TWO-STAGE TURBO CONTROL [SKYACTIV-D 2.2]

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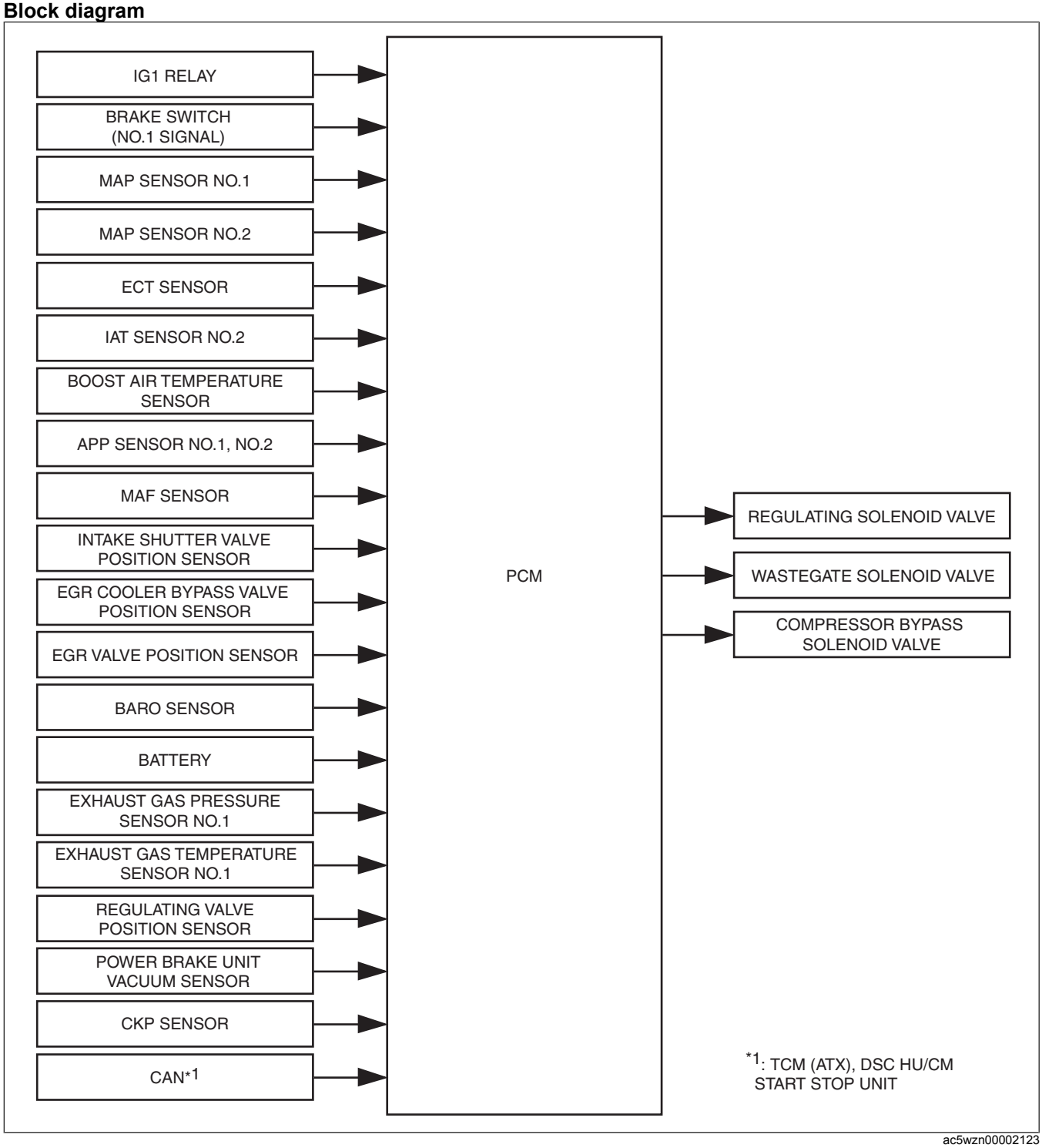
Outline

- By switching the air charging between the large-type turbocharger and small-type turbocharger, driveability under a wide range of conditions and emission performance have been improved.
- The following 3 solenoid valves are driven according to the engine operation conditions to switch the air charging between the large-type turbocharger and small-type turbocharger.
  - — Compressor bypass solenoid valve
    - The compressor bypass valve opens/closes according to the on/off signal from the PCM.
  - — Regulating solenoid valve
    - The regulating valve opens/closes according to the duty signal from the PCM.
  - — Wastegate solenoid valve
    - The wastegate valve opens/closes according to the duty signal from the PCM.

Block diagram



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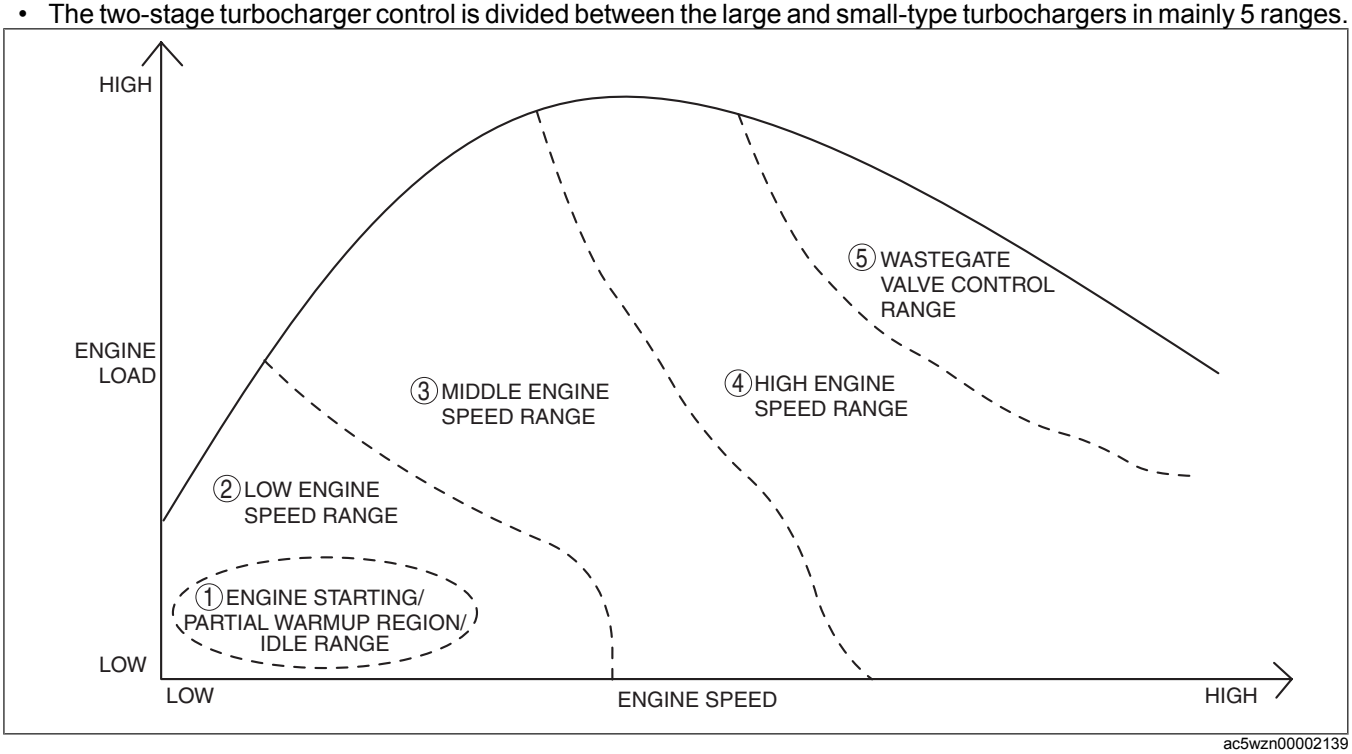
Operation

- The two-stage turbocharger control is divided between the large and small-type turbochargers in mainly 5 ranges.



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OFF: No energization
ON: Energization (on control)

Item	Operation conditions			
	Compressor bypass solenoid valve	**Regulating solenoid valve*1**	**Wastegate solenoid valve*2**	**Turbo charging condition**
(1) Engine start/partial warm-up/idle range	ON (open)	Duty 0% (open)	Duty 0% (open)	No turbo charging
(2) Low engine speed range	OFF (closed)	Duty 50—95% (closed)	Duty 60—95% (closed)	Two-stage turbo charging
(3) Middle engine speed range	OFF (closed)	Duty 0 to 95% (closed ↔ open)	Duty 60—95% (closed)	Single-stage turbo charging to two-stage turbo charging based on large-type turbocharger
(4) High engine speed range	ON (open)	Duty 0% (open)	Duty 60—95% (closed)	Single-stage turbo charging based on large-type turbocharger
(5) Air charging control range at wastegate valve	ON (open)	Duty 0% (open)	Duty 0 to 95% (closed ↔ open)	Single-stage turbo charging based on no turbo charging to large-type turbocharger

*1 : The required duty value to close the regulating valve is 50%, however, if it is difficult to close the regulating valve because of the exhaust gas pressure, the PCM increases the duty value.
*2 : The required duty value to close the wastegate valve is 60%, however, if it is difficult to close the wastegate valve because of the exhaust gas pressure, the PCM increases the duty value.

- For details on the two-stage turbo control, refer to the AIR CHARGING SYSTEM. (See AIR CHARGING SYSTEM [SKYACTIV-D 2.2].)