TWO-STAGE TURBO CONTROL [SKYACTIV-D 2.2]

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Outline

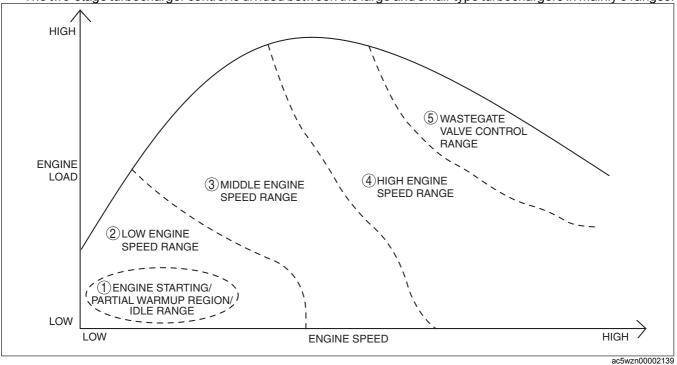
- By switching the air charging between the large-type turbocharger and small-type turbocharger, driveability under a wide range of conditions and emission performance have been improved.
- The following 3 solenoid valves are driven according to the engine operation conditions to switch the air charging 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 IG1 RELAY BRAKE SWITCH (NO.1 SIGNAL) MAP SENSOR NO.1 MAP SENSOR NO.2 **ECT SENSOR** IAT SENSOR NO.2 **BOOST AIR TEMPERATURE SENSOR** APP SENSOR NO.1, NO.2 MAF SENSOR REGULATING SOLENOID VALVE INTAKE SHUTTER VALVE POSITION SENSOR PCM WASTEGATE SOLENOID VALVE EGR COOLER BYPASS VALVE POSITION SENSOR COMPRESSOR BYPASS SOLENOID VALVE EGR VALVE POSITION SENSOR **BARO SENSOR BATTERY** EXHAUST GAS PRESSURE SENSOR NO.1 EXHAUST GAS TEMPERATURE SENSOR NO.1 REGULATING VALVE POSITION SENSOR POWER BRAKE UNIT **VACUUM SENSOR CKP SENSOR** *1: TCM (ATX), DSC HU/CM CAN*1 START STOP UNIT

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Operation

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



OFF: No energization ON: Energization (on control)

	Operation conditions			
Item	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.

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

^{*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.