SECTION 1

ENGINE

CONTENTS

General information.....1-1
1. Major specifications 1-2
2. Engine Performance Curve 1-2
Base Engine 1-3
1. Timing belt cover.....1-3
2. Piston 1-3
3. Oil ring 1-3
4. Cylinder head.....1-4
5. Variable Valve Timing (VVT) Control System 1-4
6. VVT sprocket 1-5
7. Cam shaft 1-5
8. Oil control valve (OCV).....1-6
Cooling Equipment.....1-6
Intake and Exhaust Equipment 1-7
1. Air intake system.....1-7
2. Exhaust system 1-8
Fuel System.....1-8
Control System 1-9
1. Sensors 1-11
2. Actuators 1-12
3. Fuel injection control.....1-12
4. Idle speed control 1-13
5. Ignition timing and distribution control 1-13
6. Variable Valve Timing Control System (MIVEC).....1-14
7. Purge control 1-18
8. Self-diagnosis system.....1-18
Electrical equipment.....1-19
Emission Control System 1-20
Throttle 1-21
Throttle pedal.....1-21

General information

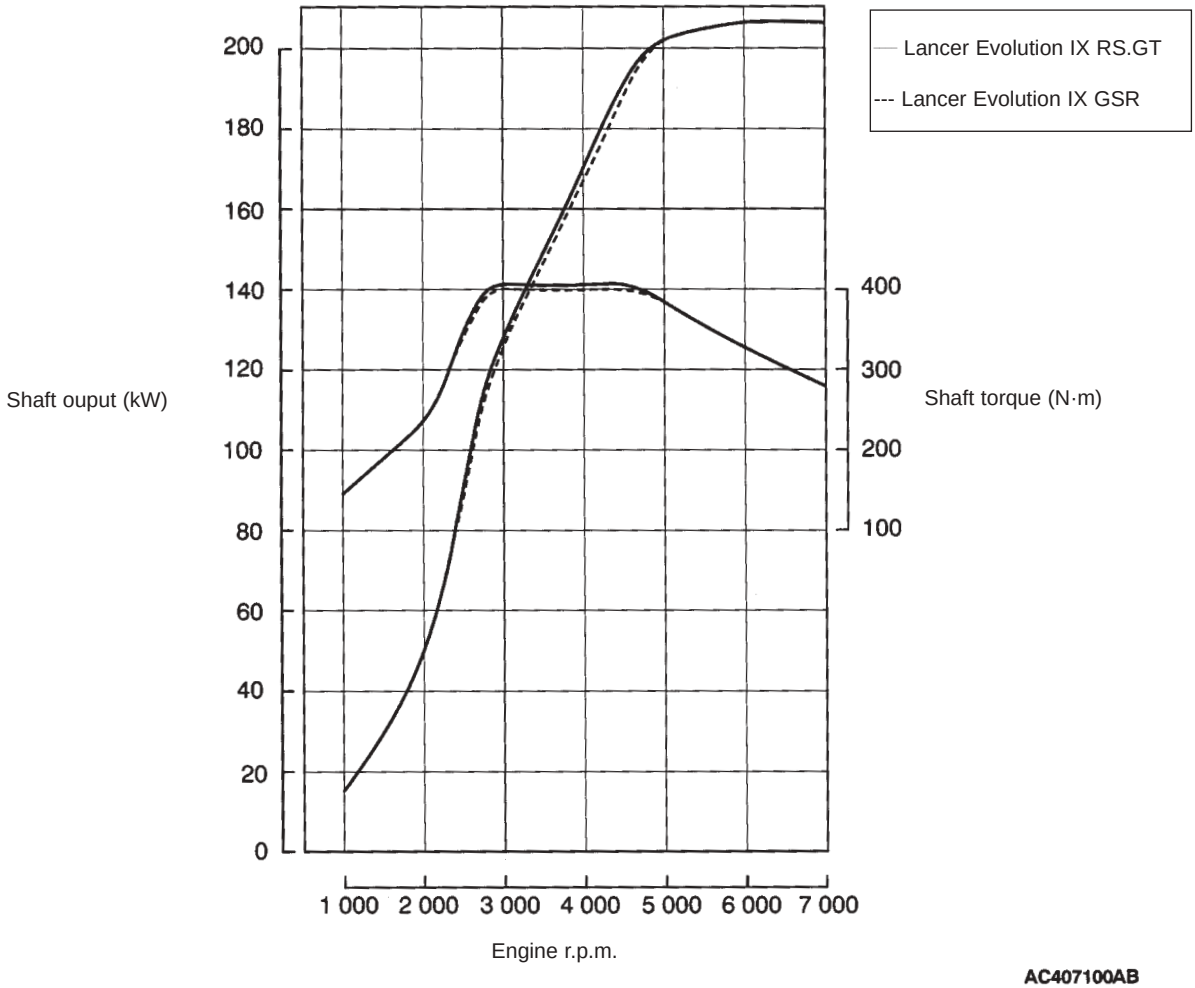
MIVEC has been adopted on the 4G63 engine installed on the Evolution IX.
With Variable Valve Timing (VVT), as well as increasing torque in the low rev range, there are major improvements in fuel consumption and emissions performance
Magnesium alloy has been used for the turbocharger compressor wheel – a world first. This has resulted in improved response. (GSR : option, GT/RS : standard)
Measures to cope with the increased output include higher levels of durability and reliability.

Other changes:
• Timing belt cover shape change
• Use of high strength pistons
• 2-piece oil rings
• Change to shape of cooling water tank using long reach plugs
• Finer cooling water temperature control using bottom by-pass type mechanism
• Use of long reach type spark plugs

1. Main Specifications

Item	GSR	GT, RS
Total displacement cc	1,997	
Combustion chamber	Pent roof type	
Bore and stroke mm	85.0 x 88.0	
Compression ratio	8.8	
Camshaft arrangement	DOHC-16 valve	
Fuel used	Unleaded premium	
Maximum output (kW/rpm)	206/6 500	
Maximum torque (Nm/rpm)	400/3 000	407/3 000
Fuel system	Electronically controlled multi-point fuel injection	
Ignition system	Electronically controlled two-coil	
Lash adjuster	Fitted	

2. Engine Performance Curve

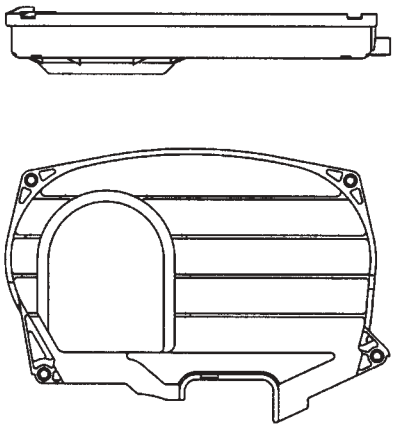


BASE ENGINE

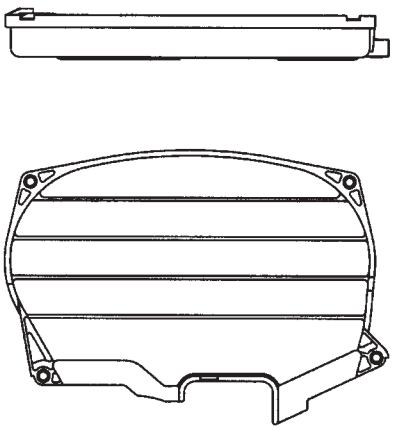
1. Timing belt cover

The timing belt front upper cover now has a V.V.T. (Variable Valve Timing) sprocket, and so the shape has been changed to maintain the correct gap.

New (Lancer Evolution IX)



Base model (Lancer Evolution VIII MR)



AK500002 AB

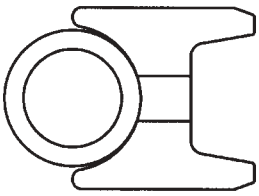
2. Pistons

Durability and reliability have been improved as a result of having used stronger piston material.

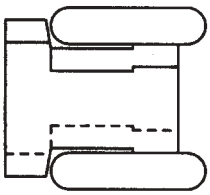
3. Oil rings

Oil consumption is decreased as a result of having used 2-piece oil rings.

New (Lancer Evolution IX)
2-piece



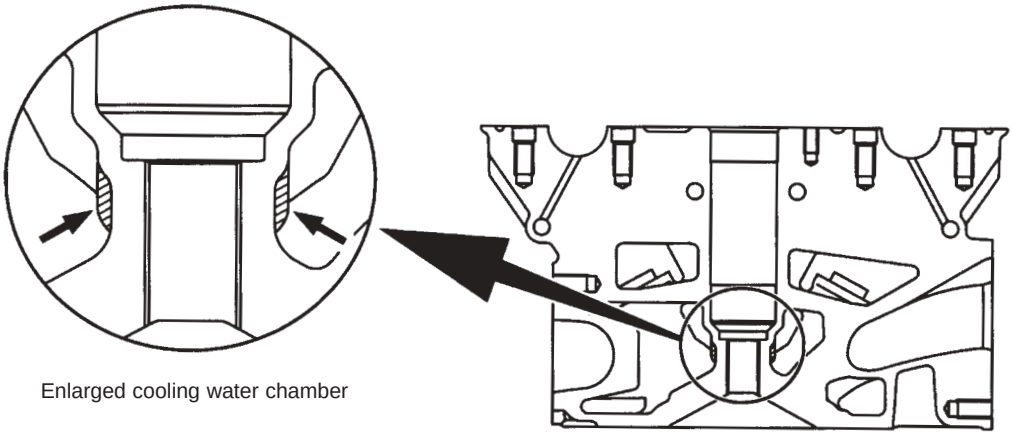
Base model (Lancer Evolution VIII MR)
3-piece



AK500005 AB

4. Cylinder head

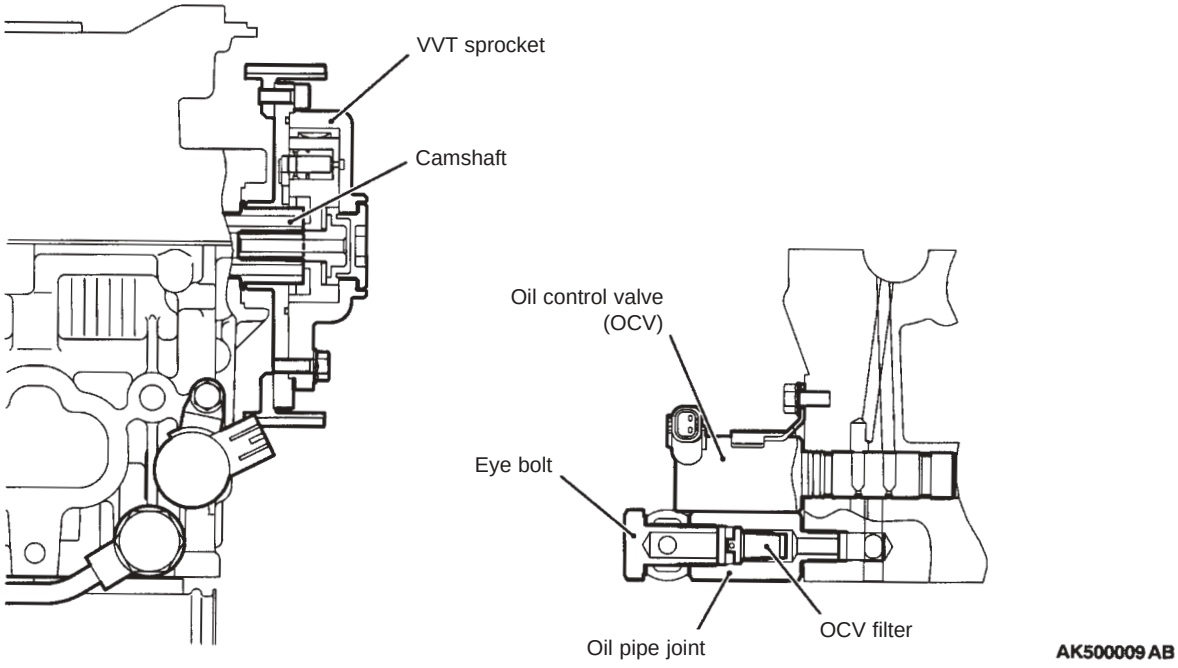
Cooling performance has been improved as a result of increasing the size of the cooling water chamber in the area of high temperature in the combustion chamber around the plugs.



AK500006 AB

5. Variable Valve Timing (VVT) control system

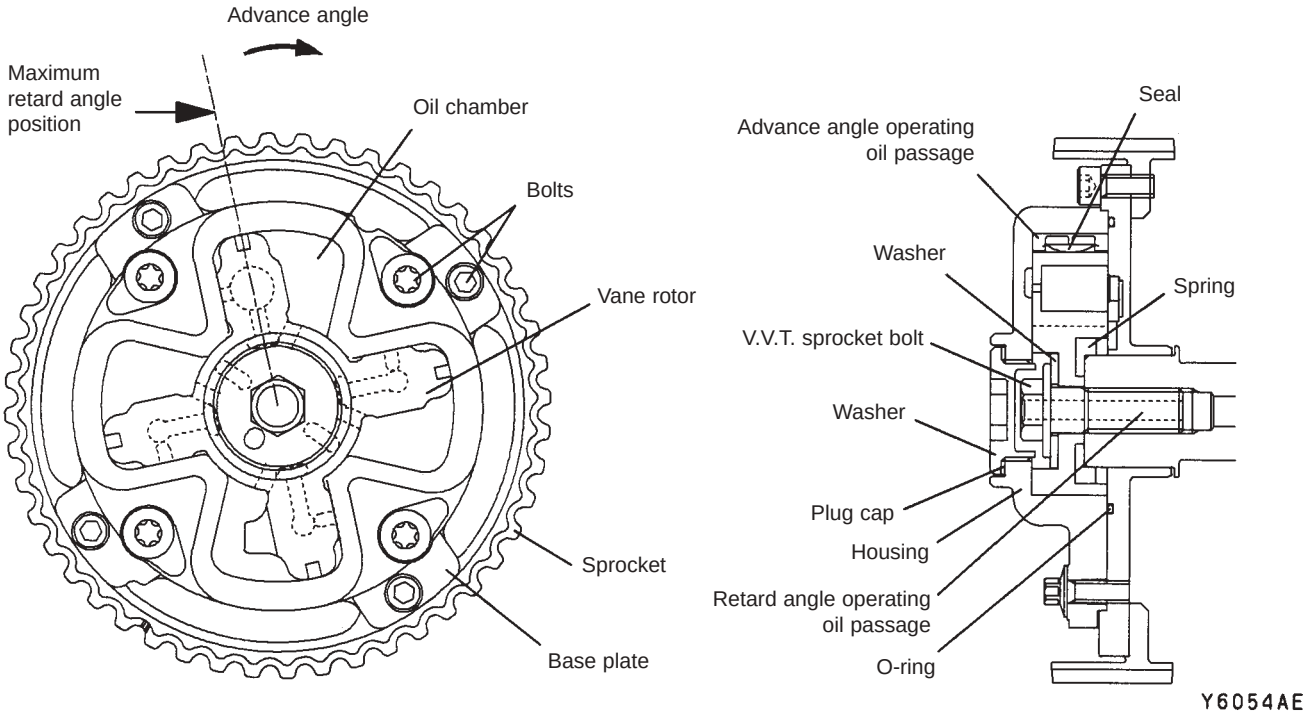
The VVT control system is shown below:



AK500009 AB

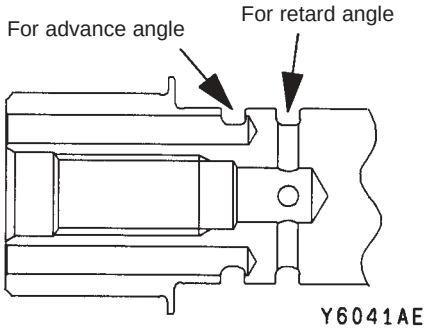
6. VARIABLE VALVE TIMING (VVT) sprocket

The V.V.T. sprocket changes valve timing using hydraulic pressure from the oil control valve to move the vane rotors.



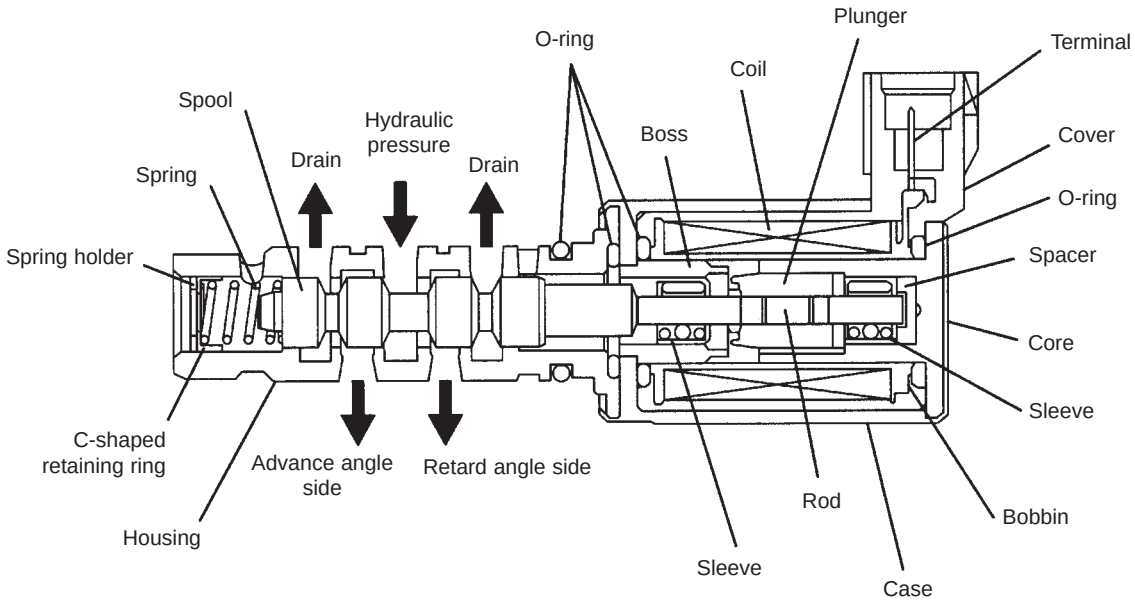
7. Camshaft

Passages have been created in the camshaft to allow hydraulic pressure to be transmitted from the oil control valve to the V.V.T. sprocket.



8. Oil control valve (OCV)

An electromagnetic valve has been used for the oil control valve, to switch hydraulic pressure driven by the V.V.T. sprocket ASSY vane rotors.



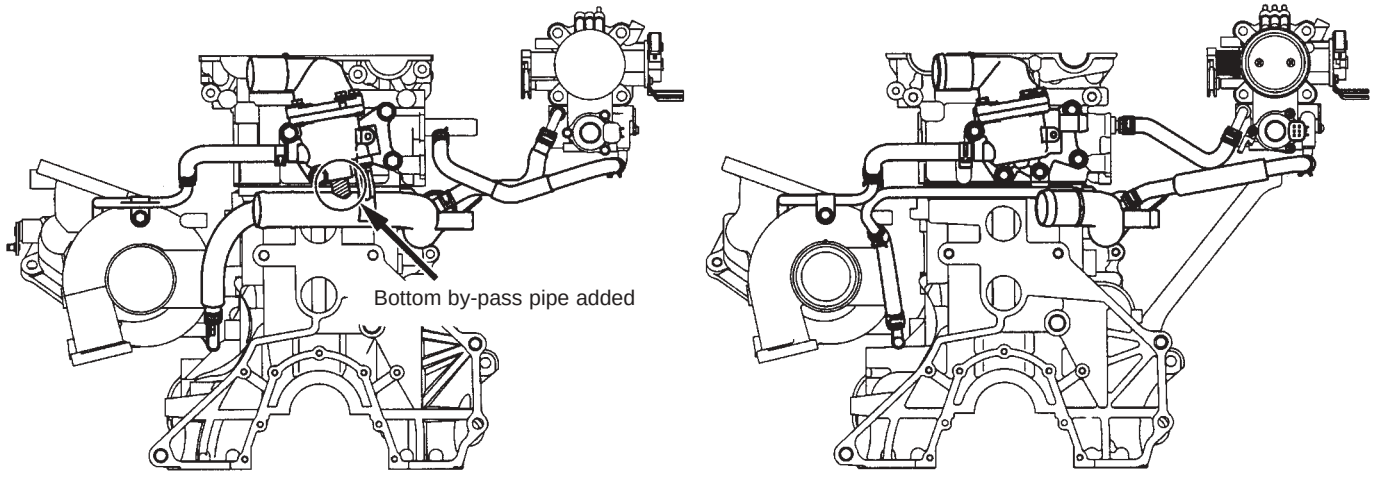
AK201866 AB

COOLING SYSTEM

Water pipes and hoses

As a measure to deal with the increased engine output, a bottom by-pass type has been used, resulting in more effective cooling water temperature control.

New (Lancer Evolution IX) Base model (Lancer Evolution VIII MR)



AK500008 AB

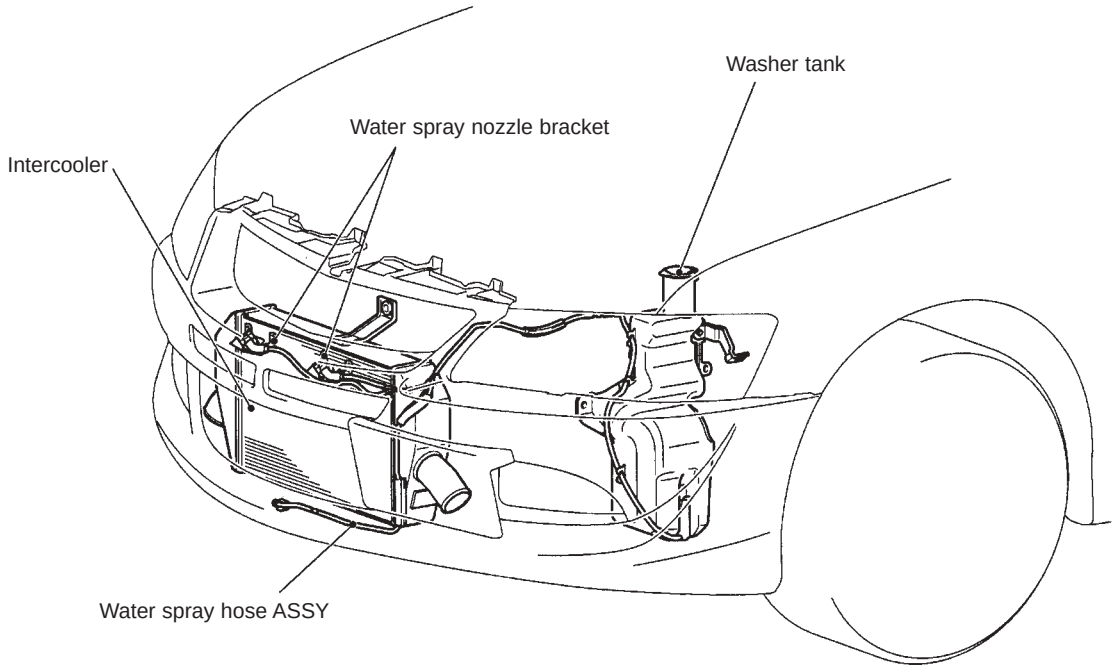
Intake and Exhaust Equipment

1. Intake system

Intercooler water spray

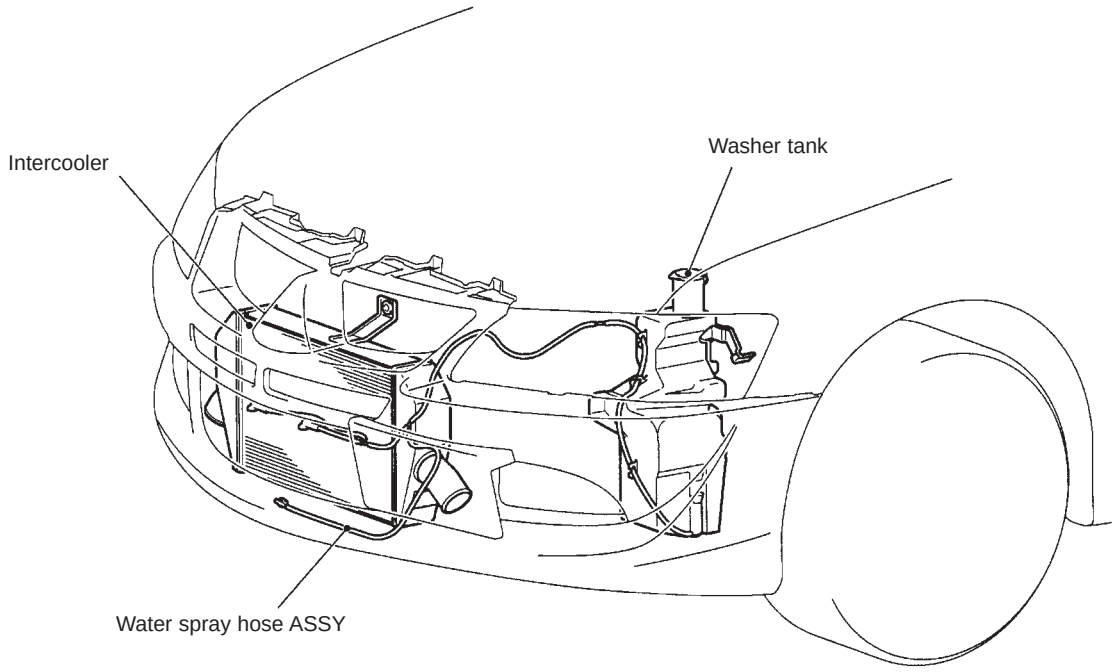
This is basically the same as on the previous Lancer Evolution VIII MR, but the changes which have been made have been accompanied by changes to the front bumper.
• change to water spray hose ASSY
• water spray nozzle bracket added

New (Lancer Evolution IX)



AC406678

Basic model (Lancer Evolution VIII MR)



AC211454

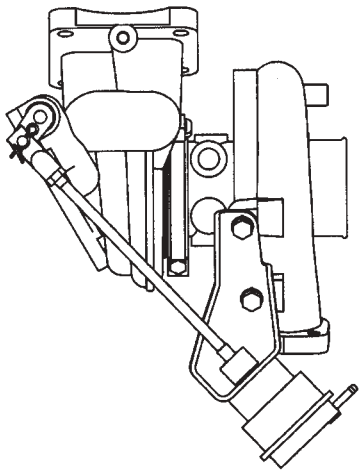
AC407017AB

2. Exhaust system

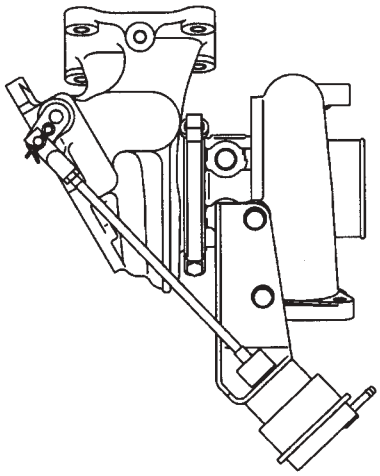
Turbocharger

A magnesium compressor turbocharger has been introduced - a 'world first' for a mass production car.
(GSR : option GT/RS : standard) The result is even better throttle response. Furthermore, the shape of the compressor housing has been changed, making intake smoother, and improved mid and low speed torque.

New (Lancer Evolution IX)



Base model (Lancer Evolution VIII MR)



AK500001 AB

FUEL SYSTEM

The fuel system is basically the same as that on the previous Lancer Evolution VIII MR, but the GT fuel tank capacity is now 55dm^3

Specifications

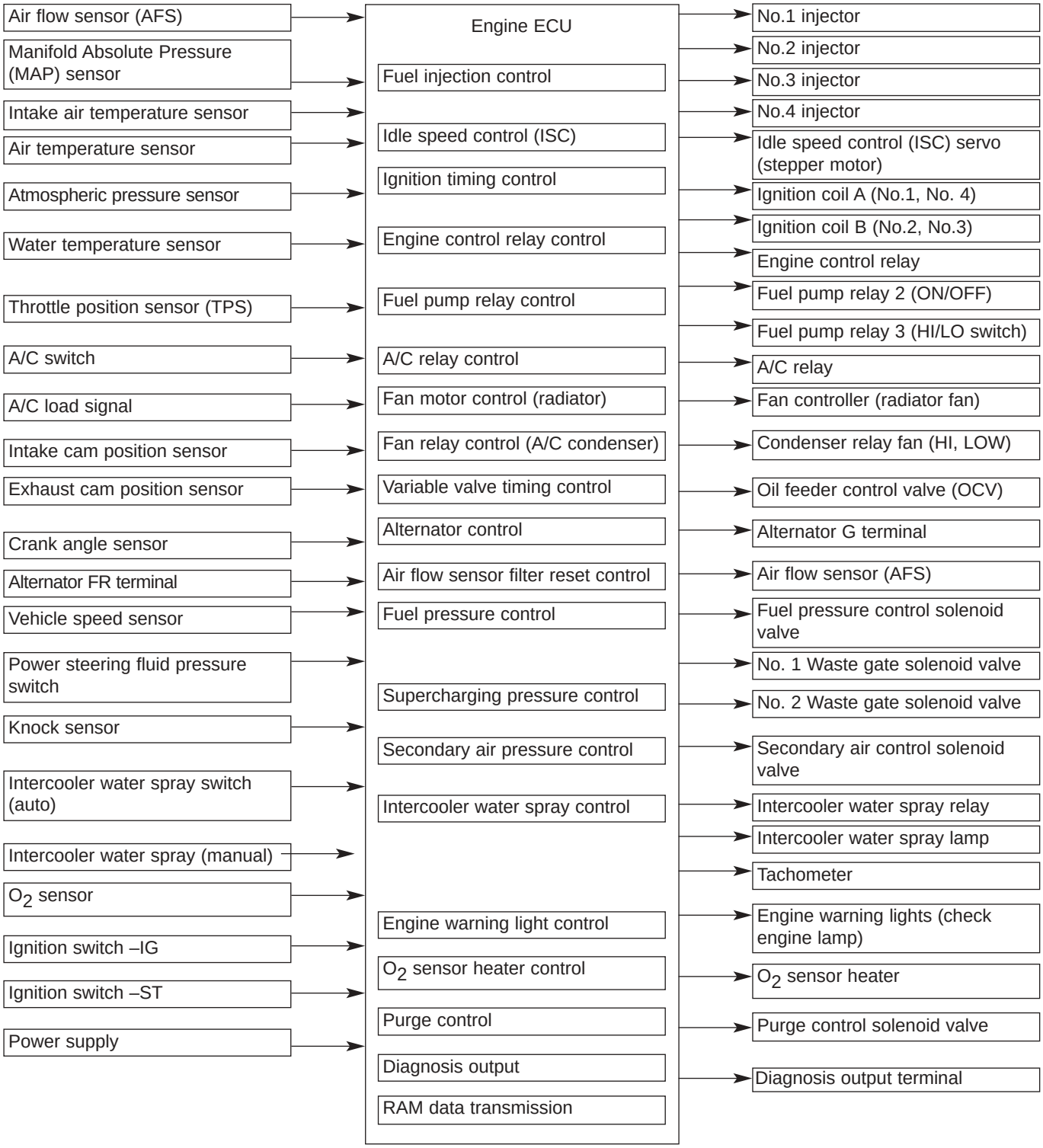
Item		Specifications
Fuel tank capacity dm^3	RS	50
	GT / GSR	55

Control system

Engine control systems in the 4G63-MIVEC-T/C engine installed on the Lancer Evolution IX are based on the controls in the Lancer Evolution VIII MR's 4G63-T/C engine, with the following changes.

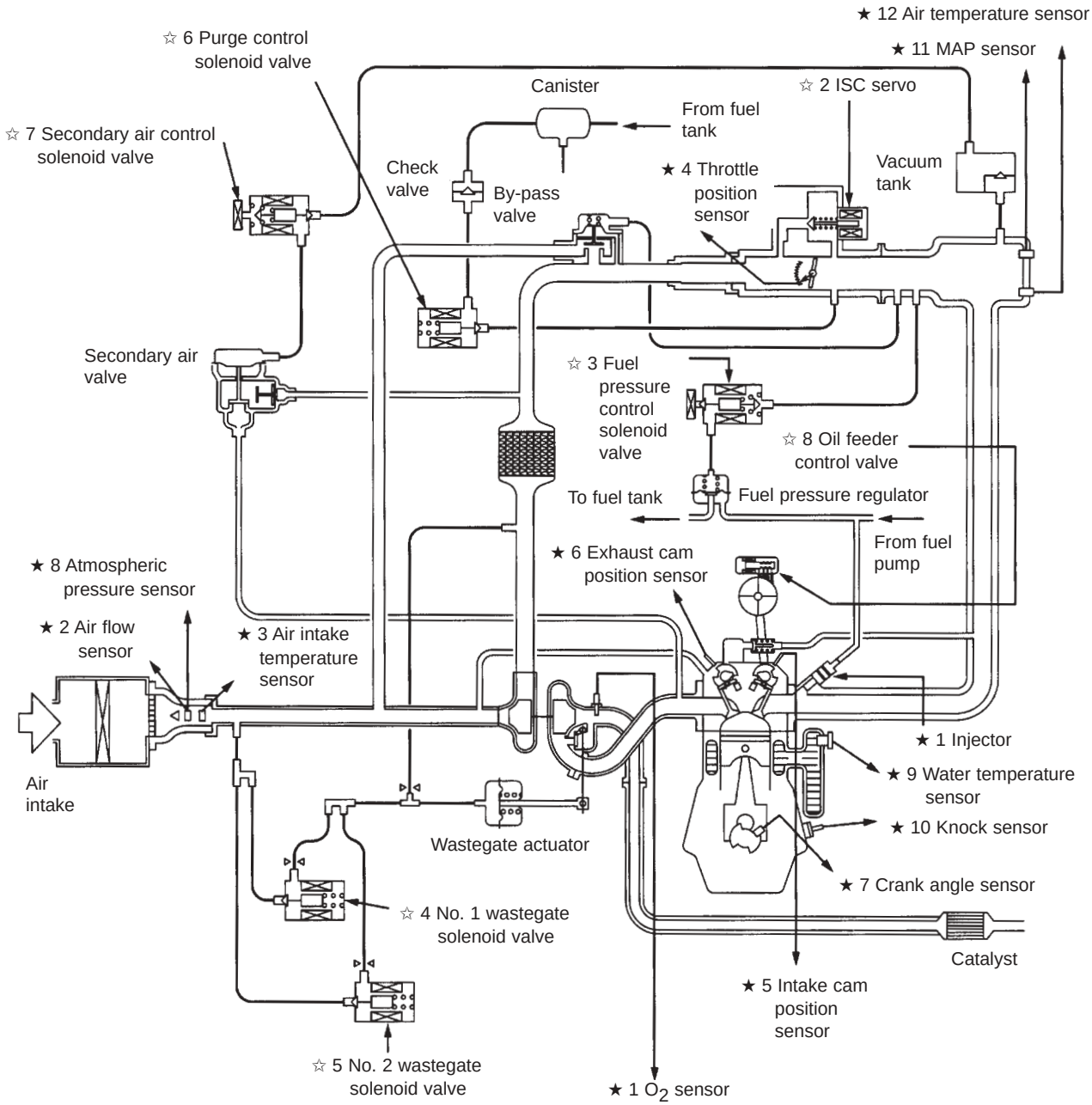
- A variable valve timing control system (MIVEC) has been adopted. This has been accompanied by the addition of an oil feeder control valve (OCV) and intake cam position sensor
- The addition of a Manifold Absolute Pressure (MAP) sensor.
- The addition of a air temperature sensor.

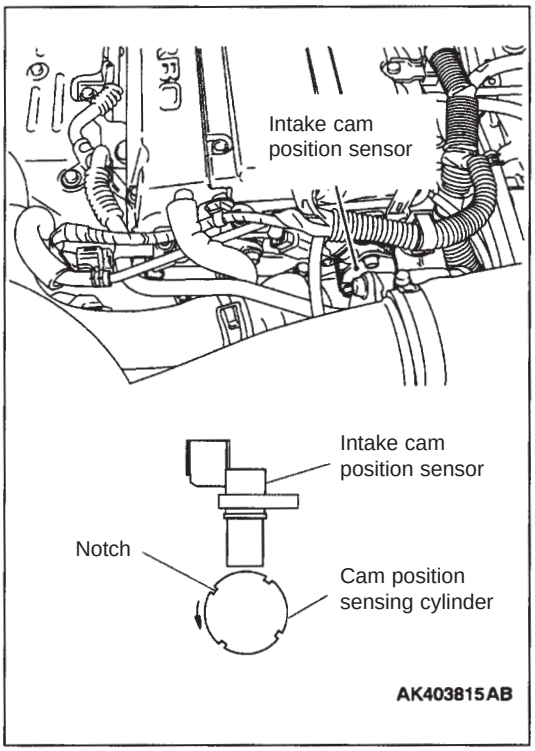
System block diagram



Control system diagram

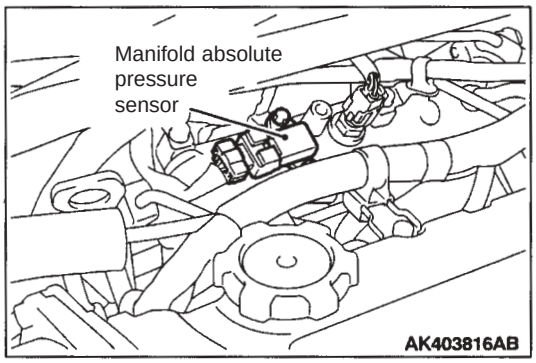
★ 1 Oxygen sensor ★ 2 Air flow sensor ★ 3 Intake air temperature sensor ★ 4 Throttle position sensor ★ 5 Intake cam position sensor ★ 6 Exhaust cam position sensor ★ 7 Crank angle sensor ★ 8 Atmospheric pressure sensor ★ 9 Water temperature sensor ★ 10 Knock sensor ★ 11 Manifold absolute pressure (MAP) sensor ★ 12 Air temperature sensor	• Power supply • Ignition switch-IG • Ignition switch-ST • Vehicle speed sensor • A/C switch • A/C load signal • Power steering fluid pressure switch • Alternator FR terminal • Intercooler water spray switch (Auto) • Intercooler water spray switch (Manual)	⇨ Engine -ECU ⇨	☆ 1 Injector ☆ 2 Idle speed control (ISC) servo (stepper motor) ☆ 3 Fuel pressure control solenoid valve ☆ 4 No. 1 Waste gate solenoid valve ☆ 5 No. 2 Waste gate solenoid valve ☆ 6 Purge control solenoid valve ☆ 7 Secondary air control solenoid valve ☆ 8 Oil feeder control valve	• Engine control relay • Fuel pump relay 2, (ON/OFF) • Fuel pump relay 3, (HI/LO switch) • A/C relay • Ignition coil • Fan controller • Condenser fan relay (HI) • Condenser fan relay (LO) • Engine warning light • Diagnosis output terminal • Alternator G terminal • Intercooler water spray relay • Intercooler water spray lamp • O_2 sensor heater



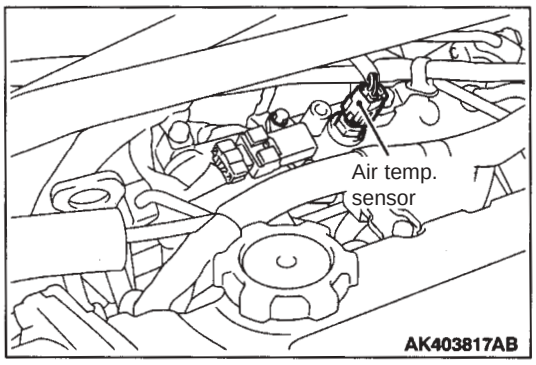


1. Sensor

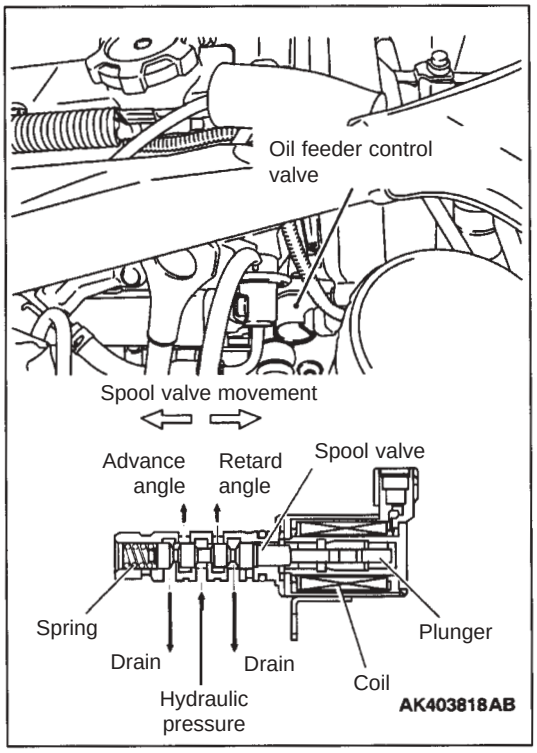
1-1 Intake cam position sensor
The intake cam position sensor is fitted to the rear of the cylinder head. The actual intake cam shaft position is detected by a Hall sensor, composed of a Hall device and a magnet, using a notch cut into cam position sensing cylinder, and sent to the engine ECU.



1-2 Manifold absolute pressure (MAP) sensor
This detects the pressure inside the intake manifold and inputs it to the engine ECU. The engine ECU adjusts the volume of injected fuel using the voltage output from this sensor.



1-3 Air temperature sensor
The air temperature inside the intake manifold is detected using a thermistor. The engine ECU adjusts the volume of injected fuel using the voltage output from this sensor.



2. Actuator

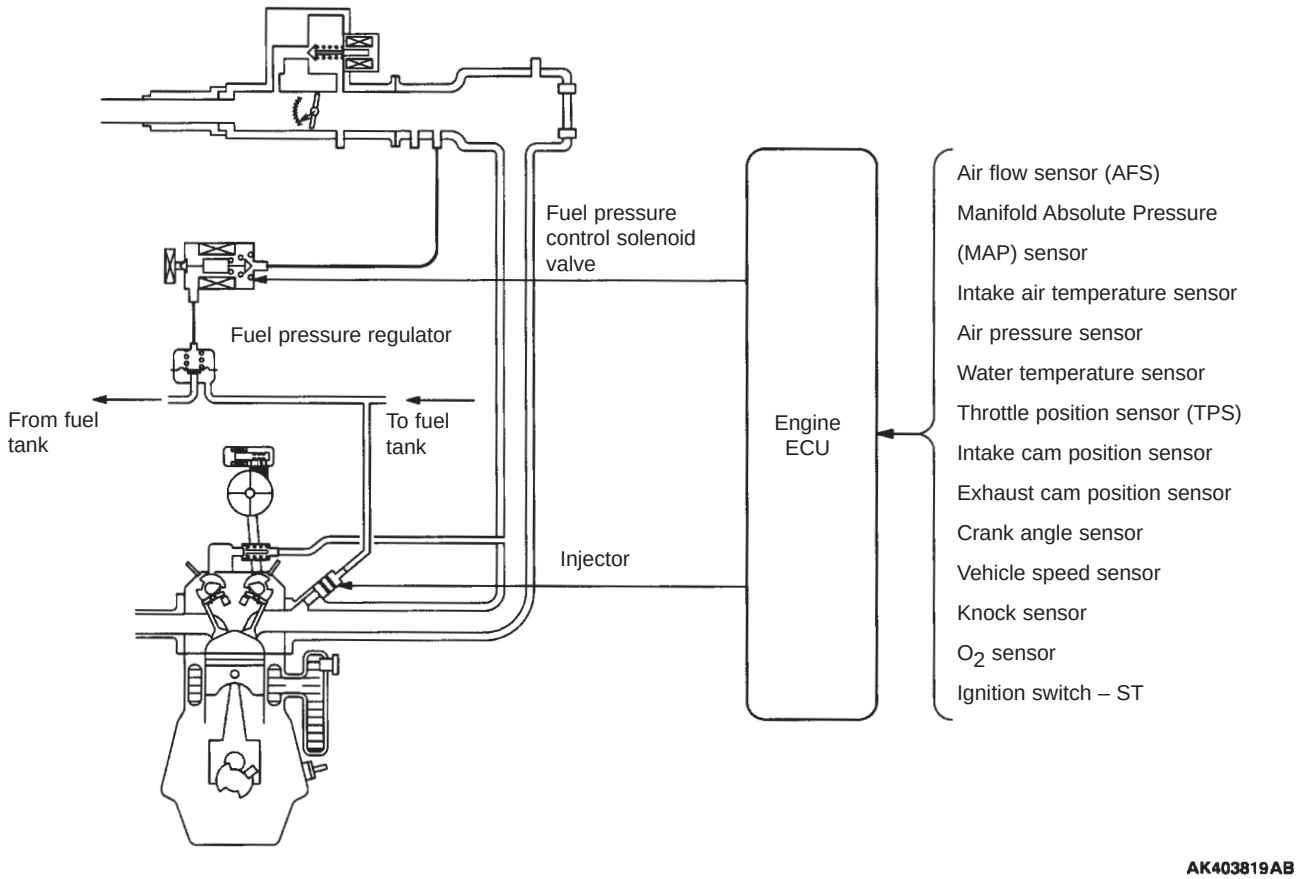
2-1. Oil feeder control valve (OCV)
The oil feeder control valve is fitted to the cylinder head. It controls the spool valve position, receiving engine ECU duty signals, and delivering hydraulic pressure from the cylinder block to the V.V.T. (Variable Valve Timing control system) sprocket advance and retard chambers. It also sets the spool valve to the maximum retard position condition, by means of a spring, when the engine is stopped.

3. Fuel injection control

These controls are basically the same as on the 4G63-T/C engine mounted in the Lancer Evolution VIII MR. However, we have made the following improvements.

- The quantity of fuel injected is adjusted based on the pressure inside the manifold measured by the manifold absolute pressure sensor (MAP) and the air temperature inside the manifold

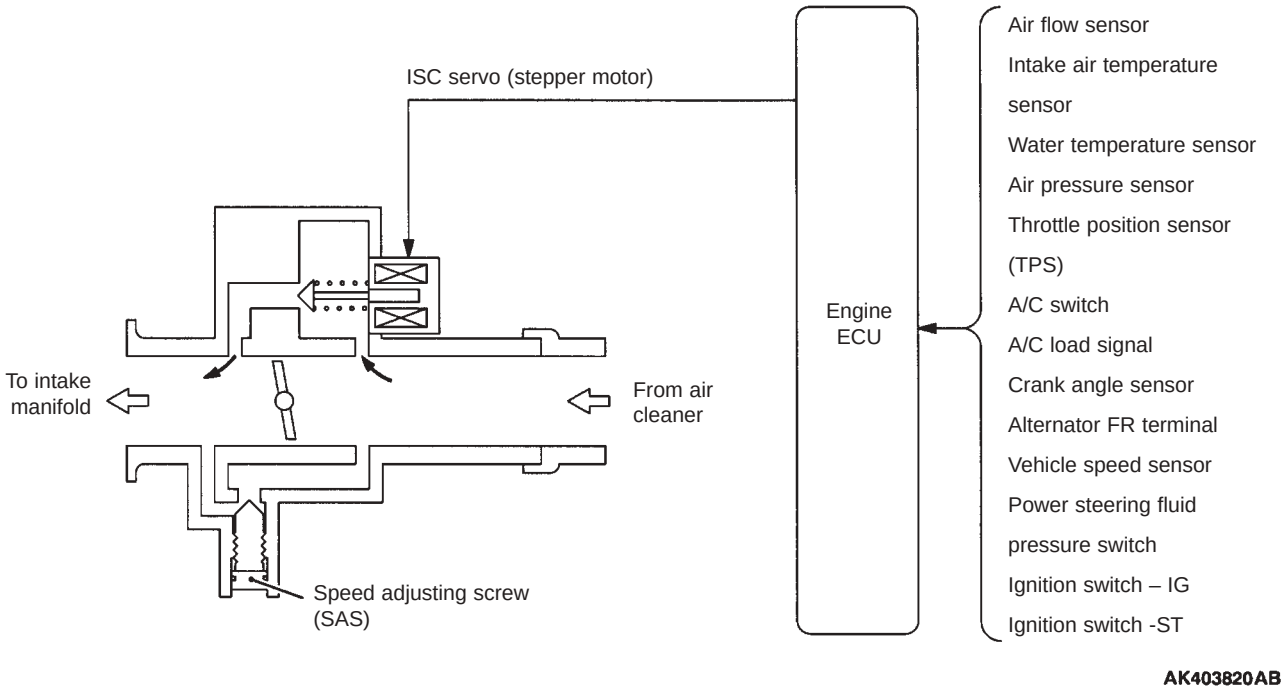
System configuration



4. Idling speed control

This is basically the same as the control system on the 4G63-T/C engine installed in the Lancer Evolution VIII MR.

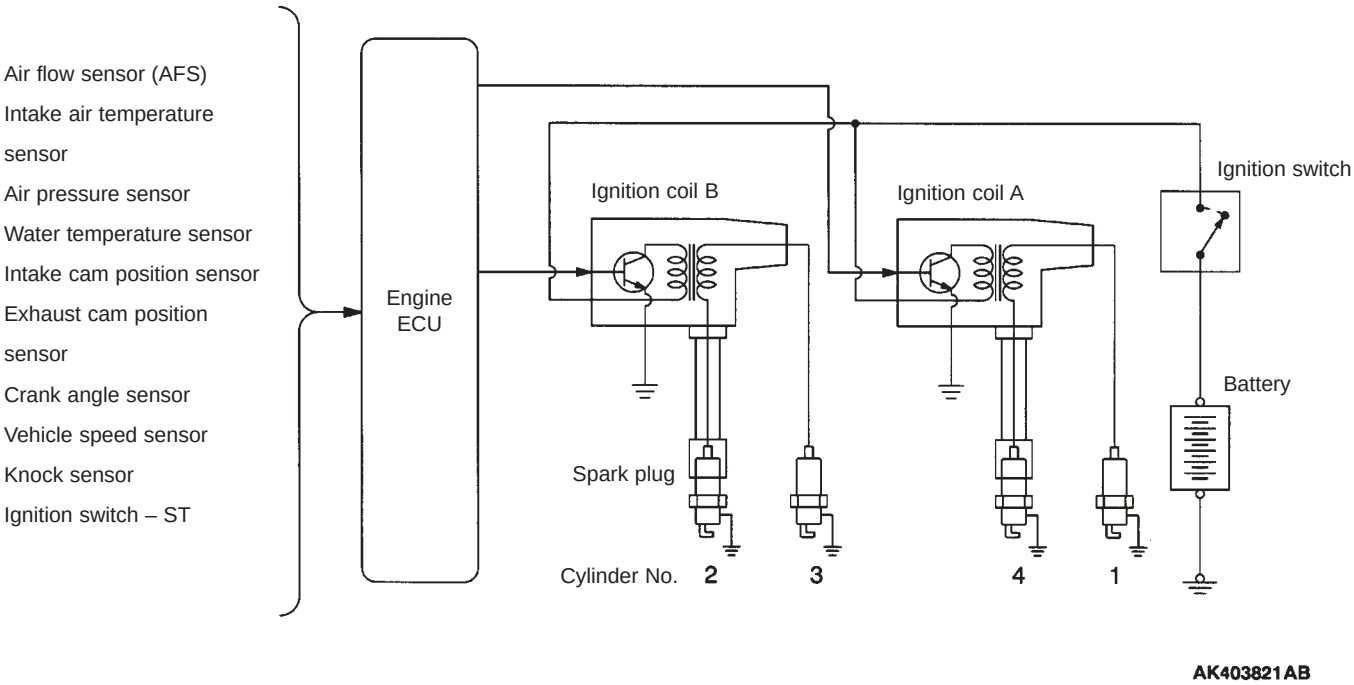
System configuration

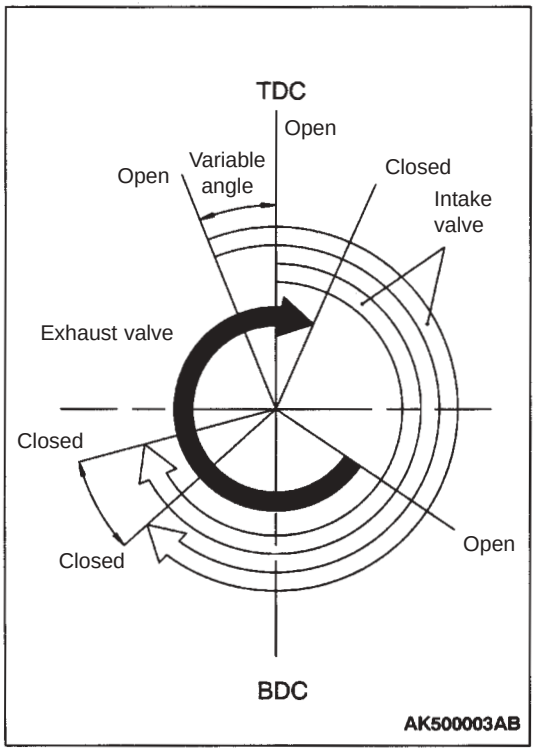


5. Ignition timing and distribution control

This is basically the same as the control system on the 4G63-T/C engine installed in the Lancer Evolution VIII MR.

System configuration

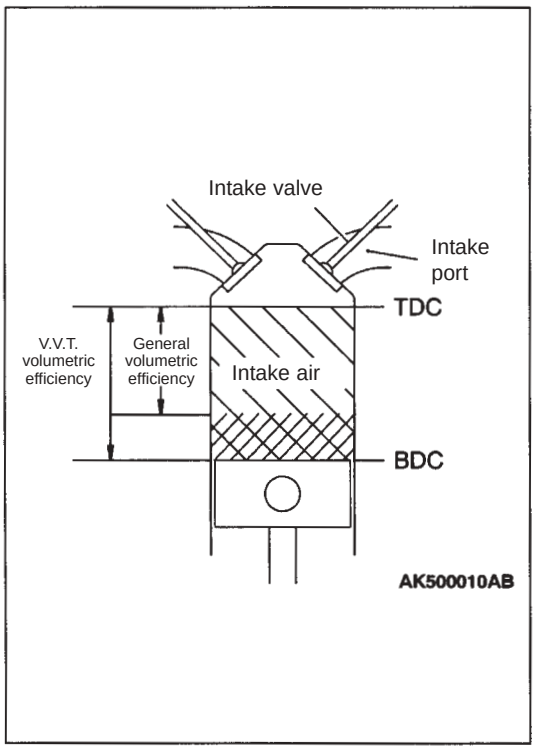




6. Variable Valve Timing control system (MIVEC)

6-1 Effects

Valve timing is, in general, fixed, but it is possible (as shown in the diagram) to have continuously variable control of the intake valve timing.
Using the MIVEC control system the most appropriate valve timing control can be set for the engine running condition, with the following results:
- Increased torque and output in all ranges
- Increased idle stability
- Improved fuel consumption and emissions performance

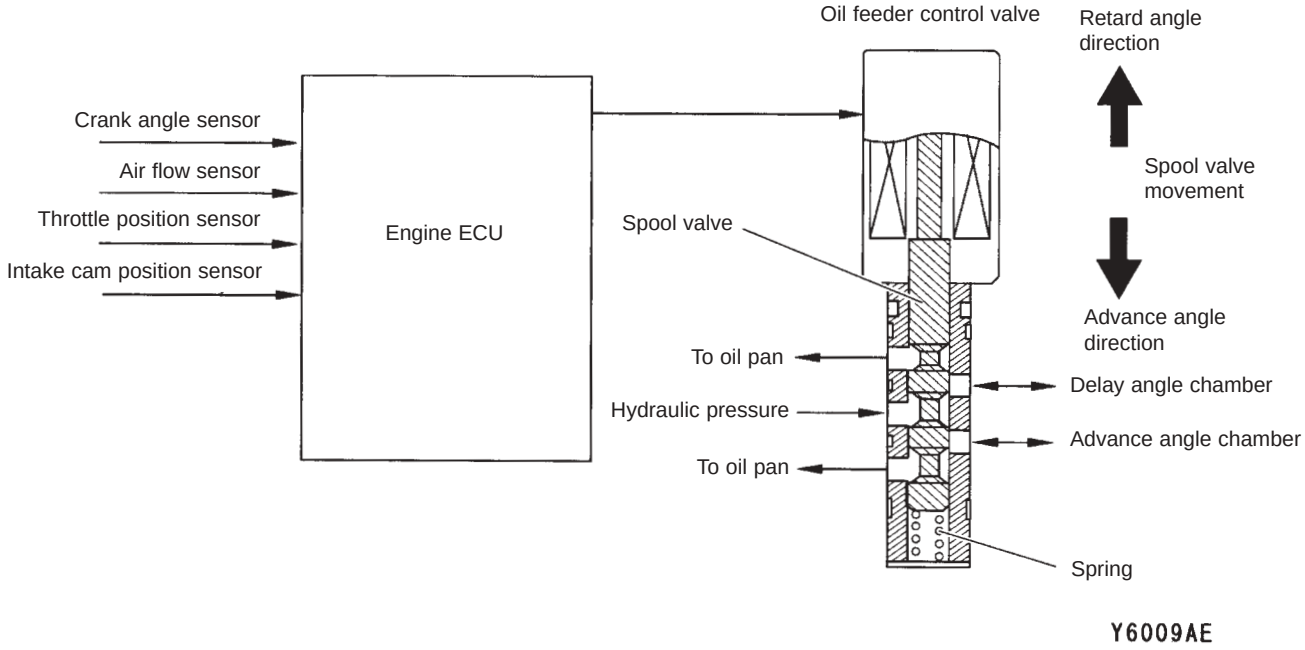


(1) Low and middle speed torque improvement
- By making the intake valve close more quickly in the low and middle engine speed ranges, it is possible to control the mixture taken in being blown back to the intake port, improve the volumetric efficiency of the intake air, and increase low and mid-range torque.
- Making the intake valves open quickly means that there is greater valve overlap, and the combustion gases inside the cylinder are expelled by the fresh air flowing in. The introduction of fresh air into the cylinders is promoted by this scavenging effect, and volumetric efficiency is improved.

(2) Improvements in high speed output performance
Volumetric efficiency is improved by delaying the closing of the intake valve, and using the inertial forces of the intake air.

(3) Increased idling stability
By reducing valve overlap, combustion can be stabilized by controlling the intake gases being blown back to the intake port.

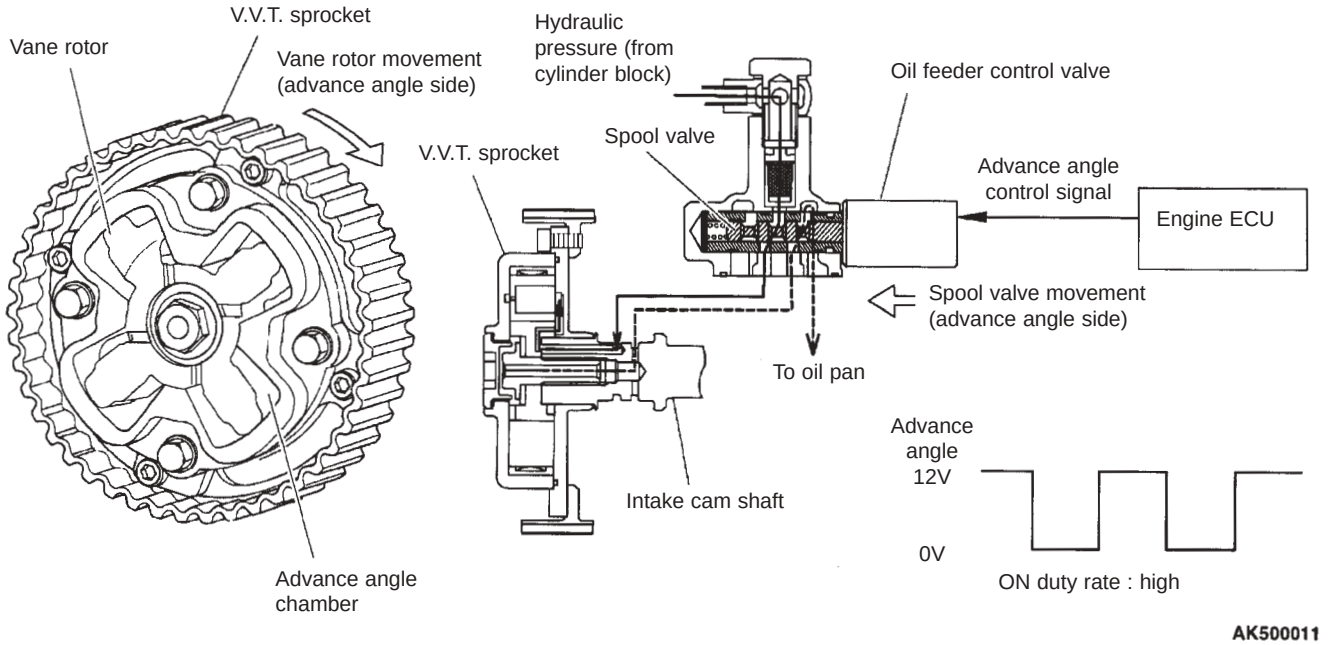
6-2 System control details



- The engine ECU ascertains the engine condition by detecting the various sensor signals, sends a duty signal to the oil feeder control valve in response to the engine condition, and controls the position of the spool valve.
  When the engine is stopped, the spool valve is set to the maximum retard angle by hydraulic pressure.
- The oil feeder control valve delivers hydraulic pressure to either the retard angle chamber or the advance angle chamber, continuously varying the intake cam shaft phases from advance angle to retard angle.

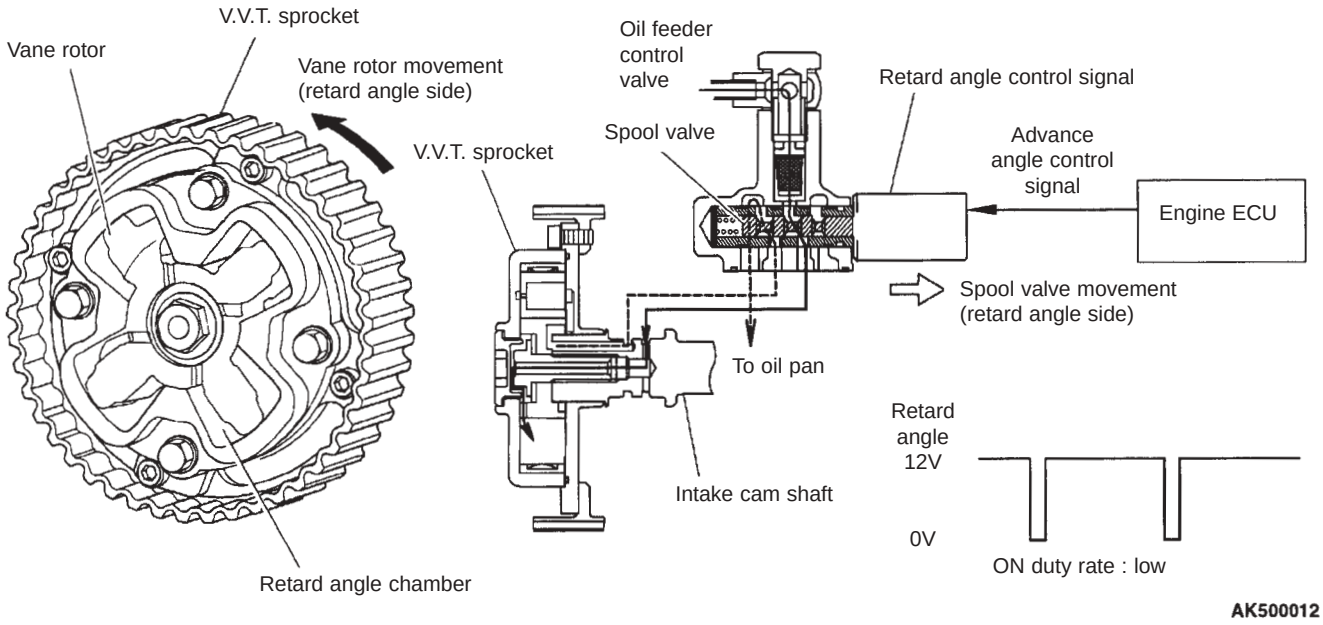
6-3. Basic operation

(1) Advance angle



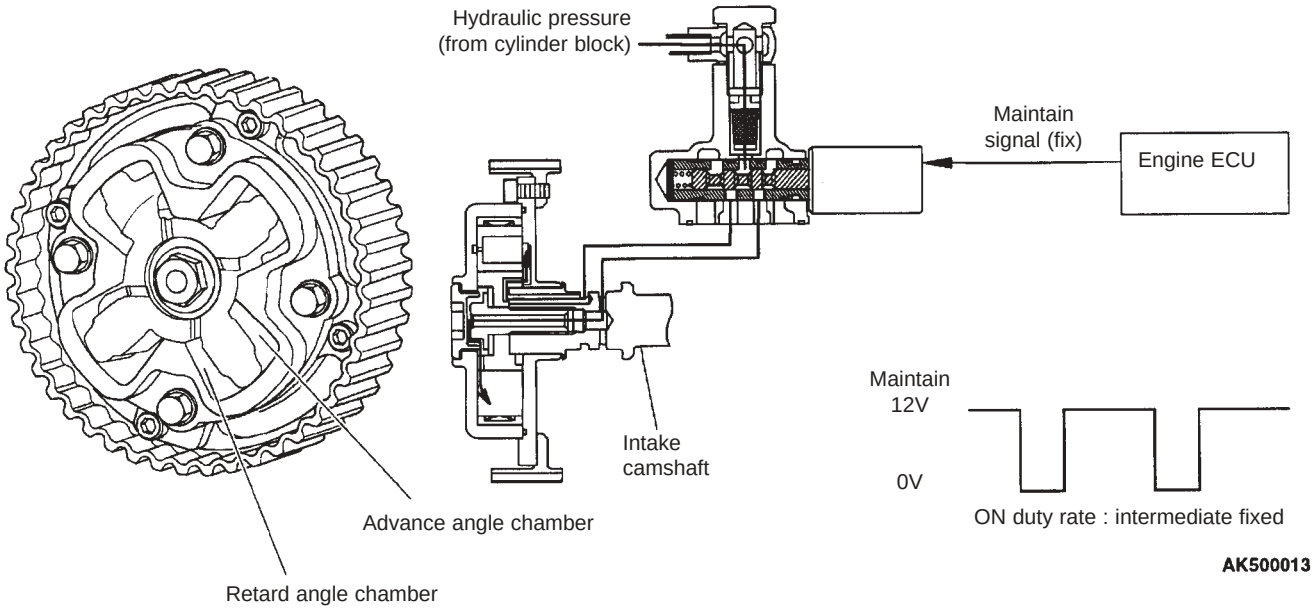
- The oil feeder control valve spool valve travels in the advance angle direction on an advance angle control signal from the engine ECU.
- Hydraulic pressure from the cylinder block is applied to the V.V.T. sprocket advance angle chamber, the vane rotor travels towards the advance angle side, and the angle of the intake cam shaft (fixed to the vane rotor) advances.

(2) Retard angle



- The oil feeder control valve spool valve travels in the retard angle direction on a retard angle control signal from the engine ECU.
- Hydraulic pressure from the cylinder block is applied to the V.V.T. sprocket retard angle chamber, the vane rotor travels towards the retard angle side, and the angle of the intake cam shaft (fixed to the vane rotor) is delayed.

(3) When cam position is maintained

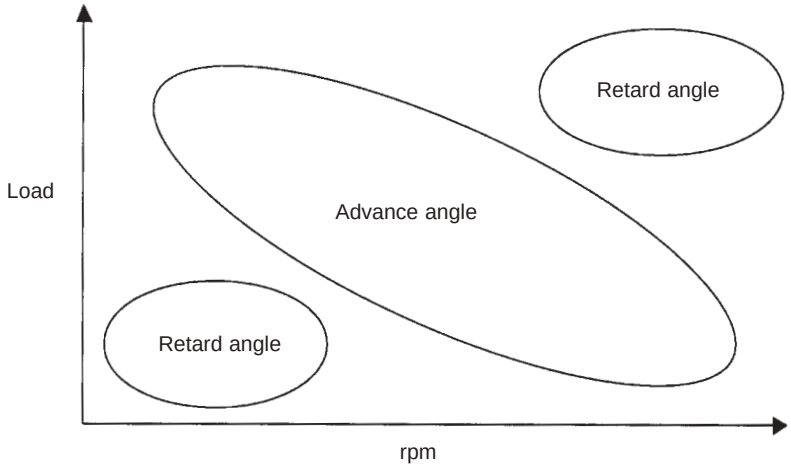


When the actual phase angle reaches the target phase angle, the advance angle chamber and retard angle chamber hydraulic pressures are maintained, as is the phase angle of the intake cam shaft. When this happens, the oil feeder control valve is controlled so that the actual phase angle is same as the target phase angle.

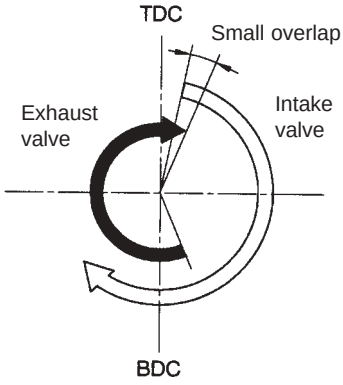
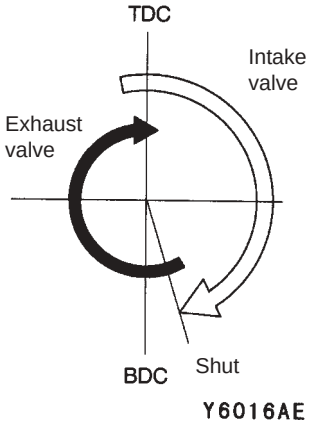
6-4. Operation under various running conditions

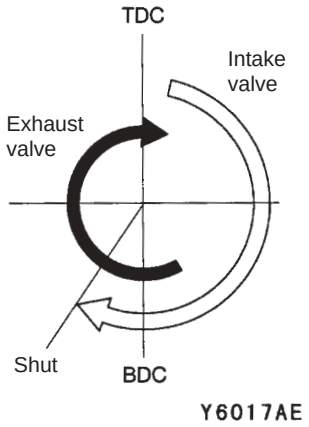
The advance and retard angle conditions are controlled in response to running conditions, with the result that low fuel consumption and emissions, and high outputs, can both be achieved.

Sketch showing operation



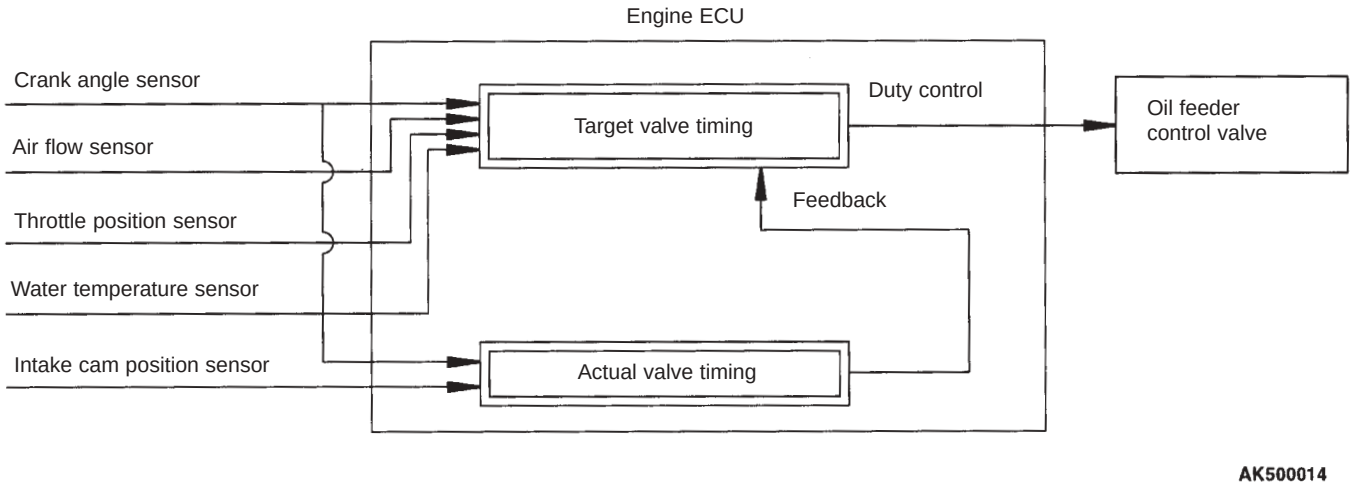
AK500004

Running condition	Valve timing	Operation	Effect
Idling	 Y6014AE	By reducing overlap, exhaust gas being blown back to the intake port is controlled.	Idling speed stability
Low/Middle range	 Y6016AE	By making the closing timing of the intake valve quicker, intake air being blown back to the intake port is controlled, volumetric efficiency is improved, and low/mid range torque is increased.	Increase in low/mid range torque.

Running condition	Valve timing	Operation	Effect
High rpm		The intake valve shutting timing is retarded to match the engine speed (rpm), and the valve timing controlled to match the intake air inertial force, resulting in an improvement in volumetric efficiency.	Increased output

6-5 Feedback control

- The engine ECU detects the various sensor signals and computes the most appropriate valve timing for the running condition, and controls the oil feeder control valve.
- The actual valve timing is detected from the intake cam position sensor signal, and feedback control is done to make this closely match the target valve timing.



(1) Detecting phase angle
Computes the phase angle using the crank angle sensor output and intake cam position sensor output signals.

7. Purge control

Please refer to Emission Control System.

8. Self-diagnosis system

The engine ECU system check is easy, and has the following functions.

a. Engine warning light.
b. Diagnosis function
c. Service data output
d. Actuator test

Note
Please refer to the maintenance manual for each item.

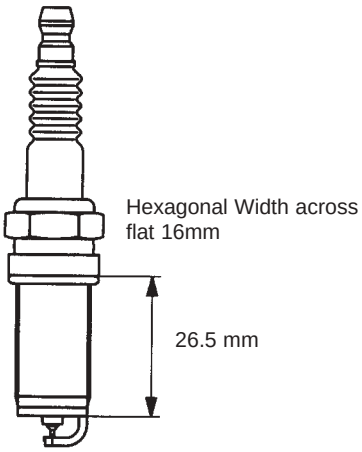
ELECTRICAL EQUIPMENT

Spark plugs

Long reach type plugs have been used in order to reduce the temperature of the combustion chamber walls in the area around the plugs.

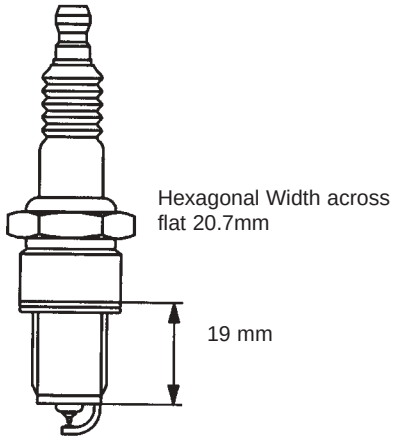
New (Lancer Evolution IX)

Long reach type



Base model (Lancer Evolution VIII MR)

Standard reach type

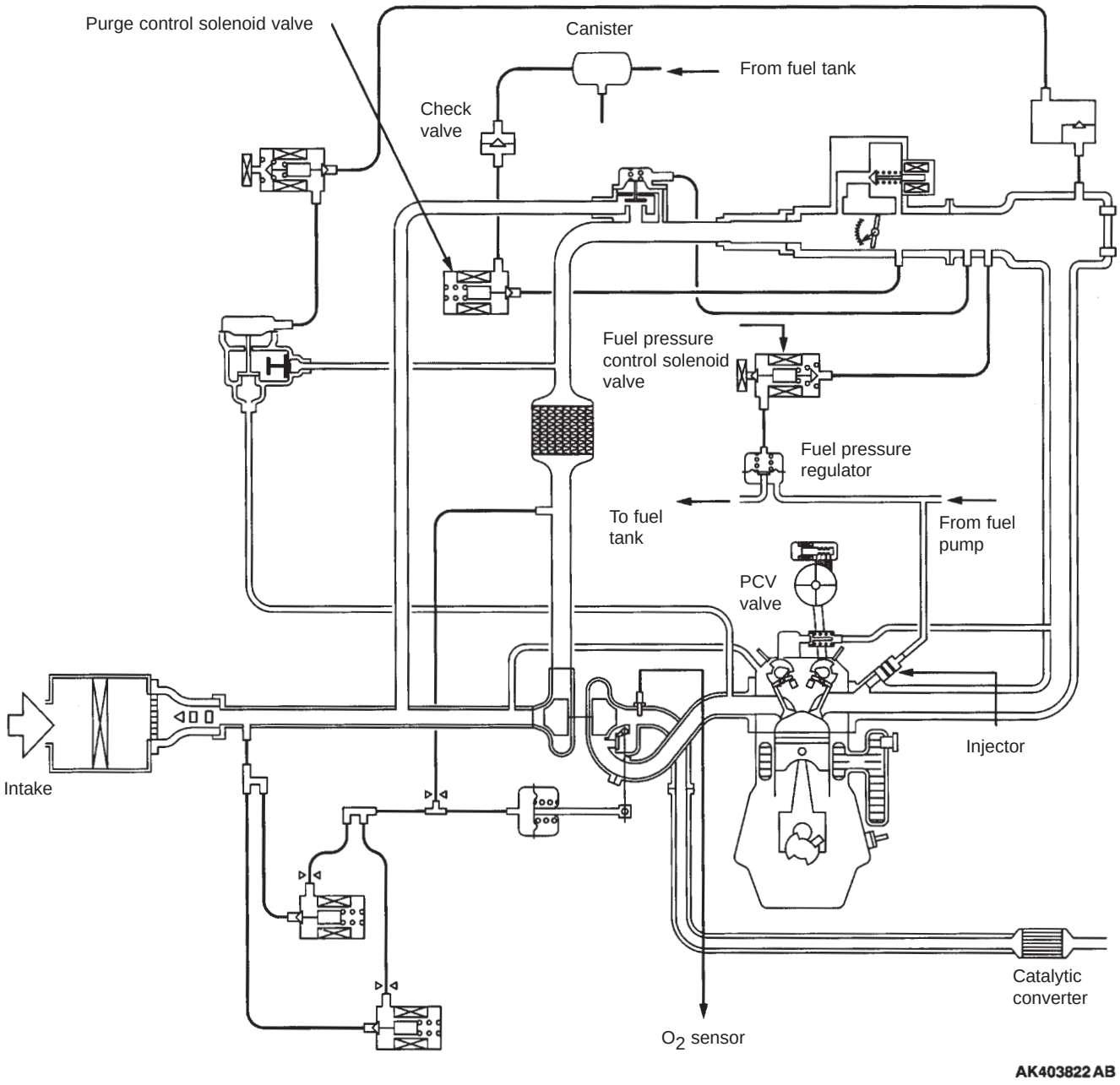


AK500007 AB

Emission control system

The control system is basically the same as the system used in the 4G63-T/C engine on the Lancer Evolution VIII MR.

Emission control system diagram



THROTTLE

Throttle pedal

The sporty image has been enhanced using aluminium pedal pad plates.

<GT,GSR>

New (Lancer Evolution IX) Base model (Lancer Evolution VIII MR)

AC407163AB

Notes