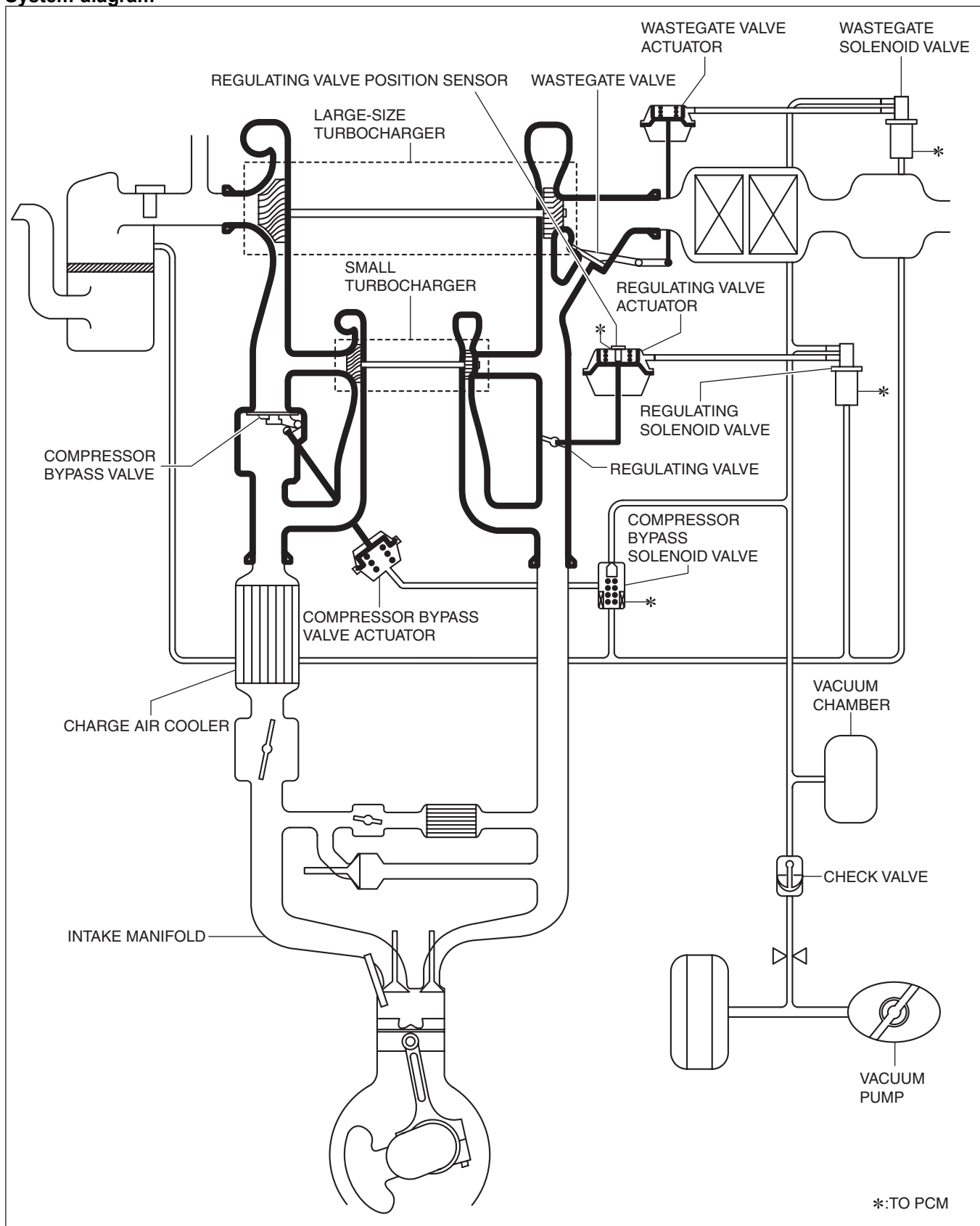

AIR CHARGING SYSTEM [SKYACTIV-D 2.2]

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Purpose, Outline

- The two-stage turbocharger selectively operates according to driving conditions to realize low emissions, low fuel consumption, high torque, and high response.
- To obtain efficient, high air charging in a wide range of driving conditions, the large-type turbocharger and the small-type turbocharger perform two-stage air charging in the low engine speed range, and only the large-type turbocharger performs air charging in the high engine speed range.

System diagram



*:TO PCM

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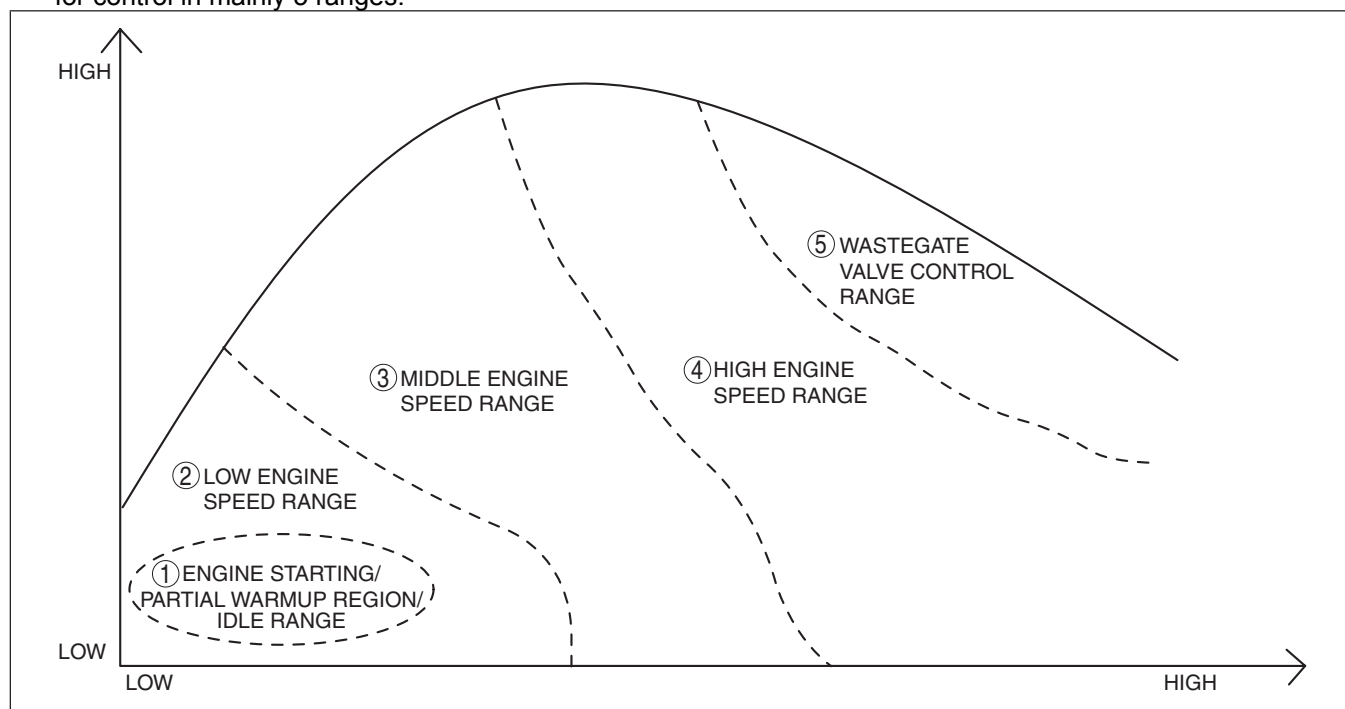
Structure

- The air charging system consists of the following parts.

Part name		Reference
Turbocharger	Large-type turbocharger	(See TURBOCHARGER [SKYACTIV-D 2.2].) (See REGULATING VALVE POSITION SENSOR [SKYACTIV-D 2.2].)
	Small-type turbocharger	
	Compressor bypass valve	
	Compressor bypass valve actuator	
	Regulating valve	
	Regulating valve actuator	
	Regulating valve position sensor	
	Wastegate valve	
	Wastegate valve actuator	
Compressor bypass solenoid valve		(See COMPRESSOR BYPASS SOLENOID VALVE [SKYACTIV-D 2.2].)
Regulating solenoid valve		(See REGULATING SOLENOID VALVE [SKYACTIV-D 2.2].)
Wastegate solenoid valve		(See WASTEGATE SOLENOID VALVE [SKYACTIV-D 2.2].)
Vacuum chamber		(See VACUUM CHAMBER [SKYACTIV-D 2.2].)
Check valve		(See CHECK VALVE [SKYACTIV-D 2.2].)
Charge air cooler		(See CHARGE AIR COOLER [SKYACTIV-D 2.2].)

Operation

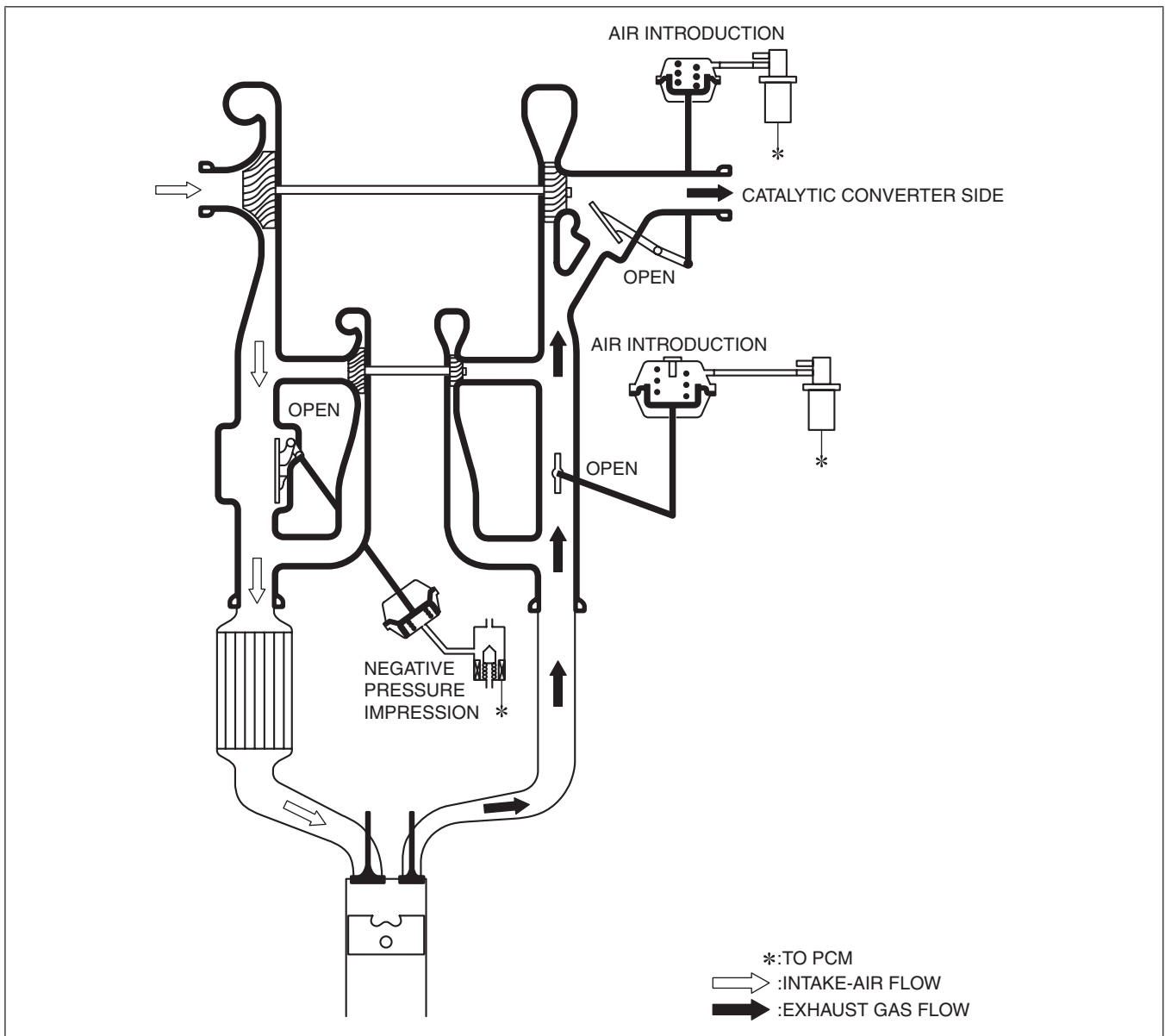
- The two-stage air charging system is divided between the large-type turbocharger and small-type turbocharger for control in mainly 5 ranges.



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1. Engine starting/partial warmup region/idle range

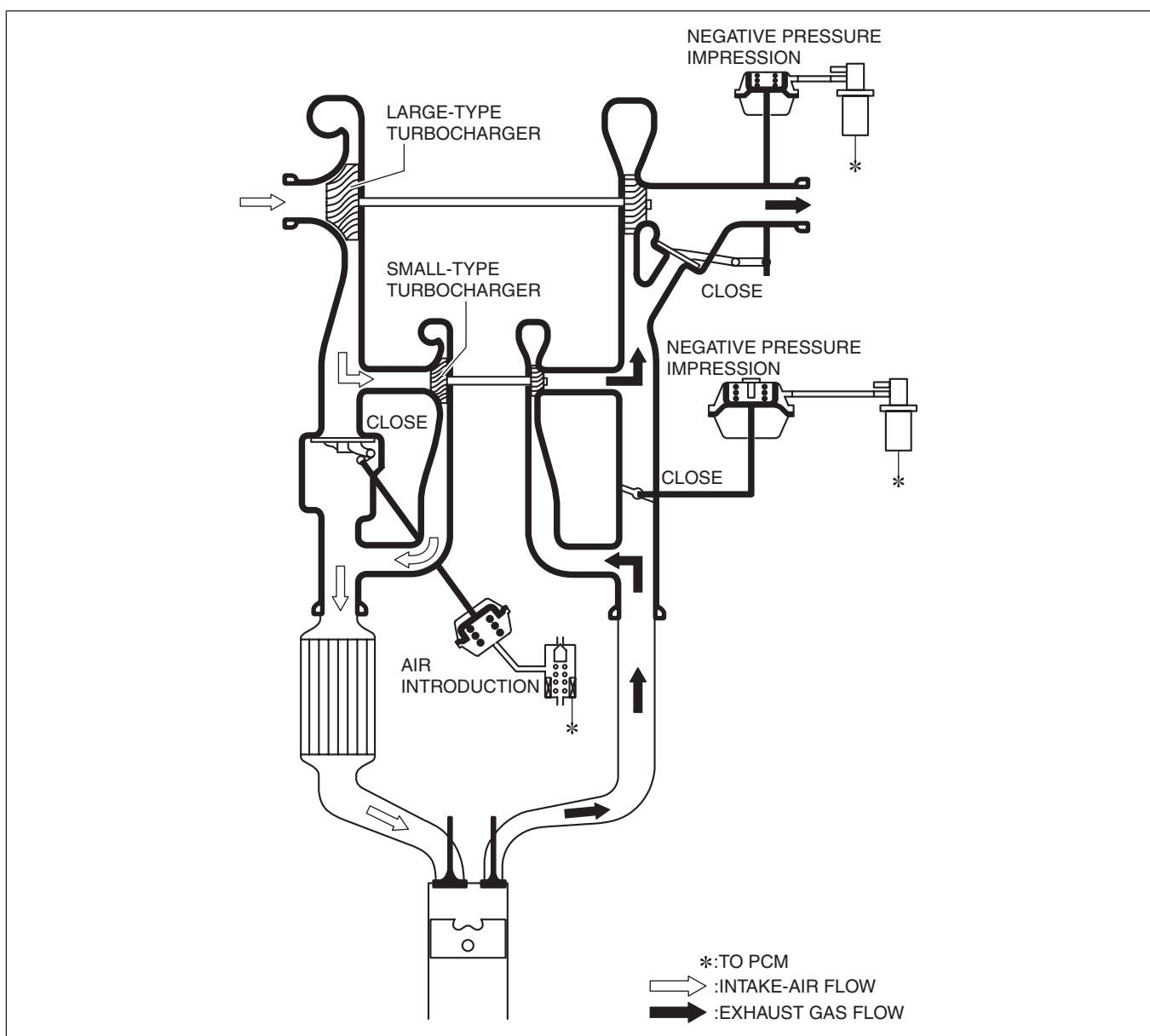
- For the purpose of earlier activation of the catalytic converter, air charging by the small-type turbocharger and large-type turbocharger is stopped. By stopping the air charging, the exhaust gas arrives at the catalytic converter as is with no loss of exhaust heat because it does not contact the turbine.



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2. Low engine speed range

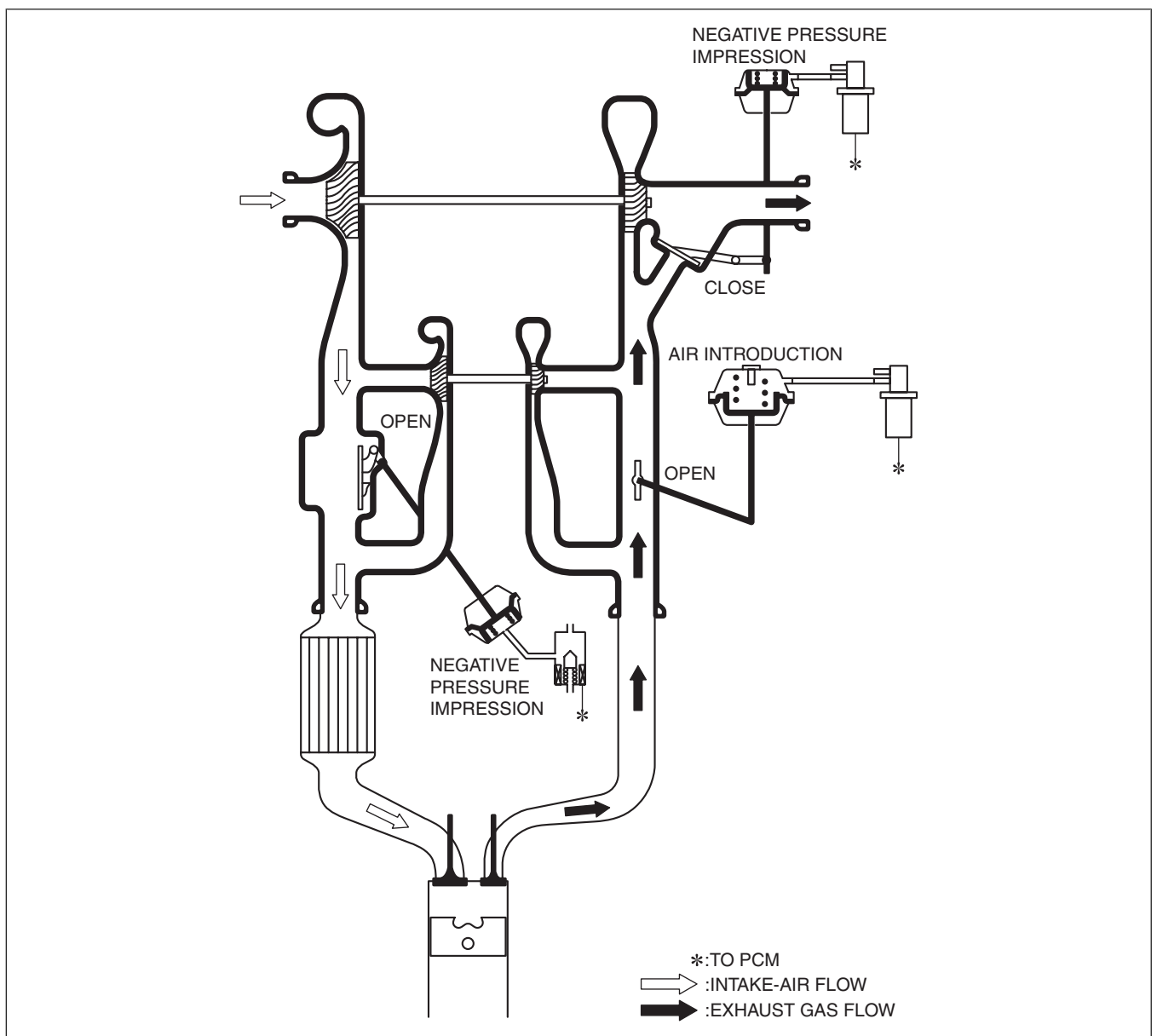
- At low engine speeds, the air charging effect by the large-type turbocharger is small because the force of the exhaust gas is small. By connecting the small-type turbocharger and large-type turbocharger in tandem and having the air charged by the large-type turbocharger further charged at the small-type turbocharger, air charging pressure is assured and high torque at the low engine speed range and high response are achieved.



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3. Middle engine speed range

- In the range bordering between the low engine speed range and the high engine speed range, the regulating valve opens and closes according to the conditions. By opening and closing the valve, generation of turbocharger lag is suppressed by switching the operation of the small-type turbocharger.



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5. Air charging pressure excess region

- In the region where air charging pressure increases, the rise in air charging pressure is suppressed by opening and closing the wastegate valve to switch the air charging of the large-type turbocharger.

