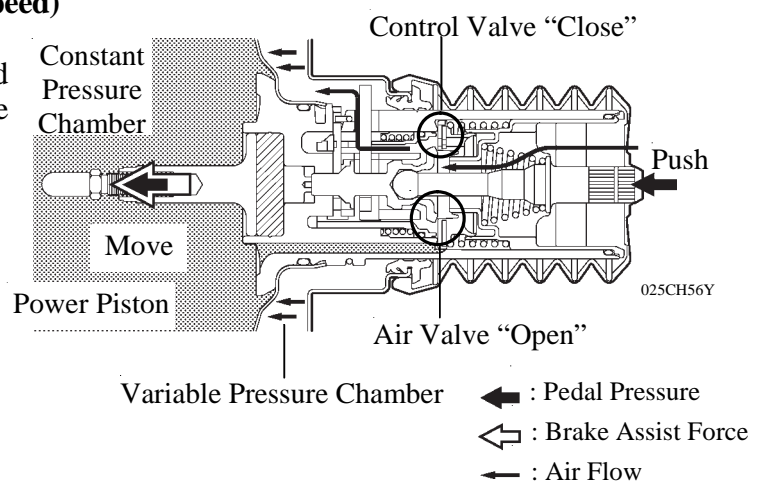
1) No Braking Condition

When the air valve closes and the control valve opens, the pressure in the constant pressure chamber and that in the variable pressure chamber become the same.



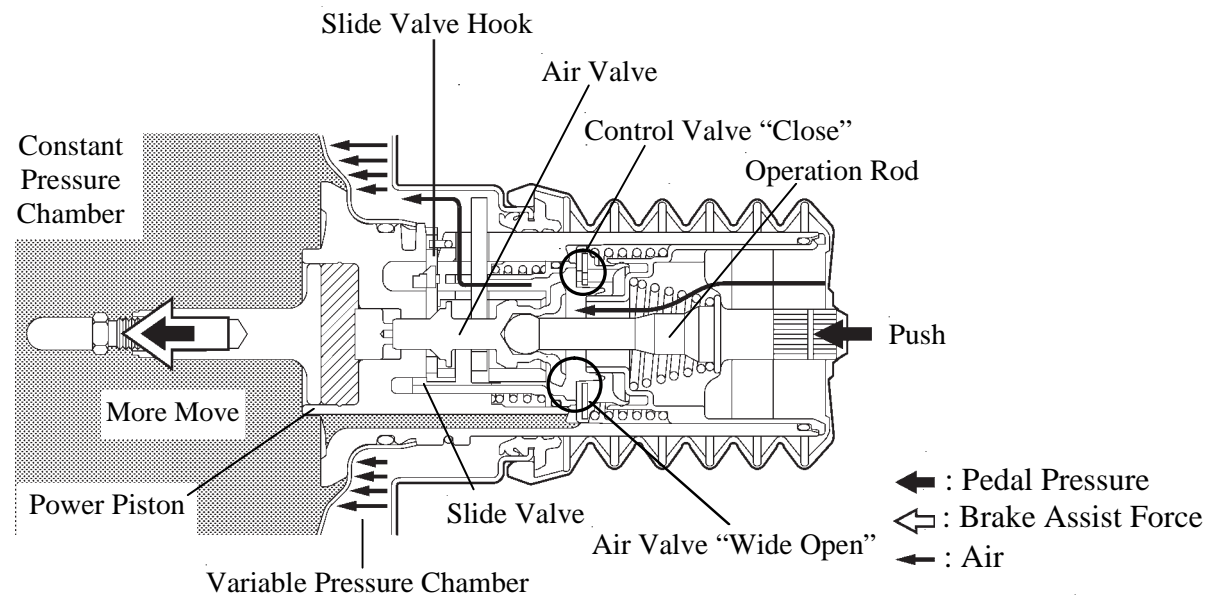
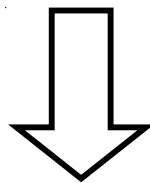
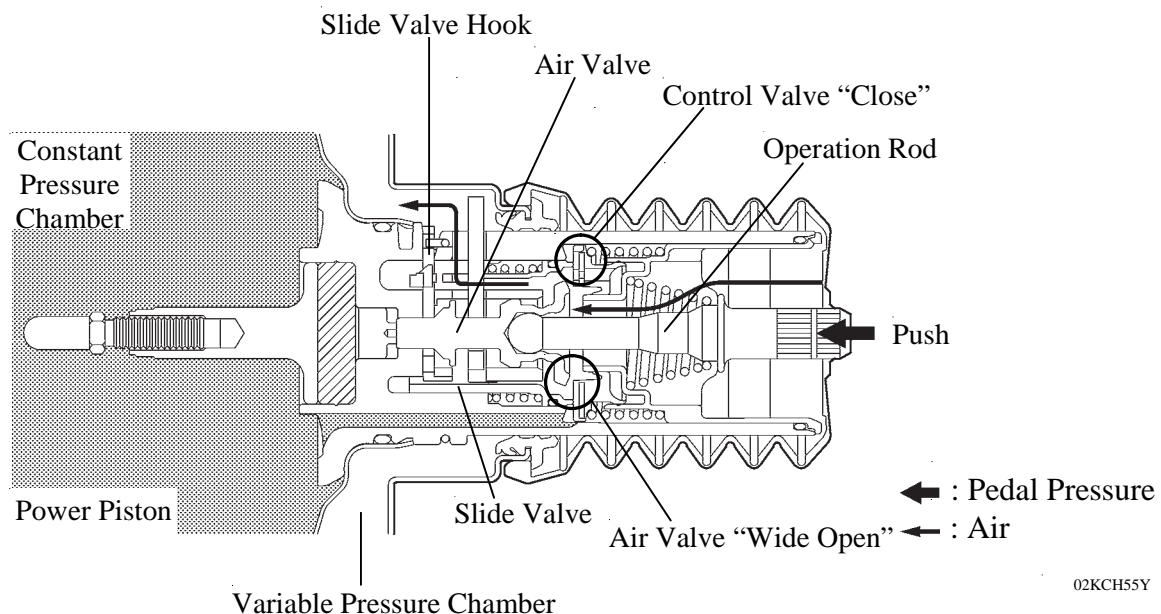
2) Normal Braking Condition (Operation Rod Speed = Power Piston Speed)

During normal braking, the air valve opens and the control valve closes to activate the brake booster function.



3) Brake Assist Condition (Operation Rod Speed > Power Piston Speed)

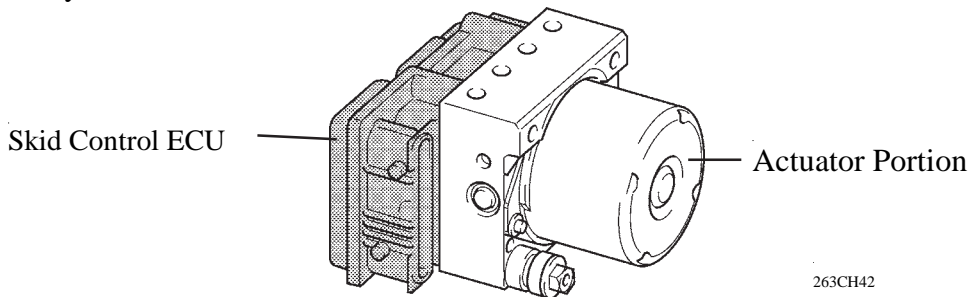
When the operation rod speed is faster than the power piston speed, the air valve pushes the slide valve hook. Consequently, the slide valve separates from the slide valve hook, the spring pushes the control valve, and the control valve closes. Thus, the opening of the air valve becomes enlarged and the air volume that is introduced increases. This results in a brake assist force to powerfully push the power piston.



7. Brake Actuator

General

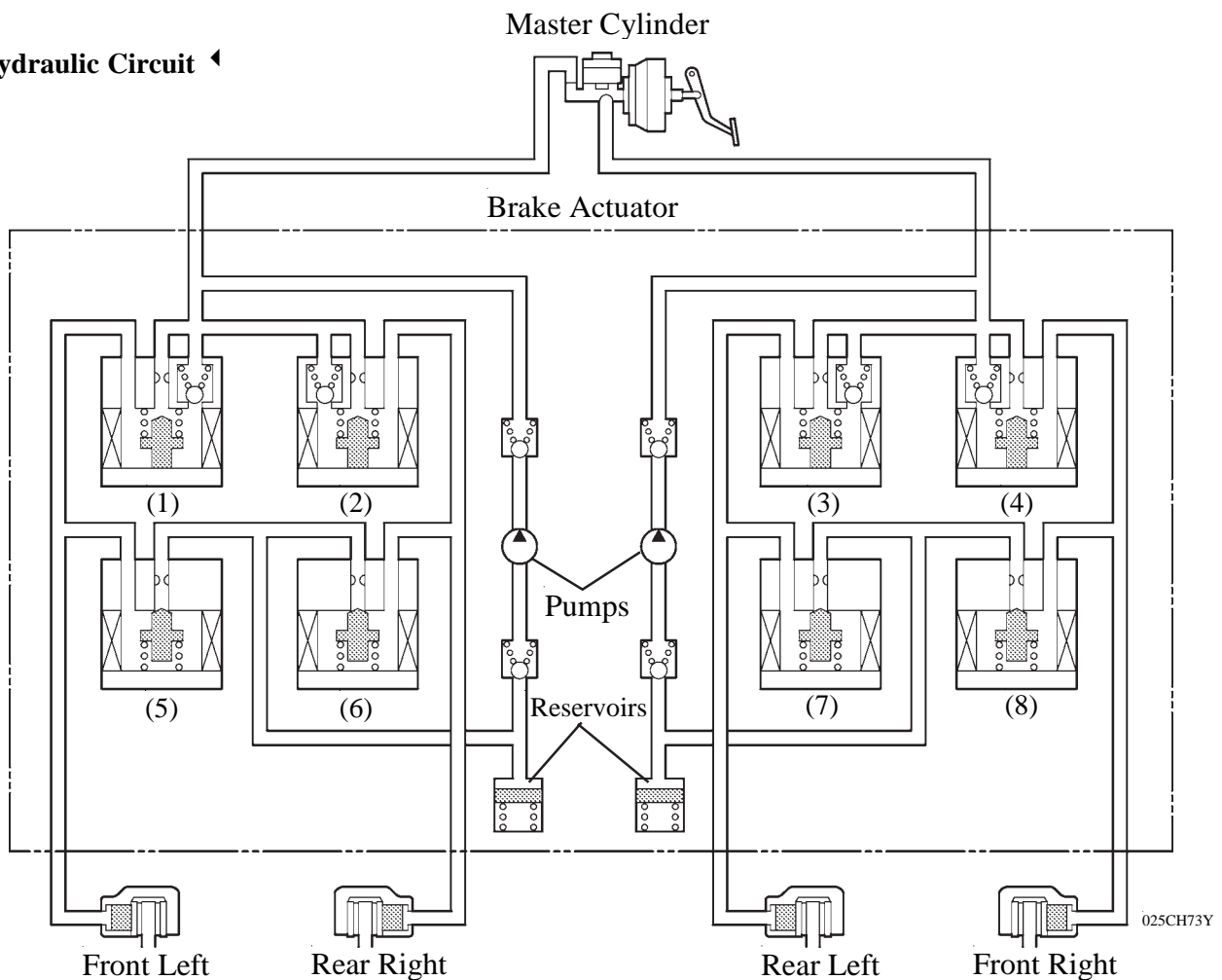
- The brake actuator consists of actuator portion, skid control ECU, ABS solenoid relay, and ABS motor relay.
- The 2 relays are built in the brake actuator.



Actuator Portion

The actuator portion consists of 8 two-position solenoid valves, 1 motor, 2 pumps and 2 reservoirs. The 8 two-solenoid valves consist of 4 pressure holding valves [(1), (2), (3), (4)] and 4 pressure reduction valves [(5), (6), (7), (8)].

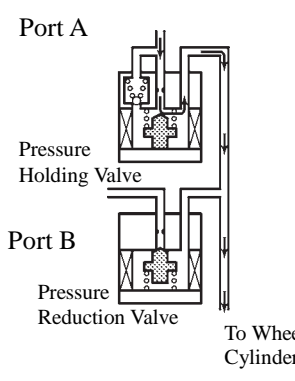
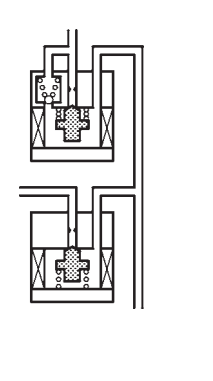
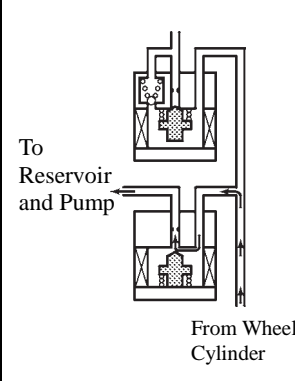
► Hydraulic Circuit ◀



8. System Operation

ABS with EBD Operation

Based on the signals received from the 4 wheel speed sensors, the skid control ECU calculates each wheel speed and deceleration, and checks wheel slipping conditions. And according to the slipping condition, the skid control ECU controls the pressure holding valve and pressure reduction valve in order to adjust the fluid pressure of the each wheel cylinder in the following 3 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 Valve</p> <p>Port B</p> <p>Pressure Reduction Valve</p> <p>To Wheel Cylinder</p> <p>169CH54</p>	 <p>169CH55</p>	 <p>To Reservoir and Pump</p> <p>From Wheel Cylinder</p> <p>169CH56</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

Initial Check

After the ignition is turned ON, and the vehicle attains an approximate speed of 15 km/h or more only at first time, the skid control ECU performs the initial check.

The functions of each solenoid valve and pump motor in the brake actuator are checked in order.

9. Diagnosis

General

If the skid control ECU detects a malfunction in the brake control system (ABS with EBD), the ABS and brake system warning lights that correspond to the function in which the malfunction have been detected indicate or light up to alert the driver of the malfunction as indicated in the table below.

○: Light ON —: Light OFF

Item	ABS	EBD	Skid Control ECU
ABS Warning Light	○	○	○
Brake System Warning Light	—	○	○

- At the same time, the DTC (Diagnostic Trouble Code) are stored in the memory. The DTC can be read by connecting the SST (09843-18040) between the Tc and CG terminals of DLC3 and observing the blinks of the ABS warning light, or by 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.
- 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 a connecting an intelligent tester II.

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 and brake assist).
 - 2-digit DTC can be read by connecting the SST (09843-18040) to Tc and CG terminals of the DLC3, and reading the code from the blinking warning light in the combination meter.
 - 5-digit DTC can be read by connecting an intelligent tester II to the DLC3.

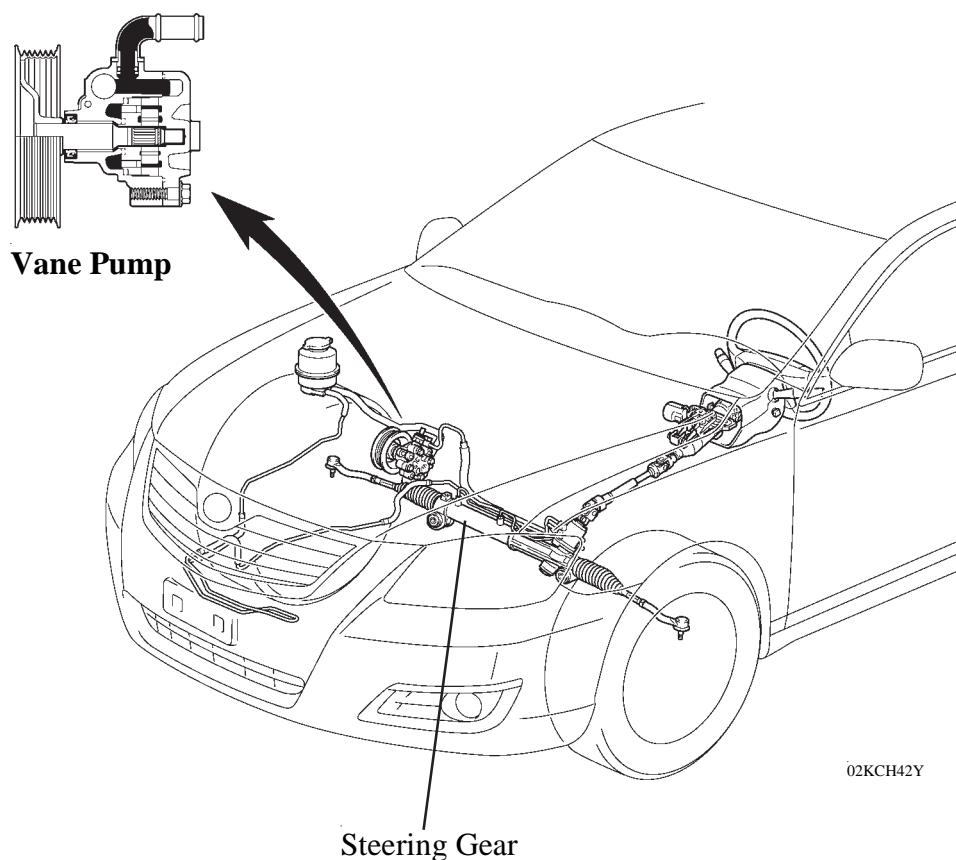
Fail-Safe

- In the event of a malfunction in the ABS, the skid control ECU prohibits the ABS operation.
- In the event of a malfunction in EBD control, the skid control ECU prohibits EBD control. Thus, the brake will be operated in the same condition as the system without the ABS with EBD.

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

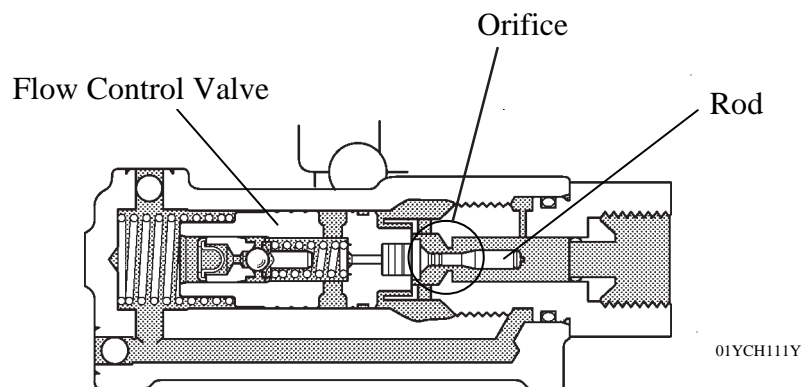
Specifications

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

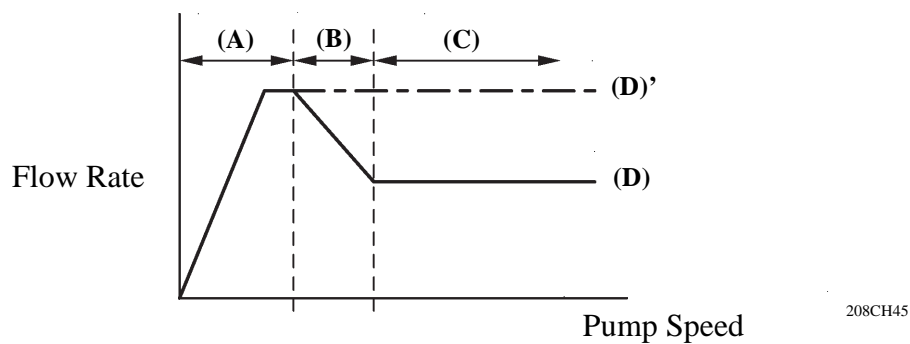
1. Construction

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.



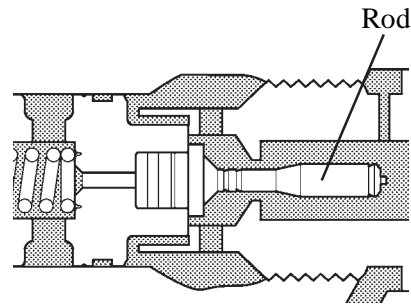
2. Operation

► Flow Rate Characteristics ◀



At Low Pump Speed Range (A)

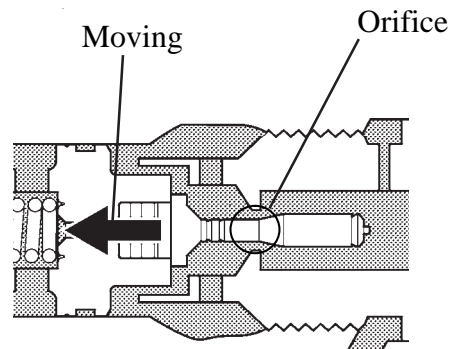
The flow rate increases proportionally to the pump speed.



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At Middle Pump Speed Range without Steering (B)

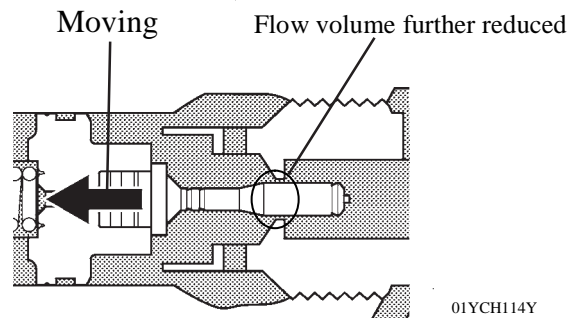
The flow control valve moves to the left, the flow rate is decreased due to the reduction in the orifice area, which is related to the rod shaft diameter at each position.



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At High Pump Speed Range without Steering (C)

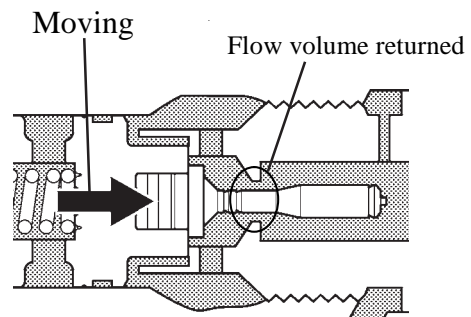
As the flow control valve moves further to the left, the flow rate is further reduced at the maximum rod shaft diameter.



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.

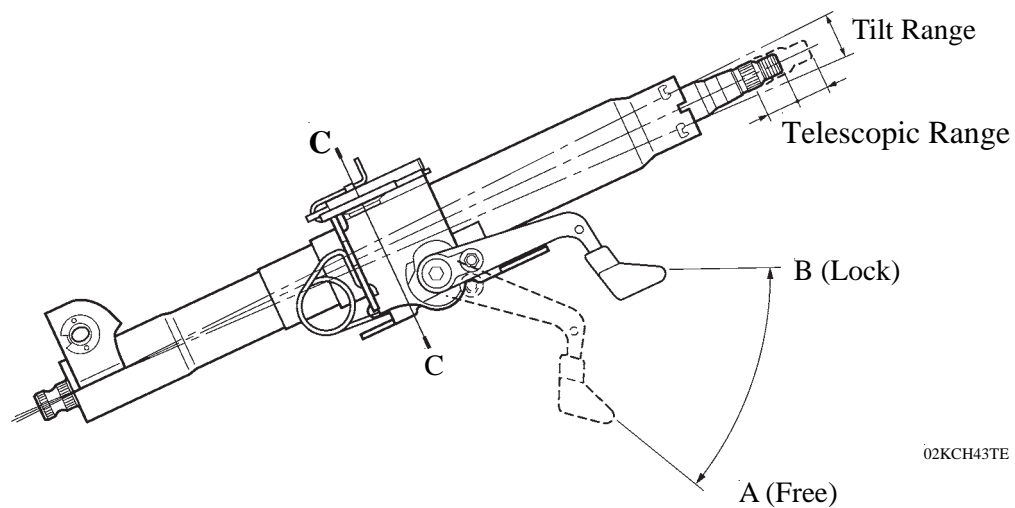


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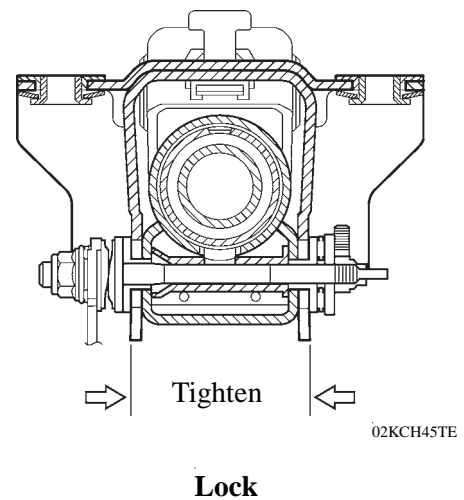
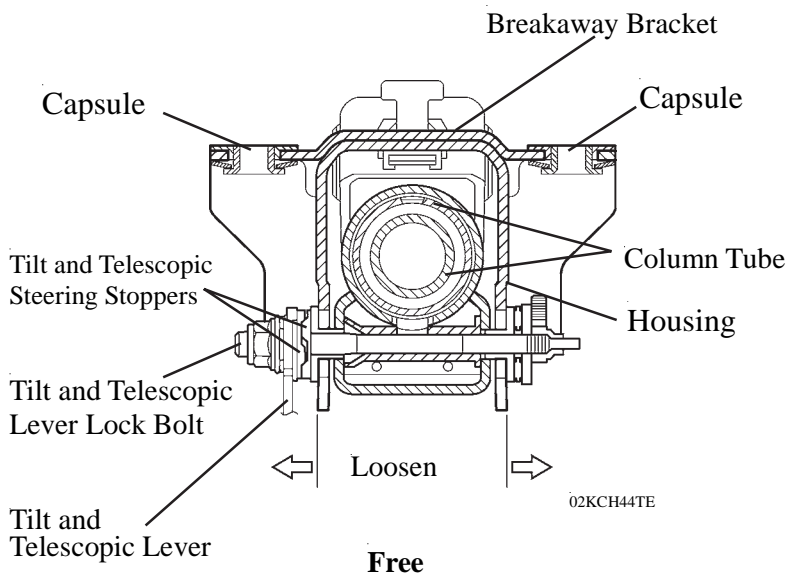
STEERING COLUMN

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° (step less) and the telescopic adjustment range of 40 mm (1.57 in.), 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 ◀

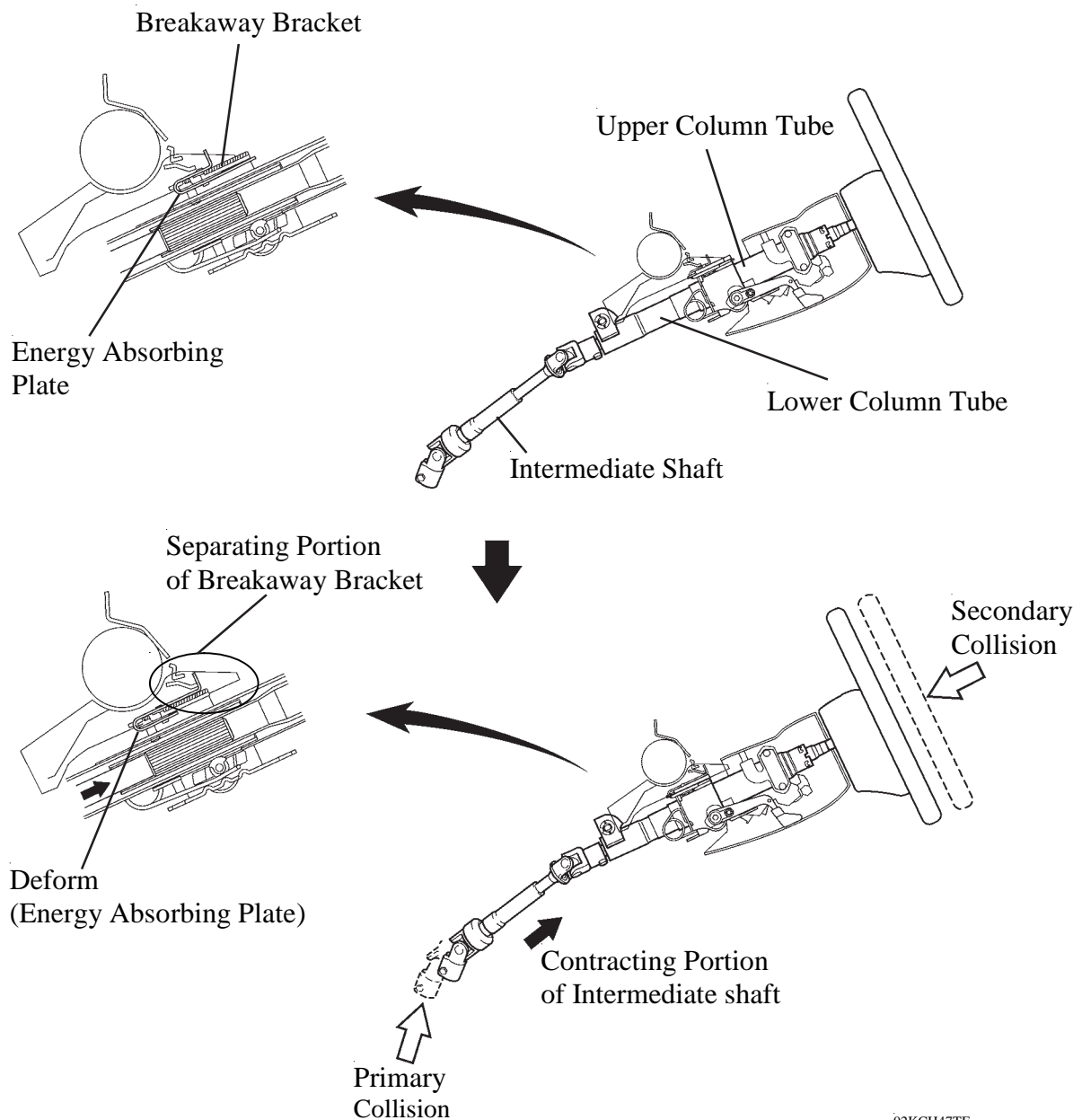


3. Energy Absorbing Mechanism

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 ◄



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-19</i>
<i>Wiper Arm & Blade.....</i>	<i>BO-19</i>
<i>Child Restraint System.....</i>	<i>BO-20</i>
<i>Seat Belt.....</i>	<i>BO-21</i>

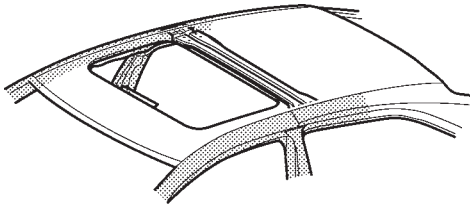
BODY


BODY STRUCTURE

✱ LIGHTWEIGHT AND HIGHLY RIGID BODY

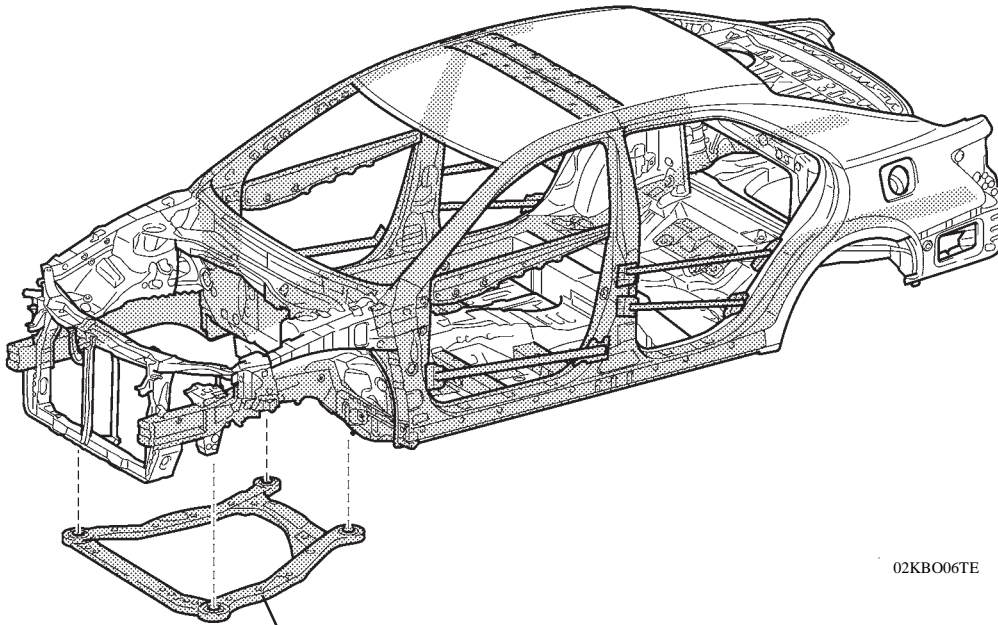
1. High Strength Sheet Steel

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

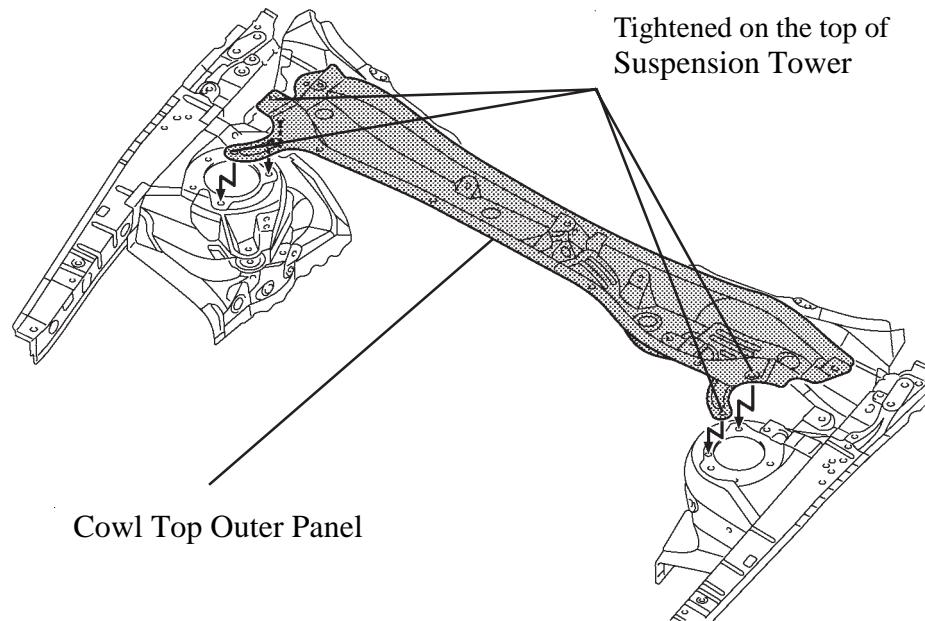


Front Sub Frame

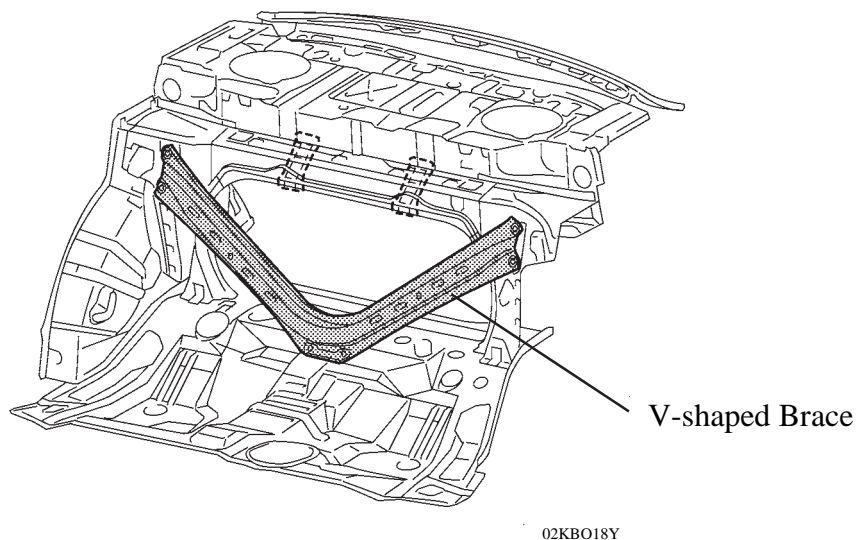
02KBO06TE

2. Brace

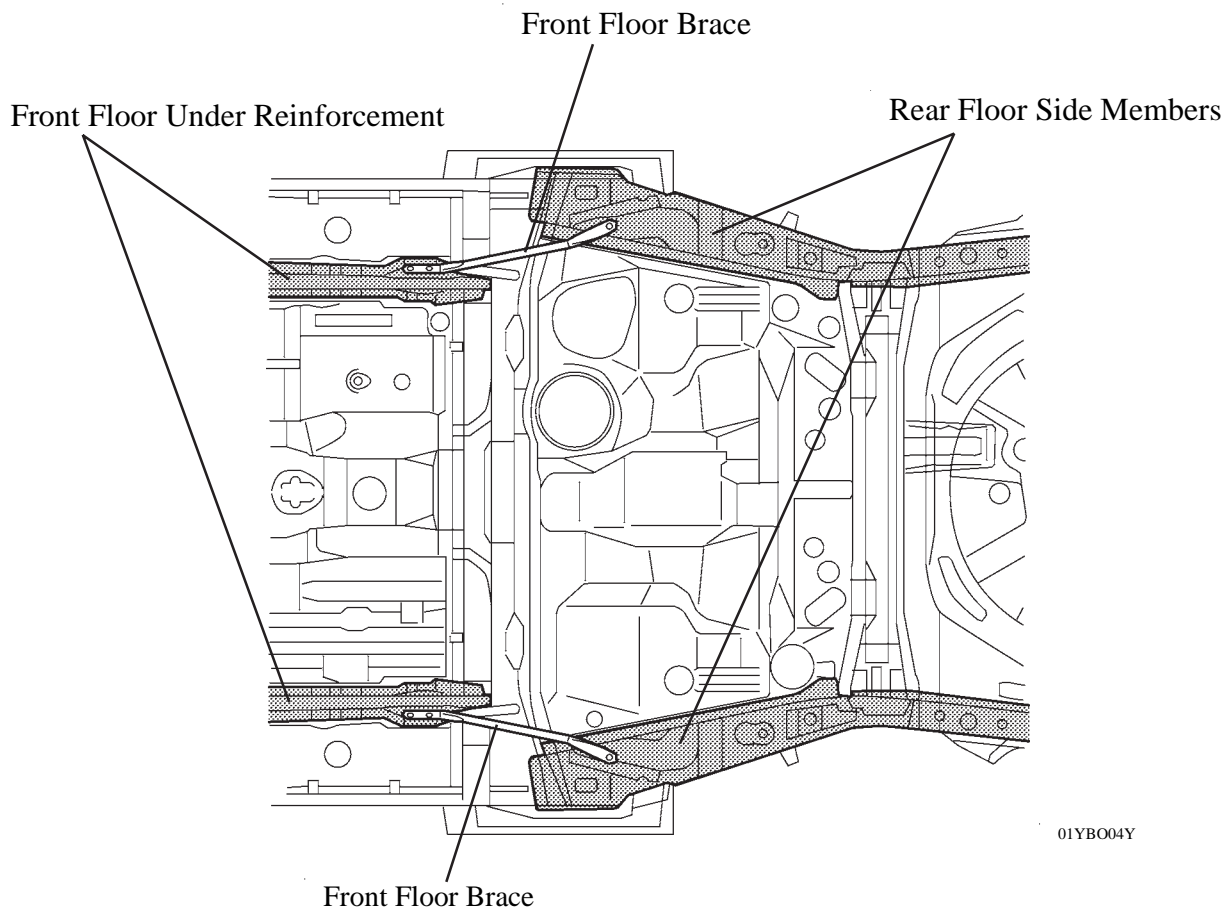
- Excellent manoeuvrability and stability has been achieved by providing a cowl top outer panel for the front suspension tower.



- On both models with fixed rear seats and those with reclining rear seats, a V-shaped brace has been provided between the rear suspension tower and the floor. As a result, the body rigidity has been enhanced and excellent manoeuvrability and stability have been achieved.



- On SE grade, 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

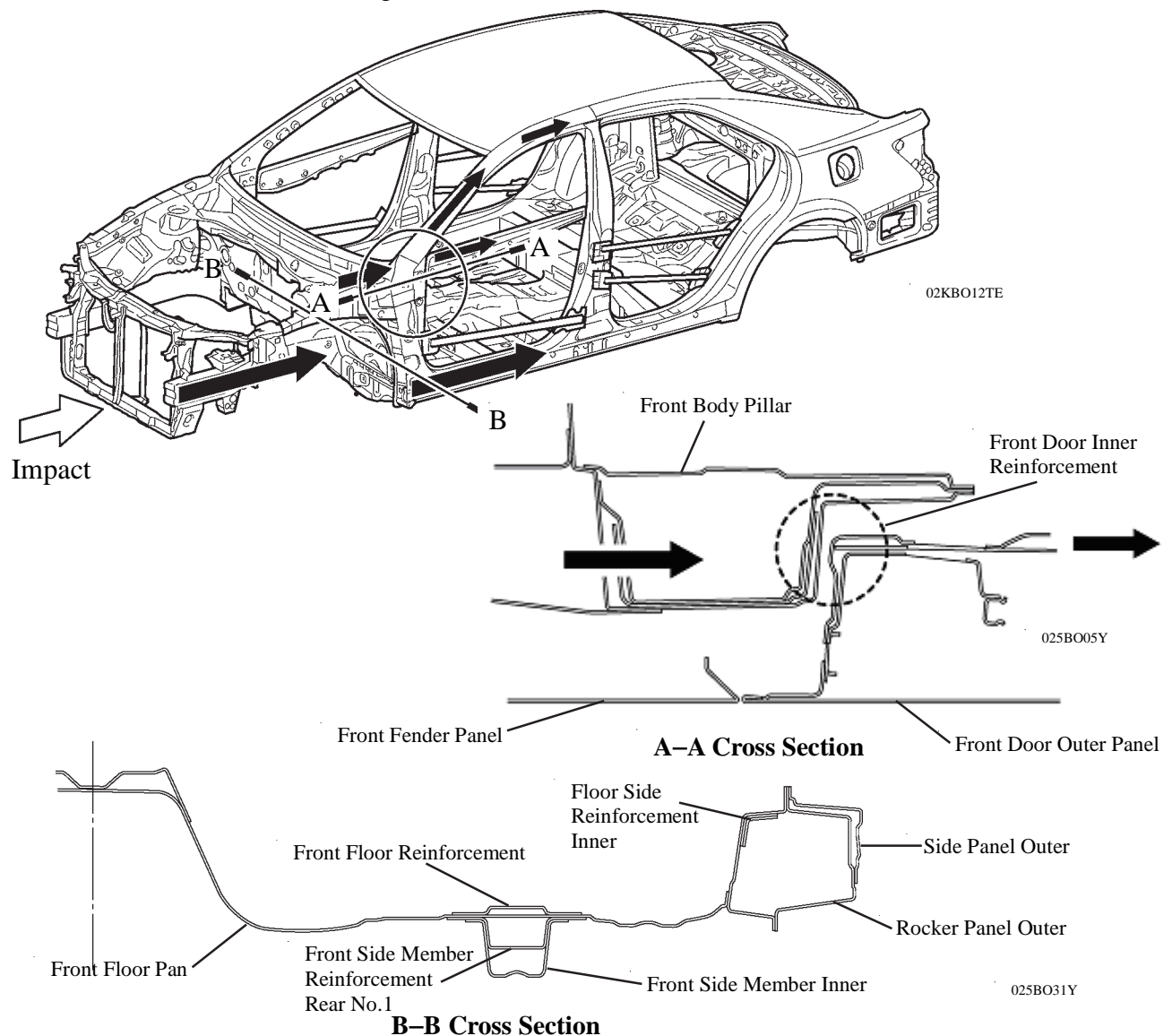
1. General

The impact absorbing structure of the new Camry 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.

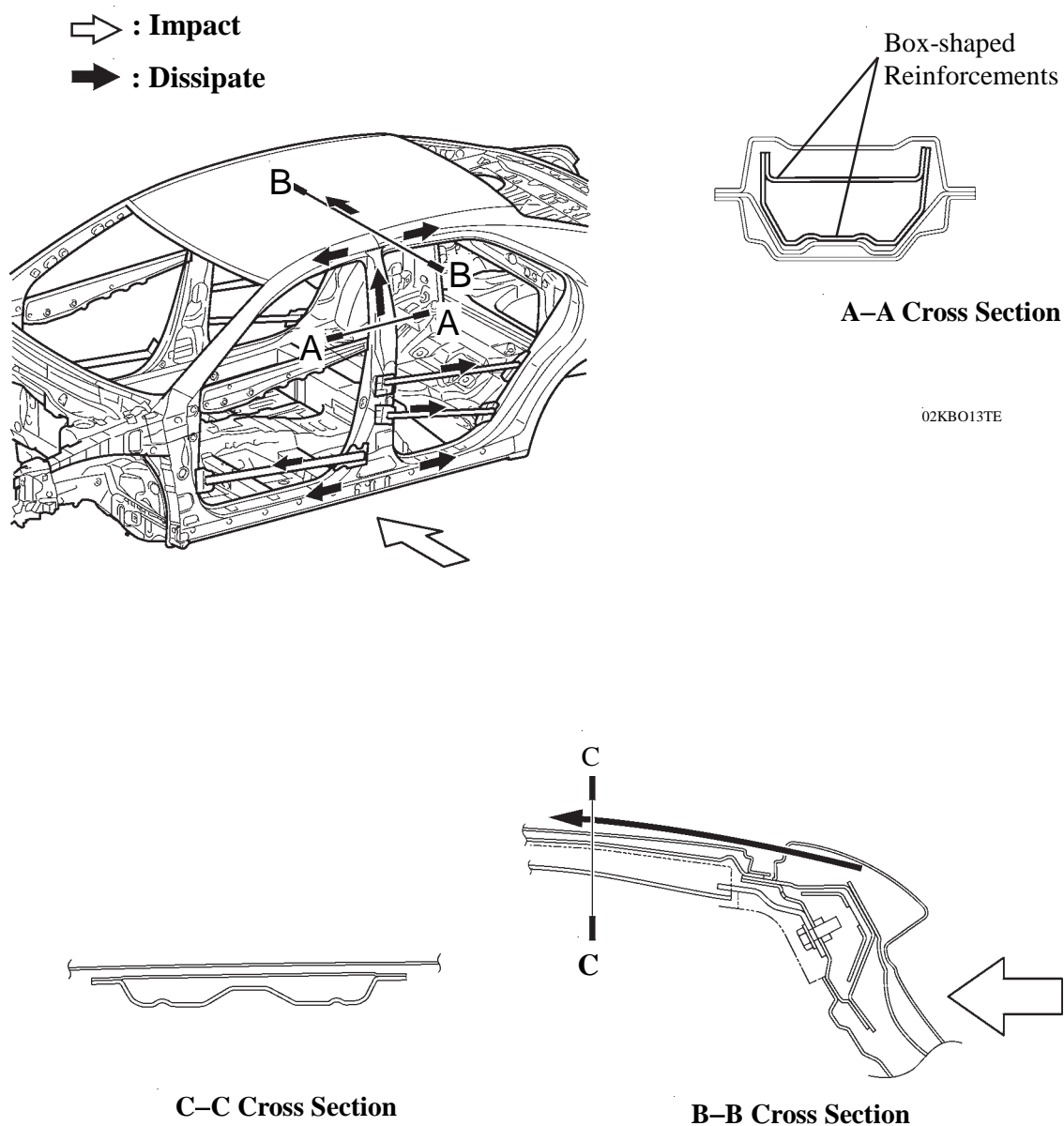
- The body disperses the impact force in the event of an offset frontal collision.
- The body strengthens inner door reinforcements and reduces the gap between the door inner panel and the pillar. This communicates impact load to the door belt line reinforcement, reducing the load on the pillar in the 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.



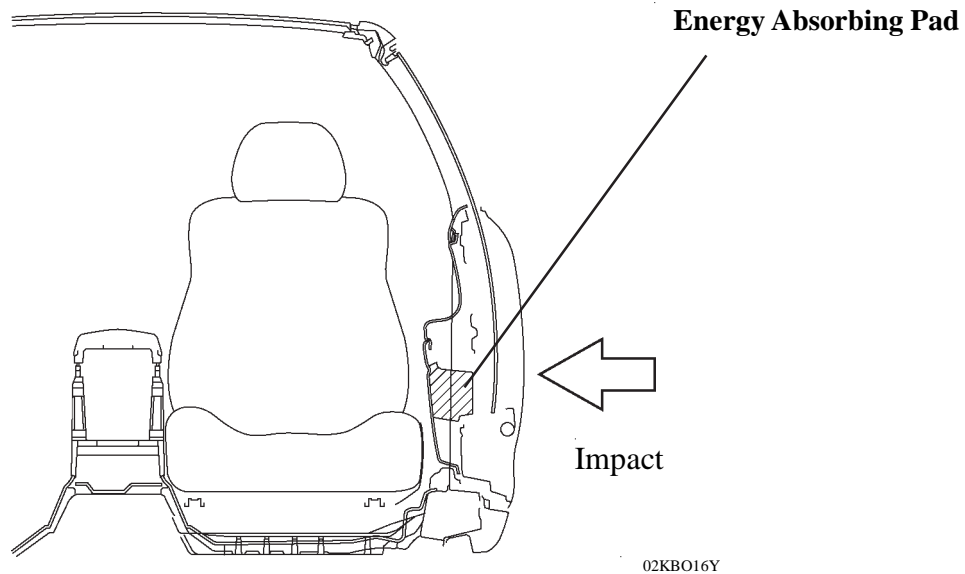
3. Impact Absorbing Structure for Side Collision

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.

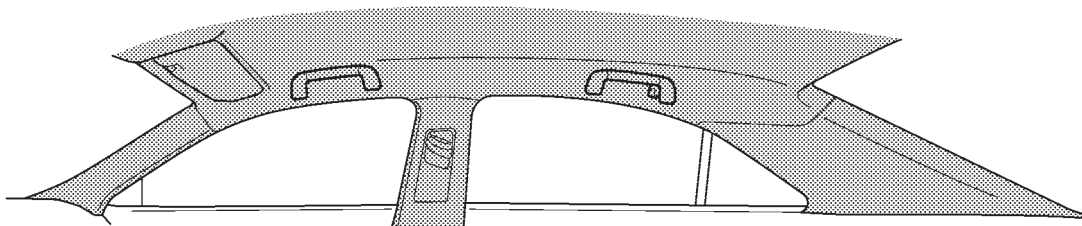


- Energy absorbing pads have been included in the door trims in order to reduce the impact on the chests and pelvises of occupant at the time of a side collision.



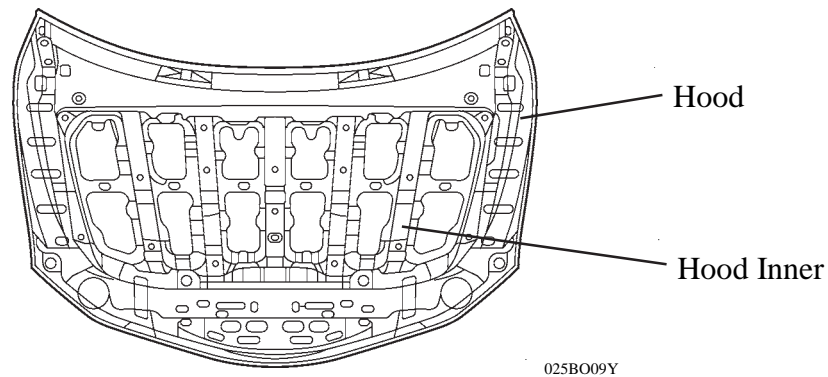
- A head impact protection structure is used. With this type of construction, if the occupant's head hits against the roof side rail or pillar due to a collision, the inner panels of the roof side rail, roof area and pillar collapse to help reduce the impact.

 : Head Impact Protection Structure

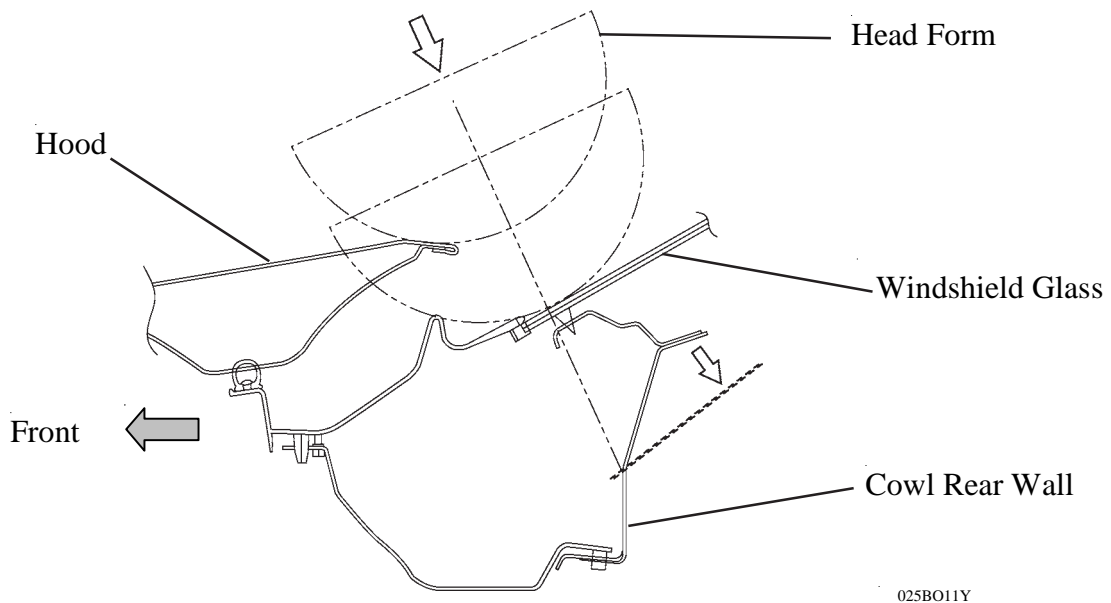


4. Reducing Pedestrian Head Injury

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

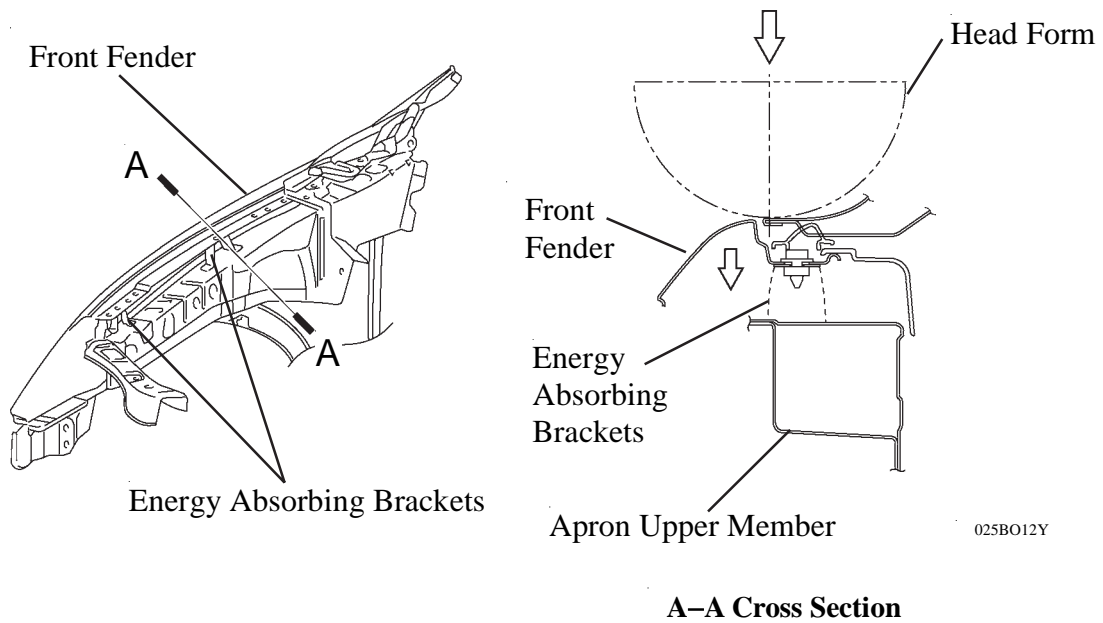


- The rear wall of the cowl has been opened, so that it can easily collapse in the direction of an impact. Thus, a completely collapsible structure has been achieved.



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.



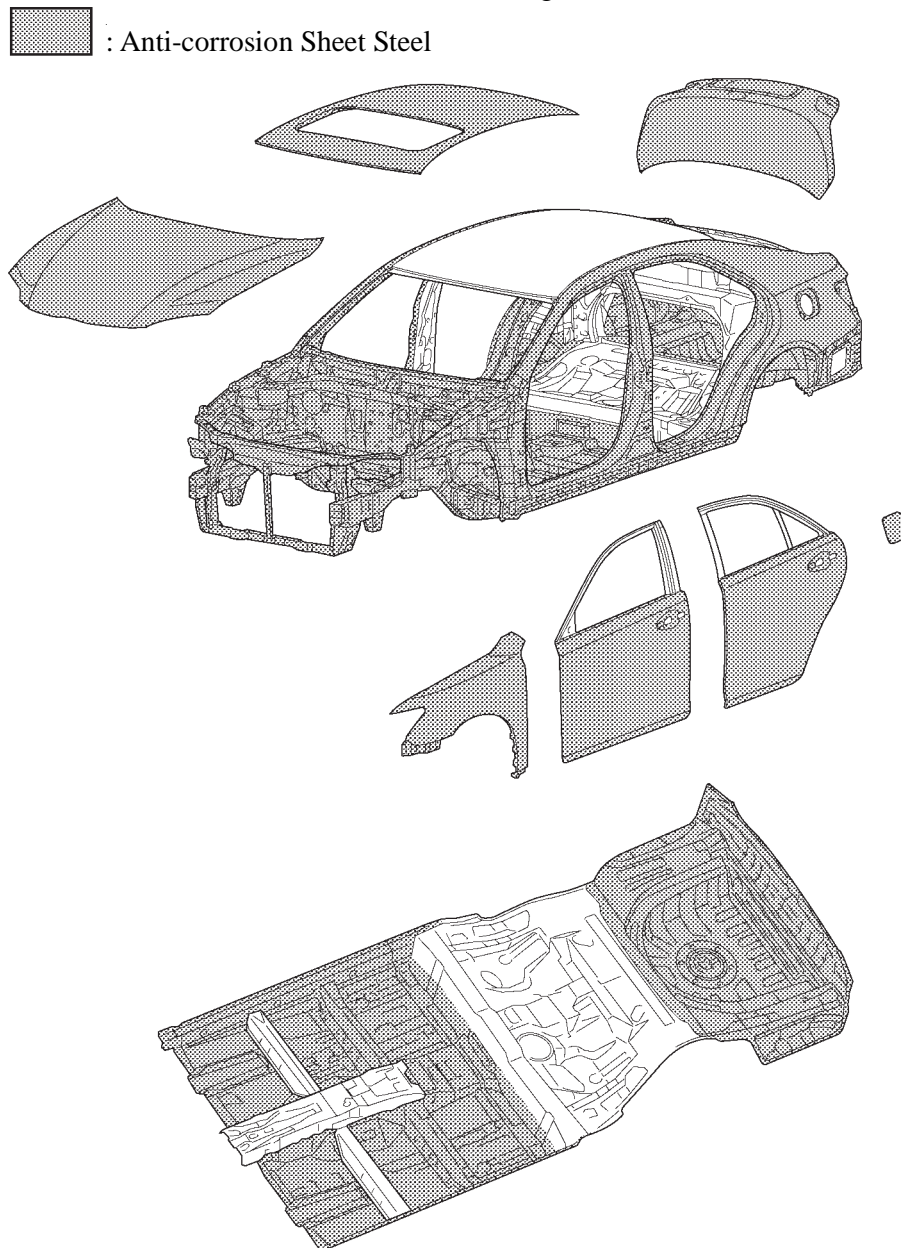
✱ RUST-RESISTANT BODY

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.






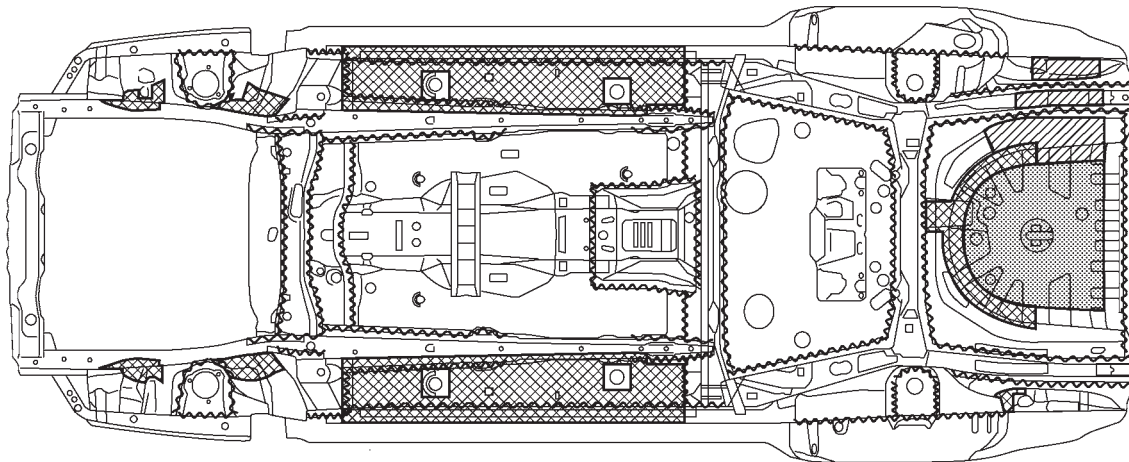
3. Wax and Sealer

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)
-  : Acrylic Acid Resin Coating

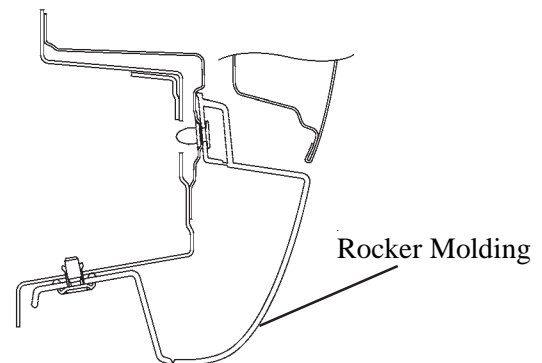
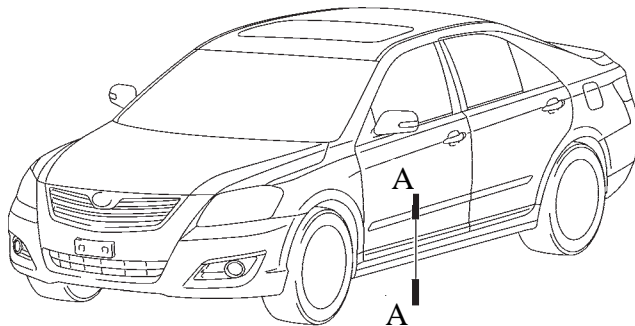


View from Bottom Side

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

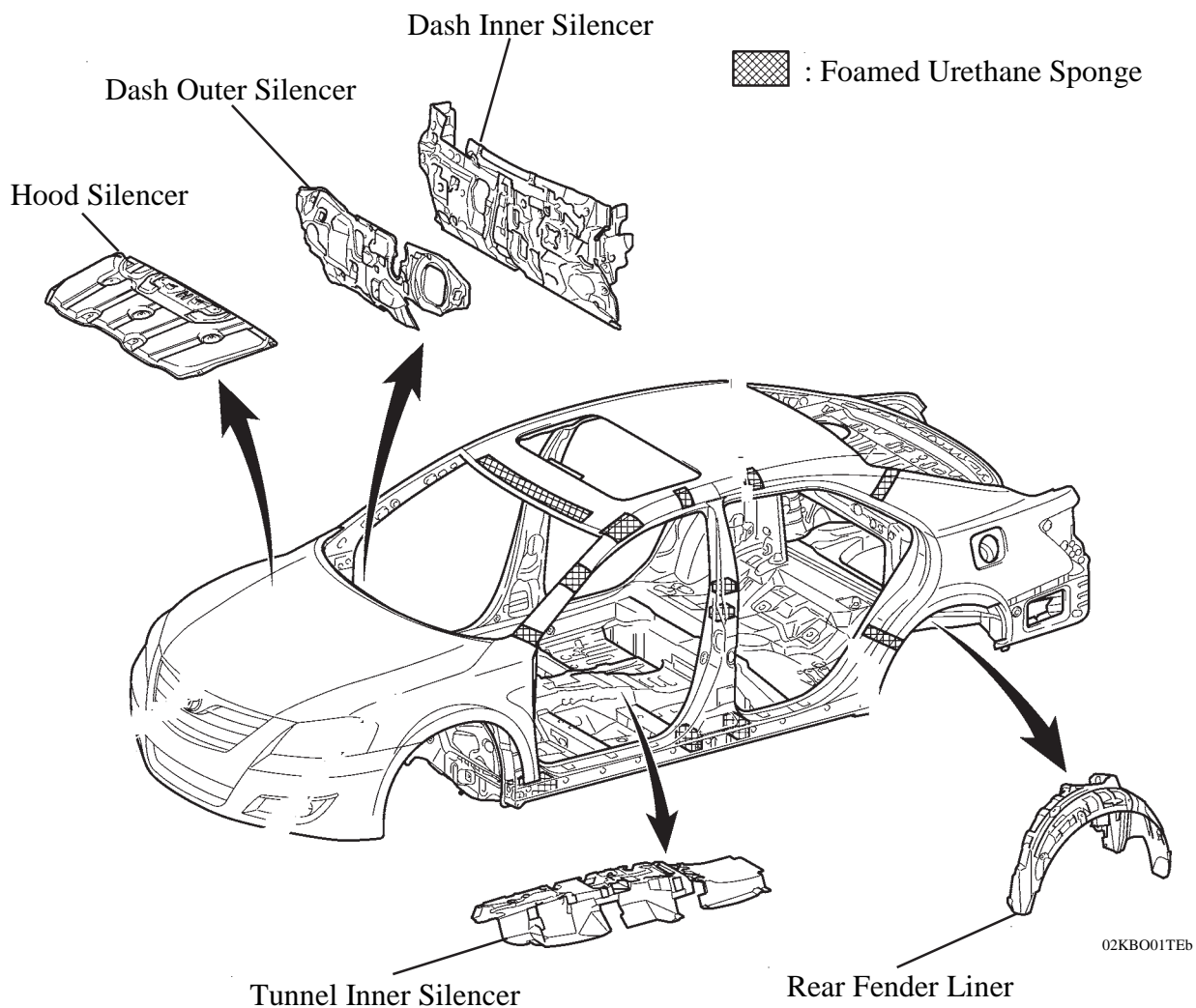
★ LOW VIBRATION AND LOW NOISE BODY

1. General

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

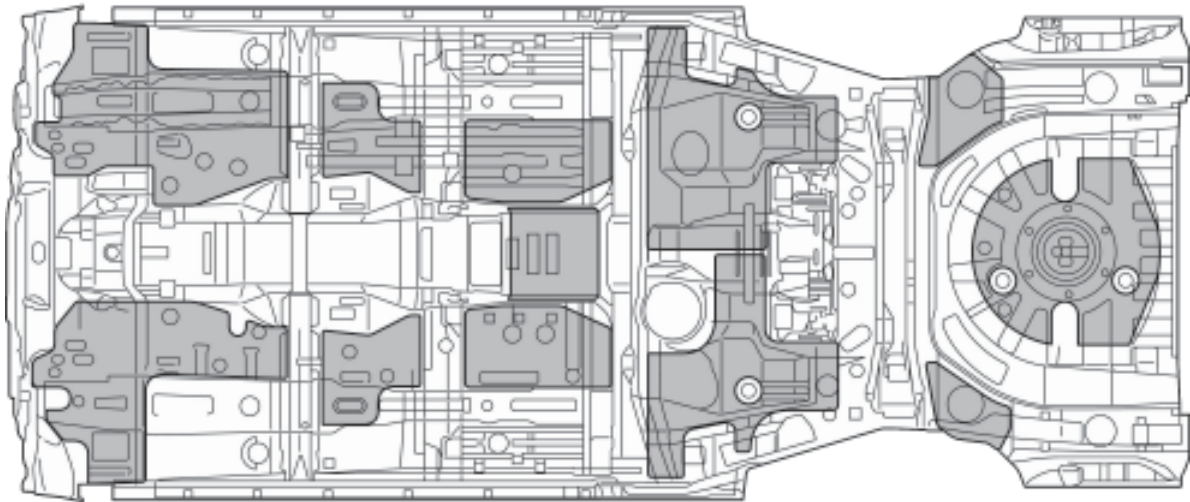
2. Sound Absorbing and Vibration Damping Materials

- 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

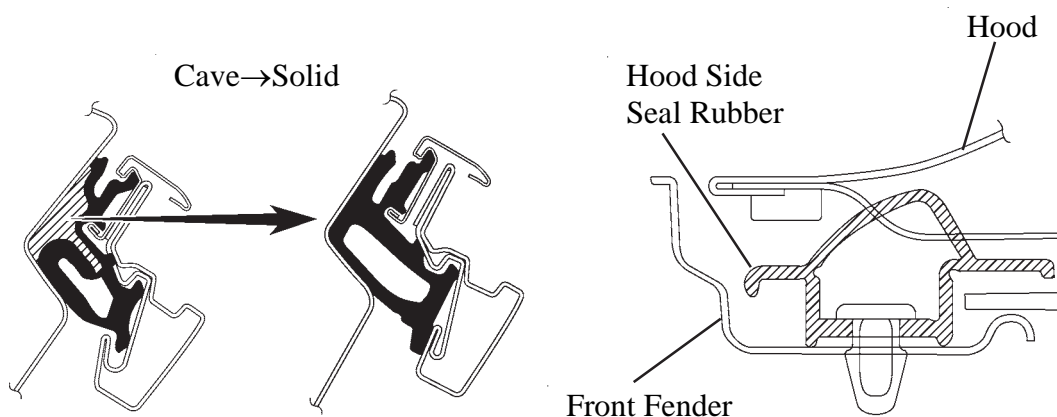
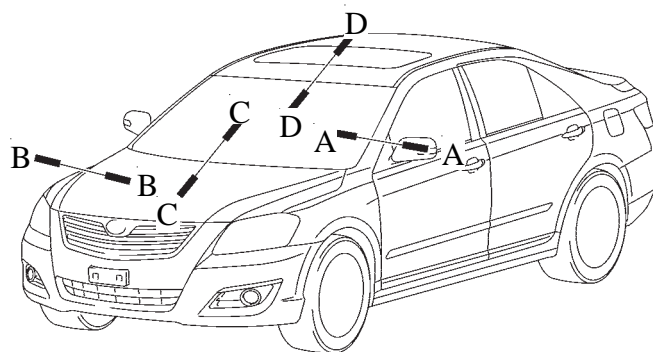


02KB004Yb

View from Top Side

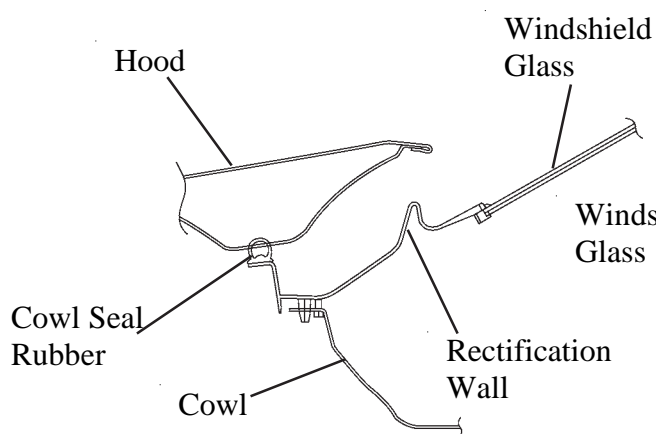
3. Reducing Wind Noise

- 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.

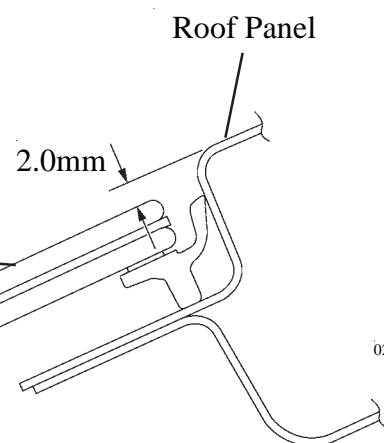


A-A Cross Section

B-B Cross Section

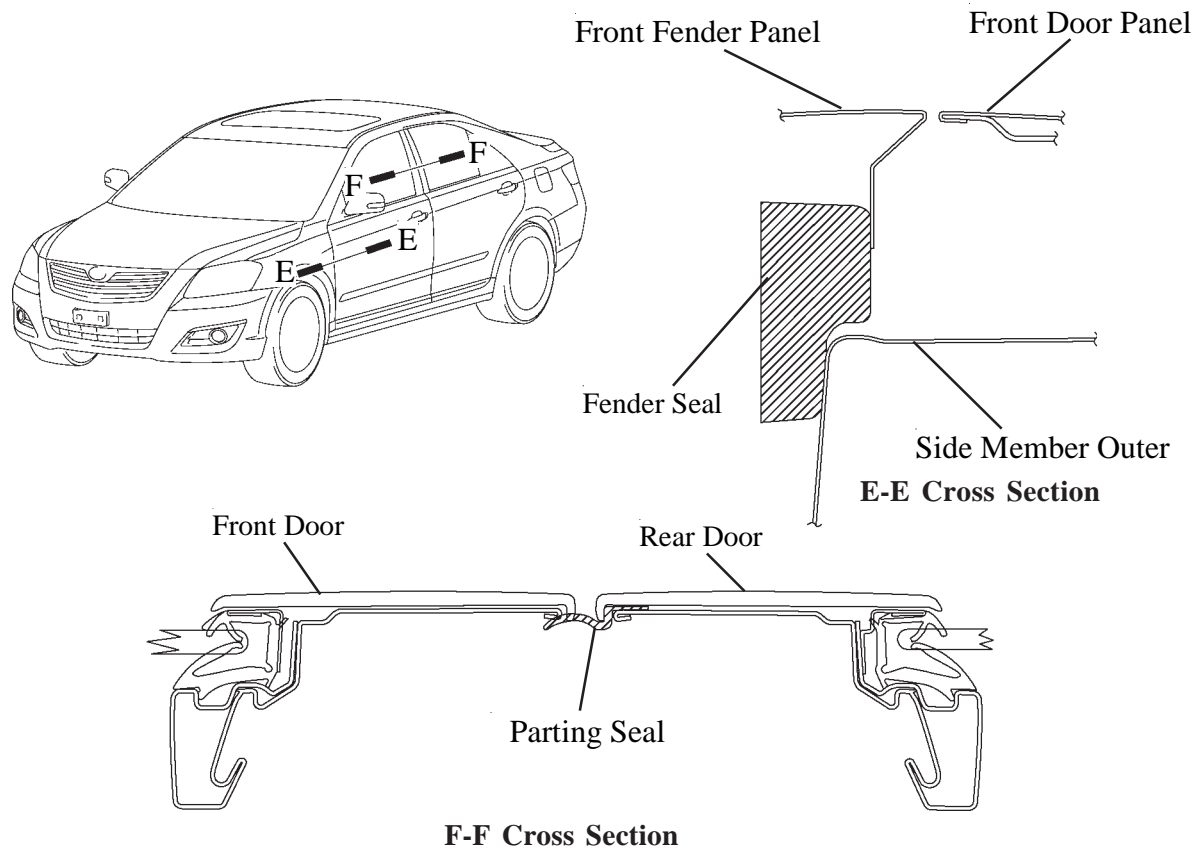


C-C Cross Section



D-D Cross Section

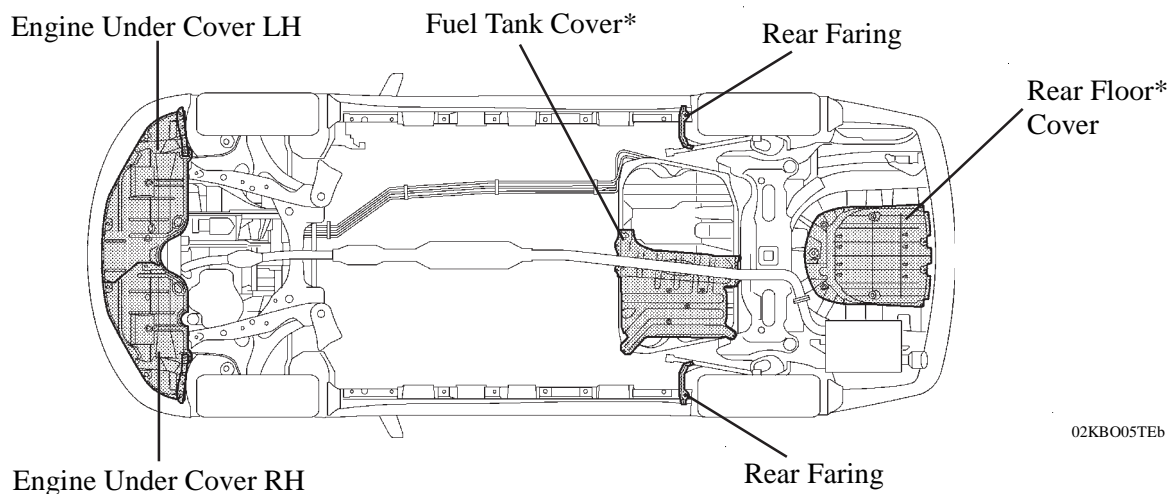
- Fender seals made of foamed resin are used between the front fender and the side member outer to prevent air from blowing through. (E-E cross section)
- Parting seals made of flexible resin are employed between the front and rear doors to eliminate air turbulence (F-F cross sections).



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✳ AERODYNAMICS

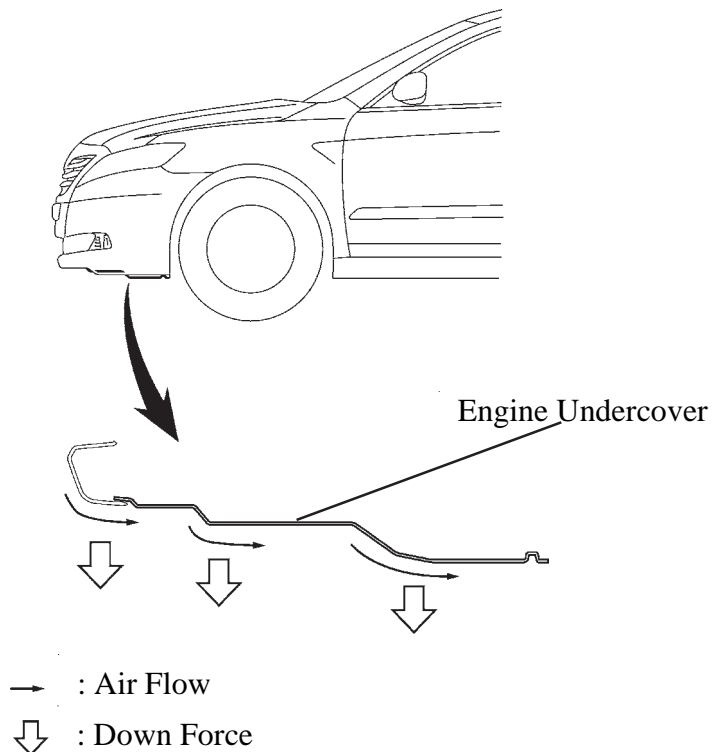
In order to achieve excellent steering stability and fuel economy, various rectifying parts have been used to regulate the airflow under the floor and the aerodynamic performance has been improved by flattening the underside of the vehicle.



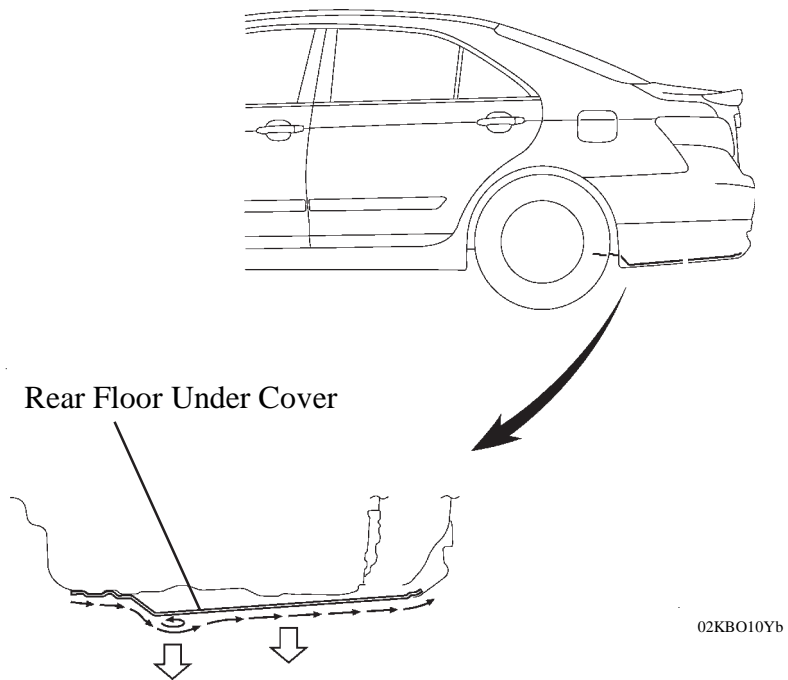
*: Sportivo grades

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.

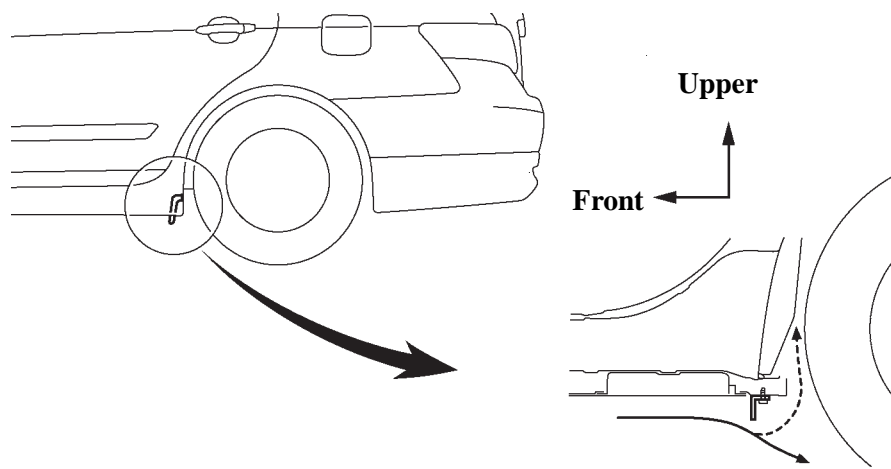


- Excellent manoeuvrability and stability have been achieved by providing a rear floor under cover that is shaped to generate rectification and swirl effects on the rear floor

**Side View**

→ : Air Flow
↓ : Down Force

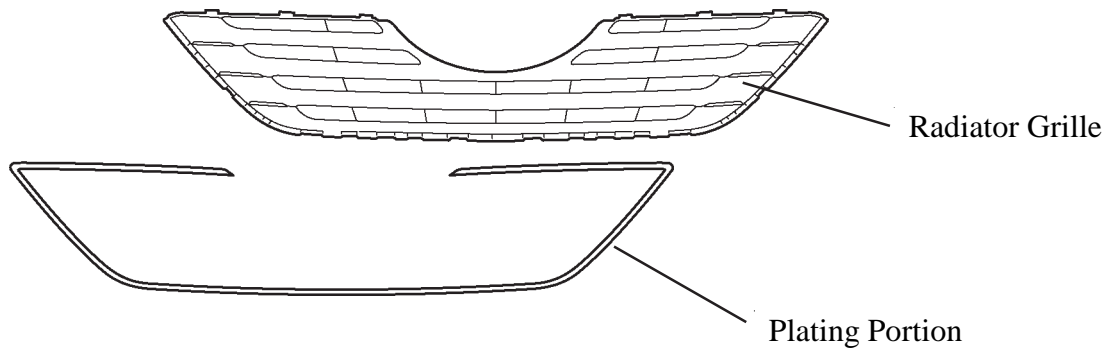
- The airflow disturbance has been reduced by using a rear faring to direct the airflow outside the tyre house, thus minimising the air resistance and improving the fuel economy.

**Side View**

ENHANCEMENT OF PRODUCT APPEAL

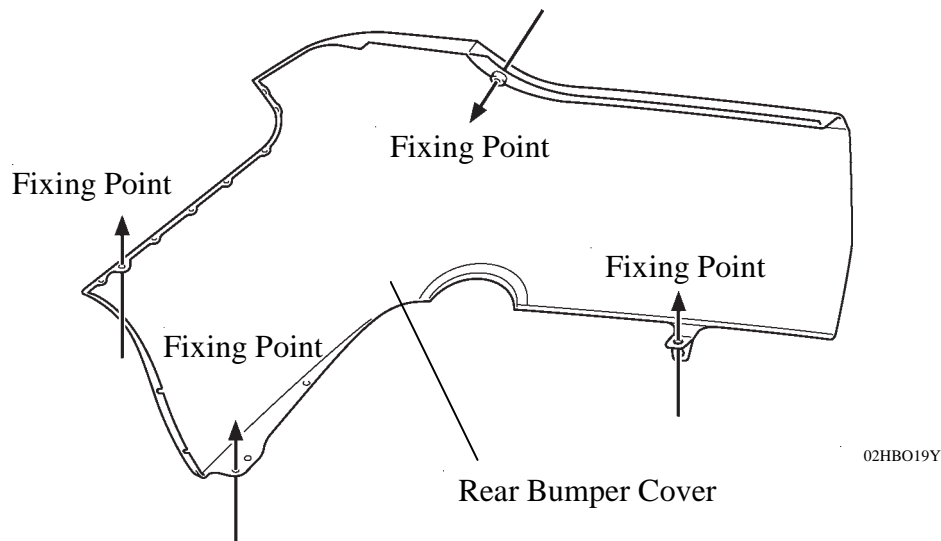
✱ PARTS WITH LOW REPAIR COST

- The plating portion of the front grille has been designed as an individual part. As a result, replacement of damaged parts only is possible, therefore reducing repair costs.



025BO23Y

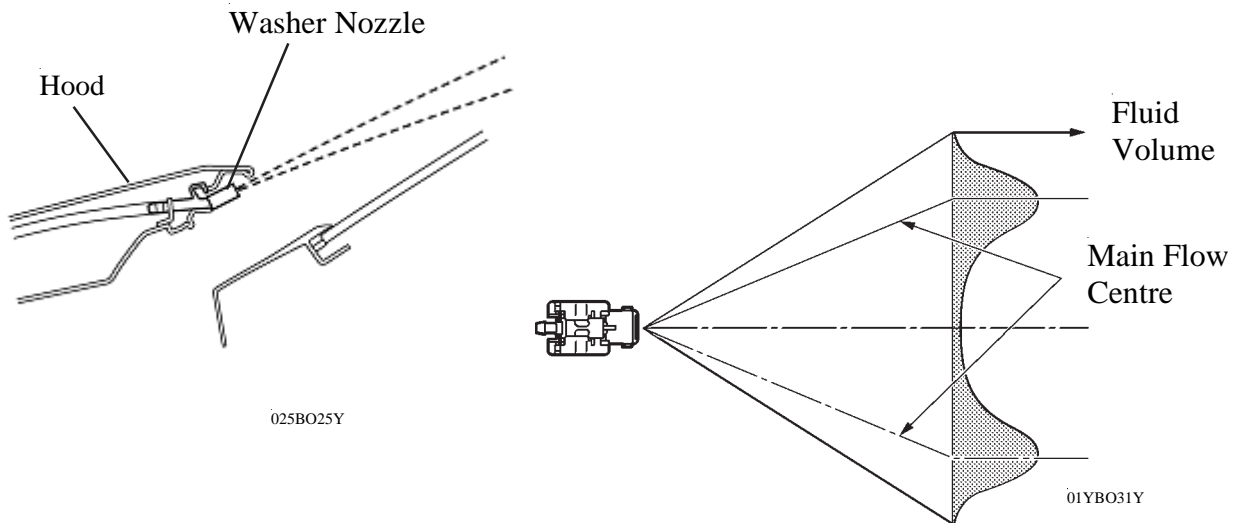
- By reducing the number of fixing points, from 18 to 8, used for installing the rear bumper cover onto the vehicle body, repair time has been shortened.



02HBO19Y

* **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.



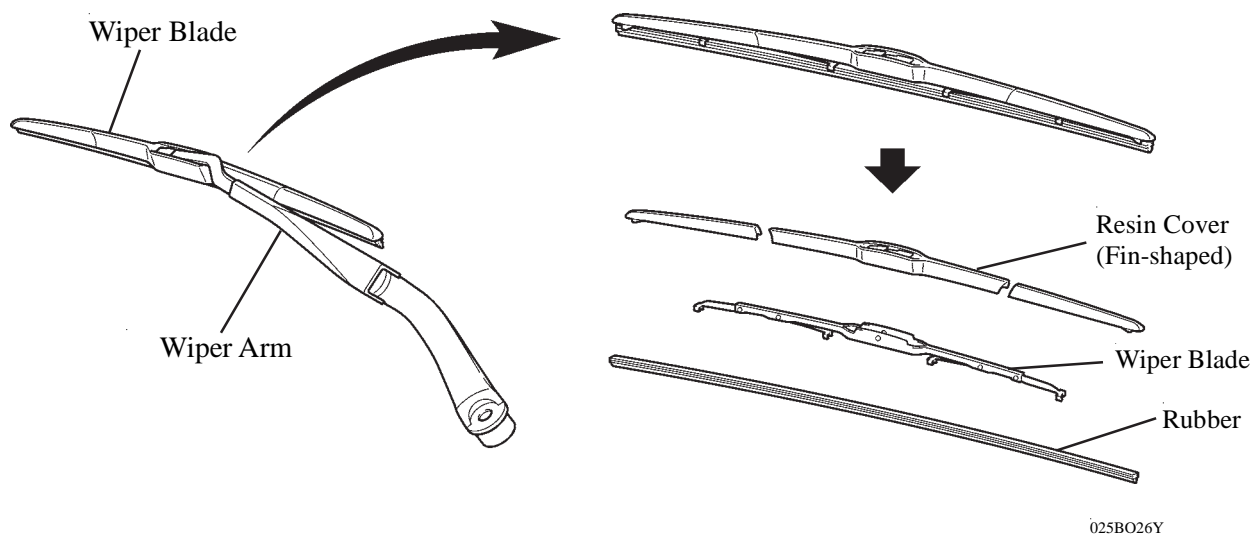
Service Tip

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 Camry Repair Manual .

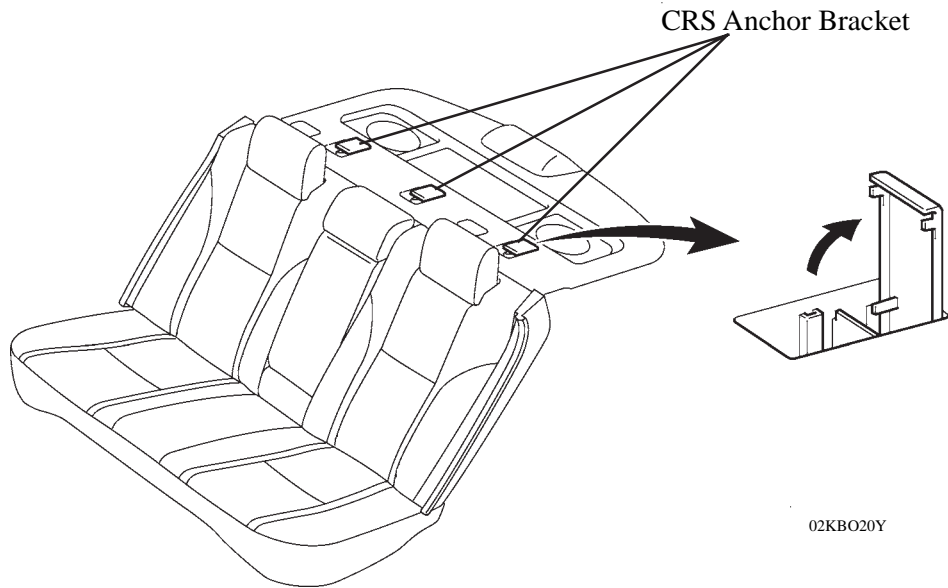
* **WIPER ARM & BLADE**

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.



✱ CHILD RESTRAINT SYSTEM

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



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 Pre-tensioner, Force Limiter and Tension Reducer
Front Passenger	3-point ELR	Electrical Sensing Type Pre-tensioner & Force Limiter
Rear Passengers (Right, Left & Centre)	3-point ELR & ALR	—

ELR - Emergency Locking Retractor

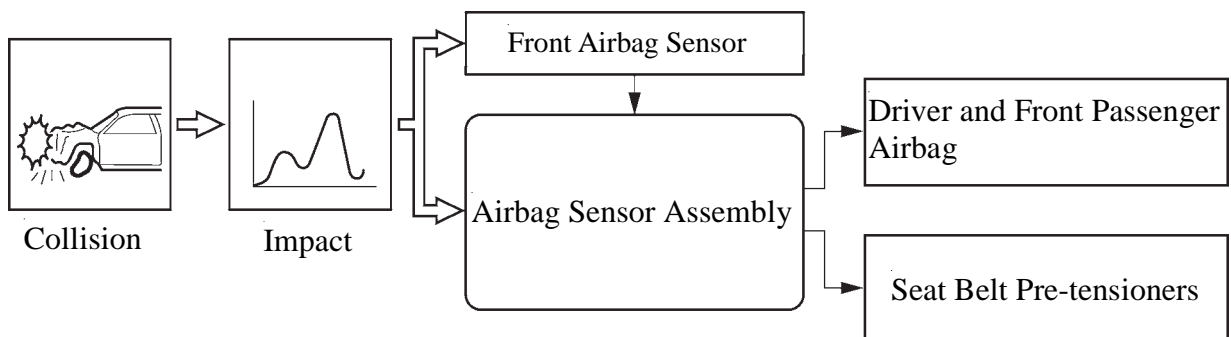
ALR - Automatic Locking Retractor

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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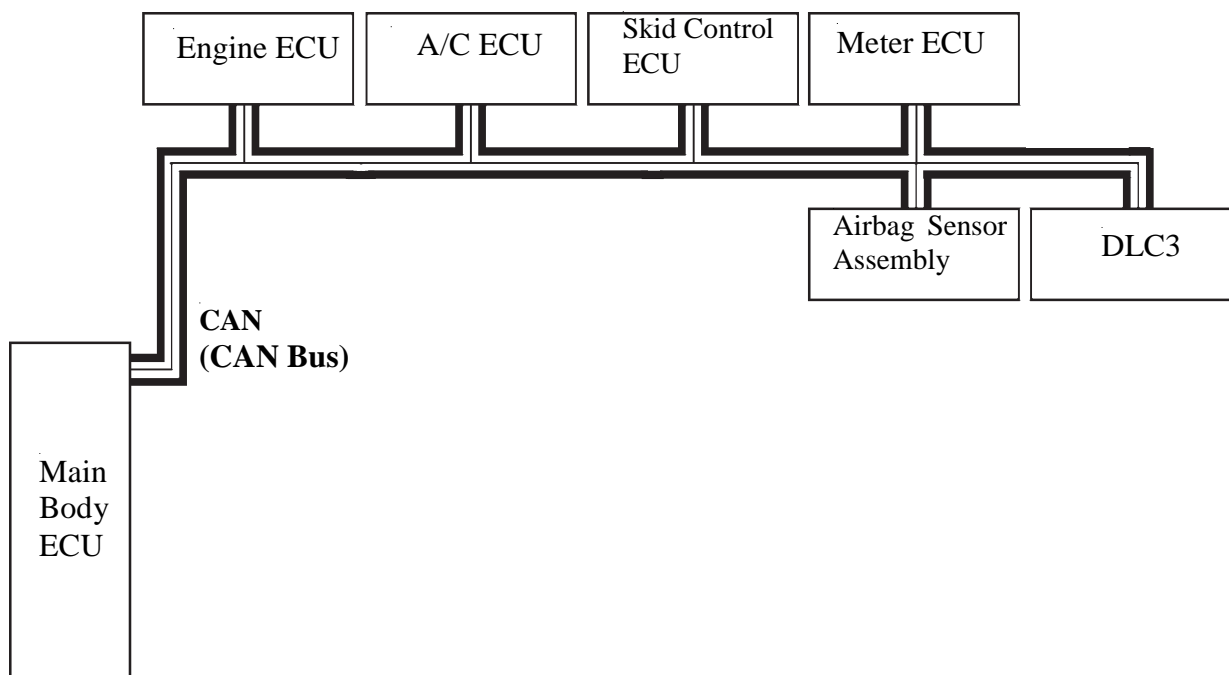
BODY ELECTRICAL

MULTIPLEX COMMUNICATION

✱ DESCRIPTION

- The multiplex communication system of the new Camry 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-9.

► System Diagram ◀

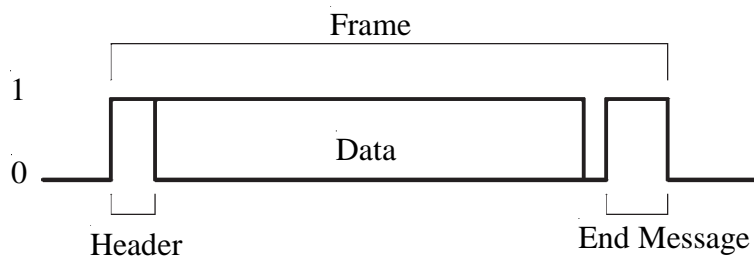


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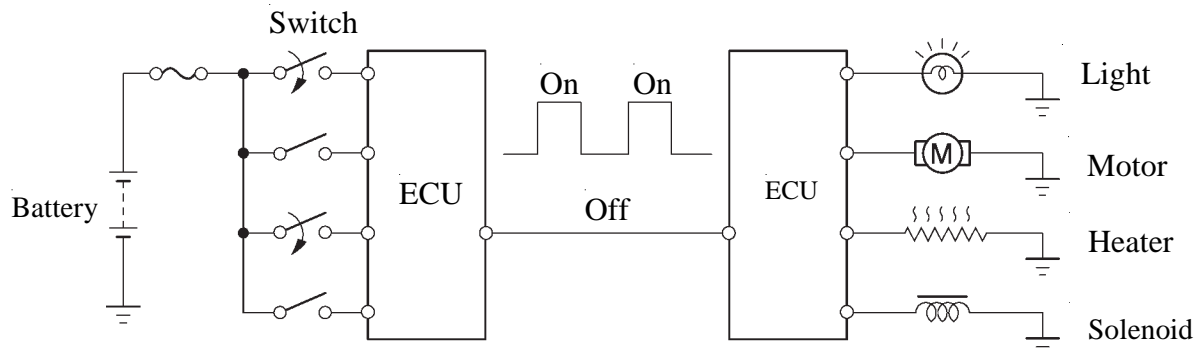
— REFERENCE —

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*¹ and BEAN*². 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*¹ and BEAN*², 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.

*¹: AVC-LAN is used in the audio-visual system of some other TOYOTA models, but is not on the new Camry.

*²: The BEAN is used in the body electrical system of the previous Camry and some other TOYOTA models, but is not used on the new Camry.




Protocol	CAN (ISO Standard)	AVC-LAN (TOYOTA Original)	BEAN (TOYOTA Original)
Communication Speed	500 kbps*/ HS-CAN 250 kbps*/ MS-CAN (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)

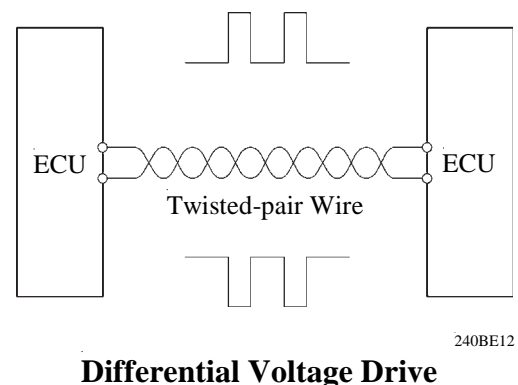
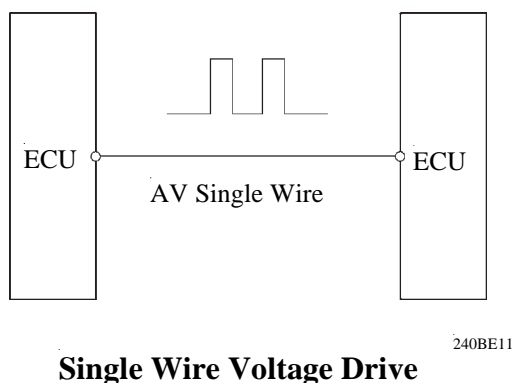
*: bps: abbreviation for “Bits per Second”, indicating the number of bits that can be transmitted per second.

2. Communication Wire

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

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

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

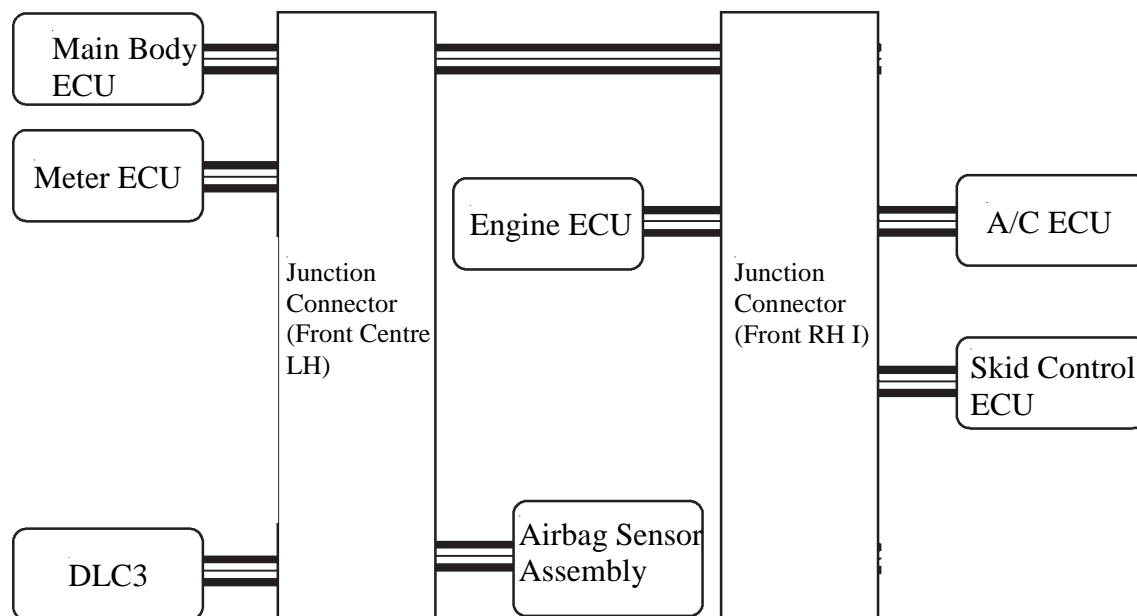


✱ CAN

1. General

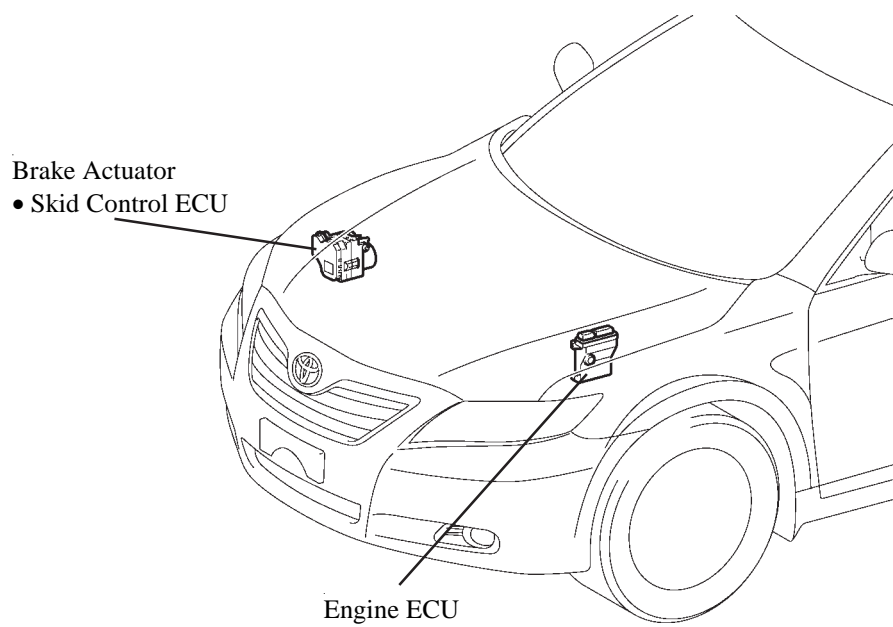
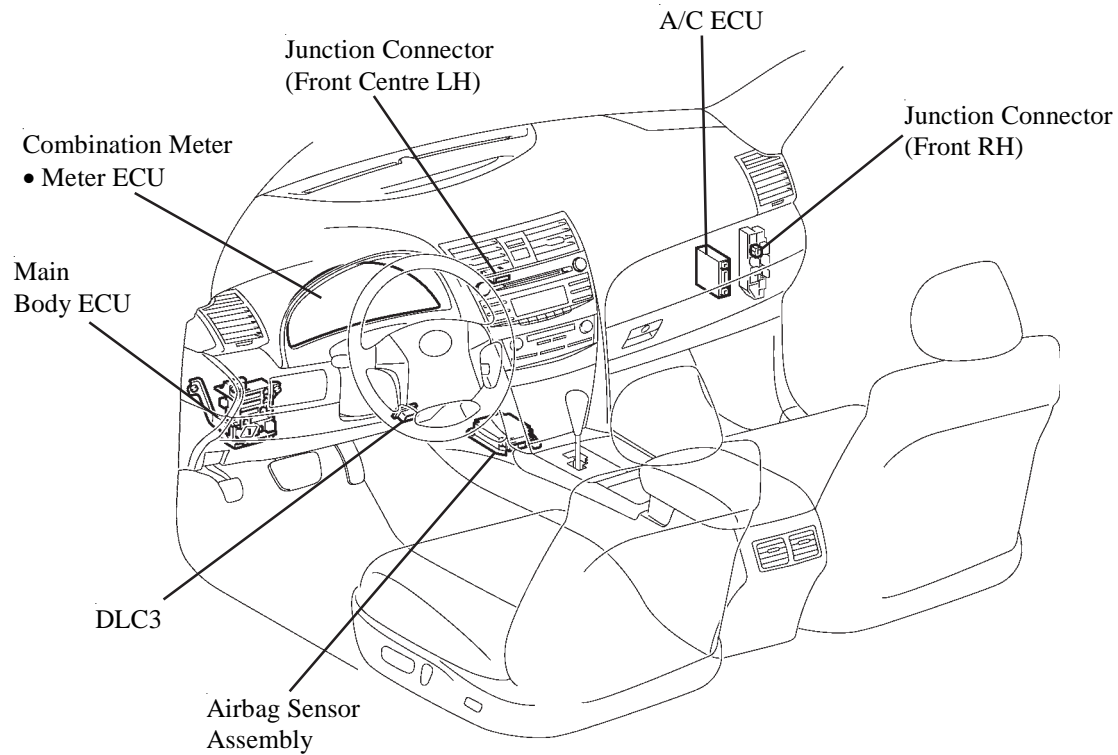
- The new Camry uses two types of CAN that have different communication speeds: HS-CAN (500kbps) and MS-CAN (250kbps).
- The terminating resistors of the CAN bus are built into the engine ECU and meter ECU.

▸ CAN Bus ◀



02KBE02Y

2. Layout of Main Components



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 Camry Repair Manual.

CUSTOMISED BODY ELECTRONICS SYSTEM

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

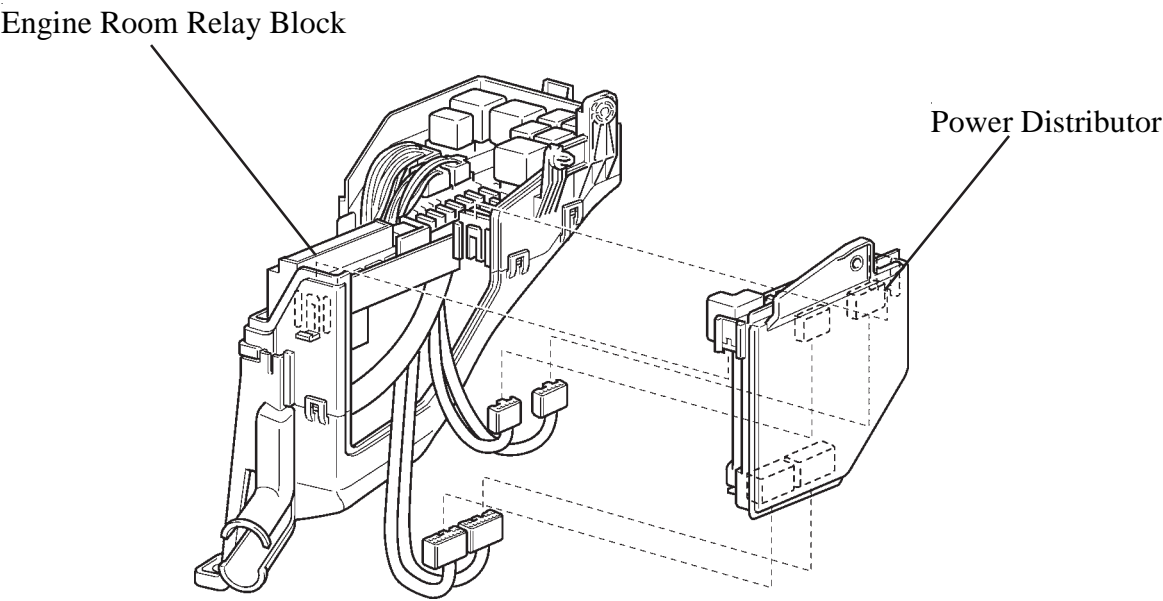
System	Intelligent Tester II Display Content	Contents	Default Setting	Available Setting
Wireless Door Lock	Trunk Lid Operation	To change the operation method of opening the trunk by the transmitter.	0.8s PR	1 TIME/ 2 TIMES / 0.8s PR / OFF
	Wireless Control	Function to turn ON/OFF of the wireless door 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 /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 /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 /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/ 15 sec/ 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/P ON	D/P ON/ D ON/ P ON/ D/P OFF
	Key Reminder Volume	Function to change the key reminder warning buzzer volume.	LARGE	SMALL/ MEDIUM/ LARGE
	Key Reminder sound	Function to change the key reminder warning buzzer frequency.	SLOW	SLOW/ FAST

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.



01YBE09Y

- The components of the power distributor are shown below.

Component	Relay
Mechanical Relay	<ul style="list-style-type: none">• Horn Relay• A/F Relay• EFI Relay• Circuit Opening Relay• Headlight Relay (RH)• Headlight Relay (LH)
Semiconductor Relay	<ul style="list-style-type: none">• Headlight HI Beam Relay

LIGHTING

☀ DESCRIPTION

1. General

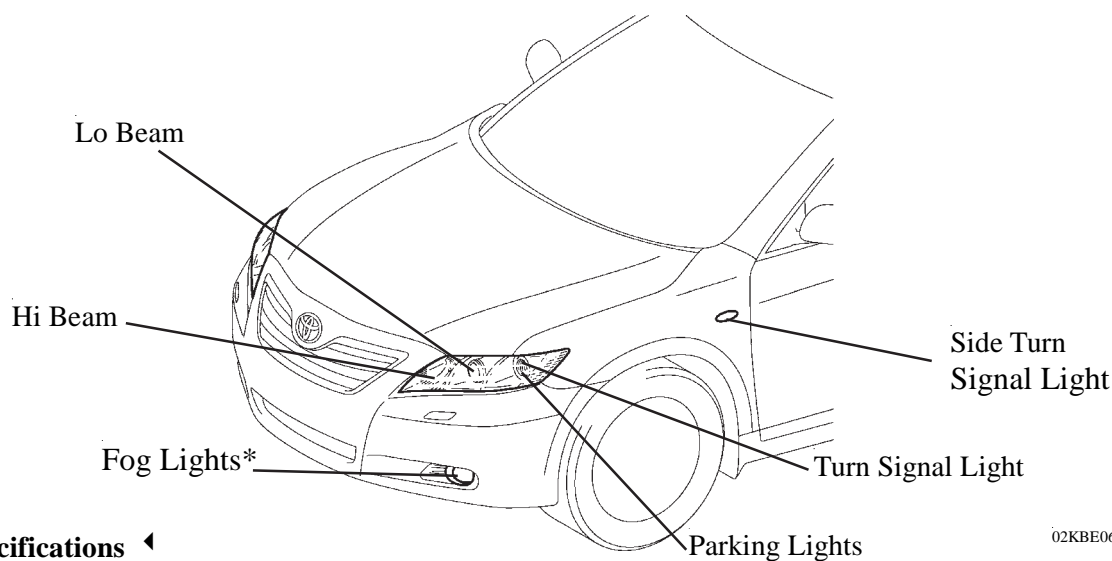
The lighting system includes the following equipment:

●: Standard

Front Fog Light		●*
Headlight	Halogen	●
Illuminated Entry		●
Light Turn-OFF System		●

*: Varies depending on grade. For details, see the equipment list in Model Outline (see page MO-25)

2. Front Exterior Light



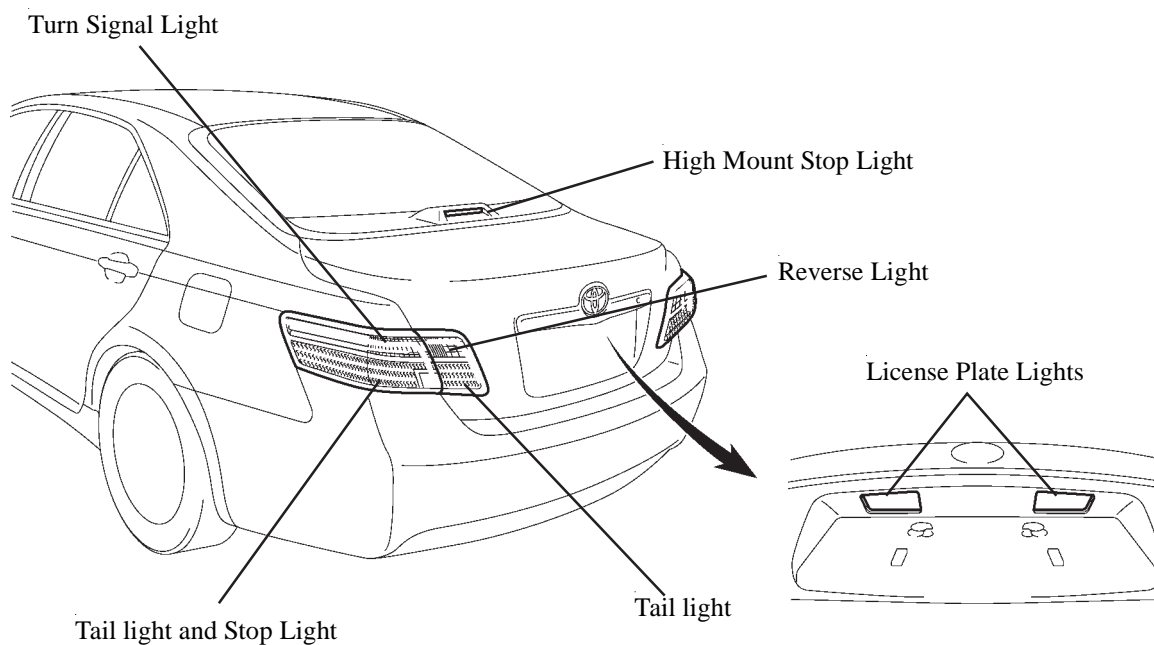
02KBE06TEb

► Specifications ◀

Light		Type	Spec
Headlight Unit	Hi Beam	Halogen Bulb	65 W
	Lo Beam (Projector Type)	Halogen Bulb	55 W
	Turn Signal Light	Wedge Base Bulb (Amber)	21 W
	Parking Lights	Wedge Base Bulb (Clear)	5 W
Side Turn Signal Light	Front Fender	Assembly Unit (Amber)	5 W
Fog Lights*		Halogen Bulb	55 W

*: Varies depending on grade. For details, see the equipment list in Model Outline (see page MO-25)

3. Rear Exterior Light



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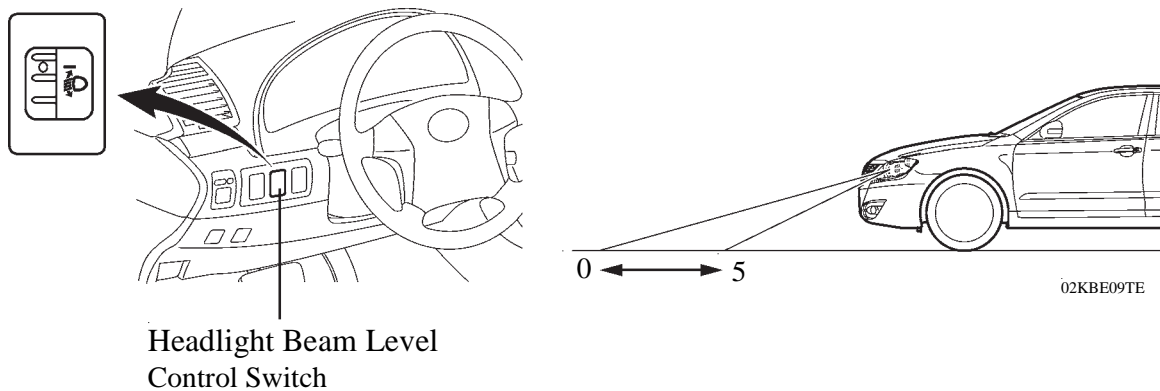
► Specifications ◀

Light		Type	Spec
Combination Light	Tail light & Stop Light	Wedge Base Bulb (Clear)	5/21W
	Tail light	Wedge Base Bulb (Clear)	5W
	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× 4	1.0W

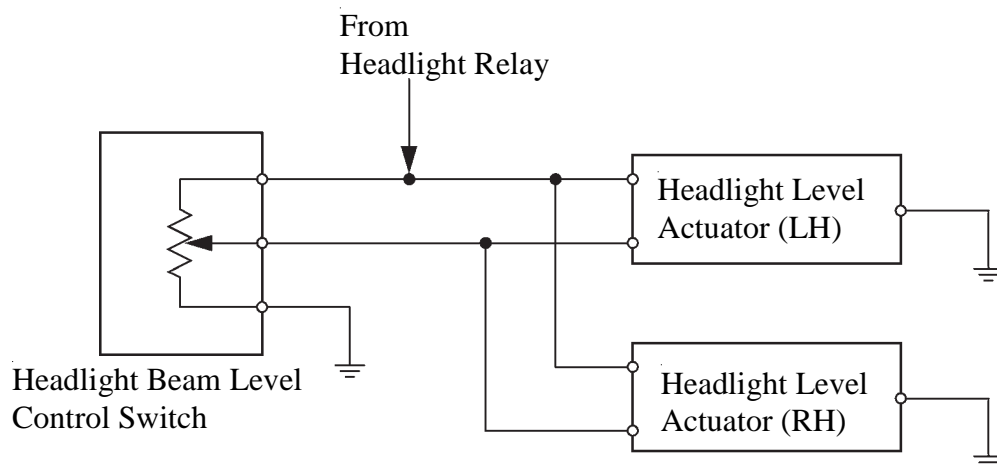
☀ HEADLIGHT BEAM LEVEL CONTROL SYSTEM

Manual Headlight Beam Level Control

When the vehicle posture changes due to the number (weight) of passengers and volume of luggage, this system enables the driver to manually adjust the headlight beam level (in 5-steps) to the appropriate level by using the headlight beam level control switch. The beam level of the headlights can be adjusted with the actuators that are integrated into the headlight units.



► Wiring Diagram ◀



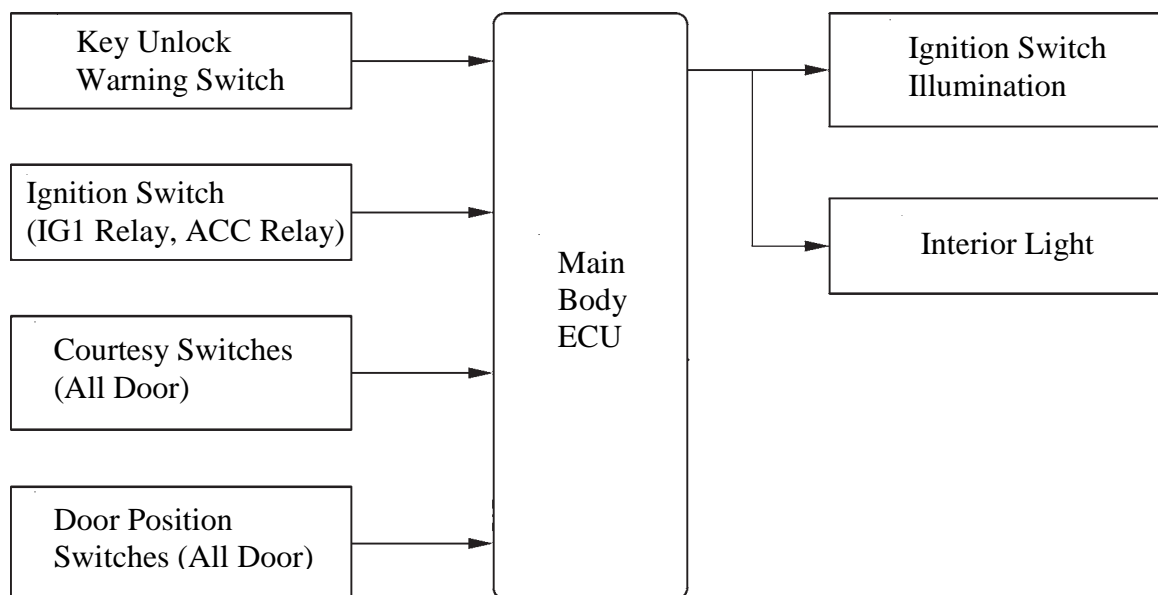
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✱ ILLUMINATED ENTRY SYSTEM

1. General

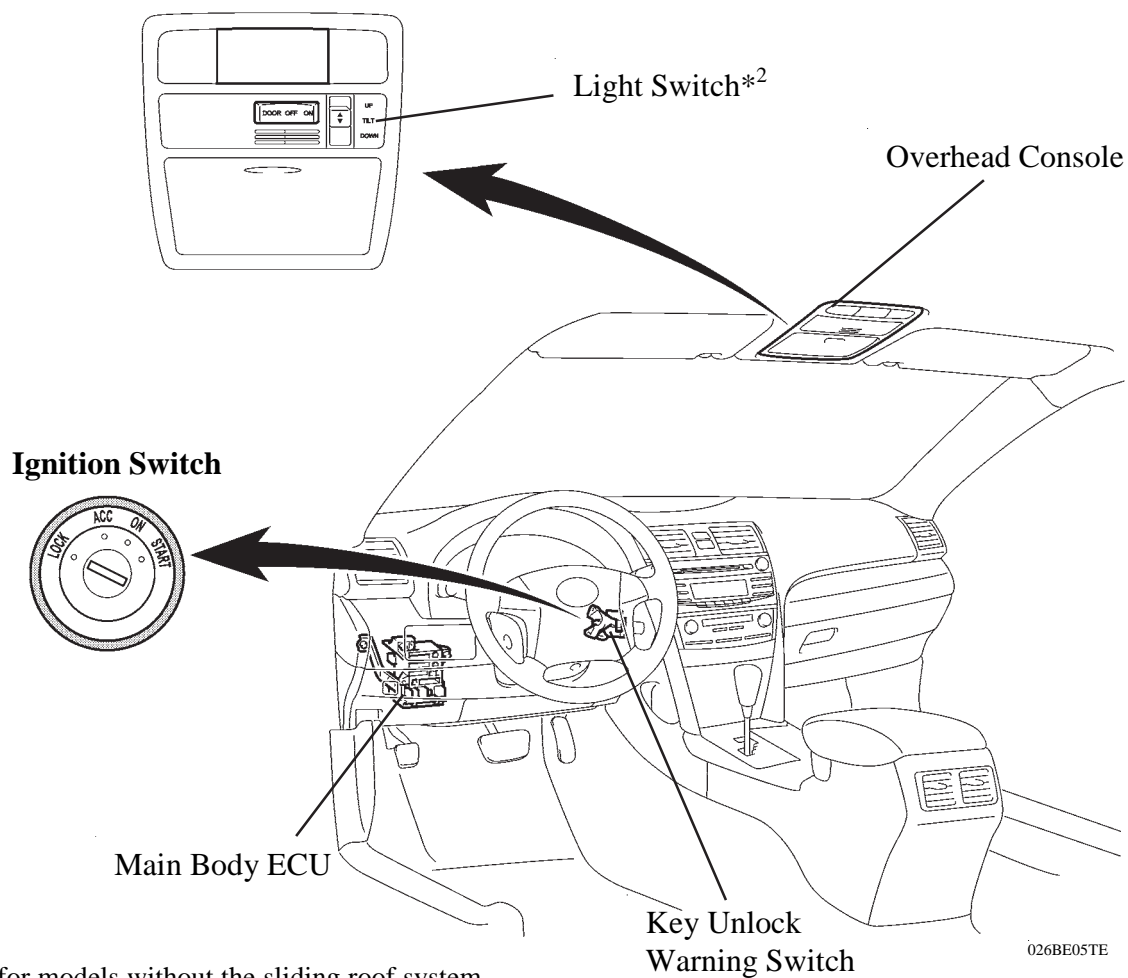
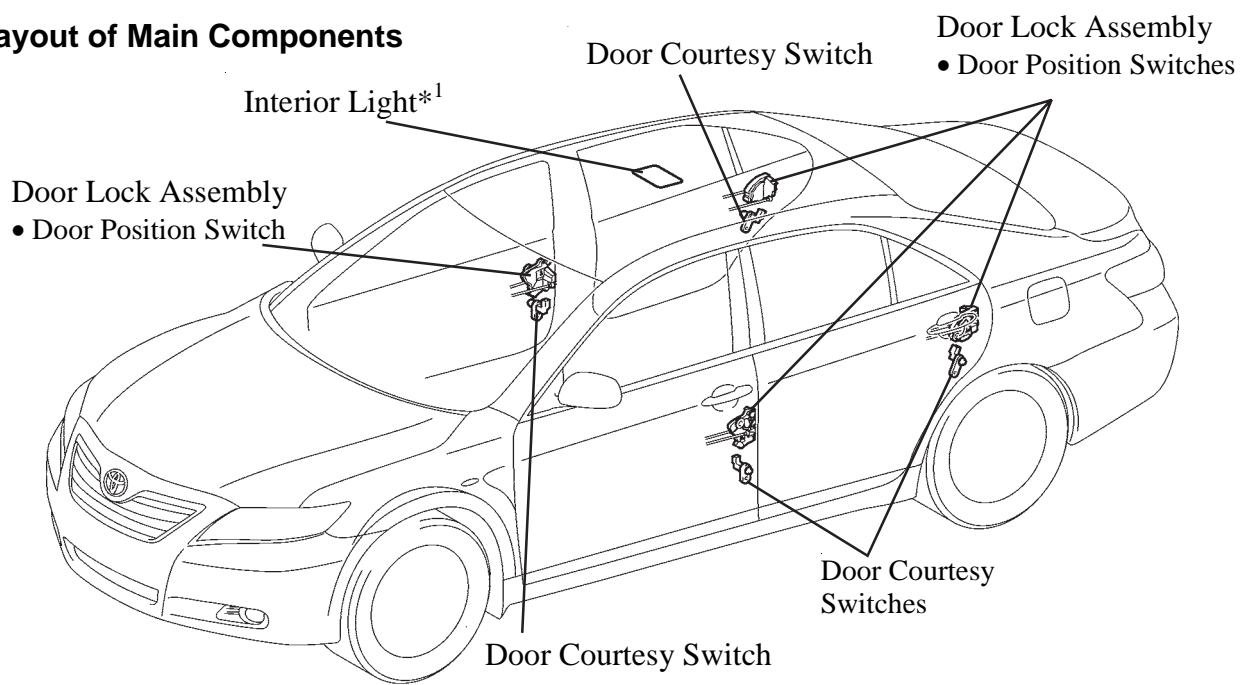
- The illuminated entry system of the new Camry controls 2 kinds of light: interior light and ignition switch.
- The interior light is operated when the light switch is in the DOOR position.

► System Diagram ◀



02KBE18Yb

2. Layout of Main Components

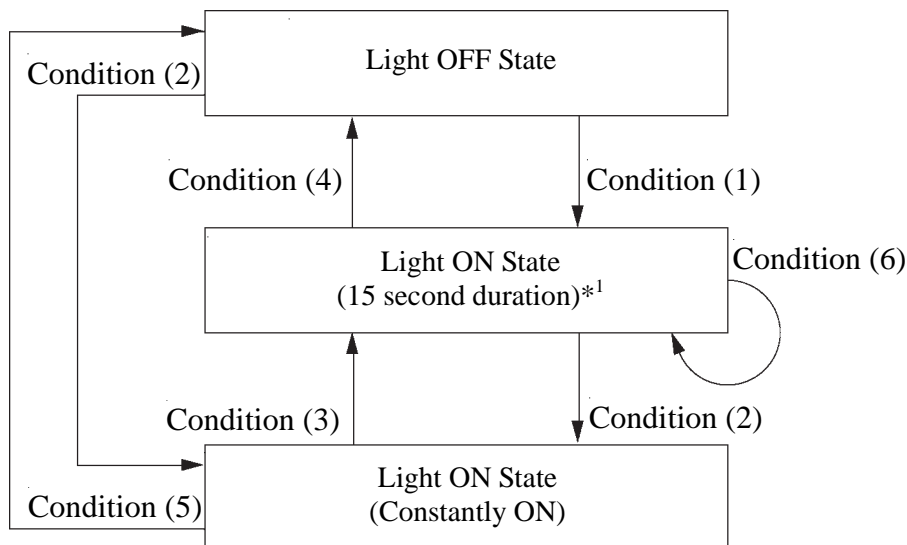


*1: Only for models without the sliding roof system

*2: Only for models with the sliding roof system

3. Interior Light Control

- The interior light control (interior light and ignition switch illumination 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.



02KBE128Yb

Condition	Item
Condition (1)	<ul style="list-style-type: none"> • With power source*² OFF and all doors closed, any door is unlocked. • With all doors closed, power source*² is changed from ACC to OFF.
Condition (2)	<ul style="list-style-type: none"> • Any door is open.
Condition (3)	<ul style="list-style-type: none"> • With power source*² OFF and all doors are closed, any door is unlocked.
Condition (4)	<ul style="list-style-type: none"> • Power source*² is ACC or ON. • More than 15 seconds have elapsed since the Light ON State (15 second duration)*¹. • With power source*² OFF and all doors closed, all doors are locked.
Condition (5)	<ul style="list-style-type: none"> • With power source*² ACC or ON, all doors are closed or locked.
Condition (6)	<ul style="list-style-type: none"> • With power source*² OFF and all doors locked, any door is unlocked.

*¹: The function setting can be changed using the customised body electronics system. For details, refer to Customised Body Electronics System section on page BE-9.

*²: The power source condition can be changed by operating the ignition switch.

4. Battery Saving Control

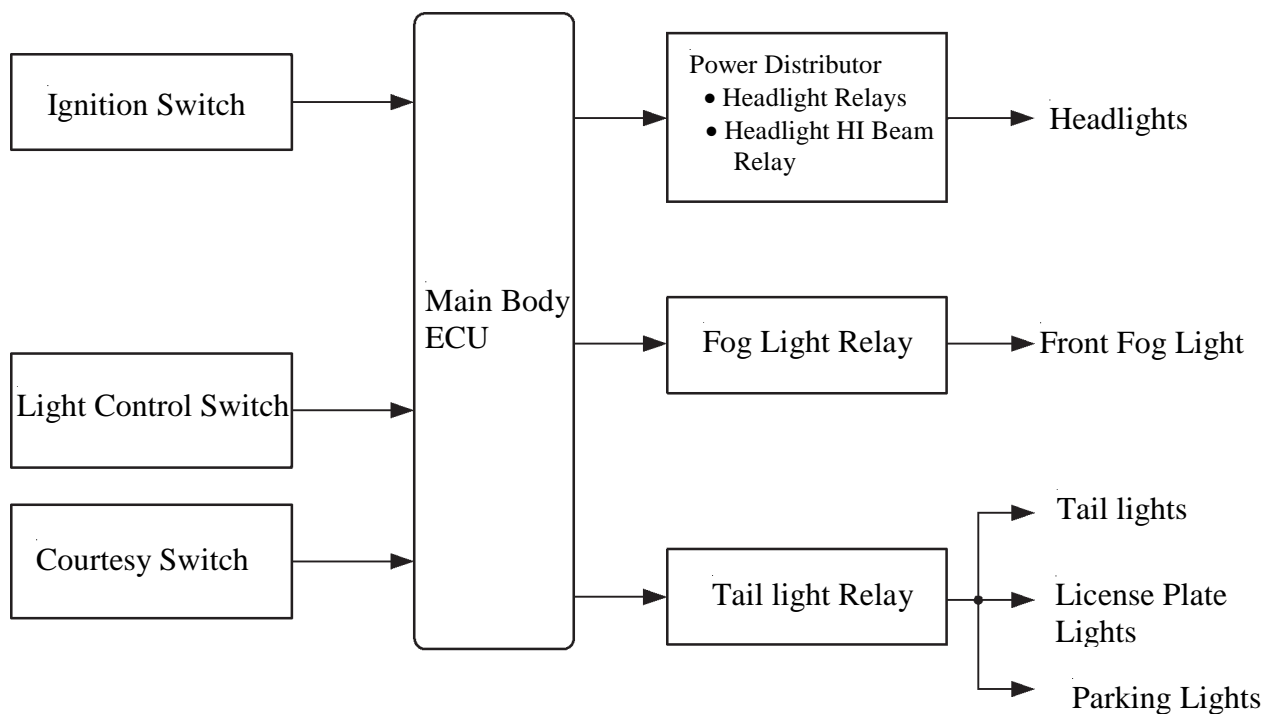
When the following two conditions have been met, battery saving control turns off the lights illuminated by the illuminated entry controls. Battery saving control is controlled by the main body ECU.

- 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.

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.

► System Diagram ◀



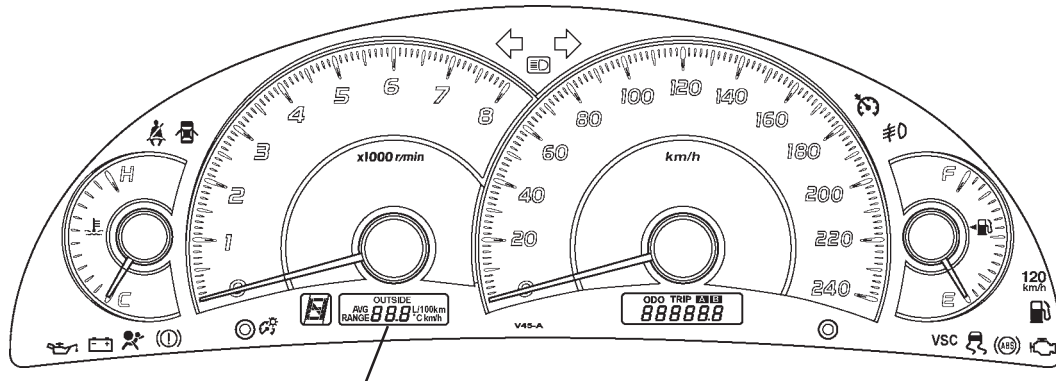
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METER

COMBINATION METER

1. General

- An analog type combination meter is used. In addition, an LCD (Liquid Crystal Display) type multi-information display has been provided below the tachometer on some grades.
- A meter ECU and buzzer are enclosed in the combination meter. This ECU maintains communication with other ECU's through the CAN (Controller Area Network).
- 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.
- A speed warning system is provided as standard. When the vehicle speed exceeds 120km/h, the system warns the driver by sounding the buzzer and flashing the warning light.



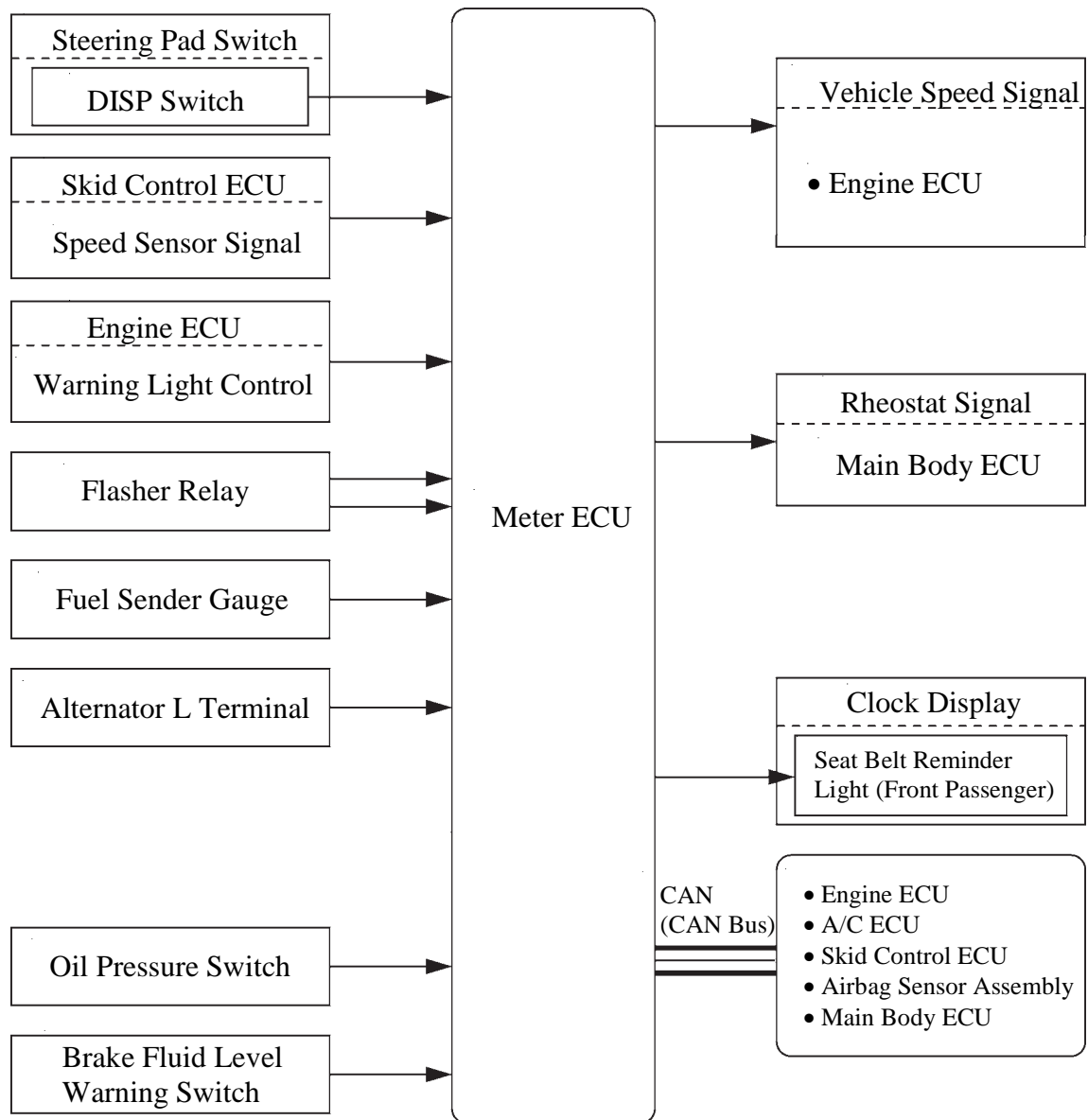
LCD (Liquid Crystal Display) Type Multi-information Display

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Service Tip

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

2. System Diagram



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► **Input and output communication signals of the meter ECU** ◀

Protocol	ECU	Input Signal to meter ECU	Output Signal from meter ECU
CAN (CAN Bus)	Engine ECU	<ul style="list-style-type: none"> • Engine speed • Engine coolant temperature • Fuel injection volume • Starter condition • Shift position • Current range position • Buzzer sounding request • Indicator light control • Diagnosis (Cruise) • Engine type information 	-
	A/C ECU	Outside temperature	Vehicle speed
	Airbag Sensor Assembly	<ul style="list-style-type: none"> • Warning light control • Seat belt remainder control (D) • Diagnosis 	Vehicle speed
	Skid Control ECU	<ul style="list-style-type: none"> • Warning light control • Indicator light control • Vehicle Speed • Diagnosis 	-
	Main Body ECU	<ul style="list-style-type: none"> • Lighting status • Parking brake switch • Courtesy switch • Buzzer sounding request • Auto dimmer signal • Unlock Warning Switch • Warning display control • Diagnosis 	Vehicle Speed

3. Multi-information Display

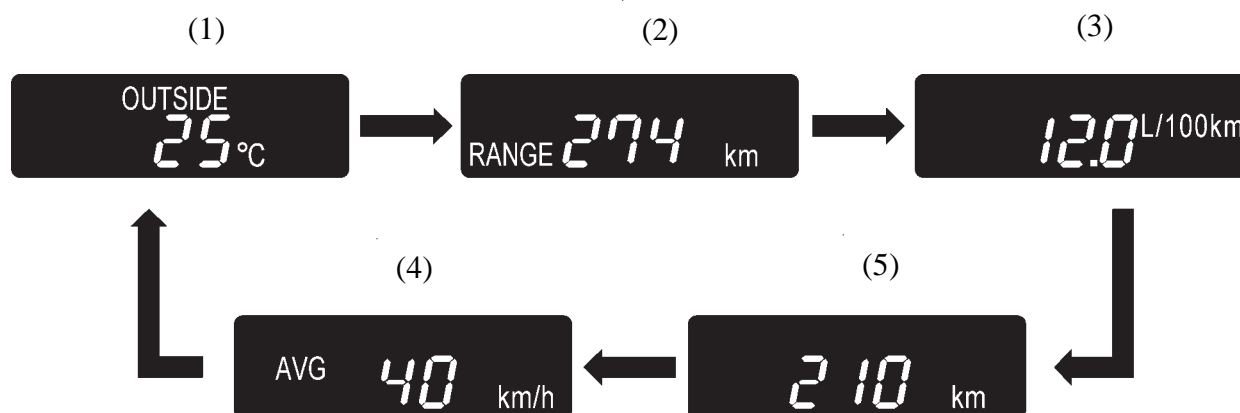
General

- The multi-information display has three modes:

Mode	Outline
Cruise Information	<ul style="list-style-type: none"> Five types of information can be displayed. The display can be switched by using the DISP switch. Analog type combination meter: outside temperature, driving range, average fuel consumption since refuelling, distance driven since engine start, and average speed since engine start.

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.



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"> 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. Updated every 1 seconds.
(3)	<ul style="list-style-type: none"> 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. The combination meter determines the vehicle has been refuelled through the signal from the fuel sender gauge. Updated every 10 seconds.
(4)	<ul style="list-style-type: none"> Displays the value calculated by the combination meter based on the distance driven since engine start. Updated every 1 km.
(5)	<ul style="list-style-type: none"> Displays the average speed calculated by the combination meter based on the length of time and the distance driven since engine start. Updated every 10 seconds.

4. Buzzer

General

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

Function	Item
Reminder	<ul style="list-style-type: none">• Key Reminder• Seat Belt Reminder (See page BE-64)

AIR CONDITIONER



DESCRIPTION

- A manual air conditioner is fitted as standard equipment on the new Camry.
- The air conditioner has the following features:

Features	Outline	Manual A/C
High Performance	FACE mode for the rear seat is installed to blow warm air and ensure excellent heating performance.	○
	A clean air 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. 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	<p>The following parts are used to ensure high cooling performance while realising a compact and lightweight construction.</p> <ul style="list-style-type: none"> • Semi-centre Location A/C Unit • RS (Revolutionary super-slim Structure) Evaporator • SFA (Straight Flow Aluminium)-II Heater Core • MF (Multi-Flow)-IV Sub -cool Condenser • Continuously Variable Capacity Type Compressor with DL (Damper Limiter) pulley. 	○

PERFORMANCE AND SPECIFICATION

1. Performance

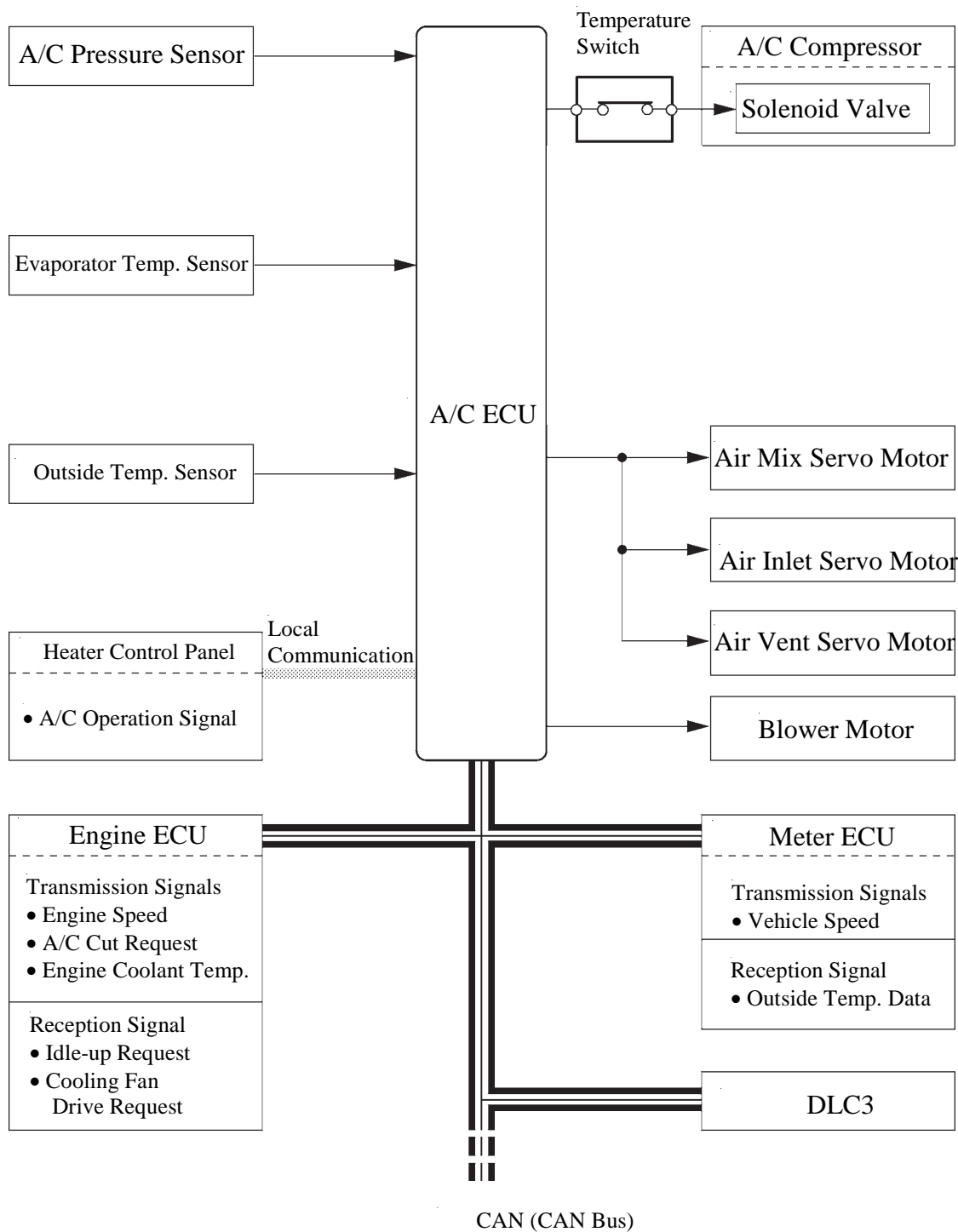
			Current (ACV36)	New (ACV40)
Heater	Heat Output	W	5200	6000
	Air Flow Volume	m ³ /h	360	←
	Power Consumption	W	Maximum 210	←
Air Conditioner	Cooling Capacity	W	5500	6100
	Air Flow Volume	m ³ /h	360	530
	Power Consumption	W	Maximum 260	←

2. Specifications

			Current (ACV36)	New (ACV40)
Ventilation and Heater Core	Heater Core	Type	SFA (Straight Flow Aluminium)	SFA (Straight Flow Aluminium) -II
		Size W×H×L mm	225 × 140 × 21	201.5 × 150 × 27
		Fin Pitch mm	2.25	1.5
	Blower	Motor Type	S80	K70 BMM
		Fan Type	Sirocco	Semi Sirocco
		Fan Size Dia.×H mm	190 × 75	165 × 70
Air Conditioner	Condenser	Type	Multi-Flow (Sub-cool)	MF (Multi-Flow) -IV
		Size W×H×L mm	670 × 387.8 × 16	720 × 370.2 × 16
		Fin Pitch mm	3.6	3.15
	Evaporator	Type	Multi-tank, Super-slim Structure	RS (Revolutionary super-slim Structure)
		Size W×H×L mm	266.2 × 255 × 56	266.3 × 251 × 38
		Fin Pitch mm	3.5	2.6
	Compressor	Type	10S17C	6SEU16
		Pulley	Magnetic Clutch	DL (Damper Limiter) without Magnetic Clutch
	Refrigerant	Type	HFC 134a	←
		Charge Volume g	550 ±50	500 ±50

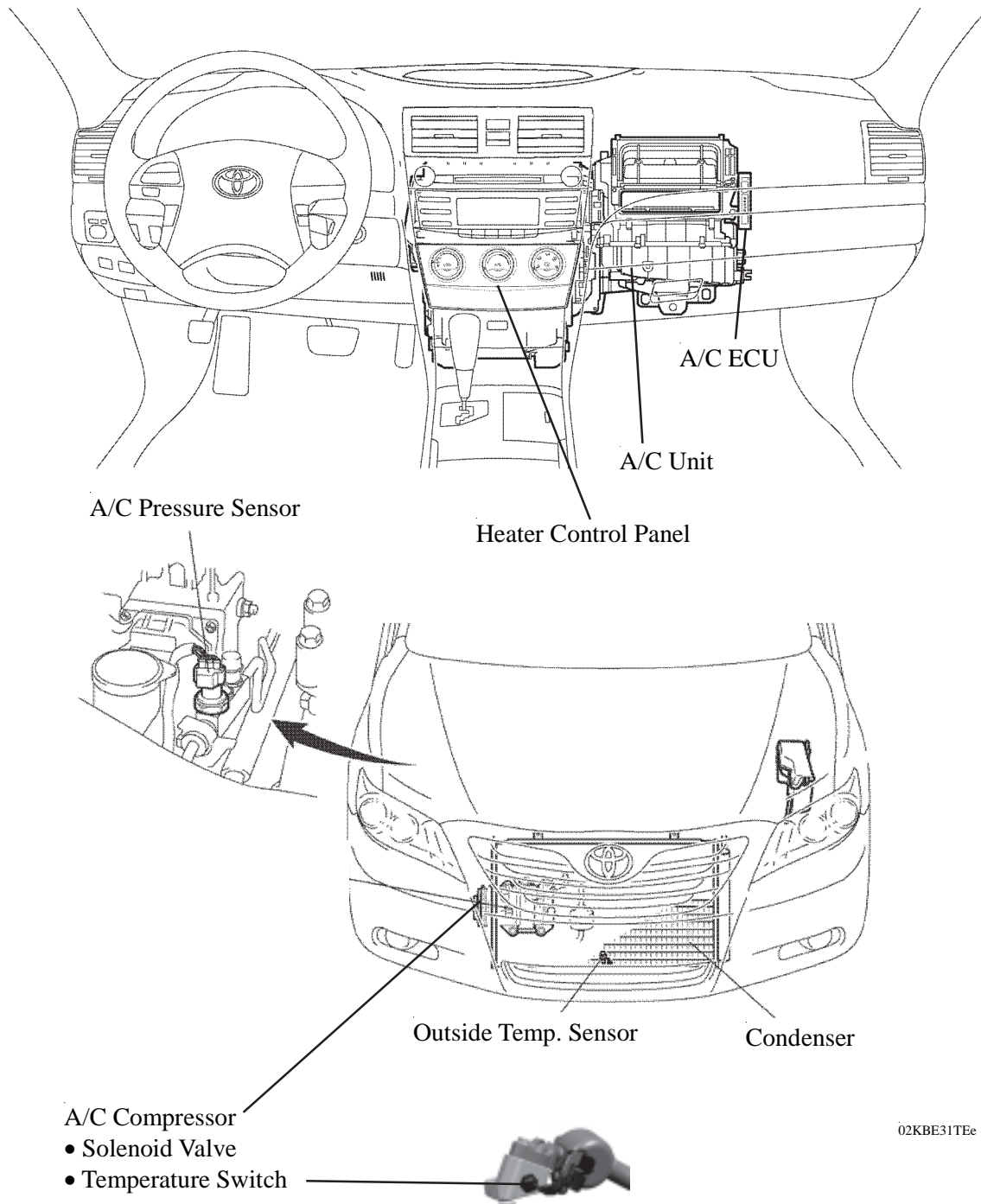
SYSTEM DIAGRAM

▶ Manual Air Conditioner ◀

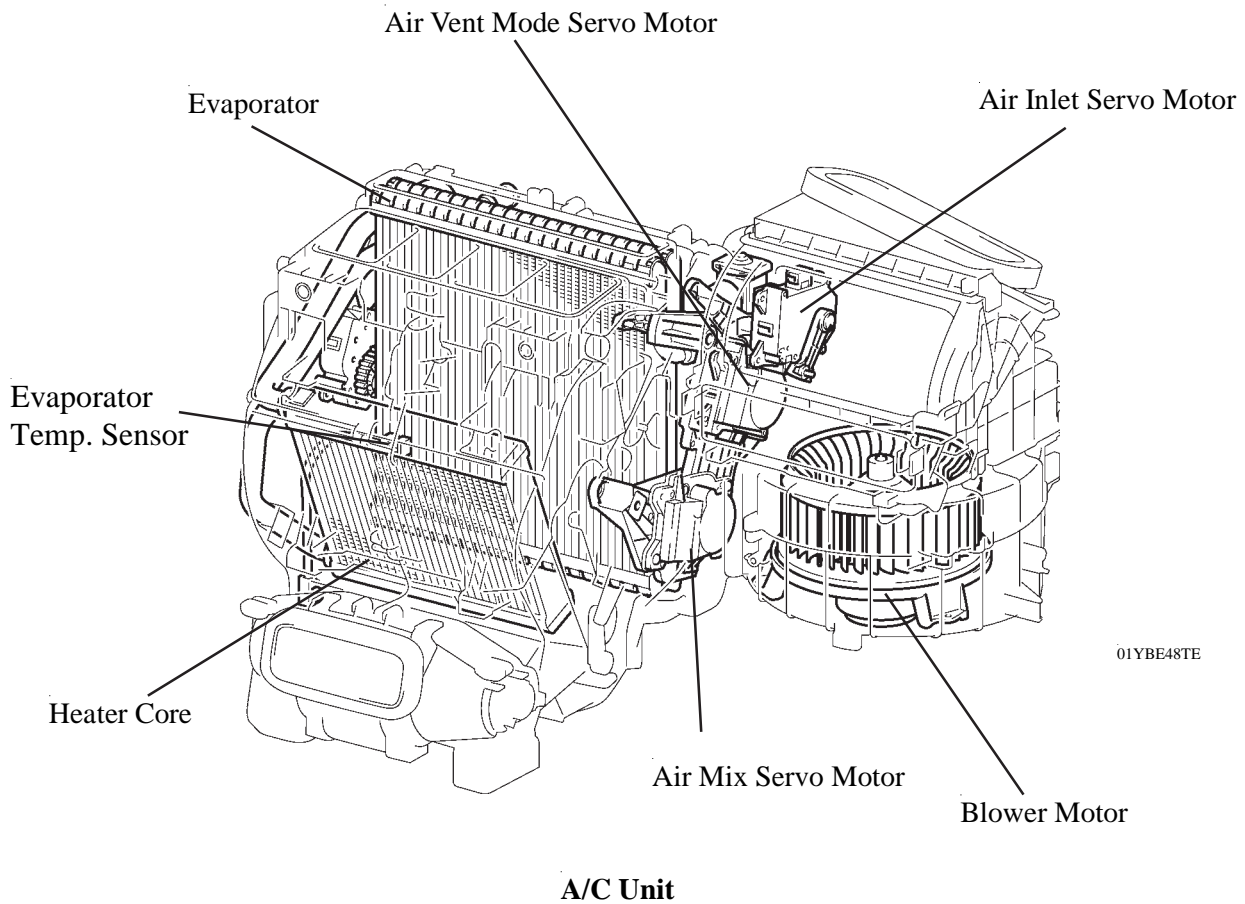


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LAYOUT OF MAIN COMPONENTS

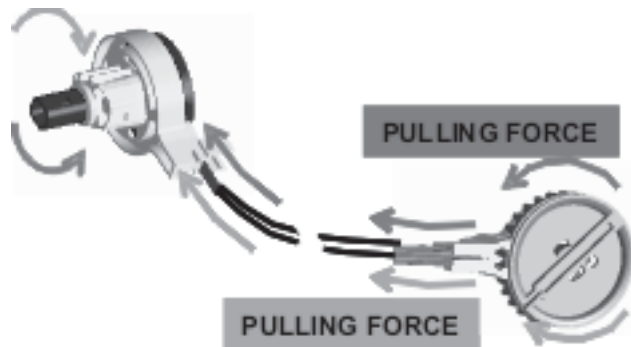


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Servo Module

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

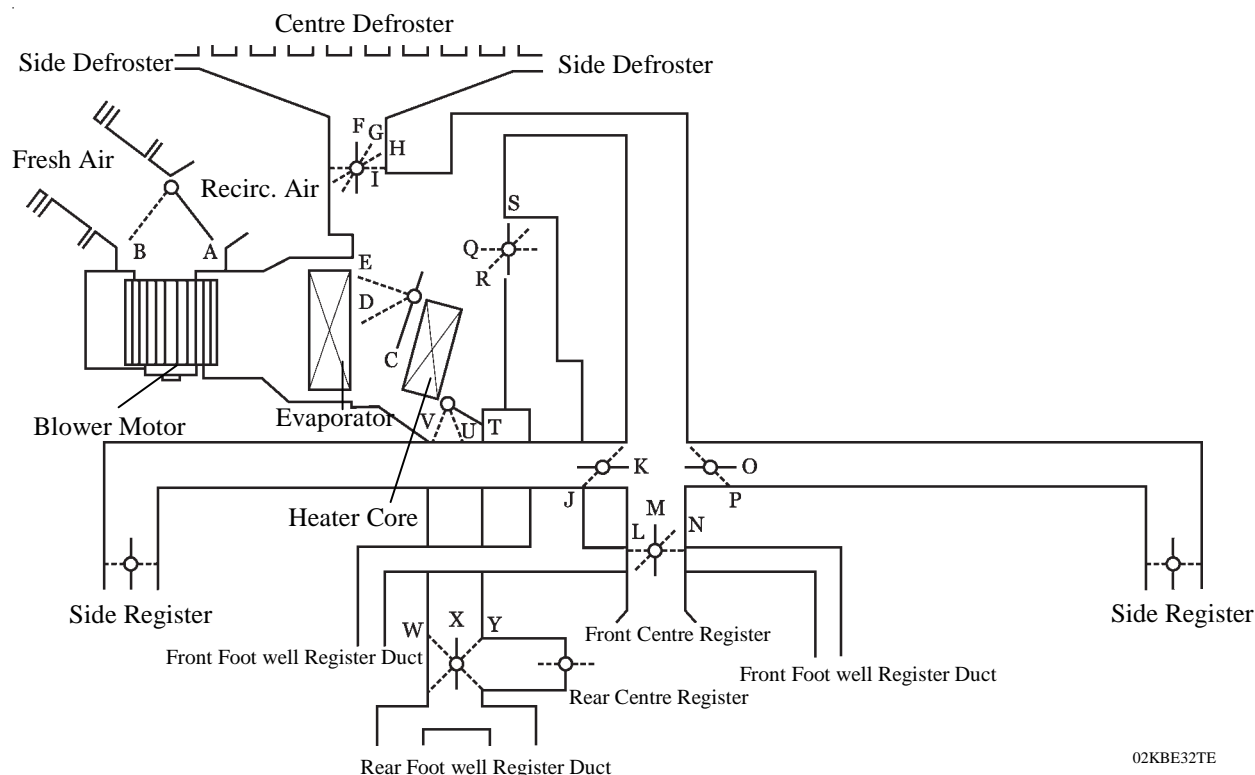


Pull Pull Control Cable

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






MODE POSITION AND DAMPER OPERATION

1. Manual Air Conditioner

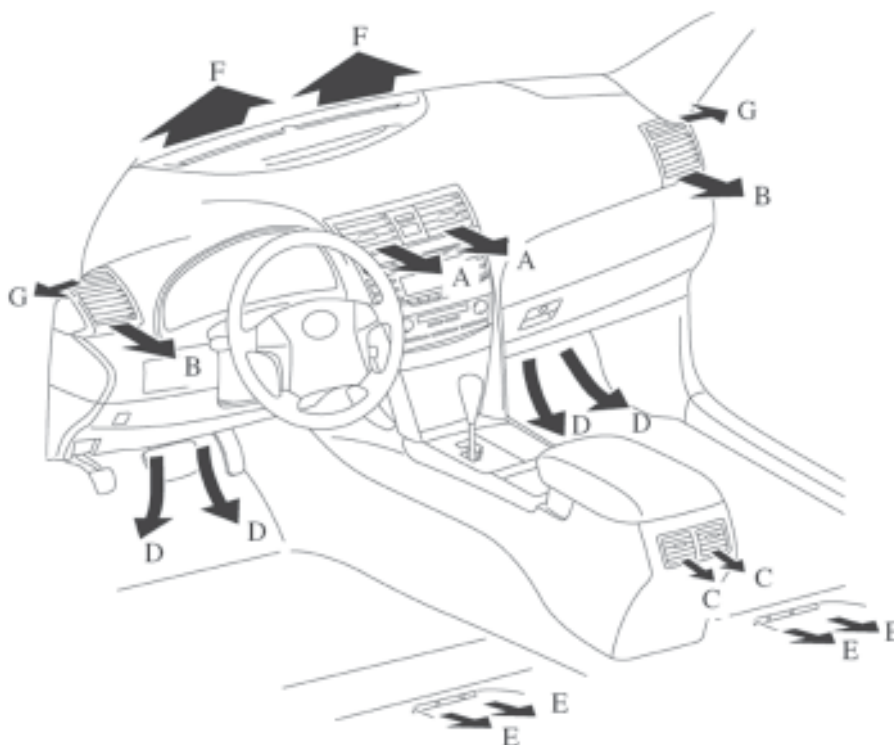


02KBE32TE






► 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 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 187BE28	F, J, L, P, S, Y	Defrosts the windshield through the centre defroster, side defroster, and side register.
	 FOOT / DEF 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 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 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 187BE24	I, K, M, O, S, W	Air blows out of the front centre register and side register.

AIR OUTLETS AND AIRFLOW VOLUME



02KBE33TE

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* ¹	○	○	●	●	●	○	○	—	—
	B/K-L* ²	○	—	○	○	○	●	●	—	—
	FOOT-F* ³	○	—	—	○	○	●	○	○	○
	FOOT-R* ⁴	○	○	—	○	○	●	●	○	○
	FOOT-D* ⁵	○	—	—	○	○	○	○	○	○
	F/D	○	○	—	○	○	●	●	○	○
	DEF	○	○	—	○	—	—	—	●	●

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

*¹: Greater airflow volume at the upper area. *²: Greater airflow volume at the lower area.

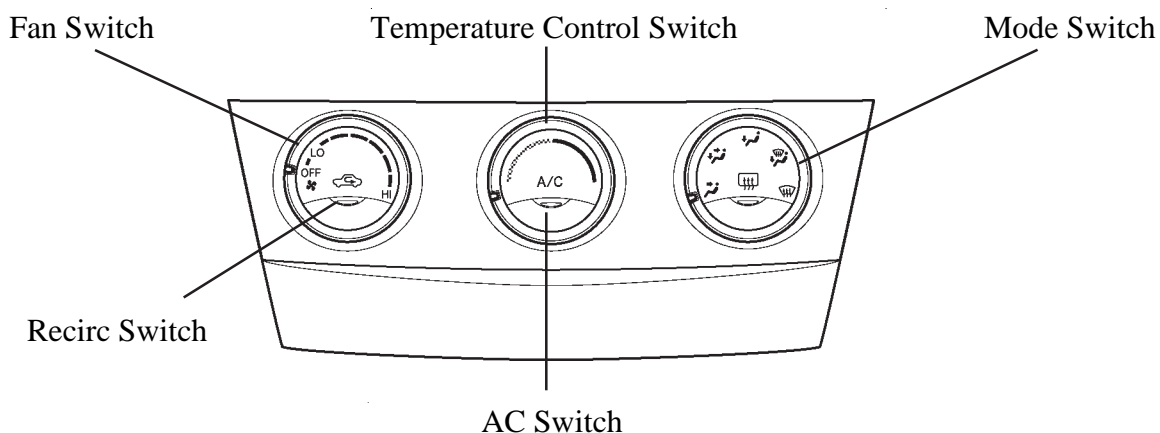
*³: Greater airflow volume at the front.

*⁴: Greater airflow volume at the rear.

*⁵: Greater airflow volume at the defroster.

CONSTRUCTION AND OPERATION

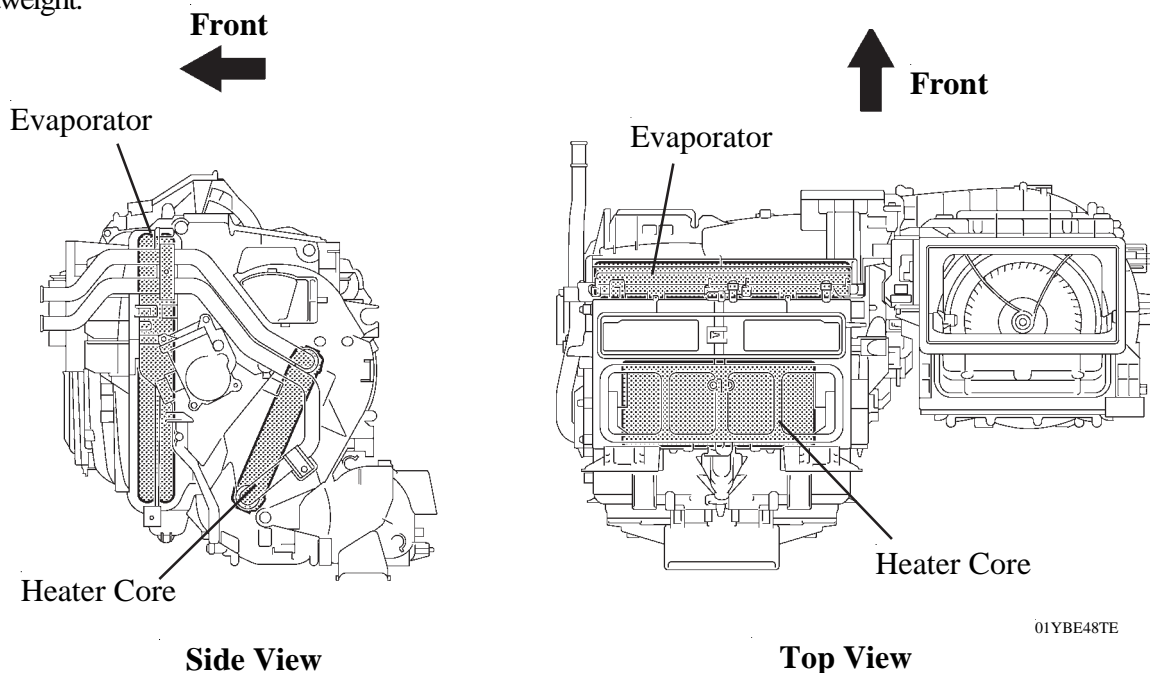
1. Heater Control Panel



2. Air Conditioner Unit

General

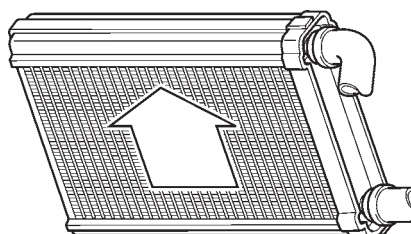
A semi-centre location air conditioner unit, in which the evaporator and heater core are placed in the vehicle's longitudinal direction, is used. As a result, the air conditioner unit has been made compact and lightweight.



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Heater Core

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



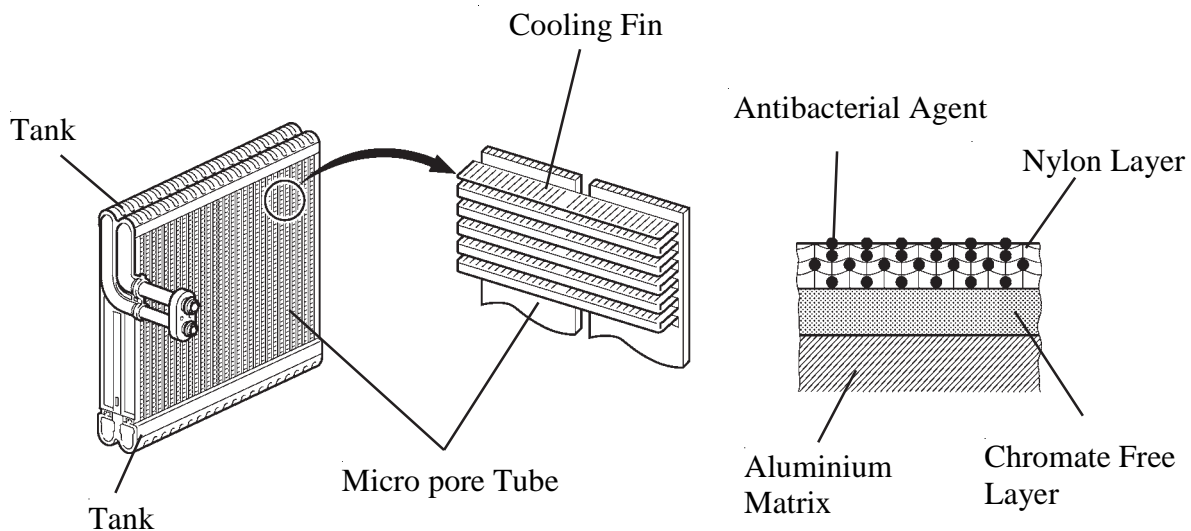
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Evaporator

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.

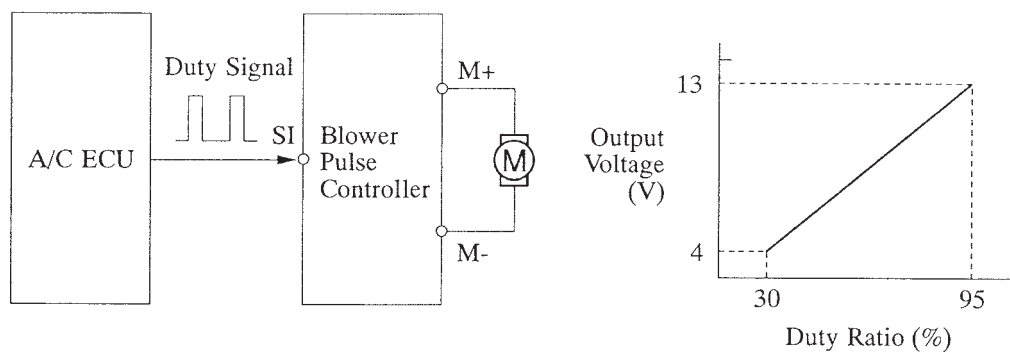


Evaporator Temp. Sensor

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.

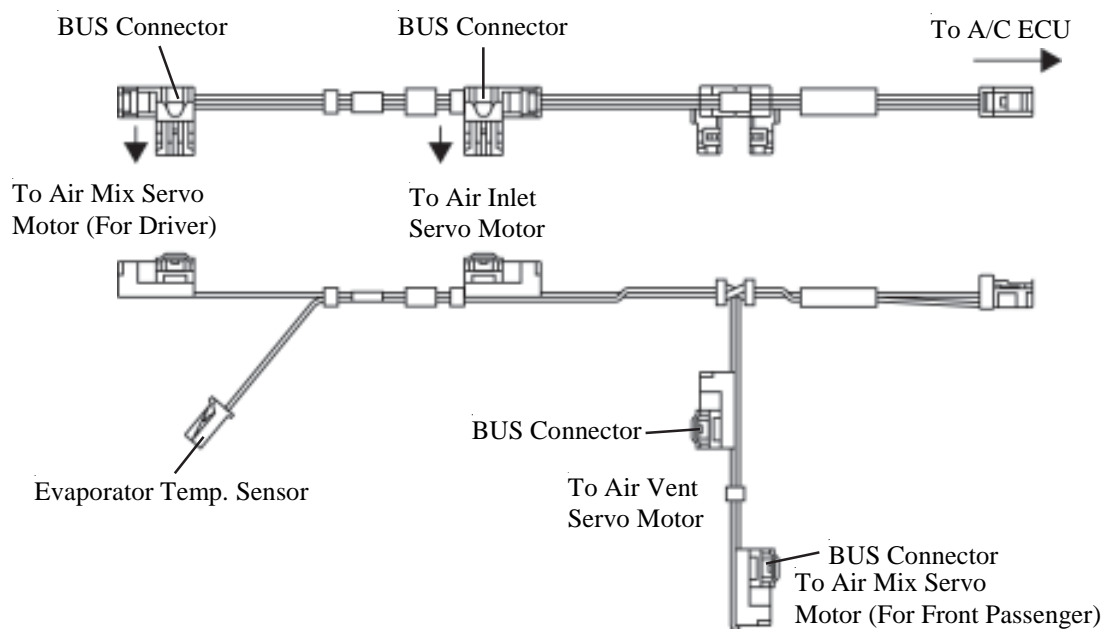
Blower Motor

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



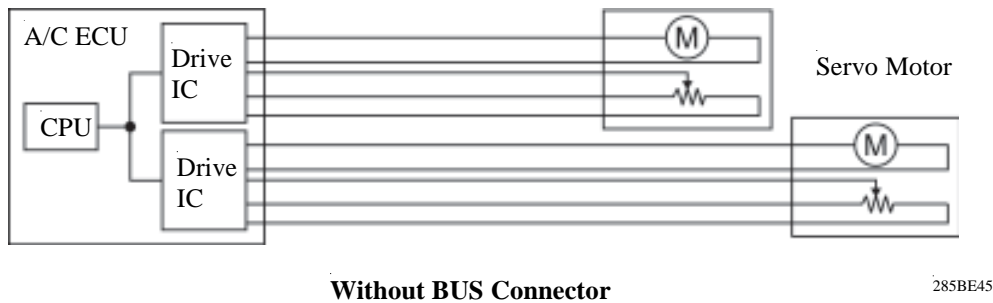
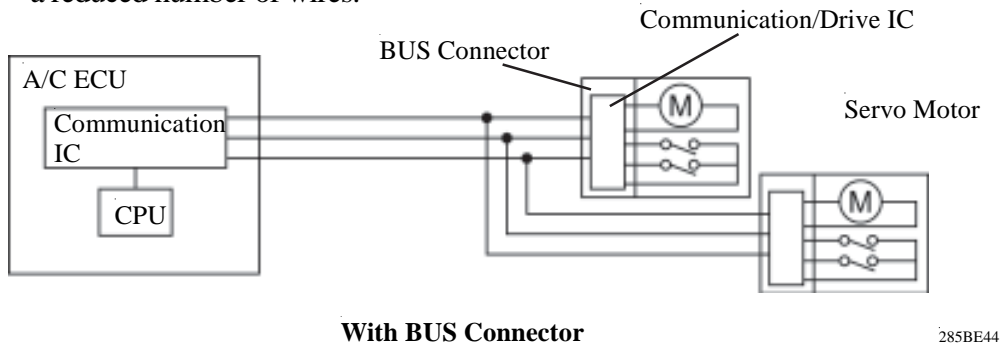
BUS Connector

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



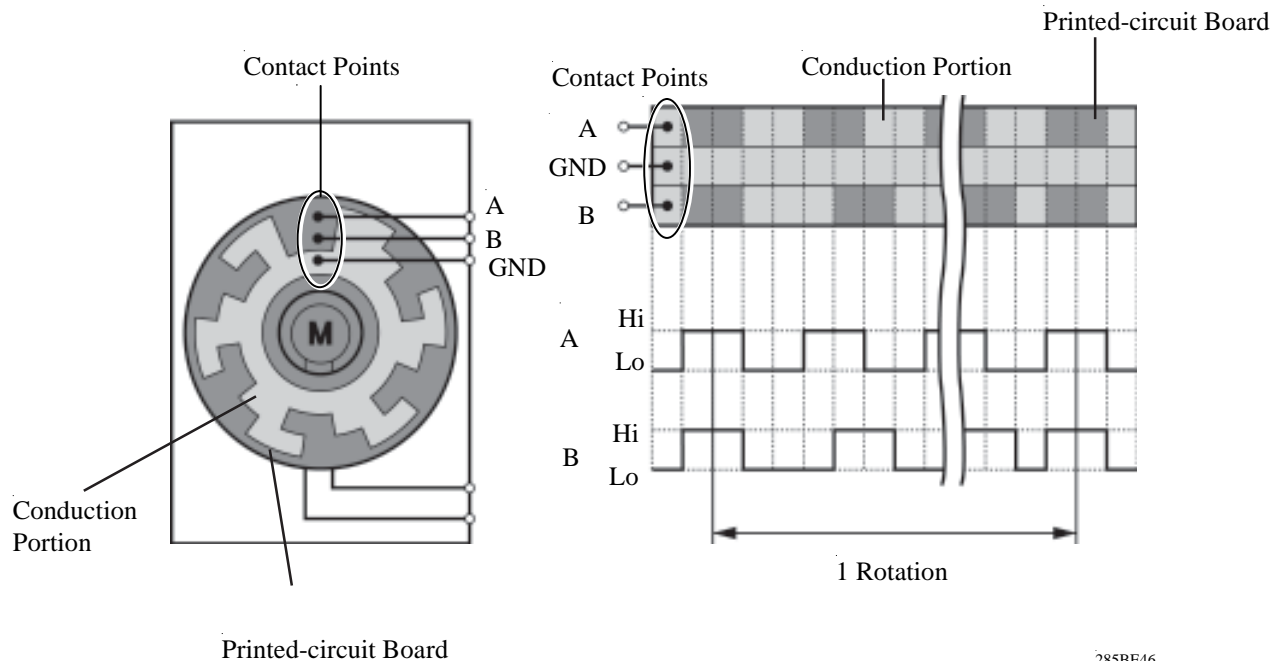
285BE43

- 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.



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.

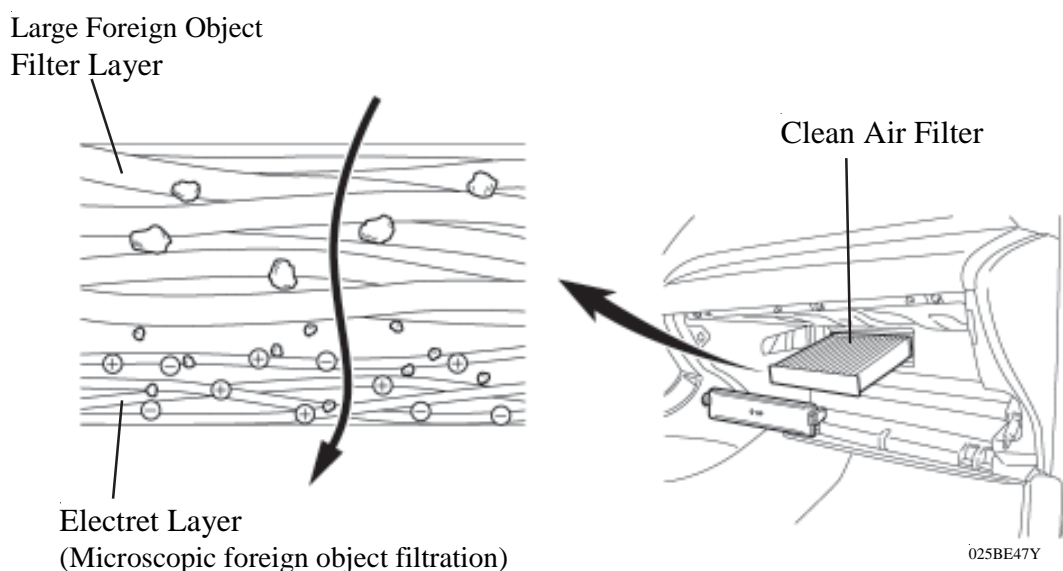


NOTE: When one of the following operations is conducted, the A/C ECU automatically performs the initialisation to detect the original positions of the servo motors. Although the rear DEF indicator on the heater control panel blinks during the initialisation, this does not indicate a malfunction.

- After the battery terminal has been disconnected, the power source is switched to IG-ON.
- The engine starts and stops repeatedly in a short period of time.
- The engine starts when the battery voltage is low.

Clean Air Filter

- A clean air Pollen-removal type 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.



Service Tip

The replacement interval of the filter:

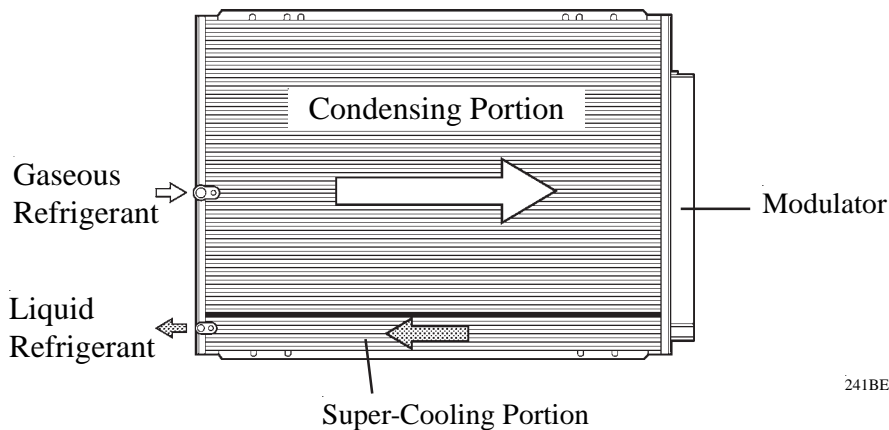
Cleaning Interval [km]		Replacement Interval [km]	
Normal Condition	Dusty Condition	Normal Condition	Dusty Condition
10,000	5,000	30,000	15,000

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-53

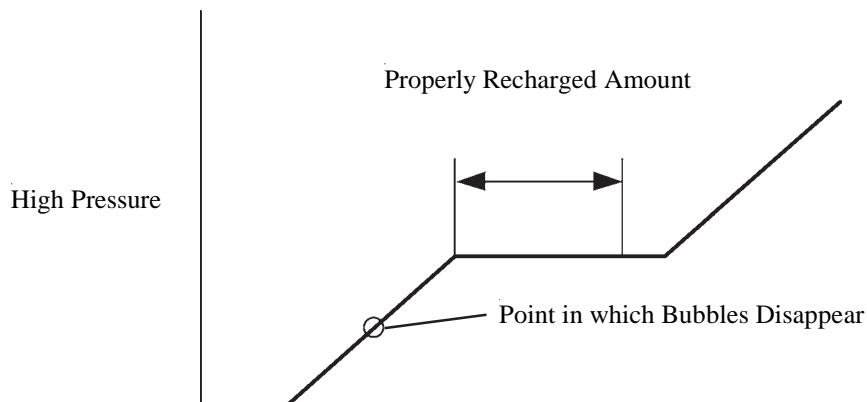


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Service Tip

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 Camry Repair Manual.

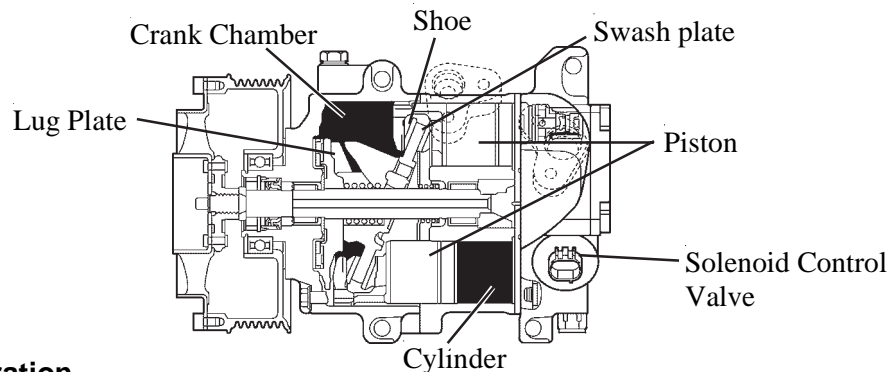


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4. A/C Compressor

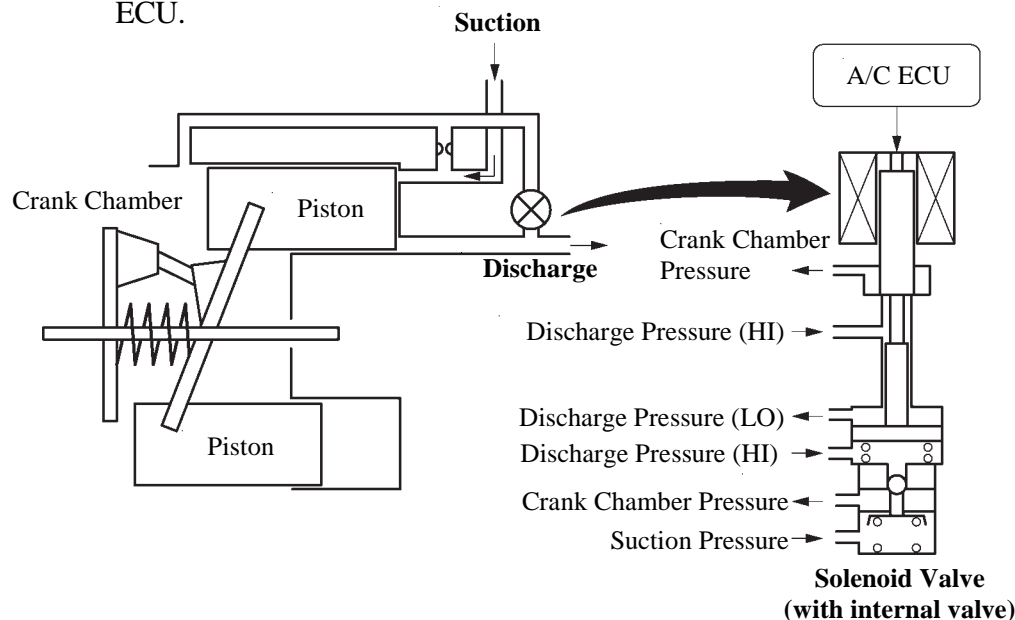
General

- 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.
- This compressor consists of the A/C pulley, shaft, lug plate, swash plate, piston, shoe, crank chamber, cylinder, and solenoid valve.
- The DL (Damper Limiter) type A/C pulley is used on all grades.
- 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.
- A temperature switch, which turns ON/OFF in accordance with the refrigerant temperature, has been provided on the A/C compressor. This switch is located in series with the solenoid valve drive circuit. When the refrigerant temperature increases abnormally, the switch turns OFF to forcibly terminate the compressor control.



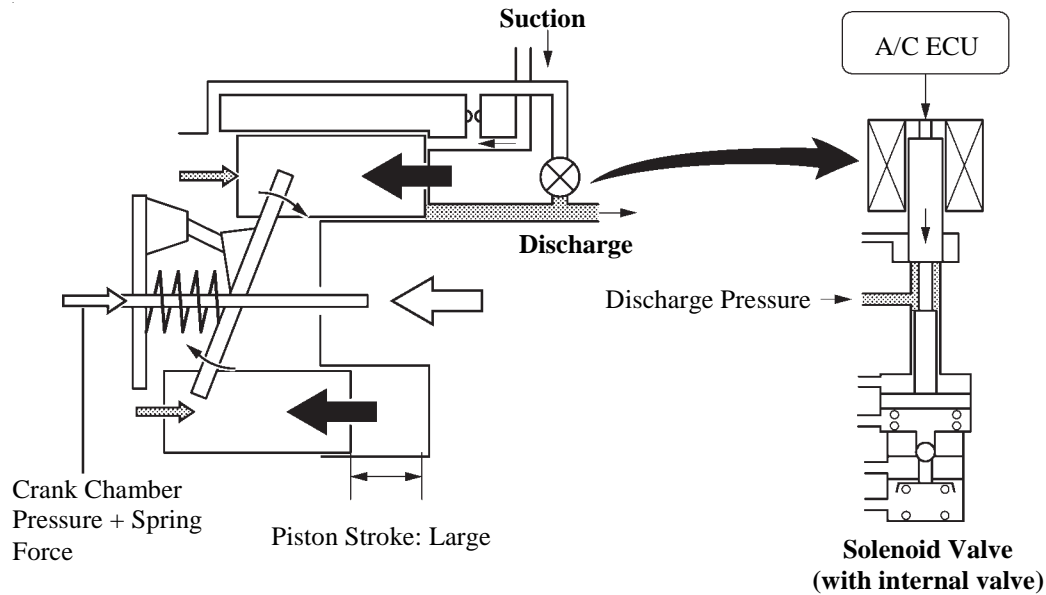
Solenoid Valve Operation

- 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.

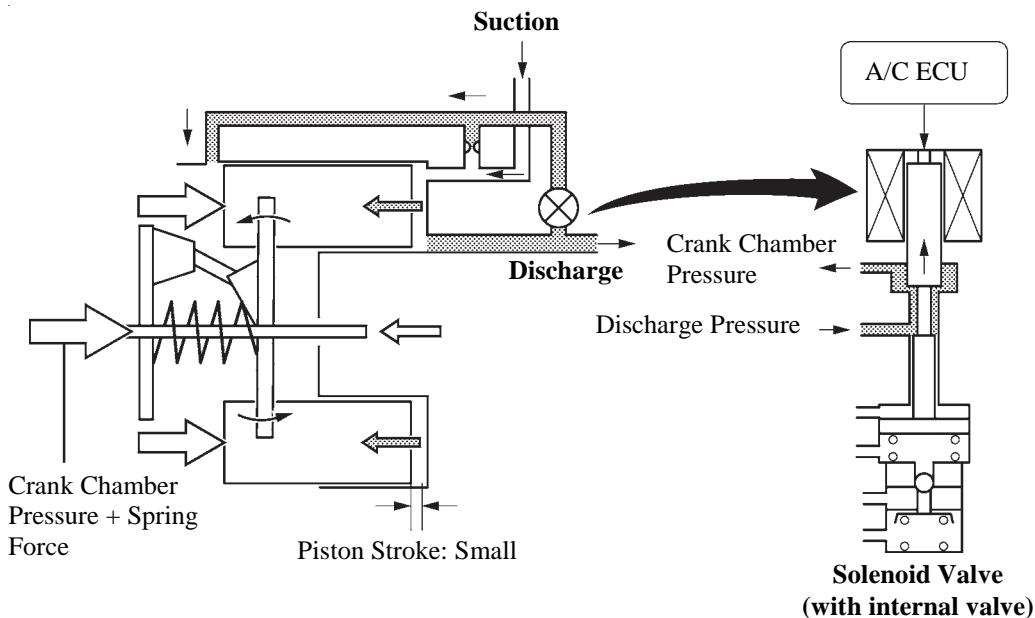


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- When the solenoid valve closes (the solenoid coil is energised), a difference in pressure is created and the pressure in the crank chamber decreases. Then, the pressure that is applied to the right side of the piston becomes greater than the pressure 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.

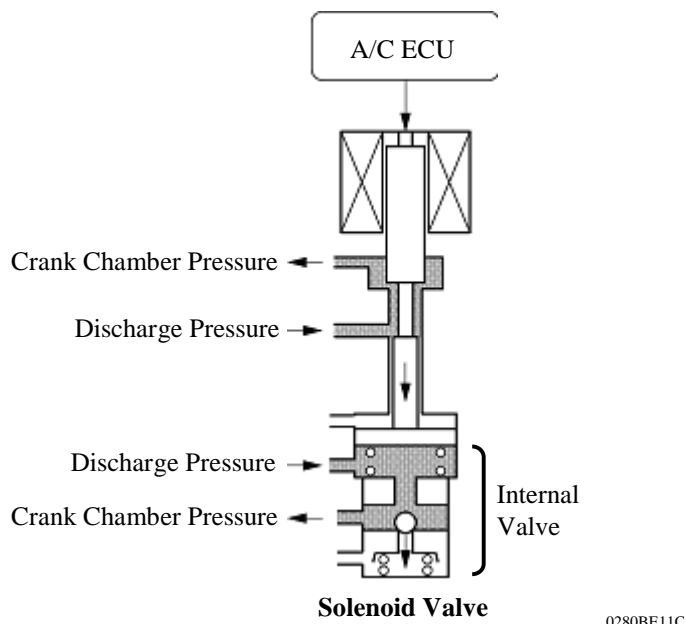


- When the solenoid valve opens (the solenoid coil is not energised), the difference in pressure disappears. Then, the pressure that is applied to the left side of the piston becomes the same as the pressure that is applied to the right side of the piston. Thus, the spring elongates and eliminates the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



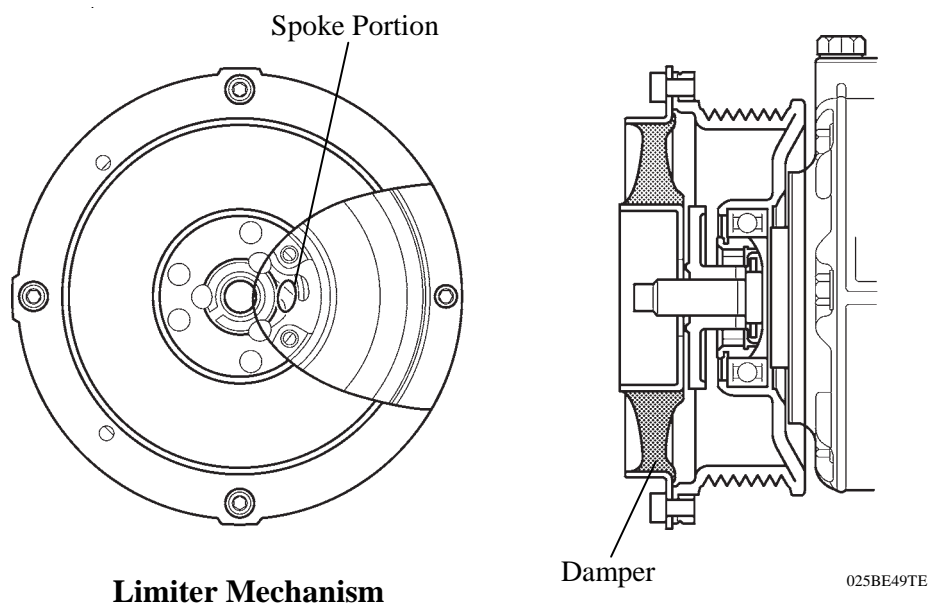
Internal Valve Operation

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.



DL type A/C Pulley

This pulley contains a damper to absorb the torque fluctuations of the engine and a limiter mechanism to protect the drive belt in case the compressor locks. In the event that the compressor locks, the limiter mechanism causes the spoke portion of the pulley to break, thus separating the pulley from the compressor.



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.

SYSTEM CONTROL

1. General

The air conditioner system has the following controls.

Control	Outline	Manual A/C
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).	○
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.	○
Rear Window Defogger Control [See page BE-73]	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 [See page BE-40]	A DTC (Diagnostic Trouble Code) is stored in the memory when the A/C ECU detects a problem with the air conditioner system.	○

2. 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).
- DTC's are read using an Intelligent Tester II.
- For details, see the Camry Repair Manual.

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 (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 (Driver Door)* ¹	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.
One-touch auto down (Driver Door)* ²	The one-touch auto down function enables the window to be fully opened with a single touch of the power window switch.
Jam Protection (Driver Door)* ¹	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 (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 either the power window master switch or the power window switches flashes to inform the user. <ul style="list-style-type: none"> • An abnormality in the Hall IC that detects the position, speed and direction of the window. • An error in the window detection position and the upper limit position recorded in the power window ECU.
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"> • Power windows can be operated using the power window switches within 40 seconds of failsafe mode being entered. • Each power window operates when the corresponding power window switch is fully pushed down or pulled up and held in that position.

*¹: On models with driver door jam protection function

*²: On models without jam protection function

Service Tip

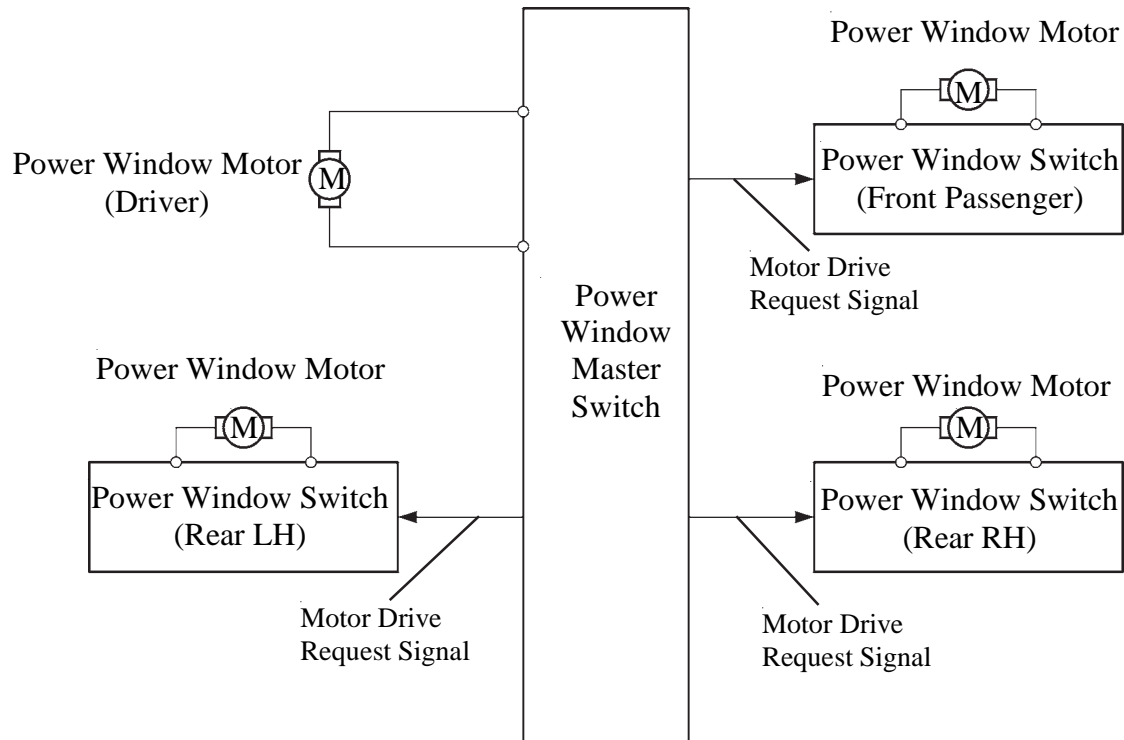
The power window motor assembly with a jam protection function stores the initial position of each door window. The memory is not cleared if battery terminals, fuses or power window motor assembly connectors are disconnected. However, after the power window motor assembly and power window regulator assembly 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

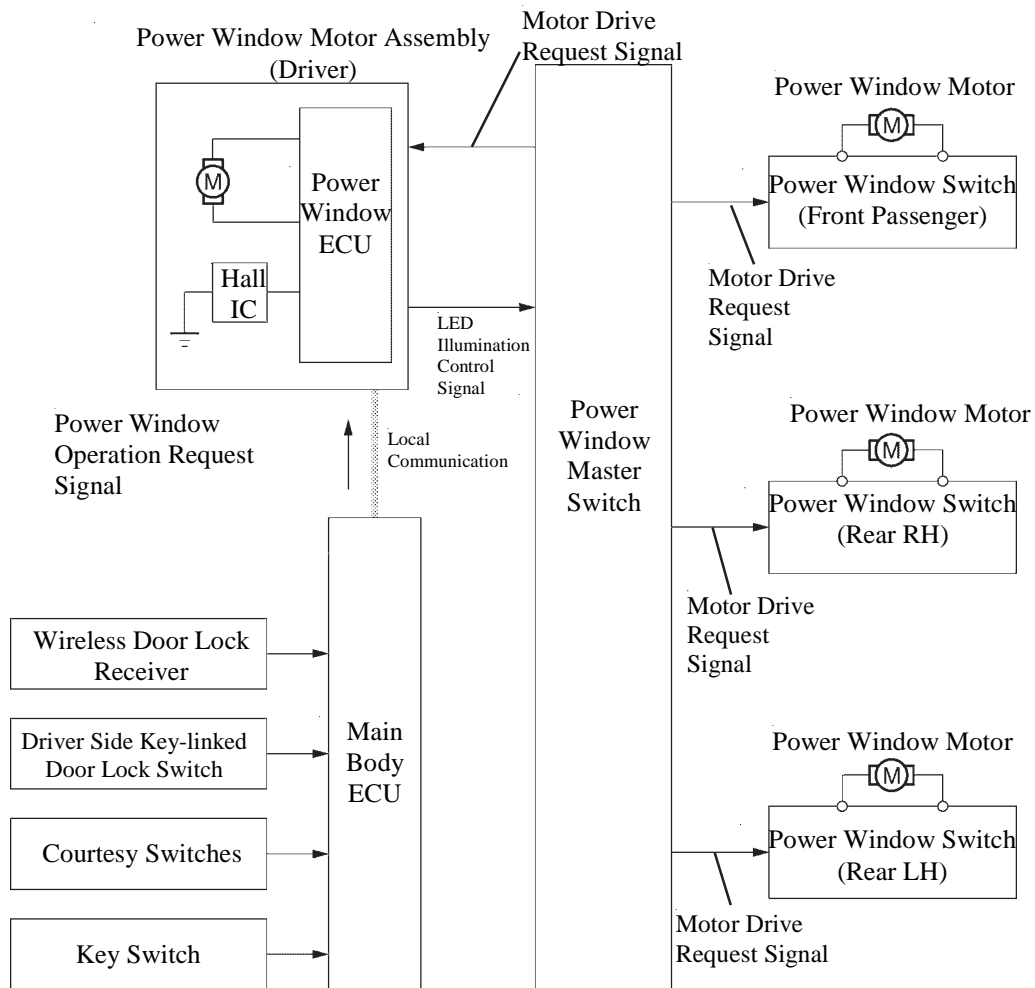
- Turn the power supply off (for example, remove a power window motor assembly connector or fuse) while the power window motor is operating.
- Check that the power window switch illumination blinks after the power source is turned on.

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 Camry Repair Manual.

► System Diagram ◀**Without jam protection function**

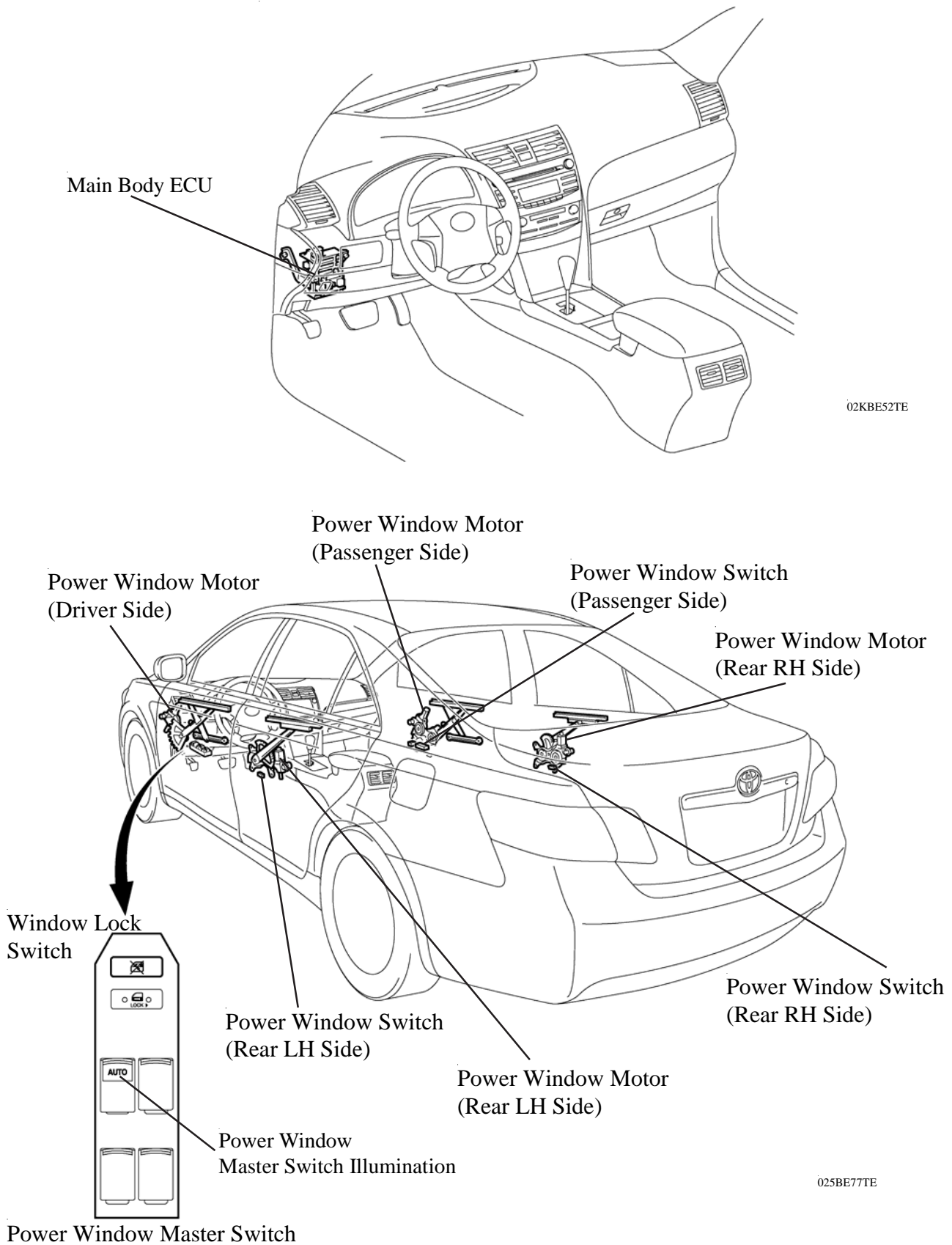
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Driver door with jam protection function

★ LAYOUT OF MAIN COMPONENTS

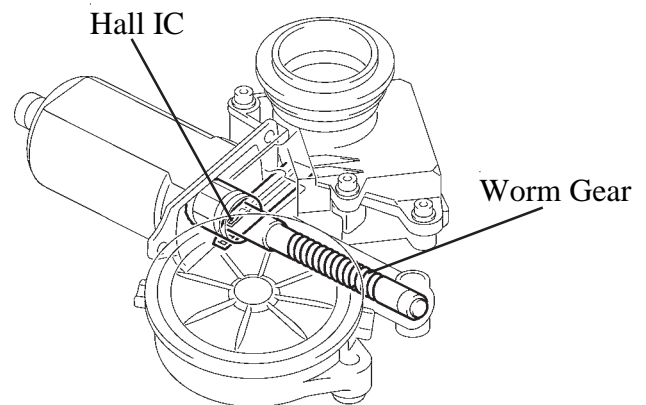


JAM PROTECTION FUNCTION

- 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.

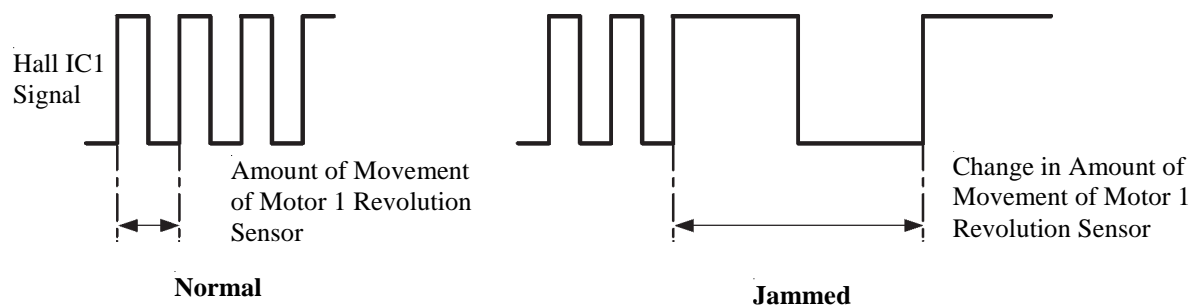
- The worm gear and Hall IC in the power window motor assembly are used to enable the power window jam protection.



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- 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 ◀



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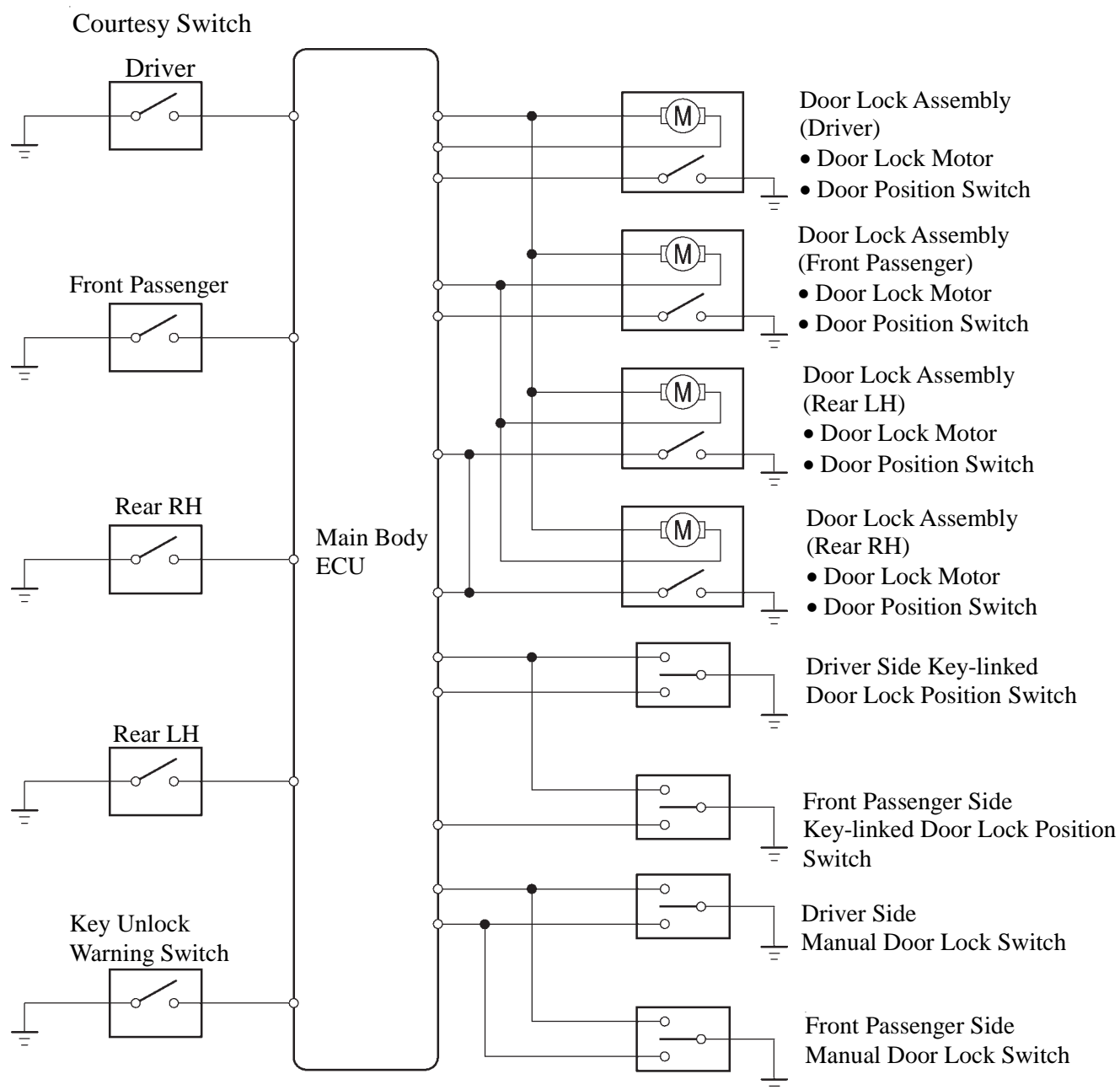
DOOR LOCK CONTROL SYSTEM

☀ DESCRIPTION

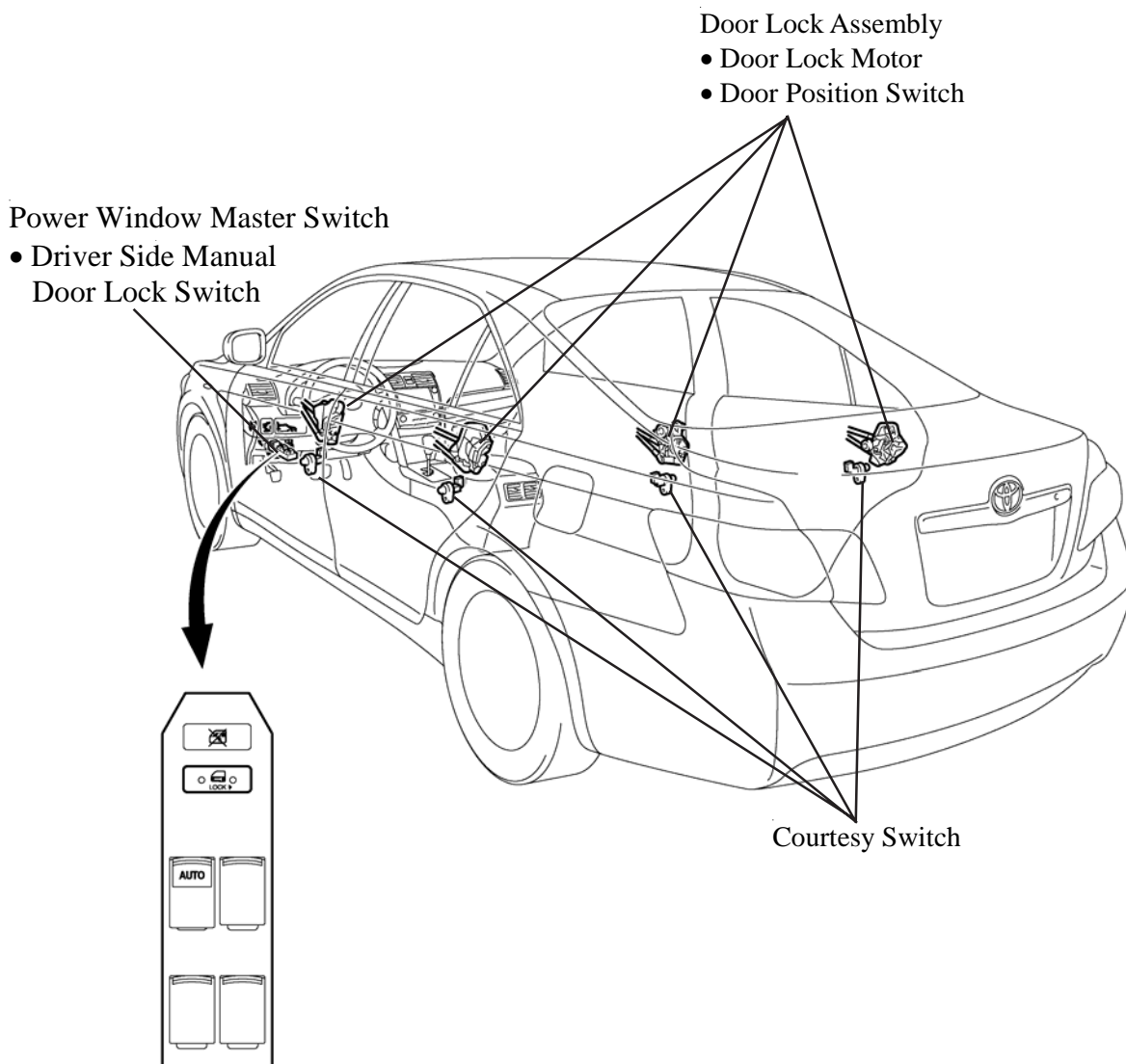
The door lock control system has the following functions:

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* ¹	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.

*¹: 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-9.



☀ LAYOUT OF MAIN COMPONENTS



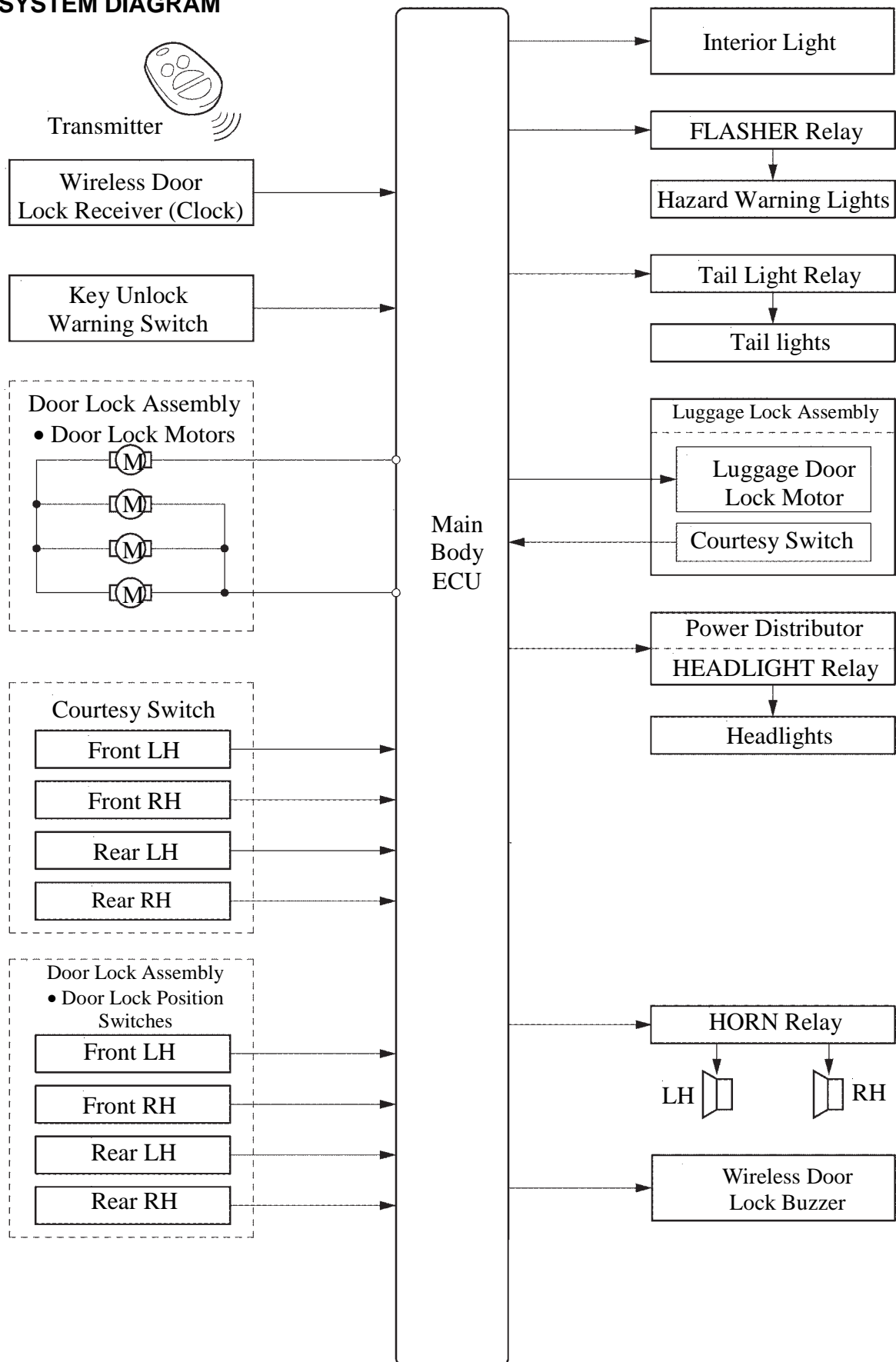
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WIRELESS DOOR LOCK REMOTE CONTROL SYSTEM

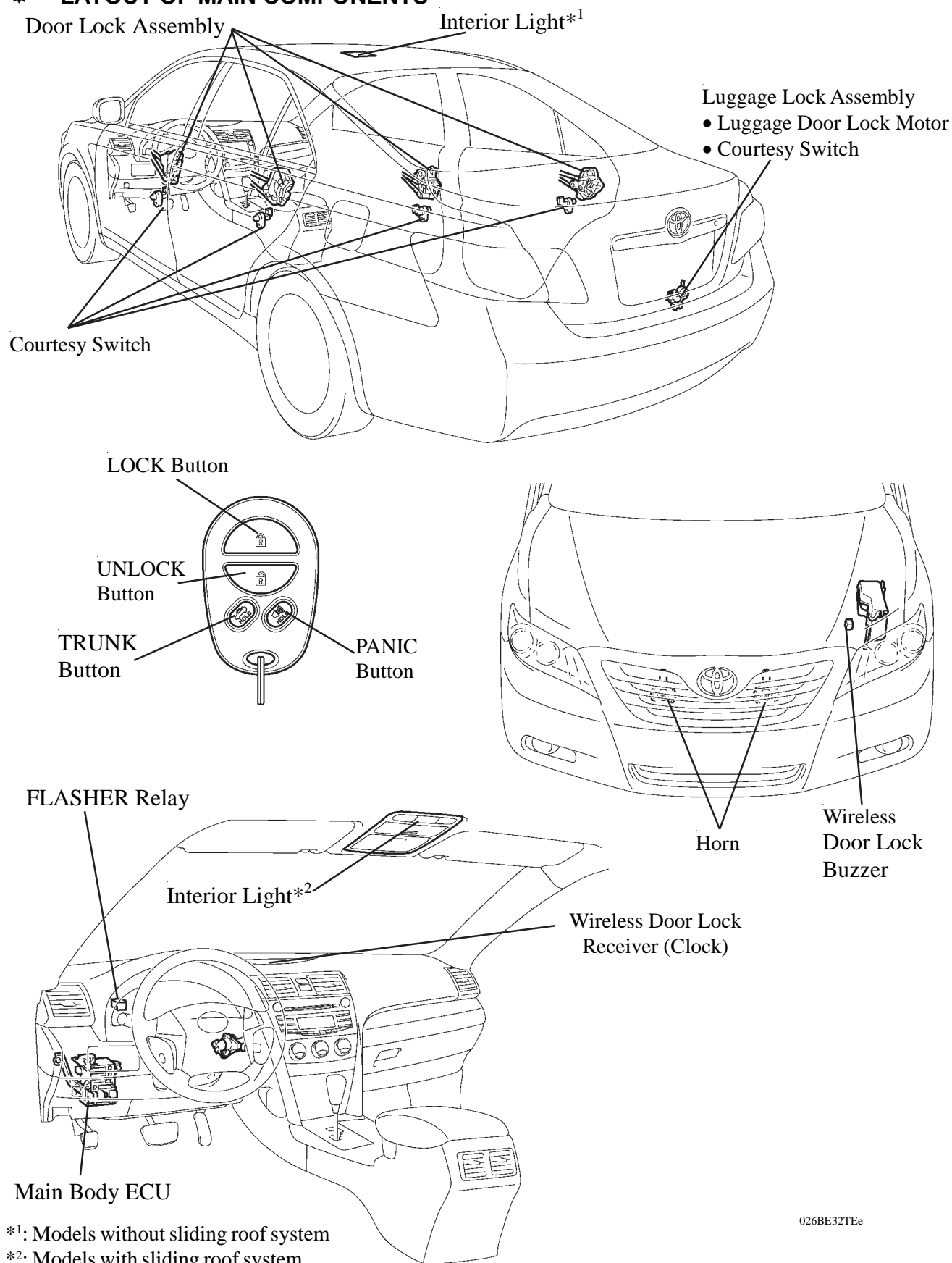
☀ DESCRIPTION

- The wireless door lock remote control system is used as standard on all models other than GL grade.
- 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



*¹: Models without sliding roof system

*²: Models with sliding roof system

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FUNCTION

1. General

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

Function	Outline
All Doors Lock	Pressing the LOCK button of the key or transmitter locks all doors.
All Doors Unlock	Pressing the UNLOCK button of the key unlocks all doors.
All Doors Unlock (2-step Unlock)* ¹	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* ²	Keeping the TRUNK button of the key pressed for longer than about 0.6 seconds opens the trunk lid.
Answer Back* ²	<ul style="list-style-type: none"> • The hazard lights flash once when locking and twice when unlocking, to inform that the operation has been completed. • The wireless door lock buzzer sounds once when locking, and sounds twice when unlocking, to inform that the operation has been completed. (Except Chinese models)
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"> • Sounds the horns. • Flashes the hazard warning lights, head lights, and tail lights. • Illuminates the interior light.
Automatic Lock* ²	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* ²	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 or 4 types of key recognition codes in the EEPROM that is contained in the integration relay.

*¹: 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-9.

*²: The setting function can be changed using the customised body electronics system. For details, refer to Customised Body Electrical System section on page BE-9.

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 Camry Repair Manual.

Mode	Function
Rewrite Mode	Erases all previously registered codes and registers only the newly received codes. This mode is used whenever a key or the 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 the key is lost.

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.

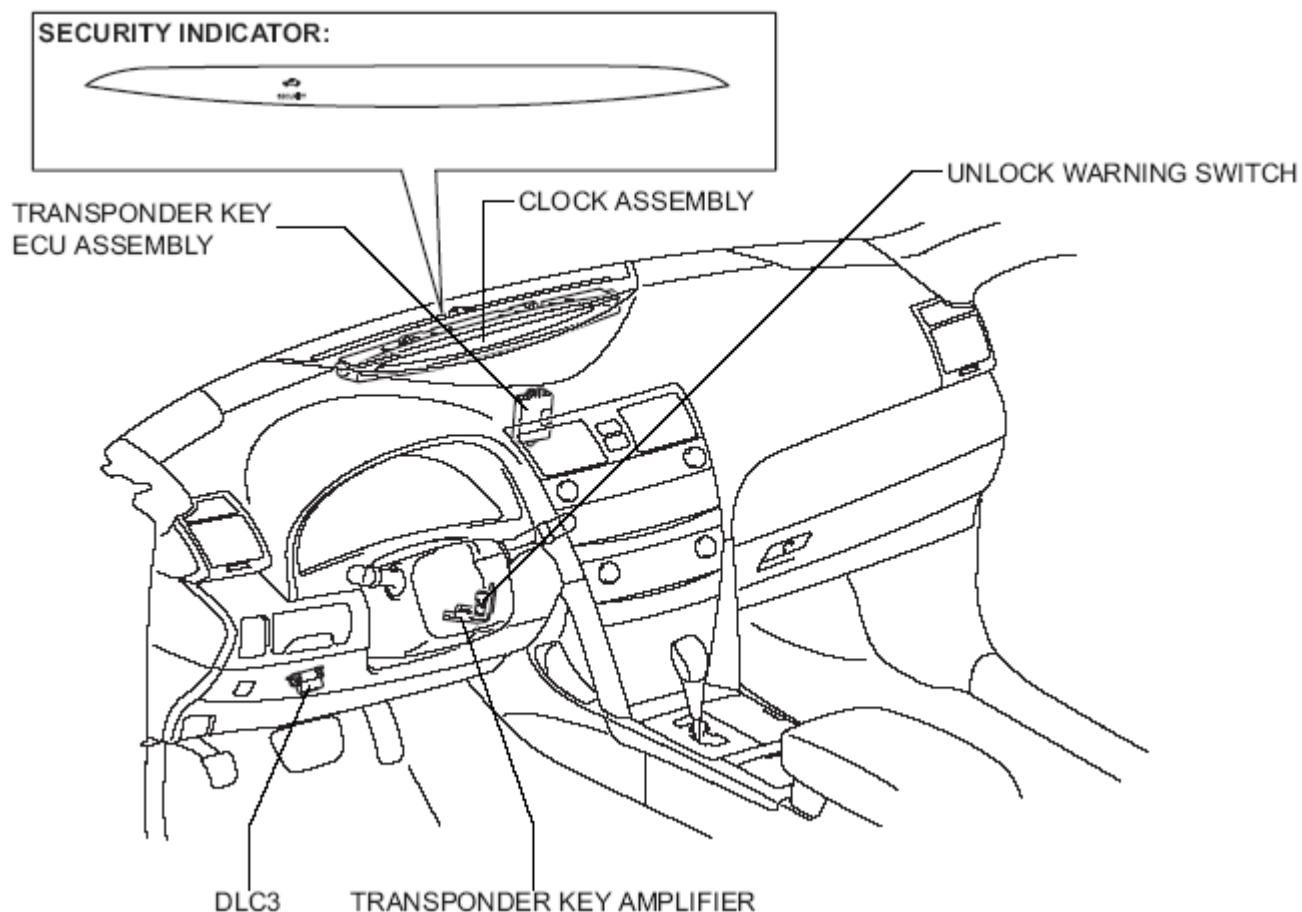
- The system is standard equipment on all models.

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).

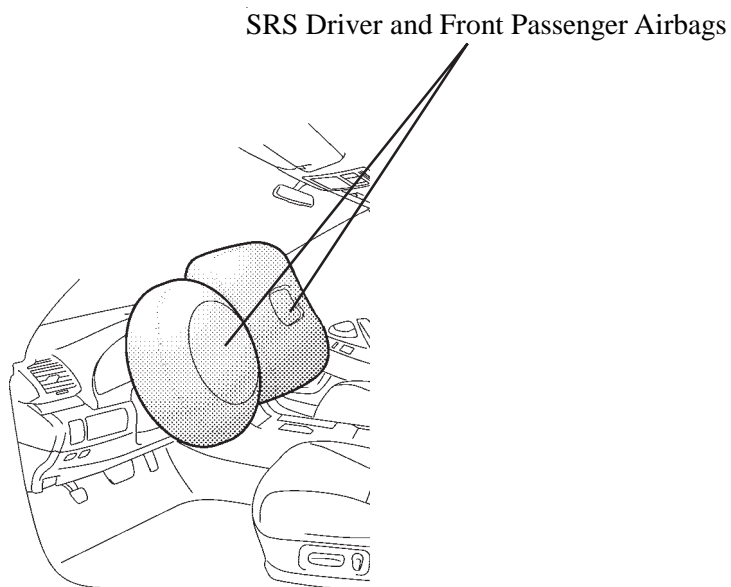
For details, see the Camry Repair Manual.



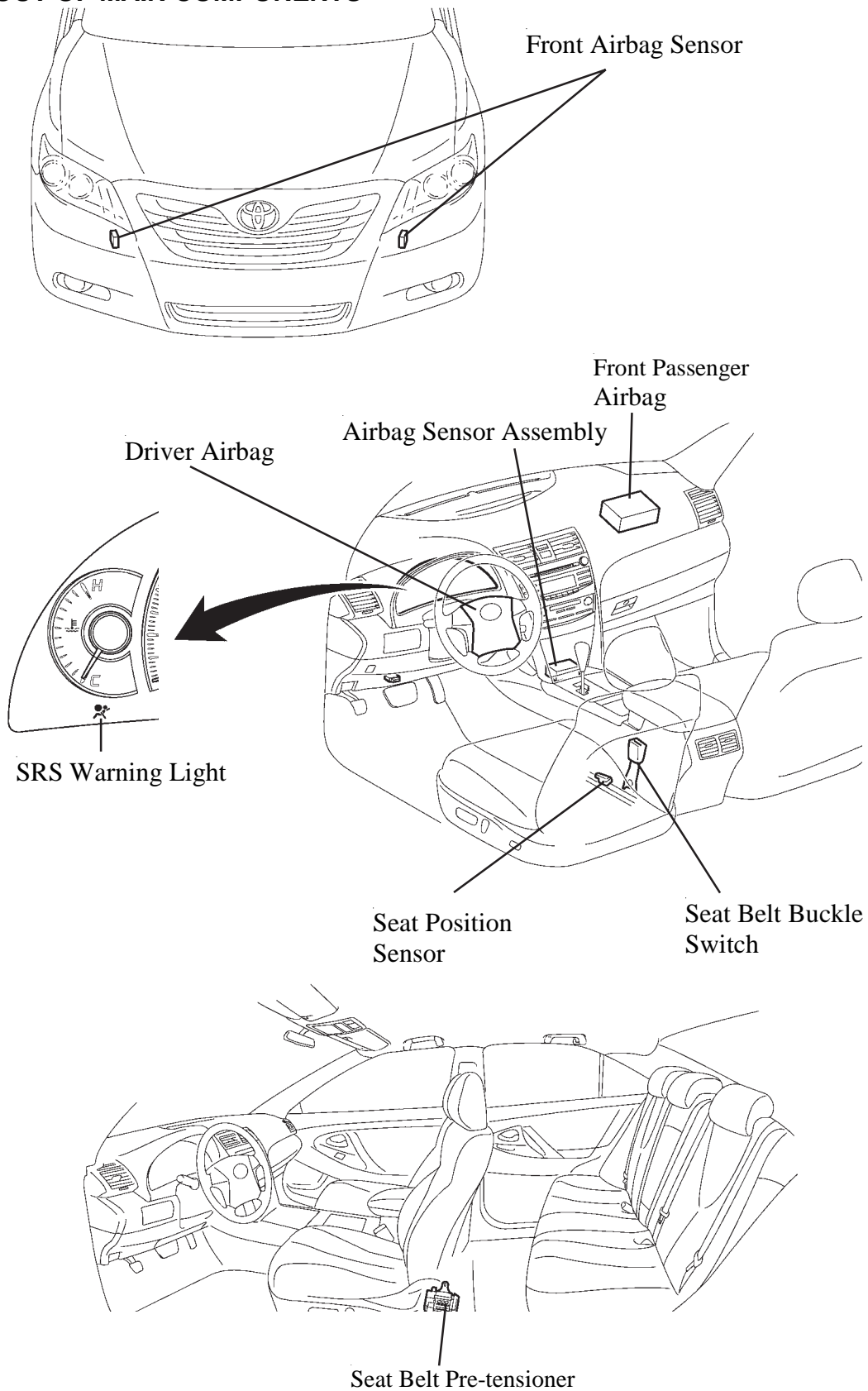
SRS AIRBAG SYSTEM

☀ 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. Dual-stage driver and passenger airbags are fitted to all models.
- 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-52.

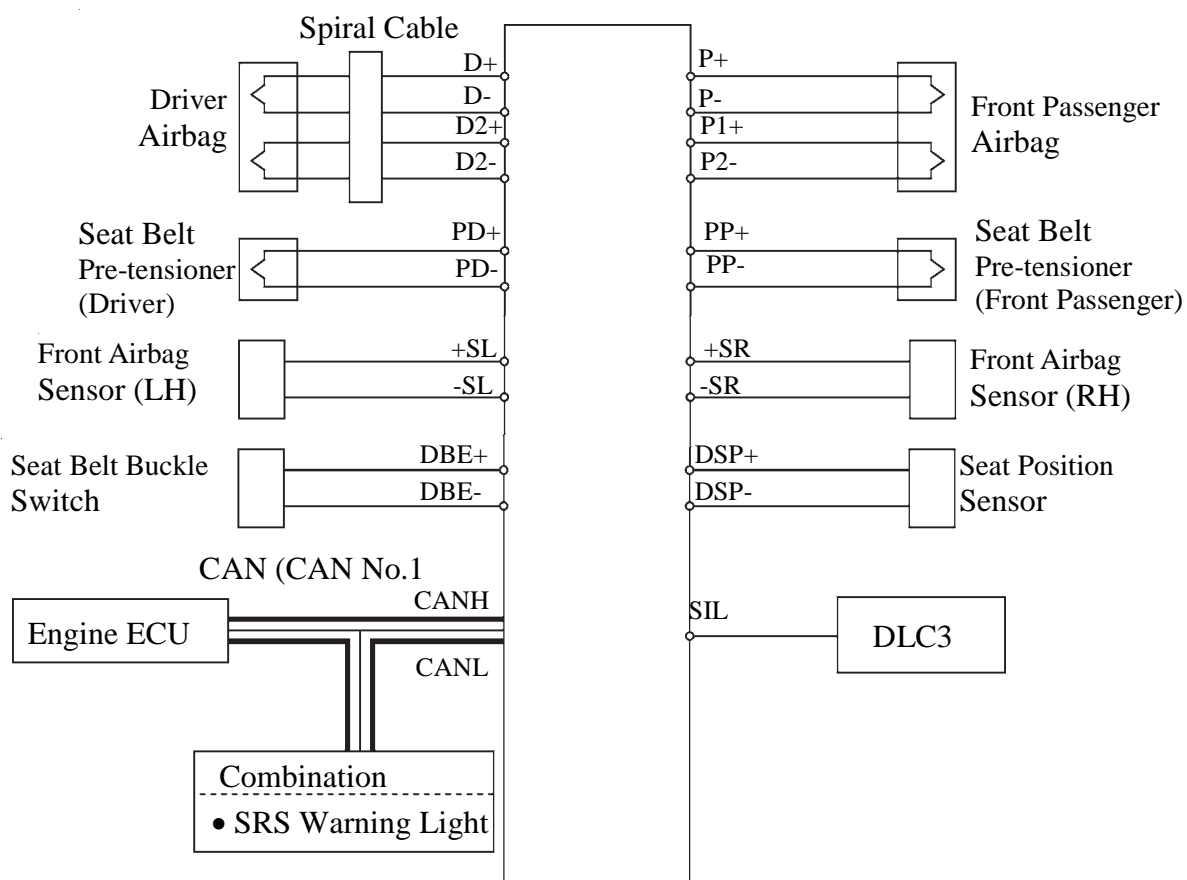


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☀ LAYOUT OF MAIN COMPONENTS

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WIRING DIAGRAM



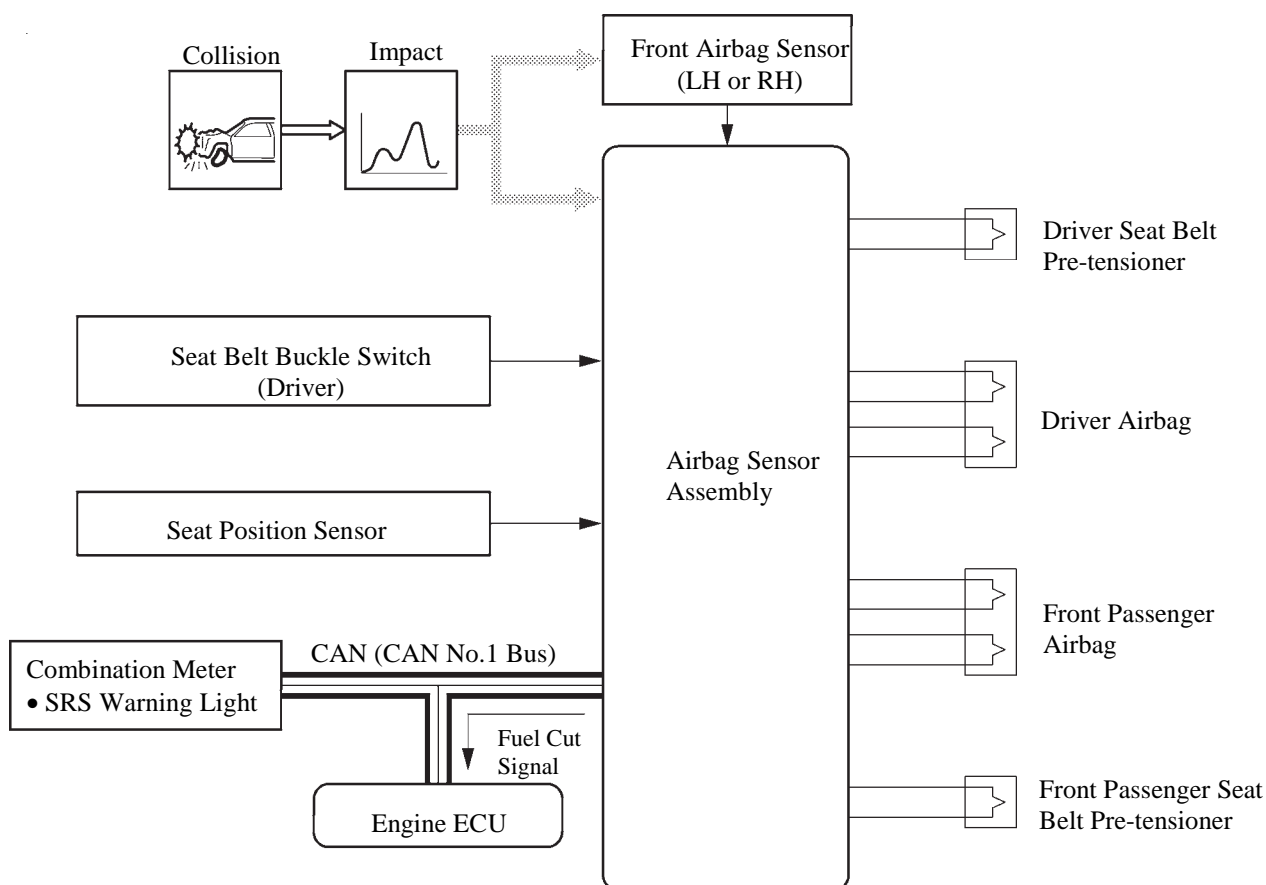
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✱ AIRBAG FOR FRONTAL COLLISION

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 driver knee airbag restrict the lower parts of the occupant's body, thus enhancing the excellent passenger protection provided by the seat belt and front airbag.
- 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 ◀



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2. Dual-stage SRS Airbag System

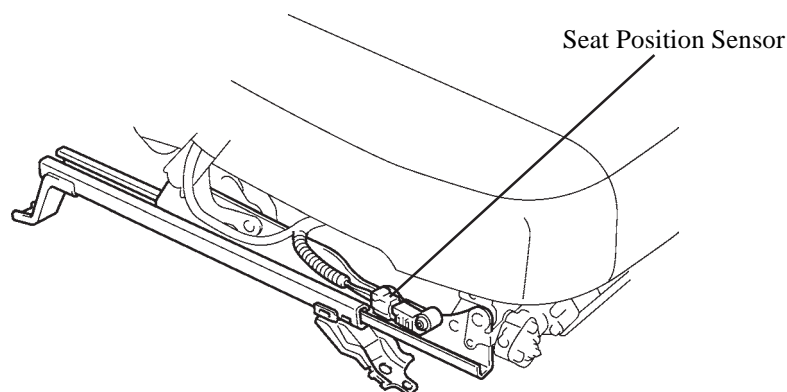
General

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.

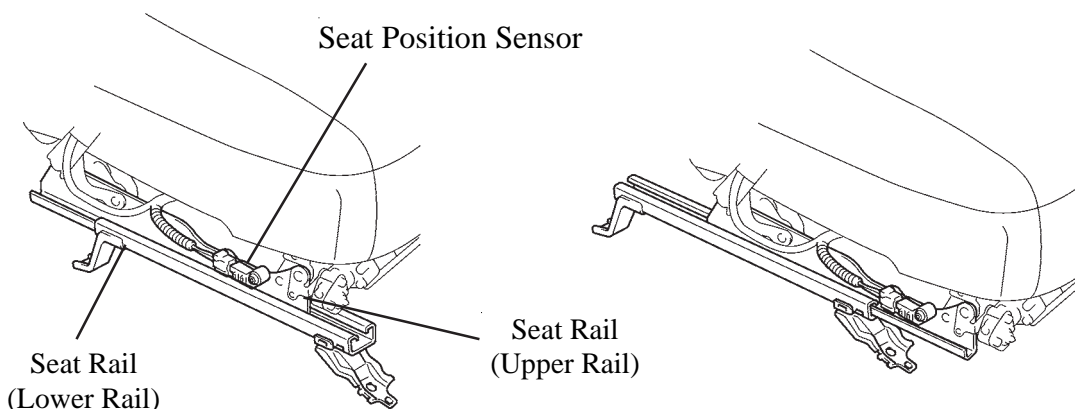


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2) Operation

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.



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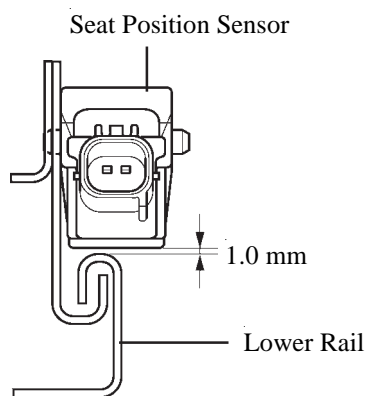
Seat position is rearward

Seat position is forward

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 Camry Repair Manual.

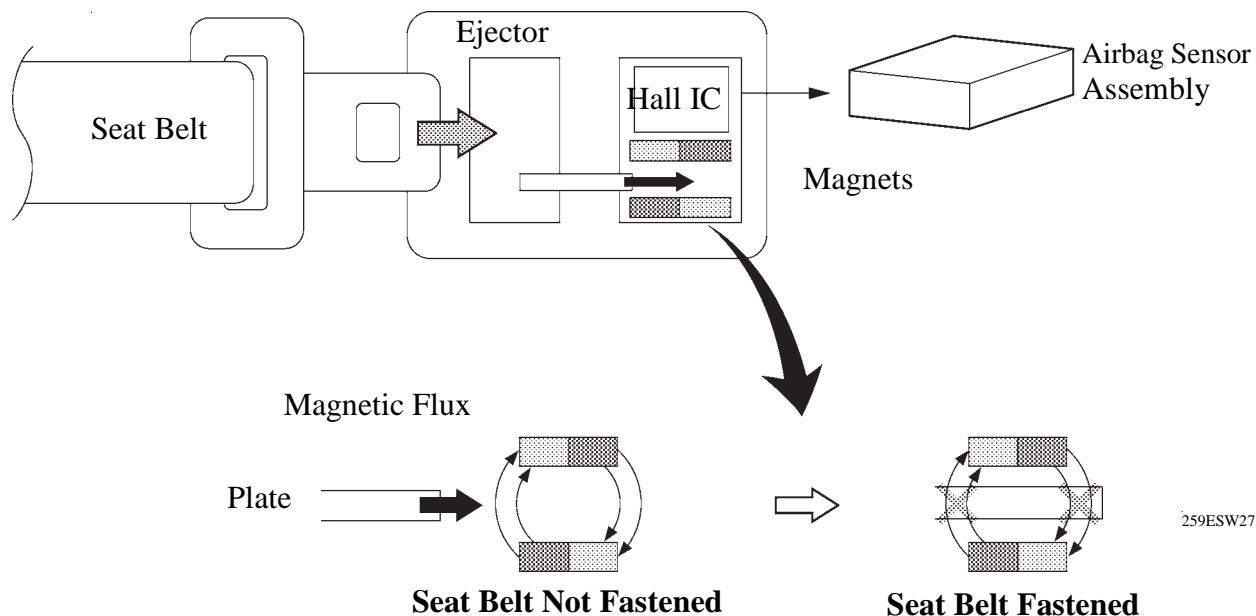


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Seat Belt Buckle Switch

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).



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3. SRS Driver and Front Passenger Airbags

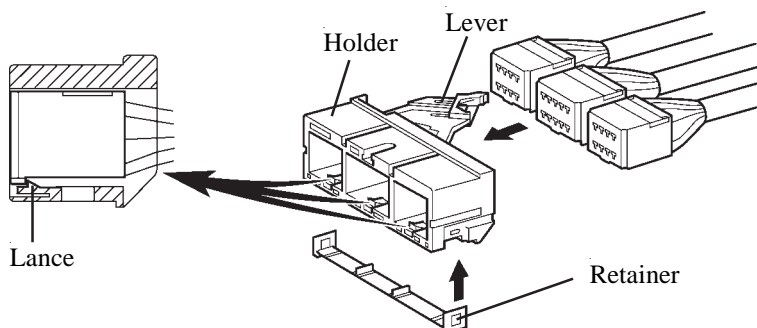
Dual-stage SRS driver and front passenger airbags contain two sets of initiators and propellants. The airbag sensor assembly helps optimise the airbag inflation speed by controlling the inflation timing of these initiators.

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.

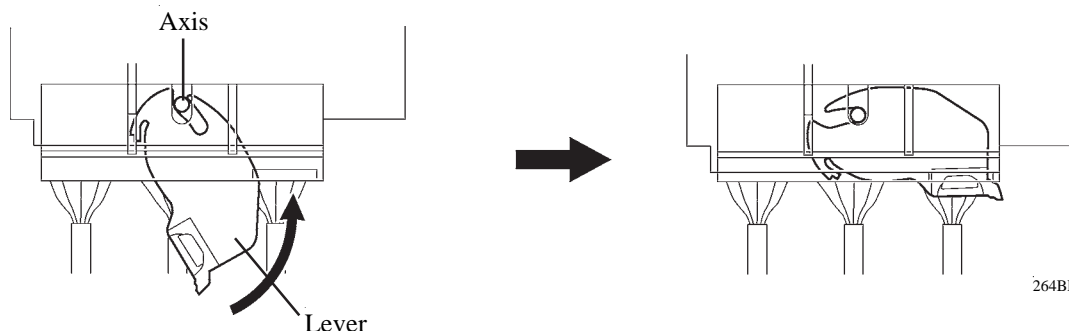
✱ IMPROPER CONNECTION PREVENTION LOCK MECHANISM

- 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.



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- 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 pretensioners based on the signals received from the front airbag sensor and the airbag sensor assembly. 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 Seat Belt Reminder 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 Camry Repair Manual.

SEAT BELT REMINDER SYSTEM

✱ FRONT OCCUPANT DETECTION SENSOR

The occupant detection sensor, which is enclosed in the seat cushion of the front passenger seat, is used to detect whether or not the front passenger seat is occupied.

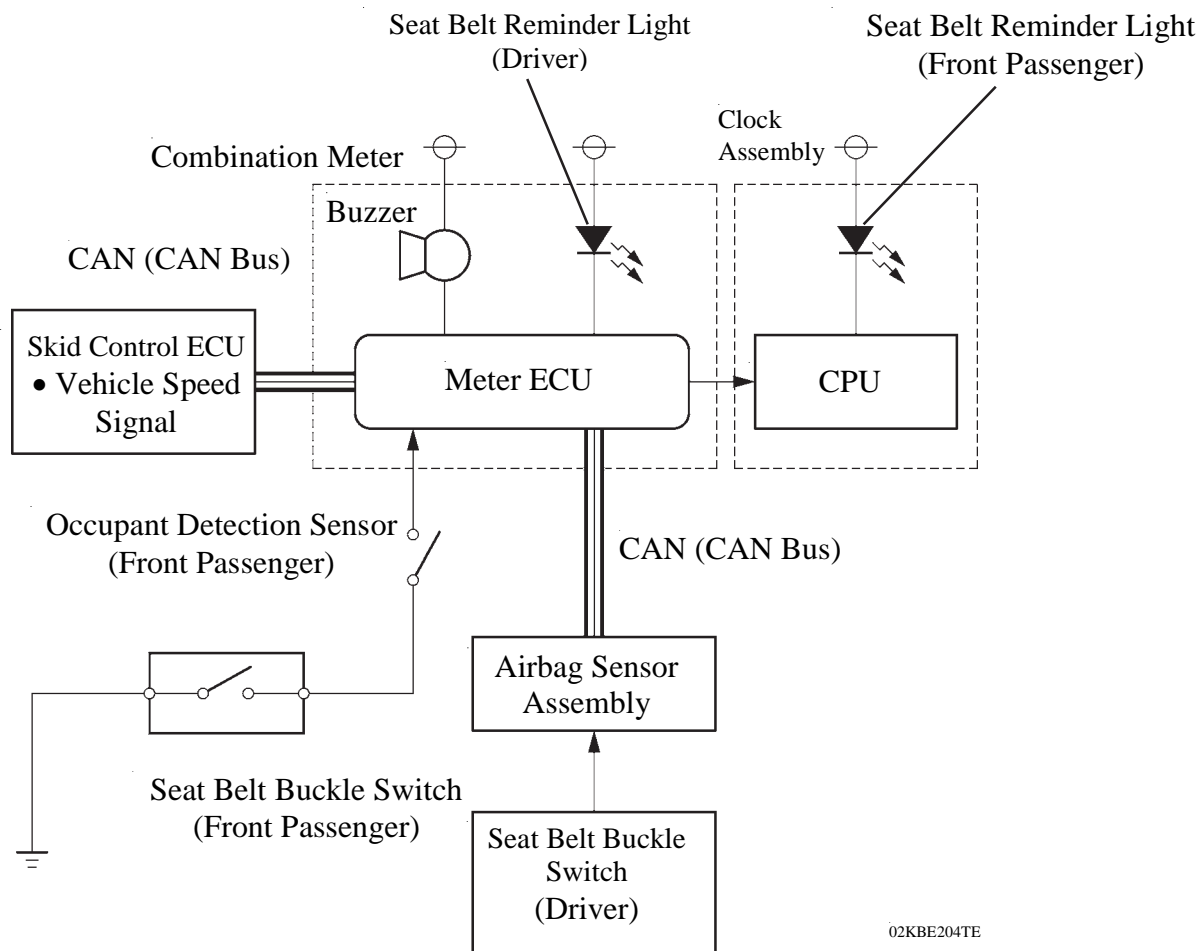
This sensor, which is shaped as illustrated below, consists of a construction in which two sheets of electrodes sandwich a spacer. When the occupant is seated, the electrode sheets come in contact with each other through the hole that is provided in the spacer portion, thus enabling the current to flow.

Thus, the sensor detects whether or not an occupant is seated in the front passenger seat.

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 switch is turned ON, this system detects the condition of the seat belts based on the signal from the seat belt buckle switch (for the driver).

► System Diagram ◀



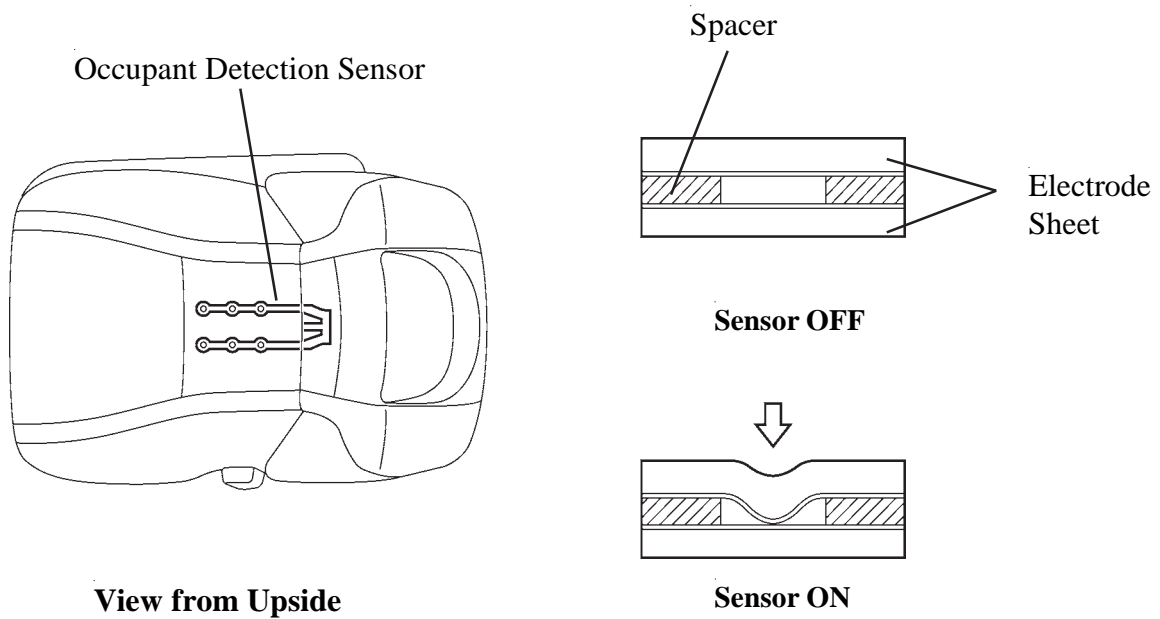
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☀ FRONT OCCUPANT DETECTION SENSOR

The occupant detection sensor, which is enclosed in the seat cushion of the front passenger seat, is used to detect whether or not the front passenger seat is occupied.

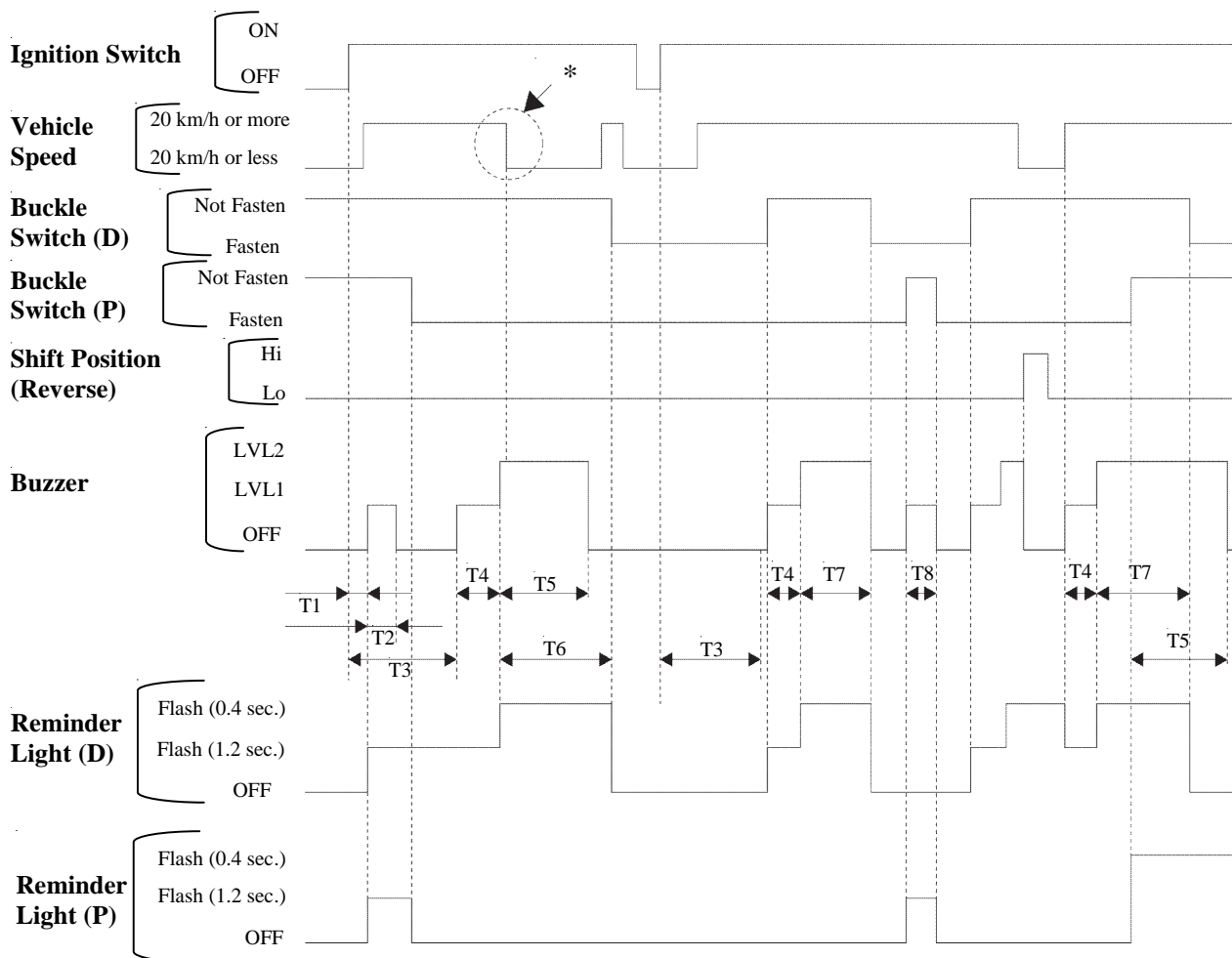
This sensor, which is shaped as illustrated below, consists of a construction in which two sheets of electrodes sandwich a spacer. When the occupant is seated, the electrode sheets come in contact with each other through the hole that is provided in the spacer portion, thus enabling the current to flow.

Thus, the sensor detects whether or not an occupant is seated in the front passenger seat.



☀ REMINDER METHOD

The timing chart of the buzzer and details of the reminder method are shown below.



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T1: About 1.8 sec.

T2: About 1.2 sec. x 5

T3: About 13.8 sec.

T4: About 9.6 sec.

T5: About 20 sec.

T6: About 20 sec. or more

T7: About 20 sec. or less

T8: About 9.6 sec. or less

**: 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

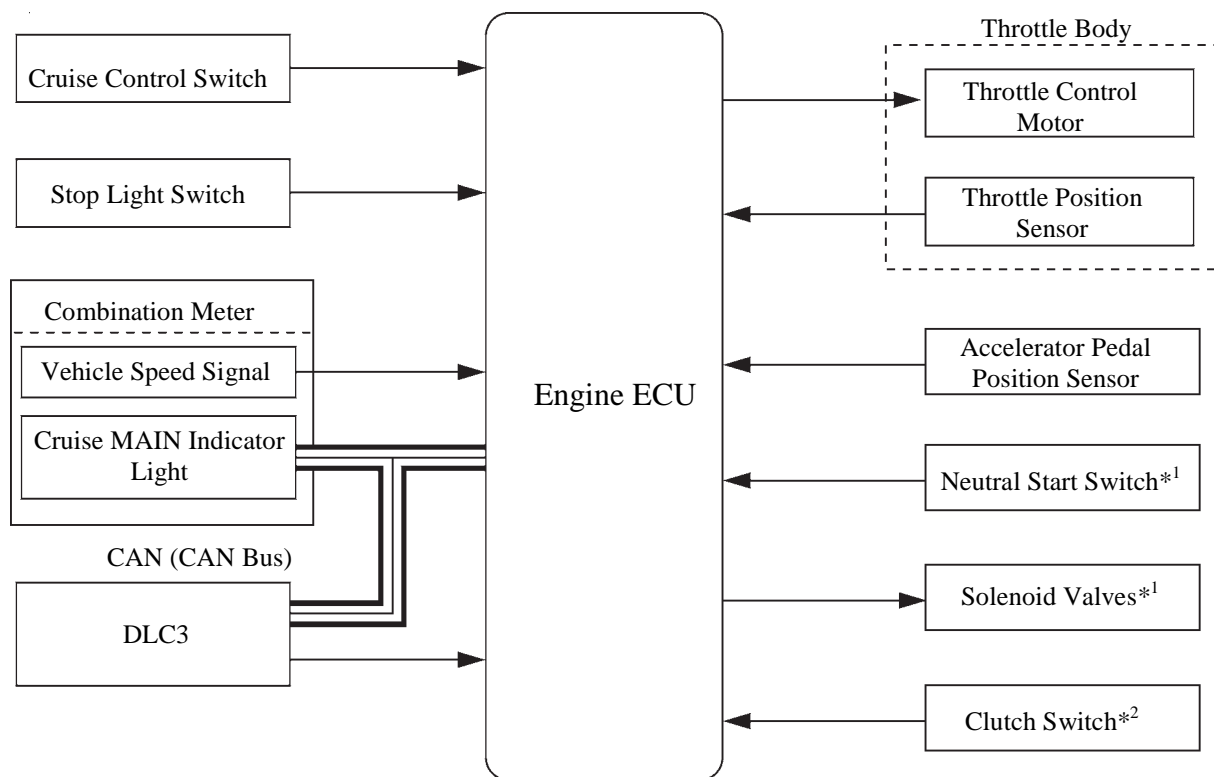
- Cruise Control is fitted on GLX and SE grades.
- Cruise Control maintains the vehicle speed set by the driver.

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).

► Models with U250E Automatic Transaxle and E354 Manual Transaxle ◄

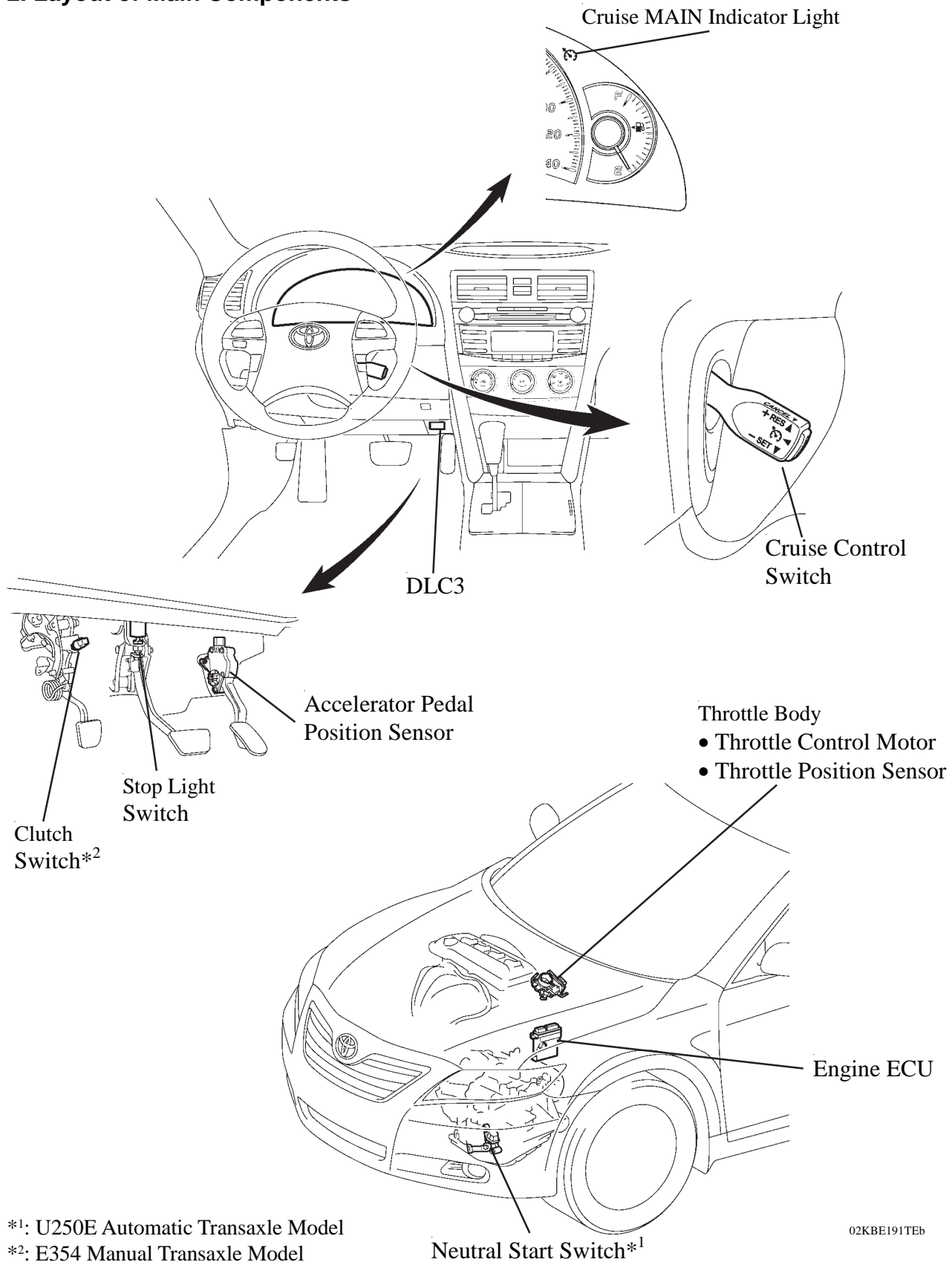


*¹: Models for U250E automatic transaxle

*²: Only for E354 manual transaxle

025BE117P

2. Layout of Main Components



*1: U250E Automatic Transaxle Model

*2: E354 Manual Transaxle Model

02KBE191TEb

U250E Automatic Transaxle and E354 Manual Transaxle Models

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"> • The vehicle is running at a vehicle speed of about 40 km/h or more.
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"> • The vehicle decelerates constantly. • The set vehicle speed changes to the speed that the vehicle is travelling at when the COAST switch is released.
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"> • The vehicle will decelerate in increments of approx. 1.6 km/h for each time the switch was pressed. • 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.
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"> • The vehicle accelerates constantly. • The set vehicle speed changes to the speed as which the switch is releases.
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"> • The vehicle accelerates in increments of approx. 1.6 km/h for each time the switch was pressed. • 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.

(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	ECT ECU incorporated into engine ECU (U250E Automatic Transaxle): When the vehicle is cruising uphill, shift-down control may be performed by the ECT (Electronic Control Transmission). When the engine ECU judges the end of cruising uphill based on the throttle valve angle, the shift-down control will turn on again. There is a case where the shift-down control turns off during ACC or RES switch control.
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"> • The clutch switch ON signal is sent to the engine ECU when the clutch pedal is depressed (only for M/T). • The stop light switch ON signal is sent to the engine ECU when the brake pedal is depressed. • The CANCEL switch ON signal is sent to engine ECU when the cruise control switch moved to CANCEL side. • The cruise control OFF signal is sent to the engine ECU when the cruise control switch ON-OFF button is pushed off. • The shift lever is moved from the D position to the N position.
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"> • Stop light switch open or short circuit • The vehicle speed signal is not input for a predetermined period of time. • ETCS-i malfunction 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"> • Stop light switch input signal is abnormal. • Cruise control switch input signal is abnormal. 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 switch is turned ON again.

(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"> • Vehicle speed is below the low speed limit (approx. 40 km/h) or less. • Vehicle speed decreases by 16 km/h or more below the speed at which the cruise control was set. • The VSC is activated.
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 memorizes the malfunction in the form of 5-digit and 2-digit DTC (Diagnostic Trouble Code).

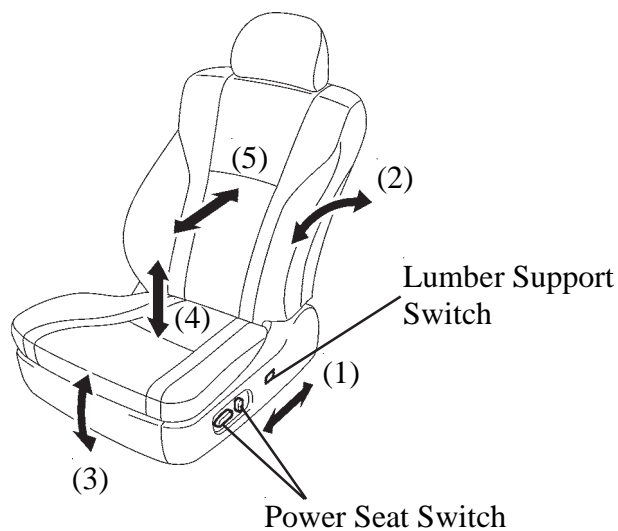
- The 5-digit DTC can be read by connecting an intelligent tester II to the DLC3.
- The 2-digit DTC is output to the cruise MAIN indicator light when the Tc and CG terminals of the DLC3 connector are connected through the use of the SST (09843-18040). Thus, these DTC are obtained by counting the number of blinks of the cruise MAIN indicator light.

POWER SEAT SYSTEM

DESCRIPTION

- The power seat system is standard on GLX and SE grades. It has the following functions;

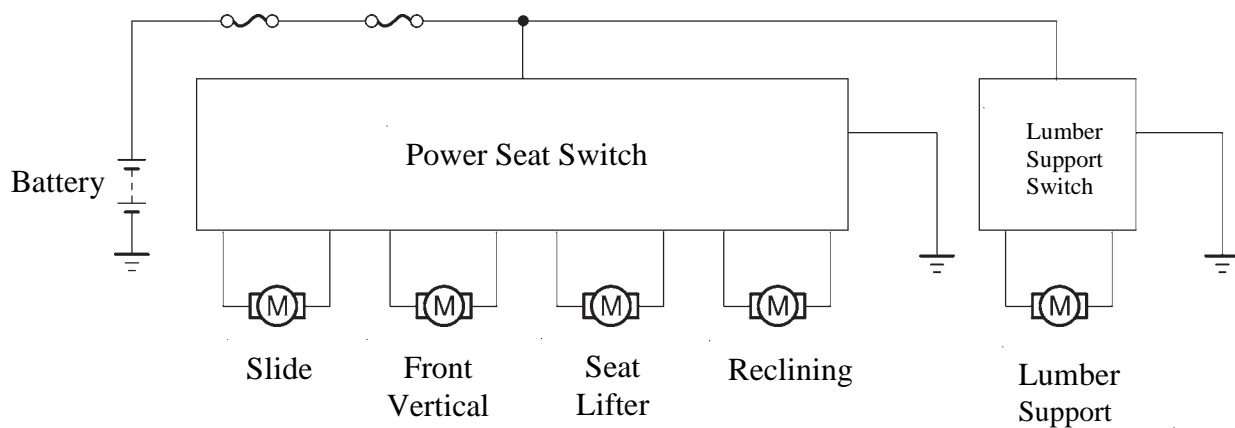
Function		Stroke
		Driver
(1)	Seat Slide	260 mm
(2)	Reclining	78 degrees
(3)	Front Vertical	24 mm
(4)	Rear Vertical (Lifter)	45 mm
(5)	Lumbar Support	21 mm



Driver Seat

02KBE74Yce

System Diagram

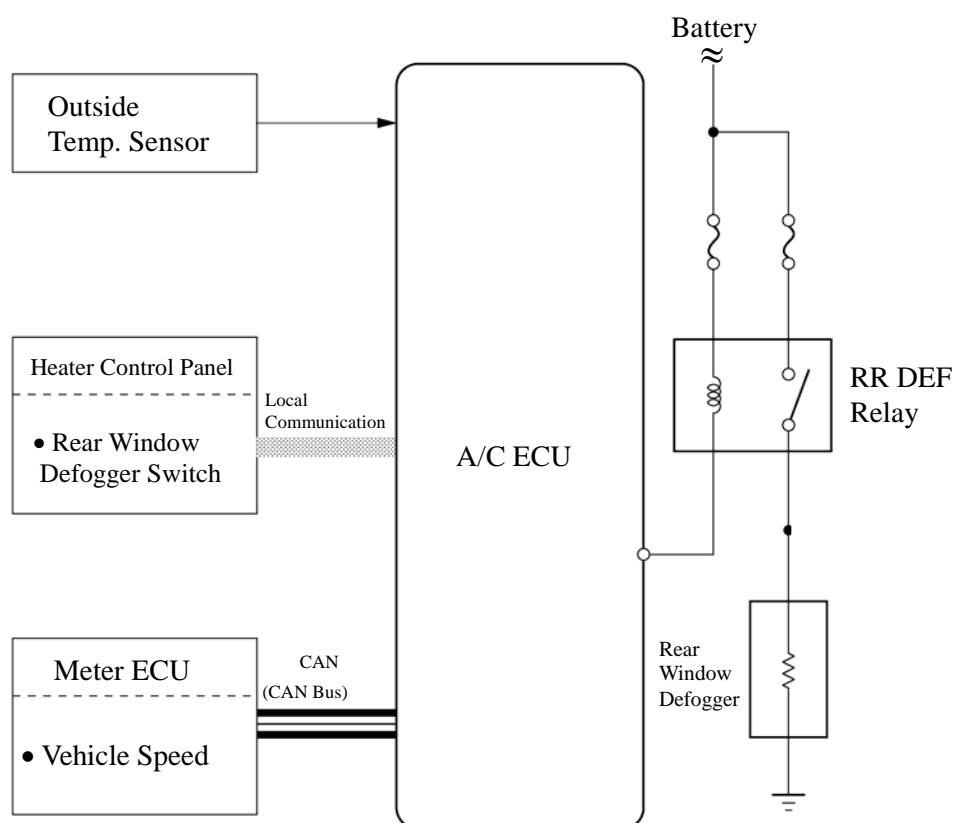


REAR WINDOW DEFOGGER SYSTEM

DESCRIPTION

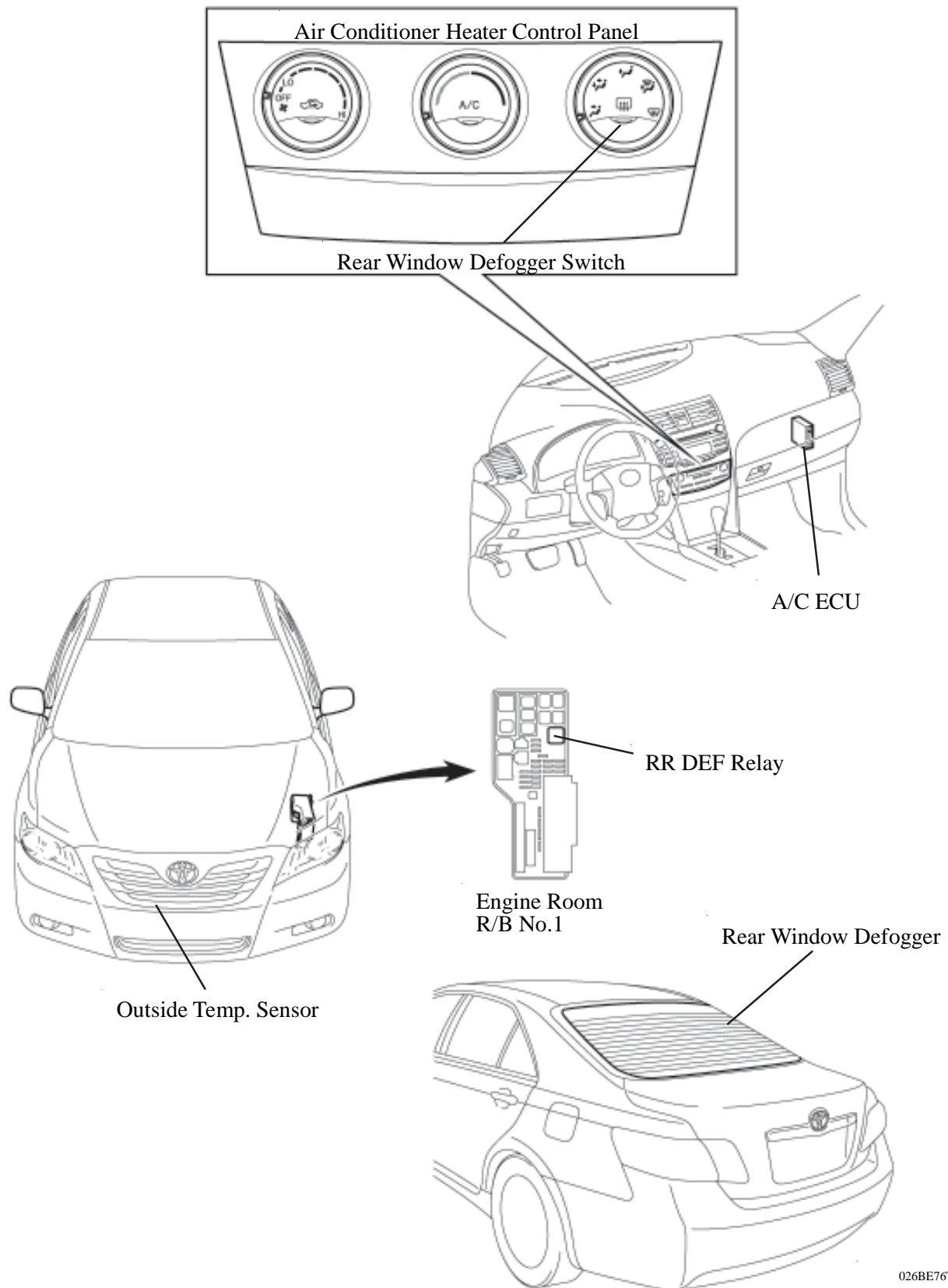
- The rear window defogger system uses the heater wire on the rear window glass to defog the rear window glass.
- This system is standard equipment on all models.
- This system is activated when the power source is turned on and the rear window defogger switch is pushed. This switch is provided with 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



026BE76TEce

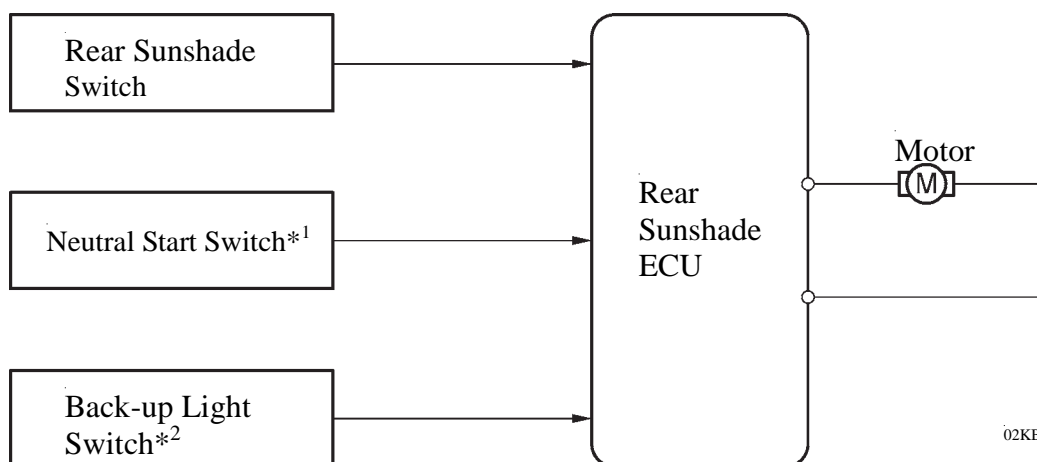
REAR SUNSHADE SYSTEM

☀ 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 available for GLX grade.
- This system is control by the sunshade ECU.
- This system 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.



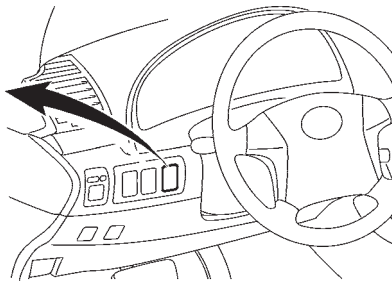
02KBE94Y

*1: A/T models

*2: M/T models

☀ LAYOUT OF MAIN COMPONENTS

Rear Sunshade Switch

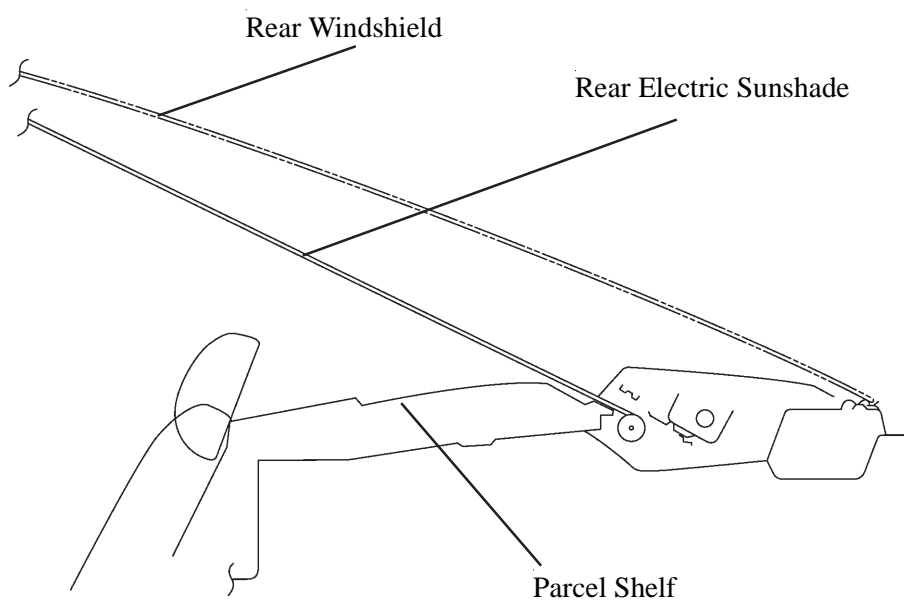


Rear Sunshade

02KBE95Yce



Sunshade ECU

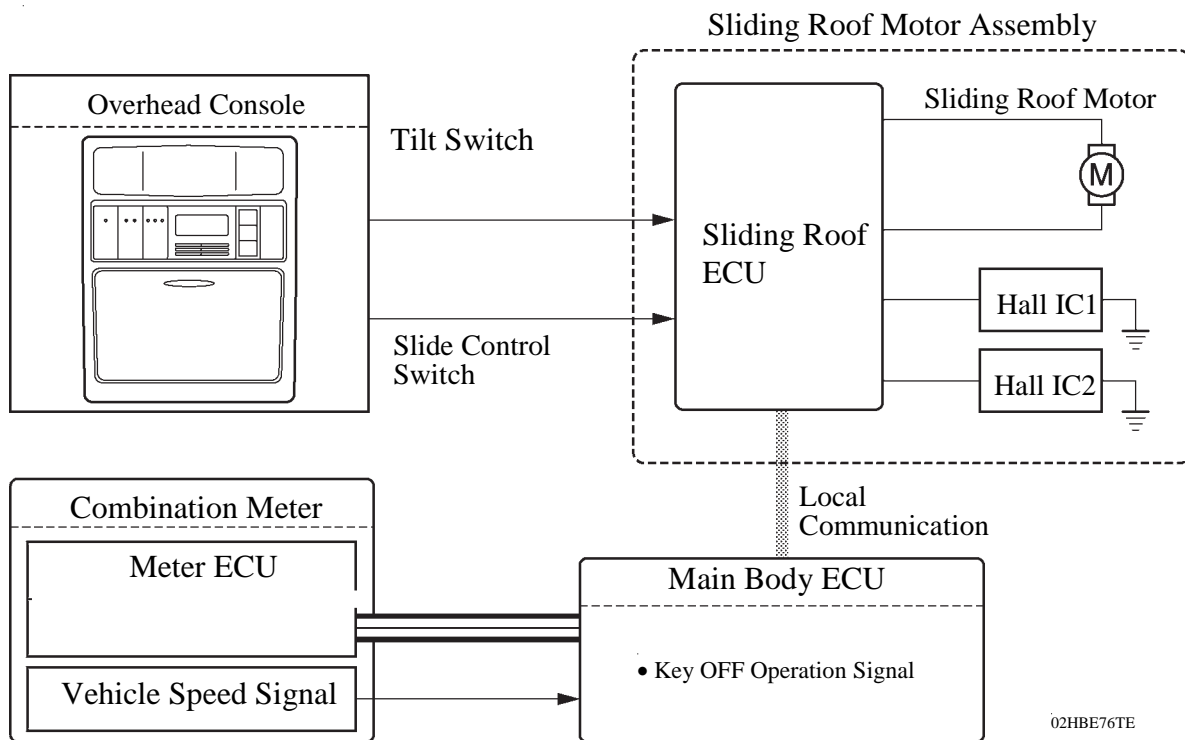


SLIDING ROOF SYSTEM

DESCRIPTION

- The sliding roof system available on some grades. For details, see the equipment list in Model Outline (see page MO-25).
- 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



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:

- 1) 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.
- 2) Keep the switch pressed for 1 second after the tilt-up operation is completed.
- 3) The sliding roof ECU performs the tilt down, open, and close operations.
- 4) 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.

For details, see the Camry Repair Manual.

FUNCTION

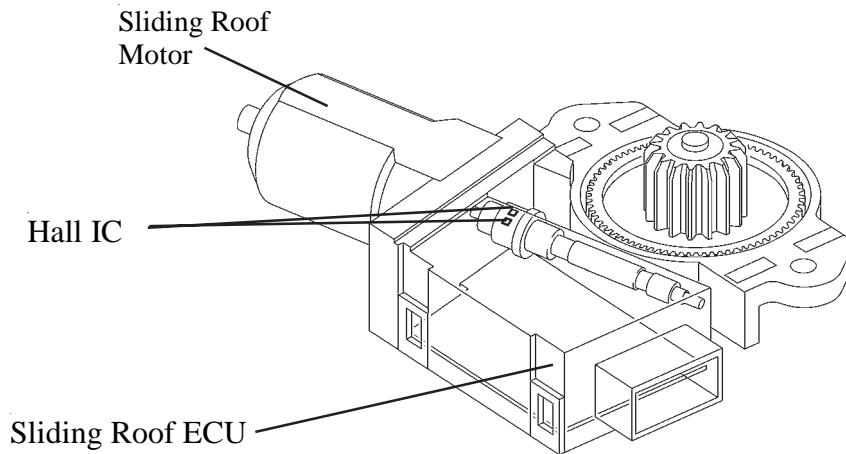
1. General

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 long 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.

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.

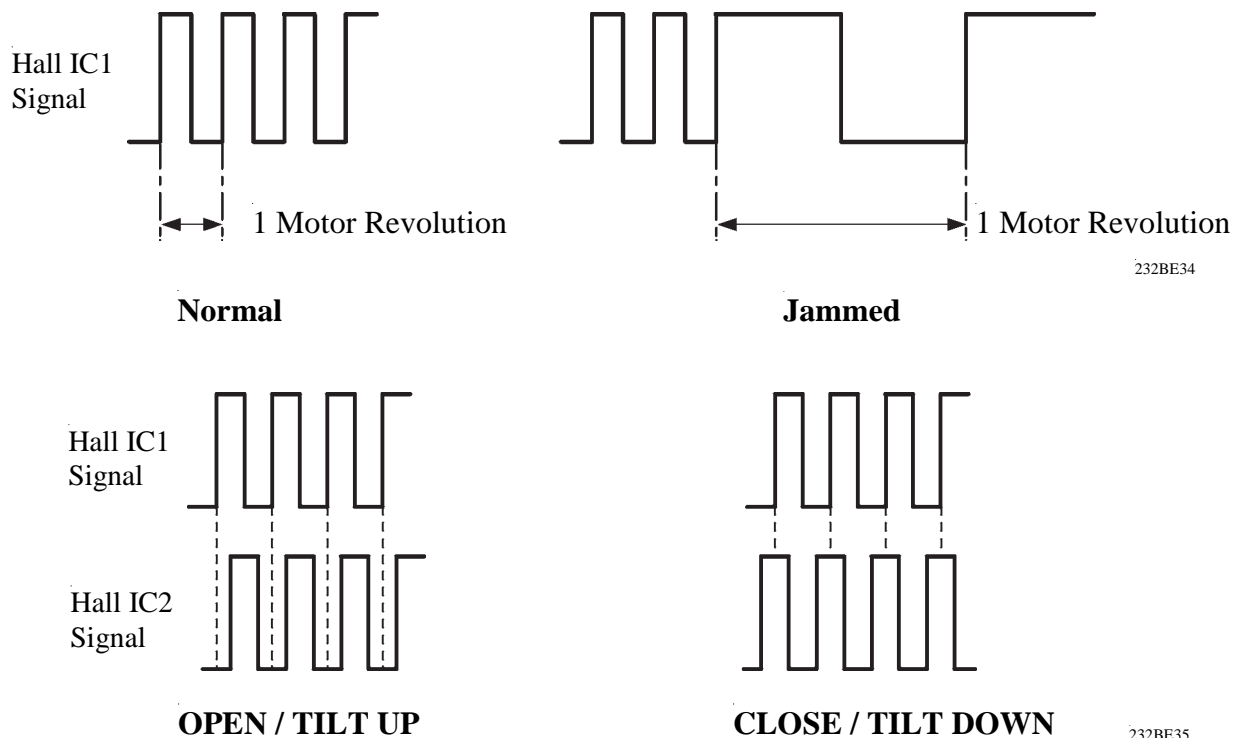


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Sliding Roof Motor Assembly

- 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.

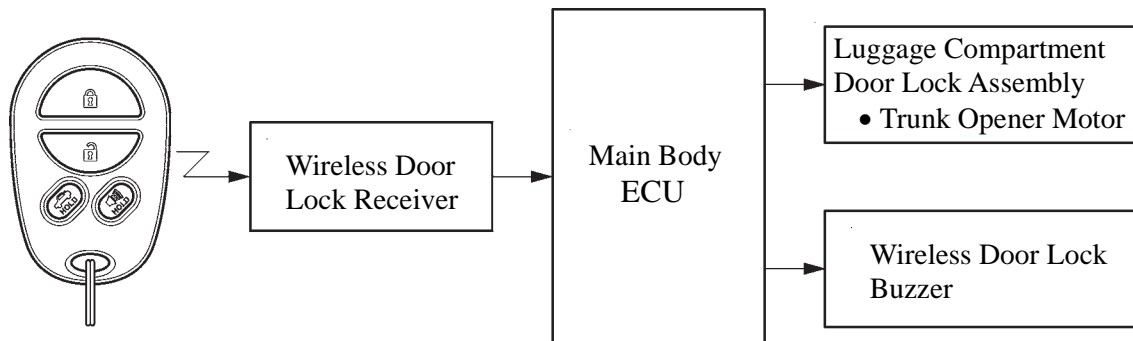
Warning Condition		The warning is activated if all of the following conditions are met: <ul style="list-style-type: none">• Sliding roof is not fully closed.• Power source is “OFF”• Driver door is opened.
Combination Meter	Buzzer	Sounds once

TRUNK OPENER

DESCRIPTION

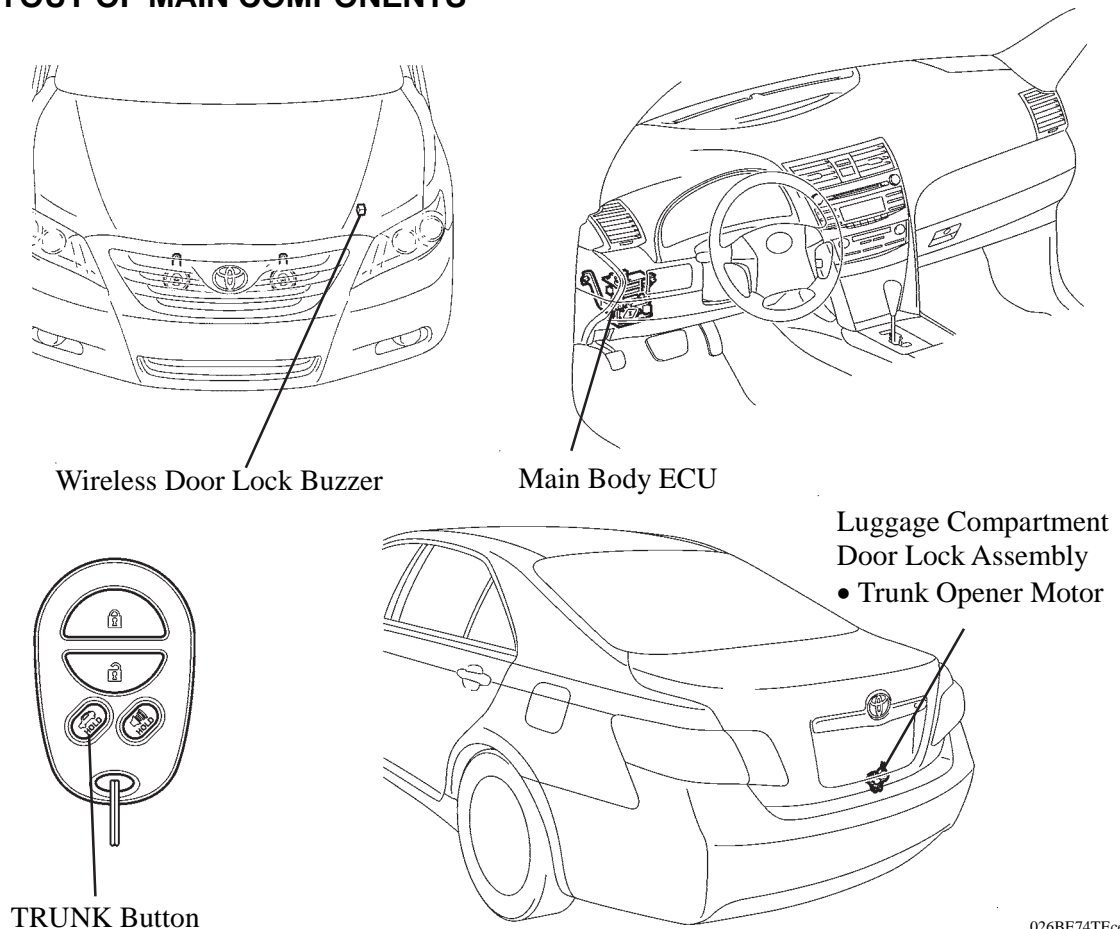
- The trunk opener can be operated through the Wireless Transmitter or Lever. For details of the wireless door lock remote control system, see page BE-49.

System Diagram



02KBE93TEb

LAYOUT OF MAIN COMPONENTS



026BE74TEce

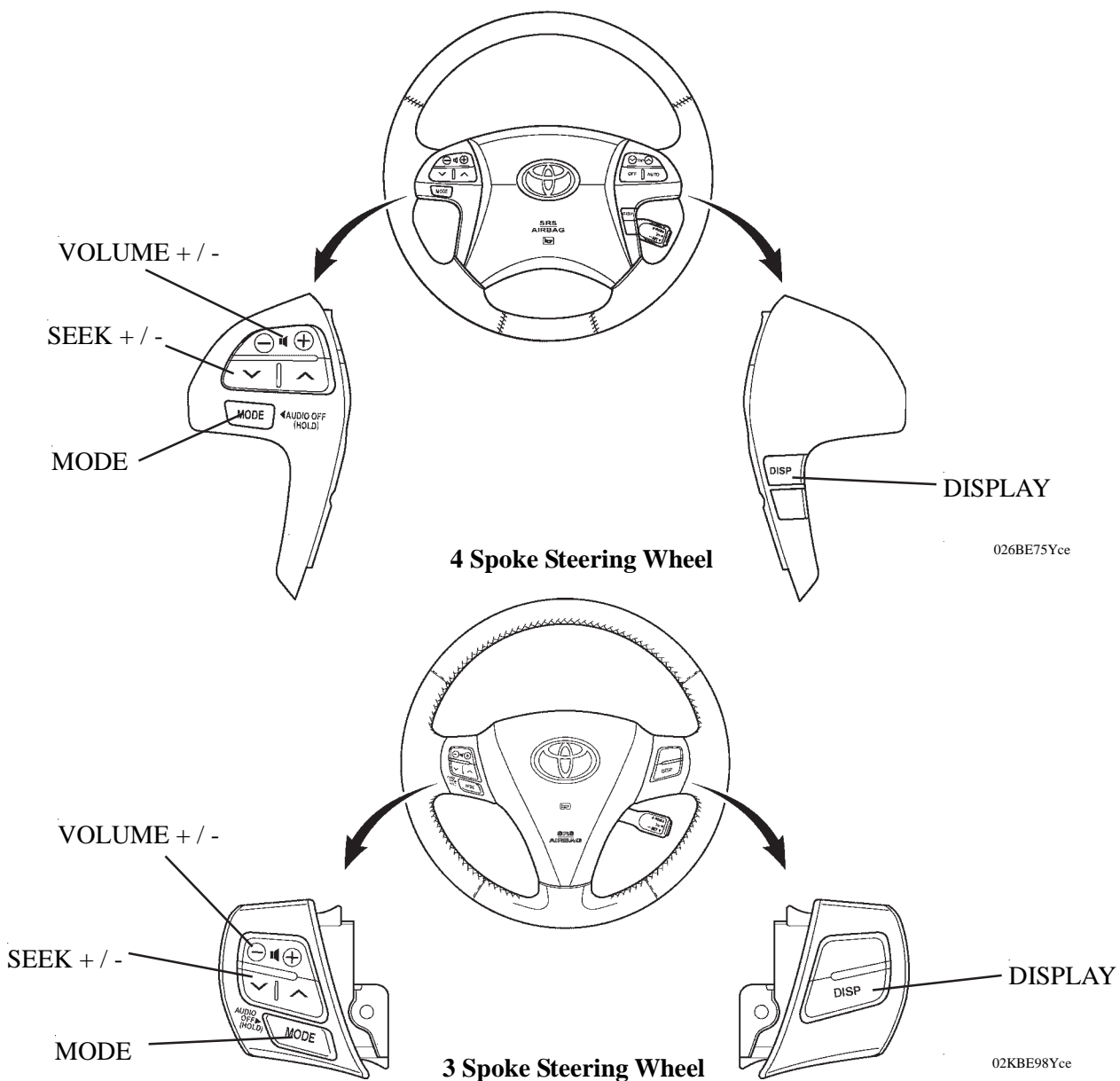
STEERING PAD SWITCH

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"> • VOLUME +/- • SEEK +/- • MODE
Multi-information Display (Combination Meter)*	DISP

*: GLX and SE Grades



APPENDIX

MAJOR TECHNICAL SPECIFICATIONS

Vehicle Grade			Altise / GL(New Zealand)	Altise / GL(New Zealand)	Ateva
Model Code			ACV40R-DEMDKQ	ACV40R-DEADKQ	ACV40R-DEANKQ
Major Dimensions & Vehicle Weights	Overall	Length mm (in.)	4805 (189.2)	4805 (189.2)	4805 (189.2)
		Width mm (in.)	1820 (71.7)	1820 (71.7)	1820 (71.7)
		Height mm (in.)	1470 (57.9)	1470 (57.9)	1470 (57.9)
	Wheel Base mm (in.)		2775 (109.3)	2775 (109.3)	2775 (109.3)
	Tread	Front mm (in.)	1575 (62.0)	1575 (62.0)	1575 (62.0)
		Rear mm (in.)	1565 (61.6)	1565 (61.6)	1565 (61.6)
	Room	Length mm (in.)	2130 (83.8)	2130 (83.8)	2130 (83.8)
		Width mm (in.)	1525 (60.0)	1525 (60.0)	1525 (60.0)
		Height mm (in.)	1200 (47.2)	1200 (47.2)	1200 (47.2), 1140 (44.9) [‡]
	Overhang	Front mm (in.)	945 (37.2)	945 (37.2)	945 (37.2)
		Rear mm (in.)	1085 (42.7)	1085 (42.7)	1085 (42.7)
	Min. Running Ground Clearance mm (in.)		150 (5.9)	150 (5.9)	150 (5.9)
	Angle of Approach degrees		—	—	—
	Angle of Departure degrees		—	—	—
	Curb Weight	Front kg (lb)	850 to 845 (1874 to 1863)	890 (1962)	895 to 900 (1973 to 1984)
		Rear kg (lb)	610 to 615 (1345 to 1356)	605 to 610 (1334 to 1345)	610 to 630 (1345 to 1389)
		Total kg (lb)	1460 (3219)	1495 to 1500 (3296 to 3307)	1505 to 1530 (3318 to 3373)
Performance	Max. Speed	km/h	200	200	200
		km/h	—	—	—
		0 to 100 km/h sec.	—	—	—
Engine	Acceleration	0 to 400 m sec.	—	—	—
		1st Gear km/h	53	53	53
	Max. Permissible Speed	2nd Gear km/h	93	95	95
		3rd Gear km/h	142	148	148
		4th Gear km/h	195	—	—
		5th Gear km/h	—	—	—
	Min. Turning Radius	Tyre m	5.5	5.5	5.5
		Body m	5.9	5.9	5.9
Engine Electrical	Engine Type		2AZ-FE	2AZ-FE	2AZ-FE
	Valve Mechanism		16-valve, DOHC with VVT-i	16-valve, DOHC with VVT-i	16-valve, DOHC with VVT-i
	Bore x Stroke mm (in.)		88.5 x 96.0 (3.48 x 3.78)	88.5 x 96.0 (3.48 x 3.78)	88.5 x 96.0 (3.48 x 3.78)
	Displacement cm ³ (cu.in)		2362 (144.1)	2362 (144.1)	2362 (144.1)
	Compression Ratio		9.6:1	9.6:1	9.6:1
	Carburetor Type		EFI	EFI	EFI
	Research Octane No. RON		91 or higher	91 or higher	91 or higher
	Max. Output (EEC) kW@rpm		117 @ 5700	117 @ 5700	117 @ 5700
Chassis	Max. Torque (EEC) N.m@rpm		218 @ 4000	218 @ 4000	218 @ 4000
	Battery Capacity (SHR) Voltage & Amp.hr.		12-48	12-48	12-48
	Alternator Output Watts		960	960	960
	Starter Output kW		1.6	1.6	1.6
	Clutch Type		Dry, Single	—	—
	Transaxle Type		E354	U250E	U250E
	Gear Ratio	In First	3.538	3.943 [‡]	3.943 [‡]
		In Second	2.045	2.197 [‡]	2.197 [‡]
		In Third	1.333	1.413 [‡]	1.413 [‡]
		In Fourth	1.028	0.975 [‡]	0.975 [‡]
		In Fifth	0.820	0.703 [‡]	0.703 [‡]
		In Reverse	3.583	3.145 [‡]	3.145 [‡]
	Differential Gear Ratio		3.944	3.391	3.391
	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

‡: With sliding roof

‡: Counter gear ratio included

MAJOR TECHNICAL SPECIFICATIONS

Vehicle Grade			Grande / GLX (New Zealand)	Sportivo	Sportivo
Model Code			ACV40R-DEAGKQ	ACV40R-DEMVKQ	ACV40R-DEAVKQ
Major Dimensions & Vehicle Weights	Overall	Length mm (in.)	4805 (189.2)	4805 (189.2)	4805 (189.2)
		Width mm (in.)	1820 (71.7)	1820 (71.7)	1820 (71.7)
		Height mm (in.)	1470(57.9)	1470(57.9)	1470(57.9)
	Wheel Base mm (in.)		2775 (109.3)	2775 (109.3)	2775 (109.3)
	Tread	Front mm (in.)	1575 (62.0)	1575 (62.0)	1575 (62.0)
		Rear mm (in.)	1565 (61.6)	1565 (61.6)	1565 (61.6)
	Room	Length mm (in.)	2130 (83.8)	2130 (83.8)	2130 (83.8)
		Width mm (in.)	1525 (60.0)	1525 (60.0)	1525 (60.0)
		Height mm (in.)	1140 (44.9)	1200 (47.2), 1140 (44.9) st	1200 (47.2), 1140 (44.9) st
	Overhang	Front mm (in.)	945 (37.2)	945 (37.2)	945 (37.2)
		Rear mm (in.)	1085 (42.7)	1085 (42.7)	1085 (42.7)
	Min. Running Ground Clearance mm (in.)		150 (5.9)	150 (5.9)	150 (5.9)
	Angle of Approach degrees		—	—	—
	Angle of Departure degrees		—	—	—
	Curb Weight	Front kg (lb)	905 (1995)	855 to 865 (1885 to 1907)	900 to 905 (1984 to 1995)
		Rear kg (lb)	620 to 625 (1367 to 1378)	620 to 630 (1367 to 1389)	615 to 630 (1356 to 1389)
		Total kg (lb)	1525 to 1530 (3362 to 3373)	1475 to 1495 (3252 to 3296)	1515 to 1535 (3340 to 3384)
Performance	Max. Speed	km/h	200	200	200
		km/h	—	—	—
		km/h	—	—	—
	Acceleration	0 to 100 km/h sec.	—	—	—
		0 to 400 m sec.	—	—	—
	Max. Permissible Speed	1st Gear km/h	53	53	53
		2nd Gear km/h	95	93	95
		3rd Gear km/h	148	142	148
		4th Gear km/h	—	195	—
		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		2AZ-FE	2AZ-FE	2AZ-FE
	Valve Mechanism		16-valve, DOHC with VVT-i	16-valve, DOHC with VVT-i	16-valve, DOHC with VVT-i
	Bore x Stroke mm (in.)		88.5 x 96.0 (3.48 x 3.78)	88.5 x 96.0 (3.48 x 3.78)	88.5 x 96.0 (3.48 x 3.78)
	Displacement cm ³ (cu.in)		2362 (144.1)	2362 (144.1)	2362 (144.1)
	Compression Ratio		9.6:1	9.6:1	9.6:1
	Carburetor Type		EFI	EFI	EFI
	Research Octane No. RON		91 or higher	91 or higher	91 or higher
	Max. Output (EEC) kW@rpm		117 @ 5700	117 @ 5700	117 @ 5700
Engine Electrical	Max. Torque (EEC) N·m@rpm		218 @ 4000	218 @ 4000	218 @ 4000
	Battery Capacity (5HR) Voltage & Amp.hr.		12-48	12-48	12-48
	Alternator Output Watts		960	960	960
Chassis	Starter Output kW		1.6	1.6	1.6
	Clutch Type		—	Dry, Single	—
	Transaxle Type		U250E	E354	U250E
	Gear Ratio	In First	3.943 st	3.538	3.943 st
		In Second	2.197 st	2.045	2.197 st
		In Third	1.413 st	1.333	1.413 st
		In Fourth	0.975 st	1.028	0.975 st
		In Fifth	0.703 st	0.820	0.703 st
		In Reverse	3.145 st	3.583	3.145 st
	Differential Gear Ratio		3.391	3.944	3.391
	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

*1: With sliding roof

*2: Counter gear ratio included