



YAMAHA

2002

TDM900(P)

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SERVICE MANUAL

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SERVICE MANUAL
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NOTICE

This manual was produced by the Yamaha Motor Company, Ltd. primarily for use by Yamaha dealers and their qualified mechanics. It is not possible to include all the knowledge of a mechanic in one manual. Therefore, anyone who uses this book to perform maintenance and repairs on Yamaha vehicles should have a basic understanding of mechanics and the techniques to repair these types of vehicles. Repair and maintenance work attempted by anyone without this knowledge is likely to render the vehicle unsafe and unfit for use.

Yamaha Motor Company, Ltd. is continually striving to improve all of its models. Modifications and significant changes in specifications or procedures will be forwarded to all authorized Yamaha dealers and will appear in future editions of this manual where applicable.

NOTE:

Designs and specifications are subject to change without notice.

IMPORTANT MANUAL INFORMATION

Particularly important information is distinguished in this manual by the following.



The Safety Alert Symbol means **ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!**



Failure to follow **WARNING** instructions could result in severe injury or death to the motorcycle operator, a bystander or a person checking or repairing the motorcycle.

CAUTION:

A **CAUTION** indicates special precautions that must be taken to avoid damage to the motorcycle.

NOTE:

A **NOTE** provides key information to make procedures easier or clearer.

HOW TO USE THIS MANUAL

This manual is intended as a handy, easy-to-read reference book for the mechanic. Comprehensive explanations of all installation, removal, disassembly, assembly, repair and check procedures are laid out with the individual steps in sequential order.

- ① The manual is divided into chapters. An abbreviation and symbol in the upper right corner of each page indicate the current chapter. Refer to “SYMBOLS”.
- ② Each chapter is divided into sections. The current section title is shown at the top of each page, except in Chapter 3 (“PERIODIC CHECKS AND ADJUSTMENTS”), where the sub-section title(s) appears.
- ③ Sub-section titles appear in smaller print than the section title.
- ④ To help identify parts and clarify procedure steps, there are exploded diagrams at the start of each removal and disassembly section.
- ⑤ Numbers are given in the order of the jobs in the exploded diagram. A circled number indicates a disassembly step.
- ⑥ Symbols indicate parts to be lubricated or replaced. Refer to “SYMBOLS”.
- ⑦ A job instruction chart accompanies the exploded diagram, providing the order of jobs, names of parts, notes in jobs, etc.
- ⑧ Jobs requiring more information (such as special tools and technical data) are described sequentially.

② ①

CLUTCH ENG

④ →

⑤ →

⑥ →

⑦ →

Order	Job/Part	Qty	Remarks
Removing the clutch			
1	Clutch spring	6	
2	Pressure plate	1	
3	Pull rod	1	
4	Friction plate 1	2	
5	Clutch plate	8	
6	Friction plate 2	7	
7	Nut	1	
8	Lock washer	1	
9	Clutch boss	1	
10	Thrust plate	1	
11	Bearing	1	
12	Spacer	1	
13	Clutch housing	1	

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CLUTCH ENG

③ →

⑧ →

REMOVING THE CLUTCH

1. Straighten the lock washer tab.
2. Loosen:
 - clutch boss nut ①

NOTE:
While holding the clutch boss ② with the universal clutch holder ④, loosen the clutch boss nut.

Universal clutch holder
90890-04086

3. Remove:
 - lock washer ②
 - Clutch boss ③

4. Remove:
 - spacer ①
 - bearing ②

NOTE:
Insert two 6-mm bolts ③ into the spacer and then remove the spacer by pulling on the bolts.

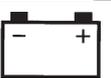
CHECKING THE FRICTION PLATES
The following procedure applies to all of the friction plates.

1. Check:
 - friction plate
Damage/wear → Replace the friction plates as a set.
2. Measure:
 - friction plate thickness
Out of specification → Replace the friction plates as a set.

NOTE:
Measure the friction plate at four places.

Friction plate thickness
2.9 ~ 3.1 mm
<Limits> 2.8 mm

5-44

① GEN INFO 	② SPEC 	
③ CHK ADJ 	④ CHAS 	
⑤ ENG 	⑥ COOL 	
⑦ FI 	⑧ ELEC 	
⑨ TRBL SHTG ?	⑩ 	
⑪ 	⑫ 	
⑬ 	⑭ 	
⑮ 	⑯ 	⑰ 
⑱ 	⑲ 	⑳ 
㉑ 	㉒ 	㉓ 
㉔ 	㉕ New	

SYMBOLS

The following symbols are not relevant to every vehicle.

Symbols ① to ⑨ indicate the subject of each chapter.

- ① General information
- ② Specifications
- ③ Periodic checks and adjustments
- ④ Chassis
- ⑤ Engine
- ⑥ Cooling system
- ⑦ Fuel injection system
- ⑧ Electrical system
- ⑨ Troubleshooting

Symbols ⑩ to ⑰ indicate the following.

- ⑩ Serviceable with engine mounted
- ⑪ Filling fluid
- ⑫ Lubricant
- ⑬ Special tool
- ⑭ Tightening torque
- ⑮ Wear limit, clearance
- ⑯ Engine speed
- ⑰ Electrical data

Symbols ⑱ to ㉓ in the exploded diagrams indicate the types of lubricants and lubrication points.

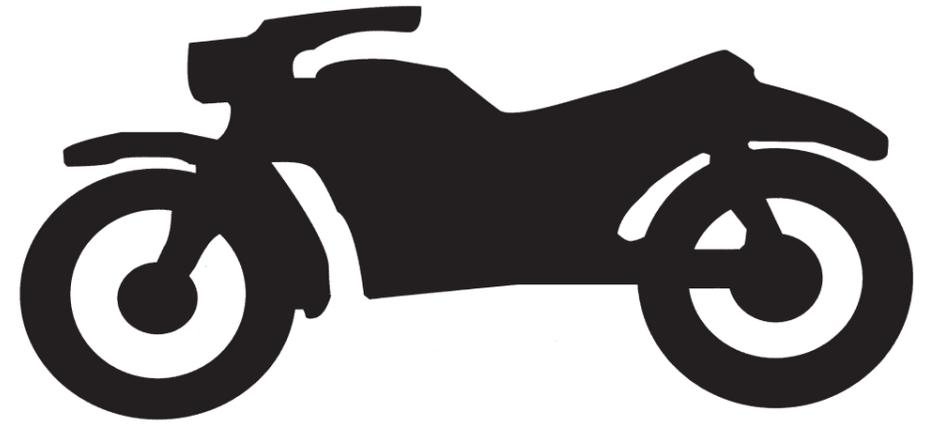
- ⑱ Engine oil
- ⑲ Gear oil
- ⑳ Molybdenum-disulfide oil
- ㉑ Wheel-bearing grease
- ㉒ Lithium-soap-based grease
- ㉓ Molybdenum-disulfide grease

Symbols ㉔ to ㉕ in the exploded diagrams indicate the following.

- ㉔ Apply locking agent (LOCTITE®)
- ㉕ Replace the part

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**GEN
INFO**

1

CHAPTER 1 GENERAL INFORMATION

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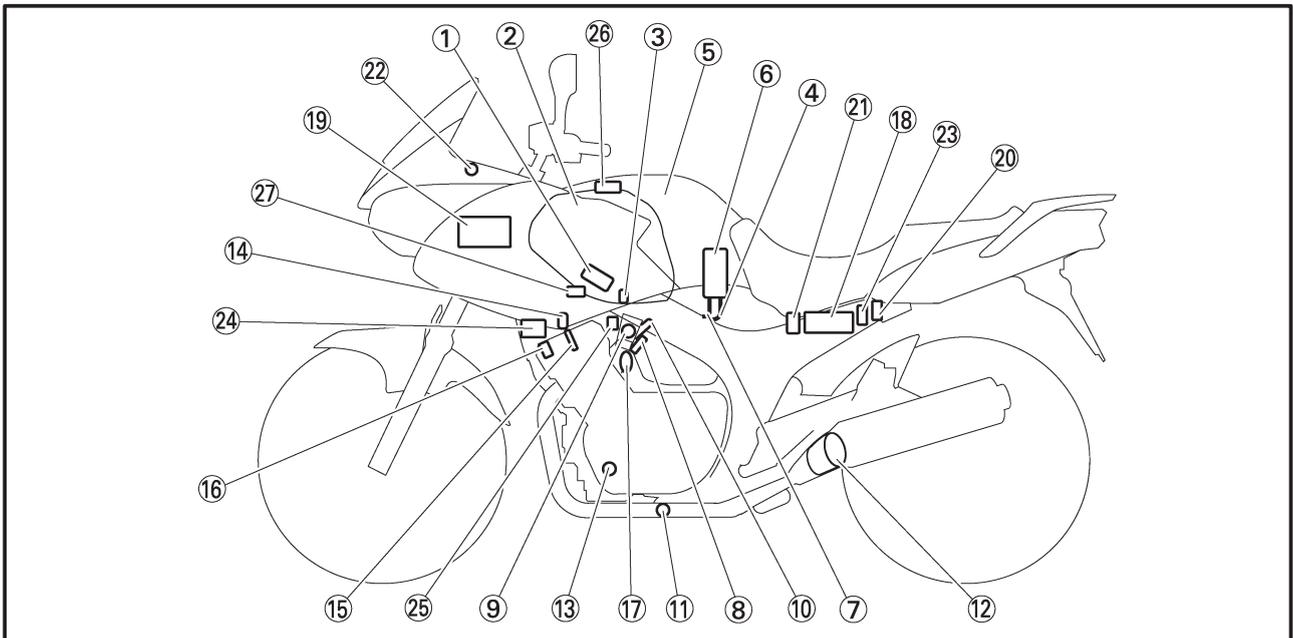
**FEATURES
OUTLINE**

The main function of a fuel supply system is to provide fuel to the combustion chamber at the optimum air-fuel ratio in accordance with the engine operating conditions and the atmospheric temperature. In the conventional carburetor system, the air-fuel ratio of the mixture that is supplied to the combustion chamber is created by the volume of the intake air and the fuel that is metered by the jet that is used in the respective chamber.

Despite the same volume of intake air, the fuel volume requirement varies by the engine operating conditions, such as acceleration, deceleration, or operating under a heavy load. Carburetors that meter the fuel through the use of jets have been provided with various auxiliary devices, so that an optimum air-fuel ratio can be achieved to accommodate the constant changes in the operating conditions of the engine.

As the requirements for the engine to deliver more performance and cleaner exhaust gases increase, it becomes necessary to control the air-fuel ratio in a more precise and finely tuned manner. To accommodate this need, this model has adopted an electronically controlled fuel injection (FI) system, in place of the conventional carburetor system. This system can achieve an optimum air-fuel ratio required by the engine at all times by using a microprocessor that regulates the fuel injection volume according to the engine operating conditions detected by various sensors.

The adoption of the FI system has resulted in a highly precise fuel supply, improved engine response, better fuel economy, and reduced exhaust emissions. Furthermore, the air induction system (AI system) has been placed under computer control together with the FI system in order to realize cleaner exhaust gases.

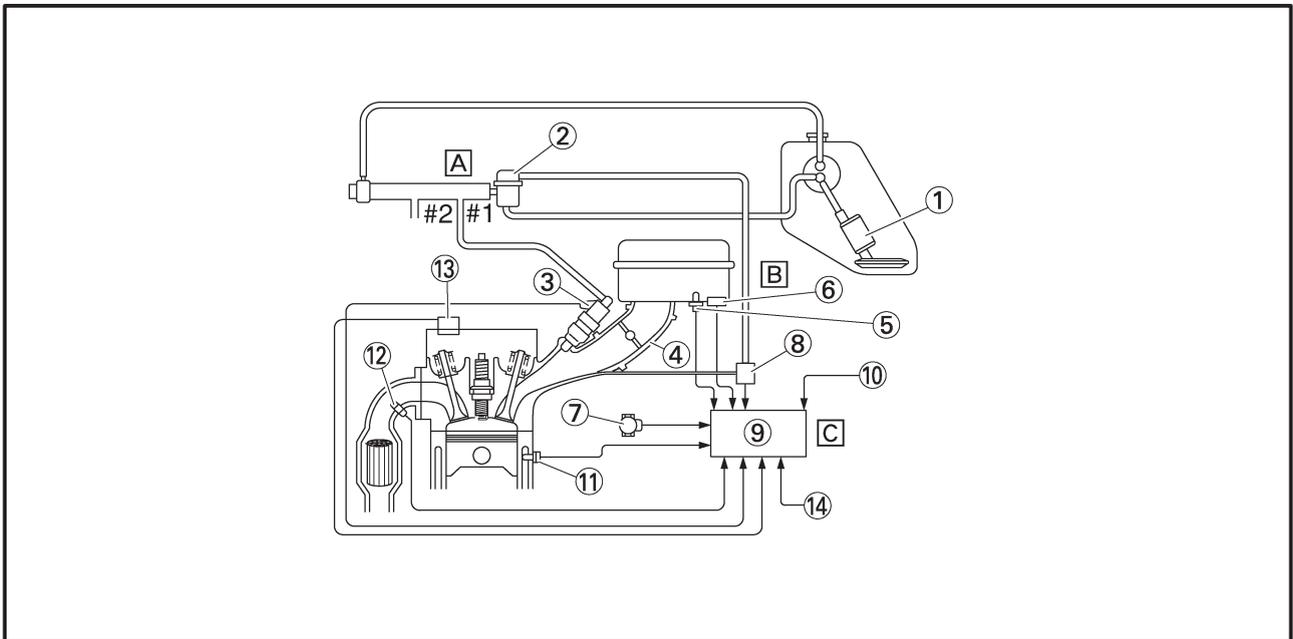


- | | | | |
|---------------------------------|----------------------------------|--------------------------------|------------------------------|
| ① Ignition coil | ⑩ Fuel injector | ⑲ ECU | ⑳ Adjustable air intake duct |
| ② Air filter case | ⑪ O ₂ sensor | ⑳ Atmospheric pressure sensor | ㉑ Intake solenoid |
| ③ Intake air temperature sensor | ⑫ Catalytic converter | ㉒ Fuel injection system relay | |
| ④ Fuel delivery hose | ⑬ Crankshaft position sensor | ㉓ Engine trouble warning light | |
| ⑤ Fuel tank | ⑭ Coolant temperature sensor | ㉔ Lean angle cut-off switch | |
| ⑥ Fuel pump | ⑮ Spark plug | ㉕ Air cut-off valve | |
| ⑦ Fuel return hose | ⑯ Cylinder identification sensor | ㉖ Fast idle plunger | |
| ⑧ Intake air pressure sensor | ⑰ Pressure regulator | | |
| ⑨ Throttle position sensor | ⑱ Battery | | |

FI SYSTEM

The fuel pump delivers fuel to the injector via the fuel filter. The pressure regulator maintains the fuel pressure that is applied to the injector at only 294 kPa (2.94 kg/cm², 2.94 bar) higher than the intake manifold pressure. Accordingly, when the energizing signal from the ECU energizes the injector, the fuel passage opens, causing the fuel to be injected into the intake manifold only during the time the passage remains open. Therefore, the longer the length of time the injector is energized (injection duration), the greater the volume of fuel that is supplied. Conversely, the shorter the length of time the injector is energized (injection duration), the lesser the volume of fuel that is supplied.

The injection duration and the injection timing are controlled by the ECU. Signals that are input from the throttle position sensor, crankshaft position sensor, intake air pressure sensor, atmospheric pressure sensor, intake temperature sensor, coolant temperature sensor, and O₂ sensor enable the ECU to determine the injection duration. The injection timing is determined through the signals from the crankshaft position sensor and the cylinder identification sensor. As a result, the volume of fuel that is required by the engine can be supplied at all times in accordance with the driving conditions.



- | | | | |
|---------------------------------|-------------------------------|----------------------------------|-------------------------|
| ① Fuel pump | ⑦ Throttle position sensor | ⑪ Coolant temperature sensor | A Fuel system |
| ② Pressure regulator | ⑧ Intake air pressure sensor | ⑫ O ₂ sensor | B Air system |
| ③ Fuel injector | ⑨ ECU | ⑬ Cylinder identification sensor | C Control system |
| ④ Throttle body | ⑩ Atmospheric pressure sensor | ⑭ Crankshaft position sensor | |
| ⑤ Intake air temperature sensor | | | |
| ⑥ Intake solenoid | | | |

Fuel control block

The fuel control block consists of the following main components:

	Component	Function
Control block	ECU	Total FI system control
	Throttle body	Air volume control
	Pressure regulator	Fuel pressure detection
Sensor block	Intake air pressure sensor	Intake air pressure detection
	Atmospheric pressure sensor	Atmospheric pressure detection
	Coolant temperature sensor	Coolant temperature detection
	Intake air temperature sensor	Intake air temperature detection
	Throttle position sensor	Throttle angle detection
	O ₂ sensor	Gas emission O ₂ concentration detection
	Cylinder identification sensor	Reference position detection
	Crankshaft position sensor	Crankshaft position detection and engine PRM detection
Speed sensor	Speed detection	
Actuator block	Injector	Fuel injection
	Fuel pump	Fuel feed
	Air induction system, air cut valve	Induction of secondary air
	Intake solenoid	Air volume control

ECU (Electronic Control Unit)

The main functions of the ECU are ignition control, fuel control, self-diagnosis, and load control.

• ECU's internal construction and functions

The main components and functions of the ECU can be broadly divided into the following four items:

A. Power supply circuit

The power supply circuit obtains power from the battery (12 V) to supply the power (5 V) that is required for operating the ECU.

B. Input interface circuits

The input interface circuits convert the signals output by all the sensors into digital signals, which can be processed by the CPU, and input them into the CPU.

C. CPU (Central Processing Unit)

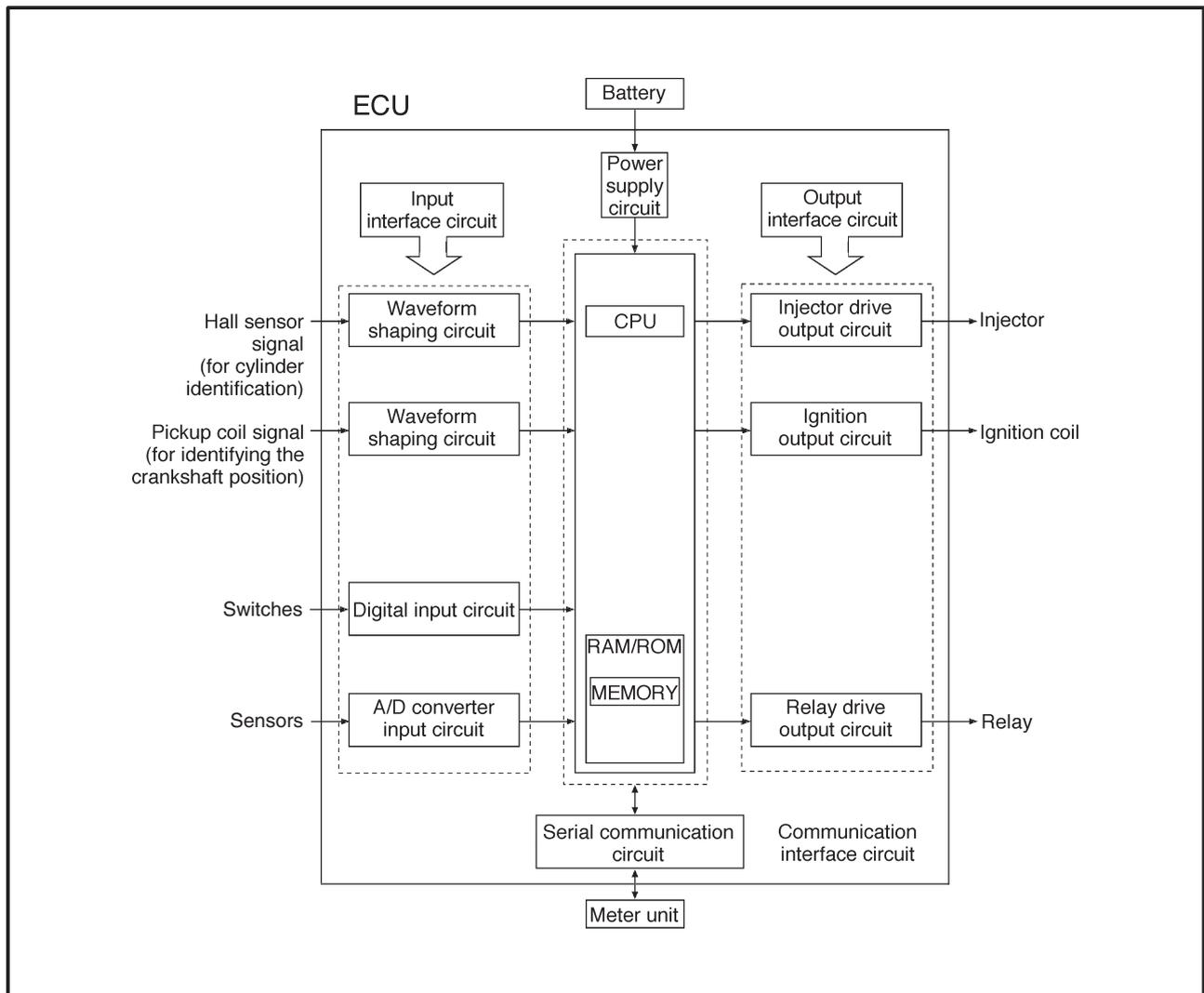
The CPU determines the condition of the sensors in accordance with the level of the signal that is output by the respective sensor. Then, the signals are temporarily stored on the RAM in the CPU. Based on those stored signals and the basic processing program on the ROM, the CPU calculates the fuel injection duration, injection timing, and ignition timing, and then sends control commands to the respective output interface circuits.

D. Output interface circuits

The output interface circuits convert the control signals output by the CPU into actuating signals for the respective actuators in order to actuate them. They also output commands to the relay output circuits as needed.

E. Interface circuit for communication

Communicates with the meter.





- Ignition control

The ignition control function of the ECU controls the ignition timing and the duration of ignition energizing. The ignition timing control uses the signals from the throttle position sensor (to detect the angle of the throttle), and the crankshaft position sensor and speed sensor (to detect the speed of the engine). This control establishes an ignition timing that suits the operating condition of the engine through compensations made to the basic ignition timing control map. The ignition energizing duration control establishes the energizing duration to suit the operating conditions by calculating the energizing duration in accordance with the signal received from the crankshaft position sensor and the battery voltage.

- Fuel control

The fuel control function of the ECU controls the injection timing and injection duration. The injection timing control controls the injection timing during the starting of the engine and the injection timing during the normal operation of the engine, based on the signals received from the crankshaft position sensor and the cylinder identification sensor. The injection duration control determines the duration of injection based on the signals received from the atmospheric pressure sensors, temperature sensors, and the position sensors, to which compensations are made to suit various conditions such as the weather, atmospheric pressure, starting, acceleration, and deceleration.

- Load control

The ECU effects load control in the following manner:

1. Stopping the fuel pump and injectors when the motorcycle overturns

The ECU turns OFF the fuel injection system relay when the lean angle cut-off switch is tripped.

2. Operating the headlight illumination relay

On the model for Europe, the ECU causes the headlight relay 2 to output a constant ON signal, provided that the main switch is ON. On the model for Australia, the ECU controls the headlight relay 2 in accordance with the engine speed as required by the daytime illumination specification.

3. Operating the radiator fan motor in accordance with the coolant temperature

The ECU controls the radiator fan motor relay ON/OFF in accordance with the coolant temperature.

4. Operating the AI system solenoid valve

The ECU controls the energizing of the solenoid valve in accordance with the driving conditions.

5. Operating the intake solenoid valve

The ECU controls the energizing of the solenoid valve in accordance with the driving conditions.

- Self-diagnosis function

The ECU is equipped with a self-diagnosis function to ensure that the engine control system is operating normally. The ECU mode functions include a diagnosis mode in addition to the normal mode.

Normal mode

- To check for any blown bulbs, this mode illuminates a warning light while the main switch is turned ON, and while the starter switch is being pressed.
- If the starting disable warning is activated, this mode alerts the rider by blinking the warning light while the start switch is being pressed.
- If a malfunction occurs in the system, this mode provides an appropriate substitute characteristic operation, and alerts the rider of the malfunction by illuminating a warning light. After the engine is stopped, this mode displays a fault code on the clock LCD.

Diagnosis mode

- In this mode, a diagnostic code is input into the ECU through the operation of the operating switch on the meter, and the ECU displays the values output by the sensors or actuates the actuators in accordance with the diagnostic code. Whether the system is operating normally can be checked by observing the illumination of the warning light, the values displayed on the meter, or the actuating state of the actuators.

Fuel pump

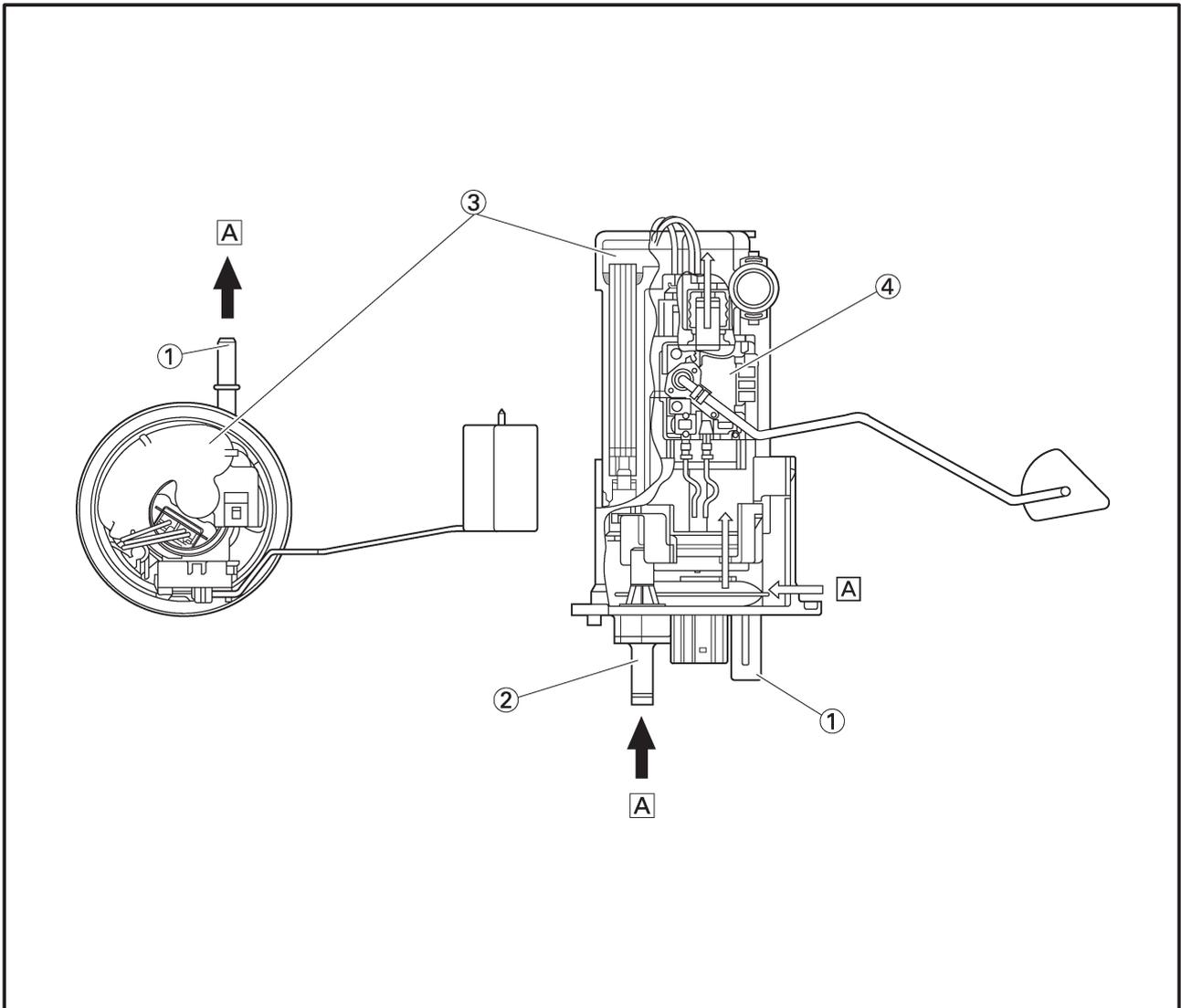
The fuel pump, which is mounted in the fuel tank, draws the fuel directly from the tank and pumps it to the injector.

A filter that is provided in the fuel pump prevents any debris in the fuel tank from entering the fuel system downstream of the pump.

The pump consists of a pump unit, electric motor, filter, and valves.

The pump unit is a Wesco type rotary pump that is connected to the motor shaft.

A relief valve is provided to prevent the fuel pressure from rising abnormally if the fuel hose becomes clogged. This valve opens when the fuel pressure at the discharge outlet reaches between 441 and 637 kPa, and returns the fuel to the fuel tank.



- ① Fuel feed nozzle
- ② Fuel return nozzle
- ③ Fuel filter
- ④ Sender unit
- Ⓐ Fuel

Pressure regulator

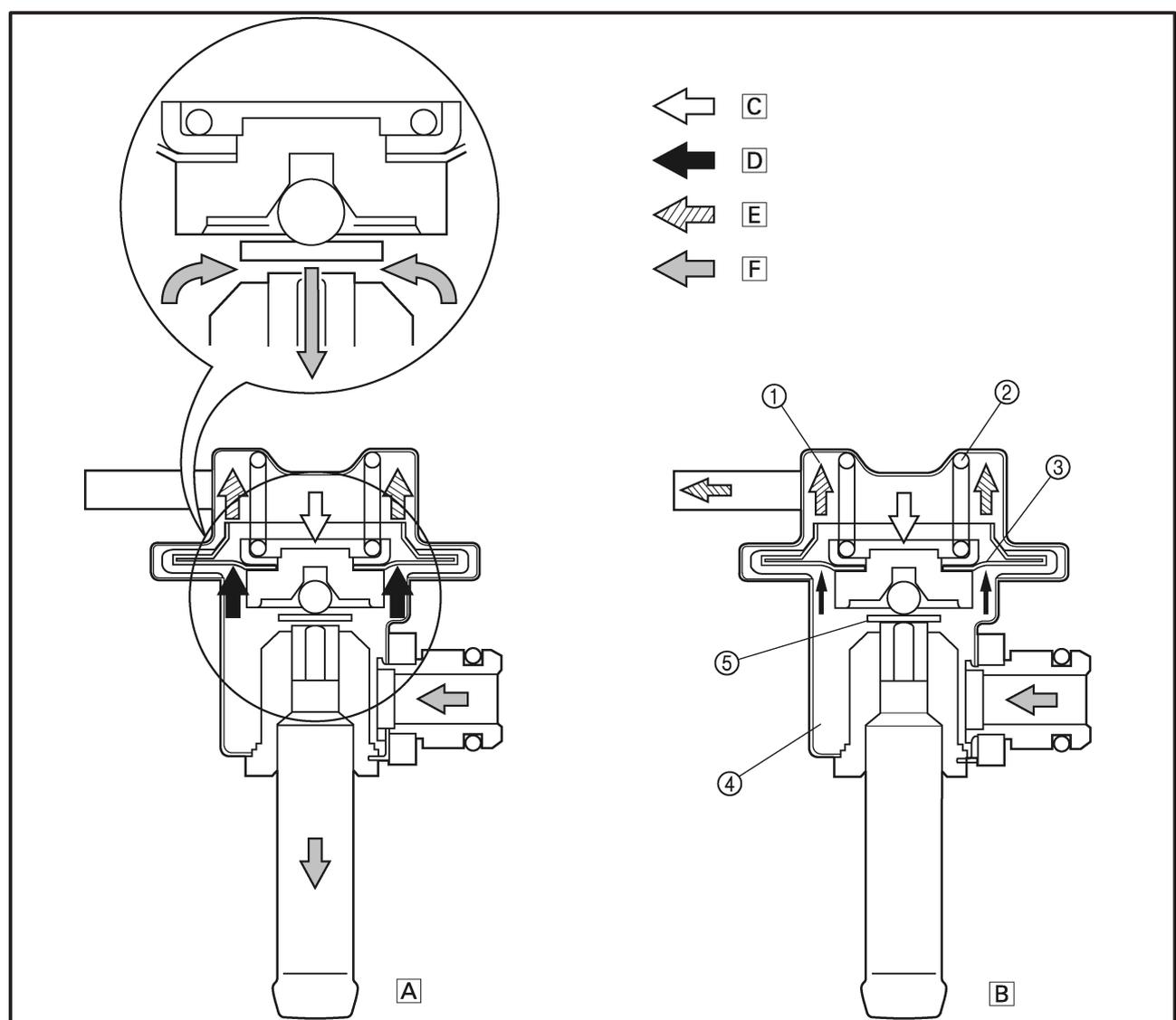
It regulates the fuel pressure that is applied to the injectors that are provided in the cylinders in order to maintain a constant pressure difference with the pressure in the intake manifold.

The fuel that is delivered by the fuel pump fills the fuel chamber through the fuel inlet of the regulator and exerts pressure on the diaphragm in the direction for opening the valve.

A spring that is provided in the spring chamber exerts pressure on the diaphragm in the direction for closing the valve, in contrast to the pressure of the fuel. Thus, the valve cannot open unless the fuel pressure overcomes the spring force.

An intake vacuum is applied to the spring chamber via a pipe. When the pressure of the fuel exceeds the sum of the intake vacuum and the spring force, the valve that is integrated with the diaphragm opens, allowing the fuel to return from the fuel outlet to the fuel tank, via the fuel return hose.

As a result, because the intake vacuum fluctuates in accordance with the changes in the operating conditions in contrast to the constant volume of fuel supplied by the pump, the valve opening/closing pressure also changes to regulate the return fuel volume. Thus, the difference between the fuel pressure and the intake manifold pressure remains constant at a prescribed pressure.



- ① Spring chamber
- ② Spring
- ③ Diaphragm

- ④ Fuel chamber
- ⑤ Valve

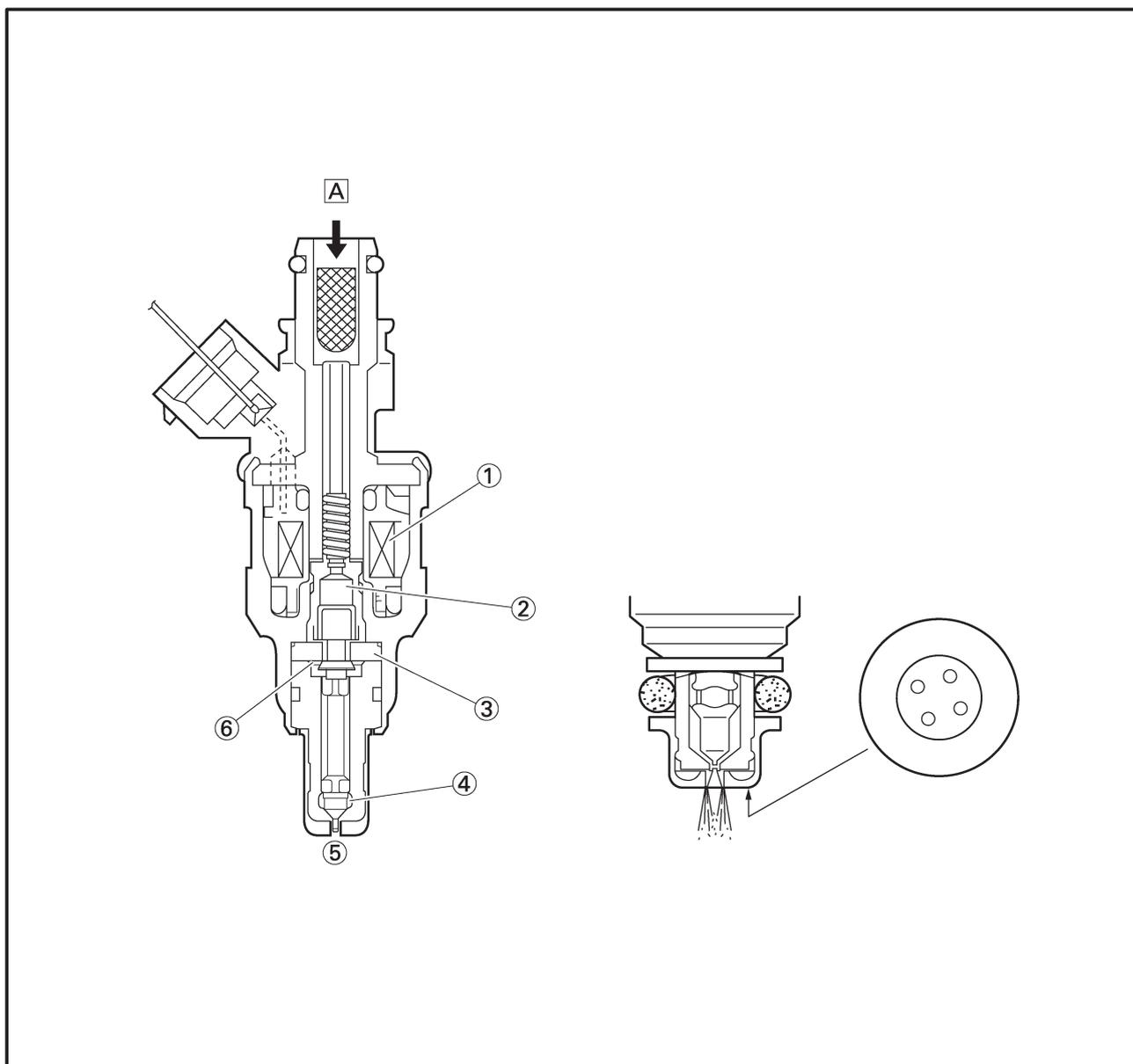
- A** Open
- B** Close
- C** Spring pressure

- D** Fuel pressure
- E** Vacuum pressure
- F** Fuel

Fuel injector

Upon receiving injection signals from the ECU, the fuel injector injects fuel. In the normal state, the core is pressed downward by the force of the spring, as illustrated. The needle that is integrated with the bottom of the core keeps the fuel passage closed.

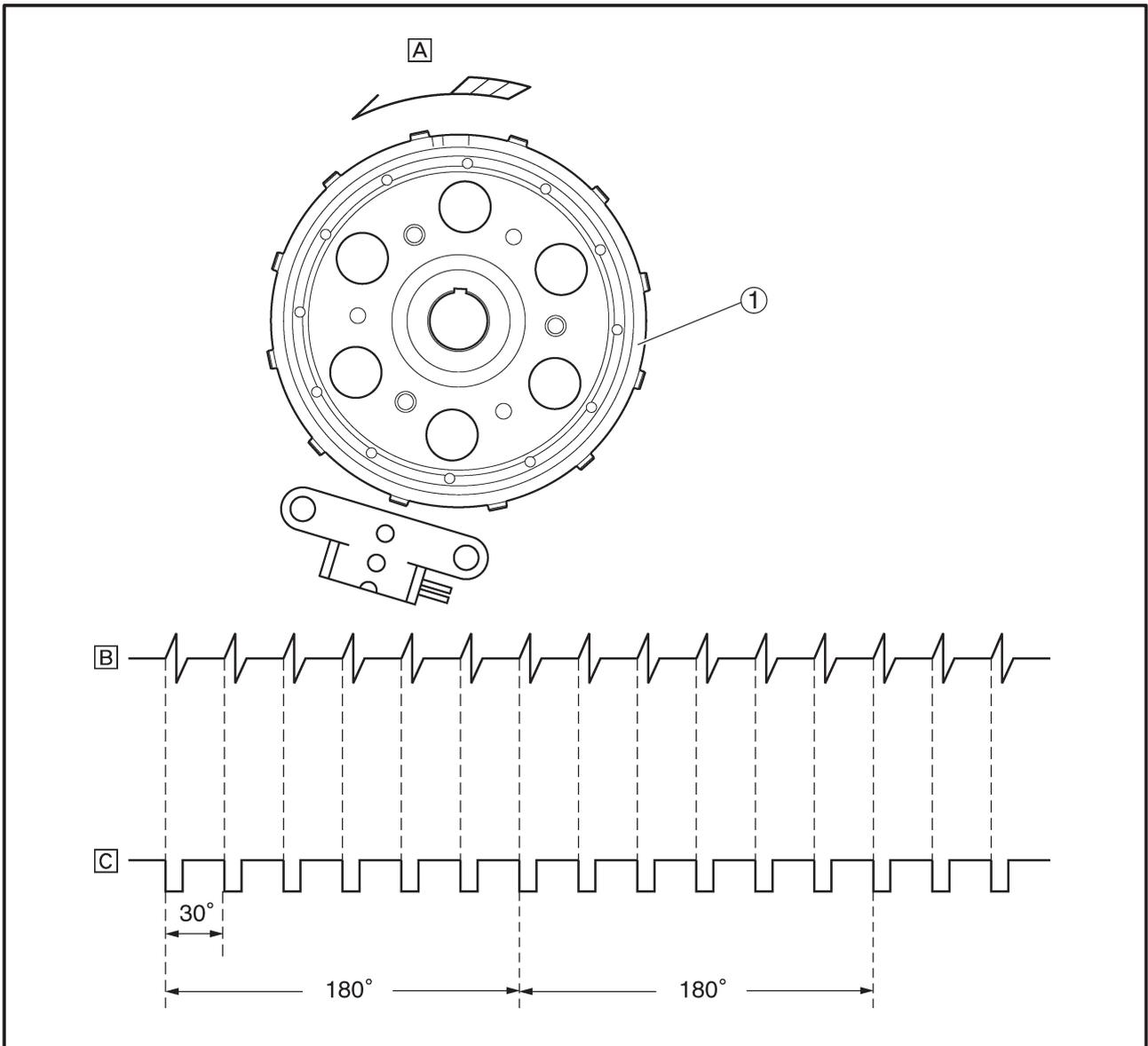
When the current flows to the coil in accordance with the signal from the ECU, the core is drawn upward, allowing the flange that is integrated with the needle to move to the spacer. Since the distance of the movement of the needle is thus kept constant, the opening area of the fuel passage also becomes constant. Because the pressure difference of the fuel to the intake manifold pressure is kept constant by the pressure regulator, the fuel volume varies in proportion to the length of time the coil is energized. The injector that has been recently adopted has a four-hole type injection orifice that enhances the atomization of fuel and improves combustion efficiency.



- ① Coil
- ② Core
- ③ Spacer
- ④ Needle
- ⑤ Inject
- ⑥ Flange
- Ⓐ Fuel

Crankshaft position sensor

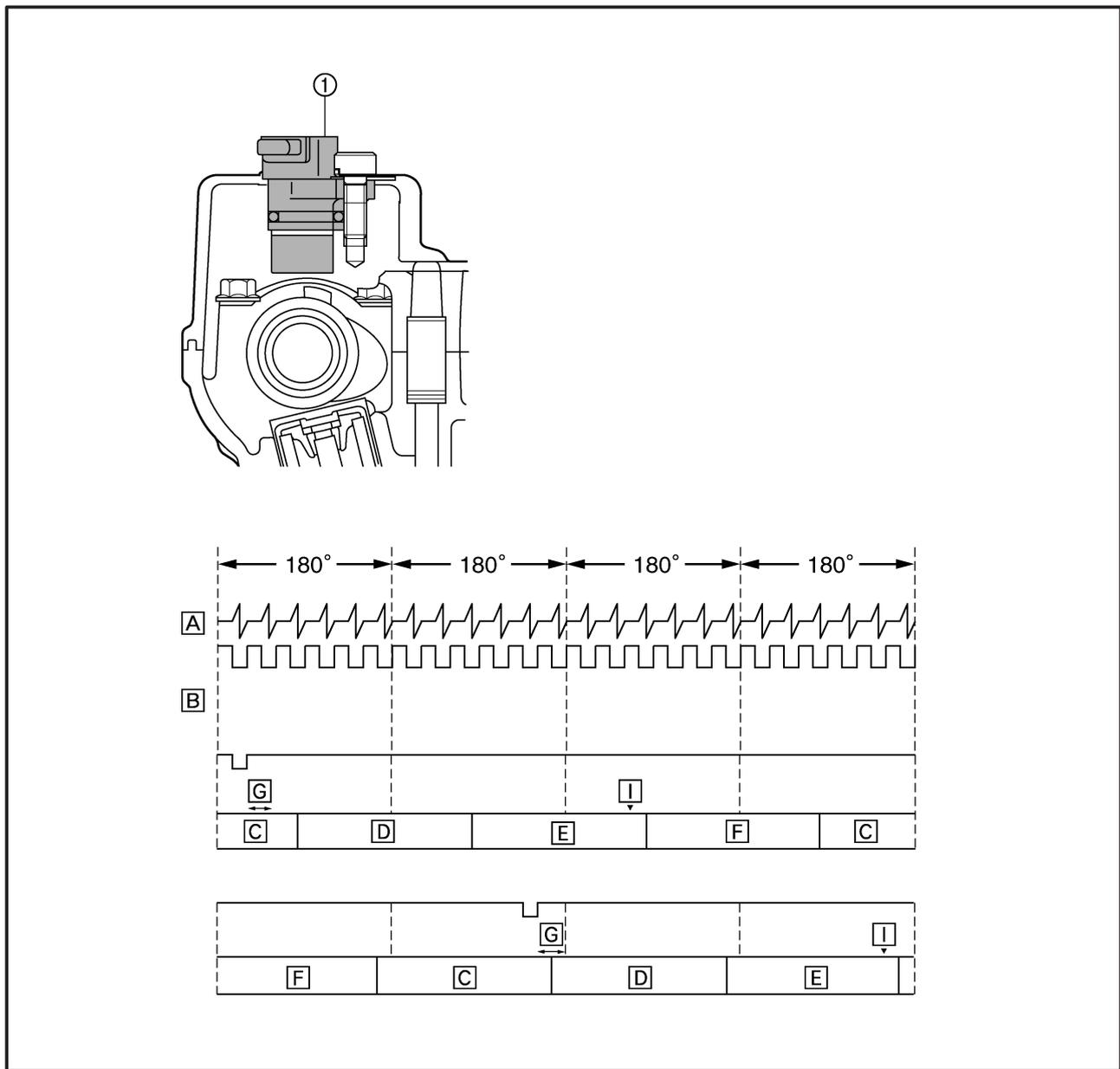
The crankshaft position sensor uses the signals of the pickup coil that is mounted on the right side of the crankshaft. When the rotation of the pickup rotor that is attached to the crankshaft causes the projections on the rotor to pass by the pickup coil, an electromotive force is generated in the coil. The voltage of this force is then input into the ECU, which calculates the position of the crankshaft and the speed of the engine. The ignition timing is then determined in accordance with the calculated data, in order to determine the corresponding injection timing. Based on the changes in the time intervals of the signals generated by the pickup coil, the ECU calculates the ignition timing advance to suit the operating conditions. The injection timing is also advanced in accordance with the ignition timing in order to supply fuel to the engine at an optimal timing.



- ① Pickup rotor
- A Direction of rotation
- B Pickup signal
- C Trigger pole

Cylinder identification sensor

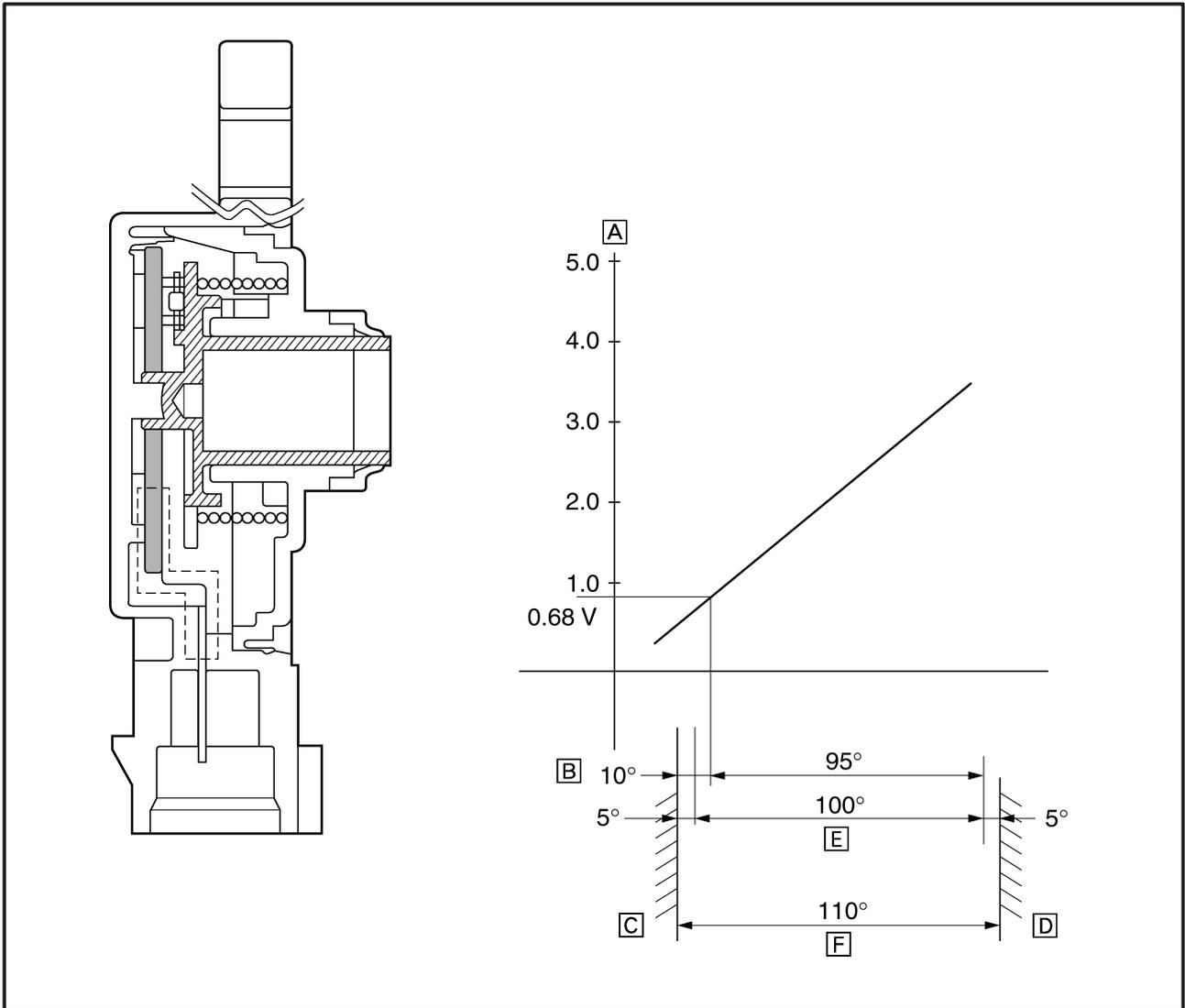
The cylinder identification sensor is mounted on the exhaust head cover of the #1 cylinder. When the exhaust cam of the #1 cylinder rotates and the projection of the cam plate passes by the sensor, the sensor generates a signal and sends it to the ECU. Based on this signal and the signal from the crankshaft position sensor, the ECU then actuates the injector of the cylinder that is currently in order to supply fuel.



- ① Cylinder identification sensor
- A Crankshaft position sensor signal
- B Cylinder identification sensor signal
- C Exhaust
- D Intake
- E Compression
- F Combustion
- G Injection
- H Ignition

Throttle position sensor

The throttle position sensor measures the intake air volume by detecting the position of the throttle valve. It detects the mechanical angle of the throttle valve through the positional relationship between the moving contact that moves in unison with the throttle shaft and the resistor board. In actual operation, the ECU supplies 5 V power to both ends of the resistor board and the voltage that is output by the throttle position sensor is used to determine the angle of the throttle valve.



- A** Output voltage
- B** Idling output position
- C** Mechanical stopper
- D** Mechanical stopper
- E** Effective electrical angle
- F** Sensor operating angle

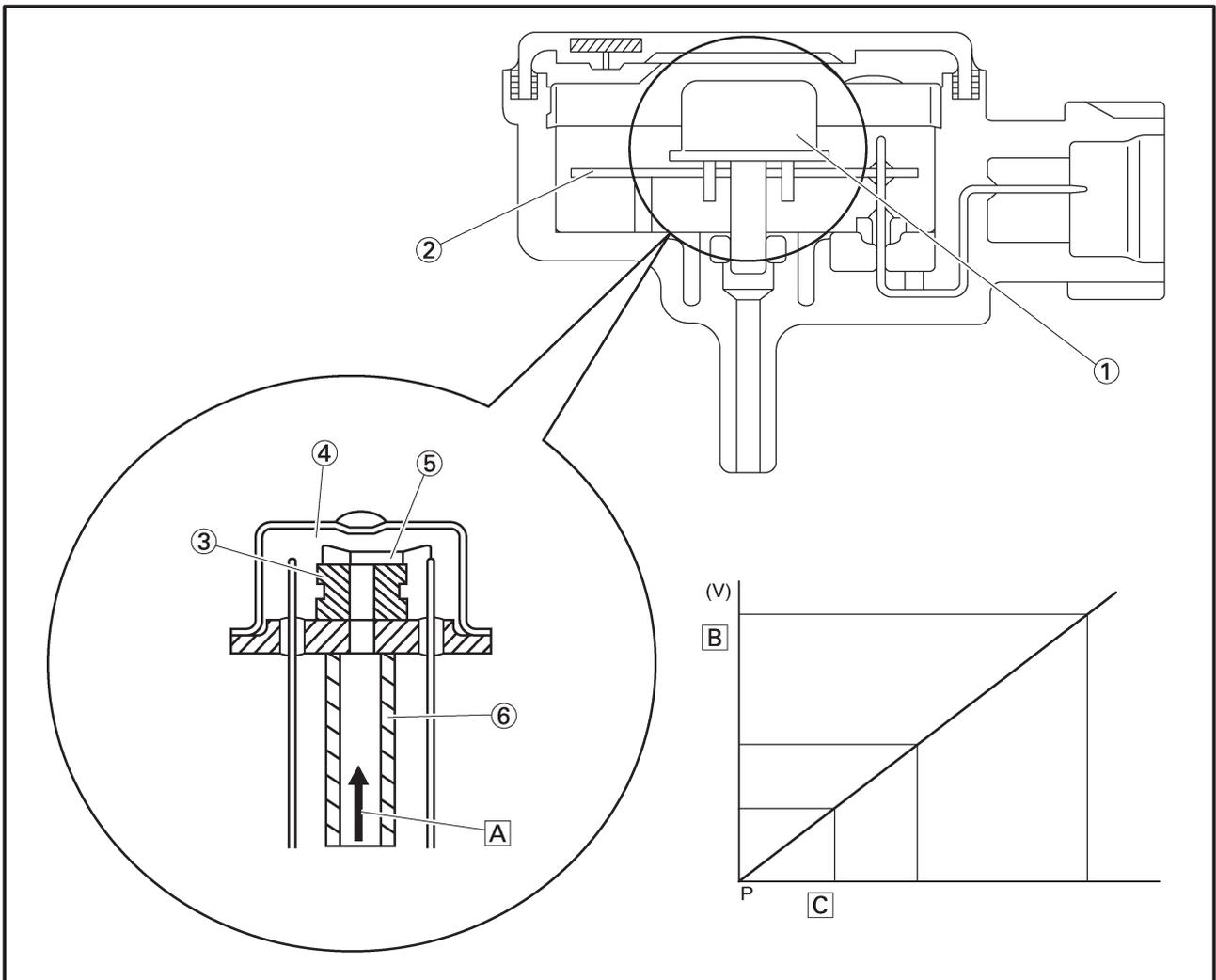
Intake air pressure sensor and atmospheric pressure sensor

• Intake air pressure sensor

The intake air pressure sensor is used for measuring the intake air volume. The intake air volume of every intake stroke is proportionate to the intake air pressure. Therefore, the intake air volume can be measured by measuring the intake air pressure. The intake air pressure sensor converts the measured intake air pressure into electrical signals and sends those signals to the ECU. When the intake air pressure is introduced into the sensor unit, which contains a vacuum chamber on one side of the silicon diaphragm, the silicon chip that is mounted on the silicon diaphragm converts the intake air pressure into electrical signals. Then, an integrated circuit (IC) amplifies and adjusts the signals and makes temperature compensations, in order to generate electrical signals that are proportionate to the pressure.

• Atmospheric pressure sensor

The atmospheric pressure sensor is used for making compensations to the changes in the air density caused by the changes in the atmospheric pressure (particularly at high altitudes). The operating principle and function of the atmospheric pressure sensor are the same as those of the aforementioned intake air pressure sensor.



- ① Sensor unit
- ② Hybrid IC
- ③ Silicon diaphragm

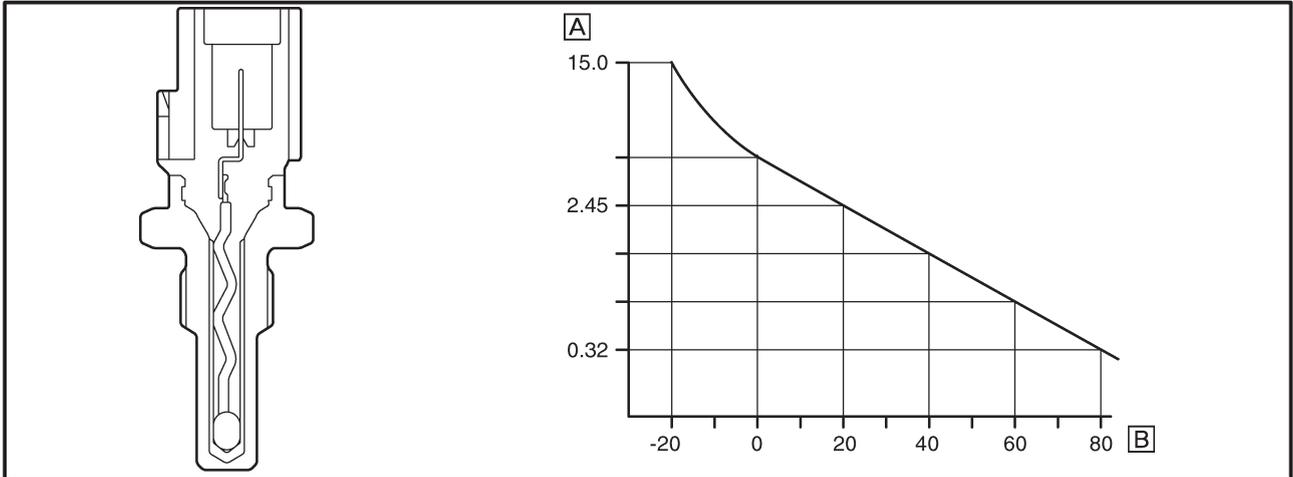
- ④ Vacuum chamber
- ⑤ Silicon chip
- ⑥ Pressure induction pipe

- Ⓐ Atmospheric pressure, intake air pressure

- Ⓑ Output voltage
- Ⓒ Input pressure

Coolant temperature sensor

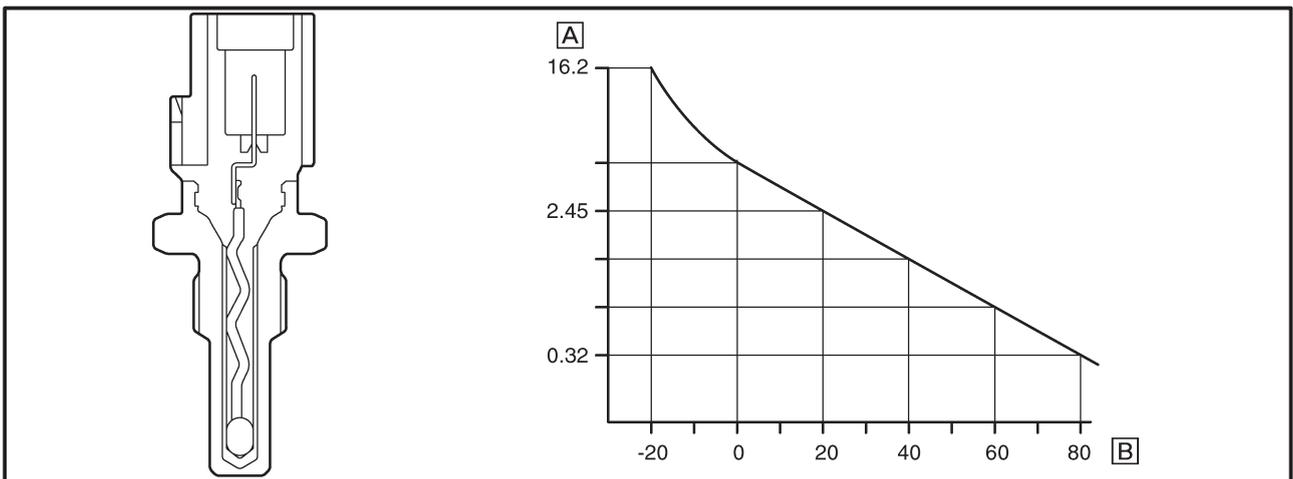
The signals from the coolant temperature sensor are used primarily for making fuel volume compensations during starting and warm-up. The coolant temperature sensor converts the temperature of the coolant into electrical signals and sends them to the ECU.



- A** Resistance kΩ
- B** Temperature °C

Intake air temperature sensor

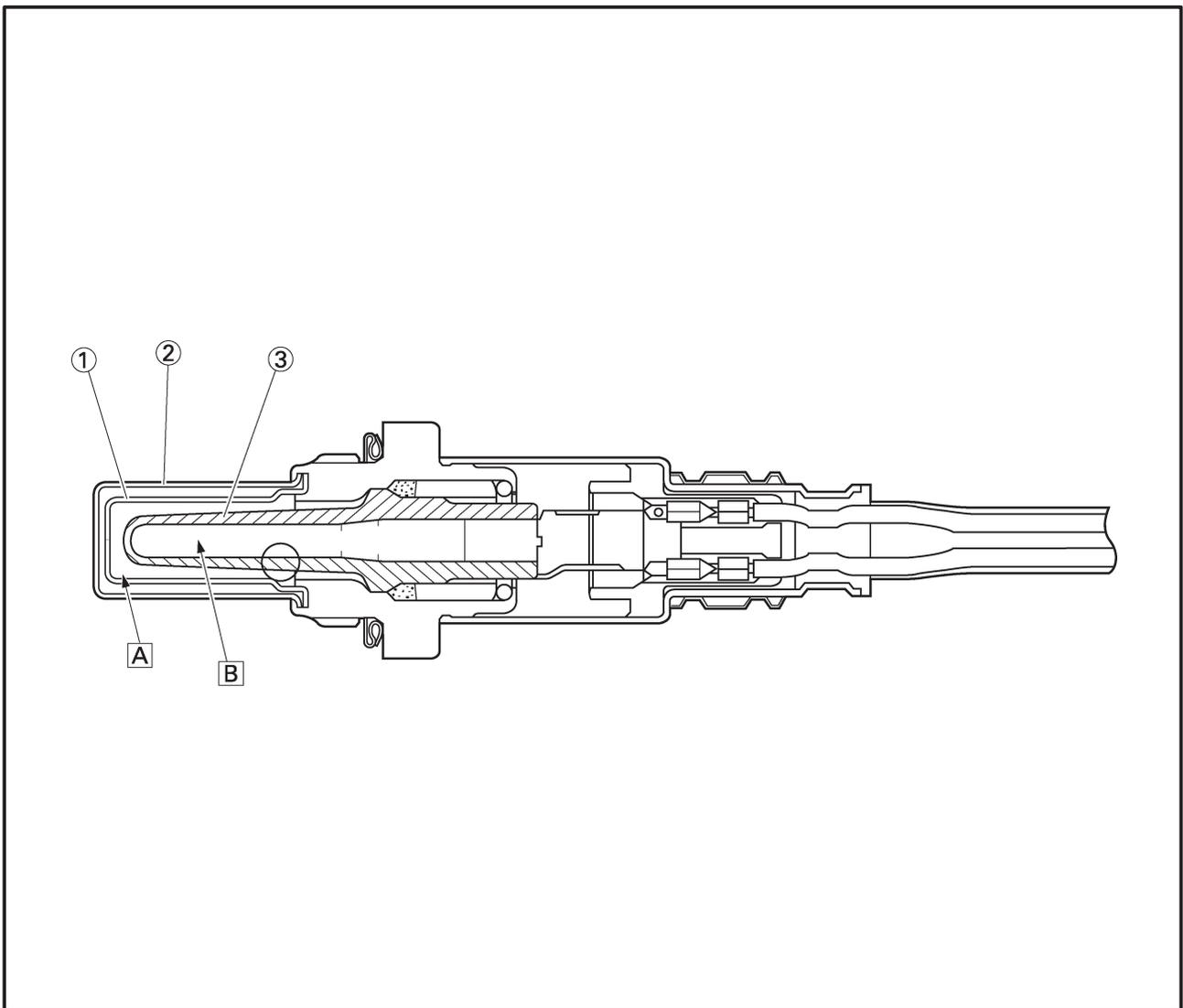
The intake temperature sensor corrects the deviation of the air-fuel mixture that is associated with the changes in the intake air density, which are created by the changes in the intake air temperature that occur due to atmospheric temperatures. This sensor uses a semi-conductor thermistor that has a large resistance at low temperatures and a small resistance at high temperatures. The thermistor converts the temperature-dependent changes in resistance into electrical resistance values, which are then input into the ECU.



- A** Resistance kΩ
- B** Temperature °C

O₂ sensor

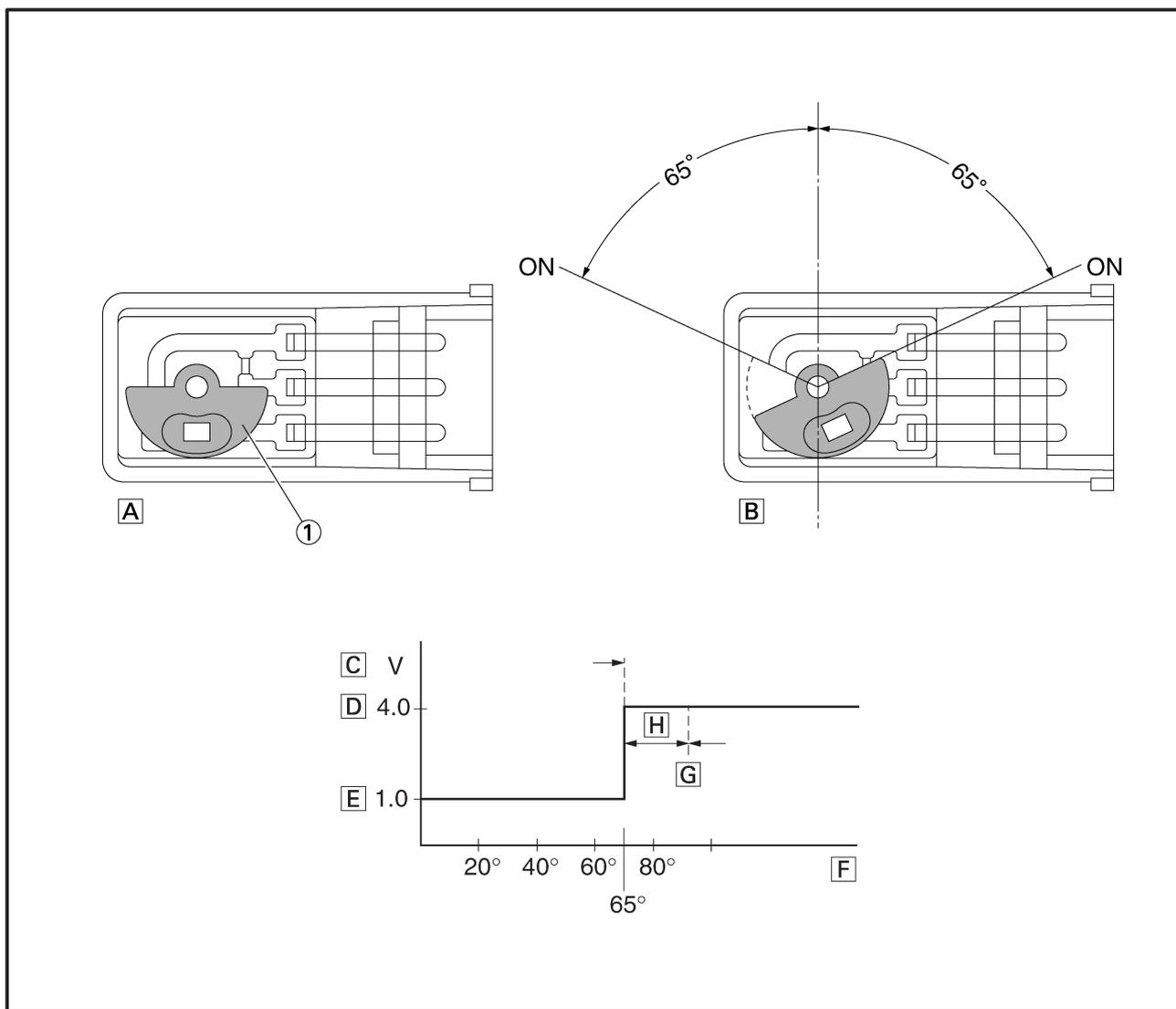
The O₂ sensor has been adopted to enable the catalyst to function at a high degree of efficiency by maintaining the air-fuel mixture near the stoichiometric ratio (14.7 : 1). This sensor, which is a zirconia type, utilizes the oxygen ion conductivity of the solid electrolyte for detecting the oxygen concentration levels. In actual operation, a zirconia tube made of solid electrolyte is exposed in the exhaust gas, so that the exterior of the zirconia tube is in contact with the exhaust gas and the interior is in contact with the atmosphere whose oxygen concentration level is known. When a difference in the oxygen concentration level is created between the outside and the inside of the zirconia tube, the oxygen ion passes through the zirconia element and generates an electromotive force. The electromotive force increases when the oxygen concentration level is low (rich air-fuel ratio) and the electromotive force decreases when the oxygen concentration level is high (lean air-fuel ratio). As electromotive force is generated in accordance with the concentration of the exhaust gas, the resultant voltage is input into the ECU in order to correct the duration of the injection of fuel.



- ① Inner cover
- ② Outer cover
- ③ Zirconia tube
- A Exhaust gas
- B Atmosphere

Lean angle cut-off switch

The lean angle cut-off switch stops the supply of fuel to the engine in case the motorcycle overturns. When the motorcycle is in the normal state, the cut-off switch outputs a constant voltage of approximately 1.0 V (low level). When the motorcycle tilts, the float in the switch tilts in proportion to the tilt of the motorcycle. However, the voltage output to the ECU remains unchanged at the low level. When the tilt of the motorcycle exceeds 70 degrees (according to the tilt of the float), the signal from the sensor increases to approximately 4.0 V (high level). When the ECU receives the high-level voltage, it determines that the motorcycle has overturned, and stops the delivery of fuel to the engine by turning OFF the fuel injection system relay that powers the fuel pump and the injectors. Once the cut-off switch is tripped, the ECU maintains this state; therefore, even if the motorcycle has recovered its upright position, this state will not be canceled unless the main switch is turned OFF, and then turned back ON.



① Float

- A** Normal
- B** Tilts
- C** Output voltage
- D** High level
- E** Low level
- F** Cut-off switch tilt angle
- G** Fuel injection system relay OFF
- H** Lag time

THREE-WAY CATALYTIC CONVERTER SYSTEM

System outline

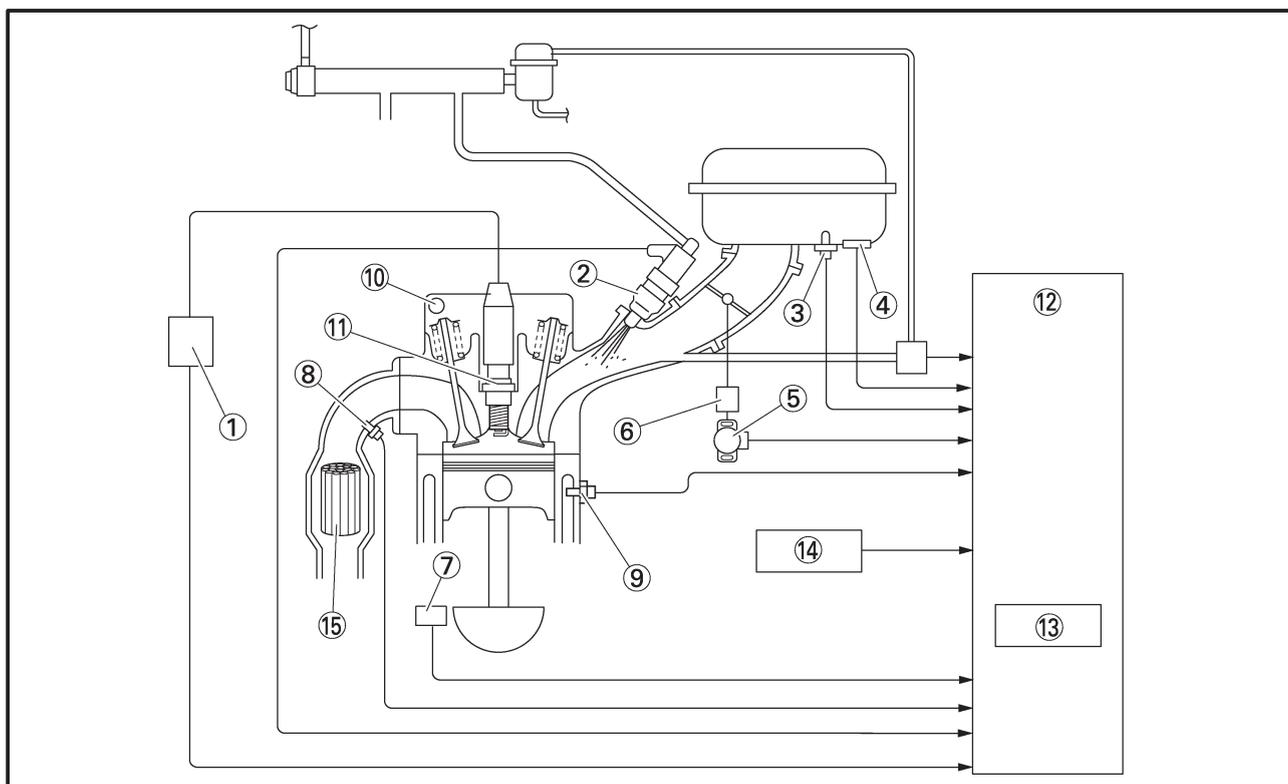
This is a highly efficient exhaust gas cleaning system that effects air-fuel control through a joint effort by the FI system, O₂ sensor, and the three-way catalytic converter system. By effecting comprehensive control of the air-fuel ratio in this manner, this system reduces the CO, HC, and NOx in the exhaust gases.

The FI system controls the mixture to an optimal air-fuel ratio (basic air-fuel ratio) that matches the operating condition of the engine in order to realize an ideal combustion.

Furthermore, an O₂ sensor that detects the concentration of oxygen that remains in the exhaust gas is provided in the exhaust pipe for the purpose of maximizing the performance of the three-way catalytic converter and to clean the exhaust gas at a high degree of efficiency. Based on this data, the ECU applies more precise compensation to the basic air-fuel ratio, in order to maintain the mixture in the vicinity of the stoichiometric air-fuel ratio of 14.7 : 1.

Through the joint effort of these control systems, the exhaust gas is cleaned in a highly efficient manner without sacrificing engine performance.

Three-way catalytic converter system diagram



- | | | | |
|---------------------------------|------------------------------|----------------------------------|-------------------------------|
| ① Ignition coil | ⑥ Intake air pressure sensor | ⑩ Cylinder identification sensor | ⑬ Igniter |
| ② Injector | ⑦ Crankshaft position sensor | ⑪ Spark plug | ⑭ Atmospheric pressure sensor |
| ③ Intake air temperature sensor | ⑧ O ₂ sensor | ⑫ ECU | ⑮ Catalytic converter |
| ④ Intake solenoid | ⑨ Coolant temperature sensor | | |
| ⑤ Throttle position sensor | | | |

Functions of components

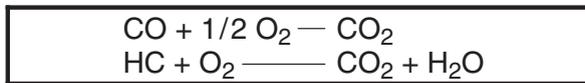
Catalyst

Because the conditions in which NOx is generated are directly opposed to those of CO and HC, there is a limit to the extent to which the concentration levels of these harmful elements can be reduced in the combustion stage. Hence, the function of the catalyst is to clean the exhaust gas at a high degree of efficiency by removing CO, HC, and NOx in the exhaust stage.

This model has adopted a monolith type metallic catalyst with a honeycomb construction, which achieves a low exhaust resistance through the large surface area of the catalyst body (with a high level of cleaning efficiency).

Catalytic substances consisting of precious metals such as platinum and rhodium are adhered to the wall surface of these honeycomb cells, which are enclosed in the exhaust pipe. As the exhaust gas comes in contact with these catalytic substances, the chemical reactions of oxidation and reduction advance in order to clean the exhaust gas.

- The CO and HC oxidize with the oxidation function of platinum, and are converted into harmless carbon dioxide (CO₂) and water (H₂O), resulting in cleaner exhaust gases.

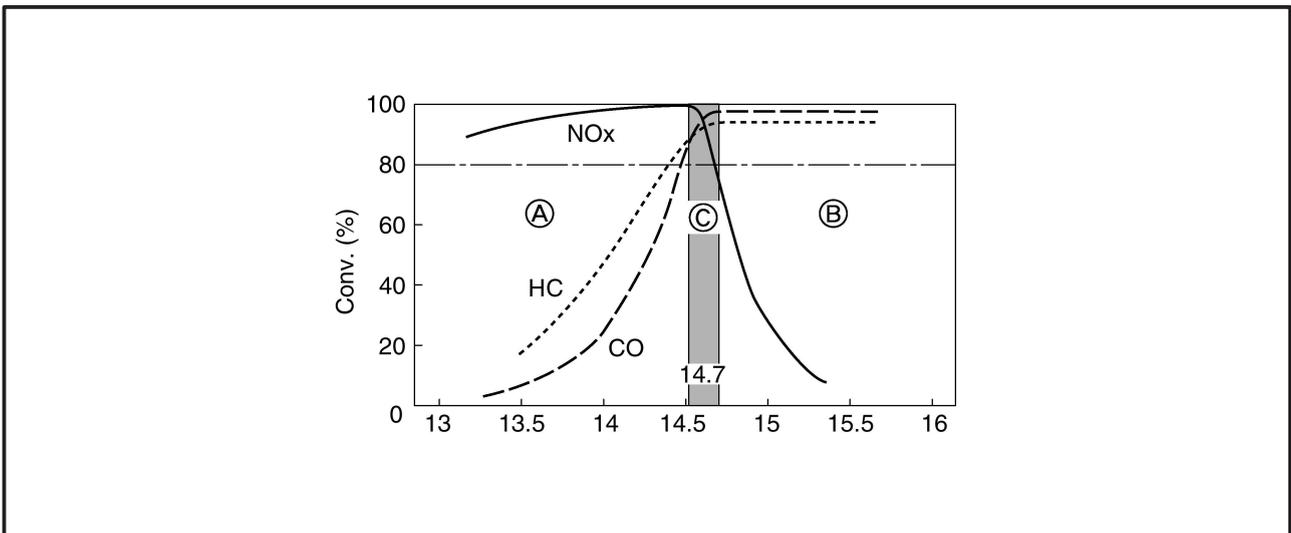


- The NOx is reduced by the reduction function of rhodium, which converts NOx into harmless nitrogen (N₂) and oxygen (O₂), resulting in cleaner exhaust gases.



To clean the exhaust gases at a high rate of efficiency through the maximization of these catalytic capacities, it is necessary to maintain and control the mixture in the vicinity of the stoichiometric air/fuel ratio of (14.7 : 1) at all times. As a means of maintaining the stoichiometric ratio, this system has adopted an O₂ feedback compensation method that uses an O₂ sensor.

Large amounts of both CO and HC are generated when the mixture is rich (as indicated by insufficient O₂ region (A)). Conversely, large amounts of NOx are generated when the mixture is lean (as indicated by excessive O₂ region (B)). Under these conflicting characteristics, the system maintains the mixture within an extremely narrow range (C) of stoichiometric ratio (14.7 : 1). As a result, the function of the catalyst is maximized, making it possible to clean the exhaust gases at a high degree of efficiency.



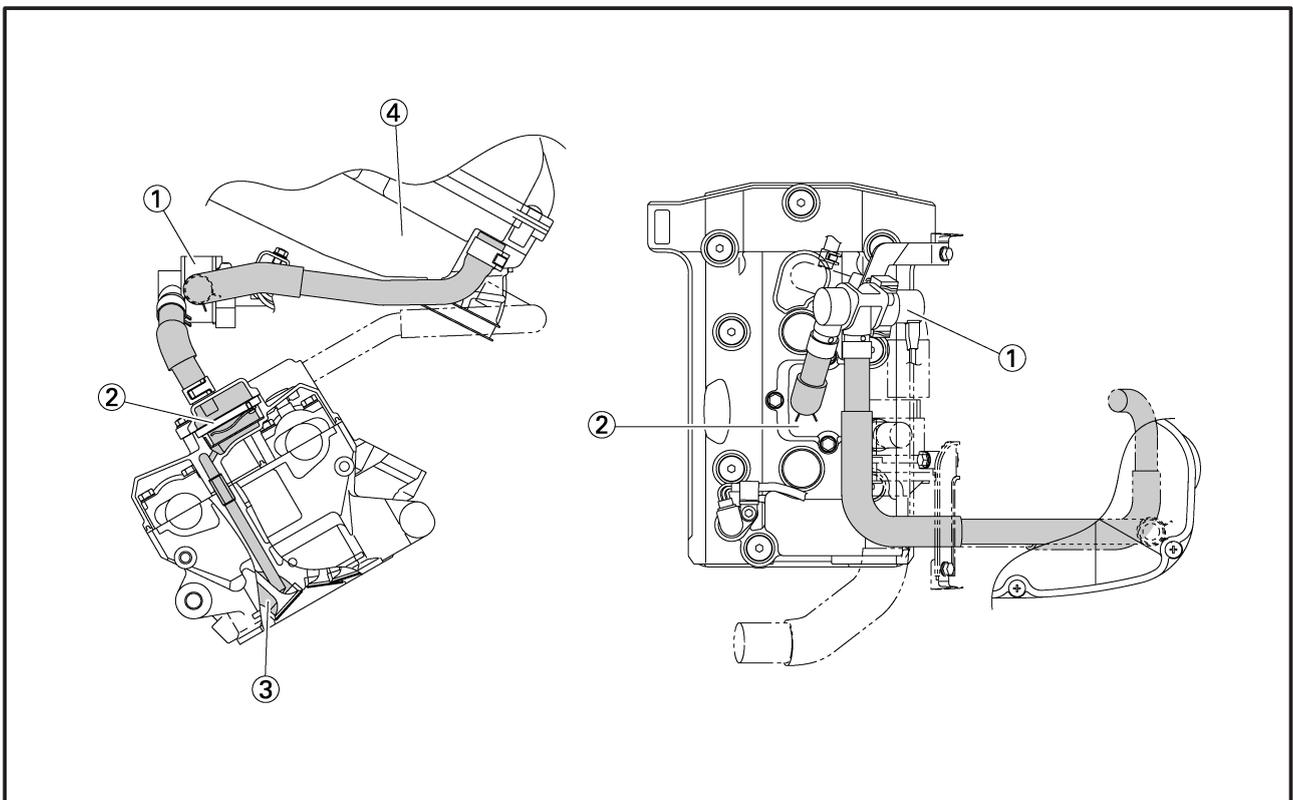
AIR INDUCTION SYSTEM

The air induction system (AI system) introduces fresh air into the exhaust port in order to burn the unburned gas (which is present in the exhaust gas) in the exhaust pipe. The burning of the unburned gases in this manner enhances the efficiency of the catalyst and results in cleaner exhaust gases.

The AI system takes a portion of the air from the air cleaner, sends it to the reed valve via the air cut-off valve, and introduces it directly into the exhaust port through the reed valve.

The air cut-off valve is controlled by the signals from the ECU in accordance with the combustion conditions. Ordinarily, the air cut-off valve opens to allow the air to flow during idle and closes to cut off the flow when the motorcycle is being driven. However, if the coolant temperature is below the specified value, the air cut-off valve remains open and allows the air to flow into the exhaust pipe until the temperature becomes higher than the specified value.

The reed valve is provided on the cylinder head cover above the cylinders, and sends air to the exhaust pipe through the inside of the cylinder head.



- ① Air cut-off valve
- ② Reed valve
- ③ Exhaust port
- ④ Air filter case