



Technical Service Bulletin

GROUP CAMPAIGN	NUMBER 17-01-045-2
DATE DECEMBER, 2017	MODEL SONATA (LF HEV/ LF PHEV)

SUBJECT: HYBRID STARTER GENERATOR (HSG) INSPECTION / REPLACEMENT
(Service Campaign T2E)

This bulletin revises TSB# 17-01-045-1 to add Sonata Plug-in Hybrid (PHEV) vehicles.

* IMPORTANT

***** Dealer Stock and Retail Vehicles *****

Dealers must perform this Service Campaign on all affected vehicles prior to customer retail delivery and whenever an affected vehicle is in the shop for any maintenance or repair.

When a vehicle arrives at the Service Department, access Hyundai Motor America's "Warranty Vehicle Information" screen via WEBDCS to identify open Campaigns.

Description: Some 2017MY SONATA HYBRID (LF HEV) and Plug-In Hybrid (LF PHEV) vehicles may develop an abnormal noise, Hybrid/Check Engine Warning Light On and/or Engine No Start if the pulley becomes loose at the Hybrid Starter Generator (HSG) shaft.

This bulletin provides the procedure to inspect and replace the HSG if necessary.

Applicable Vehicles:	Certain 2017MY Sonata Hybrid (LF HEV) and Plug-in Hybrid (LF PHEV) vehicles.
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Warranty Information:

Model	Op Code	Operation	Op Time	Causal Part	Nature Code	Cause Code
Sonata (LF HEV and PHEV)	70C001R1	HSG INSPECTION (Over 6200 miles and inspection result OK)	0.2 M/H	37390-2E930	Q55	ZZ1
	70C001R2	HSG INSPECTION AND REPLACEMENT (Over 6200 miles and inspection result NO GOOD)	1.7 M/H	37390-2E930	Q55	ZZ1
	70C001R3	HSG REPLACEMENT (Under 6200 miles)	1.6 M/H	37390-2E930	Q55	ZZ1


NOTE 1: Submit Claim on Campaign Claim Entry Screen.

NOTE 2: If a part is found in need of replacement while performing this Service Campaign and the affected part is still under warranty, submit a separate warranty claim using the same Repair Order. If the affected part is out of warranty, submit a Prior Approval Request for goodwill consideration prior to performing the work.

NOTE 3: Additional coolant replacement, if necessary, is included in the labor Op Times.

Parts Information:

NOTE: Order the following parts only in the event of replacement of the HSG:



PART NAME	FIGURE / PART NUMBER	REMARK
HSG (HYBRID STARTER GENERATOR)		1 / vehicle
	37390-2E930QQH	
INTAKE MANIFOLD GASKET	28313-2E000	4 / vehicle
THROTTLE BODY GASKET	28312-2E000	1 / Vehicle
EGR VALVE GASKET	28314-2E900	1 / Vehicle

Special Service Tool Information:



You must use either of the below tools at step-18 to compress the stiffer Hydraulic Tensioner as part of the HSG belt removal steps.

Attempting to move the Hydraulic Tensioner by wrench (as is done only for the Mechanical Tensioner) will cause the stiffer Hydraulic Tensioner to break.

PART NAME	FIGURE / PART NUMBER	REMARK
TENSIONER TOOL (UNIVERSAL)	 09244-G2100	NOTE: Only order this tool if neither tool is found at the dealer.
	 09252-2E100	Do not order this tool! The above tool is a newer version.

NOTE: Either tool should be available at the dealership as a required tool. If no tool can be found, order 09244-G2100 special tool from Bosch at 1-866-539-4248.

SERVICE PROCEDURE:

A. Inspect vehicle odometer and proceed as indicated below based on mileage:

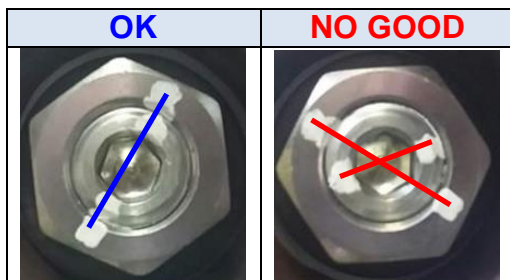
- **Over 6,200 miles:**
 - Perform the below **Section-B. HSG INSPECTION** (OP CODE : 70C001R1 or 70C001R2)
- **Under 6,200 miles:**
 - Skip to page-4 **Section-C. HSG REPLACEMENT** (OP CODE : 70C001R3)

B. HSG INSPECTION:

1. Open the hood and locate the HSG on the passenger side of the engine compartment as shown.



2. Inspect the HSG pulley nut to determine whether the paint marks line up between the nut and bolt.



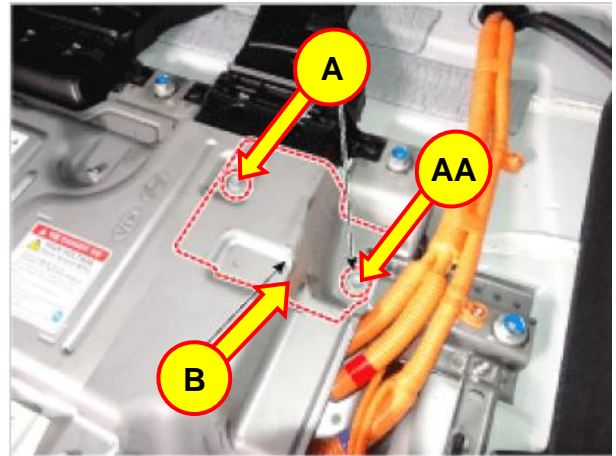
Based on the above nut rotation state:

- **OK** - TSB service is complete. (OP CODE : 70C001R1)
- **NO GOOD** - Proceed to the next page **Section-C. HSG REPLACEMENT**

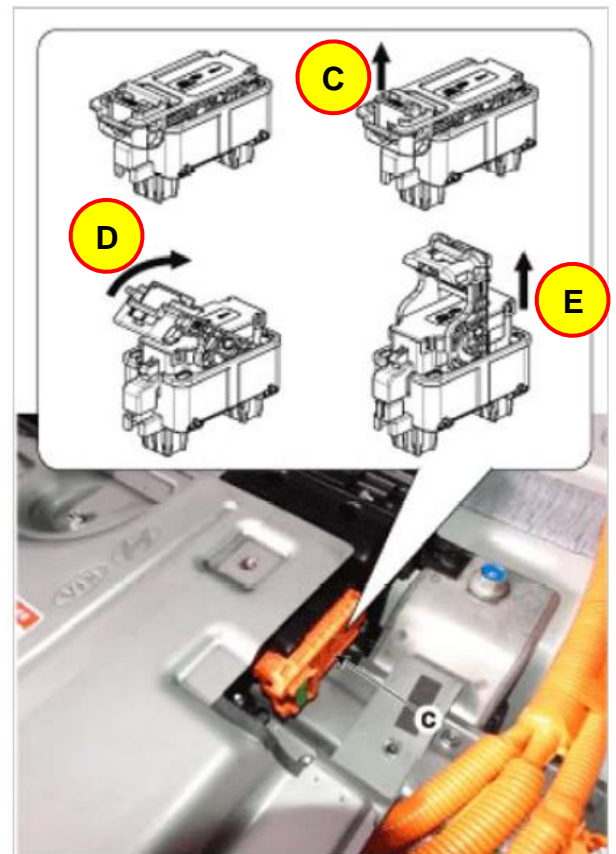
C. HSG REPLACEMENT:

NOTE: Steps 1-4 are Important Safety Requirements to disconnect the 12V and HEV 270V Battery:

1. Disconnect the 12V battery negative cable in the right side trunk trim.
NOTE: Prior to disconnecting, note customer’s AM/FM/XM radio presets.
2. Remove the luggage mat and cover board to access the HEV battery.
3. Remove the 2 safety plug cover bolts (A) and (AA), then remove the safety plug cover (B).



4. Per HEV “General Safety Information and Caution”, wear insulated safety gloves to unfasten the hook (C) and remove the safety plug (E) by pulling the lever (D) in the direction of the arrow.



▲WARNING

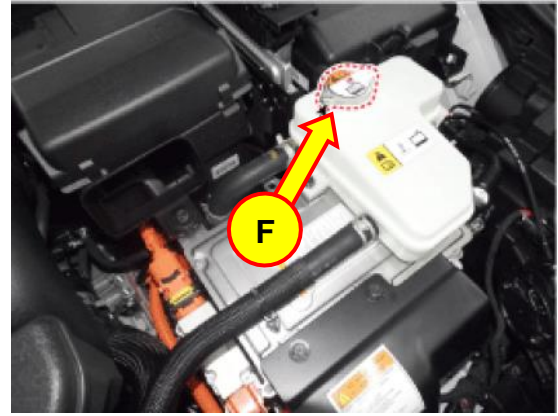
Be sure to read and follow the “General Safety Information and Caution” before doing any work related with the high voltage system.
Wait 5 minutes before disconnecting the HSG connector to allow for high voltage system capacitor discharge.
Failure to follow the safety guidelines may result in serious electrical injuries.



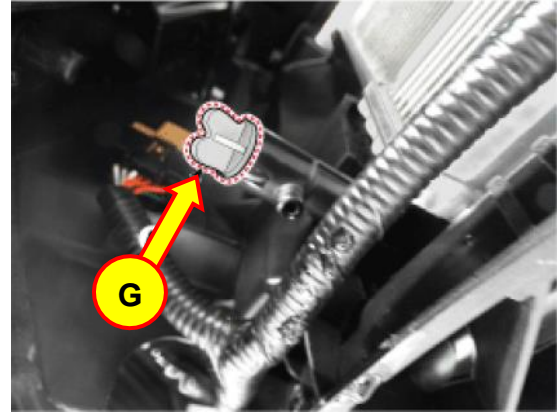
- Remove the hybrid coolant reservoir cap (F) to help drain the coolant faster.

⚠ WARNING

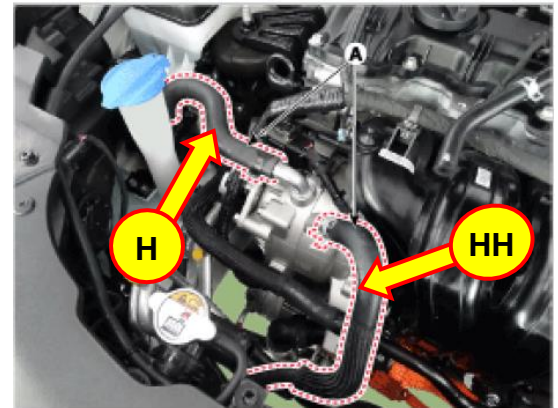
Never remove the cap when engine is hot. Serious scalding could be caused by hot fluid escaping under high pressure.



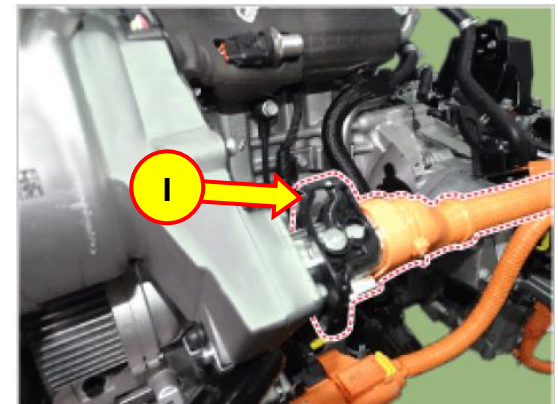
- Remove the engine room undercover. Loosen the radiator drain plug (G) and drain the hybrid coolant and discard.



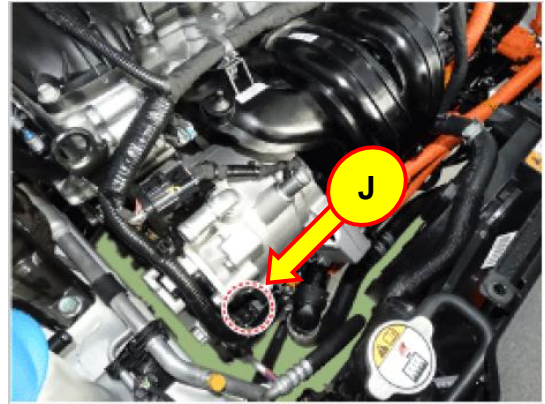
- Disconnect the 2 cooling hoses (H) and (HH) from the HSG.



- Wearing HEV insulated safety gloves, disconnect the orange HSG high voltage power cable connector (I).

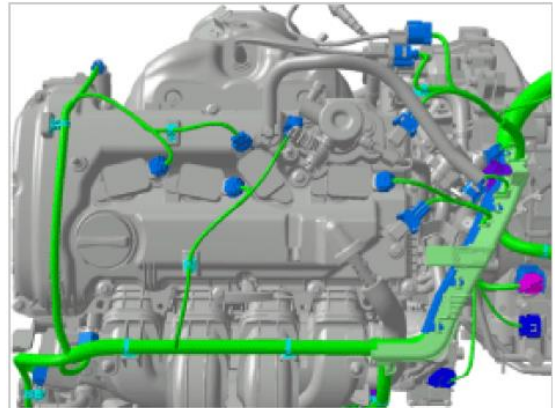


9. Disconnect the HSG sensor connector (J).

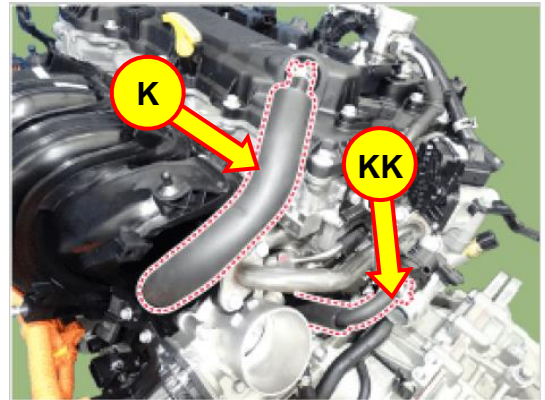


NOTE: Steps 10-16 are to remove the Intake Manifold:

10. Disconnect the wiring connectors and harness clamps, and then remove the wiring and protectors from the intake manifold.

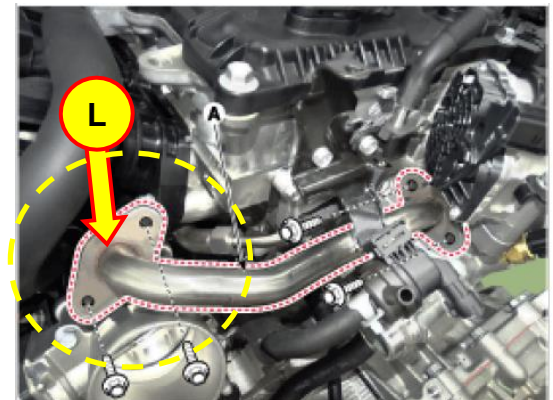


11. Disconnect the positive crankcase ventilation (PCV) hose (K) and the PCSV (purge control solenoid valve) hose (KK).

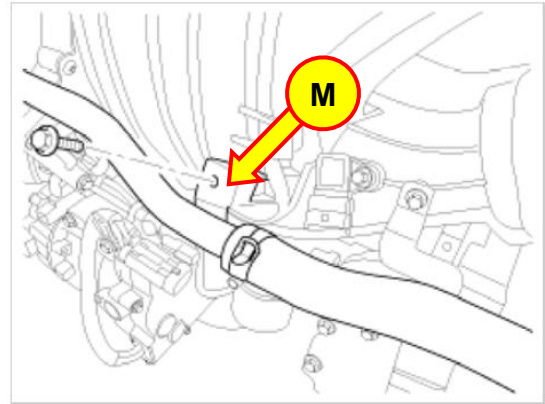


12. Remove the 2 bolts from the EGR cooler pipe (L) to the intake manifold.

EGR cooler pipe bolt tightening torque:
18.6 ~ 23.5 N.m
(1.9 ~ 2.4 kgf.m, 13.7 ~ 17.4 lb-ft)

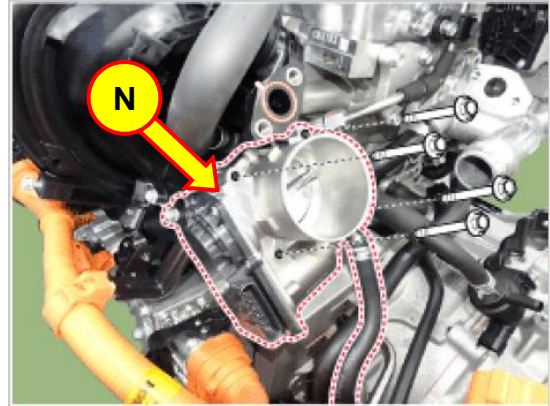


13. Disconnect the electric water pump (EWP) hose bracket (M).



14. Remove the throttle body (N).

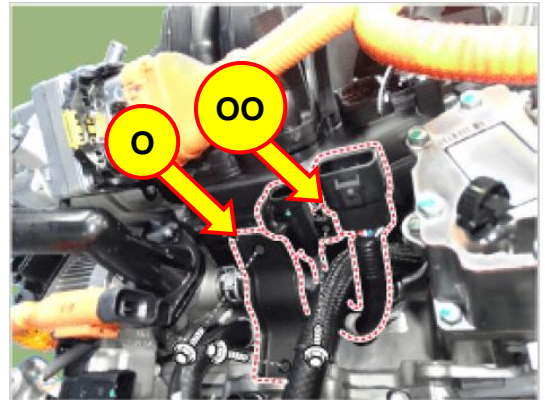
Throttle body tightening torque:
7.8 ~ 9.8 N.m
(0.8 ~ 1.0 kgf.m, 5.7 ~ 7.2 lb-ft)



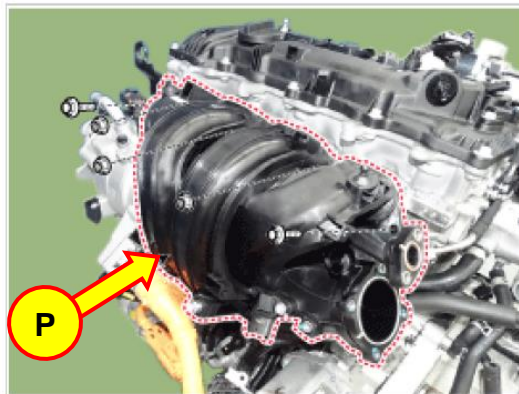
15. Remove the intake manifold stay (O) and connector bracket (OO).

Stay bolt tightening torque:
18.6 ~ 23.5 N.m
(1.9 ~ 2.4 kgf.m, 13.7 ~ 17.4 lb-ft)

Connector bracket tightening torque:
9.8 ~ 11.8 N.m
(1.0 ~ 1.2 kgf.m, 7.2 ~ 8.7 lb-ft)



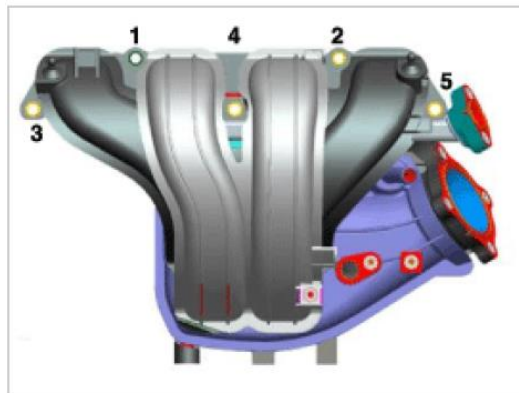
16. Remove the intake manifold (**P**) with gaskets.



NOTICE

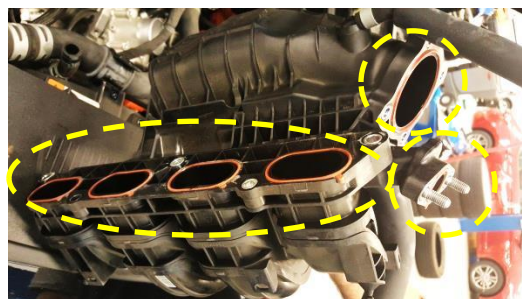
When reinstalling the intake manifold, tighten the bolts and nuts with pre-torque first. Then tighten the bolts and nuts to the below specified torque in the sequence shown to the right.

Intake Manifold bolt tightening torque:
18.6 ~ 23.5 N.m
(1.9 ~ 2.4 kgf.m, 13.7 ~ 17.4 lb-ft)



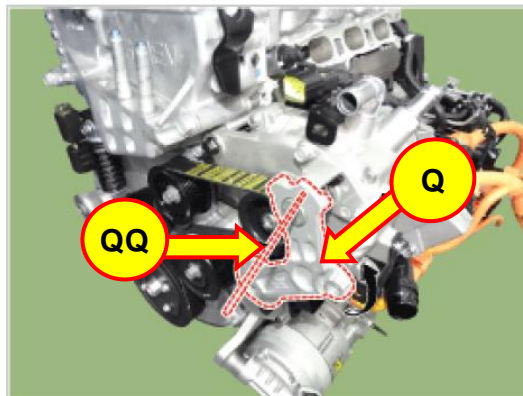
NOTICE

When reinstalling the intake manifold replace with new gaskets at the 4 intake runners, throttle body, and EGR gaskets listed on the page-2 Parts Information table.



NOTE: Steps 17-19 are for removal of the HSG belt:

- Using a wrench, turn the mechanical tensioner (Q) counterclockwise to compress the tensioner and then insert stopper pin (QQ) into the hole to hold the tensioner compressed.



! IMPORTANT

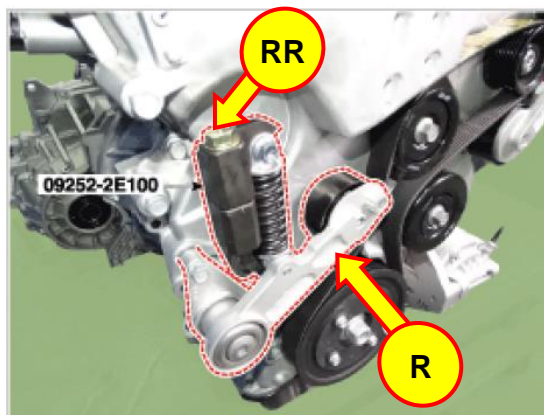
You must use the SST to compress the stiffer Hydraulic Tensioner as part of the HSG belt removal steps.

Attempting to move the Hydraulic Tensioner by wrench (as done only for the Mechanical Tensioner) will cause the stiffer hydraulic tensioner to break.

- Install one of the TENSIONER SST (09252-2E100 or 09244-G2100 as listed on page-2) to the hydraulic tensioner (R) and then compress the hydraulic tensioner by tightening the adjusting bolt (RR).

NOTICE

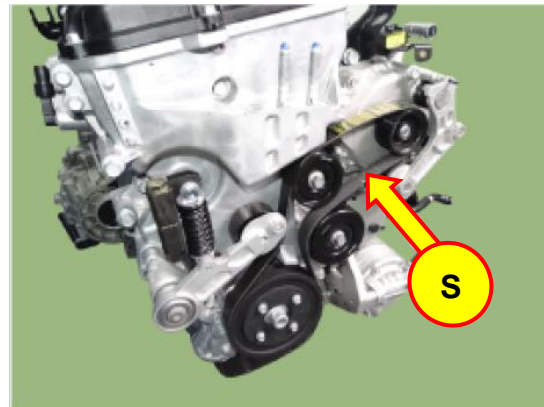
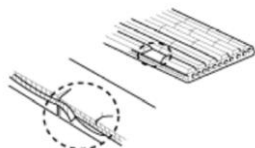
To prevent damage to the hydraulic tensioner, slowly tighten the SST nut by hand. DO NOT use an impact wrench to tighten it.



- While both tensioners are compressed, remove the drive belt (S) and inspect the belt.

NOTICE

Inspect the drive belt. Replace the belt if any chunks are found missing from the ribs. Cracks on rib side of the belt are OK.



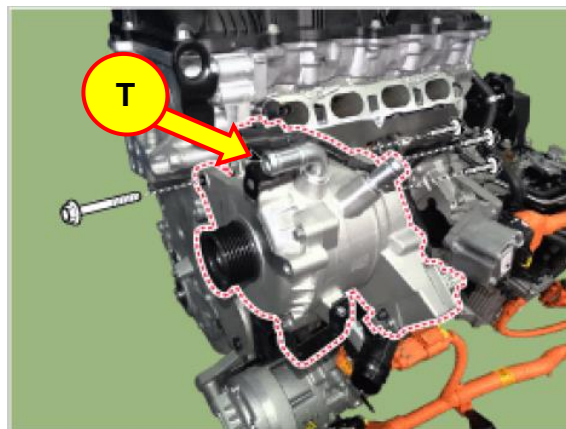
NOTE: Steps 20-26 are to replace HSG and assemble the intake manifold:

20. Remove the Hybrid Starter Generator (HSG) (T) and replace with the new HSG from the Parts Information Table.

HSG bolt tightening torque:

44.1 ~ 53.9 N.m

(4.5 ~ 5.5 kgf.m, 32.5 ~ 39.8 lb-ft)



- 20A. Prefill the new HSG with coolant from the top tube as shown. Fill using a small funnel.

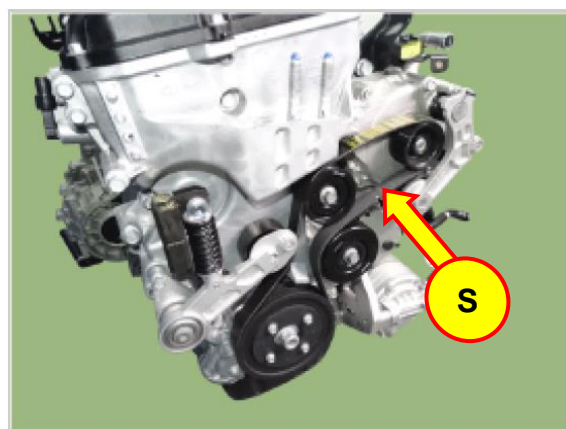
NOTE: The HSG does not need to be filled with coolant to the top of the tube. Stop once the HSG coolant level reaches the bottom of the tube. Pour in slowly and carefully so as not to overfill.



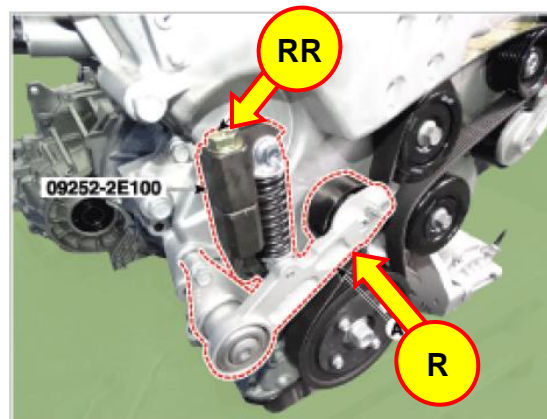
IMPORTANT

This step will best ensure that air is fully removed from the HSG. Without this prefill step, air may not be fully removed by the GDS bleeding procedure. This may result in a low hybrid coolant warning light.

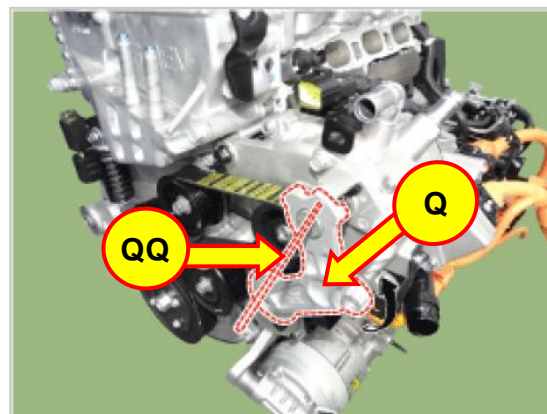
21. Re-install the drive belt (S).



22. Loosen the SST from the hydraulic tensioner (R) by loosening the adjusting bolt (RR) slowly with a hand tool. Remove the SST.

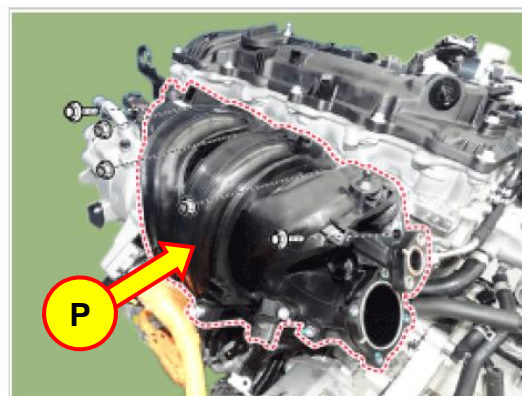


23. Using a wrench, slightly lift the mechanical tensioner (Q) to be able to remove the pin (QQ). Slowly place the tensioner in position against the belt.



24. Install the Intake Manifold (P) in reverse order of removal including new gaskets, throttle body, EGR tube, PCV, and PCSV.

NOTE: See steps 10-16 including bolt tightening torques.



25. Install the coolant hoses, high voltage connector and sensor connector to the new HSG.
26. Install the HEV 270V battery safety plug, and then the negative cable to the 12V battery.

NOTE: Steps 27-31 are to bleed air from the Hybrid Coolant System and refill coolant:

27. Fill the reservoir with coolant and water mix at 45-50% mixture up to the MAX mark. Premix the water and coolant to the specified ratio in a clean bucket prior to pouring it in the reservoir.

NOTICE

- Use only genuine antifreeze/coolant. Do not mix brands.
- For best year round corrosion protection the coolant must be mixed to 45% minimum. Greater than 55% will not provide sufficient protection against corrosion and freezing.
- Do not add rust inhibitor or antirust products; they may not be compatible with the coolant.

28. Start the engine and allow it to come to normal engine operating temperature. Wait for the cooling fans to come on several times. Accelerate the engine to help purge trapped air. Shut off the engine.
29. Perform the GDS Electric Water Pump (EWP) bleeding procedure per below steps and screenshots on the next page. Refill the hybrid coolant reservoir to between MIN and MAX while coolant is circulating.
- From main GDS Mobile screen, select GDS “S/W Management”.
 - Within “S/W Management” screen, select the “Components” tab, then choose the “Electric Water Pump Control” option.
 - With IGN ON but with READY Mode OFF (press IGN button twice without pressing the brake pedal), select OK in the following screens to proceed.

NOTICE

If EWP operates without a sufficient amount of coolant for approximately 5 seconds, the protect function will activate to stop the EWP for about 15 seconds. If a sufficient amount of coolant is added, EWP will start operating automatically.

S/W Management

Systems Components Unfold All

- Engine Control
- HEV Motor Control System
 - After Replacing Electronic Water Pump(EWP)
 - Electric Water Pump Control
 - After Replacing Motor Control Unit(MCU)
 - Motor/HSG Resolver Calibration
 - After Replacing Resolver Sensor
 - Motor/HSG Resolver Calibration
 - After Replacing Hybrid Starter Motor Generator(HSG)
 - Motor/HSG Resolver Calibration
 - Electric Water Pump Control
 - After Replacing Hybrid Motor Cooling Related Components
 - Electric Water Pump Control
 - etc.
 - System Identification
- HCU/LDC
- HEV Battery System
- Automatic Transaxle

S/W Management

• Electronic Water Pump Operation

Purpose	To bleed air and circulate the water after repair work is done on HSG/HPCU or Electric Water Pump(EWP).
Enable Condition	1. Engine Off 2. Ignition Switch On 3. NO DTC
Concerned Component	Motor Control Unit(MCU), Electric Water Pump(EWP)
Concerned DTC	-
Fail Safe	-
Etc	-

OK

S/W Management

■ Electric Water Pump Control

• [Electronic Water Pump (EWP) Operation]

This function is used when the electric water pump (EWP) is operated in order to discharge air by circulating coolant after replacing parts (inverter, LDC, EWP, HSG, OBC, radiator, hoses, etc) related to circulation and cooling of high voltage system in a hybrid vehicle.

⇒ [Condition]

1. IG On , HEV/EV Not Ready
2. NO DTC (EWP related code : P0C73)
3. Refill the coolant to the reservoir tank

Press [OK] button to continue.

OK Cancel

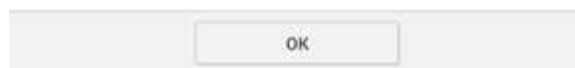
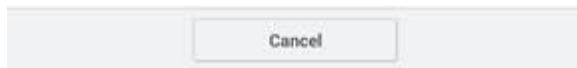
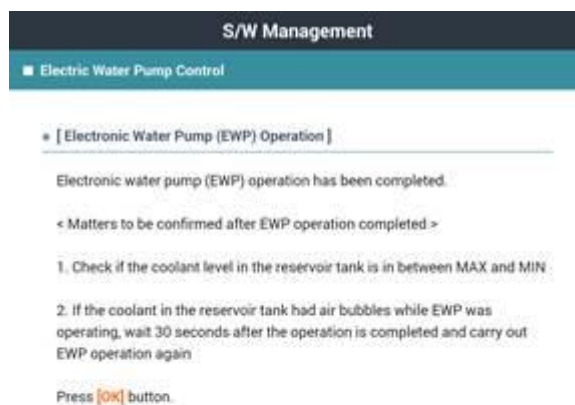
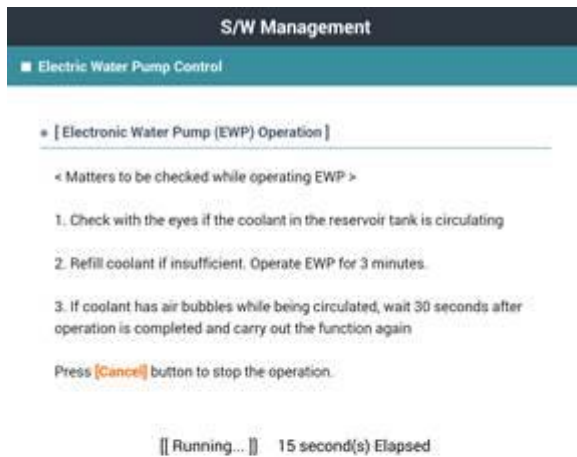
30. Bleeding of the hybrid coolant system is complete when the operational sound volume of the EWP becomes small and there are no air bubbles seen in the reservoir tank. (normally takes 3-5 minutes).

NOTICE

After air bleeding is completed, make sure that coolant in the reservoir flows without air bubble during EWP actuation.

If the coolant flow is not seen or air bubbles are still seen, repeat steps 27-29 again.

31. After air bleeding is completed, stop the GDS Mobile EWP bleeding function. Add coolant to the “MAX” level, and install the reservoir cap.



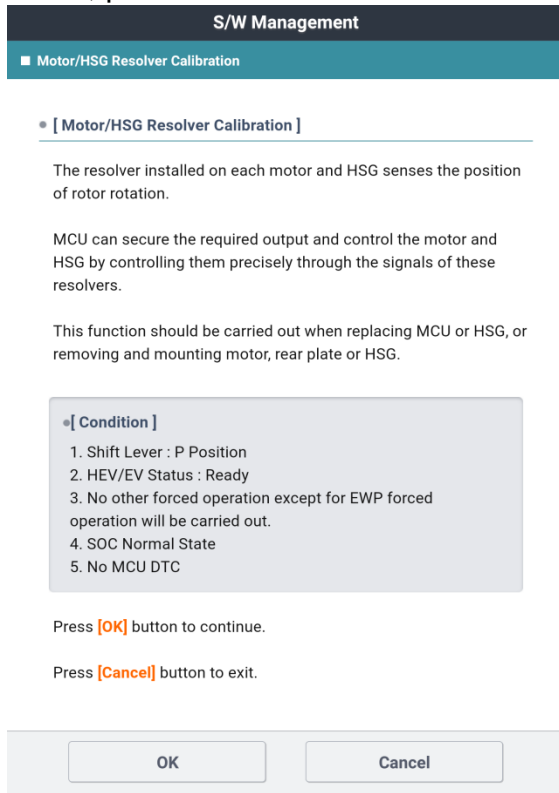
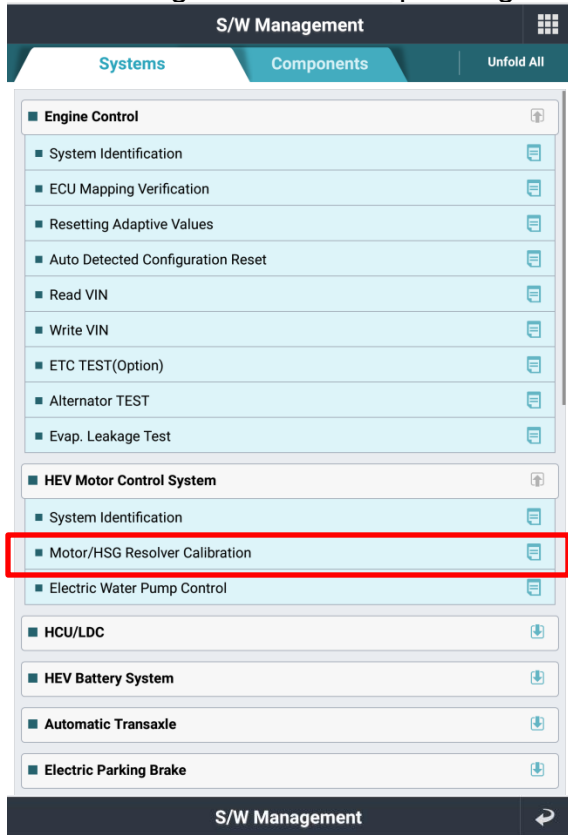
NOTICE

Make sure to add more coolant than was drained initially.

Coolant Capacity:
2.2L (0.58 gal., 2.32 U.S. qt., 1.93 Imp.qt.)

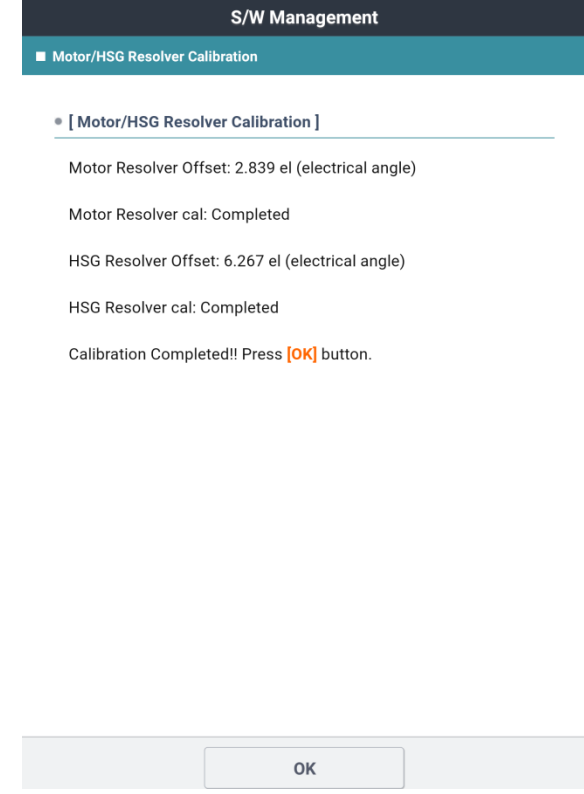
32. Install the engine room undercover.

- 33. Restore the customer’s AM/FM/XM radio presets noted from step-1.
- 34. With the engine at normal operating temperature, perform GDS HSG Resolver Calibration:



• Motor/HSG Resolver Calibration

Purpose	To calibrate resolver offset after replace Motor Control Unit(MCU), Motor, Rear plate or HSG.
Enable Condition	1.Gear Lever Position "P" 2.Ready Lamp "ON" 3.SOC : 30~80% 4.NO DTC
Concerned Component	Motor Control Unit(MCU), Resolver
Concerned DTC	P0C17
Fail Safe	Warning Lamp On
Etc	- Resolver that installed on Motor and HSG senses rotor position. - MCU uses signals from Resolver to control motor and HSG more precisely. - DTC P1C56 is stored in case of resolver calibration failure.



- 35. Service Procedure Complete