FOREWORD

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

Applicable models: AT220, 221, ST220, CT220, CDT220 Series

This manual is divided into 4 sections.

1. **Introduction** – Exterior appearance and model code.
2. **New Model Outline** – Explanation of the product to give a general understanding of its features.
3. **Technical Description** – Technical explanation of the construction and operation of each new system and component.
4. **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 occur if instructions on what to do or not to do are ignored.
NOTICE	Damage to the vehicle or components may occur if instructions on what to do or not to do are ignored.
REFERENCE	Explains the theory behind mechanisms and techniques.
NOTE	Notes or comments not included under the above 3 titles.

For detailed service specifications and repair procedures, refer to the following Repair Manuals:

Manual Name	Pub. No.
● AVENSIS/CORONA Chassis and Body Repair Manual	RM599E
● 4A-F, FE/7A-FE Engine Repair Manual Supplement	RM611E
● 3S-FE Engine Repair Manual Supplement	RM609E
● 2C-TE Engine Repair Manual Supplement	RM612E
● AVENSIS/CORONA Electrical Wiring Diagram	EWD330Y

All information contained herein is the most up-to-date at the time of publication. We reserve the right to make changes without prior notice.

This manual is for the exclusive use of the dealers.

TOYOTA MOTOR CORPORATION

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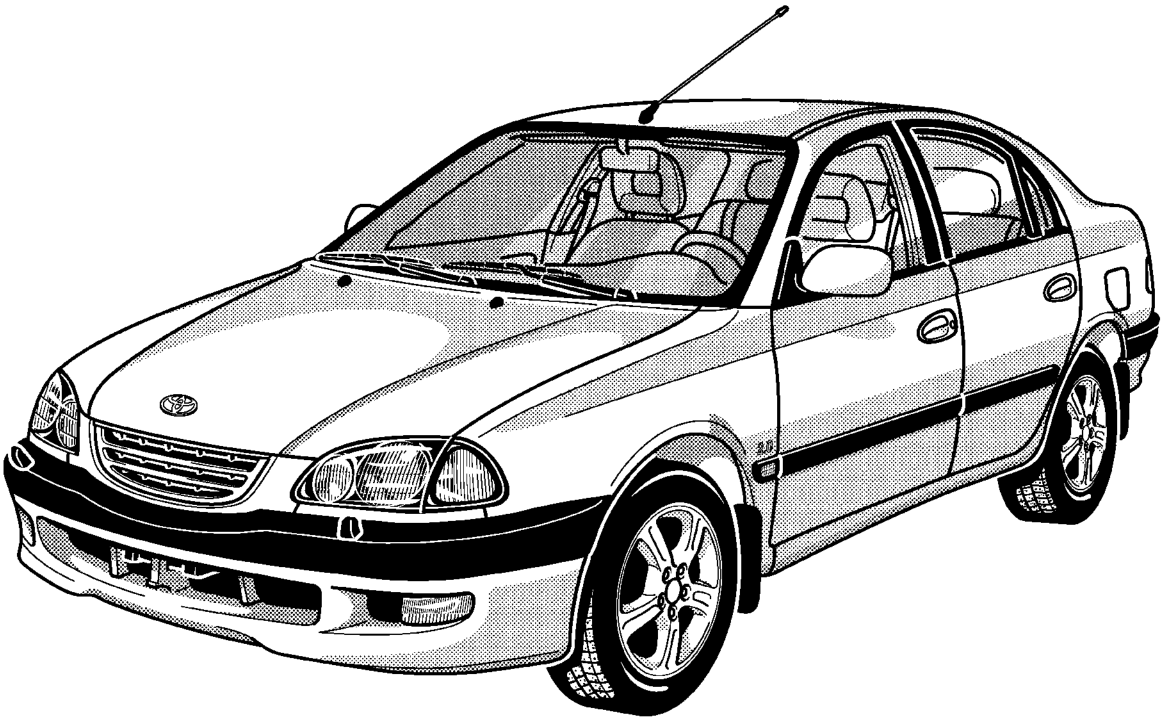
EXTERIOR APPEARANCE

4-DOOR SEDAN



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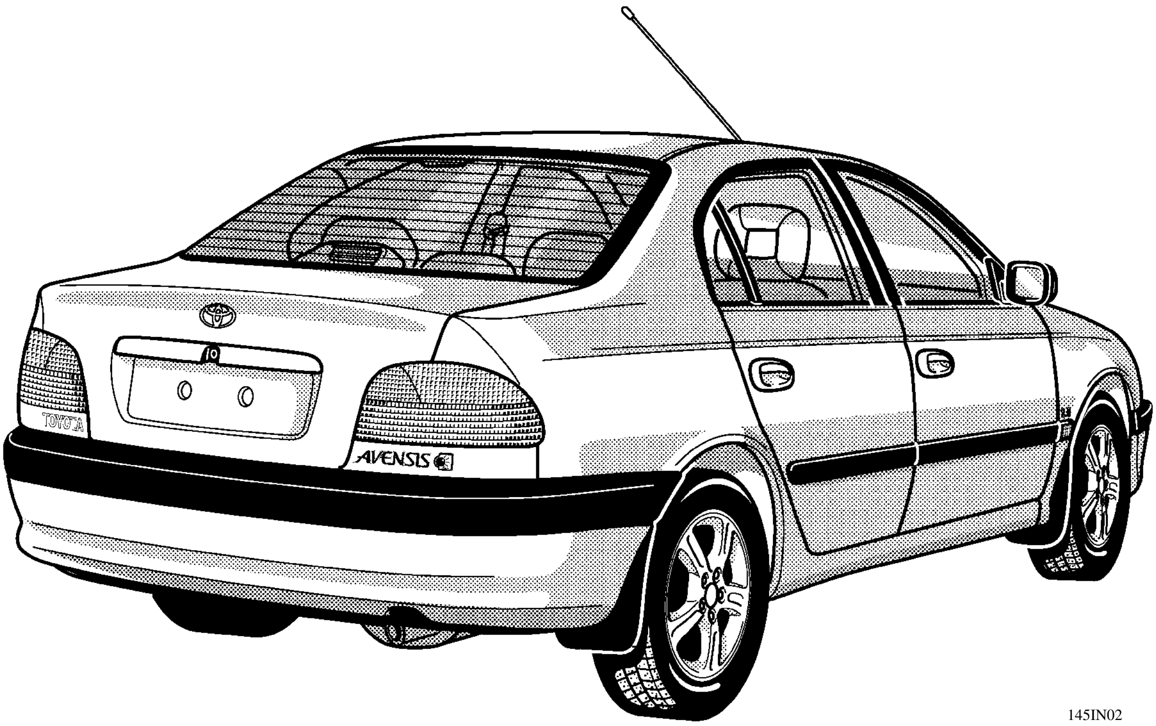

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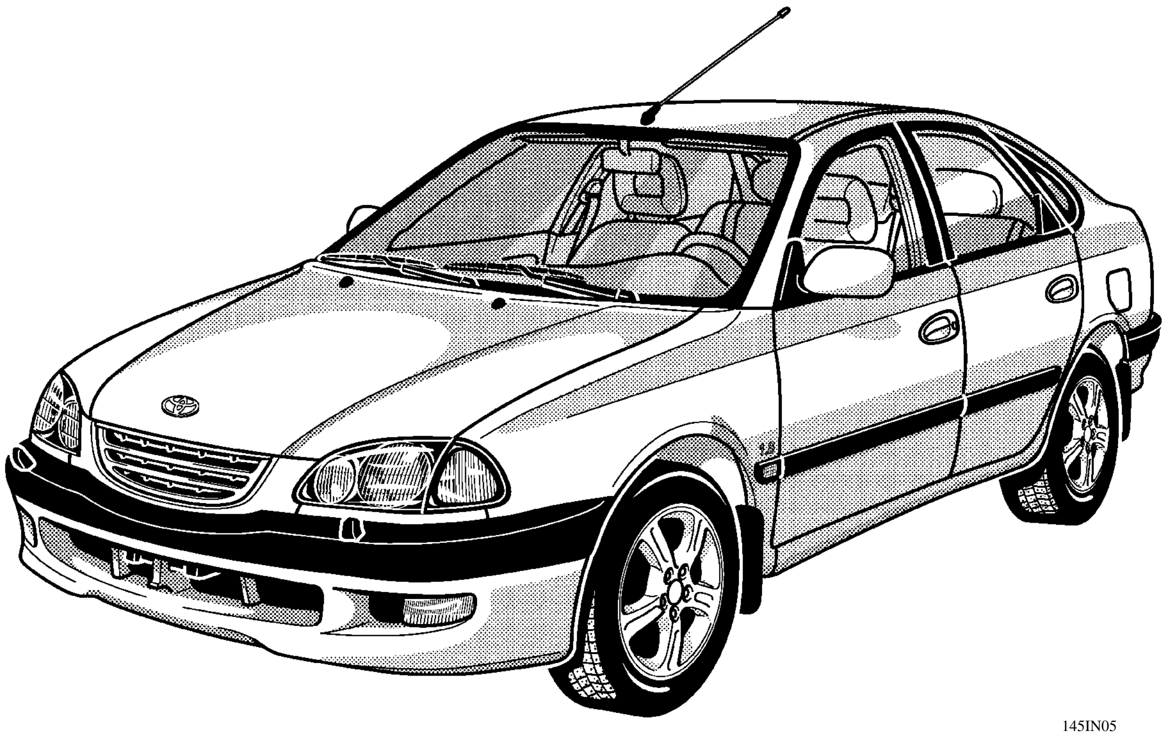
EXTERIOR APPEARANCE

5-DOOR LIFTBACK



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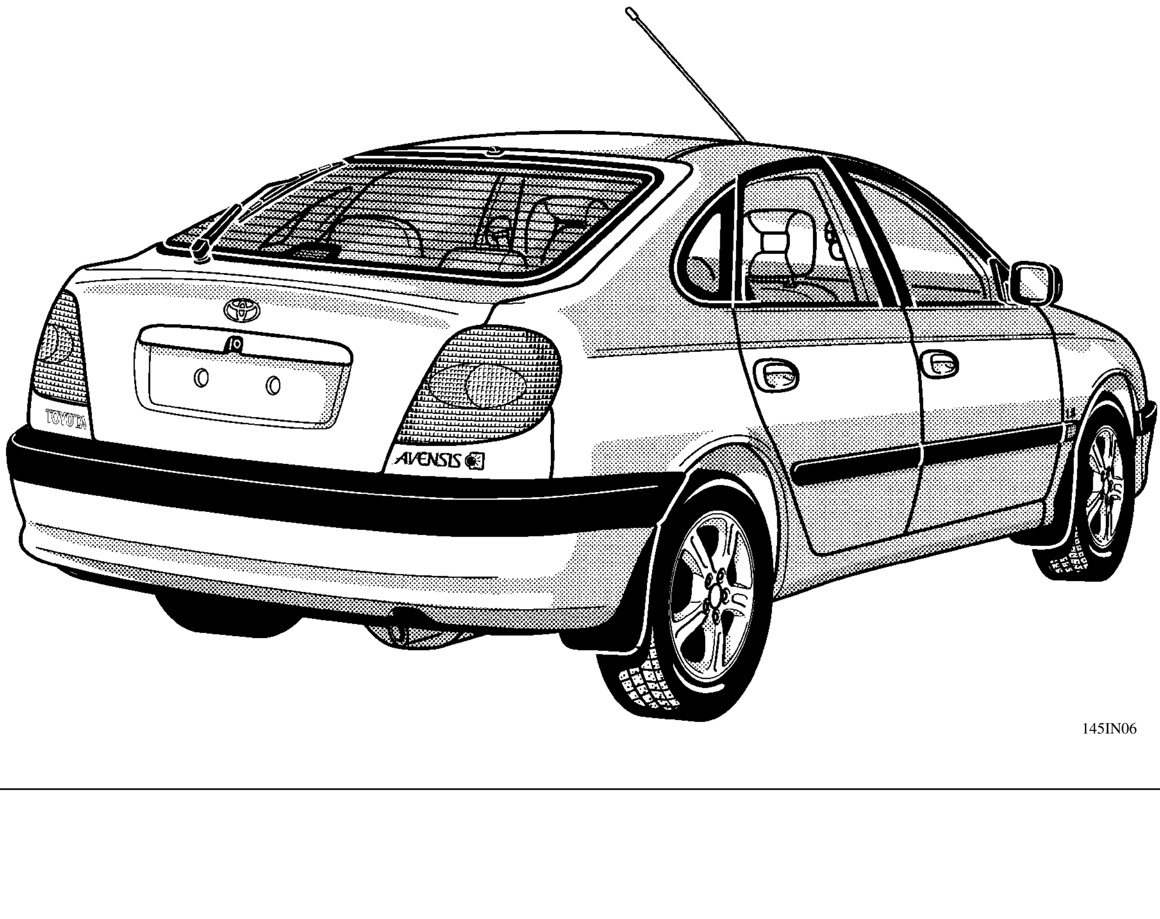

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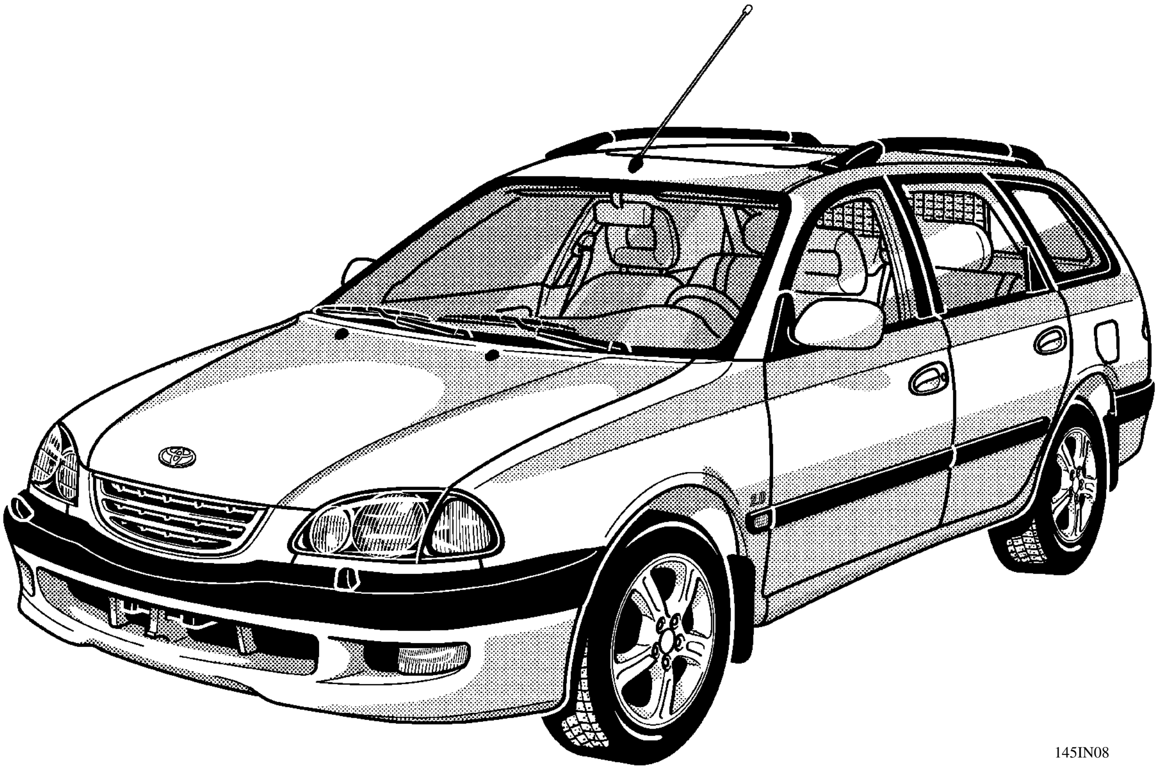
EXTERIOR APPEARANCE

5-DOOR WAGON



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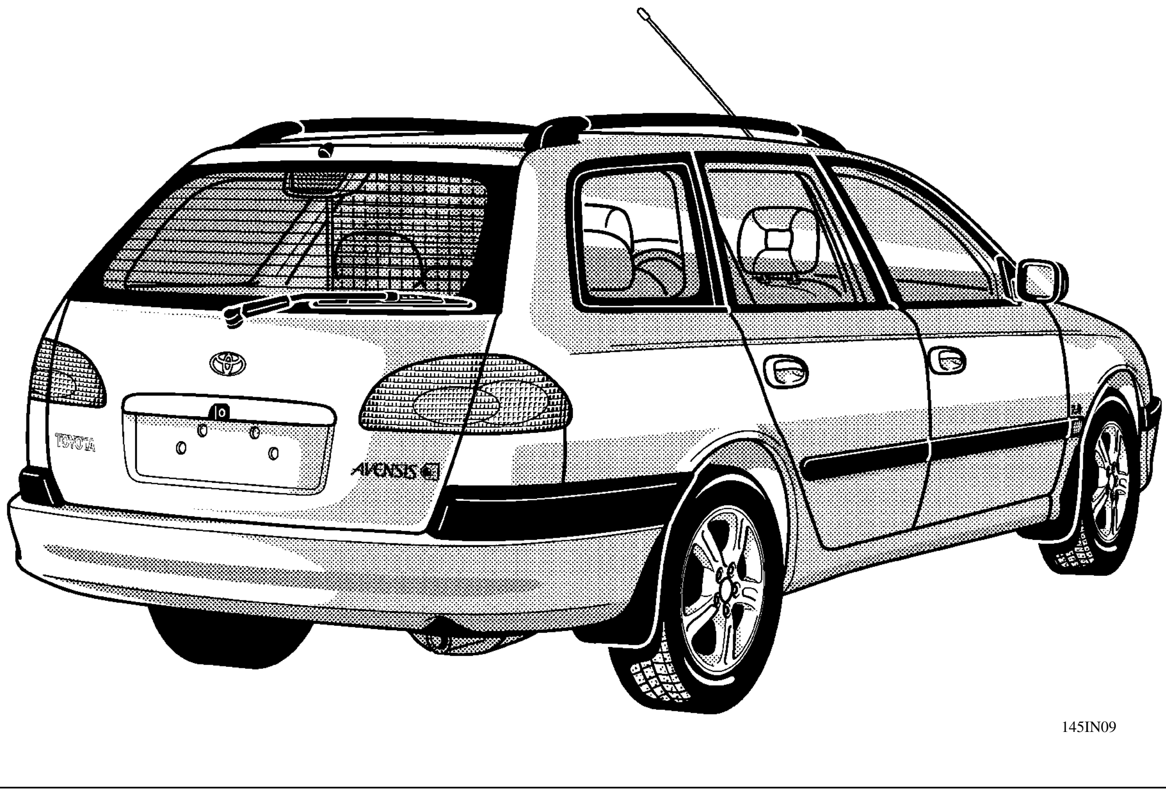

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MODEL CODE

MODEL CODE

ST220 L - A E M E K W

ST220	L	-	A	E	M	E	K	W
1	2		3	4	5	6	7	8

1	BASIC MODEL CODE
	AT220: With 4A-FE Engine AT221: With 7A-FE Engine ST220: With 3S-FE Engine CT220: With 2C-T or 2C-TE Engine

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

3	MODEL NAME
	A : AVENSIS/CORONA

4	BODY TYPE
	E : 4-Door Sedan L : 5-Door Liftback W: 5-Door Wagon

5	GEARSHIFT TYPE
	M : 5-Speed Manual, Floor P : 4-Speed Automatic, Floor

6	GRADE
	N : LINEA TERRA* E : LINEA SOL

7	ENGINE SPECIFICATION
	K : DOHC and EFI X : Turbocharger T : Turbocharger and EFI

8	DESTINATION
	W: Europe Blank: General Countries

*: Only for European Model

MODEL LINE-UP

■EUROPE

TRANSAXLE				Manual				Automatic	
				5-Speed				4-Speed	
DESTINATION	BODY TYPE	ENGINE	GRADE	C50	C250	S50	S54	A241E	A246E
Europe/AVENSIS	4-Door Sedan	4A-FE	LINEA TERRA	AT220$\substack{R\\L}$-AEMNKW					
			LINEA SOL	AT220L-AEMEKW					
		7A-FE	LINEA TERRA		AT221$\substack{R\\L}$-AEMNKW				AT221$\substack{R\\L}$-AEPNKW
			LINEA SOL		AT221$\substack{R\\L}$-AEMEKW				AT221$\substack{R\\L}$-AEPEKW
		3S-FE	LINEA SOL				ST220$\substack{R\\L}$-AEMEKW	ST220$\substack{R\\L}$-AEPEKW	
		2C-T	LINEA TERRA			CT220L-AEMNXW			
		2C-TE	LINEA TERRA			CT220$\substack{R\\L}$-AEMNTW			
			LINEA SOL			CT220L-AEMETW			
	5-Door Liftback	4A-FE	LINEA TERRA	AT220$\substack{R\\L}$-ALMNKW					
			LINEA SOL	AT220L-ALMEKW					
		7A-FE	LINEA TERRA		AT221$\substack{R\\L}$-ALMNKW				AT221$\substack{R\\L}$-ALPNKW
			LINEA SOL		AT221$\substack{R\\L}$-ALMEKW				AT221$\substack{R\\L}$-ALPEKW
		3S-FE	LINEA SOL				ST220$\substack{R\\L}$-ALMEKW	ST220$\substack{R\\L}$-ALPEKW	
		2C-TE	LINEA TERRA			CT220$\substack{R\\L}$-ALMNTW			
			LINEA SOL			CT220L-ALMETW			
	5-Door Wagon	4A-FE	LINEA TERRA	AT220$\substack{R\\L}$-AWMNKW					
			LINEA SOL	AT220L-AWMEKW					
		7A-FE	LINEA TERRA		AT221$\substack{R\\L}$-AWMNKW				AT221L-AWPNKW
			LINEA SOL		AT221L-AWMEKW				AT221L-AWPEKW
		3S-FE	LINEA SOL				ST220$\substack{R\\L}$-AWMEKW	ST220$\substack{R\\L}$-AWPEKW	
		2C-TE	LINEA TERRA			CT220$\substack{R\\L}$-AWMNTW			
			LINEA SOL			CT220L-AWMETW			

■GENERAL COUNTRIES

TRANSAXLE				Manual			Automatic	
				5-Speed			4-Speed	
DESTINATION	BODY TYPE	ENGINE	GRADE	C50	S50	S54	A241E	A245E
General Countries/CORONA	4-Door Sedan	4A-FE	–	AT220$\substack{R\\L}$-AEMNK				AT220L-AEPNK
		3S-FE				ST220$\substack{R\\L}$-AEMNK	ST220$\substack{R\\L}$-AEPNK	
		2C-T			CT220L-AEMNX			

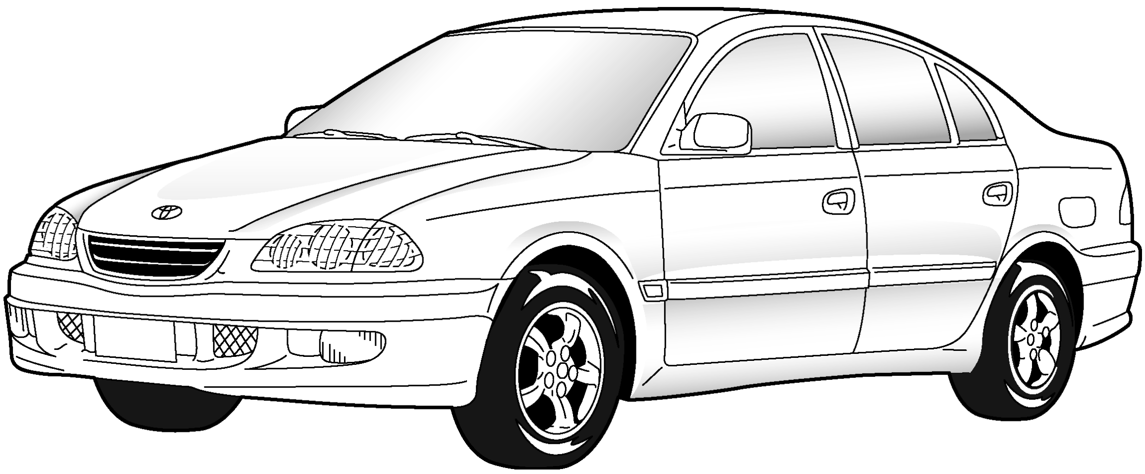
2. New Model Outline

MO

AVENSIS/CORONA

For 21st century Europe, the Avensis/Corona is a truly European sedan.

For the first time at Toyota, the integration of everything from design to production of the Avensis/Corona was carried out in Europe. Combining the refined quality of a Japanese automobile with the logical operability of a European automobile, a new model has been born with the aim of setting a new European standard. Beginning with a spacious interior cabin that stresses head clearance, this vehicle also provides lots of luggage space, enhanced entry and exit to and from the vehicle, superior visibility, and excellent aerodynamic properties. With these general quality improvements this sedan is fully equipped to appeal to the future needs of the European market. This new model outline starts off by introducing the five points of distinction that give the Avensis/Corona its charm. Please feel free to use this text in disseminating knowledge about this vehicle in the European market.



The numerous charms of the Avensis/Corona.

Five features which set new standards for the 21st century.

Feature 1	Body Design

Three body designs bursting with personality to meet the wide-ranging needs of the European user.

Feature 2	Engine Types

A wide range of engine types are available based on the high performance lean-burn engine and the new generation diesel engine.

Feature 3	Drivability

A new mechanism and many refinements have been added to the suspension, to ensure both a stable and quiet ride.

Feature 4	Safety

Beginning with a body construction, this vehicle comes equipped with a wide range of safety equipment.

Feature 5	Comfort

The interior design incorporates a large number of luxury amenities designed to maximize user comfort.

Feature 1 Body Design

Three body designs bursting with personality to meet the wide ranging needs of the European user.

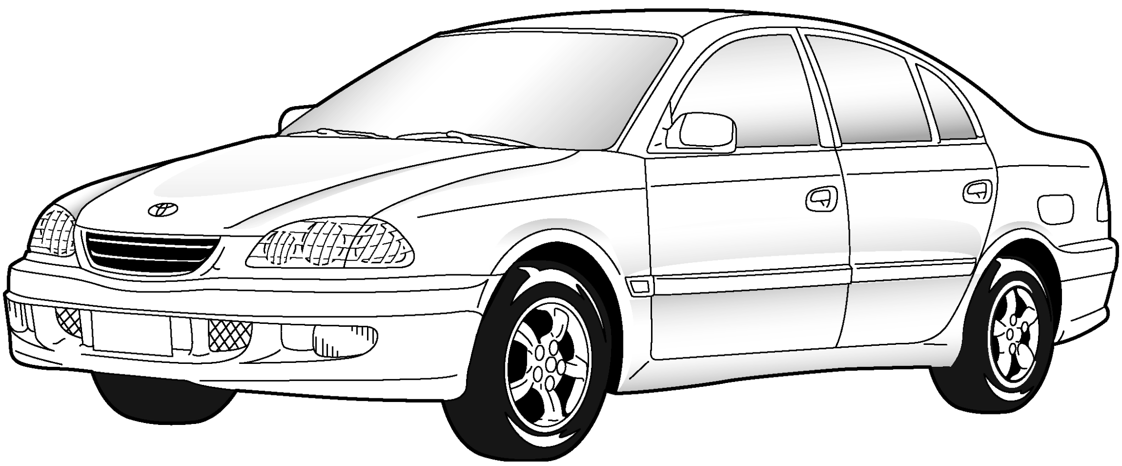
The Avensis/Corona lineup boasts three different body styles: a 4-door sedan, 5-door liftback and 5-door wagon.
This lineup offers individuality, with a large range of customization possible to meet the wide ranging needs of the European market.

Front Design

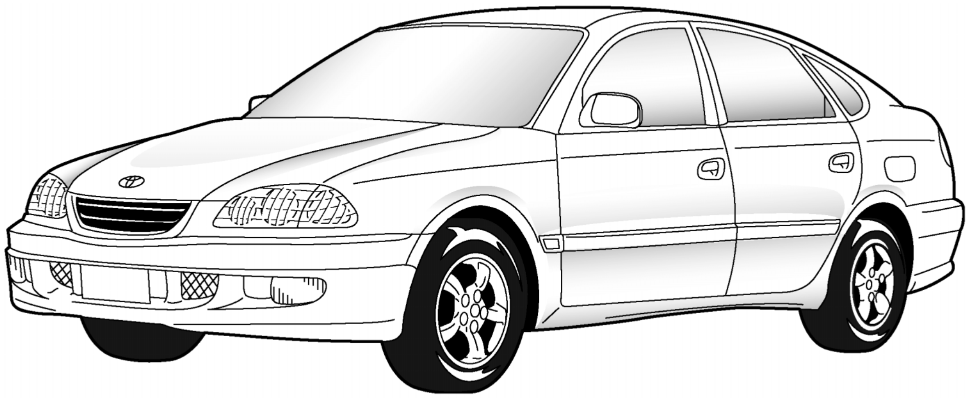
The overall length has been shortened from the previous model, and the front and rear overhang have been reduced. (Front overhang –15 mm, rear –75 mm)
In addition, by extending the wheelbase, a smart modern shape without excessive styling has been achieved.
The objective was to offer a personal sedan which would appeal to young families.

Sedan

Cd = 0.28!

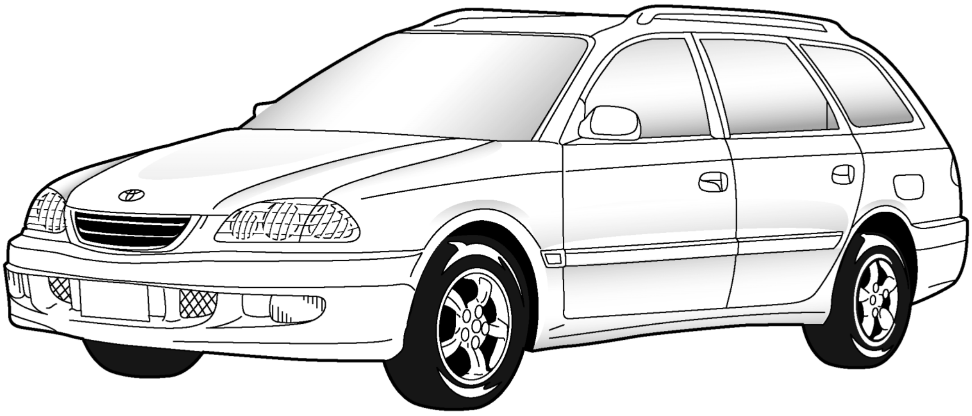


- The front header has been enlarged by 15 mm. In addition, the aperture of the front and rear doors has been widened, making it easier to get in and out of the vehicle, and providing enhanced sitting comfort.
- A rounded lens cut is used for the low-positioned high-powered head lamps. Together with superior performance, this design gives the vehicle a fresh and distinctive front view profile.
- The rounded front design, joined with the powerful hood relief gives the vehicle increased presence and an impression of greater solidity. This vehicle will stand out, even among the wide variety of vehicles found in Europe.



Liftback

Using the dynamic design of the sedan model as a base, this model emphasizes a stylish and sporty look. More so than the sedan, this model targets younger users.

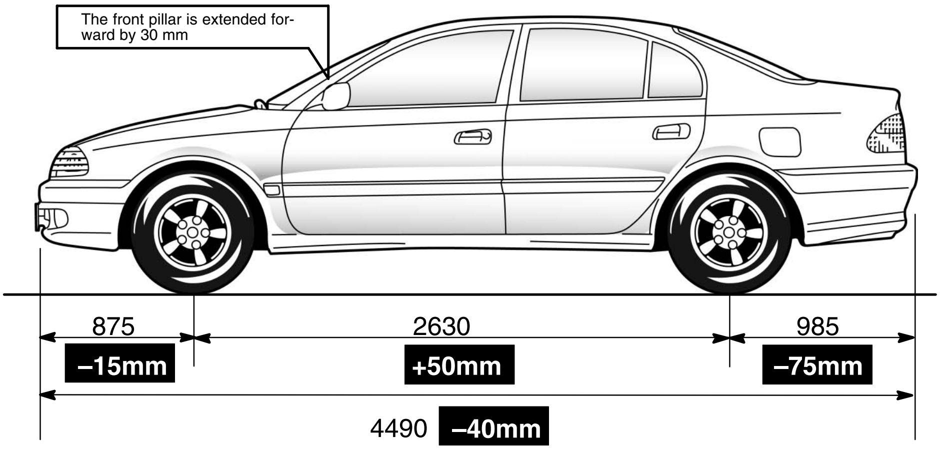


Wagon

The uncluttered sporty feel of this design gives this medium lower class station wagon the distinctive feeling of a higher-status vehicle. This design expresses a feeling of freedom.

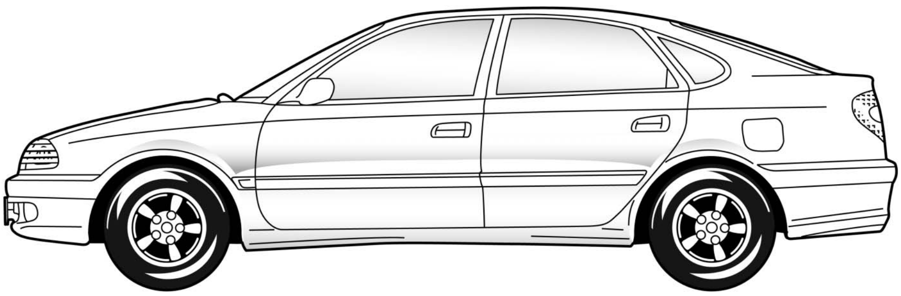
Feature 1 Body Design

Side Design



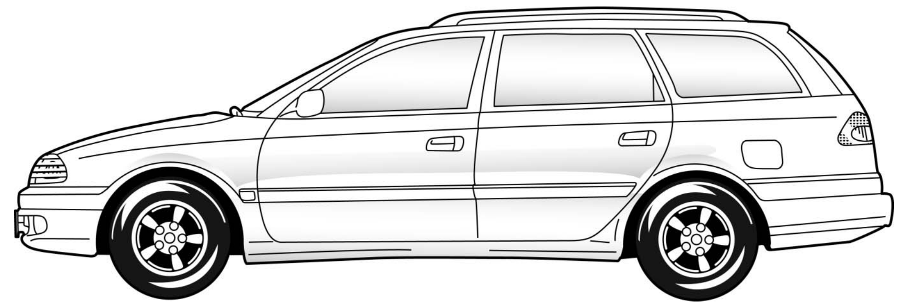
Sedan

- This model inherits a spin cast shape. Based on a wheelbase extended by 50 mm, it has a simple side view construction with a low center, and realizes both a sporty and high class feel with its tight silhouette.



Liftback

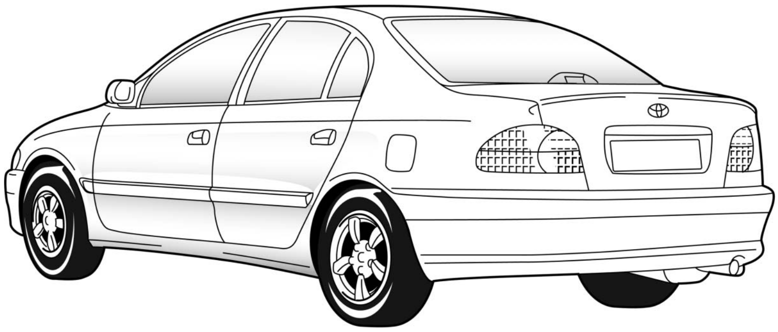
- The rear header has been lowered by approximately 10 mm, and emphasis is placed on the teardrop window opening line that flows from the front pillar to the rear pillar. In addition, the forward-tilt back door panel, slightly raised trunk, and short nimble rear overhang give it a sporty coupestyle side view.



Wagon

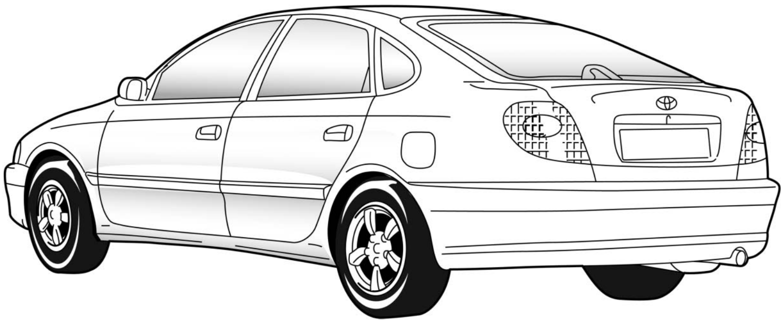
- The beautiful smooth-flowing construction that runs from the front pillar to the arch-type rear pillar help define this model's personality. In addition, an underbody that passes through the cross-section, extending from front to rear, gives it both a sporty and high class feel that is ideally suited for a medium lower class European automobile.

Rear Design



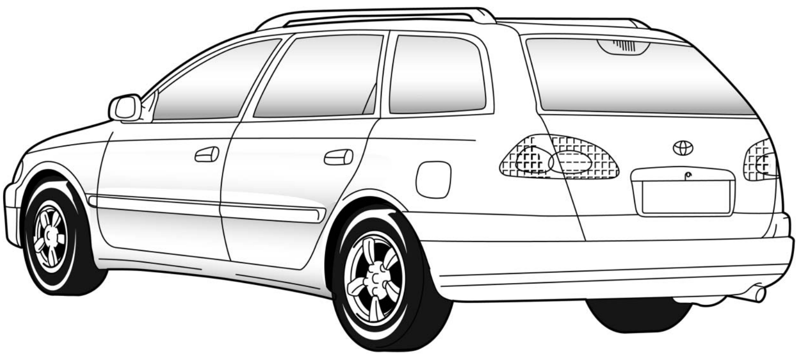
Sedan

- The rear end combines a sleek, sharp tail end with an uncluttered construction to produce a clean-looking image.
- As with the front head lamps, the rear combination lamps utilize a round design for the lens pattern, giving these independent rear lamps a high quality look.



Liftback

- Simple rear combination lamps are vertically positioned on the back door surface, which is shaped to resemble a spoiler rack. This produces a sporty rear view.
- A unique lens pattern is used for the rear combination lamps in conjunction with the front head lamps to give the rear view a strong integrated feel.



Wagon

- The roof width has been expanded to emphasize a wide body feel while also maintaining excellent rear view visibility. Good balance between the positioning of the rear combination lamps and the license plate create a distinctive rear view.
- The rear combination lamps with a unique lens pattern are positioned in a simple design. This feature produces a common identity with the other models in this series.

Feature 2

Engine Types

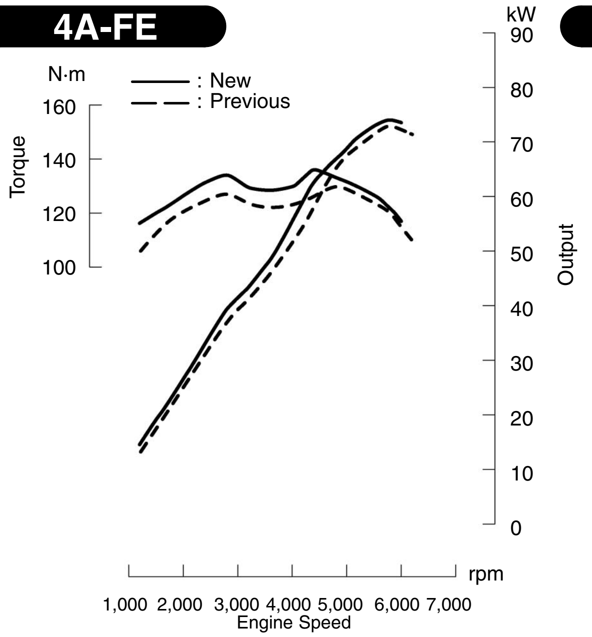
A wide range of engine types are available, based on the high-performance lean burn engine and the new generation diesel engine.

■ High-performance lean burn engine (4A-FE/7A-FE) gives driving performance and economy

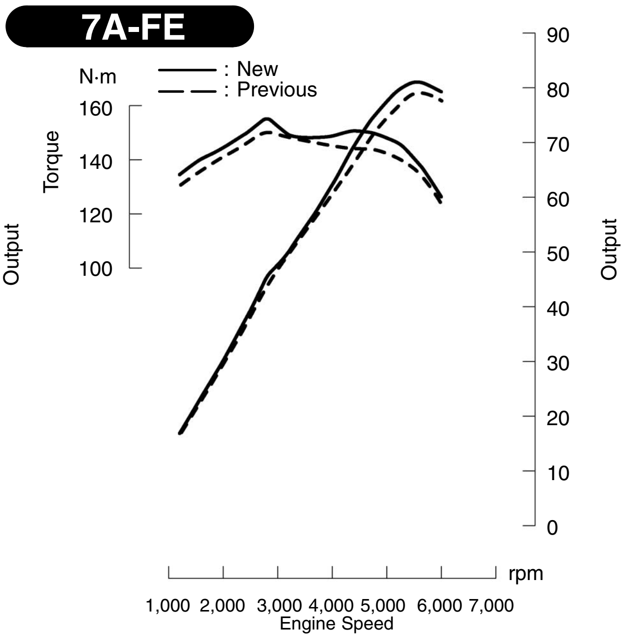
What is lean burn?
In comparison with the stoichiometric engine, this engine is able to burn with an extremely lean air mixture (lean combustion) ratio while also producing high power. The lean burn engine realizes approximately an 3 to 11% improvement in fuel consumption over the stoichiometric engine. This engine offers an excellent balance between driving performance and economy. (See comparison between the 4A-FE and the stoichiometric engine.)

Fuel Consumption (L/100km) (4A-FE, M/T)

	Lean Burn	Stoichio-metric
Urban	9.4	10.6
Extra Urban	5.9	6.1
Combined	7.1	7.7



Max. Output	**74kW/5,800rpm** Previous 73kW/5,800rpm
Max. Torque	**136N·m/4,400rpm** Previous 130N·m/4,600 ~ 5,200rpm



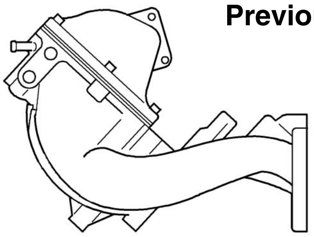
Max. Output	**81kW/5,600rpm** Previous 79kW/5,600rpm
Max. Torque	**155N·m/2,800rpm** Previous 150N·m/2,600 ~ 3,200rpm

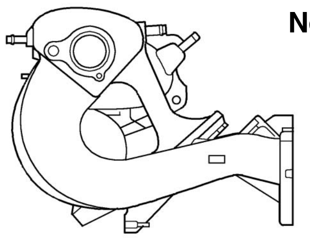
Sales Point

The 4A-FE and 7A-FE engines are able to combine economical fuel consumption by means of lean burning without sacrificing power. For those drivers who want lively driving performance but who also worry about fuel consumption, this is the perfect engine.

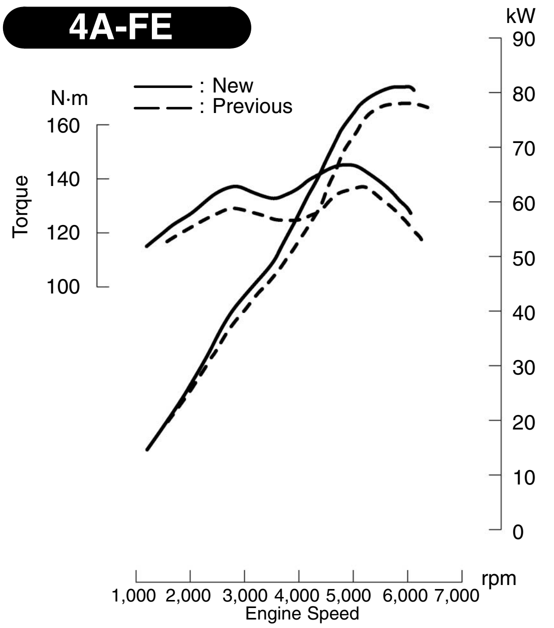
■ The low and midrange torque has been improved [4A-FE (Stoichiometric)/3S-FE] through modifications of the intake manifold and intake air chamber.

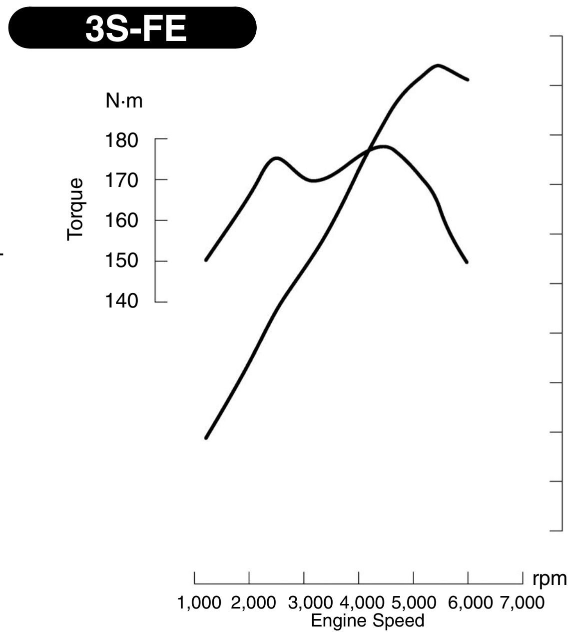
The air mixture intake efficiency has been improved by extending the length of the intake manifold. In particular, improvement in the practical control of the low and midrange torque during city driving has been achieved.





*The illustrations are intake manifold for 4A-FE engine.





The performance curves are for European specifications.

		4A-FE			3S-FE
Max. Output	Europe	**81kW/6,000rpm** Previous 78kW/6,000rpm	**Max. Output**	Europe	**94kW/5,400rpm** Previous 93kW/5,600rpm
	General	**81kW/6,000rpm** Previous 81kW/6,000rpm		General	**91kW/5,400rpm** Previous 95kW/5,600rpm
Max. Torque	Europe	**145N·m/4,800rpm** Previous 137N·m/4,800 ~ 5,000 rpm	**Max. Torque**	Europe	**178N·m/4,400rpm** Previous 178N·m/4,400 ~ 4,800rpm
	General	**145N·m/4,800rpm** Previous 142N·m/4,800rpm		General	**178N·m/4,400rpm** Previous 182N·m/4,400rpm

Sales Point

During repeated stop-and-go driving in the city, the improved low and midrange torque gives the driver a more responsive driving experience. This is perfect for those people who use their car for daily errands.

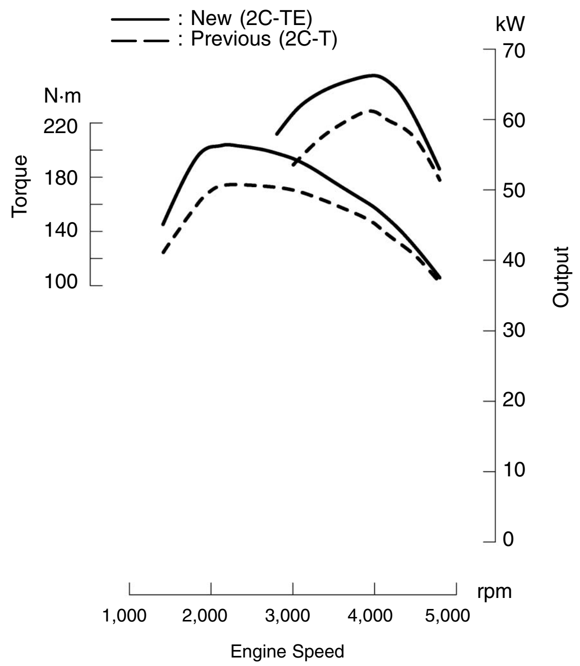
Feature 2

Engine Types

■ High output and low fuel consumption are compatible (2C-TE) as a result of the use of EFI (Electronic Fuel Injection), a newly equipped intercooler.

The fuel injection equipment is now controlled by computer (EFI) and an intercooler has also been installed. As a result of these modifications the fuel consumption has been further improved and the engine output and torque have been raised over all rpm ranges. This engine is the ultimate diesel engine: the black exhaust fumes typical of other diesel engines have been reduced to an minimum.

2C-TE



Max. Output **66kW/4,000rpm**
Previous 61kW/4,000rpm
Max. Torque **203N·m/2,200rpm**
Previous 174N·m/2,000 ~ 3,000rpm

Sales Point

The problems peculiar to diesel engines (black exhaust smoke, vibration, and noise) have all been considerably reduced with the landmark 2C-TE engine. While placing importance on economy, this engine should cause many people to re-evaluate their negative opinions of diesel engines.

■ Diesel engine that places the maximum priority on economy (2C-T)

The 2C-T engine, with an established reputation for economy, is also part of the engine lineup for the Avensis/ Corona. An even greater emphasis has been placed on economy, resulting in several added improvements.

Max. Output	**60kW/4,000rpm**
Max. Torque	**170N·m/2,200 ~ 3,000rpm**

Feature 3

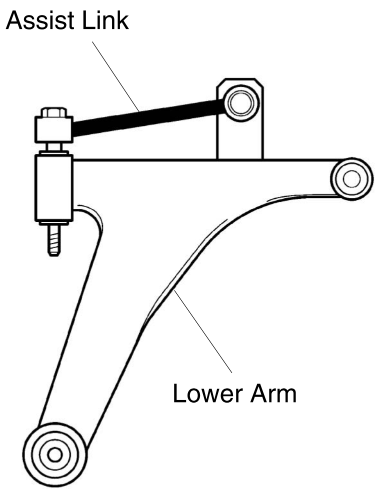
Drivability

A new mechanism and many refinements have been added to the suspension to ensure a stable and quiet ride.

■ High standard of compatibility between a comfortable ride and stable driving control

Front suspension lower arm with assist link

With the newly developed model, the lower arms on the front suspension of all manual transmission vehicles are equipped with an assist link. The assist link controls only the lower arm movements in the right and left directions, which absorbs the impact from the road surface, thereby moderating the movements of the lower arm. In doing so, this epoch-making new mechanism provides both riding comfort and steering stability at high level.



Sales Point

This mechanism, which has attained both riding comfort and driving stability at high level, is one of the fundamental elements supporting the excellent drivability of the Avensis/Corona. Whether the driver wants a sporty ride or something smoother, this vehicle delivers it.

■ A liquid and rubber composite material is used to absorb vibrations from the road surface.

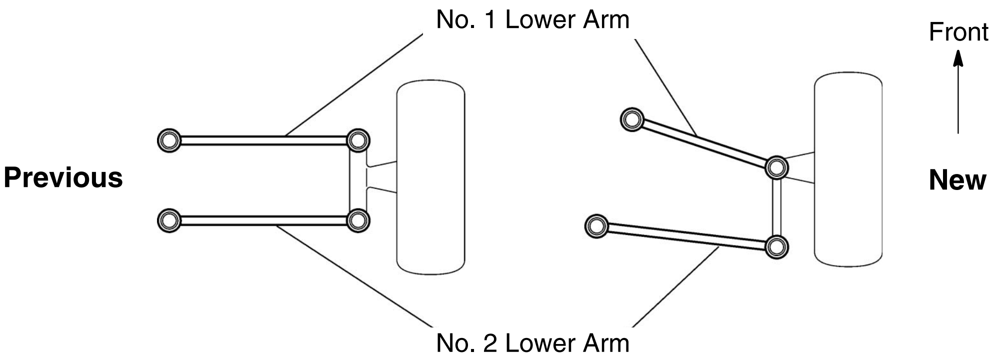
Liquid sealed suspension support

A composite material using rubber and liquid is employed in locations where the suspension unit is attached to the body (suspension support). Excellent driving stability and the absorption and reduction of vibrations are achieved.

■ Improved rear tire stability by lower arm construction

Rear suspension lower arms position change

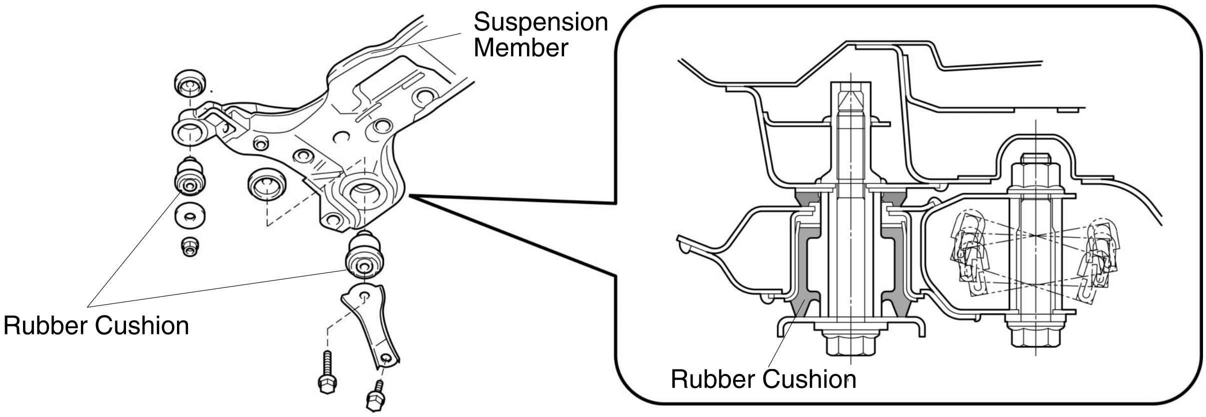
On the Avensis/Corona a lower arm mechanism is employed which stabilizes the rear tires. The ideal tire direction is adjusted with this mechanism by means of the length and positioning of the suspension arm. Superior driving stability control is achieved while maintaining a comfortable ride.



■ Major improvement in the driving feel as a result of the use of rubber cushion

Newly equipped with anti-vibration suspension member

The vehicle support suspension member is designed to receive the added weight that is exerted in the horizontal direction during driving. By mounting the member using rubber cushion, rigidity in the horizontal direction is preserved and the up and down vibrations that occur are absorbed. The transmission of vibrations to the body are suppressed without any loss in suspension member operation for a quieter ride and better driving sensation.



Sales Point

The lower arm mechanism and anti-vibration suspension do not depend solely on high technology but were born out of the result of research and invention. These mechanisms provide stable driving control, which is desirable in terms of safety, but they also yield benefits to the user in cost performance.

Feature 4 Safety

Beginning with a body construction, this vehicle is equipped with a wide range of safety features.

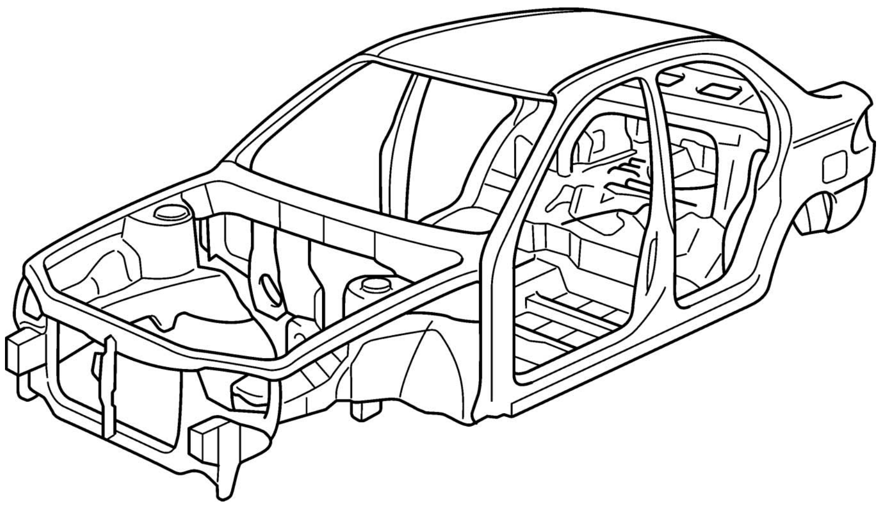
■ A superior impact energy absorbing body construction has passed strict European safety standards.

Front collision safety performance

In addition to the optimally positioned reinforcements surrounding the engine room, the forward portion of the front bumper is newly equipped with a front bumper reinforcement. A body construction has been developed that disperses the impact from a frontal collision to the left and right front side members with high efficiency. In addition, the front pillar and rockers on the upper body have been equipped with large size reinforcements. Cabin structure deformation is designed to minimize during head-on collisions as well as during offset collisions. Refer to page 113 for technical information.

Side collision safety performance

The front pillar, center pillar, roof side beams, rockers and doors have high strength. In addition the reinforcements used in the body construction have been optimally positioned to effectively disperse and absorb energy and to help minimize cabin deformation.



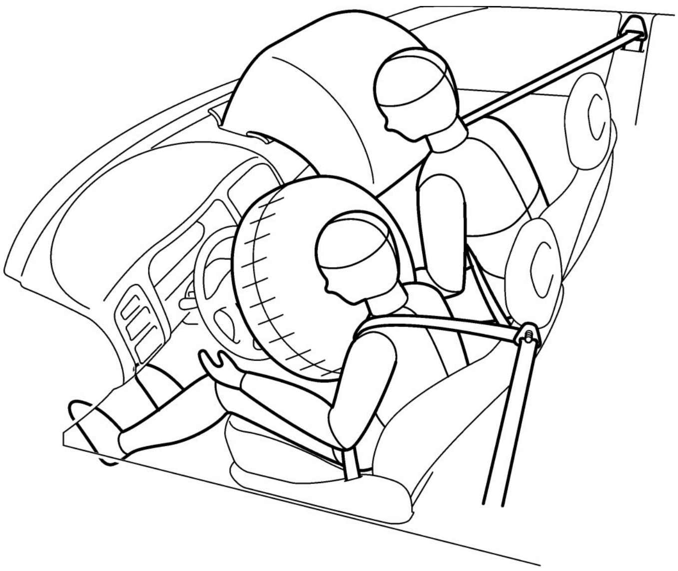
Sales Point

In the unlikely event of an accident, the body construction effectively disperses the impact and the rigid cabin helps minimize damage to the occupants. A design idea that pursues safety through the construction of the body provides users with a strong feeling of security.

■ The Avensis/Corona safety equipment is intended to protect passengers.

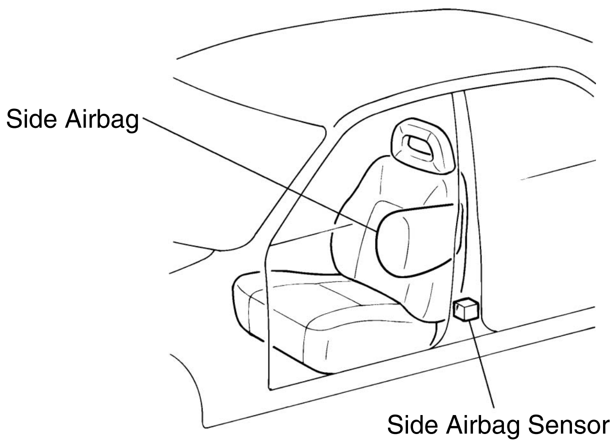
SRS airbags on the driver and passenger side

SRS airbags come as standard equipment on all vehicles for Europe and intended to protect a driver and front passenger from the impact resulting from a frontal collision.



SRS side airbags

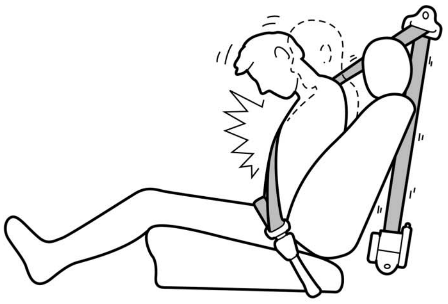
These side airbags are intended to protect passengers from the impact that occurs in the event of a side collision.



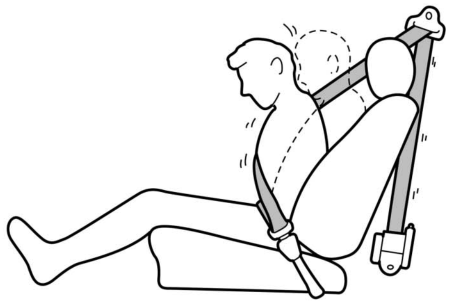
Feature 4 Safety

Seat belt pretensioner with force limiter

At the initial stage of a collision the pretensioner instantaneously winds up the belt to restrain the front seat occupant. Immediately thereafter once the belt weight load reaches the prescribed value, the force limiter maintains the belt load at a fixed level. This mechanism mitigates the impact on the passenger's upper torso and abdomen.



Seat belt without force limiter

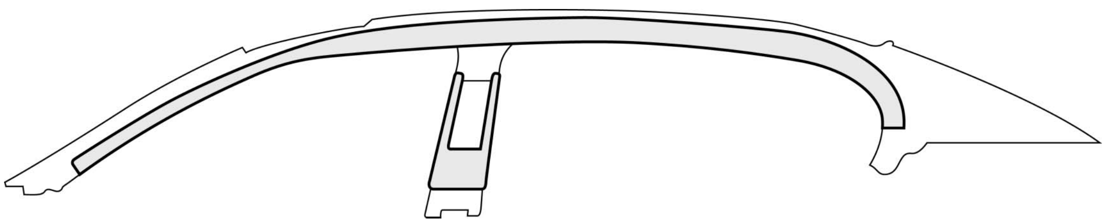


Seat belt with force limiter

This illustration shows the image of Seat Belt force limiter effect.

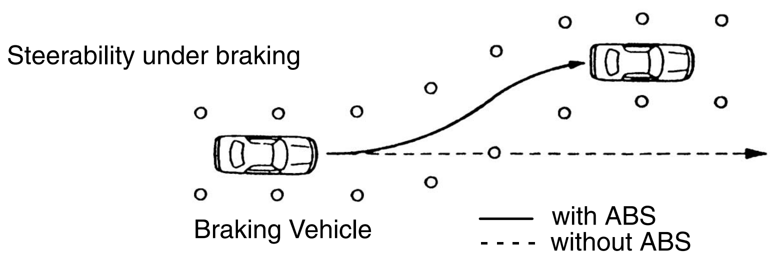
Head impact protection structure

A soft material pillar garnish and ceiling construction are used to help mitigate passenger head impact in the event of a secondary collision.



ABS

This safety system provides stabilized vehicle behavior and enhanced driving control by preventing the tires from locking under heavy braking.



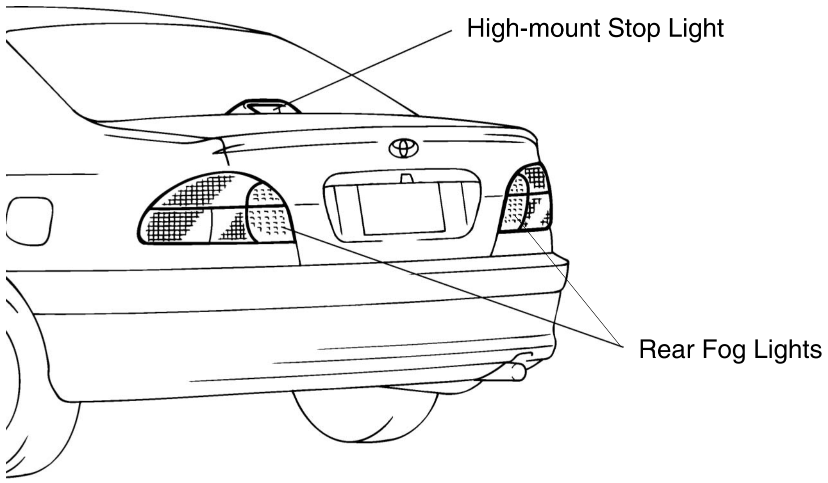
This illustration shows the image of ABS effect.

High-mount stop light

This is intended to provide high visibility during braking for the vehicle following behind in order to prevent rear end accidents.

Rear fog lights

In rain or fog, the red fog lights provide the high visibility for cars following behind, informing them of the presence of your vehicle. These lights are useful for providing visibility and preventing rear end collisions that occur during bad weather.



Jam protection function (power windows and moon roof)

This is a window (roof) reverse movement function in case something gets stuck in the driver side power window or the moon roof while it is being automatically closed. This function is especially useful in preventing accidents involving children.

Feature 5

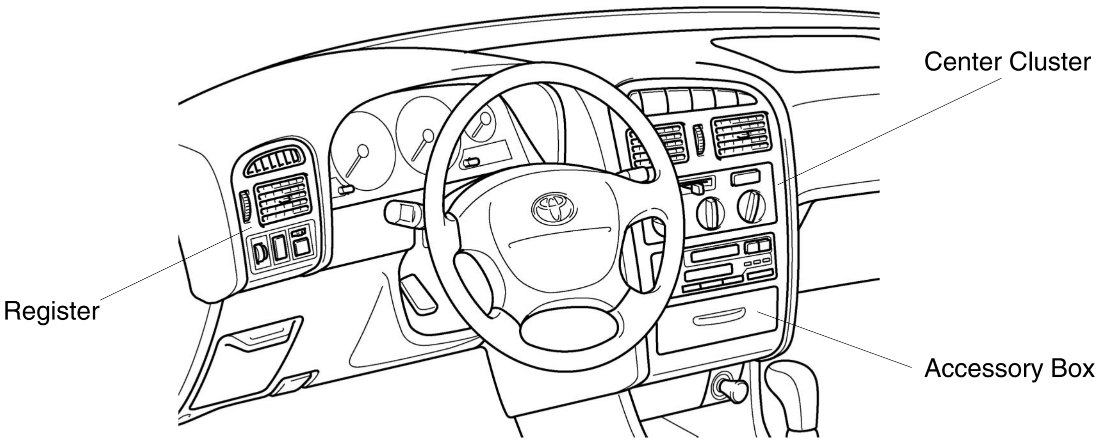
Comfort

The interior design incorporates a large number of luxury amenities designed to maximize user comfort.

■ Interior design

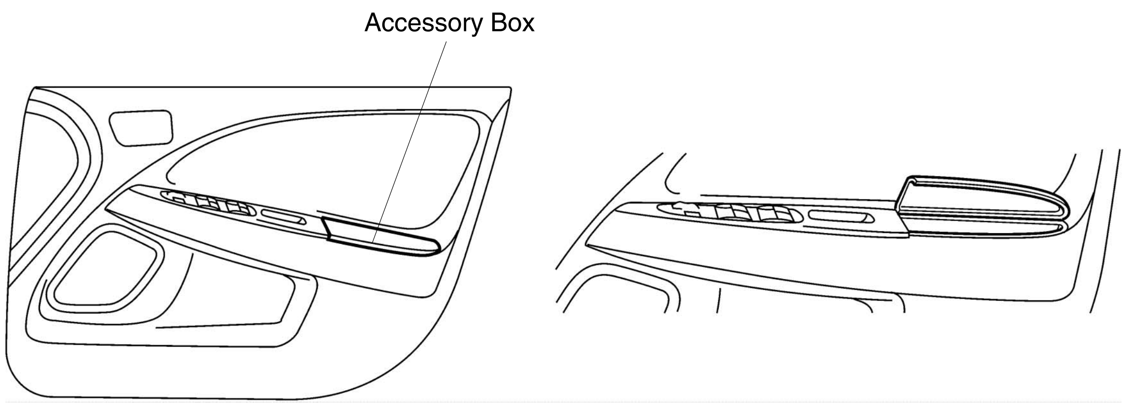
Equipped with original wood/stone relief panels

Using film inserts, wood and stone relief panels are utilized on the center cluster, driver side register and accessory box. These panels enhance the interior’s high-grade image.



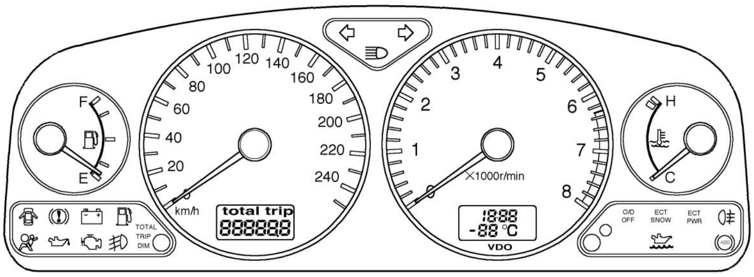
Soft door trim arm rest surface (also used on the accessory box)

The door trim arm rest has been changed to a freestanding unit and the soft feeling has been improved using PVC molding. In addition an accessory box with lid has been installed on the driver and passenger side arm rests for enhanced convenience.



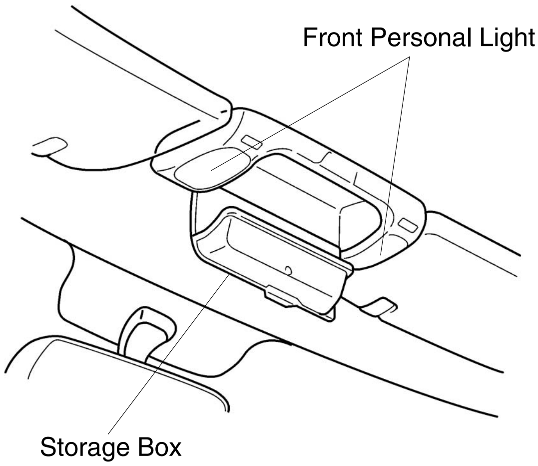
4-dial combination meter

A personal control 4-dial combination meter with a sporty flare and excellent visibility is utilized in all vehicles.



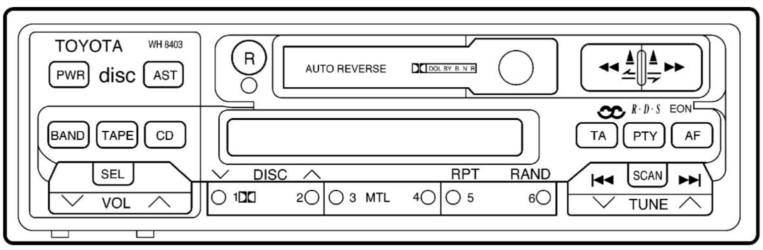
Front personal light with sunglass storage box (vehicles with moon roof only)

A storage box is integrated with the front personal light as a single unit for storing sunglasses, which can be difficult to store in a vehicle. This helps prevent sunglasses from getting scratched or damaged.



New audio lineup is available

Beginning with improved expansion due to AVC-LAN installment and including such things as improved power amplifier output and the addition of an anti-theft function by adopting a detachable panel, the vastly improved new audio lineup comes equipped with a head unit. These systems are compatible with a four speaker system for high quality sound enjoyment.

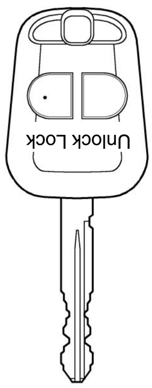


Feature 5 Comfort

■ Utility/Comfort amenities

Wireless door lock control system

This convenient function allows the doors to be locked and unlocked by means of a wireless operation using an integrated key transmitter. This feature is being used for the first time with this model.

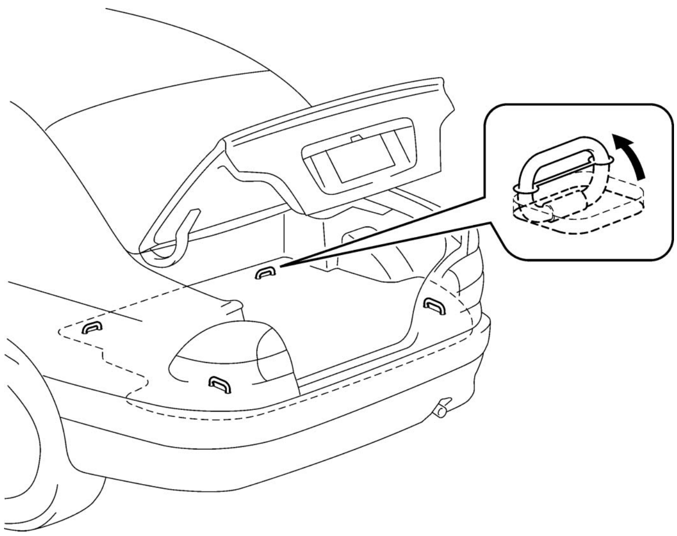


Engine immobiliser

This is a security mechanism designed for using computer control to protect against vehicle theft. With this mechanism the engine can only be started using a key that has been registered with the vehicle beforehand.

Luggage usability

The current luggage space has a high degree of usability. The sedan can hold 4 10-inch golf bags. There is enough space to hold two 75 sized and one 61 sized Samsonite suitcases in the luggage.
Also, all body types have for hooks to cover the luggage spaces.



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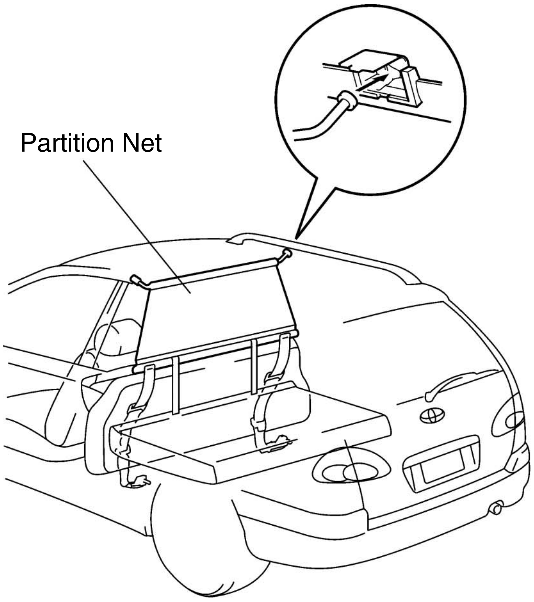
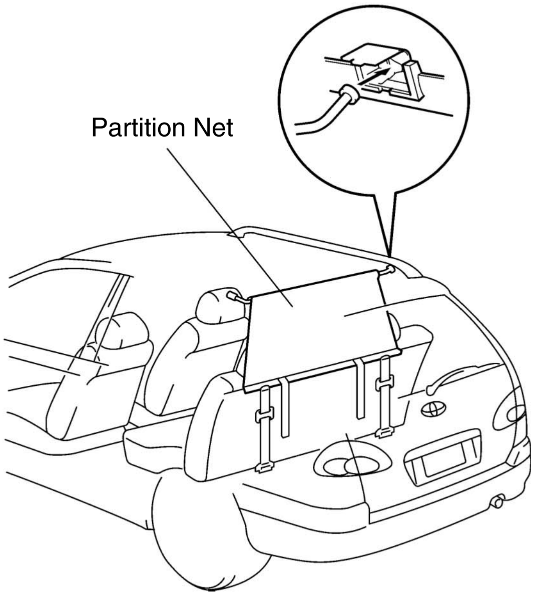
Partition net compatible with the new DIN (wagon)

A partition net for separating the passenger space from the luggage space comes as optionaly equipment on the wagon. With this net, even if a large amount of baggage is loaded, the bags don't shift and tumble into the passenger space.



Rear Seat when in Not Use



Rear Seat in Use

Feature 5

Comfort

■ Equipment List

●: Standard ○: Option —: No setting

Item		Europe		General Countries
		LINEA TERRA	LINEA SOL	
ABS		●*1	●	○*2
SRS airbag	Driver and front passenger	●	●	○*3
	Side	—	●	—
High-mount stop light		●	●	●
Front fog lights		○	●	○*4
Rear fog lights		●*5	●*5	—
Rear window wiper (Except sedan)		●	●	—
Moon roof (with jam protection)		○	○	○
Power outside rear view mirror (Aspherical mirror on the driver's side)	Black/without heater	●	—	●
	Black/with heater	○	—	—
	Body colored/without heater	—	—	○
	Body colored/with heater	○	●	—
Power door lock	D side door key interlocking	●	●	—
	D & P side door key inter-locking	—	—	●
Power window (with jam protection)	Front: Power/Rear: Manual	●	—	●
	Front: Power/Rear: Power	○	●	○
Wireless door lock control system		●	●	—
Seat upholstery	Fabric	●	●	●
	Genuine leather	—	○	—
Seat lumbar support (Driver's seat)		●	●	●
Seat heater (Front seats)		○*6	○*6	—
Coat hock		●	●	●

*1: Setting available for all models except vehicles for CIS model
*2: Setting available for left–hand drive vehicles with 3S–FE engine and without rough road specification
*3: Setting available for left–hand drive vehicles with 3S–FE engine
*4: Setting available for left–hand drive vehicles with 3S–FE engine and SRS airbag
*5: Setting available for all models except vehicles for Middle South America, Brazil and Israel models
*6: Setting available for left–hand drive vehicles with cold area specification except vehicles for Middle South America, Turkey, Brazil and Israel models

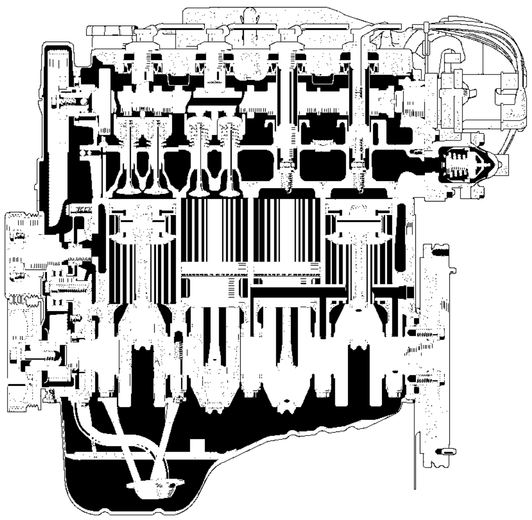
ENGINE

4A-FE ENGINE (STOICHIOMETRIC)

■ DESCRIPTION

The intake and exhaust systems of the 4A-FE engine for the Europe model have been revised to improve engine performance. In addition, the engine control system has been revised to reduce the exhaust emissions. The 4A-FE engine for General Countries has improved its torque in the low- to mid-speed range by revising its intake manifold.

▶ For Europe ◀



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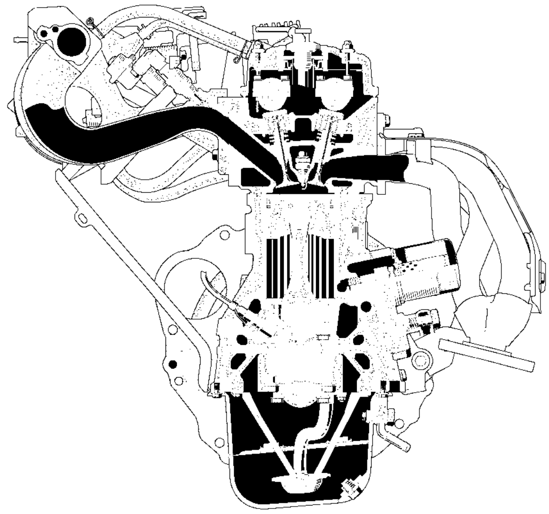

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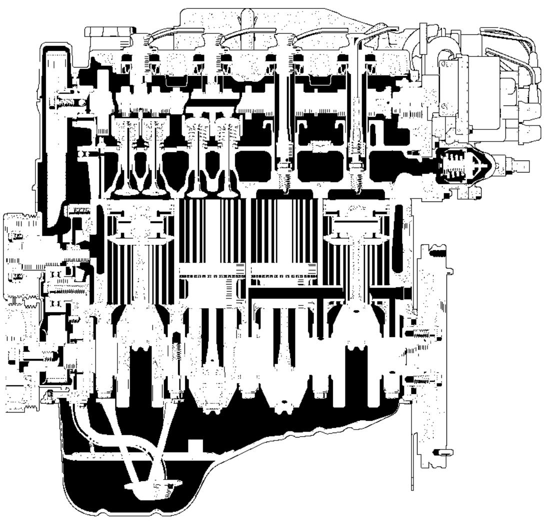
▶ For General Countries ◀



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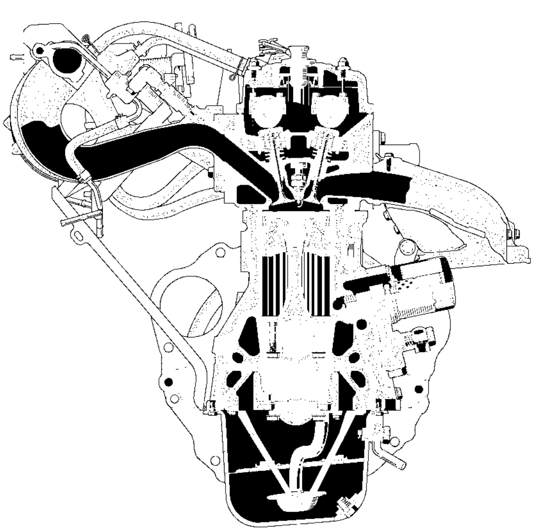

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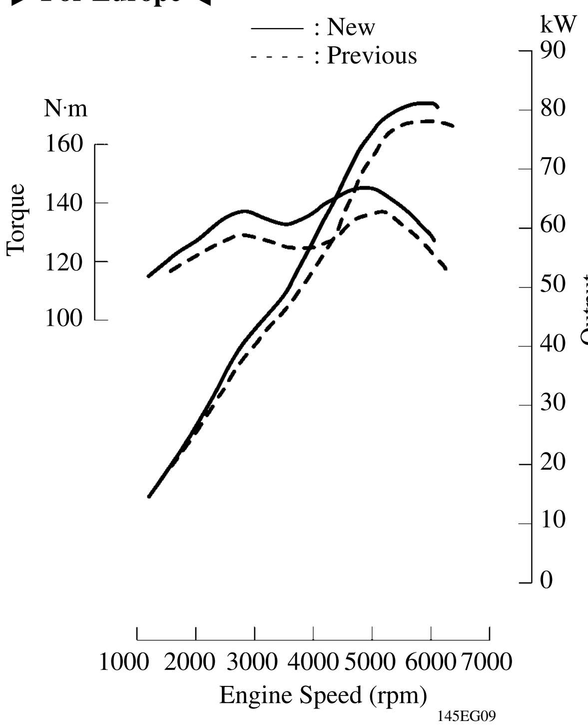
■ENGINE SPECIFICATIONS AND PERFORMANCE CURVES

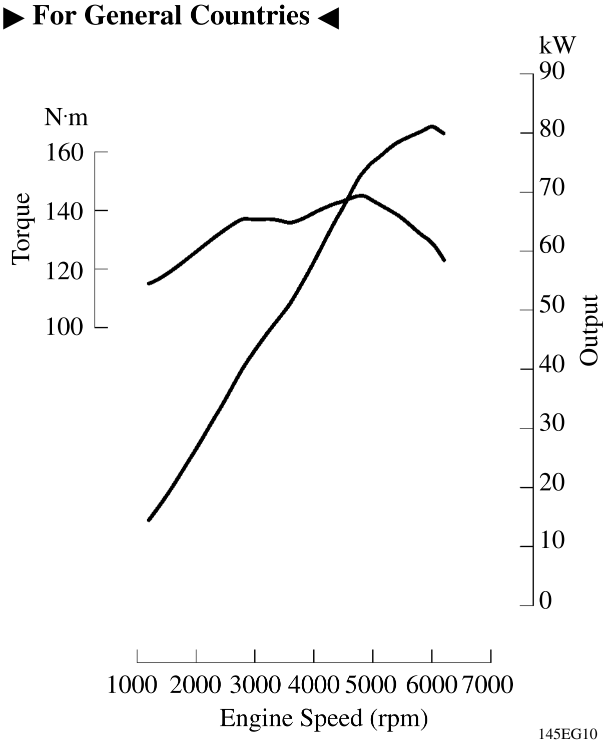
Item \ 4A-FE Engine			New	Previous
No. of Cyls. & Arrangement			4-Cylinder, In-Line	←
Valve Mechanism			16-Valve, DOHC, Belt & Gear Drive	←
Combustion Chamber			Pentroof Type	←
Manifold			Cross-Flow	←
Fuel System			EFI	←
Displacement cm^3 (cu. in.)			1587 (96.8)	←
Bore x Stroke mm (in.)			81.0 x 77.0 (3.19 x 3.03)	←
Compression Ratio			9.5 : 1	←
Max. Output [EEC]			81 kW@6000 rpm	78 kW@6000 rpm*[1] 81 kW@6000 rpm*[2]
Max. Torque [EEC]			145 N·m@4800 rpm	137 N·m@4800 ~ 5400 rpm*[1] 142 N·m@4800 rpm*[2]
Valve Timing	Intake	Open	6°BTDC	←
		Close	46°ABDC	←
	Exhaust	Open	38°BBDC	←
		Close	6°ATDC	←
Fuel Octane Number (RON)			95*[1], 90 or 95*[2]	←
Oil Grade			API SH EC-II, SJ EC or ILSAC	←

*[1]: Models for Europe
*[2]: Models for General Countries

▶ For Europe ◀



▶ For General Countries ◀



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■MAJOR DIFFERENCES

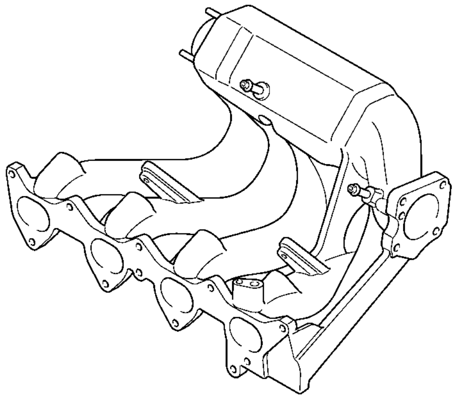
The following changes have been made to the 4A-FE Engine.

Item	Features	Europe	General Countries
Cooling System	An aluminum radiator core is used for weight reduction.	○	○
Intake and Exhaust System	The ports of the intake manifold have been extended to improve torque in the low-to mid-speed range.	○	○
	A dual exhaust manifold has been adopted to improve engine performance.	○	–
	● A ball joint has been adopted in the front exhaust pipe to reduce noise and vibration. ● The internal construction of the main muffler has been optimized to improve its quietness and reduce the exhaust pressure. ● The support of the main muffler has been changed from the 3-point to 2-point support to reduce the noise and vibration that are transmitted to the body.	○	○
Fuel System	A fuel returnless system has been adopted to reduce evaporative emissions.	○	–
Engine Control System	● The fuel injection system is changed from a 2-group injection type to sequential multiport fuel injection type. ● The power steering idle-up control has been changed from the system using an air control valve to the one using a pressure switch and an ISC valve. ● The radiator cooling fan is now controlled by the engine ECU. ● M-OBD (Multiplex On-Board Diagnosis) system is adopted.	○	–

■ INTAKE AND EXHAUST SYSTEM

1. Intake Manifold

- The intake manifold has been integrated with the intake air chamber for weight reduction.
- The length of the intake port has been optimized to improve the torque in the low-to mid-range engine speed.



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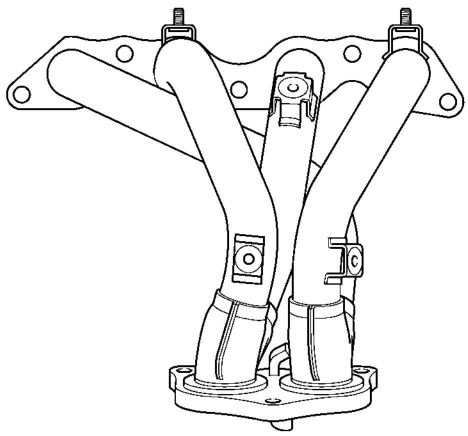
2. Exhaust Manifold

A dual exhaust manifold made of stainless steel has been adopted to improve engine performance.



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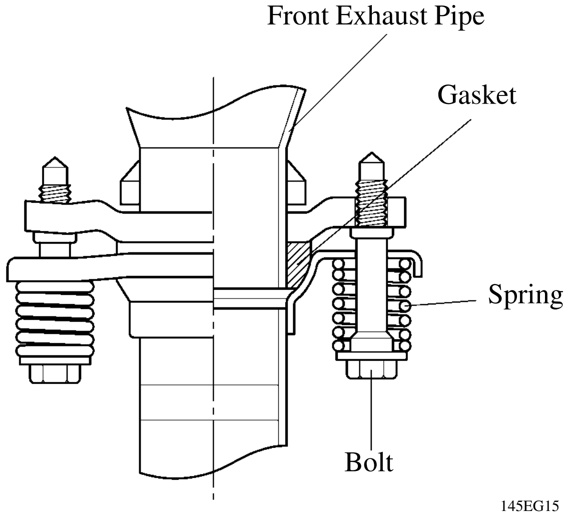
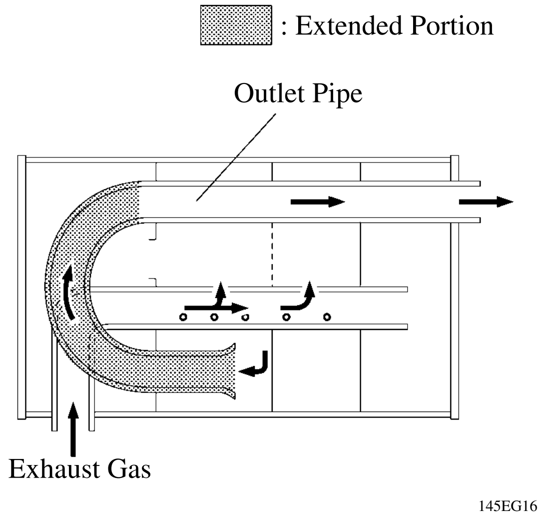
3. Exhaust Pipe

- A ball joint has been adopted in the front exhaust pipe to reduce noise and vibration transmitted to the exhaust pipe.
- The outlet pipe in the main muffler has been extended and various components have been optimally located to improve quietness and reduce the exhaust pressure.



Ball Joint

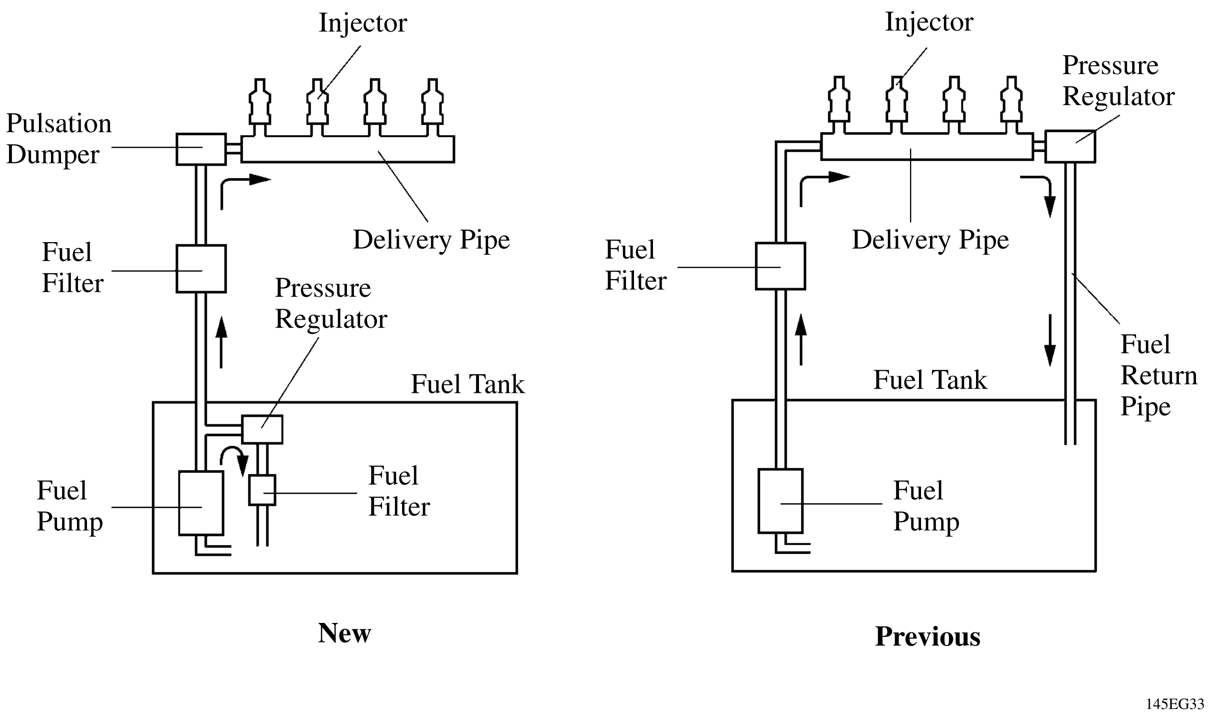


Main Muffler

■FUEL SYSTEM

1. Fuel Returnless System

The new Avensis has adopted a fuel returnless system to reduce evaporative emissions. With the pressure regulator housed inside the fuel tank, this system eliminates the return of fuel from the engine area.



■ENGINE CONTROL SYSTEM (BOSCH TYPE)

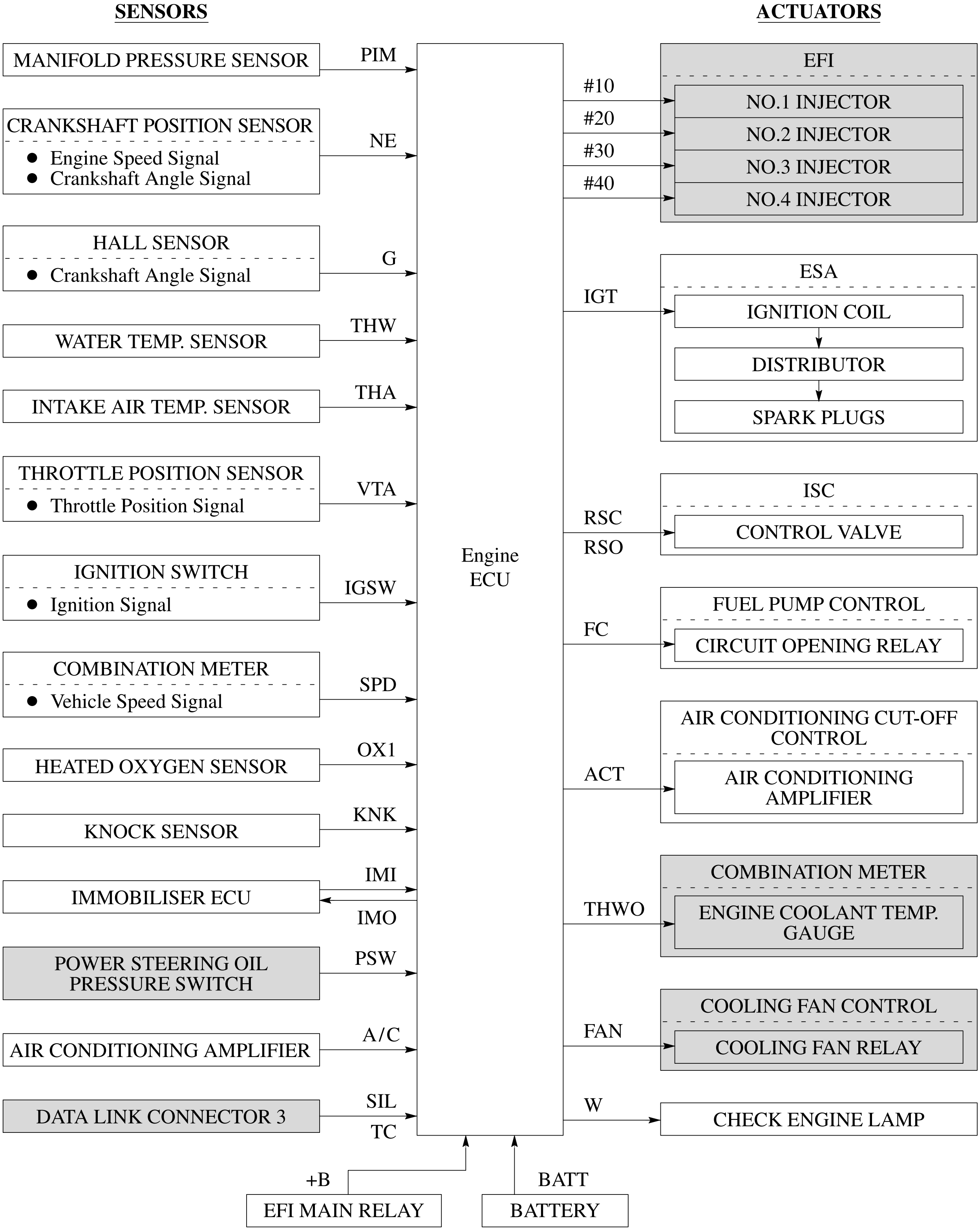
1. General

The (Bosch Type) engine control system of the 4A-FE engine for the Europe model has adopted the Sequential Multiport fuel injection system and the M-OBD (Multiplex On-Board Diagnosis) system.
The engine control system on the model for General Countries is basically the same as that of the previous model.
The engine control system (Bosch Type) of the new 4A-FE engine and previous 4A-FE engine are compered below.

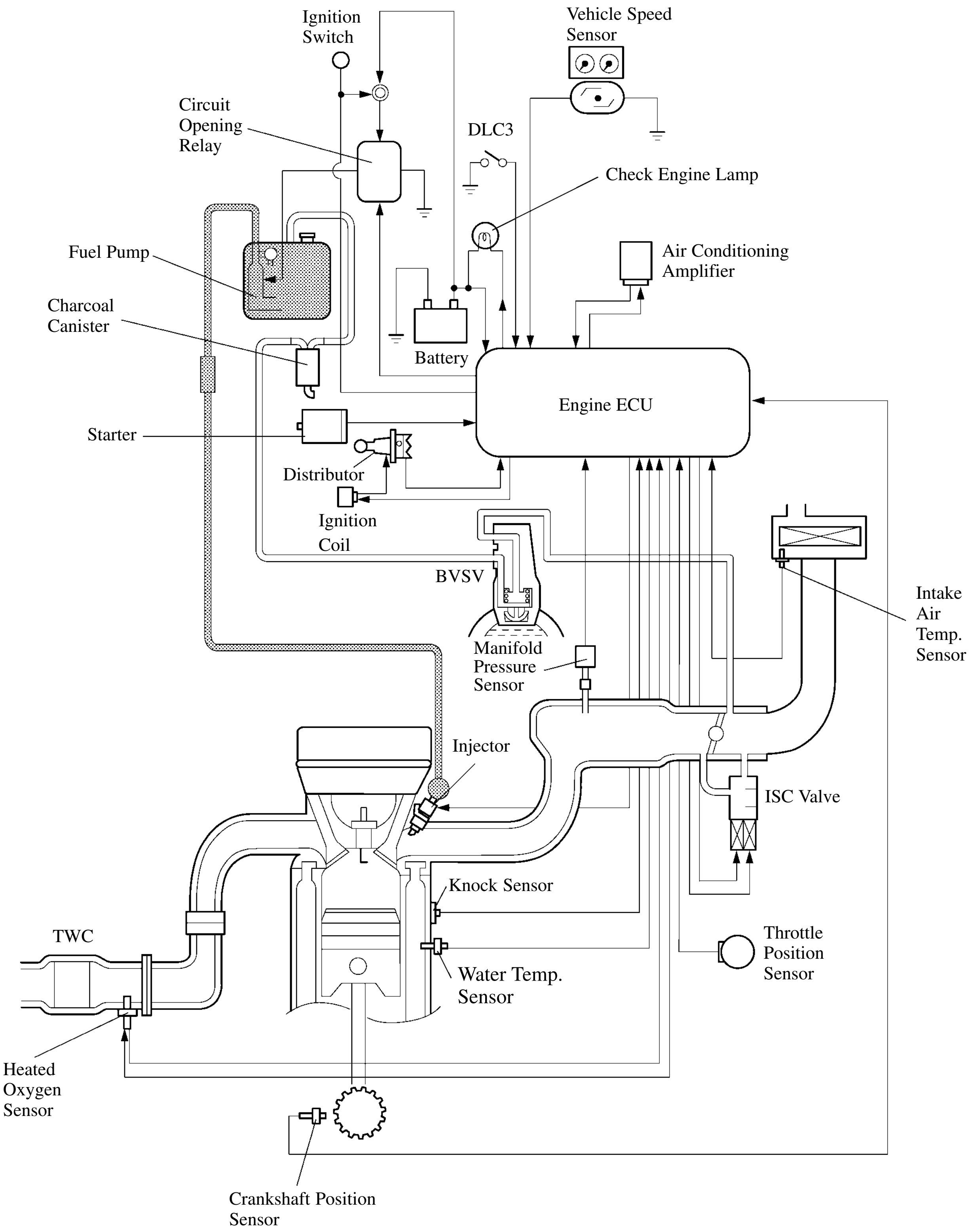
System	Outline	New	Previous
EFI (Electronic Fuel Injection)	A D-type EFI system is used, which indirectly detects intake air volume by manifold pressure sensor signal.	○	○
	The fuel injection system is a sequential multiport fuel injection system.	○	–
	The fuel injection system is a 2-group type, each of which injects 2 cylinders simultaneously.	–	○
ESA (Electronic Spark Advance)	Ignition timing is determined by the engine ECU based on signals from various sensors.	○	○
	It retards ignition timing to suppress knocking when it occurs.	○	○
ISC (Idle Speed Control)	A rotary solenoid type ISC system is used to control the fast idle and idle speeds.	○	○
Fuel Pump Control	Fuel pump operation is controlled by signals from the engine ECU based on the engine speed signal (NE).	○	○
Engine Immobiliser	Prohibits fuel delivery and ignition if an attempt is made to start the engine with an invalid ignition key.	○	○
Air Conditioner Cut-Off Control	By controlling the air conditioner compressor in accordance with the throttle valve opening angle and the vehicle speed, driveability is maintained.	○	○
Cooling Fan Control	Radiator cooling fan operation is controlled by signals from engine ECU based on the water temperature sensor signal (THW).	○	–
Diagnosis	When the engine ECU detects a malfunction, the engine ECU diagnoses and memorizes the failed section.	○	○
	A newly developed diagnostic system which utilizes a high speed bi-directional communication line to provide extended diagnostic capabilities and features.	○	–
Fail-Safe	When the engine ECU detects a malfunction, the engine ECU stops or controls the engine according to the data already stored in memory.	○	○

2. Construction

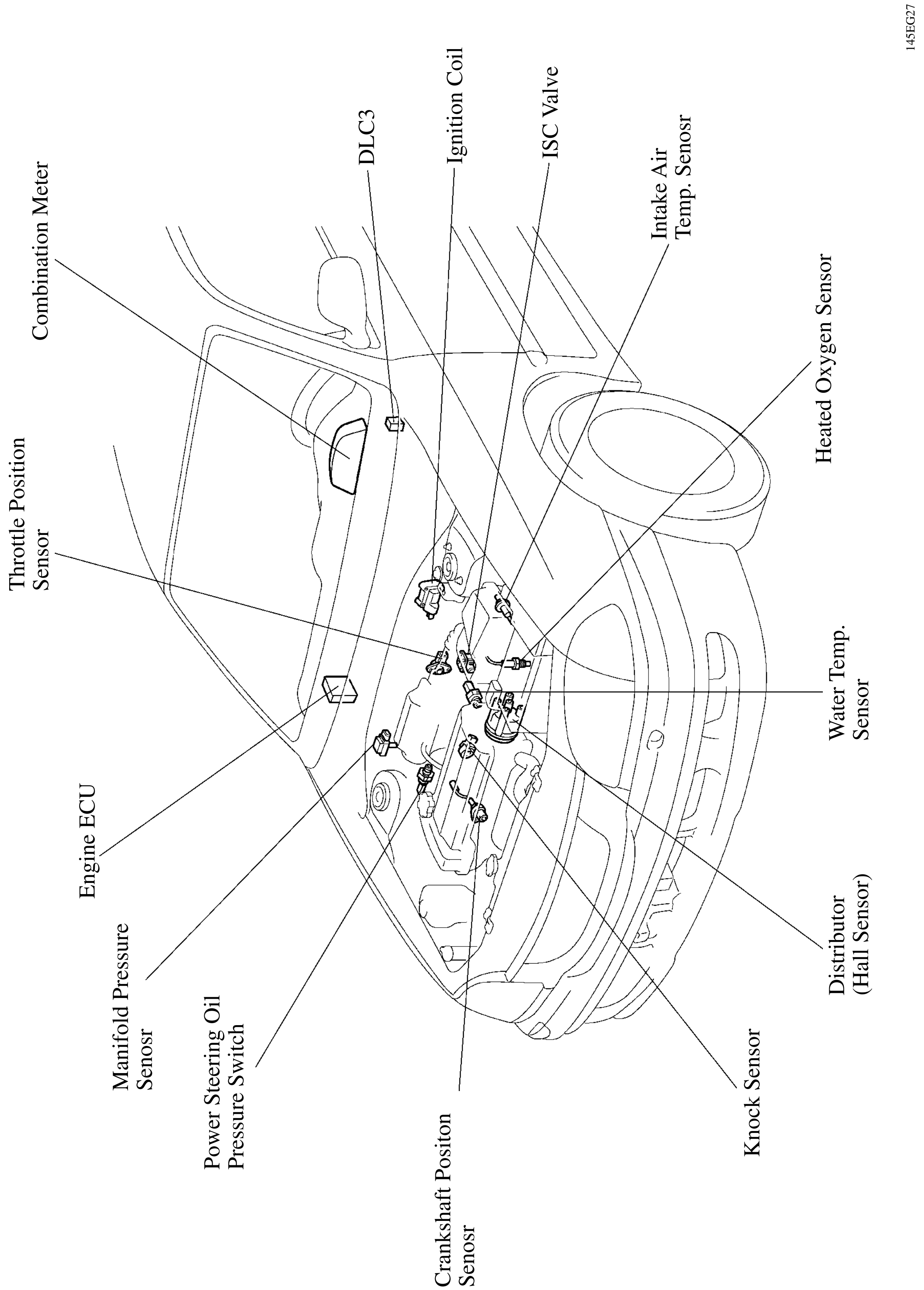
The configuration of the engine control system in the 4A-FE engine of the new AVENSIS is as shown in the following chart. Shaded portions [ ] differ from the 4A-FE engine of the previous model.



3. Engine Control System Diagram



4. Layout of Components



5. Main Components of Engine Control System

General

The following table compares the main components of the 4A-FE engine in the new and previous model.

Component \ Model		New	Previous
Manifold Pressure Sensor		Semiconductor Type	←
Throttle Position Sensor		Linear Type	←
Crankshaft Position Sensor		Pick-Up Coil Type, 1	←
Distributor	Hall Sensor	Hall Element Type	←
Knock Sensor		Built-In Piezoelectric Element Type, 1	←
Oxygen Sensor		With Heater Type	←
Injector		2-Hole Type	←
ISC Valve		Rotary Solenoid Type	←

6. EFI (Electronic Fuel Injection System)

The injection pattern has been changed from the previous 2-group injection type to the Sequential Multiport fuel injection type to improve the precision of the air-fuel ratio feedback control.

7. ISC (Idle Speed Control)

The power steering idle-up control has been changed from the system using an air control valve to the one using a pressure switch and an ISC valve.

8. Cooling Fan Control

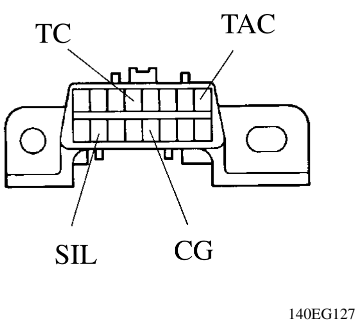
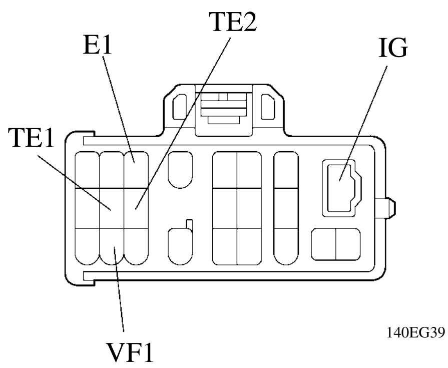
In the previous model, the operation of the cooling fan used to be controlled by the water temperature switch provided at the water inlet of the engine. In the new model, the cooling fan is controlled by the engine ECU based on the signal (THW) that is output by the water temperature sensor.

9. Engine Coolant Temperature Signal Output

In place of the temperature sender gauge used on the previous model, the engine ECU sends the engine coolant temperature signal to the engine coolant temperature gauge in the combination meter.

10. Diagnosis System

The M-OBD (Multiplex On-Board Diagnostic) system that has been adopted in the 4A-FE engine is the system that has been improved upon the previous diagnostic system in order to perform troubleshooting in a more efficient and accurate manner.
The functions of the M-OBD system can be fully utilized through the use of a hand-held tester.
The following table compares the M-OBD system and previous diagnostic system.

System / Item	M-OBD	Previous Diagnostic
Check Connector and Data Link Connector	The DLC3 (Data Link Connector 3) has been newly provided. In addition, the check connector terminals TE1, TE2, and IG have been discontinued. **▶ DLC3 ◀**  CG: Chassis Ground SIL: Provides communication between the engine ECU and the hand-held tester. TAC: Outputs the engine speed signal. TC: Provides the same function as the previous TE1 terminal.	The check connector is provided. **▶ Check Connector ◀** 
Diagnostic Trouble Code Check Method	After connecting terminals TC and CG of the DLC3, displays the code on CHECK Engine Lamp in the combination meter.	After connecting terminals TE1 and E1 of the check connector, displays the code on CHECK Engine Lamp in the combination meter.
Output Engine ECU Date	The engine ECU's control data can be output by connecting the hand-held tester to the DLC3. Output Date Speed: 9.6 kbps	The engine ECU's control data can be output by connecting the hand-held tester to the check connector. Output Date Speed: 125 bps

Furthermore, on the M-OBD system, the functions listed below can be utilized by connecting the hand-held tester to the DLC3.

Function	Details
Diagnostic Trouble Code	The system can output 5-digit diagnostic trouble codes to the tester, which are more detailed than the previous 2-digit diagnostic trouble codes, thus making it easier to identify the location of the problem. Example: Code 28 (Oxygen Sensor) → P0130 (Oxygen Sensor) → P0135 (Oxygen Sensor Heater)
Freeze-Frame Data	The system can output freeze-frame data to the tester. This data (which depicts the condition of the engine control system and the vehicle) is stored in the engine ECU at the very moment when the engine ECU has detected its last data of malfunction.
Active Test	Through the use of the tester, the actuators (VSV, fuel pump, ISC valve etc.) can be activated to a desired state.
Trouble Code Clear	Through the use of the tester, trouble codes stored in the engine ECU can be cleared.

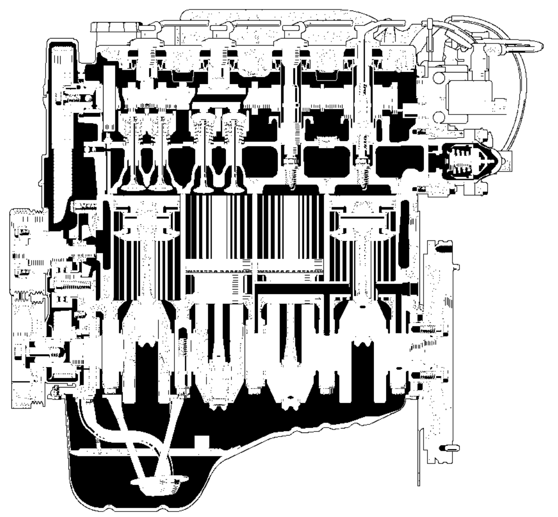
- For details of the diagnostic trouble codes, active test, etc. described above, refer to the 4A-F, -FE/7A-FE, Engine Repair Manual Supplement (Pub. No. RM611E).
- For details of the hand-held tester, refer to the Hand-Held Tester Operator's Manual.

4A-FE AND 7A-FE ENGINES (LEAN-BURN)

■ DESCRIPTION

The 4A-FE and 7A-FE engines realized improvement in torque in the low- to mid-speed range by changing the intake manifold and improvement in fuel economy by adopting resin-coated pistons.

▶ 4A-FE Engine ◀



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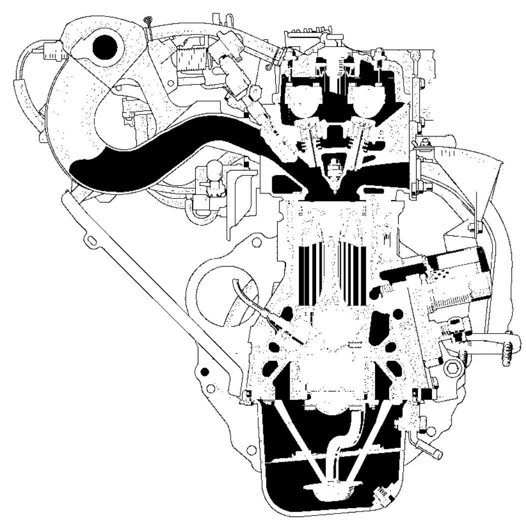

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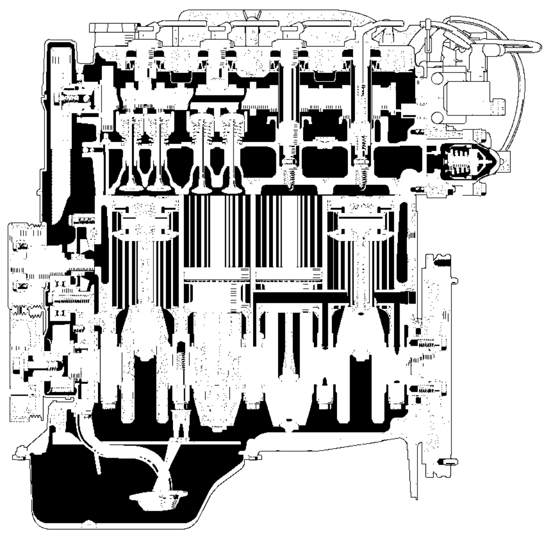
▶ 7A-FE Engine ◀



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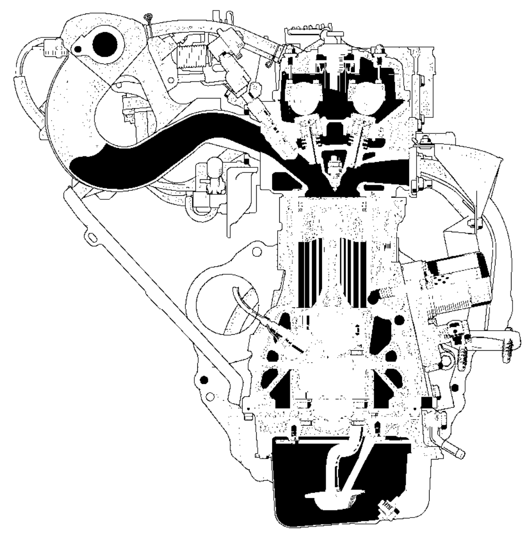
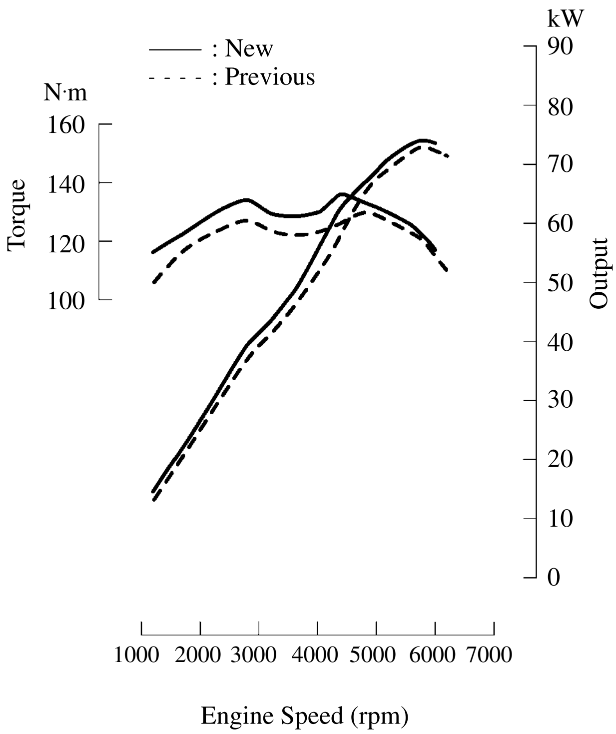


145EG08

■ENGINE SPECIFICATIONS AND PERFORMANCE CURVE (4A-FE ENGINE)

Item \ 4A-FE Engine			New	Previous
No. of Cyls. & Arrangement			4-Cylinder, In-Line	←
Valve Mechanism			16-Valve, DOHC, Belt & Gear Drive	←
Combustion Chamber			Pentroof Type	←
Manifold			Cross-Flow	←
Fuel System			EFI	←
Displacement cm³ (cu. in.)			1587 (96.8)	←
Bore x Stroke mm (in.)			81.0 x 77.0 (3.19 x 3.03)	←
Compression Ratio			9.5 : 1	←
Max. Output [EEC]			74 kW@5800 rpm	73 kW@5800 rpm
Max. Torque [EEC]			136 N·m@4400 rpm	130 N·m@4800 rpm
Valve Timing	Intake	Open	6°BTDC	←
		Close	38°ABDC	←
	Exhaust	Open	42°BBDC	←
		Close	2°ATDC	←
Fuel Octane Number (RON)			95	←
Oil Grade			API SH EC-II, SJ EC or ILSAC	←

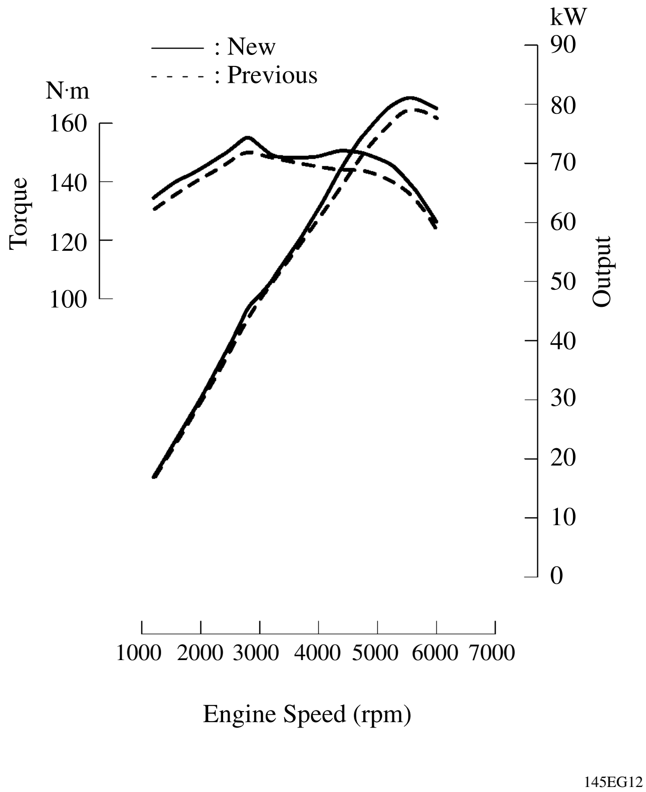


145EG11

EG

■ENGINE SPECIFICATIONS AND PERFORMANCE CURVE (7A-FE ENGINE)

Item \ 7A-FE Engine			New	Previous
No. of Cyls. & Arrangement			4-Cylinder, In-Line	←
Valve Mechanism			16-Valve, DOHC, Belt & Gear Drive	←
Combustion Chamber			Pentroof Type	←
Manifold			Cross-Flow	←
Fuel System			EFI	←
Displacement cm³ (cu. in.)			1762 (107.5)	←
Bore x Stroke mm (in.)			81.0 x 85.5 (3.19 x 3.37)	←
Compression Ratio			9.5 : 1	←
Max. Output [EEC]			81 kW@5600 rpm	79 kW@5600 rpm
Max. Torque [EEC]			155 N·m@2800 rpm	150 N·m@2800 rpm
Valve Timing	Intake	Open	2°BTDC	←
		Close	42°ABDC	←
	Exhaust	Open	38°BBDC	←
		Close	6°ATDC	←
Fuel Octane Number (RON)			95	←
Oil Grade			API SH EC-II, SJ EC or ILSAC	←



■MAJOR DIFFERENCES

The following changes have been made to the 4A-FE and 7A-FE Engines.

Item	Features
Engine Proper	● The cylinder head intake port has been changed in shape to improve engine performance and fuel economy. ● The pistons have been coated with resin to reduce friction loss and improve fuel economy.
Valve Mechanism	The spring tension of the valve springs are reduced to reduce friction loss.
Cooling System	An aluminum radiator core is used for weight reduction.
Intake and Exhaust System	● The ports of the intake manifold have been extended to improve torque in the low- to mid-speed range. ● A ball joint has been adopted in the front exhaust pipe to reduce noise and vibration. For details, see page 34. ● The internal construction of the main muffler has been optimized to improve its quietness and reduce the exhaust pressure. For details, see page 34. ● The support of the main muffler has been changed from the 3-point to 2-point support to reduce the noise and vibration that are transmitted to the body.
Fuel System	● 4-hole type fuel injectors have been adopted to improve the atomization of fuel. ● A fuel returnless system has been adopted to reduce evaporative emissions. For details, see page 34.
Ignition System	● The DIS (Direct Ignition System) is used to enhance the reliability of the ignition system. ● Iridium-tipped spark plugs have been adopted to improve ignition.
Engine Control System	● The ESA system of the 4A-FE engine has adopted a knocking correction function.* ● 1 Coil type ISC valve has been adopted. ● The power steering idle-up control has been changed from the system using an air control valve to the one using a pressure switch and an ISC valve. ● The radiator cooling fan is now controlled by the engine ECU. ● M-OBD (Multiplex On-Board Diagnosis) system is adopted. For detail, see page 40.

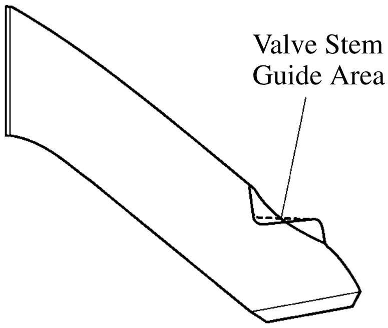
*: This function had already been adopted on the 7A-FE engine.

■ENGINE PROPER

1. Cylinder Head

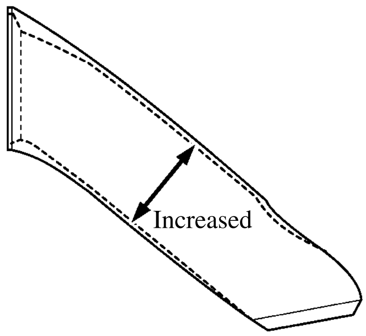
The cylinder head intake port (helical, straight) has been improved to improve engine performance and fuel economy.

- The shape of the valve stem guide area of the helical port has been changed to improve the swirl ratio without reducing the intake air volume to stabilize the lean-burn performance.
- The straight port diameter has been increased and the inside of the port has been made smoother to improve the volumetric efficiency during high-load conditions.
- The area of the port communication passage has been reduced to optimize the fuel distribution to the helical and straight ports.



Helical Port

145EG21

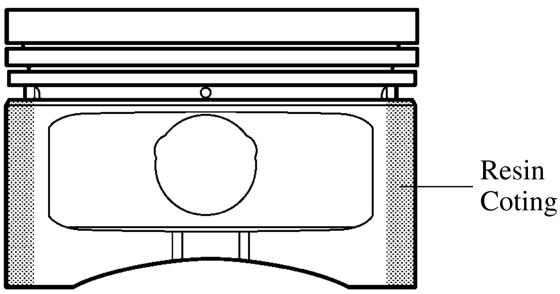


Straight Port

145EG20

2. Piston

The piston skirt has been coated with resin to reduce friction loss.

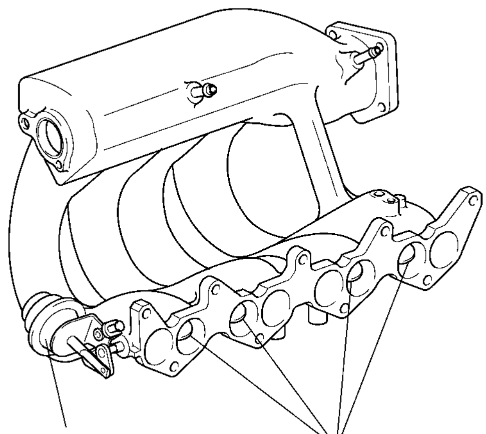


145EG22

■ INTAKE AND EXHAUST SYSTEM

1. Intake Manifold

- The intake manifold has been integrated with the intake air chamber for weight reduction.
- The length of the intake port has been optimized to improve the torque in the low- to mid-range engine speed.
- The intake air control valve and actuators have been integrated with the intake manifold.

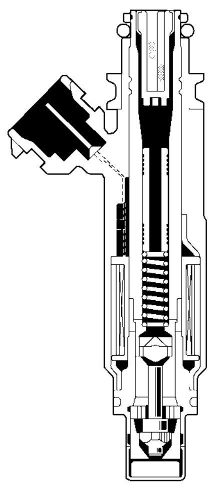


145EG23

■ FUEL SYSTEM

1. Injector

A 4-hole type fuel injector has been adopted to improve the atomization of fuel.

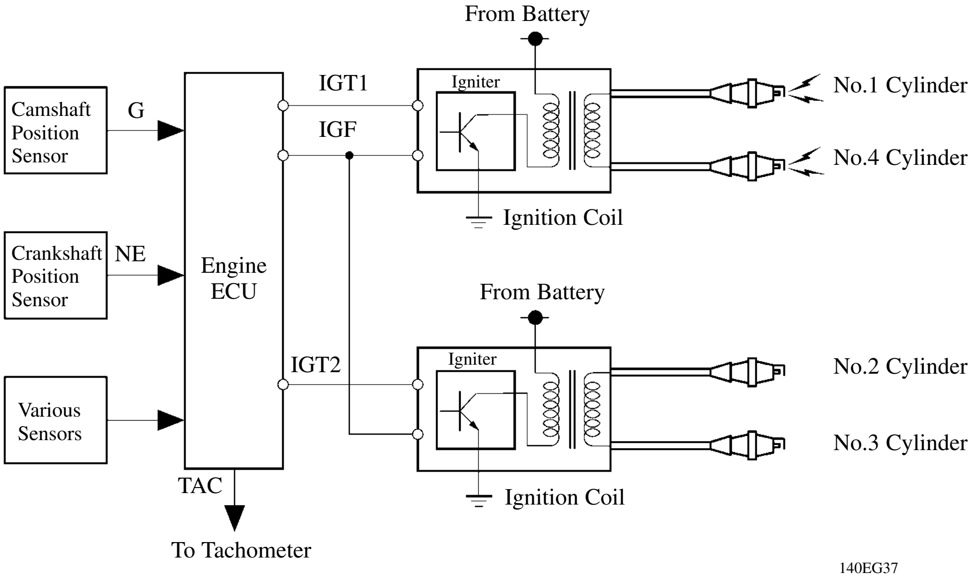


141EG12

■IGNITION SYSTEM

1. General

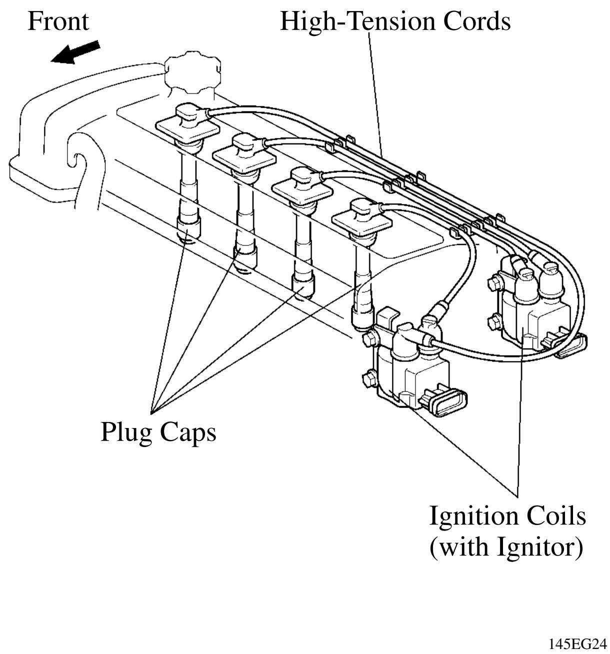
A DIS (Direct Ignition System) has been adopted in the new 4A-FE and 7A-FE engines. The DIS improves the ignition timing accuracy, reduces high-voltage loss, and enhances the overall reliability of the ignition system by eliminating the distributor.
The DIS in new 4A-FE and 7A-FE engines are a 2-cylinder simultaneous ignition system which ignites 2-cylinders simultaneously with one ignition coil.

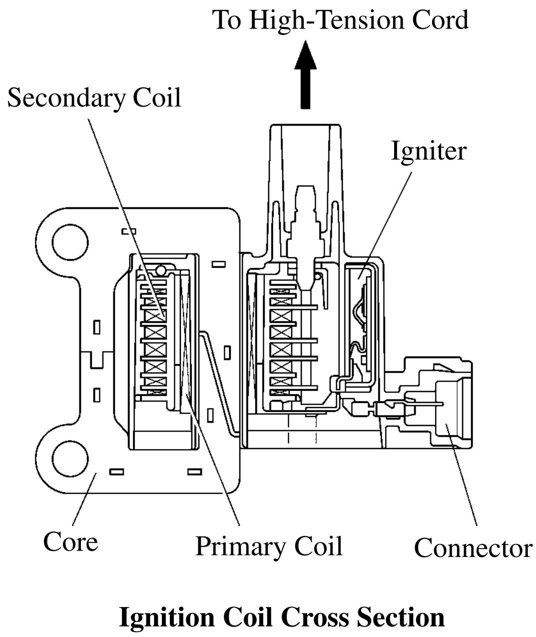


2. Ignition Coil

Construction

Construction the DIS system of the 4A-FE and 7A-FE engines consists of 2 sets of ignition coils integrated with igniter and with the high-tension cords attached directly onto the ignition coil.

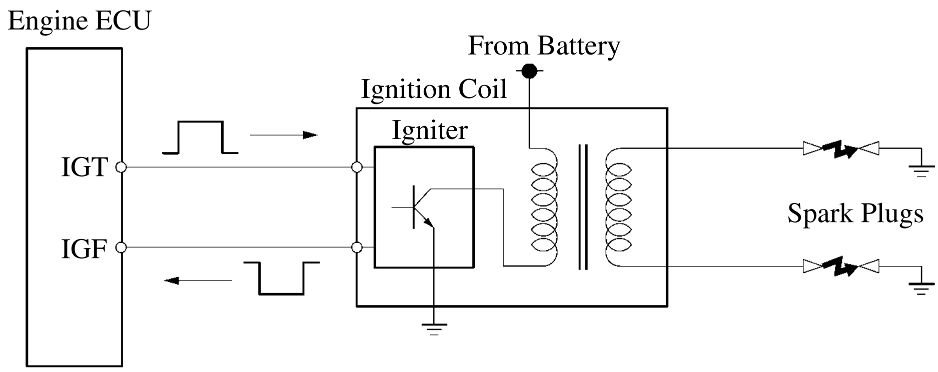




Ignition Coil Cross Section

Operation

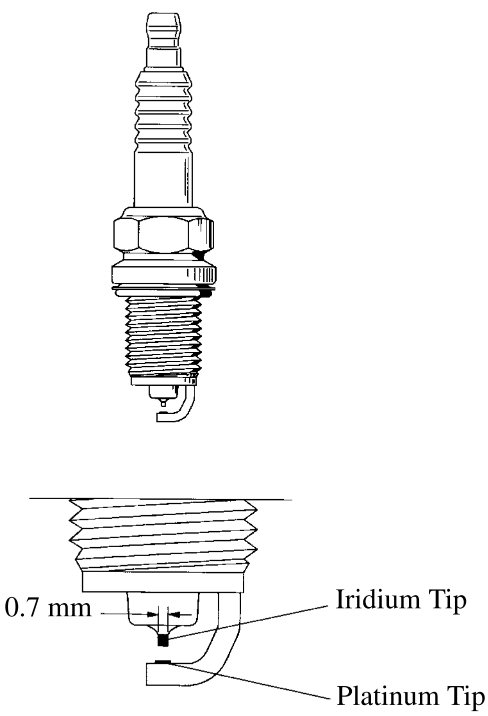
Prompted by the IGT signal received from the engine ECU, the power transistors in the igniter cuts off the current to the primary coil in the ignition coil. Accordingly, the high voltage generated in the secondary coil is supplied simultaneously to the two spark plugs via the high-tension cords that are connected to the both ends of the secondary coil. At the same time, the igniter also sends an ignition confirmation signal (IGF) as a fail-safe function to the engine ECU.



141EG06

3. Spark Plugs

Iridium-tipped spark plugs have been adopted. Their center electrode is made of iridium, which excels in wear resistance. As a result, the center electrode is made with a smaller diameter and improved the ignition performance.



151EG39

▶ Recommended Spark Plugs ◀

DENSO	SK20R-P13
Plug Gap	1.2 – 1.3 mm (0.047 – 0.051 in.)

■ENGINE CONTROL SYSTEM

1. General

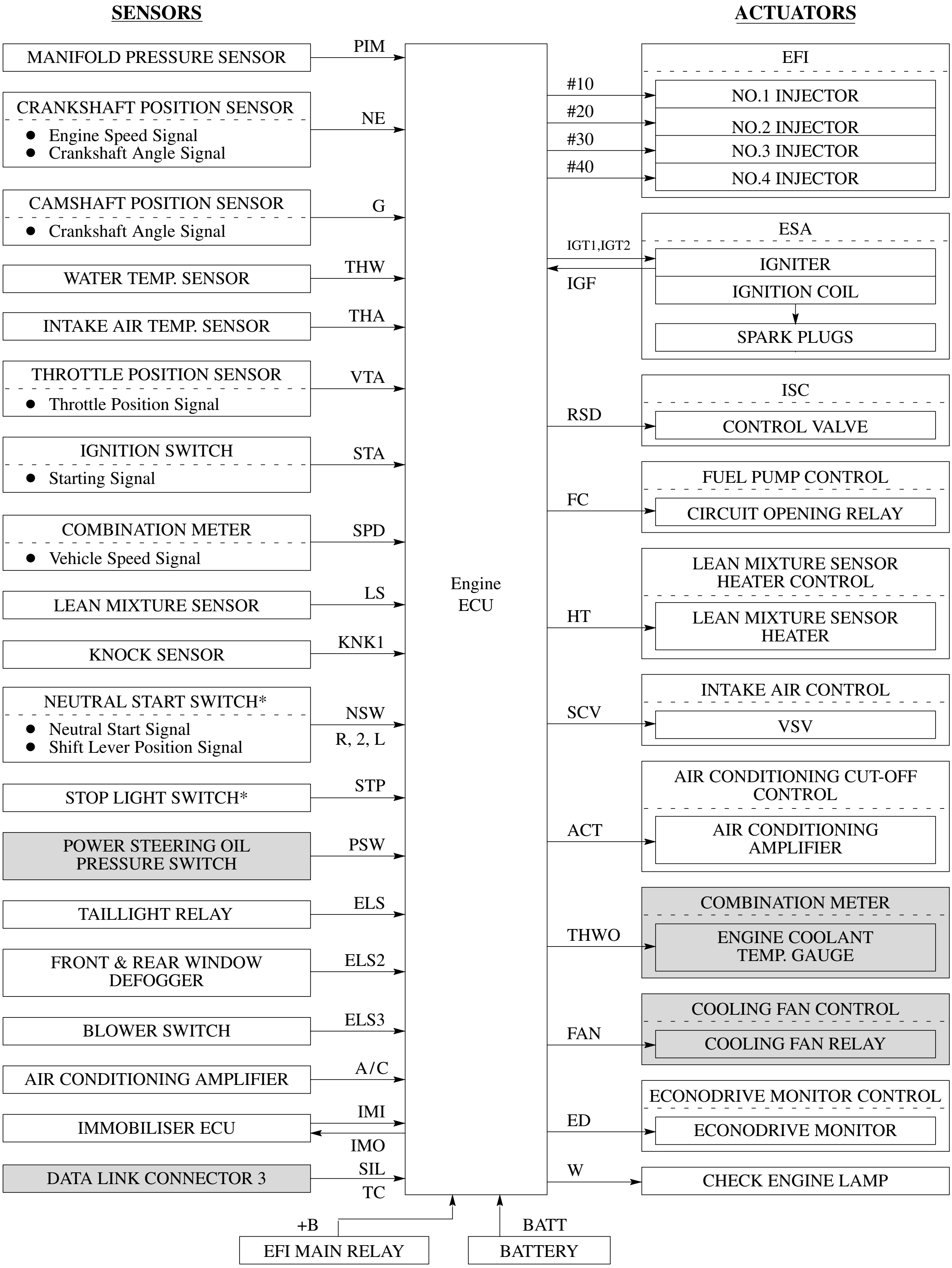
In addition to newly adopting the knocking correction function in the ESA system of the 4A-FE engine, the engine control system for all models has adopted a cooling fan control system and M-OBD (Multiplex On-Board Diagnosis) system.
The engine control system of the new engines and previous engines are compered below.

System	Outline	New	Previous
EFI (Electronic Fuel Injection)	A D-type EFI system is used, which indirectly detects intake air volume by the manifold pressure sensor signal.	○	○
	The fuel injection system is a sequential multiport fuel injection system.	○	○
ESA (Electronic Spark Advance)	Ignition timing is determined by the engine ECU based on signals from various sensors.	○	○
	It retards ignition timing to suppress knocking if knocking occurs.	○	○
	In vehicles equipped with automatic transaxle, torque control compensation during gear shifting is used to minimize the shift shock.	○*	○*
ISC (Idle Speed Control)	A rotary solenoid type ISC system is used, which controls the fast idle and idle speeds.	○	○
Intake Air Control	When the engine is under a light load and engine speed is below predetermined level fuel economy is improved by closing the intake air control valve.	○	○
Fuel Pump Control	Fuel pump operation is controlled by signals from the engine ECU based on the engine speed signal (NE).	○	○
Lean Mixture Sensor Heater Control	Maintains the temperature of the lean mixture sensor at an appropriate level to increase accuracy of detection of the oxygen concentration in the exhaust gas.	○	○
Air Conditioning Cut-Off Control	By turning the air conditioning compressor ON or OFF in accordance with the engine condition, drivability is maintained.	○	○
Cooling Fan Control	Radiator cooling fan operation is controlled by signals from engine ECU based on the water temperature sensor signal (THW).	○	–
Engine Immobiliser	Prohibits fuel delivery and ignition if an attempt is made to start the engine with an invalid ignition key.	○	○
Diagnosis	When the engine ECU detects a malfunction, the engine ECU diagnoses and memorizes the failed section.	○	○
	A newly developed diagnostic system which utilizes a high speed bi-directional communication line to provide extended diagnostic capabilities and features.	○	–
Fail-Safe	When the engine ECU detects a malfunction, the engine ECU stops or controls the engine according to the data already stored in memory.	○	○
Econodrive Monitor Control	Turns ON the indicator to inform the driver that the engine is operating at the lean-burn air-fuel ratio.	○	○

*: 7A-FE Engine Only

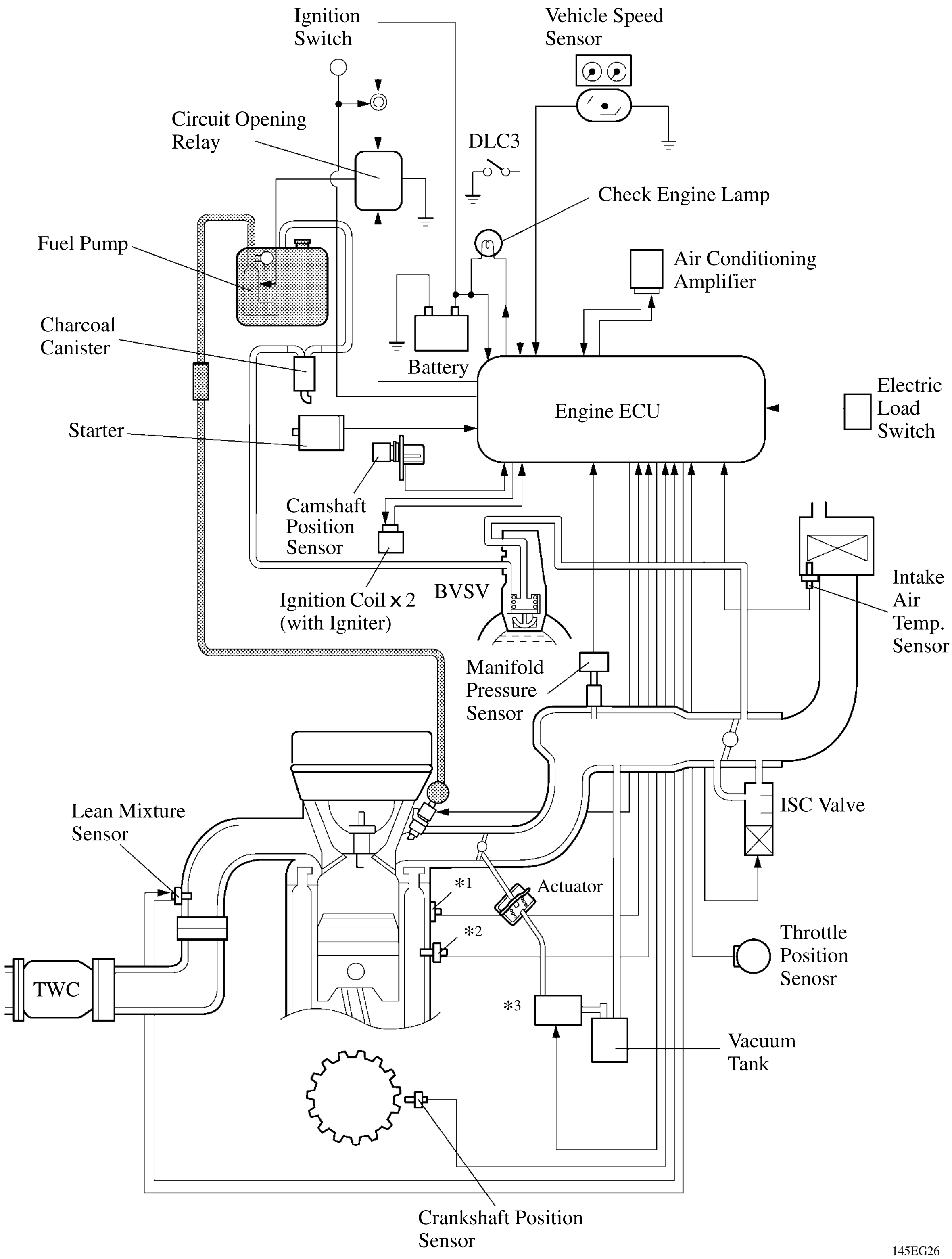
2. Construction

The configuration of the engine control system in the new 4A-FE and 7A-FE engines is as shown in the following chart. Shaded portions ▭ differ from the previous 4A-FE and 7A-FE engines.



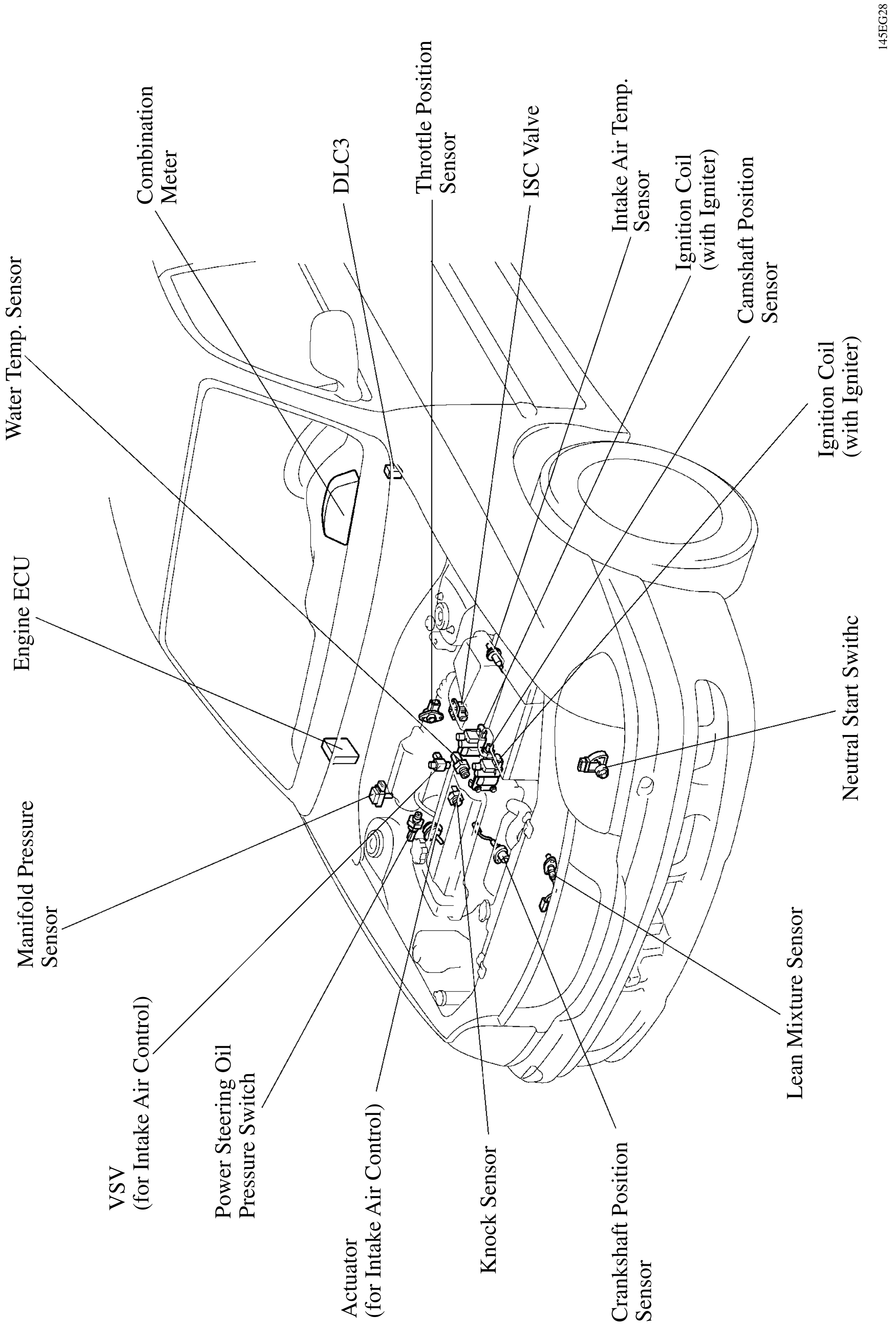
*: Applicable only to the automatic transaxle model.

3. Engine Control System Diagram



*1: Knock Sensor
*2: Water Temp. Sensor
*3: VSV (for Intake Air Control)

4. Layout of Components



5. Main Components of Engine Control System

General

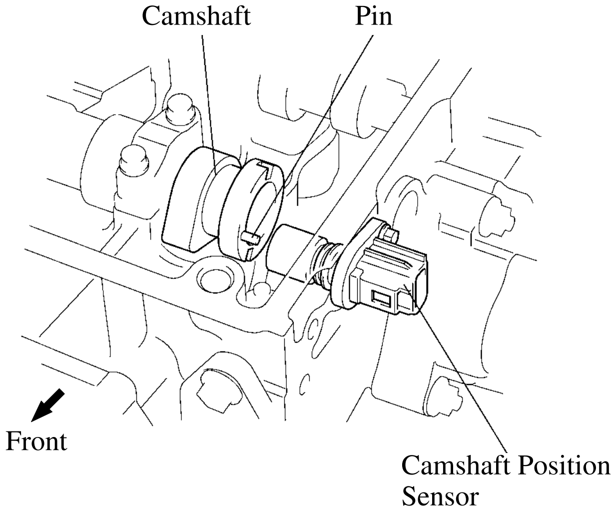
The following table compares the main components of the 4A-FE and 7A-FE engines in the new and previous model.

Component \ Model		New	Previous
Manifold Pressure Sensor		Semiconductor Type	←
Throttle Position Sensor		Linear Type	←
Crankshaft Position Sensor		Pick-Up Coil Type, 1	–
Camshaft Position Sensor		Pick-Up Coil Type, 1	–
Distributor	Crankshaft Position Sensor	–	2 Pick-Up Coils in Series
	Camshaft Position Sensor	–	Pick-Up Coil Type, 1
Knock Sensor		Built-In Piezoelectric Element Type, 1	Built-In Piezoelectric Element Type, 1*
Lean Mixture Sensor		With Heater Type	←
Injector		4-Hole Type	2-Hole Type
ISC Valve		Rotary Solenoid Type (1-Coil Type)	Rotary Solenoid Type (2-Coil Type)

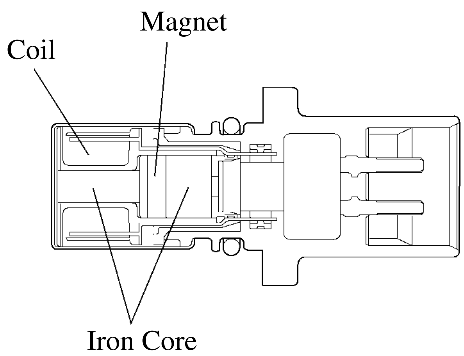
*: 7A-FE Engine Only

Camshaft Position Sensors

The camshaft position sensor consists of a magnet, coil and iron core, and it is mounted onto the right side of the cylinder head.
Each time when the camshaft rotates, the distance between the camshaft position sensor and the pin installed on the camshaft is varied. This causes the magnetic flux passing through the coil in the camshaft sensor to increase and decrease and to generate an electromotive force. Since the voltage generated when the pin on the camshaft approaches the pickup coil is the opposite of when it departs, an alternating electrical current is produced.



145EG34

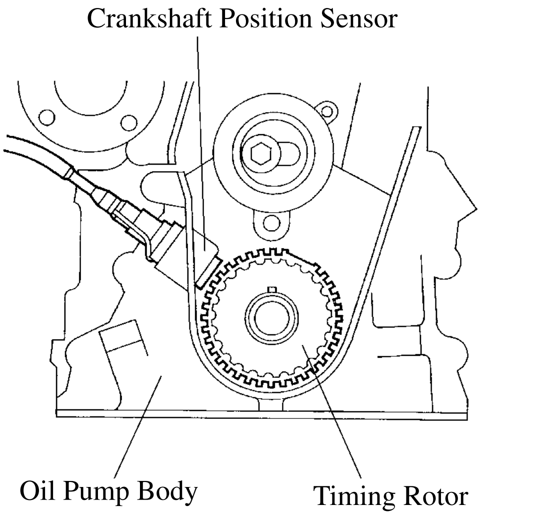


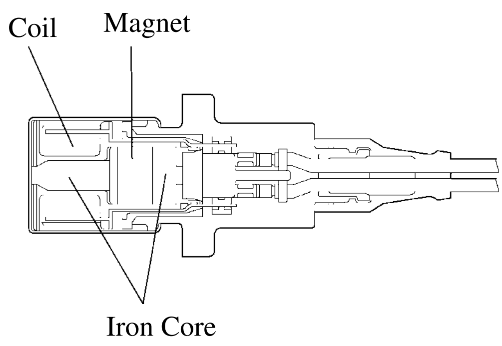
Camshaft Position Sensor Cross Section

145EG35

Crankshaft Position Sensor

The crankshaft position sensor also consists of a magnet, coil and iron core, and it is mounted on the oil pump body as illustrated below.
The timing rotor is integrated with the crankshaft pulley. The rotor's teeth are spaced 10° apart according to crankshaft angle, but since there are 2 teeth missing, as illustrated below, there is a total of 34 teeth. Accordingly, the engine ECU can detect the crankshaft angle in addition to the crankshaft speed.



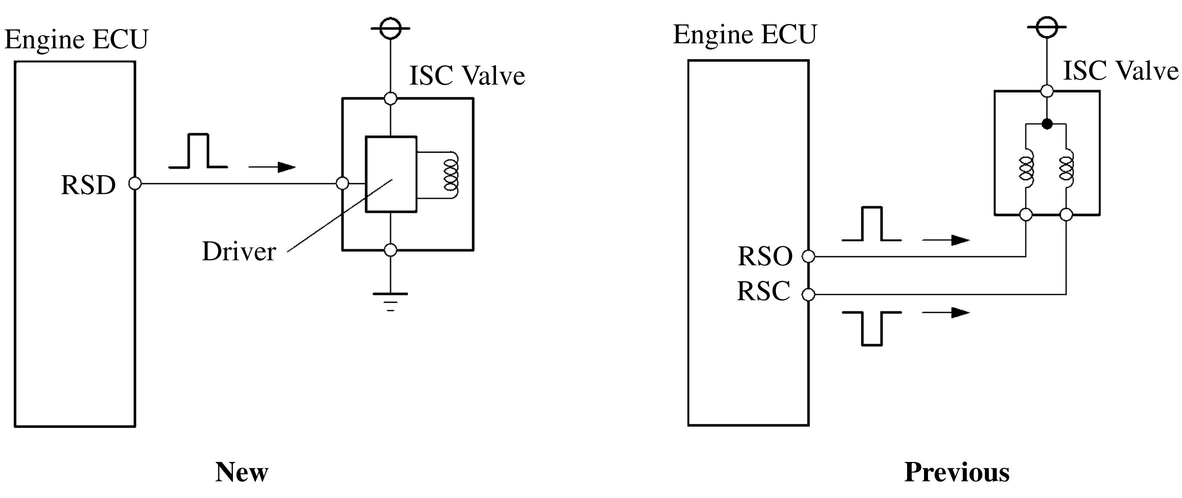


Crankshaft Position Sensor Cross Section

145EG36

ISC Valve

As on the previous model, a rotary solenoid type ISC valve is used to control the idle speed. However, instead of the 2 coils used on the previous model, the new model uses 1 coil to simplify its system.



7. ISC (Idle Speed Control)

The power steering idle-up control has been changed from the system using an air control valve to the one using a pressure switch and an ISC valve.

8. Cooling Fan Control

In the previous model, the operation of the cooling fan used to be controlled by the water temperature switch provided at the water inlet of the engine. In the new model, the cooling fan is controlled by the engine ECU based on the signal (THW) that is output by the water temperature sensor.

9. Engine Coolant Temperature Signal Output

In place of the temperature sender gauge used on the previous model, the engine ECU sends the engine coolant temperature signal to the engine coolant temperature gauge in the combination meter.

3S-FE ENGINE

■ DESCRIPTION

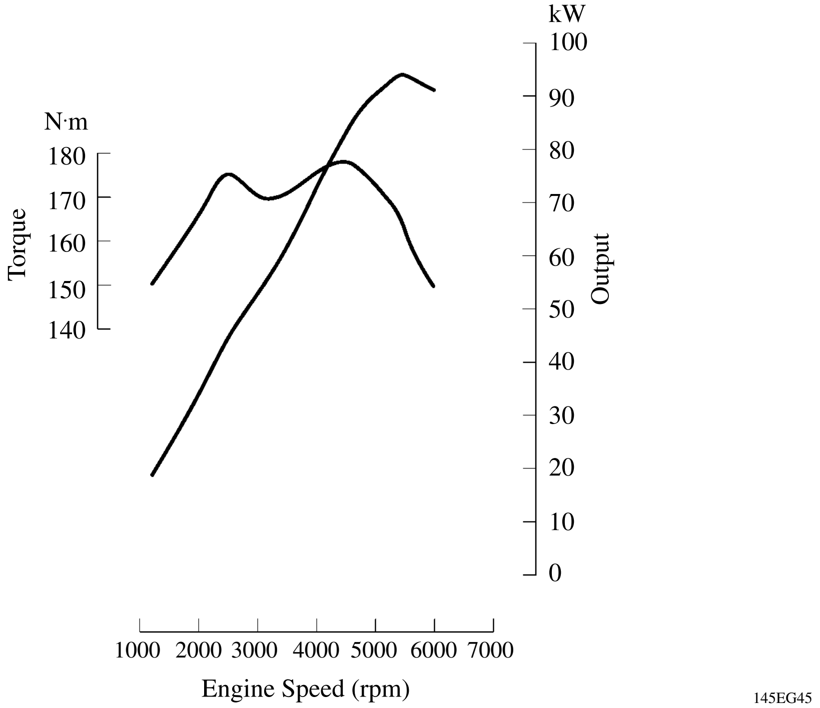
The 3S-FE engine has improved its torque in the low- to mid-speed range by changing the intake manifold and has adopted the DIS (Direct Ignition System) for its ignition system.

■ ENGINE SPECIFICATIONS AND PERFORMANCE CURVES

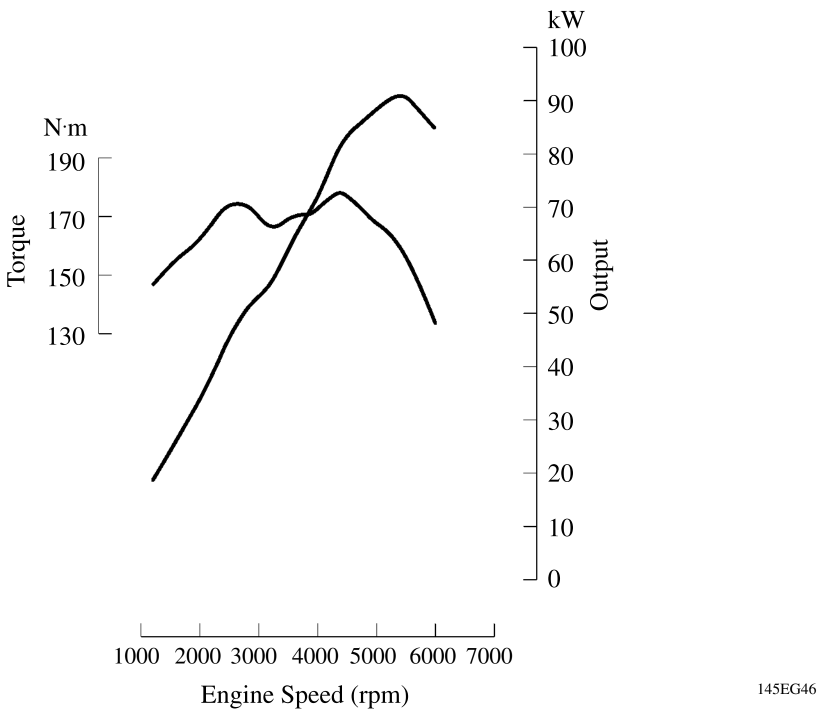
Item \ Engine			New	Previous
No. of Cyls. & Arrangement			4-Cylinder, In-Line	←
Valve Mechanism			4-Valve DOHC, Belt & Gear Drive	←
Combustion Chamber			Pentroof Type	←
Manifold			Cross-Flow	←
Fuel System			EFI	←
Displacement cm^3 (cu. in.)			1998 (121.9)	←
Bore x Stroke mm (in.)			86.0 x 86.0 (3.39 x 3.39)	←
Compression Ratio			9.8 : 1*1, 9.5 : 1*2	←
Max. Output [EEC]	Europe		94 kW@5400 rpm	93 kW@5600 rpm
	General Countries		91 kW@5400 rpm	95 kW@5600 rpm
Max. Torque [EEC]	Europe		178 N·m@4400 rpm	178 N·m@4400 ~ 4800 rpm
	General Countries		178 N·m@4400 rpm	182 N·m@4400 rpm
Valve Timing	Intake	Open	3°BTDC	←
		Close	43°ABDC	←
	Exhaust	Open	45°BBDC	←
		Close	3°ATDC	←
Fuel Octane Number RON			95*1, 90 or 95*2	←
Oil Grade			API SH EC-II, SJ EC ILSAC	←

*1: For Europe Model
*2: For General Countries Model

▶ For Europe ◀



▶ For General Countries ◀



■MAJOR DIFFERENCES

The following changes have been made to the 3S-FE Engine.

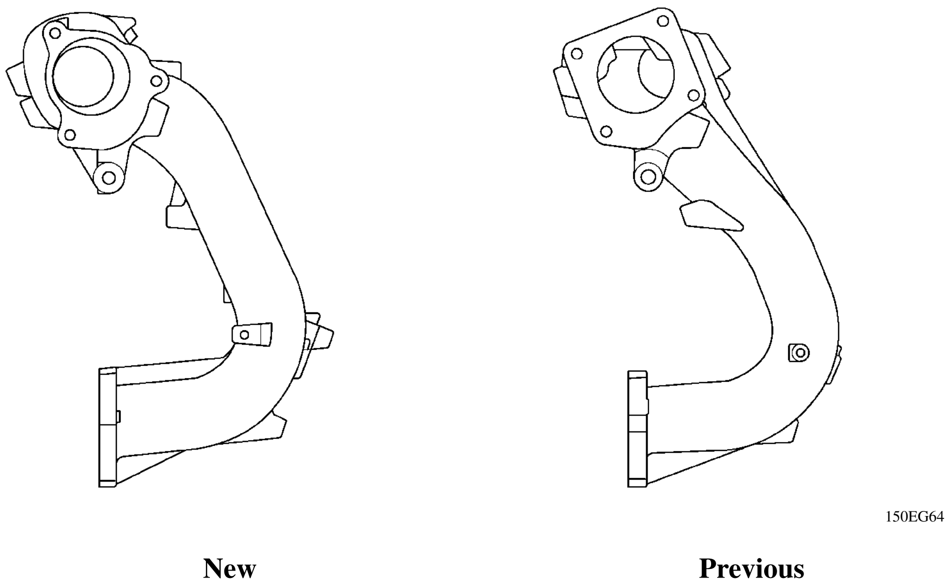
Item	Features
Cooling System	An aluminum radiator core is used for weight reduction.
Intake and Exhaust System	● The ports of the intake manifold have been extended to improve torque in the low- to mid-speed range. ● A ball joint has been adopted in the front exhaust pipe to reduce noise and vibration. ● The internal construction of the main muffler has been optimized to improve its quietness and reduce the exhaust pressure. For details, see page 34. ● The support of the main muffler has been changed from the 3-point to 2-point support to reduce the noise and vibration that are transmitted to the body.
Fuel System	A fuel returnless system has been adopted to reduce evaporative emissions*. For details, see page 34.
Ignition System	● The DIS (Direct Ignition System) is used to enhance the reliability of the ignition system.
Engine Control System	● The fuel injection system is changed from a 2-group injection type to sequential multiport fuel injection type. ● The power steering idle-up control has been changed from the system using an air control valve to the one using a pressure switch and an ISC valve. ● The radiator cooling fan is now controlled by the engine ECU. ● M-OBD (Multiplex On-Board Diagnosis) system is adopted. For details, see page 40.

*: Only for Europe Model

■INTAKE AND EXHAUST SYSTEM

1. Intake Manifold

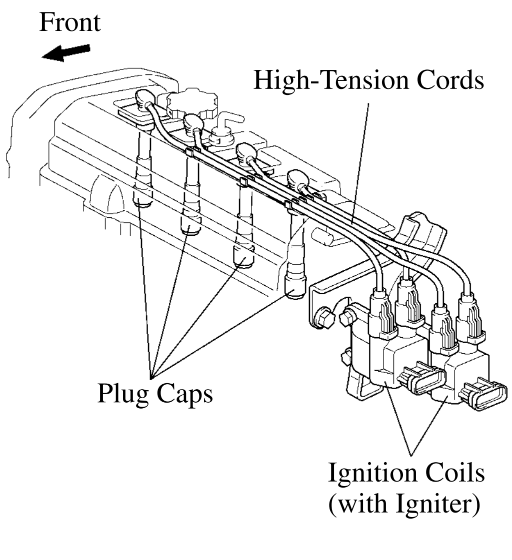
The low- to mid-speed range torque has been improved by increasing the diameter and the length of the intake manifold port and by reducing the intake air chamber capacity.

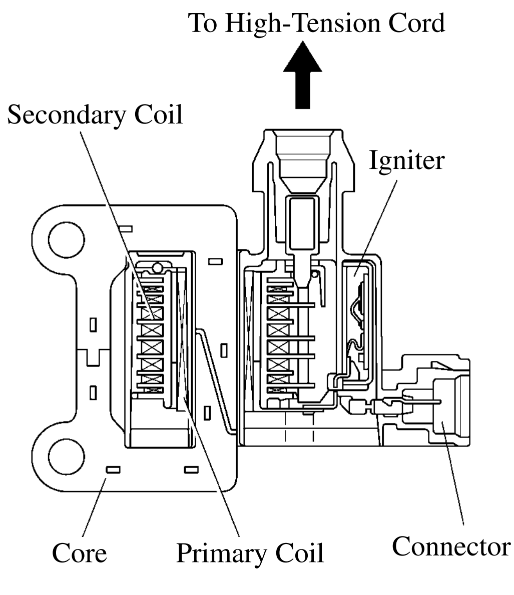


■IGNITION SYSTEM

1. General

Similar to the 4A-FE engine, the DIS (Direct Ignition System) has been adopted to improve the reliability of the ignition system.



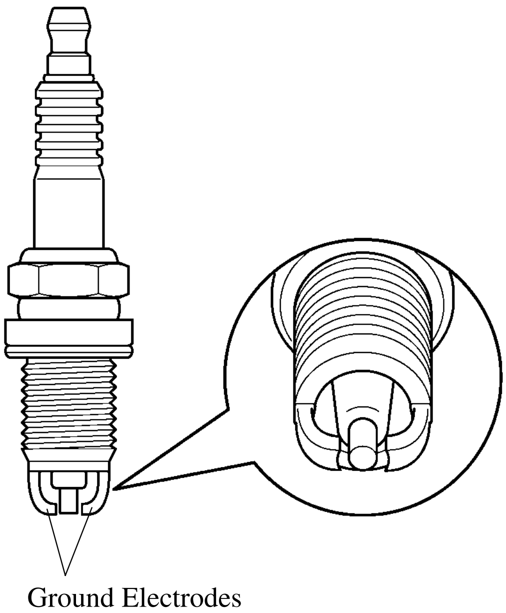


Ignition Coil Cross Section

141EG07

2. Spark Plugs

Twin ground electrode spark plugs are used on the 3S-FE engine. Due to the adoption of the DIS system, the number of sparks produced is double that produced in the conventional ignition system. To maintain spark plug durability, the ground electrodes have been made bipolar.



141EG08

▶ Recommended Spark Plugs ◀

DENSO	K20TR11
NGK	BKR6EKB11
Plug Gap	1.0 – 1.1 mm (0.039 – 0.043 in.)

■ENGINE CONTROL SYSTEM

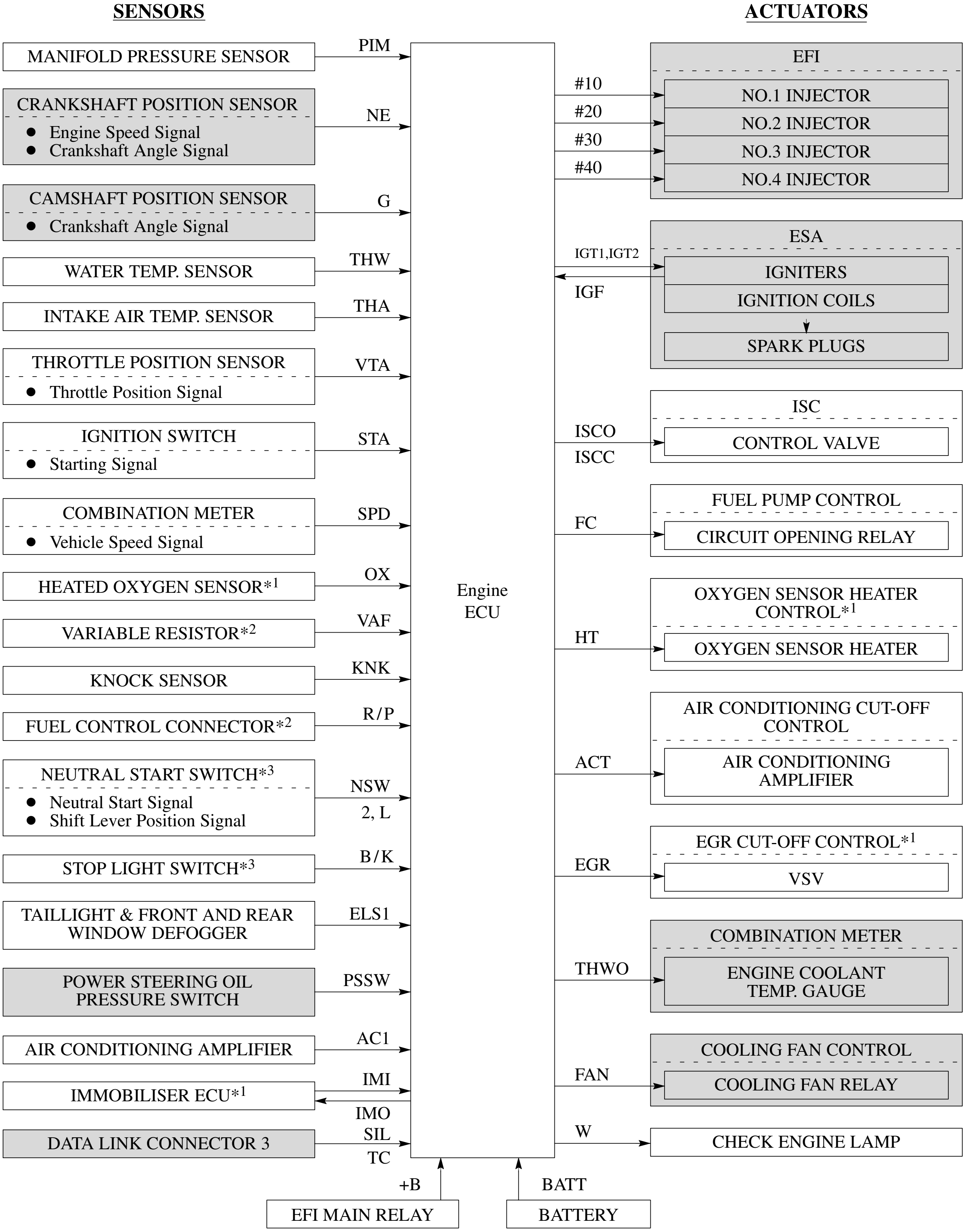
1. General

The 3S-FE engine has adopted the sequential multiport fuel injection system for its engine control system as well as an M-OBD (Multiplex On-Board Diagnosis) system.
The engine control system of new 3S-FE engine and previous 3S-FE engine are compared below.

System	Outline	New	Previous
EFI (Electronic Fuel Injection)	A D-type EFI system is used, which indirectly detects intake air volume by manifold pressure sensor signal.	○	○
	The fuel injection system is a sequential multiport fuel injection system.	○	–
	The fuel injection system is a 2-group type, each of which injects 2 cylinders simultaneously.	–	○
ESA (Electronic Spark Advance)	Ignition timing is determined by the engine ECU based on signals from various sensors.	○	○
	It retards ignition timing to suppress knocking if it occurs.	○	○
	In vehicles equipped with automatic transaxle, torque control compensation during gear shifting is used to minimize the shift shock.	○	○
ISC (Idle Speed Control)	A rotary solenoid type ISC valve is used, which controls the fast idle and idle speeds.	○	○
Fuel Pump Control	Fuel pump operation is controlled by signal from the engine ECU.	○	○
Oxygen Sensor Heated Control	Maintains the temperature of the oxygen sensor at an appropriate level to increase accuracy of detection of the oxygen concentration in the exhaust gas.	○	○
EGR Cut-Off Control	The EGR is cut off under light engine loads or low temperature conditions to maintain driveability.	○	○
Air Conditioning Cut-Off Control	By controlling the air conditioning compressor in accordance with the throttle valve opening angle and the vehicle speed, driveability is maintained.	○	○
Cooling Fan Control	Radiator cooling fan operation is controlled by signals from engine ECU based on the water temperature sensor signal (THW).	○	–
Diagnosis	When the engine ECU detects a malfunction, the engine ECU diagnoses and memorizes the failed section.	○	○
	A newly developed diagnostic system which utilizes a high speed bi-directional communication line to provide extended diagnostic capabilities and features.	○	–
Fail-Safe	When the engine ECU detects a malfunction, the engine ECU stops or controls the engine according to the data already stored in memory.	○	○

2. Construction

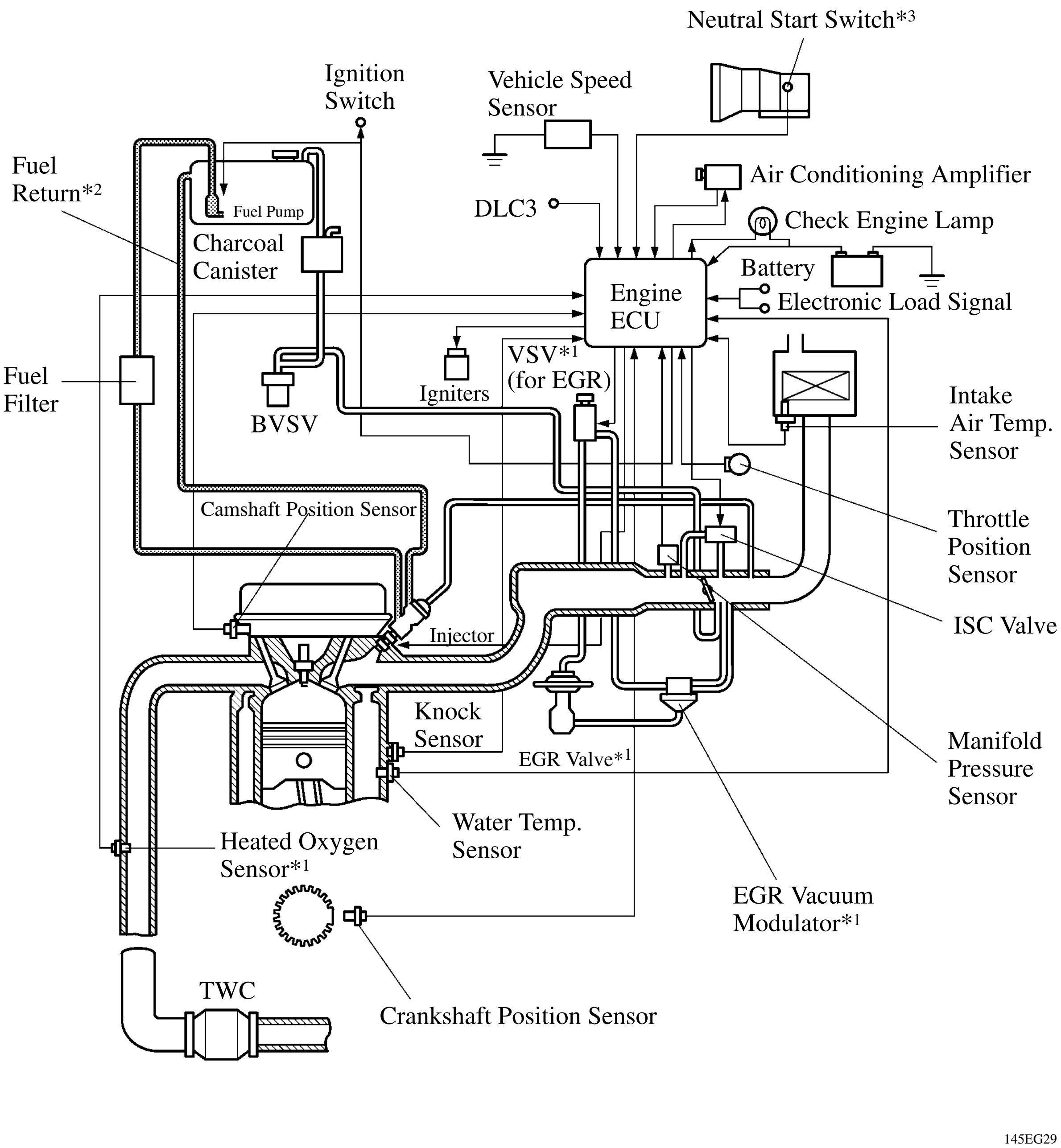
The configuration of the engine control system in the new 3S-FE engine is as shown in the following chart. Shaded portions differ from the previous 3S-FE engine.



*1: Only for Europe Model
*2: Only for General Countries Model
*3: Applicable only to the Automatic Transaxle Model.

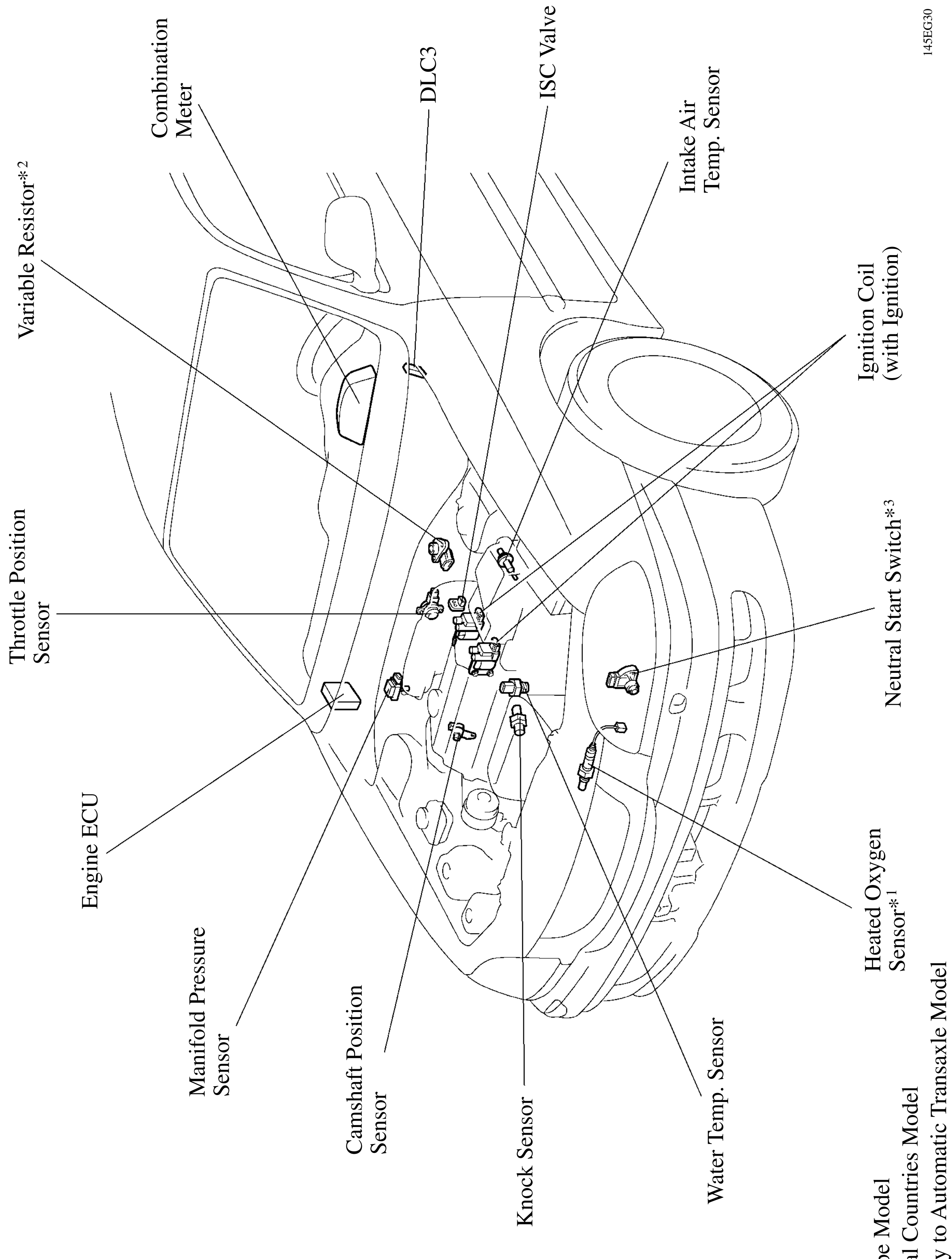
EG

3. Engine Control System Diagram



*1: Only for Europe Model
*2: Only for General Countries Model
*3: Automatic Transaxle Model Only

4. Layout of Components



*1 : Only for Europe Model
*2 : Only for Genral Countries Model
*3 : Applicable only to Automatic Transaxle Model

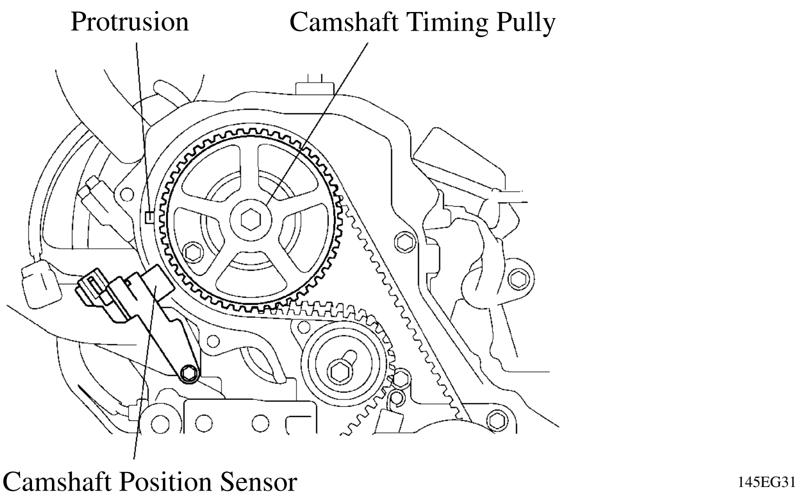
5. Main Components of Engine Control System

The following table compares the main components of the 3S-FE engine in the new and previous model.

Component \ Model		New	Previous
Manifold Pressure Sensor		Semiconductor Type	←
Throttle Position Sensor		Linear Type	←
Crankshaft Position Sensor		Pick-Up Coil Type, 1	–
Camshaft Position Sensor		Pick-Up Coil Type, 1	–
Distributor	Crankshaft Position Sensor	–	Pick-Up Coil Type, 1
	Camshaft Position Sensor	–	Pick-Up Coil Type, 1
Knock Sensor		Built-In Piezoelectric Element Type, 1	←
Oxygen Sensor		With Heater Type	←
Injector		4-Hole Type	2-Hole Type
ISC Valve		Rotary Solenoid Type	←

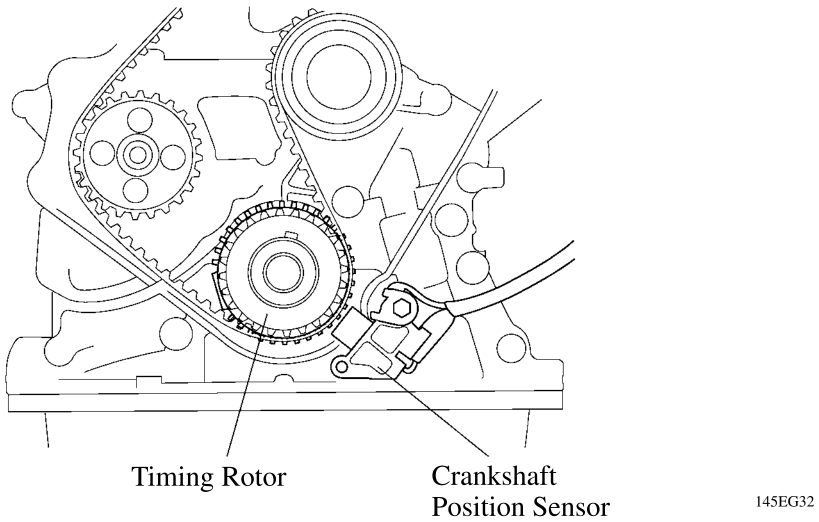
Camshaft Position Sensor

The camshaft position sensor is mounted onto the cylinder head. Using the protrusion that is provided on the timing pulley, the sensor generates 1 signal for every revolution.
This signal is then sent to the engine ECU as a crankshaft angle signal.



Crankshaft Position Sensor

The crankshaft position sensor is mounted on the oil pump body.
The timing rotor is integrated with the crankshaft pulley. The rotor's teeth are spaced 10° apart according to crankshaft angle but since there are 2 teeth missing, as illustrated below, there is a total of 34 teeth. Accordingly, the engine ECU can detect the crankshaft angle in addition to the crankshaft speed.



6. EFI (Electronic Fuel Injection System)

The injection pattern has been changed from the previous 2-group injection type to the Sequential Multiport fuel injection type to improve the precision of the air-fuel ratio feedback control.

7. ISC (Idle Speed Control)

The power steering idle-up control has been changed from the system using an air control valve to the one using a pressure switch and an ISC valve.

8. Cooling Fan Control

In the previous model, the operation of the cooling fan used to be controlled by the water temperature switch provided at the bottom of the radiator lower tank. In the new model, the cooling fan is controlled by the engine ECU based on the signal (THW) that is output by the water temperature sensor.

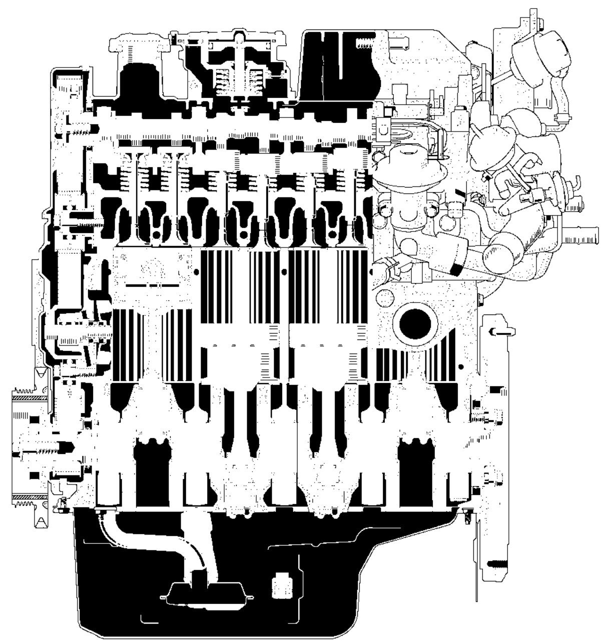
9. Engine Coolant Temperature Signal Output

In place of the temperature sender gauge used on the previous model, the engine ECU sends the engine coolant temperature signal to the engine coolant temperature gauge in the combination meter.

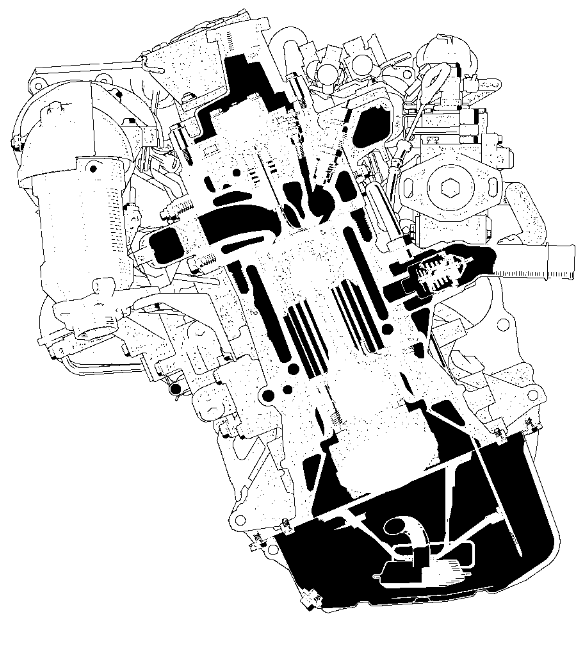
2C-T AND 2C-TE ENGINES

■ DESCRIPTION

Based on the 2C-T engine, the 2C-TE provides improved engine performance through the use of an intercooler, as well as improved driveability and reduced exhaust emissions through the use of an electronically controlled injection pump.
In the 2C-T engine, the distance between the intake and exhaust valves in the cylinder head has been increased to improve the cooling performance between the valves.



145EG18

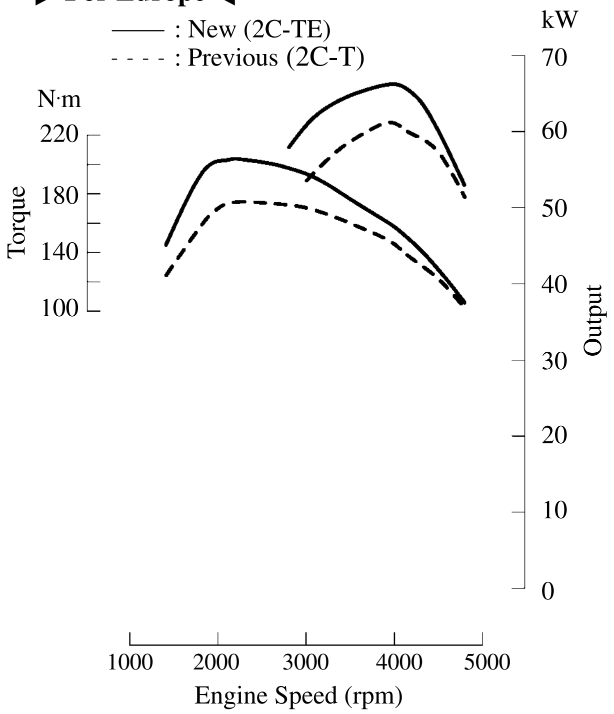


145EG19

■ ENGINE SPECIFICATIONS AND PERFORMANCE CURVES

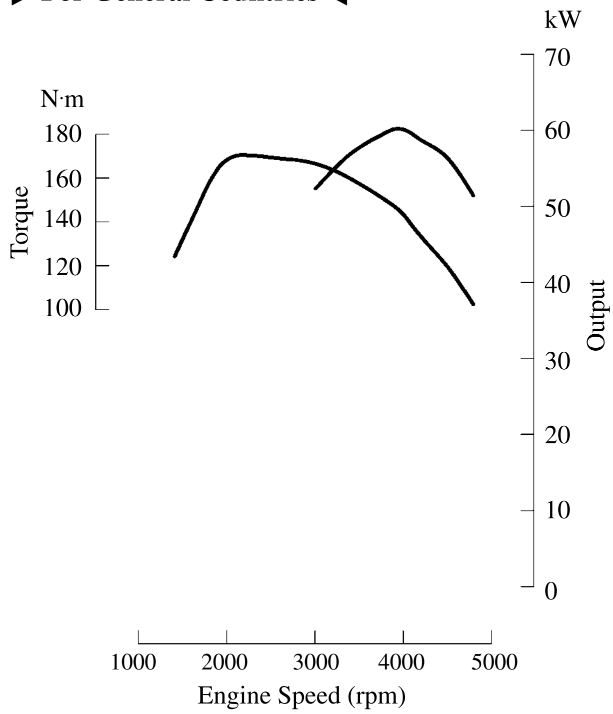
Model / Engine / Item			New 2C-TE	New 2C-T	Previous 2C-T
No. of Cyls. & Arrangement			4-Cylinder, In-Line		←
Valve Mechanism			8-Valve, OHC, Belt Drive		←
Combustion Chamber			Swirl Type		←
Manifolds			Cross-Flow		←
Fuel System			Distributor Type (Electronically Controlled)	Distributor Type (Mechanically Controlled)	←
Displacement cm³ (cu. in.)			1975 (120.5)		←
Bore x Stroke mm (in.)			86.0 x 85.0 (3.39 x 3.35)		←
Compression Ratio			23.0 : 1		←
Max. Output [EEC]		Europe	66 kW@4000 rpm	60 kW/4000 rpm	61kW@4000 rpm
		General Countries	–	60 kW/4000 rpm	61 kW@4000 rpm
Max. Torque [EEC]		Europe	203 N·m@2200 rpm	170 N·m@2000～3000 rpm	174 N·m@2000～3000 rpm
		General Countries	–	170 N·m@2000～3000 rpm	174 N·m@2000～3000 rpm
Valve Timing	Intake	Open	7°BTDC		←
		Close	35°ABDC		33°ABDC
	Exhaust	Open	56°BBDC		←
		Close	5°ATDC		←
Fuel Cetane Number			48 or higher		←
Oil Grade			CF-4		API CD or Better

▶ **For Europe** ◀



145EG38

▶ **For General Countries** ◀



145EG39

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■ MAJOR DIFFERENCES

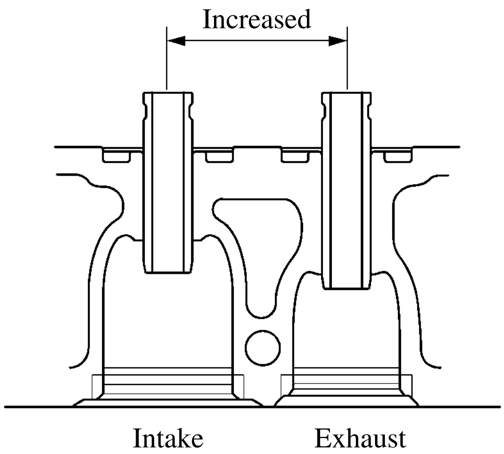
The following changes have been made to the 2C-TE and 2C-T engine.

Item	Features	2C-TE	2C-T
Engine Proper	● The distance between the intake and exhaust valves in the cylinder head has been increased to improve the cooling performance. ● The shape of the combustion chamber has been optimized to improve the torque in the low- to mid-speed range.	○	○
Intake and Exhaust System	● A diesel throttle has been adopted to reduce intake air noise and vibration. ● An intercooler has been adopted to improve engine performance. ● The exhaust manifold adopts a two-part construction to improve its reliability.	○	–
	● The internal construction of the main muffler has been optimized to improve its quietness and reduce the exhaust pressure. ● The support of the main muffler has been changed from the 3-point to 2-point support to reduce the noise and vibration that are transmitted to the body.	○	○
Turbocharger System	The size of the vanes and the clearance between various parts have been optimized to improve the turbocharging efficiency.	○	–
Cooling System	An aluminum radiator core is used for weight reduction.	○	○
Fuel System	An electronically controlled injection pump is used.	○	–
Engine Control System	● An electronic fuel injection system has been adopted. ● M-OBD (Multiplex On-Board Diagnosis) system is adopeted.	○	–

■ENGINE PROPER

1. Cylinder Head

The distance between the intake and exhaust valves has been increased to improve the cooling performance.



145EG40

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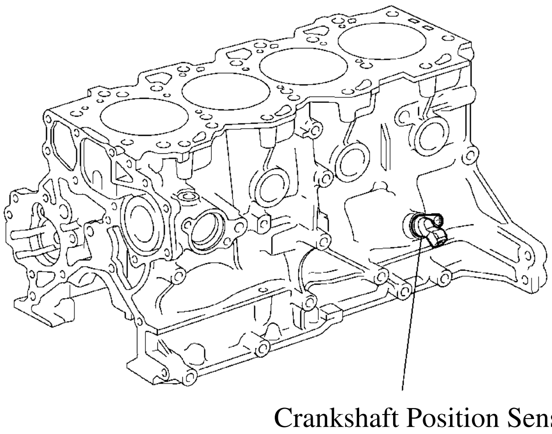
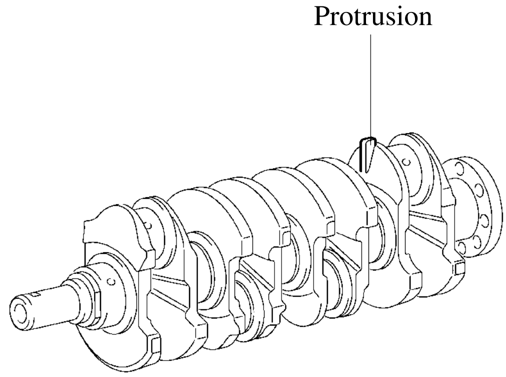
2. Cylinder Block and Crankshaft (Only for 2C-TE ENGINE)

Along with the adoption of the engine control system, a crankshaft position sensor has been provided in the cylinder block, and a protrusion has been provided on the crankshaft to generate a signal.



Cylinder Block

141EG21



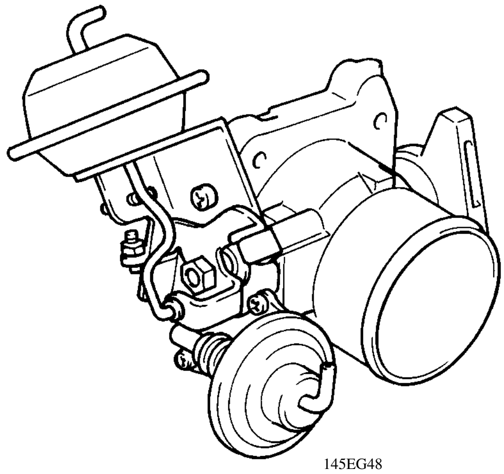
Crankshaft

141EG22

■INTAKE AND EXHAUST SYSTEM

1. Diesel Throttle (Only for 2C-TE Engine)

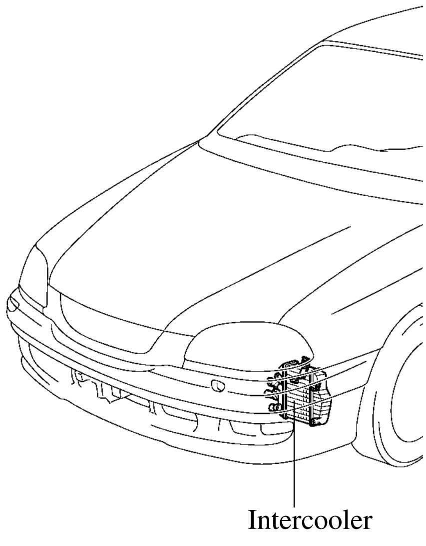
- The throttle valve that is not linked directly to an accelerator pedal has been adopted to reduce the noise and vibration during idling, deceleration, and when the engine is stopped.
- The throttle valve opening is controlled by the engine ECU in accordance with the engine condition, in the following 3 stages: wide open, idle opening, and fully closed.



145EG48

2. Intercooler (Only for 2C-TE Engine)

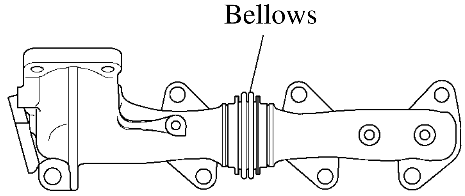
An intercooler has been adopted to improve engine performance.
The intercooler is provided in the left side of the front bumper.



145EG41

3. Exhaust Manifold (Only for 2C-TE Engine)

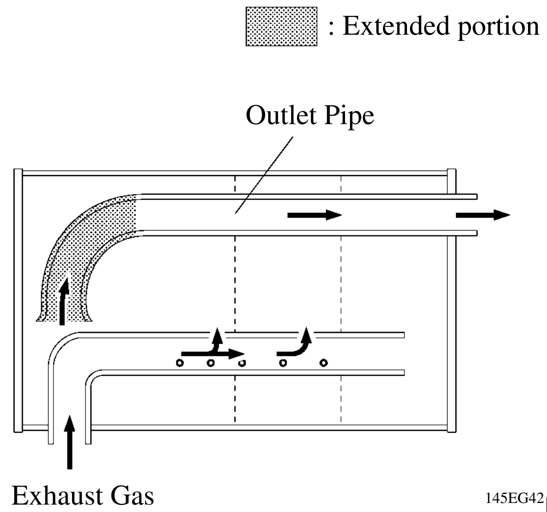
The exhaust manifold adopts a two-part construction in which the two parts are connected by a bellows to improve the manifold's reliability.



145EG53

3. Exhaust Pipe

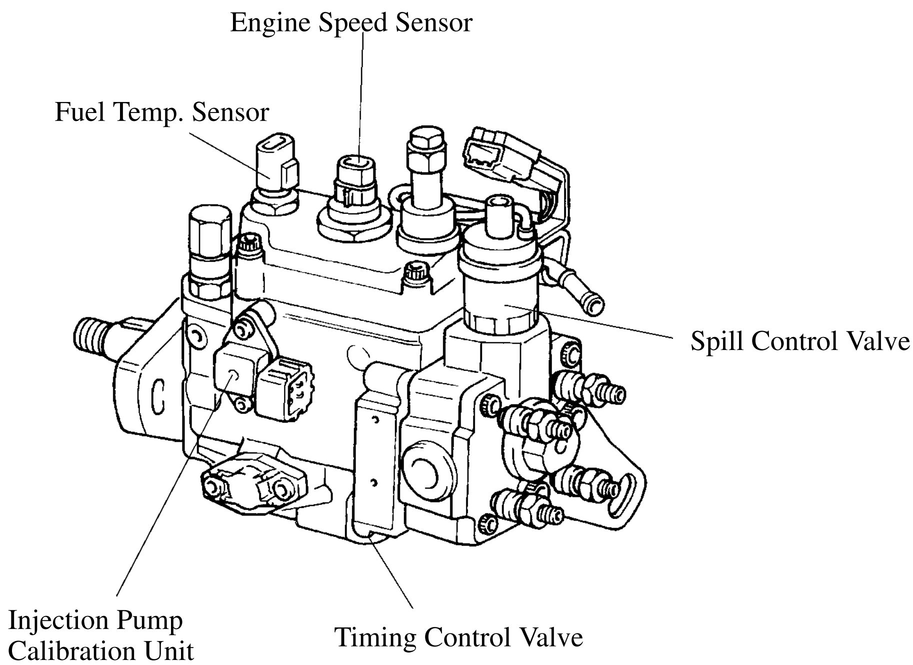
The outlet pipe in the main muffler has been extended and various components have been optimally located to improve quietness and reduce the exhaust pressure.



■ FUEL SYSTEM

1. Injection Pump (Only for 2C-TE Engine)

Along with the adoption of the engine control system, a spill control valve, timing control valve, fuel temperature sensor, engine speed sensor, and injection pump calibration unit have been provided.



■ENGINE CONTROL SYSTEM (ONLY FOR 2C-TE ENGINE)

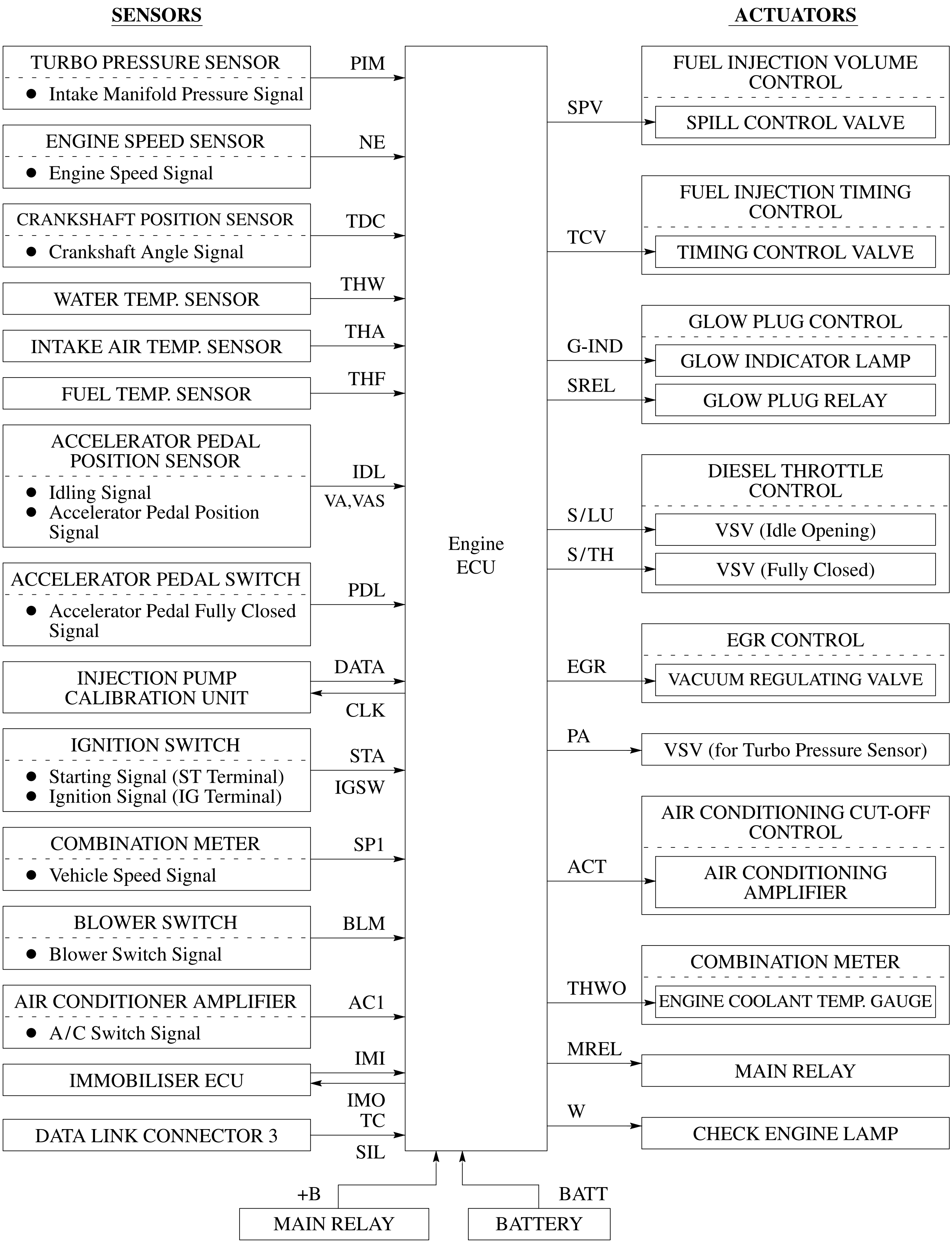
1. General

To operate the engine is an optimal condition. The engine control system of the 2C-TE engine have general control of the following functions: fuel injection volume control, fuel injection timing control and idle speed control. In addition, a diagnosis function has been added to improve the serviceability of the engine.

System	Outline
Fuel Injection Volume Control	Based on the signals received from the sensors, the engine ECU determines the fuel injection volume in accordance with the engine condition.
Fuel Injection Timing Control	Based on the signals received from the sensors, the engine ECU determines the fuel injection timing in accordance with the engine condition.
Idle Speed Control	The engine ECU determines the idle speed in accordance with the engine condition, and controls the fuel injection volume in order to achieve the target idle speed.
Stable Idling Control	Corrects the fuel injection volume that is directed to each cylinder during idling, thus reducing engine vibration.
Diesel Throttle Control	Controls the throttle valve opening in 3 stages in accordance with the engine condition.
Glow Plug Control	Controls the length of time when the current is applied to the glow plugs in accordance with the coolant temperature.
EGR Control	Controls the engine EGR volume in accordance with the engine condition.
Air Conditioning Cut-Off Control	By controlling the air conditioning compressor ON or OFF in accordance with the engine condition, drivability is maintained.
Engine Immobiliser	Prohibits fuel delivery if an attempt is made to start the engine with an invalid ignition key.
Diagnosis	● When the engine ECU detects a malfunction, the engine ECU diagnoses and memorizes the failed section. ● A newly developed diagnostic system which utilizes a high speed bi-directional communication line to provide extended diagnostic capabilities and features.
Fail-Safe	When the engine ECU detects a malfunction, the engine ECU stops or controls the engine according to the data already stored in memory.

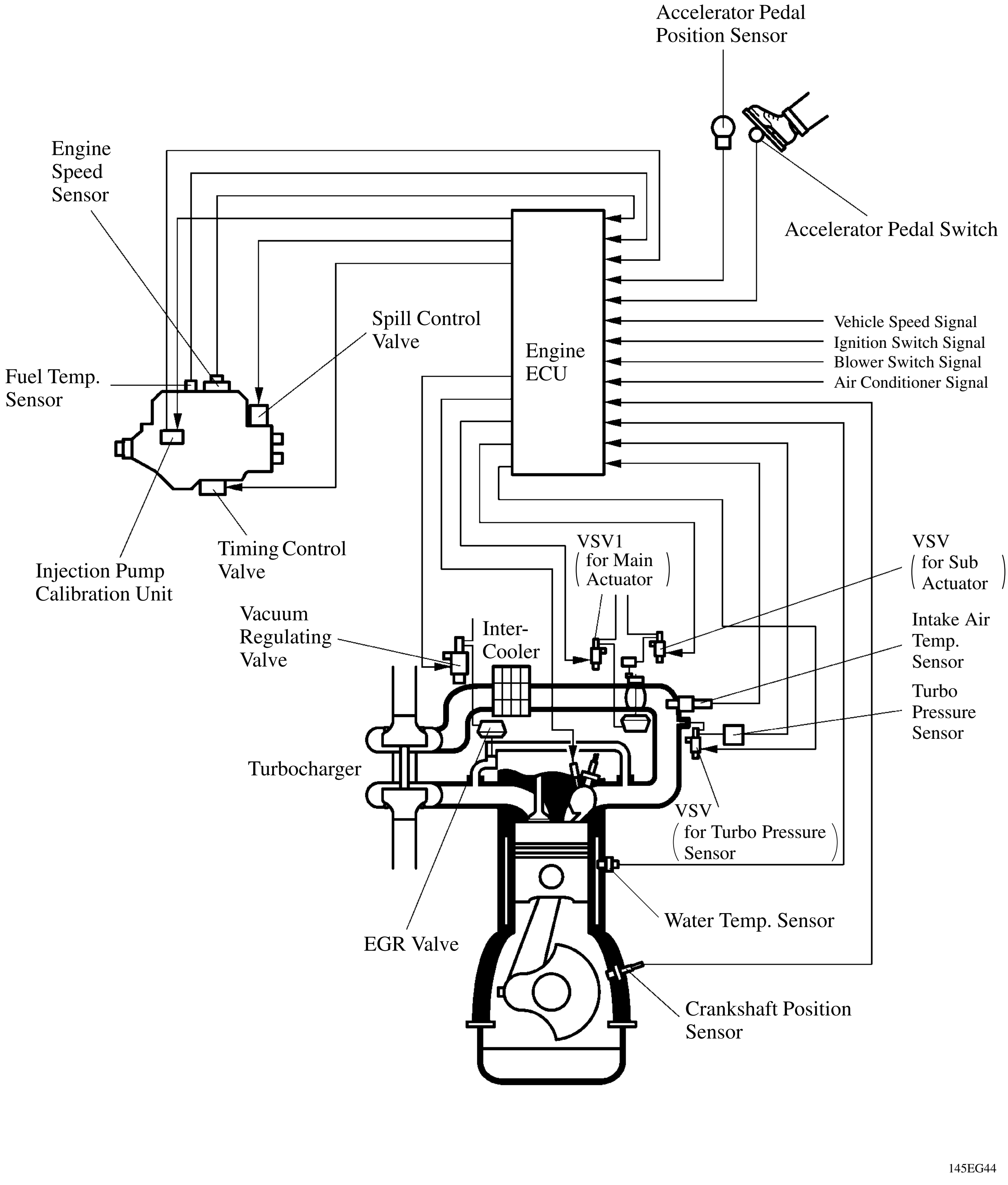
2. Construction

The configuration of the engine control system which can be broadly divided into three groups: the engine ECU, the sensors and the actuators, is shown in the following chart.

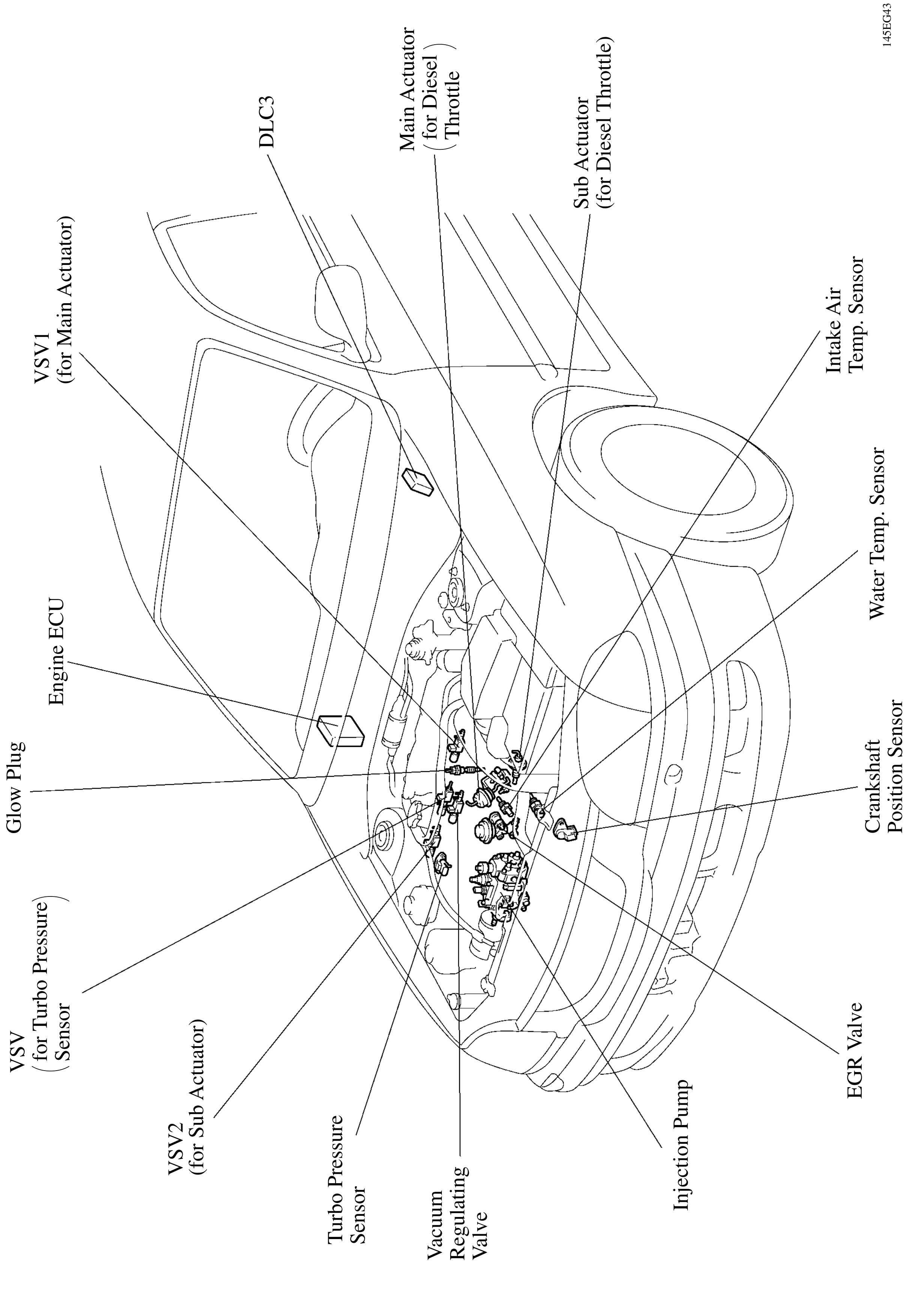


EG

3. Engine Control System Diagram



4. Layout of Components



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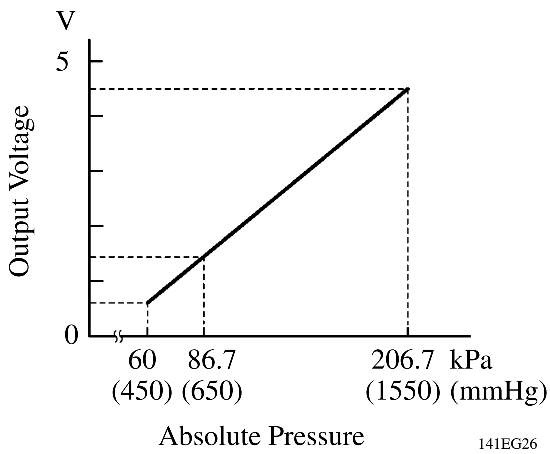
5. Main Components of Engine Control System

Turbo Pressure Sensor

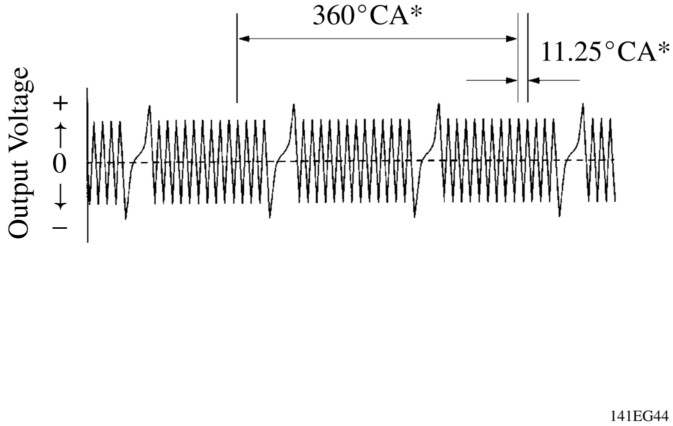
The turbo pressure sensor consists of a semiconductor which utilizes the characteristic of a silicon chip that changes its electrical resistance when pressure is applied to it. The sensor converts the intake air pressure into an electrical signal, and sends it to the engine ECU in an amplified form.
In addition, the atmospheric pressure can be detected by switching the piping passage through the operation of the VSV.

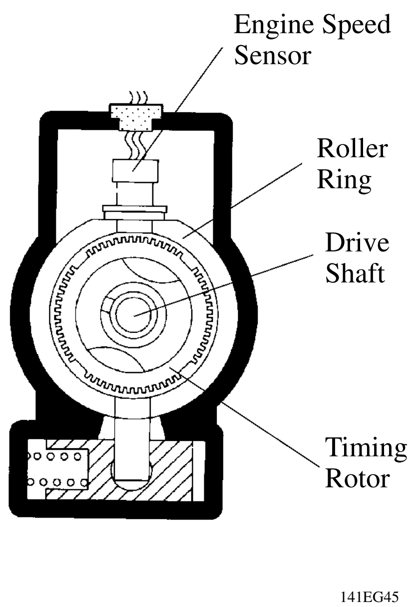


Turbo Pressure Sensor Output Characteristics

Engine Speed Sensor

The engine speed sensor is attached to the roller ring in the injection pump to detect the engine speed. The timing rotor is attached to the drive shaft. Missing 2 teeth at each of the 4 locations, the timing rotor generates a signal every 11.25° (crankshaft angle) with its 56 teeth.

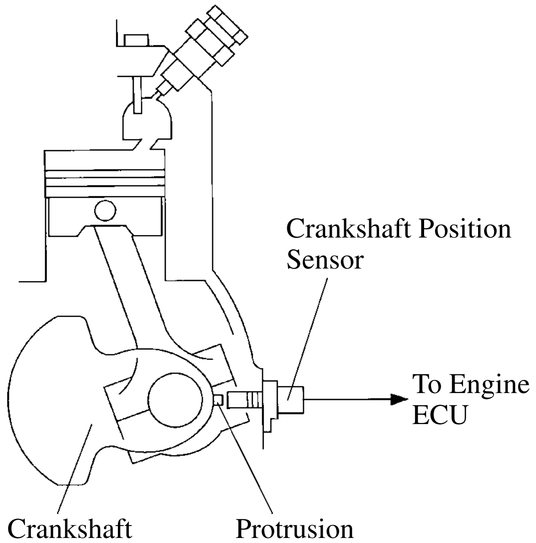




*: CA (Crankshaft Angle)

Crankshaft Position Sensor

The crankshaft position sensor is attached to the cylinder block. Using the protrusion that is provided on the crankshaft, the sensor generates 1 signal for every revolution. This signal is then sent to the engine ECU as a crankshaft position signal.



141EG46

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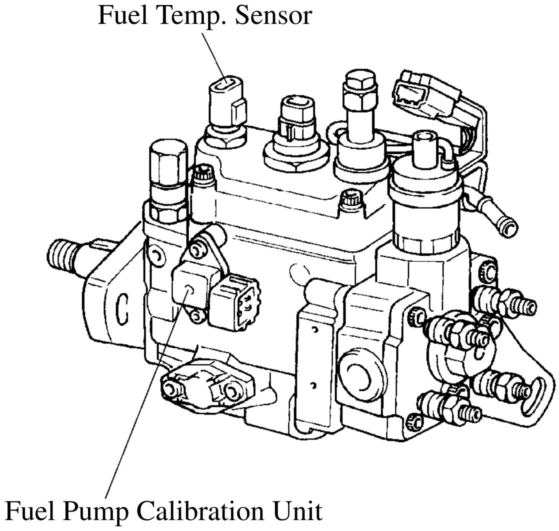
Fuel Temperature Sensor

The fuel temperature sensor is attached to the injection pump, and uses an internal thermistor to detect the fuel temperature.

Fuel Pump Calibration Unit

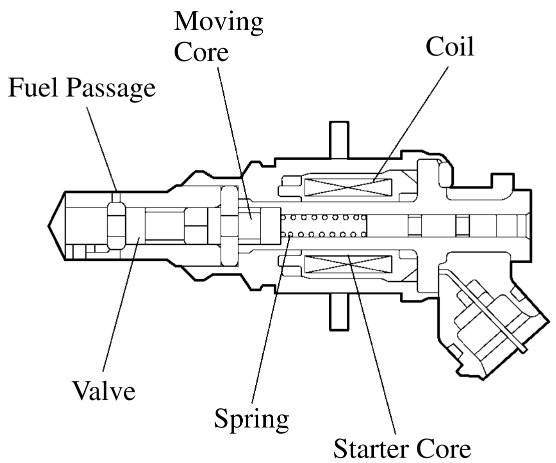
To compensate for the shift in injection volume and injection timing caused by the variances in the injection pump itself, a correction is made by using the data that is stored in the ROM in the fuel pump calibration unit.



145EG47

Timing Control Valve

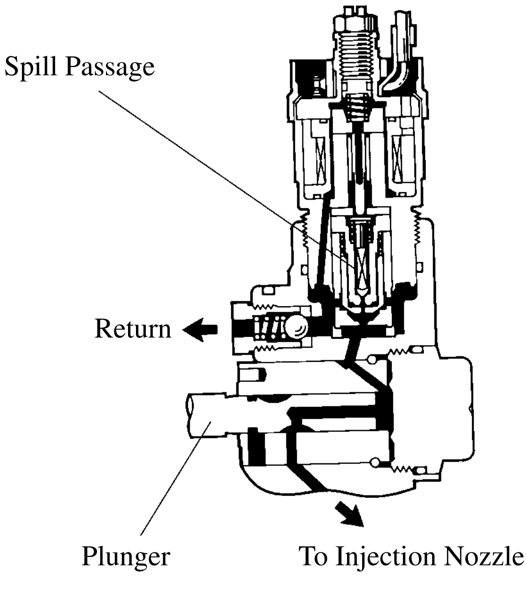
The timing control valve is attached to the injection pump. In accordance with the signals from the engine ECU, it opens the valve in the fuel passage between the high-pressure chamber and the low-pressure chamber, thus controlling the injection timing.
When the current flows to the coil of the timing control valve, the starter core becomes an electromagnet to push and compress the spring. This causes the moving core to retract and open the fuel passage.



145EG54

Spill Control Valve

The spill control valve is attached to the injection pump to control the fuel injection volume in a accordance with the signals received from the engine ECU. When the current applied to the spill control valve is shut off, the valve in the spill control valve opens by the difference in pressures. Thus, the pressure in the plunger decreases causing the injection nozzle to stop injection fuel.
The length of time till the spill control valve is turned OFF becomes the fuel injection time. Thus, the fuel injection volume is controlled by increasing or decreasing the length of time till the spill control valve is turned OFF.

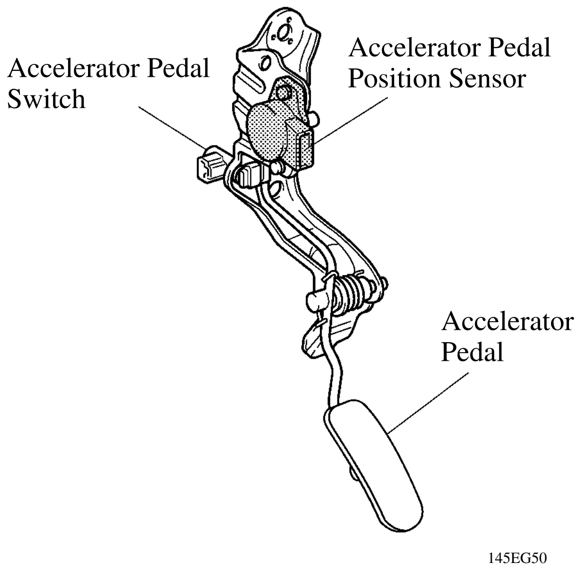


Accelerator Pedal Position Sensor

- The accelerator pedal position sensor uses a hall element that outputs voltage that changes linearly in relation to the amount of pedal effort that is applied to the accelerator pedal. The accelerator pedal position sensor uses a duplex system to ensure its reliability.
- An idle switch that detects the fully closed condition of the accelerator pedal is enclosed in the accelerator pedal position sensor.

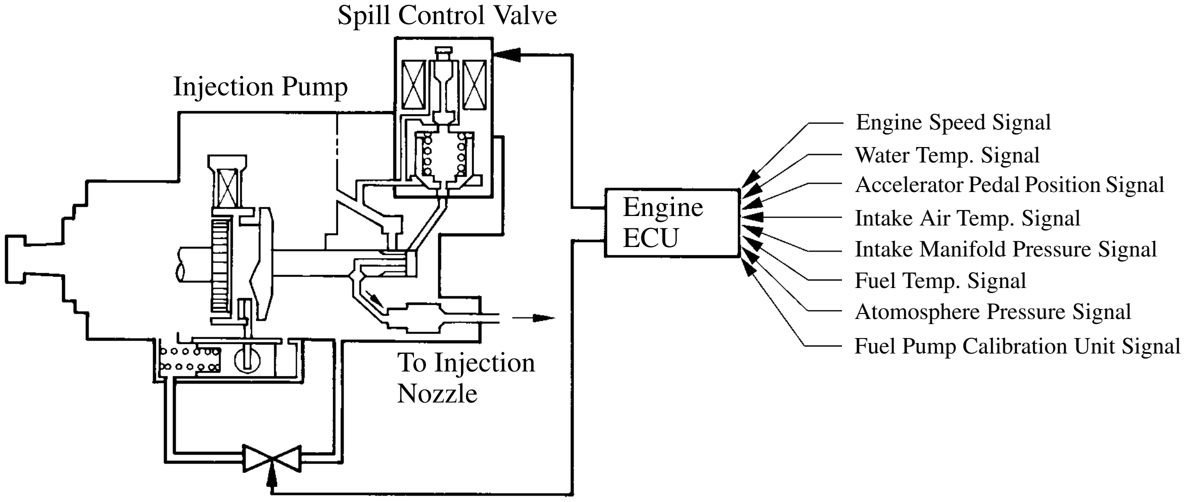
Accelerator Pedal Switch

Detects the fully closed condition of the accelerator pedal.



6. Fuel Injection Volume Control

Based on sensor signals, the engine ECU controls the fuel injection volume by calculating the fuel injection volume that is appropriate for the engine condition.



141EG50

Function of Engine ECU

The engine ECU calculates the basic injection volume based on the throttle opening and engine speed, and the maximum injection volume for the engine condition. The two injection volumes are then compared, and the lesser of the two is selected. A correction value, which is obtained via the correction resistors, is added to that injection volume, thus determining the final injection volume.

1) Basic Injection Volume

Determined in accordance with the throttle opening and the engine speed.

2) Maximum Injection Volume

Based on the signals received from the sensors, correction values are added to the theoretically required injection volume (basic maximum injection volume) to determine the maximum injection volume during engine operation.

a. Basic Maximum Injection Volume

Determined in accordance with the engine speed.

b. Intake Manifold Pressure Correction

Corrects the basic maximum injection volume in accordance with the intake manifold pressure. The higher the intake manifold pressure becomes, the larger the injection volume becomes.

c. Intake Air Temperature Correction

Corrects the variance in the air-fuel ratio that is created by the difference in the density of the intake air in accordance with the intake air temperature. The higher the intake air temperature becomes, the smaller the injection volume becomes.

d. Fuel Temperature Correction

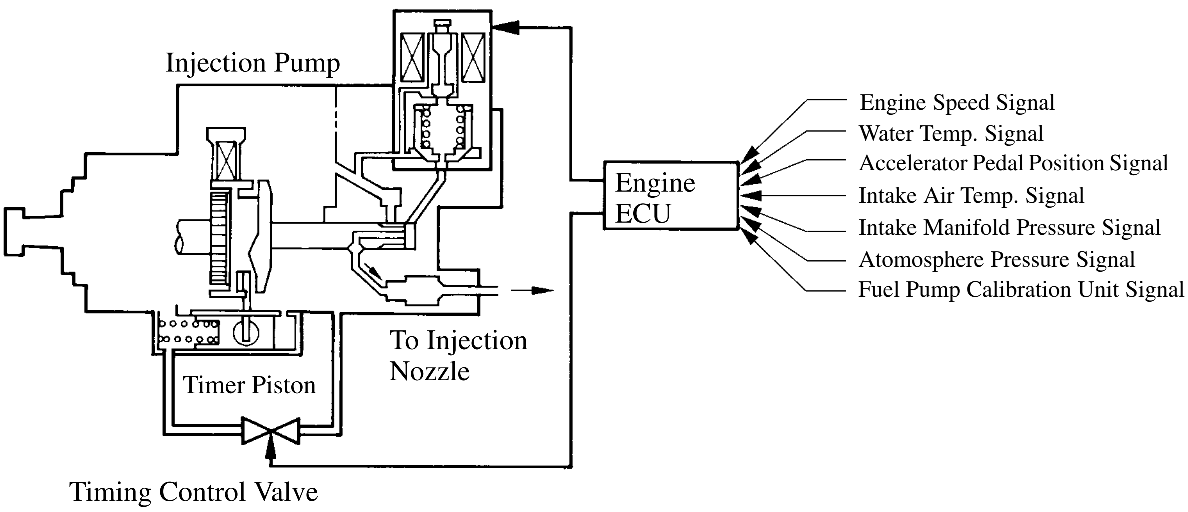
Corrects the variance in the injection volume that is created by the difference in the density of the fuel in accordance with the fuel temperature. The higher the fuel temperature becomes, the larger the injection volume becomes.

3) Starting Injection Volume Control

Determines the fuel injection volume during starting in accordance with the starting signal and the water temperature signal. When the engine is cold, the lower the coolant temperature becomes, the larger the injection volume becomes.

7. Fuel Injection Timing Control

Based on the signals received from the sensors, the engine ECU calculates and controls the fuel injection timing to be optimal for the engine condition.



141EG50

Function of Engine ECU

The engine ECU adds the corrections from the sensor signals to the basic fuel injection timing to calculate the fuel injection timing that is optimal for the engine condition.

1) Basic Injection Timing

The basic injection timing is determined in accordance with the injection volume and the engine speed.

2) Injection Timing Correction

a. Intake Manifold Pressure Correction

Corrects the basic fuel injection timing in accordance with the intake air pressure. The injection timing is advanced when the intake air pressure is low in such the case as of high altitude areas.

b. Water Temperature Control

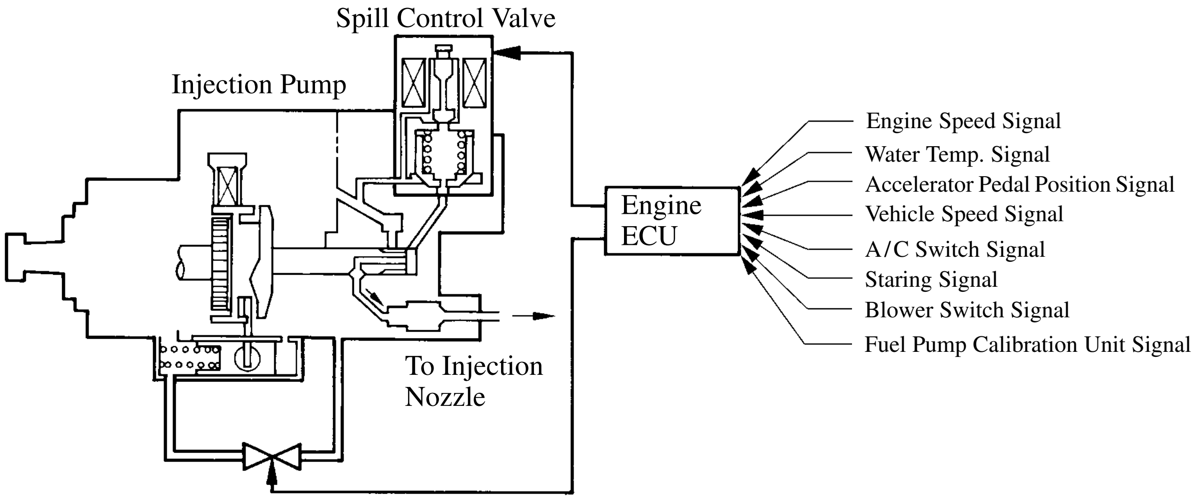
Corrects the basic fuel injection timing in accordance with the water temperature. The injection timing is advanced when the water temperature is low.

3) Starting Injection Timing Control

The starting injection timing is determined in accordance with the starting signal, water temperature signal, and engine speed. The injection timing is advanced when the water temperature is low and engine speed is high.

8. Idle Speed Control

- In this system, the engine ECU calculates the target engine speed in accordance with the engine condition, and determines the fuel injection volume, thus controlling the idle speed rpm.
- During cold operation, the idle is increased by turning ON the blower switch, thus improving the heating performance of the heater.



141EG50

Function of Engine ECU

1) Feedback Control

During idling, the feedback control controls the injection volume to achieve the target idle speed, if there is a difference between the target idle speed calculated by the engine ECU and the actual idle speed.

2) Warm-Up Control

Controls the injection volume during warm-up to achieve an optimal fast idle speed in accordance with water temperature.

3) Engine Speed Change Estimate Control

Immediately after the air conditioning switch is engaged, the idle speed can be affected by the change in the load that is applied to the engine. To prevent this symptom, the engine speed-change estimate control increases or decreases the injection volume before the idle speed changes.

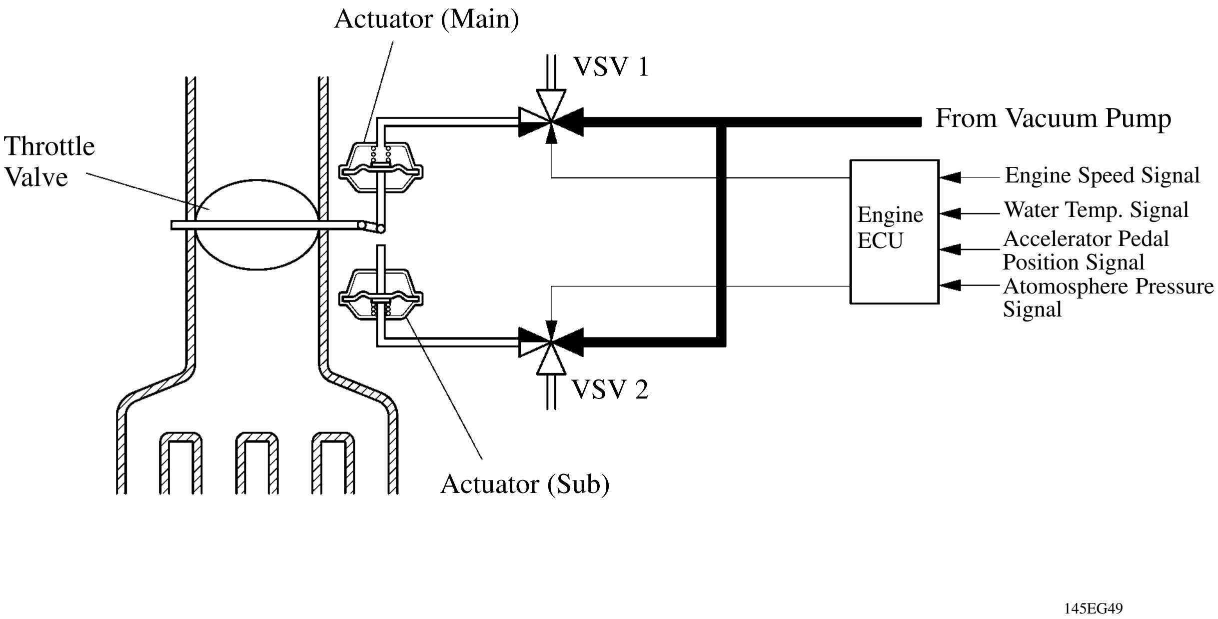
9. Stable Idling Control

Immediately after the air conditioning switch is turned ON or OFF, the load applied to the engine changes, causing the idle speed to fluctuate. To prevent this symptom, the engine speed-change estimate control increases or decreases the injection volume before the idle speed fluctuates.

10. Diesel Throttle Control

The opening of the throttle valve that is installed on the intake manifold is controlled by the engine ECU in accordance with the engine condition, in the following 3 stages: wide open, idle opening, and fully closed. As a result, the noise that is generated during idling and deceleration, as well as the noise and vibration that are generated when the engine is stopped, have been reduced.

▶ System Diagram ◀

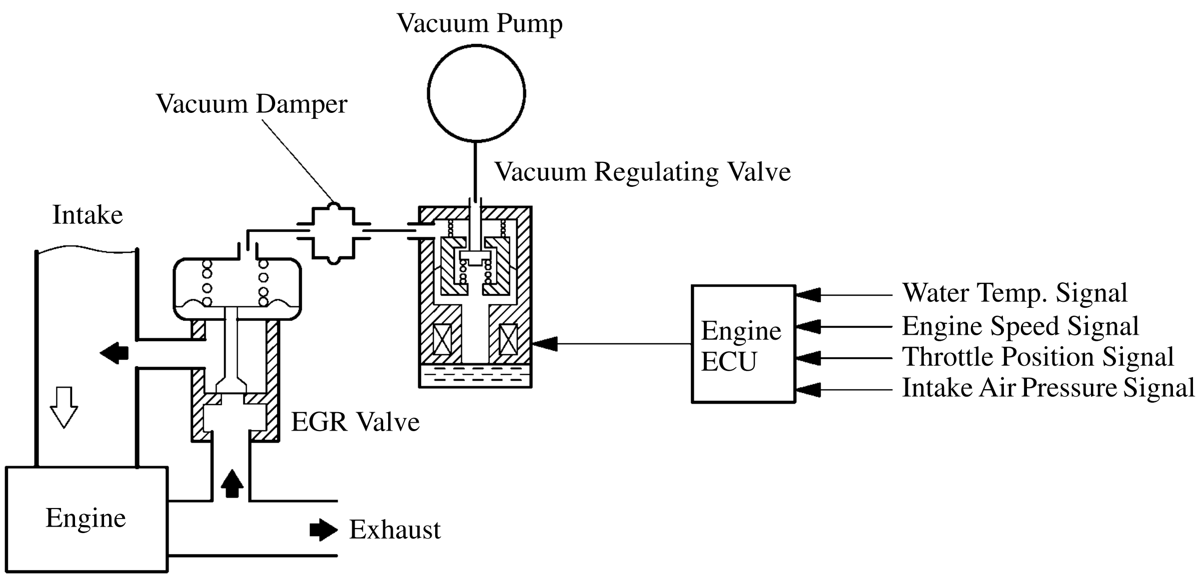


Throttle Valve \ VSV	VSV 1	VSV 2
Wide Open	OFF	OFF
Idle Opening	ON	OFF
Fully Closed	ON	ON

11. EGR Control

In the EGR control system, the engine ECU controls the vacuum regulating valve to recirculate an appropriate amount of exhaust gas to the combustion chamber in accordance with the engine condition. This results in slower combustion rate, lower combustion temperature, and reduced NOx emissions.

▶ System Diagram ◀

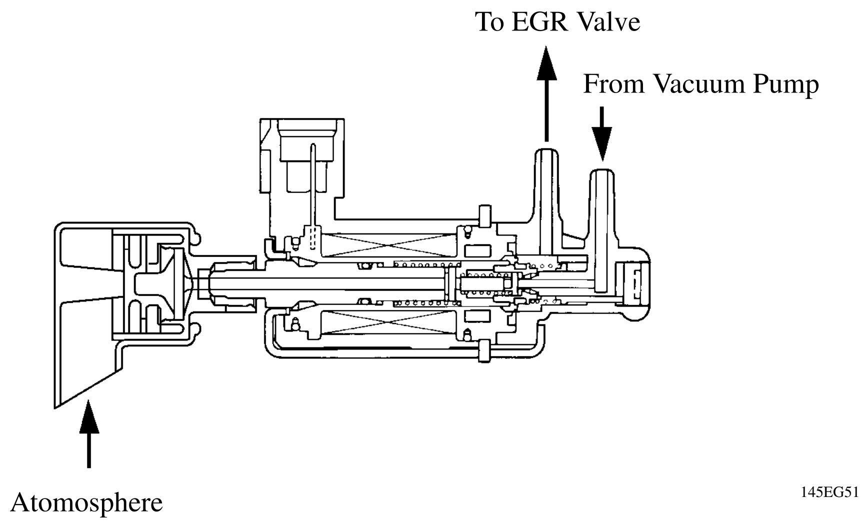


141EG31

Construction

1) Vacuum Regulating Valve

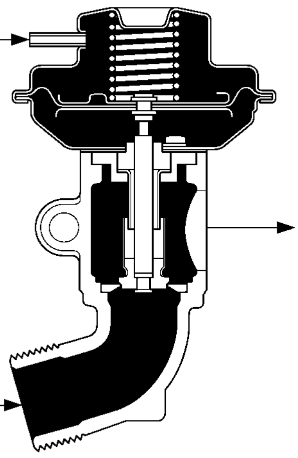
Controls the vacuum that is applied by the vacuum pump to the EGR valve in accordance with the signals from the engine ECU.



145EG51

2) EGR Valve

Using the vacuum from the vacuum regulating valve, the EGR valve opens and closes the valve to introduce exhaust gas into the intake manifold.



Operation

1) Based on the signals from the sensors, the engine ECU applies duty control to the current that is applied to the vacuum regulating valve, thus regulating the vacuum that is applied to the EGR valve. Thus, the EGR valve opening is controlled to provide the volume of EGR gas that is appropriate for the engine condition.
2) The EGR function is stopped under the conditions given below to ensure drivability and to reduce diesel smoke.

- The water temperature is below 60°C (140°F).
- The vehicle is driven under high load condition.
- During decelecration (The EGR operates at idle)

11. Engine Immobiliser System

The engine immobiliser system has been designed to prevent the vehicle from being stolen. This system uses a transponder key computer that stores the ID code of the authorized ignition key. If an attempt is made to start the engine using an unauthorized key, the transponder key computer emits a signal to the engine ECU to prohibit fuel delivery effectively in order to disable the engine. For details, see page 151 in the Engine Immobiliser system section.

12. Diagnosis

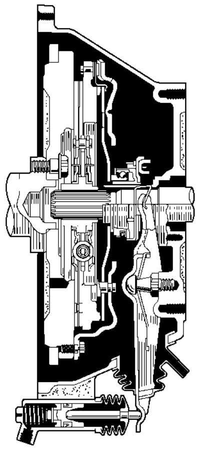
- If the engine ECU detects any problem with a sensor or an electrical circuit, it turns ON the CHECK ENGINE lamp in the combination meter to inform the driver. In addition, the malfunction code will be stored in memory.
- An M-OBD (Multiplex On-Board Diagnostic) System has been adopted to improve serviceability. For details, see page 40.

CHASSIS

CLUTCH

■ DESCRIPTION

- A dry single plate clutch which is operated by hydraulic pressure is used.
- The clutch pedal has a turn-over mechanism to reduce clutch pedal effort on the models with 2C-T and 2C-TE engine.



145CH01

2C-T and 2C-TE Engine Model

▶ **Specifications** ◀

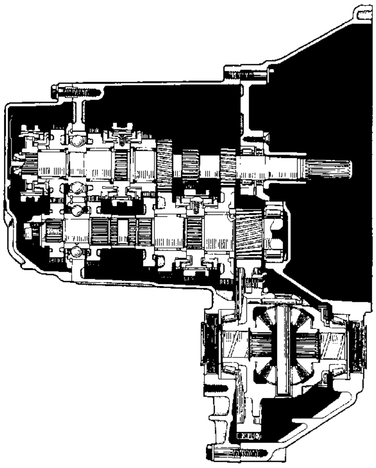
Engine Type / Item		4A-FE 7A-FE	3S-FE	2C-T 2C-TE
Clutch	Type	Dry Type Single Plate Clutch Diaphragm Spring	←	←
	Operation	Hydraulic	←	←
Clutch Cover	Type	Set Rivet	←	←
	Size mm (in.)	212 (8.35)	224 (8.82)	←
	Installed Load N	4200	4700	5200
Clutch Disc	Facing Size* mm (in.)	212 x 140 x 3.4 (8.35 x 5.51 x 0.13)	224 x 150 x 3.4 (8.82 x 5.91 x 0.13)	←
	Facing Area cm^2 ($in.^2$)	199 (30.8)	217 (33.6)	←
Master Cylinder	Type	Conventional	←	←
	Cylinder Diameter mm (in.)	15.84 (0.62)	←	←
Release Cylinder	Type	Non-Adjustable	←	←
	Cylinder Diameter mm (in.)	20.64 (0.81)	22.2 (0.87)	20.64 (0.81)

*: Outer Diameter x Inner Diameter x Thickness

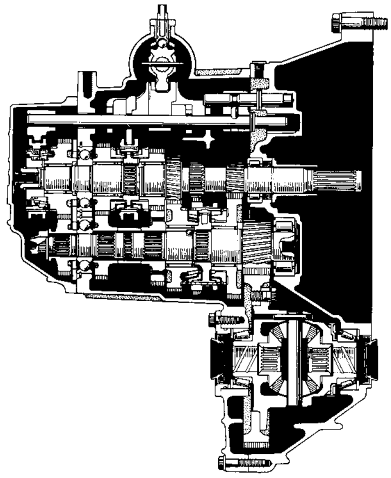
MANUAL TRANSAXLE

■ DESCRIPTION

- 4A-FE engine model uses the C50 manual transaxle.
- 7A-FE engine model uses the C250 manual transaxle. The basic construction and operation are the same as in the C50 manual transaxle. However, the gear ratio is differed.
- 3S-FE engine model uses the S54 manual transaxle.
- 2C-T and 2C-TE engine models use the S50 manual transaxle.
- The S50 manual transaxle uses a triple-cone type synchromesh mechanism in the 2nd gear.


145CH07

C50 Series Manual Transaxle


145CH05

S50 Series Manual Transaxle

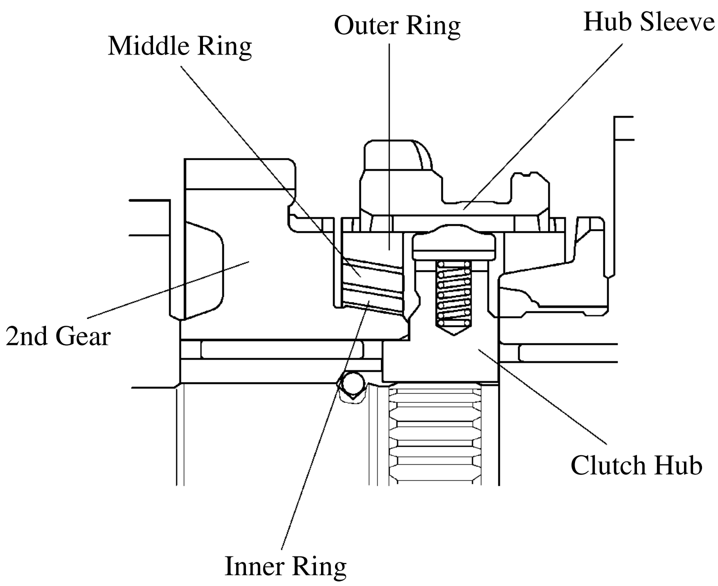
▶ Specifications ◀

Engine Type / Transaxle Type / Item		4A-FE	7A-FE	3S-FE	2C-T, 2C-TE
		C50	C250	S54	S50
Gear Ratio	1st	3.545	←	3.285	3.538
	2nd	1.904	←	1.960	2.041
	3rd	1.310	←	1.322	←
	4th	0.969	1.031	1.028	0.945
	5th	0.815	←	0.820	0.731
	Reverse	3.250	←	3.153	←
Differential Gear Ratio		4.058	3.941	3.944	3.736
Oil Capacity Liters (US qts, Imp. qts)		1.9 (2.0, 1.7)	←	2.2 (2.3, 1.9)	←
Oil Viscosity		SAE 75W-90	←	←	←
Oil Grade		API GL-4 or GL-5	←	←	←

■ TRANSMISSION GEAR

1. Triple-Cone Type Synchromesh Mechanism

The 2nd gear of the S50 manual transaxle has adopted a triple-cone type synchromesh mechanism to reduce the shift effort, to ensure a smoother shift operation, and to improve the durability of the synchromesh mechanism.
In the S54 manual transaxle, the triple-cone type synchromesh mechanism has already been adopted in the 2nd gear since the previous models.



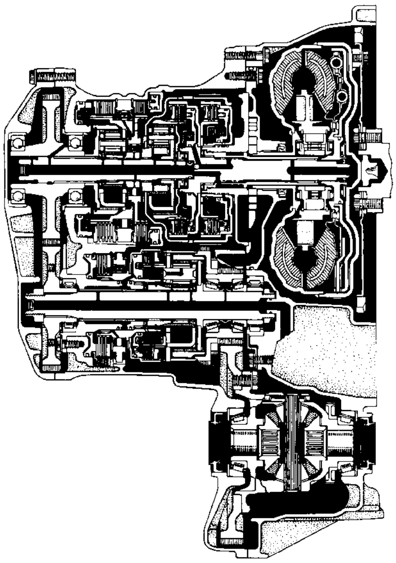
145CH14

AUTOMATIC TRANSAXLE

■ DESCRIPTION

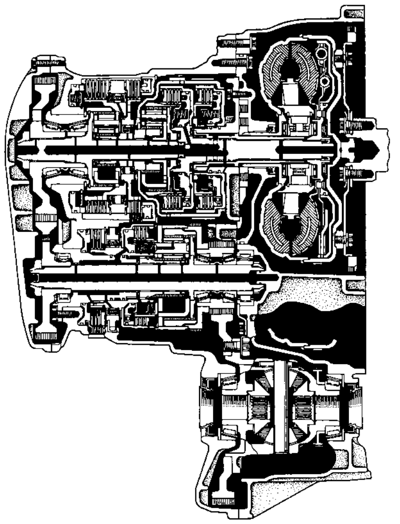
The A241E automatic transaxle is used on the 3S-FE engine model, the A245E automatic transaxle is used on the 4A-FE engine model, and the A246E automatic transaxle is used on the 7A-FE engine model. The pattern select switch is used in all automatic transaxles. Furthermore, the models for Europe are provided with a snow mode, and the LHD model for Europe is provided with a kick-down switch.
The basic construction and operation are the same as in the previous model, except for the following changes:

- The A241E has realized improvement in both drivability and fuel economy by revising the shift point and lock-up point in conjunction with the improvement of the low- to mid-speed range torque of the 3S-FE engine.
- The A246E has realized improvement in both drivability and fuel economy by revising the shift point, lock-up point, differential gear ratio, and torque converter in conjunction with the improvement of the low- to mid-speed range torque of the 7A-FE engine.
- An oil level gauge has been changed to plastic type from steel type on all automatic transaxles.
- These automatic transaxles support the M-OBD (Multiplex On-Board Diagnostic) system to enable the diagnostic codes to be accessed through the use of a hand-held tester.



145CH08

A241E Automatic Transaxle



145CH09

A246E Automatic Transaxle

▶ Specifications ◀

Engine Type / Transaxle Type / Item		A241E	A245E	A246E
		3S-FE	4A-FE	7A-FE
Gear Ratio	1st	3.643	←	4.005
	2nd	2.008	←	2.208
	3nd	1.296	←	1.425
	4th (Overdrive)	0.892	←	0.981
	Reverse	2.977	←	3.272
Differential Gear Ratio		3.178	2.962	←
Fluid Capacity Liters (US qts, Imp. qts)		8.0 (8.5, 7.0)*	7.6 (8.0, 6.7)*	←
Fluid Type		ATF D-II or DEXRON®III (DEXRON®II)	←	←

*: Differential Included

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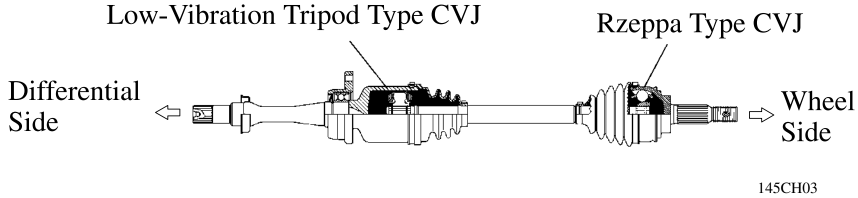
DRIVE SHAFT

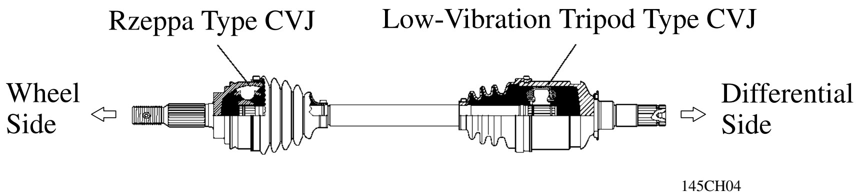
■ DESCRIPTION

The drive shaft uses the tripod type CVJ (Constant-Velocity Joint) on the differntial side, and Rzeppa type CVJ on the wheel side on all models. For the 2C-T and 2C-TE engine models a low-vibration tripod type CVJ is used on the differential side.

▶ 2C-T and 2C-TE Engine Model ◀



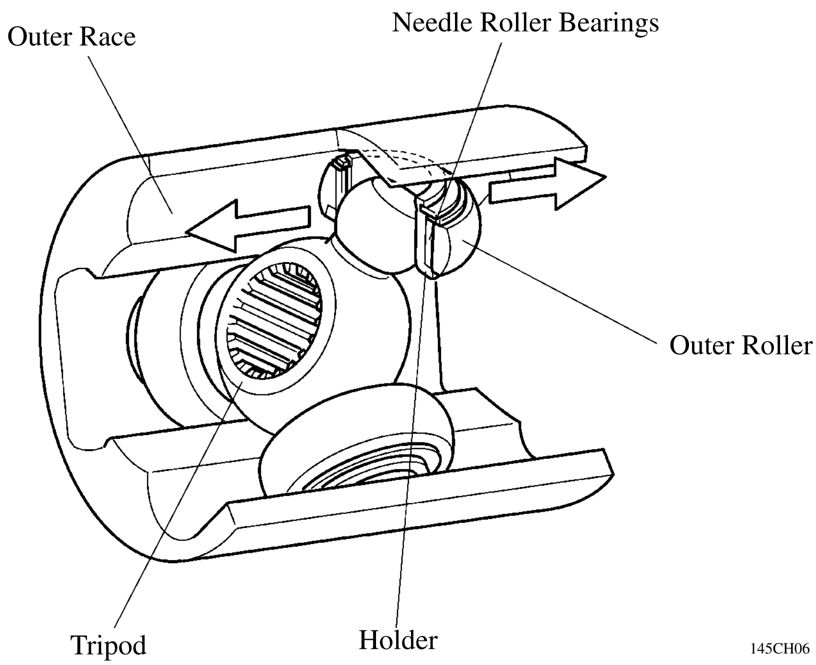
Right-Hand



Left-Hand

■ LOW VIBRATION TRIPOD TYPE CVJ

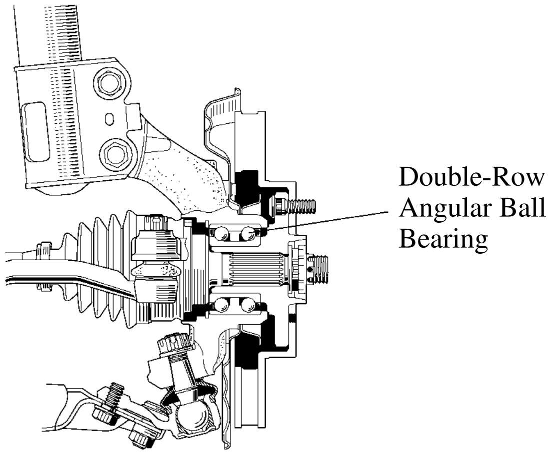
The low-vibration tripod type CVJ (Constant-Velocity Joint) consists of a tripod with a spherical tip and double rollers consisting of an outer roller and a holder.
Because the tip of the tripod is spherical, the double roller remains constantly parallel to the outer race even if the joint tilts (the illustration below shows the tripod tilted).
This design enablles the double roller to slide smoothly to realize low vibration at high installed angles.



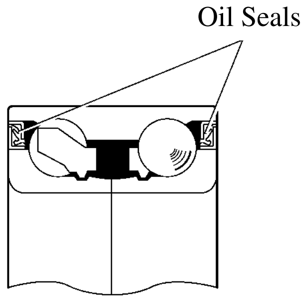
AXLES

■ FRONT AXLE

The front axle uses a double-row angular ball bearing as in the previous model.
However, the bearing size has been changed.
The oil seal has been enclosed in the bearing for weight reduction.



145CH15



145CH16

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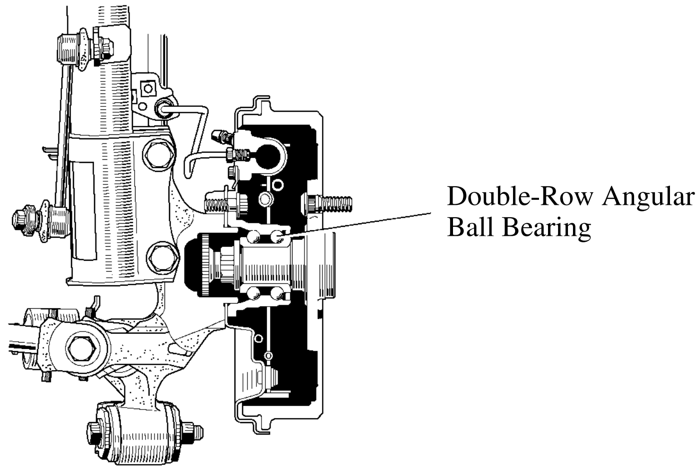
■ REAR AXLE

As in the previous models, the rear axle uses a double-row angular ball bearing.



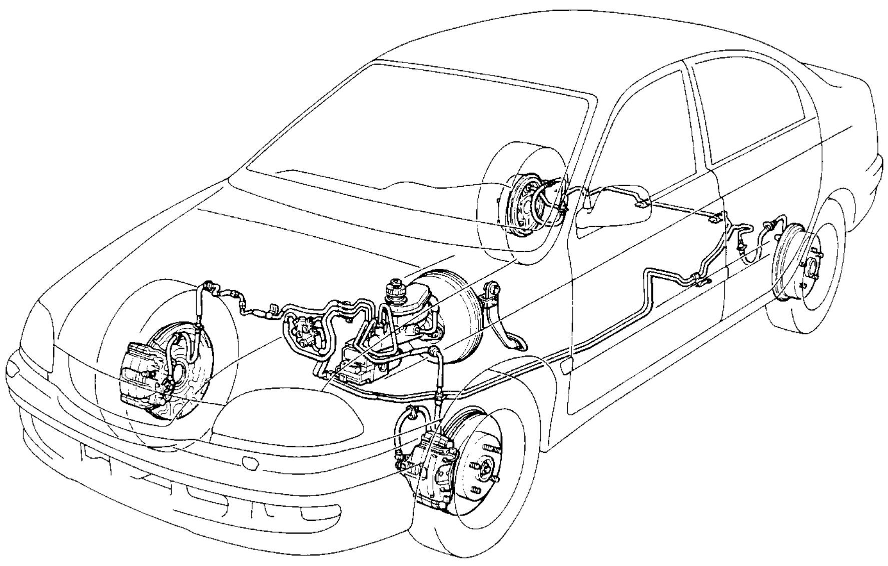
145CH17

BRAKES

■ DESCRIPTION

The ventilated disc brakes are used in the front and the leading trailing drum brakes are used in the rear as in the previous model. However, the following items have been changed.

- The master cylinder and brake booster have been changed.
- The type of the brake caliper and the size of disc rotor have been changed.
- The size of the drum brake has been changed.
- The dual proportioning valve is used on all models.
- The ABS actuator, ECU and relays are integrated.
- A mechanism that helps to prevent the brake pedal from retracting during a collision has been adopted.



Sedan LHD Model

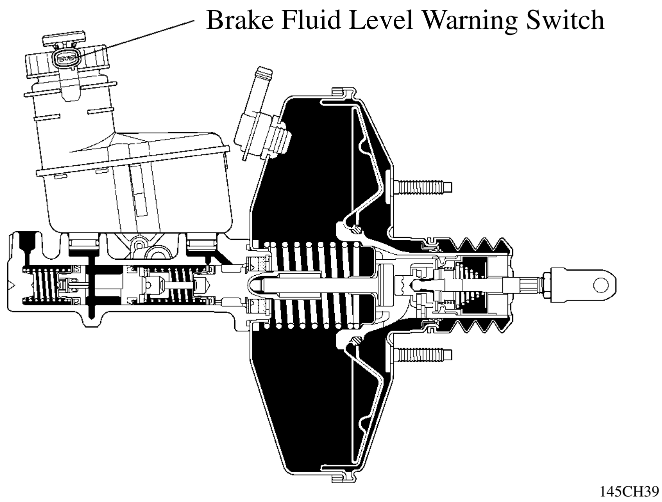
▶ Specifications ◀

Item \ Model		New	Previous
Master Cylinder	Type	Tandem (Center Port + Lockheed)	Tandem (Center Port + Lockheed*1 Lockheed + Lockheed)
	Diameter mm (in.)	23.81 (0.94)	←
Brake Booster	Type	Single	←
	Size in.	9”	←
Front Brake	Type	Ventilated Disc	←
	Caliper Type	FN Type	PE Type
	Wheel Cylinder Diameter mm (in.)	57.00 (2.24)	57.22 (2.25)
	Rotor Size (D x T)*2 mm (in.)	260 x 25 (10.24 x 0.98)	255 x 28 (10.04 x 1.10)
Rear Brake	Type	Leading Trailing Drum	←
	Wheel Cylinder Diameter mm (in.)	20.64 (0.81)	←
	Drum Inner Diameter mm (in.)	228.6 (9.00)	200 (7.87)
Brake Control Valve	Type	Dual-P Valve	Dual-P Valve, Dual-LSPV*3
	Deflection Point of Hydraulic Pressure kPa (kgf/cm^2, psi)	2940 (30, 426)*1 3430 (35, 498)	3430 (35, 498)*4 2940 (30, 426)*5 3920 (40, 569)*1
	Pressure Reduction Gradient	0.25, 0.62*1	0.25, 0.37*3
Parking Brake	Type	Drum	←
	Size mm (in.)	228.6 (9.00)	200 (7.87)
	Lever Type	Floor Lever	←
ABS		STD*6, OPT*7	OPT*8

*1: Models with ABS
*2: D: Outer Diameter, T: Thickness
*3: Sedan with ABS, Liftback with ABS and Wagon Models
*4: Sedan and Liftback Models without ABS
*5: Wagon Model without ABS
*6: Models for Europe except 2C-T Engine Model
*7: LHD Model with 3S-FE Engine for General Countries
*8: Models for Europe

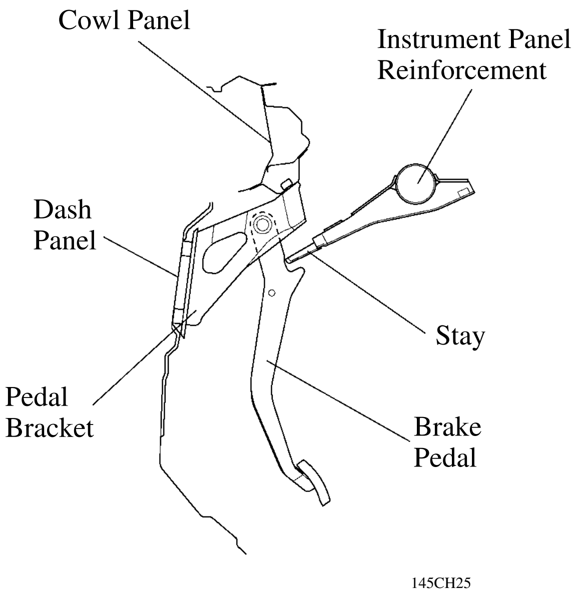
■ MASTER CYLINDER AND BRAKE BOOSTER

- On the previous models, those with ABS adopted a center port and Lockheed type tandem master cylinder, and those without ABS adopted a Lockheed and Lockheed type tandem master cylinder. However, on the new model, all models adopt a center port and Lockheed type tandem master cylinder regardless of whether or not they are equipped with ABS.
- The internal shape of the master cylinder and brake booster has been changed.
- The brake fluid level warning switch has been integrated with the cap.

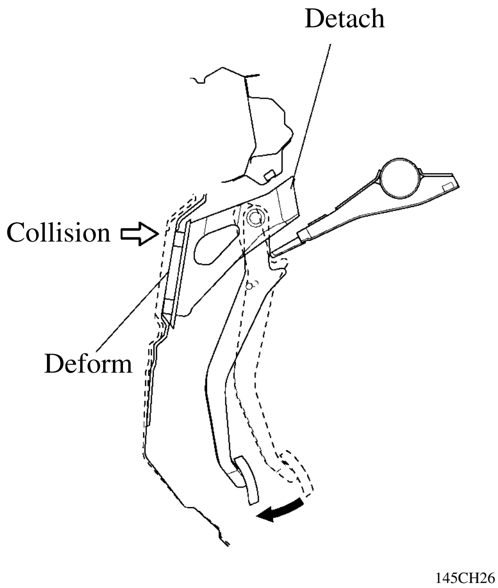


■ BRAKE PEDAL

A brake pedal retract prevention mechanism has been adopted to help minimize reduction of the driver's foot-well space during a collision.
If the dash panel deforms rearward in a collision, the brake pedal bracket detaches from the bracket of the cowl panel. Then, the stay of the instrument panel reinforcement causes the step surface of the brake pedal to move forward and downward.



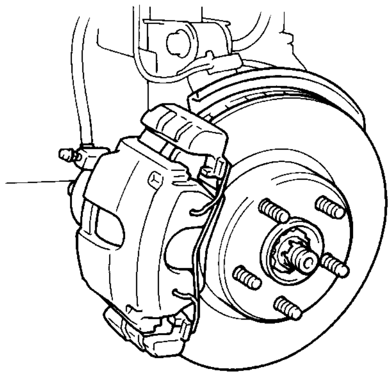
Before Collision



After Collision

■ FRONT BRAKE

The front brake caliper has been changed to the FN type from the PE type.
Also, the disc rotor size has been changed.

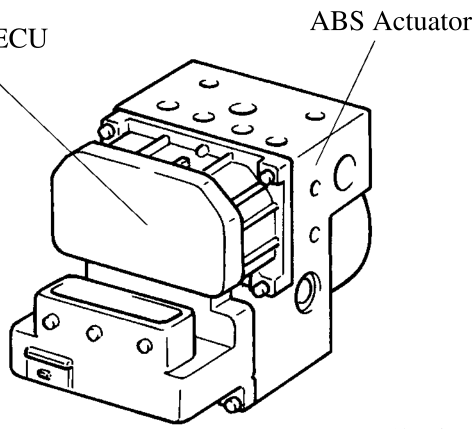


FN Type Brake Caliper

■ ABS

1. General

- The ABS actuator, ECU, and relays have been integrated for compactness and weight reduction.
- An ABS is standard equipment on the models for Europe except 2C-T engine model and optional equipment on the LHD model with 3S-FE engine for General Countries.



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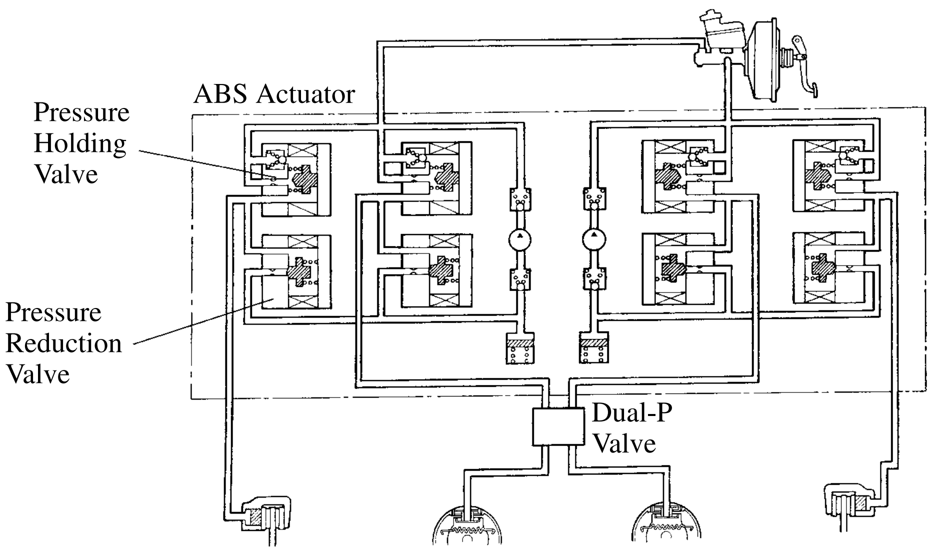
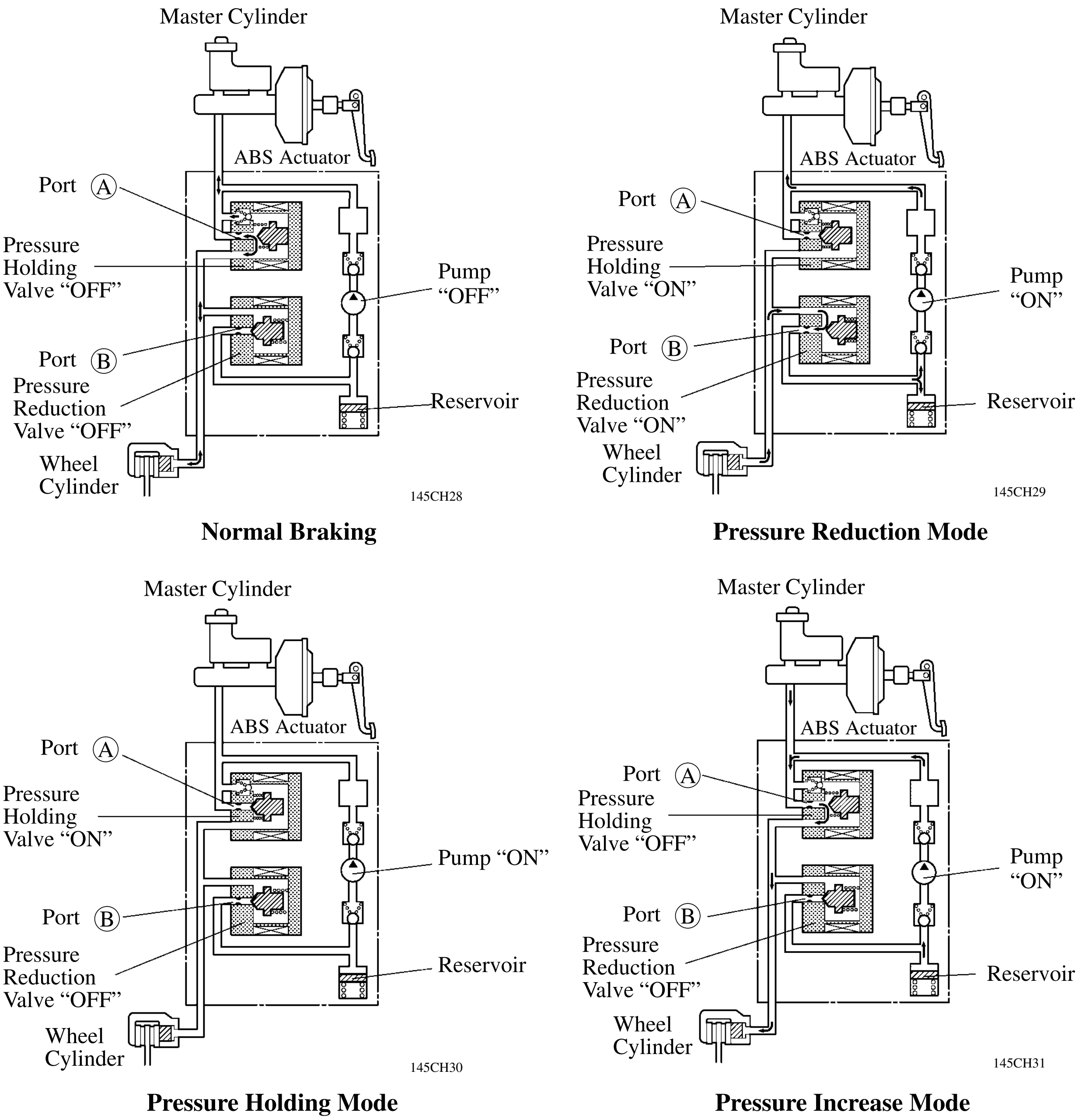
2. Hydraulic Circuit



For RHD Model	Front Right Wheel Brake	Rear Left Wheel Brake	Rear Right Wheel Brake	Front Left Wheel Brake
For LHD Model	Front Left Wheel Brake	Rear Right Wheel Brake	Rear Left Wheel Brake	Front Right Wheel Brake

3. Operation

The brake control of each wheel during ABS activation is implemented by the following 3 modes: pressure reduction, pressure holding and pressure increase modes.
The ECU controls the fluid pressure of each of the front left and right wheels independently while the fluid pressure of the rear left and right wheels is controlled simultaneously for vehicle stability.



Normal Braking / **Pressure Reduction Mode** / **Pressure Holding Mode** / **Pressure Increase Mode**

▶ Condition of Each Valve ◀

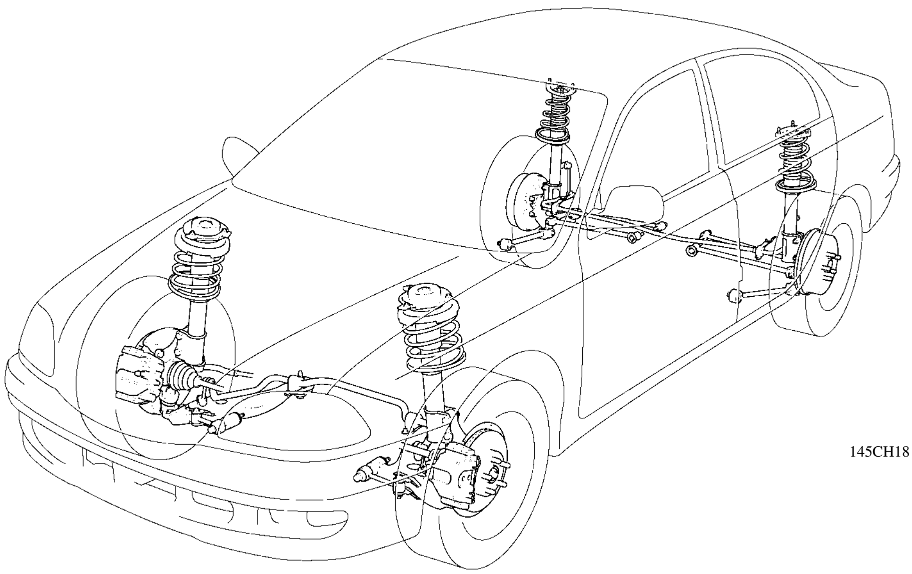
Mode / Valve	Normal Braking	ABS Activated		
		Pressure Reduction	Pressure Holding	Pressure Increase
Pressure Holding Valve (Port Ⓐ)	OFF (Open)	ON (Closed)	ON (Closed)	OFF (Open)
Pressure Reduction Valve (Port Ⓑ)	OFF (Closed)	ON (Open)	OFF (Closed)	OFF (Closed)

SUSPENSION

■ DESCRIPTION

The Macpherson strut type independent suspension is used both front and rear.
New model's suspension has the following features:

- As in the previous model, a fluid-filled suspension upper support and a suspension tower plate are used on the front suspension.
- An assist link is added on the front suspension for the manual transaxle model.
- The front suspension bushing has been changed.
- The location of the rear suspension arms has been changed.
- Rubber cushions have been adopted for mounting the suspension member onto the body.
- The shape of the rear suspension member has been changed.



Sedan Model with Manual Transaxle

▶ **Specifications** ◀

Model / Item		Normal Package		Rough Road Package	
		Sedan, Liftback	Wagon	Sedan, Liftback	Wagon
Front Suspension	Tread mm (In.)	1480 (58.3)	←	1485 (58.5)	←
	Caster* degrees	1°20'	1°21'	1°15'	←
	Camber* degrees	–0°21'	←	–0°50'	←
	Toe-In* mm (in.)	1 (0.04)	←	←	←
	King Pin Inclination* degrees	13°22'	←	14°14'	←
Rear Suspension	Tread mm (in.)	1450 (57.1)	←	1440 (56.7)	←
	Camber* degrees	–0°31'	–0°25'	–0°18'	–0°25'
	Toe-In* mm (in.)	2 (0.08)	←	←	←

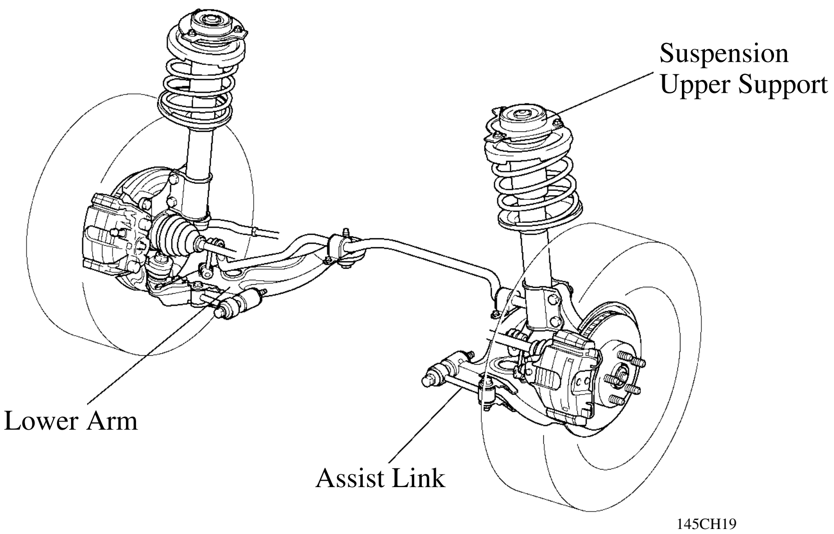
*: Unloaded Vehicle Condition

■FRONT SUSPENSION

1. General

The front suspension is basically the same as that of the previous model. However, the following are changed.

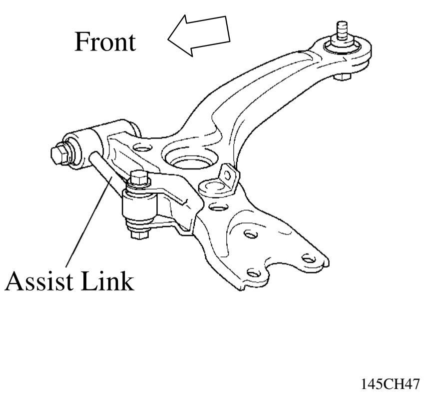
- An assist link has been added to the front of the lower arm of the manual transaxle model.
- The shape of the fluid-filled suspension upper support has been changed.

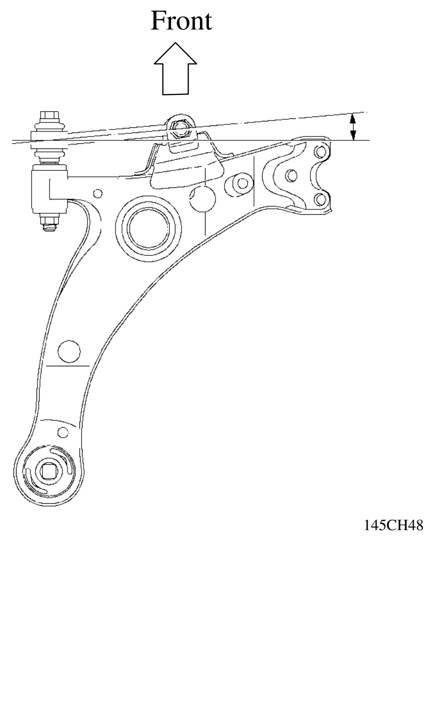


Manual Transaxle Model

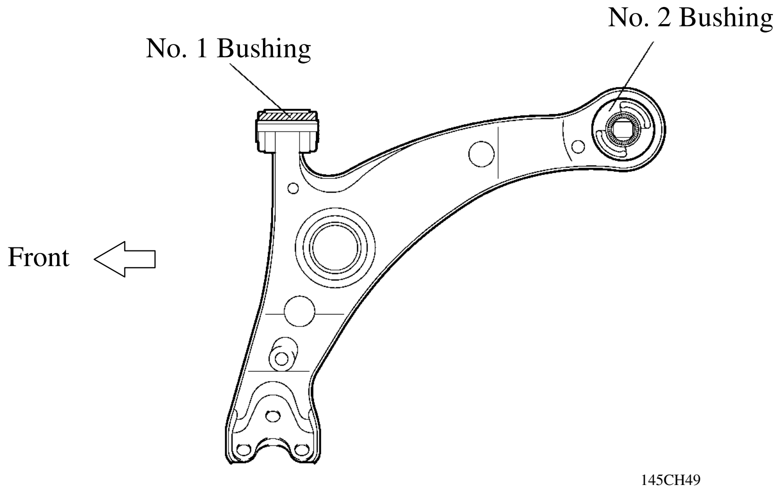
2. Lower Arm

- The assist link has been adopted in front of the lower arm on the manual transaxle model.
  By optimizing the installation angle of this assist link, optimal steering and compliance have been realized to provide an excellent steering feeling.





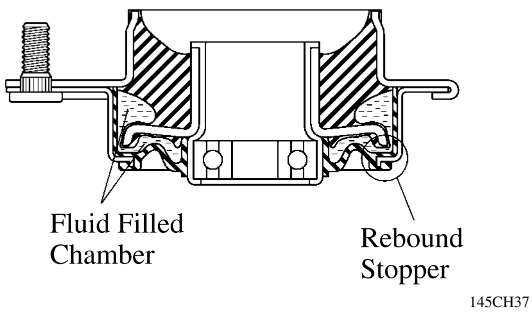
- The characteristics of the No. 1 and No. 2 bushings have been optimized to further improve the excellent riding comfort and to provide excellent stability and controllability.



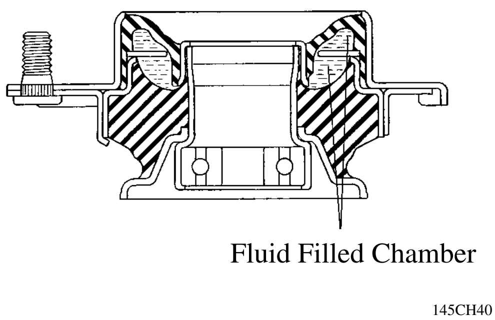
Automatic Transaxle Model

3. Suspension Upper Support

As in the previous model, a fluid-filled suspension upper support is used to restrain the noise and vibration that is transmitted from the suspension to the body.
However, the shape of the upper support has been changed to adopt a rebound stopper.



New

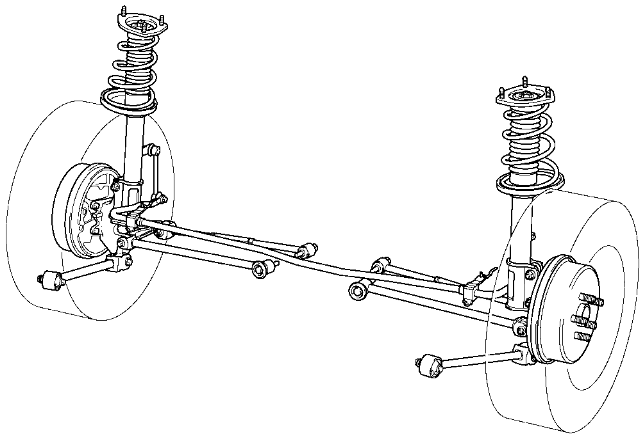


Previous

■ REAR SUSPENSION

1. General

The position of the suspension arms has been changed to optimize the compliance steer that is applied by the lateral and longitudinal forces, thus providing excellent stability and controllability.

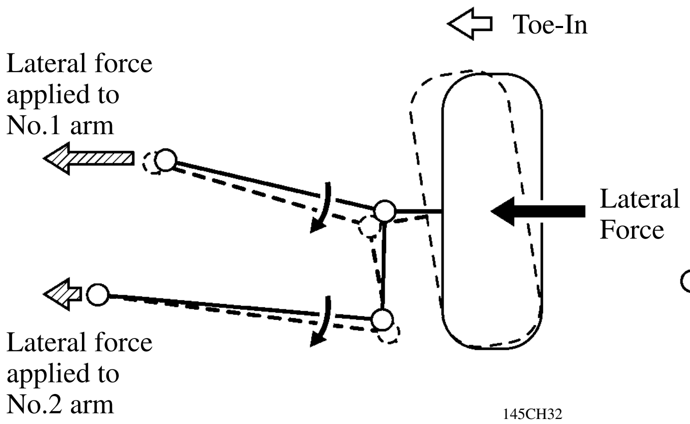


145CH20

2. Compliance Steer

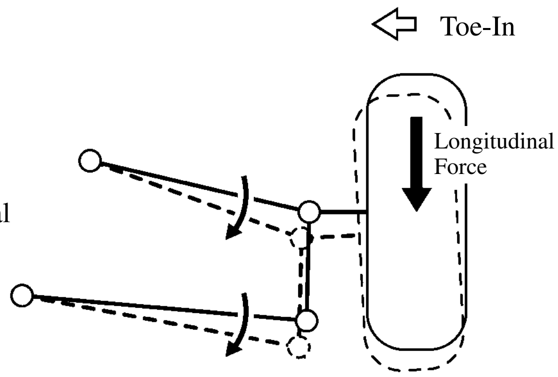
The location, length, mounting angle, and bushings of the suspension arms have been optimized to ensure that the tires always orient towards toe-in if a lateral force or longitudinal force is applied to the tires during cornering or braking, thus providing excellent stability and controllability.

▶ Type Drawing ◀



145CH32

During Lateral Force Application



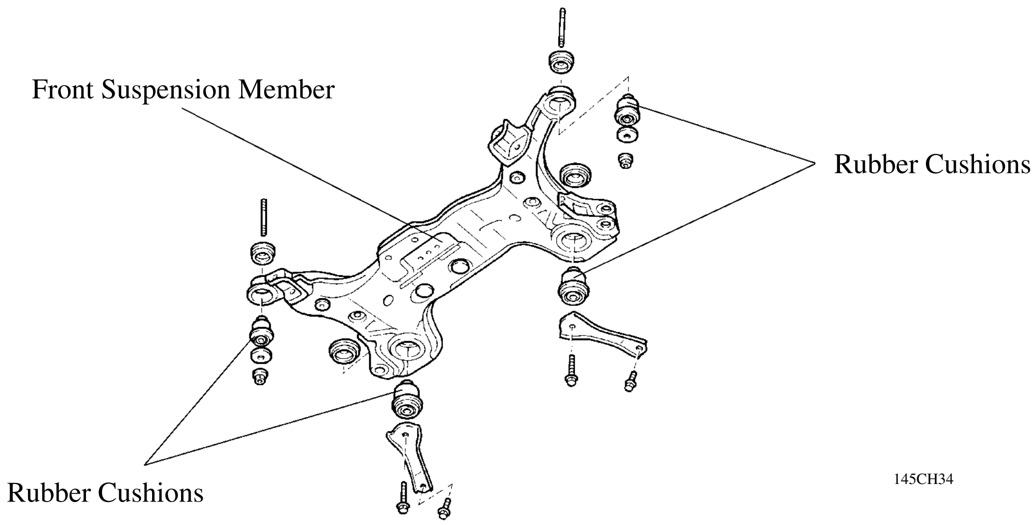
145CH33

During Longitudinal Force Application

■ SUSPENSION MEMBER

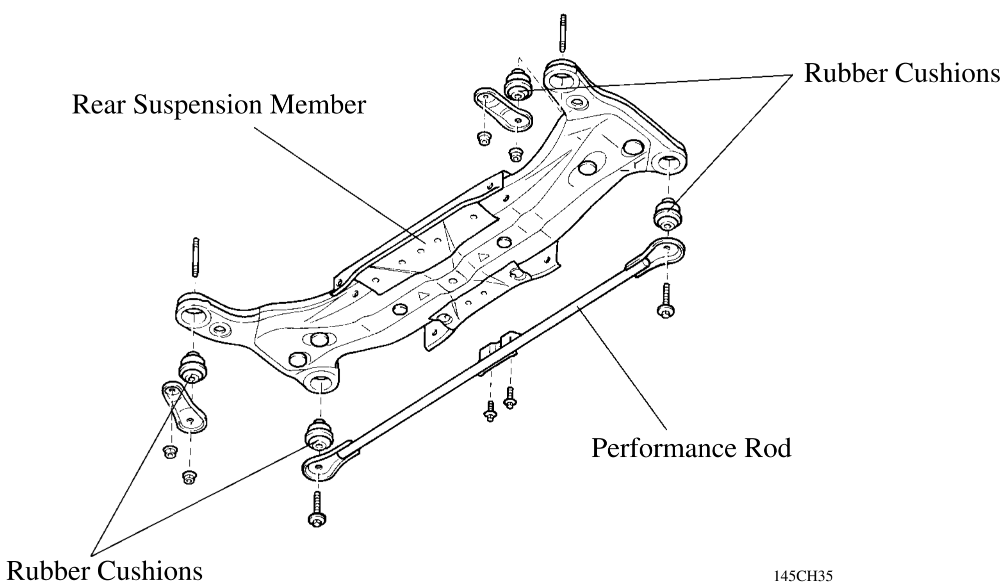
1. Front Suspension Member

Rubber cushions have been provided to the portion of the suspension member that mounts to the body in order to reduce the noise and vibration that are transmitted from the suspension to the body.



2. Rear Suspension Member

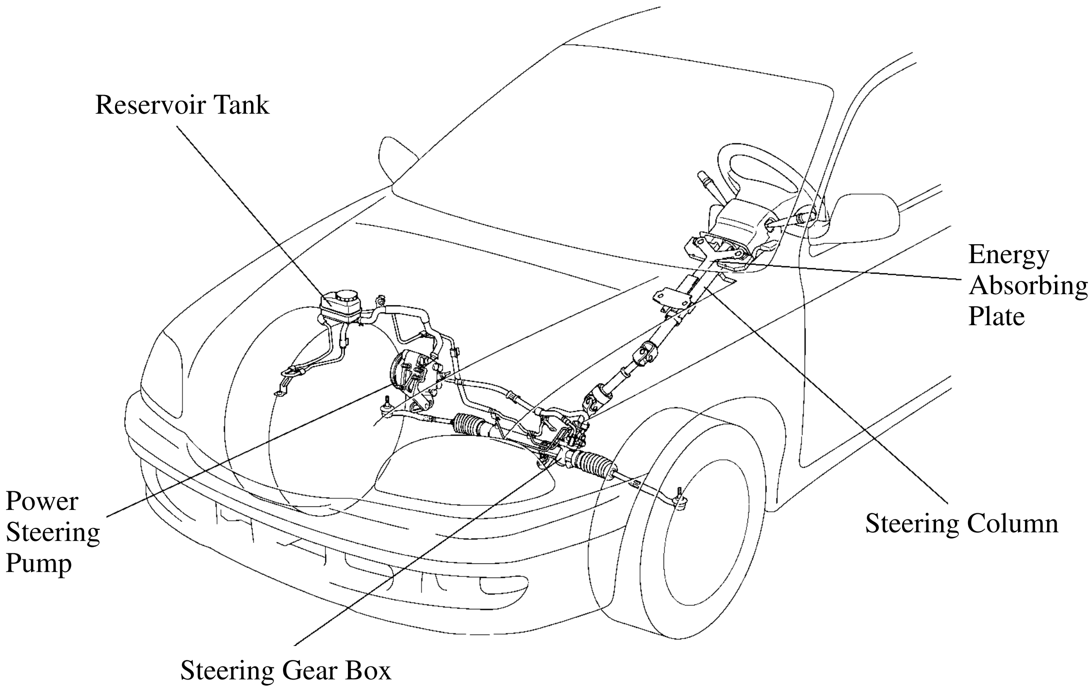
Similar to the front suspension member, rubber cushions have been provided to the portion of the rear suspension member that mounts to the body.
The shape of the suspension member has been changed and the position of the rubber cushions has been optimized. As a result, the amount of roll of the suspension member due to the lateral force that is applied to the suspension has been restrained.
Furthermore, a performance rod has been provided to increase the rigidity by securing the center of the rod against the body.
The above measures have been taken to improve riding comfort while providing excellent stability and controllability.



STEERING

■ DESCRIPTION

- A rack and pinion type steering gear is used. An engine revolution sensing type power steering is used on all models.
- A stepless tilt steering is used on all models.
- An energy absorbing plate is used on the energy absorbing mechanism for all models.
- A slide mechanism has been provided in the intermediate shaft to absorb the movement of the suspension member.
- The steering column hole cover has adopted a double-wall construction to improve its sound insulation capabilities.
- An energy absorbing rib has been provided on the column lower cover to help reduce the impact applied to the driver's knees in a collision.



LHD Model with 3S-FE Engine

▶ Specifications ◀

Gear Ratio (Overall)		17.39
No. of Turns Lock to Lock		3.04
Rack Stroke	mm (in.)	134 (5.28)
Fluid Type		ATF Type DEXRON®II or III

■POWER STEERING GEAR

1. General

- A compact and lightweigh rack and pinion type steering gear is used.
- A PCF (Positive Center Feel) mechanism has been provided in the torsion bar in the steering gear box to improve the steering response in the vicinity of the steering center.
- The hydraulic characteristics have been revised to realize optimal steering effort.

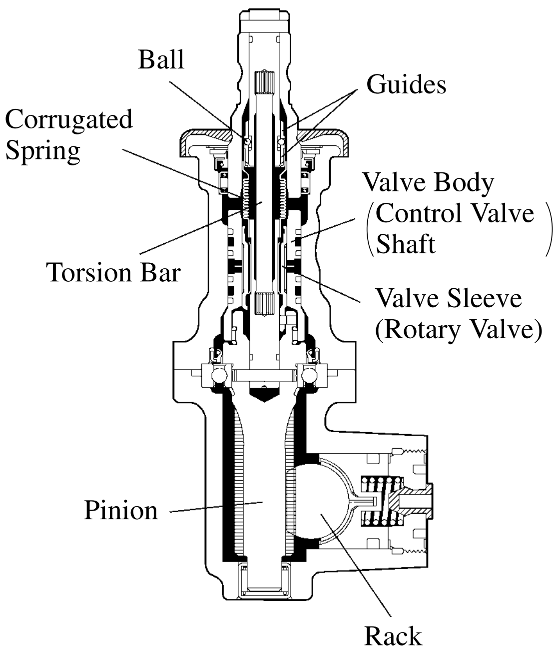
2. PCF Mechanism

General

A PCF mechanism has been provided in the torsion bar to increase the spring constant of the torsion bar in the vicinity of the steering center in order to realize excellent steering feeling when driving through long corners.

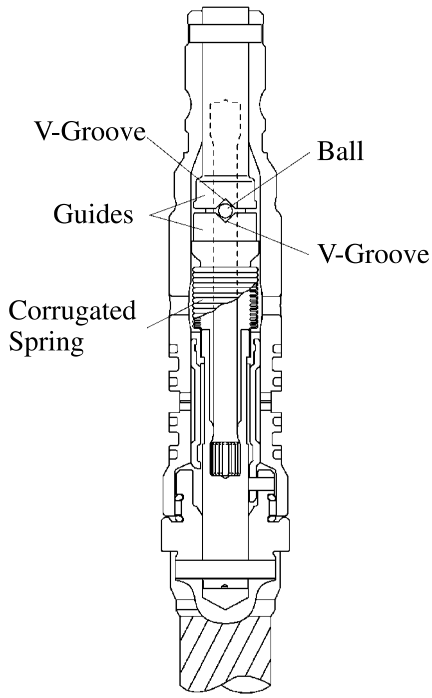
Construction

The PCF mechanism consists of a corrugated spring, balls, V-groove guides, etc.



145CH22

Gear Box Cross Section



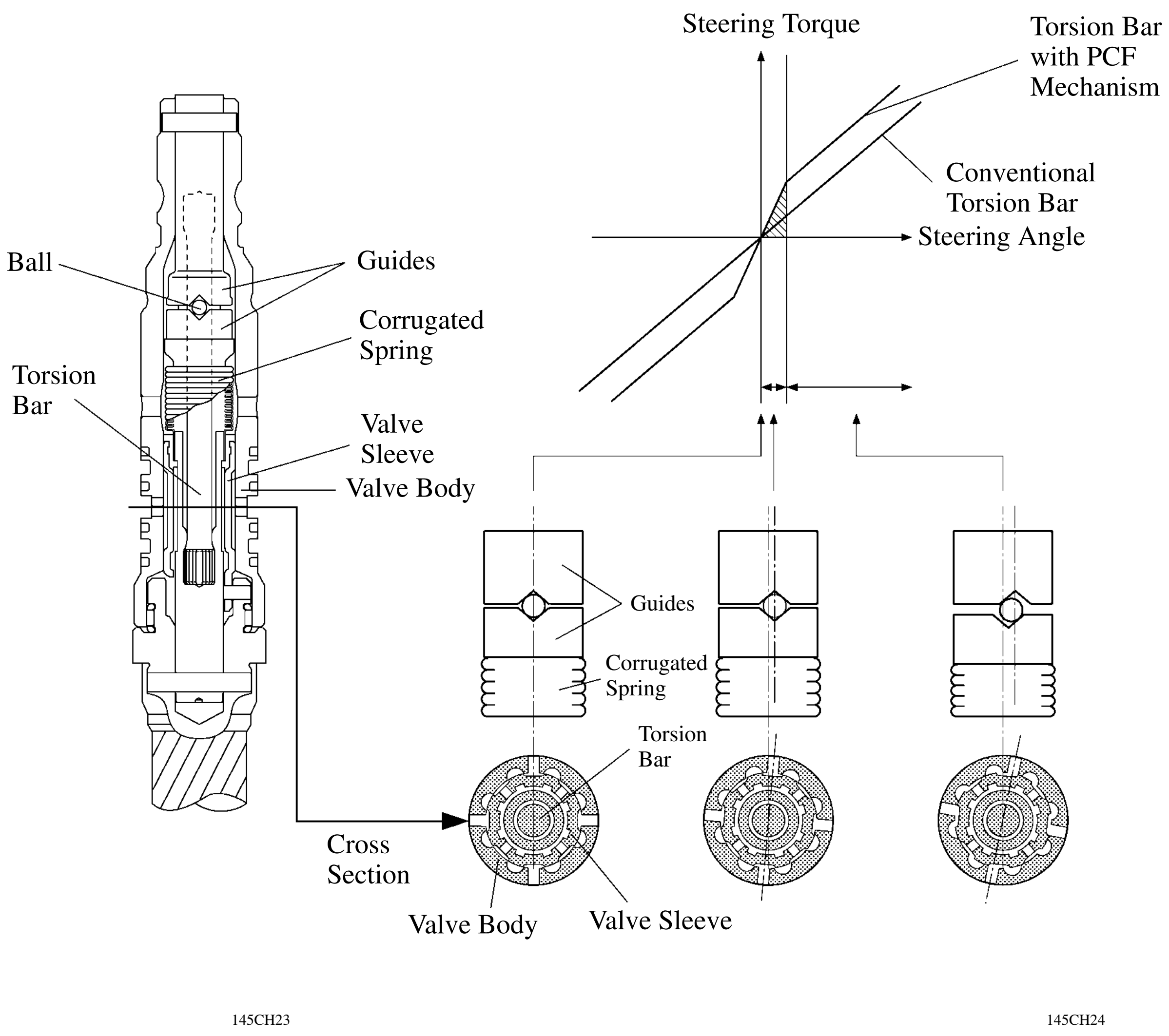
145CH23

Type Drawing of PCF Mechanism

Operation

When the steering wheel is turned slightly, the spring force of the corrugated spring in the PCF mechanism causes the top and bottom guides to rotate in unison as illustrated in the center drawing below.
Accordingly, the torsion bar does not generate torsion, and no phase difference is created between the valve body and the valve sleeve. As a result, no hydraulic assist is provided to the steering effort.
When the steering wheel is turned further, the reaction force from the wheels overcomes the spring force of the corrugated spring, causing the top and bottom guides to shift from each other, as illustrated in the right drawing below.
This generates torsion in the torsion bar, thus causing the valve body and the valve sleeve to rotate relatively for the amount of torsion. As a result, hydraulic assist is provided to the steering effort.

▶ Conceptual Drawing ◀



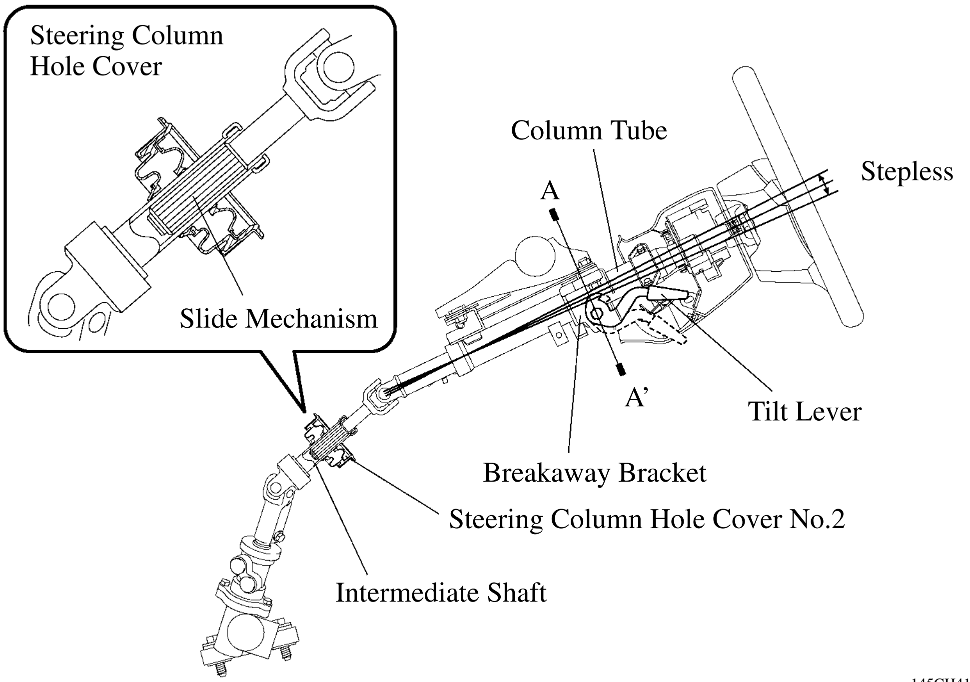
■ STEERING COLUMN

1. General

- A stepless tilt steering is used on all models.
- A slide mechanism has been provided in the intermediate shaft to absorb the movement of the suspension member.
- The steering column hole cover has adopted a double-wall construction to improve its sound insulation capabilities.

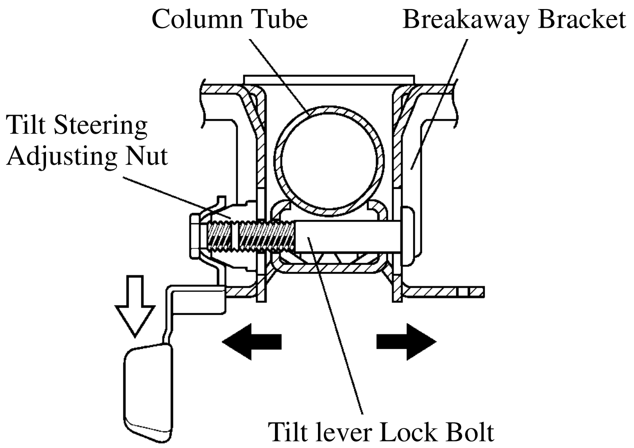
2. Tilt Steering

The tilt mechanism consists of a tilt lever, column tube, breakaway bracket, tilt lever lock bolt, tilt steering adjusting nut and etc.
When the tilt mechanism is in its locked state, operating the tilt lever downward causes the tilt steering adjusting nut to loosen (because the tilt lever lock bolt has left-handed screw threads).
When the tilt mechanism is in its free state, operating the tilt lever upward causes the tilt steering adjusting nut to tighten.



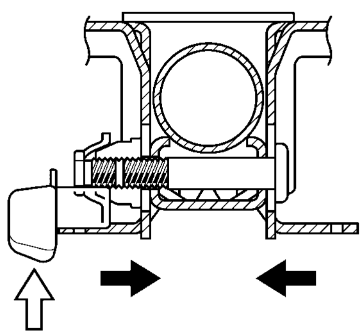
145CH41

▶ A – A' Cross Section ◀



145CH42

Free



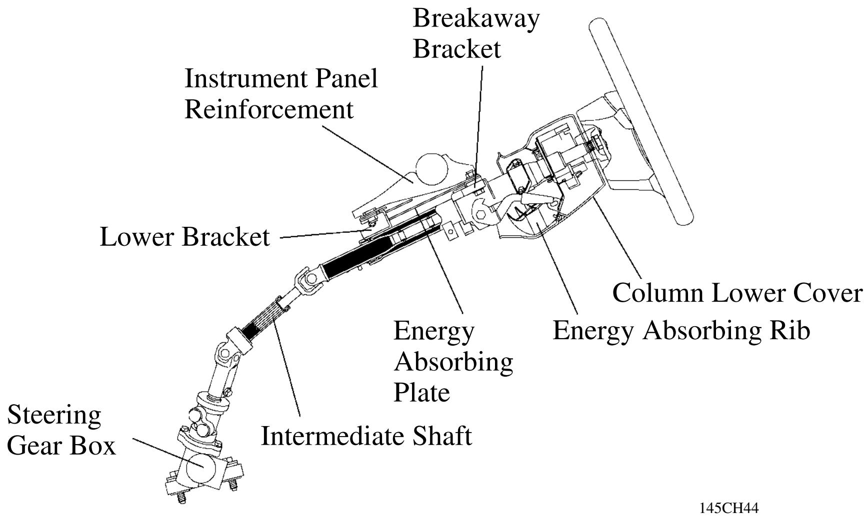
145CH43

Lock

■ENERGY ABSORBING MECHANISM

1. Construction

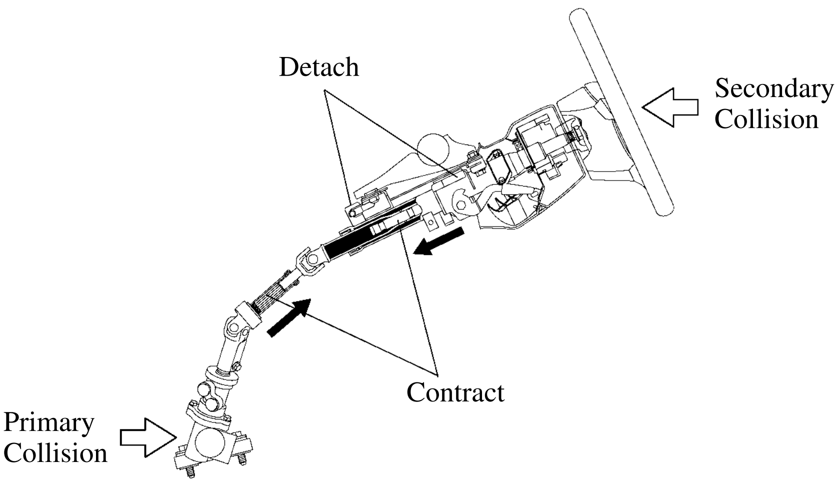
The energy absorbing mechanism in the steering column consists of a lower bracket, breakaway bracket, energy absorbing plate and a contractile main shaft. The steering column is mounted onto the instrument panel reinforcement via a lower bracket and breakaway bracket which is supported via a capsule and energy absorbing plate. The steering column and the steering gear box are connected with an elastic intermediate shaft. In addition, energy absorbing ribs have been provided on the lower column cover to help reduce the impact applied to the driver's knees in a collision.



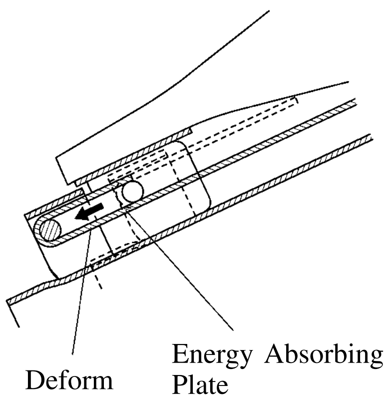
145CH44

2. Operation

When the steering gear box moves during a collision (primary collision), the main shaft and intermediate shaft contract, thus preventing the steering column and the steering wheel from protruding into the cabin. When an impact is transmitted to the steering wheel in a collision (secondary collision), the steering wheel and the steering wheel pad help absorb the impact. In addition, the breakaway bracket and the lower bracket separate causing the entire steering column to move forward.
At this time, the energy-absorbing plate becomes deformed to help absorb the impact of the secondary collision.



145CH45



145CH46

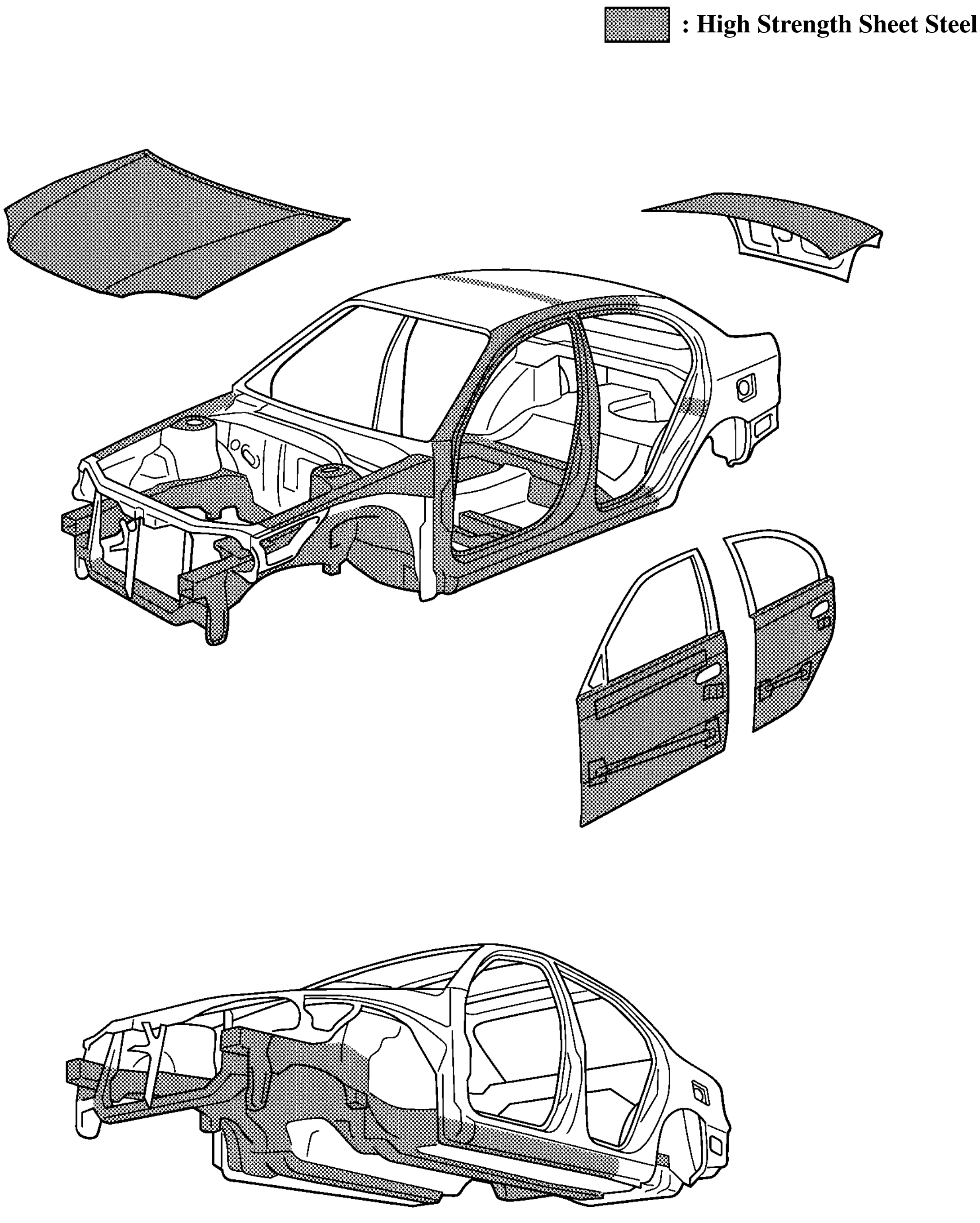
BODY

LIGHTWEIGHT AND HIGHLY RIGID BODY

The body of the new Avensis/Corona has been made lightweight and highly rigid by the optimised joining construction of the panels, adopting high-strength sheet steel, increasing the thickness of the reinforcements and members in the various areas of the body, and optimizing the allocation of materials.

■ HIGH STRENGTH SHEET STEEL

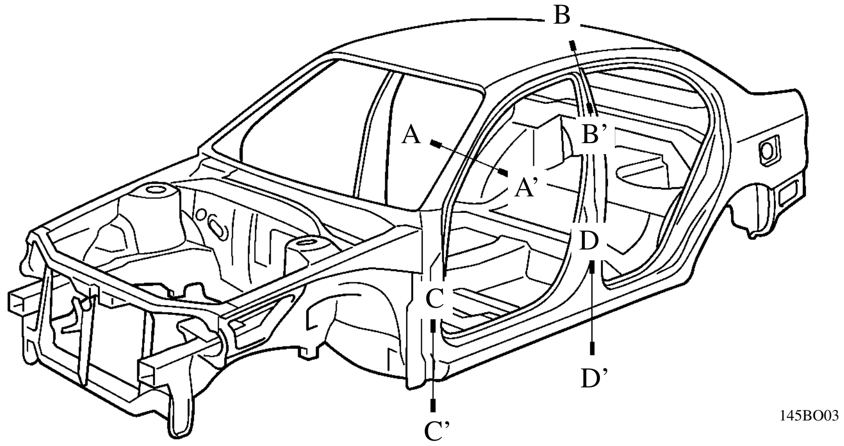
High strength sheet steel is used for the hood, door panels and members.



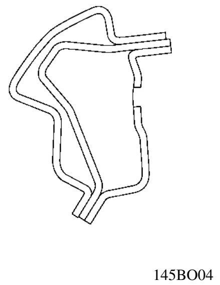
Sedan Model

■ BODY SHELL

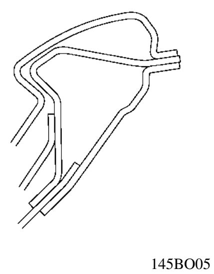
The body of the new Avensis/Corona is made highly rigid through the optimization of the location of reinforcements and the continuity in underbody members. Also, pillar joints and reinforcements are made larger and redesigned to realize the excellent joint rigidity.



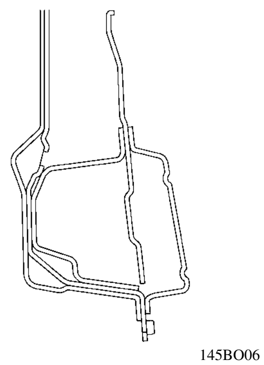
Sedan Model



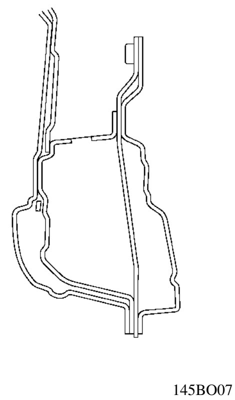
A – A' Cross Section



B – B' Cross Section



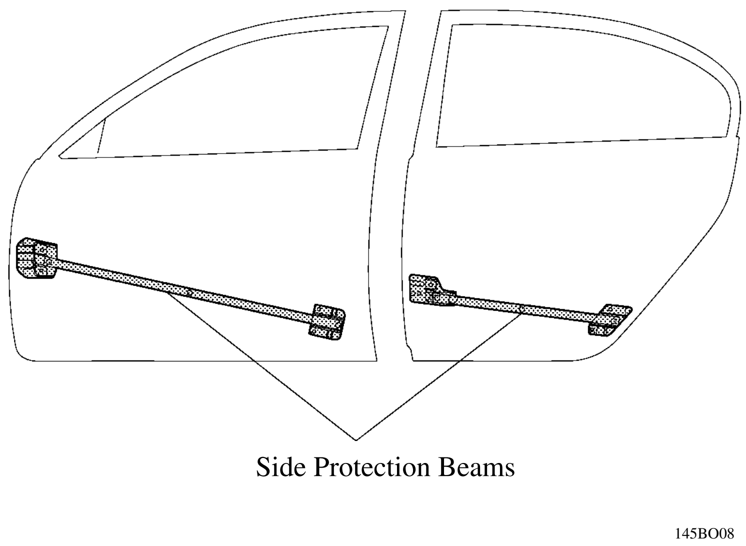
C – C' Cross Section



D – D' Cross Section

■ DOORS

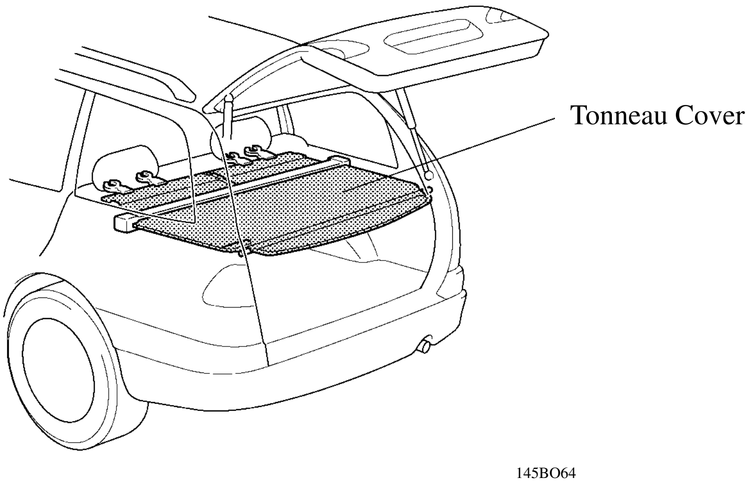
A pipe type side impact protection beams are mounted at the bottom of the front and rear doors.

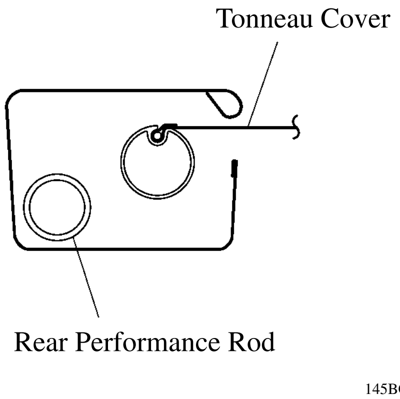


Sedan Model

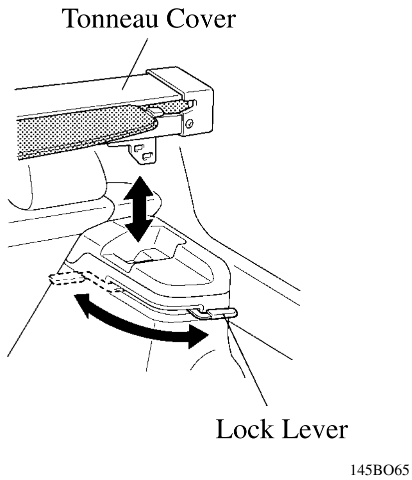
■ REAR PERFORMANCE ROD

A rear performance rod that has been newly provided on the wagon model to connect the right and left rear wheelhouses and provide the excellent body rigidity of the rear suspension area.
The rear performance rod is integrated with the tonneau cover.
Also, to facilitate the use of the luggage room of the wagon model, a lock lever has been provided to enable the rear performance rod (with tonneau cover) to be removed and reinstalled easily.





Cross Section



■ IMPACT ABSORBING STRUCTURE

1. General

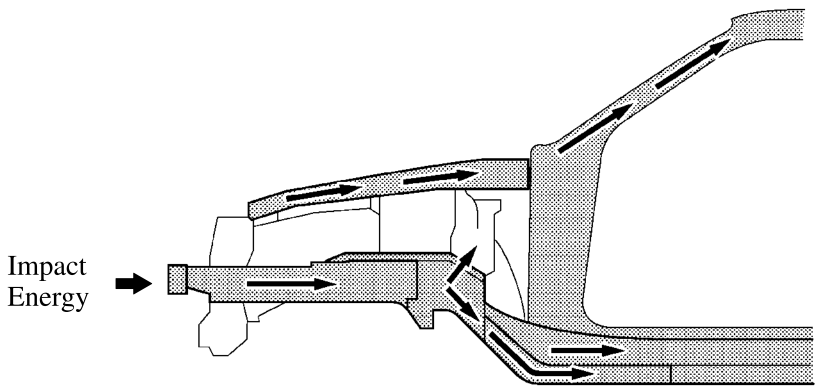
The impact absorbing structure of the new Avensis/Corona provides a body construction that can effectively absorb the energy of impact in the event of a front, rear, or side collision. Also, it realizes an excellent occupant protection performance through the use of reinforcements and members that help minimize cabin deformation.

2. Construction

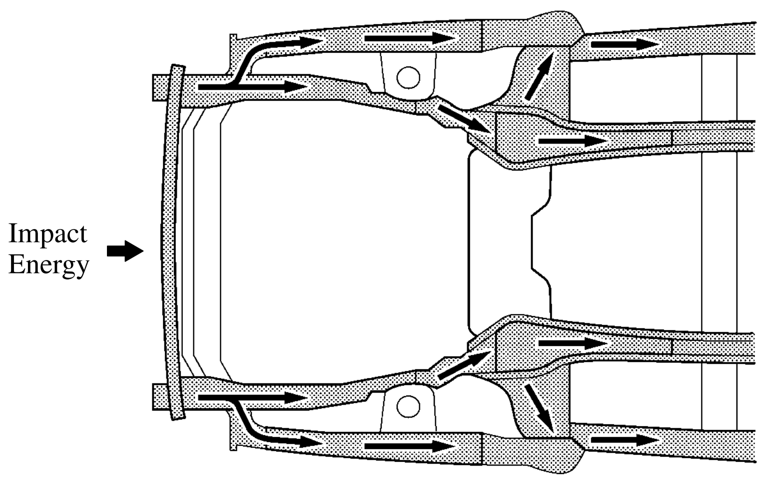
Impact Absorbing Structure for Front/Rear Collision

In conjunction with the revision made to the impact absorbing structure for front or rear collision, reinforcements and members around the cabin and the underbody have been changed in shape, their locations have been optimized, or they have been newly provided.
Accordingly, the underbody and cabin framework were made to efficiently absorb and dissipate the impact energy in case of a front or rear collision, thus realizing a body structure to help minimize cabin deformation.

▶ Impact Absorbing Structure for Front Collision ◀



145BO11

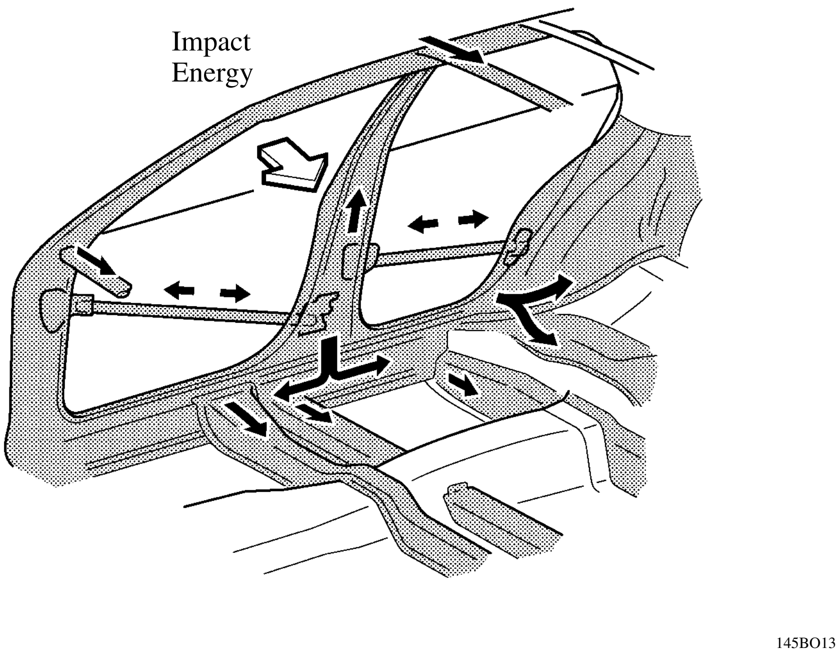


145BO12

Impact Absorbing Structure for Side Collision

Impact energy of a side collision directed to the cabin area is dispersed throughout the body via pillar reinforcements, side impact protection beams, floor cross members, etc. This dispersion of energy keeps the energy directed to the cabin to a minimum level. In addition, the body is made highly rigid through reinforced joints and the use of high strength sheet steel in order to maintain the maximum preservation of the cabin space.

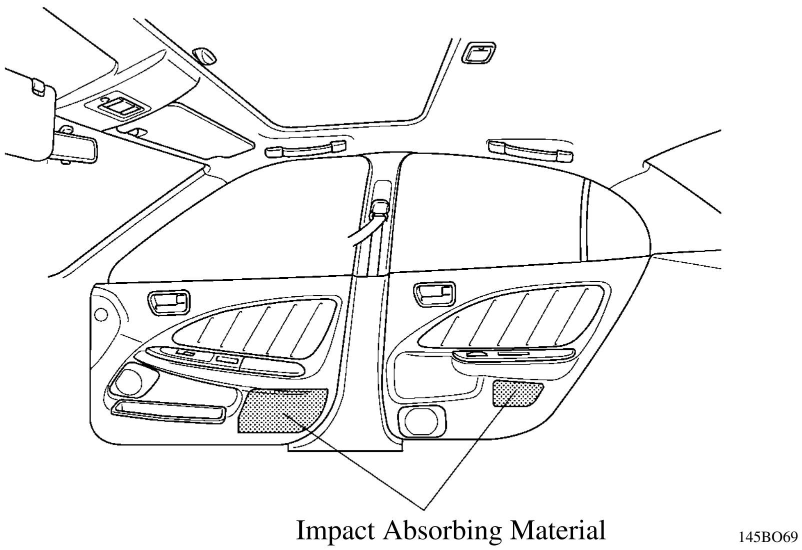
▶ Impact Absorbing Structure for Side Collision ◀



Sedan Model

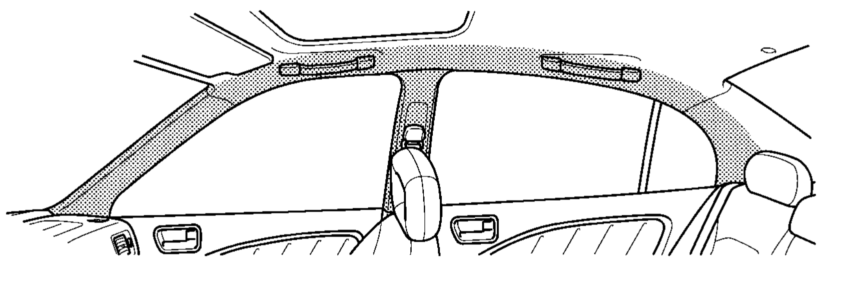
Trim and Garnish

- The door trim design is adapted to the side collision impact absorbing structure. A high impact absorbing material is used at the inside of door trim.



Sedan Model

- Also, a Head Impact Protection Structure has been adopted. With this type of construction, if the occupant's head hits against the roof side rail and pillar in reaction to a collision, the inner panel of the roof side rail and pillar collapses to help reduce the impact.



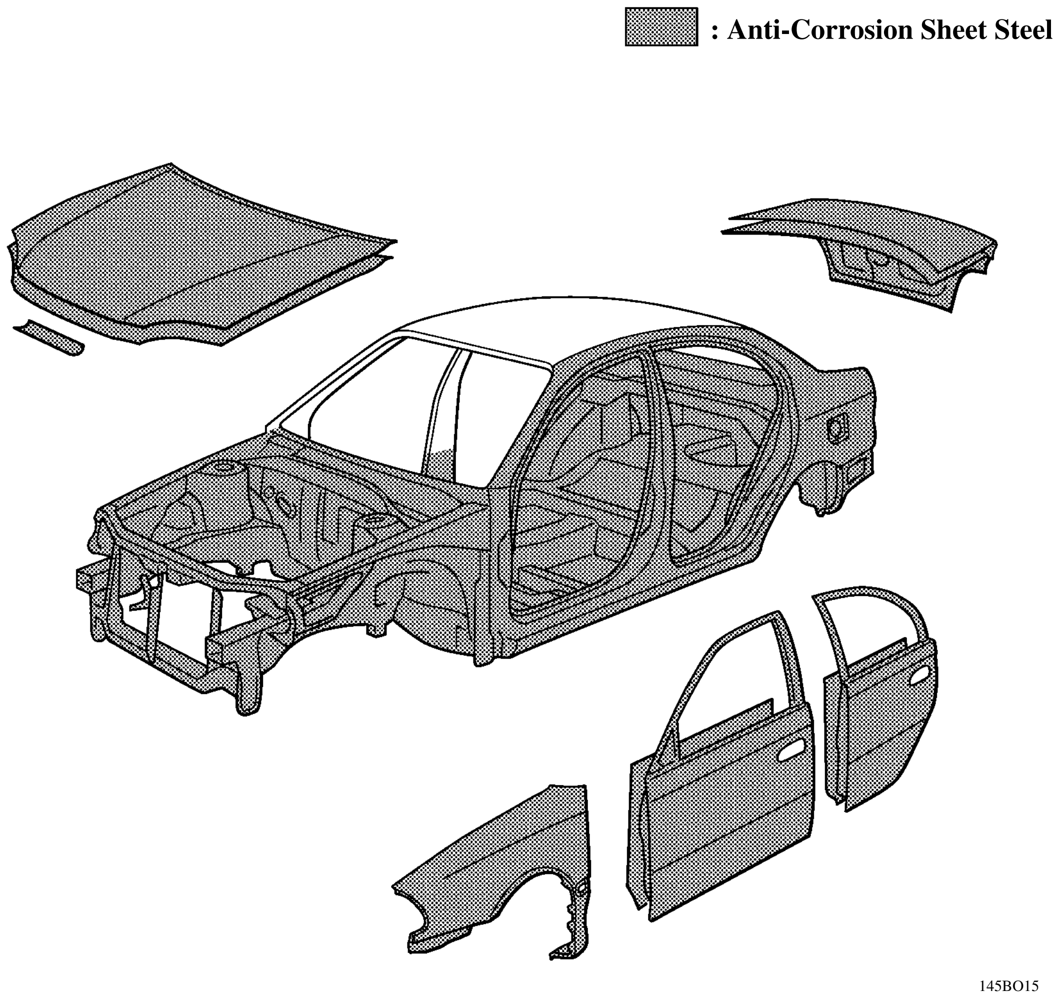
Sedan Model

RUST-RESISTANT BODY

Rust-resistant performance is enhanced by extensive use of anti-corrosion sheet steel and an anti-corrosion treatment by applying wax, sealer and anti-chipping paint to easily corroded parts such as the hood, doors and rocker panels.

■ ANTI-CORROSION SHEET STEEL

Anti-corrosion sheet steel is used in all areas other than the roof and interior parts.



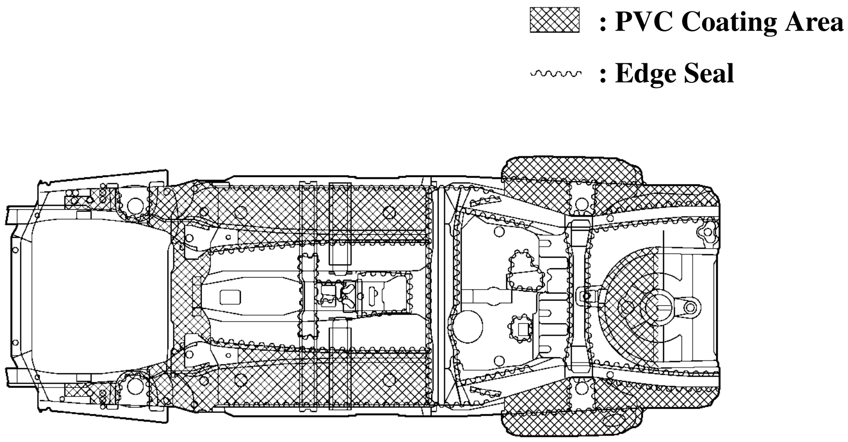
Sedan Model

■ WAX AND SEALER

Wax and sealer are applied to the hemmed portions of he hood, door panels and luggage compartment door to improve rust-resistant performance.

■ UNDER COAT

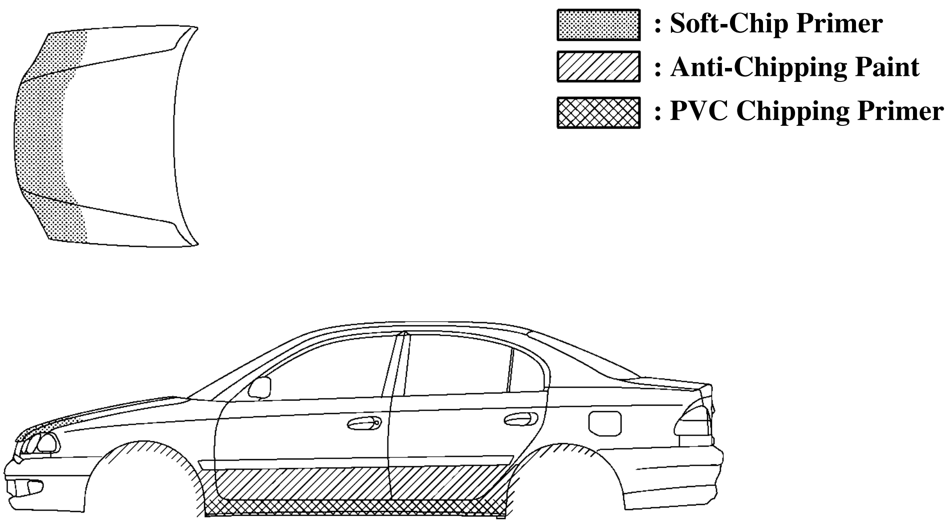
PVC (Polyvinyl Chloride) coating is applied to the under side of the body. A thick coating to improve rust resistant performance is applied to the bottom side of the cowl panel, the fender apron and other parts which are subject to damage by flying stones, etc.



145BO16

■ ANTI-CHIPPING APPLICATION

Anti-chipping paint and PVC chipping primer are applied to the lower door panel area, front and rear wheel arches and the rocker panel area to protect them from flying stones. In addition, soft-chip primer is applied to the hood.



145BO17

Sedan Model

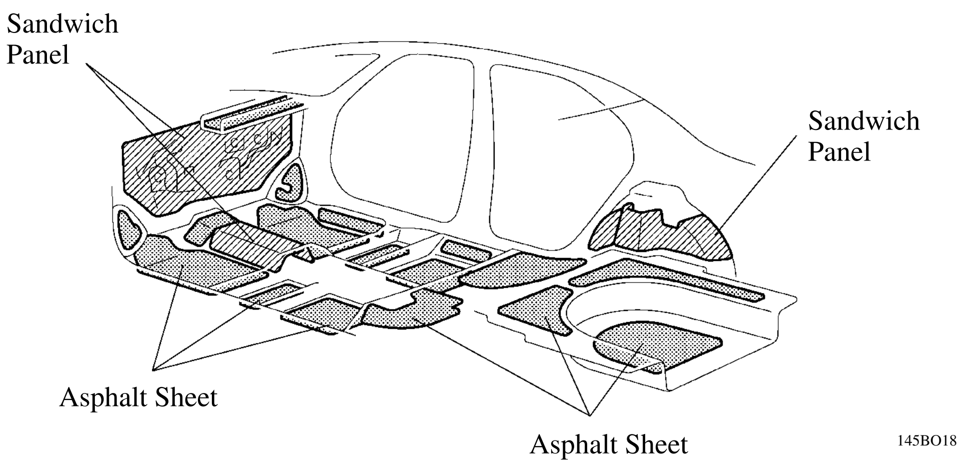
LOW VIBRATION, LOW NOISE BODY

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

■ SOUND ABSORBING AND VIBRATION DAMPING MATERIALS

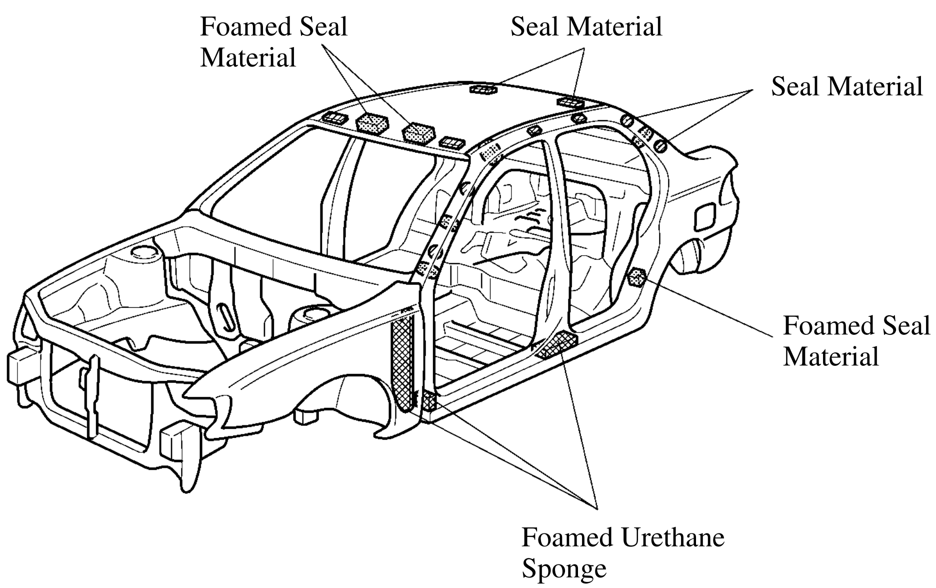
- Lightweight asphalt sheets are applied to most of the floor area to reduce engine and road noise during vehicle operation.
- Sandwich panel is used in the dash panel, front floor tunnel and rear wheel housings.
- Silencer is used in the various body shell areas to reduce engine, road, and wind noise.
- Foamed material and seal material are applied onto the roof panel and pillars to reduce wind noise.

▶ Asphalt Sheet and Sandwich Panel ◀



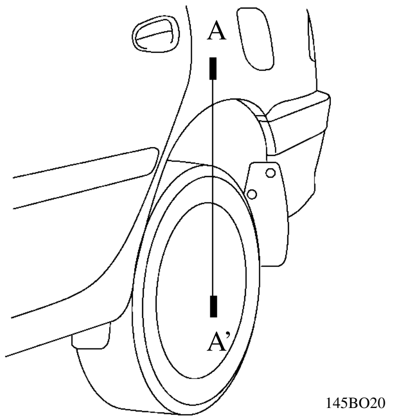
Sedan Model

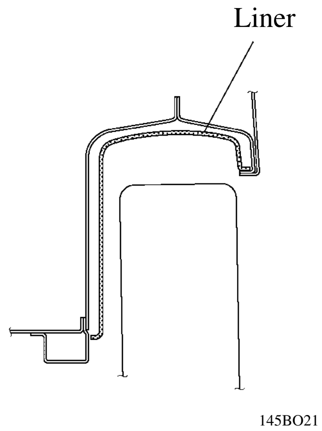
▶ Foamed Material and Seal Material ◀



Sedan Model

- A liner is used inside the rear wheelhouse to reduce the noise that is created by the sand and pebbles hurled by the tire while the vehicle is in motion.

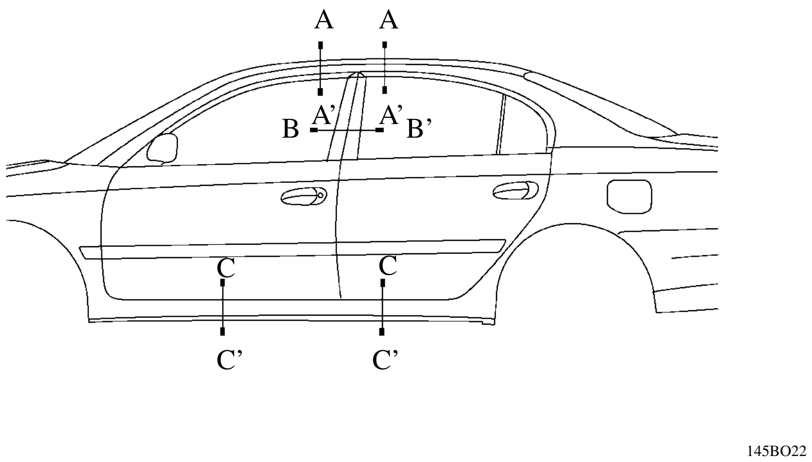


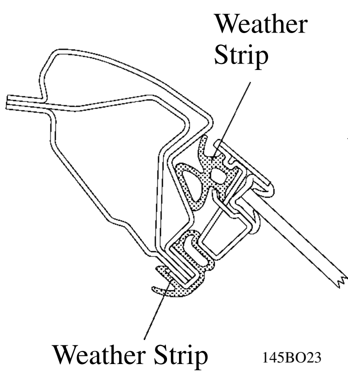


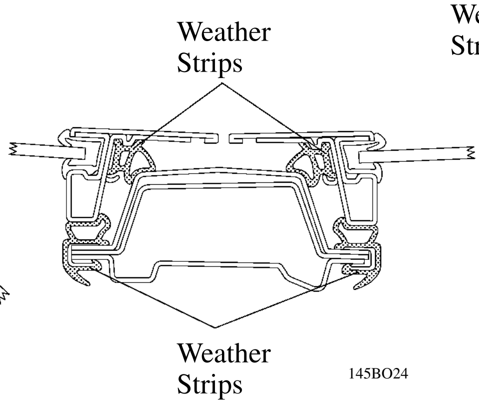
A – A’ Cross Section

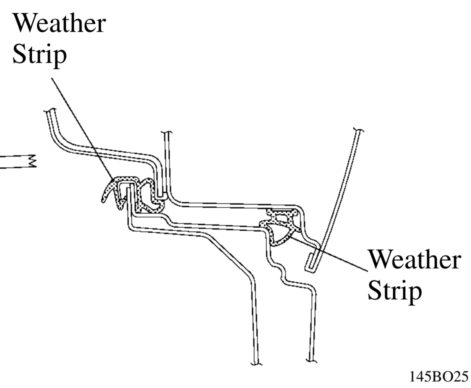
■ WEATHER STRIP

The weather strip around the doors provides double seals to reduce the wind noise created in the vicinity of the door.







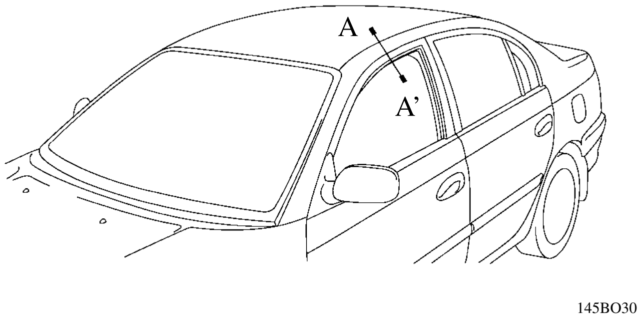


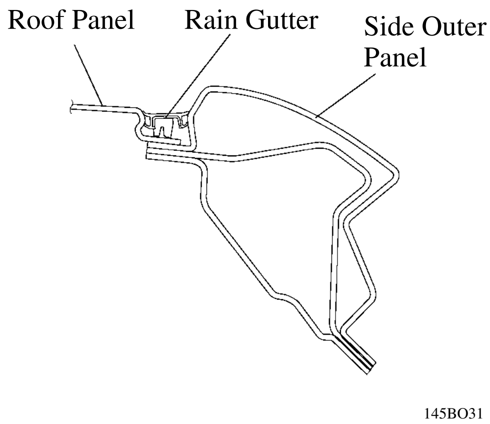
A – A’ Cross Section **B – B’ Cross Section** **C – C’ Cross Section**

ENHANCEMENT OF PRODUCT APPEAL

■ROOF

A rain gutter is provided between the side outer panel and the roof panel to reduce the amount of rain dripping from the sides of the roof.

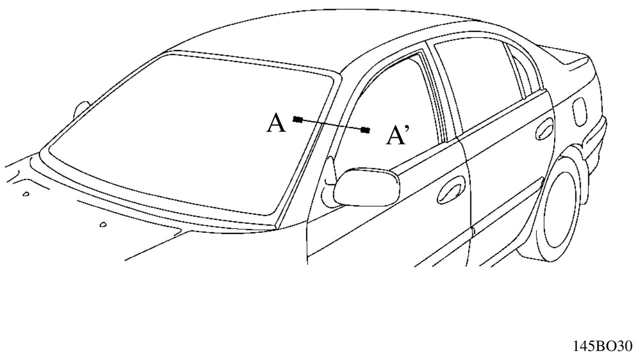


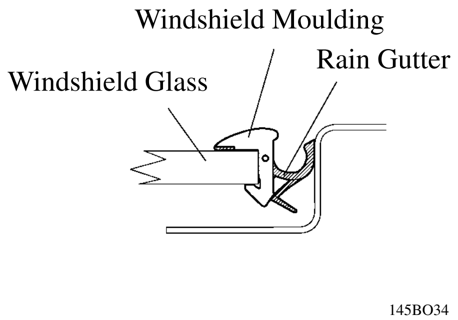


A – A’ Cross Section

■WINDSHIELD MOULDING

A rain gutter has been incorporated into the periphery of the windshield moulding in order to reduce the rain flow down from the roof panel to the windshield glass.

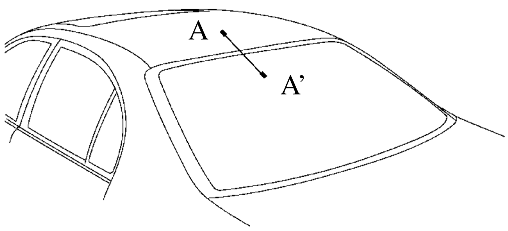




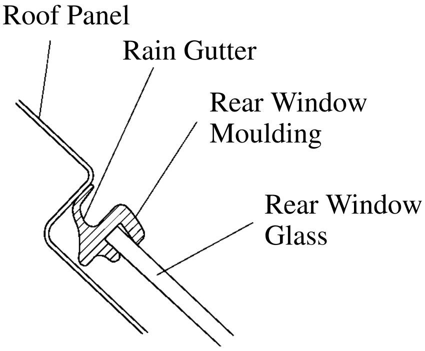
A – A’ Cross Section

■REAR WINDOW MOULDING (SEDAN MODEL)

A rain gutter is incorporated in the rear window moulding to reduce the rain flow over the rear window. Also, the width of the rear window moulding has been reduced to realize a sleek design.



145BO36

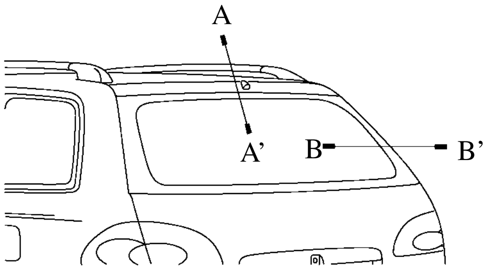


145BO37

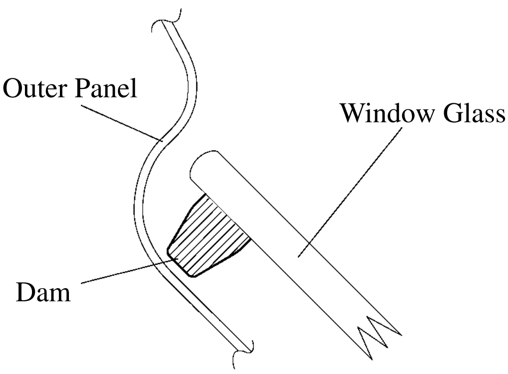
A – A' Cross Section

■BACK DOOR WINDOW MOULDING (WAGON MODEL)

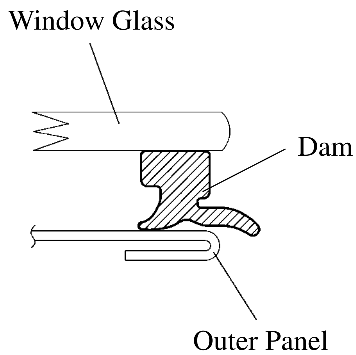
The upper and side window mouldings for the back door window glass have been discontinued to realize a sleek design.



145BO68



145BO71

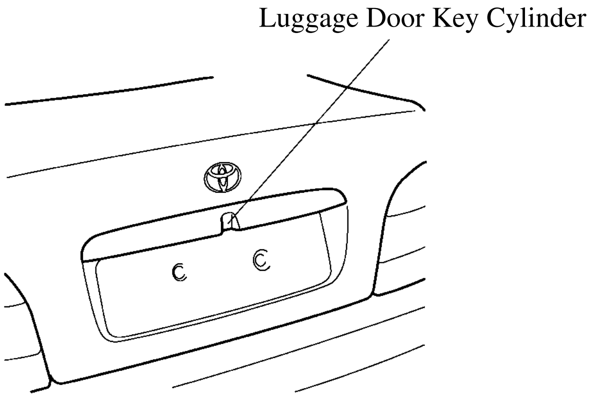


145BO72

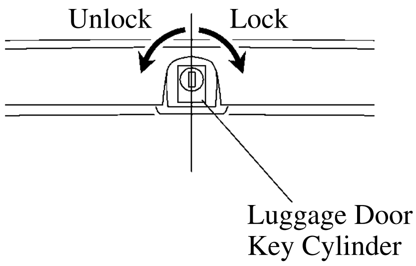
A – A' Cross Section **B – B' Cross Section**

■ LUGGAGE DOOR/BACK DOOR KEY CYLINDER

The power door lock switch or the transmitter's lock function can be used to lock/unlock the luggage door or the back door simultaneously with the front and rear doors.
However, if the luggage door or the back door has been locked by operating the key cylinder with the master key, they cannot be unlocked by operating the power door lock switch or the transmitter.



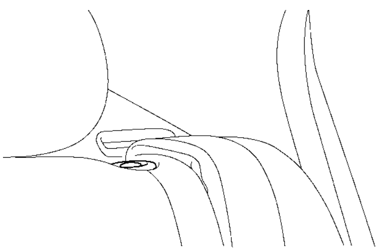
145BO44



145BO45

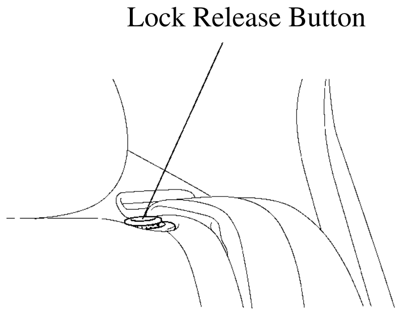
■ SEAT

The new Avensis/Corona has newly adopted a mechanism that detects if the rear seat back latch is ajar.
If the seat back latch is ajar, the tip of the lock release button protrudes, exposing a red mark on the tip to inform the passenger that the seat back latch is ajar.



145BO42

Lock State



145BO43

Half Latch State

■SEAT BELT

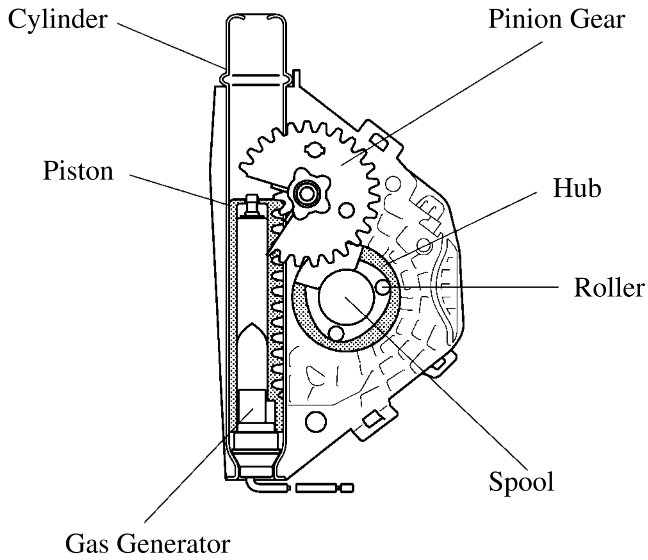
1. General

- On models for Europe, he front seats are provided with an electrical sensing type seat belt pretensioner and a seat belt force limiter.
  In the beginning of a collision, the seat belt pretensioner instantly takes up the seat belt, thus realizing the excellent belt's effectiveness in restraining the occupant.
  When the impact of a collision causes the tension of the seat belt that is applied to the occupant to reach a predetermined level, the force limiter restrains the tension, thus reducing the force that is applied to the occupant's chest area.
- In accordance with the ignition signal received from the airbag sensor assembly, the seat belt pretensioner activates simultaneously with the deployment of the SRS airbag for the driver and front passenger.

2. Seat Belt Pretensioner

Construction

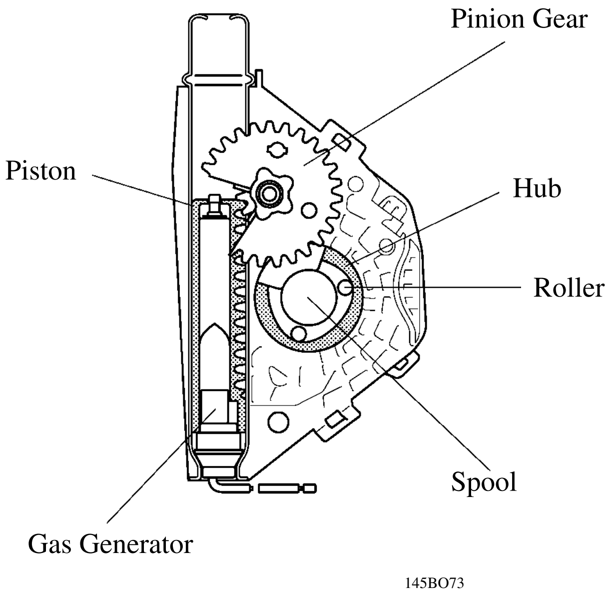
The seat belt pretensioner consists of the gas generator, piston, pinion gear, hub, rollers and spool.



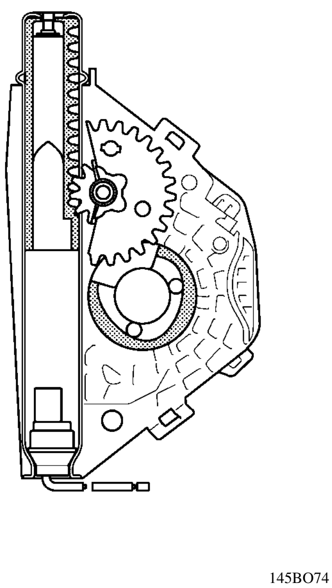
145BO73

Operation

When the gas generator ignites in response to the ignition signal received from the air sensor, the resultant combustion gas pushes the piston. The pushing of the piston causes the gear that is meshed to the periphery of the piston to rotate. The rotation of the gear rotates the hub, causing the roller to become wedged between the hub and the spool. As a result, the rotation of the hub is transmitted via the roller to the spool, thus retracting the seat belt.



Inactive

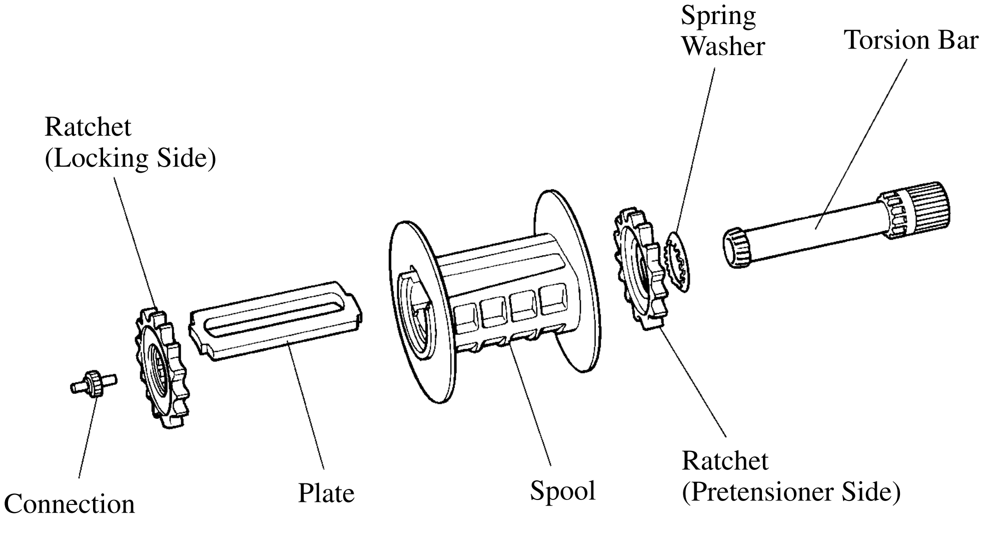


Activated

3. Seat Belt Force Limiter

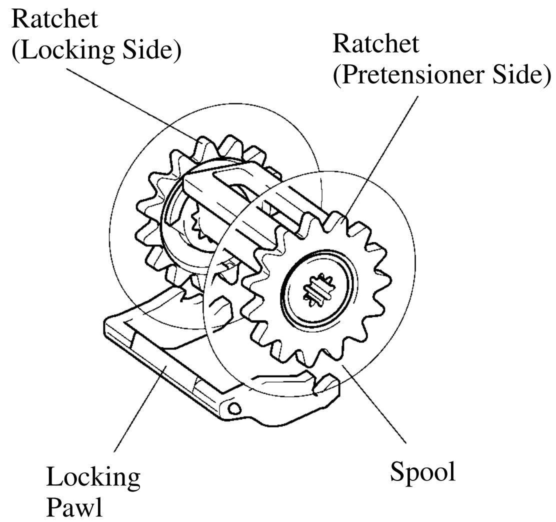
Construction

The seat belt force limiter consists of a locking pawl, ratchets, spool, torsion bar, and plate. The torsion bar is fitted into the spool at one end and into the ratchet at the other end.



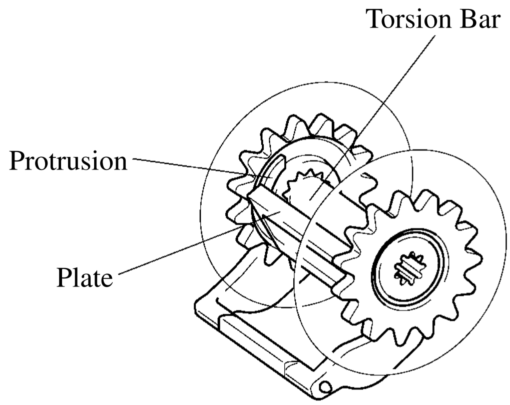
Operation

- If the seat belt is pulled out at an acceleration rate that exceeds a predetermined value, the ELR mechanism activates to engage the locking pawl with the ratchet, preventing the belt from pulling out.
- When the ELR mechanism is activated, if a force that exceeds the predetermined load is applied to the seat belt, the spool rotates, causing the seat belt to pull out. At this time, because the torsion bar is secured at one end by the ratchet and locking pawl, the torsion bar twists with the rotation of the spool (pulling out the seat belt). This twist in the torsion bar acts as a resistance against the pulling out of the seat belt. Further, as the spool rotates, the protrusion on the spool comes in contact with the plate, causing the force limiter operation to end.



145BO76

Inactive

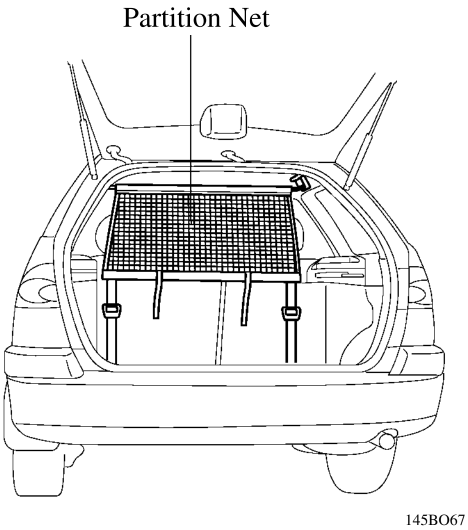


145BO77

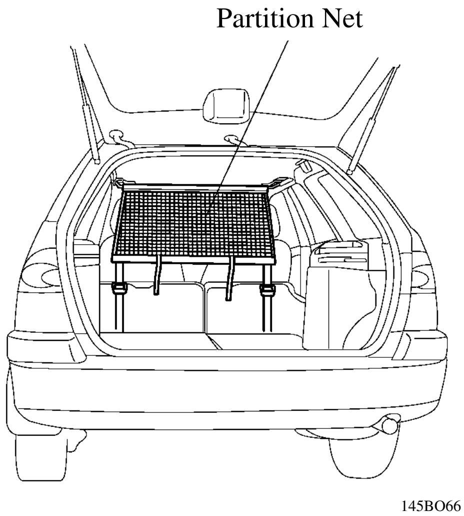
Activated

■ PARTITION NET

The wagon model has been provided with a partition net that separates the passenger area from the luggage area. When the vehicle is transporting luggage, the partition net is intended to prevent loosened luggage from intruding into the passenger area.
In addition, 2 locations have been provided for attaching the partition net, depending on whether or not the rear seat is being used.



When the rear seat is used

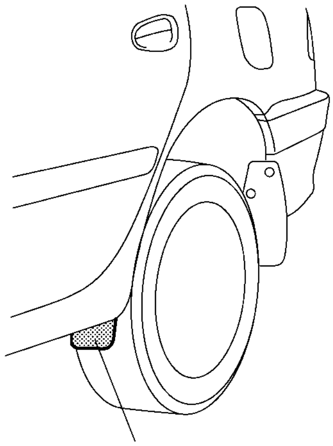


When the rear seat is not used

AERODYNAMICS

■ SPAT

A spat has been newly provided ahead of the rear tires to smooth out the airflow around the tires and reduce the air resistance while the vehicle is in motion.



BODY ELECTRICAL

LIGHTING

■DESCRIPTION

The new Avensis/Corona has the following systems:

System	Outline
Headlights	Four-sculptured type headlights in which the low-beam and high-beam headlights are mounted separately have been adopted on all models. Also, extensions have been incorporated in the headlights to realize a roundish four-headlight design. For details, see the next page.
Daytime Running Light	This system is designed to activate the headlights and taillight automatically during the daytime to keep the car highly visible to other vehicles. The basic construction and operation are the same as in the previous model.
Headlight Beam Level Control System	This system keeps the beam of the headlights adjusted to the appropriate level in accordance with the number (weight) of passengers and volume of luggage. The headlight beam level can be adjusted steplessly by operating the headlight beam level control switch. For details, see page 130.
Rear Fog Light	The rear fog light makes the car highly visible to other drivers driving behind in the rain or fog. The basic construction is the same as in the previous model. However, the operating condition of the rear fog light has been revised to prevent it from being left on unintentionally. For details, see page 132.
Headlight Cleaner	The headlight cleaner sprays windshield washer fluid onto the headlights to clean the lens. The basic construction and operation are the same as in the previous mode.

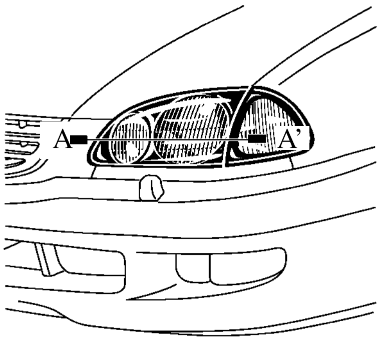
■ HEADLIGHTS

1. General

Four-sculptured type headlights in which the low-beam and high-beam headlights are mounted separately in the housing have been adopted on all new Avensis/Corona models.

2. Construction

The new Avensis/Corona has adopted a four-beam type headlight construction in which the low-beam and high-beam headlights are mounted separately in the housing. As a result, a wider light diffusion characteristic has been realized.
Also, extensions have been incorporated in the headlight housing to realize a roundish four-headlight design.



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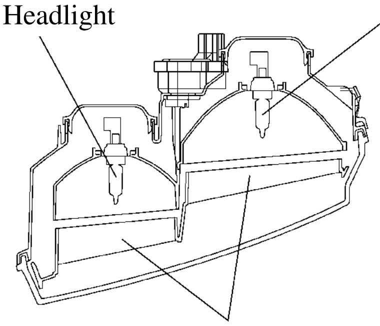


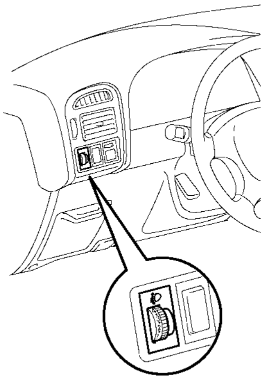
145BE02

A – A' Cross Section

■ HEADLIGHT BEAM LEVEL CONTROL SYSTEM

1. General

This system keeps the beam of the headlights adjusted to the appropriate level in accordance with the number (weight) of passengers and volume of luggage. The headlight beam level can be adjusted by operating the headlight beam level control switch.



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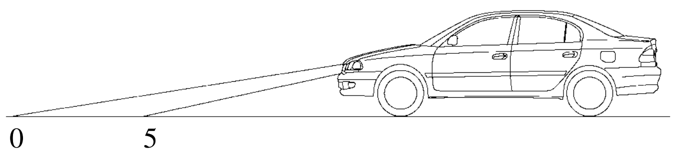
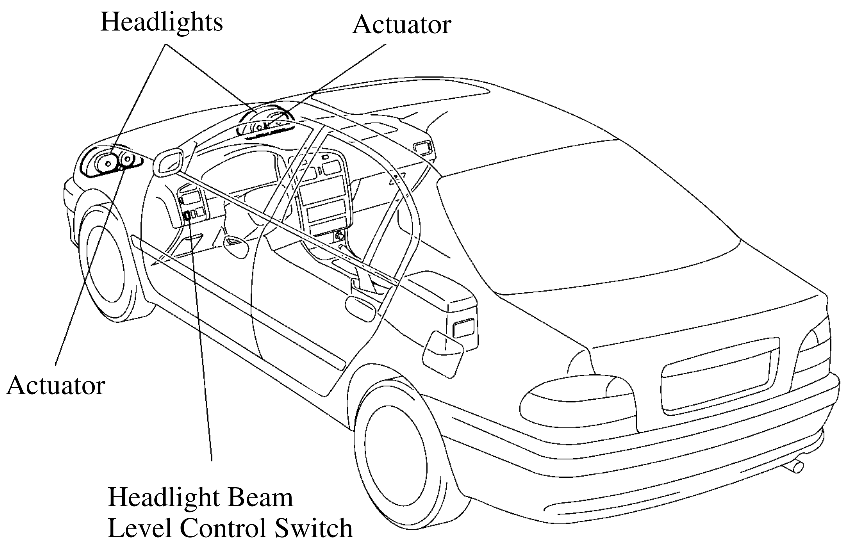


145BE27

Headlight Beam Level Control Switch

2. Layout of Components



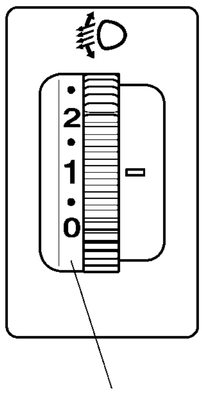
145BE58

Sedan Model

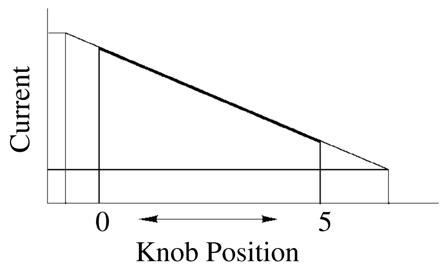
3. Construction

Headlight Beam Level Control Switch

The dial knob of the headlight beam level control switch allows the driver to make adjustment of the headlight beam level.
Equipped with an internal potentiometer, this switch outputs an amount of current in proportion to the position of the dial knob.



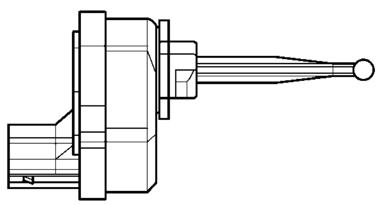
145BE07



145BE29

Actuator

According to the operation of the headlight beam level control switch, the actuator moves the reflector in the headlight to vary its beam.



145BE54

4. Operation

By operating the headlight beam level switch, an amount of current in proportion to the position of the switch is output to the actuators of both headlights.
The actuators operate the reflectors to adjust the headlight beam level according to the amount of current received from the switch.
In this manner, the headlight beam level is adjusted in accordance with the operation of the level control switch.

■REAR FOG LIGHT

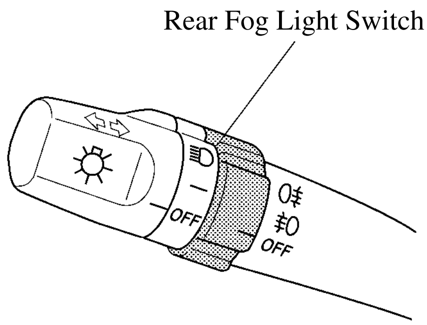
1. General

The rear fog light makes the car highly visible in the rain or fog to other drivers driving behind.
On the new Avensis/Corona, the operating condition of the rear fog light has been revised to prevent it from being left on unintentionally.

2. Construction and Operation

Rear Fog Light Switch

- The rear fog light switch is shaped like a ring and fitted over the light control switch. On the models with front fog lights, the front fog light switch and the rear fog light switch are integrated.
- The rear fog light switch is a momentary type switch. This switch turns on upon twisting and turns off upon twisting it again.



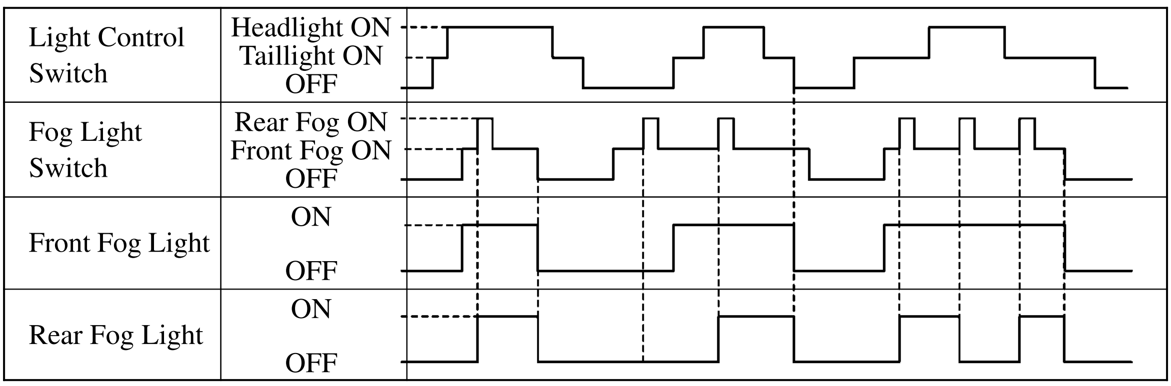
145BE30

Models with Front Fog Light

System Operation

1) Models with Front Fog Light

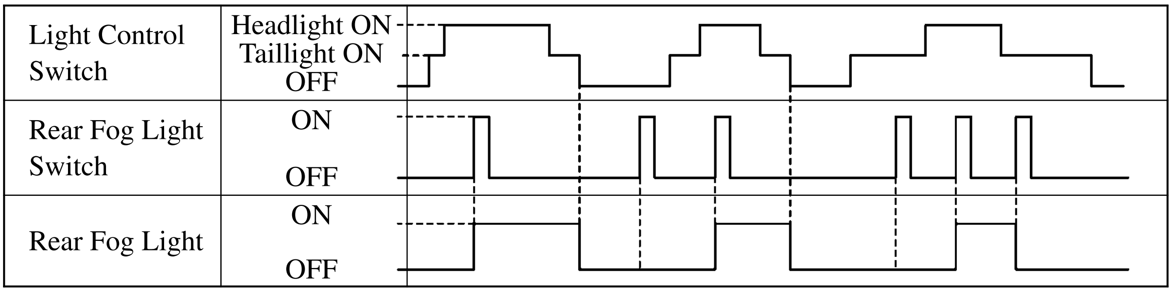
The rear fog light turns on when the rear fog light switch is twisted, providing that the taillights and headlights or front fog light are on. However, once the rear fog light is turned on, it will remain on even after the headlights and front fog light are turned off or the rear fog light switch are turned off. Once the rear fog light is turned off by turning the taillight switch off, the rear fog light will not turn on again unless the rear fog light switch is twisted again.



145BE42

2) Models without Front Fog Light

The rear fog light turns on when the rear fog light switch is twisted, providing that the taillights and headlights are on. However, once the rear fog light is turned on, it will remain on even after the headlights are turned off. Once the rear fog light is turned off by turning the taillight switch off, the rear fog ligtht will not turn on again unless the rear fog light switch is twisted again.



145BE67

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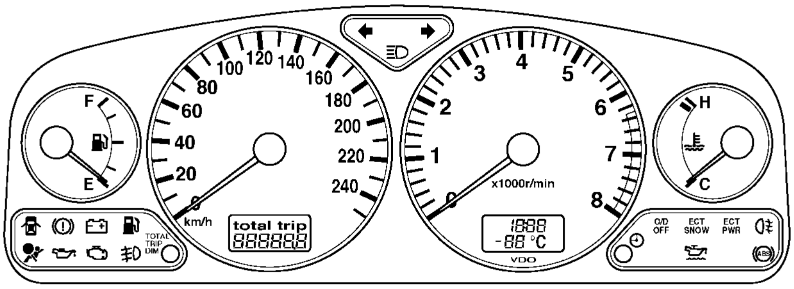
METER

■ COMBINATION METER

1. Description

An electronically controlled combination meter that uses a microcomputer has been adopted on the Avensis/ Corona.
The combination meter has the following features:

- The combination meter has a four-eye analog configuration and offers the improved visibility through the use of larger dials.
- A tachometer has been provided as standard equipment on all models.
- An electronic display odometer and trip meter are used for convenience and good visibility.
- A clock and an outside temperature gauge are enclosed in the meter.
- The function to adjust the rheostat is enclosed in the combination meter.
- The setting and the design of the indicator and warning light have been changed.



145BE22

3S-FE Engine Model

2. Construction and Operation

Gauge and Indicator

- In conjunction with the adoption of the electronically controlled combination meter, the detection method of the gauges and indicators have been changed as follows.

Model / Item	New	Previous
Fuel Warning Indicator	Based on the resistance value output by the fuel gauge, the microcomputer calculates the residual amount of fuel to indicate it on the meter.	The residual amount of fuel is detected through the fuel residual amount detection circuit that uses a thermistor to indicate it on the meter.
Water Temperature Gauge	The water temperature signal that is output by the engine ECU is used to determine the water temperature and to display it on the meter (except the models with the 2C-T engine).	A sender gauge for the detection of water temperature is used to detect the water temperature and to display it on the meter.
Engine Oil Level Warning	The sensor is used only to detect the oil level and to display it on the meter. In the combination meter, the indication of the oil temperature has been replaced with the water temperature.	A sender gauge is used to detect the oil temperature and oil level and to display it on the meter.

- The design and the setting of the indicators and warning lights have been changed from the previous model as follows.

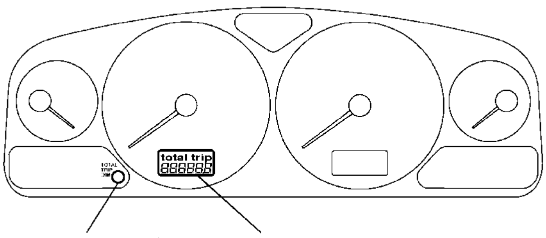
Item \ Model	New	Previous
Econodrive Monitor Indicator	ECONO	ECONOMY
Hazard Warning Indicator	— (Shares the turn signal indicator)	
Parking Brake Indicator	— (Shares the brake warning indicator)	
Front Fog Light Indicator		—

145BE55

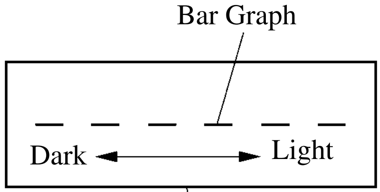
Rheostat

1) General

The rheostat that changes the brightness of the meter has been enclosed in the combination meter. By operating the instrument panel light control knob (trip meter reset knob), the rheostat changes the brightness. In addition, the LCD (Liquid Crystal Display) that displays the trip and odometer provides a bar graph that indicates the present brightness level while the rheostat is being adjusted.



145BE23

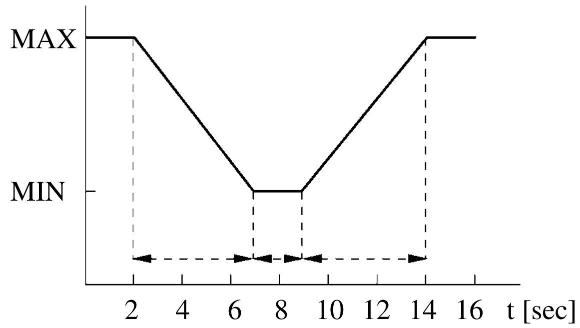


145BE24

2) Rheostat Brightness Control Method

The brightness can be adjusted on the rheostat as follows.

1. When the LCD is in the odometer mode, press the instrument panel light control knob 2 seconds or longer to activate the rheostat brightness control mode. Then, on the LCD for displaying the trip and odometer, a bar graph will appear to indicate the present brightness of the meter.
2. By continuing to press the control knob while the bar graph appears on the LCD, the brightness changes as described in the graph shown below. After the desired brightness is reached, release the knob to set the brightness. The rheostat brightness control mode ends at the moment the knob is released.



145BE25

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AIR CONDITIONING

■ DESCRIPTION

1. General

The air conditioning system in the new Avensis/Corona has the following features:

- As in the previous model, full air mix type heater and ventilator is used on all models.
- A manual air conditioner is provided as optional equipment on all models.
- An automatic air conditioner is provided as optional equipment on models for Europe.
- A sub-cool condenser that cools the refrigerant twice has been adopted.
- An aluminum heater core has been adopted on all models.
- The foot/def. mode enables the airflow ratio between the foot and defroster vents to be changed.
- A cool-air bypass damper has been provided on all models except those for Scandinavia.
- The rotary switch and lever type heater control panel has been adopted on all models.
- The models with the automatic air conditioner have adopted an automatic ECON control function as the method for controlling the compressor.

▶ Performance ◀

Item \ Model		New	Previous
Heater	Heat Output W (Kcal/h)	4760 (4090)	←
	Air Flow Volume (m^3/h)	320	←
	Power Consumption (Heater) (W)	180	←
Air Conditioner	Heat Output W (Kcal/h)	4660 (4010)	4760 (4090)
	Air Flow Volume (m^3/h)	430	←
	Power Consumption (Compressor) (W)	2700	←

▶ Specifications ◀

Item \ Model			New	Previous
Ventilation and Heater	Heater Core	Size W x H x L mm (in.)	180.9 x 180 x 27 (7.1 x 7.1 x 1.1) 180.9 x 180 x 36 (7.1 x 7.1 x 1.4)*1	178.5 x 180 x 49 (7.0 x 7.1 x 1.9)
		Fin Pitch mm (in.)	2.25 (0.09), 2.8 (0.11)*1	2.8 (0.11)
	Blower	Motor Type	BOSCH Motor	←
		Fan Size Dia. x H mm (in.)	150 x 75 (5.9 x 3.0)	←
Air Conditioner	Condenser	Type	Multi-Flow	3-Passage Flow
		Size W x H x L mm (in.)	570 x 321.3 x 16 (22.4 x 12.6 x 0.6)	686 x 349.2 x 22 (27.0 x 13.7 x 0.9)
		Fin Pitch mm (in.)	3.2 (0.13)	3.5 (0.14), 4.5 (0.18)*2
	Evaporator	Size W x H x L mm (in.)	260 x 212 x 90 (10.2 x 8.3 x 3.5)	←
		Fin Pitch mm (in.)	4.5 (0.18)	4.0 (0.16)
	Compressor	Type	10PA15	←

*1: North Europe Model
*2: 2C-TE and 2C-T Engine Model

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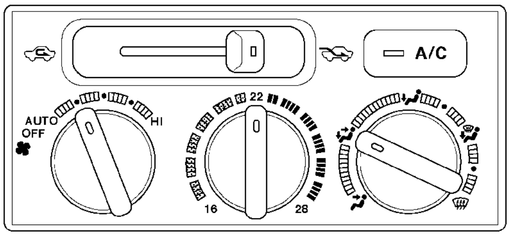
■CONSTRUCTION AND OPERATION

1. Heater Control Panel

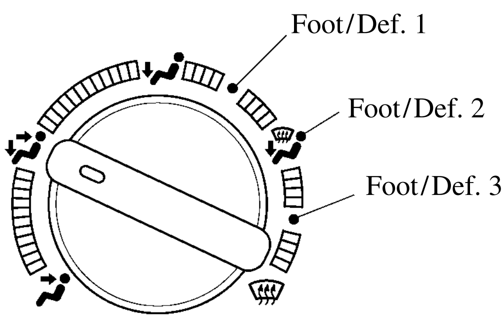
- The rotary switch and lever type heater control panel has been adopted on all models.



Automatic Air Conditioner Model

145BE20

- The mode selector switch provides 3 foot/def. mode settings.
  Thus, in the foot/def. mode, the airflow ratio between the foot and defroster vents can be changed as desired.



Mode Select Switch

145BE21

▶ Airflow Ratio ◀

Airflow Ratio / Switch Position	Foot	Def.
Foot/Def. 1	60 %	40 %
Foot/Def. 2	50 %	50 %
Foot/Def. 3	40 %	60 %

2. Air Conditioning Unit

As in the previous model, a semi-center location air conditioning unit, in which the evaporator and heater core are placed in the vehicle's longitudinal direction, has been adopted.
However, the following items have been changed.

Heater Core

An aluminum heater core has been adopted on all models.

Air Flow Dampers

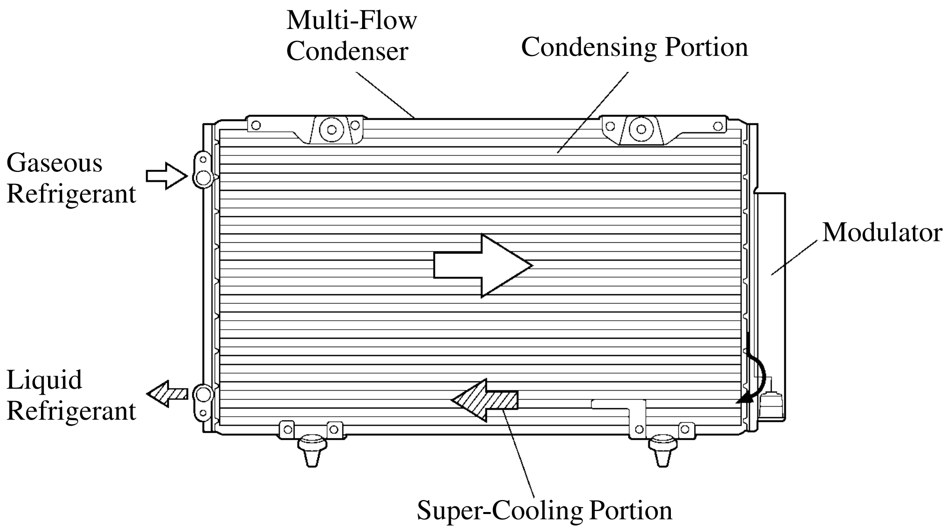
A cool-air bypass damper has been newly adopted in the cool-air bypass duct that is provided on the models except those for Sweden, Denmark, Finland and Norway.

3. Condenser

The new Avensis/Corona has newly adopted a sub-cool condenser in which a multi-flow condenser (consisting of two cooling portions: a condensing portion and a super-cooling portion) and a gas-liquid separator (modulator) have been integrated. This condenser has adopted the sub-cool cycle for its cooling cycle system to improve the heat exchanging efficiency.

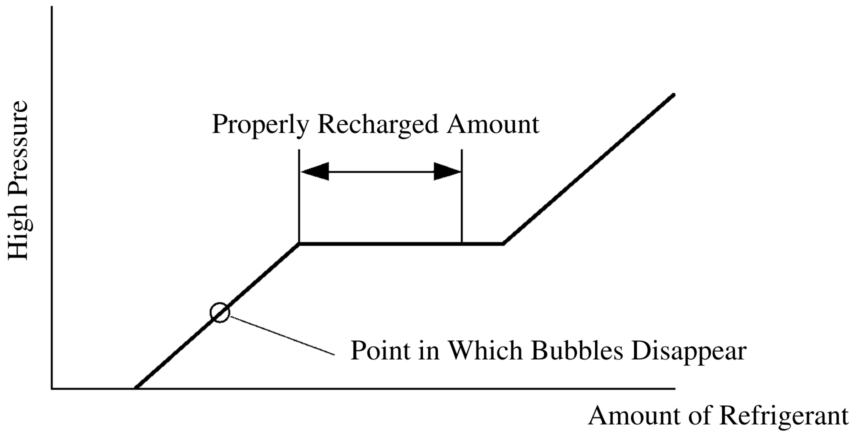
Sub-Cool Cycle

The receiver cycle of the previous condenser could not convert the gaseous refrigerant that was sent by the compressor into a completely liquefied state in the condenser. Thus, a portion of the refrigerant remained in the gaseous state as it was sent to the evaporator.
In the sub-cool cycle of the sub-cool condenser that has been adopted on the new model, after the refrigerant passes through the condensing portion of the condenser, both the liquid refrigerant and the gaseous refrigerant that could not be liquified are cooled again in the super-cooling portion. Thus, the refrigerant is sent to the evaporator in an almost completely liquefied state.



145BE31

NOTE: 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.
For the proper method of verifying the amount of the refrigerant and to recharge the system with refrigerant, see the Avensis/Corona Repair Manual (Pub. No. RM599E).



145BE38

4. Automatic Air Conditioning ECU

Compressor Control

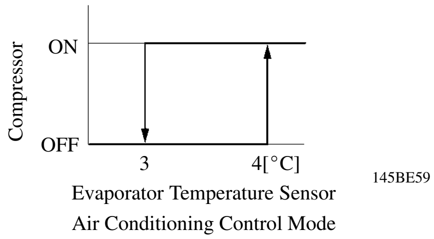
1) Automatic ECON Control

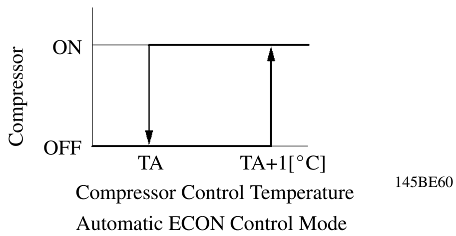
a. General

The method for controlling the compressor has been changed to automatic ECON control, thus improving fuel economy, cooling performance and ease of use.

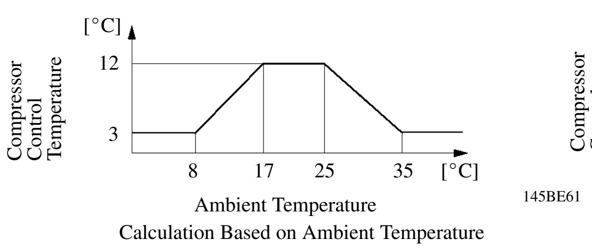
b. Operation

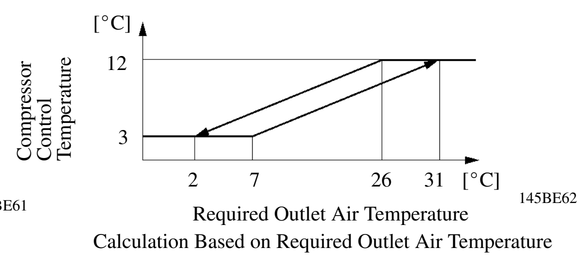
When the air outlet is in a mode other than the defroster mode, the air conditioning system operates in the air conditioning control mode for 5 minutes after the air conditioning is turned ON (compressor ON). Thus, the air conditioning ECU controls the ON/OFF function of the compressor based on the temperature that is detected by the evaporator temperature sensor.
After 5 minutes have elapsed since the air conditioning was turned ON, the air conditioning ECU will make either of the lower temperature as a compressor control temperature when calculating the compressor control temperature from the detected temperature by the ambient temperature sensor and the required outlet air temperature.
For 5 to 8 minutes after the air conditioning was turned ON, the ECU controls the compressor by increasing the compressor control temperature gradually until the compressor control temperature reaches to this calculated temperature.
After 8 minutes have elapsed from the time the air conditioning was turned ON, the air conditioning system engages in the automatic ECON control mode, and the ECU controls the compressor according to the compressor control temperature that was calculated by the aforementioned formula.
Whenever the air outlet mode is in the defroster mode, the air conditioning system is engaged in the air conditioning control mode and the ECU controls the ON/OFF function of the compressor according to the temperature that is detected by the evaporator temperature sensor.
In addition, even if the air outlet mode is changed from the defroster mode to another mode, the system will continue to operate in the air conditioning control mode until the ignition switch is turned OFF.



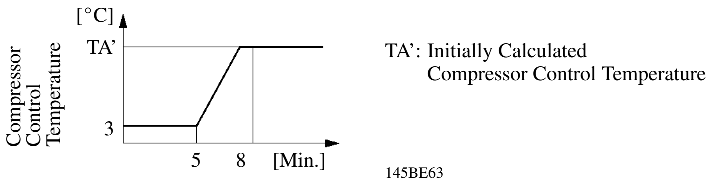


Compressor Control Temperature





Method for Calculating Compressor Control Temperature



Determining Compressor Control Temperature

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ACCESSORIES

■ DESCRIPTION

The new Avensis/Corona includes the accessory system shown below.

System	Outline
Power Window System	This system includes one-touch auto up and down and jam protection functions. The one-touch auto up and down function automatically closes and opens the driver's side window fully. A jam protection function automatically stops the power window and moves it downward, if a foreign object becomes jammed in the window during one-touch auto-up operation of the driver's window. For details, see the next page.
Door Lock Control System	This system has "key-linked lock and unlock" and "door lock control switch" functions. All doors can be locked and unlocked simultaneously by operation of the door key or door lock control switch. The basic construction and operation are the same as in the previous model.
Wireless Door Lock Remote Control System	A remote control system is adopted in which the lock and unlock functions of all doors can be controlled by the signals emitted from a transmitter. For details, see page 146.
Engine Immobiliser System	This is a theft-deterrent system which disables the engine unless the ignition key used to start the engine has an ID code that matches the pre-registered code in the vehicle. For details, see page 149.
Seat Heater	The seat heater system improves the comfort of the driver and the front passenger in a cold weather by heating the surface of the seats. It is a 2-mode control type system that provides a switch to turn the heater ON and OFF.
SRS Airbag	The SRS (Supplemental Restraint System) airbag is provided for the driver and front passenger. The SRS airbag has been designed to lessen the shock to the head and chest of the driver and front passenger with a frontal impact in the even of a collision. 3 sensor type airbag system is used in which the detection of deceleration during a collision as well as control of the airbag system is accomplished by the front airbag sensor and airbag sensor assembly. For details, see page 153.
SRS Side Airbag	The SRS side airbag is provided for the outer side of the front seat back. SRS side airbag has been designed to help reducing the impact energy that is transmitted to the driver and front passenger in the event of a side collision. For details, see page 160.
Moon Roof	A moon roof provides good ventilation and exhilarating open air driving. This system includes "one-touch slide open and close" and "jam-protection" functions.
Outside Rear View Mirror	An electrical remote control type outside rear view mirror that enables mirror angle to be adjusted by a switch operation of is provided. Also, an internal heater which operates in conjunction with the rear window defogger have been adopted.

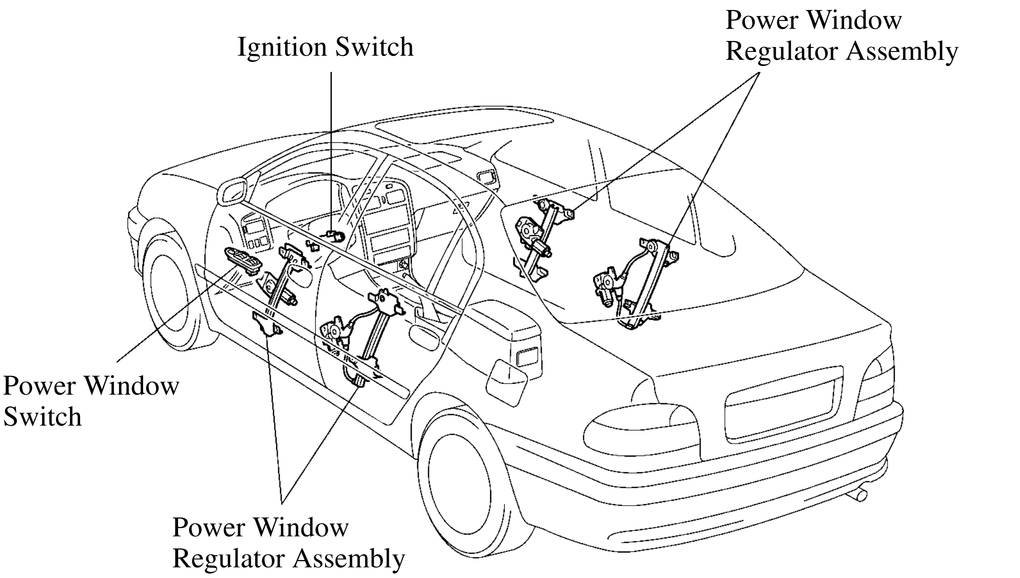
■POWER WINDOW

1. General

The new Avensis/Corona has adopted an "one-touch auto up-and-down" function in which the driver's door window can be fully opened or closed through one-touch operation.
In conjunction with this function, a jam protection function has been newly added. If a foreign object becomes jammed between the glass and the window frame during one-touch auto-up operation, this function automatically stops the power window's upward movement and moves it downward.

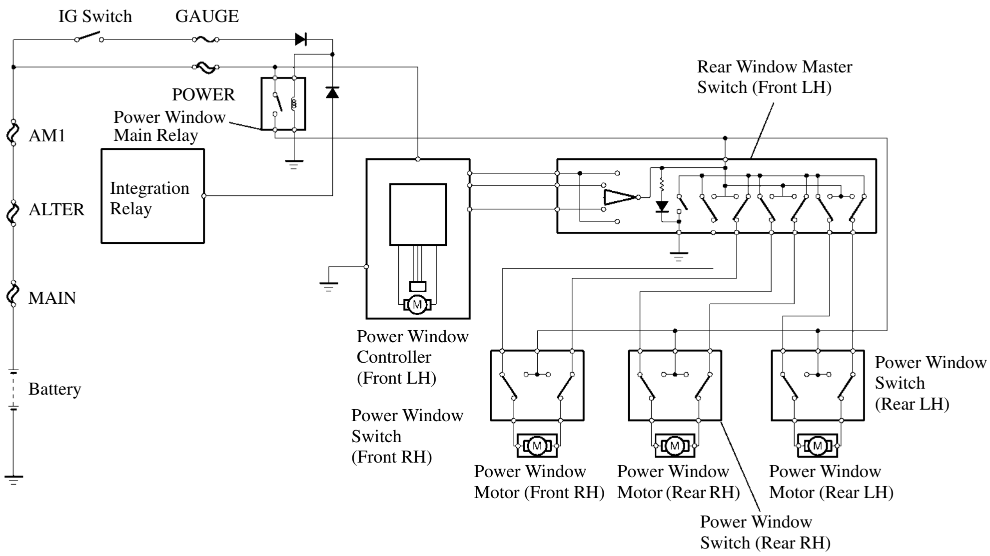
2. Layout of Components

The major function parts of jam protection function of the power window are shown below.



Sedan Model

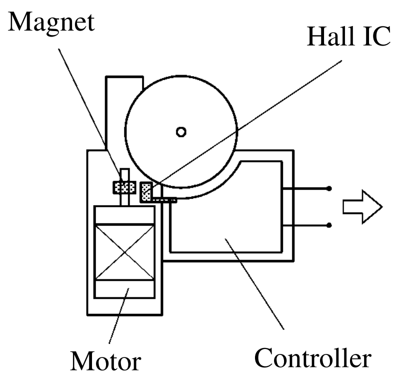
3. Wiring Diagram



4. Construction

Pulse Sensor

The pulse sensor consists of a magnet and a hall IC. The magnet rotates with the power window motor. The hall IC detects a polarity change which is caused by the rotation of the magnet, and converts it into a pulse signal. The pulse sensor (hall IC) outputs a pulse signal to the controller.
Also, the neutral zone in which the jam protection function does not operate is determined by the number of pulses.



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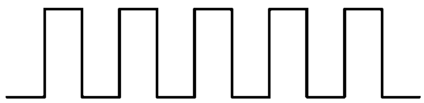


Output Pulse Signal

145BE49

Controller

Consisting of a pulse input circuit, jam judgment circuit, and motor drive circuit, the controller is integrated with the power window motor.
The jam judgment circuit detects if a foreign object is jammed in the window by sensing a change in the signal that is output by the pulse sensor.

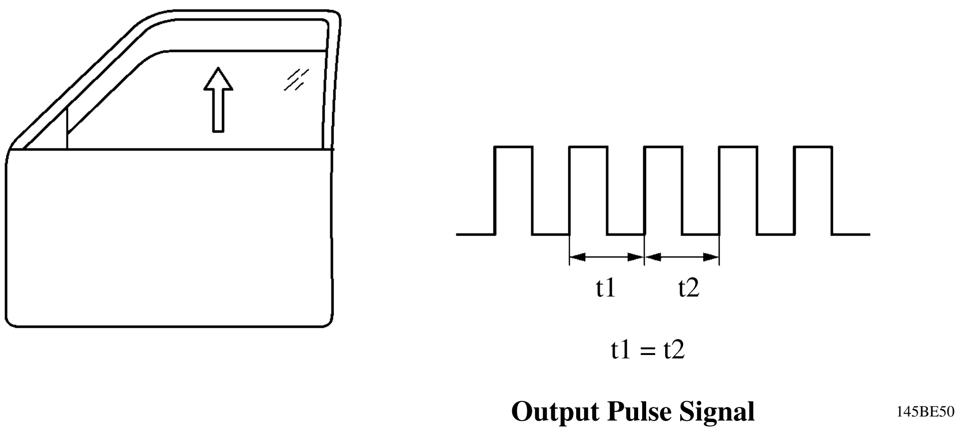
Power Window Master Switch

The power window master switch outputs control signals for the power window's up, down, one-touch auto-up, one-touch auto-down functions to the power window motor.

5. Operation

Normal Operation

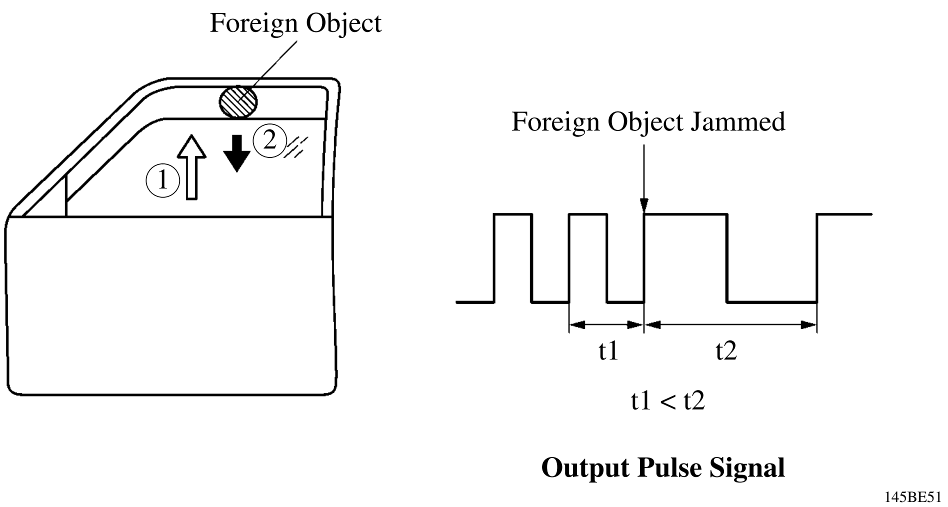
During the normal operation of the power window, the power window motor rotates at a constant speed. Accordingly, the width of the pulse signals that are output by the pulse sensor to the controller is uniform. When the controller receives pulse signals with a uniform width, it determines that no jamming occurred. Thus, the controller determines the power window movement according to the signal that is received by the controller.



Output Pulse Signal

Jam Protection Operation

If an object becomes jammed between the glass and the window frame during one-touch auto-up operation, the power window motor's speed decreases (1). Accordingly, the width of the pulse signals that are output by the pulse sensor to the controller increases. After the motor's deceleration rate exceeds a predetermined value, the jam judgment circuit determines that jamming occurred.
Then, the controller stops the upward movement of the window, and automatically moves the window downward so that there will be a window opening of 200 mm (7.9 in.) or more (2).
The jam protection function operates only during a one-touch auto-up operation.



Output Pulse Signal

NOTE: Immediately before the window is fully closed, there is an area in which the jam protection function does not operate.

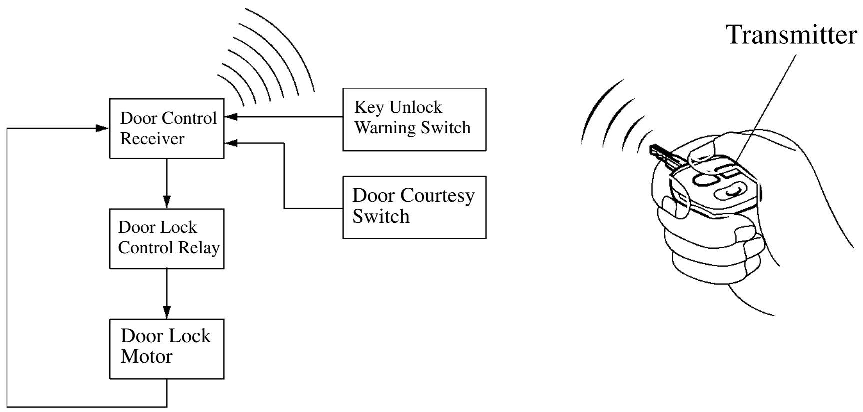
■ WIRELESS DOOR LOCK REMOTE CONTROL SYSTEM

1. General

The wireless door lock remote control system is a convenient system for locking and unlocking all the doors from a distance. The (weak radio wave) signal that is transmitted from the transmitter is received by the antenna, which is enclosed in the door control receiver. The door lock motor is then controlled in accordance with the received signal.
This system in the Avensis/Corona has the following features.

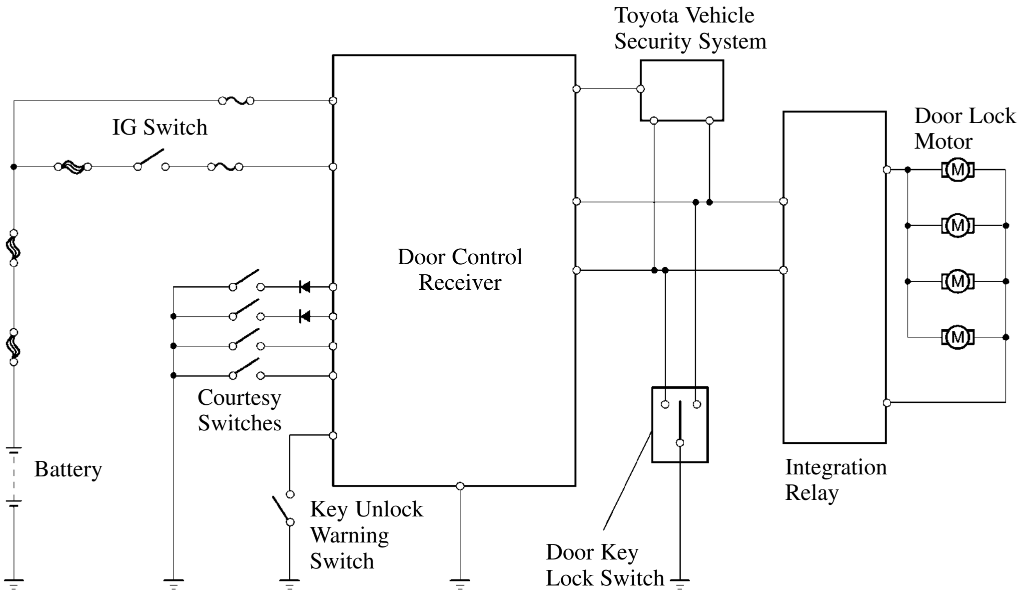
- A two-button, key-integrated transmitter has been adopted.
- The maximum of four kinds of transmitter recognition codes can be registered.
- A rolling code system, in which the signal configuration changes each time when a signal is transmitted by the transmitter, has been adopted.
- The key cylinder for the front passenger door has been discontinued on the models with the wireless door lock remote control system.

▶ System Diagram ◀



145BE12

2. Wiring Diagram



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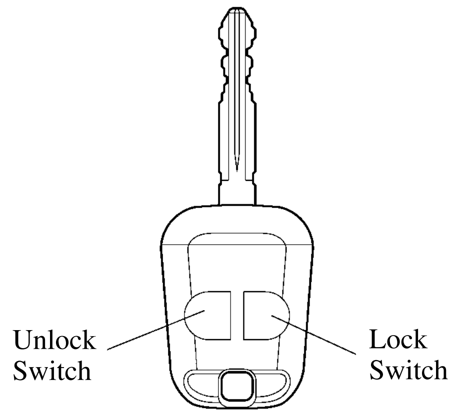
3. Construction

Transmitter

A key-integrated type transmitter, which is enclosed in the ignition key, has been adopted.
The lock and unlock functions of all the doors can be controlled by operating the switches on the transmitter.



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Door Control Receiver

The door control receiver is provided with an internal antenna to receive the signals emitted by the transmitter. When a signal is received from the transmitter, the receiver outputs an appropriate signal (to lock or unlock the door) to the door lock control relay. The receiver also contains an EEPROM which can store the transmitter recognition codes.

Key Unlock Warning Switch

The key unlock warning switch detects whether or not the ignition key is inserted into the ignition key cylinder. It goes on when the key is inserted and off when it is removed from the cylinder.

Door Courtesy Switch

The door courtesy switch detects the operation of a door. It goes on when the door is open and off when it is closed.

4. Function

Normal Operation

The following operations take place by operating the transmitter switches.

1) All Doors Unlock Operation

Unlocks all the doors after the transmitter “Unlock” switch is pressed.
However, if the luggage door or the back door have been locked by the master key, the luggage door or the back door cannot be unlocked with the transmitter.

2) All Doors Lock Operation

Locks all the doors after the transmitter “Lock” switch is pressed.

Auto Lock Function

If none of the doors are opened within 30 seconds after they are unlocked by the wireless door lock remote control, all the doors are locked again automatically.

Transmitter Switch Misoperation Prevention Function

When an ignition key is in the ignition key cylinder, the wireless door lock remote control is temporarily cancelled to prevent misoperation.

Reception Stop Function When Door is Open (Lock Function Only)

Reception is rejected when a door is open because the operator may think that all the doors are locked if the system were to operate when any of the doors is not closed completely. This function is to prevent incorrect operation on such an occasion.

Transmitter Recognition Code Registration Function

The table below shows the 4 special coded ID registration function modes through which up to 4 different codes can be registered. The codes are electronically registered (written to and stored) in the EEPROM. For details of the recognition code registration procedure, refer to the Avensis/Corona Repair Manual (Pub. No. RM599E) to register the codes correctly.

Mode	Function
Rewire Mode	Erases all previously registered codes and registers only the newly received codes. This mode is used whenever a transmitter or the wireless door lock ECU is replaced.
Add Mode	Adds a newly received code while preserving any previously registered codes. This mode is used when adding a new transmitter. 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 transmitter is lost.

Transmitter Recognition Code Resynchronizing Function

If the transmitter and the receiver go out of synchronization due to the operations described below, the transmitter in which recognition codes are registered can be resynchronized.

- The transmitter's battery has been changed.
- The transmitter has been operated continuously in an area outside of the receiver's signal reception area.

For details of the recognition code resynchronizing procedure, refer to the Avensis/Corona Repair Manual (Pub. No. RM599E).

Diagnostic Function

A diagnostic function that comprises the following 2 functions has been adopted.

- A function to check the state of the signal being sent and received by the transmitter.
- A function to distinguish a non-registered transmitter or a desynchronized transmitter from a normal transmitter.

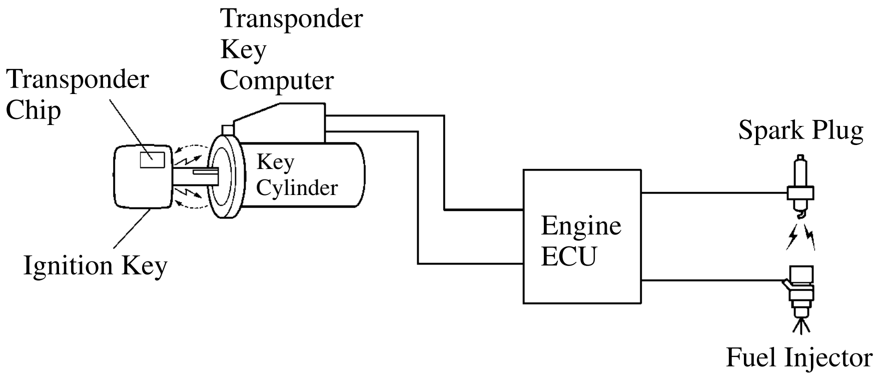
For details of the diagnostic procedure, refer to the Avensis/Corona Repair Manual (Pub. No. RM599E).

■ENGINE IMMOBILISER SYSTEM

1. General

The engine immobiliser system is a theft-deterrent system which disables the engine from starting by using the ignition key with an ID code that matches the pre-registered code in the vehicle.
This system adopts a transponder system which uses a transponder chip embedded in the grip of the ignition key. When the coil that is integrated in the transponder key computer and located around the ignition key cylinder receives the ID code signal transmitted by the transponder chip, the transponder key computer determines whether or not the ID code matches the code that is stored in the transponder key computer.

▶ System Diagram ◀

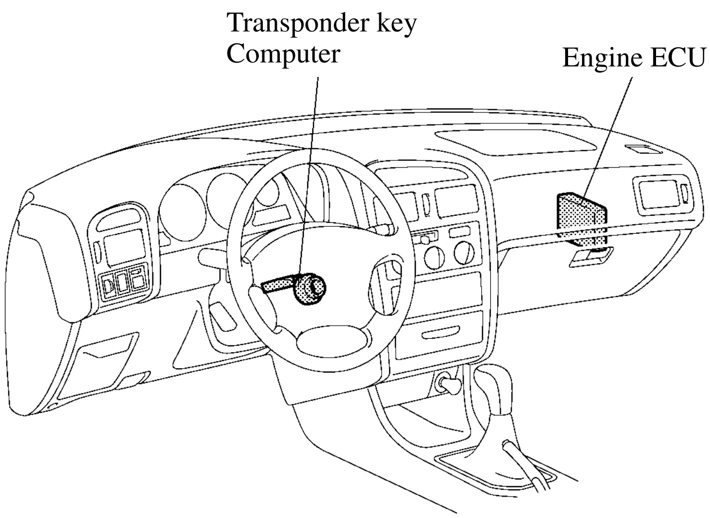


Gasoline Engine Model

145BE46

2. Layout of Components

The major function parts of the engine immobiliser system are shown below.



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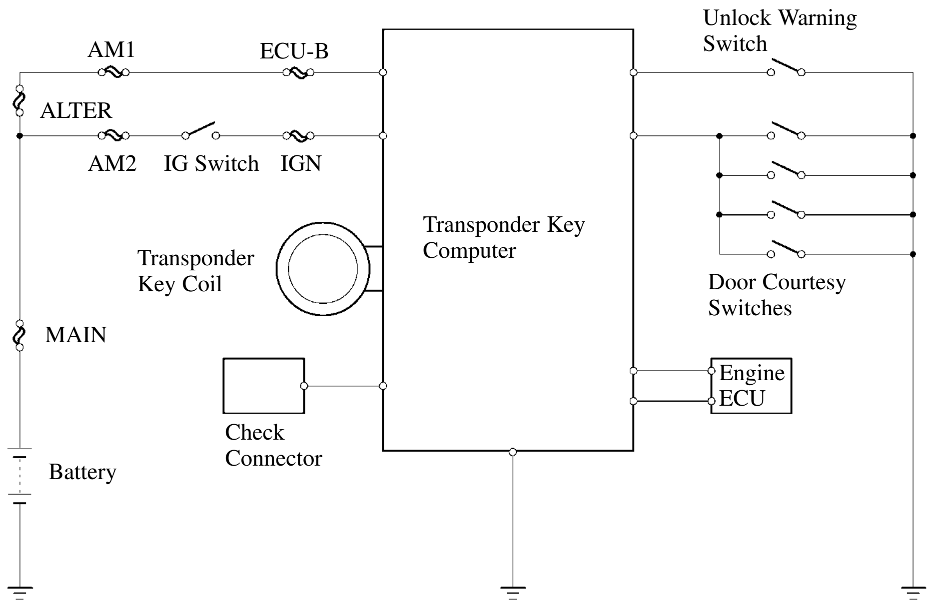
3. Wiring Diagram



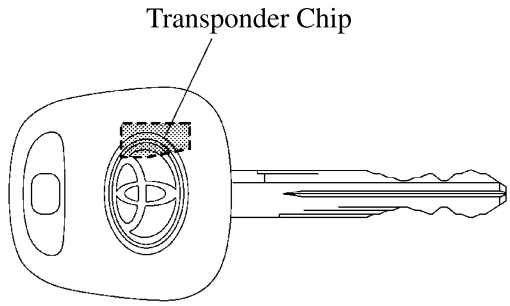
145BE44

4. Construction

The engine immobiliser system consists of the transponder key (ignition key) and transponder key computer.

Transponder Key (Ignition Key)

A transponder chip is embedded in the grip of the ignition key. Each transponder chip contains an individual transponder key code (ID code). The key does not need an internal battery to transmit a key code.



Key without Transmitter

145BE45

Transponder Key Computer

The transponder key computer integrates a coil that receives the transponder key code from the transponder chip, an amplifier that amplifies the code, and an ECU that verifies the legitimacy of the received code. The transponder key computer is installed in the upper of the key cylinder.

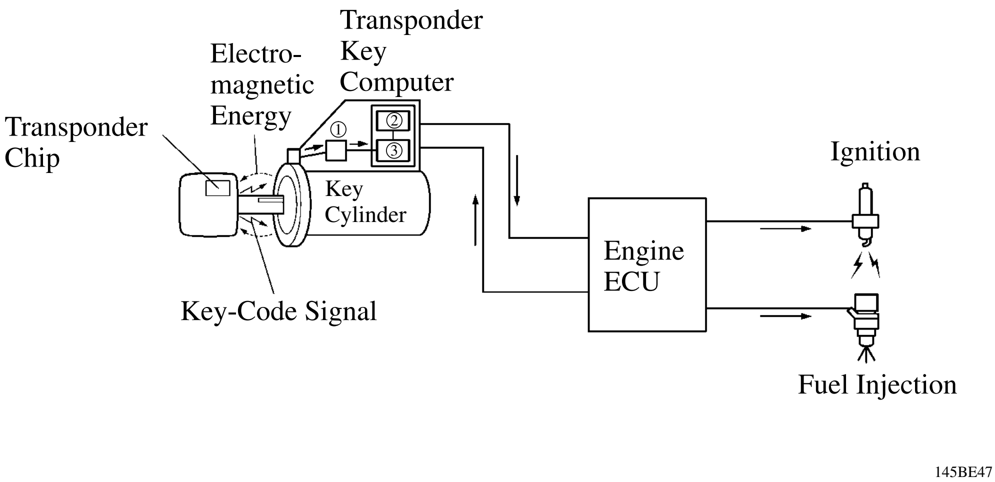
5. Operation

Setting the Engine Immobiliser System

- When the ignition key is removed from the key cylinder, the engine immobiliser system will be set.
- After 20 seconds have elapsed upon turning the ignition key from the ON position to the ACC or LOCK position, the engine immobiliser will be set.

Unsetting the Engine Immobiliser System

1. When the ignition key is inserted in the key cylinder, the transponder key computer causes the coil that is integrated in the computer to provide electromagnetic energy to the transponder chip, thus enabling the transponder chip to transmit a key-code signal.
   The condenser in the transponder chip converts and stores this energy as electrical energy. The transponder chip then uses this electrical energy to transmit a key-code signal.
2. After being received by the coil that is integrated in the computer, the key-code signal is amplified by the amplifier that is enclosed in the computer and is sent to the ECU portion to verify the legitimacy of the code.
   The key code that has been received by the ECU part is then compared to the key code that is stored in the ECU part. The code comparison process takes place, and if the codes match in a row, the ECU part unsets the immobiliser system.
   As a result, the engine will be able to start.



Gasoline Engine Model

① : Amplifier Part
② : Code Memory Circuit
③ : Code Comparison Circuit

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6. Functions

The engine immobiliser system provides the following functions:

Immobiliser Cancel Function

The immobiliser system is cancelled when the following condition is met, thus permitting authorized operation of the engine:

- The ignition key has been inserted in the key cylinder (after the transponder key computer reads the key code of the transponder chip and that code matches the pre-registered key code in a row).

New Transponder Key Code Registration Function

This function allows the registration of the key code of a new master or sub key to the transponder key computer. A maximum of 6 different transponder key codes (4 for master keys and 2 for sub keys) can be registered in the transponder key computer. This function is used if the transponder key computer is replaced with a new one.

Additional Transponder Key Code Registration Function

This function enables the registration of the key code for a new master key or sub key, while retaining the key codes that are already registered. This function is used for the purpose of adding a new master or sub key.

Transponder Key Code Delete Function

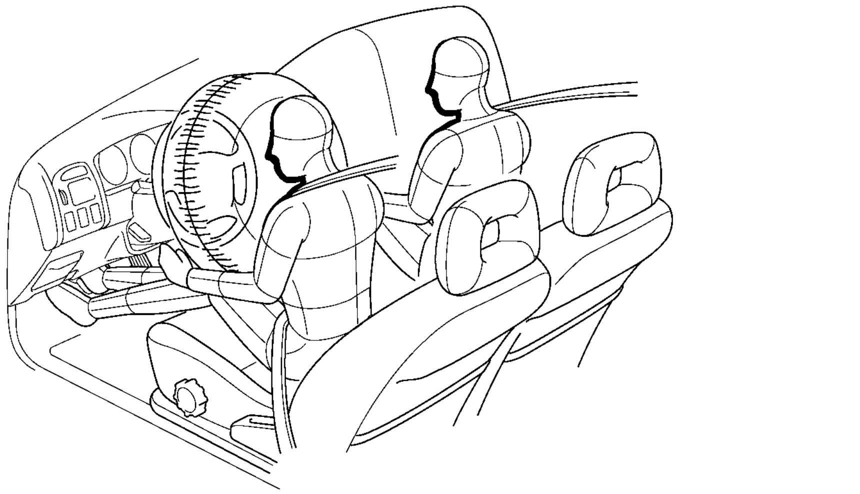
This function deletes all the transponder key codes that are registered in the transponder key computer except for the key code of the master key that was used to execute the delete function.

For further details on transponder key code registration, addition, and deletion, see the Avensis/Corona Chassis and Body Repair Manual (Pub. No. RM599E).

■ SRS AIRBAG

1. General

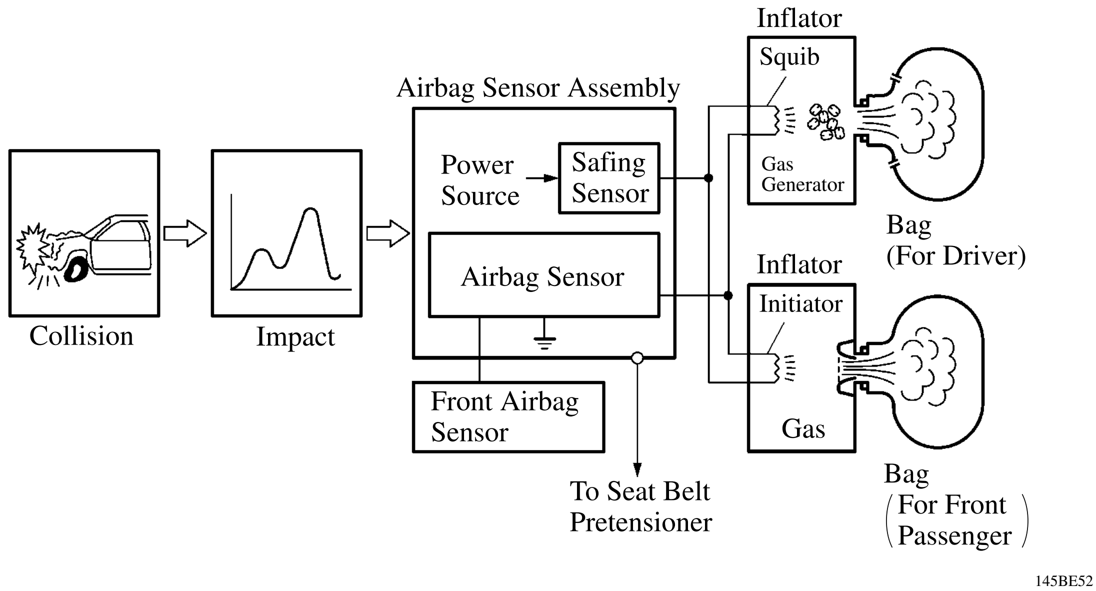
- The SRS (Supplemental Restraint System) airbag is designed to help lessen the shock to the driver and front passenger as a supplement to the seat belt.
  In a collision, the airbag sensor detects the shock and if the front-to-rear shock is greater than a specified value, the airbags stored in the steering wheel pad for the driver and above the glove box for the front passenger inflate instantly to help reduce the likelihood of the driver's or front passenger's head and chest directly hitting the steering wheel or instrument panel.
- A 3-sensor type airbag system is used, in which the detection of deceleration during a collision is accomplished by the front airbag sensor and airbag sensor enclosed in the airbag sensor assembly.
- The airbag system is controlled by the airbag sensor assembly. It has a self-diagnosis function. When it detects a system malfunction, it lights up the SRS warning light on the combination meter to alert the driver.



LHD Model

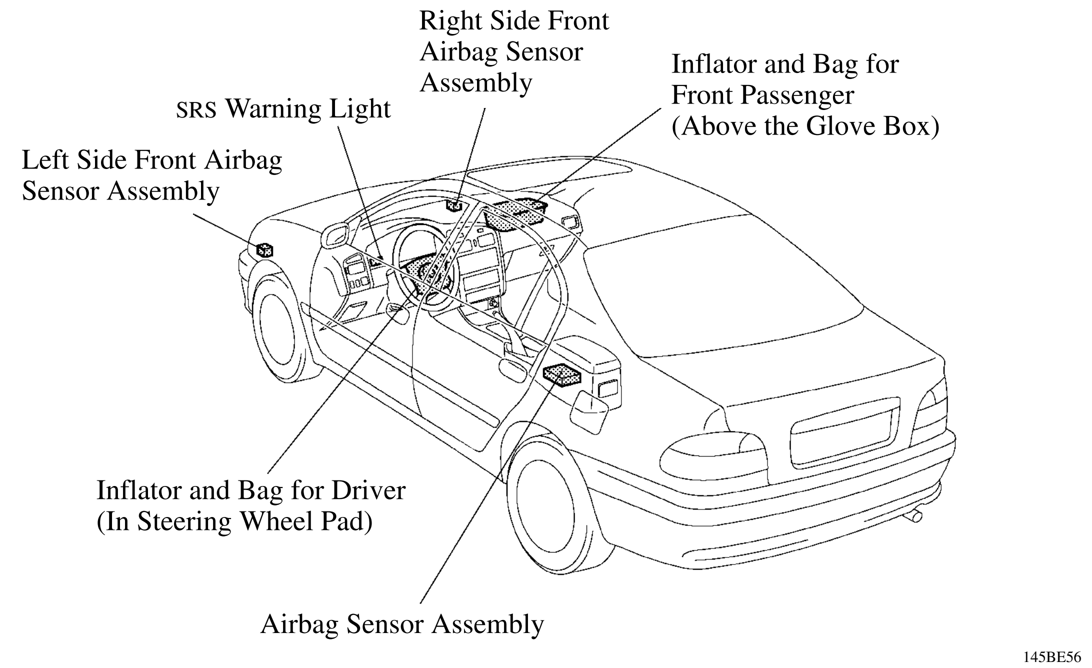
▶ System Diagram ◀

The activation processes of the SRS airbag is as illustrated below.



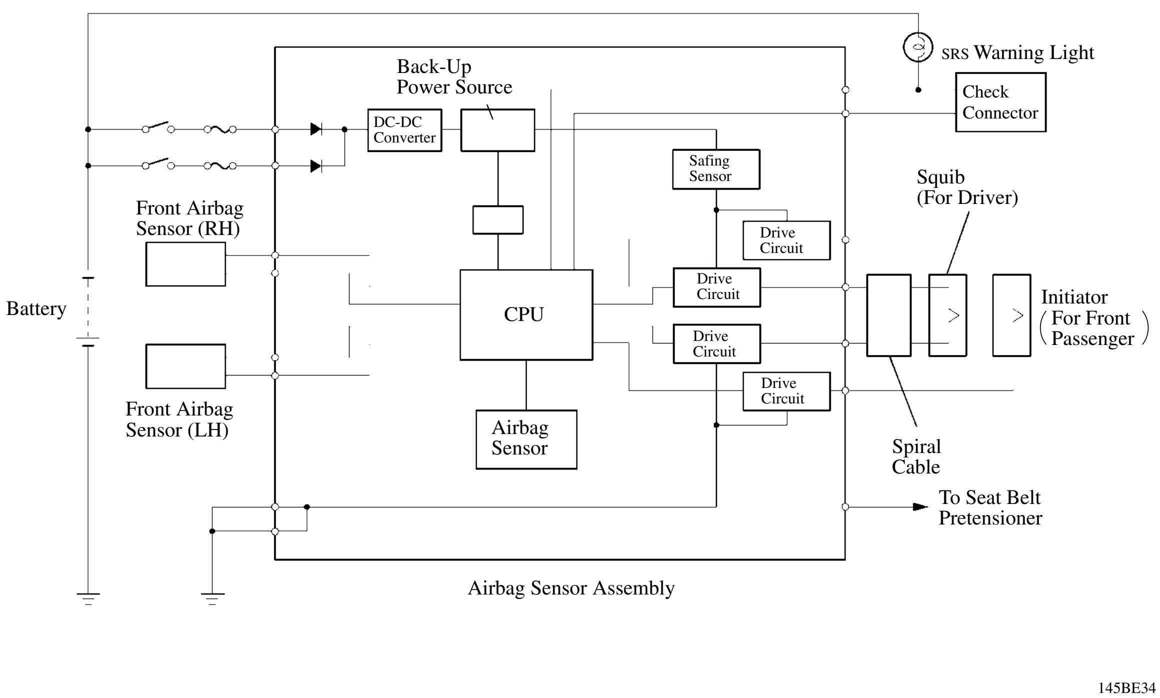
2. Layout of Components

The major function parts of the airbag systems are shown below.



LHD Model

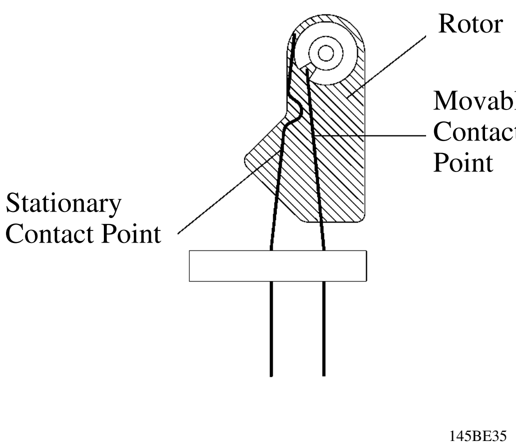
3. Wiring Diagram



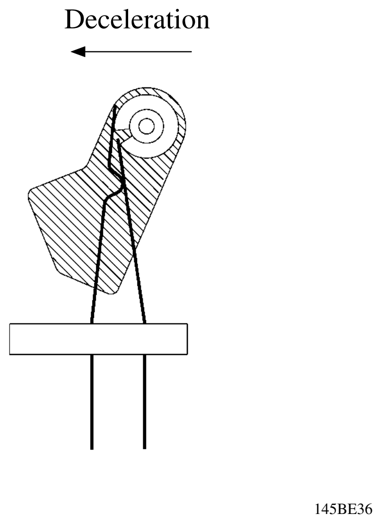
4. Construction and Operation

Front Airbag Sensor

The front airbag sensor consists of rotor, movable contact point and a stationary contact point.
The rotor is fixed by the initial set load of the movable contact point. At the same time, the movable contact point restrains the movement of the rotor which is generated during vehicle deceleration, thus preventing the unintended activation of the system.
If a sudden deceleration that exceeds a predetermined value occurs due to a collision of the vehicle, the rotor will rotate. The rotational movement of the rotor pushes the movable contact point and causes the movable and stationary contact points to come into contact. As a result, an ON signal is generated and transmitted to the airbag sensor assembly.



Normal Condition



Activated Condition

Airbag Sensor Assembly

1) Description

The airbag sensor assembly is mounted on the center floor under the instrument panel. It receives signals from the airbag sensor enclosed in the airbag sensor assembly and front airbag sensor and judges whether the airbag and seat belt pretensioner must be activated or not, and then diagnoses system malfunctions.

2) Construction and Operation

The airbag sensor assembly consists of airbag sensor, safing sensor, ignition control circuit, diagnosis circuit, etc.

a. Airbag Sensor, Ignition Control Circuit

- The airbag sensor is enclosed in the airbag sensor assembly. Based on the deceleration of the vehicle that occurs during a collision, the distortion that is created in the sensor is converted into an electric signal. This signal is a linear representation of the deceleration rate.
- The ignition control circuit performs a prescribed calculation based on the signal output by the airbag sensor and the front airbag sensor. If these calculated values are larger than a predetermined value, it activates the ignition operation.

b. Safing Sensor

The safing sensor is enclosed in the airbag sensor assembly. The sensor turns ON and outputs an ON signal to the airbag sensor assembly if a deceleration force that is higher than a predetermined value is applied to the safing sensor as a result of a frontal collision.

c. Back-Up Power Source

The back-up power source consists of a power supply capacitor and a DC-DC converter. In case of a power system failure during a collision, the power supply capacitor discharges and supplies electric power to the system. The DC-DC converter is a boosting transformer when the battery voltage drops below a certain level.

d. Diagnosis Circuit

This circuit constantly diagnoses the system for any malfunction. When a malfunction is detected, it lights up the SRS warning light on the combination meter to alert the driver.

e. Memory Circuit

When a malfunction is detected by the diagnosis circuit, it is coded and stored in this memory circuit.

Inflator and Bag

1) Construction and Operation

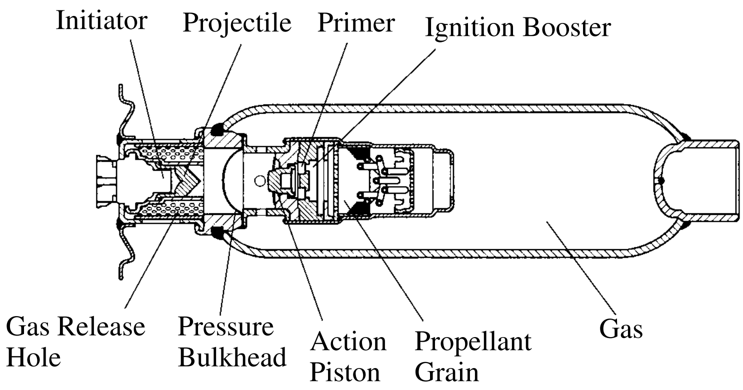
a. For Driver (In Steering Wheel)

- The inflator and bag are stored in the steering wheel pad and cannot be disassembled. The inflator contains a squib, gas generator, etc., and inflates the bag in case of collision. The bag is made of strong nylon cloth.
  Also, there are 2 gas exhaust ports provided at the back of the airbag to release the nitrogen gas quickly after the airbag has been deployed.

- The airbag sensor and front airbag sensors are activated by deceleration due to frontal collision. Electric current then ignites the squib located in the inflator. The flame spreads instantaneously to the gas generator, and a large amount of nitrogen gas is generated from the gas generator. The gas flows through the filter where cinders are removed and the gas is cooled before filling the bag. Then, as it expands, the driver's bag tears open the wheel pad outer layer to further expand and to help to restrain the impact applied to the head and chest of the driver.

b. For Front Passenger (Above the Glove Box)

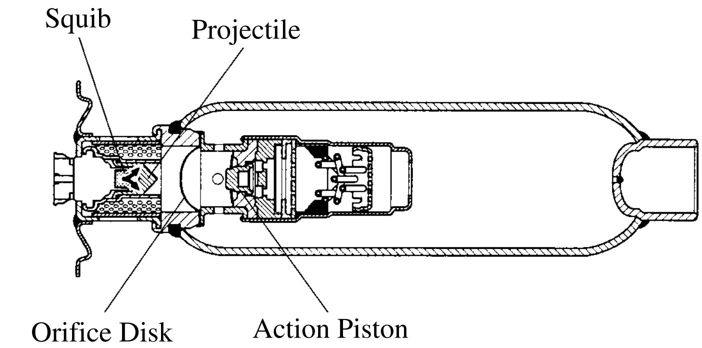
- The inflator is comprised of a initiator, projectile, pressure bulkhead, propellant grain, gas and etc.. The bag is made of strong nylon cloth, and becomes inflated by the argon gas generated by the inflator. The inflator and bag are integrated inside the case, and located in the passenger side instrument panel.



145BE13

- If the airbag sensor is turned on by deceleration due to frontal collision, electric current then ignites the initiator located in the inflator. The projectile which fired by the ignition of the initiator pierces through the pressure bulkhead and collides with the action piston, which causes the primer to ignite. The flame of the primer spreads instantaneously to the ignition booster and to the propellant grain. The gas which expanded by the heat of the ignition of the propellant grain flows into the airbag via the gas release hole, thus inflating the airbag. The airbag pushes the airbag door open to further expand and to help reduce the impact applied to the head and chest of the front passenger.

▶ Operation ◀



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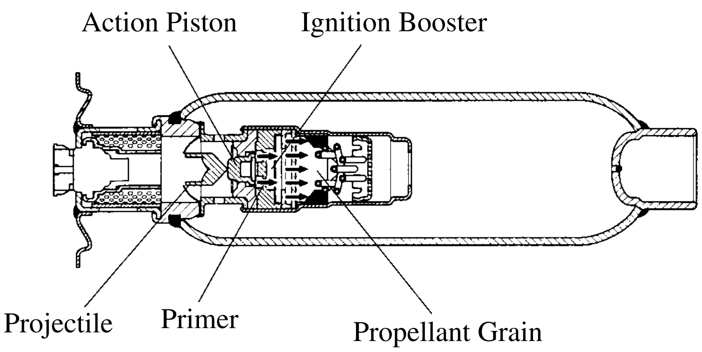

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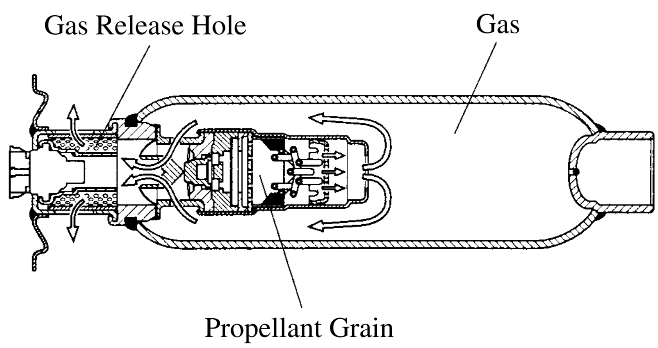

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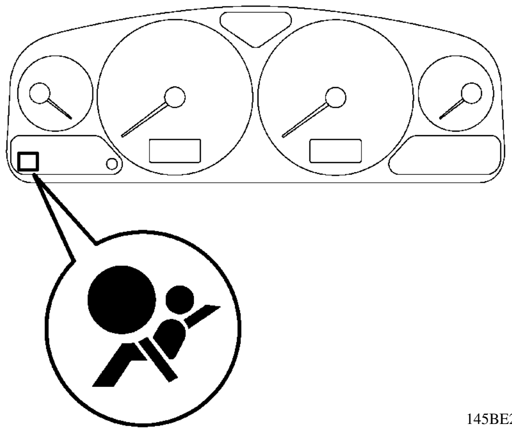
➡ : Propagation of Fire
⇨ : Flow of Argon Gas

SRS Warning Light

The SRS warning light is located on the combination meter.
It comes on to alert the driver about the system trouble when a malfunction is detected in self-diagnosis of the airbag sensor assembly and side airbag sensor assembly. In normal operating conditions when the ignition switch is turned to the ACC or ON position, the light comes on for about 6 seconds and then goes off.



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5. System Operation

Ignition Judgement and Condition

- When the vehicle collides in the hatched are (Fig. 1) and the shock is larger than a predetermined level, the airbag and the seat belt pretensioner are activated automatically. The airbag sensor is characteristically turned in such a way that can judge the need for ignition in collisions within the hatched area.
- The safing sensor is designed to be activated by a smaller deceleration rate than that of the airbag sensor. As illustrated in Fig. 2 below, ignition is operated when current flows to the squib. This happens when a safing sensor and the airbag sensor go on simultaneously.
- Airbag sensor assembly judges whether or not to inflate the airbag in accordance with ON/OFF of the front airbag sensor and the deceleration detected by the airbag sensor.

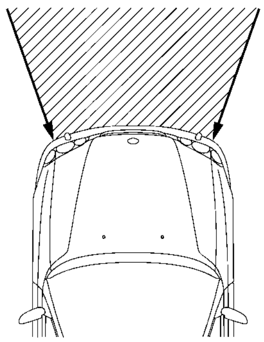

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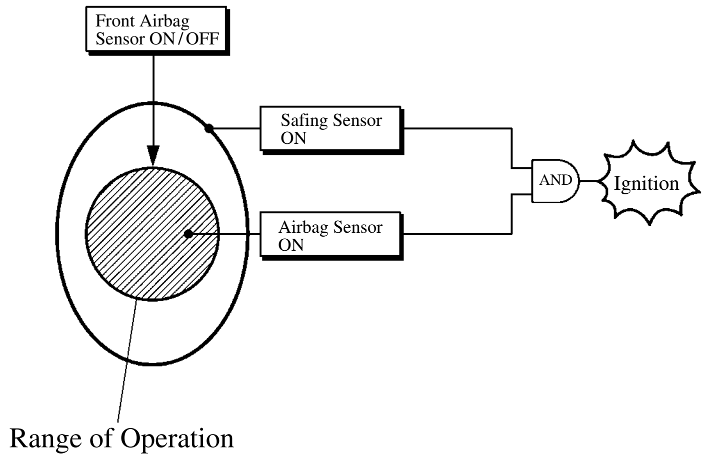
Fig. 1



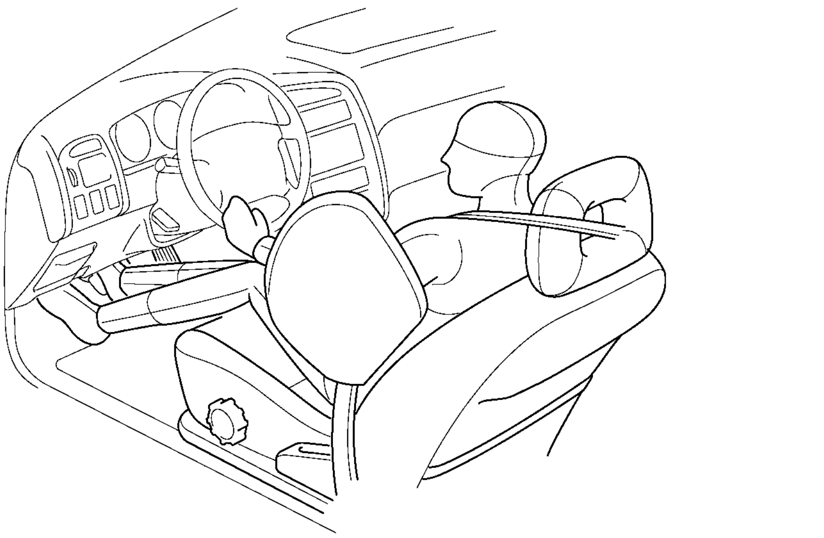
145BE18

Fig. 2

■ SRS SIDE AIRBAG

1. General

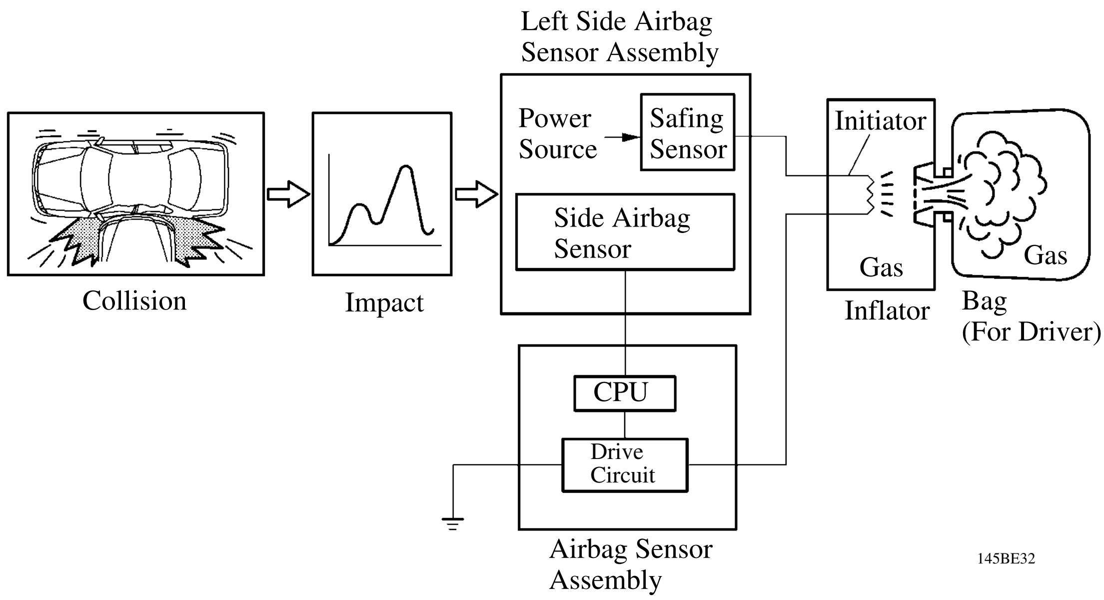
- In conjunction with the energy absorbing doors, the SRS side airbags have been designed to help reducing the impact energy that is transmitted to the driver and front passenger in the event of a side collision. In a side collision, the side airbag sensor detects the shock and if the side-to-side shock is greater than a specified value, the airbags stored in the seat back for the driver and the front passenger inflate instantly to help reducing the likelihood of the driver's or front passenger's arm and chest directly hitting against the door trim.
- Each SRS side airbag is independent of the other.
- An electrical type SRS side airbag, in which the side airbag is activated by the ignition signal emitted by the airbag sensor assembly, has been adopted.



LHD Model

▶ System Diagram ◀

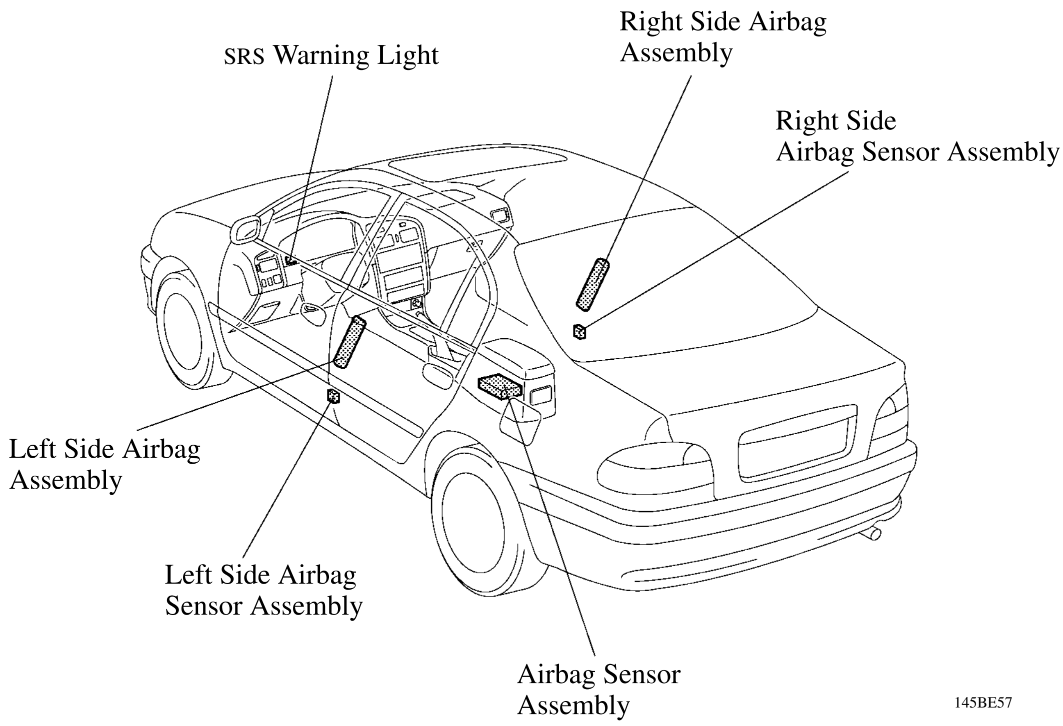
The activation processes of the SRS side airbag is as illustrated below.



For Driver (LHD Model)

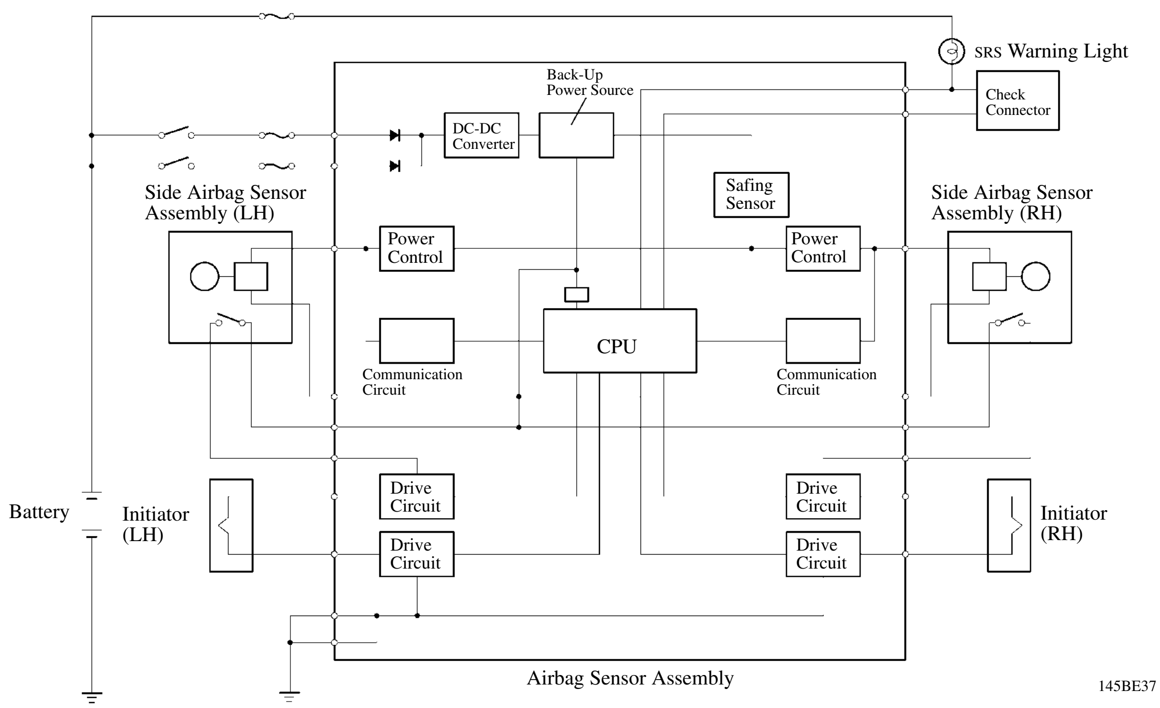
2. Layout of Components

The major function parts of the side airbag system are shown below.



LHD Model

3. Wiring Diagram



4. Construction and Operation

Side Airbag Sensor Assembly

1) Description

The side airbag sensor assembly is mounted on the right and left center pillars. It receives signals from the side airbag sensor enclosed in the side airbag sensor assembly and judges whether the side airbag must be activated or not.

2) Construction and Operation

The side airbag sensor assembly consists of side airbag sensor, safing sensor, etc.

a. Side Airbag Sensor

The side airbag sensor is enclosed in the side airbag sensor assembly based on the acceleration of the vehicle that occurs during a side collision. The distortion that is created in the sensor is converted into an electric signal. This signal is a linear representation of the acceleration rate.

b. Safing Sensor

The safing sensor is enclosed in the side airbag sensor assembly. The sensor turns ON if an acceleration force that is higher than a predetermined value is applied to the safing sensor as a result of a side collision.

Airbag Sensor Assembly

1) Description

The airbag sensor assembly is mounted on the center floor under the instrument panel.
When the airbag sensor assembly receives the airbag activation signal from the side airbag sensor assembly, it applies current to the inflator.
Furthermore, the airbag sensor assembly diagnoses a system malfunction of the side airbag system.
This is the same airbag sensor assembly which is used for the SRS airbag for the driver and front passenger.

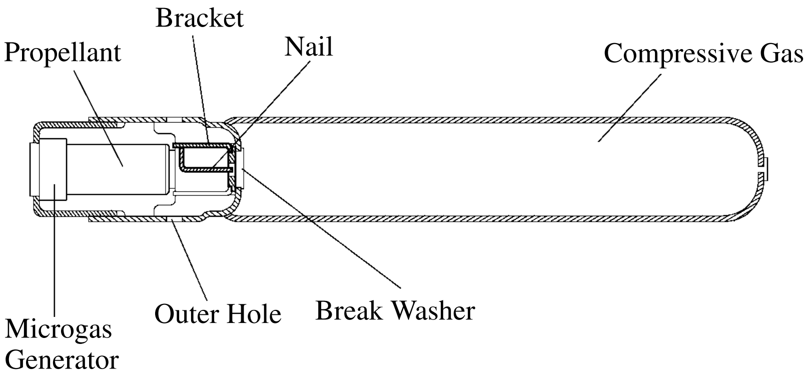
2) Construction and Operation

The airbag sensor assembly consists of ignition control circuit, back up power source, diagnosis circuit, memory circuit, etc.
For details on the construction and the operation of these items, refer to page 155.

Inflator and Bag

1) Construction

The inflator and bag are integrated inside the case and located in the outer side of the seat back. The inflator is compraised of a microgas generator, propellant, bracket, break washer and compressive gas. The bag is made of strong nylon cloth and becomes inflated by the gas heated by the inflator.



145BE39

CAUTION

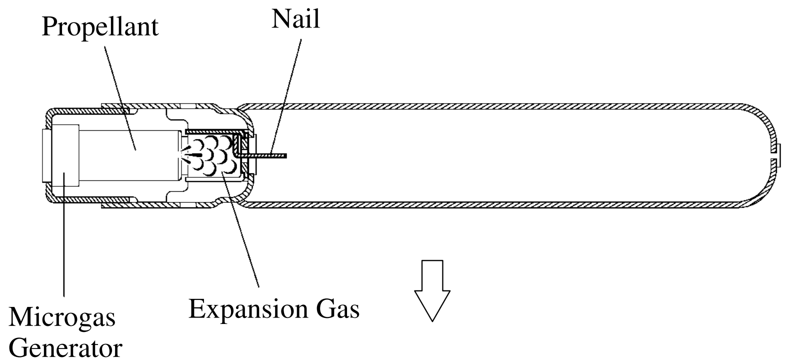
The microgas generator is ignited even by a feeble current. As it is dangerous, never measure the resistance of the microgas generator with a volt/ohmmeter, etc.

2) Operation

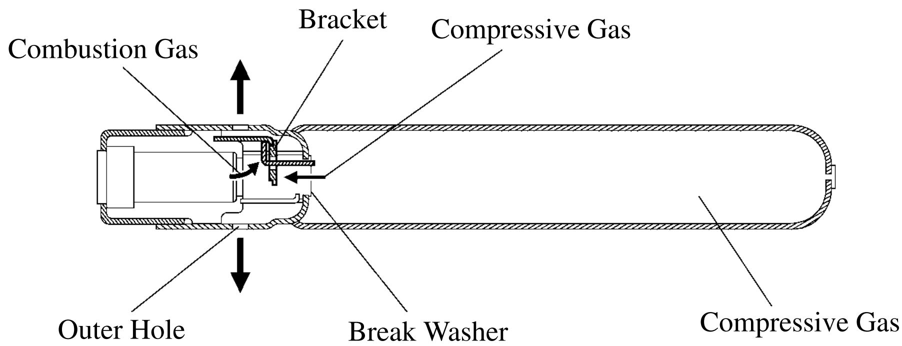
If the side airbag sensor is turned on by acceleration due to side collision, electric current then ignites the microgas generator in the inflator. The flame of microgas generator spreads instantaneously to the propellant.

The flame of microgas generator spreads instantaneously to the propellant. The combustion of the propellant causes the gas to expand and the bracket and nail to move. The movement of the bracket and nail causes the compressive gas to tear the break washer and enables the gas to be discharged. The discharged gas mixes with the propellant's combustion gas and flows into the bag through the outlet hole.

Then the side airbag tears open the seat outer cover to further expand and to help to reduce the impact applied to the arm and chest of the driver/front pasenger.



145BE40



145BE41

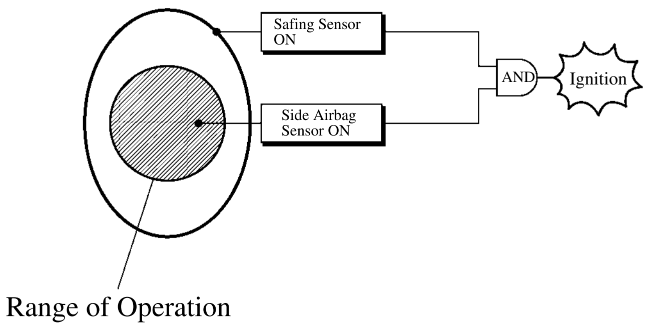
SRS Warning Light

The SRS warning light, which is located inside the combination meter, illuminates to inform the driver if a malfunction occurs in the SRS side airbag system. This light is also used as a warning light for the SRS airbag system.

5. System Operation

Ignition Judgement and Conditions

The safing sensor is designed to be activated by a smaller acceleration rate than that of the side airbag sensor. As illustrated below, ignition is caused when current flows to the initiator, which happens when a safing sensor and the side airbag sensor go on simultaneously,



145BE33

4. Appendix

AP

MAJOR TECHNICAL SPECIFICATIONS

Item			Area: Europe			
Body Type			4-Door Sedan			
Vehicle Grade			LINEA TERRA		LINEA SOL	LINEA TERRA
Model Code			AT220R-AEMNKW	AT220L-AEMNKW	AT220L-AEMEKW	AT221R-AEMNKW
Major Dimensions & Vehicle Weights	Overall	Length mm (in.)	4490 (176.8)	←	←	←
		Width mm (in.)	1710 (67.3)	←	←	←
		Height mm (in.)	1425 (56.1)	←	←	←
	Wheel Base mm (in.)		2630 (103.5)	←	←	←
	Tread	Front mm (in.)	1480 (58.3)	←	←	←
		Rear mm (in.)	1450 (57.1)	←	←	←
	Room	Length mm (in.)	1930 (76.0)	←	←	←
		Width mm (in.)	1455 (57.3)	←	←	←
		Height mm (in.)	1160 (45.7), 1110 (43.7)*1	←	←	←
	Overhang	Front mm (in.)	875 (34.4)	←	←	←
		Rear mm (in.)	985 (38.8)	←	←	←
	Min. Running Ground Clearance mm (in.)		155 (6.1)	←	←	←
	Angle of Approach degrees		17.7°	←	←	←
	Angle of Departure degrees		18.4°	←	←	←
	Curb Weight	Front kg (lb)	690 ~ 745 (1521 ~ 1642)	←	695 ~ 745 (1532 ~ 1642)	695 ~ 750 (1532 ~ 1653)
		Rear kg (lb)	505 ~ 540 (1113 ~ 1190)	←	510 ~ 540 (1124 ~ 1190)	←
		Total kg (lb)	1195 ~ 1285 (2634 ~ 2832)	←	1205 ~ 1285 (2656 ~ 2832)	1205 ~ 1290 (2656 ~ 2843)
	Gross Vehicle Weight	Front kg (lb)	860 (1896)	←	←	890 (1962)
		Rear kg (lb)	870 (1918)	←	←	←
		Total kg (lb)	1730 (3814)	←	←	1760 (3880)
	Fuel Tank Capacity ℓ (Imp.gal.)		60 (13.2)	←	←	←
	Luggage Compartment Capacity m^3 (cu.ft.)		0.50 (17.7)	←	←	←
Performance	Max. Speed km/h (mph)		190 (118)	190 (118)*2, 195 (121)*3	195 (121)	←
	Max. Cruising Speed km/h (mph)		180 (111)	←	←	←
	Acceleration	0 to 100 km/h sec.	12.1	12.1*2, 11.7*3	11.7	11.0
		0 to 400 m sec.	18.1	18.1*2, 18.0*3	18.0	17.6
	Max. Permissible Speed	1st Gear km/h (mph)	45 (27)	←	←	46 (28)
		2nd Gear km/h (mph)	83 (51)	←	←	86 (53)
		3rd Gear km/h (mph)	121 (75)	←	←	125 (77)
		4th Gear km/h (mph)	—	—	—	—
	Min. Turning Radius	Tire m (ft.)	5.4 (17.7)	←	←	←
		Body m (ft.)	5.8 (19.0)	←	←	←
Engine	Engine Type		4A-FE	←	←	7A-FE
	Valve Mechanism		16-Valve, DOHC	←	←	←
	Bore x Stroke mm (in.)		81.0 x 77.0 (3.19 x 3.03)	←	←	81.0 x 85.5 (3.19 x 3.37)
	Displacement cm^3 (cu.in.)		1587 (96.8)	←	←	1762 (107.5)
	Compression Ratio		9.5 : 1	←	←	←
	Carburetor Type or Injection Pump Type (Diesel)		EFI	←	←	←
	Research Octane No. or Cetane No. (Diesel)		95	←	←	←
	Max. Output (EEC) kW/rpm		74/5800	74/5800*2, 81/6000*3	81/6000	81/5600
	Max. Torque (EEC) N·m/rpm		136/4400	136/4400*2, 145/4800*3	145/4800	155/2800
Engine Electrical	Battery Capacity (5HR) Voltage & Amp. hr.		12-32, 48*4	←	←	←
	Alternator Output Watts		960	←	←	←
	Starter Output kW		1.1	←	←	←
Chassis	Clutch Type		Dry, Single	←	←	←
	Transaxle Type		C50	←	←	C250
	Transmission Gear Ratio	In First	3.545	←	←	←
		In Second	1.904	←	←	←
		In Third	1.310	←	←	←
		In Fourth	0.969	←	←	1.031
		In Fifth	0.815	←	←	←
		In Reverse	3.250	←	←	←
	Counter Gear Ratio		—	—	—	—
	Differential Gear Ratio (Final)		4.058	←	←	3.941
	Brake Type	Front	Ventilated Disc	←	←	←
		Rear	Leading Trailing Drum	←	←	←
	Parking Brake Type		Drum	←	←	←
	Brake Booster Type and Size in.		Single, 9”	←	←	←
	Proportioning Valve Type		Dual-P Valve	←	←	←
	Suspension Type	Front	MacPherson Strut	←	←	←
		Rear	MacPherson Strut	←	←	←
	Stabilizer Bar	Front	STD	←	←	←
		Rear	STD	←	←	←
	Steering Gear Type		Rack and Pinion	←	←	←
	Steering Gear Ratio (Overall)		17.39	←	←	←
	Power Steering Type		Integral Type	←	←	←

*1: With Moon Roof
*2: For Lean-Burn Engine
*3: For Stoichiometric Engine
*4: Option

Europe					
4-Door Sedan					
LINEA TERRA			LINEA SOL		
AT221L-AEMNKW	AT221R-AEPNKW	AT221L-AEPNKW	AT221R-AEMEKW	AT221L-AEMEKW	AT221R-AEPEKW
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
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←	←	←	←	←	←
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←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	725 ~ 780 (1598 ~ 1720)	←	695 ~ 750 (1532 ~ 1653)	←	725 ~ 780 (1598 ~ 1720)
←	←	←	←	←	←
←	1235 ~ 1320 (2722 ~ 2910)	←	1205 ~ 1290 (2656 ~ 2843)	←	1235 ~ 1320 (2722 ~ 2910)
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	185 (115)	←	195 (121)	←	185 (115)
←	175 (108)	←	180 (111)	←	175 (108)
←	12.2	←	11.0	←	12.2
←	18.5	←	18.0	←	18.5
←	54 (33)	←	54 (33)	←	54 (33)
←	98 (60)	←	98 (60)	←	98 (60)
←	—	—	—	—	—
—	—	—	—	—	—
←	←	←	←	←	←
←	←	←	←	←	←
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←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	—	—	Dry, Single	←	—
←	A246E	←	C250	←	A246E
←	4.005	←	3.545	←	4.005
←	2.208	←	1.904	←	2.208
←	1.425	←	1.310	←	1.425
←	0.981	←	1.031	←	0.981
←	—	—	0.815	←	—
←	3.272	←	3.250	←	3.272
—	—	—	—	—	—
←	2.962	←	3.941	←	2.962
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←

AP

Item			Area: Europe			
Body Type			4-Door Sedan			
Vehicle Grade			LINEA SDL			
Model Code			AT221L-AEPEKW	ST220R-AEMEKW	ST220L-AEMEKW	ST220R-AEPEKW
Major Dimensions & Vehicle Weights	Overall	Length mm (in.)	4490 (176.8)	←	←	←
		Width mm (in.)	1710 (67.3)	←	←	←
		Height mm (in.)	1425 (56.1)	←	←	←
	Wheel Base mm (in.)		2630 (103.5)	←	←	←
	Tread	Front mm (in.)	1480 (58.3)	←	←	←
		Rear mm (in.)	1450 (57.1)	←	←	←
	Room	Length mm (in.)	1930 (76.0)	←	←	←
		Width mm (in.)	1455 (57.3)	←	←	←
		Height mm (in.)	1160 (45.7), 1110 (43.7)*1	←	←	←
	Overhang	Front mm (in.)	875 (34.4)	←	←	←
		Rear mm (in.)	985 (38.8)	←	←	←
	Min. Running Ground Clearance mm (in.)		155 (6.1)	←	←	←
	Angle of Approach degrees		17.7°	←	←	←
	Angle of Departure degrees		18.4°	←	←	←
	Curb Weight	Front kg (lb)	725 ~ 780 (1598 ~ 1720)	730 ~ 780 (1609 ~ 1720)	←	755 ~ 805 (1665 ~ 1775)
		Rear kg (lb)	510 ~ 540 (1124 ~ 1190)	515 ~ 540 (1135 ~ 1190)	←	←
		Total kg (lb)	1235 ~ 1320 (2722 ~ 2910)	1245 ~ 1320 (2744 ~ 2910)	←	1270 ~ 1345 (2800 ~ 2965)
	Gross Vehicle Weight	Front kg (lb)	890 (1962)	920 (2028)	←	←
		Rear kg (lb)	870 (1918)	880 (1940)	←	←
		Total kg (lb)	1760 (3880)	1800 (3968)	←	←
	Fuel Tank Capacity ℓ (Imp.gal.)		60 (13.2)	←	←	←
	Luggage Compartment Capacity m^3 (cu.ft.)		0.50 (17.7)	←	←	←
Performance	Max. Speed km/h (mph)		185 (115)	205 (127)	←	200 (124)
	Max. Cruising Speed km/h (mph)		175 (108)	185 (115)	←	180 (111)
	Acceleration	0 to 100 km/h sec.	12.2	9.3	←	10.6
		0 to 400 m sec.	18.5	16.8	←	17.6
	Max. Permissible Speed	1st Gear km/h (mph)	54 (33)	←	←	60 (37)
		2nd Gear km/h (mph)	98 (60)	90 (55)	←	110 (68)
		3rd Gear km/h (mph)	—	134 (83)	←	—
		4th Gear km/h (mph)	—	—	—	—
	Min. Turning Radius	Tire m (ft.)	5.4 (17.7)	←	←	←
		Body m (ft.)	5.8 (19.0)	←	←	←
Engine	Engine Type		7A-FE	3S-FE	←	←
	Valve Mechanism		16-Valve, DOHC	←	←	←
	Bore x Stroke mm (in.)		81.0 x 85.5 (3.19 x 3.37)	86.0 x 86.0 (3.39 x 3.39)	←	←
	Displacement cm^3 (cu.in.)		1762 (107.5)	1998 (121.9)	←	←
	Compression Ratio		9.5 : 1	9.8 : 1	←	←
	Carburetor Type or Injection Pump Type (Diesel)		EFI	←	←	←
	Research Octane No. or Cetane No. (Diesel)		95	←	←	←
	Max. Output (EEC) kW/rpm		81/5600	94/5400	←	←
	Max. Torque (EEC) N·m/rpm		155/2800	178/4400	←	←
Engine Electrical	Battery Capacity (5HR) Voltage & Amp. hr.		12-32, 48*4	←	←	←
	Alternator Output Watts		960	←	←	←
	Starter Output kW		1.1	1.0, 1.2*4	←	←
Chassis	Clutch Type		—	Dry, Single	←	—
	Transaxle Type		A246E	S54	←	A241E
	Transmission Gear Ratio	In First	4.005	3.285	←	3.643
		In Second	2.208	1.960	←	2.008
		In Third	1.425	1.322	←	1.296
		In Fourth	0.981	1.028	←	0.892
		In Fifth	—	0.820	←	—
		In Reverse	3.272	3.153	←	2.977
	Counter Gear Ratio		—	—	—	—
	Differential Gear Ratio (Final)		2.962	3.944	←	3.178
	Brake Type	Front	Ventilated Disc	←	←	←
		Rear	Leading Trailing Drum	←	←	←
	Parking Brake Type		Drum	←	←	←
	Brake Booster Type and Size in.		Single, 9”	←	←	←
	Proportioning Valve Type		Dual-P Valve	←	←	←
	Suspension Type	Front	MacPherson Strut	←	←	←
		Rear	MacPherson Strut	←	←	←
	Stabilizer Bar	Front	STD	←	←	←
		Rear	STD	←	←	←
	Steering Gear Type		Rack and Pinion	←	←	←
	Steering Gear Ratio (Overall)		17.39	←	←	←
	Power Steering Type		Integral Type	←	←	←

*1: With Moon Roof
*4: Option
*5: Mechanically Controlled
*6: Electronically Controlled

Europe				
4-Door Sedan				
LINEA SOL	LINEA TERRA			LINEA SOL
ST220L-AEPEKW	CT220L-AEMNXW	CT220R-AEMNTW	CT220L-AEMNTW	CT220L-AEMETW
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
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←	←	←	←	←
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←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	765 ~ 855 (1687 ~ 1885)	←	←	←
←	←	←	←	←
←	1280 ~ 1395 (2822 ~ 3075)	←	←	←
←	950 (2094)	←	←	←
←	880 (1940)	←	←	←
←	1830 (4034)	←	←	←
←	←	←	←	←
←	←	←	←	←
←	—	180 (111)	←	←
←	—	170 (105)	←	←
←	—	12.0	←	←
←	—	18.1	←	←
←	42 (26)	←	←	←
←	73 (45)	←	←	←
—	113 (70)	←	←	←
—	—	—		
←	←	←	←	←
←	←	←	←	←
←	2C-T	2C-TE	←	←
←	8-Valve, OHC	←	←	←
←	86.0 x 85.0 (3.39 x 3.35)	←	←	←
←	1975 (120.5)	←	←	←
←	23.0 : 1	←	←	←
←	Distributor Type[*5]	Distributor Type[*6]	←	←
←	48	←	←	←
←	60 / 4000	66 / 4000	←	←
←	170 / 2000 ~ 3000	203 / 2200	←	←
←	12-64	←	←	←
←	1080	←	←	←
←	2.0	←	←	←
—	Dry, Single	←	←	←
←	S50	←	←	←
←	3.538	←	←	←
←	2.041	←	←	←
←	1.322	←	←	←
←	0.945	←	←	←
—	0.731	←	←	←
←	3.153	←	←	←
—	—	—	—	—
←	3.736	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←

AP

Item		Area	Europe			
Body Type			5-Door Liftback			
Vehicle Grade			LINEA TERRA		LINEA SOL	LINEA TERRA
Model Code			AT220R-ALMNKW	AT220L-ALMNKW	AT220L-ALMEKW	AT221R-ALMNKW
Major Dimensions & Vehicle Weights	Overall	Length mm (in.)	4490 (176.8)	←	←	←
		Width mm (in.)	1710 (67.3)	←	←	←
		Height mm (in.)	1425 (56.1)	←	←	←
	Wheel Base mm (in.)		2630 (103.5)	←	←	←
	Tread	Front mm (in.)	1480 (58.3)	←	←	←
		Rear mm (in.)	1450 (57.1)	←	←	←
	Room	Length mm (in.)	1930 (76.0)	←	←	←
		Width mm (in.)	1455 (57.3)	←	←	←
		Height mm (in.)	1160 (45.7), 1110 (43.7)*1	←	←	←
	Overhang	Front mm (in.)	875 (34.4)	←	←	←
		Rear mm (in.)	98.5 (38.8)	←	←	←
	Min. Running Ground Clearance mm (in.)		155 (6.1)	←	←	←
	Angle of Approach degrees		17.7°	←	←	←
	Angle of Departure degrees		18.4°	←	←	←
	Curb Weight	Front kg (lb)	695 ~ 745 (1532 ~ 1642)	←	←	695 ~ 750 (1532 ~ 1653)
		Rear kg (lb)	530 ~ 560 (1168 ~ 1235)	←	←	←
		Total kg (lb)	1225 ~ 1305 (2700 ~ 2877)	←	←	1225 ~ 1310 (2700 ~ 2888)
	Gross Vehicle Weight	Front kg (lb)	860 (1896)	←	←	890 (1962)
		Rear kg (lb)	870 (1918)	←	←	←
		Total kg (lb)	1730 (3814)	←	←	1760 (3880)
	Fuel Tank Capacity ℓ (Imp.gal.)		60 (13.2)	←	←	←
	Luggage Compartment Capacity m^3 (cu.ft.)		0.51 (18.0)	←	←	←
Performance	Max. Speed km/h (mph)		190 (118)	190 (118)*2, 195 (121)*3	195 (121)	←
	Max. Cruising Speed km/h (mph)		180 (111)	←	←	←
	Acceleration	0 to 100 km/h sec.	12.1	12.1*2, 11.7*3	11.7	11.0
		0 to 400 m sec.	18.1	18.1*2, 18.0*3	18.0	17.6
	Max. Permissible Speed	1st Gear km/h (mph)	45 (27)	←	←	46 (28)
		2nd Gear km/h (mph)	83 (51)	←	←	86 (53)
		3rd Gear km/h (mph)	121 (75)	←	←	125 (77)
		4th Gear km/h (mph)	—	—	—	—
	Min. Turning Radius	Tire m (ft.)	5.4 (17.7)	←	←	←
		Body m (ft.)	5.8 (19.0)	←	←	←
Engine	Engine Type		4A-FE	←	←	7A-FE
	Valve Mechanism		16-Valve, DOHC	←	←	←
	Bore x Stroke mm (in.)		81.0 x 77.0 (3.19 x 3.03)	←	←	81.0 x 85.5 (3.19 x 3.37)
	Displacement cm^3 (cu.in.)		1587 (96.8)	←	←	1762 (107.5)
	Compression Ratio		9.5 : 1	←	←	9.5 : 1
	Carburetor Type or Injection Pump Type (Diesel)		EFI	←	←	←
	Research Octane No. or Cetane No. (Diesel)		95	←	←	←
	Max. Output (EEC) kW/rpm		74/5800	74/5800*2, 81/6000*3	81/6000	81/5600
	Max. Torque (EEC) N·m/rpm		136/4400	136/4400*2, 145/4800*3	145/4800	155/2800
Engine Electrical	Battery Capacity (5HR) Voltage & Amp. hr.		12-32, 48*4	←	←	←
	Alternator Output Watts		960	←	←	←
	Starter Output kW		1.1	←	←	←
Chassis	Clutch Type		Dry, Single	←	←	←
	Transaxle Type		C50	←	←	C250
	Transmission Gear Ratio	In First	3.545	←	←	←
		In Second	1.904	←	←	←
		In Third	1.310	←	←	←
		In Fourth	0.969	←	←	1.031
		In Fifth	0.815	←	←	←
		In Reverse	3.250	←	←	←
	Counter Gear Ratio		—	—	—	—
	Differential Gear Ratio (Final)		4.058	←	←	3.941
	Brake Type	Front	Ventilated Disc	←	←	←
		Rear	Leading Trailing Drum	←	←	←
	Parking Brake Type		Drum	←	←	←
	Brake Booster Type and Size in.		Single, 9”	←	←	←
	Proportioning Valve Type		Dual-P Valve	←	←	←
	Suspension Type	Front	MacPherson Strut	←	←	←
		Rear	MacPherson Strut	←	←	←
	Stabilizer Bar	Front	STD	←	←	←
		Rear	STD	←	←	←
	Steering Gear Type		Rack and Pinion	←	←	←
	Steering Gear Ratio (Overall)		17.39	←	←	←
	Power Steering Type		Integral Type	←	←	←

*1: With Moon Roof
*2: For Lean-Burn Engine
*3: For Stoichiometric Engine
*4: Option

Europe					
5-Door Liftback					
LINEA TERRA			LINEA SOL		
AT221L-ALMNKW	AT221R-ALPNKW	AT221L-ALPNKW	AT221R-ALMEKW	AT221L-ALMEKW	AT221R-ALPEKW
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	725 ~ 780 (1598 ~ 1720)	←	695 ~ 750 (1532 ~ 1653)	←	725 ~ 780 (1598 ~ 1720)
←	←	←	←	←	←
←	1255 ~ 1340 (2700 ~ 2954)	←	1225 ~ 1310 (2700 ~ 2888)	←	1255 ~ 1340 (2700 ~ 2954)
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	185 (115)	←	195 (121)	←	185 (115)
←	175 (108)	←	180 (111)	←	175 (108)
←	12.2	←	11.0	←	12.2
←	18.5	←	17.6	←	18.5
←	54 (33)	←	46 (28)	←	54 (33)
←	98 (60)	←	86 (53)	←	98 (60)
←	—	—	125 (77)	←	—
—	—	—	—	—	—
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	—	—	Dry, Single	←	—
←	A246E	←	C250	←	A246E
←	4.005	←	3.545	←	4.005
←	2.208	←	1.904	←	2.208
←	1.425	←	1.310	←	1.425
←	0.981	←	1.031	←	0.981
←	—	—	0.815	←	—
←	3.272	←	3.250	←	3.272
—	—	—	—	—	—
←	2.962	←	3.941	←	2.962
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←

Item		Area	Europe			
Body Type			5-Door Liftback			
Vehicle Grade			LINEA SOL			
Model Code			AT221L-ALPEKW	ST220R-ALMEKW	ST220L-ALMEKW	ST220R-ALPEKW
Major Dimensions & Vehicle Weights	Overall	Length mm (in.)	4490 (176.8)	←	←	←
		Width mm (in.)	1710 (67.3)	←	←	←
		Height mm (in.)	1425 (56.1)	←	←	←
	Wheel Base	mm (in.)	2630 (103.5)	←	←	←
	Tread	Front mm (in.)	1480 (58.3)	←	←	←
		Rear mm (in.)	1450 (57.1)	←	←	←
	Room	Length mm (in.)	1930 (76.0)	←	←	←
		Width mm (in.)	1455 (57.3)	←	←	←
		Height mm (in.)	1160 (45.7), 1110 (43.7)*1	←	←	←
	Overhang	Front mm (in.)	875 (34.4)	←	←	←
		Rear mm (in.)	985 (38.8)	←	←	←
	Min. Running Ground Clearance	mm (in.)	155 (6.1)	←	←	←
	Angle of Approach	degrees	17.7°	←	←	←
	Angle of Departure	degrees	18.4°	←	←	←
	Curb Weight	Front kg (lb)	725 ~ 780 (1598 ~ 1720)	730 ~ 780 (1609 ~ 1720)	←	755 ~ 805 (1664 ~ 1775)
		Rear kg (lb)	530 ~ 560 (1168 ~ 1235)	535 ~ 560 (1180 ~ 1235)	←	←
		Total kg (lb)	1255 ~ 1340 (2700 ~ 2955)	1265 ~ 1340 (2789 ~ 2955)	←	1290 ~ 1365 (2844 ~ 3010)
	Gross Vehicle Weight	Front kg (lb)	890 (1962)	920 (2028)	←	←
		Rear kg (lb)	870 (1918)	880 (1940)	←	←
		Total kg (lb)	1760 (3880)	1800 (3968)	←	←
	Fuel Tank Capacity	ℓ (Imp.gal.)	60 (13.2)	←	←	←
	Luggage Compartment Capacity	m^3 (cu.ft.)	0.51 (18.0)	←	←	←
Performance	Max. Speed	km/h (mph)	185 (115)	205 (127)	←	200 (124)
	Max. Cruising Speed	km/h (mph)	175 (108)	185 (115)	←	180 (111)
	Acceleration	0 to 100 km/h sec.	12.2	9.3	←	10.6
		0 to 400 m sec.	18.5	16.8	←	17.6
	Max. Permissible Speed	1st Gear km/h (mph)	54 (33)	←	←	60 (37)
		2nd Gear km/h (mph)	98 (60)	90 (55)	←	110 (68)
		3rd Gear km/h (mph)	—	134 (83)	←	—
		4th Gear km/h (mph)	—	—	—	—
	Min. Turning Radius	Tire m (ft.)	5.4 (17.7)	←	←	←
		Body m (ft.)	5.8 (19.0)	←	←	←
Engine	Engine Type		7A-FE	3S-FE	←	←
	Valve Mechanism		16-Valve, DOHC	←	←	←
	Bore x Stroke	mm (in.)	81.0 x 85.5 (3.19 x 3.37)	86.0 x 86.0 (3.39 x 3.39)	←	←
	Displacement	cm^3 (cu.in.)	1762 (107.5)	1998 (121.9)	←	←
	Compression Ratio		9.5 : 1	9.8 : 1	←	←
	Carburetor Type or Injection Pump Type (Diesel)		EFI	←	←	←
	Research Octane No. or Cetane No. (Diesel)		95	95	←	←
	Max. Output (EEC)	kW/rpm	81/5600	94/5400	←	←
	Max. Torque (EEC)	N·m/rpm	155/2800	178/4400	←	←
Engine Electrical	Battery Capacity (5HR)	Voltage & Amp. hr.	12-32, 48*4	←	←	←
	Alternator Output	Watts	960	←	←	←
	Starter Output	kW	1.1	1.0, 1.2*4	←	←
Chassis	Clutch Type		—	Dry, Single	←	—
	Transaxle Type		A246E	S54	←	A241E
	Transmission Gear Ratio	In First	4.005	3.285	←	3.643
		In Second	2.208	1.960	←	2.008
		In Third	1.425	1.322	←	1.296
		In Fourth	0.981	1.028	←	0.892
		In Fifth	—	0.820	←	—
		In Reverse	3.272	3.153	←	2.977
	Counter Gear Ratio		—	—	—	—
	Differential Gear Ratio (Final)		2.962	3.944	←	3.178
	Brake Type	Front	Ventilated Disc	←	←	←
		Rear	Leading Trailing Drum	←	←	←
	Parking Brake Type		Drum	←	←	←
	Brake Booster Type and Size	in.	Single, 9”	←	←	←
	Proportioning Valve Type		Dual-P Valve	←	←	←
	Suspension Type	Front	MacPherson Strut	←	←	←
		Rear	MacPherson Strut	←	←	←
	Stabilizer Bar	Front	STD	←	←	←
		Rear	STD	←	←	←
	Steering Gear Type		Rack and Pinion	←	←	←
	Steering Gear Ratio (Overall)		17.39	←	←	←
	Power Steering Type		Integral Type	←	←	←

*1: With Moon Roof
*4:Option
*6:Electronically Controlled

Europe			
5-Door Liftback			
LINEA SOL	LINEA TERRA		LINEA SOL
ST220L-ALPEKW	CT220R-ALMNTW	CT220L-ALMNTW	CT220L-ALMETW
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	765 ~ 855 (1687 ~ 1885)	←	←
←	←	←	←
←	1300 ~ 1415 (2866 ~ 3120)	←	←
←	950 (2094)	←	←
←	880 (1940)	←	←
←	1830 (4034)	←	←
←	←	←	←
←	←	←	←
←	180 (111)	←	←
←	170 (105)	←	←
←	12.0	←	←
←	18.1	←	←
←	42 (26)	←	←
←	73 (45)	←	←
—	113 (70)	←	←
—	—	—	—
←	←	←	←
←	←	←	←
←	2C-TE	←	←
←	8-Valve, OHC	←	←
←	86.0 x 85.0 (3.39 x 3.35)	←	←
←	1975 (120.5)	←	←
←	23.0 : 1	←	←
←	Distributor Type*6	←	←
←	48	←	←
←	66 / 4000	←	←
←	203 / 2200	←	←
←	12-64	←	←
←	1080	←	←
←	2.0	←	←
—	Dry, Single	←	←
←	S50	←	←
←	3.538	←	←
←	2.041	←	←
←	1.322	←	←
←	0.945	←	←
—	0.731	←	←
←	3.153	←	←
—	—	—	—
←	3.736	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←

AP

Item			Area: Europe			
Body Type			5-Door Wagon			
Vehicle Grade			LINEA TERRA		LINEA SOL	LINEA TERRA
Model Code			AT220R-AWMNKW	AT220L-AWMNKW	AT220L-AWMEKW	AT221R-AWMNKW
Major Dimensions & Vehicle Weights	Overall	Length mm (in.)	4570 (179.9)	←	←	←
		Width mm (in.)	1710 (67.3)	←	←	←
		Height mm (in.)	1500 (59.1)	←	←	←
	Wheel Base mm (in.)		2630 (103.5)	←	←	←
	Tread	Front mm (in.)	1480 (58.3)	←	←	←
		Rear mm (in.)	1450 (57.1)	←	←	←
	Room	Length mm (in.)	1930 (76.0)	←	←	←
		Width mm (in.)	1455 (57.3)	←	←	←
		Height mm (in.)	1170 (46.1), 1120 (44.1)*1	←	←	←
	Overhang	Front mm (in.)	875 (34.4)	←	←	←
		Rear mm (in.)	1065 (41.9)	←	←	←
	Min. Running Ground Clearance mm (in.)		155 (6.1)	←	←	←
	Angle of Approach degrees		17.6°	←	←	←
	Angle of Departure degrees		17.4°	←	←	←
	Curb Weight	Front kg (lb)	695 ~ 745 (1532 ~ 1642)	←	←	695 ~ 750 (1532 ~ 1653)
		Rear kg (lb)	545 ~ 575 (1202 ~ 1268)	←	←	←
		Total kg (lb)	1240 ~ 1320 (2734 ~ 2910)	←	←	1240 ~ 1325 (2734 ~ 2921)
	Gross Vehicle Weight	Front kg (lb)	860 (1896)	←	←	890 (1962)
		Rear kg (lb)	870 (1918)	←	←	←
		Total kg (lb)	1730 (3814)	←	←	1760 (3880)
	Fuel Tank Capacity ℓ (Imp.gal.)		60 (13.2)	←	←	←
	Luggage Compartment Capacity m^3 (cu.ft.)		0.53 (18.7)	←	←	←
Performance	Max. Speed km/h (mph)		185 (115)	185 (115)*2, 190 (118)*3	190 (118)	←
	Max. Cruising Speed km/h (mph)		175 (108)	175 (108)*2, 180 (111)*3	180 (111)	←
	Acceleration	0 to 100 km/h sec.	12.3	12.3*2, 11.7*3	11.7	11.2
		0 to 400 m sec.	18.2	18.2*2, 18.1*3	18.1	17.7
	Max. Permissible Speed	1st Gear km/h (mph)	45 (27)	←	←	46 (28)
		2nd Gear km/h (mph)	83 (51)	←	←	86 (53)
		3rd Gear km/h (mph)	121 (75)	←	←	125 (77)
		4th Gear km/h (mph)	—	—	—	—
	Min. Turning Radius	Tire m (ft.)	5.4 (17.7)	←	←	←
		Body m (ft.)	5.8 (19.0)	←	←	←
Engine	Engine Type		4A-FE	←	←	7A-FE
	Valve Mechanism		16-Valve, DOHC	←	←	←
	Bore x Stroke mm (in.)		81.0 x 77.0 (3.19 x 3.03)	←	←	81.0 x 85.5 (3.19 x 3.37)
	Displacement cm^3 (cu.in.)		1587 (96.8)	←	←	1762 (107.5)
	Compression Ratio		9.5 : 1	←	←	←
	Carburetor Type or Injection Pump Type (Diesel)		EFI	←	←	←
	Research Octane No. or Cetane No. (Diesel)		95	←	←	←
	Max. Output (EEC) kW/rpm		74/5800	74/5800*2, 81/6000*3	81/6000	81/5600
	Max. Torque (EEC) N·m/rpm		136/4400	136/4400*2, 145/4800*3	145/4800	155/2800
Engine Electrical	Battery Capacity (5HR) Voltage & Amp. hr.		12-32, 48*4	←	←	←
	Alternator Output Watts		960	←	←	←
	Starter Output kW		1.1	←	←	←
Chassis	Clutch Type		Dry, Single	←	←	←
	Transaxle Type		C50	←	←	C250
	Transmission Gear Ratio	In First	3.545	←	←	←
		In Second	1.904	←	←	←
		In Third	1.310	←	←	←
		In Fourth	0.969	←	←	1.031
		In Fifth	0.815	←	←	←
		In Reverse	3.250	←	←	←
	Counter Gear Ratio		—	—	—	—
	Differential Gear Ratio (Final)		4.058	←	←	3.941
	Brake Type	Front	Ventilated Disc	←	←	←
		Rear	Leading Trailing Drum	←	←	←
	Parking Brake Type		Drum	←	←	←
	Brake Booster Type and Size in.		Single, 9”	←	←	←
	Proportioning Valve Type		Dual-P Valve	←	←	←
	Suspension Type	Front	MacPherson Strut	←	←	←
		Rear	MacPherson Strut	←	←	←
	Stabilizer Bar	Front	STD	←	←	←
		Rear	STD	←	←	←
	Steering Gear Type		Rack and Pinion	←	←	←
	Steering Gear Ratio (Overall)		17.39	←	←	←
	Power Steering Type		Integral Type	←	←	←

*1: With Moon Roof
*2: For Lean-Burn Engine
*3: For Stoichiometric Engine
*4: Option

Europe					
5-Door Wagon					
LINEA TERRA		LINEA SOL			
AT221L-AWMNKW	AT221L-AWPNKW	AT221L-AWMEKW	AT221L-AWPEKW	ST220R-AWMEKW	ST220L-AWMEKW
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	725 ~ 780 (1598 ~ 1720)	695 ~ 750 (1532 ~ 1653)	725 ~ 780 (1598 ~ 1720)	730 ~ 780 (1609 ~ 1720)	←
←	←	←	←	550 ~ 575 (1213 ~ 1268)	←
←	1270 ~ 1355 (2800 ~ 2988)	1240 ~ 1325 (2734 ~ 2921)	1270 ~ 1355 (2800 ~ 2988)	1280 ~ 1355 (2822 ~ 2988)	←
←	←	←	←	920 (2028)	←
←	←	←	←	880 (1940)	←
←	←	←	←	1800 (3968)	←
←	←	←	←	←	←
←	←	←	←	←	←
←	180 (111)	190 (118)	180 (111)	200 (124)	←
←	170 (105)	180 (111)	170 (105)	180 (111)	←
←	12.4	11.2	12.4	9.5	←
←	18.6	17.7	18.6	16.9	←
←	54 (33)	46 (28)	54 (33)	←	←
←	98 (60)	86 (53)	98 (60)	90 (55)	←
←	—	125 (77)	—	134 (83)	←
—	—	—	—	—	—
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	3S-FE	←
←	←	←	←	←	←
←	←	←	←	86.0 x 86.0 (3.39 x 3.39)	←
←	←	←	←	1998 (121.9)	←
←	←	←	←	9.8 : 1	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	94 / 5400	←
←	←	←	←	178 / 4400	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	1.0, 1.2*4	←
←	—	Dry, Single	—	Dry, Single	←
←	A246E	C250	A246E	S54	←
←	4.005	3.545	4.005	3.285	←
←	2.208	1.904	2.208	1.960	←
←	1.425	1.310	1.425	1.322	←
←	0.981	1.031	0.981	1.028	←
←	—	0.815	—	0.820	←
←	3.272	3.250	3.272	3.153	←
—	—	—	—	—	—
←	2.962	3.941	2.962	3.944	←
←	←	←	←	←	←
←	←	←	←	←	←
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AP

Item			Europe			
Body Type			5-Door Wagon			
Vehicle Grade			LINEA SOL		LINEA TERRA	
Model Code			ST220R-AWPEKW	ST220L-AWPEKW	CT220R-AWMNKW	CT220L-AWMNKW
Major Dimensions & Vehicle Weights	Overall	Length mm (in.)	4570 (179.9)	←	←	←
		Width mm (in.)	1710 (67.3)	←	←	←
		Height mm (in.)	1500 (59.1)	←	←	←
	Wheel Base mm (in.)		2630 (103.5)	←	←	←
	Tread	Front mm (in.)	1480 (58.3)	←	←	←
		Rear mm (in.)	1450 (57.1)	←	←	←
	Room	Length mm (in.)	1930 (76.0)	←	←	←
		Width mm (in.)	1455 (57.3)	←	←	←
		Height mm (in.)	1170 (46.1), 1120 (44.1)*1	←	←	←
	Overhang	Front mm (in.)	875 (34.4)	←	←	←
		Rear mm (in.)	1065 (41.9)	←	←	←
	Min. Running Ground Clearance mm (in.)		155 (6.1)	←	←	←
	Angle of Approach degrees		17.6°	←	←	←
	Angle of Departure degrees		17.4°	←	←	←
	Curb Weight	Front kg (lb)	755 ~ 805 (1664 ~ 1775)	←	765 ~ 855 (1687 ~ 1885)	←
		Rear kg (lb)	550 ~ 575 (1213 ~ 1268)	←	←	←
		Total kg (lb)	1305 ~ 1380 (2877 ~ 3042)	←	1315 ~ 1430 (2900 ~ 3152)	←
	Gross Vehicle Weight	Front kg (lb)	920 (2028)	←	950 (2094)	←
		Rear kg (lb)	880 (1940)	←	880 (1940)	←
		Total kg (lb)	1800 (3968)	←	1830 (4034)	←
	Fuel Tank Capacity ℓ (Imp.gal.)		60 (13.2)	←	←	←
	Luggage Compartment Capacity m^3 (cu.ft.)		0.53 (18.7)	←	←	←
Performance	Max. Speed km/h (mph)		195 (121)	←	175 (109)	←
	Max. Cruising Speed km/h (mph)		180 (111)	←	165 (102)	←
	Acceleration	0 to 100 km/h sec.	10.8	←	12.2	←
		0 to 400 m sec.	17.7	←	18.2	←
	Max. Permissible Speed	1st Gear km/h (mph)	60 (37)	←	42 (26)	←
		2nd Gear km/h (mph)	110 (68)	←	73 (45)	←
		3rd Gear km/h (mph)	—	—	113 (70)	←
		4th Gear km/h (mph)	—	—	—	—
	Min. Turning Radius	Tire m (ft.)	5.4 (17.7)	←	←	←
		Body m (ft.)	5.8 (19.0)	←	←	←
Engine	Engine Type		3S-FE	←	2C-TE	←
	Valve Mechanism		16-Valve, DOHC	←	8-Valve, OHC	←
	Bore x Stroke mm (in.)		86.0 x 86.0 (3.39 x 3.39)	←	86.0 x 85.0 (3.39 x 3.35)	←
	Displacement cm^3 (cu.in.)		1998 (121.9)	←	1975 (120.5)	←
	Compression Ratio		9.8 : 1	←	23.0 : 1	←
	Carburetor Type or Injection Pump Type (Diesel)		EFI	←	Distributor Type*6	←
	Research Octane No. or Cetane No. (Diesel)		95	←	48	←
	Max. Output (EEC) kW/rpm		94/5400	←	66/4800	←
	Max. Torque (EEC) N·m/rpm		178/4400	←	203/2200	←
Engine Electrical	Battery Capacity (5HR) Voltage & Amp. hr.		12-34, 48*4	←	12-64	←
	Alternator Output Watts		960	←	1080	←
	Starter Output kW		1.0, 1.2*4	←	2.0	←
Chassis	Clutch Type		—	—	Dry, Single	←
	Transaxle Type		A241E	←	S50	←
	Transmission Gear Ratio	In First	3.643	←	3.538	←
		In Second	2.008	←	2.041	←
		In Third	1.296	←	1.322	←
		In Fourth	0.892	←	0.945	←
		In Fifth	—	—	0.731	←
		In Reverse	2.977	←	3.153	←
	Counter Gear Ratio		—	—	—	—
	Differential Gear Ratio (Final)		3.178	←	3.736	←
	Brake Type	Front	Ventilated Disc	←	←	←
		Rear	Leading Trailing Drum	←	←	←
	Parking Brake Type		Drum	←	←	←
	Brake Booster Type and Size in.		Single, 9”	←	←	←
	Proportioning Valve Type		Dual-P Valve	←	←	←
	Suspension Type	Front	MacPherson Strut	←	←	←
		Rear	MacPherson Strut	←	←	←
	Stabilizer Bar	Front	STD	←	←	←
		Rear	STD	←	←	←
	Steering Gear Type		Rack and Pinion	←	←	←
	Steering Gear Ratio (Overall)		17.39	←	←	←
	Power Steering Type		Integral Type	←	←	←

*1: With Moon Roof
*4: Option
*6: Electronically Controlled

	Europe
	5-Door Wagon
	LINEA SOL
	CT220L-AWMEKW
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70	←

Item		Area	General Countries			
Body Type			4-Door Sedan			
Vehicle Grade			—			
Model Code			AT220R-AEMNK	AT220L-AEMNK	AT220L-AEPNK	ST220R-AEMNK
Major Dimensions & Vehicle Weights	Overall	Length mm (in.)	4490 (176.8)	←	←	←
		Width mm (in.)	1710 (67.3)	←	←	←
		Height mm (in.)	1425 (56.1)	←	←	←
	Wheel Base mm (in.)		2630 (103.5)	←	←	←
	Tread	Front mm (in.)	1480 (58.3)	←	←	←
		Rear mm (in.)	1450 (57.1)	←	←	←
	Room	Length mm (in.)	1930 (76.0)	←	←	←
		Width mm (in.)	1455 (57.3)	←	←	←
		Height mm (in.)	1160 (45.7), 1110 (43.7)*1	←	←	←
	Overhang	Front mm (in.)	875 (34.4)	←	←	←
		Rear mm (in.)	985 (38.8)	←	←	←
	Min. Running Ground Clearance mm (in.)		155 (6.1)	←	←	←
	Angle of Approach degrees		17.7°	←	←	←
	Angle of Departure degrees		18.4°	←	←	←
	Curb Weight	Front kg (lb)	685 ~ 745 (1510 ~ 1642)	←	715 ~ 775 (1576 ~ 1709)	725 ~ 780 (1598 ~ 1720)
		Rear kg (lb)	505 ~ 540 (1113 ~ 1190)	←	←	515 ~ 540 (1135 ~ 1190)
		Total kg (lb)	1190 ~ 1285 (2623 ~ 2832)	←	1220 ~ 1315 (2690 ~ 2899)	1240 ~ 1320 (2733 ~ 2910)
	Gross Vehicle Weight	Front kg (lb)	860 (1896)	←	890 (1962)	920 (2028)
		Rear kg (lb)	870 (1918)	←	←	880 (1940)
		Total kg (lb)	1730 (3814)	←	1760 (3880)	1800 (3968)
	Fuel Tank Capacity ℓ (Imp.gal.)		60 (13.2)	←	←	←
	Luggage Compartment Capacity m^3 (cu.ft.)		0.50 (17.7)	←	←	←
Performance	Max. Speed km/h (mph)		—	—	—	—
	Max. Cruising Speed km/h (mph)		—	—	—	—
	Acceleration	0 to 100 km/h sec.	—	—	—	—
		0 to 400 m sec.	—	—	—	—
	Max. Permissible Speed	1st Gear km/h (mph)	47 (29)	←	62 (38)	52 (32)
		2nd Gear km/h (mph)	87 (54)	←	114 (70)	87 (54)
		3rd Gear km/h (mph)	127 (78)	←	—	130 (80)
		4th Gear km/h (mph)	—	—	—	—
	Min. Turning Radius	Tire m (ft.)	5.4 (17.7)	←	←	←
		Body m (ft.)	5.8 (19.0)	←	←	←
Engine	Engine Type		4A-FE	←	←	3S-FE
	Valve Mechanism		16-Valve, DOHC	←	←	←
	Bore x Stroke mm (in.)		81.0 x 77.0 (3.19 x 3.03)	←	←	86.0 x 86.0 (3.39 x 3.39)
	Displacement cm^3 (cu.in.)		1587 (96.8)	←	←	1998 (121.9)
	Compression Ratio		9.5 : 1	←	←	9.8 : 1
	Carburetor Type or Injection Pump Type (Diesel)		EFI	←	←	←
	Research Octane No. or Cetane No. (Diesel)		90 or 95	←	←	←
	Max. Output (EEC) kW/rpm		81/6000	←	←	91/5600
	Max. Torque (EEC) N·m/rpm		145/4800	←	←	178/4400
Engine Electrical	Battery Capacity (5HR) Voltage & Amp. hr.		12-32, 48*4	←	←	←
	Alternator Output Watts		960	←	←	←
	Starter Output kW		1.1	←	←	1.0, 1.2*4
Chassis	Clutch Type		Dry, Single	←	—	Dry, Single
	Transaxle Type		C50	←	A245E	S54
	Transmission Gear Ratio	In First	3.545	←	3.643	3.285
		In Second	1.904	←	2.008	1.960
		In Third	1.310	←	1.296	1.322
		In Fourth	0.969	←	0.892	1.028
		In Fifth	0.815	←	—	0.820
		In Reverse	3.250	←	2.977	3.153
	Counter Gear Ratio		—	—	—	—
	Differential Gear Ratio (Final)		4.058	←	3.178	3.944
	Brake Type	Front	Ventilated Disc	←	←	←
		Rear	Leading Trailing Drum	←	←	←
	Parking Brake Type		Drum	←	←	←
	Brake Booster Type and Size in.		Single, 9”	←	←	←
	Proportioning Valve Type		Dual-P Valve	←	←	←
	Suspension Type	Front	MacPherson Strut	←	←	←
		Rear	MacPherson Strut	←	←	←
	Stabilizer Bar	Front	STD	←	←	←
		Rear	STD	←	←	←
	Steering Gear Type		Rack and Pinion	←	←	←
	Steering Gear Ratio (Overall)		17.39	←	←	←
	Power Steering Type		Integral Type	←	←	←

*1: With Moon Roof
*4: Option
*5: Mechanically Controlled

General Countries			
4-Door Sedan			
—			
ST220L-AEMNK	ST220R-AEPNK	ST220L-AEPNK	CT220L-AEMNX
←	←	←	←
←	←	←	←
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←	←	←	←
←	←	←	←
←	←	←	←
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←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	←	←	←
←	750 ~ 805 (1654 ~ 1775)	←	755 ~ 855 (1665 ~ 1885)
←	←	←	510 ~ 540 (1124 ~ 1190)
←	1265 ~ 1345 (2789 ~ 2965)	←	1265 ~ 1395 (2789 ~ 3075)
←	←	←	950 (2094)
←	←	←	880 (1940)
←	←	←	1830 (4034)
←	←	←	←
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←	58 (36)	←	42 (26)
←	106 (65)	←	73 (45)
←	—	—	113 (70)
—	—	—	—
←	←	←	←
←	←	←	←
←	←	←	2C-T
←	←	←	8-Valve, OHC
←	←	←	86.0 x 85.0 (3.39 x 3.35)
←	←	←	1975 (120.5)
←	←	←	23.0 : 1
←	←	←	Distributor Type*5
←	←	←	48
←	←	←	60 / 4000
←	←	←	170 / 2000 ~ 3000
←	←	←	12-64
←	←	←	1080
←	←	←	2.0
←	—	—	Dry, Single
←	A241E	←	S50
←	3.643	←	3.538
←	2.008	←	2.041
←	1.296	←	1.322
←	0.892	←	0.945
←	—	—	0.731
←	2.977	←	3.153
—	—	—	—
←	3.178	←	3.736
←	←	←	←
←	←	←	←
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– MEMO –

FOREWORD

To assist you in your sales and service activities, this manual explains the main characteristics of the new COROLLA, MR2, AVENSIS and LAND CRUISER/LAND CRUISER PRADO, in particular providing a technical explanation of the construction and operation of new mechanisms and new technology used.

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 instructions on what to do or not do are ignored.
NOTICE	Damage to the vehicle or components may occur if 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.

All information contained herein is the most up-to-date at the time of publication. We reserve the right to make changes without prior notice.

TOYOTA MOTOR CORPORATION

First Printing: Jul. 19, 2000 01-000719-00

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1 COROLLA

2 MR2

3 AVENSIS

4 LAND CRUISER / LAND CRUISER PRADO

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4

AVENSIS

AVENSIS

OUTLINE OF NEW FEATURES

1. Model Line-Up

- The 4A-FE and 7A-FE engine models have been discontinued.
- The 1AZ-FSE, 1ZZ-FE and 3ZZ-FE engine models have been added.

2. Exterior

A tether has been provided to prevent the fuel filler cap from being lost.

3. Interior

- A damper has been added to the glove box.
- A push-and-open type ashtray has been adopted in the center cluster.

4. 1ZZ-FE Engine

- The 1ZZ-FE engine which is an in-line, 4-cylinder, 1.8 litter, 16-valve DOHC has been adopted.
- The VVT-i (Variable Valve Timing-intelligent) system, the DIS (Direct Ignition System) and a plastic intake manifold have been adopted.

5. 3ZZ-FE Engine

- The 3ZZ-FE engine which is an in-line, 4-cylinder, 1.6 litter, 16-valve DOHC has been adopted.
- The VVT-i (Variable Valve Timing-intelligent) system, the DIS (Direct Ignition System) and a plastic intake manifold have been adopted.

6. 1AZ-FSE Engine

- The 1AZ-FSE TOYOTA D-4 (Direct injection 4-stroke gasoline engine) which is a newly developed inline 4-cylinder, 2.0 litter, 16-valve DOHC engine is added.
- The direct injection system, VVT-i (Variable Valve Timing-intelligent) system and ETCS-i (Electronic Throttle Control System-intelligent) have been adopted.

7. Clutch

In accordance with the adoption of 1ZZ-FE, 3ZZ-FE and 1AZ-FSE engines, the clutch disc and the clutch cover are optimized to each feature of engine.

8. S55 Manual Transaxle

The S55 manual transaxle is used for the 1AZ-FSE engine model.

9. C50 and C250 Manual Transaxles

- The C50 manual transaxle is used for the 3ZZ-FE engine model.
- The C250 manual transaxle is used for the 1ZZ-FE engine model.

10. E351 Manual Transaxle

The E351 manual transaxle, which is based on the previous E251, has been adopted on the 1CD-FTV engine model to realize improved performance and weight reduction.

11. U240E Automatic Transaxle

- The U240E automatic transaxle is used for the 1AZ-FSE engine model.
- The shift lock mechanism has been newly adopted.

12. A246E Automatic Transaxle

- The A246E automatic transaxle is used for the 1ZZ-FE engine model.
- The shift lock mechanism has been newly adopted.

13. Drive Shaft

The same type of drive shaft that is used on the 1CD-FTV engine model has been adopted on the 1AZ-FSE engine model.

14. Brake

- The 7" + 8" tandem brake booster has been adopted on the 1AZ-FSE engine model as a standard, and on the 1ZZ-FE and 3ZZ-FE engine models as an option.
- The ABS with EBD is standard equipment on all models. The ABS with EBD & Brake Assist & TRC & VSC System is standard equipment on the LENEA SOL grade with the 1AZ-FSE engine, and offered as an option on the LINEA TERRA grade.

  ABS (Anti-lock Brake System), EBD (Electronic Brake force Distribution),
  TRC (Traction Control), VSC (Vehicle Stability Control)

15. Body

- ISO-FIX rigid anchor for securing child seats (CRS: Child Restraint System), which comply with ISO-FIX, have been provided behind the seat cushion of both outer rear seats.
- A radiator support cover has been provided between the radiator grille and the radiator support to improve the appearance of the engine compartment.

16. Lighting

Multi-reflector type headlights and front fog lights have been adopted.

17. Combination Meter

- The color of the illumination, letters and numbers, and the dial plates has been changed to improve product appeal.
- An indicator that points to the (right or left) position of the fuel lid has been added.
- Indicator lights that are related to the VSC system have been added to the models equipped with VSC (Vehicle Stability Control).

18. Heater Control System

- Air inlet mode selector has been changed to push and lock button type from lever type.
- The control of the mode selector switch, fan speed selector switch, and temperature selector switch has been changed from the manual to the electric type in order to improve the operating feel. Accordingly, the switching of the mode doors has been changed from the previous cable-driven type to the servomotor-driven type.

19. SRS Airbag System

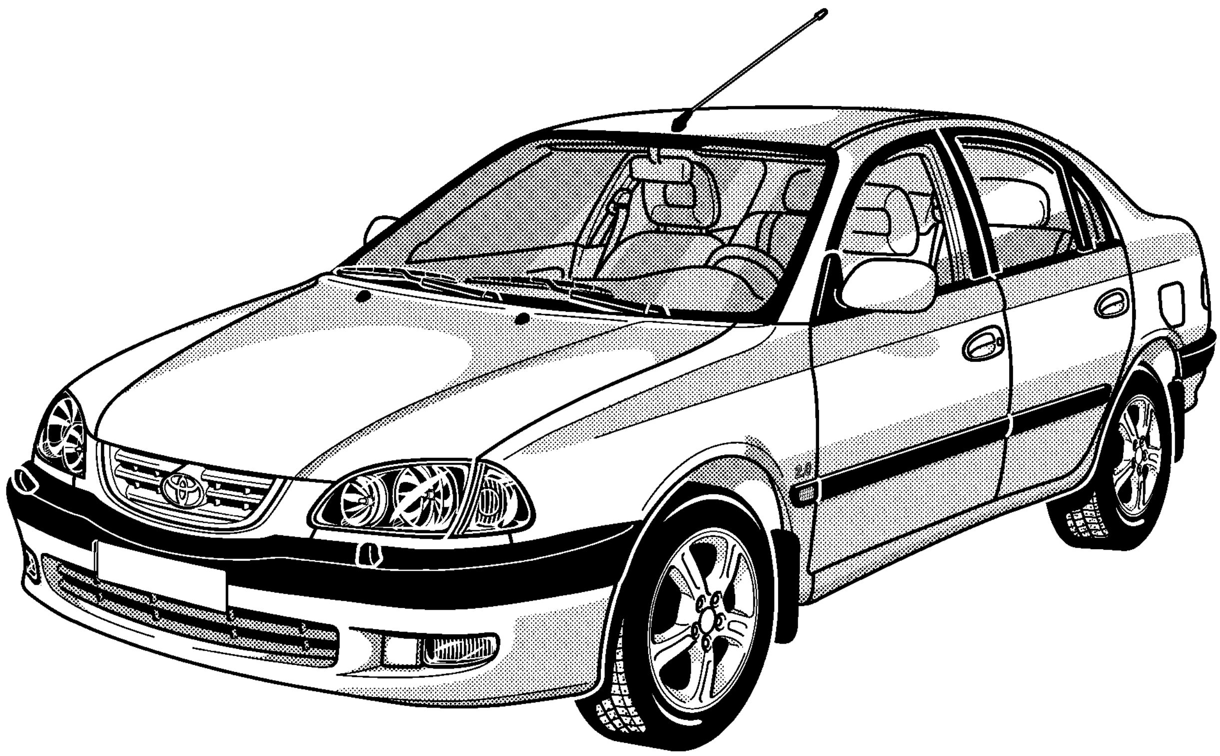
A fuel cut control is adopted to stop the fuel pump when the airbag is deployed at the front or side collision.

20. Door Lock Control System

The double locking system is standard equipment on the RHD model.

21. Audio

- A multi-information display panel has been provided on the audio unit to indicate various types of information, including the audio, average vehicle speed, fuel consumption, continuous drivable distance, time, and outside temperature.
- A steering pad switch that operates the audio unit has been provided on the steering wheel as an option.



195MO01

MODEL CODE

AZT220 L – A E M E H W

AZT220	L	–	A	E	M	E	H	W
1	2		3	4	5	6	7	8

No.	BASIC MODEL CODE
1	ZZT220 : With 3ZZ-FE Engine ZZT221 : With 1ZZ-FE Engine AZT220 : With 1AZ-FSE Engine CDT220 : With 1CD-FTV Engine

No.	STEERING WHEEL POSITION
2	L : Left-Hand Drive R : Right-Hand Drive

No.	MODEL NAME
3	A : AVENSIS

No.	BODY TYPE
4	E : 4-Door Sedan L : 5-Door Liftback W : 5-Door Wagon

No.	GEARSHIFT TYPE
5	M : 5-Speed Manual, Floor P : 4-Speed Automatic, Floor

No.	GRADE
6	N : LINEA TERRA E : LINEA SOL

No.	ENGINE SPECIFICATION
7	K : DOHC and EFI H : DOHC, EFI and Direct Injection Y : Common-Rail Diesel

No.	DESTINATION
8	W : Europe

MODEL LINE-UP

DESTINATION	BODY TYPE	ENGINE	GRADE	TRANSAXLE					
				5-Speed Manual				4-Speed Automatic	
				C50	C250	S55	E351	A246E	U240E
Europe	4-Door Sedan	3ZZ-FE	LINEA TERRA	ZZT220 $\substack{R\\L}$– AEMNKW					
			LINEA SOL	ZZT220L– AEMEKW					
		1ZZ-FE	LINEA TERRA		ZZT221 $\substack{R\\L}$– AEMNKW			ZZT221 $\substack{R\\L}$– AEPNKW	
			LINEA SOL		ZZT221 $\substack{R\\L}$– AEMEKW			ZZT221 $\substack{R\\L}$– AEPEKW	
		1AZ-FSE	LINEA TERRA			AZT220 $\substack{R\\L}$– AEMNHW			
			LINEA SOL			AZT220 $\substack{R\\L}$– AEMEHW			AZT220 $\substack{R\\L}$– AEPEHW
		1CD-FTV	LINEA TERRA				CDT220 $\substack{R\\L}$– AEMNYW		
			LINEA SOL				CDT220 $\substack{R\\L}$– AEMEYW		
	5-Door Liftback	3ZZ-FE	LINEA TERRA	ZZT220 $\substack{R\\L}$– ALMNKW					
			LINEA SOL	ZZT220L– ALMEKW					
		1ZZ-FE	LINEA TERRA		ZZT221 $\substack{R\\L}$– ALMNKW			ZZT221 $\substack{R\\L}$– ALPNKW	
			LINEA SOL		ZZT221 $\substack{R\\L}$– ALMEKW			ZZT221 $\substack{R\\L}$– ALPEKW	
		1AZ-FSE	LINEA TERRA			AZT220 $\substack{R\\L}$– ALMNHW			
			LINEA SOL			AZT220 $\substack{R\\L}$– ALMEHW			AZT220 $\substack{R\\L}$– ALPEHW
		1CD-FTV	LINEA TERRA				CDT220 $\substack{R\\L}$– ALMNYW		
			LINEA SOL				CDT220 $\substack{R\\L}$– ALMEYW		
	5-Door Wagon	3ZZ-FE	LINEA TERRA	ZZT220 $\substack{R\\L}$– AWMNKW					
			LINEA SOL	ZZT220L– AWMEKW					
		1ZZ-FE	LINEA TERRA		ZZT221 $\substack{R\\L}$– AWMNKW			ZZT221L– AWPNKW	
			LILNEA SOL		ZZT221L– AWMEKW			ZZT221L– AWPEKW	
		1AZ-FSE	LINEA TERRA			AZT220 $\substack{R\\L}$– AWMNHW			
			LINEA SOL			AZT220 $\substack{R\\L}$– AWMEHW			AZT220 $\substack{R\\L}$– AWPEHW
		1CD-FTV	LINEA TERRA				CDT220 $\substack{R\\L}$– AWMNYW		
			LINEA SOL				CDT220L– AWMEYW		

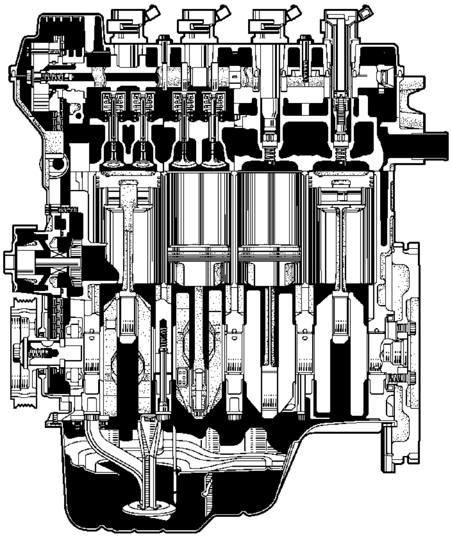
NEW FEATURES

■1ZZ-FE AND 3ZZ-FE ENGINES

1. General

The 1ZZ-FE engine is an in-line, 4-cylinder, 1.8 liter, 16-valve DOHC engine. The 3ZZ-FE engine is an in-line, 4-cylinder, 1.6 liter, 16-valve DOHC engine.
The VVT-i (Variable Valve Timing-intelligent) system, the DIS (Direct Ignition System), and a plastic intake manifold have been adopted on these engines in order to improve their engine performance and fuel economy and reduce exhaust emissions.

3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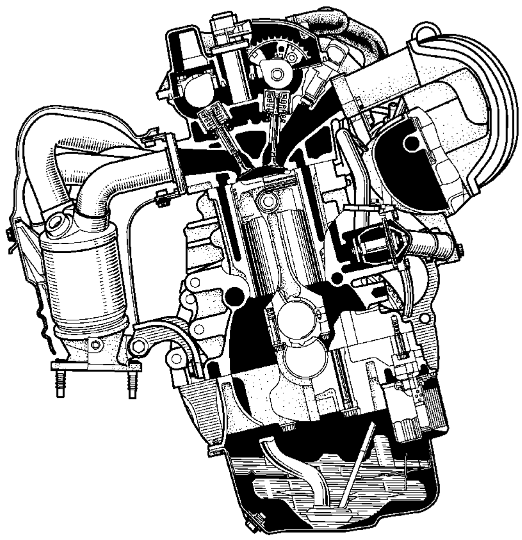
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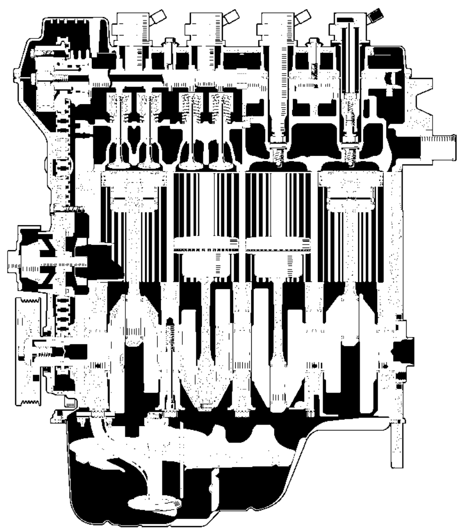
1ZZ-FE Engine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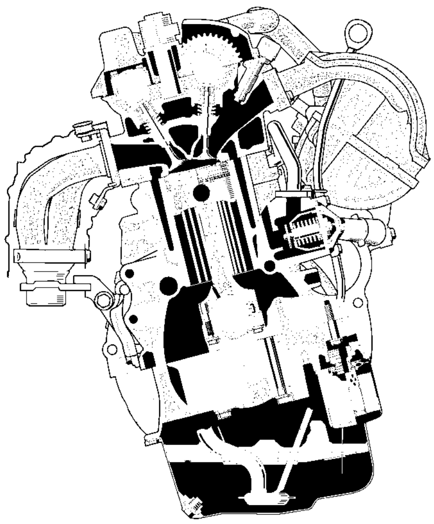
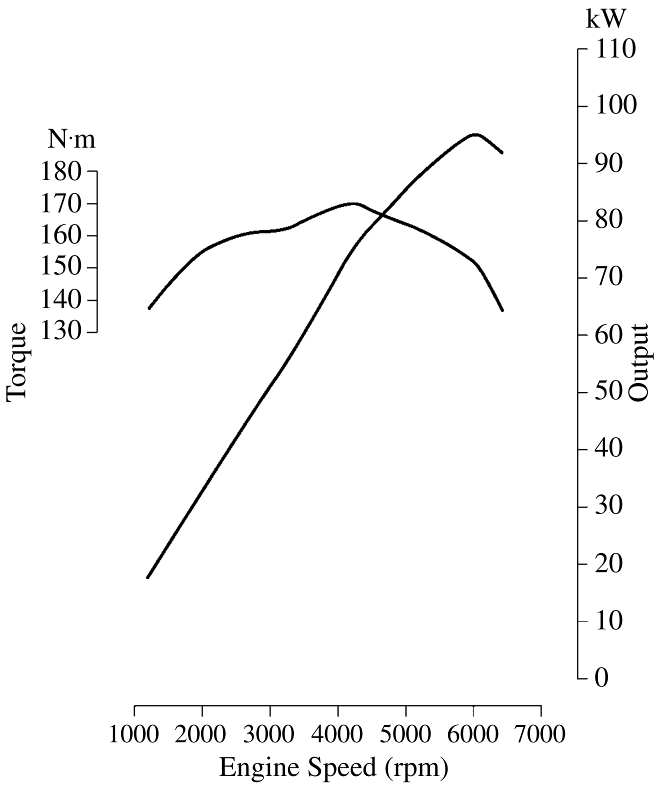

178EG02

3ZZ-FE Engine

▶ Engine Specifications ◀

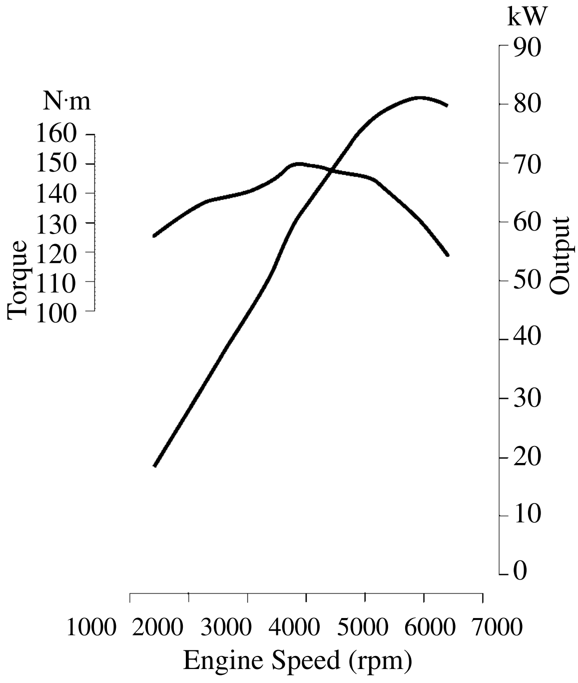
Engine Type			1ZZ-FE	3ZZ-FE
No. of Cyls. & Arrangement			4-Cylinder, In-line	←
Valve Mechanism			16-Valve DOHC, Chain Drive	←
Combustion Chamber			Pentroof Type	←
Manifolds			Cross-Flow	←
Fuel System			EFI	←
Displacement		cm^3 (cu.in.)	1794 (109.5)	1598 (97.5)
Bore x Stroke		mm (in.)	79.0 x 91.5 (3.11 x 3.60)	79.0 x 81.5 (3.11 x 3.21)
Compression Ratio			10.0 : 1	10.5 : 1
Max. Output		(EEC)	95 kW @ 6000 rpm	81 kW @ 6000 rpm
Max. Torque		(EEC)	170 N·m @ 4200 rpm	150 N·m @ 3800 rpm
Valve Timing	Intake	Open	2° ~ 42° BTDC	←
		Close	50° ~ 10° ABDC	←
	Exhaust	Open	42° BBDC	←
		Close	2° ATDC	←
Fuel Octane Number		RON	95 or More	←
Oil Grade			API SJ, EC or ILSAC	←

▶ Performance Curve ◀



1ZZ-FE Engine

195EG74



3ZZ-FE Engine

178EG03

2. Feature of 1ZZ-FE and 3ZZ-FE Engines

The 1ZZ-FE and 3ZZ-FE engines have been able to achieve the following performance through the adoption of the items listed below.

(1) High performance and fuel economy

(2) Low noise and vibration

(3) Lightweight and compact design

(4) Good serviceability

(5) Clean emission

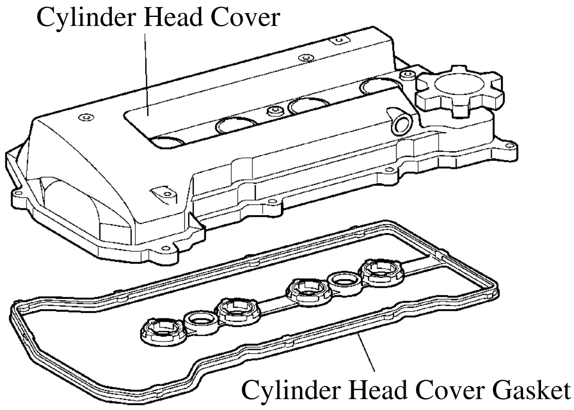
Item	(1)	(2)	(3)	(4)	(5)
The VVT-i system is used.	○				○
A cylinder block made of aluminum alloy has been adopted.			○		
The DIS (Direct Ignition System) makes ignition timing adjustment unnecessary.	○			○	
A serpentine belt drive system has been adopted.			○	○	
The fuel retrunless system has been adopted.			○	○	○
Quick connectors are used to connect the fuel hose with the fuel pipe.				○	
12-hole type fuel injectors have been adopted.*	○				○
Intake manifold made of plastic has been adopted.			○		
A dual WU-TWC (Warm Up Three-Way Catalytic Converter) for reducing exhaust emissions during engine warming has been adopted.*	○				○
A rearward exhaust layout has been adopted to realize an early activation of the catalyst.					○
Timing chain has been used.				○	
A stainless steel exhaust manifold is used for weight reduction.			○		
The crankshaft bearing caps with ladder-frame construction have been adopted.		○			

*: Only for 1ZZ-FE engine

3. Engine Proper

Cylinder Head Cover

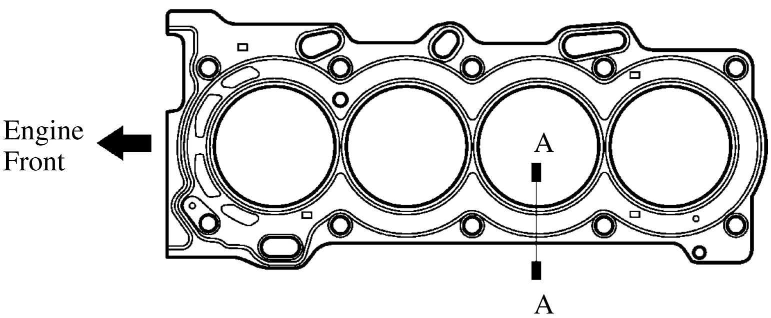
- Lightweight yet high-strength aluminum die-cast cylinder head cover is used.
- The cylinder head cover gasket and the spark plug gasket have been integrated to reduce the number of parts.
- Acrylic rubber, which excels in heat resistance and reliability, has been adopted for the cylinder head cover gasket.



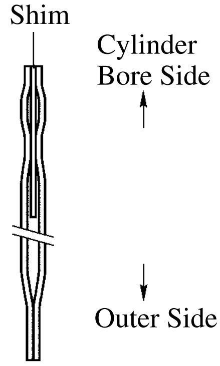
174EG03

Cylinder Head Gasket

A steel-laminate type cylinder head gasket has been adopted. A shim has been added around the cylinder bore to increase the sealing surface, thus improving the sealing performance and durability.



174EG04



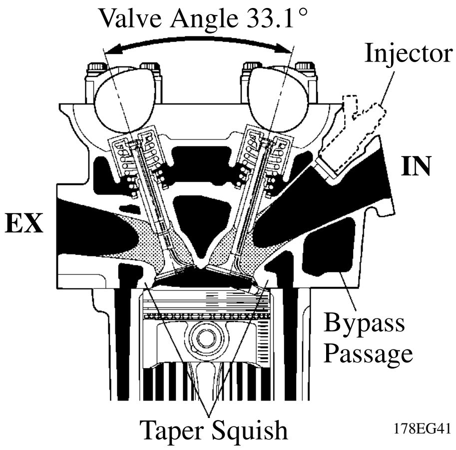
A – A Cross Section

178EG40

3

Cylinder Head

- Upright intake port have been adopted to improve the intake efficiency.
- The injectors have been installed in the cylinder head to prevent the fuel from adhering onto the intake port walls, thus reducing exhaust emissions.
- The routing of the water jacket in the cylinder head has been optimized to improve the cooling performance. In addtion, a water bypass passage has been provided below the intake ports to reduce the number of parts and to achieve weight reduction.
- The angle of the intake and exhaust valves is narrowed and set at 33.1° to permit a compact cylinder head.
- A compression ratio of 10.0 : 1 (1ZZ-FE engine) and 10.5 : 1 (3ZZ-FE engine) have been adopted and the variances in the combustion chamber volume between the cylinders have been minimized to improve the power output.
- Through the adoption of the laser-clad valve seat and the taper squish combustion chamber, the engine's knocking resistane and fuel efficiency have been improved. In addition, the valve diameter has been increased through the adoption of the laser-clad valve seat. However, the laser-clad valve seats are provided only in the 1ZZ-FE engine.



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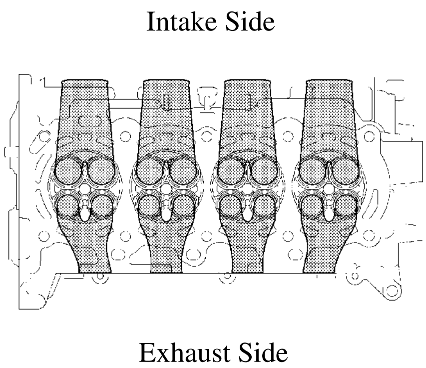
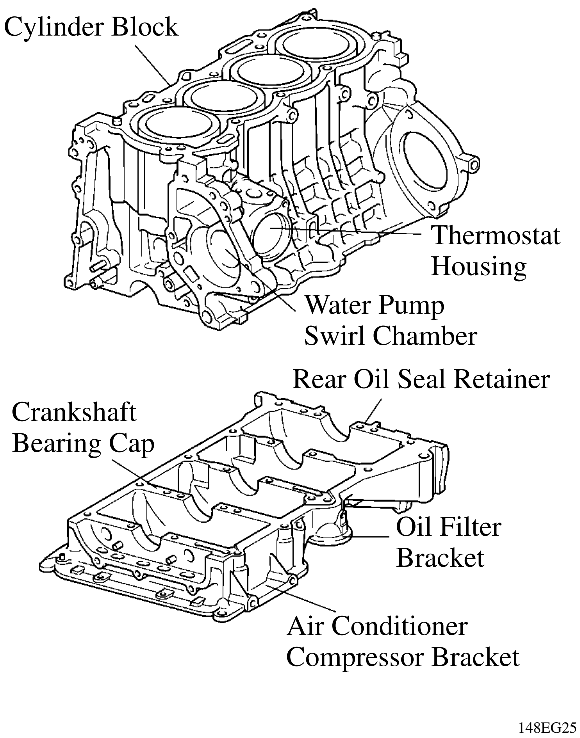


148EG26

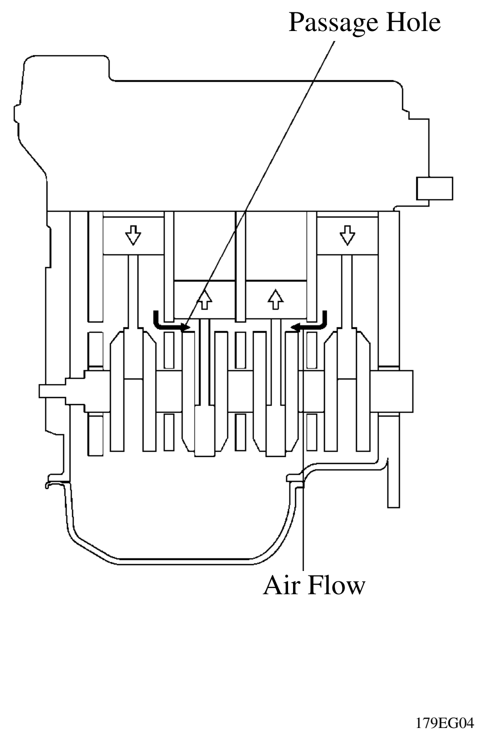
Cylinder Block

- Lightweight aluminum alloy is used for the cylinder block.
- By producing the thin cast-iron liners and cylinder block as a unit, compaction is realized.
  This liner is thin, so that boring is not possible.
- A water pump swirl chamber and an inlet passage to the pump are provided in the cylinder block.
- 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 crankshaft bearing caps with ladder-frame construction have been adopted to improve the rigidity, to reduce noise, and to improve the coupling rigidity with the transaxle.
- Cast-iron is adopted as a material for a part of a bearing journal of a crankshaft bearing cap and thus restraints the heat deformation. In addition, the oil filter bracket, the air conditioner compressor bracket, the water pump swirl chamber, the thermostat housing and the rear oil seal retainer have been integrated to reduce the number of parts.



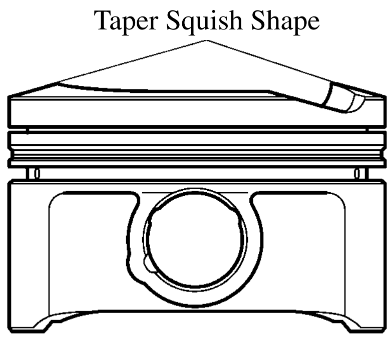
Ladder-frame Construction

▶ Air Flow During Engine Revolution ◀



Piston

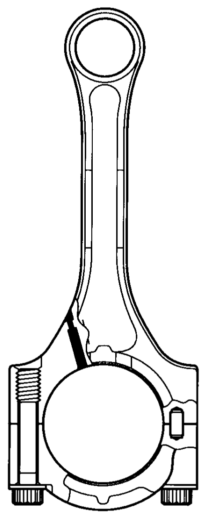
- The piston is made of aluminum alloy and skirt area is made compact and lightweight.
- The piston head portion has adopted a taper squish shape to improve the fuel combustion efficiency.
- Full floating type piston pins are used.
- By increasing the machining precision of the cylinder bore diameter,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



178EG28

Connecting Rod

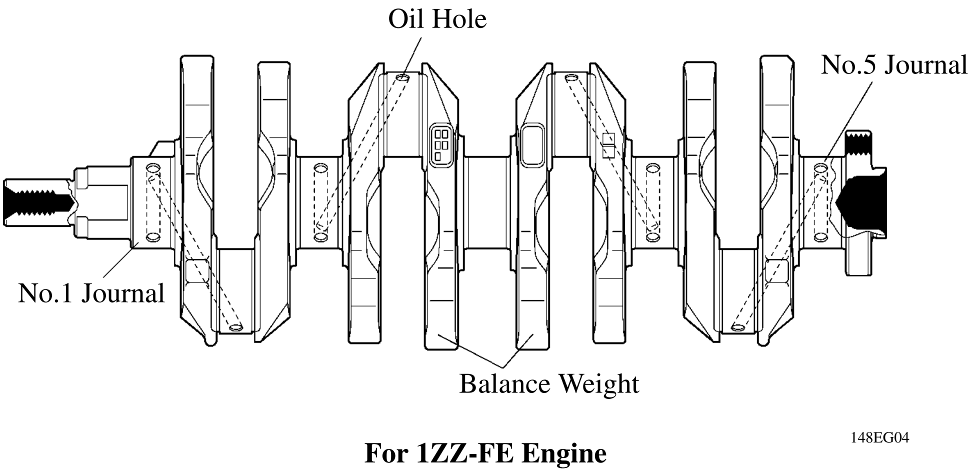
- The connecting rods are made of high-strength material for weight reduction.
- The connecting rod bearings have been reduced in width to reduce friction.
- Nutless-type plastic region tightening bolts of the connecting rod are adopted for a lighter design.



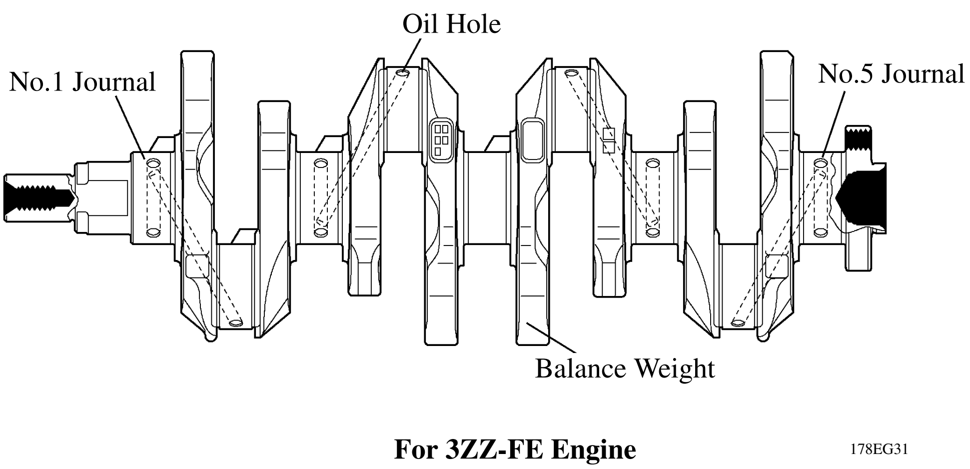
178EG29

Crankshaft

- The forged crankshaft (for 1ZZ-FE engine) has 5 journals and 8 balance weights.
- The casting crankshaft (for 3ZZ-FE engine) has 5 journals and 4 balance weights.
- The crankshaft bearings have been reduced in width to reduce friction.
- The precision and surface roughness of the pins and journals have been improved to reduce friction.



For 1ZZ-FE Engine

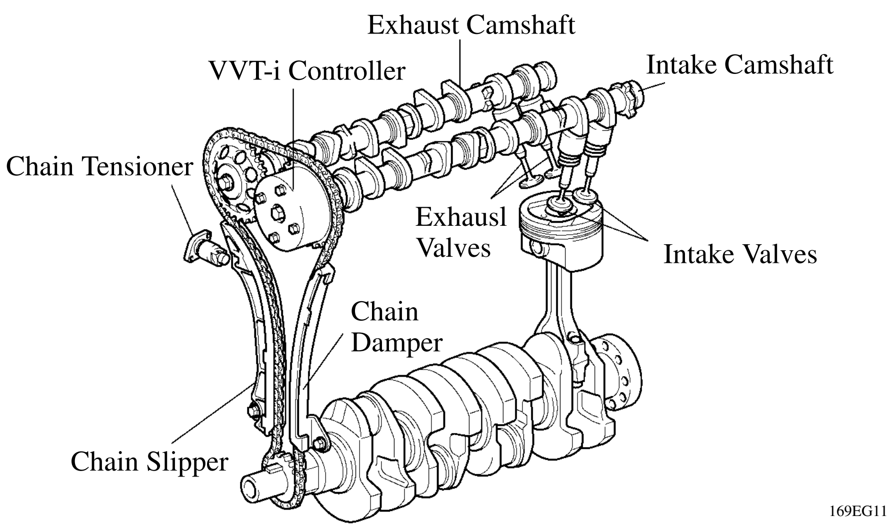


For 3ZZ-FE Engine

4. Valve Mechanism

General

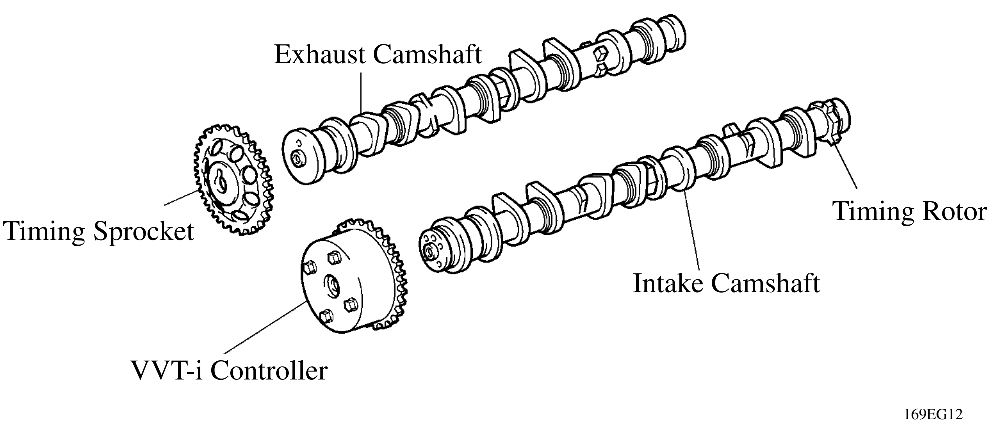
- Each cylinder is equipped with 2 intake valves and 2 exhaust valves. Intake and exhaust efficiency has been increased due to the larger total port areas.
- The valves are directly opened and closed by 2 camshafts.
- The shimless type valve lifter is used.
- The intake and exhaust camshafts are driven by a chain.
- The VVT-i (Variable Valve Timing-intelligent) system is used to improve fuel economy, engine performance and reduce exhaust emissions. For details, refer to page 98.



For 1ZZ-FE Engine

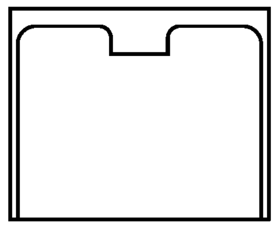
Camshaft

- 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.
- The intake camshaft is provided with timing rotor to trigger the camshaft position sensor.



Valve Lifter

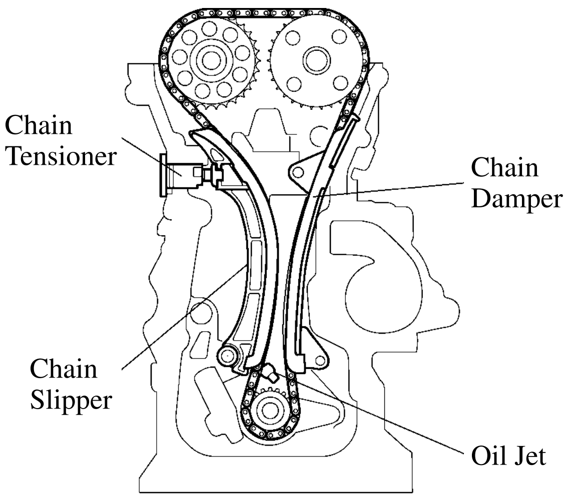
Along with the increase of the amount of valve lift, the valve adjusting shims have been discontinued and the shimless type of the valve lifter has been adopted. This valve lifter enables to make the cam contact surface greater.
The adjustment of the valve clearances is accomplished by selecting and replacing the appropriate valve lifters.



148EG05

Timing Chain

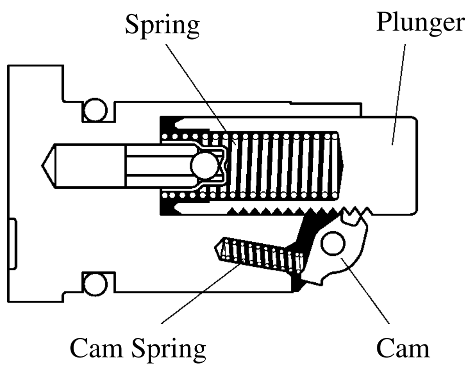
- A roller chain with an 8 mm pitch has been adopted to make the engine more compact.
- A material which has excellent wear resistance has been selected for the timing chain to improve reliability.
- The timing chain is lubricated by an oil jet.



185EG02

Chain Tensioner

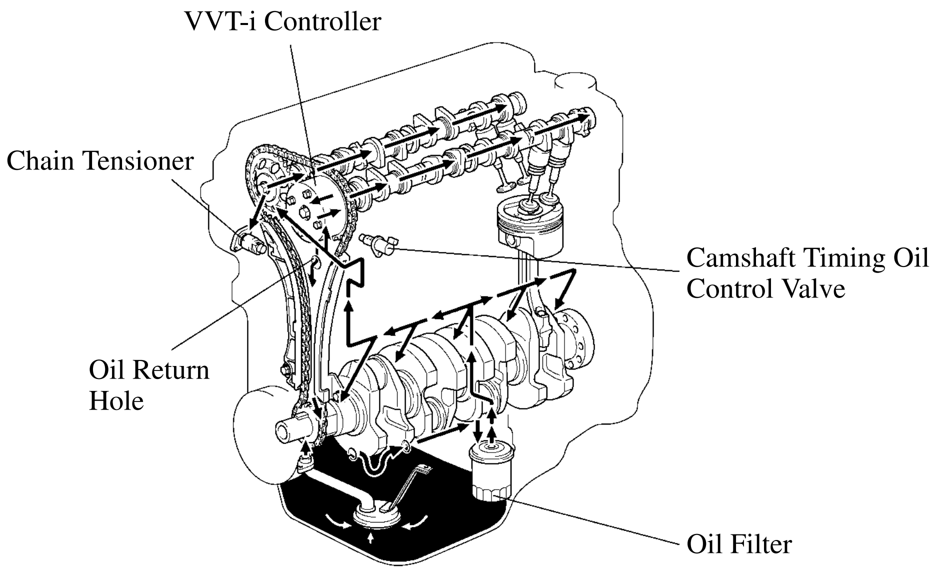
- The chain tensioner uses a spring and oil pressure to maintain proper chain tension at all times.
  The chain tensioner suppresses noise generated by the chain.
- A ratchet type non-return mechanism is also used.
- To improve serviceability, the chain tensioner is constructed so that it can be removed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



178EG05

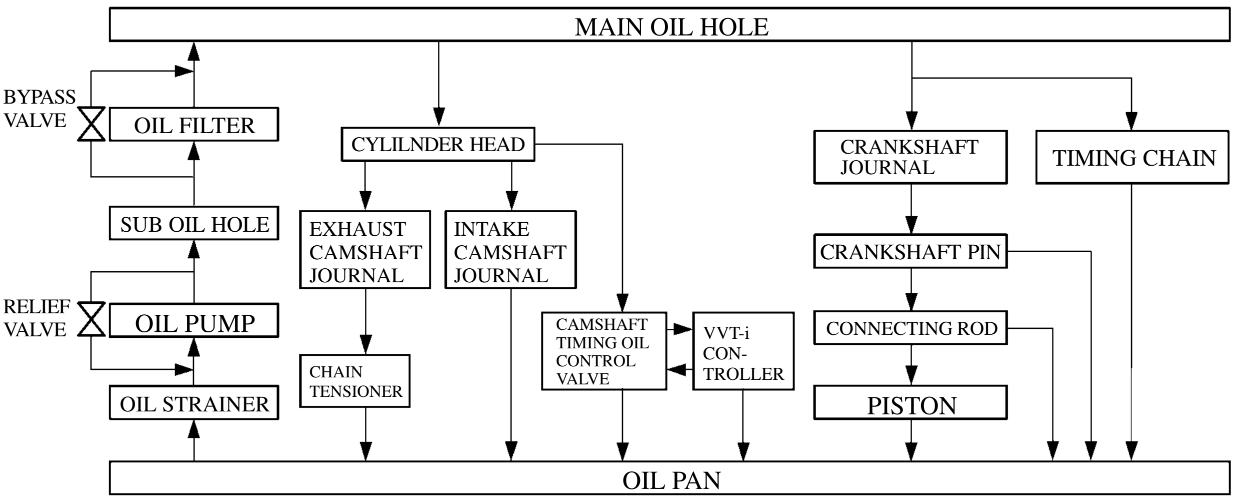
5. Lubrication System

- The lubrication circuit is fully pressurized and oil passes through an oil filter.
- The cycloid gear type oil pump is directly driven by the crankshaft.
- This engine has an oil return structure in which the oil force-fed to the upper cylinder head returns to the oil pan through the oil return hole established in the cylinder head.
- The oil filter is attached downward from the crankshaft bearing cap 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 is operated by the engine oil.



185EG34

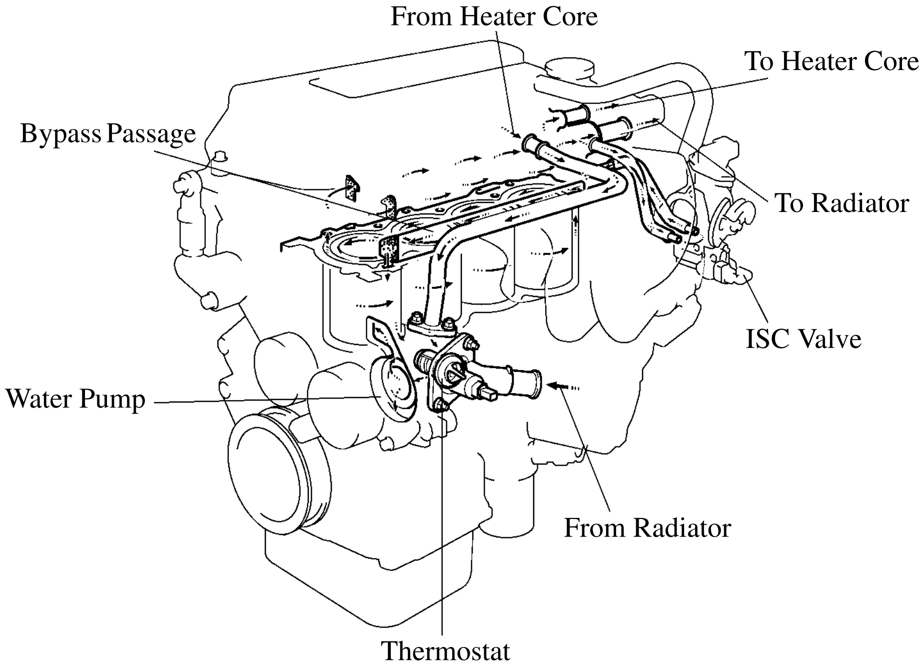
For 1ZZ-FE Engine



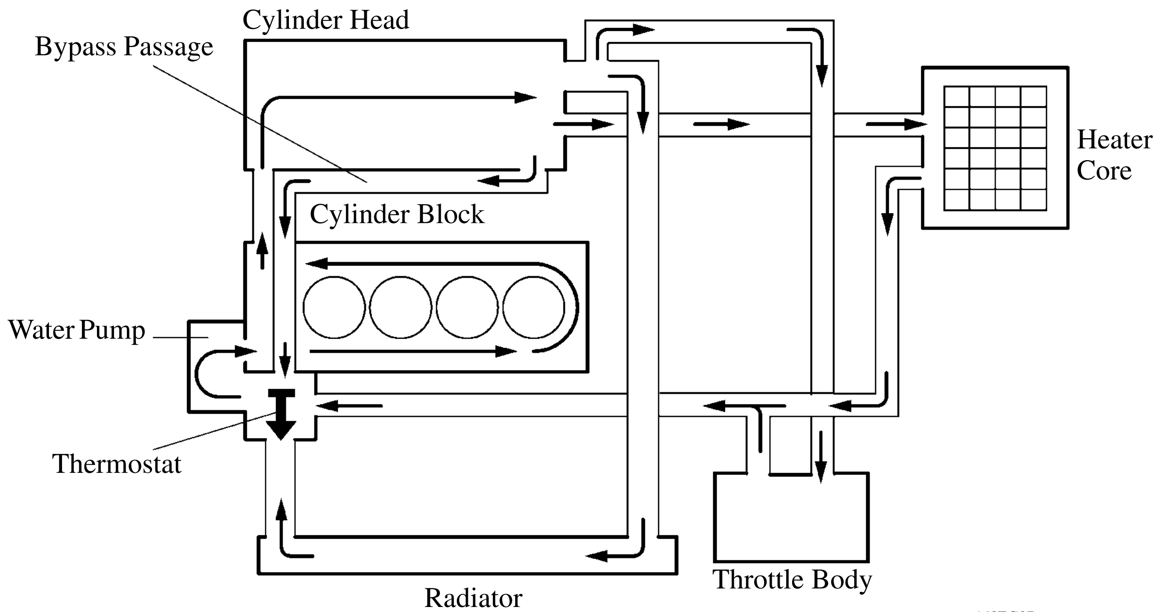
195EG04

6. Cooling System

- The cooling system is a pressurized, forced-circulation type.
- A thermostat with a bypass valve is located on the water inlet housing to maintain suitable temperature distribution in the cooling system.
- An aluminium radiator core is used for weight reduction.
- 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 water from the engine is sent to the throttle body to prevent freeze-up.



185EG51

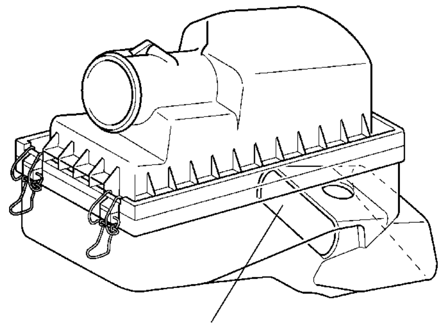


148EG07

7. Intake and Exhaust System

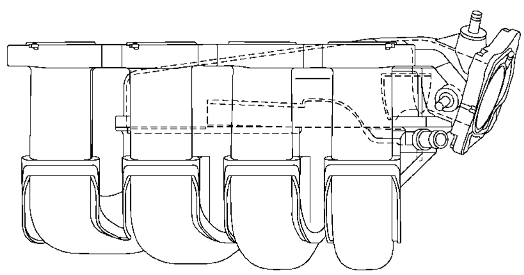
Air Cleaner

- A protruded pipe that is composite-formed with the case has been added in the air cleaner case to reduce the amount of the intake sound.



Intake Manifold

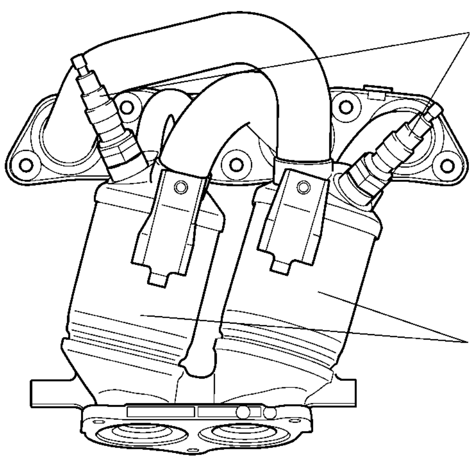
- The intake manifold has been made of plastic to reduce the weight and the amount of heat transferred from the cylinder head. As a result, it has become possible to reduce the intake air temperature and improve the intake volumetric efficiency.
- A resonator is provided in the air intake chamber to optimize the intake pulsation in order to improve the engine performance in the midspeed range.



For 1ZZ-FE Engine

Exhaust Manifold

- A dual type exhaust manifold has been installed on the front of the vehicle, in the 1ZZ-FE engine.
- A stainless steel exhaust manifold is used for weight reduction.
- A thin-wall ceramic WU-TWC (Warm Up Three-Way Catalytic Converter) has been adopted for the 1ZZ-FE engine. By decreasing the thermal capacity in this manner, it becomes easier to heat the catalyst and the catalyst's exhaust cleansing performance is improved.



For 1ZZ-FE Engine

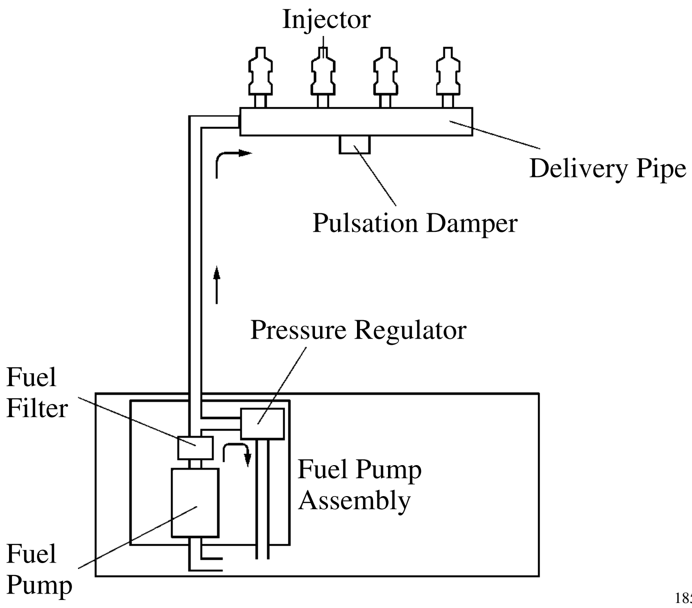
8. Fuel System

General

- The fuel returnless system has been adopted to reduce evaporative emissions.
- A fuel cut control has been adopted to stop the fuel pump when the airbag is deployed at the front or side collision.
- A quick connector has been adopted to connect the fuel pipe with the fuel hose to improve serviceability
- A compact 12-hole type injector has been adopted in the 1ZZ-FE engine.
- A compact 4-hole type injector has been adopted in the 3ZZ-FE engine.

Fuel Returnless System

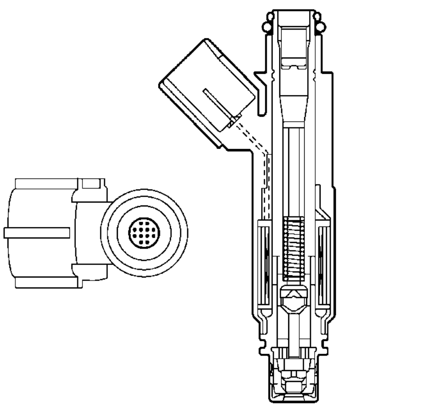
This system has been adopted to reduce the evaporative emission. As shown below, integrating the fuel filter, pressure regulator, and fuel sender gauge with fuel pump assembly it possible to discontinue the return of fuel from the engine area and prevent temperature rise inside the fuel tank.



185EG14

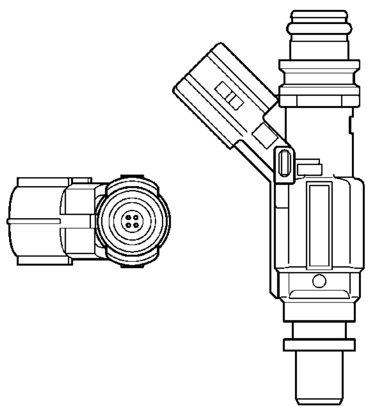
Injector

- A compact 12-hole type injector has been adopted in the 1ZZ-FE engine.
- A compact 4-hole type injector has been adopted in the 3ZZ-FE engine.



185EG04

For 1ZZ-FE Engine



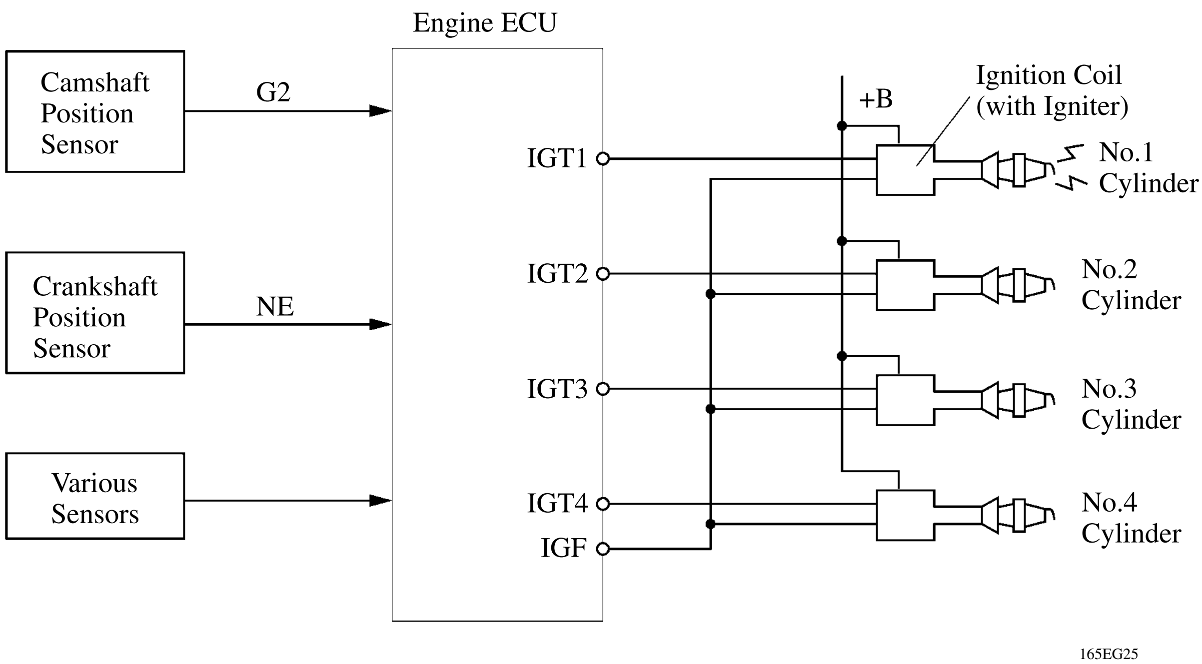
195EG83

For 3ZZ-FE Engine

9. Ignition System

General

A DIS (Direct Ignition System) has been adopted. The DIS improves the ignition timing accuracy, reduces high-voltage loss, and enhances the overall reliability of the ignition system by eliminating the distributor. The DIS is an independent ignition system which has one ignition coil (with igniter) for each cylinder.

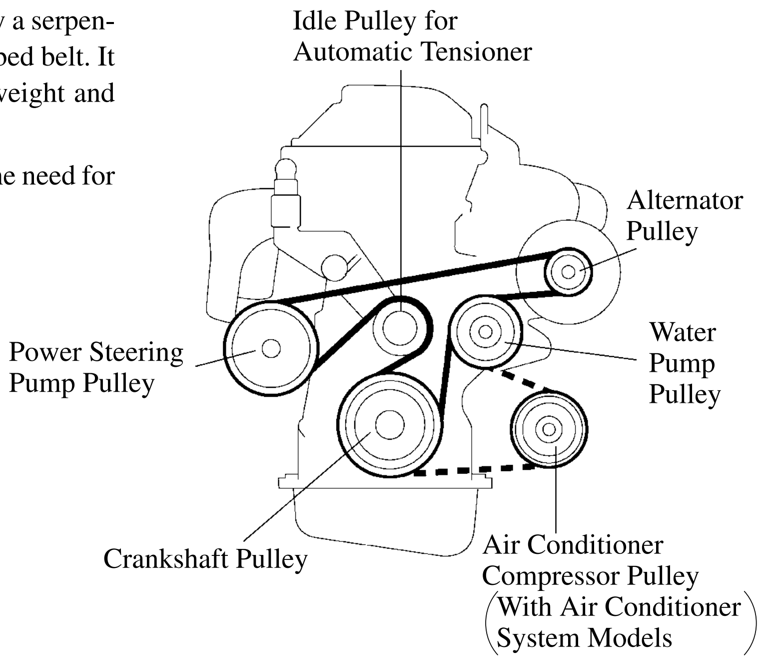


Ignition Coil

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. Also, an igniter is enclosed to simplify the system.

10. Serpentine Belt Drive System

- 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.



180EG07

11. Engine Control System

General

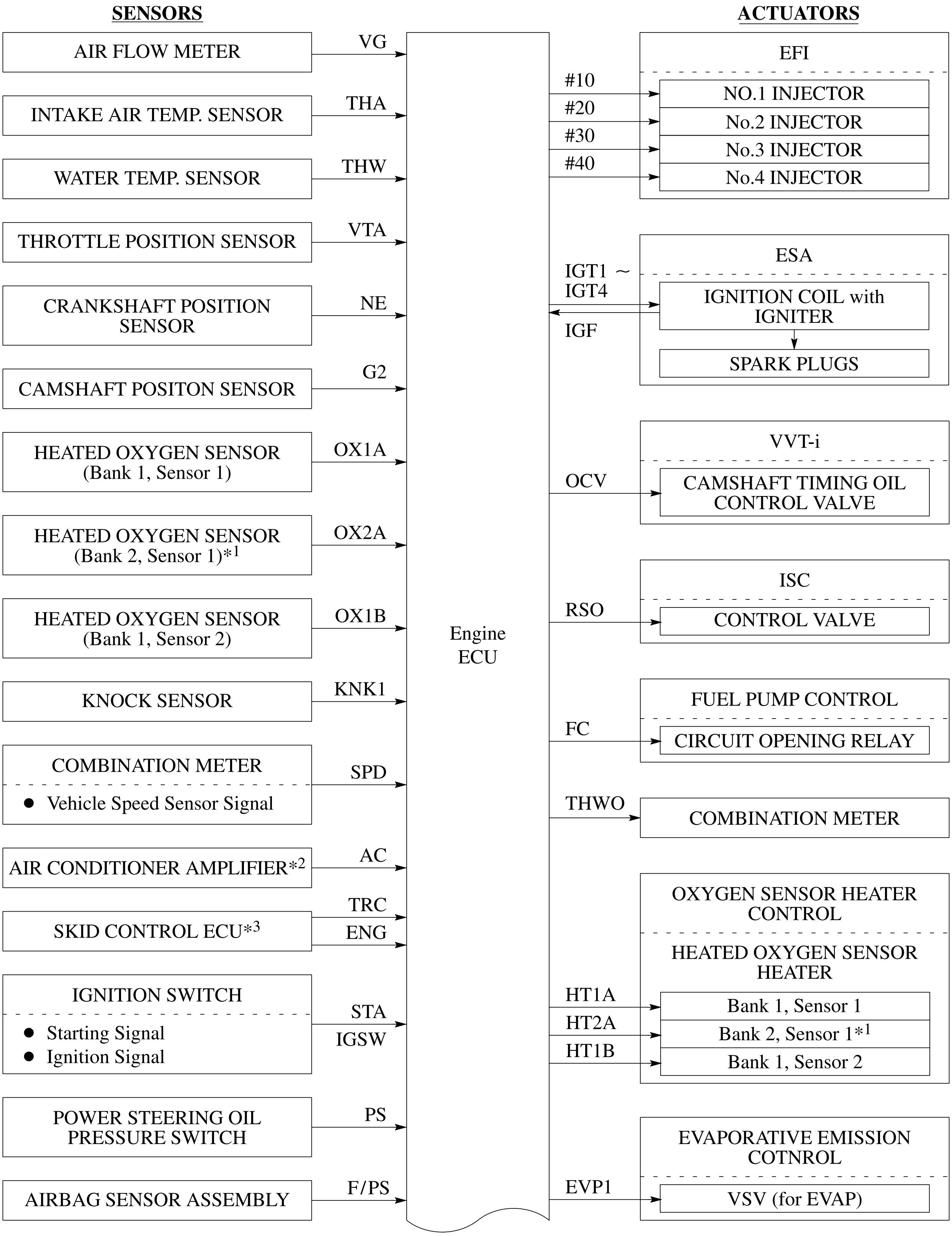
The engine control system for the 1ZZ-FE and 3ZZ-FE engines have following features.

System	Outline
EFI (Electronic Fuel Injection)	● An L-type EFI system directly detects the intake air volume with a hot-wire type air flow meter. ● The fuel injection system is a sequential multiport fuel injection system.
ESA (Electronic Spark Advance)	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.
ISC (Idle Speed Control)	A rotary solenoid type ISC valve controls the fast idle and idle speeds.
VVT-i (Variable Valve Timing-intelligent)	Controls the intake camshaft to an optimal valve timing in accordance with the engine condition. For details, see page 98.
Fuel Pump Control	● Fuel pump operation is controlled by signal from the engine ECU. ● To stop the fuel pump when the airbag is deployed at the front and side collision. For details, see page 103.
Oxygen Sensor Heater Control	Maintains the temperature of the oxygen sensors 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 emissions (HC) in the charcoal canister in accordance with engine conditions.
Air Conditioner Cut-off Control*	By turning the air conditioner compressor ON or OFF in accordance with the engine condition, drivability is maintained.
Engine Immobiliser	Prohibits fuel delivery and ignition if an attempt is made to start the engine with an invalid ignition key.
Diagnosis	When the engine ECU detects a malfunction, the engine ECU diagnoses and memorizes the failed section.
Fail-Safe	When the engine ECU defects a malfunction, the engine ECU stops or controls the engine according to the data already stored in memory.

*: With Air Conditioner Model

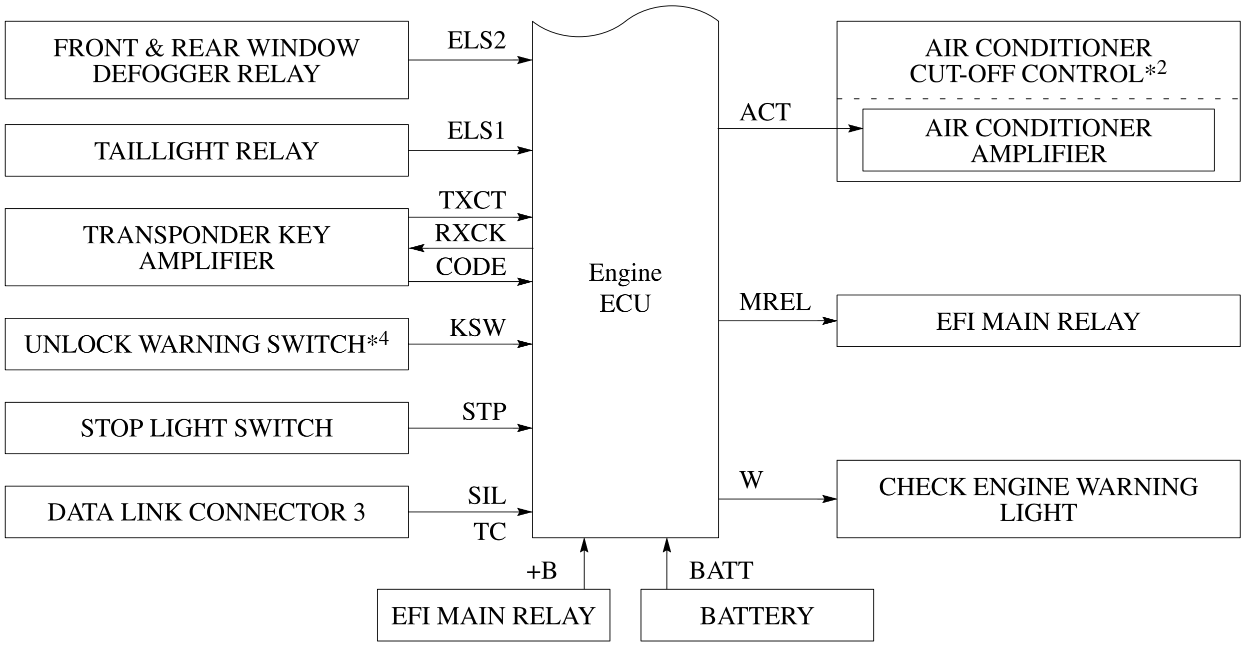
Construction

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



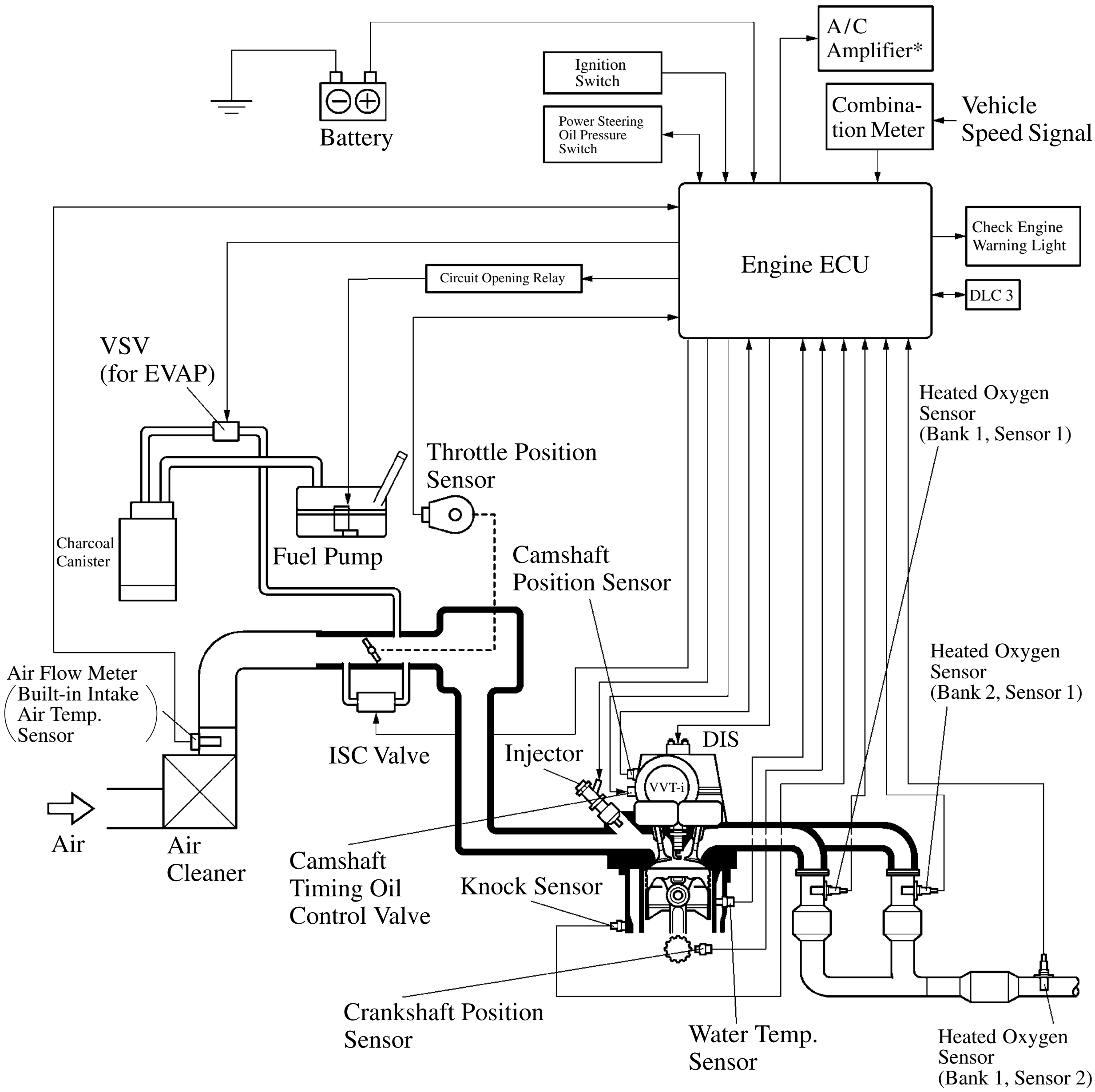
*1: Only for 1ZZ-FE Engine
*2: With Air Conditioner Model
*3: With ABS & EBD & Brake Assist & TRC & VSC

(Continued)



*2: With Air Conditioner Model
*4: Only for Automatic Transaxle

Engine Control System Diagram

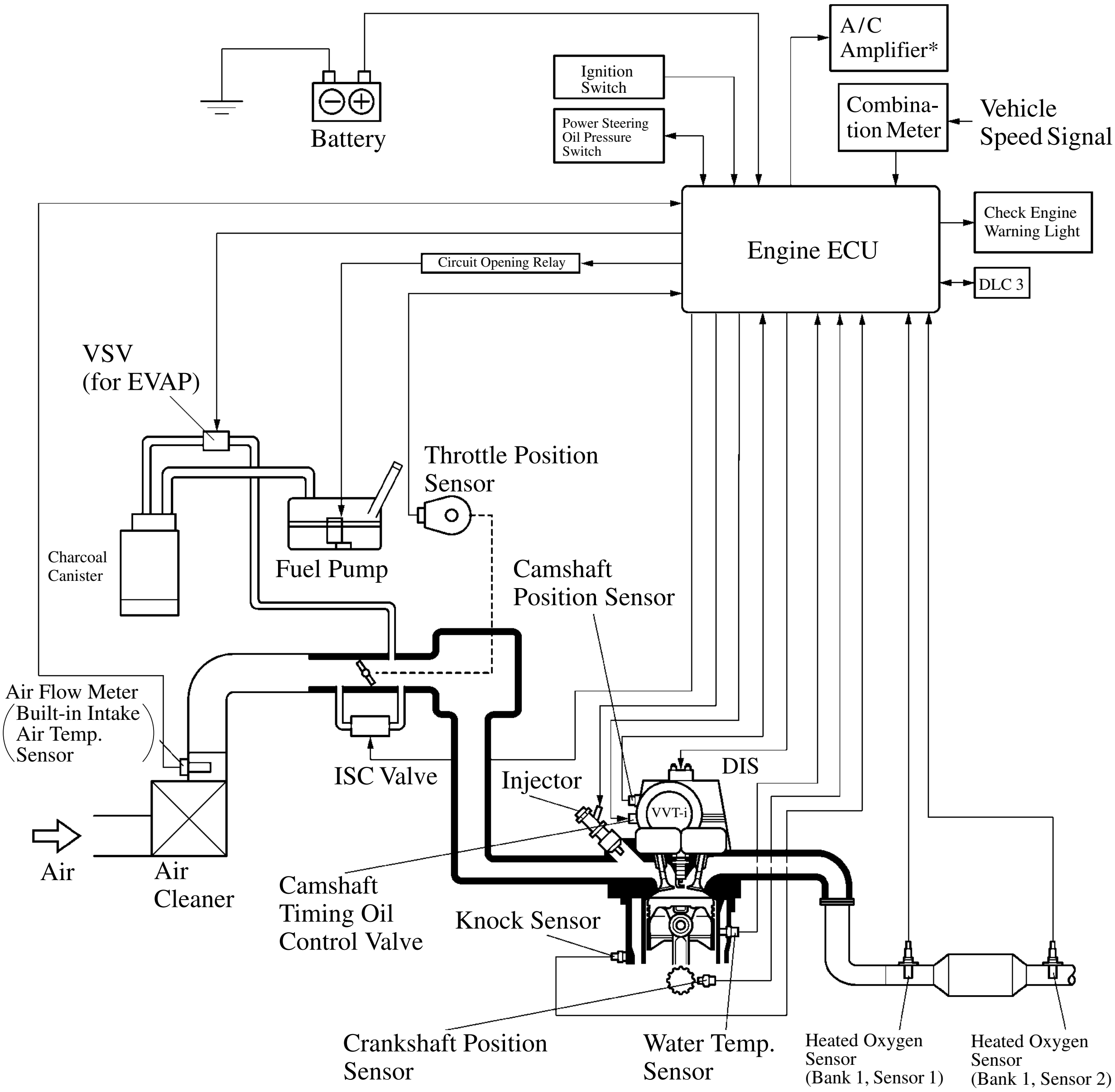


*: With Air Conditioner

For 1ZZ-FE Engine

195EG07

3

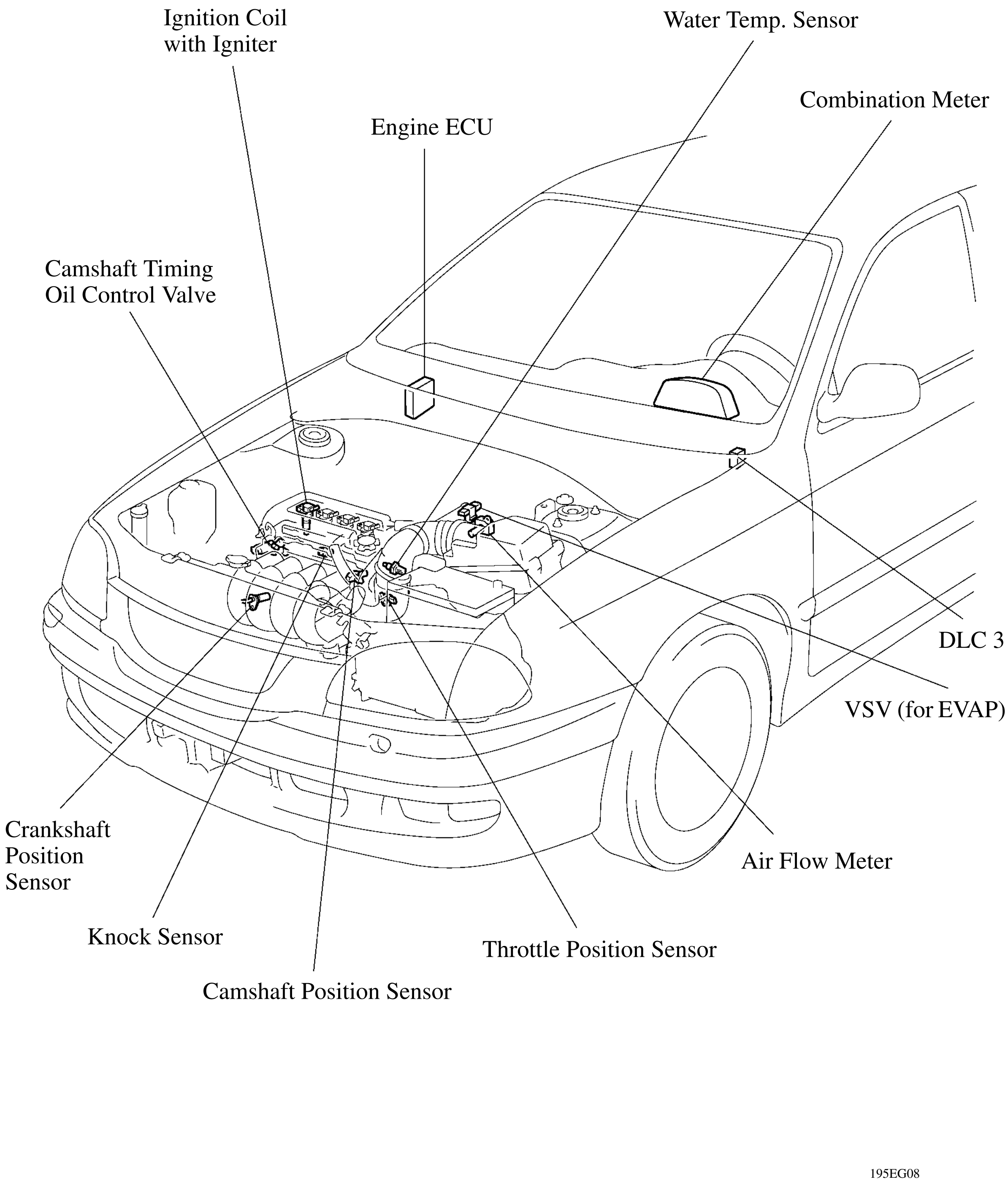


*: With Air Conditioner

For 3ZZ-FE Engine

195EG101

Layout of Main Components



Main Components of Engine Control System

1) General

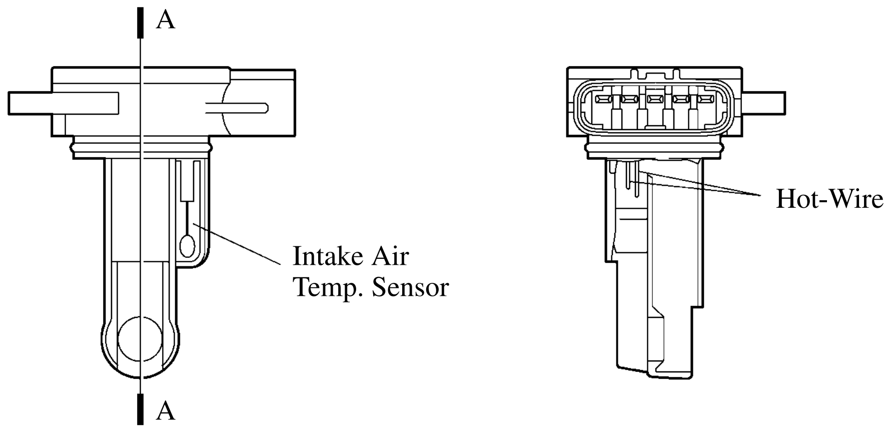
The main components of the 1ZZ-FE and 3ZZ-FE engines control system are as follows:

Components	Outline	Quantity
Air Flow Meter	Hot-Wire Type	1
Crankshaft Position Sensor (Rotor Teeth)	Pick-Up Coil Type (36-2)	1
Camshaft Position Sensor (Rotor Teeth)	Pick-Up Coil Type (3)	1
Throttle Position Sensor	Linear Type	1
Knock Sensor	Built-In Piezoelectric Element Type	1
Oxygen Sensor (Bank 1, Sensor 1) (Bank 2, Sensor 1)*[1] (Bank 1, Sensor 2)	Type with Heater	2
Injector	12-Hole Type*[1], 4-Hole Type*[2]	4
ISC Valve	Rotary Solenoid Type (1-Coil Type)	1

*[1]: Only for 1ZZ-FE Engine
*[2]: Only for 3ZZ-FE Engine

2) Air Flow Meter

A hot-wire type air flow meter has been adopted.
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 has been improved and the intake air resistance has been reduced.



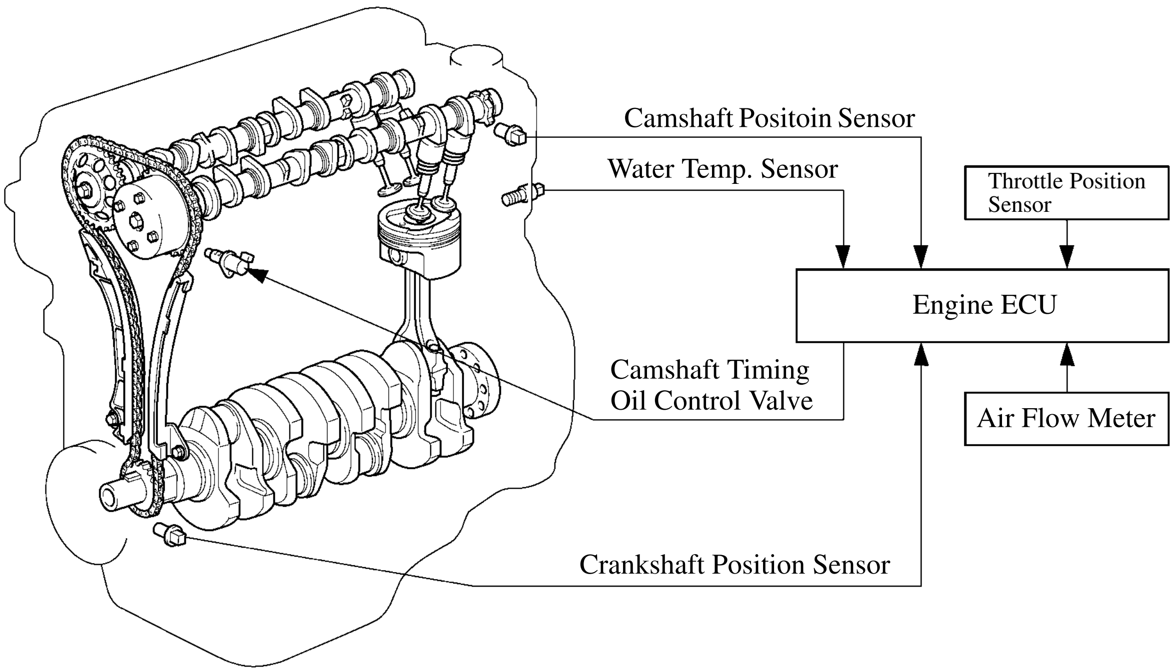
A – A Cross Section

195EG88

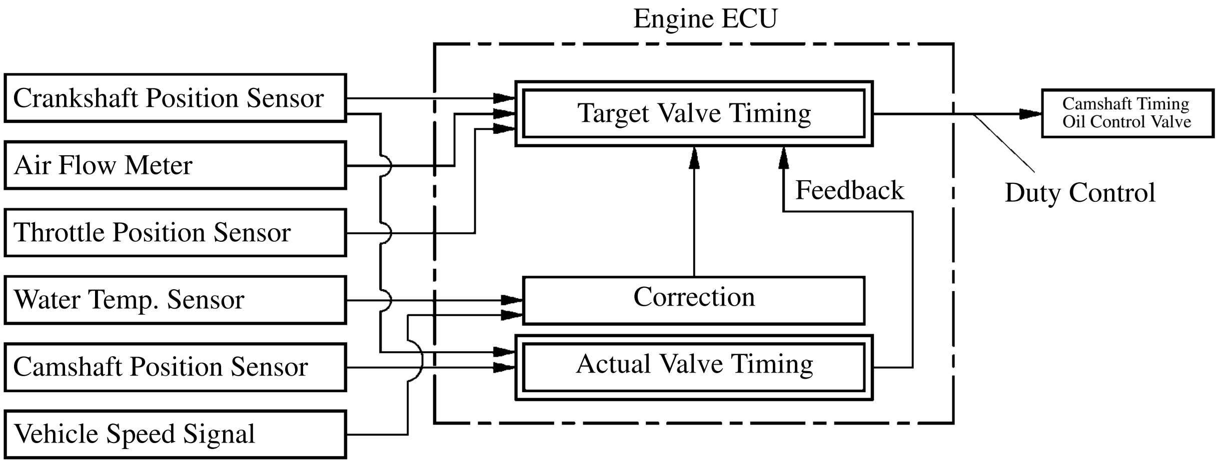
VVT-i (Variable Valve Timing-intelligent) System

1) General

The VVT-i system is designed to control the intake camshaft within a wide range of 40° (of crankshaft angle) to provide a valve timing that is optimally suited to the engine condition, thus realizing improved torque in all the speed ranges and fuel economy, and reduce exhaust emissions. The actual intake side valve timing is feedback by means of the camshaft position sensor for constant control to the target valve timing.



169EG35

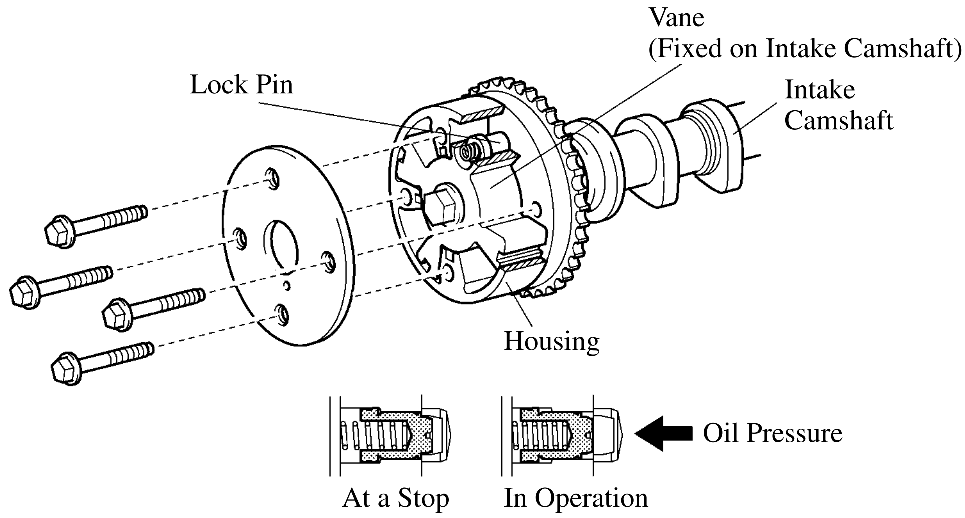


172CR07

2) Construction

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 startability.
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.

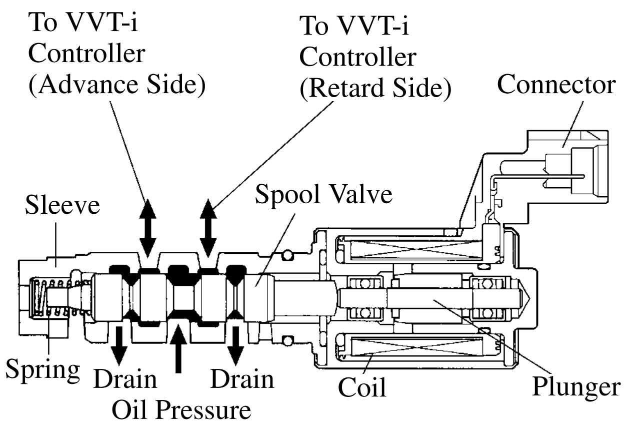


Lock Pin

169EG36

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.



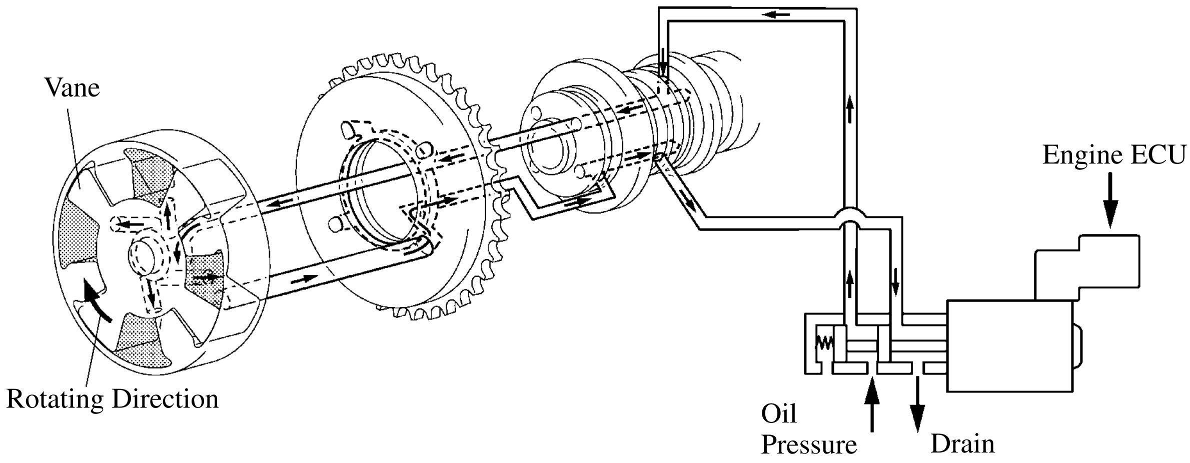
165EG34

3) Operation

- The camshaft timing oil control valve selects the path to the VVT-i controller according to the advance, retard or hold signal from the engine ECU. The VVT-i controller rotates the intake camshaft in the timing advance or retard position or holds it according to the position where the oil pressure is applied.

a. Advance

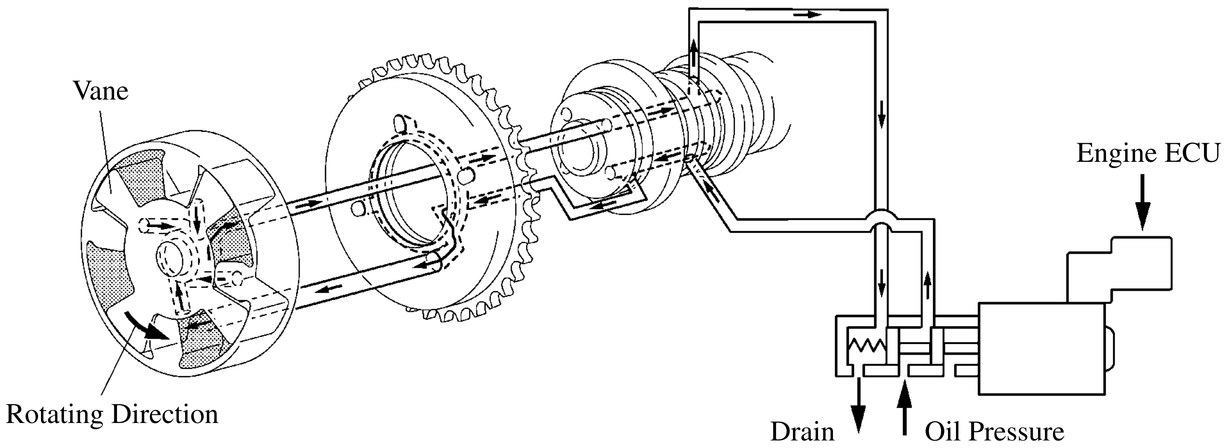
When the camshaft timing oil control valve is positioned as illustrated below by the advance signal from the engine ECU, the resultant oil pressure is applied to the timing advance side vane chamber to rotate the camshaft in the timing advance direction.



185EG18

b. Retard

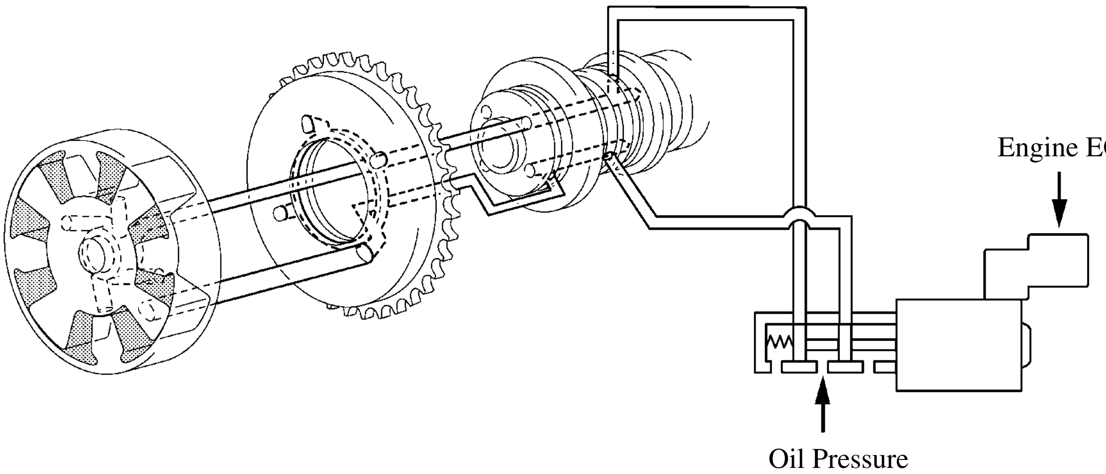
When the camshaft timing oil control valve is positioned as illustrated below by the retard signal from the engine ECU, the resultant oil pressure is applied to the timing retard side vane chamber to rotate the camshaft in the timing retard direction.



185EG19

c. Hold

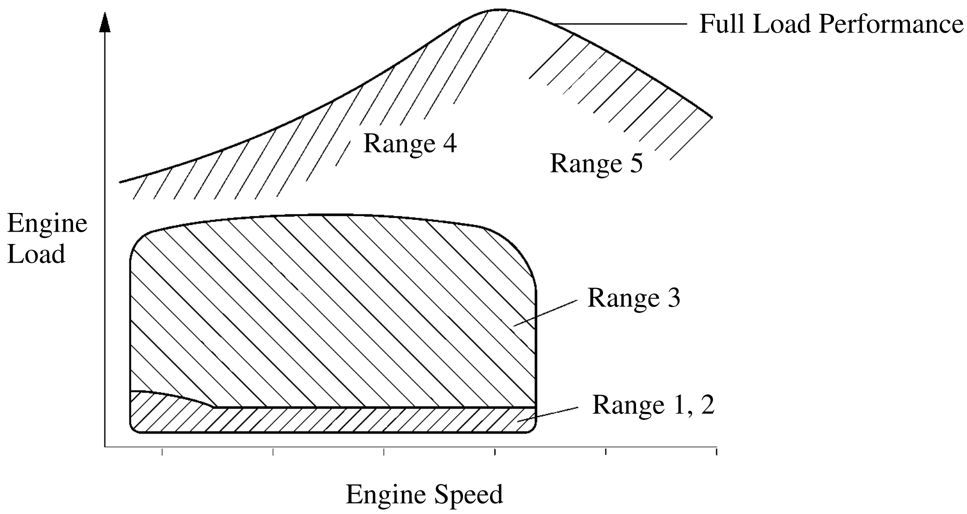
The engine ECU calculates the target timing angle according to the traveling state to perform control as described the previous page. After setting at the target timing, the valve timing is held by keeping the camshaft timing oil control valve in the neutral position unless the traveling state changes.
This adjusts the valve timing at the desired target position and prevents the engine oil from running out when it is unnecessary.



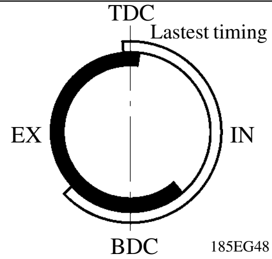
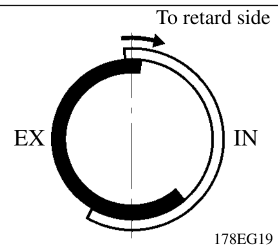
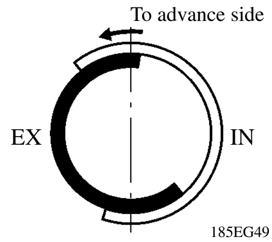
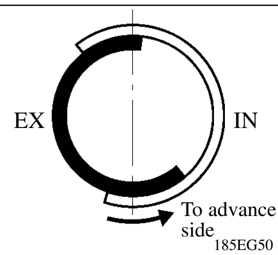
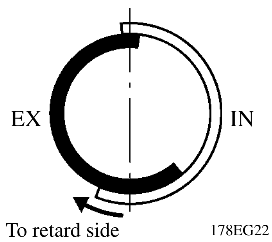
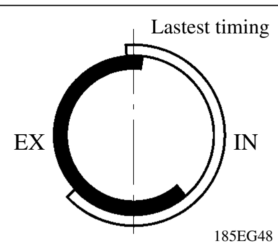
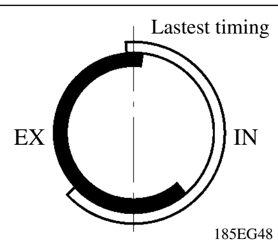
185EG20

- In proportion to the engine speed, intake air volume, throttle position and water temperature, the engine ECU calculates an optimal valve timing under each driving condition and controls the camshaft timing oil control valve. In addition, the engine ECU uses signal from the camshaft position sensor and the crankshaft position sensor to detect the actual valve timing, thus it is possible to perform feedback control to achieve the target valve timing.

▶ Operation During Various Driving Conditoin (Conceptual Diagram) ◀

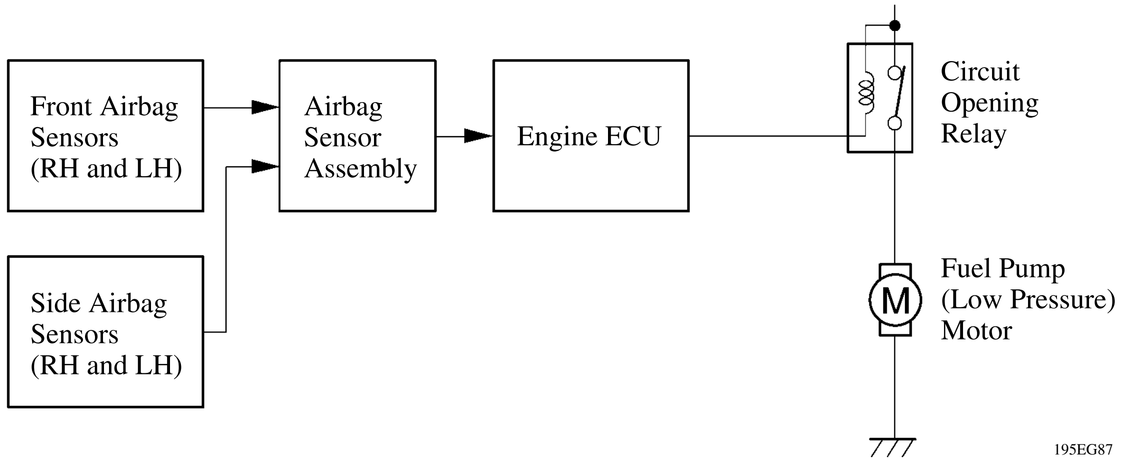


162EG46

Operation State	Range	Valve Timing	Objective	Effect
During Idling	1		Minimizing overlap to reduce blow back to the intake side	Stabilized idling rpm Better fuel economy
At Light Load	2		Decreasing overlap to reduce blow back to the intake side	Ensured engine stability
At Medium Load	3		Increasing overlap to increase internal EGR for pumping loss reduce	Better fuel economy Improved emission control
In Low to Medium Speed Range with Heavy Load	4		Advancing the intake valve close timing for volumetric efficiency improvement	Improved torque in low to medium speed range
In High Speed Range with Heavy Load	5		Retarding the intake valve close timing for volumetric efficiency improvement	Improved output
At Low Temperatures	–		Minimizing overlap to prevent blow back to the intake side leads to the lean burning condition, and stabilizes the idling speed at fast idling	Stabilized fast idle rpm Better fuel economy
Upon Starting/ Stopping the Engine	–		Minimizing overlap to minimize blow back to the intake side	Improved startability

Fuel Pump Control

A fuel cut control is adopted to stop the fuel pump when the airbag is deployed at the front or side collision. 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, thus engine can be restarted.



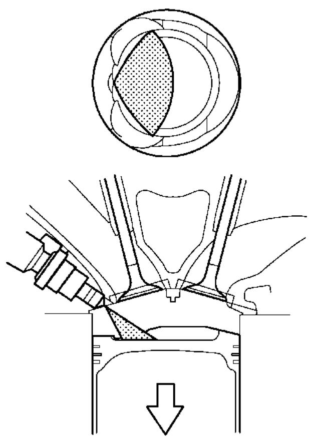
■ 1AZ-FSE ENGINE

1.General

The 1AZ-FSE TOYOTA D-4 (Direct injection 4-stroke gasoline engine) is a newly developed in-line 4-cylinder, 2.0 litter, 16-valve DOHC engine.
This engine is a newly adopted direct injection system, high pressure fuel control system and VVT-i (Variable Valve Timing-intelligent) system to realize high performance, fuel economy, clean emission, low noise and low vibration. In addition, it has adopted the ETCS-i (Electronic Throttle Control System-intelligent) to ensure excellent controllability of the vehicle and to improve its comfort.

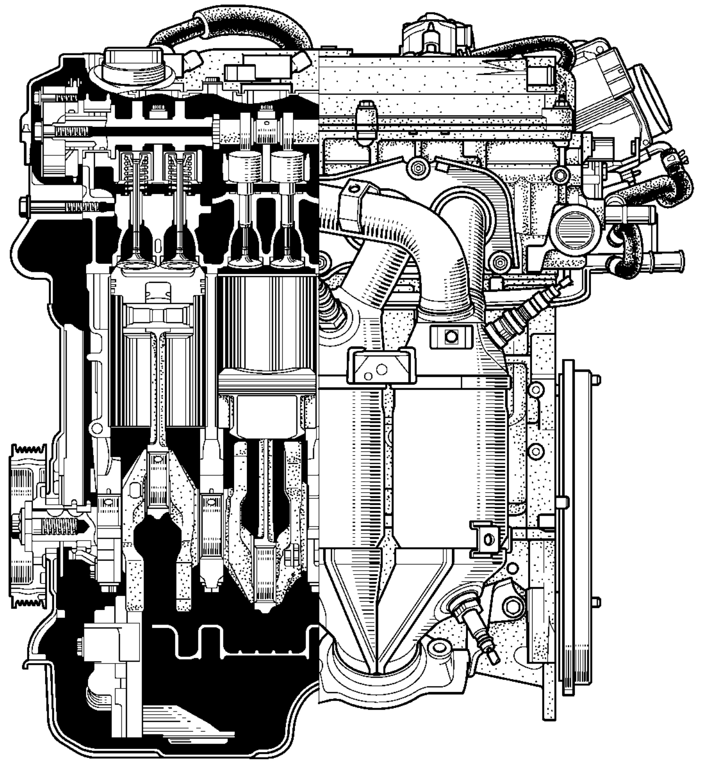
– Reference –
TOYOTA D-4 (Direct injection 4-stroke gasoline engine)

- Usual gasoline EFI engine has the injector installed on the intake port and the air and fuel injected inside the intake port is mixed and suctioned into the cylinder. On the other hand, TOYOTA D-4 has the injector installed on the combustion chamber which injects the fuel pressurized in the fuel pump (high pressure) to the combustion chamber directly. With this, vaporized latent heat effect is obtained, then the cubic footage has been improved and the knocking limit has been expanded resulting in the out improvement.
- Depending on the driving condition, by injecting the fuel at an optimal timing in the suctioning process, equal air-fuel mixture is uniformed.
- Slit nozzle type injector which enables to adjust the quantity of the high pressure fuel precisely and implement the fine-grain atomization has been adopted, thus improved the fuel efficiency.

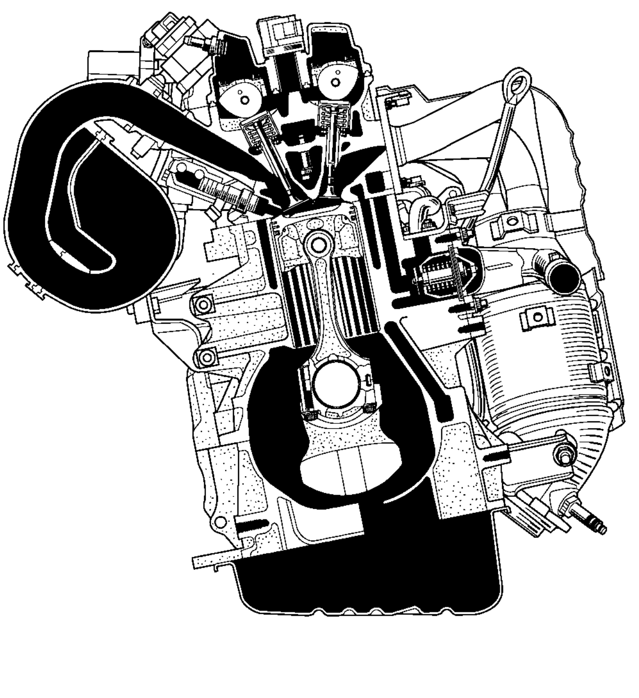


195EG85

▶ 1AZ-FSE Engine ◀



195EG86

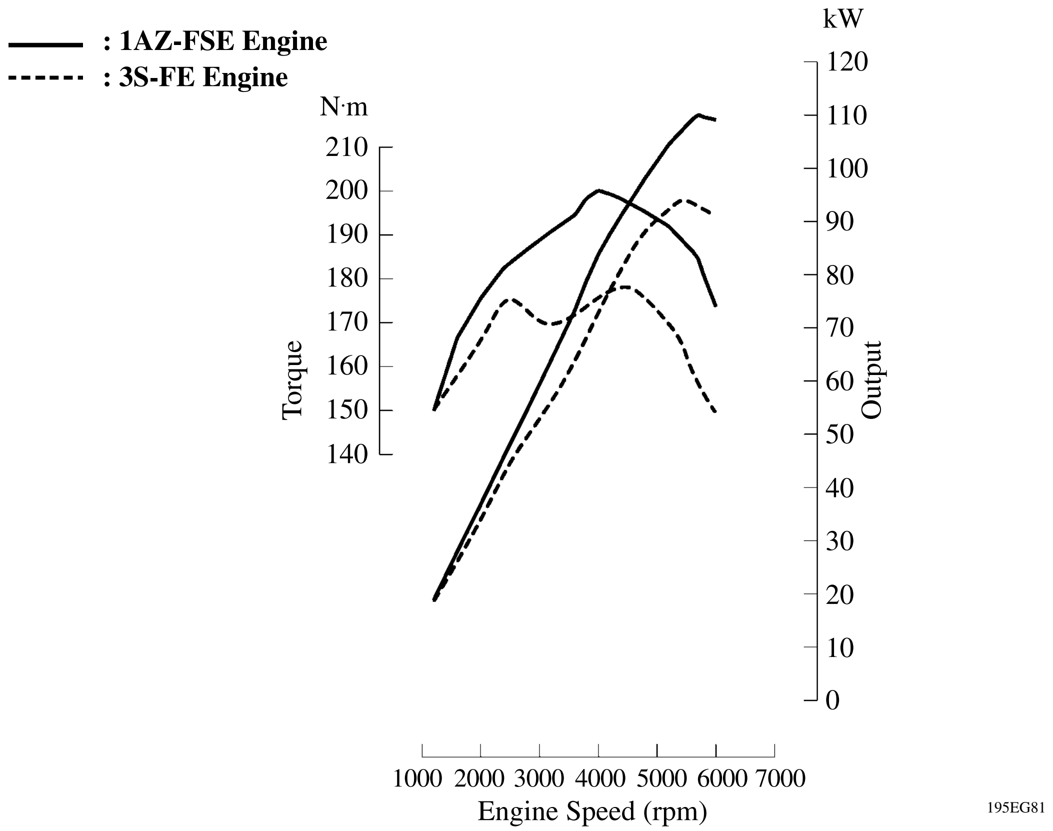


195EG09

▶ Engine Specifications ◀

Engine Type				1AZ-FSE	3S-FE
No. of Cyls. & Arrangement				4-Cylinder, In-line	←
Valve Mechanism				16-Valve DOHC, Chain Drive	16-Valve DOHC, Belt & Gear Drive
Combustion Chamber				Pentroof Type	←
Manifolds				Cross-Flow	←
Fuel System				EFI D-4	EFI
Displacement			cm^3 (cu. in.)	1998 (121.9)	←
Bore x Stroke			mm (in.)	86.0 x 86.0 (3.39 x 3.39)	←
Compression Ratio				11.0 : 1	9.8 : 1
Max. Output			(EEC)	110 kW @ 5700 rpm	94 kW @ 5400 rpm
Max. Torque			(EEC)	200 N·m @ 4000 rpm	178 N·m @ 4400 rpm
Valve Timing	Intake	Open		41° BTDC ~ 12 ATDC	3° BTDC
		Close		5° BBDC ~ 58° ABDC	43° ABDC
	Exhaust	Open		45° BBDC	←
		Close		3° ATDC	←
Fuel Octane Number			RON	95 or More	←
Oil Grade				API SJ, EC or ILSAC	←

▶ Performance Curve ◀



2. Features of 1AZ-FSE Engine

The 1AZ-FSE engine has been able to achieve the following performance through the adoption of the items listed below.

(1) High performance and fuel economy

(2) Low noise and vibration

(3) Lightweight and compact design

(4) Good serviceability

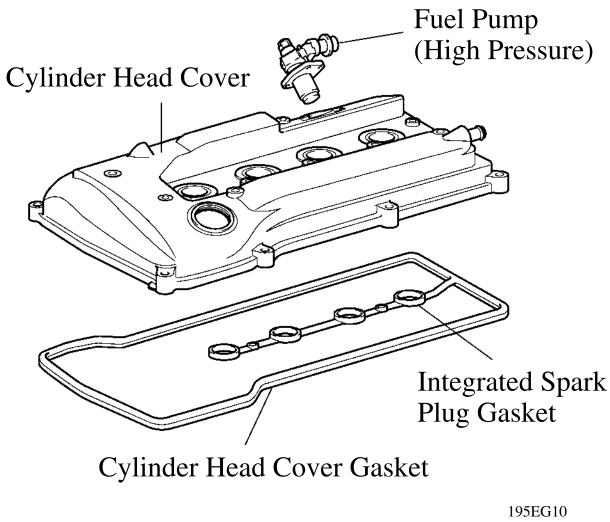
(5) Clean emission

Item	(1)	(2)	(3)	(4)	(5)
Direct injection has been adopted.	○				○
Slit nozzle type injectors that support high-pressure fuel injection have been adopted.	○				○
The VVT-i system is used.	○				○
The intake air control system has been adopted.	○				○
A cylinder block made of aluminum alloy along with a magnesium head cover has been adopted.			○		
Rigidity of the cylinder block has been improved.		○			
The DIS (Direct Ignition System) makes ignition timing adjustment unnecessary.	○			○	
A serpentine belt drive system has been adopted.			○	○	
Intake manifold made of plastic has been adopted.			○		
A dual WU-TWC (Warm Up Three-Way Catalytic Converter) for reducing exhaust emissions during engine warming has been adopted.	○				○
Iridium-tipped spark plugs have been adopted.				○	
Timing chain has been used.				○	

3. Engine Proper

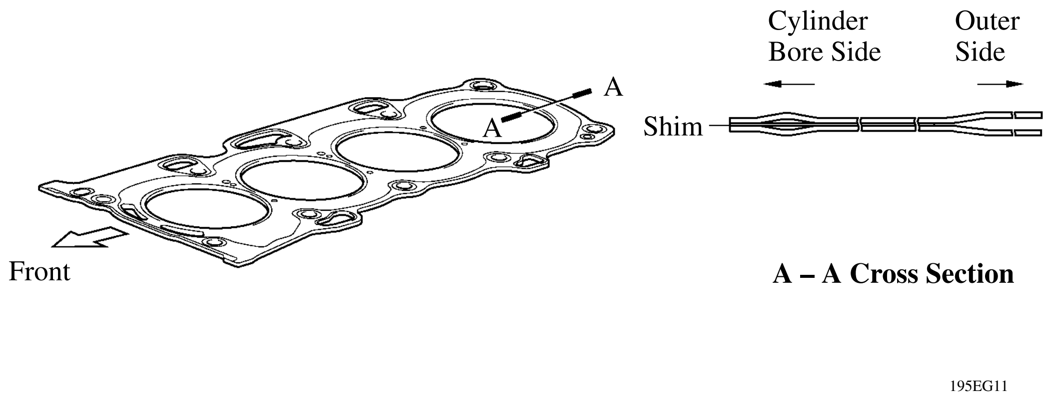
Cylinder Head Cover

- A lightweight magnesium alloy diecast cylinder head cover is used.
- The fuel pump (high pressure) has been mounted on the cylinder head cover for compactness.
- The cylinder head cover gasket and the spark plug gasket have been integrated to reduce the number of parts.
- Acrylic rubber, which excels in heat resistance and reliability, has been adopted for the cylinder head cover gasket.



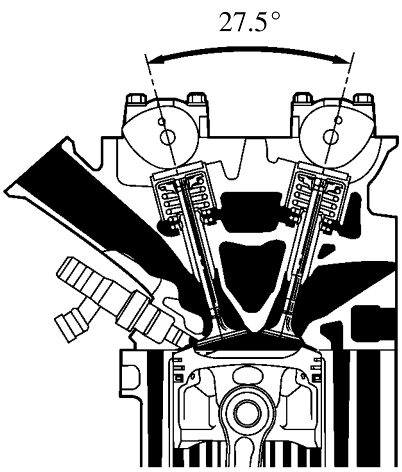
Cylinder Head Gasket

A steel-laminate type cylinder head gasket has been adopted.
A shim has been added around the cylinder bore to increase the sealing surface, thus improving the sealing performance and durability.

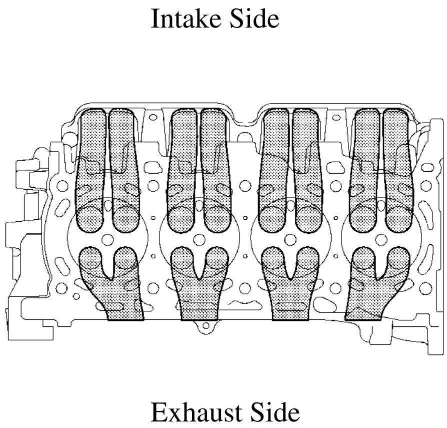


Cylinder Head

- Through the adoption of the taper squish combustion chamber, the anti-knocking performance and fuel efficiency have been improved.
- An upright intake port has been adopted to improve the intake efficiency.
- Compression ratios of 11.0 : 1 has been adopted.
- The injectors have been installed in the cylinder head.
- The routing of the water jacket in the cylinder head has been optimized to improve the 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.
- The water outlet has been integrated to reduce the number of parts.
- The angle of the intake and exhaust valves is narrowed and set at 27.5° to permit a compact cylinder head.



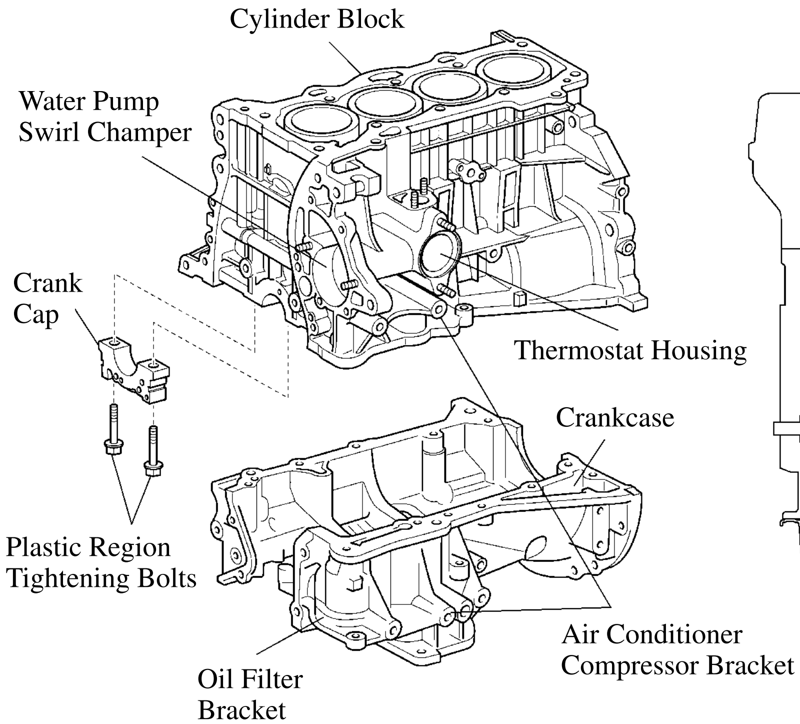
195EG12



195EG13

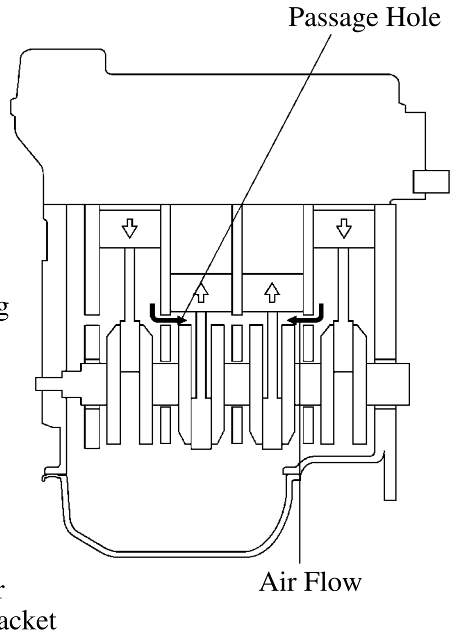
Cylinder Block

- Lightweight aluminum alloy is used for the cylinder block.
- Rigidity of the cylinder block side has been improved by curving the skirt portion of the cylinder block and optimizing the rib position on the side.
- By producing the thin cast-iron liners and cylinder block as a unit, compaction is realized.
  This liner is thin, so that boring is not possible.
- 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 bracket are integrated the crankcase, also the water pump swirl chamber, the thermostat housing and the rear oil seal retainer integrated the cylinder block to reduce the number of parts.
- Through the adoption of the offset crankshaft, the bore center has been shifted 10 mm towards the exhaust in relation to the cranksahft center. Thus, the side force when the maximum pressure is applied has been reduced and fuel economy has been improved.
- Plastic region tightening bolts have been adopted for tightening the crank caps.



195EG14

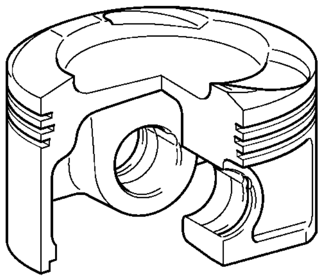
▶ Air Flow During Engine Revolution ◀



179EG04

Piston

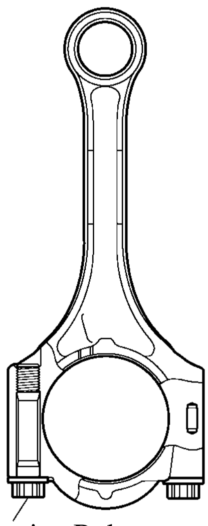
- To achieve uniform combustion through direct injection, an optimal piston head shape that promotes the mixing of the injected fuel and intake air has been adopted.
- The piston is made of aluminum alloy and skirt area is made compact and lightweight.
- Full floating type piston pins are used.
- The top ring groove is provided with alumite finish to improve its wear resistance.
- The piston skirt has been resin-coated to reduce friction.
- By increasing the machining precision of the cylinder bore diameter, the outer diameter of the piston has been made into the one type.



195EG15

Connecting Rod

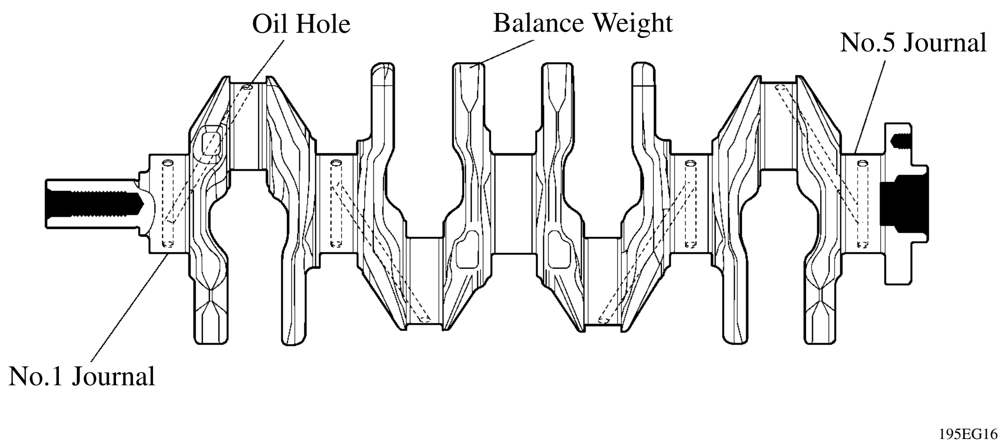
- The connecting rods and cap are made of highstrength material for weight reduction.
- Nutless-type plastic region tightening bolts of the connecting rod are adopted for a lighter design.
- The connecting rod bearings have been reduced in width to reduce friction.



181EG08

Crankshaft

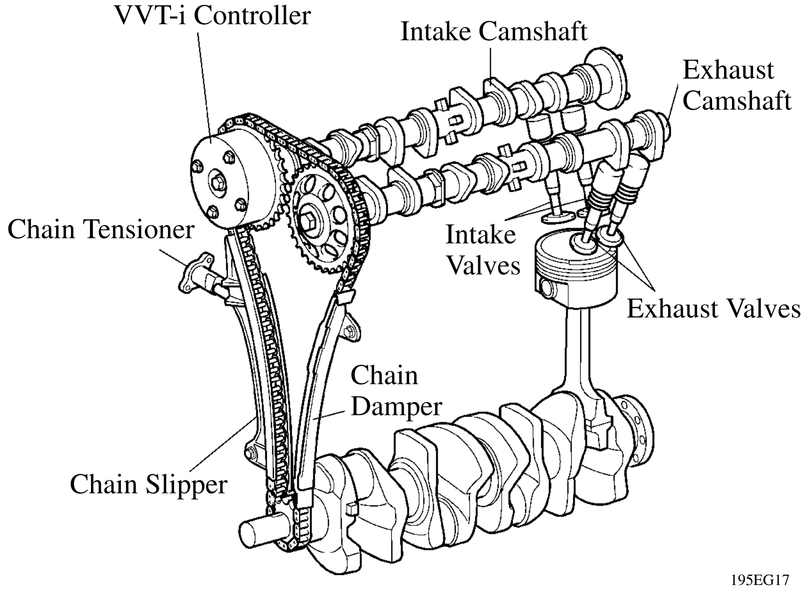
- The forged crankshaft has 5 journals and 8 balance weights.
- The crankshaft bearings have been reduced in width to reduce friction.
- The precision and surface roughness of the pins and journals have been improved to reduce friction.



4. Valve Mechanism

General

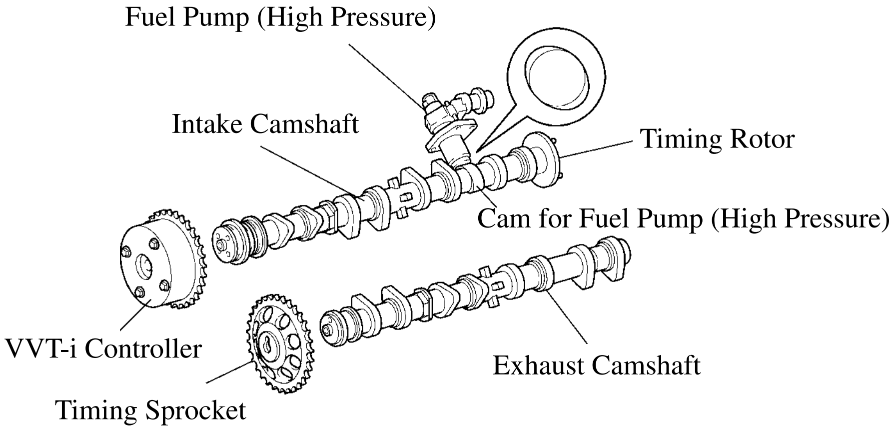
- Each cylinder is equipped with 2 intake valves and 2 exhaust valves. Intake and exhaust efficiency has been increased due to the larger total port areas.
- The valves are directly opened and closed by 2 camshafts.
- The intake and exhaust camshafts are driven by a chain.
- The VVT-i (Variable Valve Timing-intelligent) system is used to improve fuel economy, engine performance and reduce exhaust emissions. For details, see page 136.
- The shimless type valve lifter is used.



195EG17

Camshaft

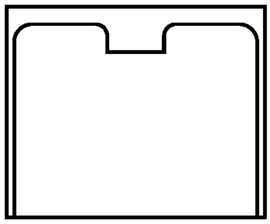
- The intake camshaft is provided with the timing rotor to trigger the camshaft position sensor, and the cam to drive the fuel pump (high pressure).
- In conjunction with the adoption of the VVT-i system, an oil passage is provided in the intake camshaft in order to supply engine oil pressure to the VVT-i system.
- A VVT-i controller has been installed on the front of the intake camshaft to very the timing of the intake valves.



195EG18

Valve Lifter

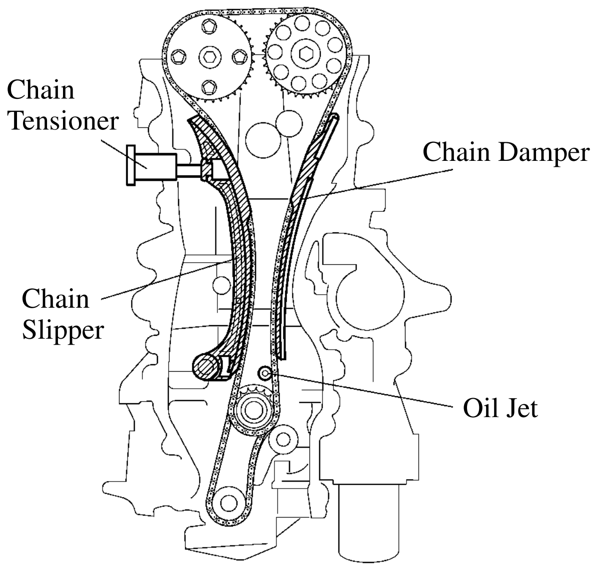
Along with the increase of the amount of valve lift, the valve adjusting shims have been discontinued and the shimless type of the valve lifter has been adopted. This valve lifter enables to make the cam contact surface greater.
The adjustment of the valve clearances is accomplished by selecting and replacing the appropriate valve lifters.



148EG05

Timing Chain

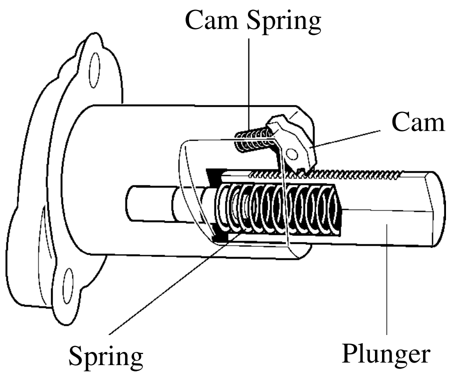
- A roller chain with an 8 mm pitch has been adopted to make the engine more compact.
- A material which has excellent wear resistance has been selected for the timing chain to improve reliability.
- The timing chian is lubricated by an oil jet.



185EG25

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 timing chain cover.

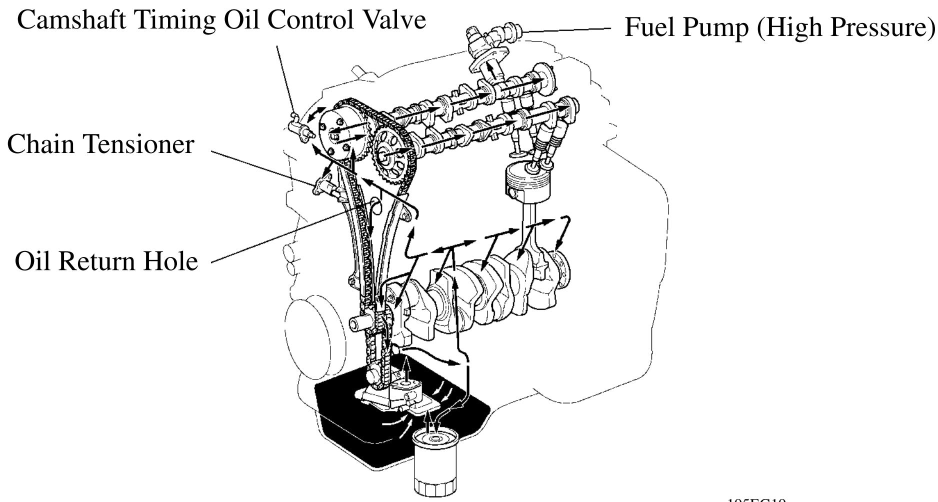


181EG14

5. Lubrication System

General

- The lubrication circuit is fully pressurized and oil passes through an oil filter.
- The trochoidal type oil pump is chain-driven by the crankshaft.
- This engine has an oil return structure in which the oil force-fed to the upper cylinder head returns to the oil pan through the cylinder block and chain cover.
- 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 is operated by the engien oil.
- Along with the adoption of the (high pressure) fuel pump, engine oil is supplied from the cylinder head to the fuel pump (high pressure).
- A water-cooled oil cooler has been installed between the crank case and the oil filter.



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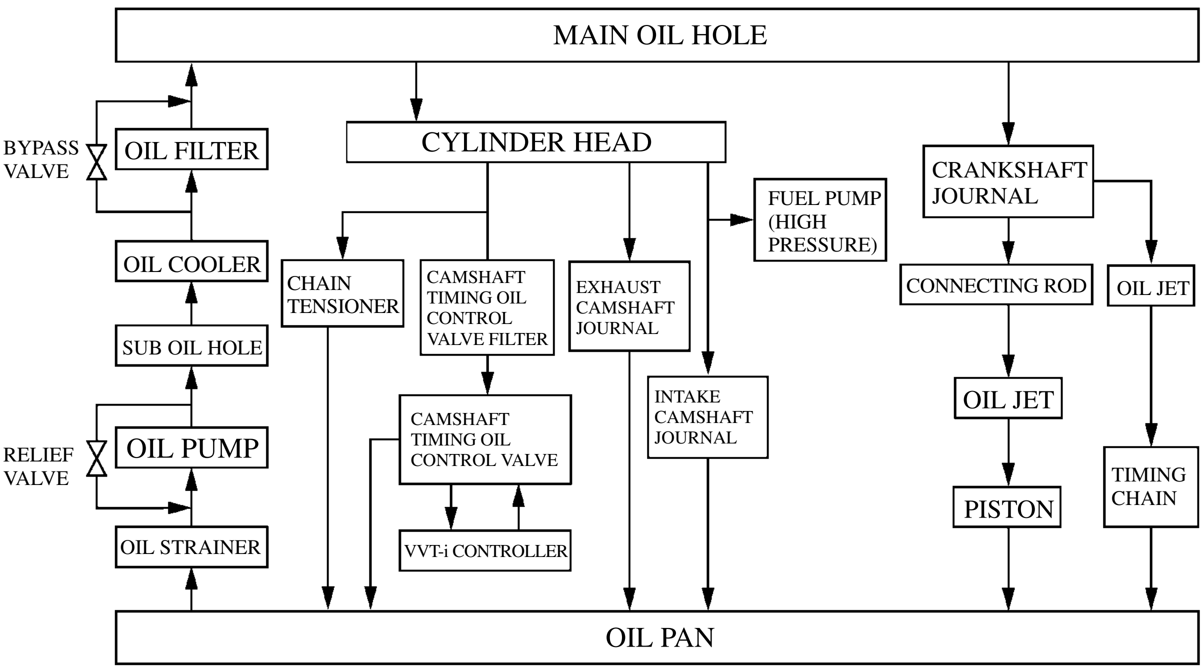
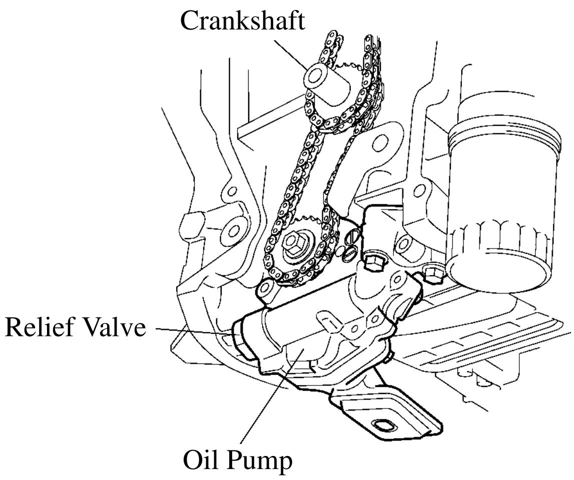


195EG20

Oil Pump

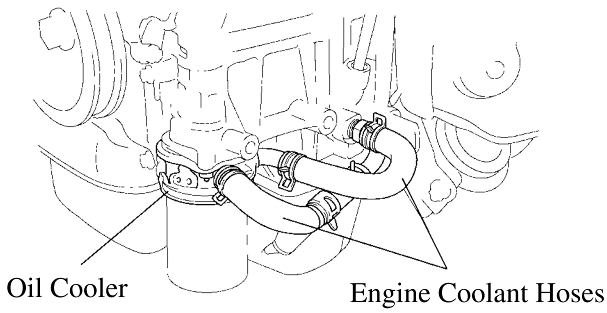
- The trochoidal type oil pump is chain-driven by the crankshaft, and fits compactly inside the oil pan.
- Friction has been reduced by means of 2 relief holes in the internal relief system.



185EG27

Oil Cooler

A water-cooled oil cooler has been installed between the crank case and the oil filter.



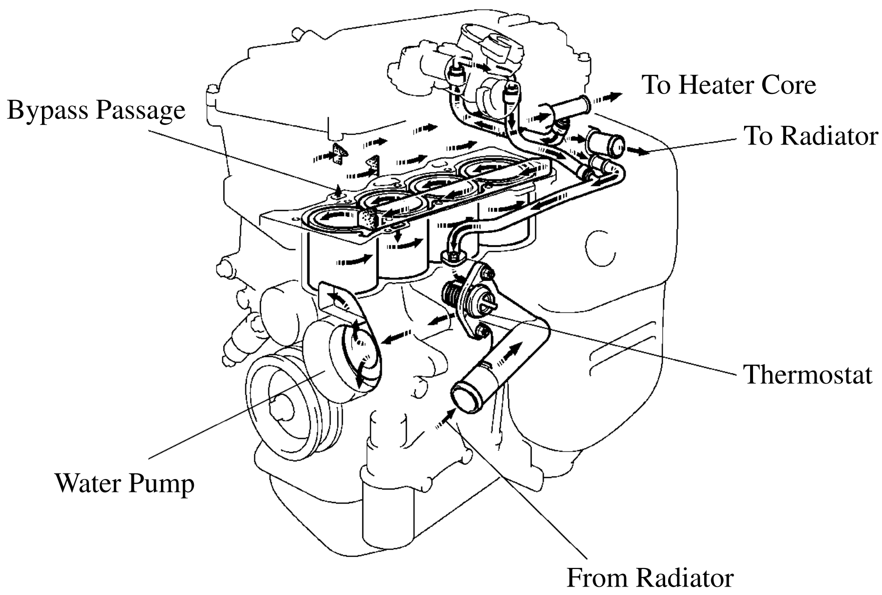
195EG21

6. Cooling System

General

- The cooling system is a pressurized, forced-circulation type.
- A thermostat with a bypass valve is located on the water inlet housing to maintain suitable temperature distribution in the cooling system.
- An aluminum radiator core is used for weight reduction.
- 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 water from the engine is sent to the throttle body to prevent freeze-up.
- A swirl chamber for the water pump has been provided in the cylinder block to make the water pump more compact.
- To improve serviceability, a drain cock for engine coolant is included to the oil cooler.

3



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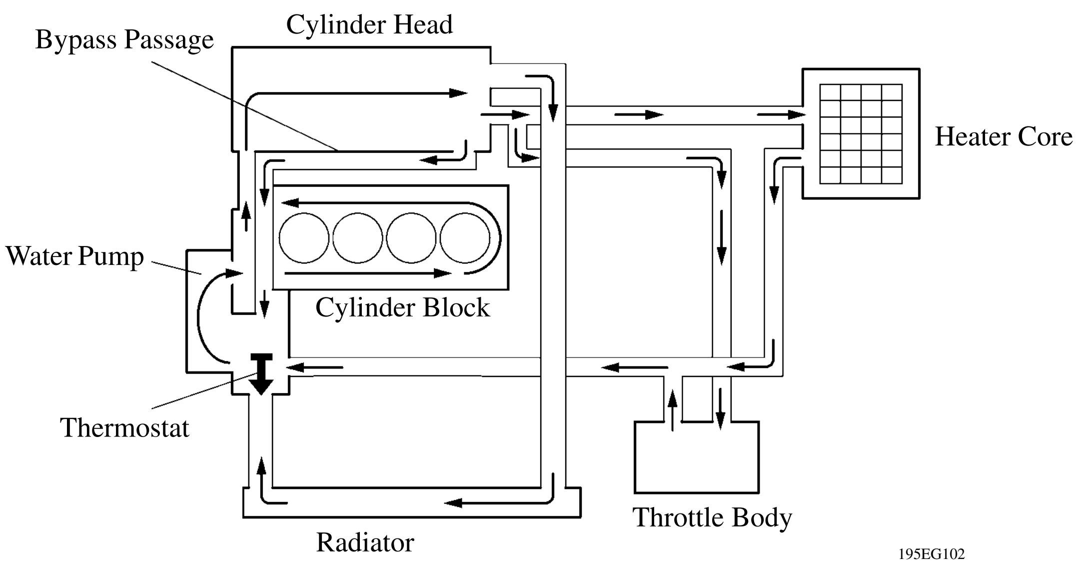
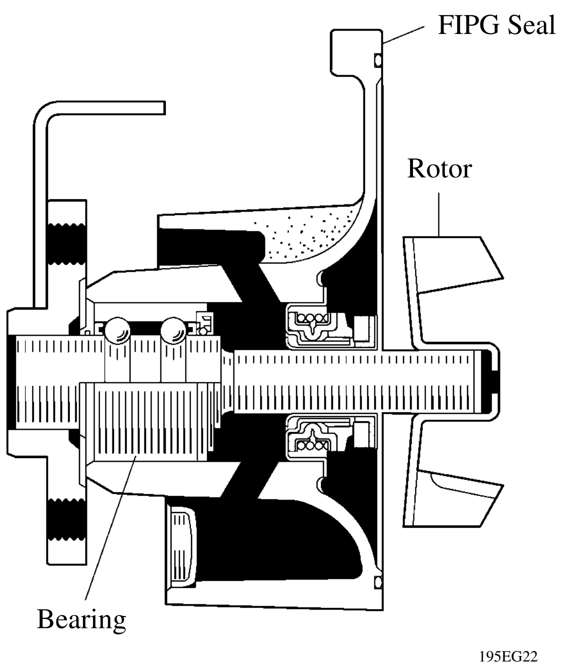


195EG102

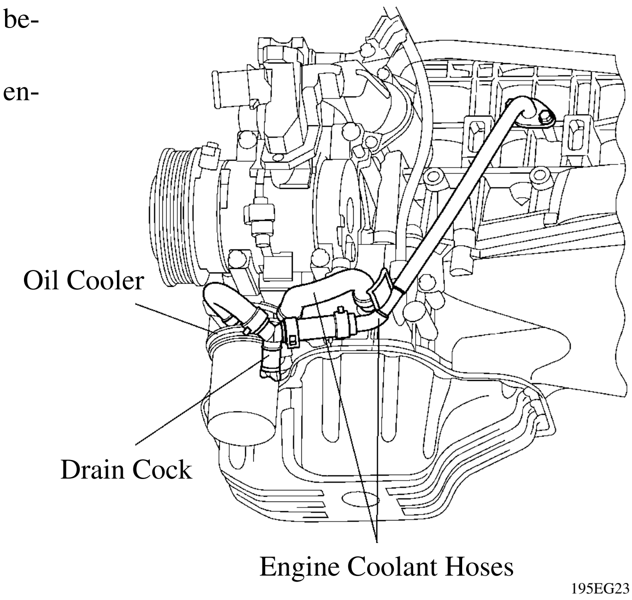
Water Pump

- A swirl chamber for the water pump has been provided in the cylinder block to make the water pump more compact.
- An FIPG (Formed-In-Place Gasket) has been adopted for sealing the water pump to the cylinder block, in order to reduce the number of parts.



Oil Cooler

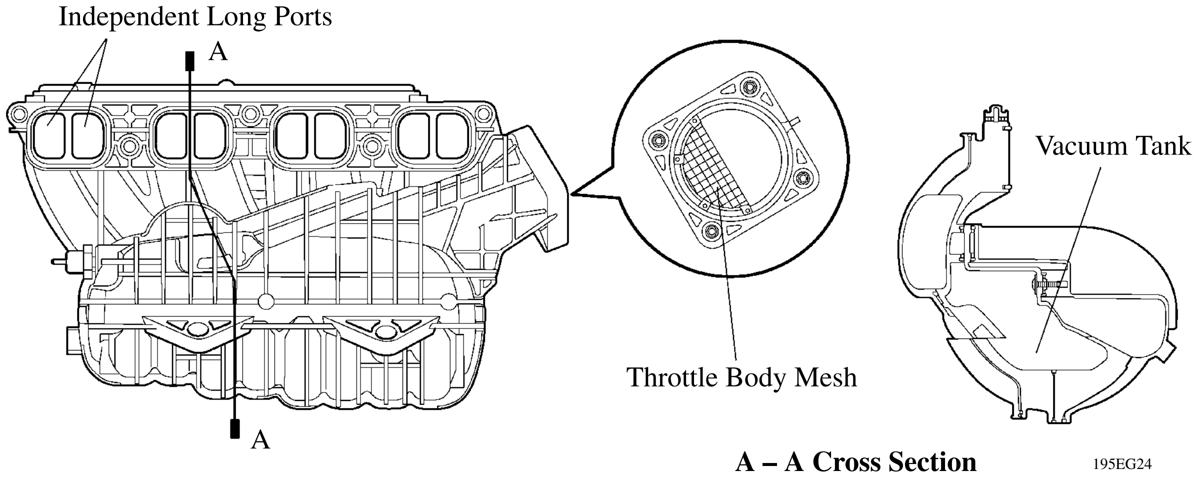
A water-cooled oil cooler has been installed between the crankcase and the oil filter.
To improve serviceability, a drain cock for engine coolant is also included.



7. Intake and Exhaust System

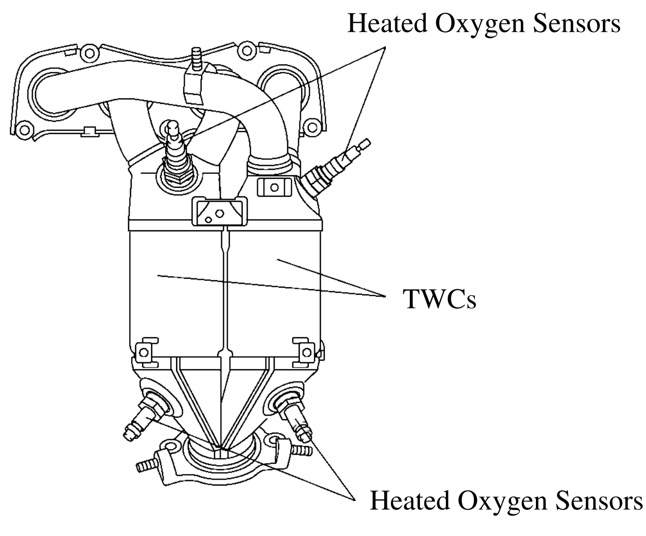
Intake Manifold

- The intake manifold has been 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.
- Eight, independent long ports have been adopted to improve the torque in the low-to mid-range engine speeds.
- A vacuum tank for intake air control has been built in to achieve a compact package with fewer parts. Refer to page 146 for details on intake air control.
- Throttle body mesh is used between the throttle body and intake manifold and integrated with the gasket between them to improve the air flow whithin the intake manifold.



Exhaust Manifold

- A dual type exhaust manifold has been installed on the front of the vehicle.
- A stainless stell exhaust manifold is used for weight reduction.
- A thin-wall ceramic WU-TWC (Warm Up Three-Way Catalytic Converter) has been adopted. By decreasing the thermal capacity in this manner, it becomes easier to heat the catalyst and the catalyst's exhaust cleansing performance is improved.

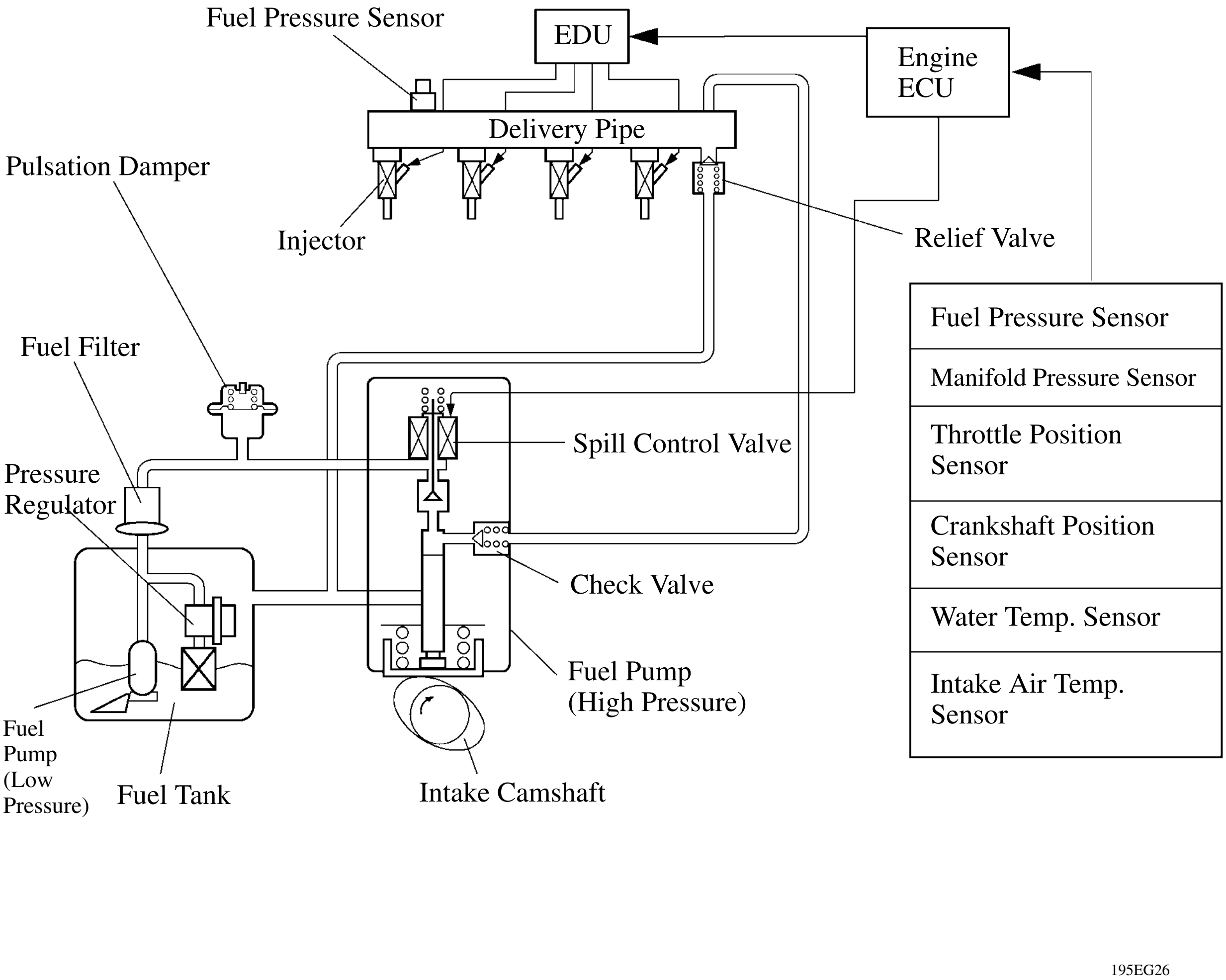


8. Direct Injection System

General

- A direct injection system has been adopted in the fuel system of the 1AZ-FSE engine.
- Mainly consisting of a fuel pump (high pressure), delivery pipe, and slit nozzle type injectors, this sytem effects optimal control for combustion by controlling the fuel pressure, injection volume, and the injection timing via the engine ECU and EDU (Electronic Driver Unit).

▶ System Diagram ◀



Component of Function

The direct injection system for the 1AZ-FSE has following components and functions.

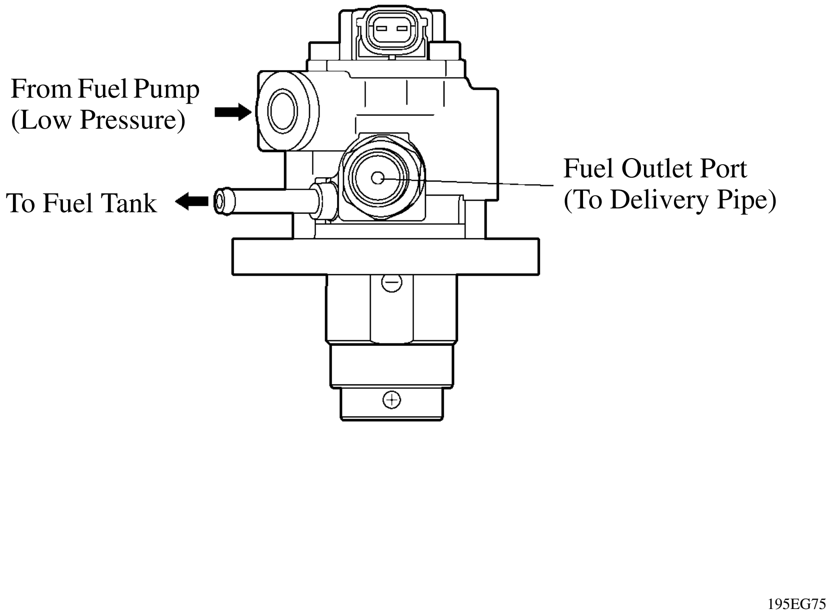
Component	Outline
Fuel Pump (High Pressure)	To pressurize the fuel from the fuel pump (low pressure) from 8 to 13 MPa and send it to the delivery pipe.
Delivery Pipe	To deliver the high pressure fuel to the injector.
Fuel Pressure Sensor	The fuel pressure sensor senses the fuel pressure and outputs the signal to the engine ECU.
Relief Valve	When the pressure in the delivery pipe is abnormally high, the relief valve leaks the fuel to the fuel tank to reduce pressure.
Injector	To adjust the quantity of the high pressure fuel and inject the fuel directly into the combustion chamber.
EDU (Electronic Driver Unit)	The EDU drives the injector at high speed.
Engine ECU	Depending on the vehicle condition, and based on the signal from each sensor, calculate the optimized injection timing and injection volume, and control the injector and fuel pump (high pressure).

Construction and Operation

1) Fuel Pump (High Pressure)

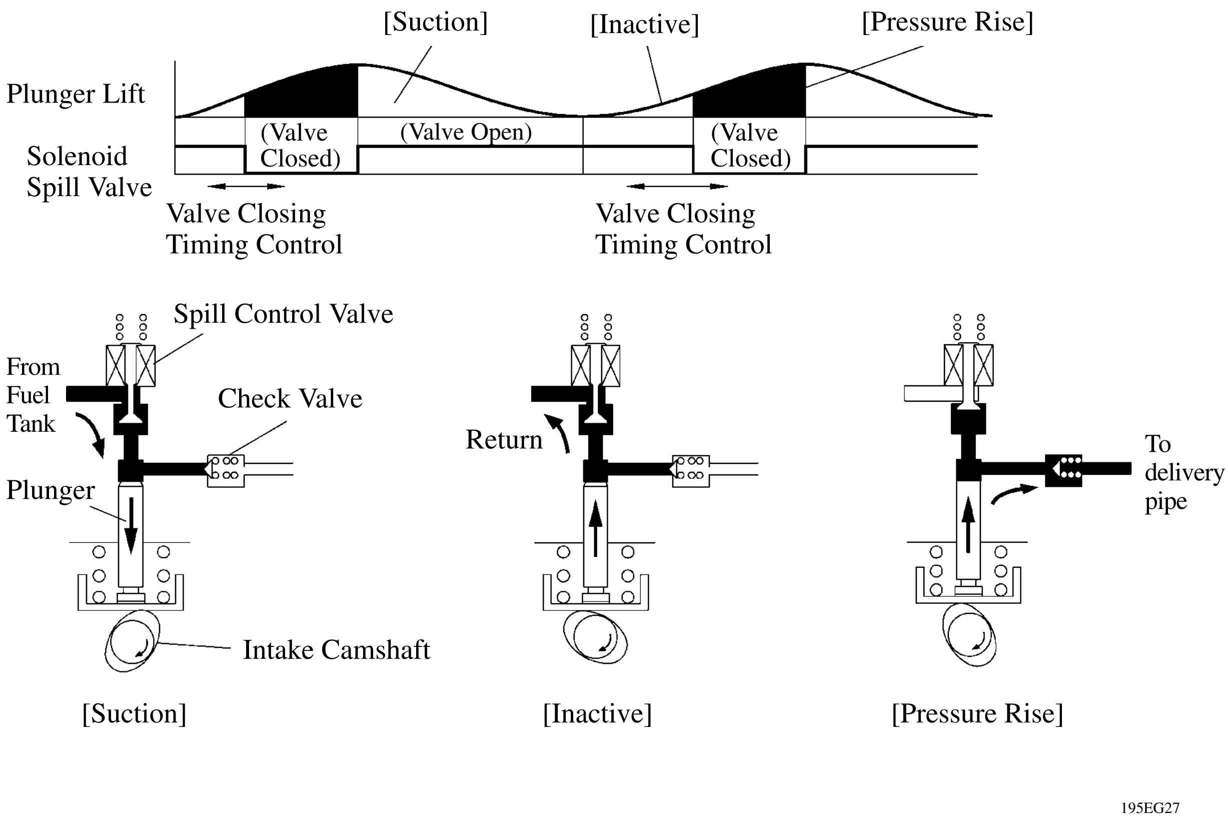
a. Construction

Fuel pump (high pressure) consists of a plunger, spill control valve and check valve. The plunger moves up and down by a pump driving cam (2 waves) of the intake camshaft. The spill control valve is established in the inlet pass of the pump, and electrically opens and closes the valve by a signal from the engine ECU and controls the pump discharging pressure. Check valve is equipped in the outlet of the pump, and it opens the valve when the fuel pressure in the pump has becomes 50 kPa and discharges the fuel to the delivery pipe.



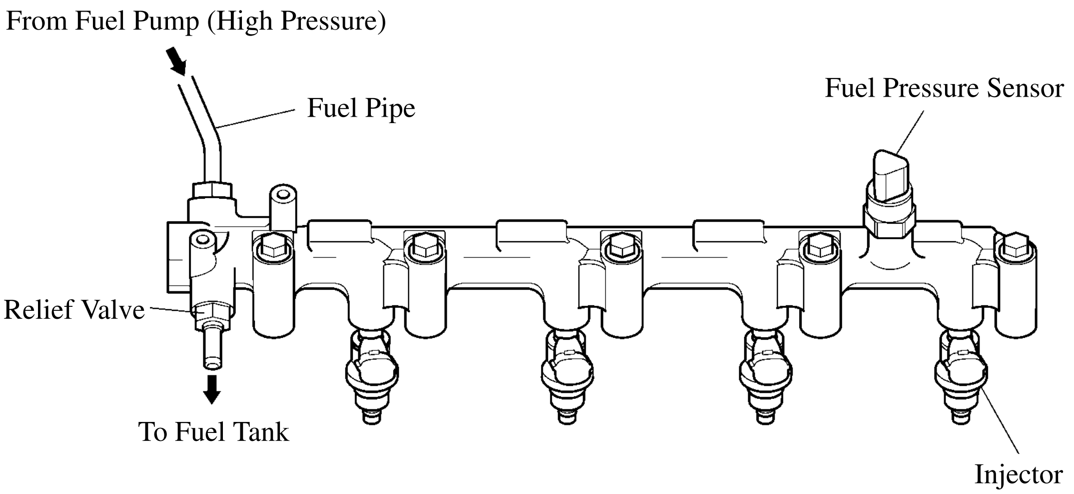
b. Operation

In the suctioning process of the pump, the spill control valve opens and the plunger strokes downward by a spring force, and the fuel is suctioned into the cylinder. Then, by the action of the cam, the plunger strokes upward, but at this time the spill control valve has not closed yet, so the part of the fuel in the cylinder is pushed back to the fuel tank side (while it is not pressurized). On the way in which the plunger is stroking upward (in the compressed process), the engine ECU closes the spill control valve and rise the fuel pressure in the cylinder. When the fuel pressure in the cylinder has exceeded 50 kPa, the check valve starts to open and discharged the fuel to the delivery pipe. The engine ECU controls the fuel discharging pressure from 8 to 13 MPa depending on the driving condition by controlling the timing to close the spill control valve valiantly.



2) Delivery Pipe

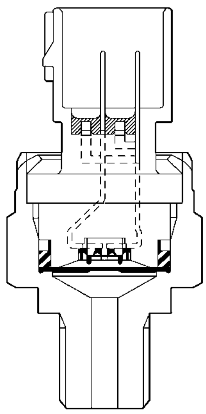
A delivery pipe made of aluminum die cast has been adopted. On the delivery pipe, injectors, fuel pressure sensor and relief valve are directly installed. By storing fuel at a high-pressure (8 to 13 MPa), the peak torque during the pumping of fuel under high load conditions has been restrained, thus reducing the vibration and noise of the fuel injection system.



195EG28

3) Fuel Pressure Sensor

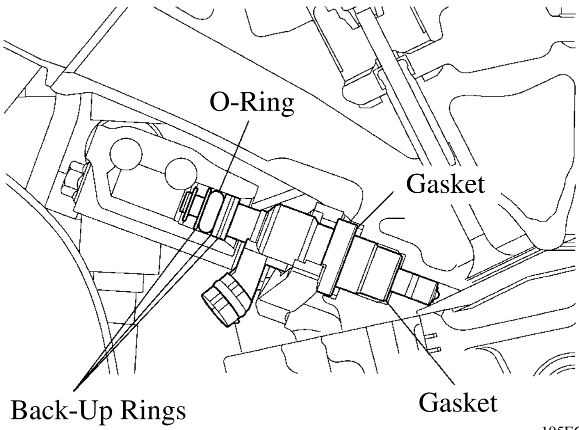
The fuel pressure sensor, which is mounted on the delivery pipe, outputs a signal that represents the fuel pressure in the delivery pipe to the engine ECU in order to constantly regulate the fuel at an optimal pressure.



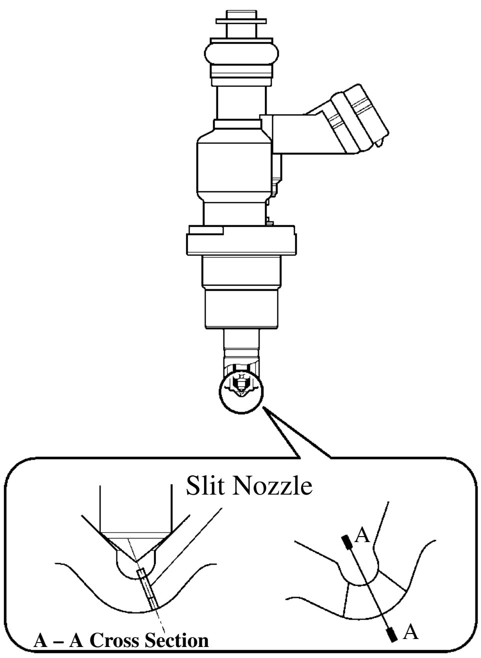
195EG77

4) Injector

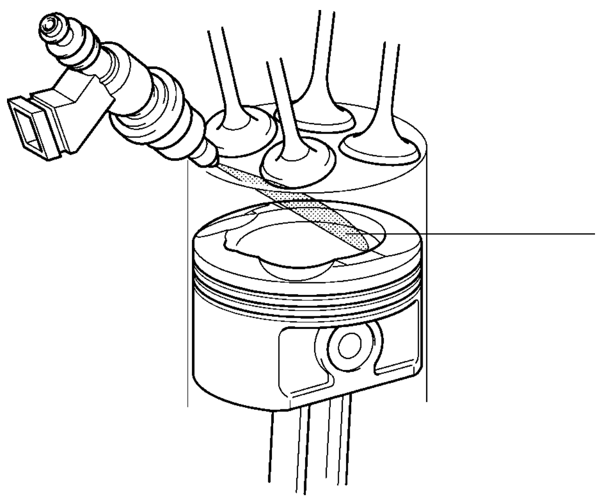
High-pressure, slit-nozzle type injectors have been adopted in conjunction with the adoption of the TOYOTA D-4 (Direct injection, 4-stroke gasoline engine). The injectors are secured to the cylinder head by way of a clamp, and the gaskets are used to seal the combustion gas in the cylinder. In addition, an O-ring and the back-up rings are used to seal the fuel and to reduce noise. And the nozzle hole has been coated to restrain the adhesion of deposits. The injectors, based on a signal from the engine ECU, adjusts the flow of the high pressure fuel and injects the fine-grain sector formed fuel directly to the combustion chamber by a slit nozzle. The injectors are actuated under high-voltage and constant-current control by the EDU in order to inject high-pressure fuel in a short time.



195EG29



195EG30



195EG31

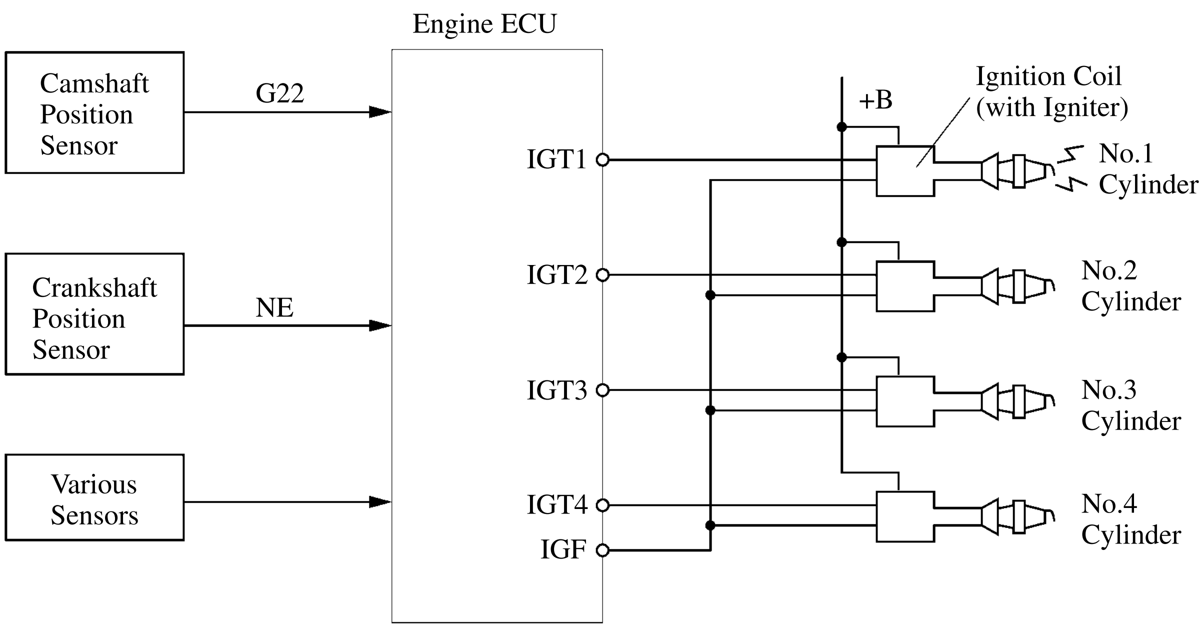
5) EDU (Electronic Driver Unit)

- The EDU has been adopted to drive the injector at high speeds. The EDU has realized high-speed driving under high fuel pressure conditions through the use of a DC/DC converter that provides a high-voltage, quick-charging system.
- The engine ECU constantly monitors the EDU and stops the engine in case an abnormal condition is detected.

9. Ignition System

General

A DIS (Direct Ignition System) has been adopted. 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 the 1AZ-FSE engine is an independent ignition system which has one ignition coil (with igniter) for each cylinder.



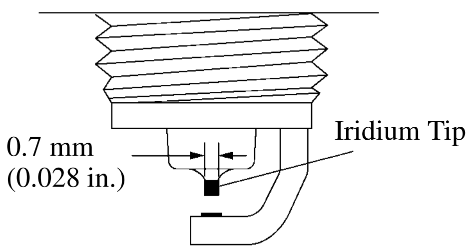
165EG25

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. Also, an igniter is enclosed to simplify the system.

Spark Plug

Iridium-tipped spark plugs have been adopted to improve ignition performance while maintaining the same level of durability of the platinum-tipped spark plugs.



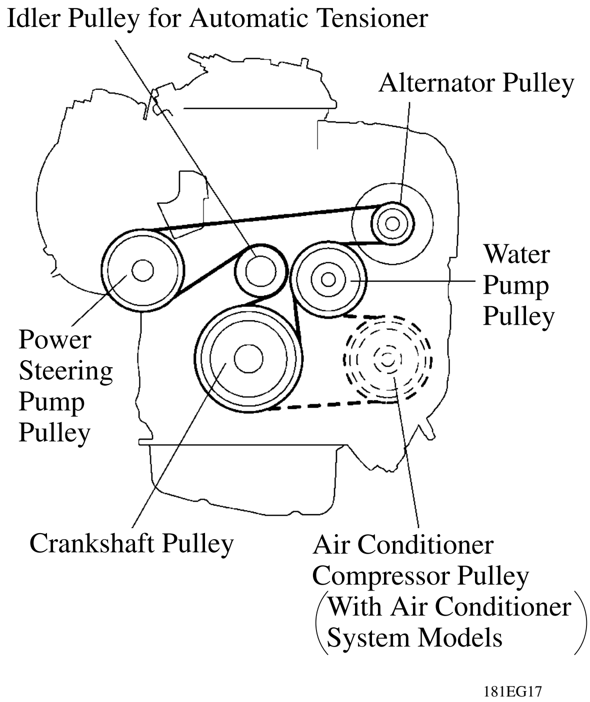
185EG38

▶ Recommended Spark Plugs ◀

DENSO	SK20R11
NGK	IFR6A11
Plug Gap	1.0 – 1.1 mm (0.039 – 0.043 in.)

10. Serpentine Belt Drive System

- 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.



11. Engine Control System

General

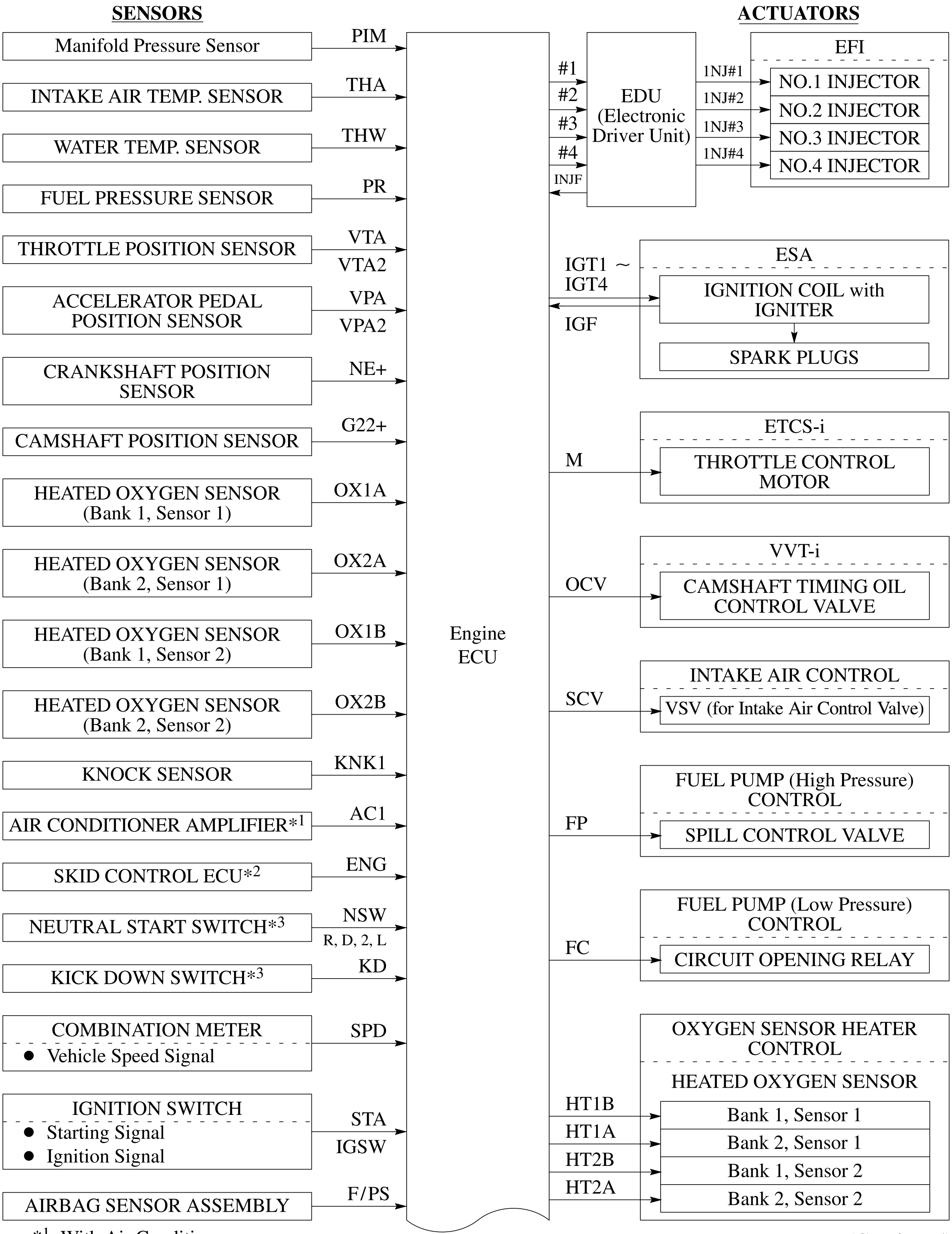
The engine control system for the 1AZ-FSE engine has following features.

System		Outline
D-4 EFI (Electronic Fuel Injection)		● A D-type EFI system is used, which indirectly detects intake air volume by the manifold pressure sensor signal. ● Incontrast to the conventional EFI, D-4 EFI conducts the injection volume control and injection timing control simultaneously. ● The fuel injection system is a sequential multiport fuel injection system. For details, refer to page 135.
ESA (Electronic Spark Advance)		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.
VVT-i (Variable Valve Timing-intelligent)		Controls the intake camshaft to an optimal valve timing in accordance with the engine condition. For details, refer to page 136.
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. In addition, comprehensively controls the ISC, VSC system, and TRC systems. For details, refer to page 141.
Intake Air Control		Controls the intake air control valve via the VSV and the diaphragm in accordance with the engine conditions. For details, refer to page 146.
Fuel Pump Control	High Pressure Side	Regulates the fuel pressure within a range of 8 to 13 MPa in accordance with driving conditions. For details, refer to page 120.
	Low Pressure Side	● Fuel pump operation is controlled by signal from the engine ECU. ● To stop the fuel pump when the airbag is deployed at the front or side collision. For details, refer to page 147.
Oxygen Sensor Heater Control		Maintains the temperature of the air fuel ratio sensor and 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 emissions (HC) in the charcoal canister in accordance with engine conditions.
Air Conditioner Cut-off Control*		By turning the air conditioner compressor ON or OFF in accordance with the engine condition, drivability is maintained.
Engine Immobiliser		Prohibits fuel delivery and ignition if an attempt is made to start the engine with an invalid ignition key.
Diagnosis		When the engine ECU detects a malfunction, the engine ECU diagnoses and memorizes the failed section. For details, refer to page 147.
Fail-Safe		When the engine ECU detects a malfunction, the engine ECU stops or controls the engine according to the data already stored in memory.

*: With Air Conditioner

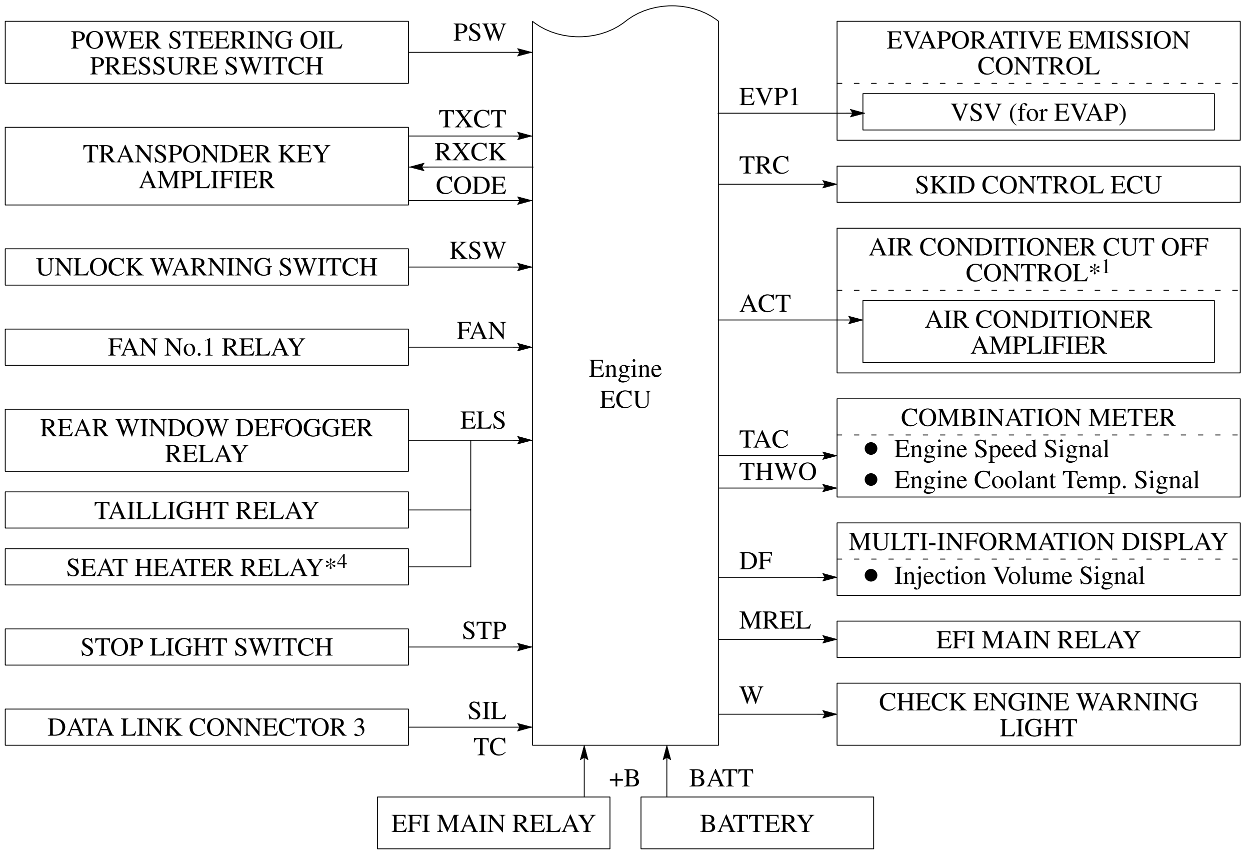
Construction

The configuration of the engine control system in the 1AZ-FSE engine is as shown in the following chart.



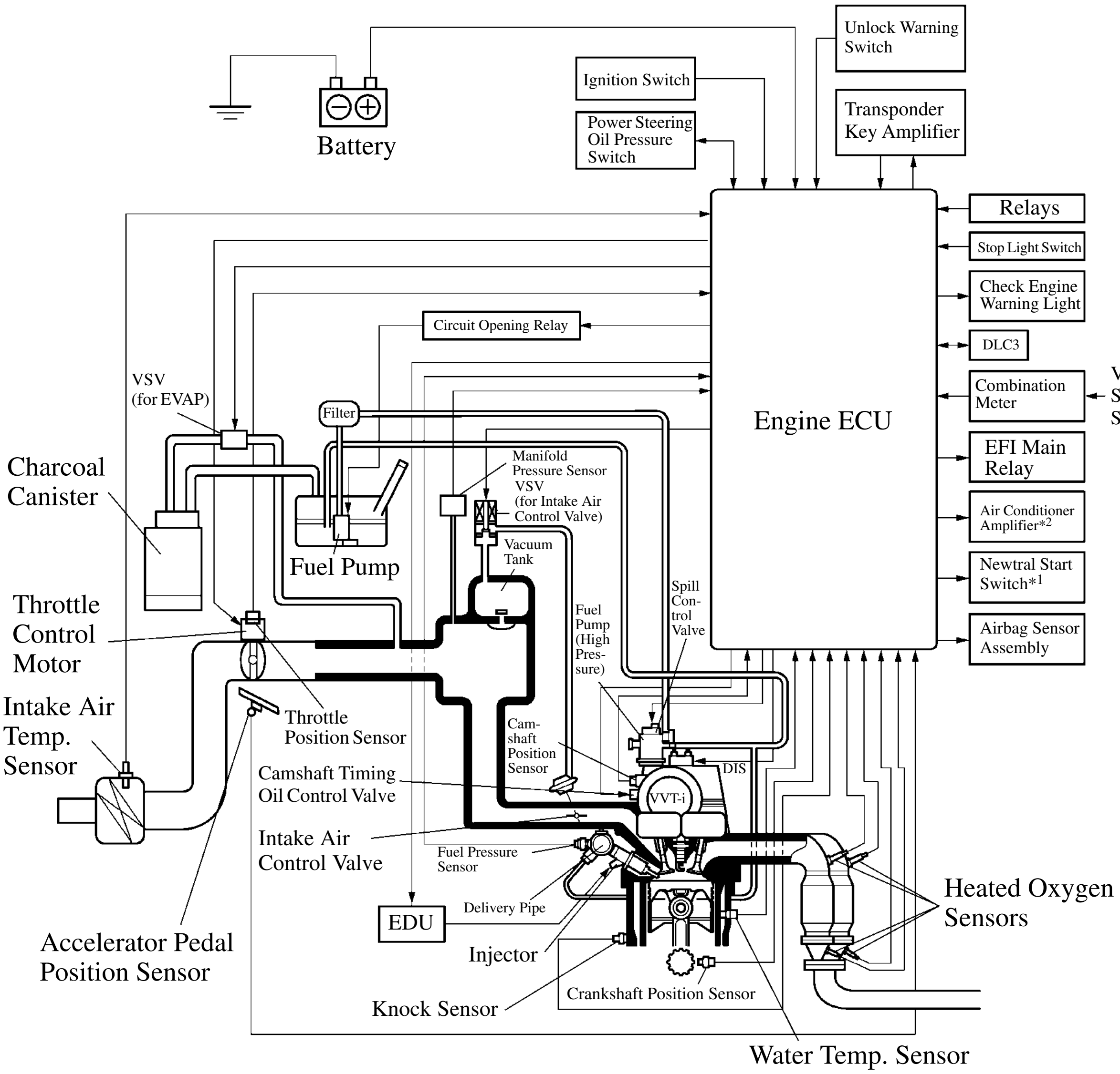
*1: With Air Conditioner
*2: With ABS & EBD & Brake Assist & TRC & VSC
*3: Only for Automatic Transaxle

(Continued)



*1: With Air Conditioner
*2: With ABS & EBD & Brake Assist & TRC & VSC
*3: Only for Automatic Transaxle
*4: With Seat Heater

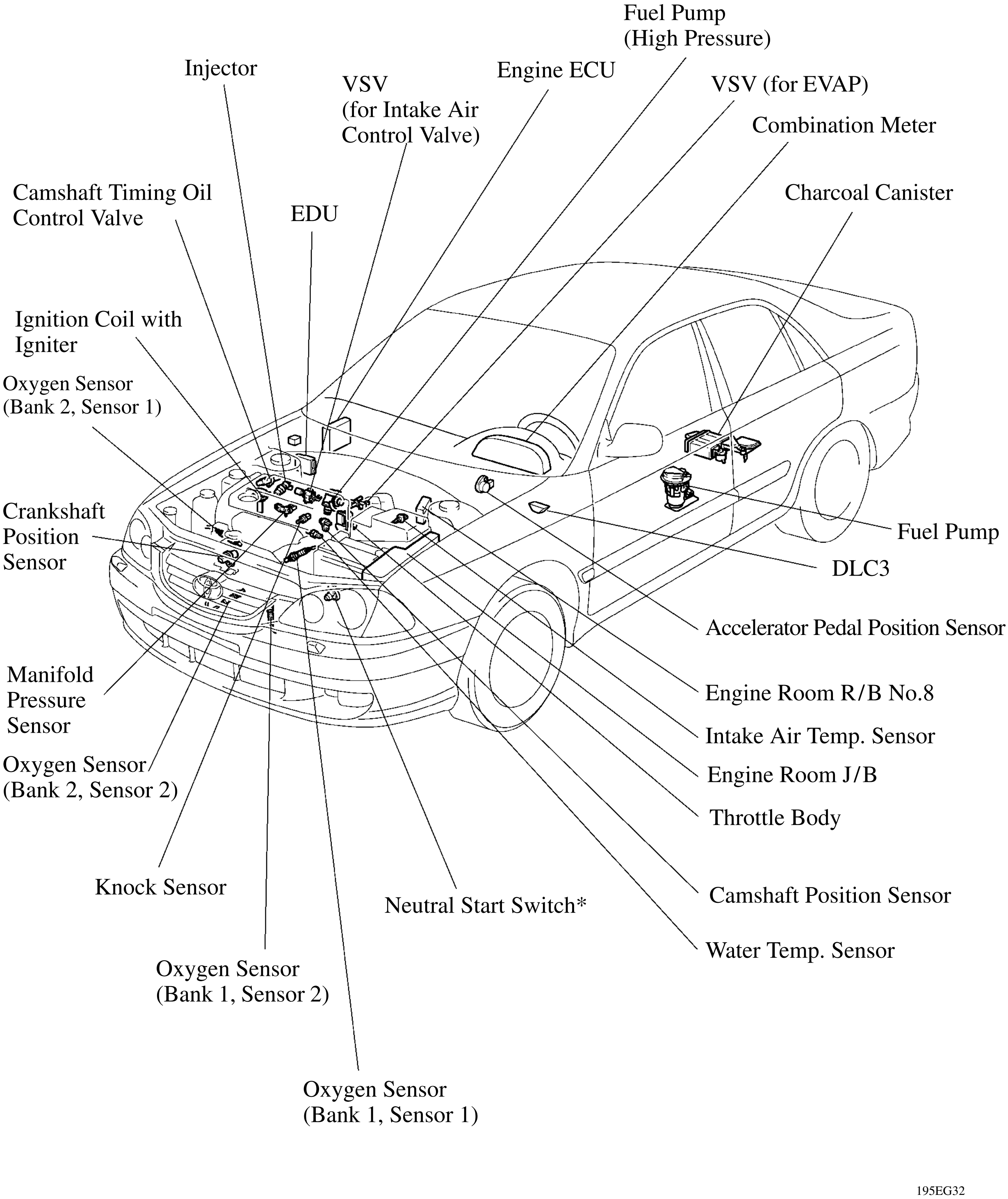
Engine Control System Diagram



195EG01

*1: Only for Automatic Transaxle
*2: With Air Conditioner

Layout of Main Components



* Only for Automatic Transaxle

Main Components of Engine Control System

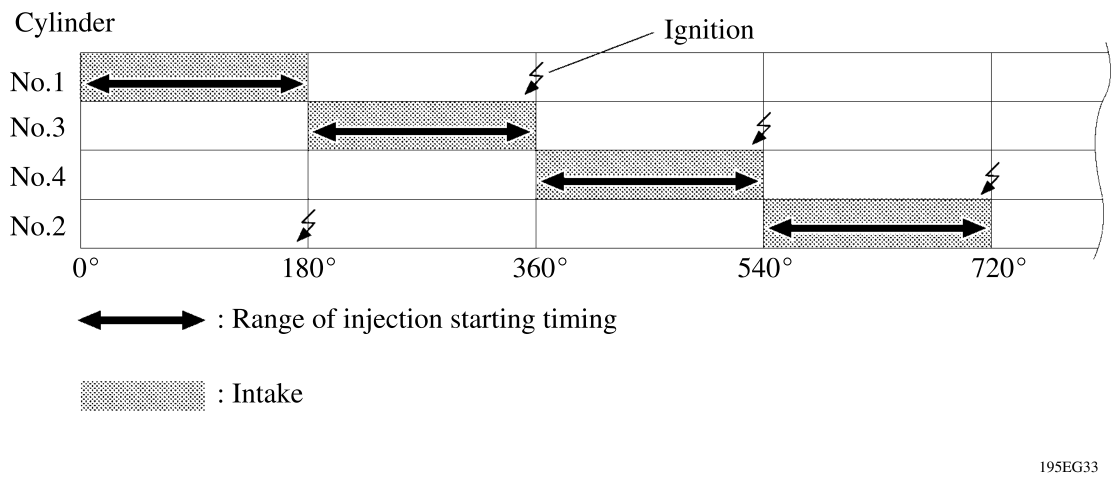
1) General

The main components of the 1AZ-FSE engine control system are as follows:

Components	Outline	Quantity
Manifold Pressure Sensor	Silicon Chip Type	1
Fuel Pressure Sensor	Semiconductor Strain Gauge Type	1
Crankshaft Position Sensor (Rotor Teeth)	Pick-Up Coil Type (36 – 2)	1
Camshaft Position Sensor (Rotor Teeth)	Pick-Up Coil Type (3)	1
Throttle Position Sensor	Linear Type	1
Accelerator Pedal Position Sensor	Linear Type	1
Knock Sensor	Built-In Piezoelectric Type	1
Oxygen Sensor (Bank 1, Sensor 1) (Bank 2, Sensor 1) (Bank 1, Sensor 2) (Bank 2, Sensor 2)	Type with Heater	4
Injector	High Pressure Slit Nozzle Type	4
EDU (Electronic Driver Unit)	Built-in DC/DC Converter	1

D-4 EFI (Electronic Fuel Injection) System

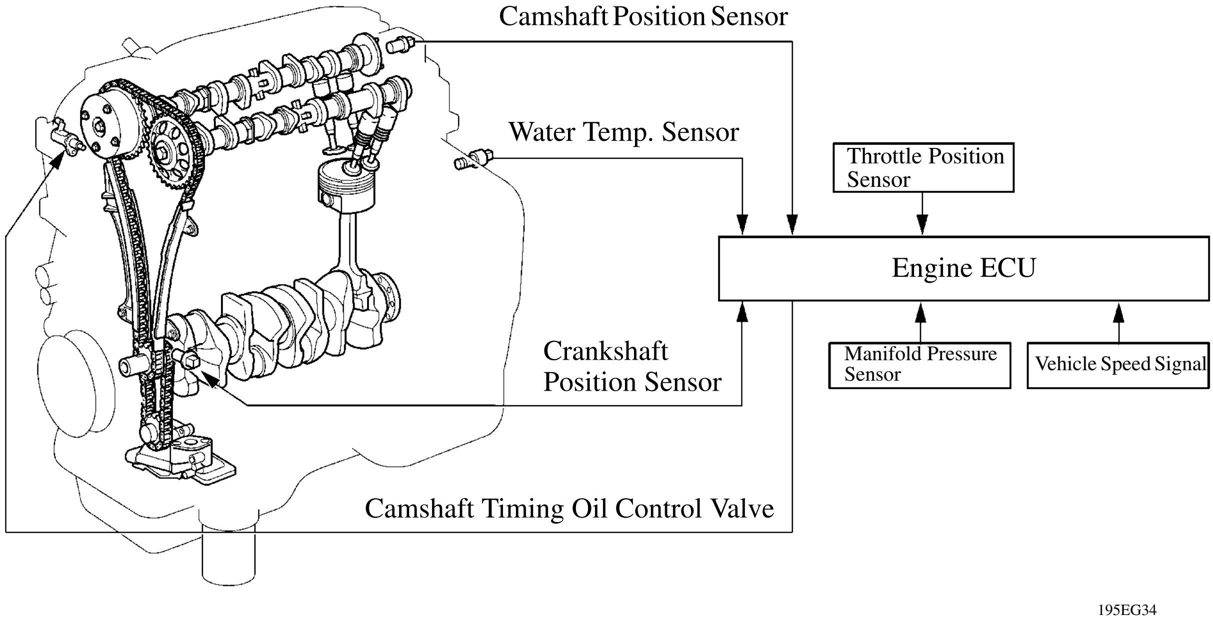
- In contrast to the conventional EFI (Electronic Fuel Injection), the D-4 (Direct Injection 4-Stroke Gasoline Engine) EFI conducts the injection volume control and injection timing control simultaneously.
- The injection volume is determined by the engine ECU, based on the signals from the vacuum sensor, to which corrections from various sensors are added. The engine ECU achieves optimal injection volume by controlling the fuel pressure and the opening time of the injector nozzle.
- A sequential multiport fuel injection system is used. The engine ECU calculates the optimal injection timing independently into each cylinder in accordance with the driving conditions.

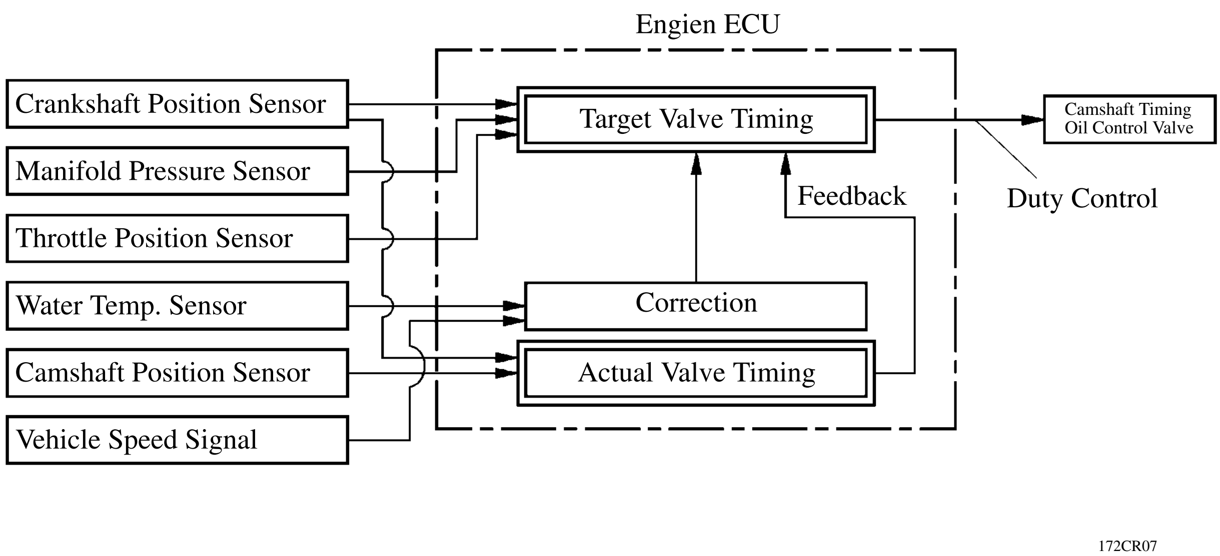


VVT-i (Variable Valve Timing-intelligent) System

1) General

The VVT-i system is designed to control the intake camshaft within a wide range of 53° (of crankshaft angle) to provide a valve timing that is optimally suited to the engine condition, thus realizing improved torque in all the speed ranges and fuel economy, and reduce exhaust emissions. The actual intake side valve timing is feedback by means of the camshaft position sensor for constant control to the target valve timing.

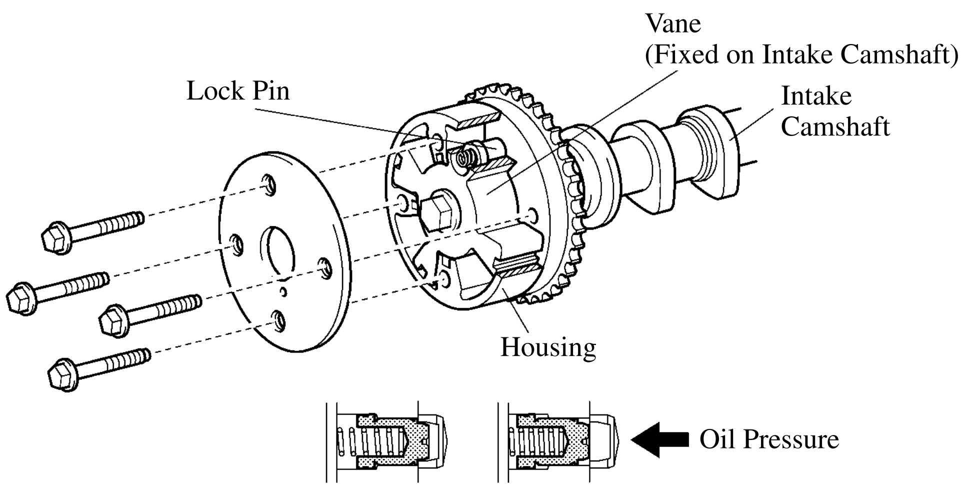




2) Construction

a. 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 startability.
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.

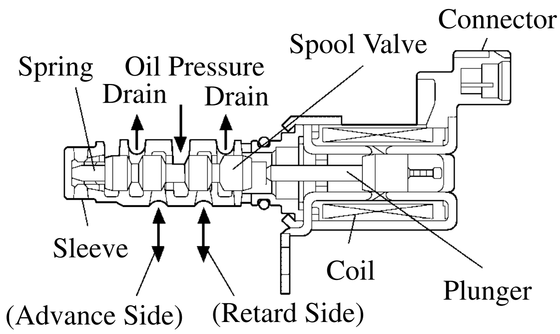


Lock Pin

169EG36

b. 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.



To VVT-i Controller

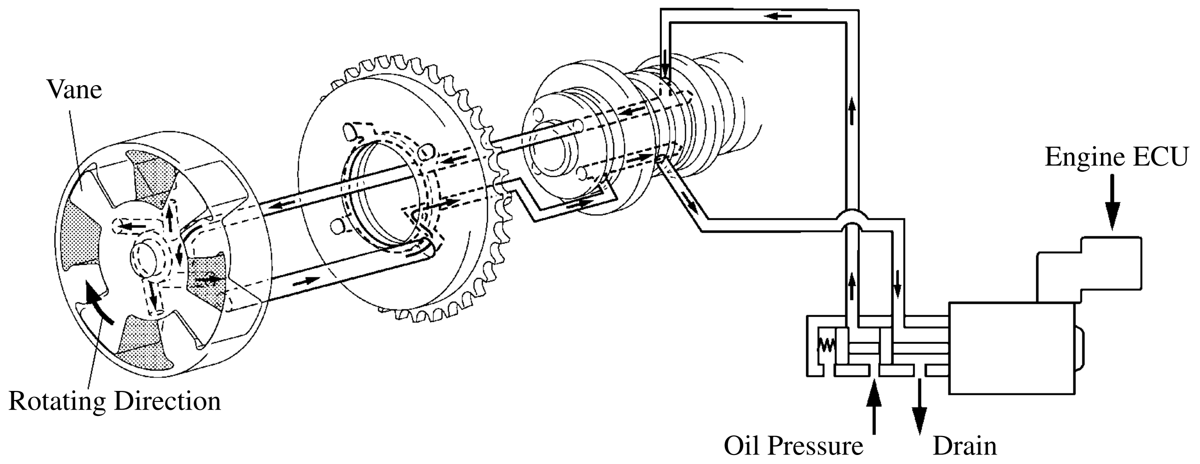
181EG39

c. Operation

- The camshaft timing oil control valve selects the path to the VVT-i controller according to the advance, retard or hold signal from the engine ECU. The VVT-i controller rotates the intake camshaft in the timing advance or retard position or holds it according to the position where the oil pressure is applied.

Advance

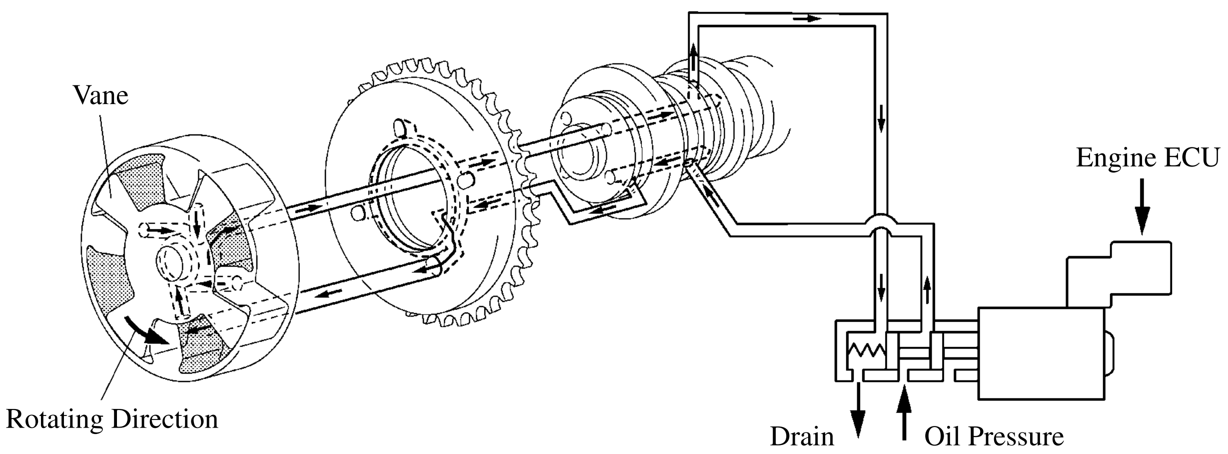
When the camshaft timing oil control valve is positioned as illustrated below by the advance signal from the engine ECU, the resultant oil pressure is applied to the timing advance side vane chamber to rotate the camshaft in the timing advance direction.



185EG18

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.

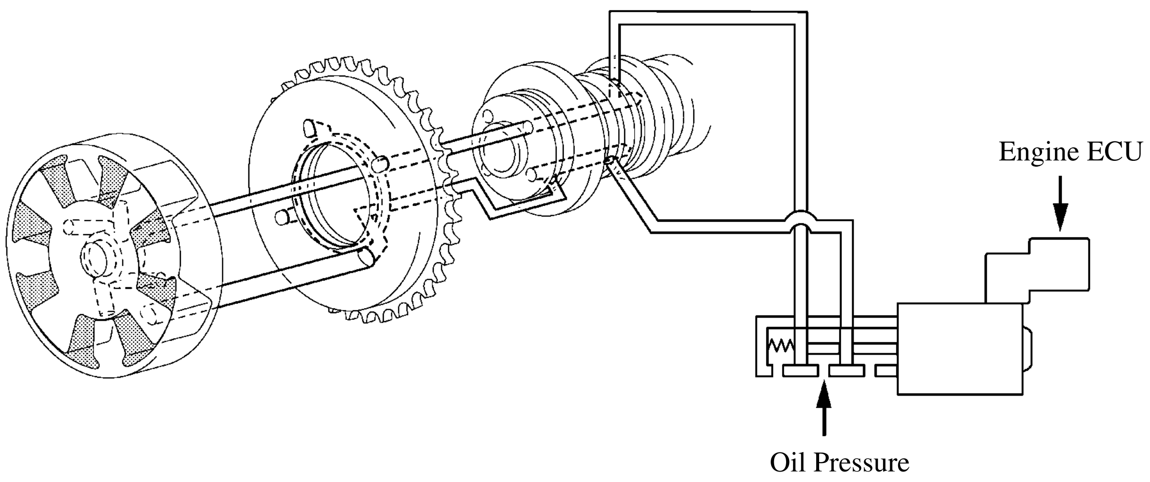


185EG19

3

Hold

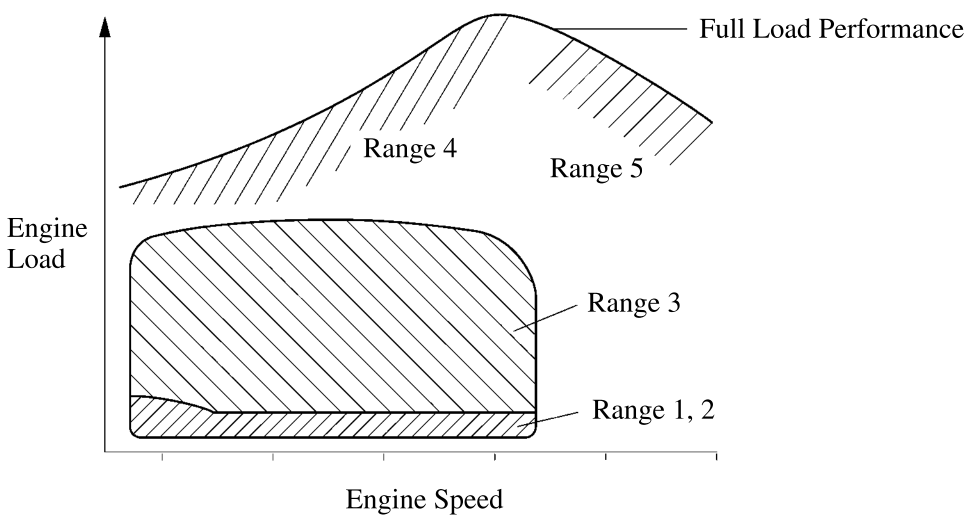
The engine ECU calculated the target timing angle according to the traveling state to perform control as described in the previous page. After setting at the target timing, the valve timing is held by keeping the camshaft timing oil control valve in the neutral position unless the traveling state changes.
The adjusts the valve timing at the desired target position and prevents the engine oil from running out when it is unnecessary.



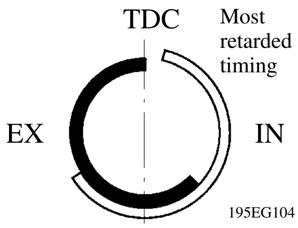
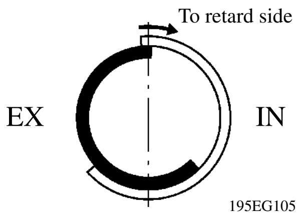
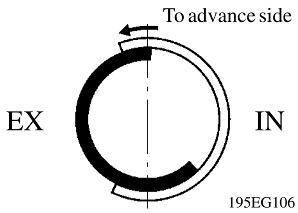
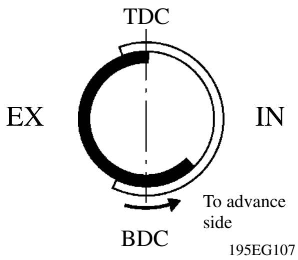
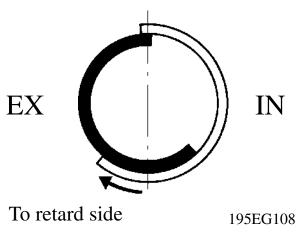
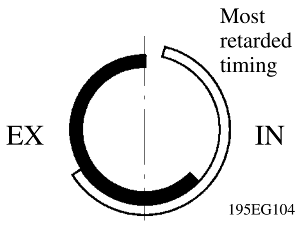
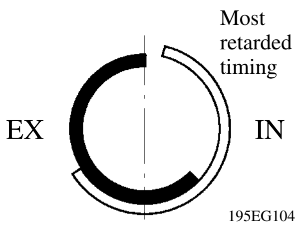
185EG20

- In proportion to the engine speed, intake air volume, throttle position and water temperature, the engine ECU calculates an optimal valve timing under each driving condition and controls the camshaft timing oil control valve. In addition, the engine ECU uses signal from the camshaft position sensor and the crankshaft position sensor to detect the actual valve timing, thus it is possible to perform feedback control to achieve the target valve timing.

▶ Operation During Various Driving Conditions (Conceptual Diagram) ◀



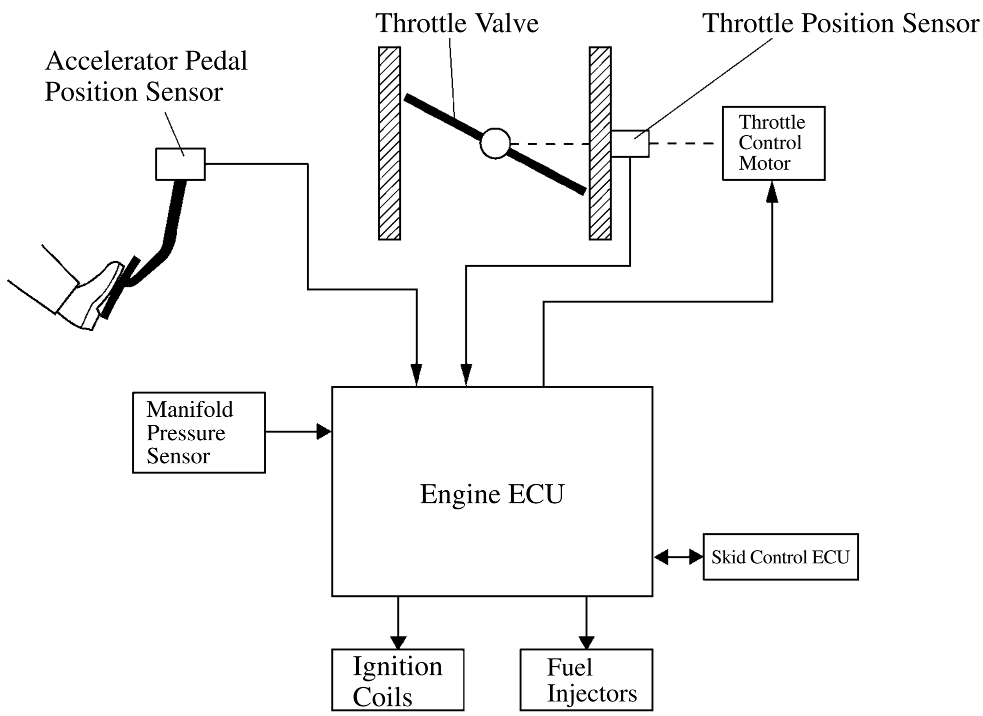
162EG46

Operation State	Range	Valve Timing	Objective	Effect
During Idling	1		Most retarded timing reduces blow back to the intake side	Stabilized idling rpm Better fuel economy
At Light Load	2		Decreasing overlap to eliminate blow back to the intake side	Ensured engine stability
At Medium Load	3		Increasing overlap to increase internal EGR for pumping loss elimination	Better fuel economy Improved emission control
In Low to Medium Speed Range with Heavy Load	4		Advancing the intake valve close timing for volumetric efficiency improvement	Improved torque in low to medium speed range
In High Speed Range with Heavy Load	5		Retarding the intake valve close timing for volumetric efficiency improvement	Improved output
At Low Temperatures	–		Most retarded timing to prevent blow back to the intake side leads to the lean burning condition, and stabilizes the idle speed at fast idling	Stabilized fast idle rpm Better fuel economy
Upon Starting/ Stopping the Engine	–		Most retarded timing minimizes blow back to the intake side	Improved startability

ETCS-i (Electronic Throttle Control System-intelligent)

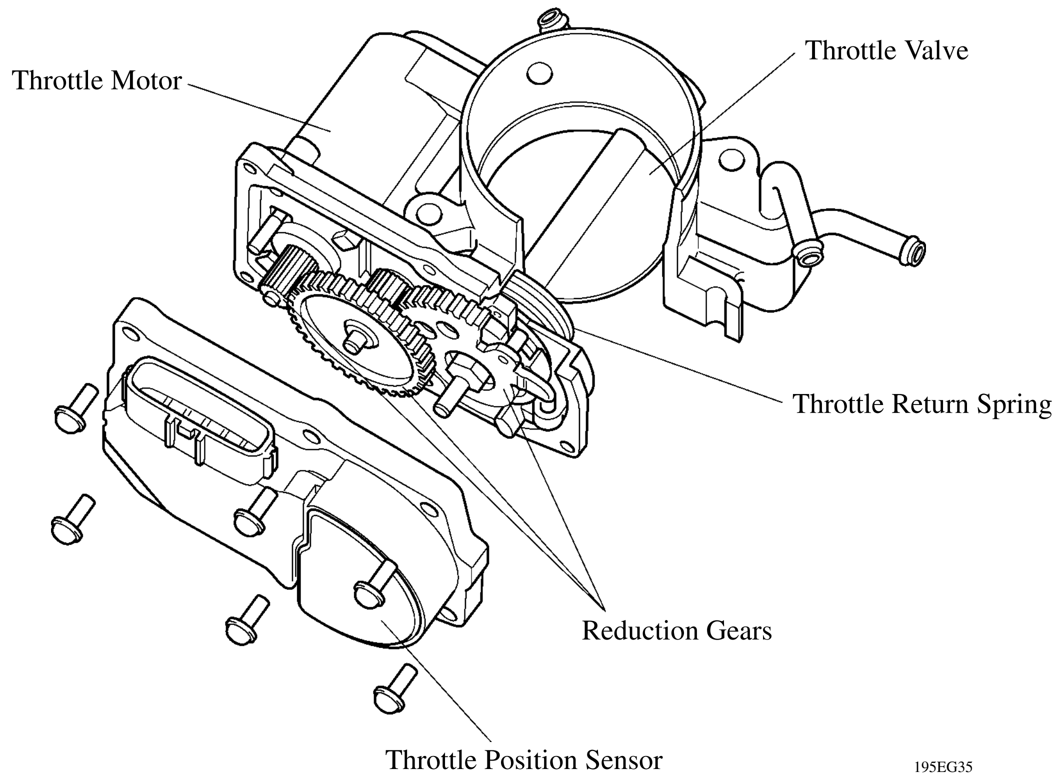
1) General

- The ETCS-i system, which realizes excellent throttle control in all the operating ranges, has been adopted. However, in the 1AZ-FSE engine, the accelerator cable has been discontinued, and an accelerator position sensor has been provided on the accelerator pedal. Accordingly, the limp-mode control during the fail-safe mode has been changed.
- In the conventional throttle body, the throttle valve opening is determined invariably by the amount of the accelerator pedal effort. In contrast, the ETCS-i uses the engine ECU to calculate the optimal throttle valve opening that is appropriate for the respective driving condition and uses a throttle control motor to control the opening.
- The ETCS-i controls the ISC (Idle Speed Control) system, the TRC (Traction Control) system and the VSC (Vehicle Stability Control) system.



188EG54

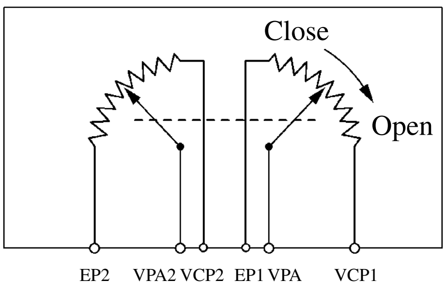
2) Construction



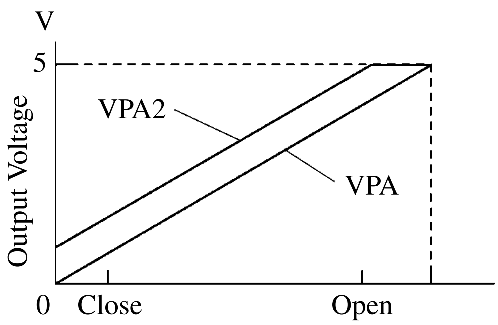
195EG35

a. Accelerator Pedal Position Sensor

The accelerator pedal position sensor is attached to the accelerator pedal. This sensor converts the accelerator pedal depressed angles into electric signals with two differing characteristics and outputs them to the ECM. One is the VPA signal that linearly outputs the voltage along the entire range of the accelerator pedal depressed angle. The other is the VPA2 signal that outputs an offset voltage.



188EG56

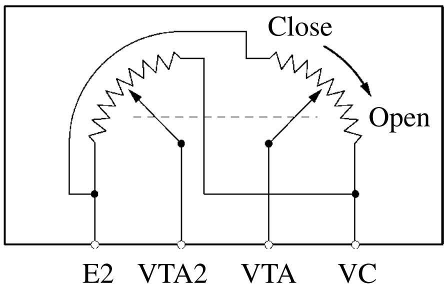


188EG57

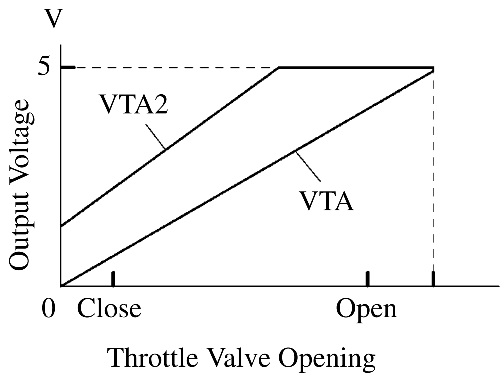
Accelerator Pedal Depressed Angle

b. Throttle Position Sensor

The throttle position sensor is attached to the throttle body.
This sensor converts the throttle valve opening angles into electric signals with two differing characteristics and outputs them to the engine ECU. One is the VTA signal that linearly outputs the voltage along the entire range of the throttle valve opening angle. The other is the VTA2 signal that outputs an offset voltage.



150EG40



150EG39

c. Throttle Control Motor

A DC motor with excellent response and minimal power consumption is used for the throttle control motor. 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 opening angle of the throttle valve.

3) Operation

The engine ECU drives the throttle control motor by determining the target throttle valve opening in accordance with the respective operating condition. The 1AZ-FSE engine mainly has the following ETCS-i controls.

a. Idle Speed Control

b. TRC Throttle Control

c. VSC Coordination Control

d. Maximum Vehicle Speed Control

e. Power Train Protection Control

f. Wheel Locking Protection Control

a. Idle Speed Control

Controls the engine ECU and the throttle valve in order to constantly effect ideal idle speed control.

b. TRC Throttle Control

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

c. VSC Coordination Control

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

d. Maximum Vehicle Speed Control

When the vehicle speed is exceeded the target speed, the engine ECU operates the throttle valve to the closing side and controls the maximum vehicle speed.

e. Power train protection control

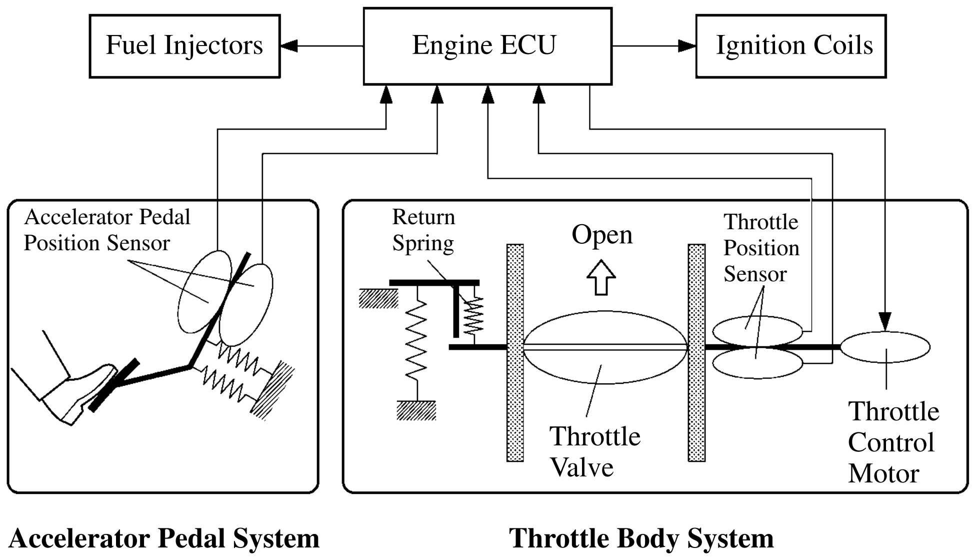
At the time of multiple shifting down when accelerating, the throttle valve opening is gradually controlled soon after the shift down in order to smooth the driving force change and to protect the driving system parts.

f. Wheel locking protection control

On the low μ road, when the driver down-shifted manually to decelerate, ECT (Electronically Controlled Transaxle) controls the opening of the throttle valve gradually in order to protect the driving wheels from locking soon after the deceleration.

4) Fail-Safe

If an abnormal condition occurs with the ETCS-i system, the check engine warning light in the combination meter illuminates to inform the driver. The accelerator pedal position sensor comprises two sensor circuits. Therefore, if an abnormal condition occurs in the accelerator pedal position sensor, and the engine ECU detects the abnormal voltage difference of the signals between these two sensor circuits, the engine ECU transfers to the limp mode by limiting the maximum opening angle of the throttle valve.
If an abnormal condition occurs in the throttle body system which comprises two sensor circuits, the engine ECU detects the abnormal voltage difference as the signals between these two circuits and cuts off the current to the throttle motor, causing the throttle valve to close. However, when the throttle motor is OFF, because a return spring is provided in the throttle valve, the force of the spring keeps the throttle valve slightly open from the fully closed state. In this state, fuel injection cutoff control and ignition timing retard control are effected in accordance with the accelerator opening, thus enabling the vehicle to be operated within the range of idling and limp mode.



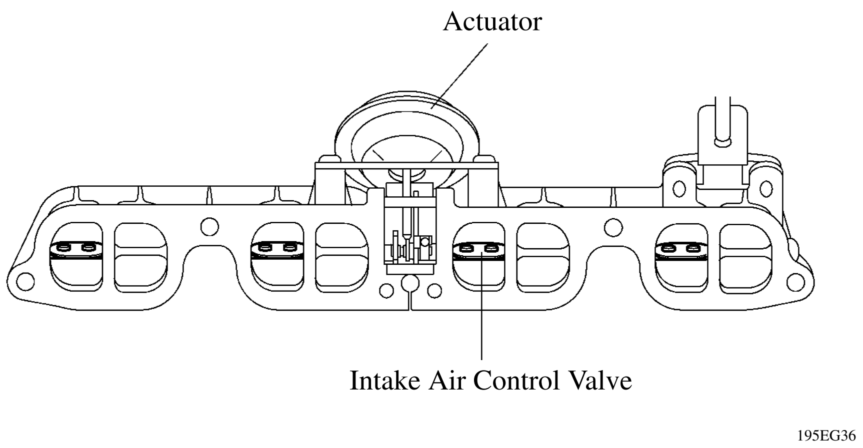
188EG59

5) Diagnosis

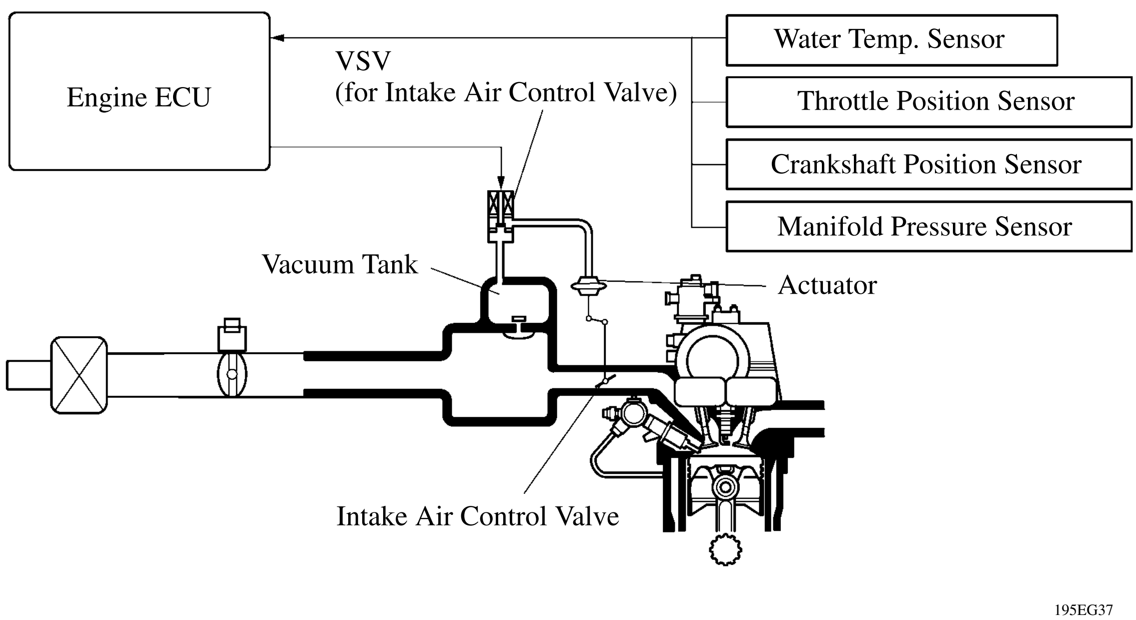
The diagnostic trouble codes can be output via DLC3 to a hand-held tester. For details, refer to the 1AZ-FSE Engine Repair Manual (Pub. No. RM783E).

Intake Air Control System

- An aluminum die-cast intake air control valve has been provided between the intake manifold and the cylinder head.
- A valve is provided on one of the two intake ports that are provided for each cylinder, and this valve is closed when the engine is operating at low speeds. Thus, increasing the intake air flow velocity and improving the volumetric efficiency. The valve is also closed when the engine coolant temperature is low to promote the atomization of fuel by strengthening the swirl in the combustion chamber. As a result, combustion is stabilized.
- According to the operating conditions of the engine, the engine ECU actuates the VSV (for intake air control valve) to turn the intake air control valve ON/OFF by regulating the vacuum that is applied to the actuator. This uses the vacuum that is stored in the vacuum tank, which is integrated in the intake manifold.



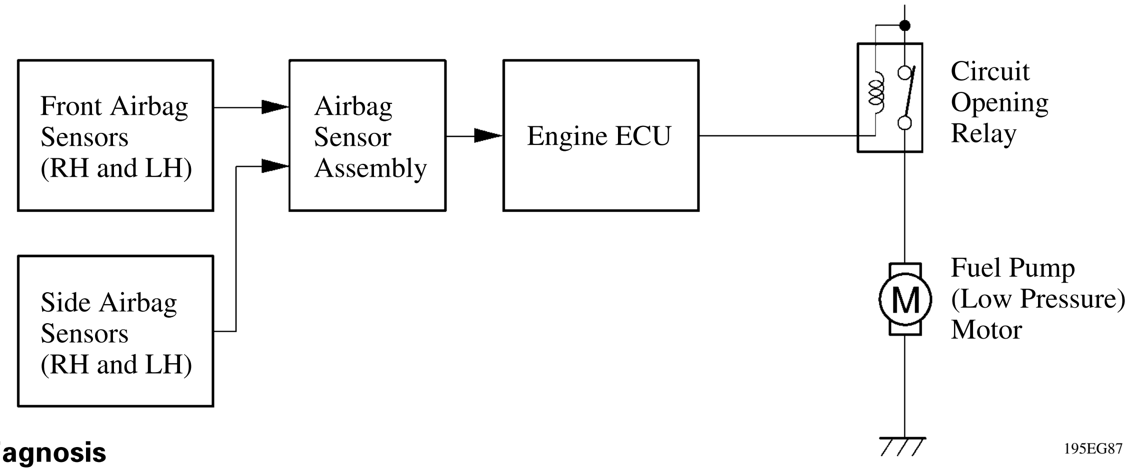
▶ System Diagram ◀



3

Fuel Pump (Low Pressure) Control

A fuel cut control is adopted to stop the fuel pump when the airbag is deployed at the front or side collision. 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, thus engine can be restarted.



Diagnosis

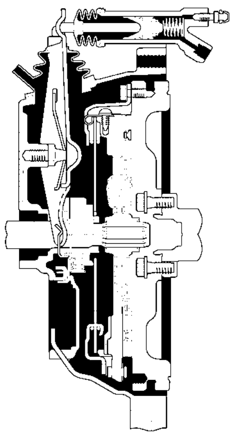
In accordance with the adoption of TOYOTA D-4 engine, DTSs (Diagnostic Trouble Codes) in the chart below are added. For details, refer to the 1AZ-FSE Engine Repair Manual (Pub. No. RM783E).

DTC No.	Detection Item	Trouble Area	Check Engine Warning Light	Memory
P0190	Fuel Rail Pressure Sensor Circuit Malfunction	● Open or short in fuel pressure sensor circuit ● Fuel pressure sensor ● Engine ECU	○	○
P0191	Fuel Rail Pressure Sensor Circuit Malfunction Range/Performance	● Fuel pressure sensor ● Engine ECU	○	○
P1215	EDU Circuit Malfunction	● Open or short in EDU circuit ● EDU ● Injector ● Engine ECU	○	○
P1235	Fuel Pump (High Pressure) Circuit Malfunction (Fuel leak)	● Open or short in fuel pump (high pressure) ● Fuel pump (high pressure) ● Engine ECU	○	○
P1653	VSV for IAC Valve Circuit Malfunction	● Open or short in VSV circuit for IAC Valve ● VSV for IAC Valve ● Engine ECU	○	○

■ CLUTCH

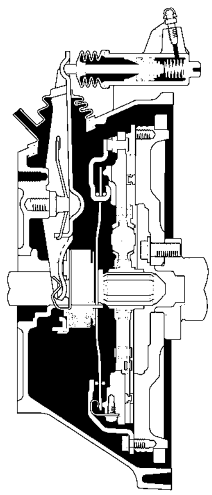
1. General

- In accordance with the adoption of 1ZZ-FE, 3ZZ-FE and 1AZ-FSE engines, the clutch disc and the clutch cover are optimized to each feature of engine.
- The clutch pedal has a turn-over mechanism to reduce clutch pedal effort on the 1AZ-FSE engine model.



185CH01

1ZZ-FE and 3ZZ-FE Engine Models



185CH02

1AZ-FSE Engine Model

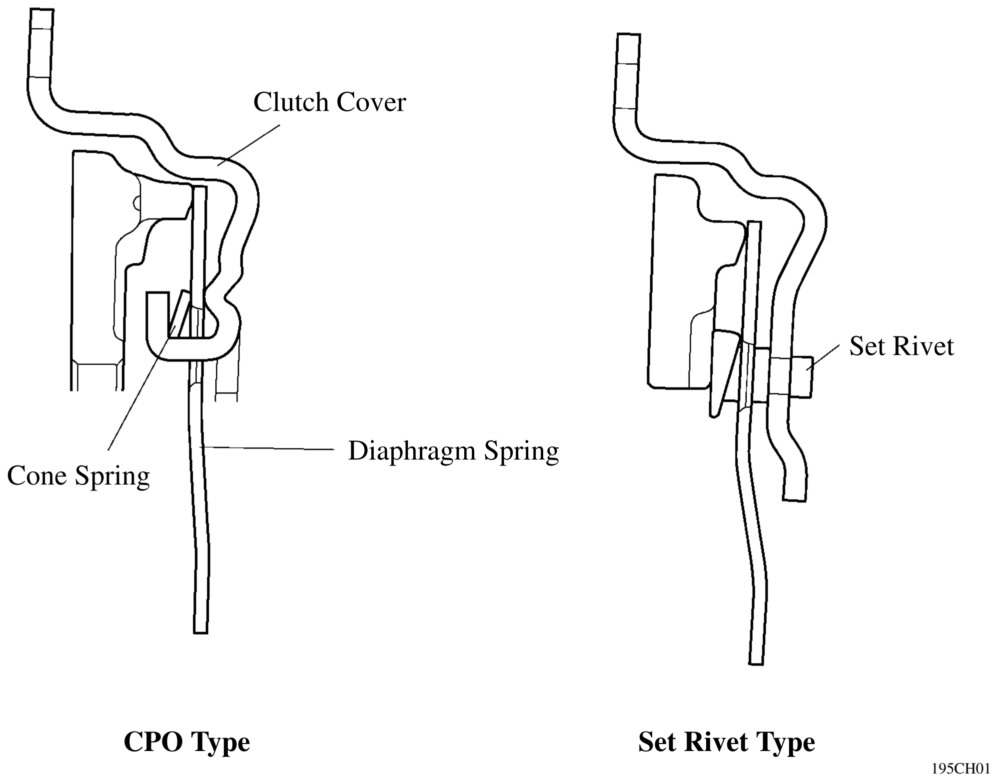
▶ Specifications ◀

<table>
<tr><td colspan="2">Engine Type</td><td>1ZZ-FE</td><td>3ZZ-FE</td><td>1AZ-FSE</td></tr>
<tr><td rowspan="2">Clutch</td><td>Type</td><td>Dry Type
Single Plate Clutch
Diaphragm Spring</td><td>←</td><td>←</td></tr>
<tr><td>Operation</td><td>Hydraulic</td><td>←</td><td>←</td></tr>
<tr><td rowspan="3">Clutch Cover</td><td>Type</td><td>CPO</td><td>←</td><td>←</td></tr>
<tr><td>Size mm (in.)</td><td>212 (8.35)</td><td>←</td><td>224 (8.82)</td></tr>
<tr><td>Installed Load N</td><td>4800</td><td>4300</td><td>5200</td></tr>
<tr><td rowspan="2">Clutch Disc</td><td>Facing Size* mm (in.)</td><td>212 x 140 x 3.4
(8.35 x 5.51 x 0.13)</td><td>←</td><td>224 x 150 x 3.4
(8.82 x 5.91 x 0.13)</td></tr>
<tr><td>Facing Area cm^2 ($in.^2$)</td><td>199 (30.8)</td><td>←</td><td>217 (33.6)</td></tr>
<tr><td rowspan="2">Master Cylinder</td><td>Type</td><td>Conventional</td><td>←</td><td>←</td></tr>
<tr><td>Cylinder Diameter mm (in.)</td><td>15.87 (0.62)</td><td>←</td><td>←</td></tr>
<tr><td rowspan="2">Release Cylinder</td><td>Type</td><td>Non-Adjustable</td><td>←</td><td>←</td></tr>
<tr><td>Cylinder Diameter mm (in.)</td><td>20.64 (0.81)</td><td>←</td><td>←</td></tr>
</table>

*: Outer Diameter x Inner Diameter x Thickness

2. Clutch Cover

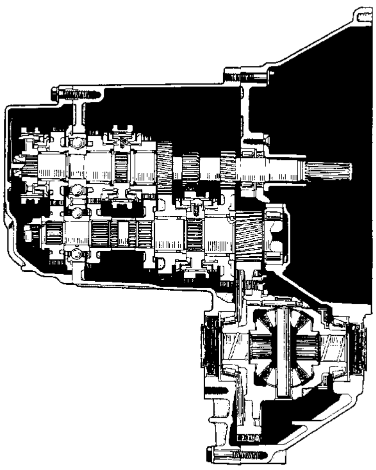
As compared with usual set rivet type, by using the cone spring at the fulcrum of the diaphragm spring, the clutch cover which has a structure to clog up the free play has been newly adopted for 1ZZ-FE, 3ZZ-FE and 1AZ-FSE engine models. Thus, performance of clutch releasing and reduction of the vibration have been improved.



■MANUAL TRANSAXLE

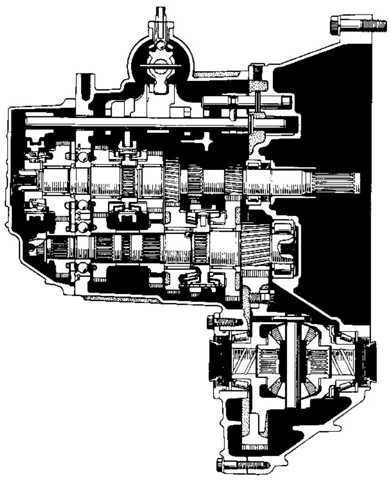
1. General

- The 1ZZ-FE engine model uses the C250 manual transaxle. However, in contrast to the previous model, a double-cone type synchromesh in the 2nd gear and a rolling type lock ball have been adopted.
- The 3ZZ-FE engine model uses the C50 manual transaxle. However, in contrast to the previous model, a rolling type lock ball has been adopted.
- 1AZ-FSE engine model uses the S55 manual transaxle.
- The 1CD-FTV engine model uses the E351 manual transaxle, instead of the previous E251 manual transaxle.
- The E351 manual transaxle has discontinued the use of an oil pump to reduce the volume of oil. The differential gear has been changed from the 4 pinion type of the previous (E251 manual transaxle) to the 2 pinion type to reduce weight.



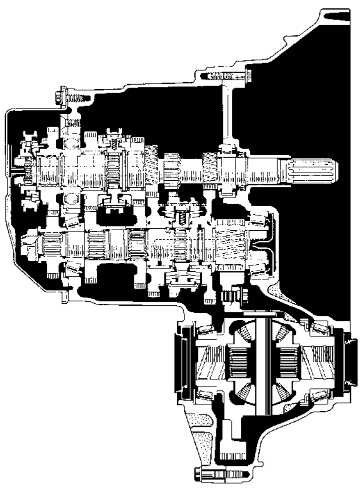
145CH07

C50 Series Manual Transaxle



145CH05

S54 Manual Transaxle



195CH27

E351 Manual Transaxle

▶ Specifications ◀

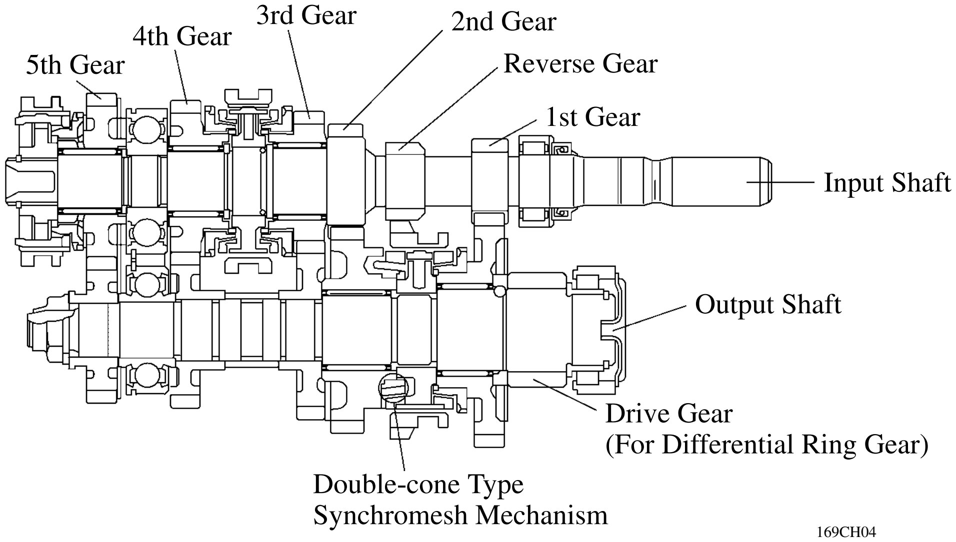
Engine Type		1ZZ-FE	3ZZ-FE	1AZ-FSE	1CD-FTV
Transaxle Type		C250	C50	S55	E351
Gear Ratio	1st	3.545	←	3.538	3.538
	2nd	1.904	←	2.041	2.045
	3rd	1.310	←	1.322	1.333
	4th	1.031	0.969	1.028	0.972
	5th	0.815	←	0.820	0.731
	Reverse	3.250	←	3.153	3.583
Differential Gear Ratio		3.941	4.058	3.736	3.684
Oil Capacity Liters (US qts, Imp. qts)		1.9 (2.0, 1.7)	←	2.2 (2.3, 1.9)	2.5 (2.6, 2.2)
Oil Viscosity		SAE 75W-90	←	←	←
Oil Grade		API GL-4 or GL-5	←	←	←

3

2. Transmission Gear

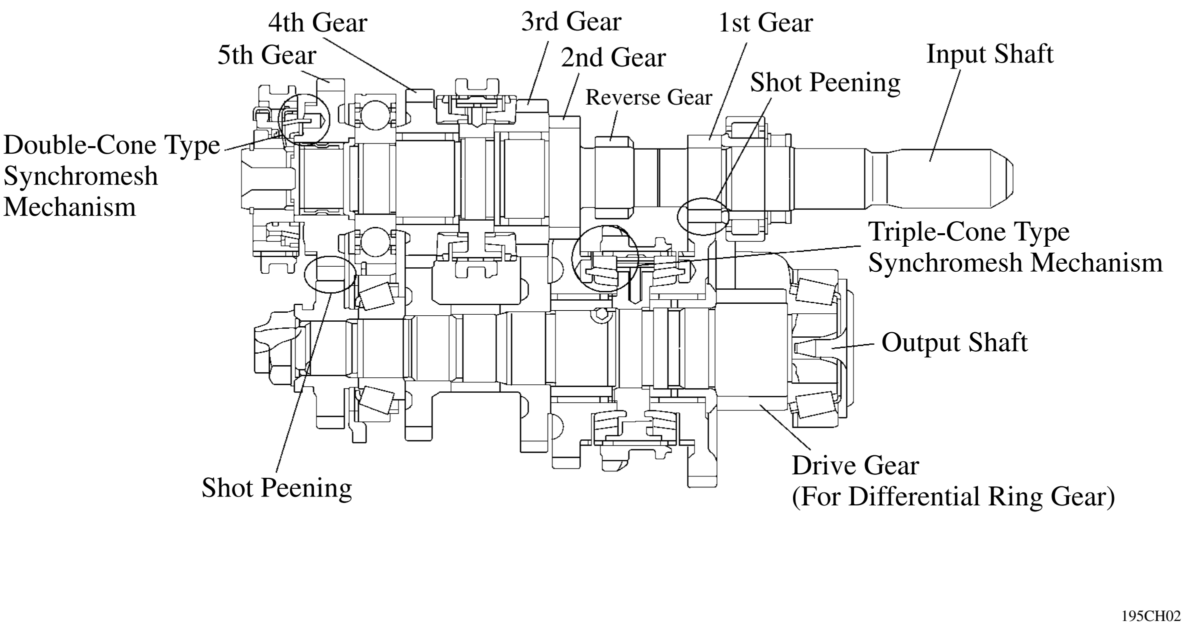
C250 Manual Transaxle

A double-cone type synchromesh mechanism is used for the 2nd gear to reduce the shift effort.



E351 Manual Transaxle

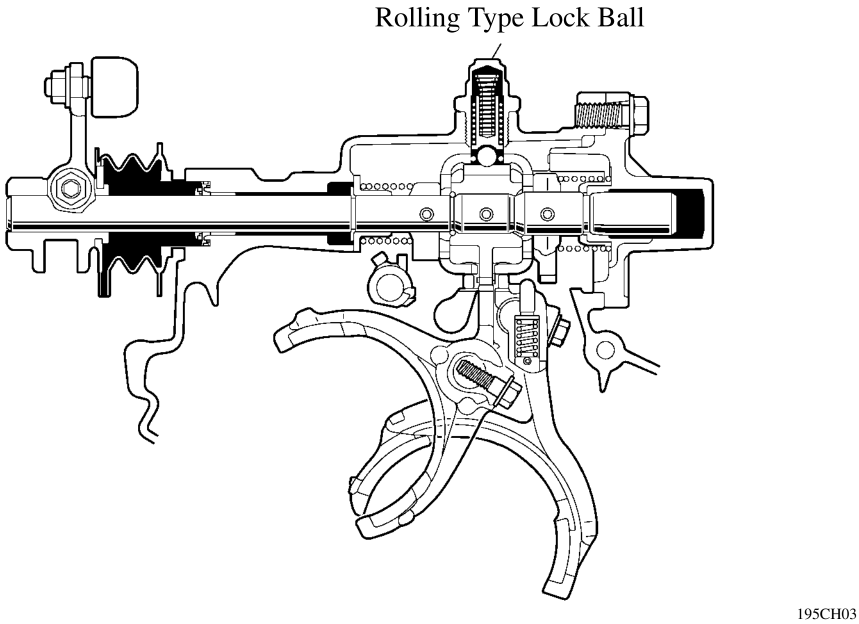
- The gears have been strengthened by adopting shot-peened 1st and 5th gears and by optimizing the gear tooth flanks.
- A triple-cone type synchromesh mechanism is used for the 1st gear and 2nd gear to increase the synchronizer capacity. This helps to reduce the shifting effort and provide smoother shifting.
- A double-cone type synchromesh mechanism is used in the 5th gear to suppress gear engagement noise.



3. Shift and Select Mechanism

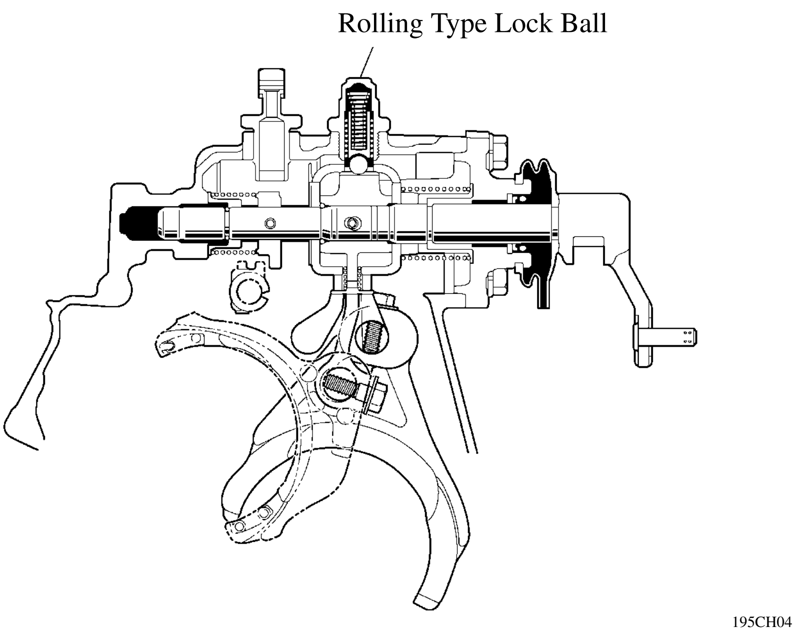
C50 and C250 Manual Transaxles

The shift feel has been improved through the adoption of the rolling type lock ball.



E351 Manual Transaxle

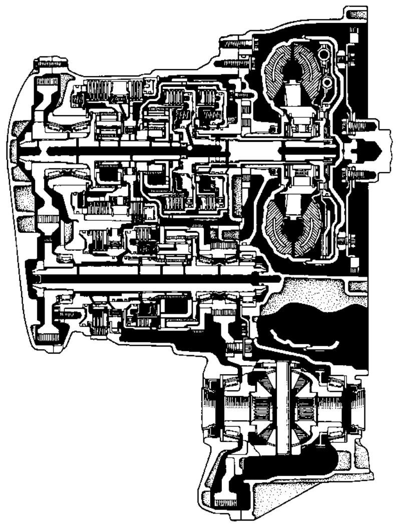
The shift feel has been improved through the adoption of the rolling type lock ball.



■ A246E AUTOMATIC TRANSAXLE

1. General

The 1ZZ-FE engine model uses the A246E automatic transaxle [ECT (Electronically Controlled Transaxle)]. In contrast to the previous model, an SLT solenoid valve has been adopted to effect optimal line pressure and clutch pressure control in accordance with the engine output and driving conditions. As a result, smooth shift characteristics have been realized.



145CH09

A246E Automatic Transaxle

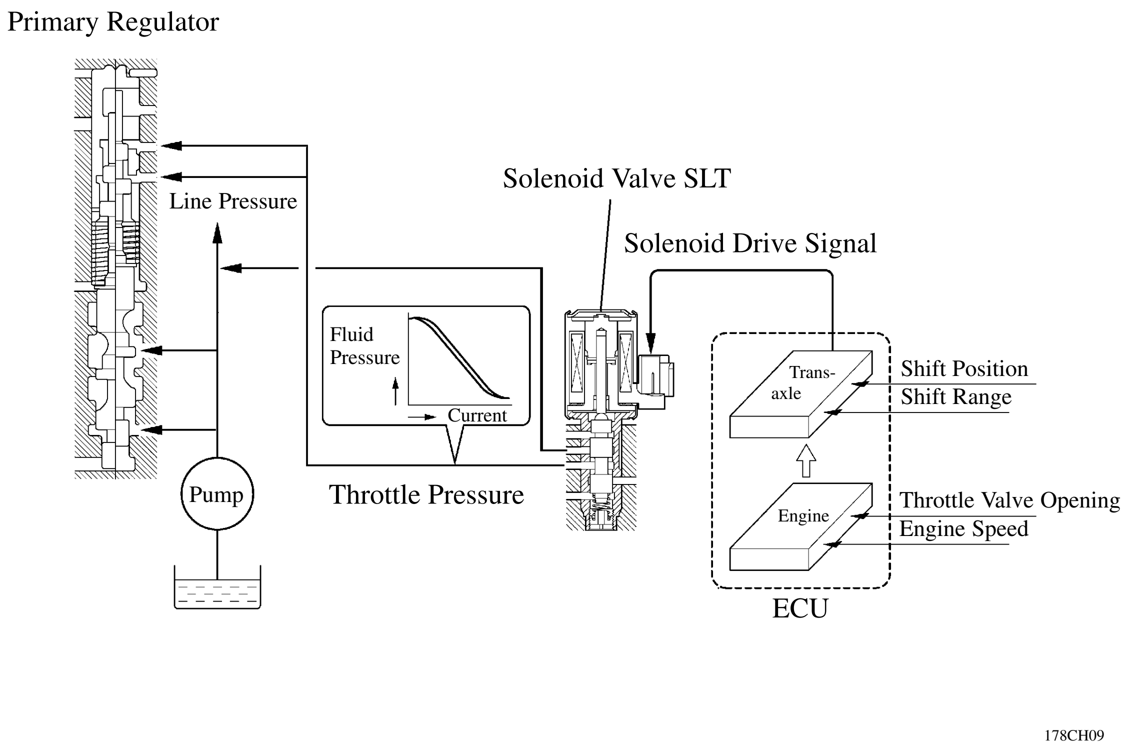
▶ Specifications ◀

Engine Type		1ZZ-FE
Gear Ratio*1	1st	4.005
	2nd	2.208
	3rd	1.425
	4th	0.981
	Reverse	3.272
Differential Gear Ratio		2.962
Fluid Capacity	Liters (US qts, Imp. qts)	7.6 (8.0, 6.7)*2
Fluid Type		ATF Type D-II

*1: Counter Gear Ratio Included
*2: Differential Included

2. Line Pressure Optimal Control

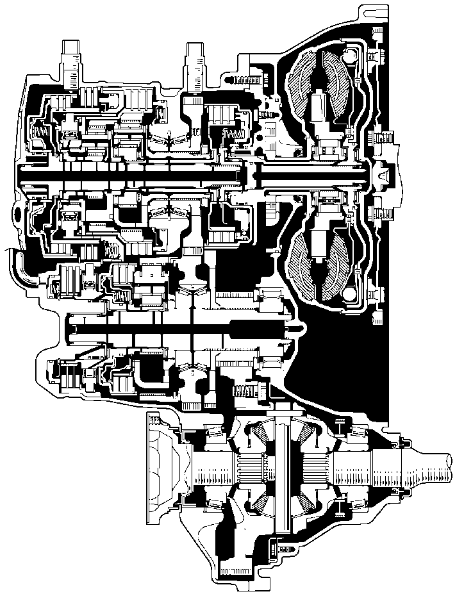
The line pressure is controlled by using a solenoid valve SLT. Through the use of the solenoid valve SLT, the line pressure is optimally controlled in accordance with the engine torque information, as well as with the internal operating conditions of the torque converter and the transaxle. Accordingly, the line pressure can be controlled minutely in accordance with the engine output, driving condition, thus realizing smooth shift characteristics and optimizing the workload on the oil pump.



■ U240E AUTOMATIC TRANSAXLE

1. General

- The compact and high-capacity 4-speed U240E automatic transaxle [Super ECT (Electronically Controlled Transaxle)] has been newly adopted on the models for 1AZ-FSE engine.
- The U240E automatic transaxle has adopted a planetary gear unit with a new gear layout.
- It is equipped with a diagnosis function, and its diagnostic trouble codes can be accessed through the O/D indicator light or by connecting a hand-held tester. For details, refer to the AVENSIS Chassis & Body Repair Manual Supplement (Pub. No. RM781E)
- A shift lock mechanism in incorporated to minimize the possibility of incorrect operation of the automatic transaxle.
- Automatic transaxle fluid is used T-IV.



169CH12

▶ Specifications ◀

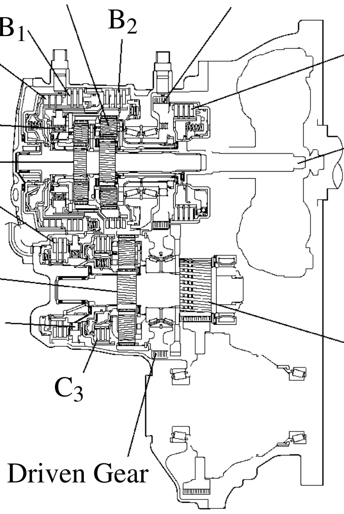
Gear Ratio*[1]	1st	3.943
	2nd	2.197
	3rd	1.413
	4th	1.020
	Reverse	3.145
Differential Gear Ratio		2.923
Fluid Capacity	Liters (US qts, Imp. qts)	7.6 (8.0, 6.7)*[2]
Fluid Type		ATF Type T-IV

*[1]: Counter Gear Ratio Included
*[2]: Differential Included

2. Planetary Gear Unit

General

The U240E automatic transaxle has adopted a new gear layout. In the new gear layout, the counter drive and driven gear are placed in front of the front planetary gear and the under drive (U/D) planetary gear unit is placed above the counter shaft. Furthermore, the force transmission method has been changed by eliminating the brake and the one-way clutch. As a result, a torque capacity that accommodates the high output engine has been attained, while realizing a compact gear unit.



169CH14

▶ Specifications ◀

C_1	Forward Clutch	The No. of Discs	4
C_2	Direct Clutch		4
C_3	U/D Direct Clutch		3
B_1	2nd Brake		4
B_2	1st & Reverse Brake		5
B_3	U/D Brake		3
F_1	No.1 One-Way Clutch	The No. of Sprags	28
F_2	U/D One-Way Clutch		15
Front Planetary Gear		The No. of Sun Gear Teeth	43
		The No. of Pinion Gear Teeth	17
		The No. of Ring Gear Teeth	77
Rear Planetary Gear		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		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

Motive Power Transaxle

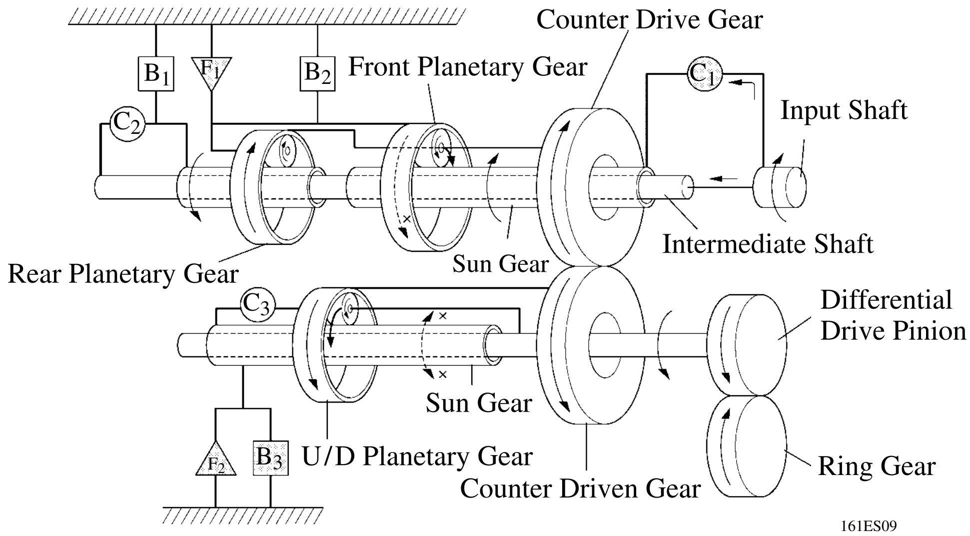
▶ Operating Conditions ◀

Shift Lever Position	Gear	Solenoid Valve SL1	Solenoid Valve SL2	Solenoid Valve S4	Solenoid Valve DSL	C_1	C_2	C_3	B_1	B_2	B_3	F_1	F_2
P	Park	ON	ON	OFF	OFF						○		
R	Reverse	ON	OFF	OFF	OFF		○			○	○		
N	Neutral	ON	ON	OFF	OFF						○		
D	1st	ON	ON	OFF	OFF	○					○	○	○
	2nd	OFF	ON	OFF	OFF	○			○		○		○
	3rd	OFF/ON*	OFF	OFF	OFF	○	○				○		○
	4th	OFF/ON*	OFF	ON	OFF	○	○	○					
2	1st	ON	ON	OFF	OFF	○					○	○	○
	2nd	OFF	ON	OFF	OFF	○			○		○		○
L	1st	ON	ON	OFF	ON	○				○	○	○	○

*: Lock-up ON

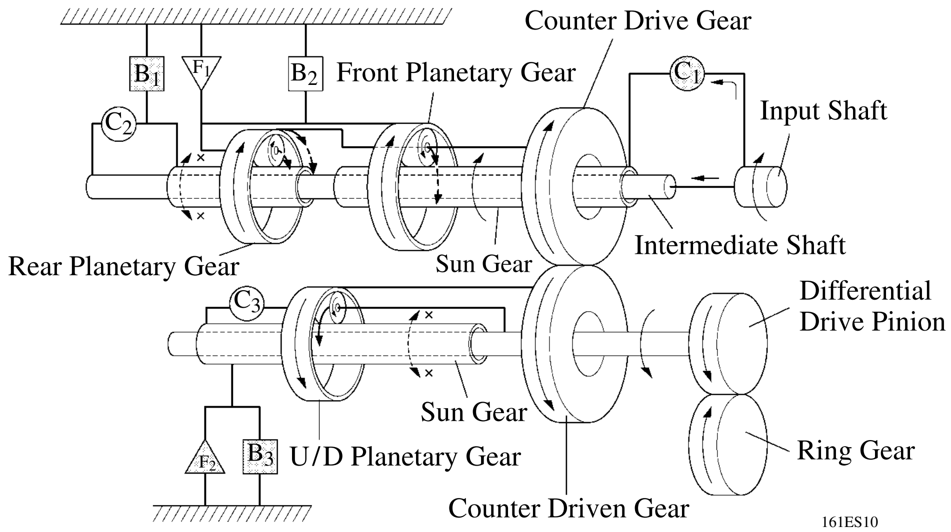
3

1) **1st Gear (D or 2 Position)**



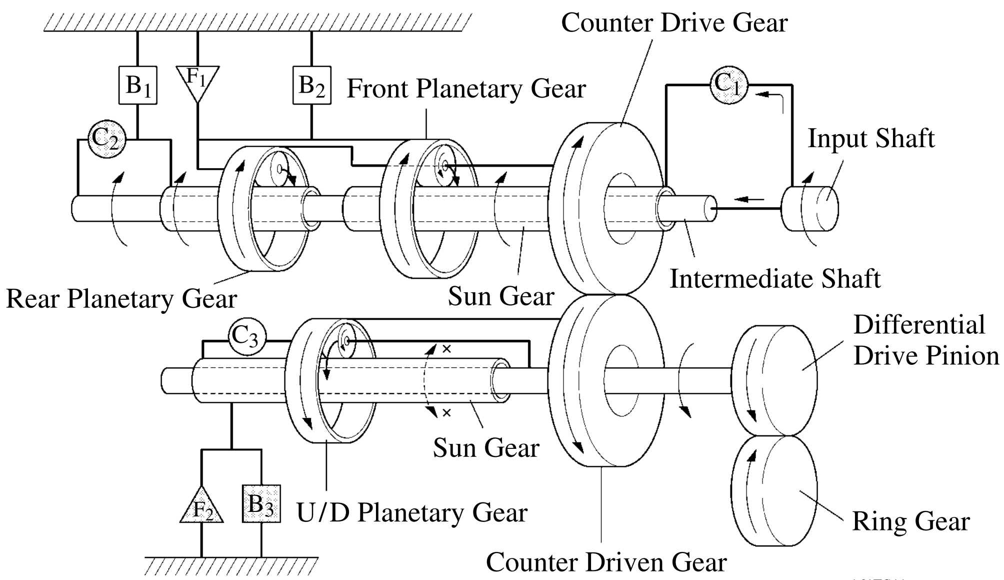
161ES09

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



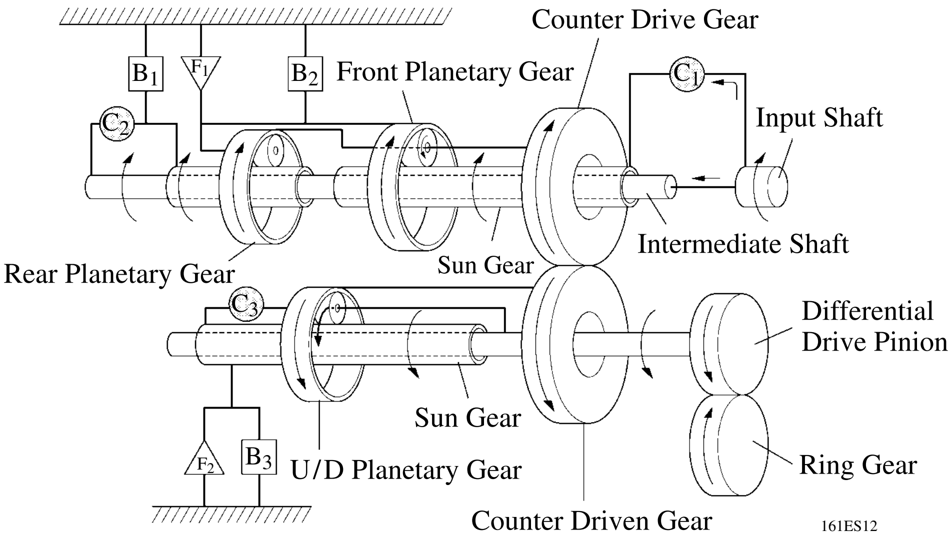
161ES10

3) **3rd Gear (D Position)**

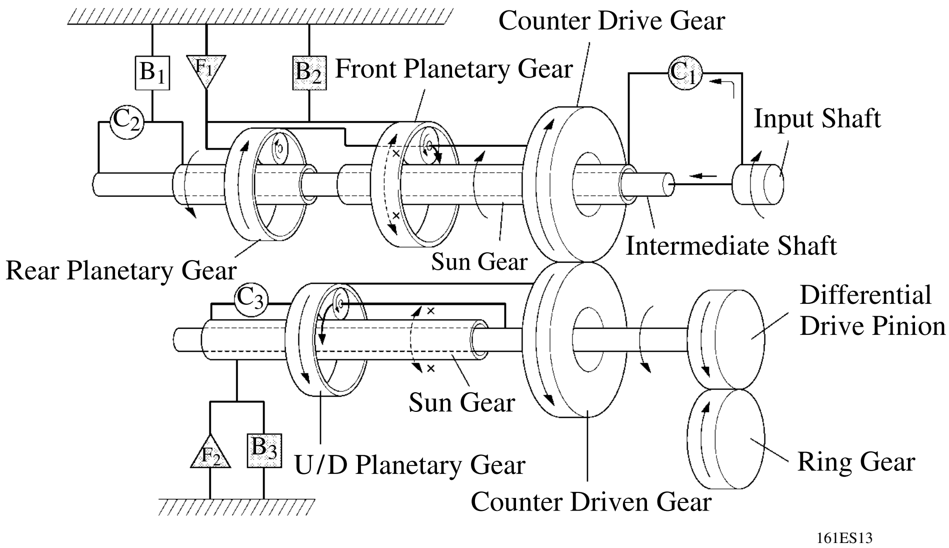


161ES11

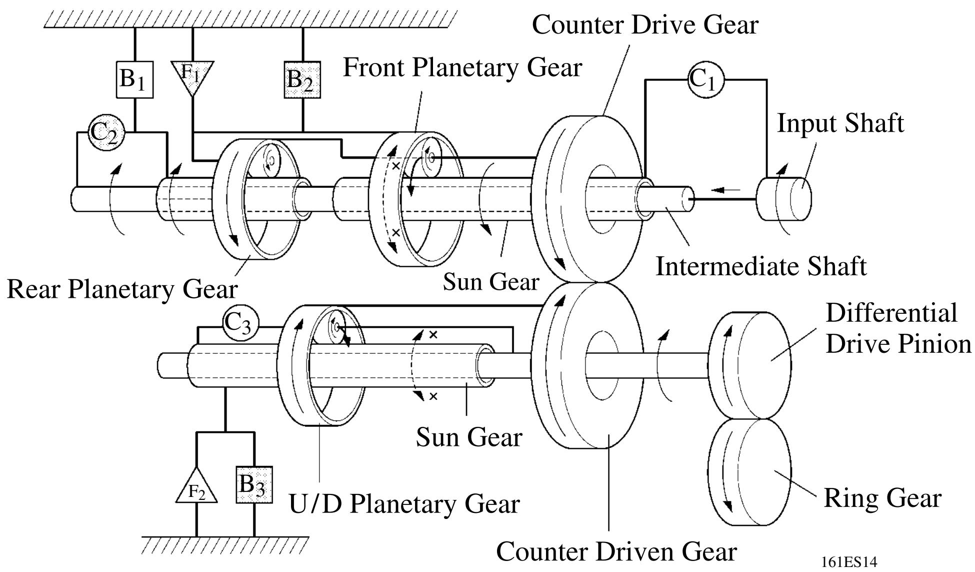
4) 4th Gear (D Position)



5) 1st Gear (L Position)



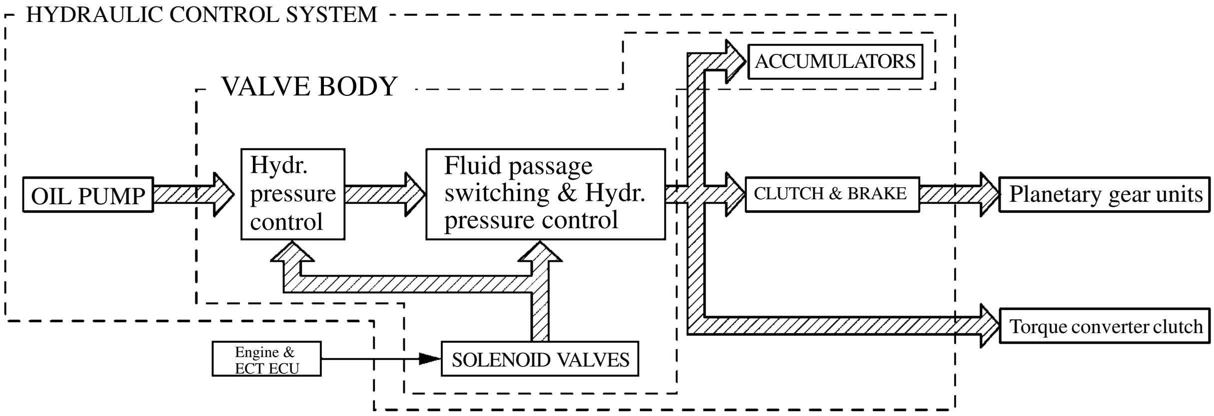
6) Reverse Gear (R Position)



3. Hydraulic Control System

General

The hydraulic control system is composed of the oil pump, the valve body, the solenoid valves, the accumulators, the clutches and brakes as well as the fluid passages which connected all of these components. Based on the hydraulic pressure acting on the torque converter clutch, clutches and brakes in accordance with the vehicle driving conditions.



165CH56

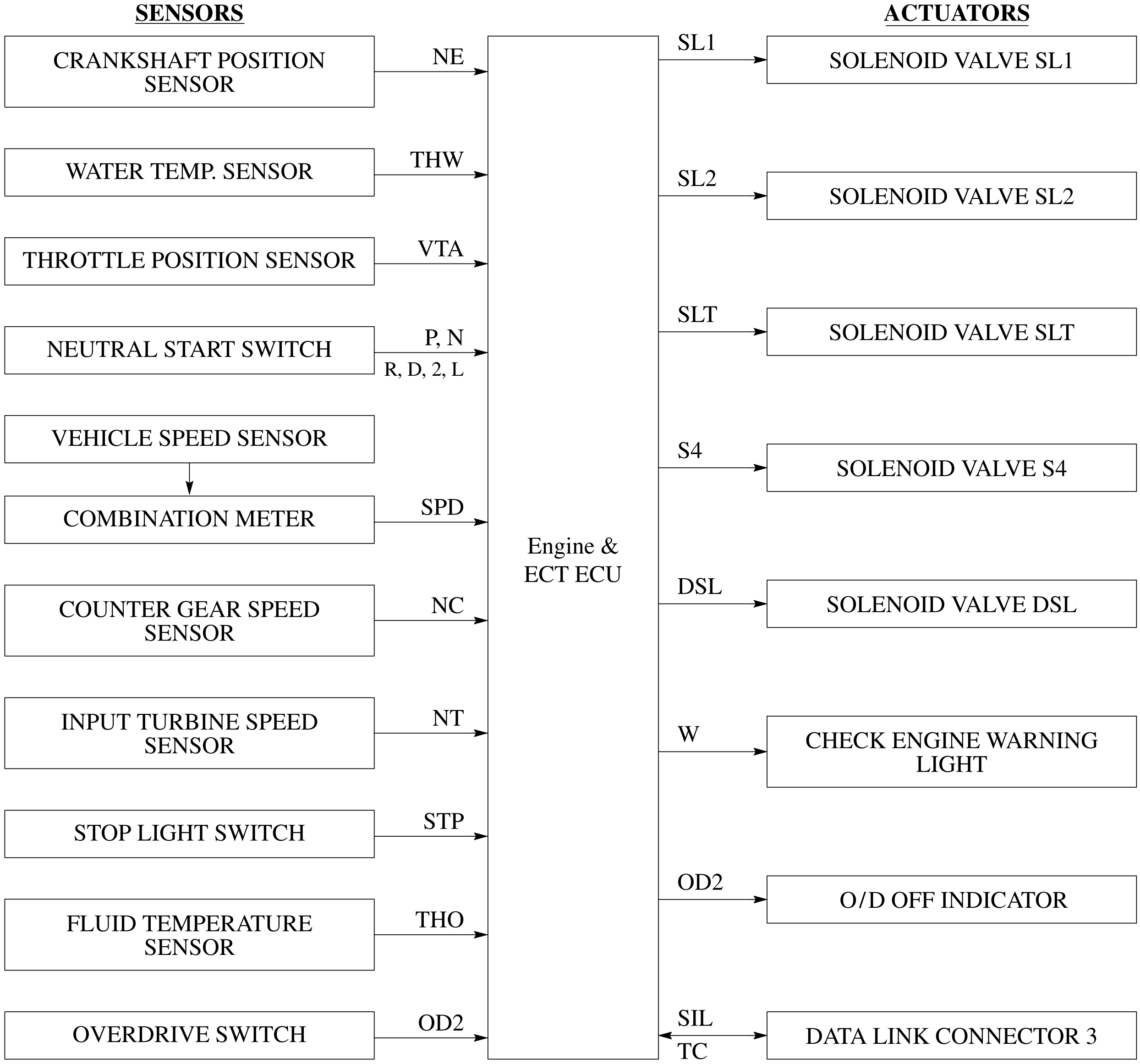
Valve Body

The valve body has a two-stage construction. Also, a compact, lightweight, and highly rigid valve body has been realized. All the solenoid valves are installed in the lower valve body.

4. Electronic Control System

Construction

The configuration of the electronic control system in the U240E automatic transaxle is as shown in the following chart.

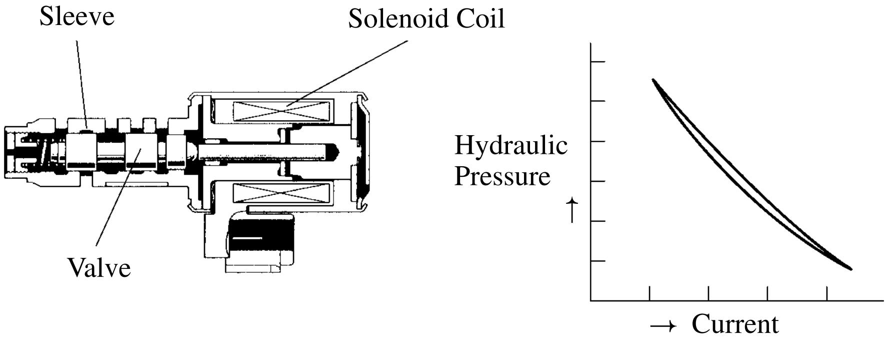


Solenoid Valves

1) Solenoid Valves SL1, SL2 and SLT

a. General

In order to provide a hydraulic pressure that is proportion to current that flows to the solenoid coil, the solenoid valve SL1, SL2 and SLT linearly controls the line pressure based on the signals it receives from the engine & ECT ECU.
The solenoid valves SL1, SL2 and SLT have the same basic structure.



161ES22

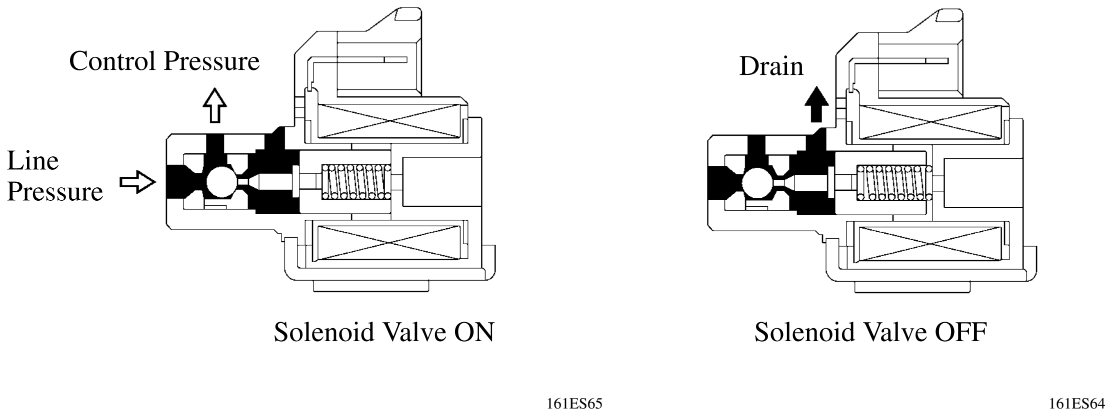
b. Functions of Solenoid Valve SL1, SL2 and SLT

Solenoid Valve	Action	Function
SL1	For clutch engagement pressure control	● B_1 brake pressure control ● Lock-up clutch pressure control
SL2		C_2 clutch pressure control
SLT	For line pressure control	● Line pressure control ● Secondary pressure control

2) Solenoid Valves S4 and DSL

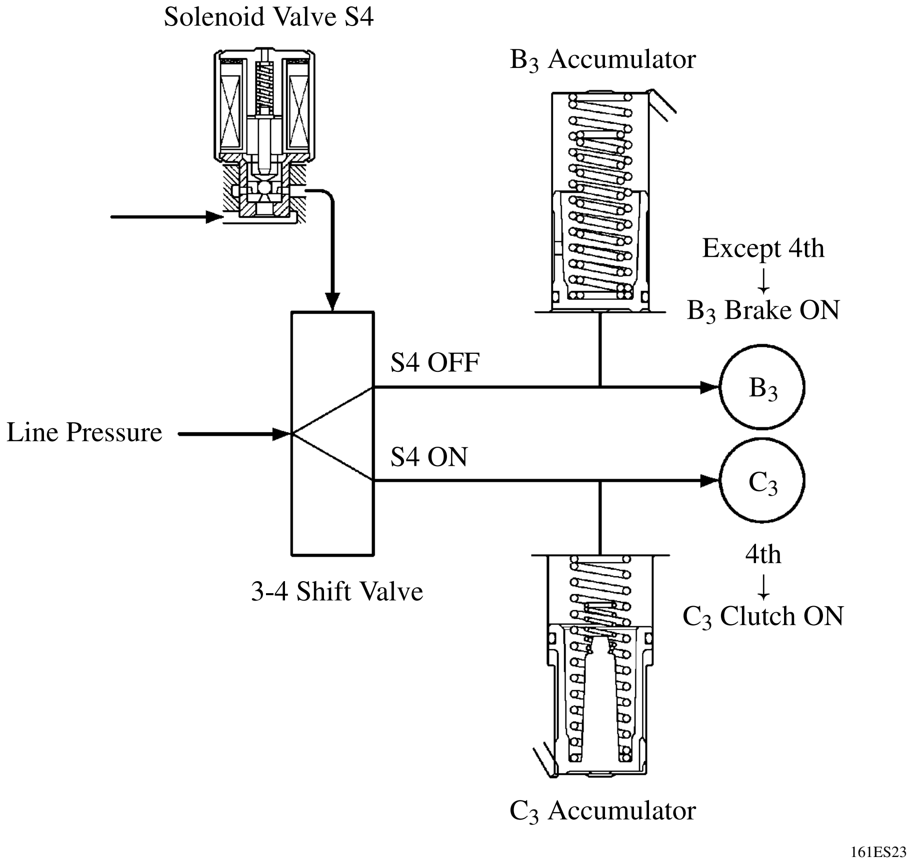
a. General

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



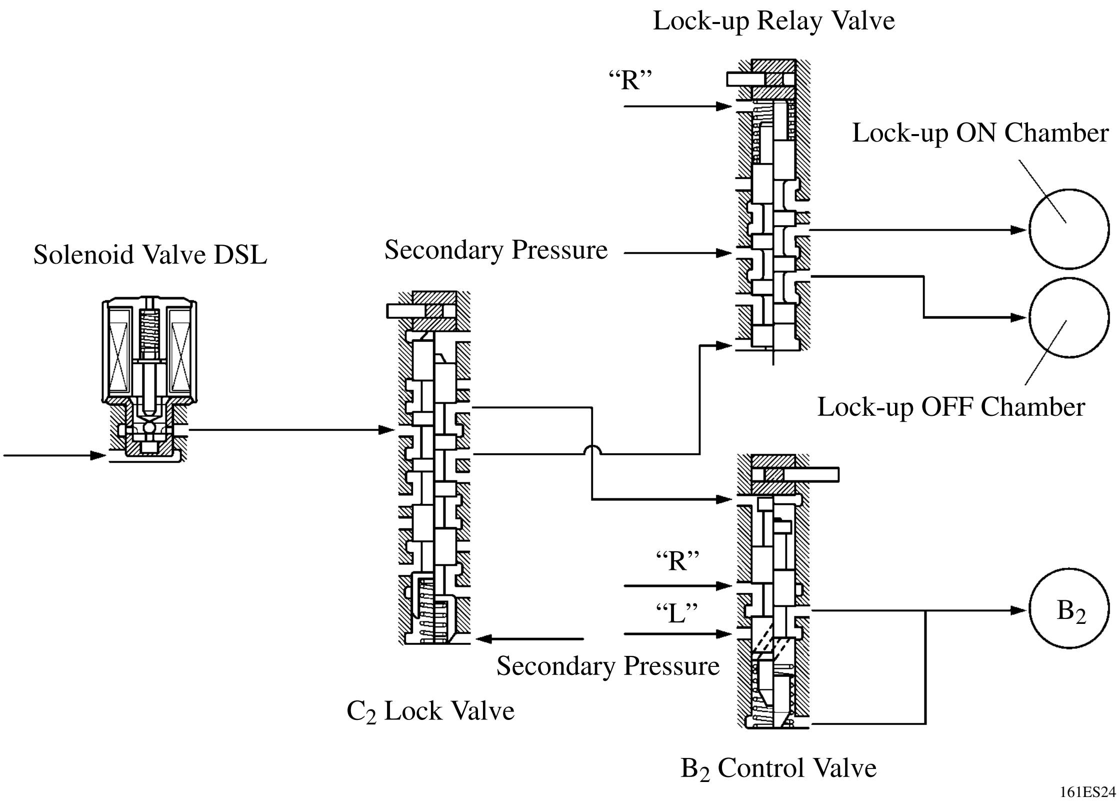
b. Function of Solenoid Valve S4

The solenoid valves S4 when set to ON controls the 3-4 shift valve to establish the 4th by changing over the fluid pressure applied to B_3 brake and C_3 clutch.



c. Function of Solenoid Valve DSL

The solenoid valve DSL controls the B_2 control valve when the transaxle is shifted in the R or L position. During lock-up, the lock-up relay valve is controlled via the C_2 lock valve.



Fluid Temperature Sensor

A fluid temperature sensor is installed inside the valve body for direct detection of the fluid temperature.

Speed Sensors

The U240E automatic transaxle has adopted an input turbine speed sensor (for the NT signal) and a counter gear speed sensor (for the NC signal). Thus, the engine 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.

5. Automatic Transaxle Control System

General

The automatic transaxle control system of the U240E automatic transaxle consists of the control listed below.

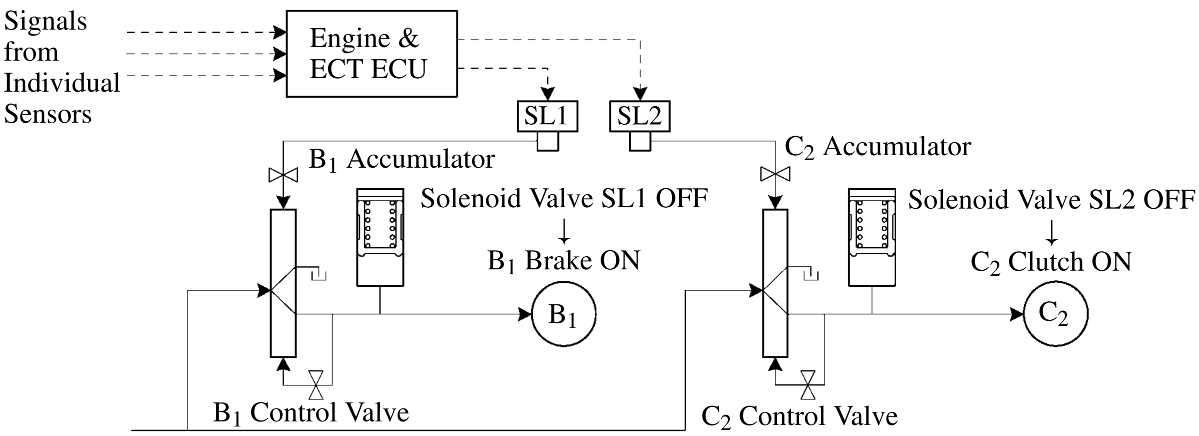
System	Function
Clutch Pressure Control	● Controls the pressure that is applied directly to B_1 brake and C_2 clutch by actuating the shift solenoid valve in accordance with the engine ECU signals. ● The solenoid valves SL1 and SL2 minutely controls the clutch pressure in accordance with the engine output and driving conditions.
Apply Orifice Control	The apply orifice control valve varies the apply orifice to control the flow volume supplied to the B_3 brake.
Centrifugal Fluid Pressure Cancelling Mechanism	Applies an equal pressure from the opposite side to cancel the influence of the pressure that is created by centrifugal force.
Line Pressure Optimal Control	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.
Engine Torque Control	Retards the engine ignition timing temporarily to improve shift feeling during up or down shifting.
Shifting Control in Uphill Traveling	Controls to restrict the 4th upshift by using the engine & ECT ECU to determine whether the vehicle is traveling uphill.
High Response Shift Control	The shift time lag has been reduced to half by the centrifugal fluid pressure cancelling mechanism and clutch pressure optimal control.
Shift Timing Control	The engine & ECT ECU sends current to the solenoid valve SL1 and/or SL2 based on signals from each sensor and shifts the gear.
Lock-Up Timing Control	The engine & ECT ECU sends current to the shift solenoid valve based on signals from each sensor and engages or disengages the lock-up clutch.
“N” to “D” Squat Control	When the shift lever is shifted from “N” to “D” range, the gear is temporarily shifted to 3rd and then to 1st to reduce vehicle squat.

3

Clutch Pressure Control

1) Clutch to Clutch Pressure Control

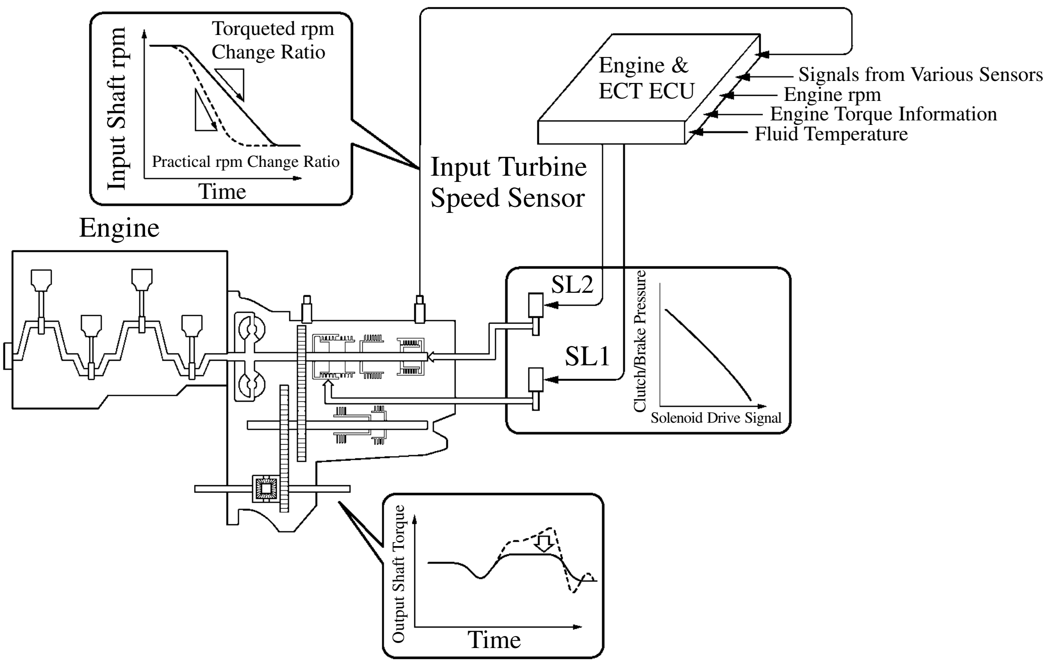
A direct clutch pressure control has been adopted for shifting from the 1st to 2nd gear, and from the 2nd to 3rd gear. Actuates solenoid valves SL1 and LS2 in accordance with the signals from the engine & ECT ECU, and guides this output pressure directly to control valves B_1 and C_2 in order to regulate the line pressure that acts on the B_1 brake and C_2 clutch. As a result, compact B_1 and C_2 accumulators without a back pressure chamber have been realized.



161ES15

2) Clutch Pressure Optimal Control

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



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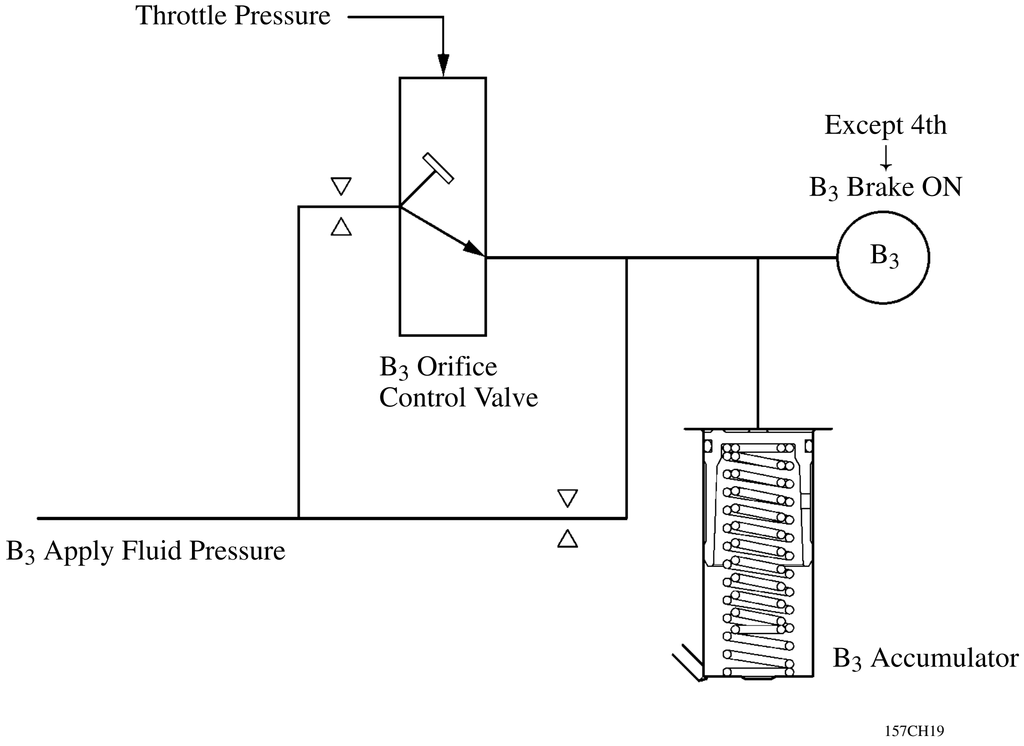
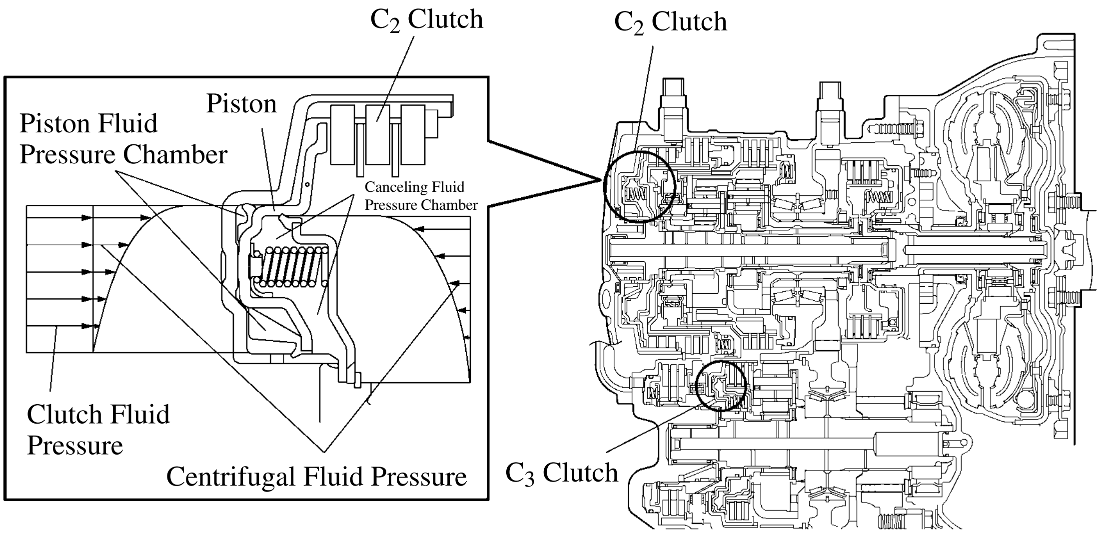
Apply Orifice Control

The B_3 orifice control valve has been provided for the B_3 brake, which is applied when shifting from 4th to 3rd. The B_3 orifice control valve is controlled by the amount of the throttle 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 control valve's apply orifice.

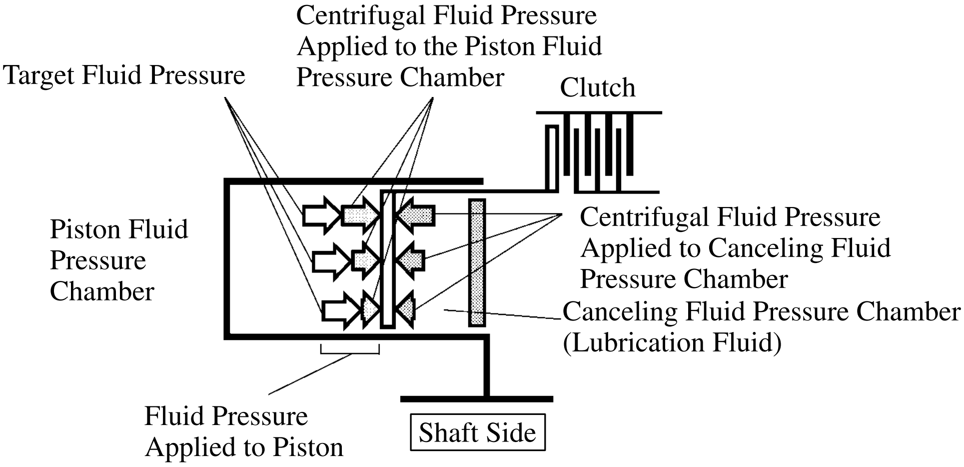


Centrifugal Fluid Pressure Canceling Mechanism

A centrifugal fluid pressure canceling mechanism has been adopted in the C_2 and C_3 clutches that are applied when shifting from 2nd to 3rd and from 3rd to 4th. In the conventional clutch mechanism, to prevent the generation of pressure by the centrifugal force that is applied to the fluid in the piston fluid pressure chamber when the clutch is released, a check ball is provided to discharge the fluid. Therefore, before the clutch can be subsequently applied, it took time for the fluid to fill the piston fluid pressure chamber. During shifting, in addition to the pressure that is controlled by the valve body, the pressure that acts on the fluid in the piston fluid pressure chamber also exerts influence, which is dependent upon rpm fluctuations. In order to eliminate this influence, a canceling fluid pressure chamber is provided opposite to the piston fluid pressure chamber.
By utilizing the lubrication fluid such as that of the shaft, the same amount of centrifugal force is applied, thus canceling 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.



169CH47

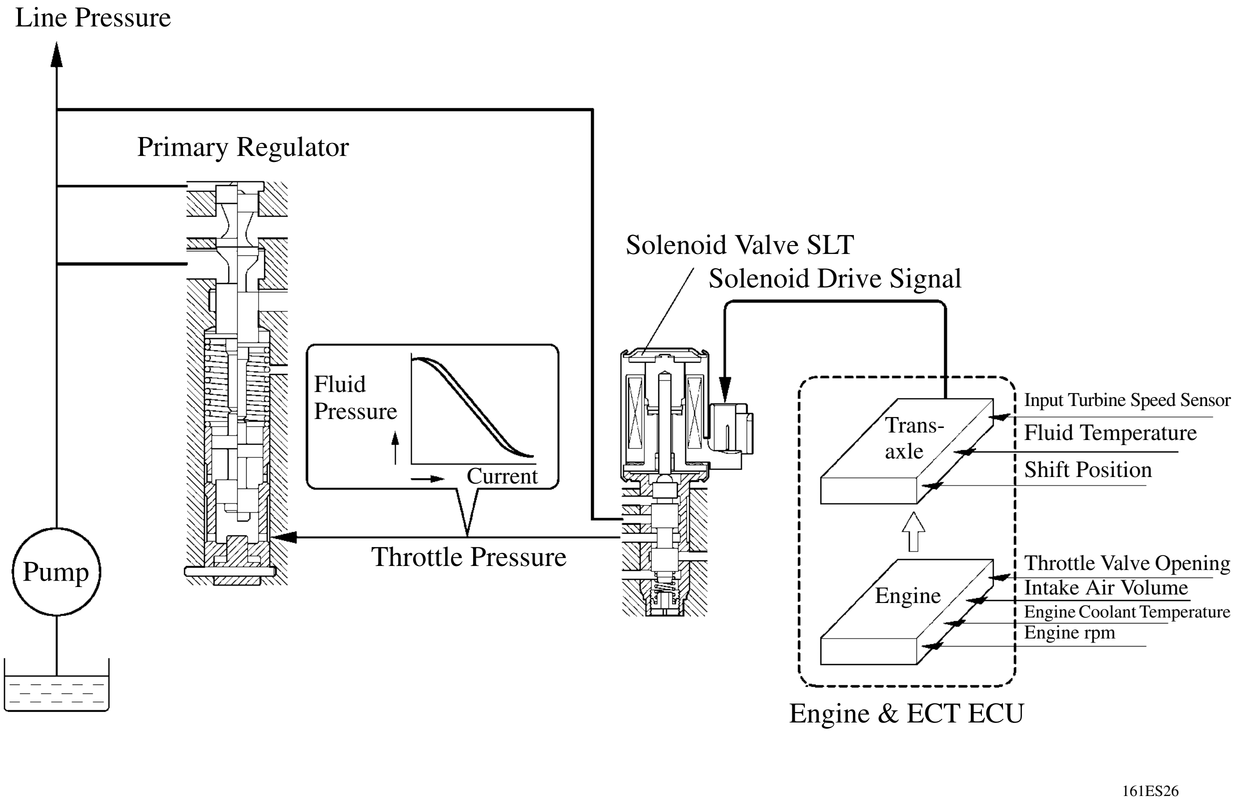


157CH17

Fluid pressure applied to piston	–	Centrifugal fluid pressure applied to canceling fluid pressure chamber	=	Target fluid pressure (original clutch pressure)

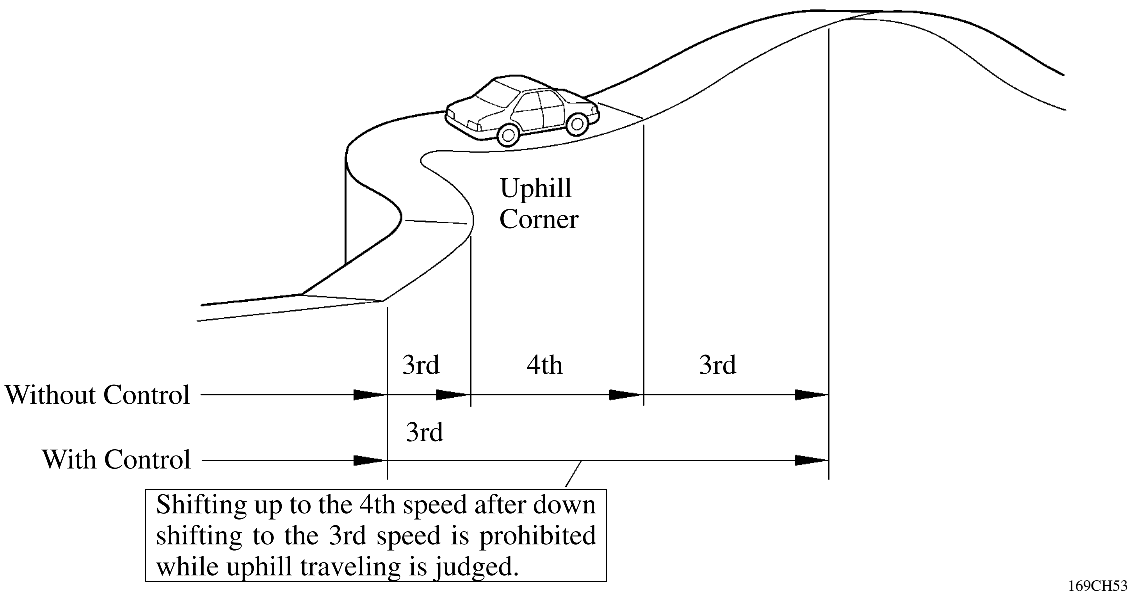
Line Pressure Optimal Control

The line pressure is controlled by using a solenoid valve SLT. Through the use of the 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 controlled minutely in accordance with the engine output, traveling condition, and the ATF temperature, thus realizing smooth shift characteristics and optimizing the workload on the oil pump.



Shifting Control in Uphill Traveling

With shifting control in uphill traveling, the engine & ECT ECU calculates the throttle opening angle and the acceleration rate to determine whether the vehicle is in the uphill. While driving uphill on a winding road with ups and downs, the 4th upshift is restricted to ensure a smooth drive.



High Response Shift Control

Due to the use of the previously mentioned centrifugal fluid pressure canceling mechanism and the clutch pressure optimal control, not only smooth shifting has been achieved, but the shift time lag has been halved to realize excellent response.

6. Fail Safe Function

This function minimizes the loss of operability when any abnormality occurs in each sensor or solenoid. Control is effected as follows if a malfunction occurs in the sensors and solenoids:

- During a speed sensor malfunction, the vehicle speed is detected through the signals from the counter gear speed sensor to effect normal control.
- During a counter gear speed sensor malfunction, 4th upshift is prohibited.
- During an ATF temperature sensor malfunction, 4th upshift is prohibited.
- During a malfunction in the solenoid valve SL1, SL2, or S4, the current to the faulty solenoid valve is cut off and control is effected by operating the normal solenoid valves. Shift control is effected as described in the table below, depending on the faulty solenoid.

When all solenoids are normal				When shift solenoid SL1 is abnormal								When SL2 is abnormal				When S4 is abnormal			
				Traveling 3rd or 4th				Traveling 1st or 2nd											
Solenoid			Gear	Solenoid			Gear	Solenoid			Gear	Solenoid			Gear	Solenoid			Gear
SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4	
ON	ON	OFF	1st	X	ON ↓ OFF	OFF	3rd	X*2	ON	OFF	2nd	ON ↓ OFF	X	OFF	3rd	ON	ON	X	1st
OFF	ON	OFF	2nd	X	ON ↓ OFF	OFF	3rd	X*2	ON	OFF	2nd	OFF	X	OFF	3rd	OFF	ON	X	2nd
OFF/ ON*1	OFF	OFF	3rd	X	OFF	OFF	3rd	X*2	OFF ↓ ON	OFF ↓ ON	3rd	OFF/ ON*1	X	OFF	3rd	OFF/ ON*1	OFF	X	3rd
OFF/ ON*1	OFF	ON	4th	X	OFF	ON	4th	X*2	OFF ↓ ON	ON	3rd	OFF/ ON*1	X	ON	4th	OFF/ ON*1	OFF	X	3rd

When SL1 and SL2 are abnormal				When SL1 and S4 are abnormal								When SL2 and S4 are abnormal				When SL1, SL2 and S4 are abnormal			
				Traveling 3rd or 4th				Traveling 1st or 2nd											
Solenoid			Gear	Solenoid			Gear	Solenoid			Gear	Solenoid			Gear	Solenoid			Gear
SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4		SL1	SL2	S4	
X	X	OFF	3rd	X	ON ↓ OFF	X	3rd	X	ON	X	2nd	ON ↓ OFF	X	X	3rd	X	X	X	3rd
X	X	OFF	3rd	X	ON ↓ OFF	X	3rd	X	ON	X	2nd	OFF	X	X	3rd	X	X	X	3rd
X	X	OFF	3rd	X	OFF	X	3rd	X	OFF ↓ ON	X	2nd	OFF/ ON*1	X	X	3rd	X	X	X	3rd
X	X	ON	4th	X	OFF	X	3rd	X	OFF ↓ ON	X	2nd	OFF/ ON*1	X	X	3rd	X	X	X	3rd

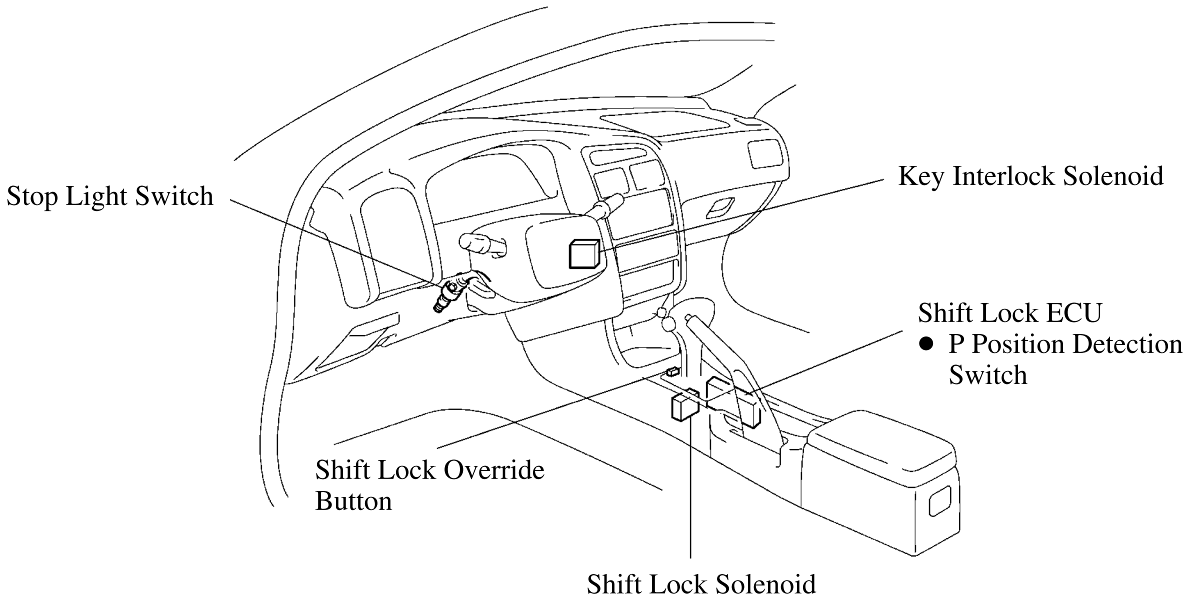
*1: Lock-up ON
*2: B_1 is constantly operating

■ SHIFT LOCK SYSTEM

1. General

A shift lock system that help prevent the unintended operation of the shift lever has been provided.
The shift lock system consists of a key interlock device and shift lock mechanism.

2. Layout of Components



3. Function of Components

Components	Function
P Position Detection Switch	Detects whether or not the shift lever is in P position and sends signals to the shift lock ECU.
Key Interlock Solenoid	Regulates the movement of the ignition key cylinder.
Shift Lock Solenoid	Regulates the operation of the shift lever at P position.
Stop Light Switch	Sends the brake signal to the shift lock ECU.
Shift Lock ECU	Receives inputs of various types of signals and regulates the operation of the two solenoids.

4. Key Interlock Device

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.

5. Shift Lock Mechanism

The shift lock mechanism prevents the shift lever from being shifted out of the “P” position to any other position unless the ignition switch is turned ON and the brake pedal is pressed.
A shift lock override lever, which manually overrides the shift lock mechanism, is provided.

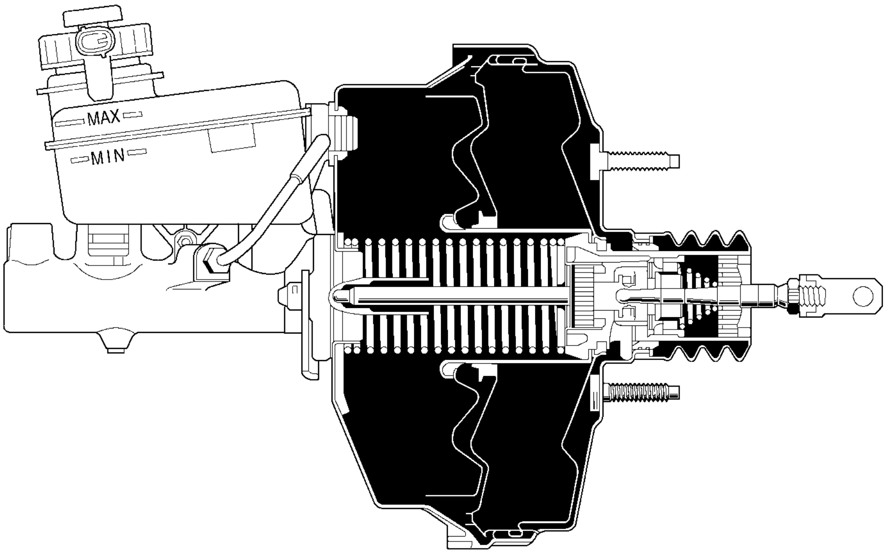
■ BRAKE

1. General

- The 7” + 8” tandem brake booster has been adopted on the 1AZ-FSE engine model as a standard, and on the 1ZZ-FE and 3ZZ-FE engine models as an option.
- EBD (Electronic Brake force Distribution) control has been added to the previous ABS (Antilock Brake System) as standard equipment on all models.
- ABS with EBD & Brake Assist & TRC (Traction Control) & VSC (Vehicle Stability Control) has been provided as standard equipment on the LINEA SOL grade of the 1AZ-FSE engine model and as an option on the LINEA TERRA grade.
  The skid control ECU and the brake actuator have been integrated.

2. Brake Booster

The 7” + 8” tandem brake booster has been adopted to achieve an optimal braking force.



LHD Model

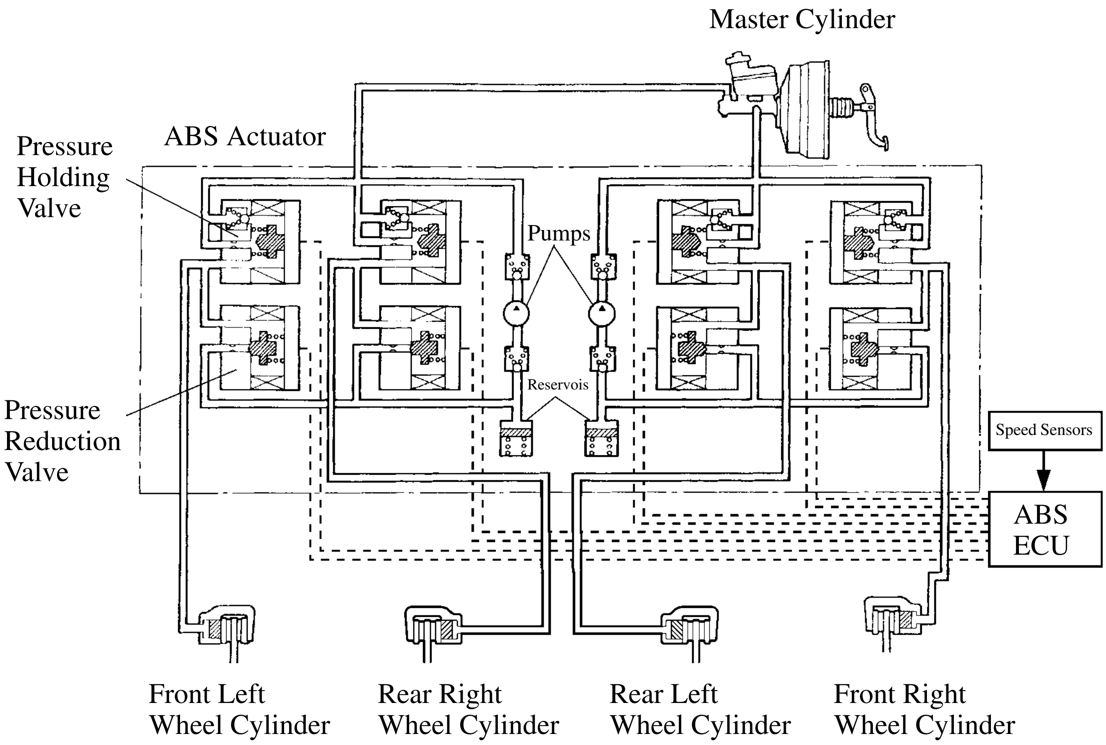
195CH05

3. ABS with EBD

General

ABS equipped with the EBD control has been adopted.
The EBD control utilizes ABS, realizing the proper brake force distribution between front and rear wheels in accordance with the driving conditions.

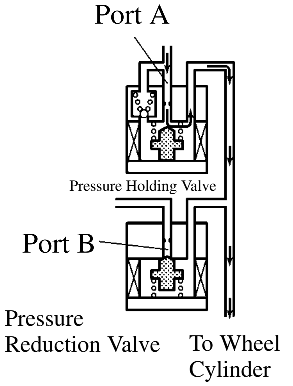
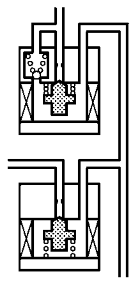
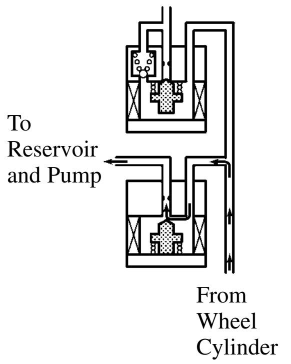
Hydraulic Circuit



195CH06

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 condition. And according to the slipping condition, the ECU controls the pressure holding valve and pressure reduction valve in order to adjust the fluid pressure of each wheel cylinder in the following 3 modes: pressure reduction, pressure holding, and pressure increase modes.

Not Activated	Normal Braking	—	—
Activated	Pressure Increase Mode	Pressure Holding Mode	Pressure Reduction Mode
Hydraulic Circuit	 169CH54	 169CH55	 169CH56
Pressure Holding Valve (Port A)	OFF (Open)	ON (Close)	ON (Close)
Pressure Reduction Valve (Port B)	OFF (Close)	OFF (Close)	ON (Open)
Wheel Cylinder Pressure	Increase	Hold	Reduction

Self Diagnosis

If the skid control ECU detects a malfunction in the ABS or EBD control, the warning lights will turn on.

The ECU will also store the code of the malfunctions. See the AVENSIS Chassis & Body Repair Manual Supplement (Pub. No. RM781E) for the diagnostic trouble code check method, diagnostic code and diagnostic code clearance.

Fail Safe

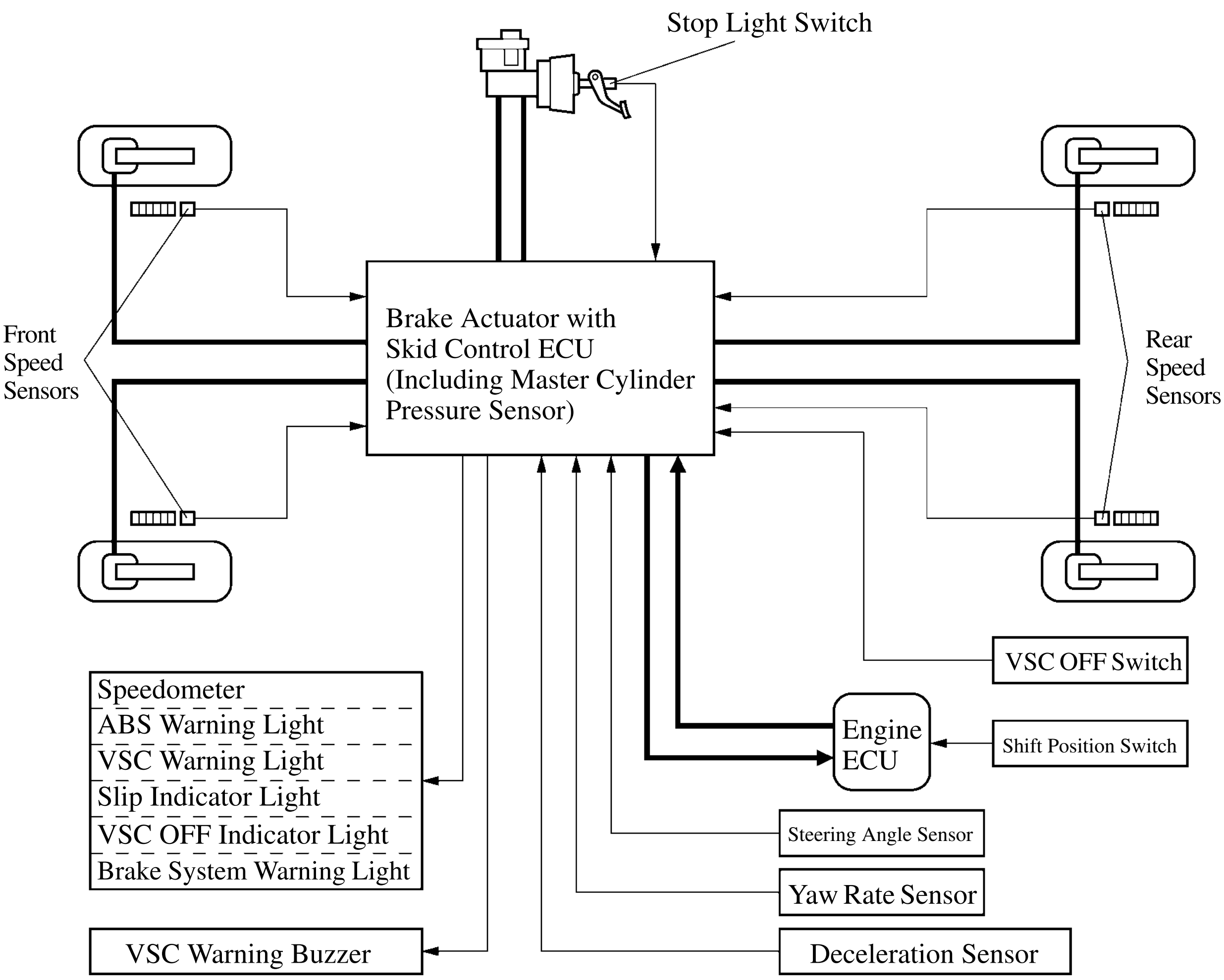
In the event of a malfunction in the ABS, the skid control ECU turns on the ABS warning light and prohibits the ABS control. In the case of the malfunction that the EBD control can not be carried out, the ABS ECU also turns on the brake system warning light and prohibits the EBD control.

4. ABS with EBD & Brake Assist & TRC & VSC System

General

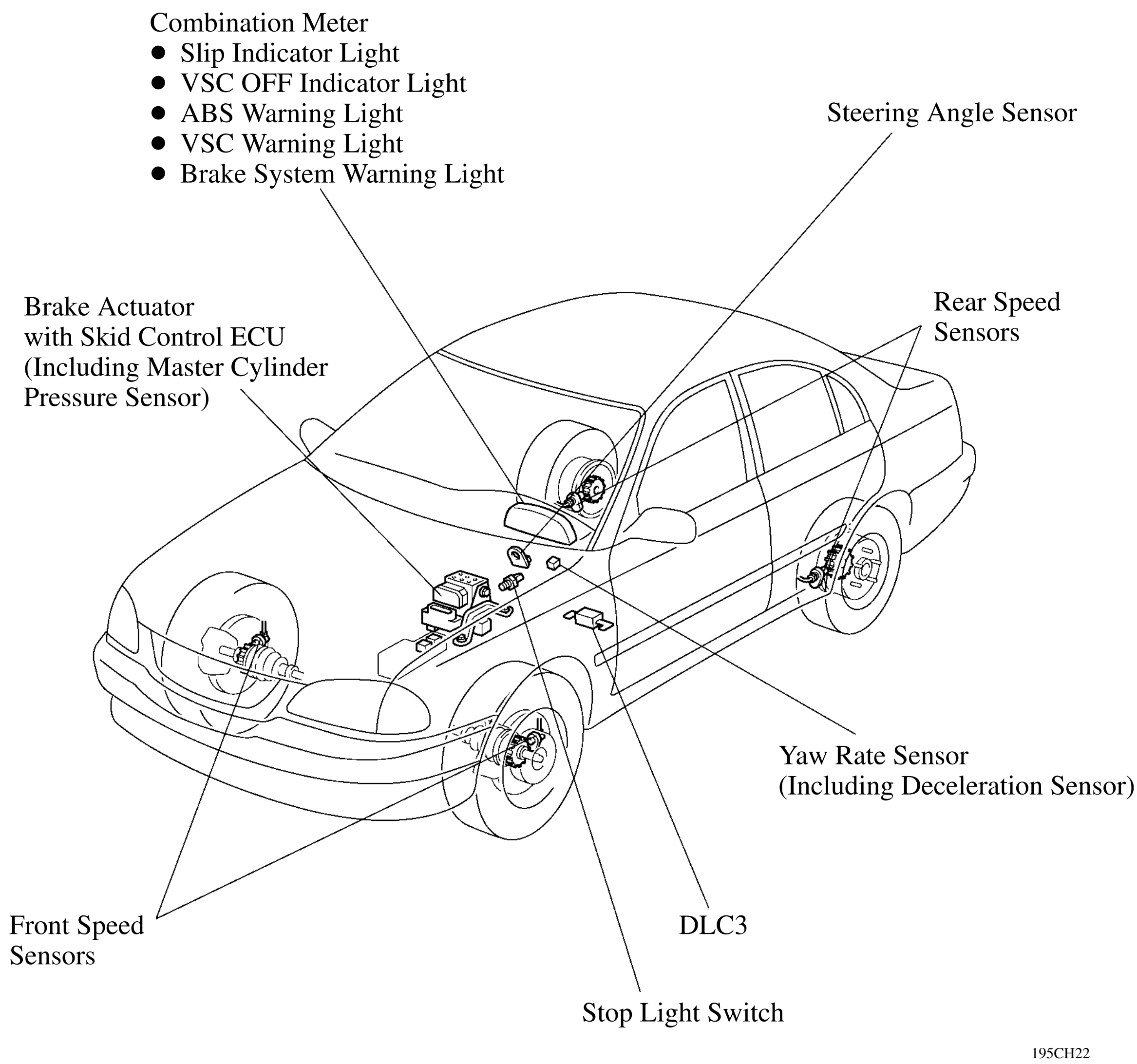
- The primary purpose of the ABS and TRC system has been to help the vehicle's stability during braking and acceleration. In contrast, the purpose of the VSC system is to help the vehicle's stability during cornering.
- Ordinarily, the vehicle corners in a stable manner in accordance with the steering operation. However, depending on the unexpected situations or external elements such as the ground surface conditions, vehicle speed, and emergency avoidance maneuvers, the vehicle may exhibit strong understeer or oversteer tendencies. In such situations, the VSC system dampens the strong understeer or oversteer to help vehicle stability.
- The primary purpose of the Brake Assist system is to provide an auxiliary brake force assist to the driver who cannot generate a large brake force during emergency braking, thus maximizing the vehicle's brake performance.
- The EBD control utilizes ABS, realizing the proper brake force distribution between front and rear wheels in accordance with the driving conditions.

System Diagram



195CH07

Layout of Main Components



Function of Main Components

Components		Function
Warning Light and Indicator Light	ABS Warning Light	Lights up to alert the driver when the ECU detects the malfunction in the ABS or Brake Assist System.
	VSC Warning Light	Lights up to alert the driver when the ECU detects the malfunction in the TRC or VSC system.
	Slip Indicator Light	Blinks to inform the driver when the TRC system or the VSC system is operated.
	VSC OFF Indicator Light	Lights up to inform the driver when the TRC and VSC system is turned OFF by the VSC OFF switch. When the skid control ECU detects the malfunction in the TRC or VSC system.
	Brake System Warning Light	Lights up together with the ABS warning light to alert the driver when the ECU detects the malfunction not only in the ABS but also in the EBD control.
Engine ECU		Sends the throttle valve opening angle signal, shift position signal, etc., to the skid control ECU.
Skid Control ECU		Judges the vehicle driving condition based on signals from each sensor, and sends brake control signal to the brake actuator. Also transmits the control information to the engine ECU.
Brake Actuator		Changes the fluid path based on the signals from the skid control ECU during the operation of the ABS with EBD & Brake Assist & TRC & VSC system, in order to control the fluid pressure that is applied to the wheel cylinders.
Speed Sensors		Detect the wheel speed of each of four wheels.
Master Cylinder Pressure Sensor		Assembled in the brake actuator and detects the master cylinder pressure.
Control Relay	Pump Motor Relay	Controls the pump motor operation in the actuator.
	Solenoid Relay	Supply power to the solenoid valves in the actuator.
VSC OFF Switch		Turns the TRC and VSC system inoperative.
VSC Warning Buzzer		Emits an intermittent sound to inform the driver that the ECU detects the strong understeer tendency or strong oversteer tendency.
Stop Light Switch		Detects the brake depressing signal.
Yaw Rate Sensor		Detects the vehicle’s yaw rate.
Deceleration Sensor		Detects the vehicle’s acceleration in the lateral directions.
Steering Angle Sensor		Detects the steering direction and angle of the steering wheel.

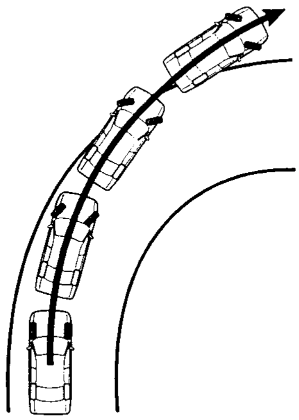
3

Outline of VSC System

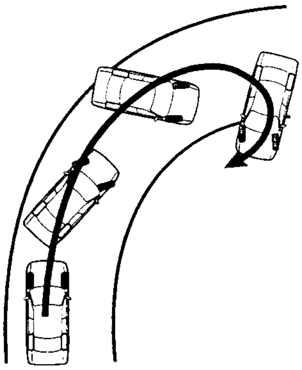
1) General

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

- When the front wheels lose grip in relation to the rear wheels (strong understeer tendency).
- When the rear wheels lose grip in relation to the front wheels (strong oversteer tendency).



Strong Understeer Tendency



Strong Oversteer Tendency

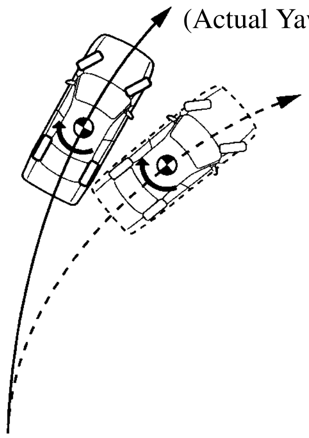
2) Method for Determining the Vehicle Condition

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

a. Determining Understeer

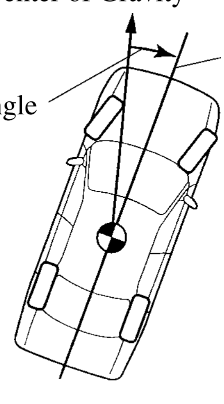
Whether or not the vehicle is in the state of understeer is determined by the difference between the target yaw rate and the vehicle's actual yaw rate.

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



b. Determining Oversteer

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

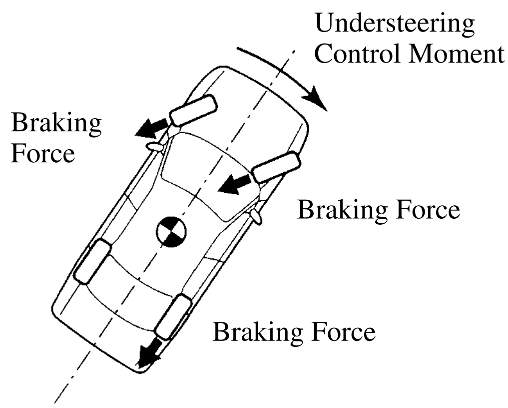


3) Method of VSC Operation

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

a. Dampening a Strong Understeer

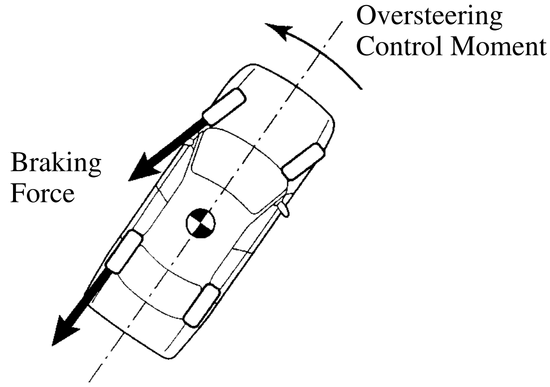
When the skid control ECU determines that the vehicle exhibits a strong tendency to understeer, depending on the extent of that tendency, it controls the engine output and applies the brakes of the front wheels and inside rear wheel, thus providing the vehicle with an understeer control moment, which helps dampen its tendency to understeer. Also, depending on whether the brakes are ON or OFF and the condition of the vehicle, there are circumstances in which the brakes might not be applied to the wheels even if those wheels are targeted for braking.



Making a Right Turn

b. Dampening a Strong Oversteer

When the skid control ECU determines that the vehicle exhibits a strong tendency to oversteer, depending on the extent of that tendency, it controls the engine output and applies the brakes of the front and rear wheels of the outside of the turn, thus generating an inertial moment in the vehicle's outward direction, which helps dampen its tendency to oversteer.



Making a Right Turn

Outline of Brake Assist System

Brake Assist interprets a quick push of the brake pedal as emergency braking and supplements the braking power applied if the driver has not stepped hard enough on the brake pedal.
In emergencies, drivers, especially inexperienced ones, often panic and do not apply sufficient pressure on the brake pedal.
Brake Assist system measures the speed and force with which the brake pedal is pushed to determine whether the driver is attempting to brake rapidly, and applies additional pressure to maximize braking performance of both conventional brakes and ABS equipped brakes.
A key feature of Brake Assist is that the timing 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 reduce the amount of assistance it provides.

– REFERENCE –

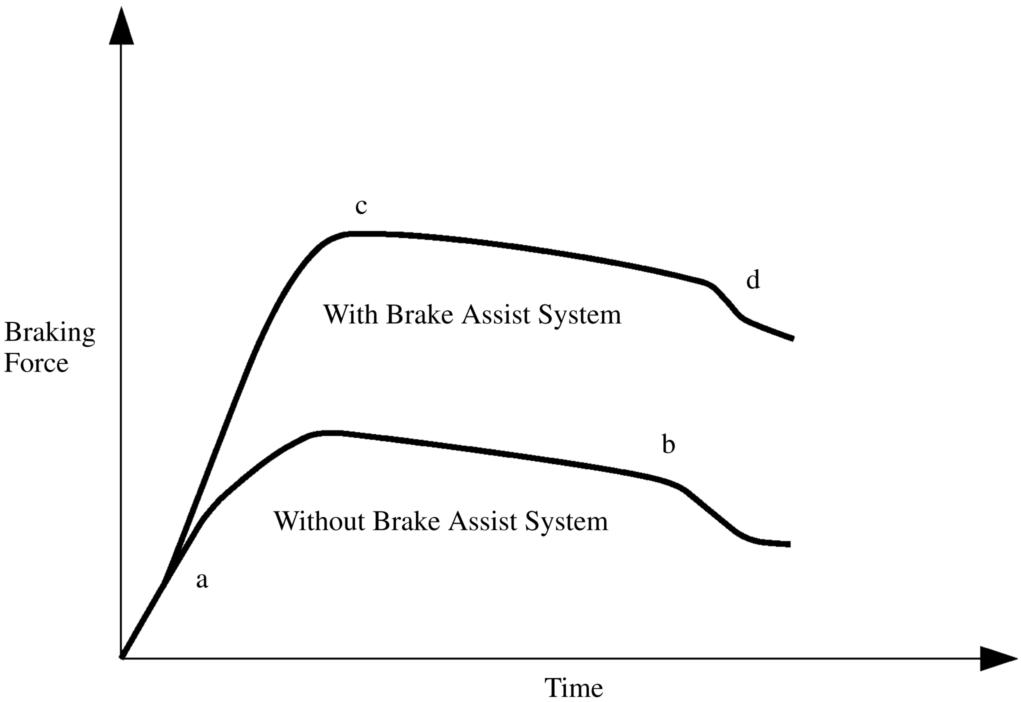
Effectiveness of the Brake Assist Operation:

a. During emergency braking, an inexperienced driver, or a driver in a state of panic might not be able to firmly depress the brake pedal, although driver can depress it quickly. As a result, only a small amount of brake force is generated.

b. The pedal effort of this type of driver might weaken as time passes, causing a reduction in the braking force.

c. Based on how quickly the brake pedal is depressed, the Brake Assist operation assesses the intention of the driver to apply emergency braking and increases the brake force.

d. After the Brake Assist operation, if the driver intentionally releases the brake pedal, the assist operation reduces the amount of Brake Assist in order to reduce the feeling of uneasiness.

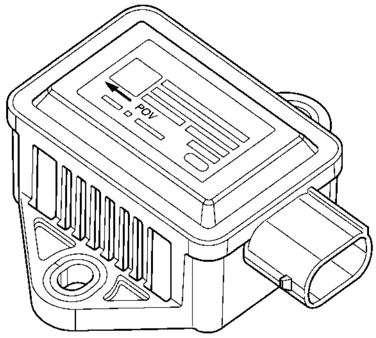


170CH18

Construction and Operation of Main Components

1) Yaw Rate Sensor

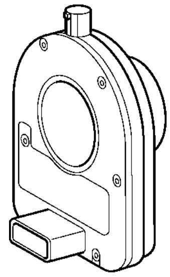
A deceleration sensor is built into the yaw rate sensor. This sensor detects the yaw rate and deceleration, and sends this signal to the Skid Control ECU.



195CH24

2) Steering Angle Sensor

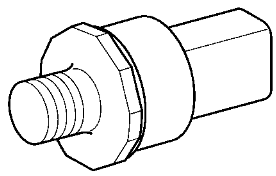
The steering angle sensor detects the steering direction and angle, and sends this signal to the skid control ECU.



195CH08

3) Master Cylinder Pressure Sensor

The master cylinder pressure sensor detects the hydraulic pressure that is generated in accordance with the pedal effort applied to the brake pedal and outputs the signals to the skid control ECU.



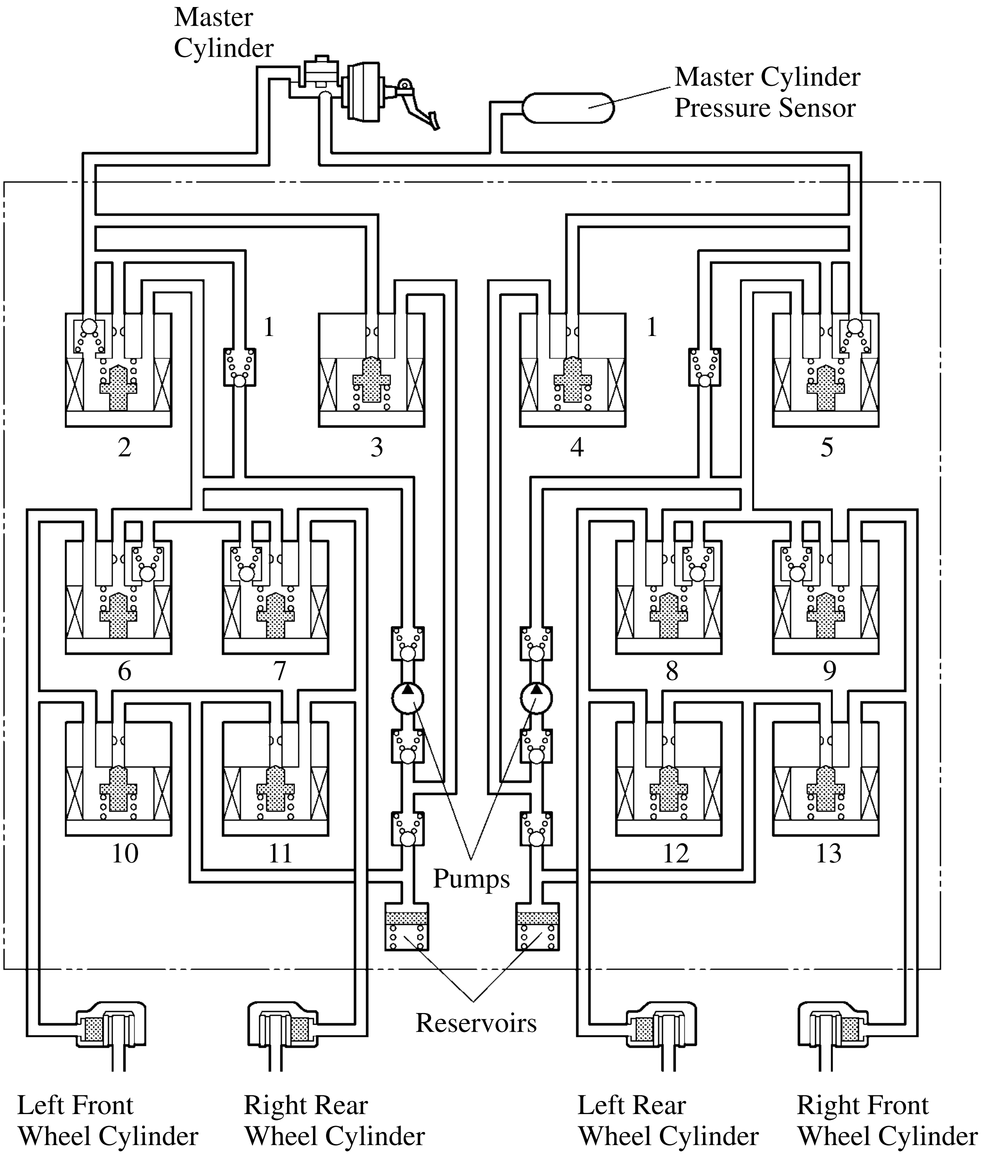
195CH09

4) Brake Actuator (ABS with EBD & Brake Assist & TRC & VSC Actuator)

a. Construction

The brake actuator consists of 12 two-position solenoid valves, 1 motor 2 pumps, 2 reservoirs and 2 pressure regulator valves (1). The 12 two-position solenoid valves consist of 2 master cylinder cut solenoid valves (2, 5), 2 reservoir cut solenoid valves (3, 4), 4 pressure holding valves (6, 7, 8, 9) and 4 pressure reduction valves (10, 11, 12, 13).
Pressure regulator valves (1) are assembled into the master cylinder cut solenoid valve (3, 5).

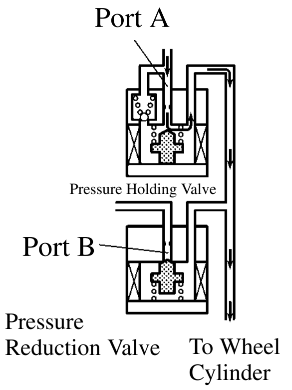
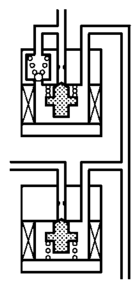
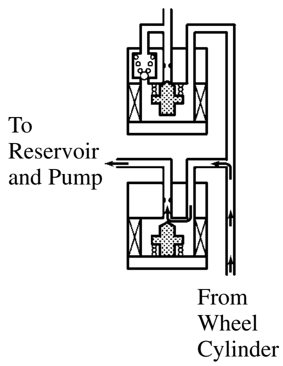
b. Hydraulic Circuit



195CH10

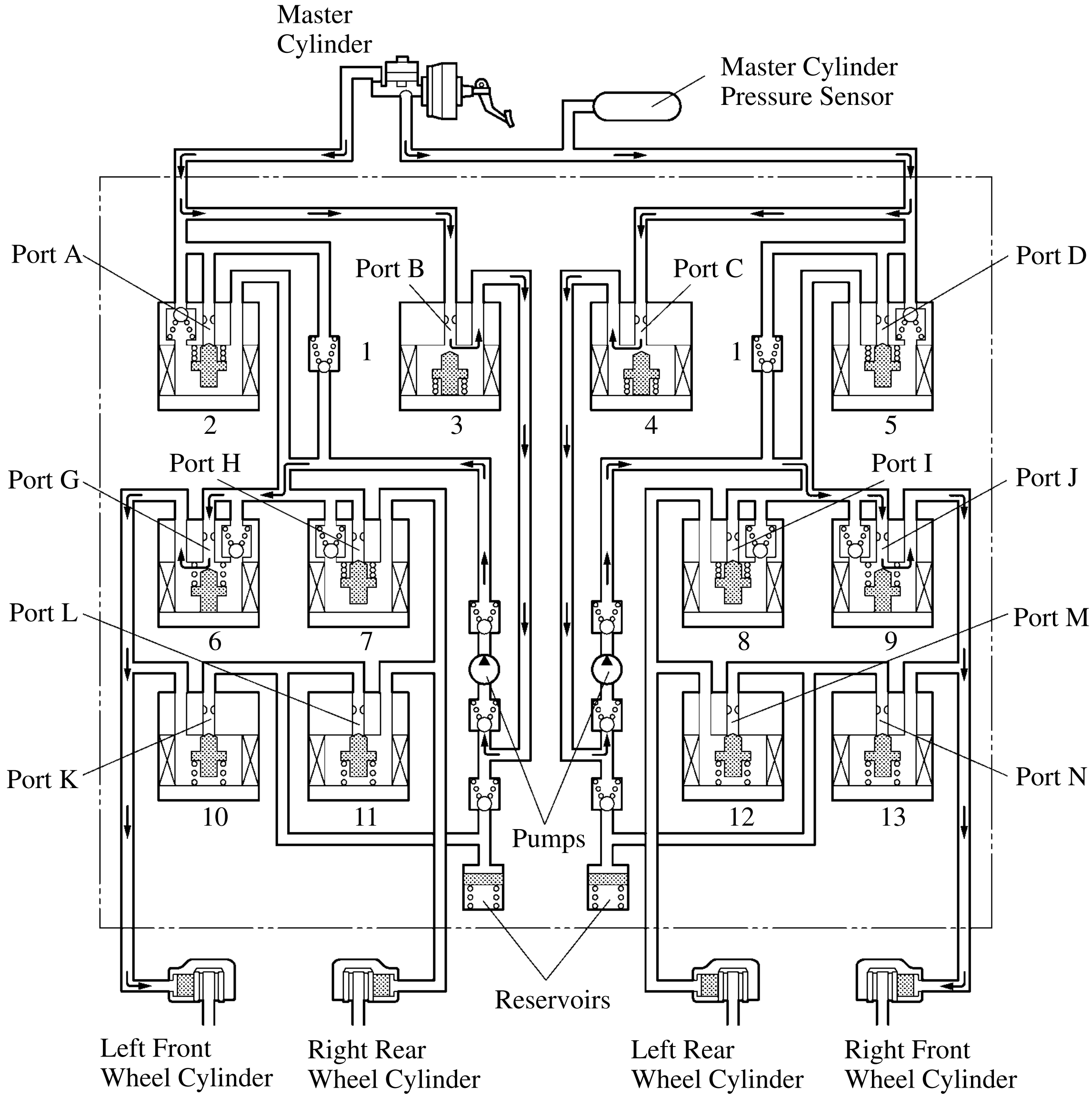
c. ABS with EBD Operation

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 condition. And according to the slipping condition, the ECU controls the pressure holding valve and pressure reduction valve in order to adjust the fluid pressure of each wheel cylinder in the following 3 modes: pressure reduction, pressure holding, and pressure increase modes.

Not Activated	Normal Braking	—	—
Activated	Pressure Increase Mode	Pressure Holding Mode	Pressure Reduction Mode
Hydraulic Circuit	 169CH54	 169CH55	 169CH56
Pressure Holding Valve (Port A)	OFF (Open)	ON (Close)	ON (Close)
Pressure Reduction Valve (Port B)	OFF (Close)	OFF (Close)	ON (Open)
Wheel Cylinder Pressure	Increase	Hold	Reduction

d. TRC Operation

The fluid pressure that is generated by the pump, is regulated by the pressure regulator valve to the required pressure. Thus, the wheel cylinder of the drive wheel (front wheels) are controlled in the following 3 modes : pressure reduction, pressure holding, and pressure increase modes, to restrain the slippage of the drive wheels. The diagram below shows the hydraulic circuit in the pressure increase mode when the TRC operation is activated. In other operating modes, the pressure holding valve and the pressure reduction valve are turned ON/OFF according to the ABS operation pattern described on the previous page.



Increase Mode

Item			TRC Not Activated	TRC Activated		
				Pressure Increase Mode	Pressure Holding Mode	Pressure Reduction Mode
2	Master Cylinder Cut Solenoid Valve (Front and Rear)		OFF	ON	ON	ON
5	Port: A, D		Open	Close	Close	Close
3	Reservoir Cut Solenoid Valve (Front and Rear)		OFF	ON	ON	ON
4	Port: B, C		Close	Open	Open	Open
6	Pressure Holding Valve (Front)		OFF	OFF	ON	ON
9	Port: G, J		Open	Open	Close	Close
7	Pressure Holding Valve (Rear)		OFF	ON	ON	ON
8	Port: H, I		Open	Close	Close	Close
10	Pressure Reduction Valve (Front)		OFF	OFF	OFF	ON
13	Port: K, N		Close	Close	Close	Open
11	Pressure Reduction Valve (Rear)		OFF	OFF	OFF	OFF
12	Port: L, M		Close	Close	Close	Close
Wheel Cylinder Pressure		Front Wheels	—	Increase	Hold	Reduction
		Rear Wheels	—	—	—	—

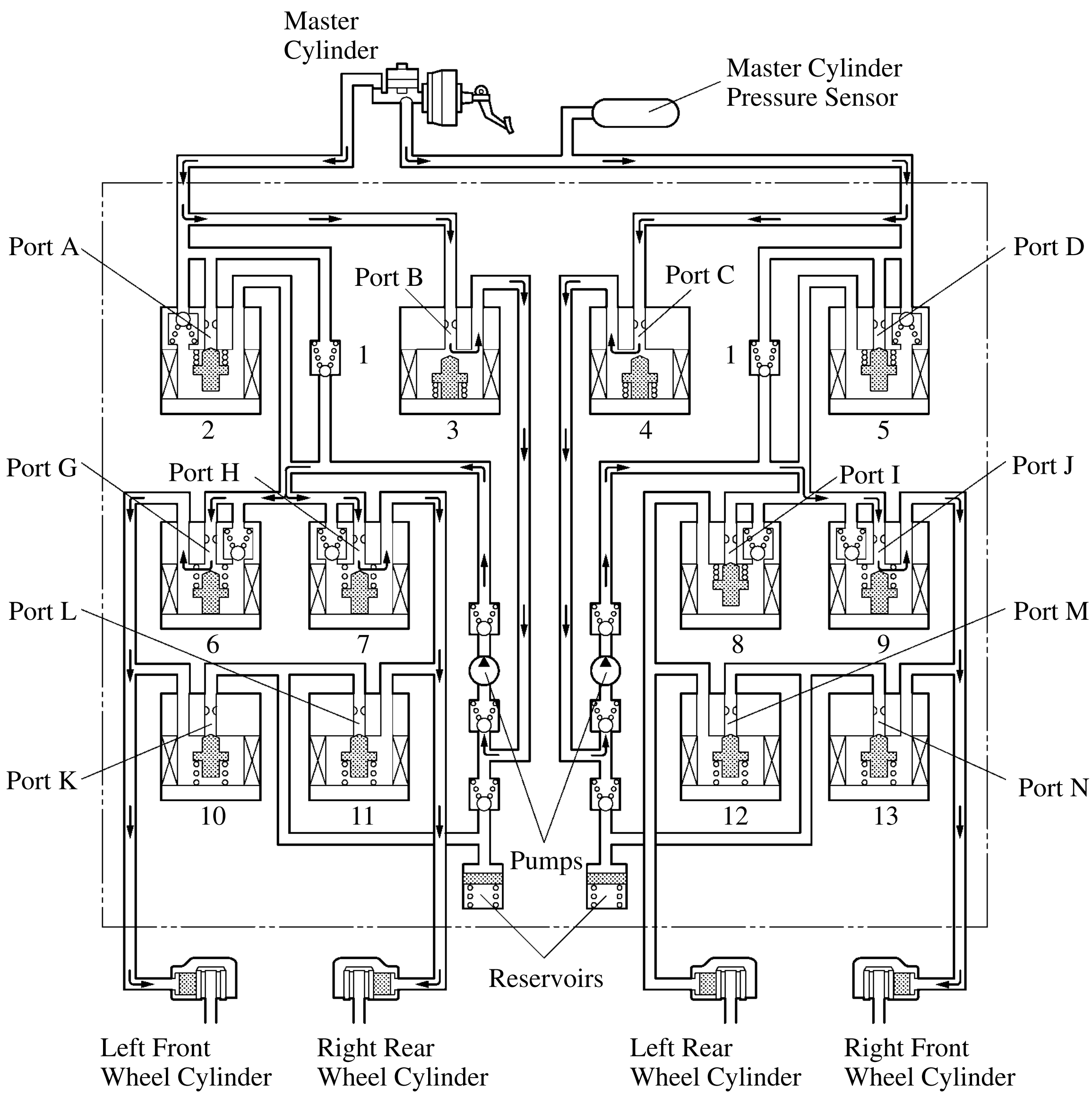
e. VSC Operation

General

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

Understeer Restraining Control

In understeer restraining control, the brakes of the front wheels and rear wheel of the inner side of the turn is applied. Also, depending on whether the brake is ON or OFF and the condition of the vehicle, there are circumstances in which the brake might not be applied to the wheels even if those wheels are targeted for braking. The diagram below shows the hydraulic circuit in the pressure increase mode, as it restrains an understeer condition while the vehicle makes a right turn.
In other operating modes, the pressure holding valve and the pressure reduction valve are turned ON/OFF according to the ABS operation pattern.



Increase Mode

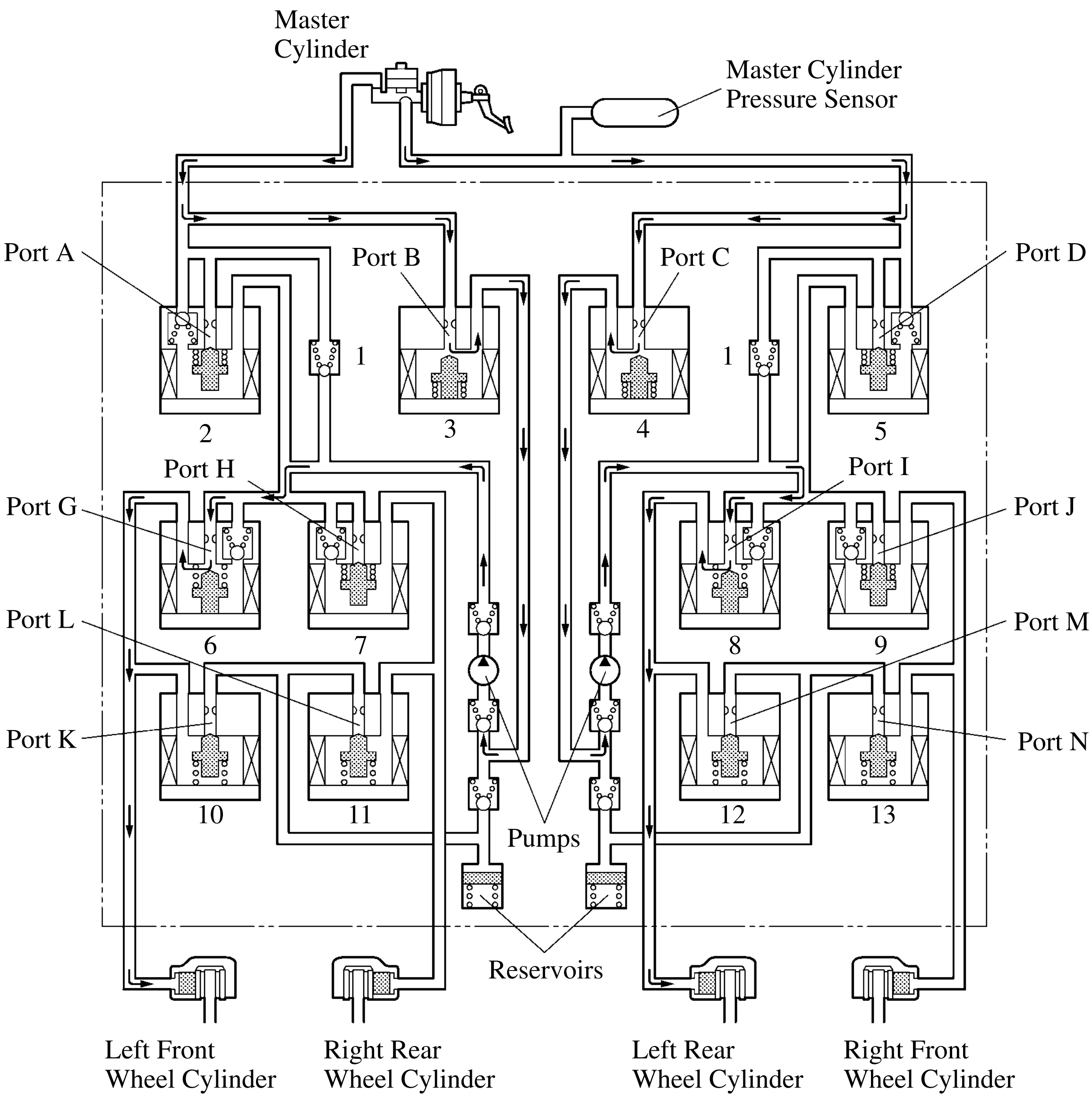
▶ **While the Vehicle Makes a Right Turn** ◀

Item			VSC Not Activated	VSC Activated		
				Pressure Increase Mode	Pressure Holding Mode	Pressure Reduction Mode
2 5	Master Cylinder Cut Solenoid Valve (Front and Rear)		OFF	ON	ON	ON
	Port: A, D		Open	Close	Close	Close
3 4	Reservoir Cut Solenoid Valve (Front and Rear)		OFF	ON	ON	ON
	Port: B, C		Close	Open	Open	Open
6 7 9	Pressure Holding Valve (Left and Right Front, Right Rear)		OFF	OFF	ON	ON
	Port: G, H, J		Open	Open	Close	Close
8	Pressure Holding Valve (Left Rear)		OFF	ON	ON	ON
	Port: I		Open	Close	Close	Close
10 11 13	Pressure Reduction Valve (Left and Right Front, Right Rear)		OFF	OFF	OFF	ON
	Port: K, L, N		Close	Close	Close	Open
12	Pressure Reduction Valve (Left Rear)		OFF	OFF	OFF	OFF
	Port: M		Close	Close	Close	Close
Wheel Cylinder Pressure		Right Front Wheel	—	Increase	Hold	Reduction
		Left Front Wheel	—	Increase	Hold	Reduction
		Right Rear Wheel	—	Increase	Hold	Reduction
		Left Rear Wheel	—	—	—	—

3

Oversteer Restraining Control

In oversteer restraining control, the brake of the front and rear wheels of the outer side of the turn is applied. As an example, the diagram below shows the hydraulic circuit in the pressure increase mode, as it restrains an oversteer condition while the vehicle makes a right turn.
As in understeer restraining control, in other operating modes, the pressure holding valve and the pressure reduction valve are turned ON/OFF according to the ABS operation pattern.
However, in oversteer control, the pressure holding valve is turned ON and blocks the hydraulic passage to the frot inner wheel in order to prevent applying the brake to the front inner wheel.



Increase Mode

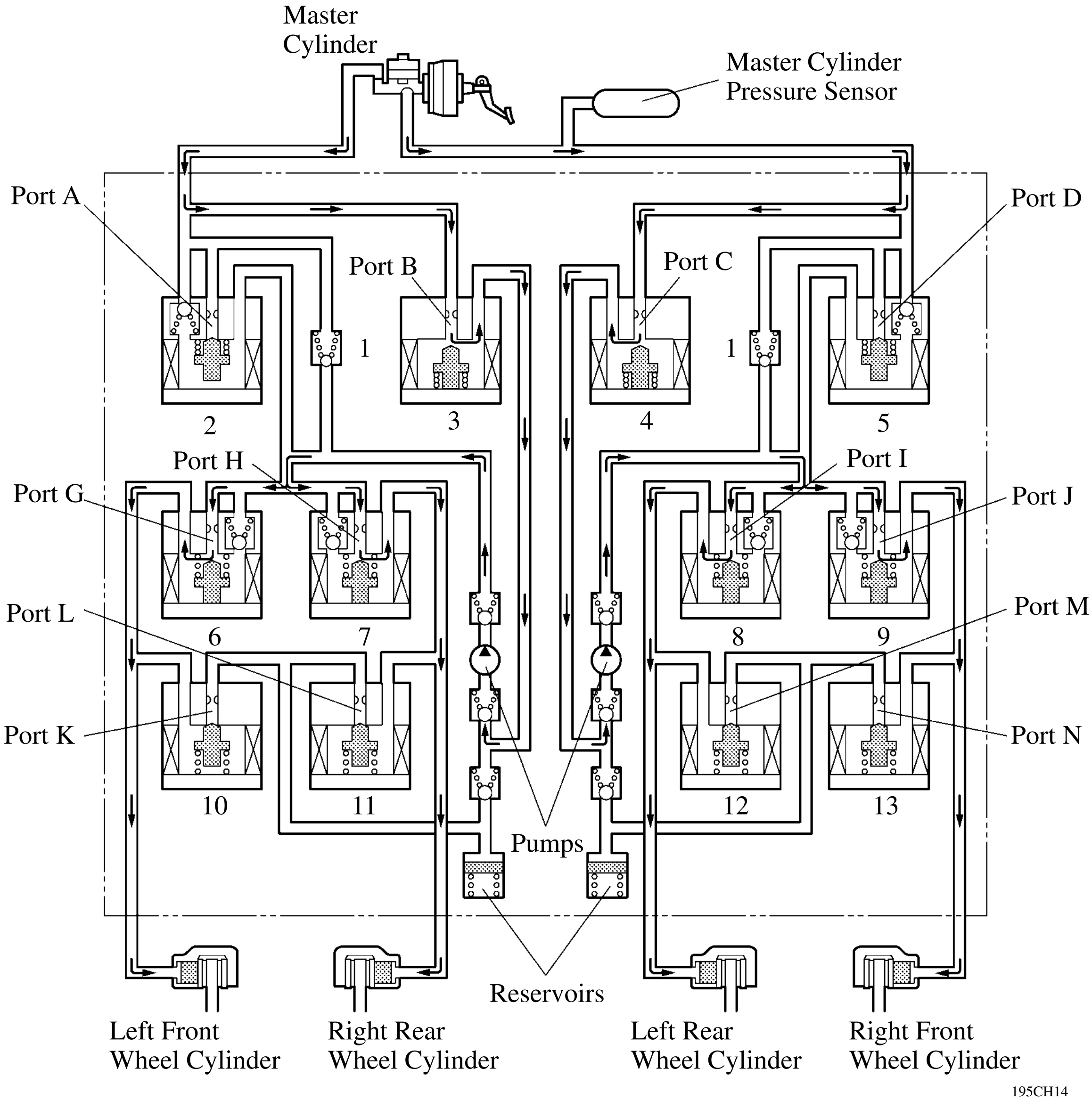
195CH13

▶ While the Vehicle Makes a Right Turn ◀

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

f. Brake Assist Operation

The fluid pressure that has been generated by the pump in the brake actuator is directed to the wheel cylinders. By applying a greater fluid pressure than the master cylinder, a greater braking force is achieved.

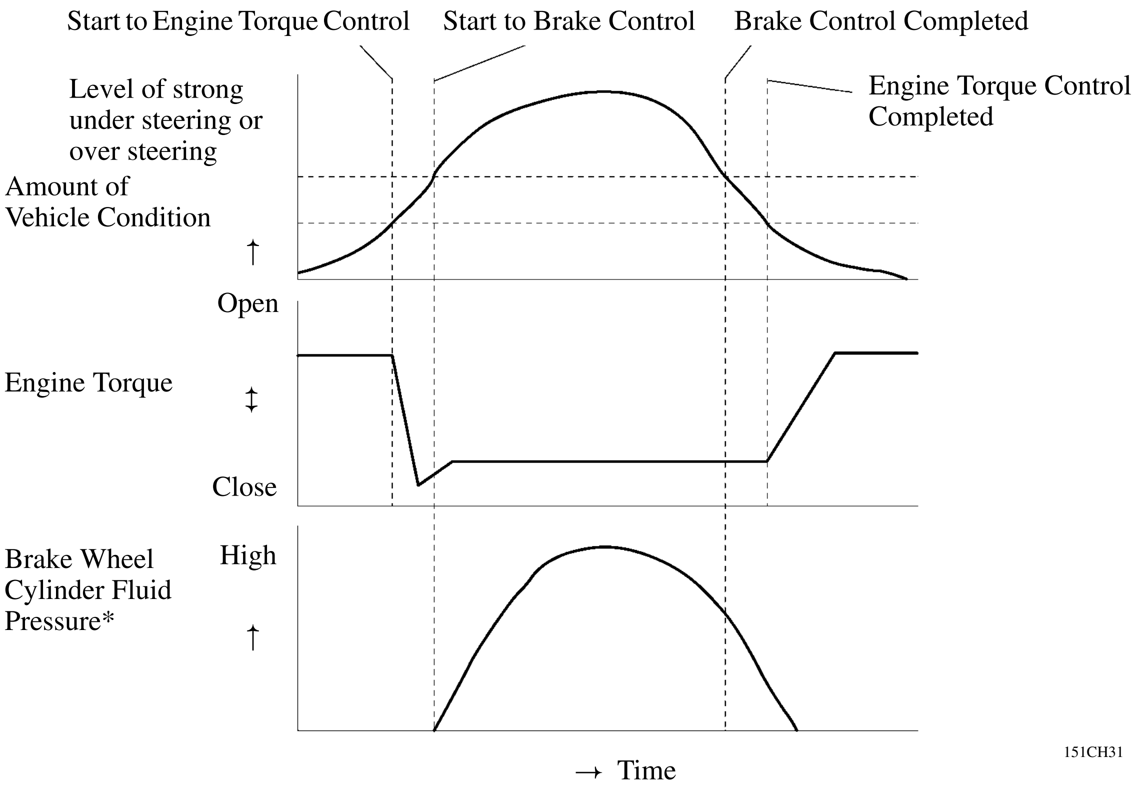


Item		Brake Assist Not Activated	Brake Assist Activated
2	Master Cylinder Cut Solenoid Valve (Front and Rear)	OFF	ON
5	Port: A, D	Open	Close
3	Reservoir Cut Solenoid Valve (Front and Rear)	OFF	ON
4	Port: B, C	Close	Open
6, 7	Pressure Holding Valve (Front and Rear)	OFF	OFF
8, 9	Port: G, H, I, J	Open	Open
10, 11	Pressure Reduction Valve (Front and Rear)	OFF	OFF
12, 13	Port: K, L, M, N	Close	Close

5) Skid Control ECU

a. Vehicle Stability Control

Based on the 4 types of sensor signals received from the speed sensors, yaw rate sensor (including deceleration sensor) and steering sensor, the Skid Control ECU calculates the amount of vehicle condition. If a strong understeer or oversteer tendency is created during an emergency avoidance maneuver or cornering, and the Skid Control ECU determines that the amount of vehicle condition exceeds a prescribed value, it controls the engine torque control and the brake fluid pressure according to the amount of the vehicle condition.



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

b. Self-Diagnosis

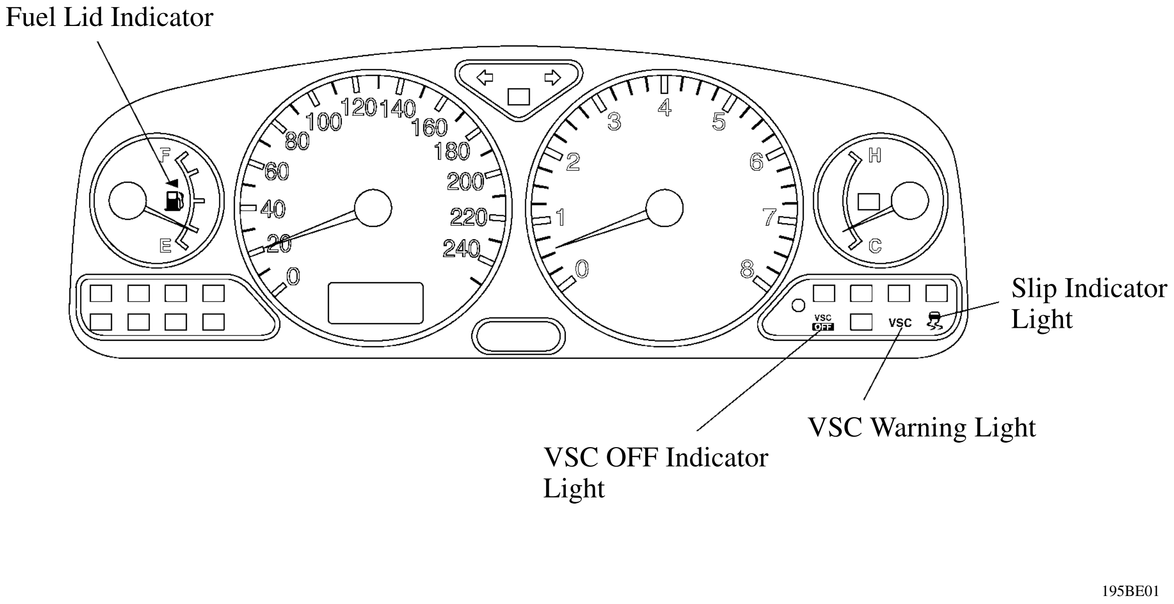
If the Skid Control ECU detects a malfunction in the VSC system, the warning light or the indicator light that corresponds to the function in which the malfunction has been detected lights up, to alert the driver of the malfunction. The ECU will also store the codes of the malfunctions. The DTCs (Diagnostic Trouble Codes) can be accessed through the blinking of the VSC warning light or the use of a hand-held tester. For details, see the AVENSIS Chassis & Body Repair Manual Supplement (Pub. RM781E).

c. Fail Safe

In the event of a malfunction in the Skid Control ECU turns on the ABS warning light and the VSC warning light and prohibits the ABS, TRC, VSC and Brake Assist control. In the case of the malfunction that the EBD control can not be carried out, the ECU also turns on the brake system warning light and prohibits the EBD control.

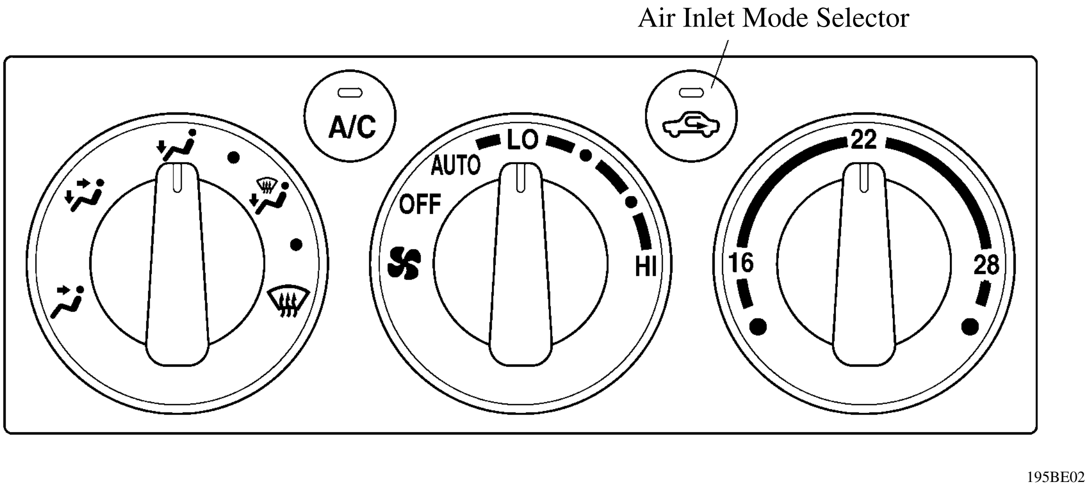
■ COMBINATION METER

- The color of the illumination, letters and numbers, and the dial plates has been changed to improve product appeal.
- An indicator that points to the (right or left) position of the fuel lid has been added.
- Indicator lights that are related to the VSC system have been added to the models equipped with VSC (Vehicle Stability Control).

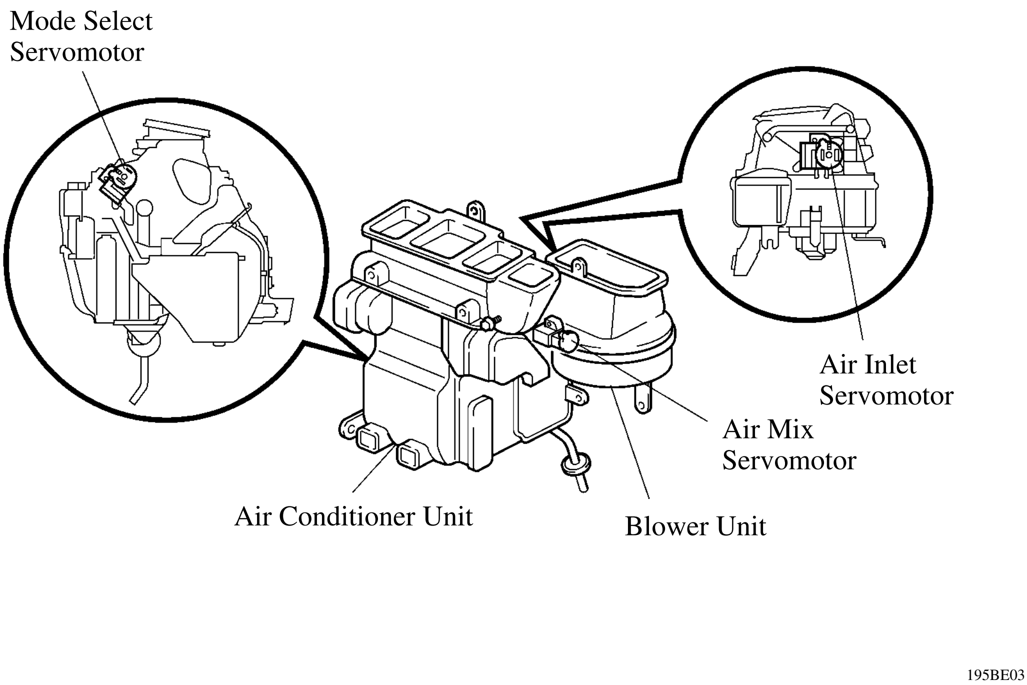


■HEATER CONTROL SYSTEM

- Air inlet mode selector has been changed to push and lock button type from lever type.
- The control of the mode selector switch, fan speed selector switch, and temperature selector switch has been changed from the manual to the electric type in order to improve the operating feel. Accordingly, the switching of the mode doors has been changed from the previous cable-driven type to the servomotor-driven type.



with Air Conditioner Model



■DOOR LOCK CONTROL SYSTEM

1. General

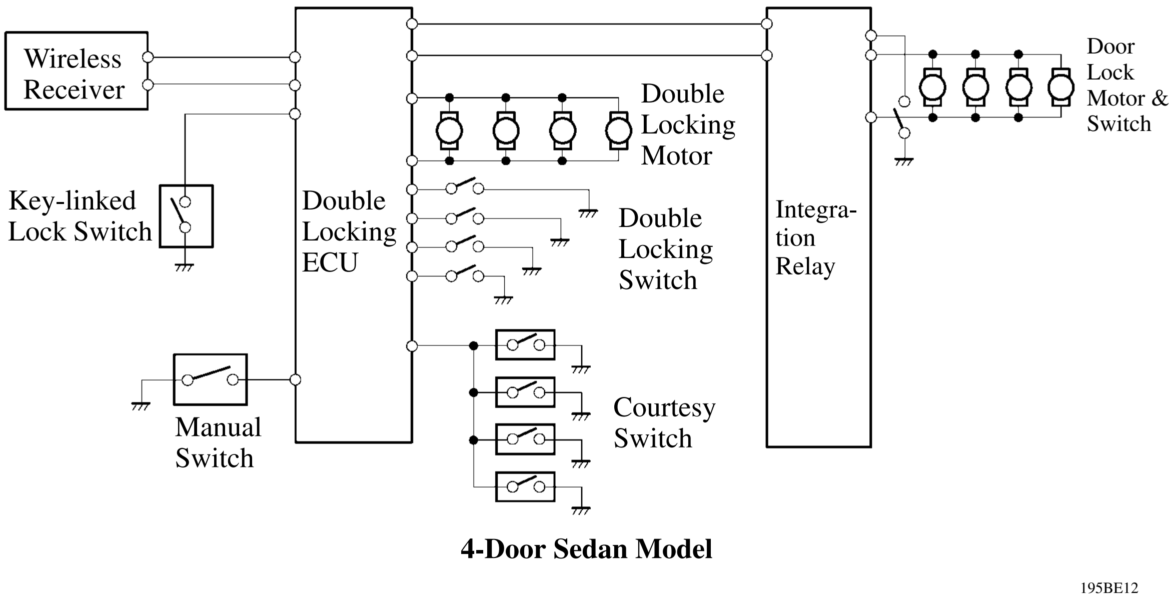
The double locking system is standard equipment on the RHD model for Europe.

2. Double Locking System

General

- The double locking system also prevents the doors from being opened through the operation of the inside door knobs. Thus, the doors cannot be opened either from the inside or the outside of the vehicle.
- To lock the doors with this system, pressing the transmitter's LOCK switch, then pressing it again within 5 seconds activates the double locking system.

▶ System Diagram ◀



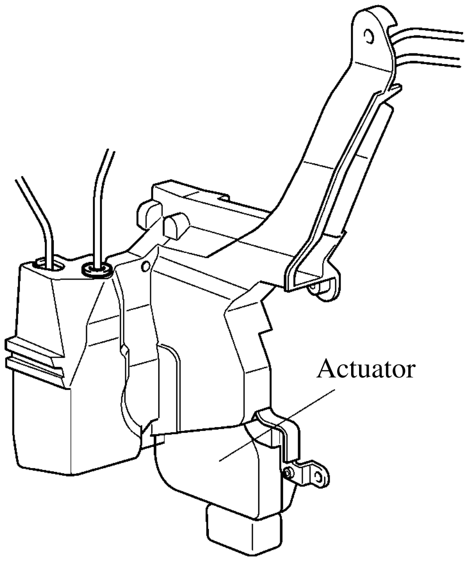
4-Door Sedan Model

CAUTION

Never activate the double locking system when there are people in the vehicle because the doors cannot be opened from the inside of the vehicle.
If locking the doors by accident, press "Unlock" button of the transmitter.

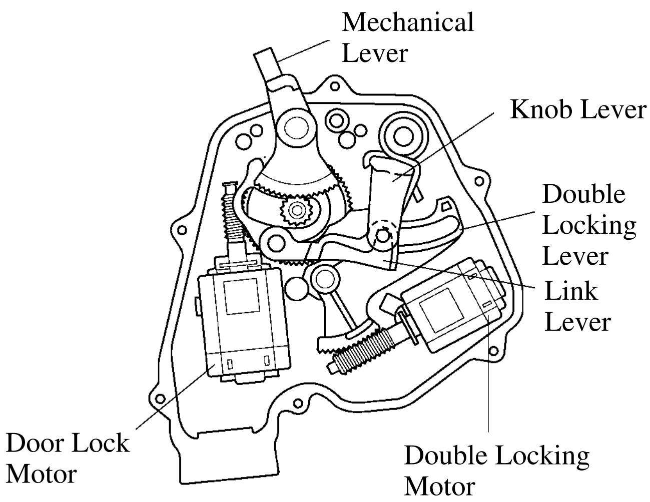
Construction

The actuator contains both the mechanism for the door lock system and the double locking system including a motor and a link.



Lock Assy

185BE11



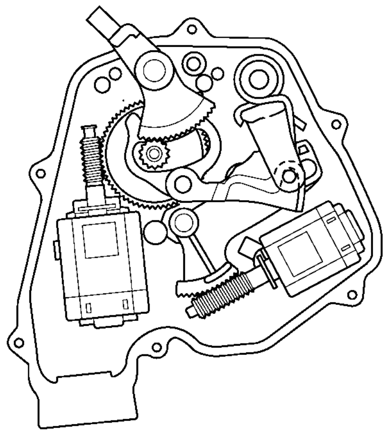
Actuator

195BE04

Item	Function
Knob Lever	An input/output lever connected directly to the inside door knob.
Link Lever	Connects the knob lever and the mechanical lever.
Double Locking Lever	Engages and disengages the link lever.
Double Locking Motor	A motor that moves the double locking lever.
Mechanical Lever	A lever that outputs to the mechanical locking portion.
Door Lock Motor	A motor that moves the mechanical lever.

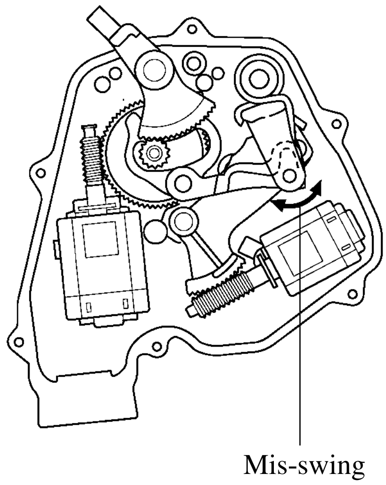
Operation

- When a door is locked through the operation of the transmitter, it locks in the normal manner; furthermore, the knob lever becomes disengaged by the function of the double locking motor. As a result, if an attempt is made to unlock the door by operating the inside knob, the knob lever will merely mis-swing, without being able to unlock the door.
- The locking/unlocking function of the double locking system is normally activated by operating the transmitter.



195BE05

Normal Lock Condition



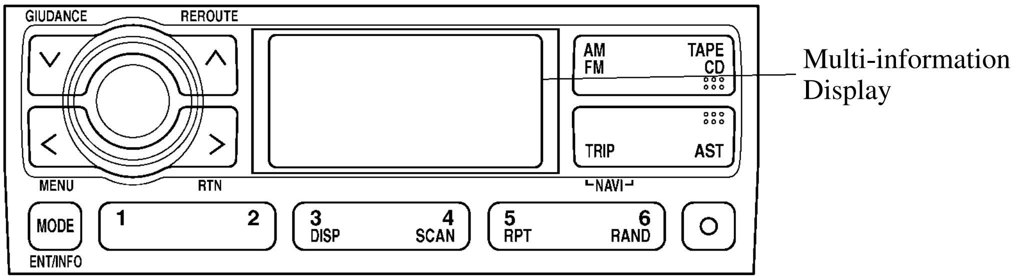
195BE06

Double Locking Condition

■AUDIO

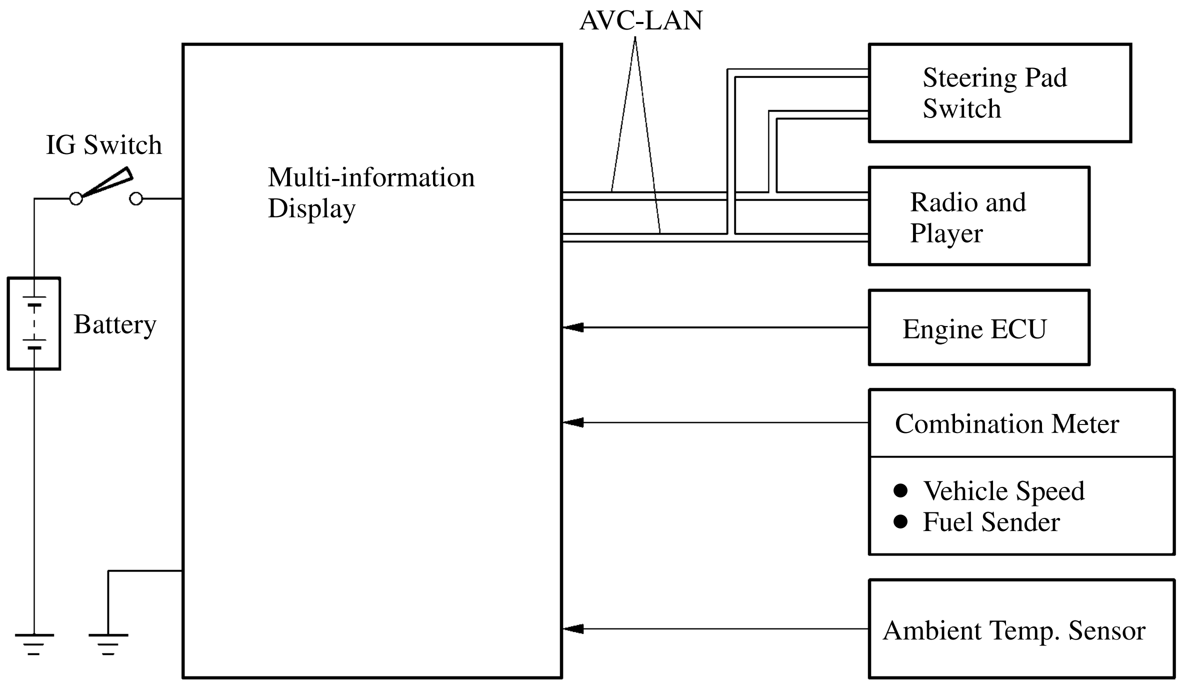
1. General

- A multi-information display panel has been provided on the audio unit to indicate various types of information, including the audio, average vehicle speed, fuel consumption, continuous drivable distance, time, and outside temperature.
- A steering pad switch that operates the audio unit has been provided on the steering wheel as an option. This switch has a built-in ECU that transmits the operating conditions of the switch to the multi-information display and the radio and player via the AVC-LAN (Audio Visual Communication-Local Area Network).



195BE08

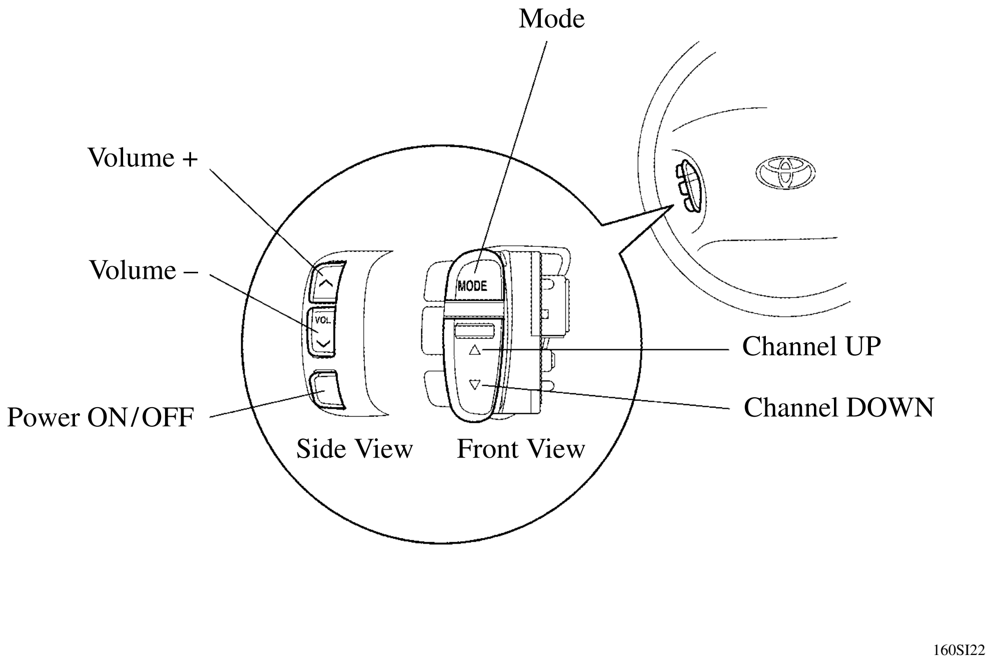
▶ System Diagram ◀



195BE07

2. Steering Pad Switch

The steering pad switch contains frequently used audio switches (volume +, volume –, power ON/OFF, mode, and channel up/down) to improve the ease of use of the audio unit. This switch has a built-in ECU that transmits the operating conditions of the switch to the multi-information display.



MAJOR TECHNICAL SPECIFICATIONS

Item \ Area			Europe			
Body Type			4-Door Sedan			
Vehicle Grade			LINEA TERRA		LINEA SOL	LINEA TERRA
Model Code			ZZT220R-AEMNKW	ZZT220L-AEMNKW	ZZT220L-AEMEKW	ZZT221R-AEMNKW
Major Dimensions & Vehicle Weights	Overall	Length mm (in.)	4520 (178.0)	←	←	←
		Width mm (in.)	1710 (67.3)	←	←	←
		Height mm (in.)	1425 (56.1)	←	←	←
	Wheel Base mm (in.)		2630 (103.5)	←	←	←
	Tread	Front mm (in.)	1480 (58.3)	←	←	←
		Rear mm (in.)	1450 (57.1)	←	←	←
	Room	Length mm (in.)	1930 (76.0)	←	←	←
		Width mm (in.)	1455 (57.3)	←	←	←
		Height mm (in.)	1160 (45.7), 1110 (43.7)*1	←	←	←
	Overhang	Front mm (in.)	905 (35.6)	←	←	←
		Rear mm (in.)	985 (38.8)	←	←	←
	Min. Running Ground Clearance mm (in.)		145 (5.7)	←	←	140 (5.5)
	Angle of Approach degrees		14.4°	←	←	←
	Angle of Departure degrees		18.4°	←	←	←
	Curb Weight	Front kg (lb)	685 ~ 735 (1510 ~ 1620)	←	←	685 ~ 740 (1510 ~ 1631)
		Rear kg (lb)	515 ~ 545 (1135 ~ 1202)	←	←	←
		Total kg (lb)	1200 ~ 1280 (2646 ~ 2822)	←	←	1200 ~ 1285 (2646 ~ 2833)
	Gross Vehicle Weight	Front kg (lb)	860 (1896)	←	←	890 (1962)
		Rear kg (lb)	870 (1918)	←	←	870 (1918)
		Total kg (lb)	1730 (3814)	←	←	1760 (3880)
	Fuel Tank Capacity ℓ (Imp.gal.)		60 (13.2)	←	←	←
	Luggage Compartment Capacity m³ (cu.ft.)		0.50 (17.7)	←	←	←
Performance	Max. Speed km/h (mph)		195 (121)	←	←	200 (124)
	Max. Cruising Speed km/h (mph)		—	—	—	—
	Acceleration	0 to 100 km/h sec.	11.3	←	←	10.0
		0 to 400 m sec.	17.7	←	←	17.1
	Max. Permissible Speed	1st Gear km/h (mph)	49 (30)	←	←	50 (31)
		2nd Gear km/h (mph)	92 (57)	←	←	94 (58)
		3rd Gear km/h (mph)	134 (83)	←	←	137 (85)
		4th Gear km/h (mph)	181 (112)	←	←	175 (108)
	Min. Turning Radius	Tire m (ft.)	5.4 (17.7)	←	←	←
		Body m (ft.)	5.8 (19.0)	←	←	←
Engine	Engine Type		3ZZ-FE	←	←	1ZZ-FE
	Valve Mechanism		16-Valve, DOHC	←	←	←
	Bore x Stroke mm (in.)		79.0 x 81.5 (3.11 x 3.21)	←	←	79.0 x 91.5 (3.11 x 3.60)
	Displacement cm³ (cu.in.)		1598 (97.5)	←	←	1794 (109.5)
	Compression Ratio		10.5 : 1	←	←	10.0 : 1
	Carburetor Type or Injection Pump Type (Diesel)		EFI	←	←	←
	Research Octane No. or Cetane No. (Diesel)		95 or More	←	←	←
	Max. Output (EEC) kW/rpm		81/6000	←	←	95/6000
	Max. Torque (EEC) N·m/rpm		150/3800	←	←	170/4200
Engine Electrical	Battery Capacity (5HR) Voltage & Amp. hr.		12-32, 48*2	←	←	←
	Alternator Output Watts		960	←	←	←
	Starter Output kW		1.1	←	←	←
Chassis	Clutch Type		Dry, Single	←	←	←
	Transaxle Type		C50	←	←	C250
	Transmission Gear Ratio	In First	3.545	←	←	←
		In Second	1.904	←	←	←
		In Third	1.310	←	←	←
		In Fourth	0.969	←	←	1.031
		In Fifth	0.815	←	←	←
		In Reverse	3.250	←	←	←
	Counter Gear Ratio		—	—	—	—
	Differential Gear Ratio (Final)		4.058	←	←	3.941
	Brake Type	Front	Ventilated Disc	←	←	←
		Rear	Leading Trailing Drum, Solid Disc*2	←	←	←
	Parking Brake Type		Drum	←	←	←
	Brake Booster Type and Size in.		Single 9", Tandem 7" + 8"*2	←	←	←
	Proportioning Valve Type		—	—	—	—
	Suspension Type	Front	MacPherson Strut	←	←	←
		Rear	MacPherson Strut	←	←	←
	Stabilizer Bar	Front	STD	←	←	←
		Rear	STD	←	←	←
	Steering Gear Type		Rack and Pinion	←	←	←
	Steering Gear Ratio (Overall)		15.66	←	←	←
	Power Steering Type		Integral Type	←	←	←

*1: With Moon Roof
*2: Option

	Europe					
	4-Door Sedan					
	LINEA TERRA			LINEA SOL		
	ZZT221L-AEMNKW	ZZT221R-AEPNKW	ZZT221L-AEPNKW	ZZT221R-AEMEKW	ZZT221L-AEMEKW	ZZT221R-AEPEKW
5	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
10	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
15	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
	←	715 ~ 770 (1576 ~ 1698)	←	685 ~ 740 (1510 ~ 1631)	←	715 ~ 770 (1576 ~ 1698)
20	←	←	←	←	←	←
	←	1230 ~ 1315 (2712 ~ 2899)	←	1200 ~ 1285 (2646 ~ 2833)	←	1230 ~ 1315 (2712 ~ 2899)
	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
25	←	←	←	←	←	←
	←	←	←	←	←	←
	←	195 (121)	←	200 (124)	←	195 (121)
	—	—	—	—	—	—
	←	11.4	←	10.0	←	11.4
30	←	18.1	←	17.1	←	18.1
	←	58 (36)	←	50 (31)	←	58 (36)
	←	105 (65)	←	94 (58)	←	105 (65)
	←	—	—	137 (85)	←	—
	—	—	—	175 (108)	←	—
35	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
40	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
45	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
	←	—	—	Dry, Single	←	—
50	←	A246E	←	C250	←	A246E
	←	4.005	←	3.545	←	4.005
	←	2.208	←	1.904	←	2.208
	←	1.425	←	1.310	←	1.425
	←	0.981	←	1.031	←	0.981
55	←	—	—	0.815	←	—
	←	3.272	←	3.250	←	3.272
	—	—	—	—	—	—
	←	2.962	←	3.941	←	2.962
	←	←	←	←	←	←
60	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
	—	—	—	—	—	—
	←	←	←	←	←	←
65	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
	←	←	←	←	←	←
70	←	←	←	←	←	←

3

Item			Area: Europe			
Body Type			4-Door Sedan			
Vehicle Grade			LINEA SOL	LINEA TERRA		LINEA SOL
Model Code			ZZT221L-AEPEKW	AZT220R-AEMNHW	AZT220L-AEMNHW	AZT220R-AEMEHW
Major Dimensions & Vehicle Weights	Overall	Length mm (in.)	4520 (178.0)	←	←	←
		Width mm (in.)	1710 (67.3)	←	←	←
		Height mm (in.)	1425 (56.1)	←	←	←
	Wheel Base mm (in.)		2630 (103.5)	←	←	←
	Tread	Front mm (in.)	1480 (58.3)	←	←	←
		Rear mm (in.)	1450 (57.1)	←	←	←
	Room	Length mm (in.)	1930 (76.0)	←	←	←
		Width mm (in.)	1455 (57.3)	←	←	←
		Height mm (in.)	1160 (45.7), 1110 (43.7)*1	←	←	←
	Overhang	Front mm (in.)	905 (35.6)	←	←	←
		Rear mm (in.)	985 (38.8)	←	←	←
	Min. Running Ground Clearance mm (in.)		140 (5.5)	145 (5.7)	←	←
	Angle of Approach degrees		14.4°	←	←	←
	Angle of Departure degrees		18.4°	←	←	←
	Curb Weight	Front kg (lb)	715 ~ 770 (1576 ~ 1698)	730 ~ 780 (1609 ~ 1720)	←	←
		Rear kg (lb)	515 ~ 545 (1135 ~ 1202)	515 ~ 540 (1135 ~ 1190)	←	←
		Total kg (lb)	1230 ~ 1315 (2712 ~ 2899)	1245 ~ 1320 (2745 ~ 2910)	←	←
	Gross Vehicle Weight	Front kg (lb)	890 (1962)	920 (2028)	←	←
		Rear kg (lb)	870 (1918)	880 (1940)	←	←
		Total kg (lb)	1760 (3880)	1800 (3968)	←	←
	Fuel Tank Capacity ℓ (Imp.gal.)		60 (13.2)	←	←	←
	Luggage Compartment Capacity m^3 (cu.ft.)		0.50 (17.7)	←	←	←
Performance	Max. Speed km/h (mph)		195 (121)	210 (130)	←	←
	Max. Cruising Speed km/h (mph)		—	—	—	—
	Acceleration	0 to 100 km/h sec.	11.4	9.1	←	←
		0 to 400 m sec.	18.1	16.6	←	←
	Max. Permissible Speed	1st Gear km/h (mph)	58 (36)	54 (33)	←	←
		2nd Gear km/h (mph)	105 (65)	93 (58)	←	←
		3rd Gear km/h (mph)	—	144 (89)	←	←
		4th Gear km/h (mph)	—	185 (115)	←	←
	Min. Turning Radius	Tire m (ft.)	5.4 (17.7)	←	←	←
		Body m (ft.)	5.8 (19.0)	←	←	←
Engine	Engine Type		1ZZ-FE	1AZ-FSE	←	←
	Valve Mechanism		16-Valve, DOHC	←	←	←
	Bore x Stroke mm (in.)		79.0 x 91.5 (3.11 x 3.60)	86.0 x 86.0 (3.39 x 3.39)	←	←
	Displacement cm^3 (cu.in.)		1794 (109.5)	1998 (121.9)	←	←
	Compression Ratio		10.0 : 1	11.0 : 1	←	←
	Carburetor Type or Injection Pump Type (Diesel)		EFI	←	←	←
	Research Octane No. or Cetane No. (Diesel)		95 or More	←	←	←
	Max. Output (EEC) kW/rpm		95/6000	110/5700	←	←
	Max. Torque (EEC) N·m/rpm		170/4200	200/4000	←	←
Engine Electrical	Battery Capacity (5HR) Voltage & Amp. hr.		12-32, 48*2	←	←	←
	Alternator Output Watts		960	←	←	←
	Starter Output kW		1.1	1.0, 1.2*2	←	←
Chassis	Clutch Type		—	Dry, Single	←	←
	Transaxle Type		A246E	S55	←	←
	Transmission Gear Ratio	In First	4.005	3.538	←	←
		In Second	2.208	2.041	←	←
		In Third	1.425	1.322	←	←
		In Fourth	0.981	1.028	←	←
		In Fifth	←	0.820	←	←
		In Reverse	3.272	3.153	←	←
	Counter Gear Ratio		—	—	—	—
	Differential Gear Ratio (Final)		2.962	3.736	←	←
	Brake Type	Front	Ventilated Disc	←	←	←
		Rear	Leading Trailing Drum, Solid Disc*2	←	←	Solid Disc
	Parking Brake Type		Drum	←	←	←
	Brake Booster Type and Size in.		Single 9", Tandem 7" + 8"*2	Tandem 7" + 8"	←	←
	Proportioning Valve Type		—	—	—	—
	Suspension Type	Front	MacPherson Strut	←	←	←
		Rear	MacPherson Strut	←	←	←
	Stabilizer Bar	Front	STD	←	←	←
		Rear	STD	←	←	←
	Steering Gear Type		Rack and Pinion	←	←	←
	Steering Gear Ratio (Overall)		15.66	←	←	←
	Power Steering Type		Integral Type	←	←	←

*1: With Moon Roof
*2: Option

Europe					
4-Door Sedan					
LINEA SOL			LINEA TERRA		LINEA SOL
AZT220L-AEMEHW	AZT220R-AEPEHW	AZT220L-AEPEHW	CDT220R-AEMNYW	CDT220L-AEMNYW	CDT220R-AEMEYW
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	155 (6.1)	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	755 ~ 805 (1664 ~ 1774)	←	805 ~ 855 (1775 ~ 1885)	←	←
←	←	←	515 ~ 540 (1135 ~ 1190)	←	←
←	1270 ~ 1345 (2800 ~ 2965)	←	1320 ~ 1395 (2910 ~ 3075)	←	←
←	←	←	950 (2094)	←	←
←	←	←	880 (1940)	←	←
←	←	←	1830 (4034)	←	←
←	←	←	60 (13.2)	←	←
←	←	←	0.50 (17.7)	←	←
←	205 (127)	←	195 (121)	←	←
—	—	—	—	—	—
←	9.9	←	11.4	←	←
←	17.1	←	17.8	←	←
←	60 (37)	←	44 (27)	←	←
←	107 (67)	←	77 (48)	←	←
←	—	—	118 (73)	←	←
←	—	—	162 (100)	←	←
←	←	←	5.4 (17.7)	←	←
←	←	←	5.8 (19.0)	←	←
←	←	←	1CD-FTV	←	←
←	←	←	←	←	←
←	←	←	82.2 x 94.0 (3.24 x 3.70)	←	←
←	←	←	1995 (121.7)	←	←
←	←	←	18.6 : 1	←	←
←	←	—	Common-Rail Type	←	←
←	←	←	52	←	←
←	←	←	81/4000	←	←
←	←	←	250/2000 ~ 2400	←	←
←	←	←	12-64	←	←
←	←	←	1440	←	←
←	←	←	2.0	←	←
←	—	—	Dry, Single	←	←
←	U240E	←	E351	←	←
←	3.943	←	3.538	←	←
←	2.197	←	2.045	←	←
←	1.413	←	1.333	←	←
←	1.020	←	0.972	←	←
←	—	—	0.731	←	←
←	3.145	←	3.583	←	←
—	—	—	—	—	—
←	2.923	←	3.684	←	←
←	←	←	←	←	←
←	←	←	Leading Trailing Drum, Solid Disc*2	←	←
←	←	←	←	←	←
←	←	←	Single 9”	←	←
—	—	—	—	—	—
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←

Item \ Area			Europe			
Body Type			4-Door Sedan	5-Door Liftback		
Vehicle Grade			LINEA SOL	LINEA TERRA		LINEA SOL
Model Code			CDT220L-AEMEYW	ZZT220R-ALMNKW	ZZT220L-ALMNKW	ZZT220L-ALMEKW
Major Dimensions & Vehicle Weights	Overall	Length mm (in.)	4520 (178.0)	←	←	←
		Width mm (in.)	1710 (67.3)	←	←	←
		Height mm (in.)	1425 (56.1)	←	←	←
	Wheel Base mm (in.)		2630 (103.5)	←	←	←
	Tread	Front mm (in.)	1480 (58.3)	←	←	←
		Rear mm (in.)	1450 (57.1)	←	←	←
	Room	Length mm (in.)	1930 (76.0)	←	←	←
		Width mm (in.)	1455 (57.3)	←	←	←
		Height mm (in.)	1160 (45.7), 1110 (43.7)*1	←	←	←
	Overhang	Front mm (in.)	905 (35.6)	←	←	←
		Rear mm (in.)	985 (38.8)	←	←	←
	Min. Running Ground Clearance mm (in.)		155 (6.1)	145 (5.7)	←	←
	Angle of Approach degrees		14.4°	←	←	←
	Angle of Departure degrees		18.4°	←	←	←
	Curb Weight	Front kg (lb)	805 ~ 855 (1775 ~ 1885)	685 ~ 735 (1510 ~ 1620)	←	←
		Rear kg (lb)	515 ~ 540 (1135 ~ 1190)	535 ~ 565 (1179 ~ 1246)	←	←
		Total kg (lb)	1320 ~ 1395 (2910 ~ 3075)	1220 ~ 1300 (2690 ~ 2860)	←	←
	Gross Vehicle Weight	Front kg (lb)	950 (2094)	860 (1896)	←	←
		Rear kg (lb)	880 (1940)	870 (1918)	←	←
		Total kg (lb)	1830 (4034)	1730 (3814)	←	←
	Fuel Tank Capacity ℓ (Imp.gal.)		60 (13.2)	←	←	←
	Luggage Compartment Capacity m³ (cu.ft.)		0.50 (17.7)	0.51 (18.0)	←	←
Performance	Max. Speed km/h (mph)		195 (121)	←	←	←
	Max. Cruising Speed km/h (mph)		—	—	—	—
	Acceleration	0 to 100 km/h sec.	11.4	11.3	←	←
		0 to 400 m sec.	17.8	17.7	←	←
	Max. Permissible Speed	1st Gear km/h (mph)	44 (27)	49 (30)	←	←
		2nd Gear km/h (mph)	77 (48)	92 (57)	←	←
		3rd Gear km/h (mph)	118 (73)	134 (83)	←	←
		4th Gear km/h (mph)	162 (100)	181 (112)	←	←
	Min. Turning Radius	Tire m (ft.)	5.4 (17.8)	←	←	←
		Body m (ft.)	5.8 (19.0)	←	←	←
Engine	Engine Type		1CD-FTV	3ZZ-FE	←	←
	Valve Mechanism		16-Valve, DOHC	16-Valve, DOHC	←	←
	Bore x Stroke mm (in.)		82.2 x 94.0 (3.24 x 3.70)	79.0 x 81.5 (3.11 x 3.21)	←	←
	Displacement cm³ (cu.in.)		1995 (121.7)	1598 (97.5)	←	←
	Compression Ratio		18.6 : 1	10.5 : 1	←	←
	Carburetor Type or Injection Pump Type (Diesel)		Common-Rail Type	EFI	←	←
	Research Octane No. or Cetane No. (Diesel)		52	95 or More	←	←
	Max. Output (EEC) kW/rpm		81/4000	81/6000	←	←
	Max. Torque (EEC) N·m/rpm		250/2000 ~ 2400	150/3800	←	←
Engine Electrical	Battery Capacity (5HR) Voltage & Amp. hr.		12-64	12-32, 48*2	←	←
	Alternator Output Watts		1440	960	←	←
	Starter Output kW		2.0	1.1	←	←
Chassis	Clutch Type		Dry, Single	Dry, Single	←	←
	Transaxle Type		E351	C50	←	←
	Transmission Gear Ratio	In First	3.538	3.545	←	←
		In Second	2.045	1.904	←	←
		In Third	1.333	1.310	←	←
		In Fourth	0.972	0.969	←	←
		In Fifth	0.731	0.815	←	←
		In Reverse	3.583	3.250	←	←
	Counter Gear Ratio		—	—	—	—
	Differential Gear Ratio (Final)		3.684	4.058	←	←
	Brake Type	Front	Ventilated Disc	←	←	←
		Rear	Leading Trailing Drum, Solid Disc*2	←	←	←
	Parking Brake Type		Drum	←	←	←
	Brake Booster Type and Size in.		Single 9"	Single 9", Tandem 7" + 8"*2	←	←
	Proportioning Valve Type		—	—	—	—
	Suspension Type	Front	MacPherson Strut	←	←	←
		Rear	MacPherson Strut	←	←	←
	Stabilizer Bar	Front	STD	←	←	←
		Rear	STD	←	←	←
	Steering Gear Type		Rack and Pinion	←	←	←
	Steering Gear Ratio (Overall)		15.66	←	←	←
	Power Steering Type		Integral Type	←	←	←

*1: With Moon Roof
*2: Option

Europe					
5-Door Liftback					
LINEA TERRA				LINEA SOL	
ZZT221R-ALMNKW	ZZT221L-ALMNKW	ZZT221R-ALPNKW	ZZT221L-ALPNKW	ZZT221R-ALMEKW	ZZT221L-ALMEKW
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
140 (5.5)	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
685 ~ 740 (1510 ~ 1631)	←	715 ~ 770 (1576 ~ 1698)	←	685 ~ 740 (1510 ~ 1631)	←
535 ~ 565 (1179 ~ 1246)	←	535 ~ 565 (1179 ~ 1246)	←	535 ~ 565 (1179 ~ 1246)	←
1220 ~ 1305 (2690 ~ 2877)	←	1250 ~ 1335 (2756 ~ 2943)	←	1220 ~ 1305 (2690 ~ 2877)	←
890 (1962)	←	←	←	←	←
870 (1918)	←	←	←	←	←
1760 (3880)	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
200 (124)	←	195 (121)	←	200 (124)	←
—	—	—	—	—	—
10.0	←	11.4	←	10.0	←
17.1	←	18.1	←	17.1	←
50 (31)	←	58 (36)	←	50 (31)	←
94 (58)	←	105 (65)	←	94 (58)	←
137 (85)	←	—	—	137 (85)	←
175 (108)	←	—	—	175 (108)	←
←	←	←	←	←	←
←	←	←	←	←	←
1ZZ-FE	←	←	←	←	←
←	←	←	←	←	←
79.0 x 91.5 (3.11 x 3.60)	←	←	←	←	←
1794 (109.5)	←	←	←	←	←
10.0 : 1	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
95 / 6000	←	←	←	←	←
170 / 4200	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	—	—	Dry, Single	←
C250	←	A246E	←	C250	←
←	←	4.005	←	3.545	←
←	←	2.208	←	1.904	←
←	←	1.425	←	1.310	←
1.031	←	0.981	←	1.031	←
←	←	—	—	0.815	←
←	←	3.272	←	3.250	←
—	—	—	—	—	—
3.941	←	2.962	←	3.941	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
—	—	—	—	—	—
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←

3

Item \ Area			Europe			
Body Type			5-Door Liftback			
Vehicle Grade			LINEA SOL		LINEA TERRA	
Model Code			ZZT221R-ALPEKW	ZZT221L-ALPEKW	AZT220R-ALMNHW	AZT220L-ALMNHW
Major Dimensions & Vehicle Weights	Overall	Length mm (in.)	4520 (178.0)	←	←	←
		Width mm (in.)	1710 (67.3)	←	←	←
		Height mm (in.)	1425 (56.1)	←	←	←
	Wheel Base mm (in.)		2630 (103.5)	←	←	←
	Tread	Front mm (in.)	1480 (58.3)	←	←	←
		Rear mm (in.)	1450 (57.1)	←	←	←
	Room	Length mm (in.)	1930 (76.0)	←	←	←
		Width mm (in.)	1455 (57.3)	←	←	←
		Height mm (in.)	1160 (45.7), 1110 (43.7)*1	←	←	←
	Overhang	Front mm (in.)	905 (35.6)	←	←	←
		Rear mm (in.)	985 (38.8)	←	←	←
	Min. Running Ground Clearance mm (in.)		140 (5.5)	←	145 (5.7)	←
	Angle of Approach degrees		14.4°	←	←	←
	Angle of Departure degrees		18.4°	←	←	←
	Curb Weight	Front kg (lb)	715 ~ 770 (1576 ~ 1698)	←	730 ~ 780 (1609 ~ 1720)	←
		Rear kg (lb)	535 ~ 565 (1179 ~ 1246)	←	535 ~ 560 (1179 ~ 1235)	←
		Total kg (lb)	1250 ~ 1335 (2756 ~ 2943)	←	1265 ~ 1340 (2789 ~ 2954)	←
	Gross Vehicle Weight	Front kg (lb)	890 (1962)	←	920 (2028)	←
		Rear kg (lb)	870 (1918)	←	880 (1940)	←
		Total kg (lb)	1760 (3880)	←	1800 (3968)	←
	Fuel Tank Capacity ℓ (Imp.gal.)		60 (13.2)	←	←	←
	Luggage Compartment Capacity m^3 (cu.ft.)		0.51 (18.0)	←	←	←
Performance	Max. Speed km/h (mph)		195 (121)	←	210 (130)	←
	Max. Cruising Speed km/h (mph)		—	—	—	—
	Acceleration	0 to 100 km/h sec.	11.4	←	9.1	←
		0 to 400 m sec.	18.1	←	16.6	←
	Max. Permissible Speed	1st Gear km/h (mph)	58 (36)	←	54 (33)	←
		2nd Gear km/h (mph)	105 (65)	←	93 (58)	←
		3rd Gear km/h (mph)	—	—	144 (89)	←
		4th Gear km/h (mph)	—	—	185 (115)	←
	Min. Turning Radius	Tire m (ft.)	5.4 (17.7)	←	←	←
		Body m (ft.)	5.8 (19.0)	←	←	←
Engine	Engine Type		1ZZ-FE	←	1AZ-FSE	←
	Valve Mechanism		16-Valve, DOHC	←	←	←
	Bore x Stroke mm (in.)		79.0 x 91.5 (3.11 x 3.60)	←	86.0 x 86.0 (3.39 x 3.39)	←
	Displacement cm^3 (cu.in.)		1794 (109.5)	←	1998 (121.9)	←
	Compression Ratio		10.1 : 1	←	11.0 : 1	←
	Carburetor Type or Injection Pump Type (Diesel)		EFI	←	←	←
	Research Octane No. or Cetane No. (Diesel)		95 or More	←	←	←
	Max. Output (EEC) kW/rpm		95/6000	←	110/5700	←
	Max. Torque (EEC) N·m/rpm		170/4200	←	200/4000	←
Engine Electrical	Battery Capacity (5HR) Voltage & Amp. hr.		12-32, 48*2	←	←	←
	Alternator Output Watts		960	←	←	←
	Starter Output kW		1.1	←	1.0, 1.2*2	←
Chassis	Clutch Type		—	—	Dry, Single	←
	Transaxle Type		A246E	←	S55	←
	Transmission Gear Ratio	In First	4.005	←	3.538	←
		In Second	2.208	←	2.041	←
		In Third	1.425	←	1.322	←
		In Fourth	0.981	←	1.028	←
		In Fifth	—	—	0.820	←
		In Reverse	3.272	←	3.153	←
	Counter Gear Ratio		—	—	—	—
	Differential Gear Ratio (Final)		2.962	←	3.736	←
	Brake Type	Front	Ventilated Disc	←	←	←
		Rear	Leading Trailing Drum, Solid Disc*2	←	←	←
	Parking Brake Type		Drum	←	←	←
	Brake Booster Type and Size in.		Single 9", Tandem 7" + 8"*2	←	Tandem 7" + 8"	←
	Proportioning Valve Type		—	—	—	—
	Suspension Type	Front	MacPherson Strut	←	←	←
		Rear	MacPherson Strut	←	←	←
	Stabilizer Bar	Front	STD	←	←	←
		Rear	STD	←	←	←
	Steering Gear Type		Rack and Pinion	←	←	←
	Steering Gear Ratio (Overall)		15.66	←	←	←
	Power Steering Type		Integral Type	←	←	←

*1: With Moon Roof
*2: Option

Europe					
5-Door Liftback					
LINEA SOL				LINEA TERRA	
AZT220R-ALMEHW	AZT220L-ALMEHW	AZT220R-ALPEHW	AZT220L-ALPEHW	CDT220R-ALMNYW	CDT220L-ALMNYW
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	155 (6.1)	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	755 ~ 805 (1664 ~ 1775)	←	805 ~ 855 (1775 ~ 1885)	←
←	←	←	←	535 ~ 560 (1179 ~ 1235)	←
←	←	1290 ~ 1365 (2844 ~ 3009)	←	1340 ~ 1415 (2954 ~ 3120)	←
←	←	←	←	950 (2094)	←
←	←	←	←	880 (1940)	←
←	←	←	←	1830 (4034)	←
←	←	←	←	60 (13.2)	←
←	←	←	←	←	←
←	←	205 (127)	←	195 (121)	←
—	—	—	—	—	—
←	←	9.9	←	11.4	←
←	←	17.1	←	17.8	←
←	←	60 (37)	←	44 (27)	←
←	←	107 (67)	←	77 (48)	←
←	←	—	—	118 (73)	←
←	←	—	—	162 (100)	←
←	←	←	←	5.4 (17.7)	←
←	←	←	←	5.8 (19.0)	←
←	←	←	←	1CD-FTV	←
←	←	←	←	←	←
←	←	←	←	82.2 x 94.0 (3.24 x 3.70)	←
←	←	←	←	1995 (121.7)	←
←	←	←	←	18.6 : 1	←
←	←	←	←	Common-Rail Type	←
←	←	←	←	52	←
←	←	←	←	81 / 4000	←
←	←	←	←	250 / 2000 ~ 2400	←
←	←	←	←	12-64	←
←	←	←	←	1440	←
←	←	←	←	2.0	←
←	←	—	—	Dry, Single	←
←	←	U240E	←	E351	←
←	←	3.943	←	3.538	←
←	←	2.197	←	2.045	←
←	←	1.413	←	1.333	←
←	←	1.020	←	0.972	←
←	←	—	—	0.731	←
←	←	3.145	←	3.683	←
—	—	—	—	—	—
←	←	2.923	←	3.583	←
←	←	←	←	←	←
Solid Disc	←	←	←	Leading Trailing Drum, Solid Disc*2	←
←	←	←	←	←	←
←	←	←	←	Single 9"	←
—	—	—	—	—	—
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←

3

Item			Area: Europe			
Body Type			5-Door Liftback		5-Door Wagon	
Vehicle Grade			LINEA SOL		LINEA TERRA	
Model Code			CDT220R-ALMEYW	CDT220L-ALMEYW	ZZT220-R-AWMNKW	ZZT220L-AWMNKW
Major Dimensions & Vehicle Weights	Overall	Length mm (in.)	4520 (178.0)	←	4600 (181.1)	←
		Width mm (in.)	1710 (67.3)	←	←	←
		Height mm (in.)	1425 (56.1)	←	1500 (59.1)	←
	Wheel Base mm (in.)		2630 (103.5)	←	←	←
	Tread	Front mm (in.)	1480 (58.3)	←	←	←
		Rear mm (in.)	1450 (57.1)	←	←	←
	Room	Length mm (in.)	1930 (76.0)	←	←	←
		Width mm (in.)	1455 (57.3)	←	←	←
		Height mm (in.)	1160 (45.7), 1110 (43.7)*1	←	1170 (46.1), 1120 (44.1)*1	←
	Overhang	Front mm (in.)	905 (35.6)	←	←	←
		Rear mm (in.)	985 (38.8)	←	1065 (41.9)	←
	Min. Running Ground Clearance mm (in.)		155 (6.1)	←	145 (5.7)	←
	Angle of Approach degrees		14.4°	←	←	←
	Angle of Departure degrees		18.4°	←	17.4°	←
	Curb Weight	Front kg (lb)	805 ~ 855 (1775 ~ 1885)	←	685 ~ 735 (1510 ~ 1620)	←
		Rear kg (lb)	535 ~ 560 (1179 ~ 1235)	←	550 ~ 580 (1213 ~ 1279)	←
		Total kg (lb)	1340 ~ 1415 (2954 ~ 3120)	←	1235 ~ 1315 (2723 ~ 2900)	←
	Gross Vehicle Weight	Front kg (lb)	950 (2094)	←	860 (1896)	←
		Rear kg (lb)	880 (1940)	←	870 (1918)	←
		Total kg (lb)	1830 (4034)	←	1730 (3814)	←
	Fuel Tank Capacity ℓ (Imp.gal.)		60 (13.2)	←	←	←
	Luggage Compartment Capacity m^3 (cu.ft.)		0.51 (18.0)	←	0.53 (18.7)	←
Performance	Max. Speed km/h (mph)		195 (121)	←	190 (118)	←
	Max. Cruising Speed km/h (mph)		—	—	—	—
	Acceleration	0 to 100 km/h sec.	11.4	←	11.5	←
		0 to 400 m sec.	17.8	←	17.8	←
	Max. Permissible Speed	1st Gear km/h (mph)	44 (27)	←	49 (30)	←
		2nd Gear km/h (mph)	77 (48)	←	92 (57)	←
		3rd Gear km/h (mph)	118 (73)	←	134 (83)	←
		4th Gear km/h (mph)	162 (100)	←	181 (112)	←
	Min. Turning Radius	Tire m (ft.)	5.4 (17.7)	←	←	←
		Body m (ft.)	5.8 (19.0)	←	←	←
Engine	Engine Type		1CD-FTV	←	3ZZ-FE	←
	Valve Mechanism		16-Valve, DOHC	←	16-Valve, DOHC	←
	Bore x Stroke mm (in.)		82.2 x 94.0 (3.24 x 3.70)	←	79.0 x 81.5 (3.11 x 3.21)	←
	Displacement cm^3 (cu.in.)		1995 (121.7)	←	1598 (97.5)	←
	Compression Ratio		18.6 : 1	←	10.5 : 1	←
	Carburetor Type or Injection Pump Type (Diesel)		Common-Rail Type	←	EFI	←
	Research Octane No. or Cetane No. (Diesel)		52	←	95 or More	←
	Max. Output (EEC) kW/rpm		81/4000	←	81/6000	←
	Max. Torque (EEC) N·m/rpm		250/2000 ~ 2400	←	150/3800	←
Engine Electrical	Battery Capacity (5HR) Voltage & Amp. hr.		12-64	←	12-32, 48*2	←
	Alternator Output Watts		1440	←	960	←
	Starter Output kW		2.0	←	1.1	←
Chassis	Clutch Type		Dry, Single	←	←	←
	Transaxle Type		E351	←	C50	←
	Transmission Gear Ratio	In First	3.538	←	3.545	←
		In Second	2.045	←	1.904	←
		In Third	1.333	←	1.310	←
		In Fourth	0.972	←	0.969	←
		In Fifth	0.731	←	0.815	←
		In Reverse	3.583	←	3.250	←
	Counter Gear Ratio		—	—	—	—
	Differential Gear Ratio (Final)		3.684	←	4.058	←
	Brake Type	Front	Ventilated Disc	←	←	←
		Rear	Leading Trailing Drum, Solid Disc*2	←	←	←
	Parking Brake Type		Drum	←	←	←
	Brake Booster Type and Size in.		Single 9”	←	Single 9”, Tandem 7” + 8”*2	←
	Proportioning Valve Type		—	—	—	—
	Suspension Type	Front	MacPherson Strut	←	←	←
		Rear	MacPherson Strut	←	←	←
	Stabilizer Bar	Front	STD	←	←	←
		Rear	STD	←	←	←
	Steering Gear Type		Rack and Pinion	←	←	←
	Steering Gear Ratio (Overall)		15.66	←	←	←
	Power Steering Type		Integral Type	←	←	←

*1: With Moon Roof
*2: Option

Europe					
5-Door Wagon					
LINEA SOL	LINEA TERRA			LINEA SOL	
ZZT220L-AWMEKW	ZZT221R-AWMNKW	ZZT221L-AWMNKW	ZZT221L-AWPNKW	ZZT221L-AWMEKW	ZZT221L-AWPEKW
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	140 (5.5)	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	685 ~ 740 (1510 ~ 1631)	←	715 ~ 770 (1576 ~ 1698)	685 ~ 740 (1510 ~ 1631)	715 ~ 770 (1576 ~ 1698)
←	←	←	←	←	←
←	1235 ~ 1320 (2723 ~ 2910)	←	1265 ~ 1350 (2789 ~ 2976)	1235 ~ 1320 (2723 ~ 2910)	1265 ~1350 (2789 ~ 2976)
←	890 (1962)	←	←	←	←
←	←	←	←	←	←
←	1760 (3880)	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	195 (121)	←	190 (118)	195 (121)	190 (118)
—	—	—	—	—	—
←	10.2	←	11.6	10.2	11.6
←	17.2	←	18.2	17.2	18.2
←	50 (31)	←	58 (36)	50 (31)	58 (36)
←	94 (58)	←	105 (65)	94 (58)	105 (65)
←	137 (85)	←	—	137 (85)	—
←	175 (108)	←	—	175 (108)	—
←	←	←	←	←	←
←	←	←	←	←	←
←	1ZZ-FE	←	←	←	←
←	←	←	←	←	←
←	79.0 x 91.5 (3.11 x 3.60)	←	←	←	←
←	1794 (109.5)	←	←	←	←
←	10.1 : 1	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	95 / 6000	←	←	←	←
←	170 / 4200	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	—	Dry, Single	—
←	C250	←	A246E	C250	A246E
←	←	←	4.005	3.545	4.005
←	←	←	2.208	1.904	2.208
←	←	←	1.425	1.310	1.425
←	1.031	←	0.981	1.031	0.981
←	←	←	—	0.815	—
←	←	←	3.272	3.250	3.272
←	←	←	←	←	←
←	3.941	←	2.962	3.941	2.962
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
—	—	—	—	—	—
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←
←	←	←	←	←	←

3

Item		Area	Europe			
Body Type			5-Door Wagon			
Vehicle Grade			LINEA TERRA		LINEA SOL	
Model Code			AZT220R-AWMNHW	AZT220L-AWMNHW	AZT220R-AWMEHW	AZT220L-AWMEHW
Major Dimensions & Vehicle Weights	Overall	Length mm (in.)	4600 (181.1)	←	←	←
		Width mm (in.)	1710 (67.3)	←	←	←
		Height mm (in.)	1500 (59.1)	←	←	←
	Wheel Base mm (in.)		2630 (103.5)	←	←	←
	Tread	Front mm (in.)	1480 (58.3)	←	←	←
		Rear mm (in.)	1450 (57.1)	←	←	←
	Room	Length mm (in.)	1930 (76.0)	←	←	←
		Width mm (in.)	1455 (57.3)	←	←	←
		Height mm (in.)	1170 (46.1), 1120 (44.1)*1	←	←	←
	Overhang	Front mm (in.)	905 (35.6)	←	←	←
		Rear mm (in.)	1065 (41.9)	←	←	←
	Min. Running Ground Clearance mm (in.)		145 (5.7)	←	←	←
	Angle of Approach degrees		14.4°	←	←	←
	Angle of Departure degrees		17.4°	←	←	←
	Curb Weight	Front kg (lb)	730 ~ 780 (1609 ~ 1720)	←	←	←
		Rear kg (lb)	550 ~ 575 (1213 ~ 1268)	←	←	←
		Total kg (lb)	1280 ~ 1355 (2822 ~ 2987)	←	←	←
	Gross Vehicle Weight	Front kg (lb)	920 (2028)	←	←	←
		Rear kg (lb)	880 (1940)	←	←	←
		Total kg (lb)	1800 (3968)	←	←	←
	Fuel Tank Capacity ℓ (lmp.gal.)		60 (13.2)	←	←	←
	Luggage Compartment Capacity m^3 (cu.ft.)		0.53 (18.7)	←	←	←
Performance	Max. Speed km/h (mph)		205 (127)	←	←	←
	Max. Cruising Speed km/h (mph)		—	—	—	—
	Acceleration	0 to 100 km/h sec.	9.3	←	←	←
		0 to 400 m sec.	16.7	←	←	←
	Max. Permissible Speed	1st Gear km/h (mph)	54 (33)	←	←	←
		2nd Gear km/h (mph)	93 (58)	←	←	←
		3rd Gear km/h (mph)	144 (89)	←	←	←
		4th Gear km/h (mph)	185 (115)	←	←	←
	Min. Turning Radius	Tire m (ft.)	5.4 (17.7)	←	←	←
		Body m (ft.)	5.8 (19.0)	←	←	←
Engine	Engine Type		1AZ-FSE	←	←	←
	Valve Mechanism		16-Valve, DOHC	←	←	←
	Bore x Stroke mm (in.)		86.0 x 86.0 (3.39 x 3.39)	←	←	←
	Displacement cm^3 (cu.in.)		1998 (121.9)	←	←	←
	Compression Ratio		11.0 : 1	←	←	←
	Carburetor Type or Injection Pump Type (Diesel)		EFI	←	←	←
	Research Octane No. or Cetane No. (Diesel)		95 or More	←	←	←
	Max. Output (EEC) kW/rpm		110/5700	←	←	←
	Max. Torque (EEC) N·m/rpm		200/4000	←	←	←
Engine Electrical	Battery Capacity (5HR) Voltage & Amp. hr.		12-34, 48*2	←	←	←
	Alternator Output Watts		960	←	←	←
	Starter Output kW		1.0, 1.2*2	←	←	←
Chassis	Clutch Type		Dry, Single	←	←	←
	Transaxle Type		S55	←	←	←
	Transmission Gear Ratio	In First	3.538	←	←	←
		In Second	2.041	←	←	←
		In Third	1.322	←	←	←
		In Fourth	1.028	←	←	←
		In Fifth	0.820	←	←	←
		In Reverse	3.153	←	←	←
	Counter Gear Ratio		—	—	—	—
	Differential Gear Ratio (Final)		3.736	←	←	←
	Brake Type	Front	Ventilated Disc	←	←	←
		Rear	Leading Trailing Drum, Solid Disc*2	←	Solid Disc	←
	Parking Brake Type		Drum	←	←	←
	Brake Booster Type and Size in.		Tandem 7" + 8"	←	←	←
	Proportioning Valve Type		—	—	—	—
	Suspension Type	Front	MacPherson Strut	←	←	←
		Rear	MacPherson Strut	←	←	←
	Stabilizer Bar	Front	STD	←	←	←
		Rear	STD	←	←	←
	Steering Gear Type		Rack and Pinion	←	←	←
	Steering Gear Ratio (Overall)		15.66	←	←	←
	Power Steering Type		Integral Type	←	←	←

*1: With Moon Roof
*2: Option

Europe				
5-Door Wagon				
LINEA SOL		LINEA TERRA		LINEA SOL
AZT220R-AWPEHW	AZT220L-AWPEHW	CDT220R-AWMNYW	CDT220L-AWMNYW	CDT220L-AWMEYN
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	155 (6.1)	←	←
←	←	←	←	←
←	←	←	←	←
755 ~ 805 (1664 ~ 1775)	←	805 ~ 855 (1775 ~ 1885)	←	←
←	←	←	←	←
1305 ~ 1380 (2877 ~ 3042)	←	1335 ~ 1430 (2943 ~ 3153)	←	←
←	←	950 (2094)	←	←
←	←	880 (1940)	←	←
←	←	1830 (4034)	←	←
←	←	60 (13.2)	←	←
←	←	←	←	←
200 (124)	←	190 (118)	←	←
—	—	—	—	—
10.1	←	11.6	←	←
17.2	←	17.9	←	←
60 (37)	←	44 (27)	←	←
107 (67)	←	77 (48)	←	←
—	—	118 (73)	←	←
—	—	162 (100)	←	←
←	←	5.4 (17.7)	←	←
←	←	5.8 (19.0)	←	←
←	←	1CD-FTV	←	←
←	←	←	←	←
←	←	82.2 x 94.0 (3.24 x 3.70)	←	←
←	←	1995 (121.7)	←	←
←	←	18.6 : 1	←	←
←	←	Common-Rail Type	←	←
←	←	52	←	←
←	←	81 / 4000	←	←
←	←	250 / 2000 ~ 2400	←	←
←	←	12-64	←	←
←	←	1440	←	←
←	←	2.0	←	←
—	←	Dry, Single	←	←
U240E	←	E351	←	←
3.943	←	3.538	←	←
2.197	←	2.045	←	←
1.413	←	1.333	←	←
1.020	←	0.972	←	←
—	—	0.731	←	←
3.145	←	3.583	←	←
—	—	—	—	—
2.923	←	3.684	←	←
←	←	←	←	←
←	←	Leading Trailing Drum, Solid Disc*2	←	←
←	←	←	←	←
←	←	Single 9”	←	←
—	—	—	—	—
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←
←	←	←	←	←

3

– MEMO –