# FOREWORD

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

Applicable models: ZZW30 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 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. |

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

| Manual Name | Pub. No. |
|---|---|
| • 2000 MR2 Repair Manual | RM760U |
| • 2000 MR2 Electrical Wiring Diagram | EWD408U |

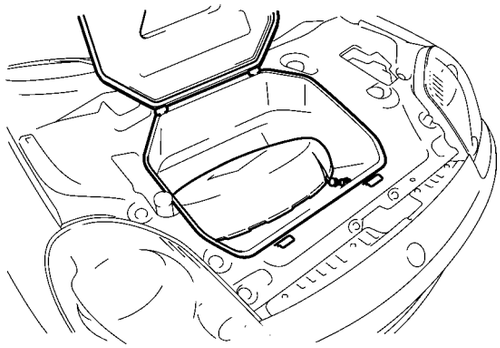
All information contained herein is the most up-to-date at the time of publication. We reserve the right to make changes without prior notice.

**TOYOTA MOTOR CORPORATION**


First Printing: Nov. 15, 1999 01–991115–00

## Front Box

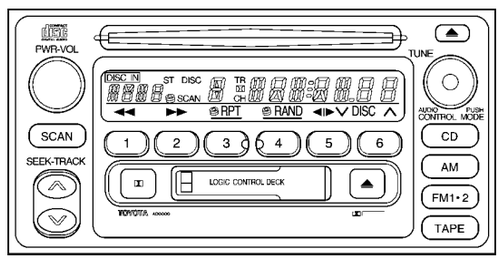
● A front box for the spare tire and a little additional storage space.



179MO21

## Audio

● Fitted standard is a radio-less 4-speaker system and a fixed-type rod antenna for all models. Also available as an option is an auto-type antenna and an AM/FM/Cassette/CD system which has excellent operability and is easy to see.



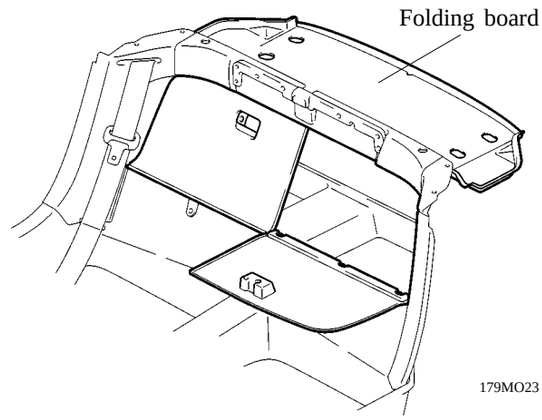

179MO22

## Immobiliser

● Theft prevention is provided through a device that will not allow the car to be started with any other than the correct key. The engine cannot be started unless the ID code to the transponder chip buried in the key and the pre-registered ID code in the ECM match.

## Luggage Space

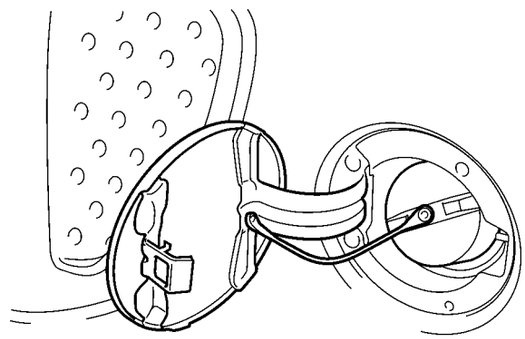
● Luggage space is provided behind the seats and divided into left and right sections, both with lockable lids. It is possible to store up to a 9-inch golf bag in this space when the top is closed and both side trims are removed. The MR2 is also fitted with a folding board which can be used to store small items when the top is closed.




179MO23

## Fuel Cap Tether

● A tether connecting the fuel cap to the fuel lid has been fitted to elimate the worry of lost fuel caps.



179MO24

## Front Fender & Quarter Panel

● Detachable bolt-on-type front fenders and quarter panels enhance availability of repair, making room for development on the after-sales market.

# DEVELOPMENT OBJECTIVES

## The long-awaited debut of the lightweight sports MR2 - the car to surpass the new century!

**"More carefree and unconfined driving" – this car was developed for exactly that reason.**
**A sporty design finished off with a soft-top.**
**Packaged with a short overhang and long wheelbase.**
**Surpassing steering and suspension system to support agility. An interior without superfluous show....**
**With a mid-ship layout ideal for running and handling, we welcome the debut of the MR2 – the lightweight sports car for the new century!**

179IN01

# A totally new view on the value of a sports car.


1 A refreshing yet simple silhouette reflecting an image of agility.

2 A polished interior that is both functional and stimulating to the sports minded.

3 A mechanism that directly relays the will of the driver.

4 Safety functions that can support the duress of sporty driving and give the driver a feeling of reliability.

5 A no-waste package equipped with easy-to-use functions.

# EXTERIOR

# A refreshing yet simple silhouette reflecting an image of agility.

## Front Design

### The front design gives of an energetic and sporty feel.

- The wide grill is set low to give aggressive and brawny appeal.
- Gutsiness accentuated through the shape of the graphic front combination lamps, the hood and corner sections.

179MO01

## Rear Design

### The rear design reflects width and stability.

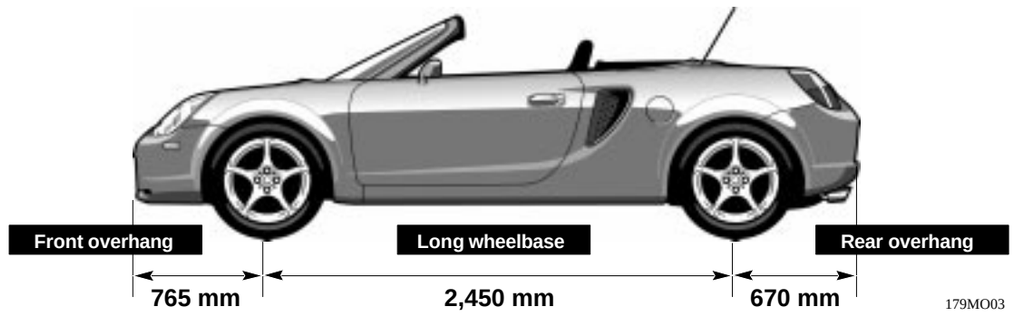
- Rear combination lamps with an individualistic design to create sporty appeal consistent to that of the front view.
- Individualized layout of the character line of the hood and the air outlets.


179MO02

# Side Design

### *A side view with a fluid line and no unnecessary frills.*

- Only a wedge-shape cut of a mid-ship can bring out this kind of solid feel.
- Sporty feel expressed through the characteristic shape of the side air intakes.



179MO03

# Soft Top

### *The soft-top allows you to enjoy the refreshing feel of the wind rushing through your hair.*

- The MR2 features a manual, two-division, linked convertible roof. This two-division linked style allows the soft-top to be stored neatly and evenly, and prevents the upper face from reversing. The tempered glass rear window has a built-in defogger, ensuring excellent rear visibility and durability.


179MO04

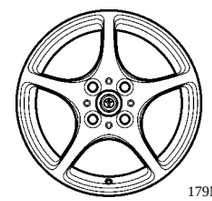
# Tire & Disc Wheel

### *Tire*

- Fitted tires are of different sizes between front and rear.
  Tire sizes
  Front: 185/55R 15-81V
  Rear: 205/50R 15-85V

### *Aluminum Wheel*

- The thin spokes produce a sharp image.
  Wheel sizes
  Front: 15 × 6 JJ
  Rear: 15 × 6 1/2JJ


179MO06

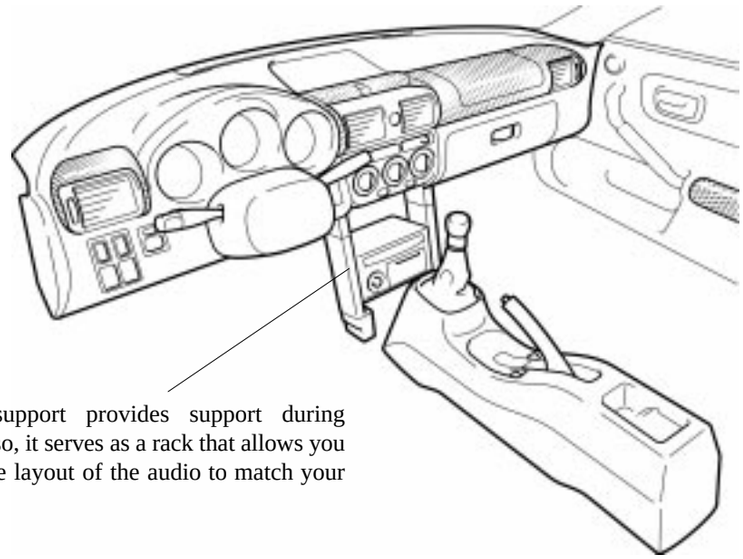
# INTERIOR

## A polished interior that is both functional and stimulating to the sports minded.

### Instrument Panel & Knee Support

***The instrument panel is both functional and sporty.***

- The simple mold brings out the sporty feel.
- The instrument panel giving priority to both design and operability.

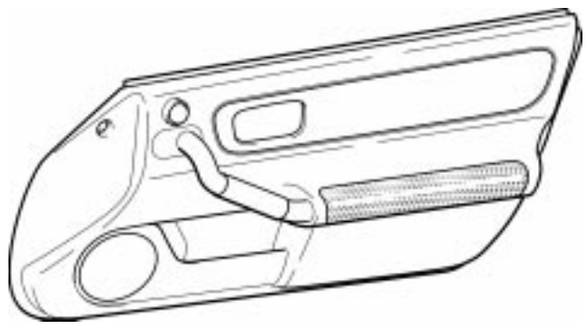


179MO07

- The knee support provides support during cornering, also, it serves as a rack that allows you to arrange the layout of the audio to match your desires.

### Door Trim

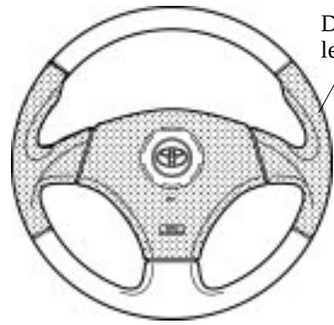
- A metallic, pipe-like door grip is adopted for sporty feel.
- The emblem covering is the same in material as the seat side covering for harmony.
- A B5 size door pocket is provided for storing road maps and the like.



179MO08

## Steering Wheel

● Three-spoke steering wheel with genuine leather cover, dimpled at the grip and center pad – this specification adds a touch of luxury.

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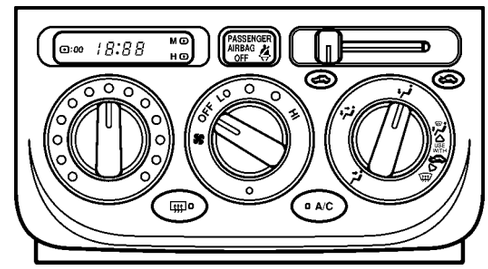
## Heater Control Panel

● A dial-type heater control panel – a simple design that matches that of the interior.




179MO10

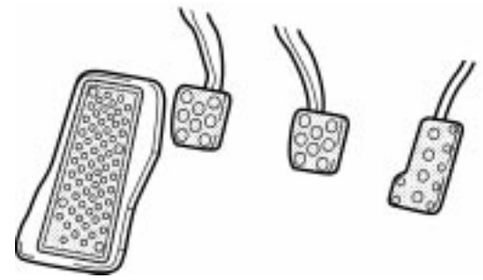
## Combination Meter

● A pyramid of 3 individual silver-backed analog meters, with the tachometer positioned at the center, has been utilized to realize sportiness and easy visibility. The sporty feel is also heightened by the dot display for the red zone on the tachometer.

179MO11

## Sports Pedals

● Sporty aluminum pedals fitted to the new MR2 offers good functional usage and excellent design.



179MO12

## Seat

● The seats adopted for the MR2 are superior to support your body to make you feel as one with the car. Mesh fabric is used for the main section and material with a lustrous feel has been used for the side sections.

179MO13

# MAIN MECHANISM

# A mechanism that directly relays the will of the driver.

## Engine

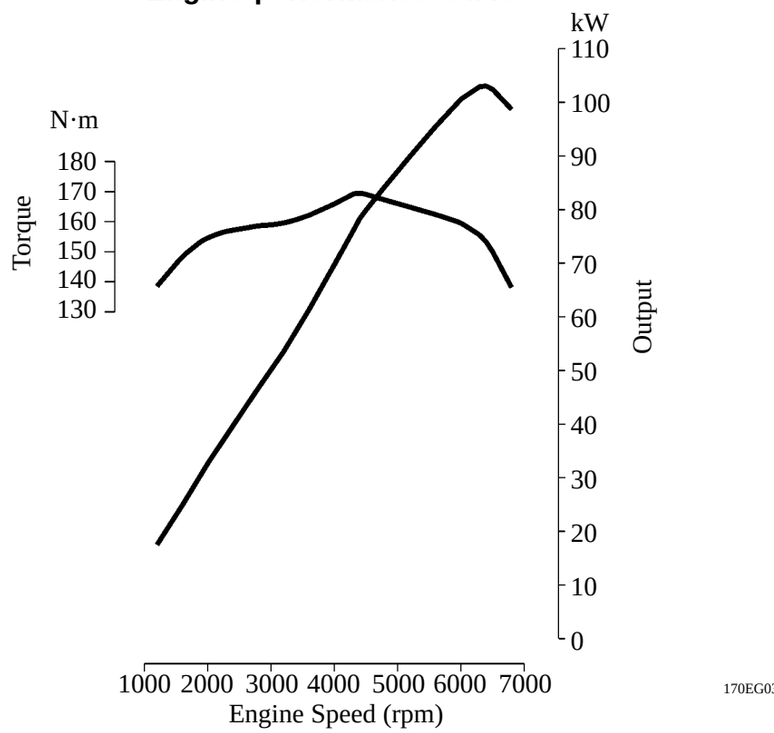
### Fitted with a VVT-i 1.8 liter, 1ZZ-FE engine.

● The feeling of release is delivered through the acceleration created by the 1.8 liter 1ZZ-FE engine, which is in accord with the “New Generation Light Sports Car.” and through the lightweight body.

### Outline of the engine

| | | |
|---|---|---|
| Displacement | $cm^3$ (cu. in.) | 1,794 (109.5) |
| Type | | L4 DOHC 16-valve |
| Bore × stroke | mm (in.) | 79.0 × 91.5 (3.11 × 3.60) |
| Compression ratio | | 10.0 : 1 |
| Maximum output | kW/rpm (HP @ rpm) | 103/6,400 (138 @ 6400) |
| Maximum torque | N·m/rpm (ft·lbf @ rpm) | 170/4,400 (125 @ 4400) |

**Engine performance curve**

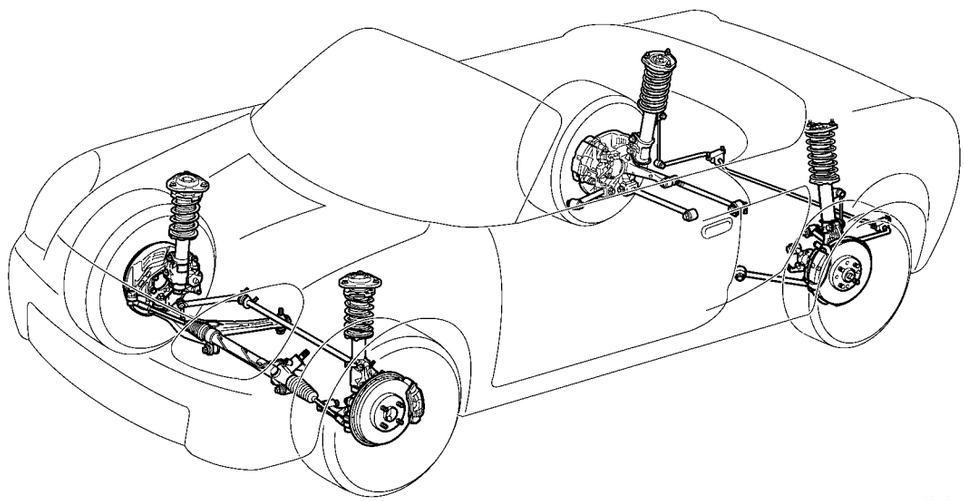


## Helical Gear Type Torque-Sensing LSD
### (Option)

● Helical gear type LSD is available as an option to enhance the sportiness of the ride.

## Suspension

● An L-shape lower arm MacPherson strut suspension is utilized on the front and dual-link MacPherson strut suspension on the rear to realize excellent riding comfort, stability and controllability.



179CH07

## Power Steering (EHPS: Electro-Hydraulic Power Steering)

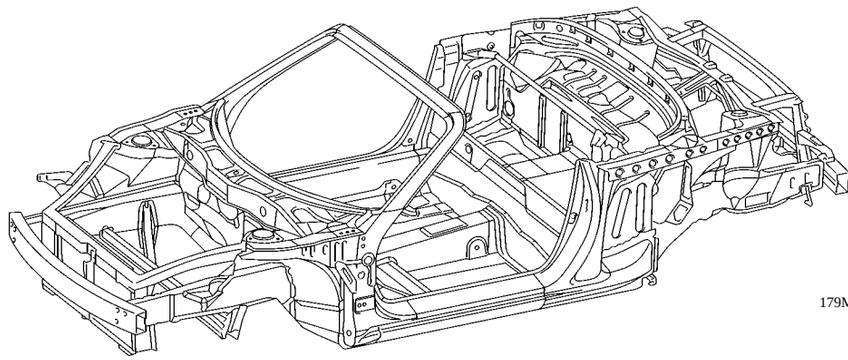
● Through improved pump efficiency and minimizing of each part on the previous EHPS, we have been able to make the lighter weight of the pump and more energy efficient. We also optimized the control to realize an improved sensory experience in steering.

# SAFETY

## Safety functions that can support the duress of sporty driving and give the driver a feeling of reliability.

### Body Structure

● We didn't just remodel the previous coupe body; we used a specialized open body – a first for Toyota. Whilst increasing the rigidity of each section through the braces, cross members, spare tire cross members and further reinforced braces, we were also able to realize lighter weight.



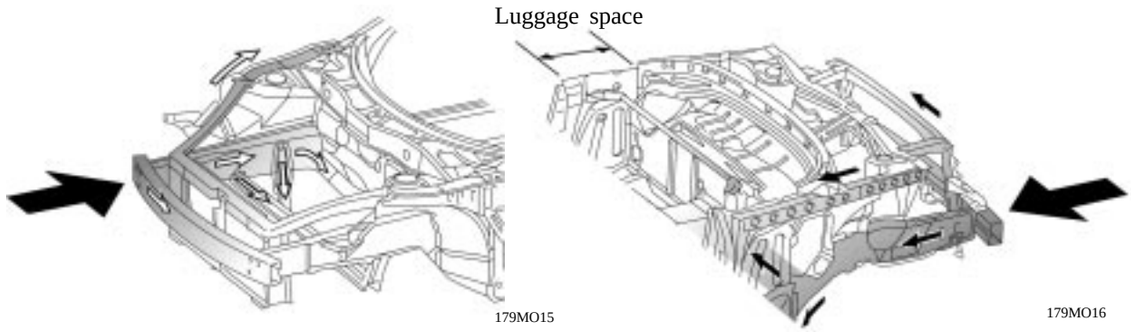
179MO14

### Front Impact

● Cross members and braces have been utilized for each section while securing an effective crushable zone through the mid-ship layout. The structure is designed to effectively absorb and disperse the force of frontal impacts.

### Rear Impact

● Safety in rear impacts is insured through the use of the luggage area, and rear upper and rear side members.




179MO15

179MO16

### SRS Airbag

● The driver's and passenger seats come with airbags as standard.

● Airbags work to supplement the protection provided by the seatbelts in frontal impacts, softening the shock felt by the driver and passenger.

● Passenger airbag manual on-off switch has been added.

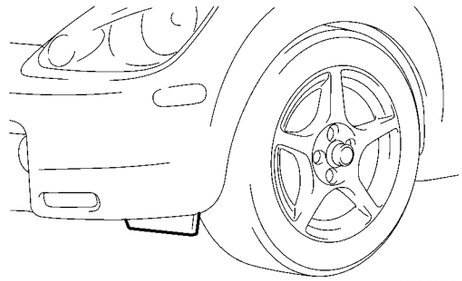
# EQUIPMENT

## A no-waste package equipped with easy-to-use functions.

## Front Tire Fairing & Air Deflector

● Excellent aerodynamics have been achieved through the front tire fairing which control the air flow around the tires.
An air deflector has been fitted to offset wind drag when the top is open for increased riding comfort.

**Front Tire Fairing**



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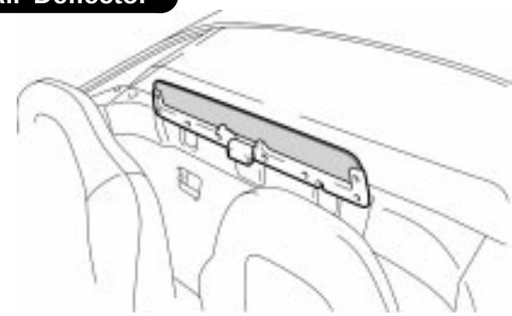
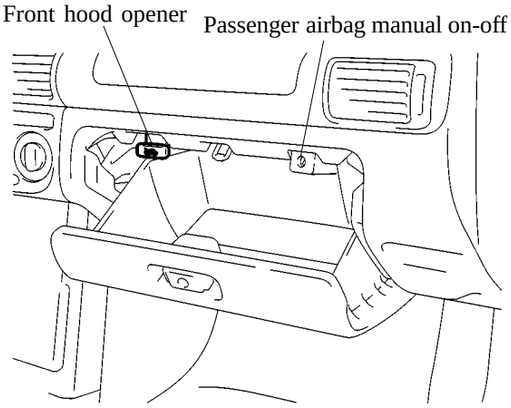
**Air Deflector**



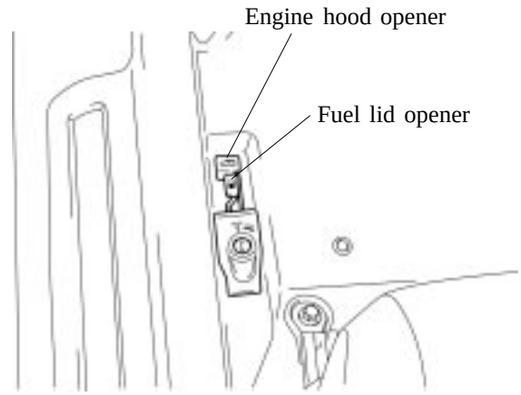
179MO18

## Front Hood, Engine Hood & Fuel Lid Opener

● In consideration for security while the top is open, a front hood opener has been fitted to the interior of the key lockable glovebox, and the engine hood and fuel lid openers have been fitted with key locks.




179MO19




179MO20

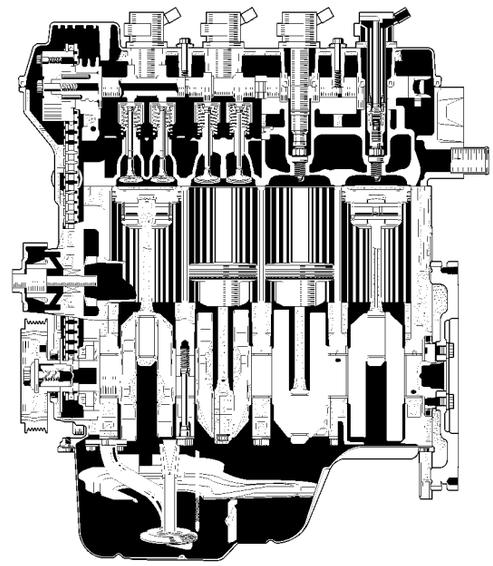
# ENGINE

## 1ZZ-FE ENGINE

### ■DESCRIPTION

The new MR2 uses the in-line 4-cylinder, 1.8-liter, 16-valve DOHC 1ZZ-FE engine that is acclaimed in its application on the ’00 Celica

This engine has adopted the VVT-i (Variable Valve Timing-intelligent) system and has been developed to realize high performance, quietness, fuel economy and cleaner emissions.



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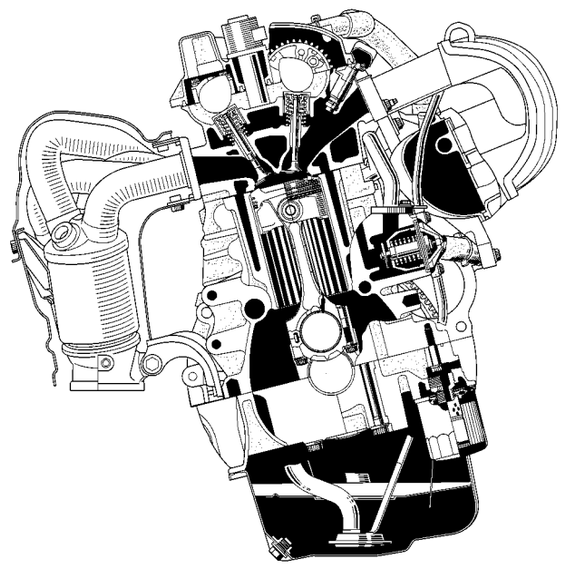
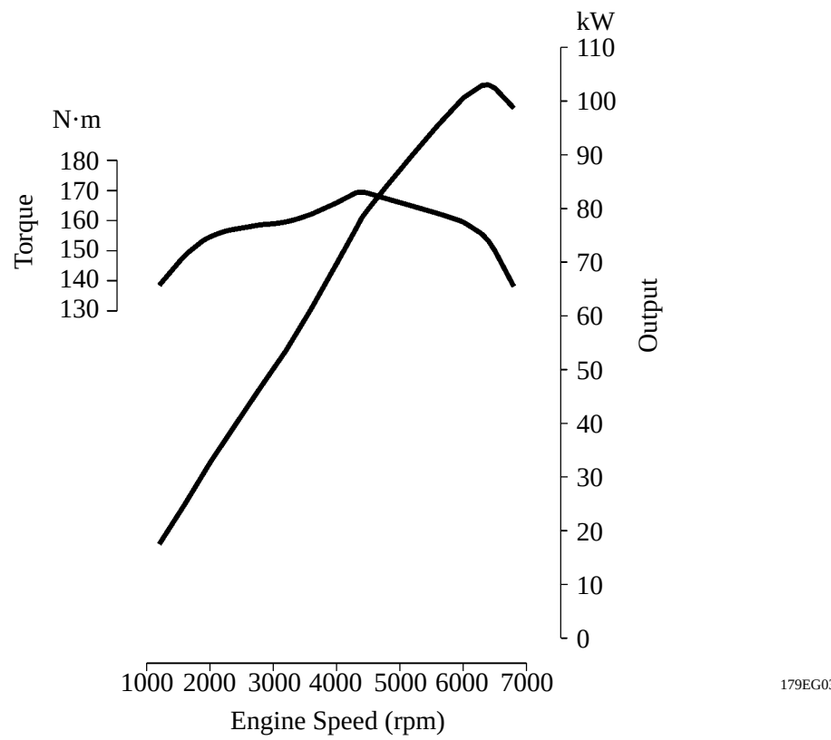


179EG02

**▶ Engine Specifications ◀**

| Engine Type | | | 1ZZ-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 | | | SFI |
| Displacement | | $cm^3$ (cu. in.) | 1794 (109.5) |
| Bore × Stroke | | mm (in.) | 79.0 × 91.5 (3.11 × 3.60) |
| Compression Ratio | | | 10.0 : 1 |
| Max. Output | | [SAE-NET] | 103 kW @ 6400 rpm (138 HP @ 6400 rpm) |
| Max. Torque | | [SAE-NET] | 170 N·m @ 4400 rpm (125 ft·lbf @ 4400 rpm) |
| Valve Timing | Intake | Open | 5° ~ 48° BTDC |
| | | Close | 55° ~ 12° ABDC |
| | Exhaust | Open | 42° BBDC |
| | | Close | 2° ATDC |
| Fuel Octane Number | | RON | 91 |
| Oil Grade | | | API, SJ EC or ILSAC |

**▶ Engine Specifications ◀**



## ■FEATURES OF 1ZZ-FE ENGINE

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

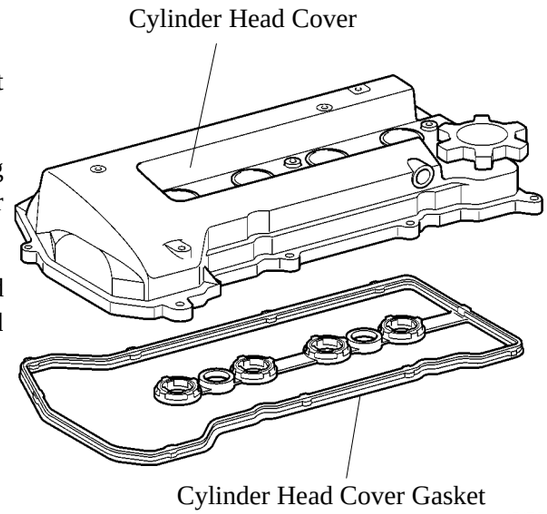
(1) High performance and fuel economy
(2) Low noise and vibration
(3) Lightweight and compact design
(4) Good serviceability
(5) Clean emission

| Item | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| 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. | | | | ○ | |
| Serpentine belt drive system has been adopted. | | | ○ | ○ | |
| The fuel returnless system has been adopted. | | | ○ | | ○ |
| Quick connectors are used to connect the fuel hose with the fuel pipes. | | | | ○ | |
| 12-hole type fuel injectors have been adopted. | ○ | | | | ○ |
| A dual type exhaust manifold has been adopted. | ○ | | | | |
| Intake manifold made of plastic has been adopted. | | | ○ | | |
| A heat insulator and exhaust manifold with optimized shapes have been adopted. | | ○ | | | ○ |
| A pipe is provided inside the air cleaner box to reduce the intake sound. | | ○ | | | |
| A WU-TWC (Warm Up Three-Way Catalytic Converter) for improving exhaust emissions has been adopted. | | | | | ○ |
| ORVR (On-Board Refueling Vapor Recovery) system has been adopted. | | | | | ○ |
| A vacuum system that detects leaks in the evaporative emission control system has been adopted. | | | | | ○ |

## ■ENGINE PROPER

### 1. Cylinder Head Cover

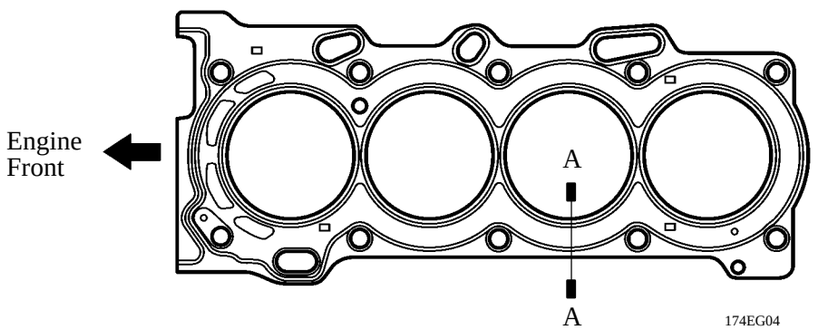
- Lightweight yet high-strength aluminum diecast cylinder head cover is used.
- The cylinder head cover gasket and the spark plug gasket have been integrated to reduce the number of parts.
- Acrylic rubber, which excels in heat resistance and reliability, has been adopted for the cylinder head cover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




174EG03

### 2. 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.

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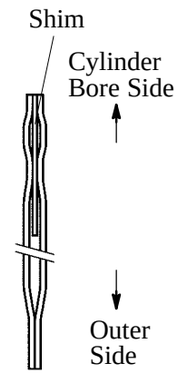
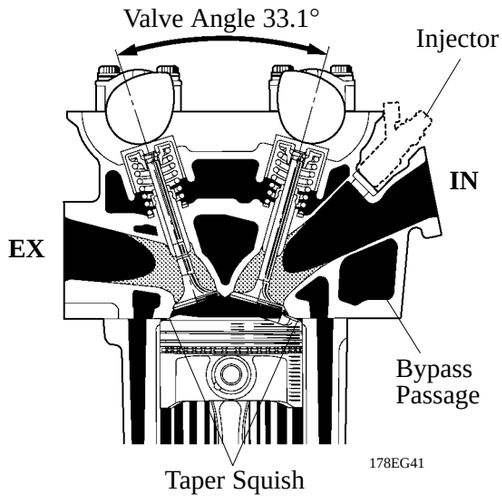


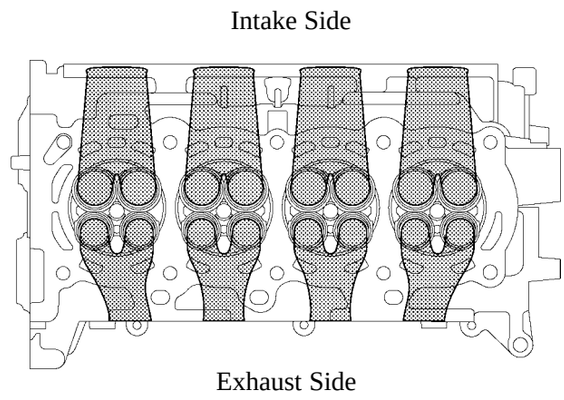

**A – A Cross Section**

178EG40

## 3. Cylinder Head

- 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.
- Upright intake port have been adopted to improve the intake efficiency.
- A compression ratio of 10.0 : 1 has been adopted and the variances in the combustion chamber volume between the cylinders have been minimized to improve the power output.
- 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 coolilng performance. In addition, 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.

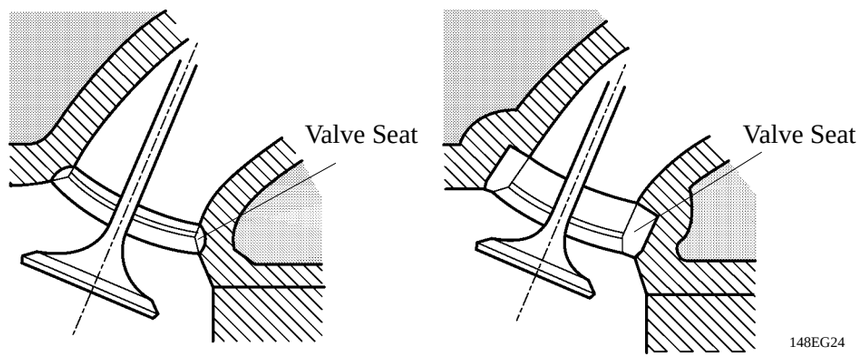



***– REFERENCE –***

*Laser Clad Valve Seat*

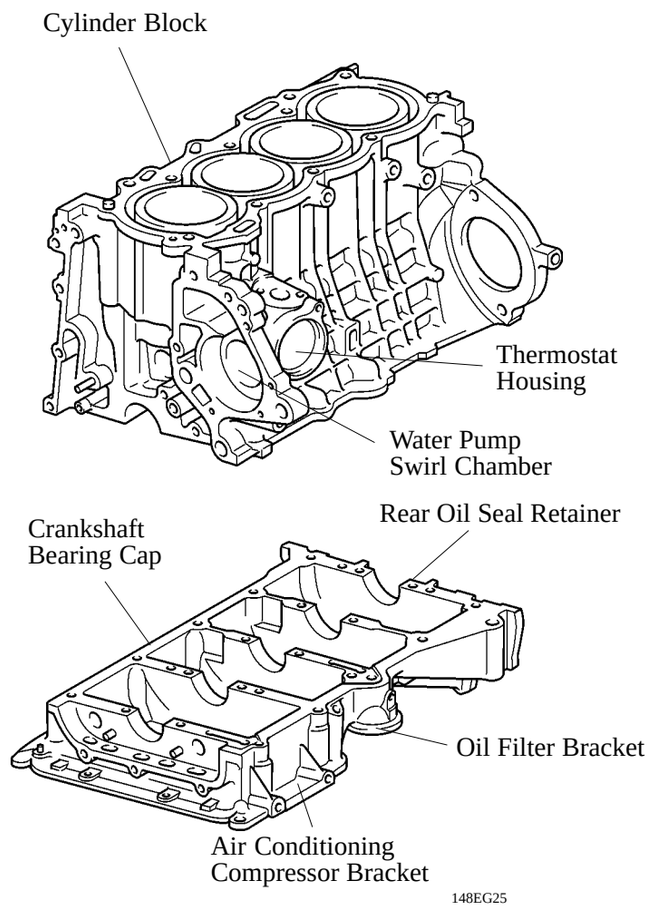
Previously, the valve seat consisted of a seat ring shrink-fitted into the cylinder head. However, with the laser-clad valve seat, a highly wear-resistant alloy is welded onto the cylinder head, and subsequently machine-cut to form the valve seat.
With this system, the valve seat can be made thinner. As a result, the valve seat diameter has been increased and the cooling performance around the valve seat has been improved.



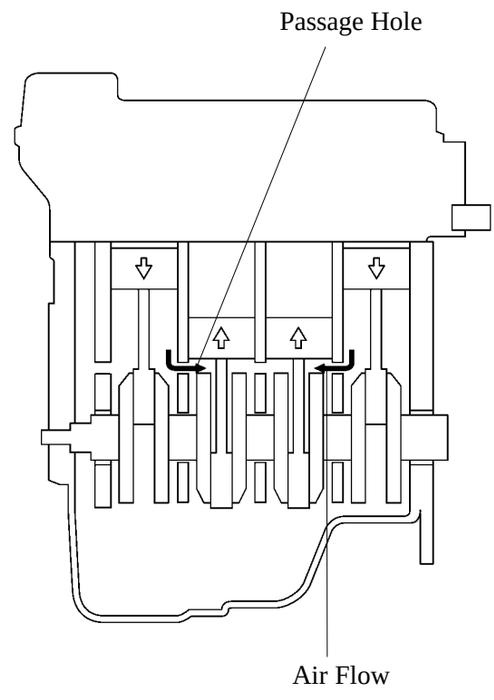

**Laser Clad Valve Seat** **Shrink Fit Valve Seat**

## 4. 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 crank shaft bearing cap and thus restraints the heat deformation. In addition, the oil filter bracket, the air conditioning 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.

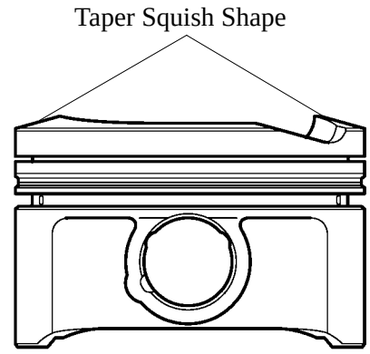



**▶ Air Flow During Engine Revolution ◀**



## 5. Piston

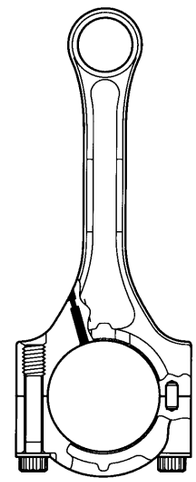
- The piston is made of aluminum alloy and skirt area is made compact and lightweight.
- The piston head portion has adopted a taper squish shape to improve the fuel combustion efficiency.
- Full floating type piston pins are used.




178EG28

## 6. Connecting Rod

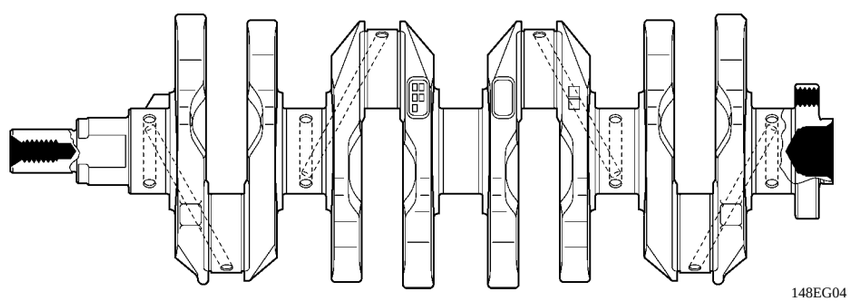
- The connecting rods are made of high-strength material for weight reduction.
- The connecting rod bearings have been reduced in width to reduce friction.



178EG29

## 7. 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.
- The front and rear overhang of the crankshaft has been reduced in order to reduce the crankshaft's bending vibration.

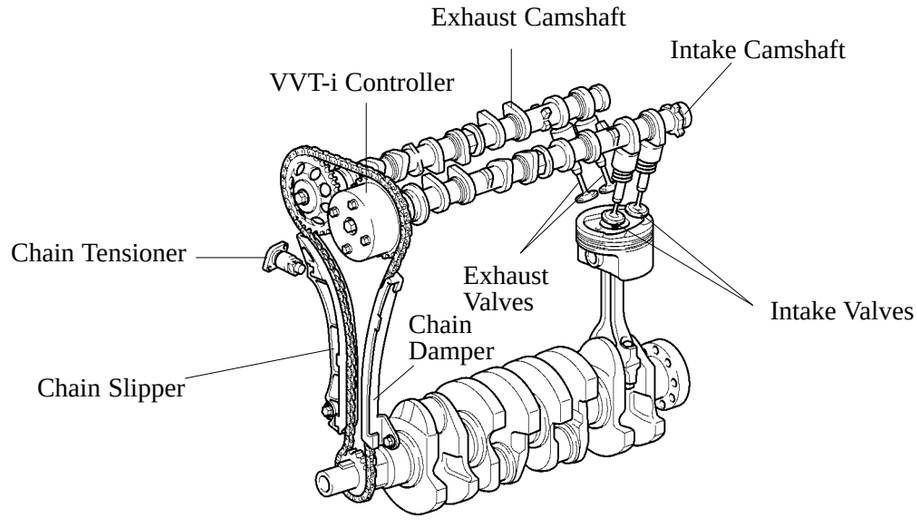


148EG04

## ■VALVE MECHANISM

### 1. General

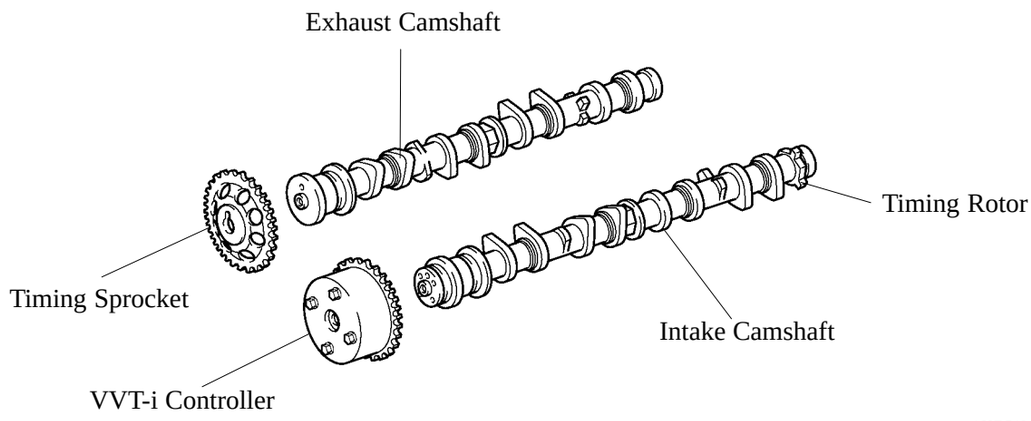
- Each cylinder is equipped with 2 intake valves and 2 exhaust valves. Intake and exhaust efficiency has been increased due to the larger total port areas.
- The valves are directly opened and closed by 2 camshafts.
- The intake and exhaust camshafts are driven by a chain.
  The VVT-i system is used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




169EG11

### 2. Camshafts

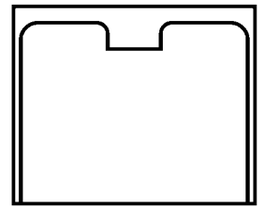
- In conjunction with the adoption of the VVT-i system, an oil passage is provided in the intake camshaft in order to supply engine oil pressure to the VVT-i system.
- A VVT-i controller has been installed on the front of the intake camshaft to vary the timing of the intake valves.
- The intake camshaft is provided with timing rotor to trigger the camshaft position sensor.




169EG12

## 3. Valve Lifter

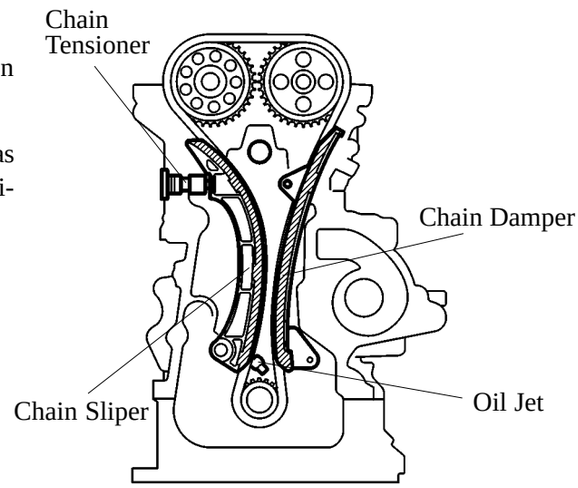
Along with the increase of the amount of valve lift, the valve adjusting shims have been discontinued and the shimless type of the valve lifter has been adopted. This valve lifter enables to make the cam contact surface greater.
The adjustment of the valve clearances is accomplished by selecting and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



148EG05

## 4. Timing Chain

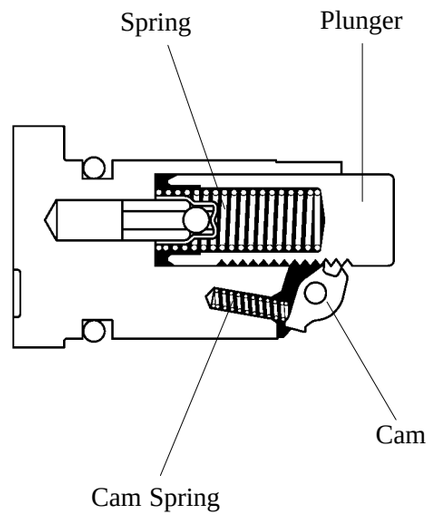
- A roller chain with an 8 mm pitch has been adopted to make the engine more compact.
- A material which has excellent wear resistance has been selected for the timing chain to improve reliability.
- The timing chain is lubricated by an oil jet.




179EG05

## 5. Chain Tensioner

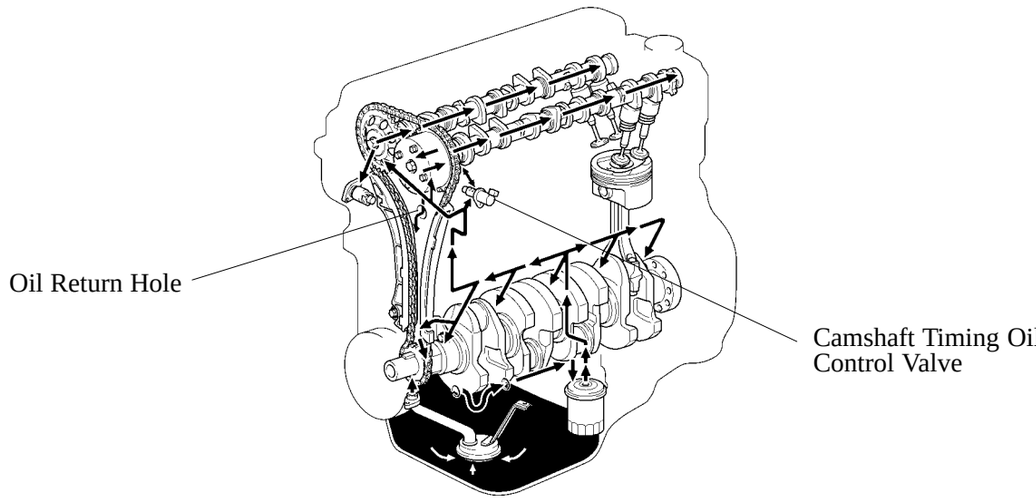
- The chain tensioner uses a spring and oil pressure to maintain proper chain tension at all times.
  The chain tensioner suppresses noise generated by the chain.
- A ratchet type non-return mechanism is also used.
- To improve serviceability, the chain tensioner is constructed so that it can be removed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



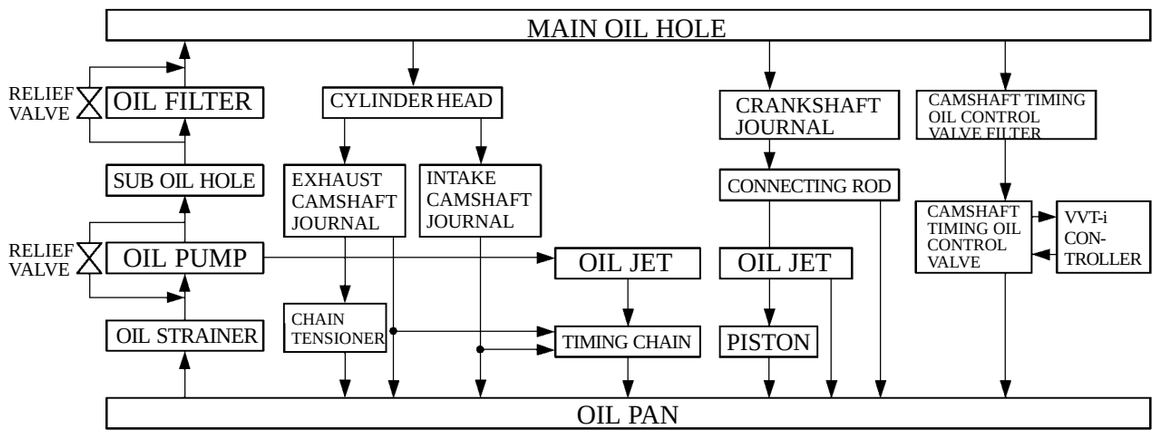

178EG05

## ■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.




179EG06

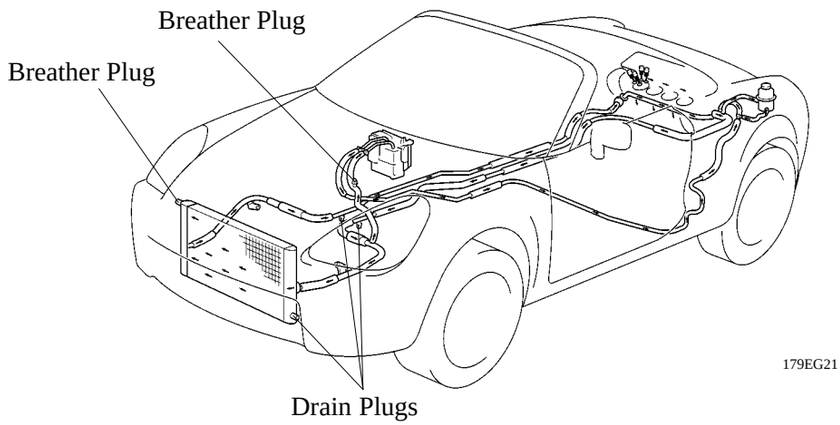


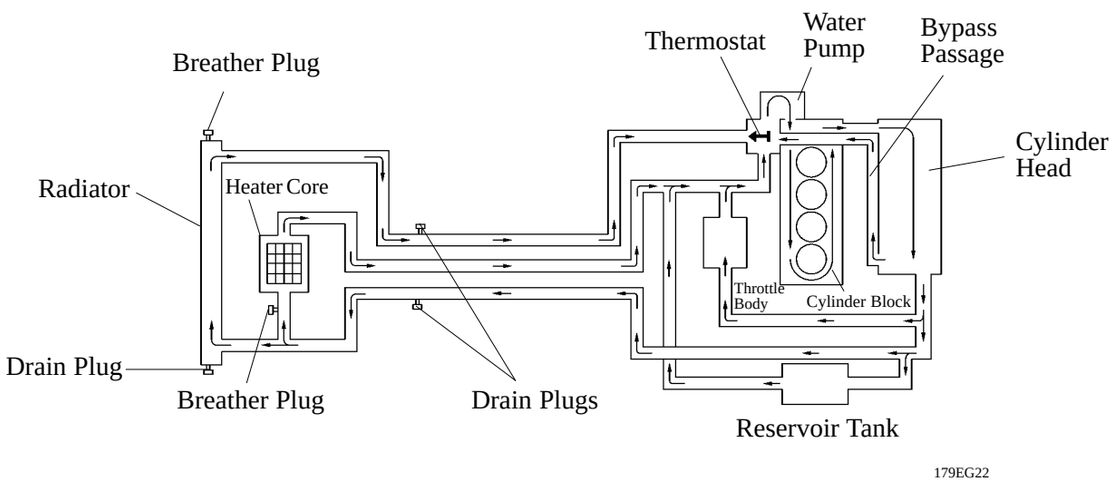

169EG18

## ■COOLING SYSTEM

### 1. 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.
- A pressurized reservoir tank has been adopted.
- 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.
- An aluminum radiator core is used for weight reduction.
- A drain plug is provided on the radiator pipe and radiator, and a breather plug for bleeding air is provided on the radiator and the heater core to improve the ease of changing the engine coolant.
  For further details regarding the changing of the engine coolant, refer to the 2000 MR2 Repair Manual (Pub. No. RM760U).



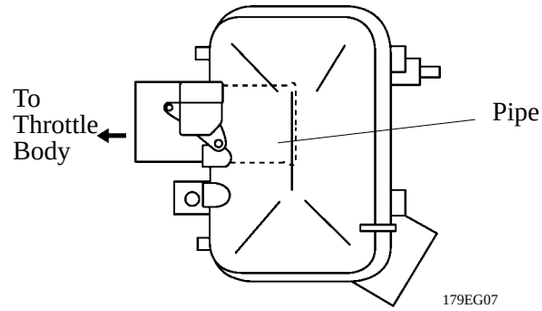
## 2. Pressurized Reservoir Tank

The pressurized reservoir tank uses a conventional radiator cap on the reservoir tank, thus enabling the reservoir tank to also maintain pressure. The coolant passage is completely sealed to block the entry of air. The coolant is constantly circulated throughout the system because the reservoir tank has been made a part of the coolant passage. By eliminating any contact with the outside air in this manner, the loss or deterioration of the coolant through evaporation is prevented. Furthermore, because the air in the coolant passage is separated into gaseous and liquid forms in the reservoir tank, the gas-liquid separation performance has been improved.

## ■INTAKE AND EXHAUST SYSTEM

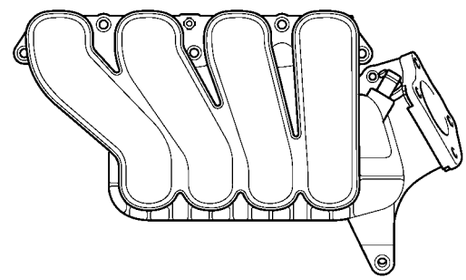
### 1. Air Cleaner Box

A pipe is provided inside the air cleaner box to reduce the intake sound.



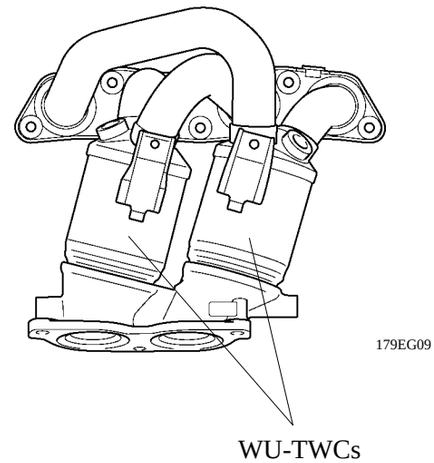

### 2. Intake Manifold

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.



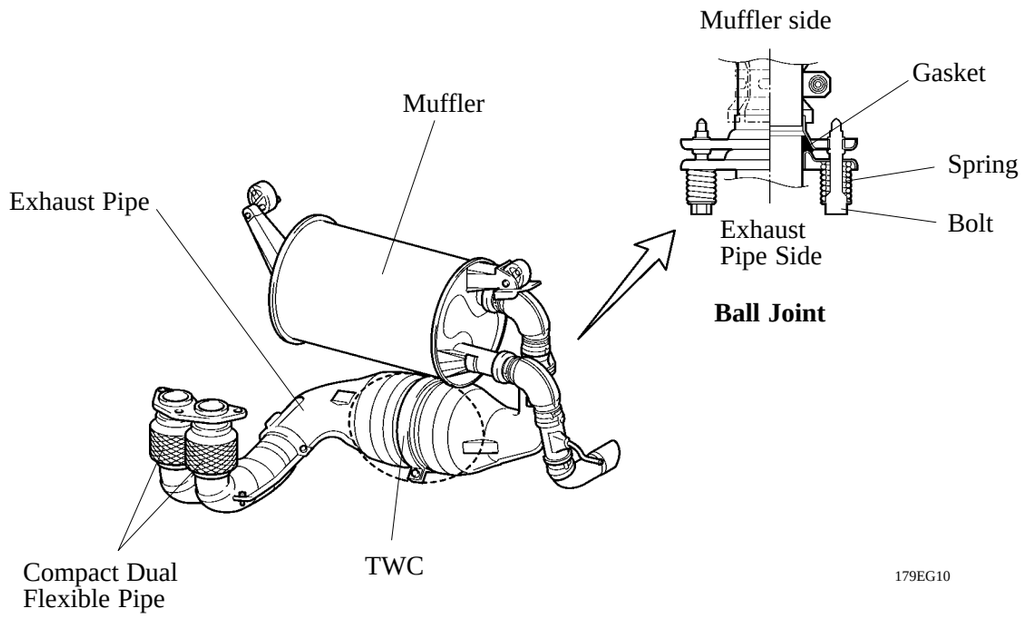
## 3. Exhaust Manifold

- A dual type exhaust manifold has been adopted.
- A stainless steel exhaust manifold is used for weight reduction.
- A WU-TWC (Warm Up Three-Way Catalytic Converter) for improving exhaust emissions has been adopted.




## 4. Exhaust Pipe and Muffler

- The exhaust pipe has adopted a compact dual flexible pipe. Noise and vibration have been effectively reduced by optimally positioning this pipe.
- A ball joint is used to joint the exhaust pipe to the muffler. As a result, a simple construction and reliability improvement have been realized.
- A TWC (Three-Way Catalytic Converter) for improving exhaust emissions has been adopted.



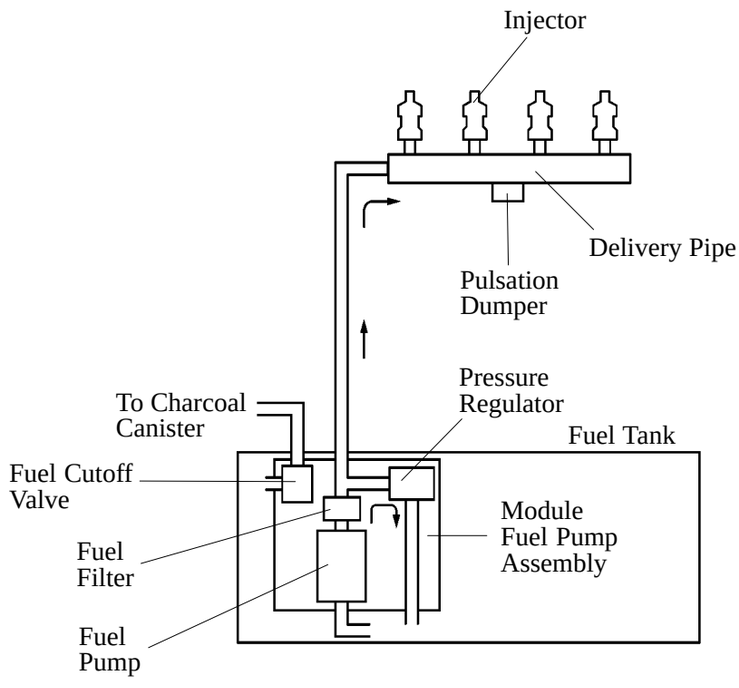
## ■FUEL SYSTEM

### 1. General

- A compact 12-hole type injector has been a dopted to improve the atomization of fuel.
- The fuel returnless system has been adopted to reduce evaporative emissions.
- A fuel cut control has been newly adopted to stop the fuel pump when the SRS airbag is deployed, thus helping reduce fuel leakage.
- A quick connector has been adopted to connect the fuel pipe with the fuel hose to improve serviceability.
- A tether has been provided on the fuel filler cap to prevent the cap from being lost.
- A compact fuel pump in which a fuel filter and pressure regulator are integrated in the module fuel pump assembly has been adopted. The fuel cutoff valve is housed in the module fuel pump assembly.
  A service hole has been provided in the floor panel directly above the module fuel pump assembly to improve serviceability.
- The ORVR (On-Board Refueling Vapor Recovery) system has been adopted.

### 2. Fuel Returnless System

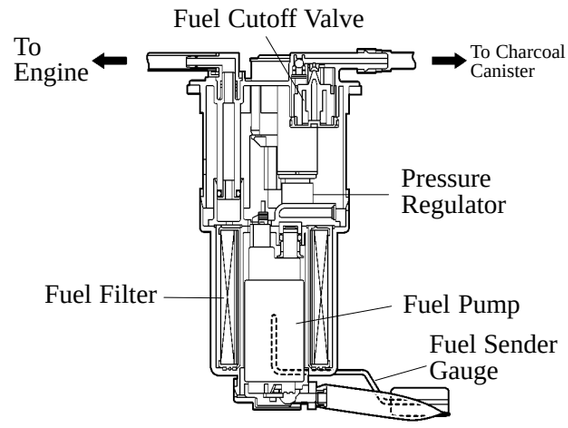
The fuel returnless system has been adopted to reduce evaporative emissions. With the pressure regulator and the fuel filter-integrated fuel pump are housed inside the fuel tank, this system eliminates the return of fuel from the engine area. This helps prevent the internal temperature of the fuel tank from rising, and reduces evaporative emissions.




179EG11

## 3. Module Fuel Pump Assembly

A compact fuel pump in which a fuel filter and pressure regulator are integrated in the module fuel pump assembly has been adopted. The fuel cutoff valve and fuel sender gauge are housed in the module fuel pump assembly.

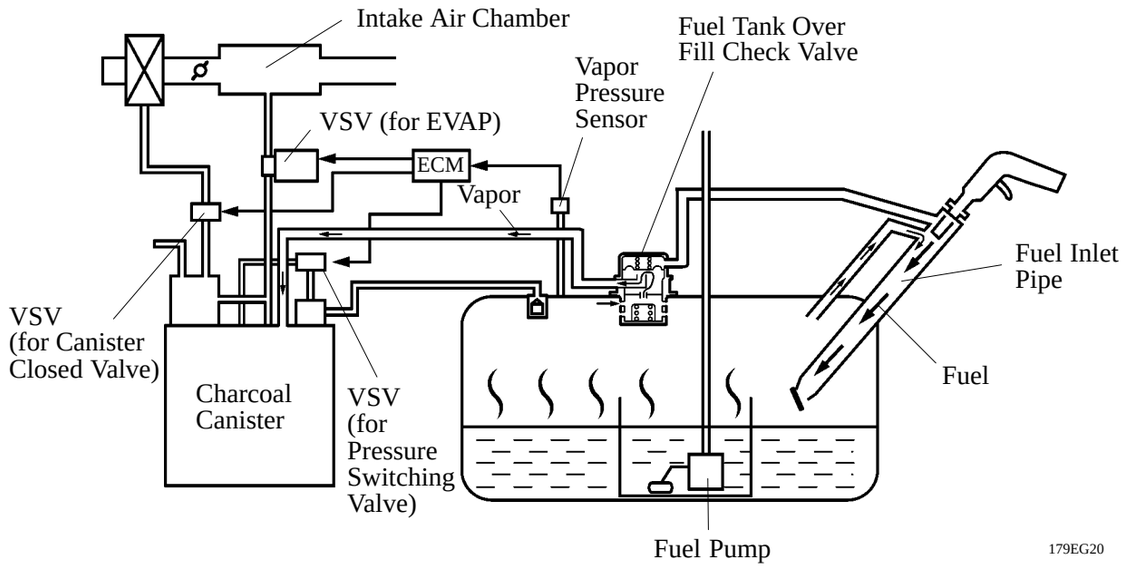



179EG12

## 4. ORVR System

### General

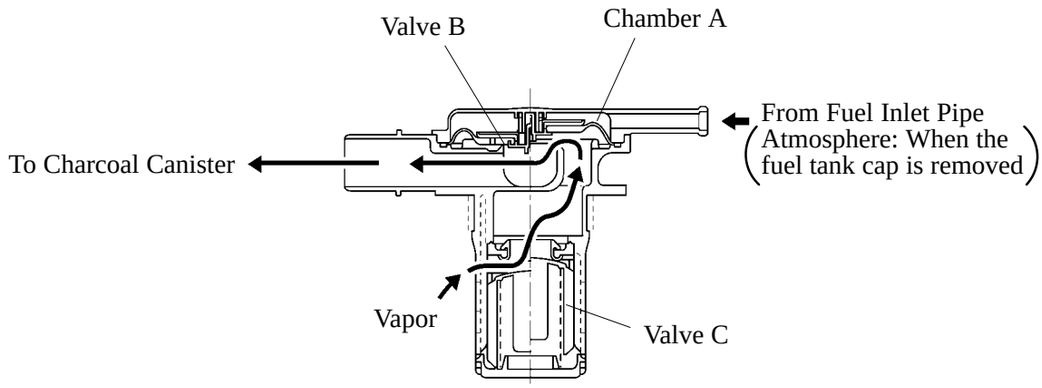
The ORVR (On-Board Refueling Vapor Recovery) is a system that uses a charcoal canister, which is provided onboard, to recover the fuel vapor that is generated during refueling. This reduces the discharge of fuel vapor into the atmosphere.




179EG20

### Operation

When the fuel tank cap is removed, atmosphere applies to the fuel tank over fill check valve's chamber A. Refueling causes the internal pressure of the fuel tank to increase, the vapor flows to the charcoal canister while maintaining valve B pressed, thus allowing the vapor to become absorbed by the charcoal canister. When the tank is full, valve C closes, thus shutting off the passage to the charcoal canister.

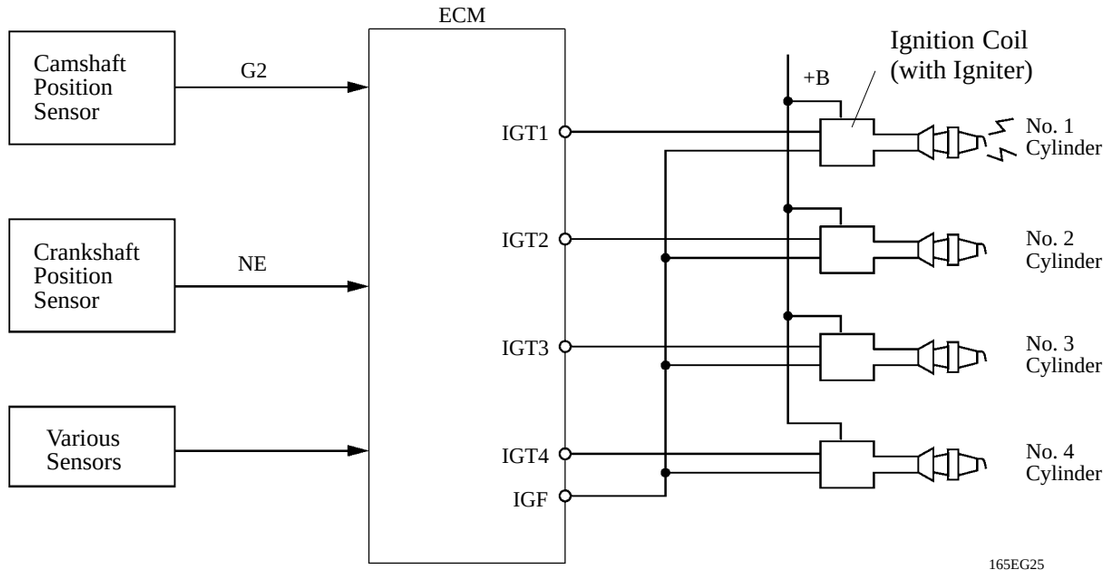



**Fuel Tank Over Fill Check Valve** 179EG13

## ■IGNITION SYSTEM

### 1. 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 1ZZ-FE engine is an independent ignition system which has one ignition coil (with igniter) for each cylinder.




### 2. Ignition Coil

The DIS provides 4 ignition coils, one for each cylinder. The spark plug caps, which provide contact to the spark plugs, are integrated with an ignition coil. Also, an igniter is enclosed to simplify the system.

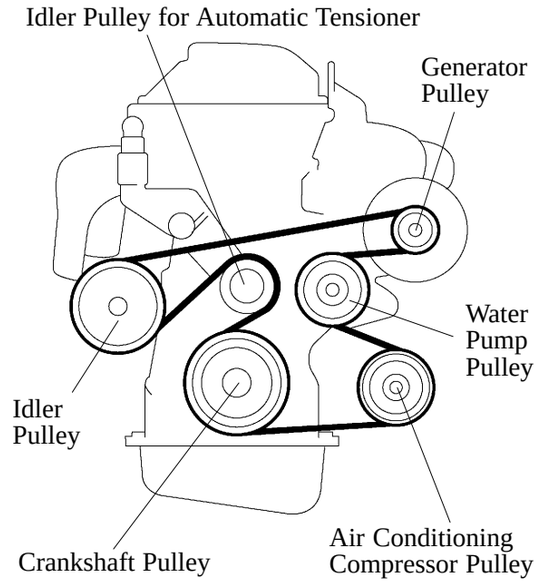
### 3. Spark Plug

Iridium-tipped spark plugs have been adopted to realize a 120,000-mile maintenance-free operation. 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.

## ■SERPENTINE BELT DRIVE SYSTEM

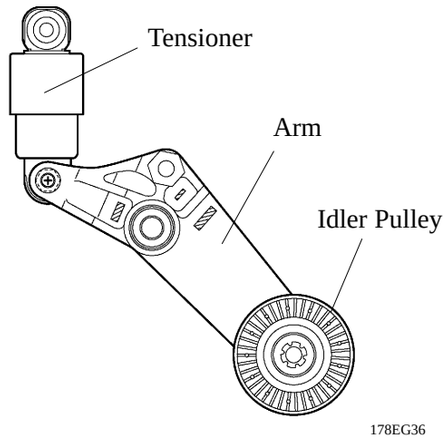
### 1. General

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

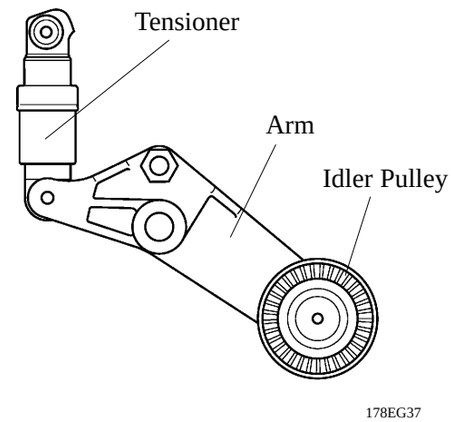



### 2. Automatic Tensioner

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




**OTICS Made**




**INA Made**

## ■ENGINE CONTROL SYSTEM

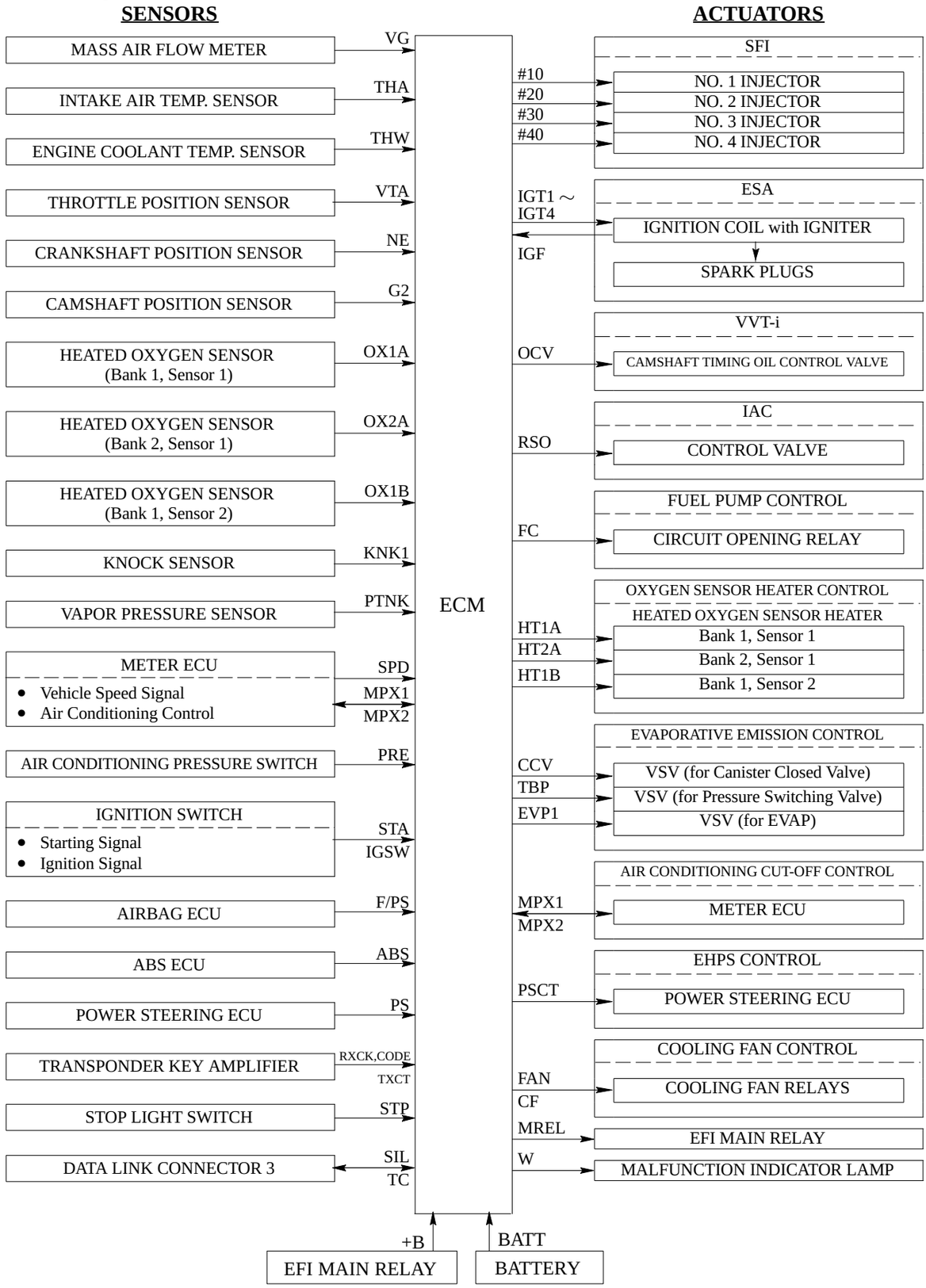
### 1. General

The engine control system for the 1ZZ-FE engine has following system.

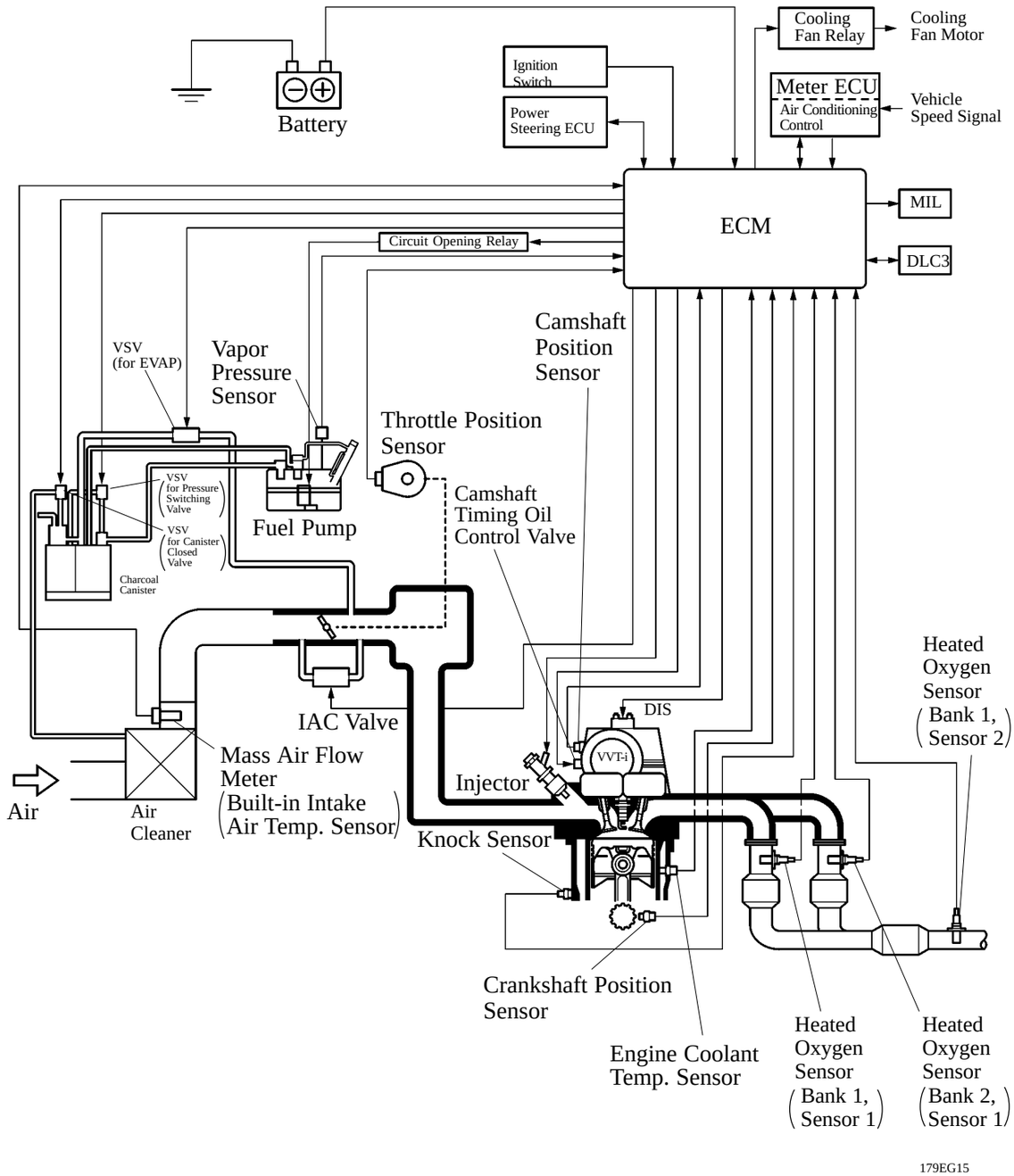
| System | Outline |
|---|---|
| SFI (Sequential Multiport Fuel Injection) | An L-type SFI system directly detects the intake air volume with a hot-wire type mass air flow meter. |
| ESA (Electronic Spark Advance) | Ignition timing is determined by the ECM based on signals from various sensors. The ECM corrects ignition timing in response to engine knocking. |
| IAC (Idle Air Control) | A rotary solenoid type IAC 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 41. |
| EHPS (Electro-Hydraulic Power Steering Control) | When the engine is started at low temperatures or at low rpm, the EHPS is cut to reduce the load on the generator, maintain engine startability and prevent engine stalling. For details, see page 65. |
| Fuel Pump Control | ● Fuel pump operation is controlled by signal from the ECM.<br>● To stop the fuel pump while the SRS airbag is in operation. For details, see page 46. |
| 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 ECM controls the purge flow of evaporative emissions (HC) in the charcoal canister in accordance with engine conditions.<br>● Using 3 VSVs and a vapor pressure sensor, the ECM detects any evaporative emission leakage occurring between the fuel tank and the charcoal canister through the changes in the tank pressure. For details, see page 48. |
| 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 ECM based on the engine coolant temperature sensor signal (THW) and the condition of the air conditioning operation. For details, see page 47. |
| Engine Immobiliser | Prohibits fuel delivery and ignition if an attempt is made to start the engine with an invalid ignition key. For details, see page 49. |
| Diagnosis | ● When the ECM detects a malfunction, the ECM diagnoses and memorizes the failed section.<br>● The diagnosis system includes a function that detects a malfunction in the thermostat. |
| Fail-Safe | When the ECM detects a malfunction, the ECM stops or controls the engine according to the data already stored in memory. |

## 2. Construction

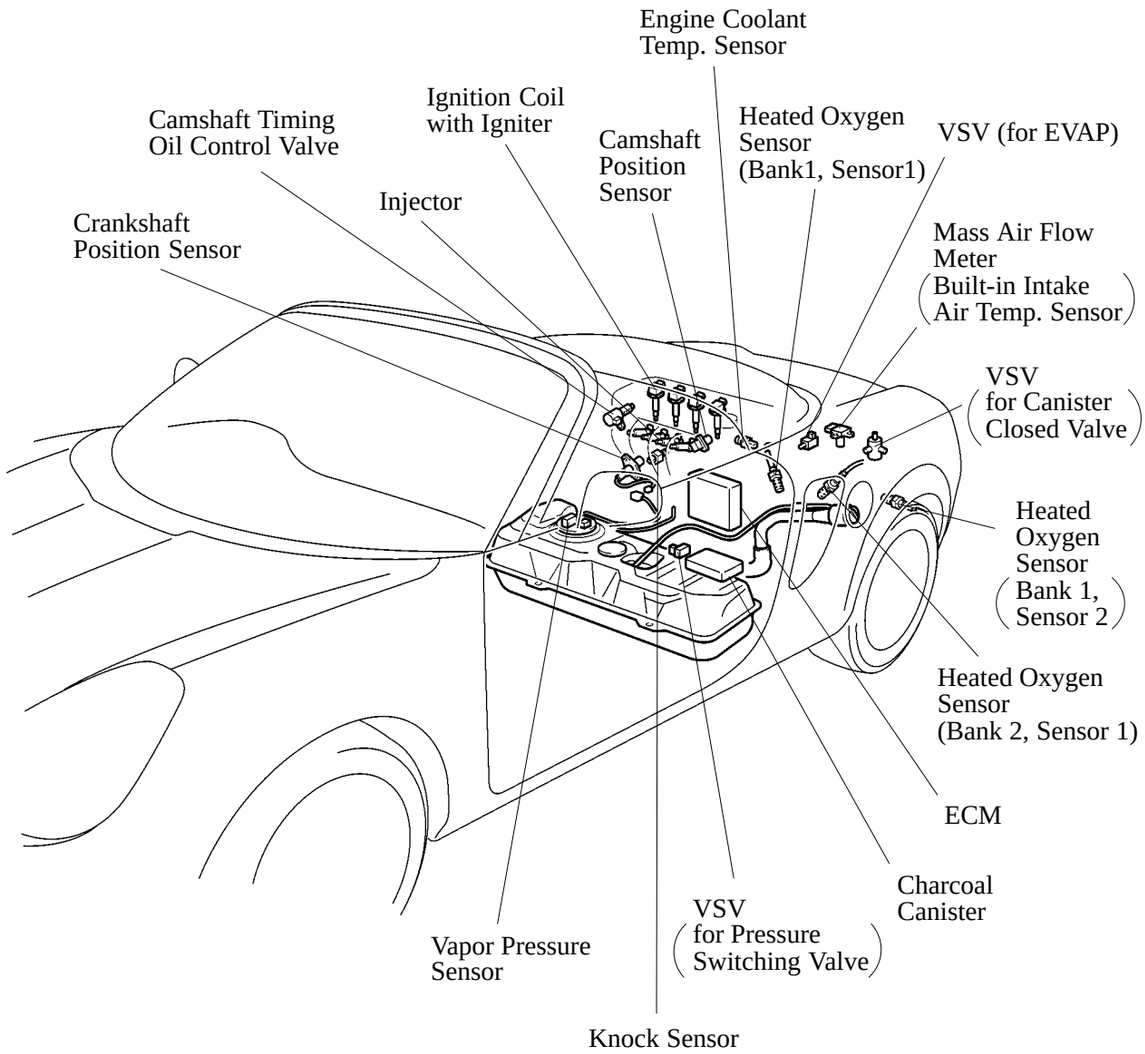
The configuration of the engine control system in the 1ZZ-FE engine in the new MR2 is as shown in the following chart.



## 3. Engine Control System Diagram



## 4. Layout of Main Components



## 5. Main Components of Engine Control System

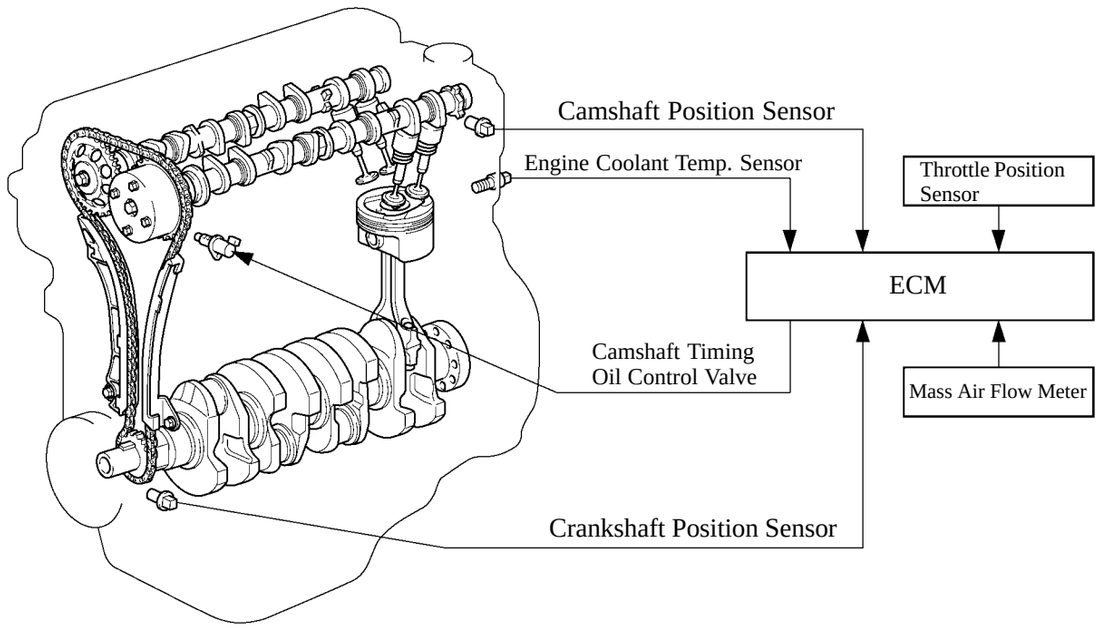
The main components of the 1ZZ-FE engine control system are as follows:

| Components | Outline | Quantity |
|---|---|---|
| Mass 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 | Heated Oxygen Sensor<br>(Bank 1, Sensor 1)<br>(Bank 2, Sensor 1)<br>(Bank 1, Sensor 2) | 3 |
| Injector | 12-Hole Type | 4 |
| IAC Valve | Rotary Solenoid Type<br>(1-Coil Type) | 1 |

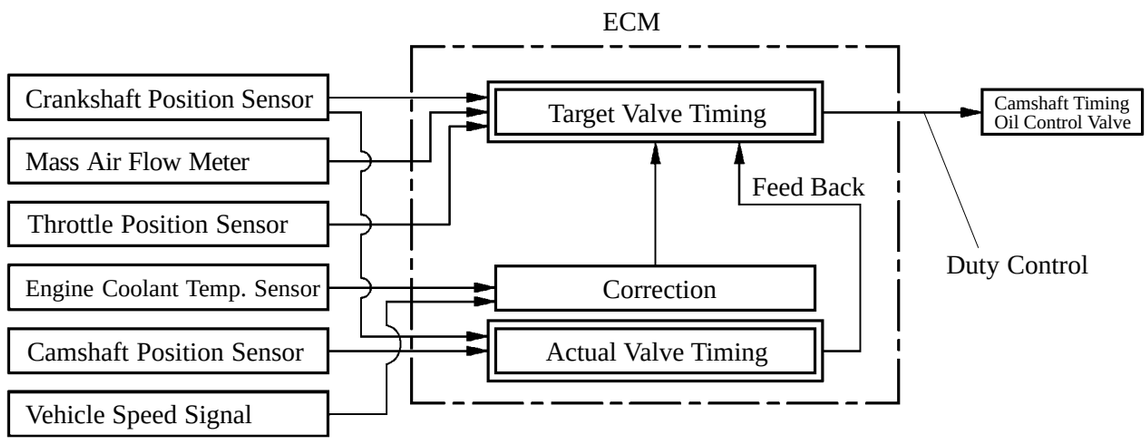
## 6. VVT-i (Variable Valve Timing-intelligent) System

### General

This system controls the intake camshaft valve timing so as to obtain balance between the engine output, fuel consumption and emission control performance. The actual intake side valve timing is feed back by means of the camshaft position sensor for constant control to the target valve timing.




169EG35

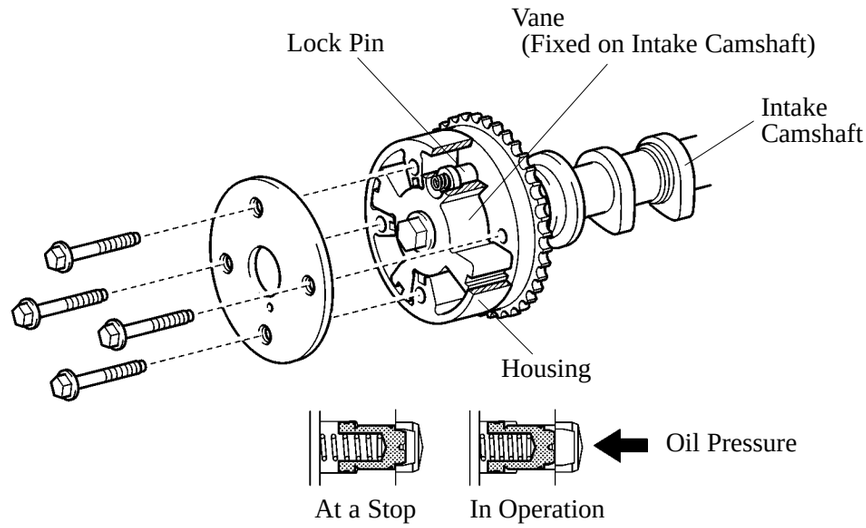



172CR07

## Construction

### 1) VVT-i Controller

This controller consists of the housing driven from the timing chain and the vane coupled with the intake camshaft.
The oil pressure sent from the advance or retard side path at the intake camshaft causes rotation in the VVT-i controller vane circumferential direction to vary the intake valve timing continuously.
When the engine is stopped, the intake camshaft will be in the most retarded state to ensure 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.

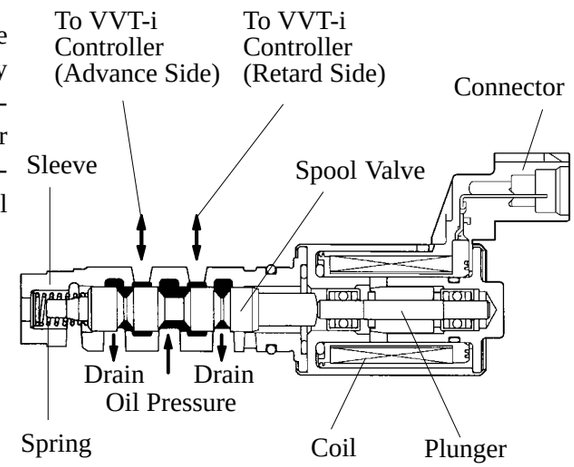



**Lock Pin**

169EG36

### 2) Camshaft Timing Oil Control Valve

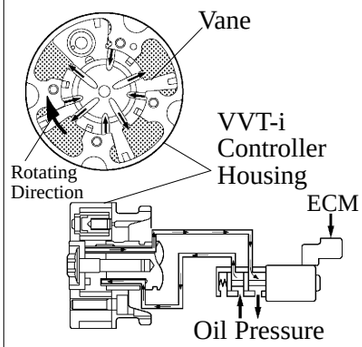
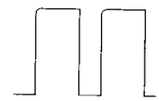
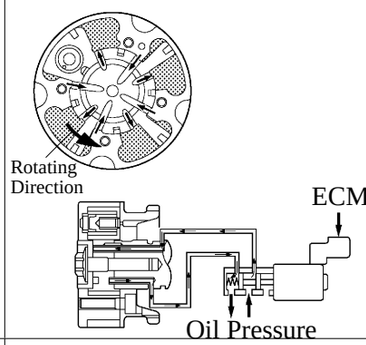
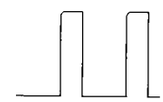
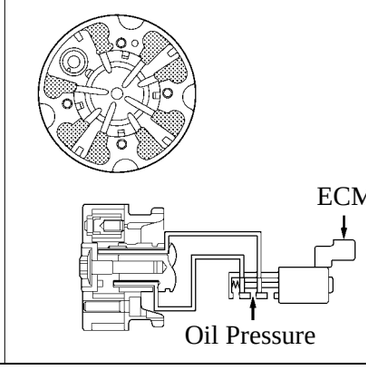
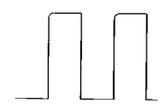
The camshaft timing oil control valve controls the spool valve position in accordance with the duty control from the ECM thus allocating the hydraulic pressure that is applied to the VVT-i controller to the advance and the retard side. When the engine is stopped, the camshaft timing oil control valve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




165EG34

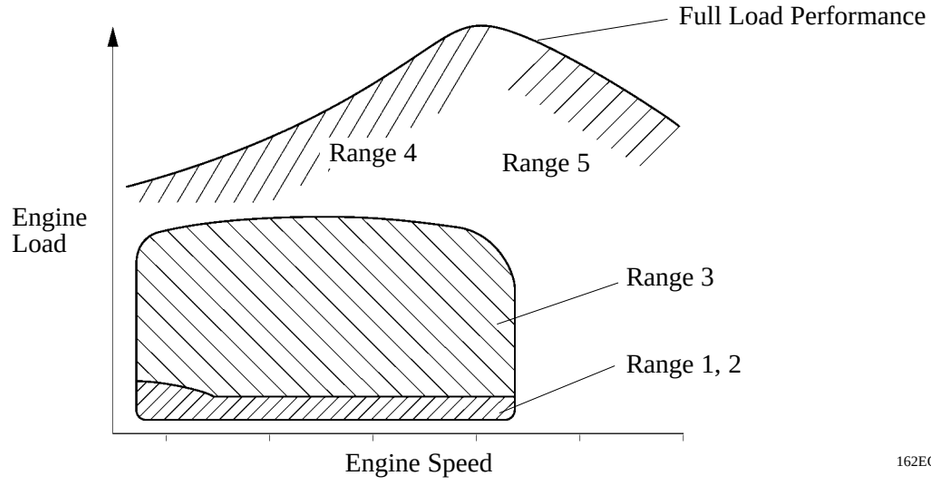
### Operation

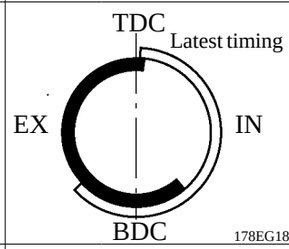
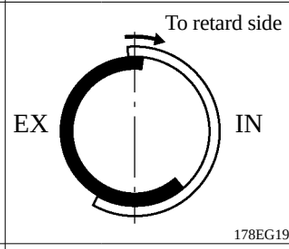
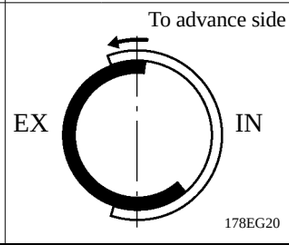
- The camshaft timing oil control valve selects the path to the VVT-i controller according to the advance, retard or hold signal from the ECM. The VVT-i controller rotates the intake camshaft in the timing advance or retard position or holds it according to the position where the oil pressure is applied.

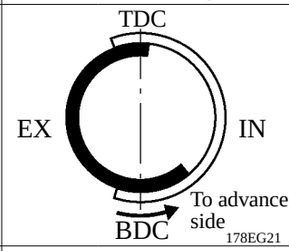
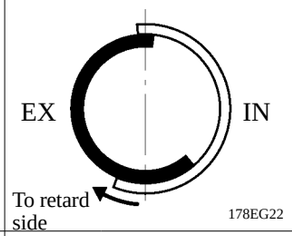
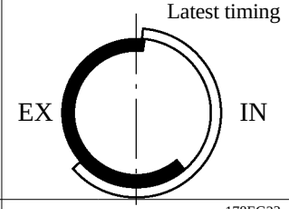
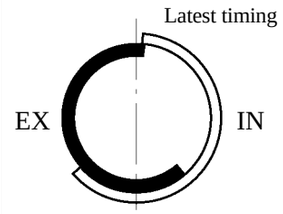
| | Operation | Camshaft Timing Oil Control Valve Drive Signal | Description |
|---|---|---|---|
| Advance |  178EG15 | Advance Signal<br>  <br>Duty Ratio 157EG35 | When the camshaft timing oil control valve is positioned as illustration by the advance signal from the ECM, the resultant oil pressure is applied to the timing advance side vane chamber to rotate the camshaft in the timing advance direction. |
| Retard |  178EG16 | Retard Signal<br>  <br>Duty Ratio 157EG36 | When the camshaft timing oil control valve is positioned as illustration by the retard signal from the ECM, the resultant oil pressure is applied to the timing retard side vane chamber to rotate the camshaft in the timing retard direction. |
| Hold |  178EG17 | Hold Signal<br>  <br>Duty Ratio 157EG37 | The ECM calculates the target timing angle according to the traveling state to perform control as described above. 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.<br>This adjusts the valve timing at the desired target position and prevents the engine oil from running out when it is unnecessary. |

- In proportion to the engine speed, intake air volume, throttle position and water temperature, the ECM calculates an optimal valve timing under each driving condition and control the camshaft timing oil control valve. In addition, ECM uses signal from the camshaft position sensor and the crankshaft position sensor to detect the actual valve timing, thus performing feed back control to achieve the target valve timing.

**▶ Operation During Various Driving Condition (Conceptual Diagram) ◀**




| 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 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 |

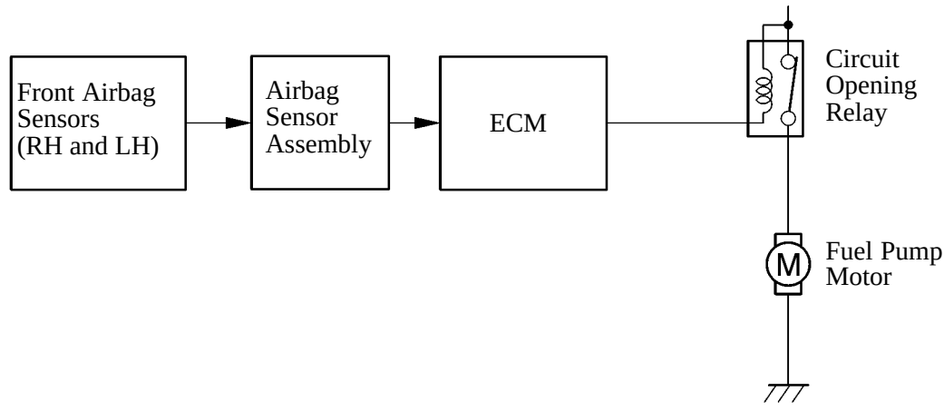
| Operation State | Range | Valve Timing | Objective | Effect |
|---|---|---|---|---|
| In Low to Medium Speed Range with Heavy Load | 4 |  | Advancing the intake valve close timing for volumetric efficiency improvement | Improved torque in low to medium speed range |
| In High Speed Range with Heavy 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 for reduction of fuel increase at low temperatures, and stabilizing the idling rpm for decreasing fast idle rotation | Stabilized fast idle rpm<br>Better fuel economy |
| Upon Starting/ Stopping the Engine | — |  | Minimizing overlap to minimize blow back to the intake side | Improved startability |

## 7. Fuel Pump Control

A fuel cut control is adopted to stop the fuel pump when the SRS airbag is deployed, thus helping reduce fuel leakage.

In this system, the airbag deployment signal from the airbag sensor assembly is detected by the ECM, which 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.

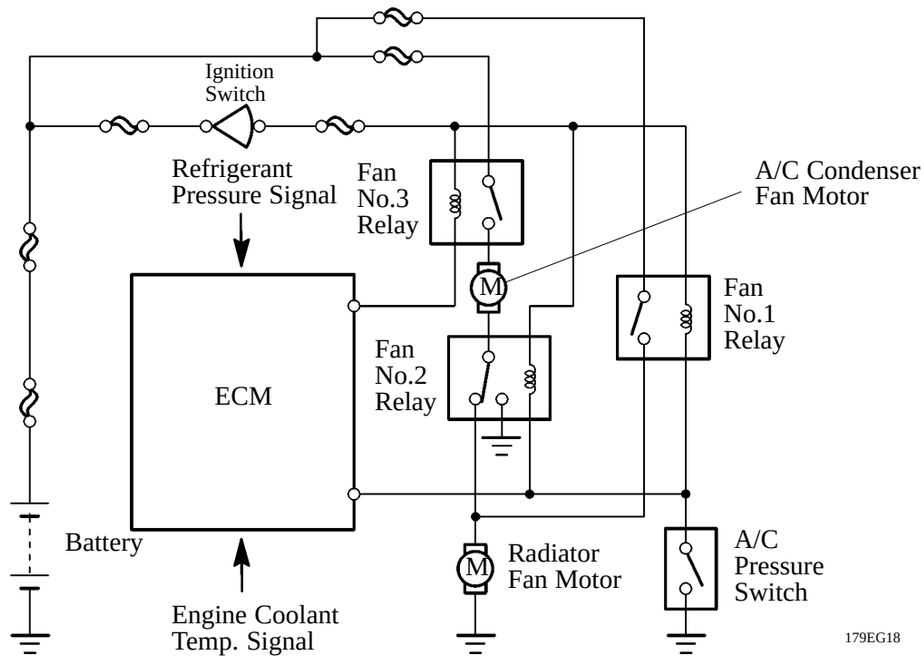



179EG17

## 8. Cooling Fan Control

In contrast to the previous electric cooling fan system, the cooling fan main relay and the engine coolant temperature switch have been discontinued. Instead, by sharing the engine coolant temperature sensor to control the fan motor, a simpler system has been realized.
This cooling fan control turns 3 fan relays ON/OFF in accordance with the engine coolant temperature and the operating conditions of the air conditioning system. When it is ON, the control is switched to operate the 2 fan motors at Low (serial) or High (parallel).

**▶ Wiring Diagram ◀**




**▶ Cooling Fan Operation ◀**

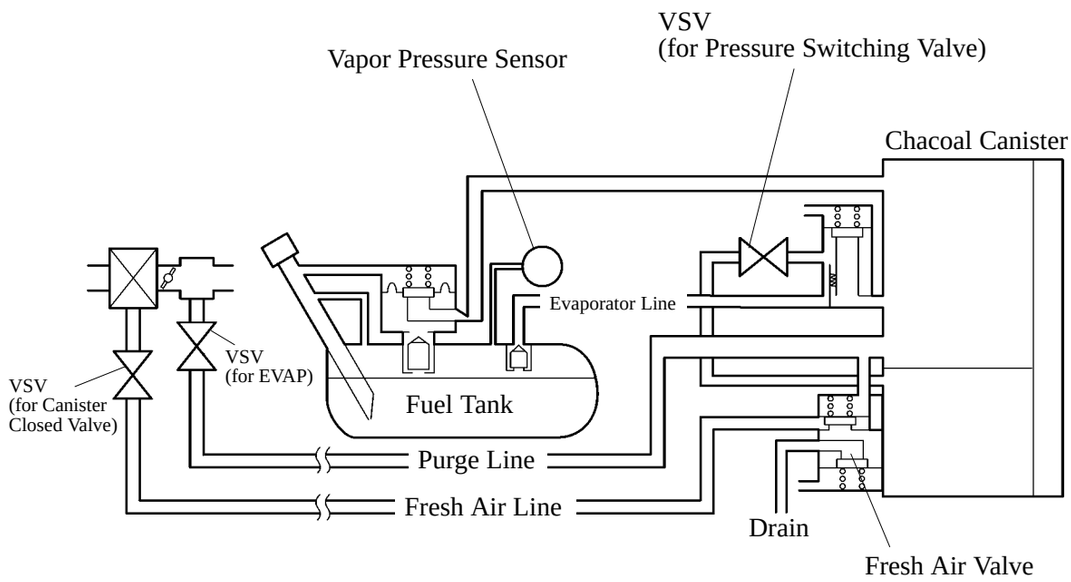
| Air Conditioning Condition | | Engine Coolant Temperature | |
|---|---|---|---|
| Compressor | Refrigerant Pressure | About 83°C (181°F) or Lower | About 90°C (194°F) or Higher |
| OFF | 1.2 MPa (12.5 kgf/cm$^2$) or Lower | OFF | High |
| ON | 1.2 MPa (12.5 kgf/cm$^2$) or Lower | Low | High |
| | 1.5 MPa (15.5 kgf/cm$^2$) or Higher | High | High |

## 9. Evaporative Emission Control System

### General

A vacuum system, which is identical to the one used on the ’00 Celica, has been newly adopted to detect leaks in the evaporative emission control system. This vacuum system detects leaks by forcefully introducing the purge vacuum into the entire system and monitoring the changes in the pressure. It consists of the following main components:

- A VSV (for canister closed valve) that closes the fresh air line from the air cleaner to the charcoal canister has been adopted.
- A VSV (for pressure switching valve) that opens the evaporator line between the fuel tank and the charcoal canister has been adopted.
- Function to close the purge line from the air intake chamber to the charcoal canister for this system is added to the original functions of VSV (for EVAP).
- A vapor pressure sensor that measures the pressure in the fuel tank while checking for evaporative emission leaks and sends signals to the ECM has been adopted.




179EG19

### Operation

Initially, when the VSV (for canister closed valve) is closed, and the VSV (for pressure switching valve) and the VSV (for EVAP) are opened, a vacuum is applied to the purge line from the air intake to the charcoal canister and to the evaporator line from the charcoal canister to the fuel tank. Next, the VSV (for EVAP) is closed in order to maintain a vacuum from the VSV (for EVAP) to the inside of the fuel tank. Then, any subsequent changes in the pressure are monitored by the vapor pressure sensor in order to check for evaporative emission leaks.
If a leak is detected, the malfunction indicator lamp (MIL) illuminates to inform the driver. Also, the diagnostic trouble code (DTC) can be accessed through the use of a hand-held tester.
For details on the DTCs, refer to the 2000 MR2 Repair Manual (Pub. No. RM760U).

## 10. Engine Immobiliser System

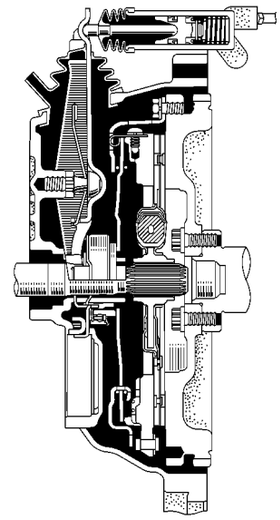
The engine immobiliser system has been designed to prevent the vehicle from being stolen. This system uses a ECM that stores the ID code of the authorized ignition key. If an attempt is made to start the engine using an unauthorized key, the ECM prohibit fuel delivery and ignition, effectively disabling the engine. For details see page 94 in the Engine Immobiliser System section.

# CHASSIS

## CLUTCH

### ■DESCRIPTION

A dry type single plate clutch which is operated by hydraulic pressure is used.



179CH01

**▶ Specifications ◀**

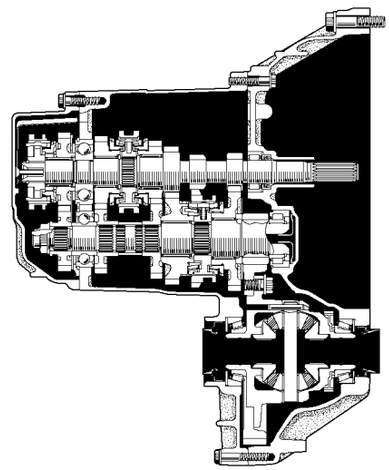
| | | | |
|---|---|---|---|
| Clutch | Type | | Dry Type Single Plate Clutch, Diaphragm Spring |
| | Operation | | Hydraulic |
| Clutch Cover | Type | | DST*1 |
| | Size | mm (in.) | 212 (8.35) |
| | Installed Load | N | 4900 |
| Clutch Disc | Facing Size*2 | mm (in.) | 212 × 140 × 3.5 (8.35 × 5.51 × 0.14) |
| | Facing Area | $cm^2$ ($in.^2$) | 199 (30.8) |
| Master Cylinder | Type | | Conventional |
| | Cylinder Dia. | mm (in.) | 15.87 (0.62) |
| Release Cylinder | Type | | Non-Adjustable |
| | Cylinder Dia. | mm (in.) | 20.64 (0.81) |

*1: DST (Diaphragm Spring Turnover)
*2: Outer Diameter × Inner Diameter × Thickness

# C56 MANUAL TRANSAXLE

## ■DESCRIPTION

Based on the C50 series manual transaxle, the C56 manual transaxle is used on the new MR2. The basic construction and operation are the same as of the ’00 Celica. However, on the new MR2, a helical gear type torque-sensing LSD (Limited Slip Differential) is an optional equipment.



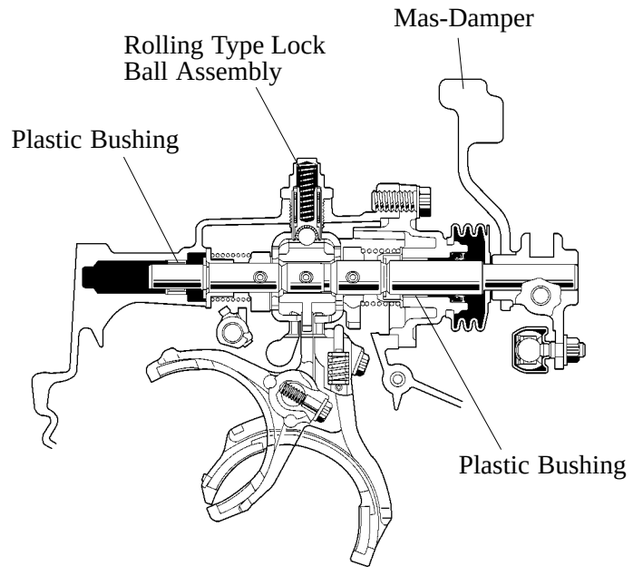
179CH25

**▶ Specifications ◀**

| | | |
|---|---|---|
| Gear Ratio | 1st | 3.166 |
| | 2nd | 1.904 |
| | 3rd | 1.392 |
| | 4th | 1.031 |
| | 5th | 0.815 |
| | Reverse | 3.250 |
| Differential Gear Ratio | | 4.312 |
| Oil Capacity Liters (US qts, Imp.qts) | without LSD | 1.9 (2.0, 1.7) |
| | with LSD | 1.8 (1.9, 1.6) |
| Oil Viscosity | | SAE 75W-90 |
| Oil Grade | | API GL-4 or GL-5 |
| LSD | | OPT |

## ■SHIFT AND SELECT MECHANISM

The shift feel has been improved through the adoption of the plastic bushings in the support portion for the shift and select shaft, a mass damper on the shift and select shaft, and a rolling type lock ball assembly.




179CH18

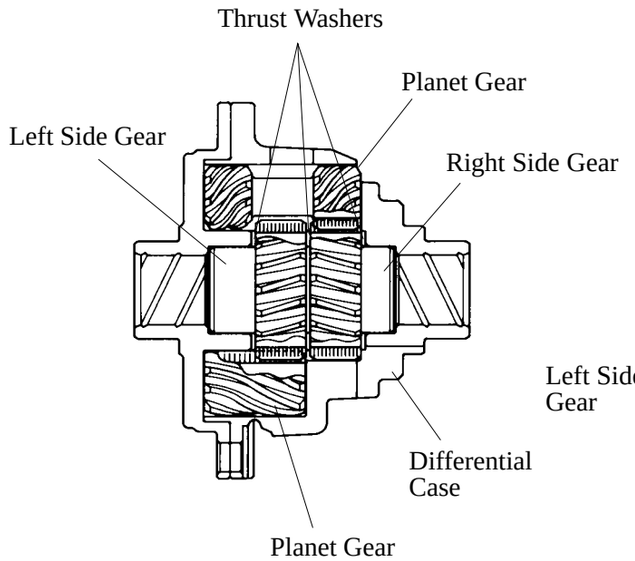
## ■HELICAL GEAR TYPE TORQUE-SENSING LSD

### 1. Characteristics

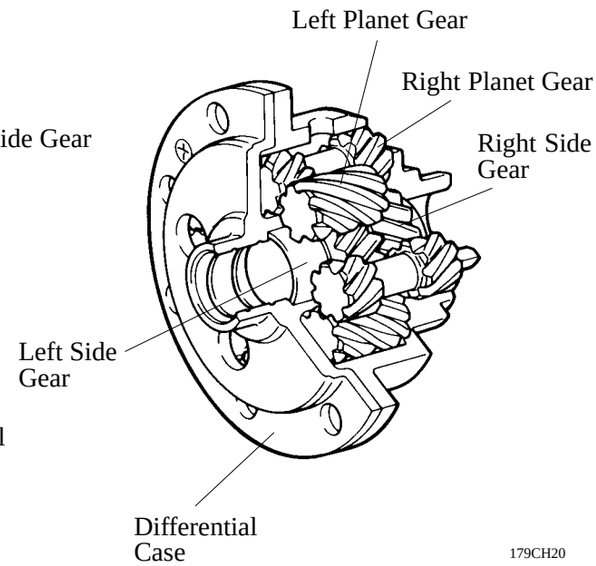
- Good traction of high bias ratio design is obtained through the utilization of two types of friction: One is the friction that is generated between the planet gear's tooth tips and the differential case's inner wall. The other is the friction that is generated between the side gear end face and the thrust washer.
- Quick response and minimum time lag until differential limiting force is generated.
- The bias ratio sustains minimal changes due to aging and maintains a stable performance.
- A simple, compact, and lightweight differential configuration has been achieved through the use of the helical gear.
- Ordinary transaxle oil must be used; do not use special LSD oil.

## 2. Construction

The helical gear type torque-sensing LSD consists of a differential case, 8 planet gears, 2 side gears and 3 thrust washers.
Planet gears mesh with one another as a pair, and each gear of the pair meshes with the side gear on its right or left side.
The planet gears are supported by the hole that is provided in the differential case. They are constructed so that they revolve while rotating over the side gear.



179CH19

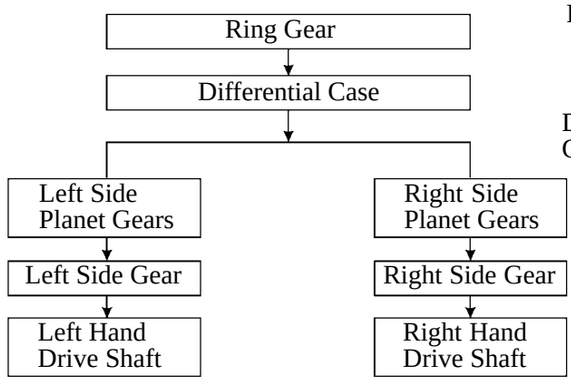


179CH20

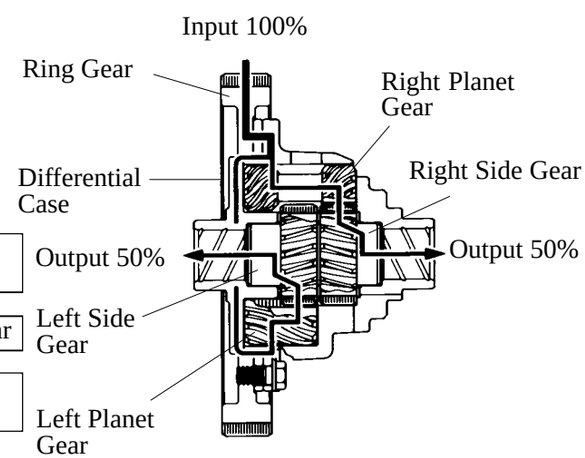
## 3. Operation

### Straight-Ahead Operation

Since side gears (left and right) and planet gears are rotating together with the differential case as a unit when the vehicle is running straight-forward, the driving force is transmitted from the ring gear to the differential case, planet gears and side gears.



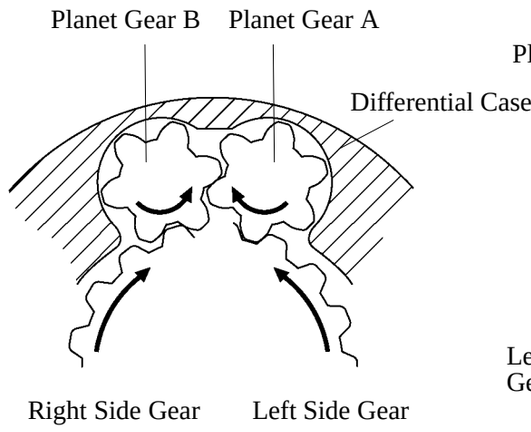
179CH24



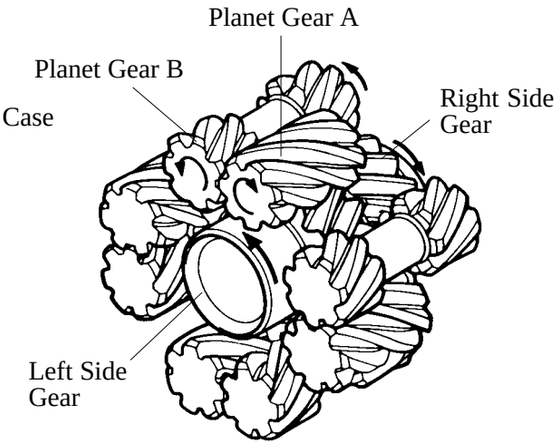
179CH21

## Cornering

Supposing that the differential case is not moving, rotating the left side gear counterclockwise causes planet gear A (which meshes with the left side gear) to rotate clockwise.
Furthermore, planet gear B, which is paired with planet gear A, rotates counterclockwise, causing the right side gear (which meshes with planet gear B) to rotate clockwise.
Therefore the left and right side gears rotate in the opposite direction each other, thus accomplishing a motion differential.



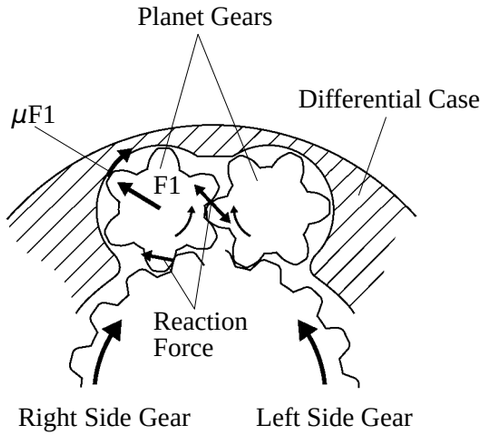

163CH81



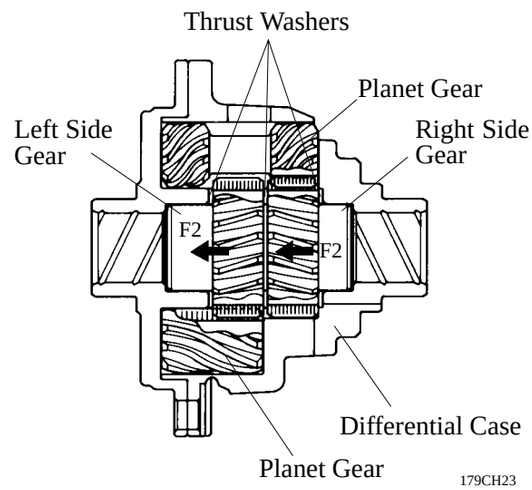

179CH22

## Limited Slip Differential Operation

Limited slip is accomplished primarily by the friction that is generated between the planet gear's tooth tips and the differential case's inner wall, and the friction that is generated between the side gear end face and thrust washer.
The principle of limited slip enables the resultant reaction force F1 (which is created by the meshing reaction of the planet gear and the side gear and the meshing reaction of the planet gears themselves) to push the planet gear in the direction of the differential case in proportion to the input torque.
Due to the reaction force F1, the friction force $\mu$F1 (which is generated between the tooth tip of the planet gear and the inner wall of the differential case) acts in the direction to stop the planet gear's rotation.
At the same time, because of the helical angle that is provided in the differential gear, thrust force F2 is generated towards the axle shaft. Accordingly, friction force $\mu$F2 (which is generated between the side gear end face and the thrust washer) applies a force to cancel out the rotational difference between the side gears themselves as well as between the side gear and the differential case.




163CH83

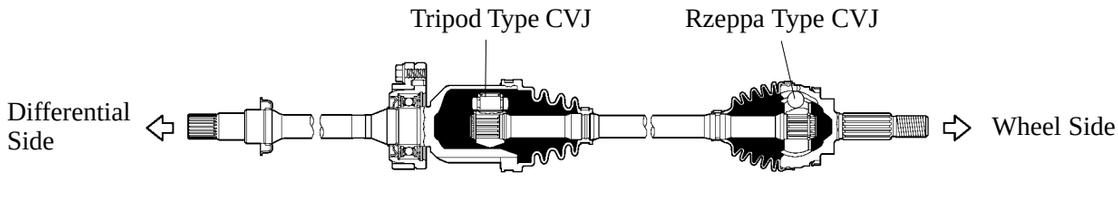



179CH23

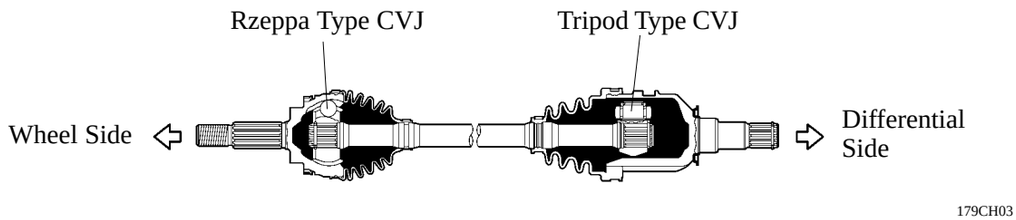
# DRIVE SHAFT

## ■ DESCRIPTION

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




**Right-Hand Drive Shaft**



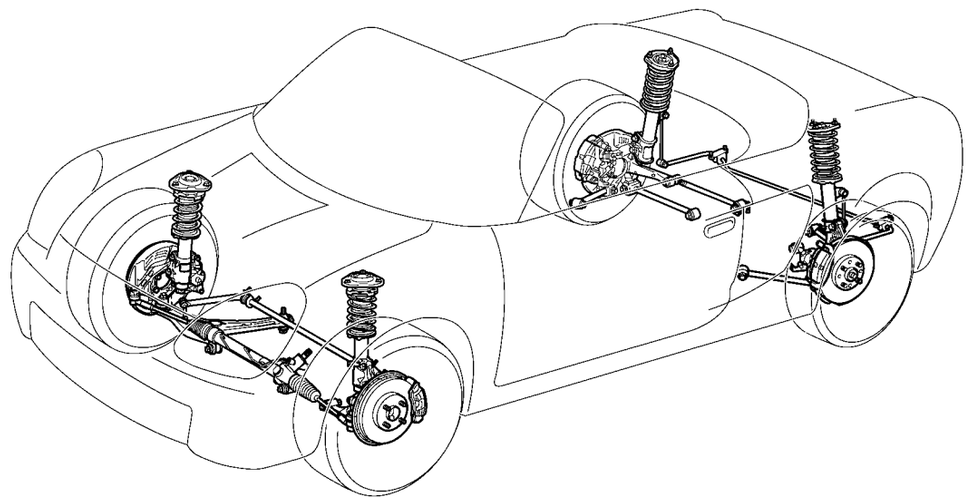

**Left-Hand Drive Shaft**

# SUSPENSION AND AXLES

## ■SUSPENSION

### 1. General

A MacPherson strut type independent suspension is used for both the front and rear suspensions in the new MR2. On the new MR2, the characteristics, the allocation of the components, the springs and the shock absorbers have been optimally tuned to realize excellent riding comfort, stability and controllability.



179CH07

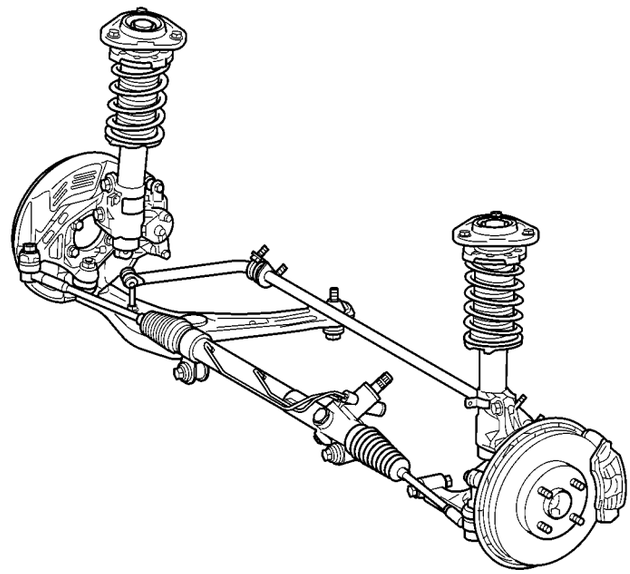
**▶ Specifications ◀**

| Item | | Front | Rear |
|---|---|---|---|
| Tread | mm (in.) | 1475 (58.1) | 1460 (57.5) |
| Caster* | degrees | 3°08’ | — |
| Camber* | degrees | –0°47’ | –1°05’ |
| Toe-In* | mm (in.) | 1.5 (0.06) | 3 (0.12) |
| King Pin Inclination* | degrees | 14°52’ | — |

*: Unloaded Vehicle Condition

## 2. Front Suspension

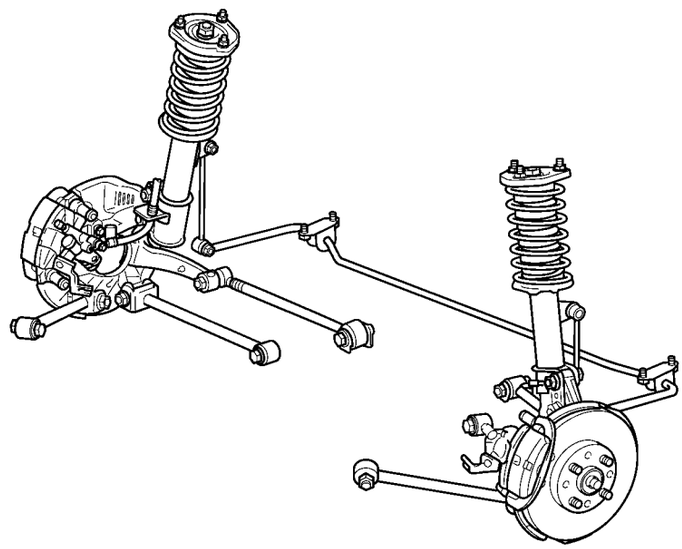
- An L-shaped stamped lower arm, which is integrated with the lower ball joint, has been adopted for weight reduction.
- A straight stabilizer bar shape has been adopted to efficiently dampen the roll effect and to reduce weight.
- A stabilizer bar link has been installed on the lower arm in consideration of its influences on the steering operation effort.



179CH08

## 3. Rear Suspension

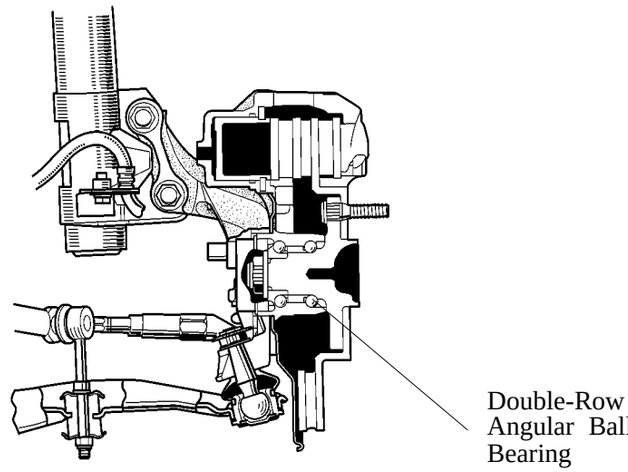
- Dual-link MacPherson strut suspension is used.
- The strut rod has been installed on the axle carrier to ensure excellent riding comfort.
- Rear suspension realizes excellent stability and controllability by optimizing the suspension geometry and camber change.



179CH09

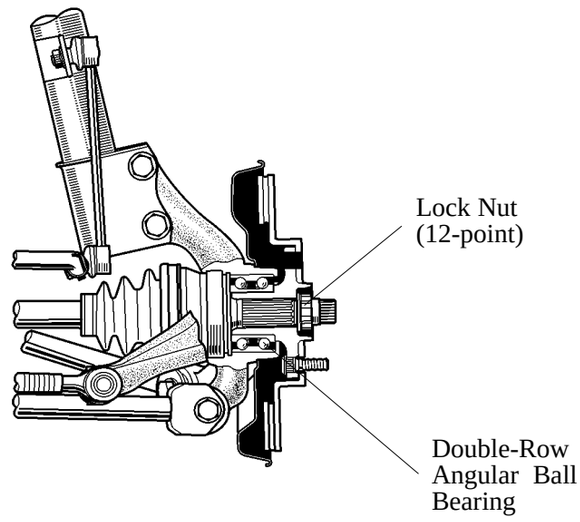
## ■ AXLES

- A double-row angular ball bearing is used for both the front and rear axles.
- A lock nut (12-point) has been adopted and staked for tightening the rear axle hub in order to ensure the tightening performance. This nut cannot be reused.




**Front Axle**

179CH04



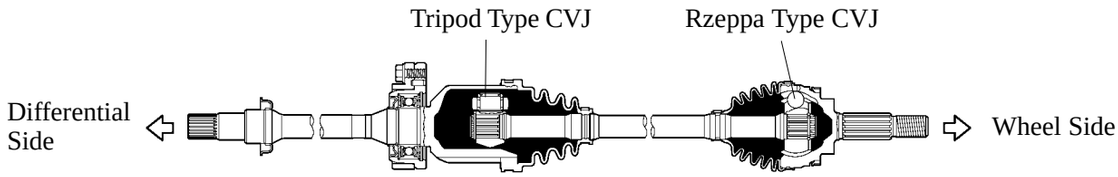

**Rear Axle**

179CH05

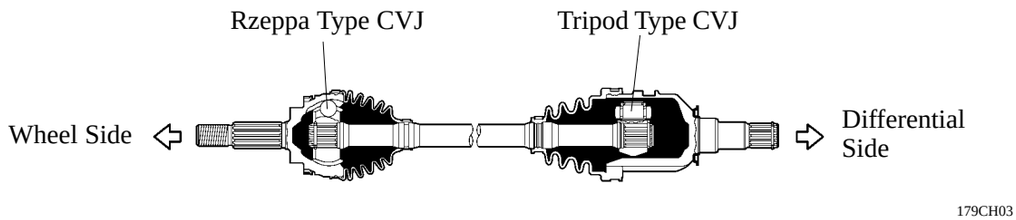
# DRIVE SHAFT

## ■ DESCRIPTION

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




**Right-Hand Drive Shaft**

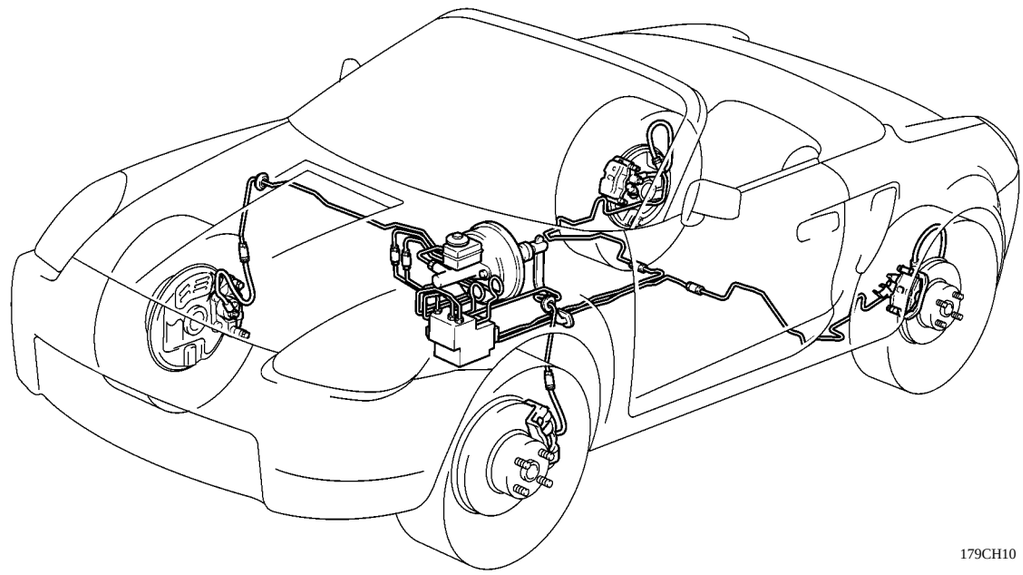



**Left-Hand Drive Shaft**

# BRAKES

## ■ DESCRIPTION

- The ventilated disc brake is used for both front and rear brakes.
- The ABS (Anti-lock Brake System) is standard equipment on all models.



179CH10

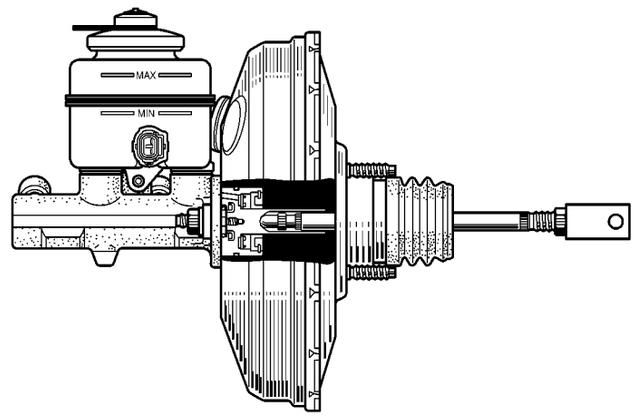
**▶ Specifications ◀**

| | | | |
|---|---|---|---|
| Master Cylinder | Type | | Tandem |
| | Diameter | mm (in.) | 22.22 (0.87) |
| Brake Booster | Type | | Single |
| | Size | in. | 8” |
| Front Brake | Type | | Ventilated Disc |
| | Caliper Type | | PE51 |
| | Wheel Cylinder Dia. | mm (in.) | 51.1 (2.01) |
| | Rotor Size (D × T)* | mm (in.) | 255 × 20 (10.0 × 0.79) |
| Rear Brake | Type | | Ventilated Disc |
| | Caliper Type | | AD45P |
| | Wheel Cylinder Dia. | mm (in.) | 44.45 (1.75) |
| | Rotor Size (D × T)* | mm (in.) | 263 × 16 (10.4 × 0.63) |
| Parking Brake | Type | | Disc |
| | Lever Type | | Center Lever |
| ABS | | | STD |

* : D: Outer Diameter, T: Thickness

## ■MASTER CYLINDER AND BRAKE BOOSTER

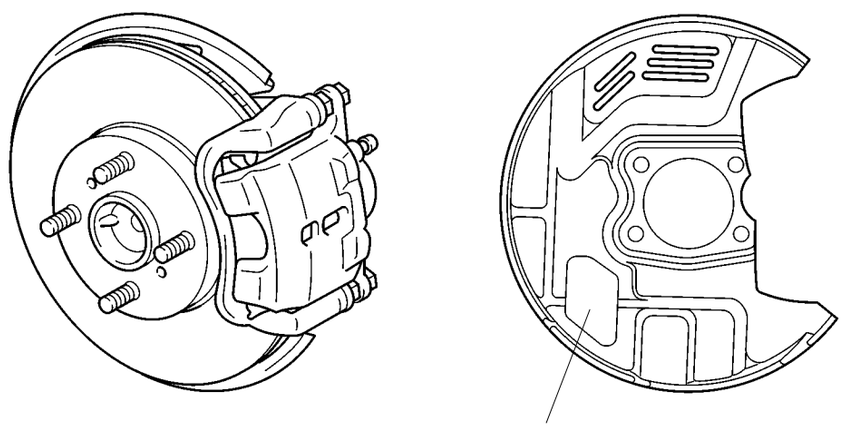
- A type of brake booster into which the master cylinder is inserted has been adopted to achieve a compact configuration.
- Lightweight and compact 8 inch single brake booster has been adopted.




179CH06

## ■FRONT BRAKE

- New lightweight and compact brake caliper has been adopted. It realizes excellent brake performance and improves anti-squeak performance.
- The vent holes in the dust cover have been optimally located to improve the cooling performance of the disc rotor.

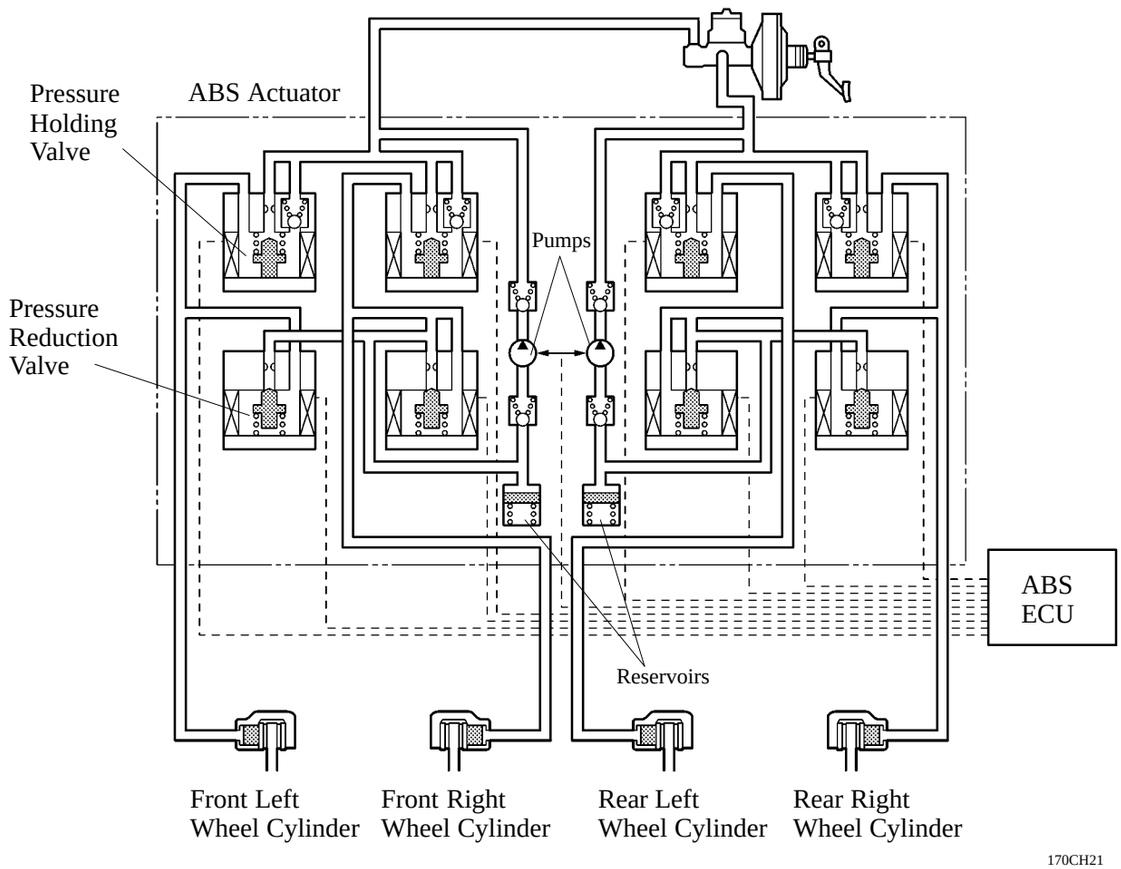



179CH11

## ■ABS

The new MR2 uses an ABS in which control is effected independently to the right and left wheel brakes in the front and rear.

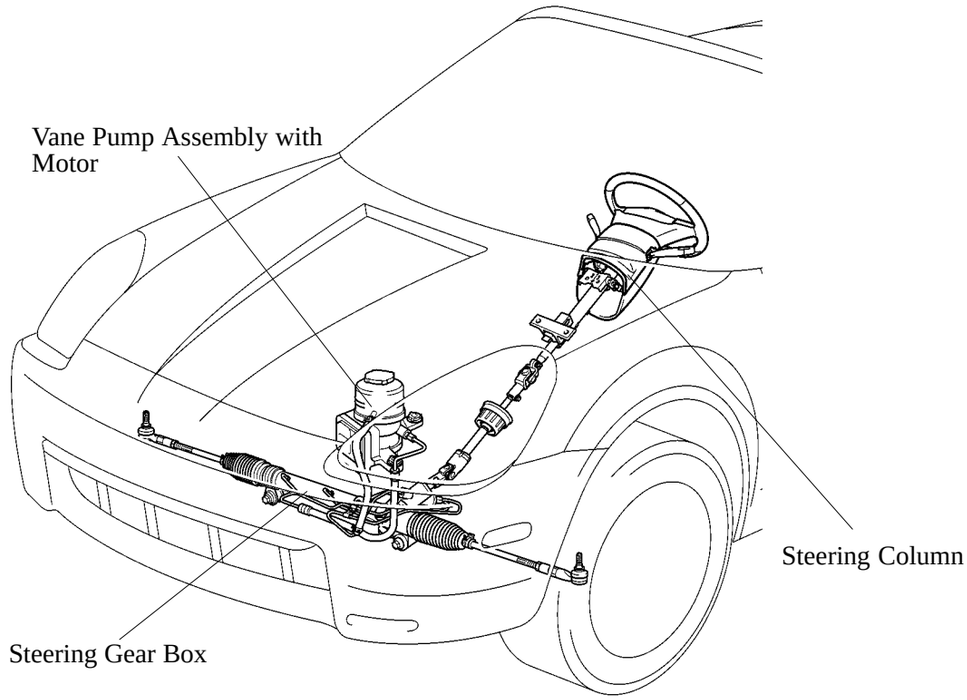
**▶ Hydraulic Circuit ◀**



# STEERING

## ■ DESCRIPTION

- The stepless tilt steering is used. The steering column has adopted an energy absorbing mechanism that uses energy absorbing plate. The basic construction and operation are the same as of the ’00 Celica.
- A rack and pinion type steering is used. The EHPS (Electro-Hydraulic Power Steering) is standard equipment on all models.

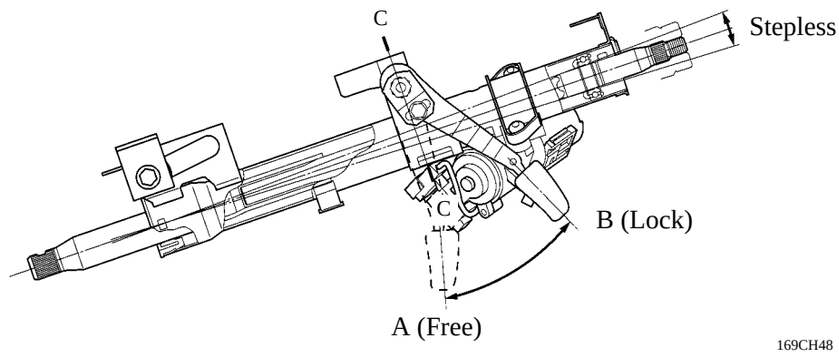



**▶ Specifications ◀**

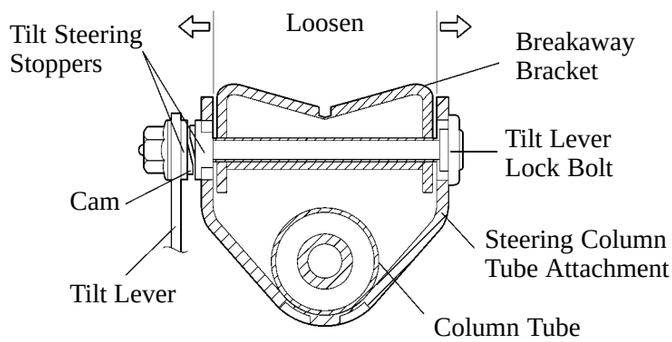
| | |
|---|---|
| Gear Ratio (Overall) | 13.6 |
| No. of Turns Lock to Lock | 2.66 |
| Rack Stroke mm (in.) | 124.4 (4.90) |
| Fluid Type | TOYOTA P.S FLUID EH |

## ■TILT STEERING

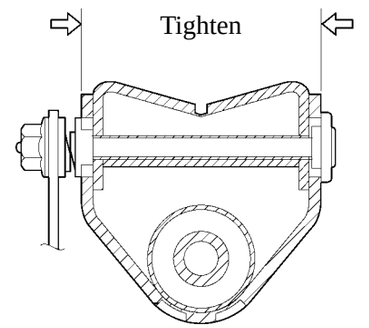
The tilt mechanism mainly consists of a tilt lever, steering column tube attachment, breakaway bracket, tilt lever lock bolt and tilt steering stoppers.
When the tilt mechanism is in its locked state, the tilt lever at B position causes the cam of the tilt steering stoppers to tighten the steering column tube attachment.
When the tilt mechanism is in its free state, the tilt lever at A position causes the cam of the tilt steering stoppers to loosen the steering column tube attachment.




**▶ C – C Cross Section ◀**



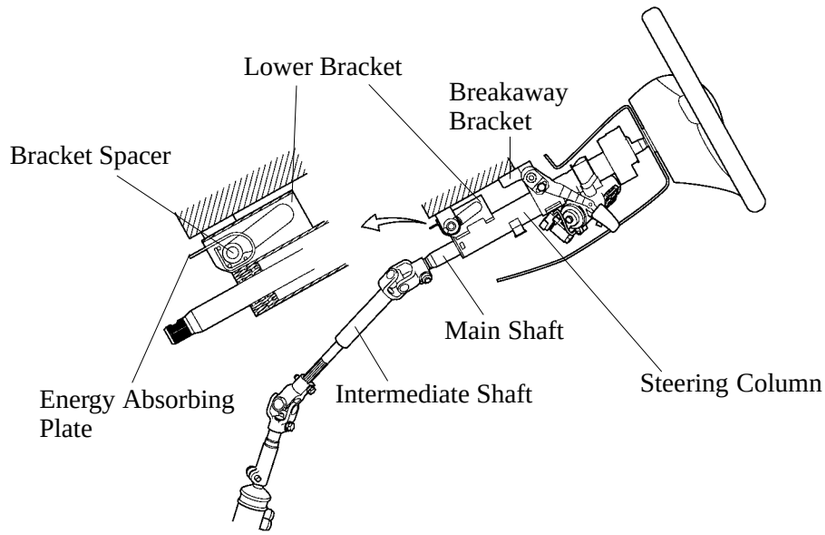

**Free**



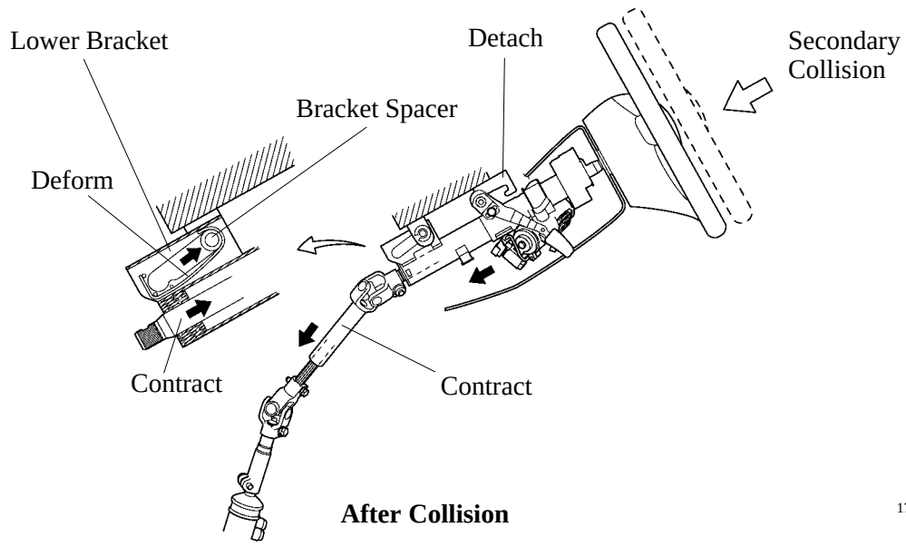

**Lock**

## ■ENERGY ABSORBING MECHANISM

The energy absorbing mechanism mainly consists of a lower bracket, energy absorbing plate, breakaway bracket, contractile main shaft and contractile intermediate shaft.
When an impact is transmitted to the steering wheel in a frontal collision (Secondary collision), the lower bracket and the bracket spacer, as well as the breakaway bracket and the tilt lever lock bolt separate, causing the entire steering column to move forward.
At the same time, the energy absorbing plate in the lower bracket is deformed by the bracket spacer and absorbs the impact of the secondary collision.
Furthermore, the amount of forward movement of the entire steering column is absorbed by the contraction of the main shaft and the intermediate shaft.




**Before Collision** 169CH51




**After Collision** 179CH17

## ■EHPS (Electro-Hydraulic Power Steering)

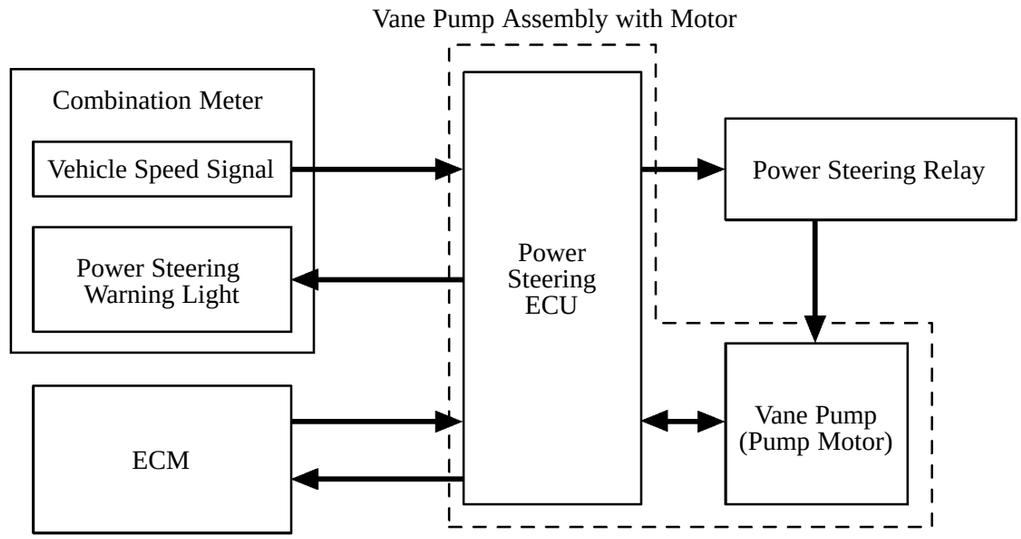
### 1. General

In conventional and ordinary hydraulically-controlled power steering, hydraulic pressure needed for control is generated when the pump is turned by the engine. In the EHPS, the vane pump is turned by an electric motor, giving in the following advantage:

- The speed of the pump motor is controlled by the power steering ECU so that power steering assist characteristics suited to the driving conditions are easily provided.
- There is no engine power loss due to the vane pump driving by electric motor.

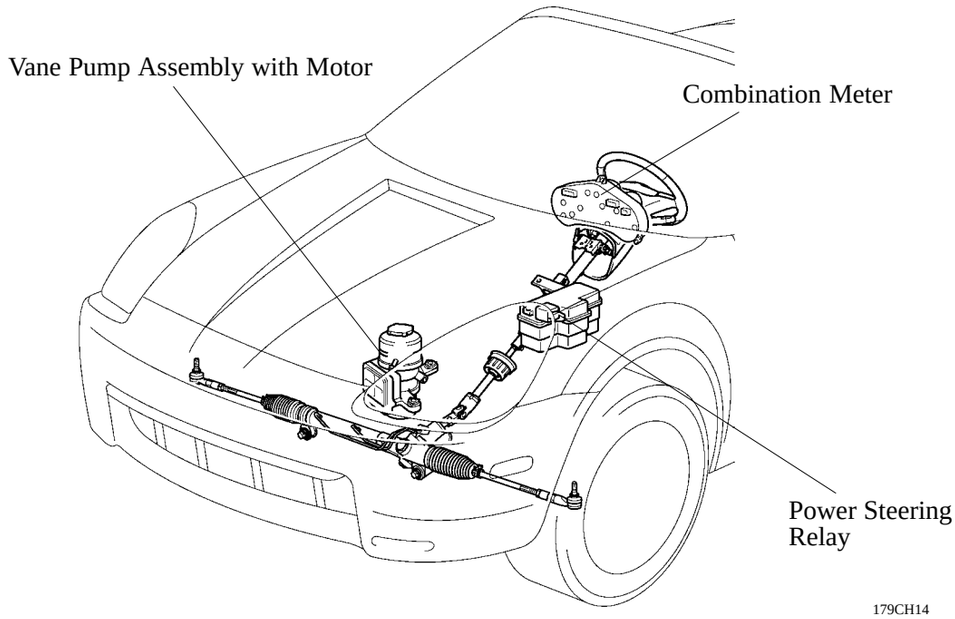
In addition, the EHPS is appropriate for the midship model because all system components are grouped in the front.

**▶ System Diagram ◀**




179CH13

## 2. Layout of Main Components

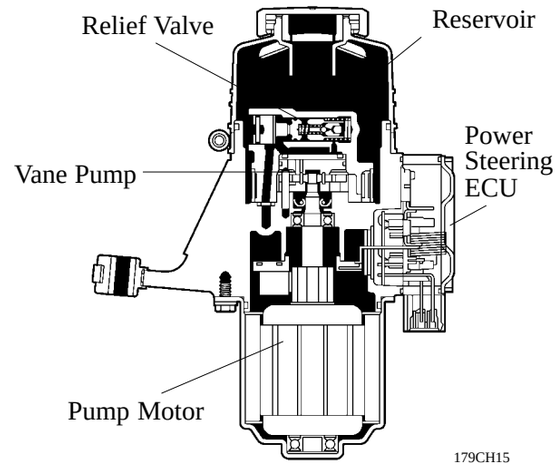



## 3. Function of Main Components

| Components | | Function |
|---|---|---|
| Combination Meter | | Outputs to the power steering ECU the vehicle speed signal that has been input from the ABS ECU. |
| | Power Steering Warning Light | Lights up to alert the driver when the power steering ECU detects the malfunction in the EHPS system. |
| Vane Pump Assembly with Motor | Vane Pump & Reservoir | • Provides the steering gear box with an amount of fluid that is in accordance with the vehicle speed and the steering conditions.<br>• Transmits the steering conditions to the pump motor by way of the changes in the hydraulic pressure of the vane pump. |
| | Pump Motor | • Drives the vane pump.<br>• Feeds back the steering conditions to the power steering ECU by way of the changes in the amperage of the pump motor. |
| | Power Steering ECU | • Judges the vehicle driving condition based on signals from the speed sensor and vane pump (pump motor), and sends steering assist control signal to the vane pump (pump motor).<br>• The engine idle-up control function prevents poor engine performance caused by an increase in electrical load when the motor current increases.<br>• The relay control function stops the motor drive according to the engine condition or in the presence of actuator malfunction.<br>• When the ECU detects the malfunction in the EHPS system, it lights up power steering warning light.<br>• Flashes the power steering warning light by switching the diagnosis mode in order to display the DTC (Diagnostic Trouble Code).<br>• The fail-safe function that is triggered when a malfunction occurs. |
| ECM | | Outputs the EHPS stop signal to the power steering ECU when the engine is started at a low water temperature or at a low engine speed. |
| Power Steering Relay | | Supplies the power to the pump motor. |

## 4. Construction and Operation of Vane Pump Assembly with Motor

The vane pump assembly with motor consists of the reservoir, vane pump, pump motor and power steering ECU. It has a relief valve which relieves to the inlet side when the discharge pressure rises over 4.9 Mpa (50 kg/cm$^2$) and thus prevents an abnormal pressure build up.




179CH15

## 5. System Control

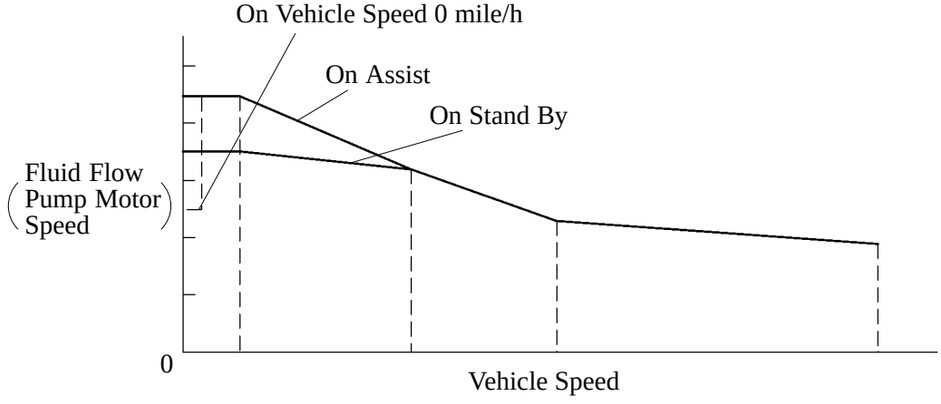
### General

In the EHPS system, the power steering ECU judges the conditions of the vehicle and the pump motor, and determines the fluid flow (pump motor speed) to be applied to the motor accordingly. The power steering ECU consists of the following five functions: pump motor control, engine idle-up control, relay control, diagnostic function, and fail-safe function.

### Pump Motor Control

The power steering ECU receives signals from the vehicle speed signal and the pump motor, judges the current vehicle condition, and determines the fluid flow (pump motor speed) to be applied to the pump motor accordingly.
The pump motor control consists of three maps: normal, non-steering, and 0 mile/h vehicle speed.
The voltage being applied to the pump motor decreased, as shown in the following graph, as the vehicle speed increases.

- Normally, the fluid flow (pump motor speed) of the pump motor is controlled based on the assist map, in accordance with the vehicle speed and steering conditions.
- If the non-steering state is prolonged, the control of the fluid flow (pump motor speed) to the pump motor transfers to the standby map to save energy.
- If the non-steering state is prolonged at 0 mile/h vehicle speed, the fluid flow (pump motor speed) to the pump motor is reduced even further.




179CH16

### Engine Idle-Up Control

When the electric current going to the pump motor rises above a predetermined level, the pump motor sends an idle-up signal to the ECM to prevent poor engine performance due to an increased electric load.

### Relay Control

The power steering relay supplies electric current to the pump motor. The power steering ECU turns this relay off when the pump motor is turned off by the fail-safe function due to a malfunction in an EHPS system or a signal received from the ECM that the coolant temperature or engine speed is extremely low.

### Diagnostic Function

If the power steering ECU detects a malfunction in the EHPS system, the warning light that corresponds to the function in which the malfunction has been detected lights up to alert the driver of the malfunction. The power steering ECU will also store the codes of the malfunctions. The DTCs (Diagnostic Trouble Codes) can be accessed through the blinking of the power steering warning light or the use of a hand-held tester. For details, see the 2000 MR2 Repair Manual (Pub. No. RM760U).

### Fail-Safe Function

When a malfunction is detected by the diagnostic function, the power steering ECU deactivates the pump motor automatically. As a result, the EHPS system operates the same way as manual steering.

# BODY

## BODY STRUCTURE

### ■DESCRIPTION

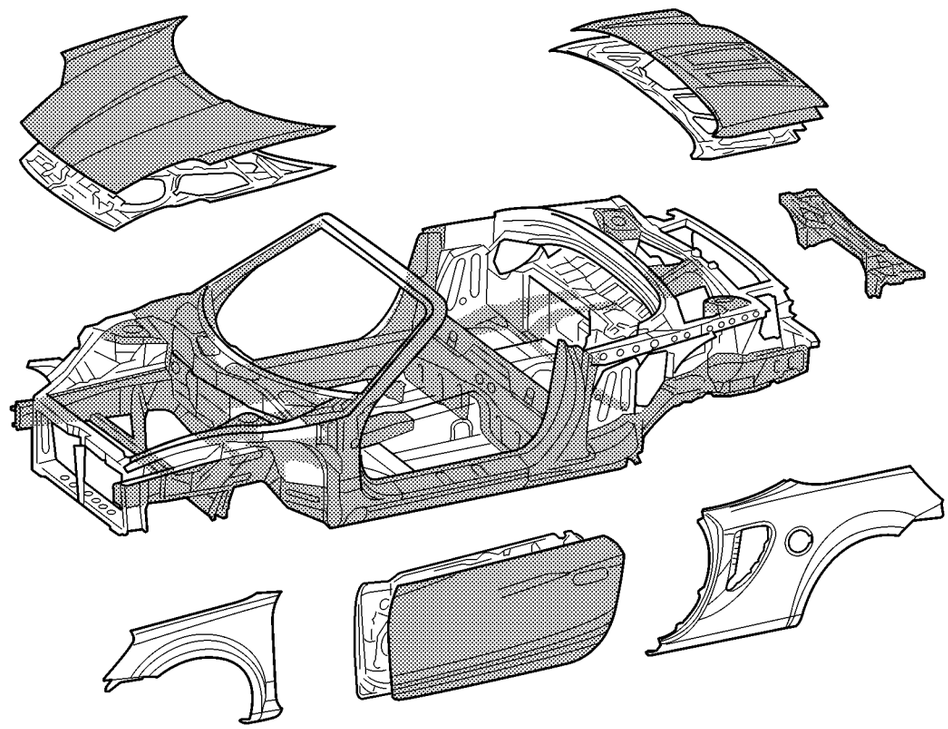
The new MR2 has adopted a body construction that achieves both high rigidity and safety.

### ■LIGHTWEIGHT AND HIGHLY RIGID BODY

#### 1. High Strength Sheet Steel

High strength sheet steel has been used in order to ensure body rigidity and realize a lightweight body.

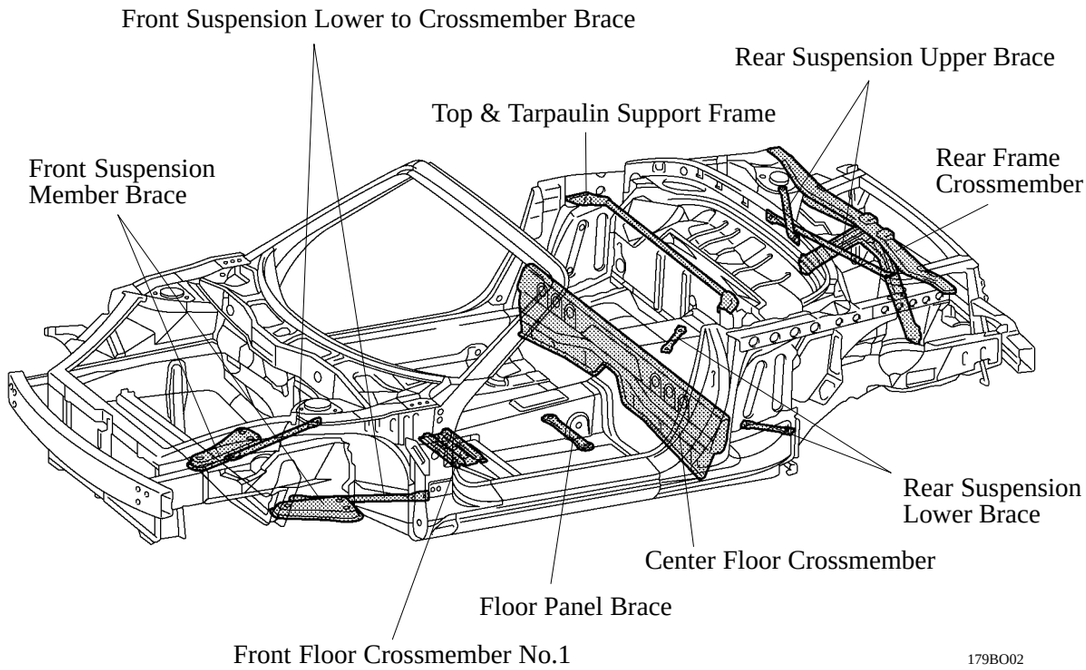
**: High Strength Sheet Steel**



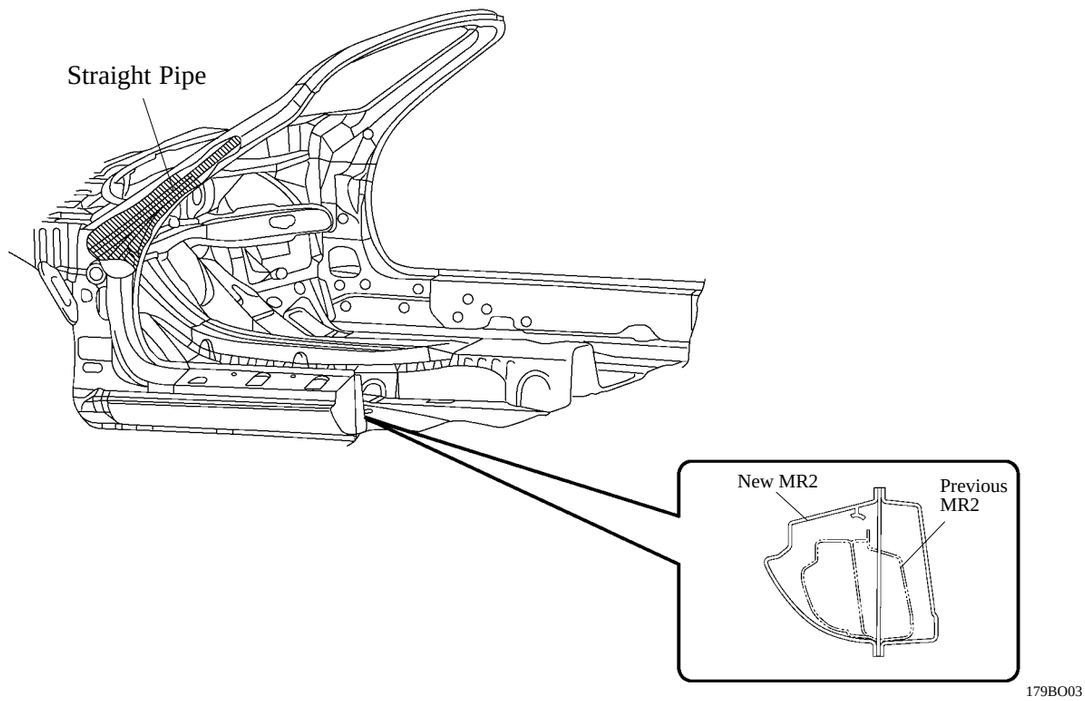
179BO01

## 2. Body Shell

- The members and braces have been effectively located to ensure high rigidity and to realize excellent stability and controllability.

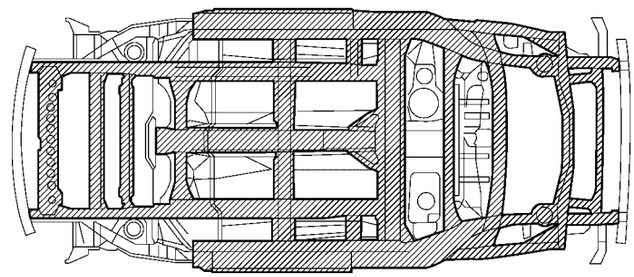



- A straight pipe is provided inside the front pillar to ensure the pillar rigidity that is equal to the closed body construction used in conventional sedans.
- The bottom of the front pillar has been enlarged to increase its joining rigidity with the rocker area.
- The cross section of the rocker has been increased in size to improve body rigidity.



## 3. Under Body

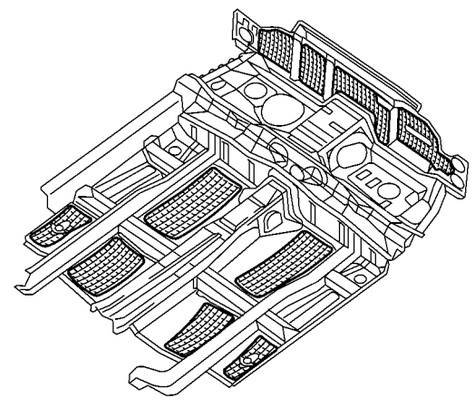
By making the main framework straight and optimizing the joint structure of each framework, thus result in improving the body more light-weight and with high rigidity.



179BO04

## 4. Floor Panel and Room Partition Panel

By dividing the floor panel and room partition panel in the ten sheets and making their structure rounded, thus rigidity improvement and road noise reduction are realized.



179BO05

## ■SAFETY FEATURES

### 1. Impact Absorbing Structure

#### General

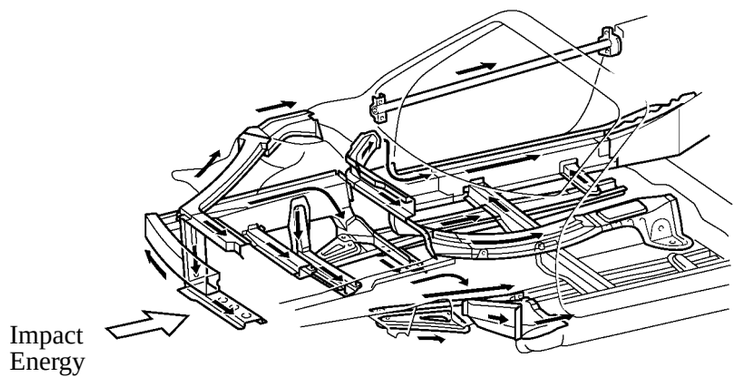
The impact absorbing structure of the MR2 provides a body construction that can effectively absorb the energy of impact in the event of a front or side collision. Also, it realizes an excellent occupant protection performance through the use of reinforcements and members that help minimize cabin deformation.

#### Construction

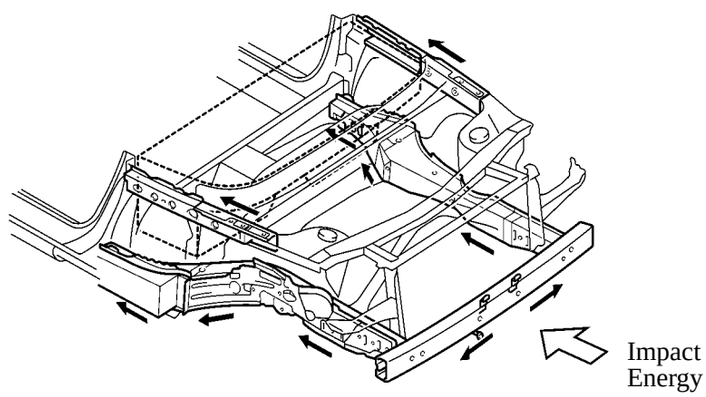
**1) Impact Absorbing Structure for Front/Rear Collision**

In conjunction with the revision made to the impact absorbing structure for a front or rear collision, the cross section of the underbody members, and reinforcements have been increased in size and thickness of the material used.
Accordingly, the underbody and cabin framework were made to absorb and dissipate the impact energy efficiency in case of a front or rear collision, thus realizing the minimized cabin deformation.

**▶ Impact Absorbing Structure for Front/Rear Collision ◀**




179BO06

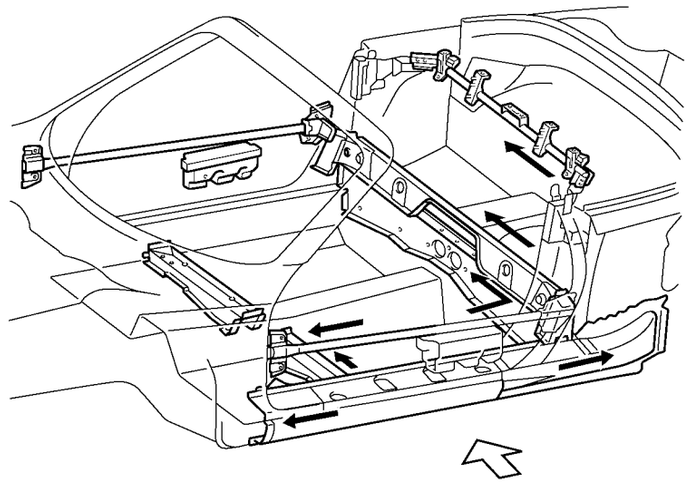



179BO07

**2) Impact Absorbing Structure for Side Collision**

- The front floor crossmember, top & tarpaulin support frame, and the center floor crossmember have been optimally located to minimize the deformation of the cabin during a collision.
- A bulkhead that is joined directly to the center floor crossmember has been provided in the center pillar in order to enhance the transmission of energy to the center floor crossmember during a collision.
- Side impact protection beams have been provided to the pillars and the laps in order to efficiently absorb and dissipate the energy during a collision. Furthermore, a door trim center pad that absorbs the impact has been provided in the door trim in order to dampen the impact that is applied to the occupants during a collision.

**▶ Impact Absorbing Structure for Side Collision ◀**



## ■RUST-RESISTANT BODY

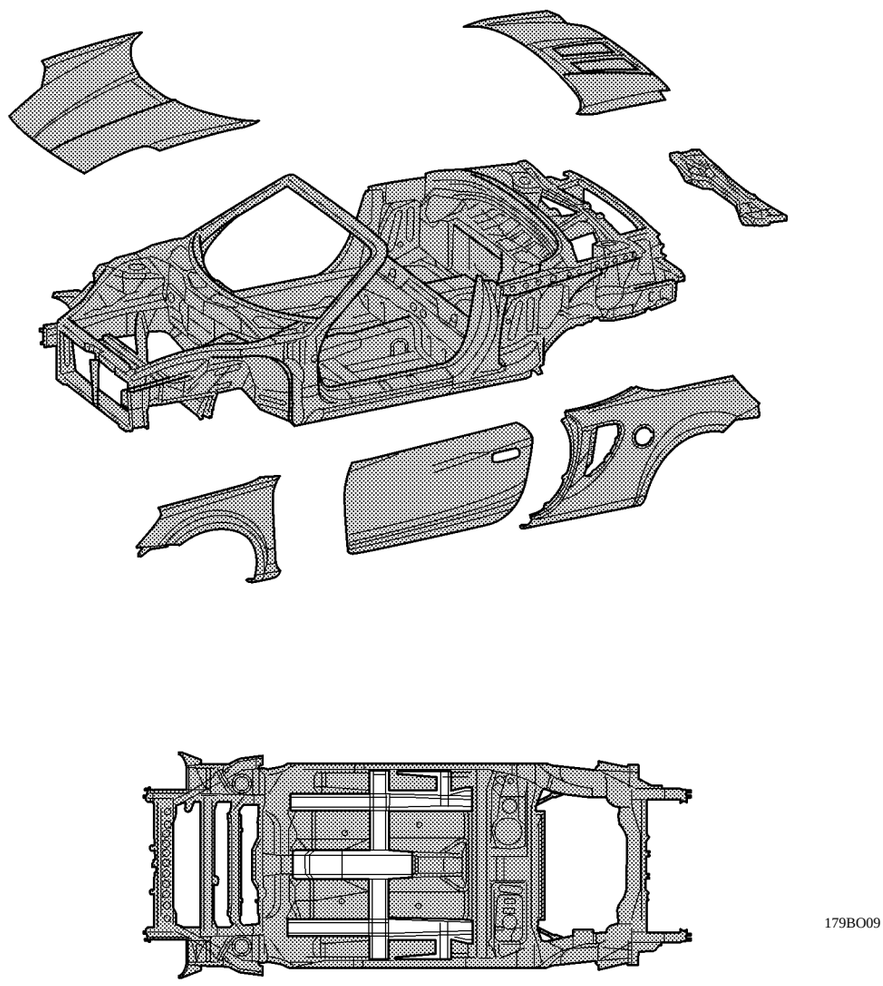
### 1. General

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 hoods, doors and rocker panels.

### 2. Anti-Corrosion Sheet Steel

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

**: Anti-Corrosion Sheet Steel**



179BO09

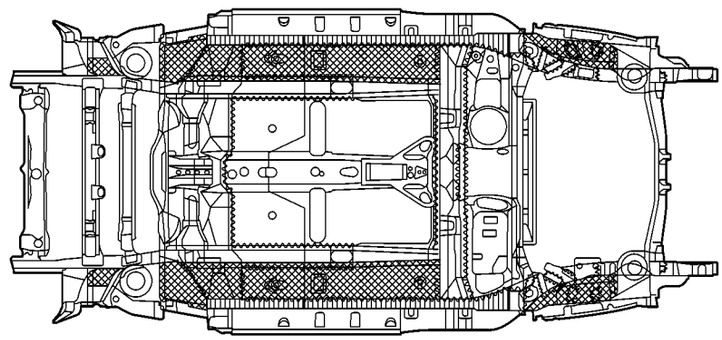
## 3. Wax and Sealer

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

## 4. 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 stone chipping, etc.

**: PVC Coating Area**
**: PVC Coating Area (Thick Coating)**
**: Edge Seal**

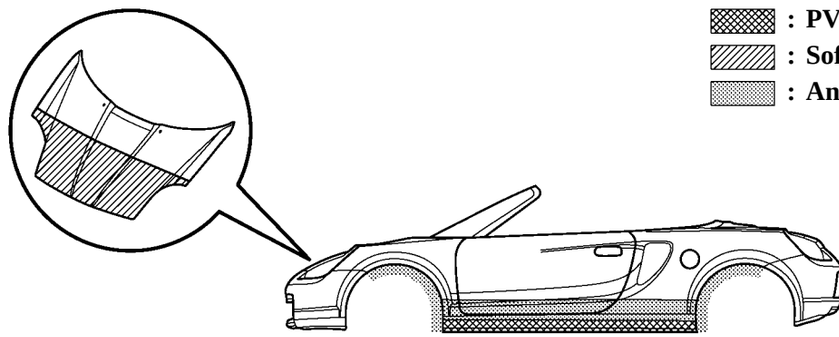


179BO10

## 5. 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 stone chipping. In addition, soft-chip primer is applied to the hood.

**: PVC Chipping Primer**
**: Soft-Chipping Primer**
**: Anti-Chipping Paint**



179BO11

## ■LOW VIBRATION AND LOW NOISE BODY

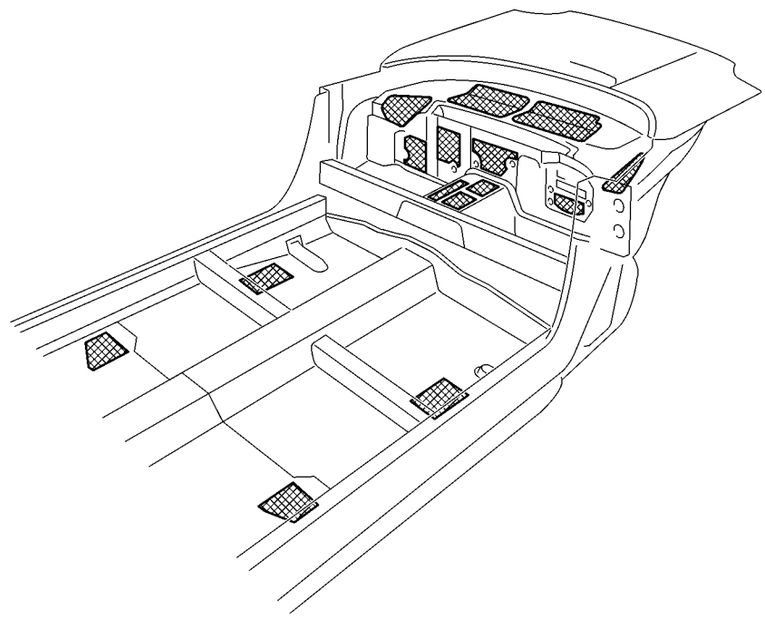
### 1. General

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

### 2. Sound Absorbing and Vibration Damping Materials

Asphalt sheets is provided on the floor panel and room partition panel to suppress the engine and road noise.

**: Asphalt Sheet**

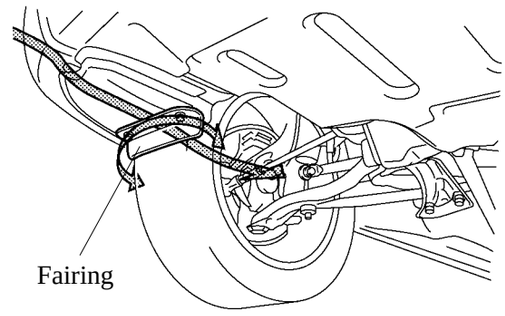


179BO12

# AERODYNAMICS

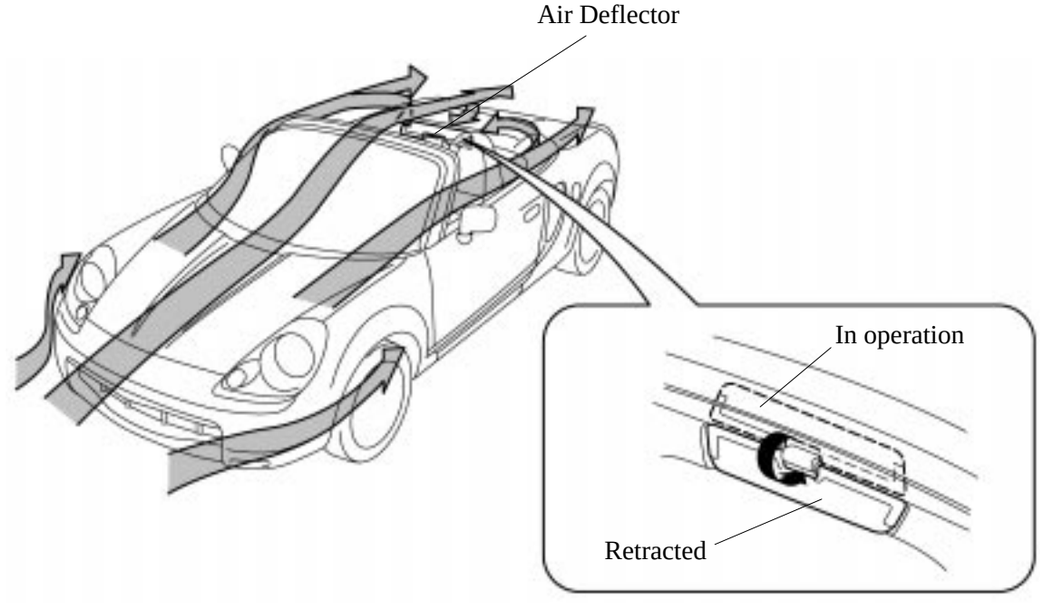
## ■ DESCRIPTION

- The front portion of the fender liner has been shaped to efficiently direct the airflow to the brake rotors in order to ensure the cooling performance of the brakes.
- A front fairing are provided to smooth out the airflow around the tires and reduce the air resistance while the vehicle is in motion.




179BO13

- A manual type air deflector has been provided to reduce the amount of airflow rolling in from the back while the vehicle is in motion.



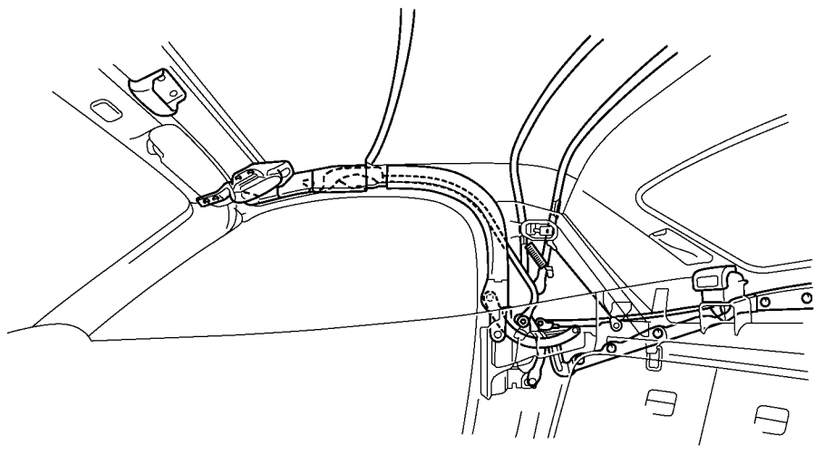

179BO14

# ENHANCEMENT OF PRODUCT APPEAL

## ■CONVERTIBLE MECHANISM

### 1. General

- A manual convertible mechanism with a 2-way split link around the side window that opens and closes the tarpaulin has been adopted. This tarpaulin is attractive and its ceiling does not become soiled because the roof surface faces outward whether it is open or closed.
- The rear window uses glass with a defogger.



179BO15

### 2. Construction

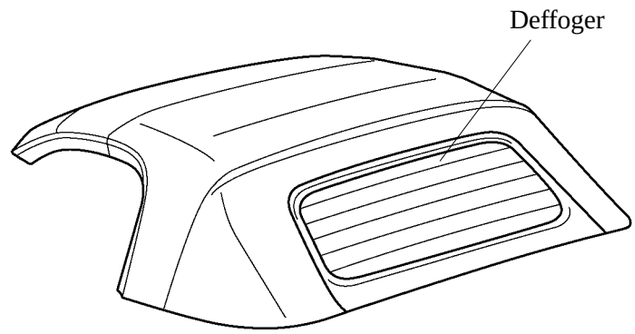
This convertible mechanism consists of tarpaulin, rear window, link, top lock, top handle.

#### Tarpaulin

It is made of lightweight cotton-PVC (polyvinyl Chloride) dual construction.

#### Rear Window

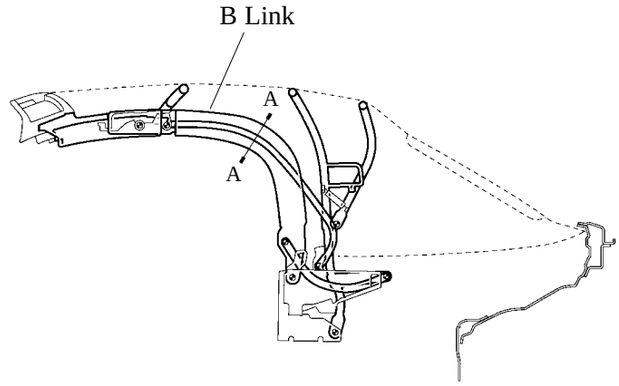
Reinforced glass of 2.5 mm thickness with a defogger is used for the rear window to realize excellent rear visibility and weight reduction.

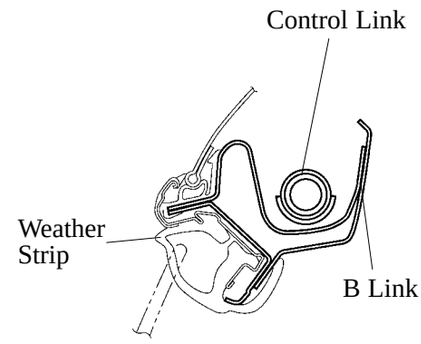



179BO16

### Link

The B link, which consists of 3 panels to form a closed cross section, increases the rigidity of the area from the pillar to the roof.
A control link is provided on the inside of the B link to improve its appearance from the vehicle interior.



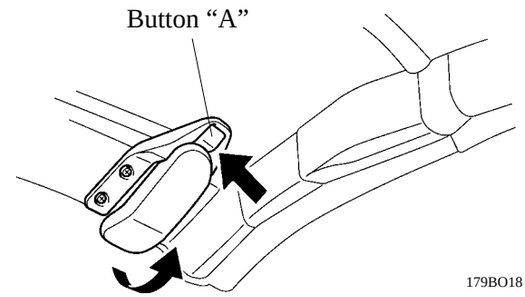




**A – A Cross Section**

179BO17

### Top Lock

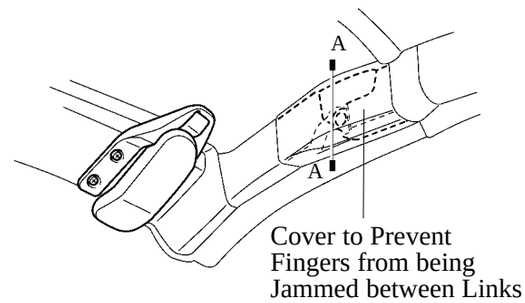
- The lock lever is a type in which a lever and cover are integrated to cover the lock body.
- The lock lever can be pulled towards you by pressing button “A” and unlocking the lock lever.

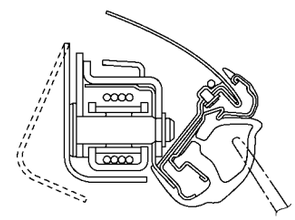



179BO18

### Cover to prevent fingers from being jammed between links

A cover to prevent fingers from being jammed between links while the roof side is lifted by hand to open or close the roof has been adopted.



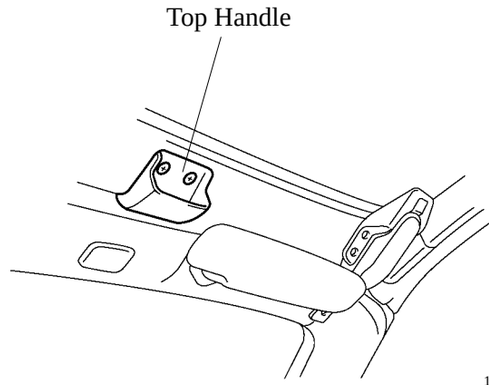



**A – A Cross Section**

179BO19

### Top Handle

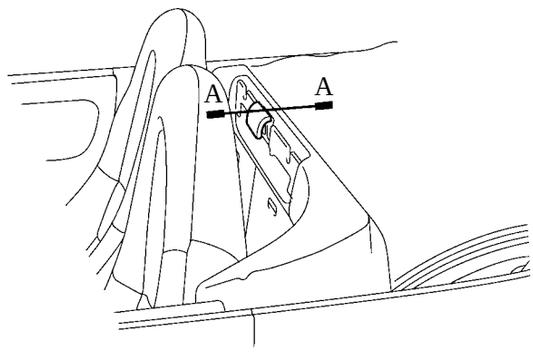
A top handle is provided in the center of the header to ensure the ease of operation while opening or closing the roof from the inside of the vehicle.
This handle also acts as a striker to secure the roof while it is open.

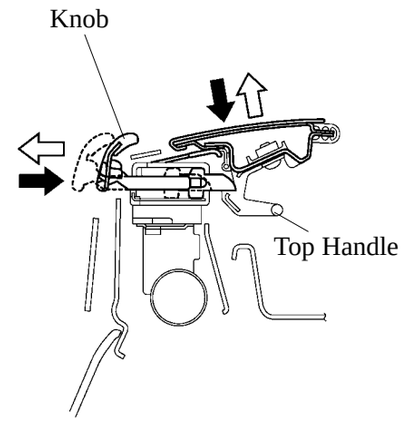



179BO20

### Open Latch

- When the roof is open, this latch is used to secure the roof against the top handle, which acts as the striker.
- Pulling the knob releases the lock, thus enabling the roof to be closed.



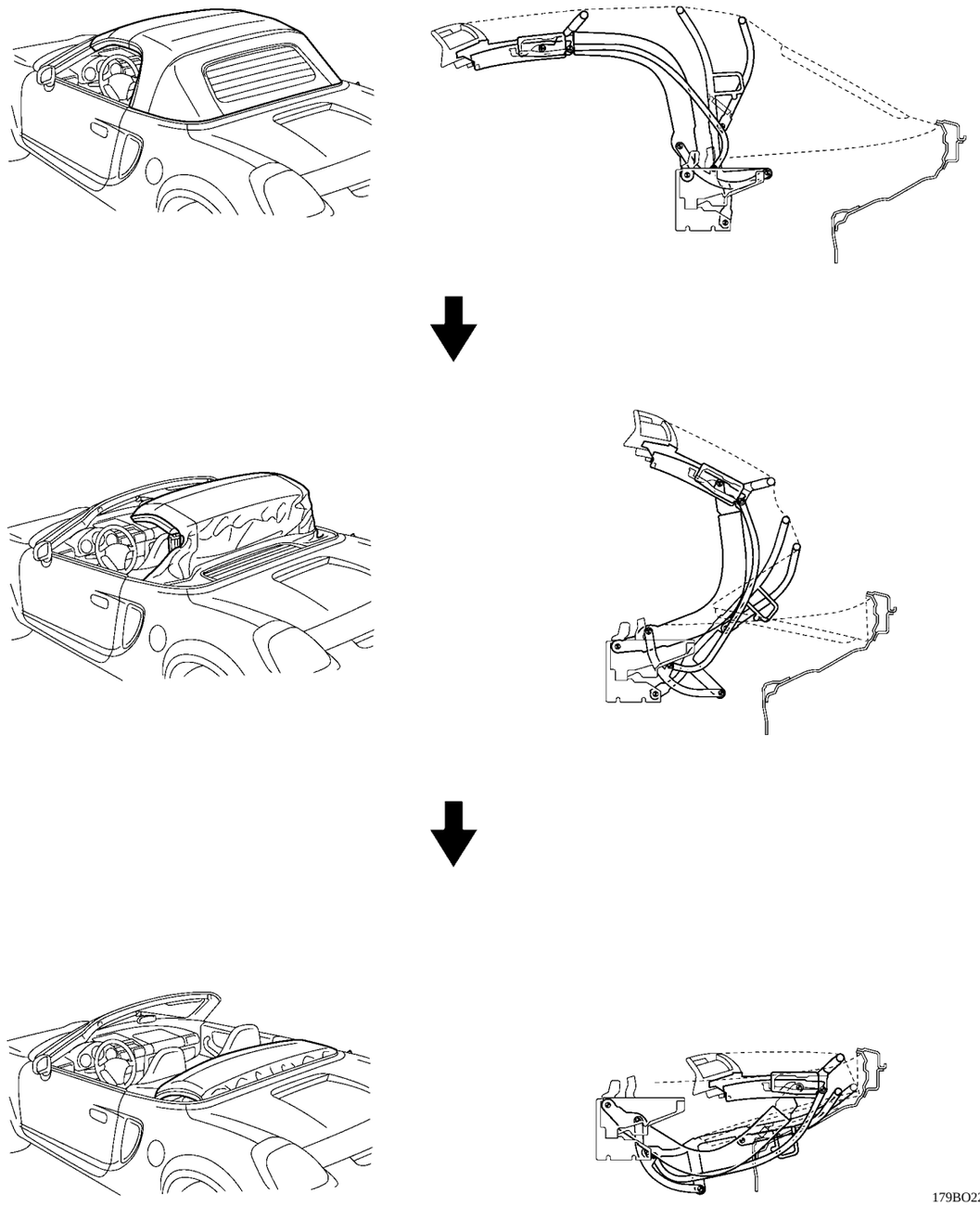




**A – A Cross Section**

179BO21

## 3. Operation

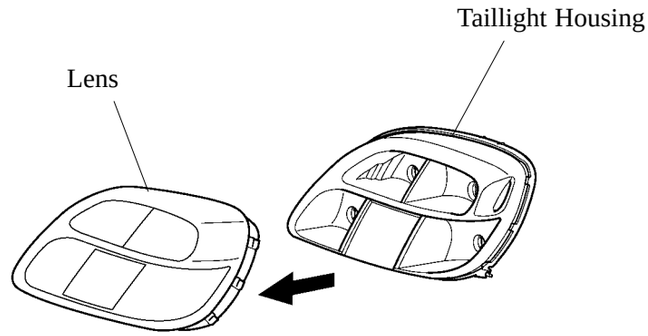
- When the tarpaulin is open, the roof surface moves in a parallel manner due to the movement of the links. Thus, even when the tarpaulin is open, the roof surface faces outward, just as when it is closed.
- To open the tarpaulin, release the top lock and move the roof towards the back of the vehicle. To close the tarpaulin, pull on the knob of the open latch, move the roof towards the front of the vehicle, and secure the top lock.



179BO22

## ■TAILLIGHTS

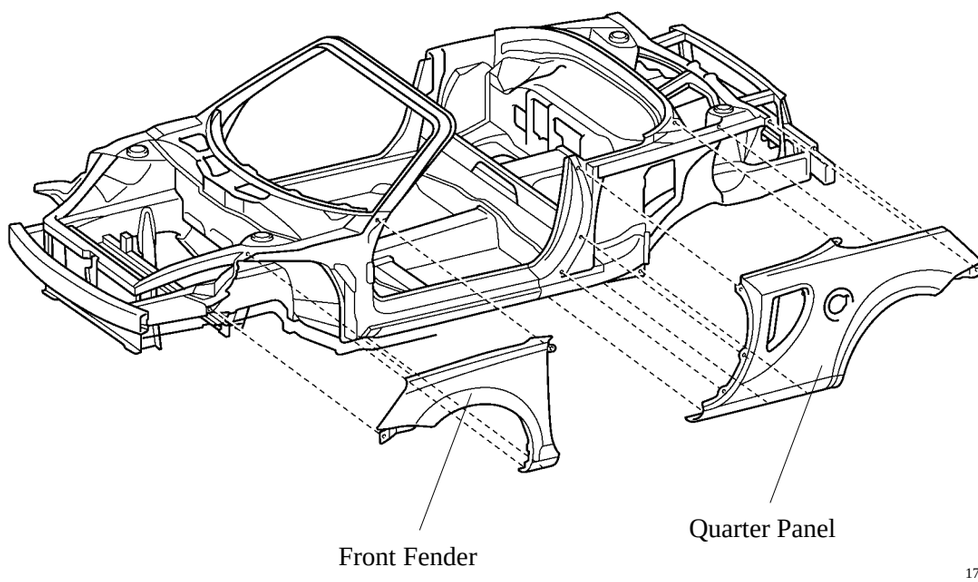
By making the structure of lenses of the taillights detachable, serviceability is improved as it enables you to deal with only by replacing the lenses in case that they are broken. For details, see the 2000 MR2 Repair Manual (Pub. No. RM760U).




179BO23

## ■FRONT FENDER AND QUARTER PANEL

The front fender and the quarter panel are secured with bolts, thus enabling them to be removed or reinstalled. Also, the rear wheel house has been discontinued to enhance the vehicle's weight reduction and serviceability.




179BO24

## ■SEAT BELT

- On both seats are provided an electrical sensing type seat belt pretensioner and a seat belt force limiter. The basic construction and operation are the same as in the ’99 TOYOTA TACOMA.
- On both seats are provided ELR (Emergency Locking Retractor) and tension reducer seat belts.

# BODY ELECTRICAL

## LIGHTING

### ■HEADLIGHTS

- 2-sculptured wave-reflector type headlights have been adopted on all models.
- Through the use of wave-reflectors, the diffusion of light from the headlights in the forward direction and sideways has been increased to improve visibility.

### ■DAYTIME RUNNING LIGHT SYSTEM

#### 1. General

- This system is designed to automatically activate the headlights during the daytime to keep the car highly visible to other vehicles.
  The headlights are activated by reducing the normal low-beam brightness.
- A PWM (Pulse Width Modulation) control has been adopted as the light reduction control system for the daytime running lights.
- The basic construction and operation are the same as in the ’00 Corolla.

#### 2. Operation

For details, see the ’98 Corolla New Car Features (Pub. No. NCF148U)

### ■LIGHT REMINDER SYSTEM

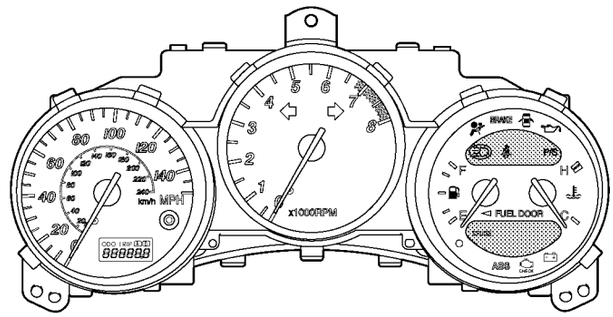
When the ignition key is turned from the ON or ACC to LOCK position while the driver’s door open with the taillights or headlights turned on, this system warns the driver that the lights remain on by sounding the buzzer.

# METER

## ■COMBINATION METER

### 1. General

- A sporty look is achieved by locating the tachometer in the center and indicating the red zone with dots.
- An odo/trip meter that uses an LCD (Liquid Ctystal Display) is provided below the speedometer.
- A flashing warning indicator light and buzzer have been adopted for the driver's seat belt.
- This combination meter has adopted a meter ECU and communication is maintained between the ECM and the meter ECU in order to exchange engine coolant temperature, oil pressure, battery, engine speed, and vehicle speed data.

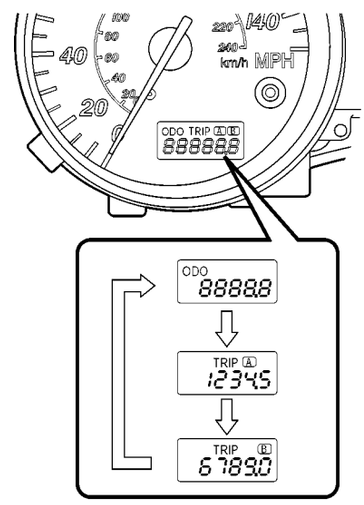



179BE01

### 2. Construction and Operation

#### Odo/Trip Meter

An LCD (Liquid Crystal Display) has been adopted for the odo/trip meter. The switching of the modes is effected by pressing the odo/trip selector/reset switch, which causes the LCD to display in the following order: odo meter → trip meter A → trip meter B.
While trip meter A or B is displayed, pressing the odo/trip selector/reset switch 0.8 seconds or longer causes the driven distance displayed by the current trip mode to revert to 0.0 mile.
The trip meter will resume measuring the distance at the moment the odo/trip selector/reset switch is released.




179BE07

# AIR CONDITIONING

## ■ DESCRIPTION

The air conditioning system in the MR2 has the following features:

- A compact, lightweight, and highly efficient straight flow (full-path flow) aluminum heater core has been adopted.
- The heat exchange efficiency has been improved through the adoption of the sub-cool condenser.
- A compact, high-performance scroll compressor with oil separator has been adopted.
- A multi-tank, super-slim structure evaporator has been adopted.

**▶ Performance ◀**

| Item | | | Performance |
|---|---|---|---|
| Heater | Heat Output | W | 4400 |
| | Air Flow Volume | $m^3/h$ | 260 |
| | Power Consumption | W | 165 |
| Air Conditioning | Heat Output* | W | 3800 |
| | Air Flow Volume | $m^3/h$ | 410 |
| | Power Consumption | W | 210 |
| Defroster | Air Flow Volume | $m^3/h$ | 280 |

*: When the compressor speed is 1800 rpm

**▶ Specifications ◀**

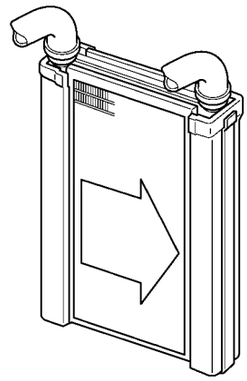
| Item | | | Specifications |
|---|---|---|---|
| Ventilation and Heater | Heater Core | Type | Straight Flow (Full-path Flow) |
| | | Size W × H × L mm (in.) | 130 × 216.9 × 27 (5.7 × 8.5 × 1.1) |
| | | Fin Pitch mm (in.) | 1.8 (0.07) |
| | Blower | Motor Type | S70F – 13T |
| | | Fan Type | Sirocco Fan |
| | | Fan Size Dia. × H mm (in.) | 140 × 65 (5.5 × 2.6) |
| Air Conditioning | Condenser | Type | Multi-Flow (Sub-Cool) |
| | | Size W × H × L mm (in.) | 650 × 302.3 × 16 (25.6 × 11.9 × 0.63) |
| | | Fin Pitch mm (in.) | 3.6 (0.14) |
| | Evaporator | Type | Drawn Cup Type |
| | | Size W × H × L mm (in.) | 227.3 × 205 × 50 (8.95 × 8.0 × 1.97) |
| | | Fin Pitch mm (in.) | 3.5 (0.14) |
| | Compressor | Type | SCS06 |

## ■CONSTRUCTION AND OPERATION

### 1. Air Conditioning Unit

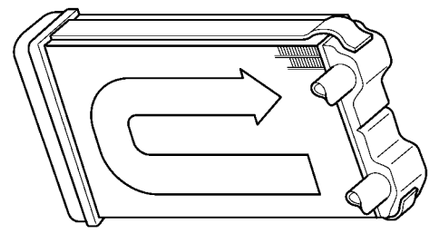
#### Heater Core

A compact, lightweight, and highly efficient straight flow (full-path flow) aluminum heater core has been adopted.



179BE08

**New**

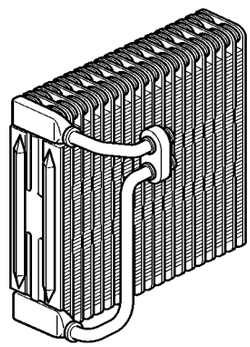


152BE22

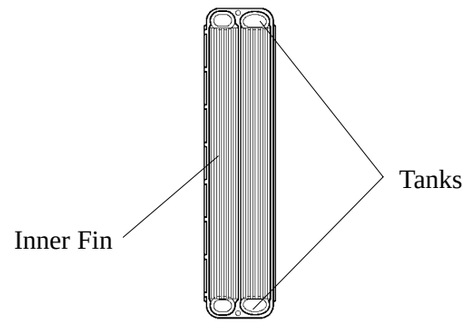
**Previous**

#### Evaporator

By placing the tanks at the top and the bottom of the evaporator unit and by adopting an inner fin construction, the heat exchanging efficiency has been improved and the evaporator unit's temperature distribution has been made more uniform. As a result, it has become possible to realize a thinner evaporator construction.



179BE09



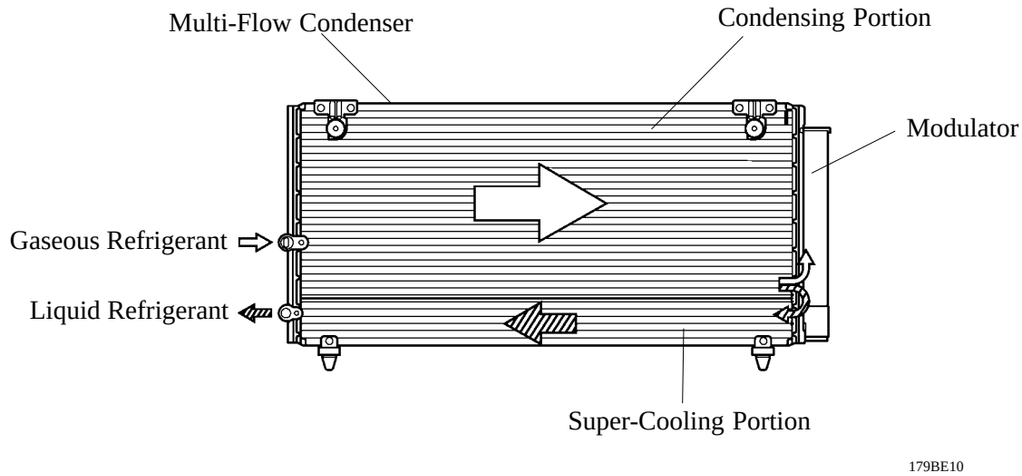

152BE24

## 2. Condenser

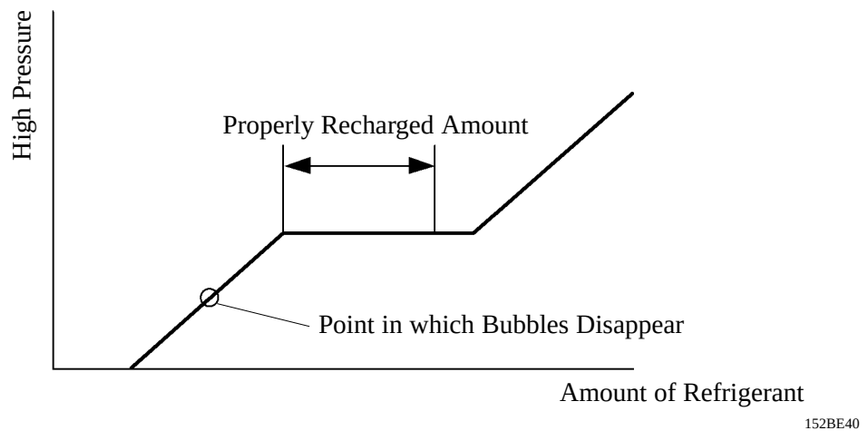
The new MR2 has adopted sub-cool condenser in which a multi-flow condenser (consisting of two cooling portions: a condensing portion and a super-cooling portion) and a gas-liquid separator (modulator) have been integrated. This condensor has adopted the sub-cool cycle for its cooling cycle system to improve the heat exchanging efficiency.

### Sub-Cool Cycle

In the sub-cool cycle of the sub-cool condenser that has been adopted, after the refrigerant passes through the condensing portion of the condenser, both the liquid refrigerant and the gaseous refrigerant that could not be liquefied are cooled again in the super-cooling portion. Thus, the refrigerant is sent to the evaporator in an almost completely liquefied state.




**NOTE:** 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 2000 MR2 Repair Manual (Pub. No. RM760U).



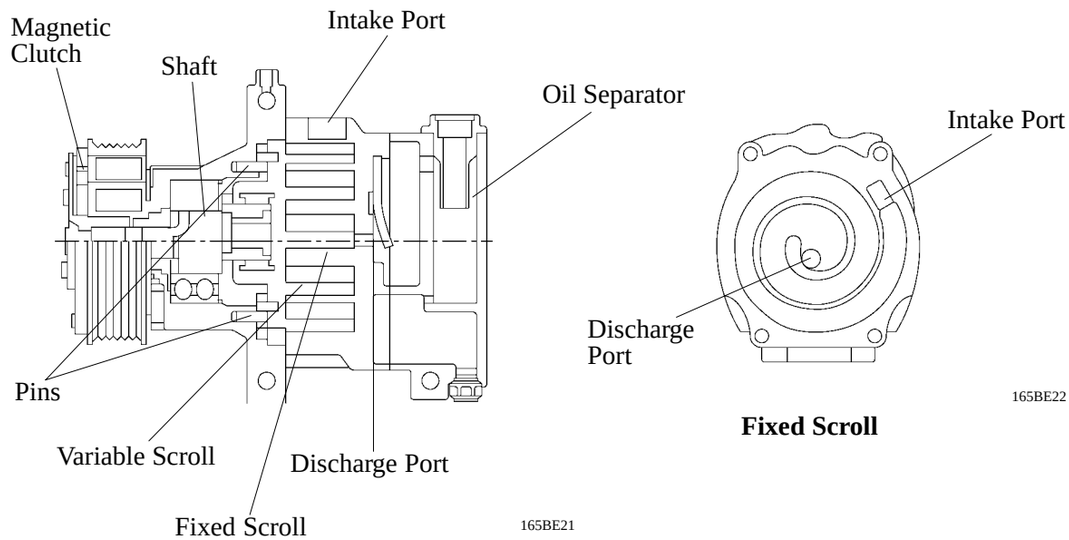
## 3. Compressor

### General

A compact and high performance scroll compressor with oil separator has been adopted.

### Construction

The scroll compressor with oil separator consists of a spirally wound fixed scroll and variable scroll that form a pair, and oil separator, and a magnetic clutch.
The fixed scroll is integrated with the housing. Because the rotation of the shaft causes the variable scroll to revolve while maintaining the same posture, the volume of the space that is partitioned by both scrolls varies to perform the suction, compression, and the discharge of the refrigerant gas.
A pin is attached behind the variable scroll to prevent the autorotation of the variable scroll, allowing it only to revolve.
Locating the intake port directly above the scrolls enables direct suction, thus realizing improved suction efficiency.
Containing a built-in oil separator, this compressor is able to separate the compressor oil that is intermixed with the refrigerant and circulates in the refrigeration cycle, thus realizing a reduction in the oil circulation rate.




**Fixed Scroll**

## Operation

### 1) Suction

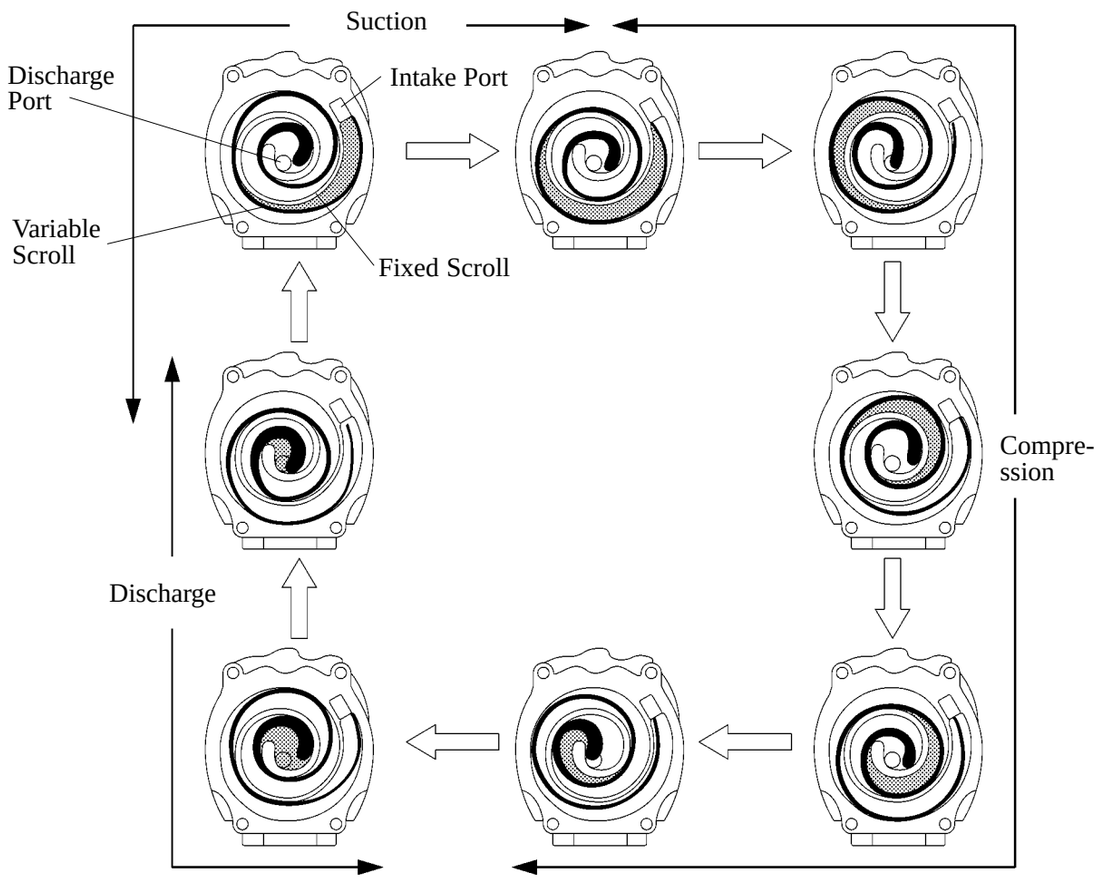
As the capacity of the compression chamber, which is created between the variable scroll and the fixed scroll, increases in accordance with the revolution of the variable scroll, refrigerant gas is drawn in from the intake port.

### 2) Compression

From the state at which the suction process has been completed, as the revolution of the variable scroll advances further, the capacity of the compression chamber decreases gradually. Consequently, the refrigerant gas that has been drawn in becomes compressed gradually and is sent to the center of the fixed scroll. The compression of the refrigerant gas is completed when the variable scroll completes approximately 2 revolutions.

### 3) Discharge

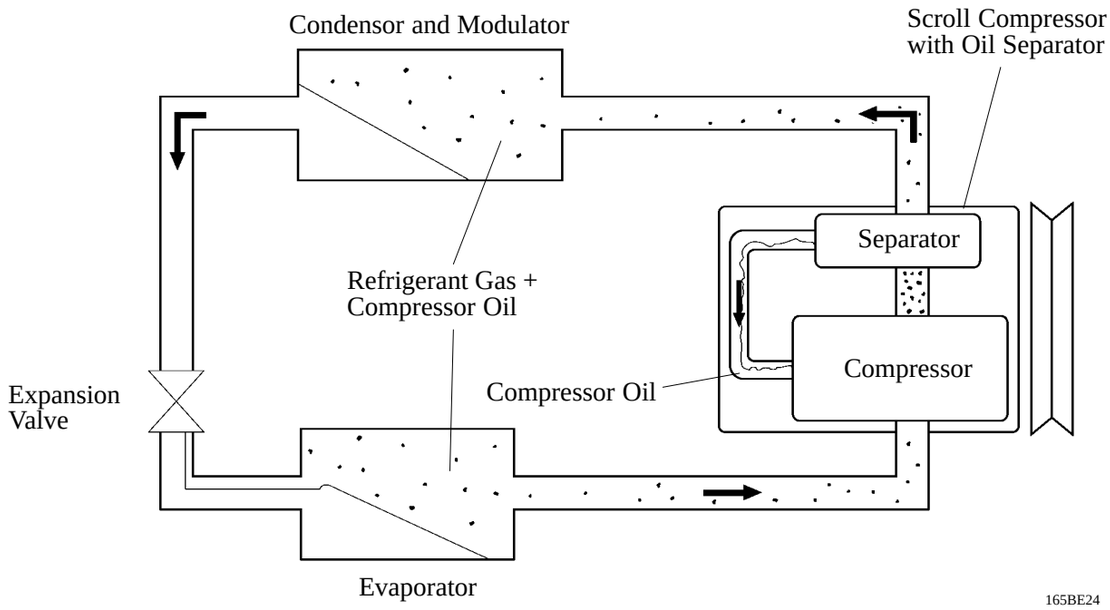
When the compression of the refrigerant gas is completed and the refrigerant pressure becomes high, the refrigerant gas discharges through the discharge port located in the center of the fixed scroll by pushing the discharge valve.



## Oil Separator

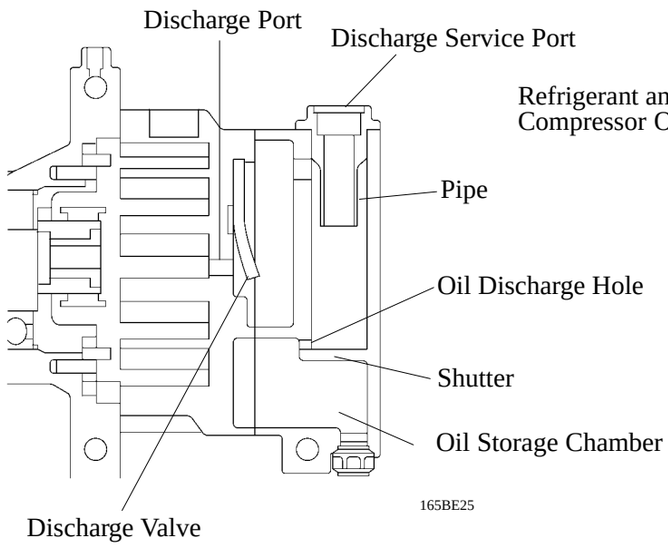
### 1) General

A CS (Centrifugal with Shutter) type oil separator has been adopted to reduce the circulation rate of the compressor oil that is intermixed with the refrigerant and circulates in the refrigeration cycle. This oil separator is provided with a cylindrical pipe in the separator case, enabling the refrigerant gas that has been discharged through the discharge gas inlet to be separated into refrigerant gas and oil through centrifugal force, and minimizing the outflow of the oil to the discharge service port. As a result, the oil circulation rate has been reduced and makes energy savings possible.

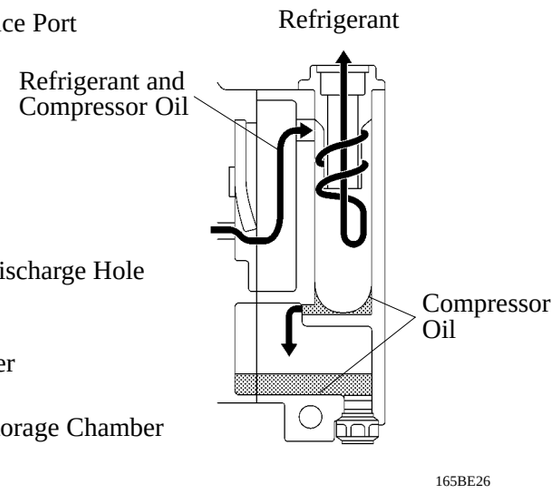


### 2) Construction and Operation

The refrigerant gas that is discharged from the discharge port flows by rotating around the cylindrical pipe in the oil separator. At this time, the centrifugal force that is created during the rotation separates the refrigerant gas and the compressor oil due to the difference in their specific gravity. The refrigerant gas with the lighter specific gravity passes through the inside of the pipe and travels from the discharge service port to the outside of the compressor. The compressor oil with the heavier specific gravity is discharged through the oil discharge hole in the shutter and is stored in the oil storage chamber. Then, the compressor oil is fed again into the compressor and circulates inside the compressor.




165BE25




165BE26

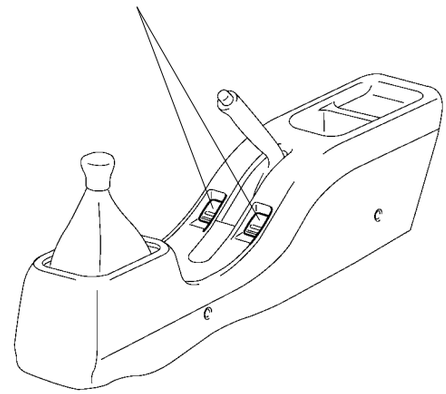
# ACCESSORIES

## ■POWER WINDOW SYSTEM

The power window system has the following features:

- This system includes “driver’s door one-touch auto down” function.
  The one-touch auto down function automatically opens the driver’s side window fully.
- The control of this system is effected by the body ECU.
- The power window switches have been located in the center of the rear console.

Power Window Switches



179BE02

## ■DOOR LOCK CONTROL SYSTEM

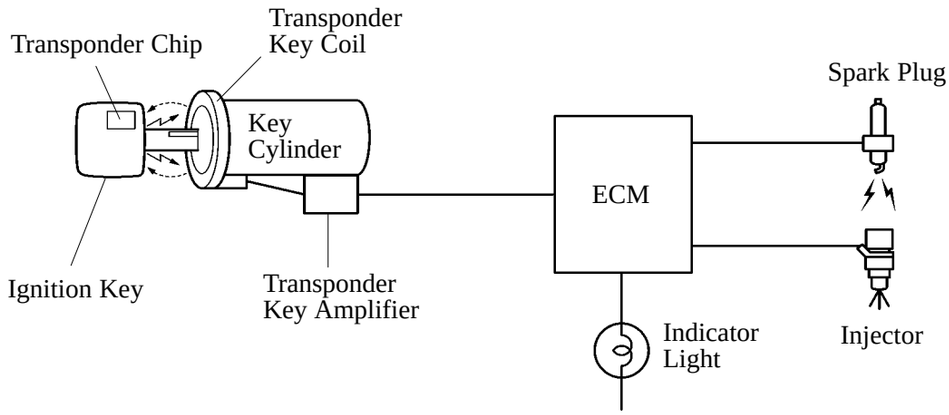
The door lock control system has the following features:

- This system has a “key-linked lock and unlock”, “key-confine prevention” and “manual unlock prohibition” functions.
- A 2-step unlock function is provided to unlock the driver’s door by turning the key cylinder first and to unlock passenger’s door by turning it the second time.
- The control of this system is effected by the body ECU.

## ■ENGINE IMMOBILISER SYSTEM

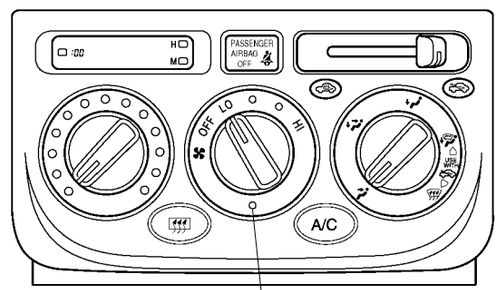
- The engine immobiliser system is a theft-deterrent system which disables the engine from starting using the ignition key with an ID code that matched is the pre-registered code in the vehicle.
  This system adopts a transponder system which uses a transponder chip embedded in the grip of the ignition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

**▶ System Diagram ◀**




165BE52

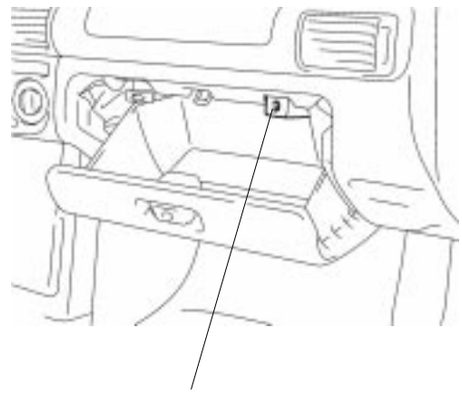
- The indicator light for the engine immobiliser system is provided in the heater control panel. This indicator light flashes when the system is set.



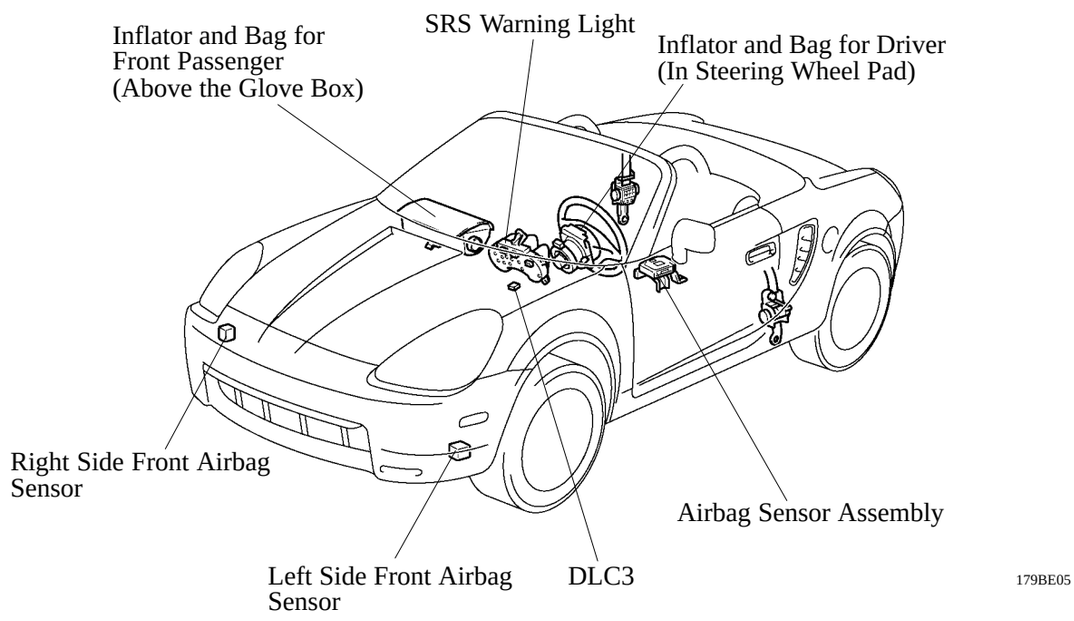

179BE03

## ■SRS AIRBAG

- The SRS (Supplemental Restraint System) airbags are provided for the driver and passenger. The SRS airbags have been designed to help reducing the shocks to the heads and chests of the driver and front passenger in the event of a frontial impact collision as supplements to the seat belts.
- A 3-sensor type airbag system is used in which the detection of deceleration during a front collision as well as control of the airbag system is accomplished by the airbag sensor assembly and front airbag sensors.
- On new MR2, ON-OFF system has been provided to enable the SRS airbag for the front passenger to be used or not to be used in accordance with the vehicle's use condition.
  This prevents the airbag from deploying. At this time, the passenger airbag OFF indicator light illuminates informing the driver and passenger that the front passenger SRS is inactive.
- The function of the ECU to memorize the seat belt wearing condition while inflating the airbag is added.
- The new MR2 has adopted a fuel cut control that stops the fuel pump to minimize fuel leakage if the airbag has been deployed.

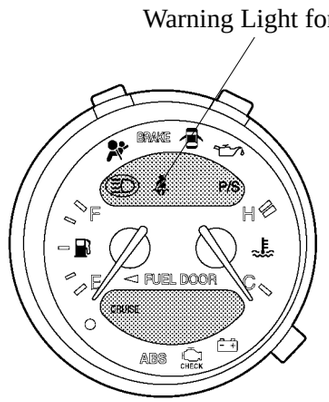



**▶ Layout of Components ◀**

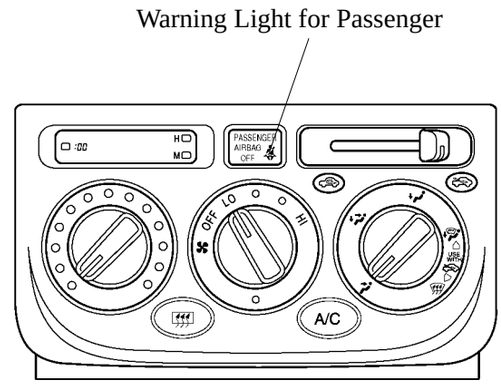


## ■SEAT BELT WARNING SYSTEM

- If the driver or the front passenger has not buckled the respective seat belt when the ignition switch is turned ON, the seat belt warning system flashing the warning light, and sounds the buzzer (for driver) to inform the driver and the front passenger that their seat belts have not been buckled.
- The occupant detection sensor, which is enclosed in the seat cushion of the front passenger seat, is used to detect whether or not the front passenger seat is occupied.




179BE06




179BE03

## ■KEY REMINDER SYSTEM

When the driver’s door is opened with the ignition key in the ACC or LOCK position, this system sounds a buzzer to warn the driver that the ignition key has not been removed.

# BODY ELECTRICAL

## LIGHTING

### ■HEADLIGHTS

- 2-sculptured wave-reflector type headlights have been adopted on all models.
- Through the use of wave-reflectors, the diffusion of light from the headlights in the forward direction and sideways has been increased to improve visibility.

### ■DAYTIME RUNNING LIGHT SYSTEM

#### 1. General

- This system is designed to automatically activate the headlights during the daytime to keep the car highly visible to other vehicles.
  The headlights are activated by reducing the normal low-beam brightness.
- A PWM (Pulse Width Modulation) control has been adopted as the light reduction control system for the daytime running lights.
- The basic construction and operation are the same as in the ’00 Corolla.

#### 2. Operation

For details, see the ’98 Corolla New Car Features (Pub. No. NCF148U)

### ■LIGHT REMINDER SYSTEM

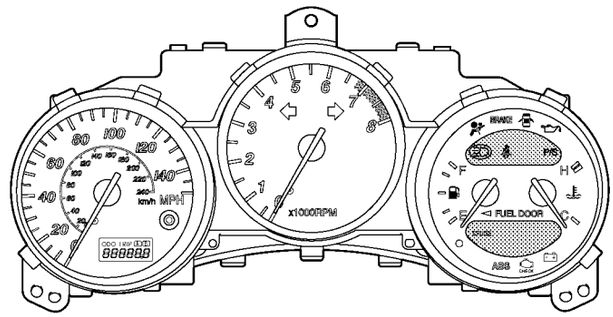
When the ignition key is turned from the ON or ACC to LOCK position while the driver’s door open with the taillights or headlights turned on, this system warns the driver that the lights remain on by sounding the buzzer.

# METER

## ■COMBINATION METER

### 1. General

- A sporty look is achieved by locating the tachometer in the center and indicating the red zone with dots.
- An odo/trip meter that uses an LCD (Liquid Ctystal Display) is provided below the speedometer.
- A flashing warning indicator light and buzzer have been adopted for the driver's seat belt.
- This combination meter has adopted a meter ECU and communication is maintained between the ECM and the meter ECU in order to exchange engine coolant temperature, oil pressure, battery, engine speed, and vehicle speed data.

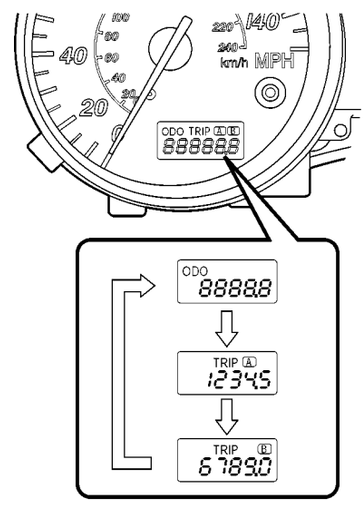



179BE01

### 2. Construction and Operation

#### Odo/Trip Meter

An LCD (Liquid Crystal Display) has been adopted for the odo/trip meter. The switching of the modes is effected by pressing the odo/trip selector/reset switch, which causes the LCD to display in the following order: odo meter → trip meter A → trip meter B.
While trip meter A or B is displayed, pressing the odo/trip selector/reset switch 0.8 seconds or longer causes the driven distance displayed by the current trip mode to revert to 0.0 mile.
The trip meter will resume measuring the distance at the moment the odo/trip selector/reset switch is released.




179BE07

# AIR CONDITIONING

## ■ DESCRIPTION

The air conditioning system in the MR2 has the following features:

- A compact, lightweight, and highly efficient straight flow (full-path flow) aluminum heater core has been adopted.
- The heat exchange efficiency has been improved through the adoption of the sub-cool condenser.
- A compact, high-performance scroll compressor with oil separator has been adopted.
- A multi-tank, super-slim structure evaporator has been adopted.

**▶ Performance ◀**

| Item | | | Performance |
|---|---|---|---|
| Heater | Heat Output | W | 4400 |
| | Air Flow Volume | $m^3/h$ | 260 |
| | Power Consumption | W | 165 |
| Air Conditioning | Heat Output* | W | 3800 |
| | Air Flow Volume | $m^3/h$ | 410 |
| | Power Consumption | W | 210 |
| Defroster | Air Flow Volume | $m^3/h$ | 280 |

*: When the compressor speed is 1800 rpm

**▶ Specifications ◀**

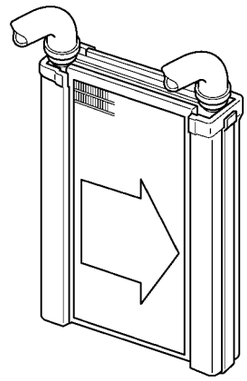
| Item | | | Specifications |
|---|---|---|---|
| Ventilation and Heater | Heater Core | Type | Straight Flow (Full-path Flow) |
| | | Size W × H × L mm (in.) | 130 × 216.9 × 27 (5.7 × 8.5 × 1.1) |
| | | Fin Pitch mm (in.) | 1.8 (0.07) |
| | Blower | Motor Type | S70F – 13T |
| | | Fan Type | Sirocco Fan |
| | | Fan Size Dia. × H mm (in.) | 140 × 65 (5.5 × 2.6) |
| Air Conditioning | Condenser | Type | Multi-Flow (Sub-Cool) |
| | | Size W × H × L mm (in.) | 650 × 302.3 × 16 (25.6 × 11.9 × 0.63) |
| | | Fin Pitch mm (in.) | 3.6 (0.14) |
| | Evaporator | Type | Drawn Cup Type |
| | | Size W × H × L mm (in.) | 227.3 × 205 × 50 (8.95 × 8.0 × 1.97) |
| | | Fin Pitch mm (in.) | 3.5 (0.14) |
| | Compressor | Type | SCS06 |

## ■CONSTRUCTION AND OPERATION

### 1. Air Conditioning Unit

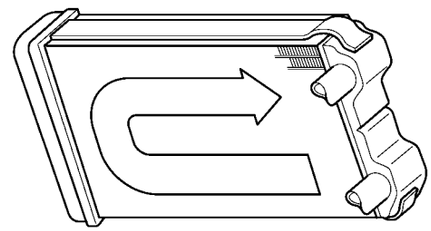
#### Heater Core

A compact, lightweight, and highly efficient straight flow (full-path flow) aluminum heater core has been adopted.



179BE08

**New**

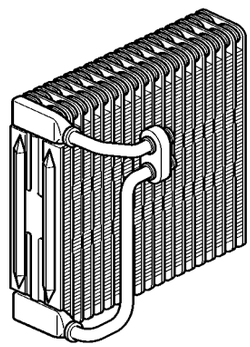


152BE22

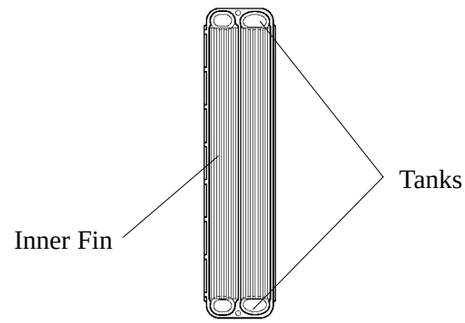
**Previous**

#### Evaporator

By placing the tanks at the top and the bottom of the evaporator unit and by adopting an inner fin construction, the heat exchanging efficiency has been improved and the evaporator unit's temperature distribution has been made more uniform. As a result, it has become possible to realize a thinner evaporator construction.



179BE09



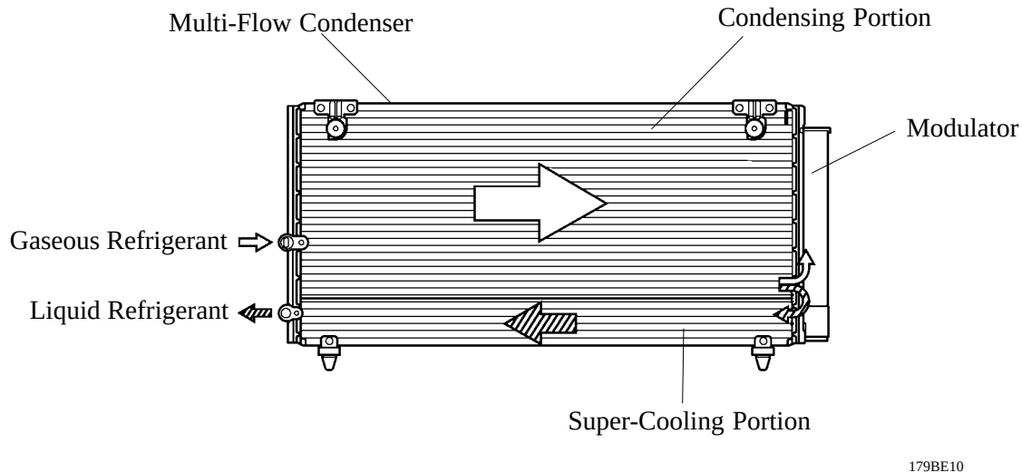

152BE24

## 2. Condenser

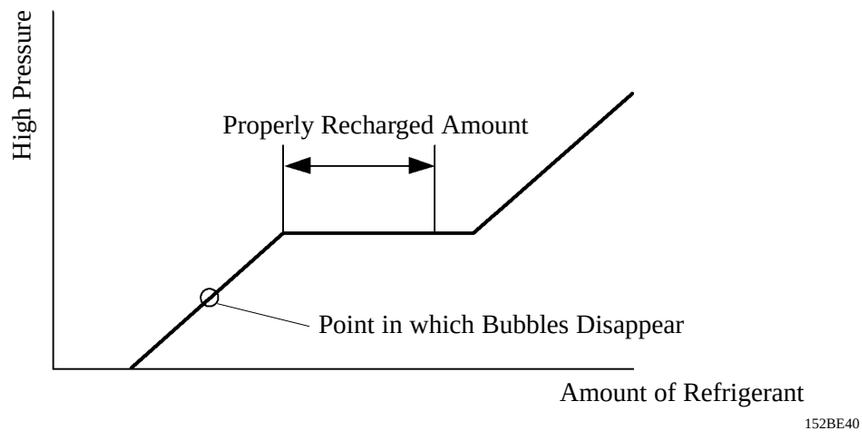
The new MR2 has adopted sub-cool condenser in which a multi-flow condenser (consisting of two cooling portions: a condensing portion and a super-cooling portion) and a gas-liquid separator (modulator) have been integrated. This condensor has adopted the sub-cool cycle for its cooling cycle system to improve the heat exchanging efficiency.

### Sub-Cool Cycle

In the sub-cool cycle of the sub-cool condenser that has been adopted, after the refrigerant passes through the condensing portion of the condenser, both the liquid refrigerant and the gaseous refrigerant that could not be liquefied are cooled again in the super-cooling portion. Thus, the refrigerant is sent to the evaporator in an almost completely liquefied state.




**NOTE:** 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 2000 MR2 Repair Manual (Pub. No. RM760U).



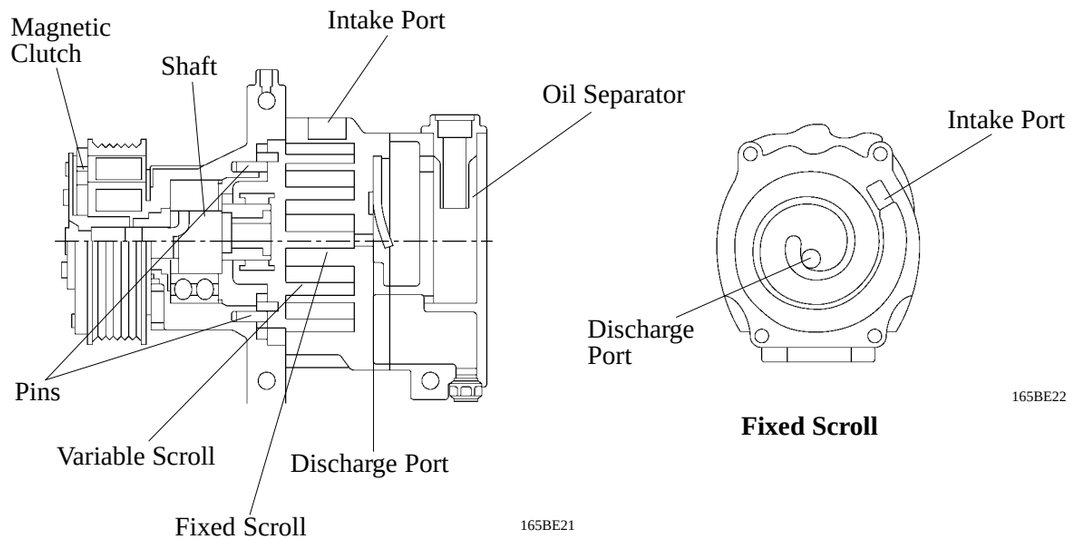
## 3. Compressor

### General

A compact and high performance scroll compressor with oil separator has been adopted.

### Construction

The scroll compressor with oil separator consists of a spirally wound fixed scroll and variable scroll that form a pair, and oil separator, and a magnetic clutch.
The fixed scroll is integrated with the housing. Because the rotation of the shaft causes the variable scroll to revolve while maintaining the same posture, the volume of the space that is partitioned by both scrolls varies to perform the suction, compression, and the discharge of the refrigerant gas.
A pin is attached behind the variable scroll to prevent the autorotation of the variable scroll, allowing it only to revolve.
Locating the intake port directly above the scrolls enables direct suction, thus realizing improved suction efficiency.
Containing a built-in oil separator, this compressor is able to separate the compressor oil that is intermixed with the refrigerant and circulates in the refrigeration cycle, thus realizing a reduction in the oil circulation rate.




**Fixed Scroll**

## Operation

### 1) Suction

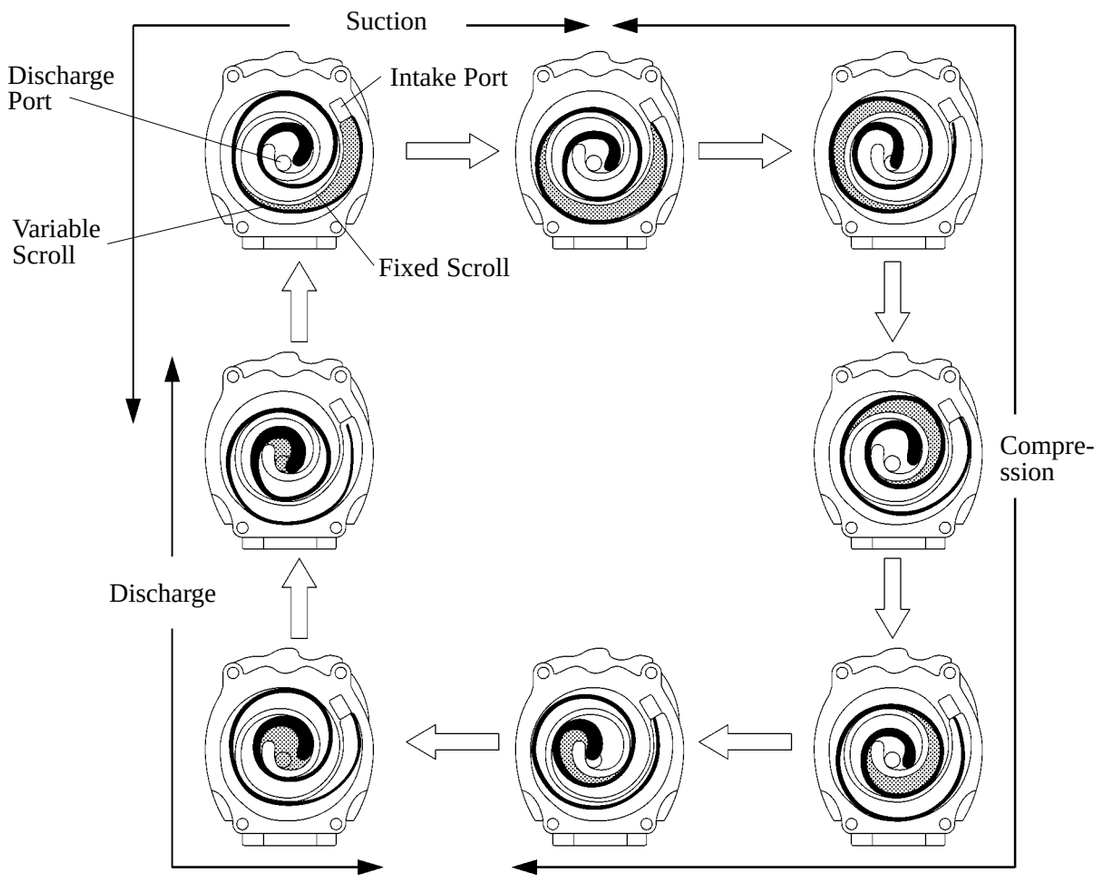
As the capacity of the compression chamber, which is created between the variable scroll and the fixed scroll, increases in accordance with the revolution of the variable scroll, refrigerant gas is drawn in from the intake port.

### 2) Compression

From the state at which the suction process has been completed, as the revolution of the variable scroll advances further, the capacity of the compression chamber decreases gradually. Consequently, the refrigerant gas that has been drawn in becomes compressed gradually and is sent to the center of the fixed scroll. The compression of the refrigerant gas is completed when the variable scroll completes approximately 2 revolutions.

### 3) Discharge

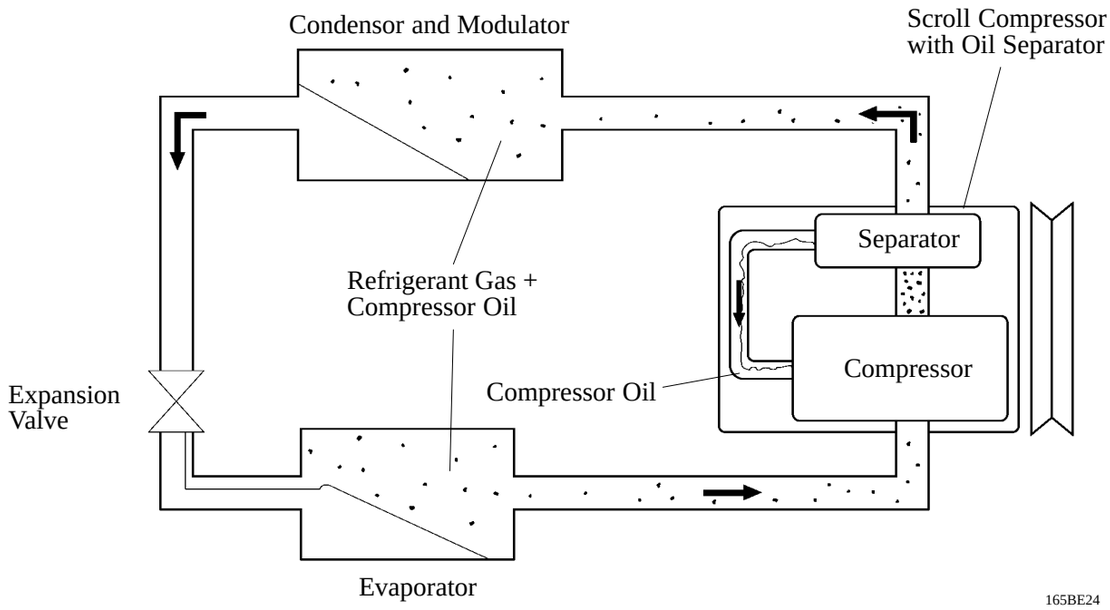
When the compression of the refrigerant gas is completed and the refrigerant pressure becomes high, the refrigerant gas discharges through the discharge port located in the center of the fixed scroll by pushing the discharge valve.



## Oil Separator

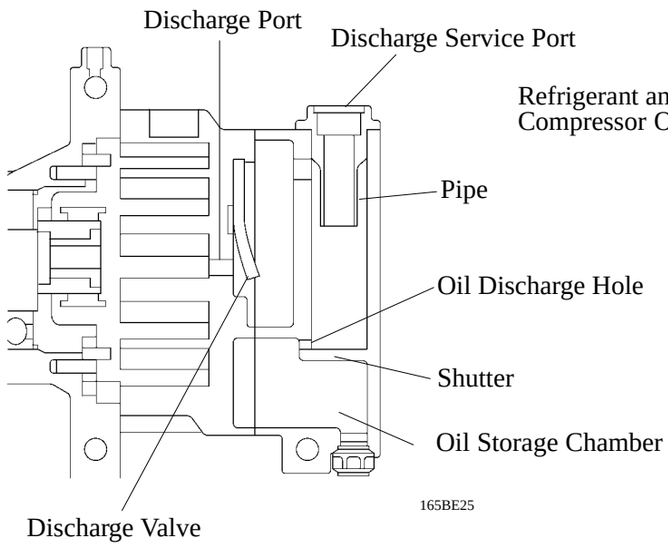
### 1) General

A CS (Centrifugal with Shutter) type oil separator has been adopted to reduce the circulation rate of the compressor oil that is intermixed with the refrigerant and circulates in the refrigeration cycle. This oil separator is provided with a cylindrical pipe in the separator case, enabling the refrigerant gas that has been discharged through the discharge gas inlet to be separated into refrigerant gas and oil through centrifugal force, and minimizing the outflow of the oil to the discharge service port. As a result, the oil circulation rate has been reduced and makes energy savings possible.



### 2) Construction and Operation

The refrigerant gas that is discharged from the discharge port flows by rotating around the cylindrical pipe in the oil separator. At this time, the centrifugal force that is created during the rotation separates the refrigerant gas and the compressor oil due to the difference in their specific gravity. The refrigerant gas with the lighter specific gravity passes through the inside of the pipe and travels from the discharge service port to the outside of the compressor. The compressor oil with the heavier specific gravity is discharged through the oil discharge hole in the shutter and is stored in the oil storage chamber. Then, the compressor oil is fed again into the compressor and circulates inside the compressor.

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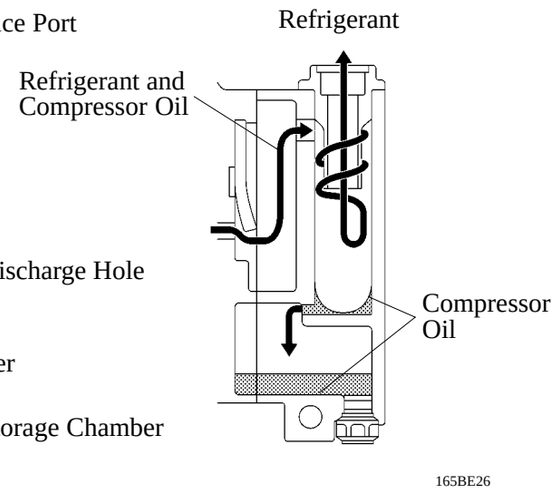



165BE26

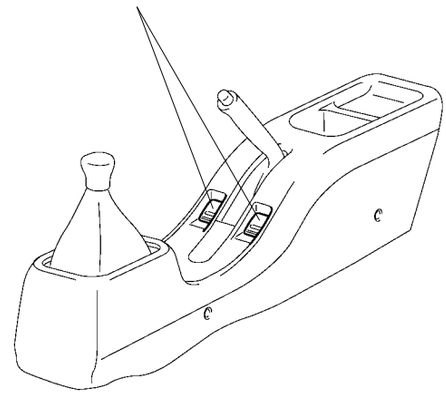
# ACCESSORIES

## ■POWER WINDOW SYSTEM

The power window system has the following features:

- This system includes “driver’s door one-touch auto down” function.
  The one-touch auto down function automatically opens the driver’s side window fully.
- The control of this system is effected by the body ECU.
- The power window switches have been located in the center of the rear console.

Power Window Switches



179BE02

## ■DOOR LOCK CONTROL SYSTEM

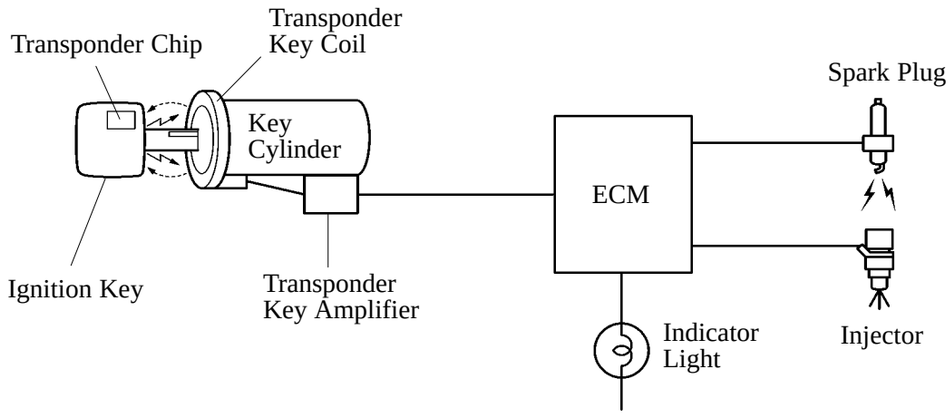
The door lock control system has the following features:

- This system has a “key-linked lock and unlock”, “key-confine prevention” and “manual unlock prohibition” functions.
- A 2-step unlock function is provided to unlock the driver’s door by turning the key cylinder first and to unlock passenger’s door by turning it the second time.
- The control of this system is effected by the body ECU.

## ■ENGINE IMMOBILISER SYSTEM

- The engine immobiliser system is a theft-deterrent system which disables the engine from starting using the ignition key with an ID code that matched is 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 located around the ignition key cylinder receives the ID code signal transmitted by the transponder chip, the immobiliser computer included in the ECM determines whether or not the ID code matches the code stored in the immobiliser computer.

**▶ System Diagram ◀**

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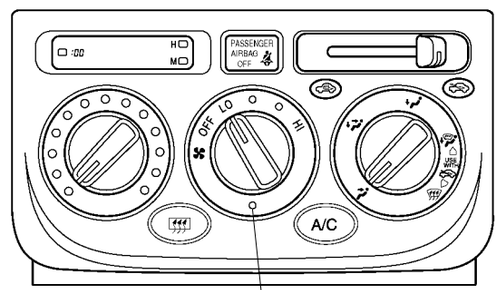
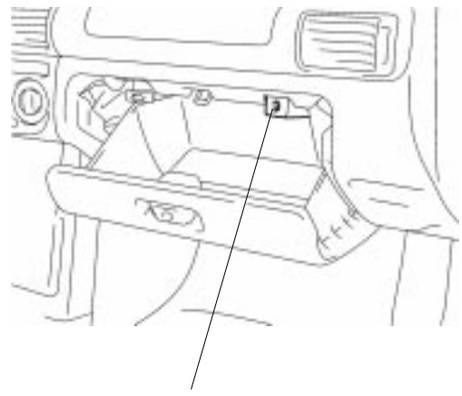
- The indicator light for the engine immobiliser system is provided in the heater control panel. This indicator light flashes when the system is set.




179BE03

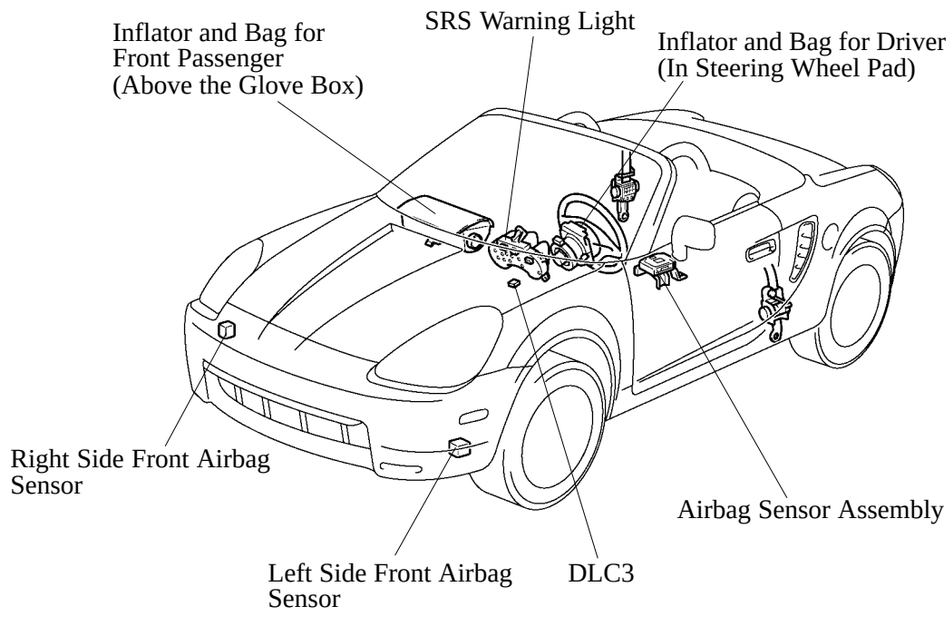
## ■SRS AIRBAG

- The SRS (Supplemental Restraint System) airbags are provided for the driver and passenger. The SRS airbags have been designed to help reducing the shocks to the heads and chests of the driver and front passenger in the event of a frontial impact collision as supplements to the seat belts.
- A 3-sensor type airbag system is used in which the detection of deceleration during a front collision as well as control of the airbag system is accomplished by the airbag sensor assembly and front airbag sensors.
- On new MR2, ON-OFF system has been provided to enable the SRS airbag for the front passenger to be used or not to be used in accordance with the vehicle's use condition.
  This prevents the airbag from deploying. At this time, the passenger airbag OFF indicator light illuminates informing the driver and passenger that the front passenger SRS is inactive.
- The function of the ECU to memorize the seat belt wearing condition while inflating the airbag is added.
- The new MR2 has adopted a fuel cut control that stops the fuel pump to minimize fuel leakage if the airbag has been deployed.




179BE04

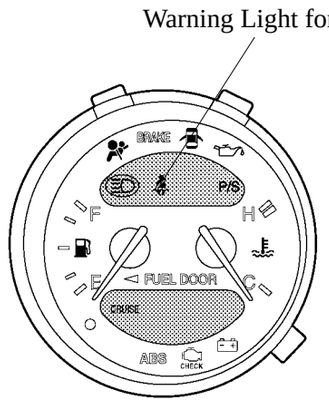
**▶ Layout of Components ◀**




179BE05

## ■SEAT BELT WARNING SYSTEM

- If the driver or the front passenger has not buckled the respective seat belt when the ignition switch is turned ON, the seat belt warning system flashing the warning light, and sounds the buzzer (for driver) to inform the driver and the front passenger that their seat belts have not been buckled.
- The occupant detection sensor, which is enclosed in the seat cushion of the front passenger seat, is used to detect whether or not the front passenger seat is occupied.

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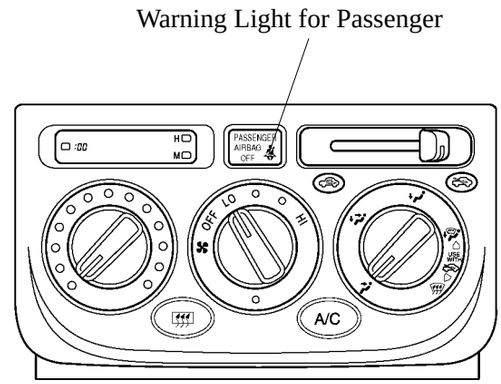


179BE03

## ■KEY REMINDER SYSTEM

When the driver’s door is opened with the ignition key in the ACC or LOCK position, this system sounds a buzzer to warn the driver that the ignition key has not been removed.

# MAJOR TECHNICAL SPECIFICATIONS

| Item | | | Area | U.S.A. |
|---|---|---|---|---|
| | Body Type | | | Convertible |
| | Vehicle Grade | | | G |
| | Model Code | | | ZZW30L-AKMQHA |
| Major Dimensions & Vehicle Weights | Overall | Length | mm (in.) | 3885 (153.0) |
| | | Width | mm (in.) | 1695 (66.7) |
| | | Height* | mm (in.) | 1240 (48.8) |
| | Wheel Base | | mm (in.) | 2450 (96.5) |
| | Tread | Front | mm (in.) | 1475 (58.1) |
| | | Rear | mm (in.) | 1460 (57.5) |
| | Effective Head Room | Front | mm (in.) | 947 (37.3) |
| | | Rear | mm (in.) | — |
| | Effective Leg Room | Front | mm (in.) | 1072 (42.2) |
| | | Rear | mm (in.) | — |
| | Shoulder Room | Front | mm (in.) | 1295 (51.0) |
| | | Rear | mm (in.) | — |
| | Overhang | Front | mm (in.) | 765 (30.1) |
| | | Rear | mm (in.) | 670 (26.4) |
| | Min. Running Ground Clearance | | mm (in.) | 125 |
| | Angle of Approach | | degrees | 16 |
| | Angle of Departure | | degrees | 20 |
| | Curb Weight | Front | kg (lb) | 420 ~ 433 (925 ~ 955) |
| | | Rear | kg (lb) | 576 ~ 596 (1270 ~ 1315) |
| | | Total | kg (lb) | 996 ~ 1030 (2195 ~ 2270) |
| | Gross Vehicle Weight | Front | kg (lb) | 513 (1130) |
| | | Rear | kg (lb) | 710 (1565) |
| | | Total | kg (lb) | 1222 (2695) |
| | Fuel Tank Capacity | | ℓ (US. gal., lmp.gal) | 48 (12.7, 10.6) |
| | Luggage Compartment Capacity | | $m^3$ (cu.ft.) | 0.09 (3.18) |
| Performance | Max. Speed | | km/h (mph) | 210 (131.3) |
| | Max. Cruising Speed | | km/h (mph) | 170 (106.3) |
| | Acceleration | 0 to 100 km/h | sec. | 7.5 |
| | | 0 to 400 m | sec. | 15.2 |
| | Max. Permissible Speed | 1st Gear | km/h (mph) | 53 (33) |
| | | 2nd Gear | km/h (mph) | 88 (55) |
| | | 3rd Gear | km/h (mph) | 120 (75) |
| | | 4th Gear | km/h (mph) | 163 (101) |
| | Turning Diameter (Outside Front) | Wall to Wall | m (ft.) | 5.3 (17.4) |
| | | Curb to Curb | m (ft.) | 5.2 (17.1) |
| Engine | Engine Type | | | 1ZZ-FE |
| | Valve Mechanism | | | 16-Valve, DOHC |
| | Bore × Stroke | | mm (in.) | 79.0 × 91.5 (3.11 × 3.60) |
| | Displacement | | $cm^3$ (cu.in.) | 1794 (109.5) |
| | Compression Ratio | | | 10.0 : 1 |
| | Carburetor Type | | | SFI |
| | Research Octane No. | | RON | 91 |
| | Max. Output (SAE-NET) | | kW/rpm (HP@rpm) | 103/6400 (138@6400) |
| | Max. Torque (SAE-NET) | | N·m/rpm (lb·ft@rpm) | 170/4400 (125@4400) |
| Engine Electrical | Battery Capacity (5HR) | | Voltage & Amp.hr. | 12 – 36 |
| | Generator Output | | Watts | 960 |
| | Starter Output | | kW | 1.4 |
| Chassis | Clutch Type | | | Dry, Single |
| | Transaxle Type | | | C56 |
| | Transmission Gear Ratio | In First | | 3.166 |
| | | In Second | | 1.904 |
| | | In Third | | 1.392 |
| | | In Fourth | | 1.031 |
| | | In Fifth | | 0.815 |
| | | In Reverse | | 3.250 |
| | Counter Gear Ratio | | | — |
| | Differential Gear Ratio (Final) | | | 4.312 |
| | Brake Type | Front | | Disc |
| | | Rear | | Disc |
| | Parking Brake Type | | | Disc |
| | Brake Booster Type and Size | | in. | Single, 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) | | | 13.6 |
| | Power Steering Type | | | Integral Type |

* : Unladen Vehicle