

---

## GROUP 13B

# MULTIPOINT FUEL INJECTION (MPI) <4G69>

### CONTENTS

GENERAL INFORMATION . . . . .	13B-2	VARIABLE INDUCTION COTROL . . .	13B-17
SENSOR . . . . .	13B-12	IGNITION TIMING AND DISTRIBUTION CONTROL . . . . .	13B-19
ACTUATOR . . . . .	13B-14	EGR CONTROL, PURGE CONTROL	13B-21
THROTTLE VALVE OPENING ANGLE CONTROL . . . . .	13B-15	OTHER CONTROL FUNCTIONS . . . .	13B-21
FUEL INJECTION CONTROL . . . . .	13B-17	DIAGNOSIS SYSTEM . . . . .	13B-21

## GENERAL INFORMATION

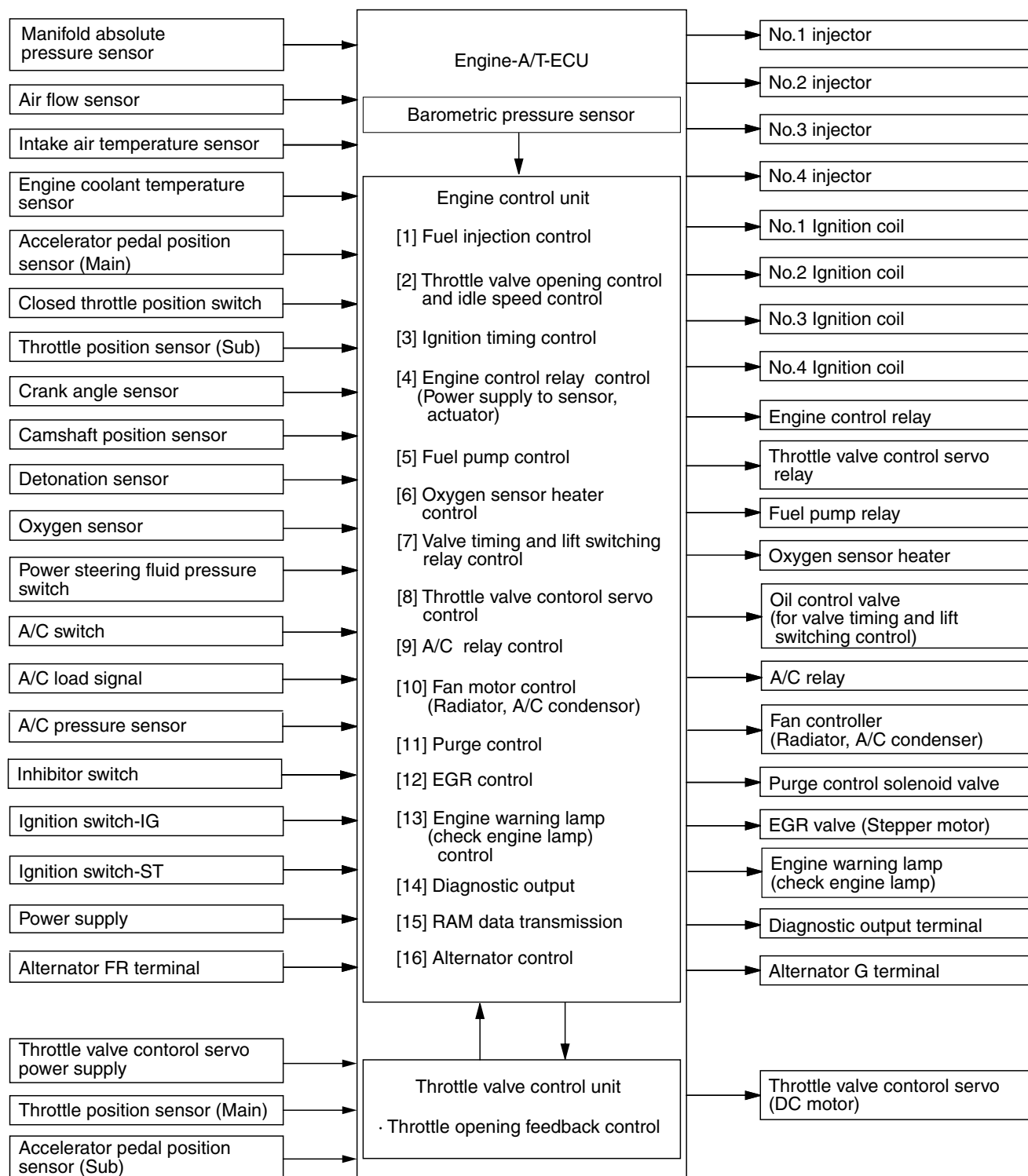
M2132000100837

This time, 4G69-SOHC MIVEC of the addition added the following improvement based on 4G63-DOHC which is loaded into OUTLANER.

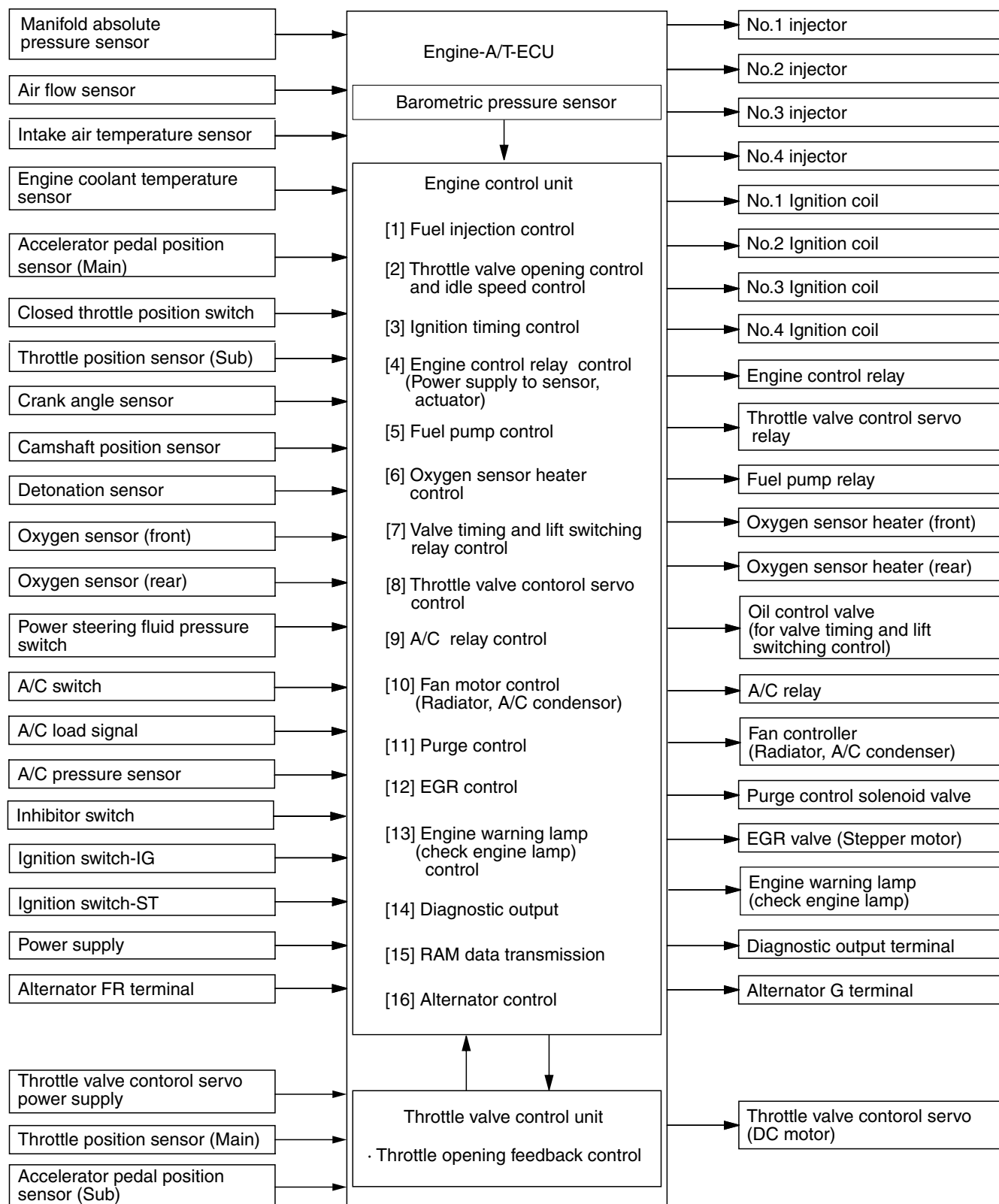
Improvements	Remarks
A variable induction control is adopted.	The improvement of low-speed torque and high-speed power output.
The barometric pressure sensor has been adopted to a type that is built into the Engine-A/T-ECU	The simplification of the system.
A dual manifold catalytic converters (MCC) is adopted <Vehicles for Australia and New Zealand>.	The improvement of the exhaust gas purge performance.
The adoption of dual oxygen sensors, along with the adoption of dual manifold catalytic converters (MCC) <Vehicles for Australia and New Zealand>.	The improvement of the exhaust gas purge performance.
A heat-sensing type air flow sensor has been adopted.	Can be installed in the air intake hose because it is compact and light weight.
A electronically controlled throttle valve control is adopted.	The improves mileage and reduces emission gas (NOx).
A stepper motor type exhaust gas recirculation valve is adopted.	Improves fuel economy and reduce emission (NOx).
EEPROM is adopted to the Engine-A/T-ECU.	Even if the battery is detached, the study value is not deleted.

## SYSTEM BLOCK DIAGRAM

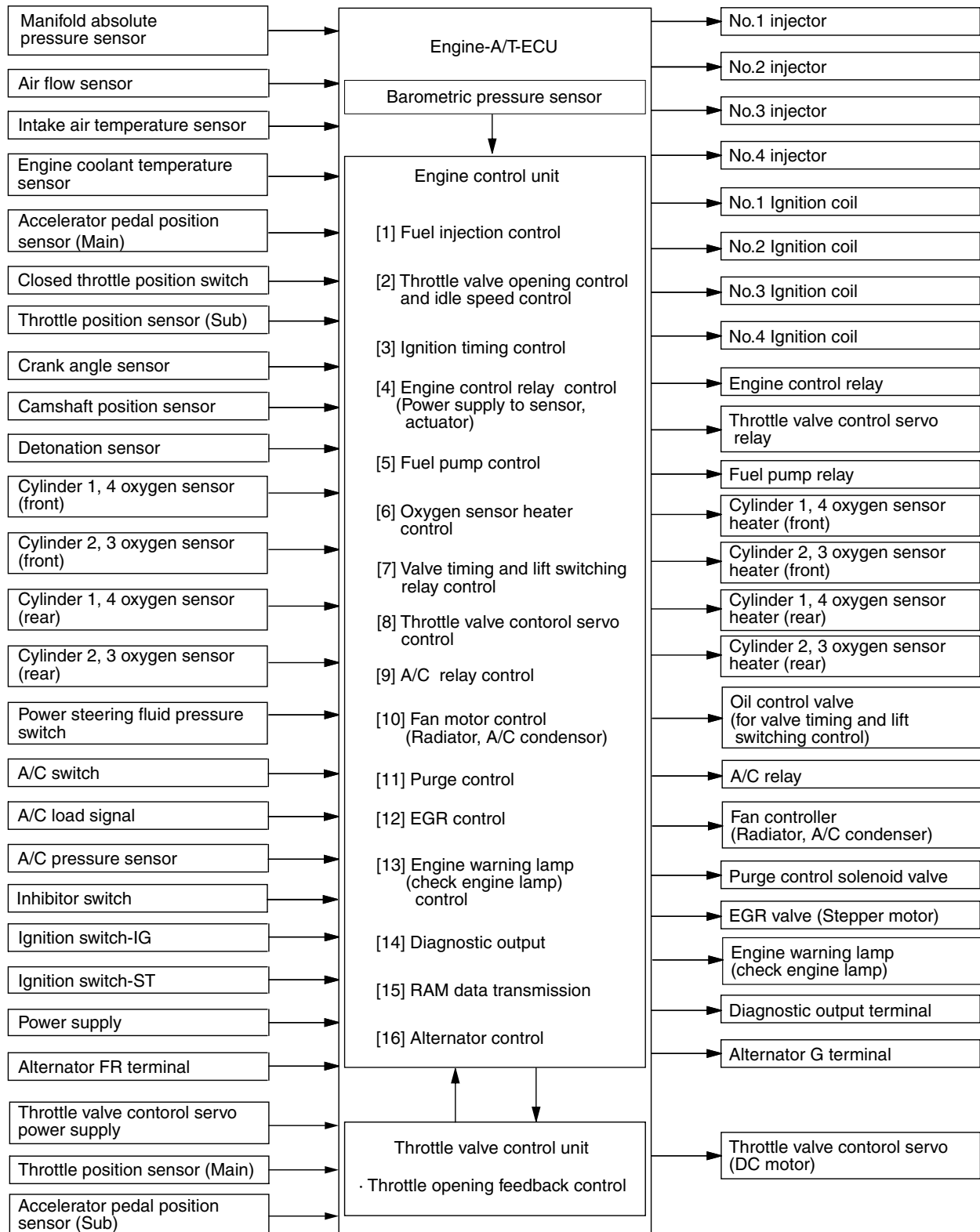
<Vehicles except for Brazil, Chile, Australia and New Zealand>



## &lt;Vehicles for Brazil and Chile&gt;

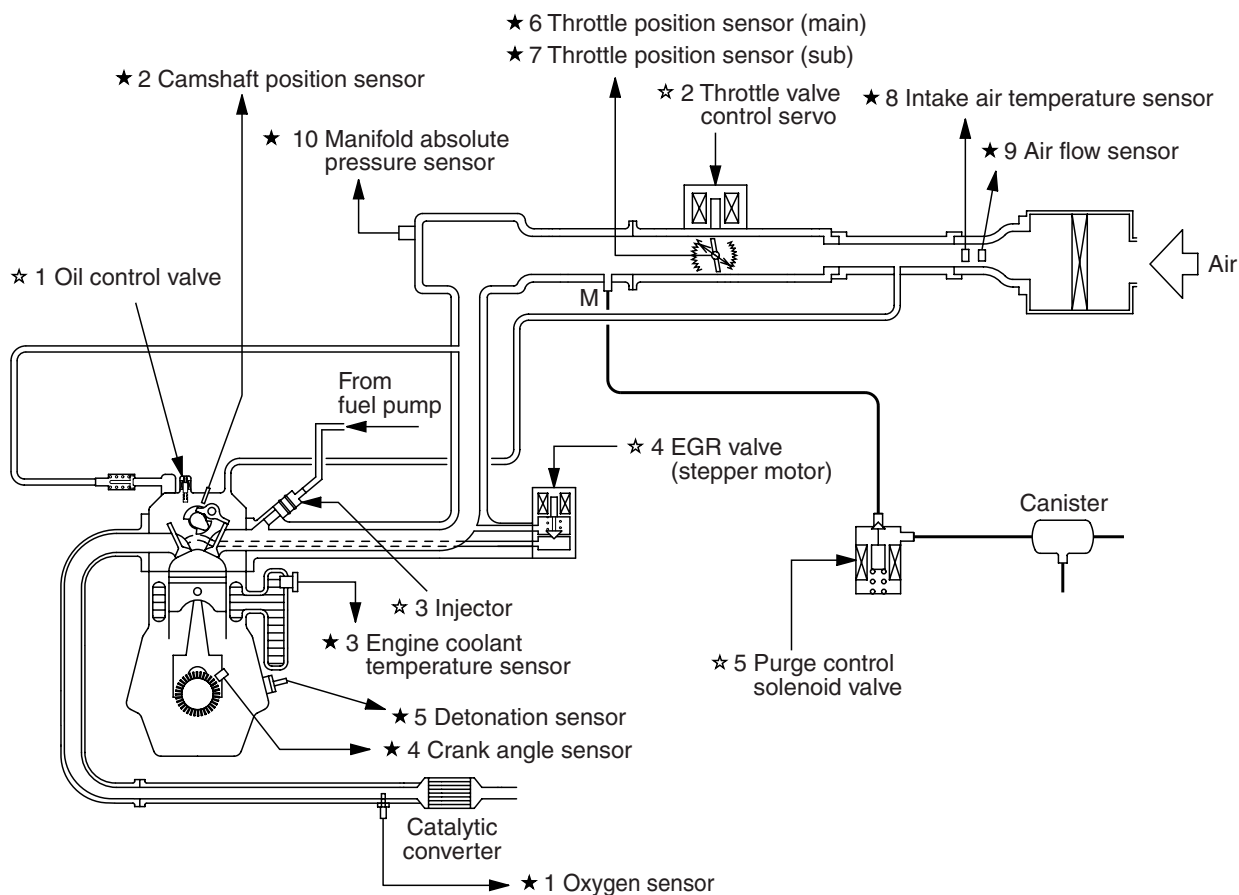
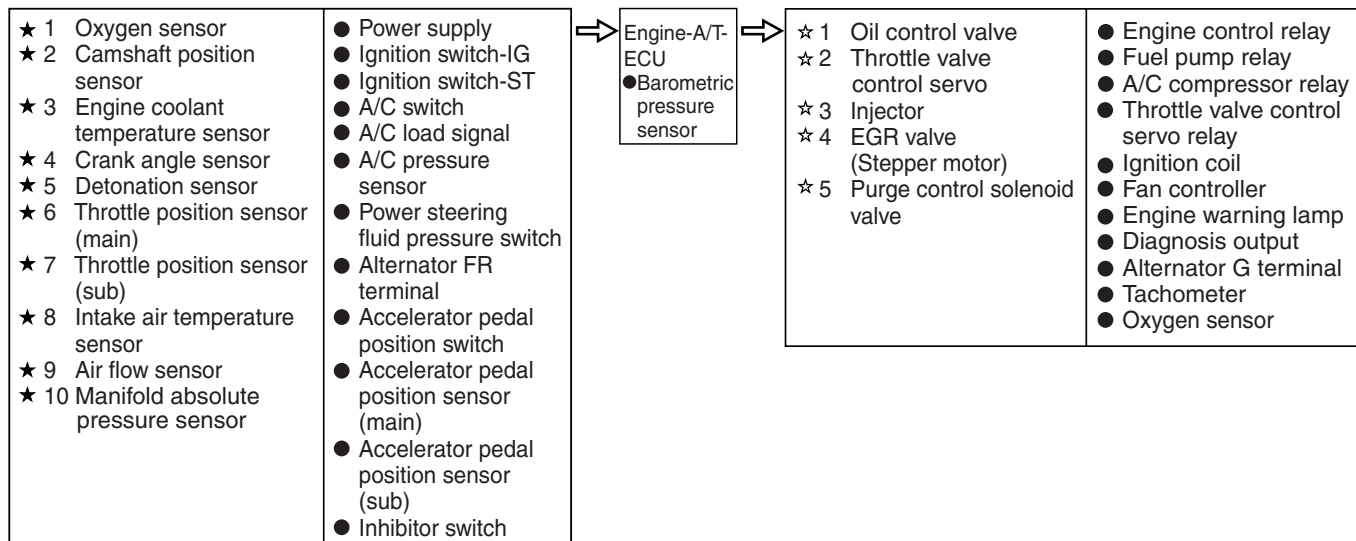


**<Vehicles for Australia and New Zealand>**



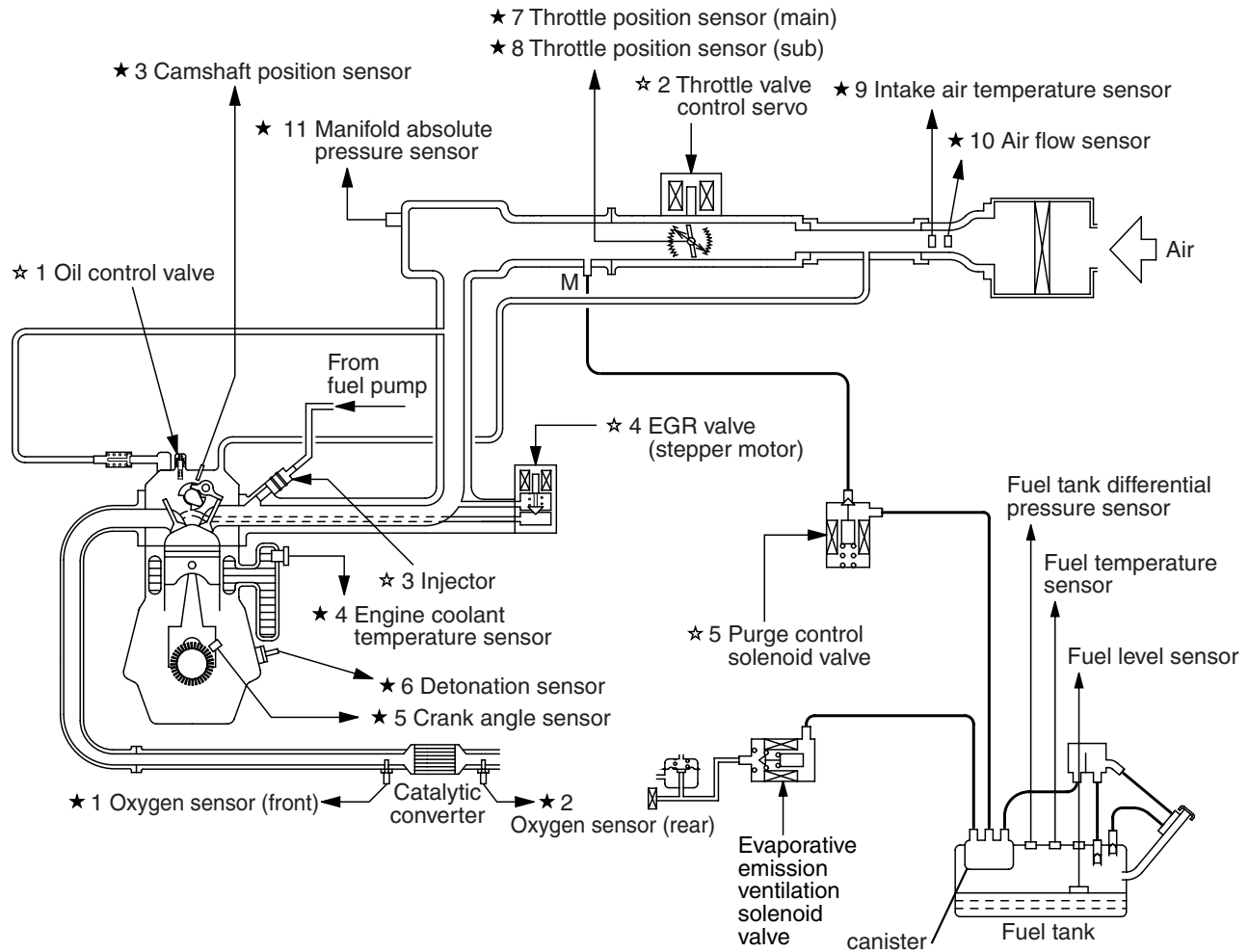
## CONTROL SYSTEM DIAGRAM

&lt;Vehicles except for Brazil, Chile, Australia and New Zealand&gt;



**<Vehicles for Brazil and Chile>**

<ul style="list-style-type: none"> <li>★ 1 Oxygen sensor (front)</li> <li>★ 2 Oxygen sensor (rear)</li> <li>★ 3 Camshaft position sensor</li> <li>★ 4 Engine coolant temperature sensor</li> <li>★ 5 Crank angle sensor</li> <li>★ 6 Detonation sensor</li> <li>★ 7 Throttle position sensor (main)</li> <li>★ 8 Throttle position sensor (sub)</li> <li>★ 9 Intake air temperature sensor</li> <li>★ 10 Air flow sensor</li> <li>★ 11 Manifold absolute pressure sensor</li> </ul>	<ul style="list-style-type: none"> <li>● Power supply</li> <li>● Ignition switch-IG</li> <li>● Ignition switch-ST</li> <li>● A/C switch</li> <li>● A/C load signal</li> <li>● A/C pressure sensor</li> <li>● Power steering fluid pressure switch</li> <li>● Alternator FR terminal</li> <li>● Accelerator pedal position switch</li> <li>● Accelerator pedal position sensor (main)</li> <li>● Accelerator pedal position sensor (sub)</li> <li>● Inhibitor switch</li> </ul>	⇒ Engine-A/T-ECU ● Barometric pressure sensor	<ul style="list-style-type: none"> <li>★ 1 Oil control valve</li> <li>★ 2 Throttle valve control servo</li> <li>★ 3 Injector</li> <li>★ 4 EGR valve (Stepper motor)</li> <li>★ 5 Purge control solenoid valve</li> </ul>	<ul style="list-style-type: none"> <li>● Engine control relay</li> <li>● Fuel pump relay</li> <li>● A/C compressor relay</li> <li>● Throttle valve control servo relay</li> <li>● Ignition coil</li> <li>● Fan controller</li> <li>● Engine warning lamp</li> <li>● Diagnosis output</li> <li>● Alternator G terminal</li> <li>● Tachometer</li> <li>● Oxygen sensor (front)</li> <li>● Oxygen sensor (rear)</li> </ul>
---	--	--	--	---

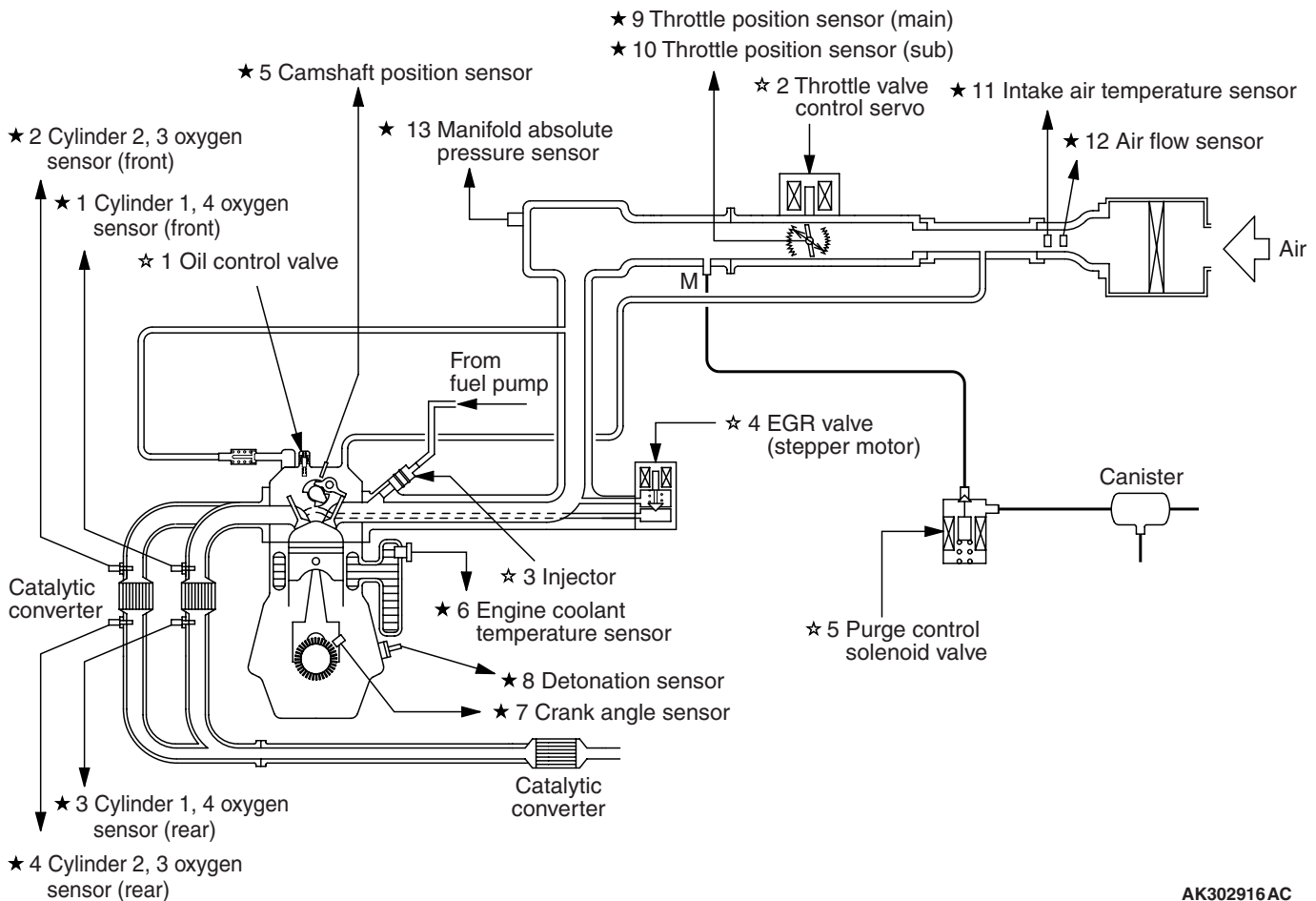


AK401342 AB

**NOTE:** The evaporative emission ventilation solenoid valve [always OPEN (OFF)], fuel tank differential pressure sensor, fuel level gauge, fuel temperature sensor are not used for engine control.

## &lt;Vehicles for Australia and New Zealand&gt;

<ul style="list-style-type: none"> <li>★ 1 Cylinder 1, 4 oxygen sensor (front)</li> <li>★ 2 Cylinder 2, 3 oxygen sensor (front)</li> <li>★ 3 Cylinder 1, 4 oxygen sensor (rear)</li> <li>★ 4 Cylinder 2, 3 oxygen sensor (rear)</li> <li>★ 5 Camshaft position sensor</li> <li>★ 6 Engine coolant temperature sensor</li> <li>★ 7 Crank angle sensor</li> <li>★ 8 Detonation sensor</li> <li>★ 9 Throttle position sensor (main)</li> <li>★ 10 Throttle position sensor (sub)</li> <li>★ 11 Intake air temperature sensor</li> <li>★ 12 Air flow sensor</li> <li>★ 13 Manifold absolute pressure sensor</li> </ul>	<ul style="list-style-type: none"> <li>● Power supply</li> <li>● Ignition switch-IG</li> <li>● Ignition switch-ST</li> <li>● A/C switch</li> <li>● A/C load signal</li> <li>● A/C pressure sensor</li> <li>● Power steering fluid pressure switch</li> <li>● Alternator FR terminal</li> <li>● Accelerator pedal position switch</li> <li>● Accelerator pedal position sensor (main)</li> <li>● Accelerator pedal position sensor (sub)</li> <li>● Inhibitor switch</li> </ul>	<div style="border: 1px solid black; padding: 5px; text-align: center;">             Engine-A/T-ECU              ● Barometric pressure sensor           </div>	<ul style="list-style-type: none"> <li>★ 1 Oil control valve</li> <li>★ 2 Throttle valve control servo</li> <li>★ 3 Injector</li> <li>★ 4 EGR valve (Stepper motor)</li> <li>★ 5 Purge control solenoid valve</li> </ul>	<ul style="list-style-type: none"> <li>● Engine control relay</li> <li>● Fuel pump relay</li> <li>● A/C compressor relay</li> <li>● Throttle valve control servo relay</li> <li>● Ignition coil</li> <li>● Fan controller</li> <li>● Engine warning lamp</li> <li>● Diagnosis output</li> <li>● Alternator G terminal</li> <li>● Tachometer</li> <li>● Cylinder 1, 4 oxygen sensor (front)</li> <li>● Cylinder 2, 3 oxygen sensor (front)</li> <li>● Cylinder 1, 4 oxygen sensor (rear)</li> <li>● Cylinder 2, 3 oxygen sensor (rear)</li> </ul>
--	--	--	--	--





**LIST OF COMPONENT FUNCTIONS**

<b>Name</b>		<b>Function</b>
ECU	Engine-A/T-ECU	The signals that are input by the sensors enable the actuators to be controlled in accordance with the driving conditions.
Sensors	Ignition switch-IG	This signal indicates the ON/OFF condition of the ignition switch. When this signal is input, the Engine-A/T-ECU supplies power to the crank angle sensor, camshaft position sensor, etc.
	Ignition switch-ST	This signal indicates that the engine is cranking. Based on this signal, the Engine-A/T-ECU controls the fuel injection, throttle valve position, and the injection timing that are suited for starting the engine.
	Air flow sensor (AFS)	This signal, which indicates the intake air flow rate (mass), is input into the Engine-A/T-ECU. Based on the signals from this sensor, the Engine-A/T-ECU effects fuel injection control.
	Barometric pressure sensor	This sensor detects the altitude of the vehicle. It enables the Engine-A/T-ECU to make fuel injection volume corrections in order to achieve an appropriate air-fuel ratio.
	Manifold absolute pressure sensor	The intake pipe pressure is detected and input the engine-A/T-ECU. The engine-A/T-ECU controls the fuel injection based on this signal. Detects the internal pressure changes of intake manifold in accordance with the exhaust gas recirculation valve opening or closing. Performs the self-diagnostics of exhaust gas recirculation systems.
	Oxygen sensor	This sensor, which contains zirconia and platinum electrodes, detects the level of oxygen concentration in the exhaust gases. The Engine-A/T-ECU determines whether the air-fuel ratio is at the optimal stoichiometric ratio in accordance with this oxygen concentration level.
	Intake air temperature sensor	This sensor, which contains a thermistor, detects the temperature of the intake air. The Engine-A/T-ECU makes fuel injection volume corrections that suit the intake air temperature, in accordance with the voltage that is output by this sensor.
	Engine coolant temperature sensor	This sensor, which contains a thermistor, detects the temperature of the engine coolant. The Engine-A/T-ECU determines the warm-up condition of the engine in accordance with the voltage that is output by this sensor, in order to control the fuel injection volume, idle speed, and ignition timing.
	Throttle position sensor (TPS) <main, sub>	This sensor detects the position of the throttle valve and inputs it into the Engine-A/T-ECU. Based on the voltage that is output by this sensor, the Engine-A/T-ECU effects throttle valve feedback control.
	Accelerator pedal position sensor (APS) <main, sub>	This sensor detects the position of the accelerator and inputs it into the Engine-A/T-ECU. Based on the voltage that is output by this sensor, which determines the accelerator position (and the intention of the driver), the Engine-A/T-ECU effects appropriate fuel injection and throttle valve position controls.
	Camshaft position sensor	This sensor detects the top-dead-center (TDC) of the compression stroke of each cylinder.

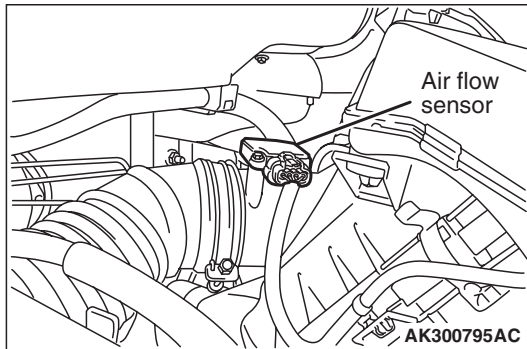
Name		Function
Sensors	Crank angle sensor	This sensor detects the crank angle and inputs it into the Engine-A/T-ECU. The Engine-A/T-ECU effects injector control and other controls in accordance with the signals received from this sensor.
	Detonation sensor	This sensor, which contains a piezoelectric element, detects the vibration of the cylinder block that results from knocking. The Engine-A/T-ECU detects only the knocking of the engine from these vibrations, in order to retard the ignition timing in accordance with the strength of the knocks.
	Power steering fluid pressure switch	This is a contact point type switch that detects the load on the power steering.
	A/C switch	Detects the ON/OFF condition of the A/C.
	A/C load signal	A/C inputs the drive state of the compressor (low load/high load) to the engine-A/T-ECU. The engine-A/T-ECU controls the A/C idle-up engine speed using this signal.
	A/C pressure sensor	A/C detects the refrigerant pressure and inputs the load of the A/C compressor to the engine-A/T-ECU.
	Alternator FR terminal	This terminal is used for detecting the duty cycle ratio that energizes the alternator field coil.
	Inhibitor switch	This is a contact point type switch that inputs a signal into the Engine-A/T-ECU to determine whether the shift lever is in the neutral position.

<b>Name</b>		<b>Function</b>
Actuators	Engine control relay	This relay turns ON and OFF the Engine-A/T-ECU power circuit.
	Throttle valve control servo relay	This relay turns ON and OFF the actuation power circuit for the throttle valve control servo in the Engine-A/T-ECU.
	Injector	The injectors inject fuel in accordance with the injection signals received from the Engine-A/T-ECU.
	Ignition coil (with power transistor)	Applies ignition coil primary current intermittently in accordance with the ignition signals received from the Engine-A/T-ECU, in order to generate high voltage for ignition.
	Fuel pump relay	Controls the power supplied to the fuel pump in accordance with the signals received from the Engine-A/T-ECU.
	A/C relay	Controls the operation of the A/C compressor in accordance with the signals received from the Engine-A/T-ECU.
	Purge control solenoid valve	Controls the flow rate of the purge air introduced into the surge tank in accordance with the signals received from the Engine-A/T-ECU.
	EGR valve (stepper motor)	Controls the EGR flow rate in accordance with the signals received from the Engine-A/T-ECU.
	Alternator G terminal	Controls the amount of current generated by the alternator in accordance with the signals received from the Engine-A/T-ECU.
	Fan controller	Controls the speed of the radiator fan and the condenser fan steplessly in accordance with the signals received from the Engine-A/T-ECU.
	Throttle valve control servo	Controls the throttle valve position in accordance with the signals received from the Engine-A/T-ECU.
	Oil control valve (OCV)	The oil control valve, which is actuated by the signals received from the Engine-A/T-ECU, changes the valve timing.
	Engine warning lamp (check warning lamp)	Illuminates to notify the driver of any abnormalities when a problem occurs with any of the sensors.
	Oxygen sensor heater	Turns ON and OFF the oxygen sensor heater circuit in accordance with the signals received from the Engine-A/T-ECU.

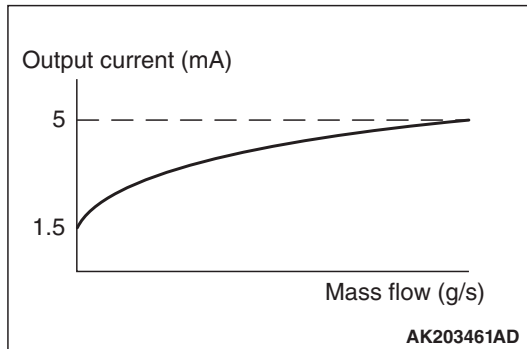
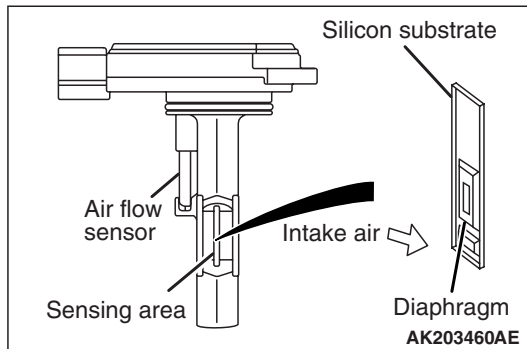
## SENSOR

M2132001000286

### AIR FLOW SENSOR



A heat-sensing type air flow sensor has been adopted. In contrast to the Karman vortex air flow sensor, which detects the volumetric flow rate of air, this type utilizes the flow speed dependence characteristics of heat transmission to detect the mass flow rate of air, converts it into an amperage, and outputs it to the Engine-A/T-ECU.



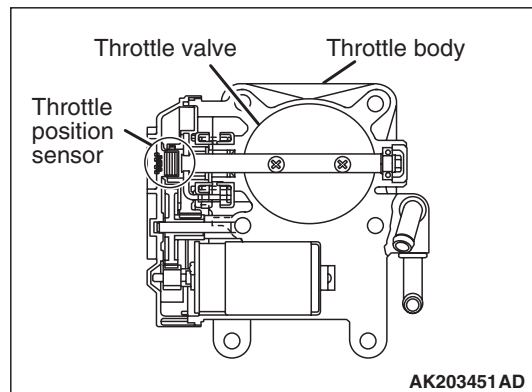
The sensing portion consists of an ultra-compact, heat-sensing membrane resistor. The Engine-A/T-ECU regulates the amperage in order to maintain a constant temperature in the heat-sensing resistor. When the mass flow rate of air increases, the heat transmission from the heat-sensing resistor to the air also increases. Therefore, the amperage that is regulated by the Engine-A/T-ECU increases. Because the heat transmission rate and the amperage are proportionate, the Engine-A/T-ECU is able to

measure the air flow rate based on the amperage. The use of the ultra-compact membrane resistor, which provides the same high-speed response as the Karman vortex air flow sensor, enabled the compact and lightweight sensor to be installed in the air intake hose.

### BAROMETRIC PRESSURE SENSOR

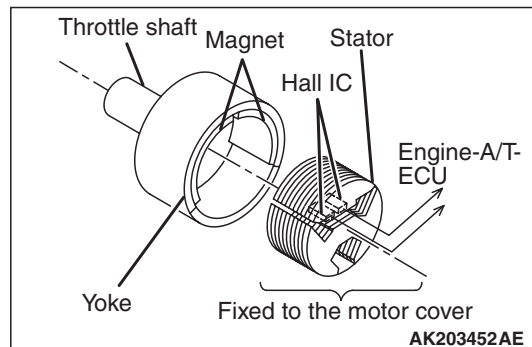
This sensor has been changed to a type that is built into the Engine-A/T-ECU.

### THROTTLE POSITION SENSOR

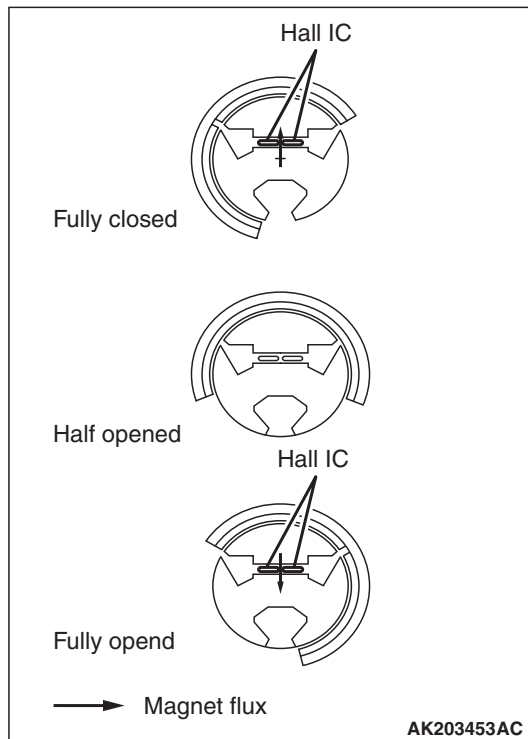


The throttle position sensor, which is located in the throttle body, outputs a voltage signal, which corresponds to the rotational angle of the throttle shaft, to the Engine-A/T-ECU. In accordance with this signal, the Engine-A/T-ECU effects feedback control of the throttle valve control servo. This throttle position sensor uses a non-contact Hall IC to enhance its reliability.

### CONSTRUCTION AND SYSTEM



The throttle position consists of a permanent magnet fixed to the throttle shaft, a Hall IC that outputs electrical voltage in accordance with the magnetic flux density, and a stator that effectively guides the magnetic flux from the permanent magnet into the Hall IC.



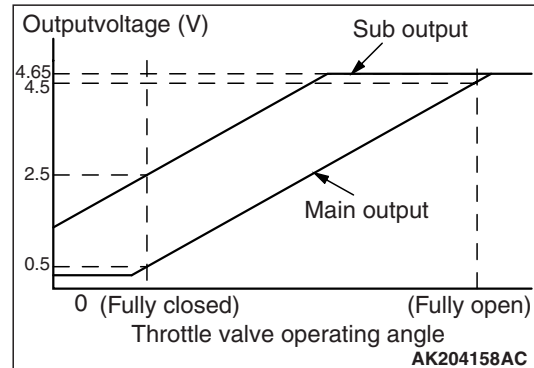
The magnetic flux density that passes into the Hall IC when the throttle valve is fully closed is kept to a maximum in the above direction on this paper.

As the result of this, the electrical voltage is minimal output.

The magnetic flux density is zero when the throttle valve is half opened.

The magnetic flux density that passes into the Hall IC when the throttle valve is fully opened is kept to maximum in the below direction on this paper.

As the result of this, the electrical voltage is maximal output.

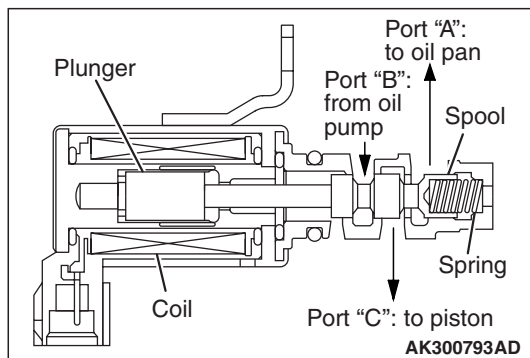


The throttle position sensor outputs through two systems (main and sub). This improves the accuracy of the system to detect malfunctions and reinforces the failsafe function in order to ensure reliability.

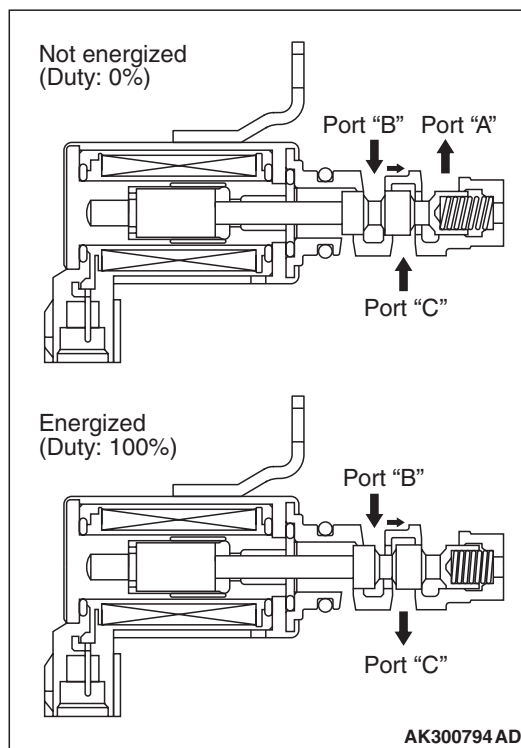
## ACTUATOR

M2132002000096

## OIL CONTROL VALVE



The oil control valve, which consists of a solenoid valve that operates under duty cycle control, is mounted to the cylinder head and used in hydraulic pressure control for switching the cams.



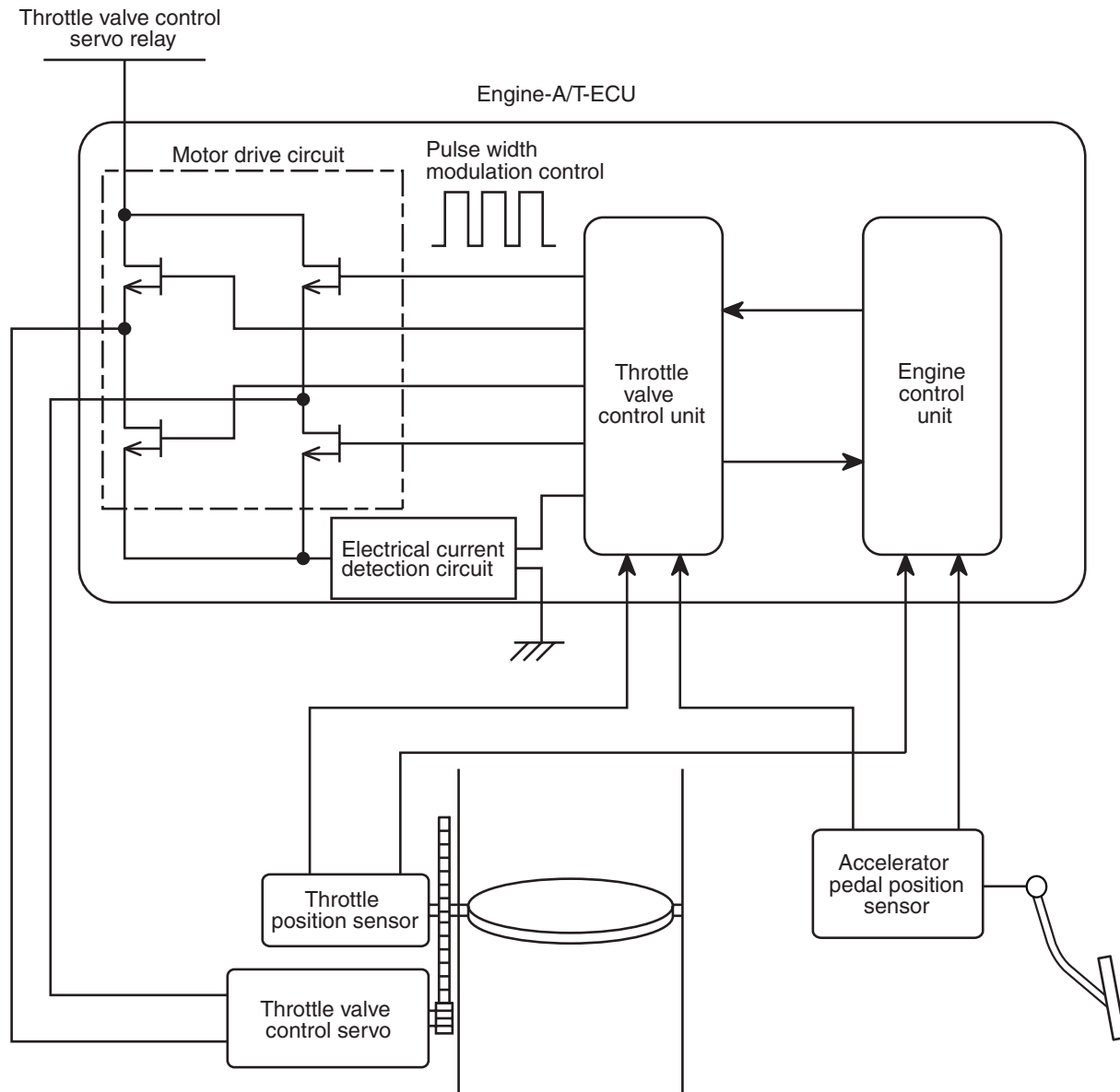
When the coil of the oil control valve is not energized (duty cycle ratio: 0%), port B closes, ports A and C open to each other, causing the oil that was acting on the cam switching control piston to be discharged from port C via port A. When the coil is energized (duty cycle ratio: 100%), the spool valve moves, port A closes, and ports B and C are open to each other. The oil that is pumped by the oil pump flows via ports B and C and acts on the cam switching control piston.

## THROTTLE VALVE OPENING ANGLE CONTROL

M2132015000171

- The electronically controlled throttle valve system electronically regulates the throttle valve opening. The engine control unit in the Engine-A/T-ECU monitors the amount of the accelerator pedal travel through the accelerator pedal position sensor and issues premapped target throttle valve opening values to the throttle valve control servo unit in the Engine-A/T-ECU in accordance with operating conditions. Thus, the throttle valve control servo unit achieves the target throttle valve opening by controlling the current supplied to the throttle valve control servo, which is attached to the throttle body.
- This system also controls the idle speed in addition to controlling the throttle valve opening. Thus, the previously used idle speed control (ISC) motor has been disconnected.

## SYSTEM CONFIGURATION DIAGRAM



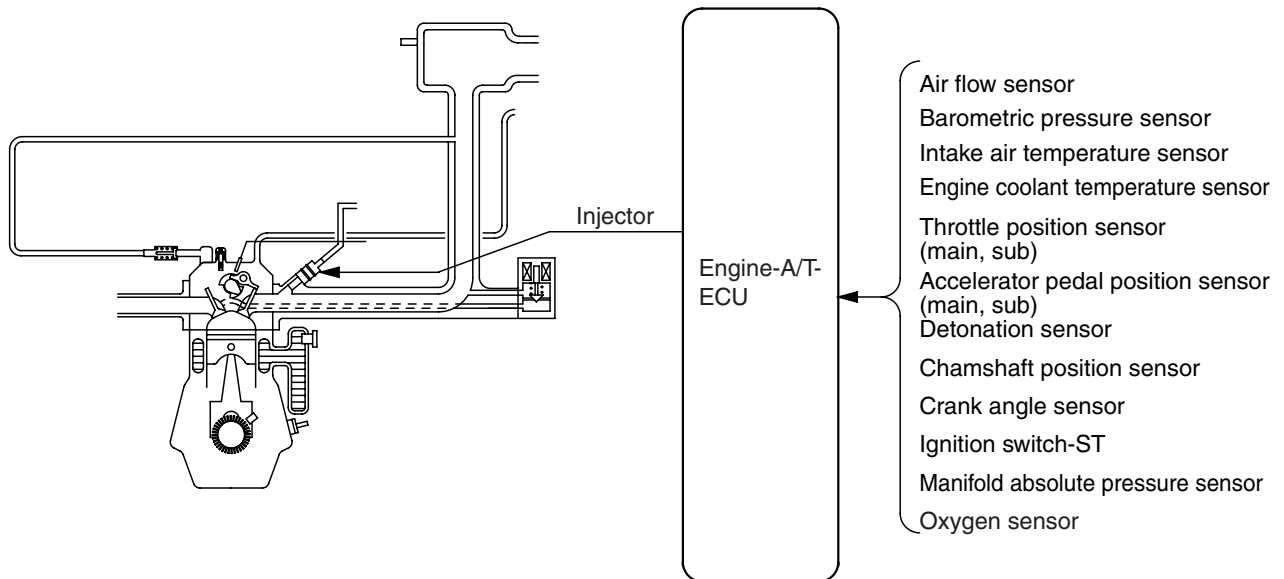


## FUEL INJECTION CONTROL

M2132003000691

The fuel injection of the 4G69-SOHC MIVEC engine is controlled by a system that is essentially the same as the system for the OUTLANDER 4G63-DOHC engine.

### SYSTEM CONFIGURATION DIAGRAM



AK401343AB

### OXYGEN SENSOR <Vehicles for Australia and New Zealand>

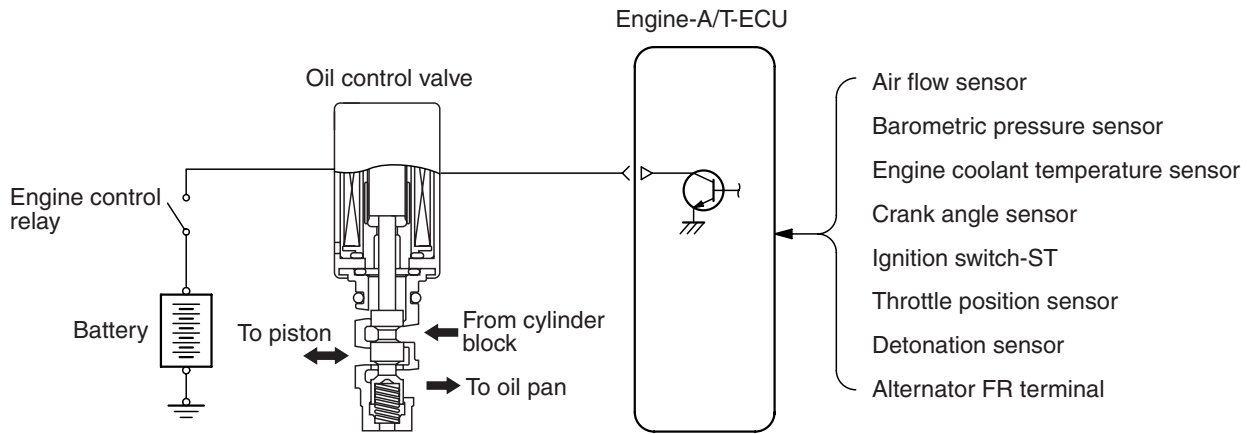
The oxygen sensors detect the level of oxygen concentration in the exhaust gases. A total of four front and rear oxygen sensors are installed in front and back of the dual manifold catalytic converter (MCC), respectively. The Engine-A/T-ECU uses the output signal of the front oxygen sensor for each MCC to

effect closed-loop control, and uses the output signal of the rear oxygen sensor in order to make corrections to the output signal of the front oxygen sensor. By resolving the output signal deviations associated with the deterioration of the front oxygen sensor, this system is able to effect a level of exhaust gas control that is higher than in the past.

## VARIABLE INDUCTION CONTROL

M2132017000081

This system uses a low-speed cam to actuate the intake valve during low engine speeds, and a high-speed cam to actuate the intake valve during high engine speeds. As a result, this system realizes further improvement in low-speed torque and high-speed power output over the conventional engine.



AK300245AH

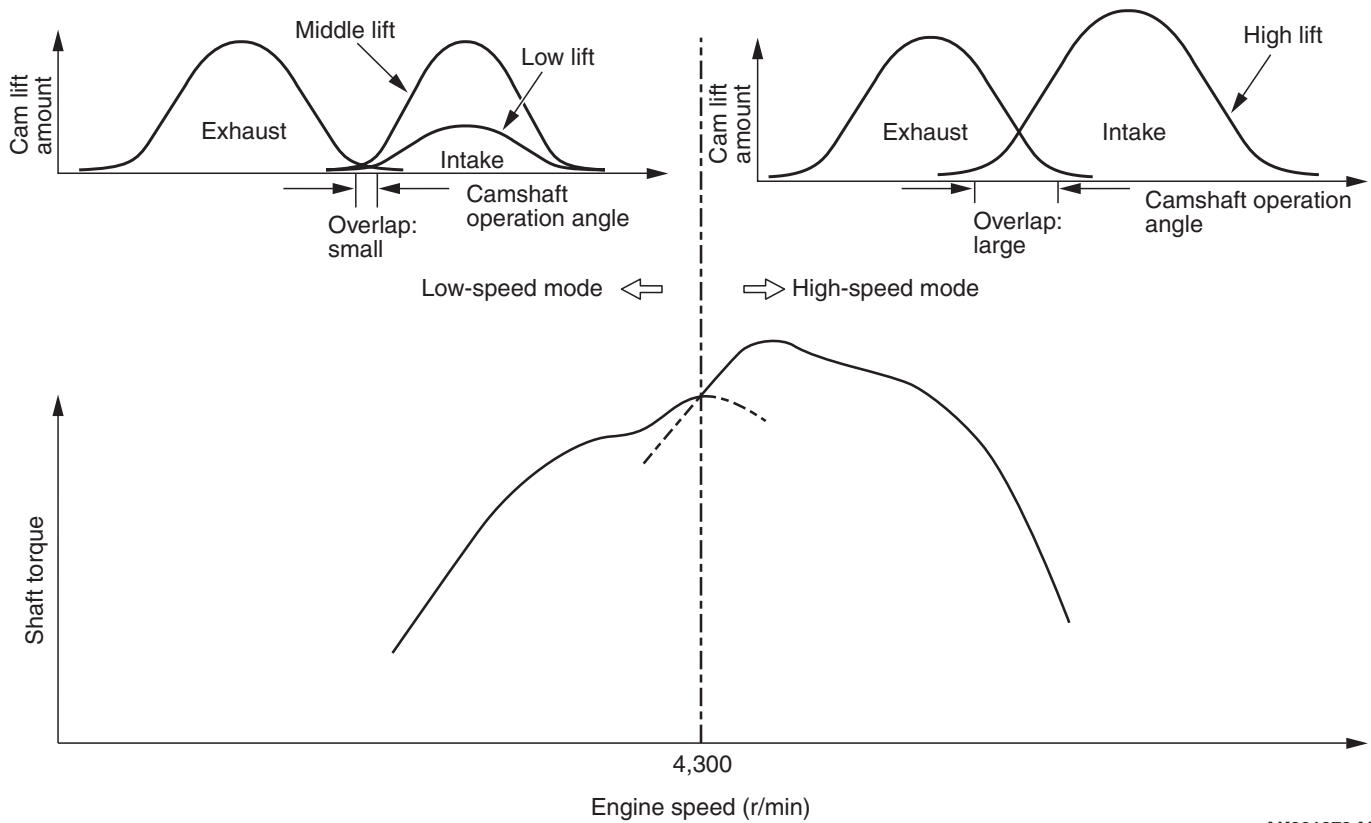
The low-speed cam has a shorter valve overlap and valve-opening duration, and possesses characteristics that are well-suited to low-speed operations in which the intake air inertia is small. The high-speed cam has a longer valve overlap and valve-opening duration, and possesses characteristics that are well-suited to high-speed operations in which the intake air inertia is large. When the engine is operating at low speeds (below 4,300 rpm), the oil control valve is OFF (duty cycle ratio: 0%). Therefore, the cam switching control piston remains down, allowing the intake valve to be actuated by the low-speed cam. The low-speed cam consists of two cams with different valve lifts, and the two cams actuate one intake valve each. For this reason, a difference is

created between the valve lifts, creating a more powerful flow of air-fuel mixture and stabilizing combustion in the cylinder. As a result, low fuel consumption, low exhaust gas emissions, and high torque have been realized.

When the engine is operating at high speeds (above 4,300 rpm), the Engine-A/T-ECU turns on the oil control valve (duty cycle ratio: 100% for 2 seconds while switching, and 60% after 2 seconds have elapsed). Consequently, the hydraulic pressure acts on the cam switching control piston, causing the high-speed cam to actuate the intake valve. As a result, the valve opening duration and the valve lift increase, effectively increasing the intake air volume and the power output.

Under the conditions indicated below, the low-speed cam always operates the intake valve:

- Engine coolant temperature below 20° C
- Within 10 seconds upon starting the engine



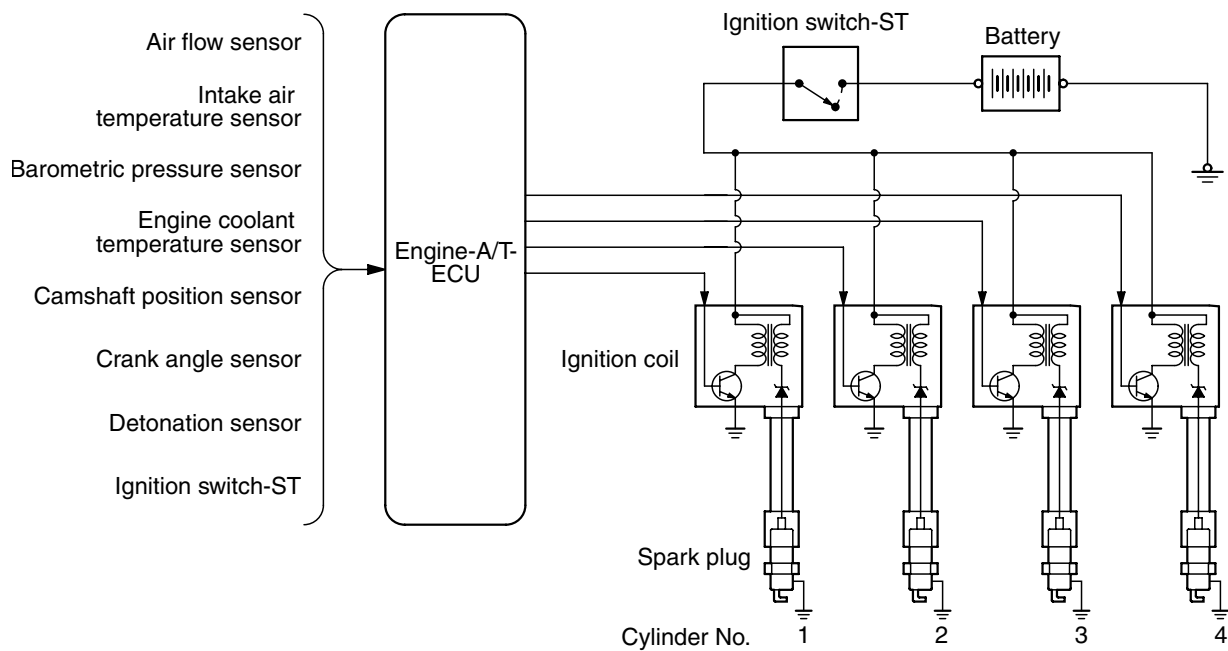
AK301379 AD

## IGNITION TIMING AND DISTRIBUTION CONTROL

M2132005000396

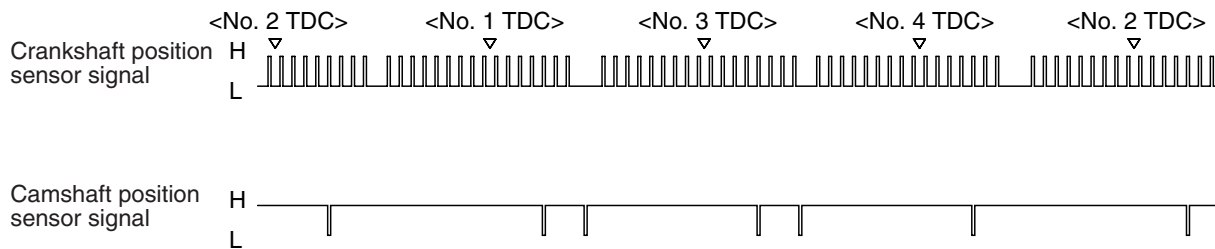
The control arrangement is basically the same as that 4G6-GDI engine using GALANT.

SYSTEM CONFIGURATION DIAGRAM



AK101328AM

IGNITION TIMING CONTROL



Cylinder stroke	Ignition			
No. 1 Cylinder	Compression	Combustion	Exhaust	Intake
No. 3 Cylinder	Intake	Compression	Combustion	Exhaust
No. 4 Cylinder	Exhaust	Intake	Compression	Combustion
No. 2 Cylinder	Combustion	Exhaust	Intake	Compression

AK301362AC

## EGR CONTROL, PURGE CONTROL

M2132011000072

Refer to EMISSION CONTROL SYSTEM

## OTHER CONTROL FUNCTIONS

M2132010000176

The following controls are basically the same as those of the 4G6-MPI engine of the SPACE WAGON:

- Fan motor control
- Power supply
- Fuel pump relay control
- Oxygen sensor heater control
- A/C pressure relay control
- Air flow sensor filter reset control
- Alternator control

## DIAGNOSIS SYSTEM

M2132009000730

Engine-A/T-ECU has been provided with the following functions for easier system inspection.

### FREEZE-FRAME DATA

When the engine-A/T-ECU detects a problem and stores the resulting diagnosis code, the engine condition at that time is also memorized. The M.U.T.-II/III can then be used to analyze this data in order to increase the effectiveness of troubleshooting. The freeze-frame data display items are given below.

Item No.	Data	Unit
12	Air flow sensor	gm/s
13	Intake air temperature sensor	°C
21	Engine coolant temperature sensor	°C
22	Crank angle sensor	r/min
24	Vehicle speed	km/h
44	Ignition advance	deg
81	Long-term fuel compensation (cylinder 1, 4)	%
82	Short-term fuel compensation (cylinder 1, 4)	%
83*	Long-term fuel compensation (cylinder 2, 3)	%
84*	Short-term fuel compensation (cylinder 2, 3)	%
88	Fuel control condition (cylinder 1, 4)	Open loop
		Closed loop
		Open loop owing to drive condition
		Open loop owing to system malfunction
		Closed loop based on one oxygen sensor
89*	Fuel control condition (cylinder 2, 3)	OL
		CL
		OL-DRV.
		OL-SYS.
		CL- HO2S

Item No.	Data	Unit
87	Calculation load value	%
8A	Throttle position sensor (main)	%
—	Diagnosis code during data recording	—

NOTE: \*: Vehicles for Australia and New Zealand

## DIAGNOSIS CODE

The diagnosis and engine warning lamp items are given in the table below.

Code No.	Diagnosis item	Main diagnosis contents	Engine warning lamp
P0100	Air flow sensor system	Open circuit or short-circuit in sensor-related circuits	ON
P0105	Manifold absolute pressure sensor system	Open circuit or short-circuit in sensor-related circuits	ON
P0110	Intake air temperature sensor system	Open circuit in sensor-related circuits	ON
P0115	Engine coolant temperature sensor system	Short-circuit in sensor-related circuits	ON
P0122*	Throttle position sensor (main) circuit low input	Open circuit or short-circuit in sensor-related circuits	ON
P0123*	Throttle position sensor (main) circuit high input	Open circuit in sensor-related circuits	ON
P0125*	Feedback system monitor* <sup>1</sup>	Oxygen sensor not operating	ON
P0130	Cylinder 1, 4 oxygen sensor (front) system* <sup>1</sup>	Abnormal sensor output	ON
P0135	Cylinder 1, 4 oxygen sensor (front) heater system* <sup>1</sup>	Open circuit or short-circuit in heater-related circuits	ON
P0136	Cylinder 1, 4 oxygen sensor (rear) system* <sup>1</sup>	Abnormal sensor output	ON
P0141	Cylinder 1, 4 oxygen sensor (rear) heater system* <sup>1</sup>	Open circuit or short-circuit in sensor-related circuits	ON
P0150	Cylinder 2, 3 oxygen sensor (front) system* <sup>1</sup>	Abnormal sensor output	ON
P0155	Cylinder 2, 3 oxygen sensor (front) heater system* <sup>1</sup>	Open circuit or short-circuit in heater-related circuits	ON
P0156	Cylinder 2, 3 oxygen sensor (rear) system* <sup>1</sup>	Abnormal sensor output	ON
P0161	Cylinder 2, 3 oxygen sensor (rear) heater system* <sup>1</sup>	Open circuit or short-circuit in heater-related circuits	ON
P0170	Abnormal fuel system (cylinder 1, 4)* <sup>1</sup>	Abnormal sensor output	ON
P0173	Abnormal fuel system (cylinder 2, 3)* <sup>1</sup>	Abnormal sensor output	ON

Code No.	Diagnosis item	Main diagnosis contents	Engine warning lamp
P0201	No. 1 injector system	Open circuit or short-circuit in injector-related circuits	ON
P0202	No. 2 injector system	Open circuit or short-circuit in injector-related circuits	ON
P0203	No. 3 injector system	Open circuit or short-circuit in injector-related circuits	ON
P0204	No. 4 injector system	Open circuit or short-circuit in injector-related circuits	ON
P0222*	Throttle position sensor (sub) circuit low input	Open circuit or short-circuit in sensor-related circuits	ON
P0223*	Throttle position sensor (sub) circuit high input	Open circuit in sensor-related circuits	ON
P0300	Ignition coil (power transistor) system* <sup>2</sup>	Abnormal ignition signal (Mis-firing)	ON
P0300	Random / multiple cylinder mis-fire detected* <sup>1</sup>	Abnormal ignition signal (Mis-firing)	ON
P0301	No. 1 cylinder mis-fire detected* <sup>1</sup>	Mis-firing	ON
P0302	No. 2 cylinder mis-fire detected* <sup>1</sup>		
P0303	No. 3 cylinder mis-fire detected* <sup>1</sup>		
P0304	No. 4 cylinder mis-fire detected* <sup>1</sup>		
P0325	Detonation sensor system	Abnormal sensor output	—
P0335	Crank angle sensor system	Abnormal sensor output	ON
P0340	Camshaft position sensor system	Abnormal sensor output	ON
P0403	Exhaust gas recirculation (EGR) control system* <sup>1</sup>	Open circuit or short-circuit in solenoid valve-related circuits	ON
P0421	Warm up catalyst malfunction (cylinder 1, 4)* <sup>1</sup>	Abnormal exhaust gas purification performance of catalyst	ON
P0431	Warm up catalyst malfunction (cylinder 2, 3)* <sup>1</sup>	Abnormal exhaust gas purification performance of catalyst	ON
P0443	Evaporative emission system purge control valve system* <sup>1</sup>	Open circuit or short-circuit in solenoid valve-related circuits	ON
P0500	Vehicles speed signal system	Abnormal sensor output	ON
P0505	Idle speed control (ISC) system* <sup>1</sup>	Intake system vacuum leak	ON
P0513	Immobilizer malfunction <Vehicles for GCC, Australia, New Zealand and South africa>	Open circuit or short-circuit in system-related circuits	—
P0551*	Power steering fluid pressure switch system* <sup>1</sup>	Open circuit or short-circuit in system-related circuits	ON
P0554	Power steering fluid pressure switch circuit intermittent* <sup>1</sup>	Abnormal power steering switch	ON
P0603	EEPROM malfunction	Abnormality in engine-A/T-ECU	ON

Code No.	Diagnosis item	Main diagnosis contents	Engine warning lamp
P0606*	Microcomputer malfunction system	Abnormality in engine-A/T-ECU	ON
P0606*	Engine-A/T-ECU main processor malfunction	Abnormality in engine-A/T-ECU	ON
P0622	Alternator FR terminal circuit malfunction	Open circuit or short-circuit in system-related circuits	–
P0638*	Throttle valve control servo circuit range/performance problem	Abnormal throttle valve control servo	ON
P0642*	Throttle position sensor power supply	Abnormality in engine-A/T-ECU	ON
P0657*	Throttle valve control servo relay circuit malfunction	Open circuit or short-circuit in sensor-related circuits	ON
P0705	Inhibitor switch system* <sup>1</sup>	abnormality in A/T system	ON
P0710	A/T fluid temperature sensor system* <sup>1</sup>	abnormality in A/T system	ON
P0715*	Input shaft speed sensor system* <sup>1</sup>	abnormality in A/T system	ON
P0720*	Output shaft speed sensor system* <sup>1</sup>	abnormality in A/T system	ON
P0740*	Torque converter clutch solenoid valve system* <sup>1</sup>	abnormality in A/T system	ON
P0750*	Low-reverse solenoid valve system* <sup>1</sup>	abnormality in A/T system	ON
P0755*	Underdrive solenoid valve system* <sup>1</sup>	abnormality in A/T system	ON
P0760*	Second solenoid valve system* <sup>1</sup>	abnormality in A/T system	ON
P0765*	Overdrive solenoid valve system* <sup>1</sup>	abnormality in A/T system	ON
P1010	Oil control valve circuit	Open circuit or short-circuit in solenoid valve-related circuits	ON
P1021	Oil control valve circuit* <sup>2</sup>	Open circuit or short-circuit in solenoid valve-related circuits	ON
P1602*	Communication Malfunction (between engine-A/T-ECU main processor and system LSI)	Abnormality in engine-ECU	ON
P1603*	Battery back-up circuit malfunction* <sup>1</sup>	Open circuit or short-circuit in system-related circuits	ON
P1751*	A/T control relay malfunction	Abnormality in A/T system	ON
P2100*	Throttle valve control servo circuit (open)	Open circuit in system-related circuits	ON
P2101*	Throttle valve control servo magneto malfunction	Short-circuit in system-related circuits	ON
P2102*	Throttle valve control servo circuit (shorted low)	Short-circuit in system-related circuits	ON



Code No.	Diagnosis item	Main diagnosis contents	Engine warning lamp
P2103*	Throttle valve control servo circuit (shorted high)	Short-circuit in system-related circuits	ON
P2121*	Accelerator pedal position sensor (main) circuit range/performance problem <Vehicles except for Australia, New Zealand and South africa>	Abnormal sensor output	ON
P2122*	Accelerator pedal position sensor (main) circuit low input	Open circuit or short-circuit in sensor-related circuits	ON
P2123*	Accelerator pedal position sensor (main) circuit high input	Open circuit in sensor-related circuits	ON
P2126	Accelerator pedal position sensor (main) circuit range/performance problem <Vehicles except for Australia, New Zealand and South africa>	Abnormal sensor output	ON
P2127*	Accelerator pedal position sensor (sub) circuit low input	Open circuit or short-circuit in sensor-related circuits	ON
P2128*	Accelerator pedal position sensor (sub) circuit high input	Open circuit in sensor-related circuits	ON
P2135*	Throttle position sensor (main and sub) circuit range/performance problem	Abnormal sensor output	ON
P2138*	Accelerator pedal position sensor (main and sub) circuit range/performance problem	Abnormal sensor output	ON
P2173*	Abnormal intake air amount	Abnormal sensor output	ON
P2226	Barometric pressure sensor system	Abnormality engine-A/T-ECU	ON

*NOTE: When the first time a malfunction is detected, the engine-A/T-ECU does not store a fault code. However, if the same malfunction is again detected the next time the engine is operated, a fault code is stored. For systems or components marked with "\*" to be diagnosed, when the first time a malfunction is detected, a fault code is stored and the engine warning lamp is illuminated.*

*NOTE: \*1: Vehicles for Australia and New Zealand*

*NOTE: \*2: Vehicles except for Australia and New Zealand*

## DATA LIST FUNCTION

The data list items are given in the table below

Item No.	Inspection item	Unit
11	Oxygen sensor (front)* <sup>1</sup>	mV
12	Air flow sensor	g/s
13	Intake air temperature sensor	°C
14	Throttle position sensor (sub)	mV
16	Power supply voltage	V
18	Cranking signal (ignition switch-ST)	ON/OFF

Item No.	Inspection item	Unit
21	Engine coolant temperature sensor	°C
22	Crank angle sensor	r/min
25	Barometric pressure sensor	kPa
26*4	Idle position switch	ON/OFF
27	Power steering fluid pressure switch	ON/OFF
28	A/C switch	ON/OFF
29	Inhibitor switch	P, N/D, 2, L, R
37	Volumetric efficiency	%
39*3	Cylinder 2, 3 oxygen sensor (front)	mV
41	Injectors	ms
44	Ignition advance	° BTDC
49	A/C relay	ON/OFF
59	Oxygen sensor (rear)*2	mV
68	EGR valve	STEP
69*3	Cylinder 2, 3 oxygen sensor (rear)	mV
77	Accelerator pedal position sensor (sub)	mV
78	Accelerator pedal position sensor (main)	mV
79	Throttle position sensor (main)	mV
95	Manifold absolute pressure sensor	kPa
9A	Throttle position sensor (main) mid opening learning valve	mV
12*	Air flow sensor	gm/s
13*	Intake air temperature sensor	°C
21*	Engine coolant temperature sensor	°C
22*	Crank angle sensor	r/min
24*	Vehicle speed sensor	km/h
44*	Ignition advance	deg
81*	Long-term fuel compensation on (No.1, No.4 cylinder)	%
82*	Short-term fuel compensation on (No.1, No.4 cylinder)	%
83*	Long-term fuel compensation on (No.2, No.3 cylinder)	%
84*	Short-term fuel compensation on (No.2, No.3 cylinder)	%
87*	Calculated load valve	%
88*	Fuel control condition on (No.1, No.4 cylinder)	Closed loop/Open loop –drive condition
89*	Fuel control condition on (No.2, No.3 cylinder)	Closed loop/Open loop –drive condition
8A*	Throttle position sensor (main)	%
95*	Manifold absolute pressure sensor	kPa
A1*	Cylinder 1, 4 oxygen sensor (front)	V

Item No.	Inspection item	Unit
A2*	Cylinder 1, 4 oxygen sensor (rear)	V
A3*	Cylinder 2, 3 oxygen sensor (front)	V
A4*	Cylinder 2, 3 oxygen sensor (rear)	V

*NOTE: Items marked "\*" will not appear if a data list is selected in the check mode (Vehicles for Australia and New Zealand).*

*NOTE:*

*\*1: Oxygen sensor <Vehicles except for Brazil, Chili, Australia and New Zealand>*

*Oxygen sensor (front) <Vehicles for Brazil and Chili>*

*Cylinder 1, 4 oxygen sensor (front) <Vehicles for Australia and New Zealand>*

*NOTE:*

*\*2: Oxygen sensor (rear) <Vehicles for Brazil and Chili>*

*Cylinder 1, 4 oxygen sensor (rear) <Vehicles for Australia and New Zealand>*

*NOTE:*

*\*3: Vehicles for Australia and New Zealand*

*NOTE:*

*\*4: Vehicles except for Australia and New Zealand*

## **ACTUATOR TEST FUNCTION**

The actuator test items are given in the table below

Item No.	Inspection item	Drive contents
01	Injectors	Cut fuel to No.1 injector
02		Cut fuel to No.2 injector
03		Cut fuel to No.3 injector
04		Cut fuel to No.4 injector
07	Fuel pump	Fuel pump operates and fuel is recirculated
08	Purge control solenoid valve	Solenoid valve turns from OFF to ON
17	Basic ignition timing	Set to ignition adjustment mode
21	Fan controller	Drive the fan motor
22	Oil control valve	Oil control valve turns from OFF the ON
34	Electronic-controlled throttle valve system	Stop the throttle valve control servo

---

## NOTES