FOREWORD [SKYACTIV-D 2.2]

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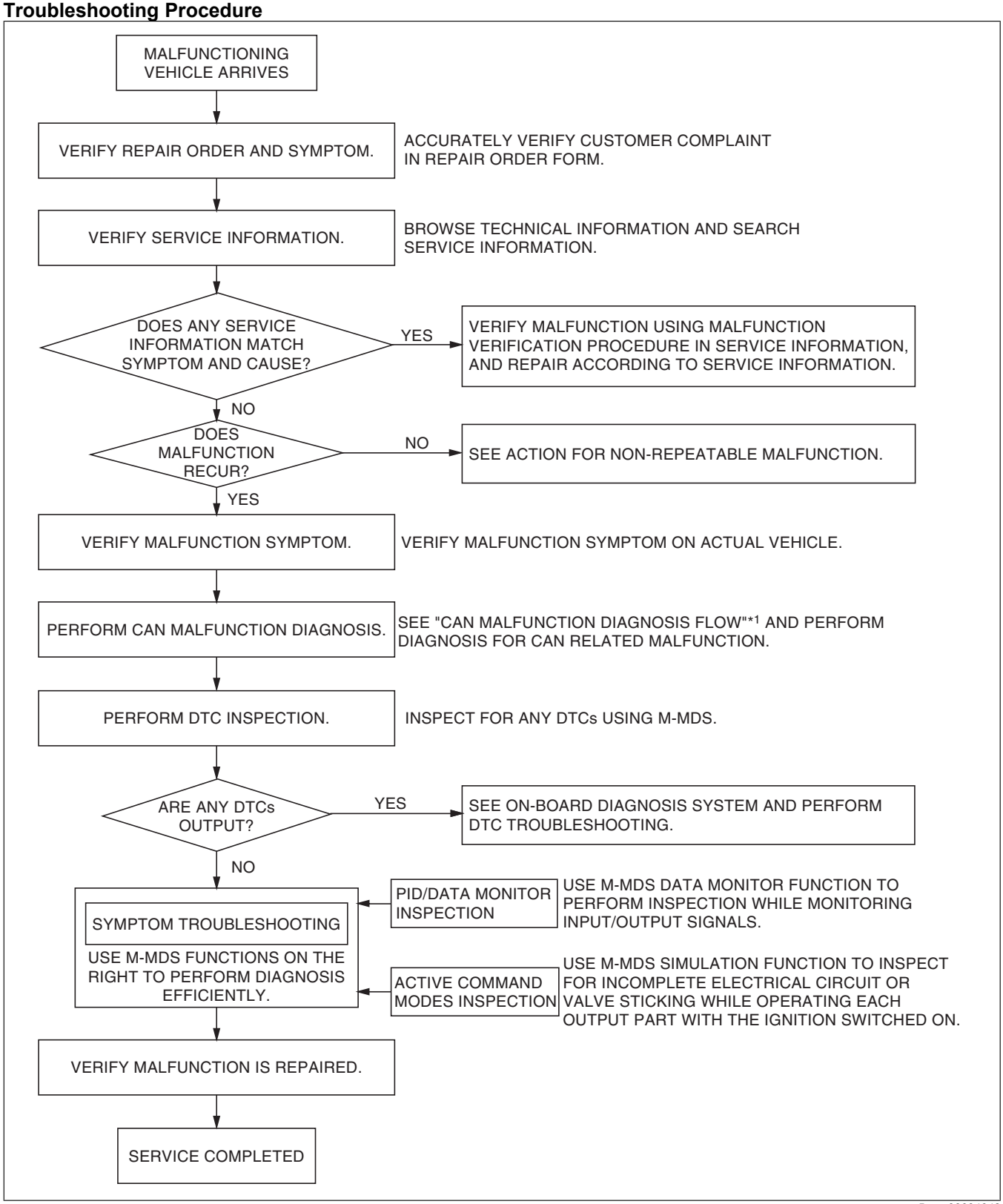
- If there is any vehicle malfunction complaint lodged by a customer, perform malfunction diagnosis according to the troubleshooting procedure.

Troubleshooting Procedure



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*1 : CONTROLLER AREA NETWORK (CAN) MALFUNCTION DIAGNOSIS FLOW [SKYACTIV-D 2.2 (L.H.D.)]/ CONTROLLER AREA NETWORK (CAN) MALFUNCTION DIAGNOSIS FLOW [SKYACTIV-D 2.2 (R.H.D.)]

Repair order form

Repair order form and malfunction symptom check sheet

	Repair order	Check with customer	Diagnosis	Repair	Explanation to customer
Date/time					
In-charge					

Customer statement (When? What? What time(s)? Where it occurs. Warning light illumination? Can anyone replicate problem?)

Vehicle body number:	Registration date:	Date of malfunction occurrence:	Odometer reading km {mph}
Engine (SOHC/DOHC/RE/DE) (Cab /EGI/ Turbo/ Miller cycle/ LPG/Direct injection)		Transmission (MT/HAT/EC-AT/CVT)	

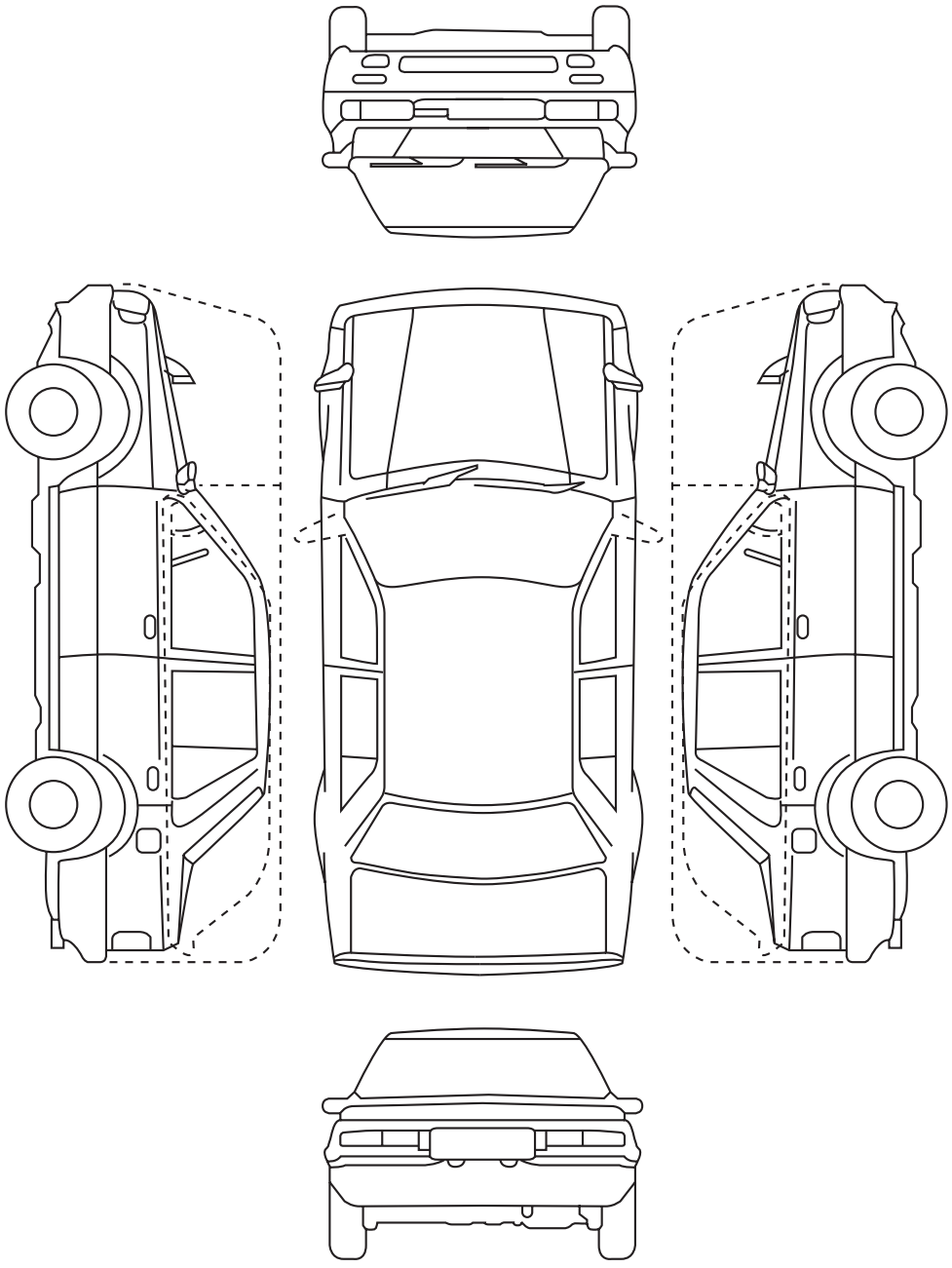
Environmental conditions				Occurrence frequency	Driving conditions									
Weather	Ambient temp.	Drive scenario	Grade		Fuel	Warm-up condition	Driving operation	Driving posture	Load	Accelerator opening angle	Shift position		Eng RPM	Vehicle speed	Pattern of use
Sunny Cloudy Rain Snow High wind Wind gusts N/A Other	-10˚C {14˚F} or less -10— 0˚C {14—32˚F} 0—10˚C {32—50˚F} 10—15˚C {50—59˚F} 15—20˚C {59—58˚F} 20—25˚C {68—77˚F} 25—30˚C {77—86˚F} 30—35˚C {86—95˚F} 35—4{0˚C {95—104˚F} 40—45˚C {104—113˚F} 45˚C {113˚F} or more N/A Other	Depart/arrive Traffic jam (city) Standard city street Suburbs Highway Uneven road Dry road surface Wet road surface Snow bound road Icy road Other	Flat Upgrade Down grade N/A Other	Once/day 2-3 times/day 4-5 times/day Many times/day Once/week 2-3 times/week 4-5 times/week Once/month 2-3 times/month 4-5 times/month Other	Regular High Oct. Diesel LPG Other Fuel gauge F E	Cold Half-warmed Fully warmed N/A Other Water temp. gauge H C	When starting After starting Re-starting (min. after stopped) Idling Racing Accel. from stop Normal driving Deceleration Braking Soft braking Clutch disengage Sudden accel. Light accel. Shifting (km/h {mph} → km/h {mph}) Other	Vehicle stopped Straight-on driving Reversing Right turn Left turn Other	Headlights on Exterior lights on A/C on AUTO ˚C{˚F} Blower: 1 step Blower: 2 steps Blower: 3 steps Blower: 4 steps Power steering lock to lock Rear defrost on Wipers on Audio on Other	0/8 1/8 2/8 3/8 4/8 5/8 6/8 7/8 8/8	MT AT	1 2 3 4 5 6 N R P R N D S L Hold M (km/h {mph})	Idle Less than 1,000 Less than 1,500 Less than 2,000 Less than 2,500 Less than 3,000 Less than 4,000 Less than 4,500 Less than 5,000 Less than 5,500 Less than 6,000 Less than 6,500 7,000 or more	5 km/h {3 mph} 10 km/h {6.2 mph} 20 km/h {12 mph} 30 km/h {19 mph} 40 km/h {25 mph} 50 km/h {31 mph} 60 km/h {37 mph} 70 km/h {43 mph} 80 km/h {50 mph} 90 km/h {56 mph} 100 km/h {62.1 mph} 110 km/h {68.4 mph} 120 km/h {74.6 mph} 130 km/h {80.8 mph} 140 km/h {87 mph} 150 km/h {93.2 mph} 160 km/h {99.4 mph}	Work_____% Minor use_____% Trips_____% Other_____% Between ENG. start→Stop: Distance, time Approx km Approx Hrs. No. of occupants: Load condition kg Other

DTC, measured data (fuel pressure, intake manifold vacuum, throttle sensor electromotive force, air flow electromotive force, other), maintenance, repair, accident history, installation of commercial devices

Dealer name:	Vehicle body number:	Odometer reading:
Vehicle-in date:	Estimated repair completion date:	Person in-charge:
Subject (Content):		

Audio memory

	1	2	3	4	5	6	Fuel level
FM1							E F
FM2							
AM							



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Repair order form (i-stop)

i-stop inoperable diagnostic sheet (i-stop indicator light (green) non-illumination while driving)

Dealer name: VIN:

1. Vehicle inspection

Inspection date Date customer verified malfunction:

No	Item	Inspection result					
1	Inoperable i-stop replicated?	During replication		Not replicated			
2	DTCs (including pending code) Yes/No	DTC:					
3	Extension FFD acquired (zip file) (Can/cannot acquire)	—					
4	Verification of BATT_SOC "i-stop operation conditions 68.4% or more."	%	* Due to the possibility of recurrence when BATT_SOC is 70% or less, after inspection completion, perform normal battery charging (10 A/3 hrs) and after battery learning, deliver vehicle.				
		Measurement timing: Vehicle-in, after charging, after inspection completed					
5	Battery specific gravity measurement	+ side (1)	-2	-3	-4	-5	(6) - side
6	BATT_CUR (current) measurement during idling	A					
7	BATT_V (voltage) measurement during idling If constant 14.5 V, in refresh mode.	M-MDS V		Circuit tester V			

2. Repair order form

1) Customer's usual vehicle pattern of use

Frequency of use	Electrical load		Usual driving environment		Usual use purpose		Meters & MID display
Once/day or more Once every 2-3 days Once/week Once/2-3 weeks Once/month Other	Headlights	Used often Sometimes Does not use	City traffic jam City streets Suburbs Highway	% % % %	Work use Shopping Travel Other	% % % %	When i-stop does not operate, does the A/C operation priority display appear? Yes, No, Unknown,
	A/C	・AUTO ℃ ・Manual Blower step	Other				
	Period of time used				From ENG start to stop: Distance, time Approx. km Approx. Hrs.		
	Morning Noon (during day) Nighttime	% % %			Occupant number Load condition kg		

2) Has customer discharged the battery accidently at some time Yes/No Yes, No

3) Has initialization learning (i-stop learning) been performed on the battery in the past? Yes, No

4) If learning has been performed, record the charging method, charging time, and BATT_SOC value after battery initialization learning (i-stop learning) was completed.

Quick charging (Hrs.) Normal charging (Hrs.) BATT_SOC value (%)

5) Number of times vehicle is stopped per one drive and i-stop frequency
(Ex: One drive, vehicle stopped times, i-stop times)

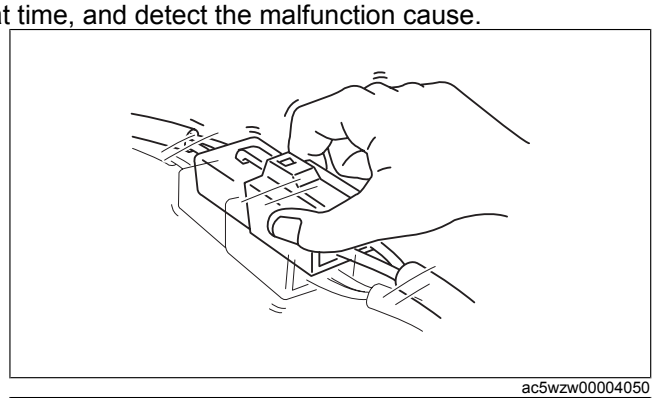
No. of times vehicle stopped in one driver ( ) No. of times i-stop functions ( )

6) Are there any variations prior to the stated malfunction
Ex.) Happens when driving to work. When going to pick up the kids at kindergarten.

7) Verify the use conditions which consume battery power when the vehicle is mainly used.
Ex.) Kindergarten, pick-up from after-school events, how long vehicle is stopped, and the electric load at those times (AC, audio use conditions).

Action for Non-repeatable Malfunction

- If the malfunction does not recur, verify the malfunction cause by performing the following actions:
  - — Based on the repair order form, attempt to drive the vehicle or perform tests to replicate the malfunction, record the data (such as PCM circuit voltage) at that time, and detect the malfunction cause.
  - — Shake the wiring harness or connector of the electrical component which is suspected to be the cause of the malfunction, and inspect for malfunction or occurrence of any DTCs.



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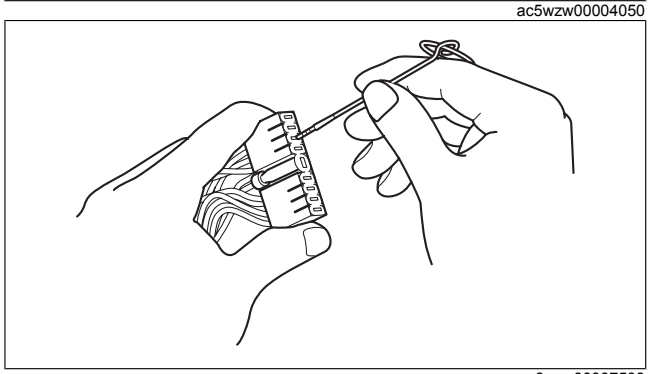
  - — Inspect the female terminals on the connector of the electric component which is suspected to be the cause of the malfunction for poor connection.



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i-stop control

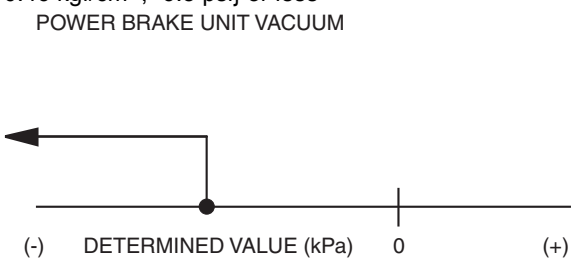
- The i-stop system is programmed to not function (stop or restart engine) while the bonnet is open, however, when performing servicing in the engine compartment be careful so as to prevent getting caught in a rotating part if the engine were too restart accidentally.
- When performing an asterisks (*) troubleshooting inspection, shake the applicable part, wiring harness, and connector by hand to discover whether poor contact points are the cause of any intermittent malfunction. If there is a problem, inspect to make sure connectors, terminals and wiring harnesses are connected correctly and undamaged, and repair or replace if necessary.
- Depending on the vehicle operation status and the conditions indicated in the table below, the engine may not stop or it may restart for a condition unrelated to driving operations (system is normal).

Engine stop control

i-stop (engine-stop control) permit condition

- The conditions to stop the engine by the i-stop control are as follows:

Purpose	Condition item	ATX	MTX
Driveability	Vehicle speed	0 km/h {0 mph}	3 km/h {2 mph} or less
	Brake pedal	Brake pedal depressed in D position or M position (except 2nd gear fixed mode) (If ABS operates during deceleration, i-stop operation is inhibited.)	Not applicable
	Brake fluid pressure	Brake fluid pressure is 1.25 MPa {12.7 kgf/cm^2, 181 psi} or more in D position or M position (except 2nd gear fixed mode) (pedal force sufficient to suppress vehicle lurch when engine is restarted)	Not applicable
	Accelerator pedal	Released (foot removed from accelerator pedal)	←
	Clutch pedal	Not applicable	30% or less (clutch pedal opening angle)
	Gear position	Not applicable	Neutral
	Vehicle conditions	Vehicle stopped in D position (After vehicle is stopped and shifted into N position, engine stops 0.6 s after operation. In addition, after vehicle is stopped in D position and if shifted into P position, engine stop condition continues by i-stop control	Not applicable
Marketability	Cabin temperature (With full-auto air conditioner)	Difference between target temperature in cabin and temperature in cabin is within a certain value (A/C cabin temperature control is performed)	←
	A/C temperature (With full-auto air conditioner)	Setting other than MAX/MIN	←
	Warm up condition (With manual air conditioner)	Ambient temperature is 10 °C {50 °F} or more and engine coolant temperature is 60 °C {140 °F} or more	←
	Cold condition (With manual air conditioner)	Ambient temperature is 29 °C {84 °F} or less and evaporator temperature is 9 °C {48 °F} or less	←
	Ambient temperature	-10—50 °C {14—122 °F}	←
	Steering speed	15 deg/sec or less	←
	Steering angle	-65—65 ° (Center) (After EPS control module learned center value)	Not applicable
	Steering torque	1.4 N·m {14 kgf·cm, 12 in·lbf} or less	←
	i-stop OFF switch	OFF	←
	Vehicle speed history	3 km/h {2 mph} or more	4 km/h {2.5 mph} or more

Purpose	Condition item	ATX	MTX
Safety	Battery charge condition	70% or more (determined from current sensor signal))	←
	Battery fluid temperature	0—70 °C {32—158 °F}	←
	Battery voltage	11.2 V or more	←
	Estimated battery voltage during engine restart	7.45 or more*1	←
	Defroster switch	OFF	←
	Power brake unit vacuum	-45 kPa {-0.46 kgf/cm2, -6.5 psi} or less 	
	Door (front, rear)	Closed	←
	Bonnet	Closed*2	←
	Liftgate	Closed	←
	Vehicle inclination angle	When level, less than ± 7%	Not applicable
	Seat belt (driver)	Fastened	←
	System condition	i-stop related module normal	←
System restriction	Fast idle increase	Completed	←
	Fuel injection amount learning	Completed	←
	DPF regeneration	Completed	←
	Battery condition learning setting	Completed	←
	Steering angle sensor initialization setting	Completed	Not applicable
	DSC sensor initialization	Completed	Not applicable
Engine condition	Engine coolant temperature	30—110 °C {86—230 °F}	←
	Intake air temperature	100°C {212 °F} or less	←
	TFT temperature	20—120 °C {68—248 °F}	Not applicable
Environment condition	Altitude	**European (L.H.D. U.K.) specs.** • 1,800 m or less **Except for European (L.H.D. U.K.) specs.** • 1,500 m or less	←

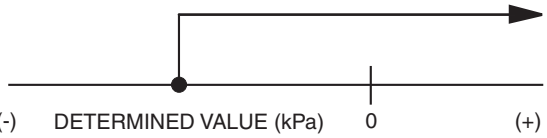
*1 : If the i-stop is operated repeatedly with a high-capacity audio system or added electronic device connected to the DC-DC converter, engine stop by the i-stop control is inhibited at a faster timing than normal.

*2 : If the engine is started while the hood is open, i-stop is inhibited until the engine is stopped.

Engine restart control

i-stop (engine restart control) conditions

- Conditions for restarting the engine during i-stop control (engine stopped) are as follows:

Purpose	Condition item	
	ATX	MTX
Driver operation	Not applicable	Clutch pedal depression rate: 86% or more (If the clutch pedal depressed and then it is released while the engine is cranking to restart by the i-stop control, engine stop by the i-stop control continues. If the same operation is repeated several times, the engine will stall.)
	Brake pedal released → depressed while in P or N position	Not applicable
	Brake fluid pressure is 0.35 MPa {3.6 kgf/cm2, 51 psi} or less in D position or M position	Not applicable
	Accelerator pedal depressed while in D or M position	Not applicable
	Steering torque is 2.8 N·m {29 kgf·cm, 25 in·lbf} or more in D position or M position	Not applicable
	Steering angle (D or M position (except 2nd gear fixed mode)): -70° or less or 70° or more (after EPS control module learned center value)	Not applicable
	Engine start by key operation	←
	Shift operation • When changed to the M position (2nd gear fixed mode) • P or N position →D or M or R position	Not applicable
Marketability	A/C request (With full-auto air conditioner)	←
	A/C temperature MAX setting, MIN setting (With full-auto air conditioner)	←
	Warm up condition (With manual air conditioner): Ambient temperature is 9 °C {48 °F} or less and engine coolant temperature is 57 °C {135 °F} or less	←
	Cold condition (With manual air conditioner): Ambient temperature is 30 °C {86 °F} or more and evaporator temperature is 10 °C {50 °F} or more	←
	Battery charge 68% or less	←
	Battery charge rate is specified value or more	←
	Estimated battery voltage when engine is restarted is 7.25 V or less	←
	i-stop OFF switch on	←
Safety	**Except for European (L.H.D. U.K.) specs.** • The following conditions are met while in P or N position (determined that driver is not in vehicle). — Seat belt (driver): Not fastened — Door (driver): Open	**Except for European (L.H.D. U.K.) specs.** • The following conditions are met while in neutral position (determined that driver is not in vehicle). — Seat belt (driver): Not fastened — Door (driver): Open
	Defroster switch on	←
	Power brake unit vacuum: -43 kPa {-0.44 kgf/cm^2, -6.2 psi} or more POWER BRAKE UNIT VACUUM  (-) DETERMINED VALUE (kPa) 0 (+)	←
	Vehicle speed: 1 km/h {0.6 mph} or more	Vehicle speed: 4 km/h {2.5 mph} or more
	Engine stop time by the i-stop control: 120 s or more	←