1MZ-FE ENGINE

■DESCRIPTION

The 1MZ-FE engine, which is a V6, 3.0-liter, 24-valve DOHC engine, based on the 1MZ-FE engine on the ’01 Camry.
This engine has following features that have been newly adopted in order to realize the further improvement of the engine performance, fuel economy and to reduce exhaust emissions.

- The PS (Planetary reduction Segment conductor motor) starter has been adopted.
- Meets the ULEV (Ultra Low Emission Vehicle) regulation requirements
- Meets the SFTP (Supplementary Federal Test Procedure) regulation requirements
- ETCS-i (Electronic Throttle Control System-intelligent) has been adopted.
- Air intake control system has been adopted.

▶ Engine Specification ◀

Model			’02 Camry	’01 Camry
No. of Cyls. & Arrangement			6-Cylinder, V Type	←
Valve Mechanism			24-Valve DOHC, Belt & Gear Drive	←
Combustion Chamber			Pentroof Type	←
Manifolds			Cross-Flow	←
Fuel System			SFI	←
Displacement cm^3 (cu. in.)			2995 (182.8)	←
Bore × Stroke mm (in.)			87.5 × 83.0 (3.44 × 3.27)	←
Compression Ratio			10.5 : 1	←
Max. Output (SAE-NET)			143 kw @ 5300 rpm (192 HP @ 5300 rpm)	143 kw @ 5200 rpm (192 HP @ 5200 rpm)
Max. Torque (SAE-NET)			283 N·m @ 4400 rpm (209 lb·ft @ 4400 rpm)	281 N·m @ 4400 rpm (207 lb·ft @ 4400 rpm)
Valve Timing	Intake	Open	4°BTDC	←
		Close	44°ABDC	←
	Exhaust	Open	46°BBDC	←
		Close	2°ATDC	←
Firing Order			1-2-3-4-5-6	←
Research Octane Number			91 or higher	←
Octane Rating			87 or higher	←
Dry Weight kg (lb)			158 (348)	155 (342)
Oil Grade			API SJ, SL, EC or ILSAC	API SH, SJ , EC or ILSAC

■FEATURES OF 1MZ-FE ENGINE

The 1MZ-FE engine has been able to achieve the following performance through the adoption of the item 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)	’02 Camry	’01 Camry
The ETCS-i has been adopted.	○					○	—
A cylinder block made of aluminum alloy has been adopted.			○			○	←
Independent type DIS (Direct Ignition 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 with high atomizing performance have been adopted.	○				○	○	—
Iridium-tipped spark plugs have been adopted.	○			○		○	—
ACIS (Acoustic Control Induction System) is used.	○					○	←
Air intake control system has been adopted.	○	○				○	—
EGR system is used.					○	○	←
A 2-way exhaust control system has been adopted.	○	○				○	←
The use of an air fuel ratio sensor allows precise control.					○	○	←*
The PS (Planetary reduction-Segment conductor motor) starter has been adopted.			○			○	—

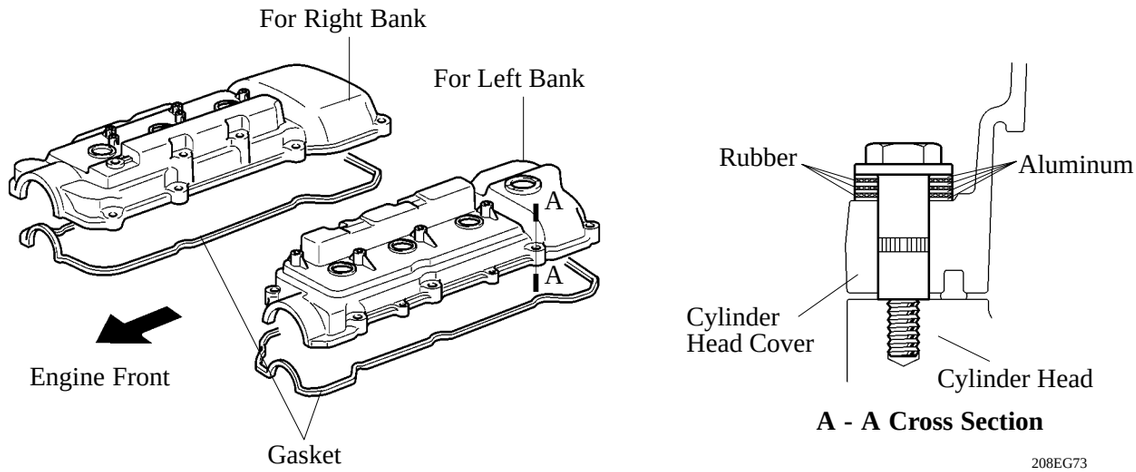
*: California Specification Model

Other parts and construction are the same as in the ’01 Camry.

■ENGINE PROPER

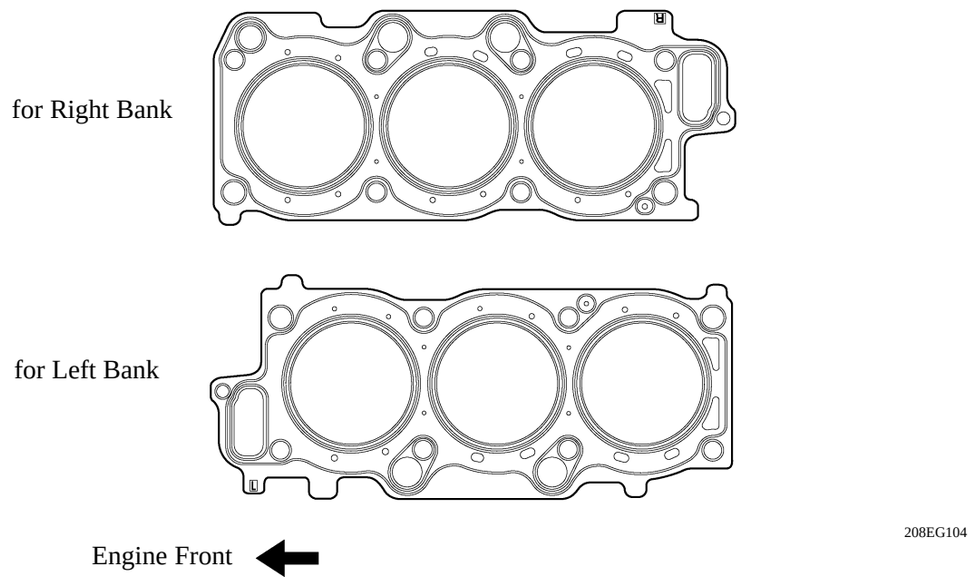
1. Cylinder Head Cover

- Lightweight yet high-strength aluminum diecast cylinder head covers are used.
- An aluminum washer made of vibration-damping laminated aluminum sheet is used on the evenly spaced shoulder bolts which fasten the cylinder head covers.



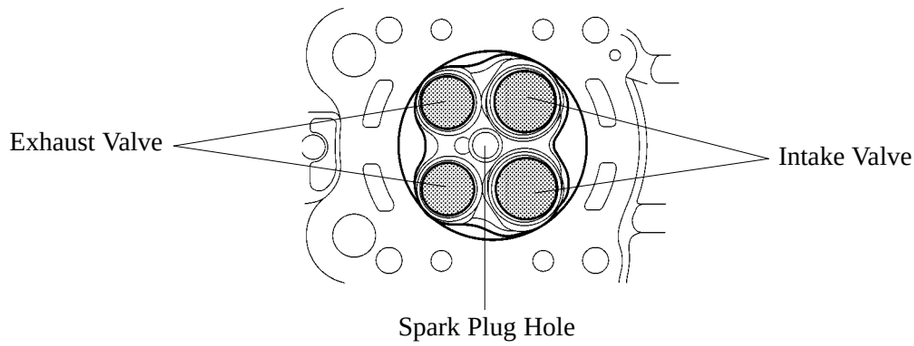
2. Cylinder Head Gasket

- A metal type cylinder head gasket which offers superior pressure resistance and sealing performance has been adopted.



3. Cylinder Head

- The cylinder head, which is made of aluminum, has adopted a pentroof-type combustion chamber. The spark plug has been located in the center of the combustion chamber.
- The angle of the intake and exhaust valves is narrowed and set at 22.5° to permit a compact cylinder head.
- Upright, small-diameter intake ports are adopted.
- The cross section of the protrusion of the valve guide into the intake port has been reduced by decreasing the valve stem diameter and the valve guide outer diameter.
- Plastic region tightening bolt is used for the cylinder head bolts for good axial tension.



View of Back Side

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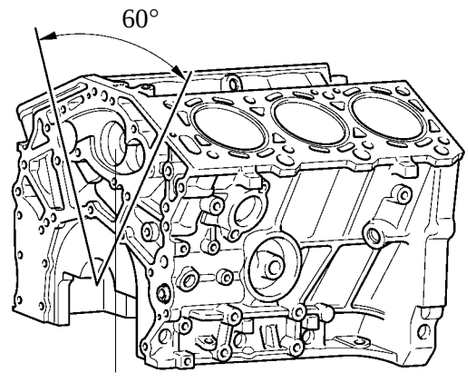
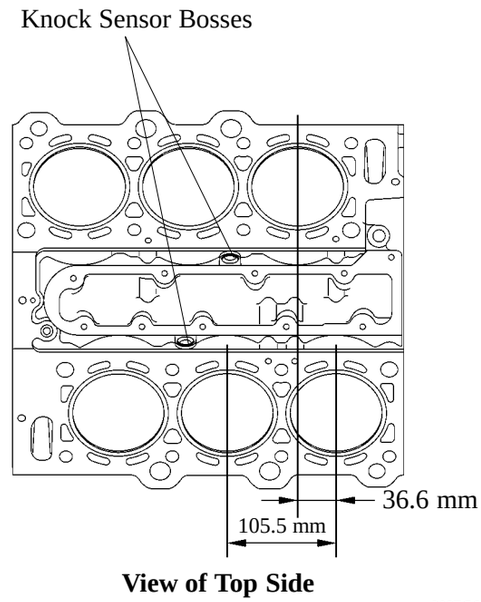
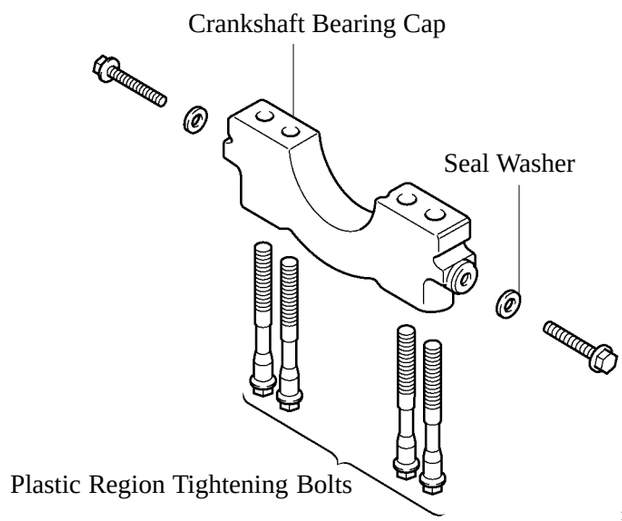
4. Cylinder Block

- The cylinder block has a bank angle of 60°, a bank offset of 36.6 mm (1.44 in.) and a bore pitch of 105.5 mm (4.15 in.), resulting in a compact block.
- Lightweight aluminum alloy is used for the cylinder block.
- A thin cast-iron liner is press- fit inside the cylinder to ensure an added reliability. 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 V-bank to help make the engine compact.
- Knock sensor bosses are provided at 2 locations in V-bank.
- The crankshaft bearing caps are tightened using 4 plastic- region bolts for each journal. In addition, each cap is tightened laterally to improve its reliability.

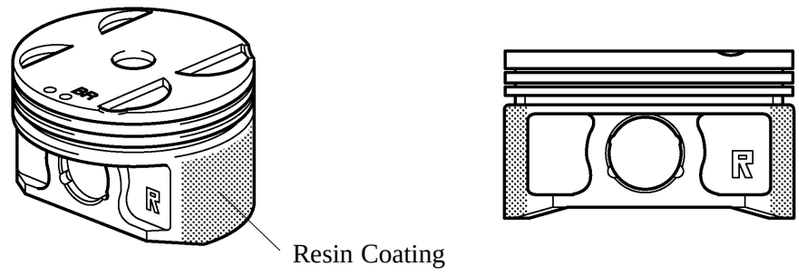






5. Piston

- The piston is made of aluminum alloy and skirt area is made compact and lightweight.
- The piston skirt has been coated with resin to reduce the friction loss.
- Full floating type piston pins are used.
- Each of the pistons is made specifically for the right or left bank.



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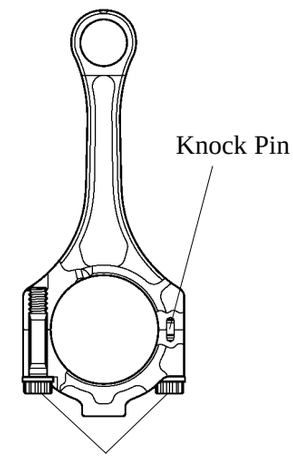
for Right Bank

6. Connecting Rod

- Connecting rods that have been forged for high strength are used for weight reduction.
- An aluminum bearing with overlay is used for the connecting rod bearings.
- Plastic region tightening bolts are used.
- Knock pins are used at the mating surfaces of the bearing caps of the connecting rod to minimize the shifting of the bearing caps during assembly.



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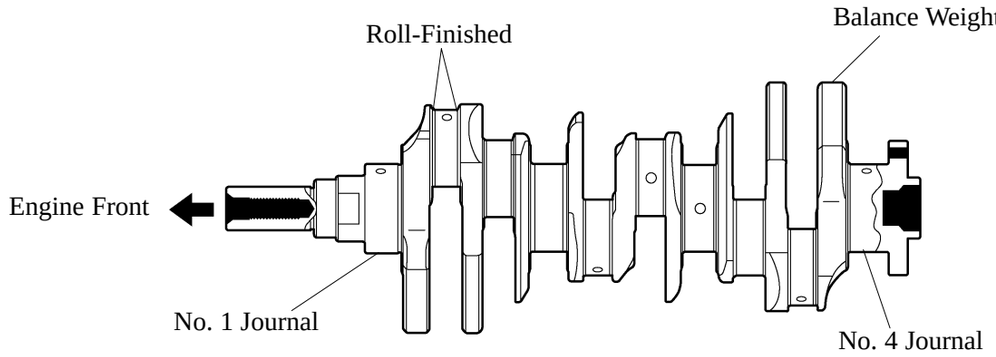
7. Crankshaft

- The crankshaft is made of forged steel and has 4 journals and 9 balance weights.
- All pin and journal fillets are roll-finished to maintain adequate strength.
- The crankshaft bearings for the No.1 and No.4 journals are made wider to decrease noise and vibration, and those for the No.2 and No.3 journals are made narrower friction.



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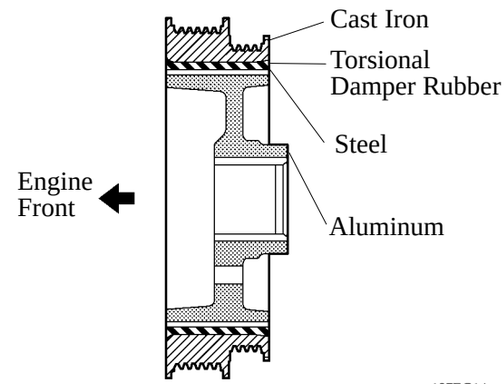
8. Crankshaft Pulley

- The crankshaft pulley hub is made of aluminum to reduce weight and vibration.
- The rigidity of the torsional damper rubber has been optimized to reduce noise.



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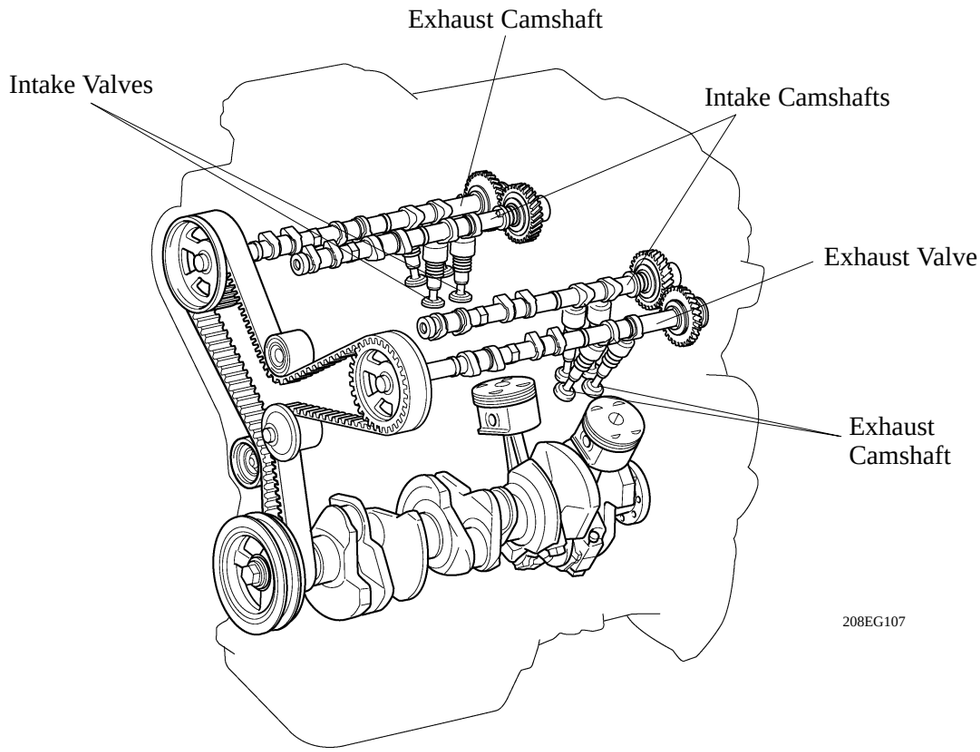
■VALVE MECHANISM

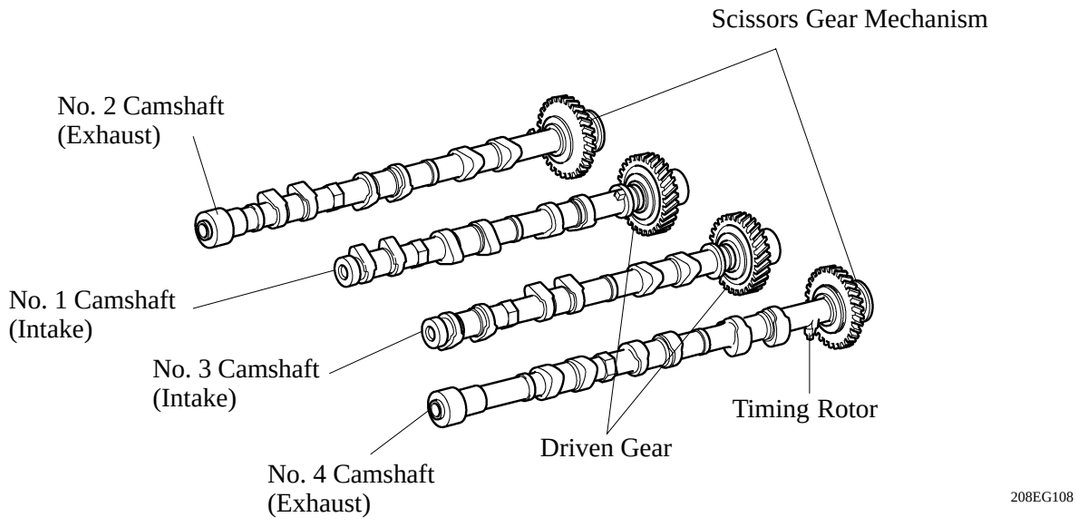
1. General

- The valves are directly opened and closed by 4 camshafts.
- The exhaust camshafts are driven by a timing belt, while the intake camshafts are driven through gears on the exhaust camshafts.



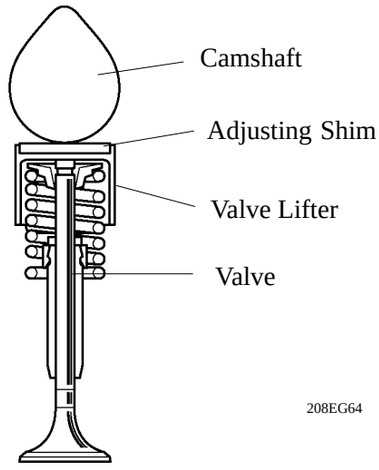
2. Camshafts

- The camshafts are made of cast iron alloy.
- In conjunction with the use of the DIS (Direct Ignition System), the No.4 camshaft is provided with timing rotor to trigger the camshaft position sensor.
- The intake camshafts are driven by gears on the exhaust camshafts.The scissors gear mechanism is used on drive gear of the exhaust camshaft to control backlash and suppress gear noise.



3. Intake and Exhaust Valve and Valve Lifter

- Narrower valve stems have been adopted to reduce the intake and exhaust resistance and for weight reduction.
- The adjusting shim has been located directly above the valve lifter. This construction allows the adjusting shim to be replaced without removing the camshaft, which improves the serviceability during valve clearance adjustment.
- A cutout is provided in the valve lifter to improve the serviceability of replacing the adjusting shims.



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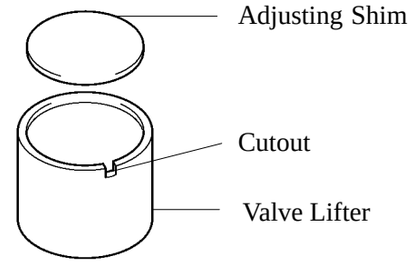

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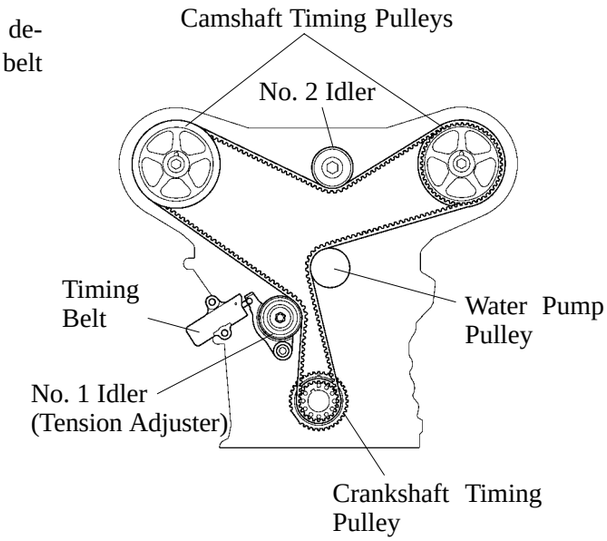
Service Tip

The adjusting shims are available in 17 sizes in increments of 0.050 mm (0.0020 in.), from 2.500 (0.0984 in.) to 3.300 (0.1299 in.).
For details, refer to see the 2002 Camry Repair Manual (Pub. No. RM881U).

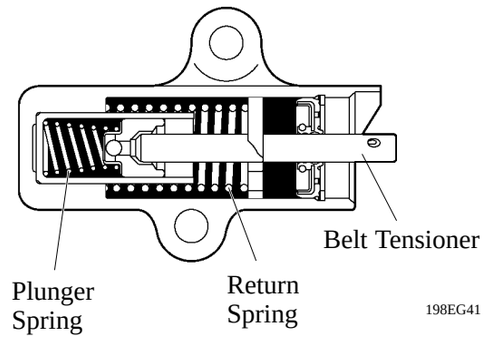
4. Timing Belt

The timing belt tooth configuration has been designed to help to reduce noise and to enable the belt to transmit power under high load factors.



5. Timing Belt Tensioner

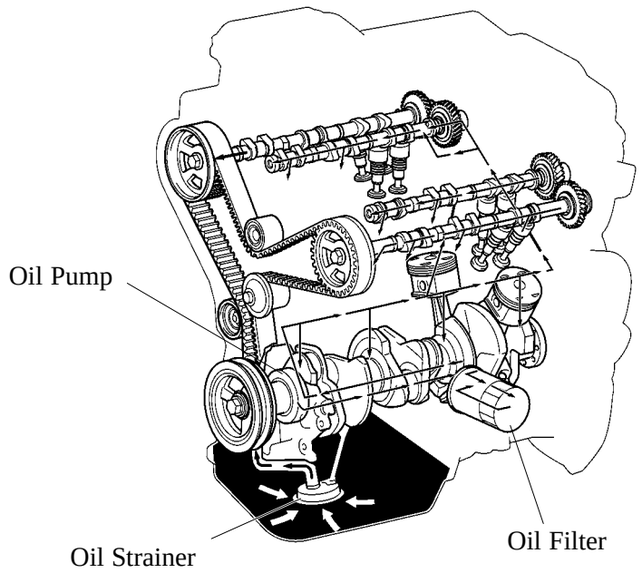
The timing belt tensioner uses a spring and silicon oil damper, and maintains proper timing belt tension at all times.
The timing belt tensioner suppresses noise generated by the timing belt.



■LUBRICATION SYSTEM

1. General

- The lubrication is fully pressurized and all oil passes through an oil filter.
- A trochoid gear type oil pump is directly driven by the crankshaft.



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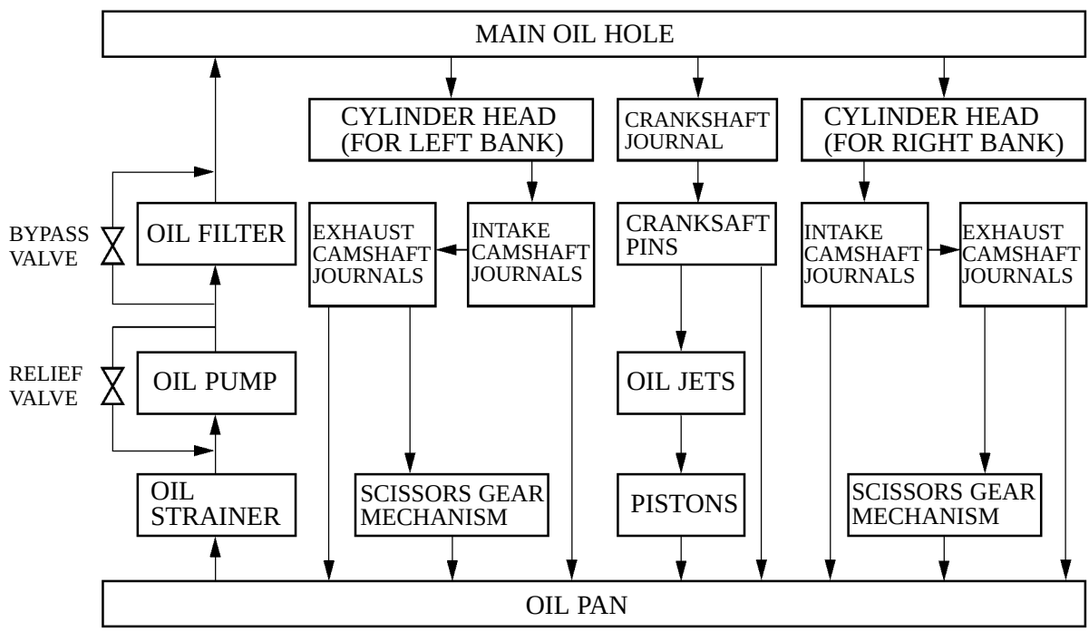

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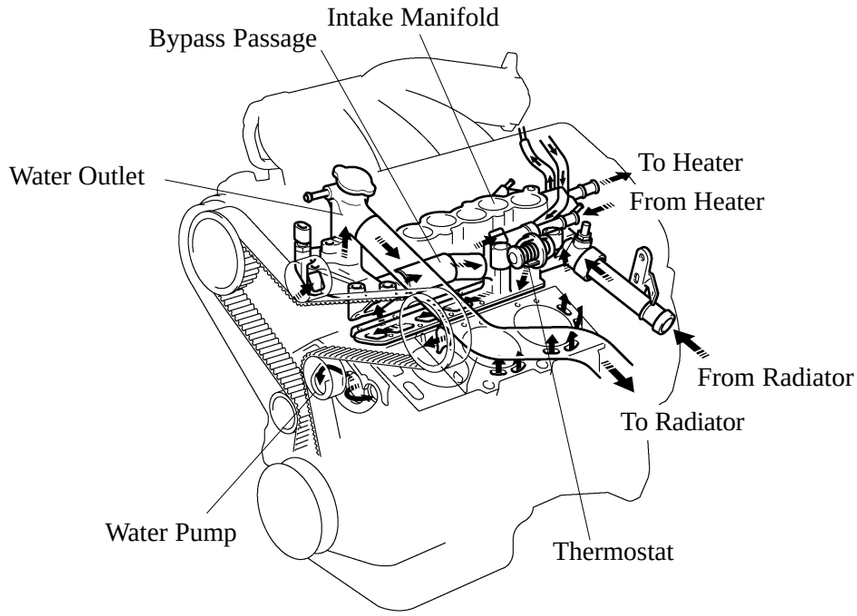
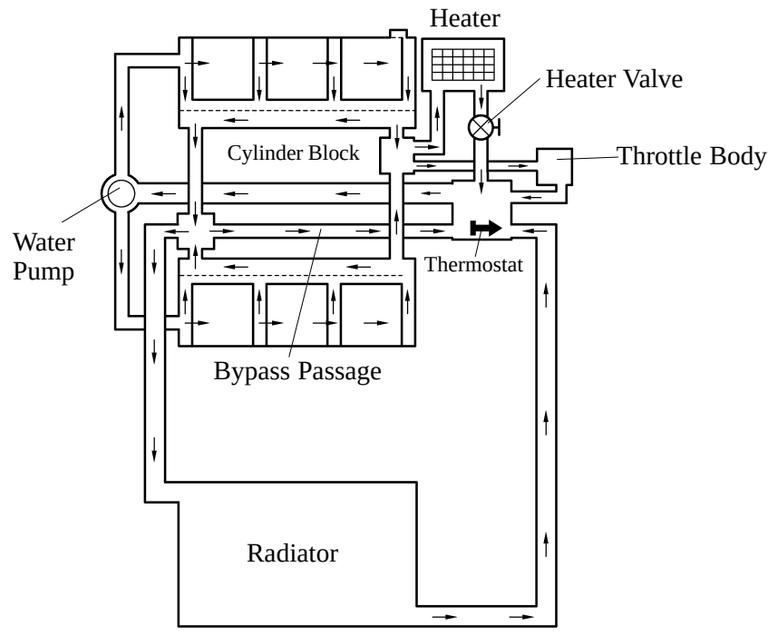
▶ Specifications ◀

Oil Capacity Liters (US qts, Imp. qts)	Dry	5.5 (5.8, 4.8)
	with Oil Filter	4.7 (5.0, 4.1)
	without Oil Filter	4.5 (4.8, 4.0)

■COOLING SYSTEM

- The cooling system is a pressurized, forced-circulation type.
- A thermostat having a bypass valve is located on the water pump inlet side of the cooling circuit.





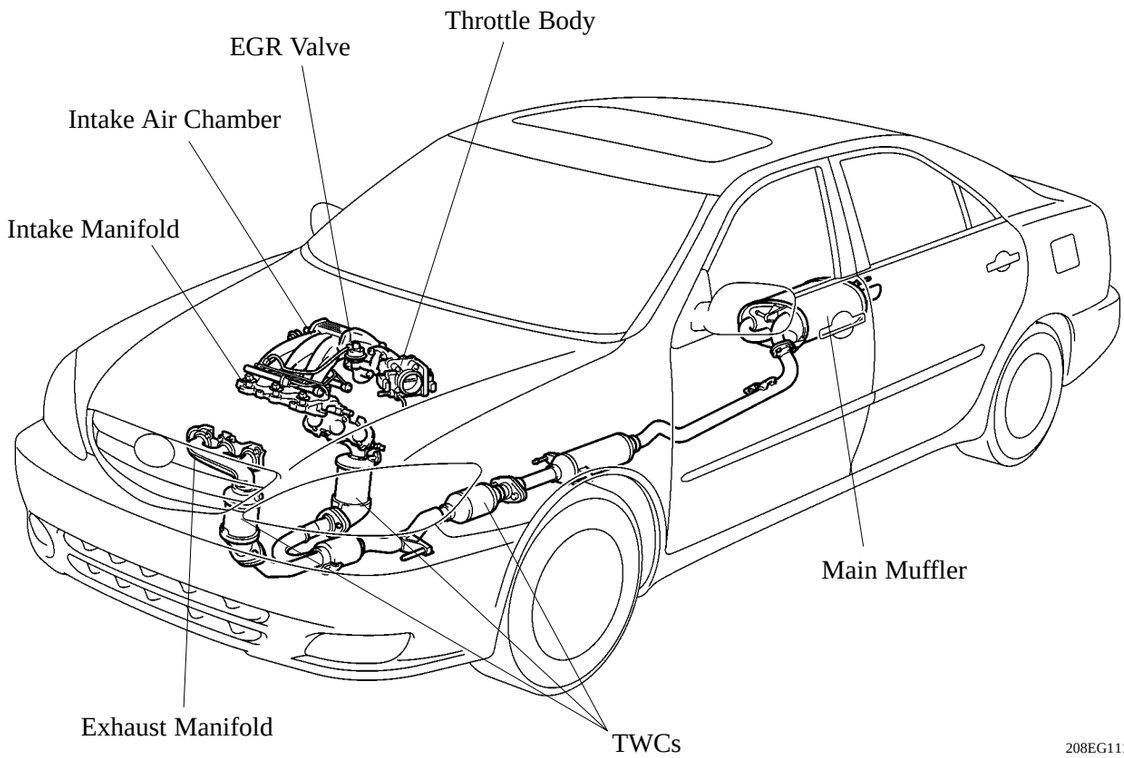
▶ Specifications ◀

Engine Coolant	Capacity liters (US qts, Imp. qts)	9.2 (9.7, 8.1)
	Type	TOYOTA Long Life Coolant or Equivalent
Thermostat	Opening Temperature °C (°F)	80 - 84 (176 - 183)

■INTAKE AND EXHAUST SYSTEM

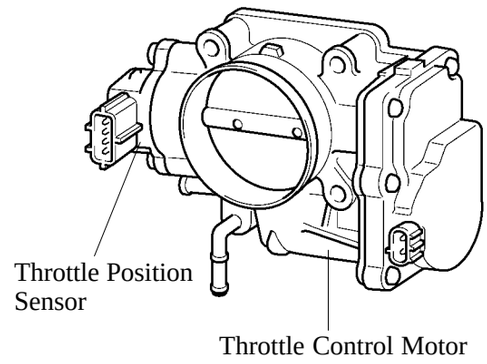
1. General

- The adoption of the ETCS-i (Electronic Throttle Control System-intelligent) has realized excellent throttle control.
- The adoption of the ACIS (Acoustic Control Induction System) has improved the engine performance.
- The adoption of the air intake control system has improved engine noise reduction and performance. For details, see page EG-86.
- 2-way exhaust control system is provided to reduce noise and vibration in the main muffler.
- The EGR (Exhaust Gas Recirculation) system is used to reduce and control NOx formation.



2. Throttle Body

- The link-less type ETCS-i has adopted and it realizes excellent throttle control.
  For details of ETCS-i control, refer to see page EG-81.
- A DC motor with excellent response and minimal power consumption is used for the throttle control motor. The ECM performs the duty ratio control of the direction and the amperage of the current that flows to the throttle control motor in order to regulate the opening angle of the throttle valve.



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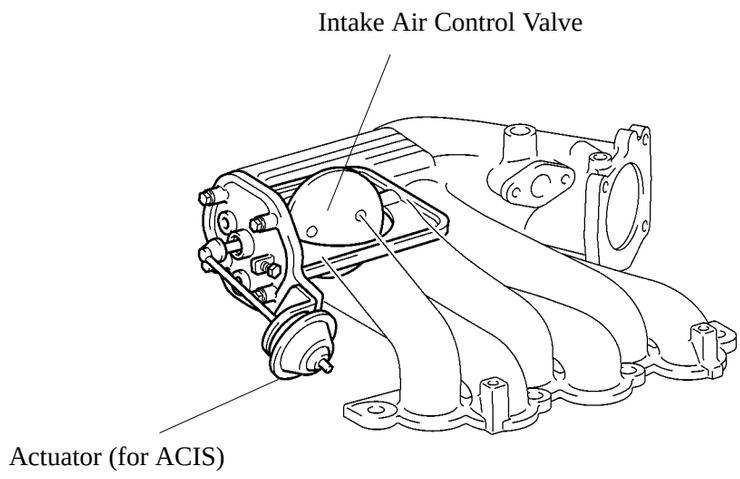
3. Intake Air Chamber

The intake air chamber consists of upper and lower sections and contains an intake air control valve. This valve is activated by ACIS (Acoustic Control Induction System) and is used to alter the intake pipe length to improve the engine performance in all speed ranges. For details of ACIS control, refer to see page EG-83.



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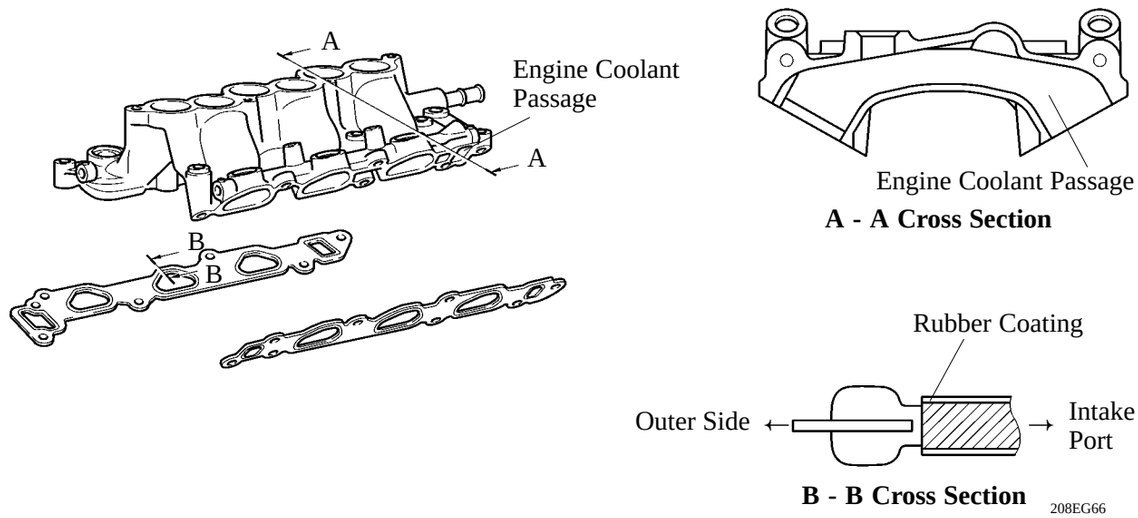
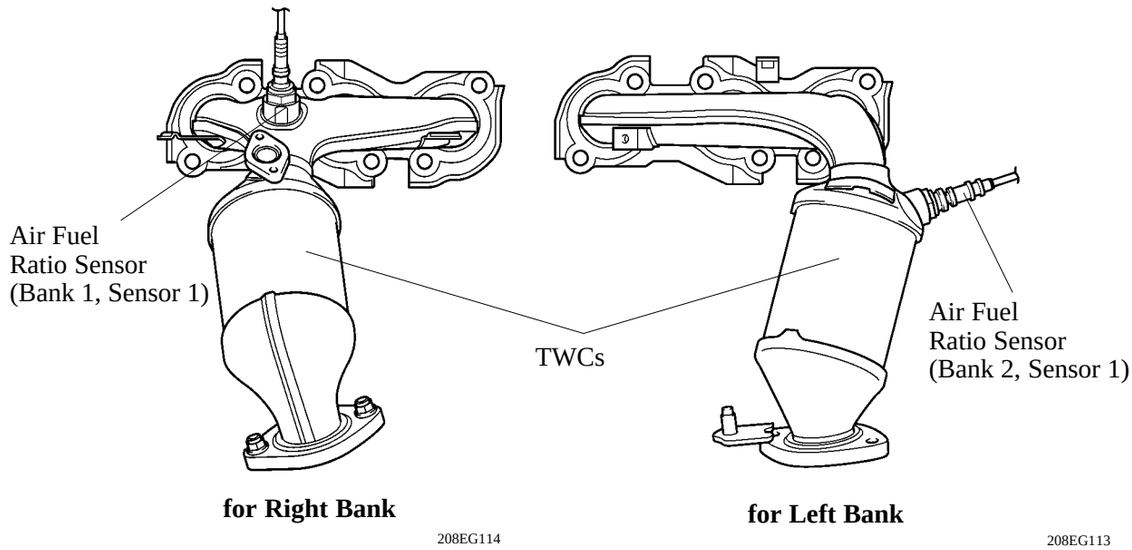
4. Intake Manifold

- The port diameter of the intake manifold has been increased and the port length has been optimized to improve engine performance.
- An engine coolant passage connects the left and right banks at the rear end of the intake manifold.
- The intake manifold gaskets has rubber coating applied onto surface, and provide superior durability.



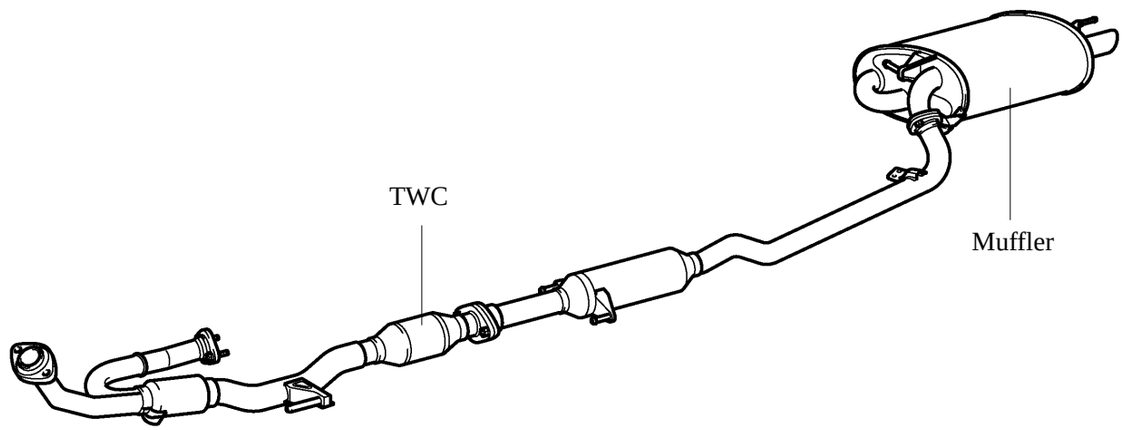
5. Exhaust Manifold

- A stainless steel exhaust manifold is used for improving the warm-up of three-way catalytic converter and for weight reduction.
- The air fuel ratio sensor has been adopted to the exhaust manifold.
- An ultra thin-wall, high-cell metal type TWC (Three-Way Catalytic Converter) has been adopted. This TWC enables to improve exhaust emissions by optimizing the cells density.



6. Exhaust Pipe

- An ultra thin-wall, high-cell ceramic type TWC has been adopted. This TWC enables to improve exhaust emissions by optimizing the cells density.
- 2- way exhaust control system is provided to reduce noise and vibration in the main muffler. For details, see page EG-23 in 2AZ-FE engine section.

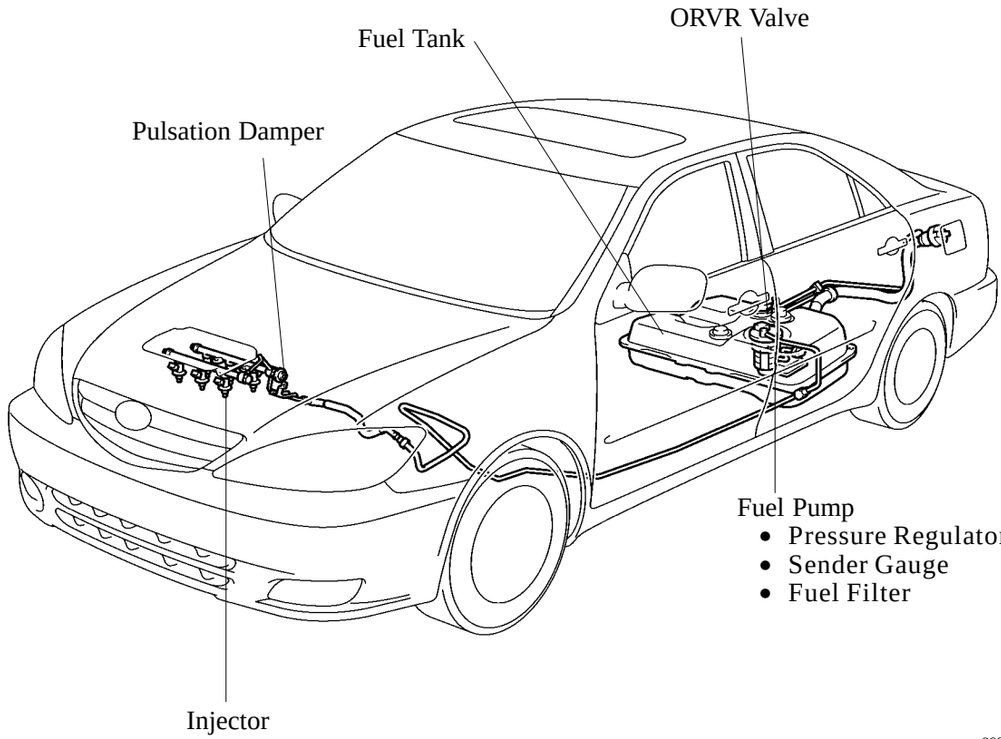


208EG115

■FUEL SYSTEM

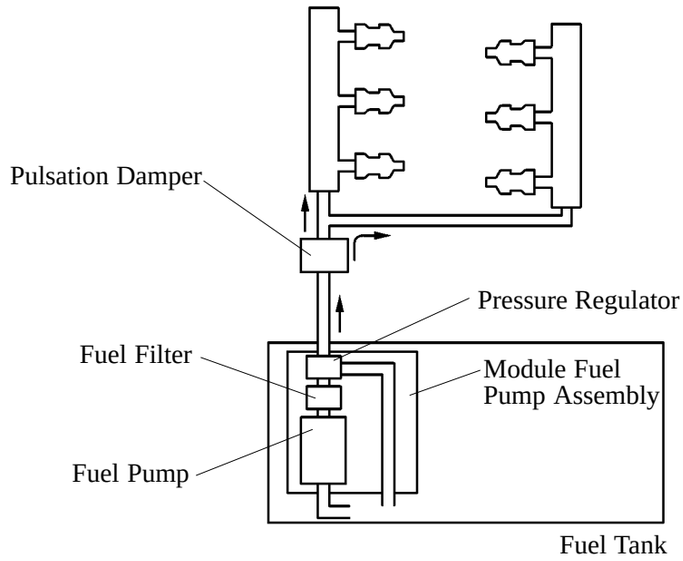
1. General

- A fuel returnless system has been used to reduce evaporative emissions.
- A compact fuel pump in which a fuel filter and pressure regulator are integrated in the module fuel pump assembly has been adopted. For details, see page EG-26 in 2AZ-FE engine section.
- A quick connector has been adopted to connect the fuel pipe with the fuel hose to improve serviceability.
- A compact 12-hole type injector with high atomizing performance has been adopted to improve the atomization of fuel. As the result, the air assist system used on ’01 Camry has been discontinued.
- A tether has been provided on the fuel filter cap to prevent the cap from being lost, which results in preventing the leakage of fuel or the evaporative gas.
- The quick-turn type fuel tank cap has been newly adopted to improve usability.
- The ORVR (On-board Refueling Vapor Recovery) system has been adopted. For details, see page EG-45.



2. Fuel Returnless System

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



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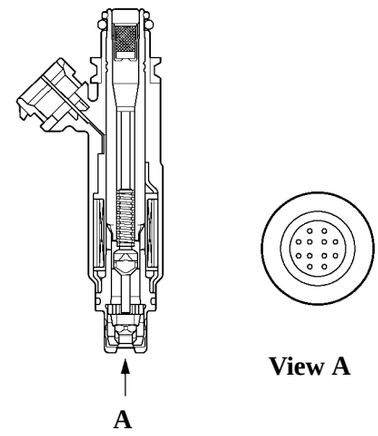
3. Fuel Injector

The 12-hole type injector has been adopted to improve the atomization of fuel.



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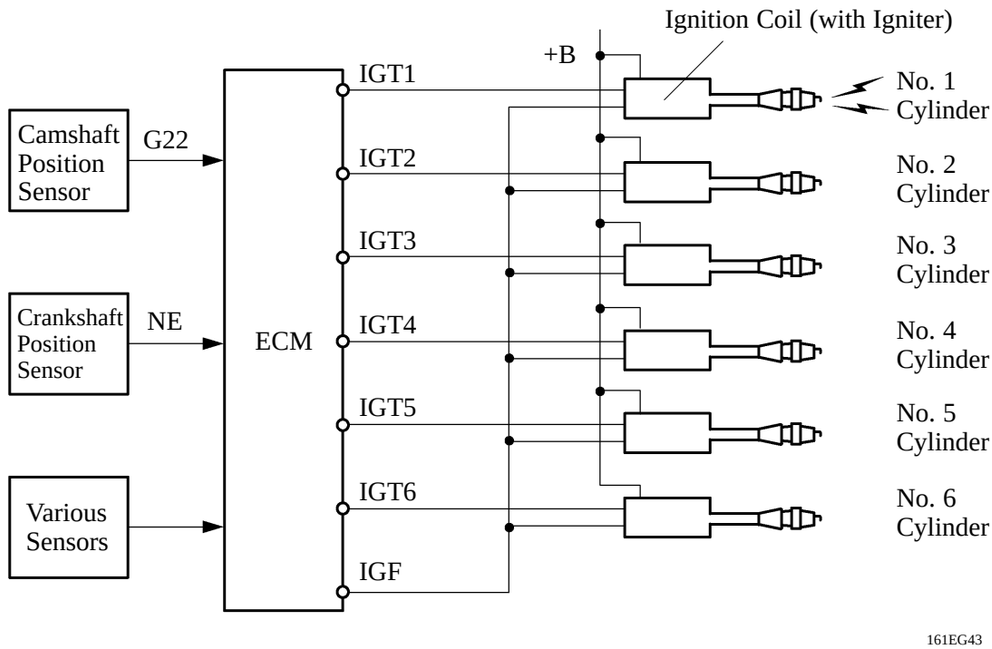
■IGNITION SYSTEM

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 this engine is an independent ignition system which has one ignition coil (with igniter) for each cylinder.
- Iridium-tipped spark plugs have been adopted to realize a 120,000 mile (192,000 km) maintenance-free operation. For details, see page EG-27 in 2AZ-FE engine section.



2. Ignition Coil

The DIS provides 6 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.

■STARTING SYSTEM

A compact and lightweight PS (Planetary reduction-Segment conductor motor) starter has been adopted on all models. For details, see page EG-28 in 2AZ-FE engine.

■ENGINE CONTROL SYSTEM

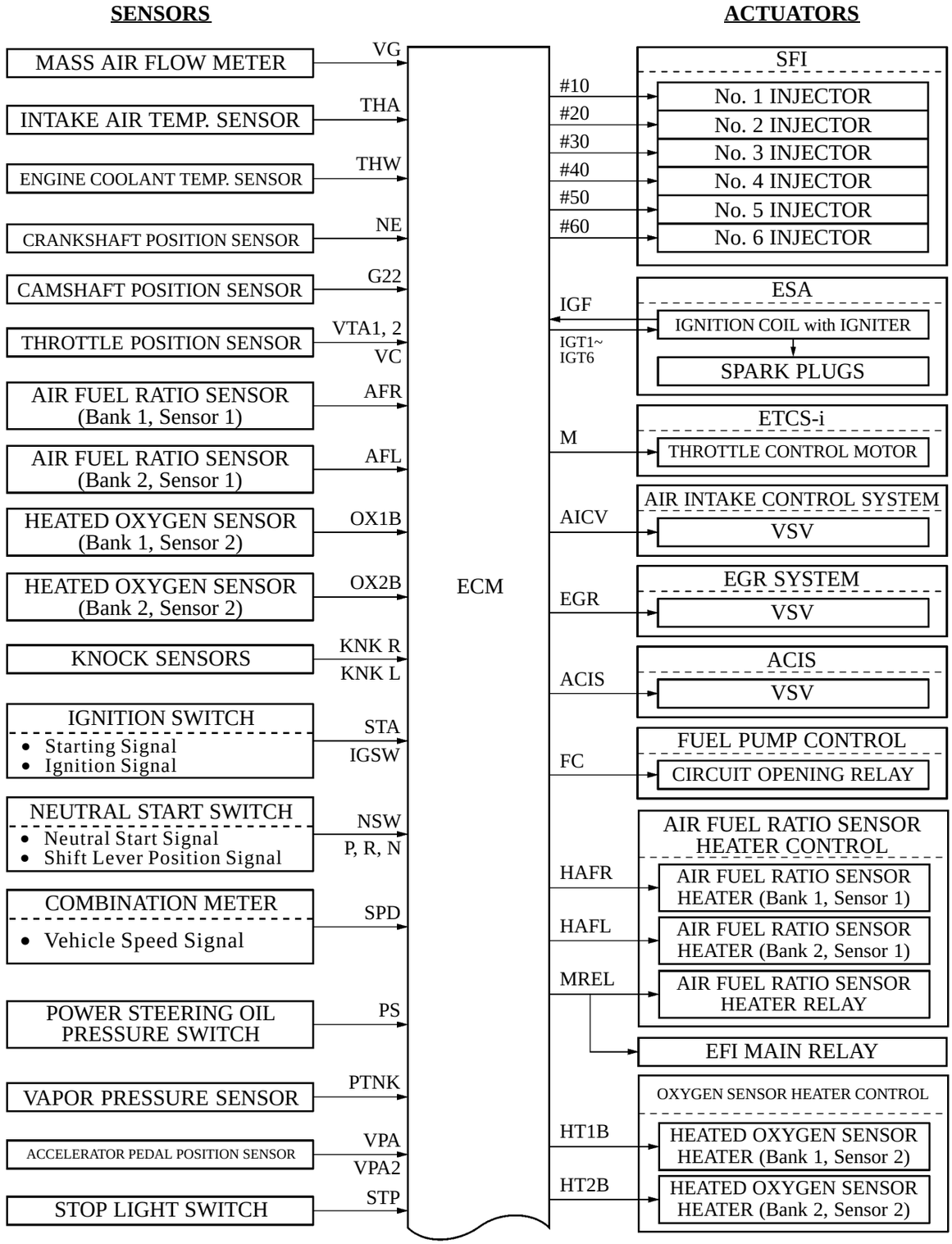
1. General

The engine control system of the 1MZ-FE engine has following system.

System	Outline	'02 Camry	'01 Camry
SFI (Sequential Multiport Fuel Injection) (For details, see page EG-80)	An L-type SFI system directly detects the intake air mass with a hot wire type mass air flow meter.	○	←
ESA (Electronic Spark Advance) (For details, see page EG-80)	Ignition timing is determined by the ECM based on signals from various sensors. The ECM corrects ignition timing in response to engine knocking.	○	←
ETCS-i (Electronic Throttle Control System-intelligent) (For details, see page EG-81)	Optimally controls the throttle valve opening in accordance with the amount of accelerator pedal effort and the condition of the engine and the vehicle.	○	—
ACIS (Acoustic Control Induction System) (For details, see page EG-83)	The intake air passages are switched according to the engine speed and throttle valve opening angle to provide high performance in all speed ranges.	○	←
Air Intake Control System (For details, see page EG-86)	The intake air duct is divided into two areas, and the ECM controls the air intake control valve and the actuator that are provided in one of the areas to reduce the amount of engine noise.	○	—
Fuel Pump Control	Fuel pump operation is controlled by signal from the ECM.	○	←
Air Fuel Ratio Sensor, Oxygen Sensor Heater Control	Maintains the temperature of the air fuel ratio sensor or oxygen sensor at an appropriate level to increase accuracy of detection of the oxygen concentration in the exhaust gas.	○	←
EGR (Exhaust Gas Recirculation) System	• This system recirculates a portion of the exhaust gases through the intake in order to reduce the amount of NOx in the exhaust gases. • Cuts off EGR according to the engine condition to maintain drivability of the vehicle and durability of the EGR components.	○	←
Evaporative Emission Control (For details, see page EG-44)	• The ECM controls the purge flow of evaporative emission (HC) in the charcoal canister in accordance with engine conditions. • Using 3 VSVs and a vapor pressure sensor, the ECM detects any evaoprative emission leakage occurring between the fuel tank and the charcoal canister through the changes in the tank pressure.	○	←
Air Conditioning Cut-off Control	By turning the air conditioner compressor ON or OFF in accordance with the engine condition, drivability is maintained.	○	←
Engine Immobiliser	Prohibits fuel delivery and ignition if an attempt is made to start the engine with an invalid ignition key.	○	←
Diagnosis (For details, see page EG-87)	When the ECM detects a malfunction, the ECM diagnoses and memorizes the failed section.	○	←
	To increase the speed for processing the signals, the 32-bit CPU of the ECM has been adopted	○	—
Fail-Safe (For details, see page EG-88)	When the ECM detects a malfunction, the ECM stops or controls the engine according to the data already stored in the memory.	○	←

2. Construction

The configuration of the engine control system in the 1MZ-FE engine in the '02 Camry is as shown in the following chart.



(Continued)

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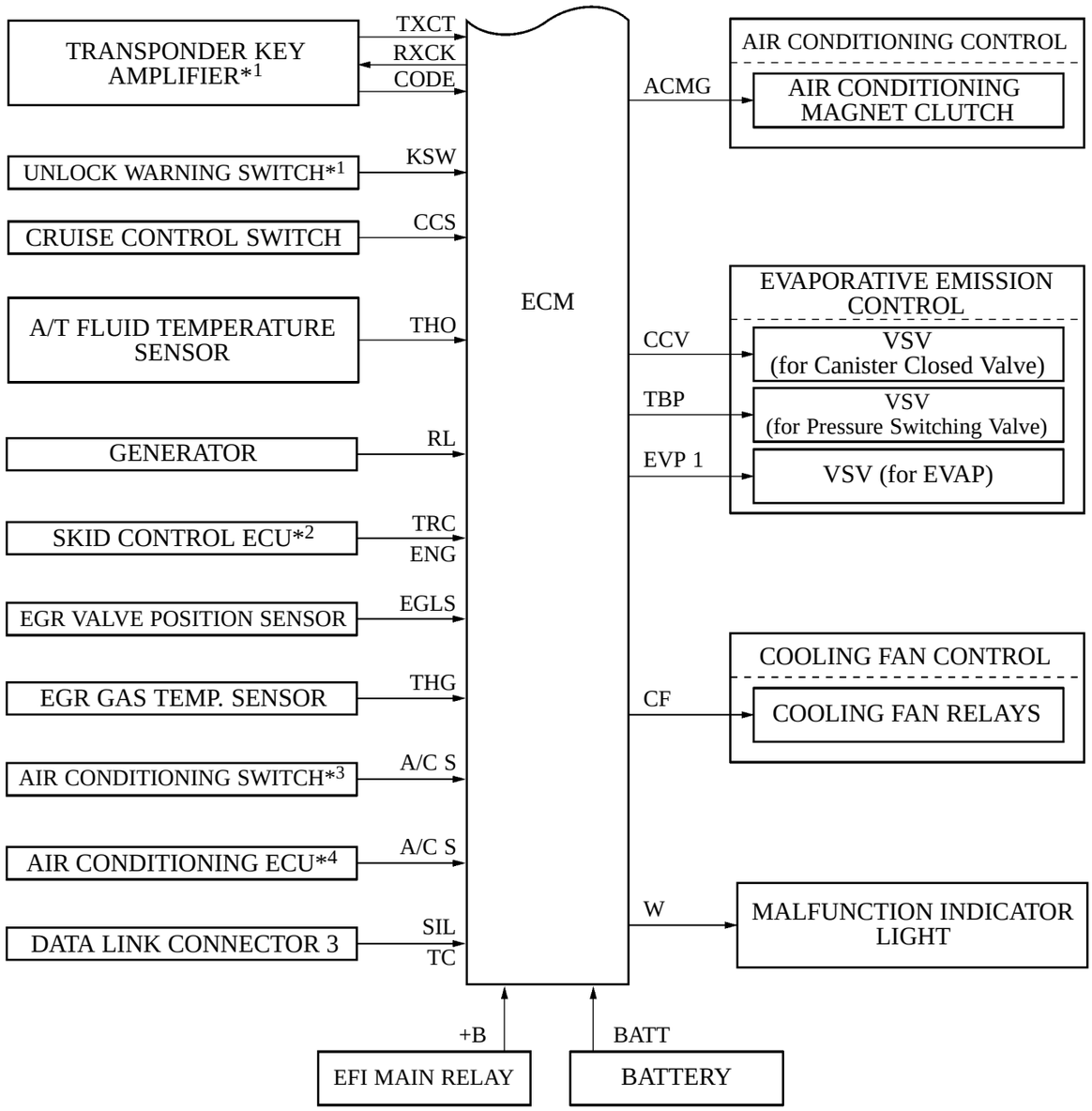
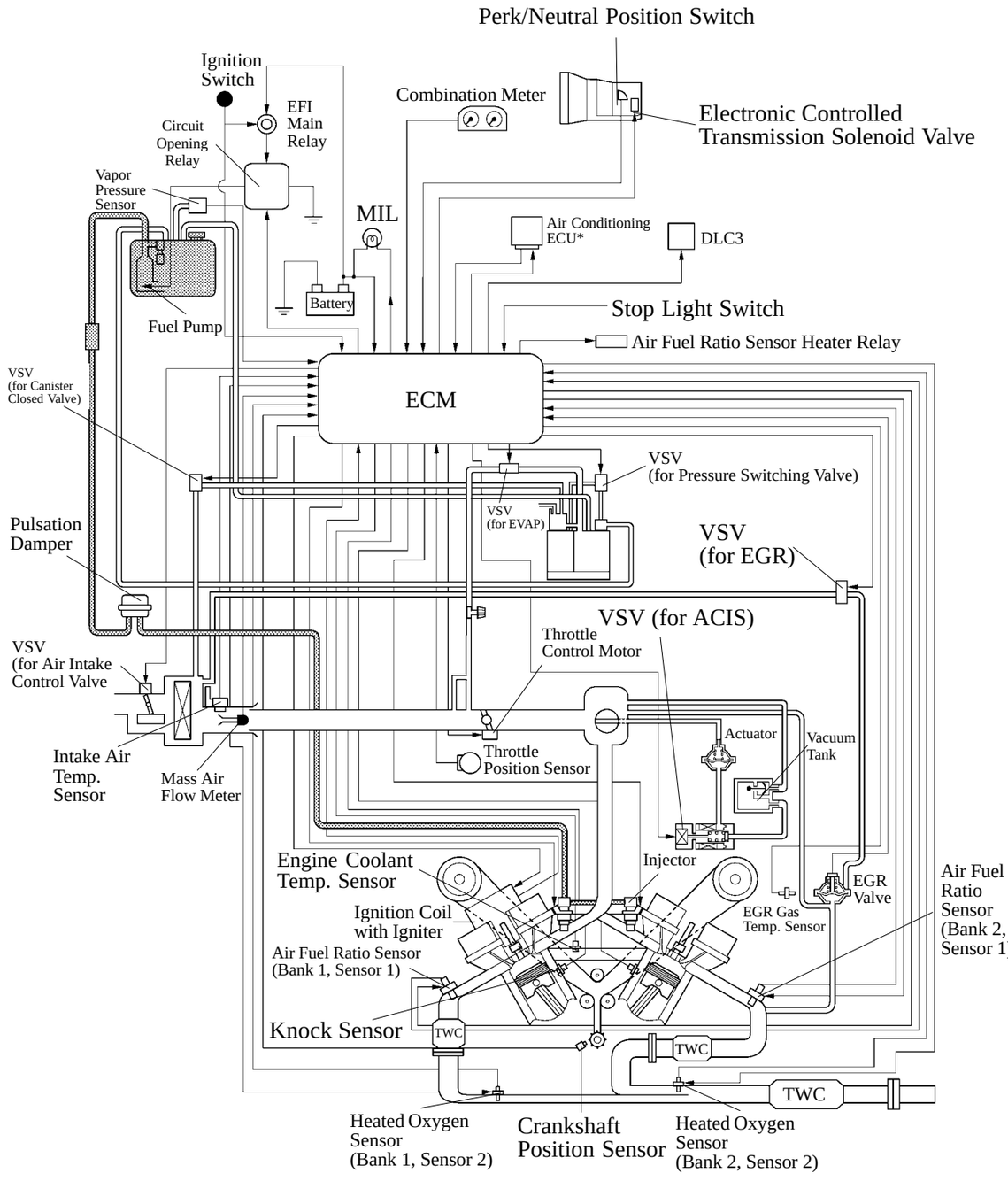


208EG37

*1: with Engine Immobiliser System
*2: with VSC System
*3: with Manual Air Conditioning System
*4: with Automatic Air Conditioning System

3. Engine Control System Diagram



*: with Automatic Air Conditioning System

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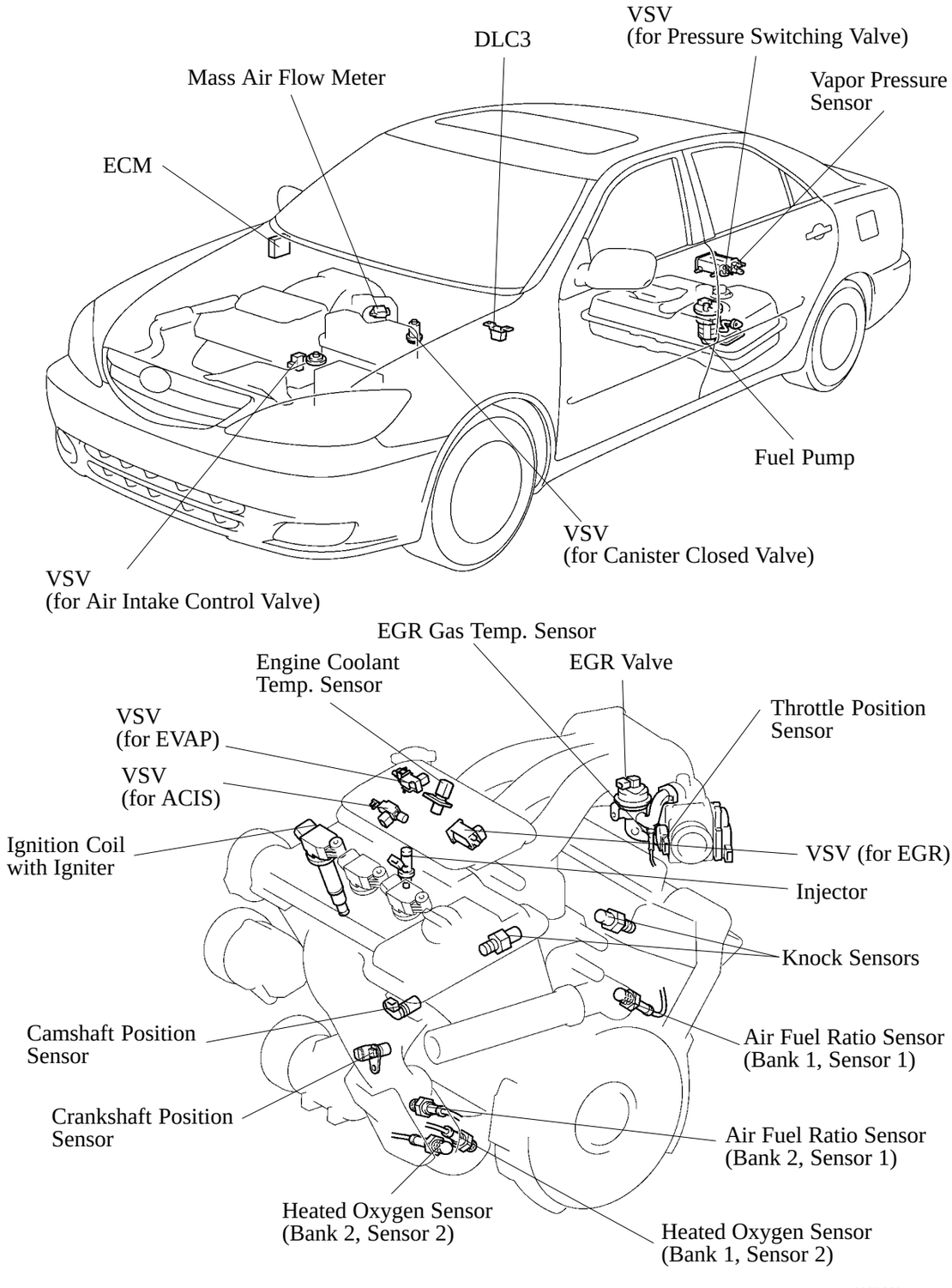
4. Layout of Main Component



5. Main Components of Engine Control System

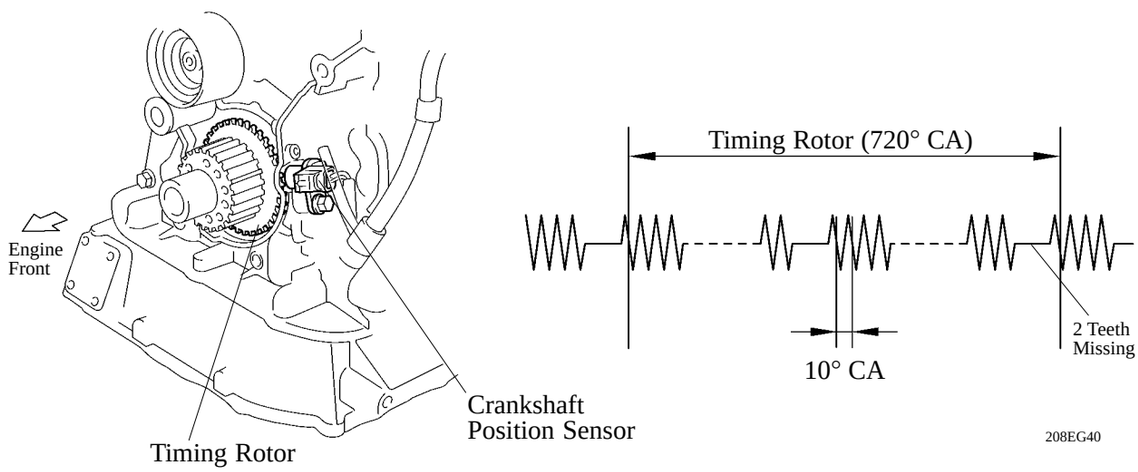
General

The following table compares the main components.

Components	New		Previous	
	Outline	Quantity	Outline	Quantity
ECM	32-bit CPU	1	16-bit CPU	1
Mass Air Flow Meter (For details, see page EG-36)	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	←	
Accelerator Pedal Position Sensor (For details, see page EG-38)	Linear Type	1	—	
Knock Sensor	Built-in Piezoelectric Type	1	←	
Air Fuel Ratio Sensor (Bank 1, Sensor 1) (Bank 2, Sensor 1)	with Heater Type	2	← (A/T Model)	
Oxygen Sensor (Bank 1, Sensor 2) (Bank 2, Sensor 2)	with Heater Type	2	with Heater Type	3 (M/T Model)
				1 (A/T Model)
Injector	12-hole Type	6	4-hole Type	6

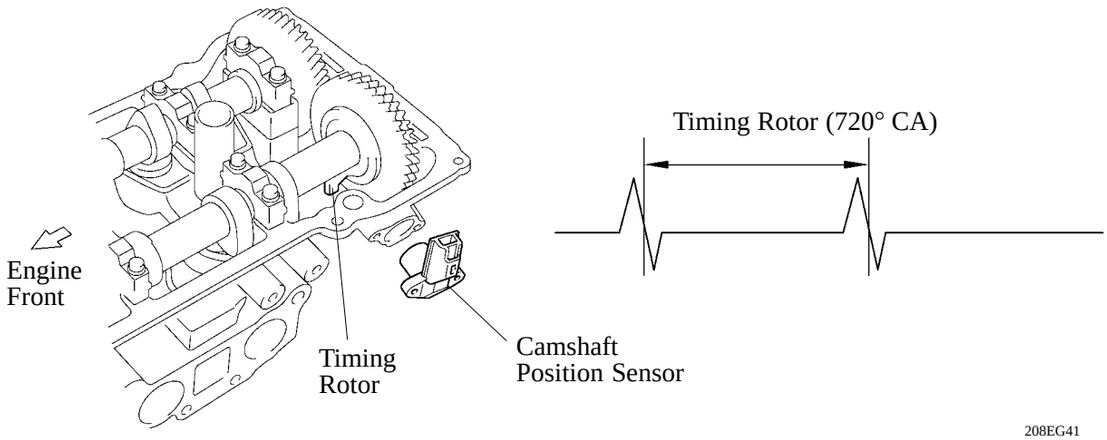
Crankshaft Position Sensor

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



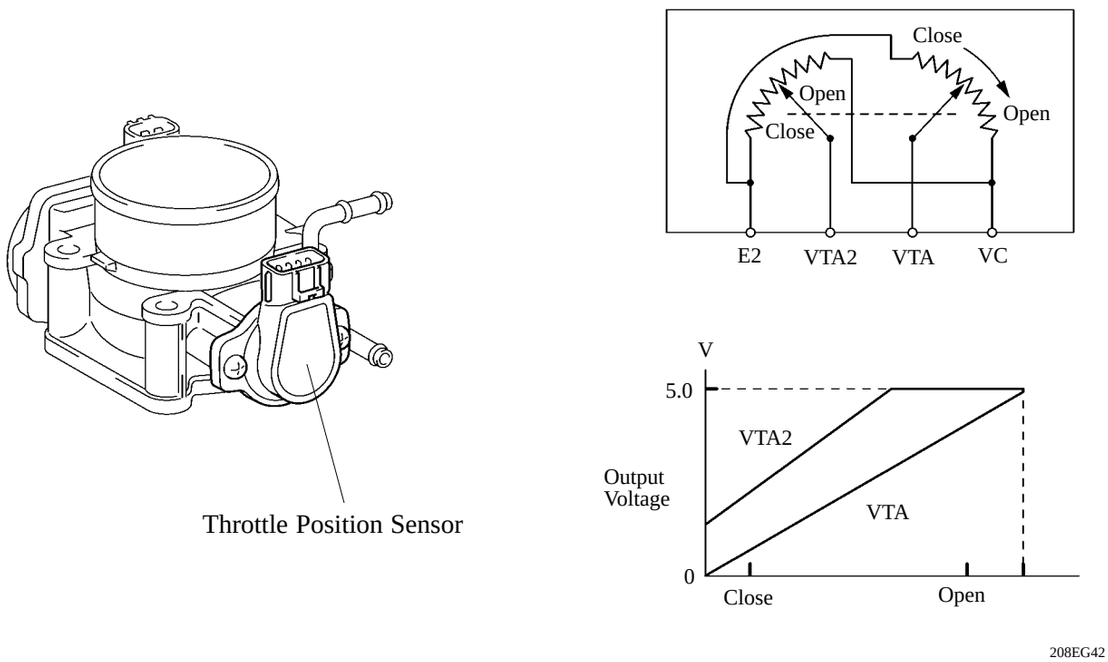
Camshaft Position Sensor

The camshaft position sensor is mounted on the left side cylinder head. To detect the camshaft position, a timing rotor that is provided on the camshaft is used to generate 1 pulses for every 2 revolutions of the crankshaft.



Throttle Position Sensor

This sensor converts the throttle valve opening angles into electronic signals with two differing characteristics and outputs them to the ECM. One is the VTA signal that linearly outputs the voltage along the entire range of the throttle valve opening angle. The other is the VTA 2 signal that outputs an offset voltage.



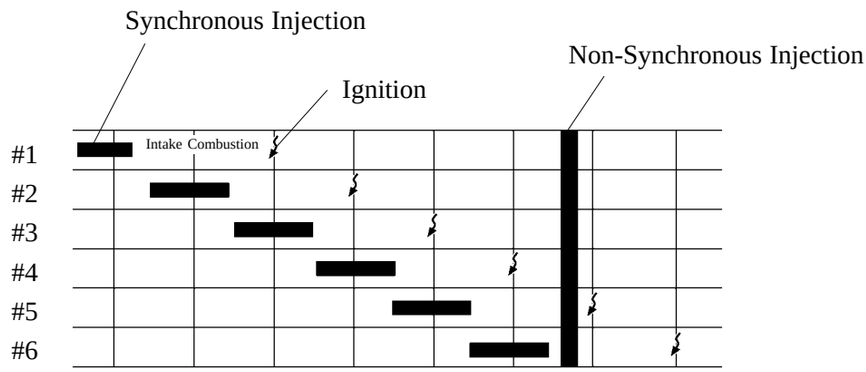
6. SFI (Sequential Multiport electronic Fuel Injection) System

- An L-type SFI system directly detects the intake air mass with a hot wire type mass air flow meter.
- An independent injection system (in which fuel is injected once into each cylinder for each two revolution of the crankshaft) has been adopted.
- There are two types of fuel injection:

  a) One is synchronous injection in which corrections based on the signals from the sensors are added to the basic injection time so that injection occurs always at the same timing.

  b) The other is non-synchronous injection in which injection is effected by detecting the requests from the signals of the sensors regardless of the crankshaft angle.

  Furthermore, to protect the engine and improve fuel economy, the system effects fuel cutoff in which the injection of fuel is stopped temporarily in accordance with the driving conditions.



Independent Injection

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7. ESA (Electronic Spark Advance)

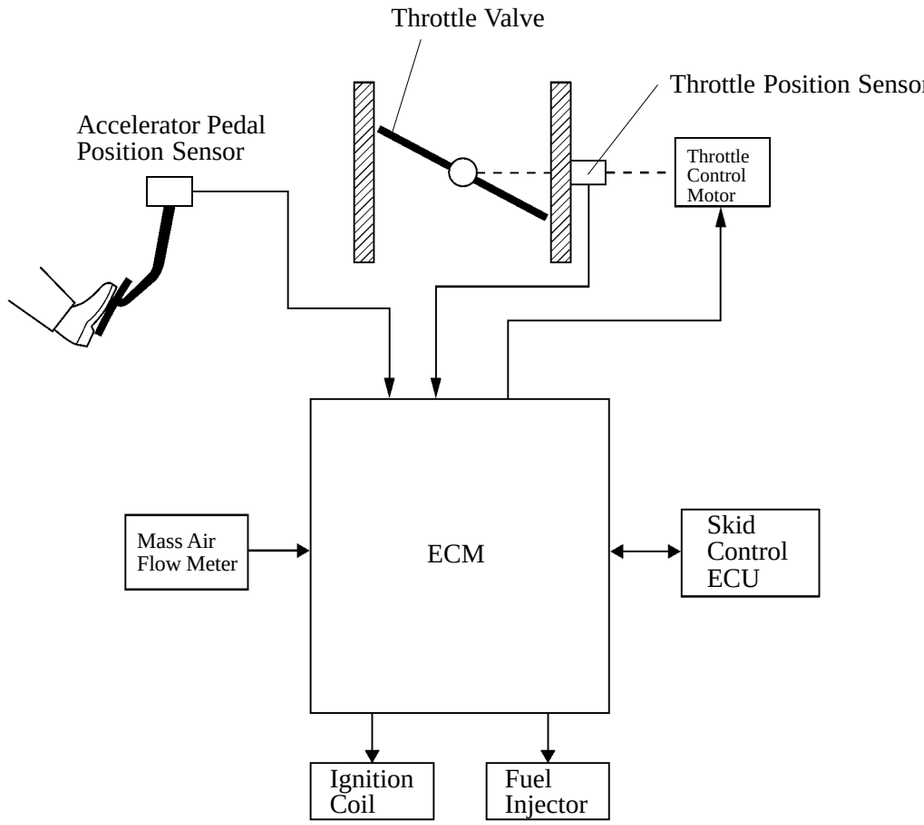
This system selects the optimal ignition timing in accordance with the signals received from the sensors and sends the (IGT) ignition signal to the igniter. The default ignition timing is set to 5° BTDC.

8. ETCS-i (Electronic Throttle Control System-intelligent)

General

- In the conventional throttle body, the throttle valve opening in determined invariably by the amount of the accelerator pedal effort. In contrast, the ETCS-i uses the ECM to calculate the optimal throttle valve opening that is appropriate for the respective driving condition and uses a throttle control motor to control the opening.
- The accelerator cable and link have been discontinued, and an a accelerator position sensor has been provided on the accelerator pedal.

▶ System Diagram ◀



Operation

1) General

The ECM drives the throttle control motor by determining the target throttle valve opening in accordance with the respective vehicle operating condition.

- Idle Speed Control
- Shift Shock Reduction Control
- Cruise Control

2) Idle Speed Control

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

3) Shift Shock Reduction Control

The throttle control is synchronized to the ECT (Electronically Controlled Transmission) control during the shifting of the transmission in order to reduce the shift shock.

4) TRAC Throttle Control

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

5) VSC Coordination Control

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

6) Cruise Control

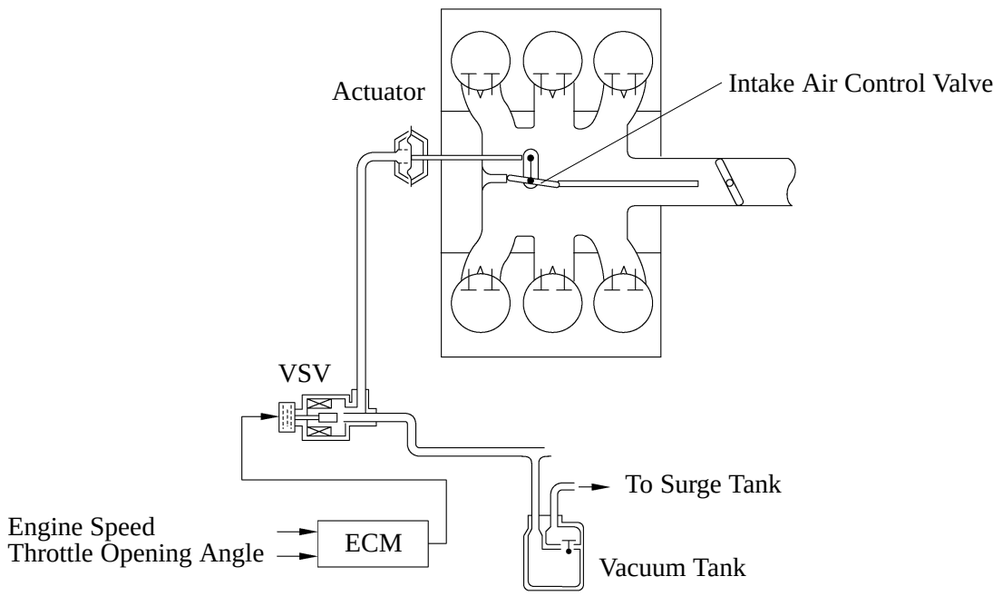
An ECM with an integrated cruise control ECU directly actuates the throttle valve to effect the operation of the cruise control.

9. ACIS (Acoustic Control Induction System)

General

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

▶ System Diagram ◀



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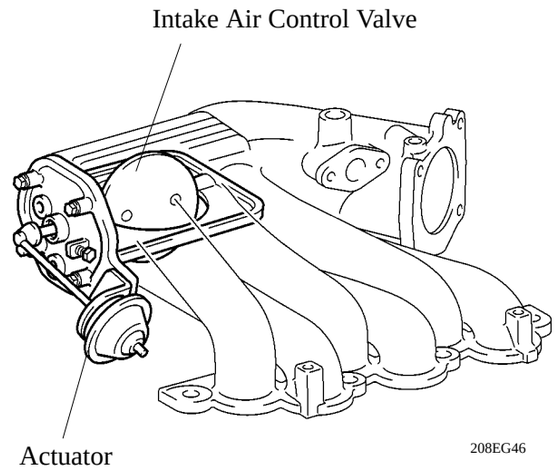
General

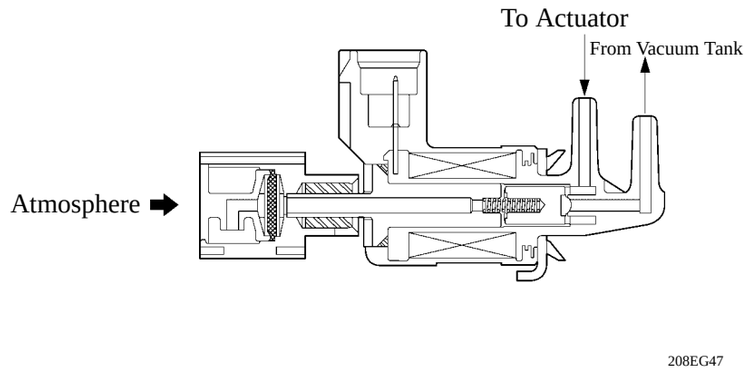
1) Intake Air Control Valve

The intake air control valves, which are provided in the intake air chamber, open and close to change the effective length of the intake manifold in two stages.



2) VSV (Vacuum Switching Valve)

Controls the vacuum that is applied to the actuator by way of the signal (ACIS) that is output by the ECM.



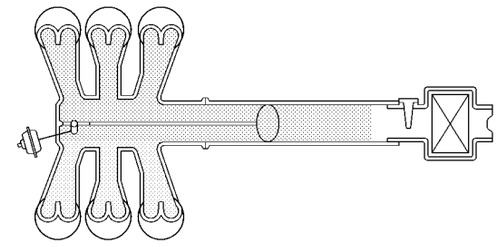
3) Vacuum Tank

Equipped with an internal check valve, the vacuum tank stores the vacuum that is applied to the actuator in order to maintain the intake air control valve fully closed even during low-vacuum conditions.

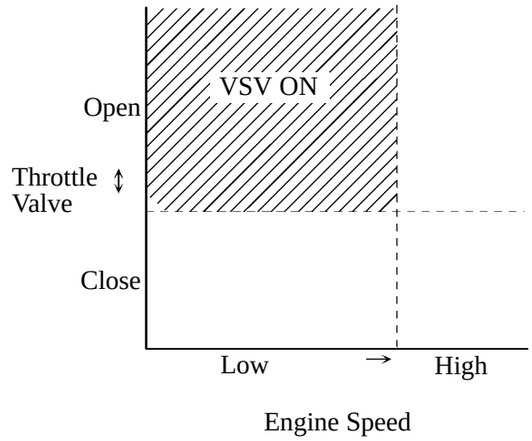
Operation

1) When the Intake Control Valve Closes (VSV ON)

The ECM activates the VSV to match the longer pulsation cycle so that the negative pressure acts on the diaphragm chamber of the actuator. This closes the control valve. As a result, the effective length of the intake manifold is lengthened and the intake efficiency in the low-to-medium speed range is improved due to the dynamic effect of the intake air, thereby increasing the power output.



: Effective Intake Manifold Length



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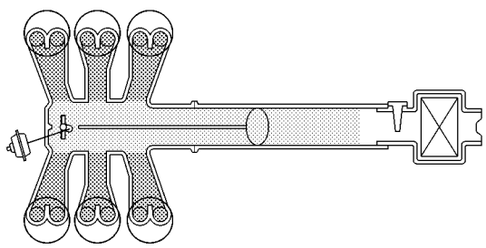
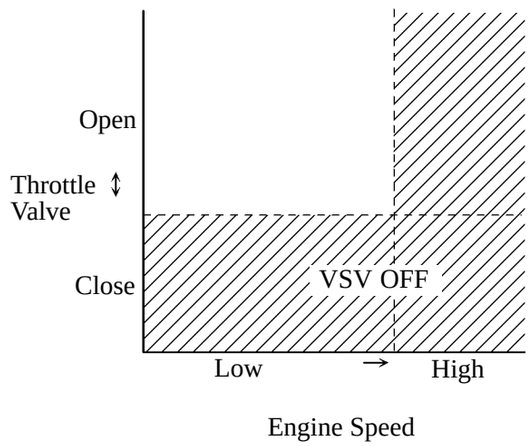
2) When the Intake Control Valve Open (VSV OFF)

The ECM deactivates the VSV to match the shorter pulsation cycle so that atmospheric air is led into the diaphragm chamber of the actuator and opens the control valve. When the control valve is open, the effective length of the intake air chamber is shortened and peak intake efficiency is shifted to the high engine speed range, thus providing greater output at high engine speeds.



: Effective Intake Manifold Length

: Effective Intake Air Chamber



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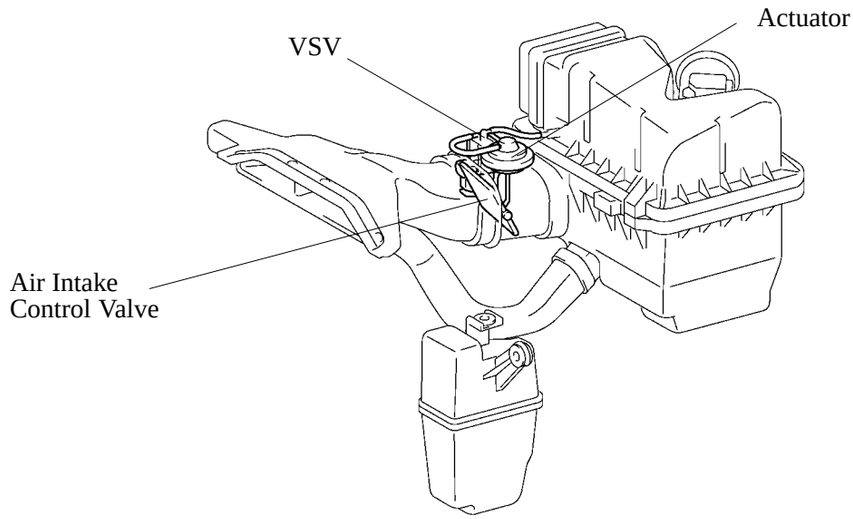
10. Air Intake Control System

General

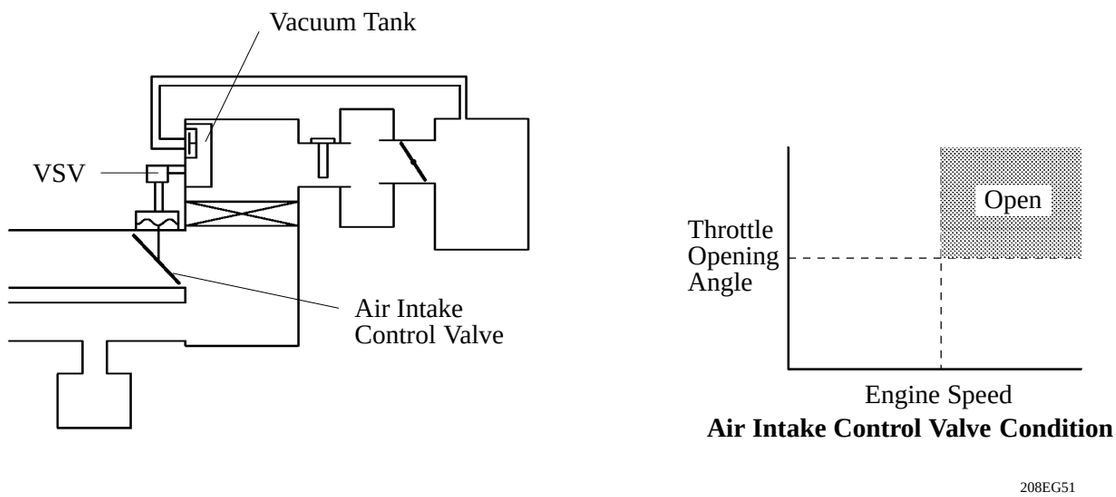
The air cleaner inlet is divided into two areas, and a air intake control valve and an actuator have beenprovided in one of the areas.
As a result, a reduction in intake noise in the low-speed range and an increase in the power output in the high-speed range have been realized.

▶ Layout of Components ◀



Operation

When the engine is operating in the low-to mid-speed range, this control operates the air intake control valve to close one side of the air cleaner inlet.
When the engine is operating in the high-speed range, this control operates the air intake control valve to open both side of the air cleaner inlet to effect the intake of air.



11. Diagnosis

When the ECM detects a malfunction, the ECM makes a diagnosis and memorizes the failed section. Furthermore, the MIL (Malfunction Indicator Light) in the combination meter illuminates or blinks to inform the driver.
The ECM will also store the DTCs of the malfunctions.
The DTCs can be accessed the use of the hand-held tester.

Service Tip

The length of time to clear the DTC via the battery terminal has been changed from the previous 10 seconds to 1 minute.

— Changes (from '01 Camry) —

The DTCs (Diagnostic Trouble Codes) listed below have been added or discontinued.

▶ Added DTCs ◀

DTC No.	Detection Item
P0156	O_2 Sensor Circuit Malfunction (Bank 2, Sensor 2)
P0161	O_2 Sensor Heater Circuit Malfunction (Bank 2, Sensor 2)
P0430	Catalyst System Efficiency Below Threshold (Bank 2)
P0605	Internal Control Module Read Only Memory (ROM) Error
P1120	Accelerator Pedal Position Sensor Circuit Malfunction
P1121	Accelerator Pedal Position Sensor Range/Performance Problem
P1125	Throttle Control Motor Circuit Malfunction
P1127	ETCS Actuator Power Source Circuit Malfunction
P1128	Throttle Control Motor Lock Malfunction
P1129	Electric Throttle Control System Malfunction
P1633	ECM Malfunction (ETCS Circuit)

▶ Discontinued DTCs ◀

DTC No.	Detection Item
P0130	O_2 Sensor Circuit Malfunction (Bank 1, Sensor 1)
P0133	O_2 Sensor Circuit Slow Response (Bank 1, Sensor 1)
P0135	O_2 Sensor Heater Circuit Malfunction (Bank 1, Sensor 1)
P0150	O_2 Sensor Circuit Malfunction (Bank 2, Sensor 1)
P0153	O_2 Sensor Circuit Slow Response (Bank 2, Sensor 1)
P0155	O_2 Sensor Heater Circuit Malfunction (Bank 2, Sensor 1)

12. Fail-Safe

General

When the ECM detects a malfunction, the ECM stops or controls the engine according to the data already stored in the memory.

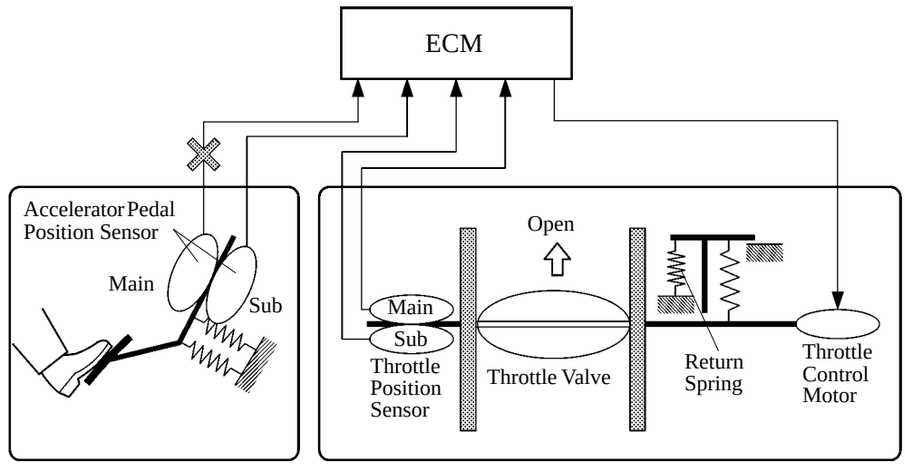
▶ Fail-Safe Control List ◀

: New

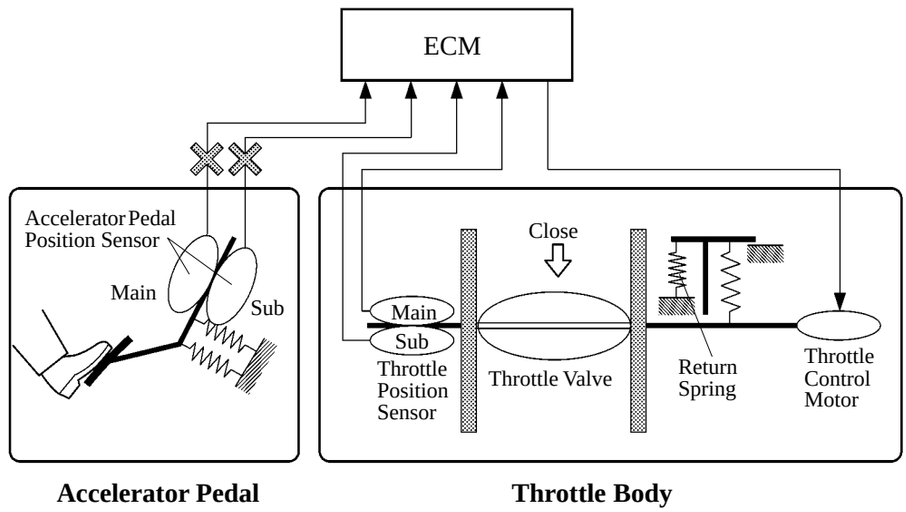
Location on Malfunction	Description Control
Mass Air Flow Meter	In case of a signal malfunction, the engine could operate poorly or the catalyst could overheat if the engine continues to be controlled with the signals from the sensors. Therefore, the ECM effects control by using the values in the ECM or stops the engine.
Accelerator Pedal Position Sensor (For details, see page EG-89)	In case of a signal malfunction, the ECM calculates the accelerator pedal opening angle that is limited by the dual system sensor value and continues effecting throttle valve control. If both system malfunction, the ECM considers that the accelerator pedal is fully closed.
Throttle Position Sensor (For details, see page EG-90)	In case of a signal malfunction, the ECM cuts off the current to the throttle control motor. The throttle valve returns to the prescribed opening by the force of the return spring. The ECM then adjusts the engine output by controlling the fuel injection and ignition timing in accordance with the accelerator pedal opening angle to enable the vehicle to continue driving.
Engine Coolant Temp. Sensor and Intake Air Temp. Sensor	In case of a signal malfunction, the use of the values from the sensors will make the air-fuel ratio become too rich or too lean, which could causes the engine to stall or to run poorly during cold operation. Therefore, the ECM fixes the air-fuel ratio to the stoichiometric ratio and uses the constant values of 80°C engine coolant temperature and 20°C intake air temperature to perform the calculation.
Knock Sensor	In case of a malfunction in the knock sensor or in the knocking signal system (open or short circuit), the engine could become damaged if the timing is advanced despite the presence of knocking. Therefore, if a malfunction is detected in the knock sensor system, the ECM turns the timing retard correction of the knock sensor into the maximum retard value.
Ignition Coil (with Igniter)	In case of a malfunction in the ignition system, such as an open circuit in the ignition coil, the catalyst could be become overheated due to engine misfire. Therefore, if the (IGF) ignition signal is not input twice or more in a row, the ECM determines that a malfunction occurred in the ignition system and stops only the injection of fuel into the cylinder with the malfunction.

Fail-Safe of Accelerator Pedal Position Sensor

- The accelerator pedal position sensor comprises two (main, sub) sensor circuits. If a malfunction occurs in either one of the sensor circuits, the ECM detects the abnormal signal voltage difference between these two sensor circuit and switches to the limp mode. In the limp mode, the remaining circuit is used to calculate the accelerator pedal opening, in order to operate the vehicle under limp mode control.



- If both systems malfunction, the ECM detects the abnormal signal voltage between these two sensor circuits and regards that the opening angle of the accelerator pedal is fully opened and then continues the throttle control. At this time, the vehicle can be driven within its idling range.



Fail-Safe of Throttle Position Sensor

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