HYUNDAI **Technical Service Bulletin**	GROUP **ENGINE**	NUMBER **23-EM-008H**
	DATE **DECEMBER 2023**	MODEL **Multiple Models**
SUBJECT:	ENGINE OIL CONSUMPTION INSPECTION AND REPAIR GUIDELINES	

This TSB supersedes 03-20-001 and 21-EM-003H with updates to the entire service process.

Description:
This bulletin provides the inspection procedure to diagnose and repair vehicles with concerns of engine oil consumption, including methods to resolve symptoms caused by carbon deposits within the engine. All internal combustion engines consume engine oil as normal part of the operation during the combustion process, depending on driving conditions and habits and mileage. Hyundai recommends regular oil changes according to factory maintenance schedules and checking engine oil levels periodically using the dipstick.

APPLICABLE VEHICLES: All Models & All MY vehicles equipped with Gasoline Engines

Warranty Information:

OP CODE	OPERATION	OP TIME	NATURE	CAUSE
21000F00	1st Visit Engine Oil Inspection **(Enabling Period - NO)** ✓ **Exception Rule Check: GOOD** ✓ Prepared Vehicle for Initial Mileage Accumulation	0.6 M/H	E71	ZZ1
21000FCC	2nd Visit Engine Oil Inspection **(Enabling Period - NO)** ✓ **Initial Mileage Accumulation Result: NG** ✓ COMPLETED **Combustion Chamber Cleaning*** ✓ Prepared Vehicle for 2nd Mileage Accumulation	2.2 M/H		
21000FC1	1st Visit Engine Oil Inspection **(Enabling Period - YES)** ✓ **Exception Rule Check: GOOD** ✓ COMPLETED **Combustion Chamber Cleaning*** ✓ Prepared Vehicle for Mileage Accumulation	2.2 M/H		
21000F02	Engine Oil Inspection **(After Any Mileage Accumulation)** **Inspection Test Result: GOOD** (No Engine R&R)	0.6 M/H		
21000F03	Engine Oil Inspection **(After Cleaning and Final Retest)** ✓ Returned from Mileage Accumulation after Cleaning **Final Retest Result: NG** (Submit PA for Engine R&R)	0.6 M/H		

NOTE1: Do not perform and claim any inspection operations until the Exception Rule Check has been completed and no open issues are found.

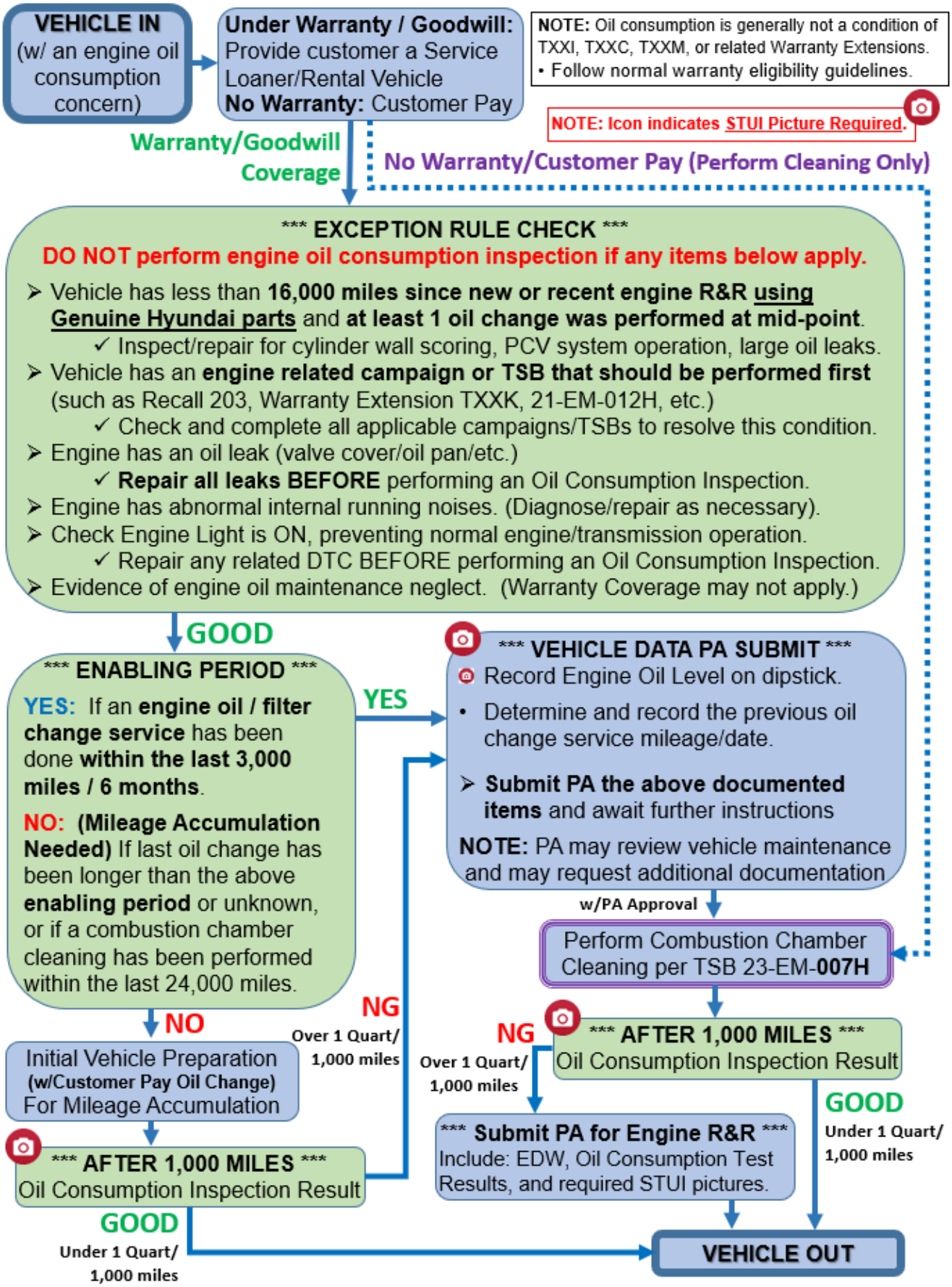
NOTE2: For **Causal P/N**, please refer to the LTS for the applicable part to labor op combination.

NOTE3: *PA approval is required prior to performing TSB 23-EM-007H "COMBUSTION CHAMBER CLEANING PROCEDURE" (or latest version).

**NOTE4: ***TSB 23-EM-007H "COMBUSTION CHAMBER CLEANING PROCEDURE" does not apply to vehicles equipped with V6/V8 engines (until further notice).

- **[For V6/V8 engines only]** If inspection results indicate oil consumption is potentially above specification, perform top cylinder cleaning using commercially available industry standard methods including an engine oil/filter change service afterwards. Alternative cleaning products used for V6/V8 cleaning may be entered in the sublet field.

Inspection Procedure Overview:



Inspection Procedure:

1. **Check vehicle for warranty eligibility.**
   - Vehicle under warranty/goodwill coverage: Provide customer a Service Loaner/Rental Vehicle, go to next step.
   - No warranty/customer pay: Skip to Step 7 for Combustion Chamber Cleaning guideline.

2. **Perform Exception Rule Check.**

NOTICE

DO NOT perform engine oil consumption inspection if any items below apply (resolve as needed).

- Vehicle has less than **16,000 miles since new or recent engine R&R using Genuine Hyundai parts and at least 1 oil change was performed at mid-point**.
  - ✓ Inspect/repair for cylinder wall scoring, poor PCV system operation, or large oil leaks.
- Vehicle has an **engine related campaign or TSB that should be performed first** (such as Recall 203, Warranty Extension TXXK, 21-EM-012H, etc.)
  - ✓ Check and complete all applicable campaigns/TSBs to resolve this condition.
- Engine has an oil leak (valve cover/oil pan/etc.)
  - ✓ **Repair all leaks BEFORE** performing an Oil Consumption Inspection.
- Engine has abnormal internal running noises. (Diagnose/repair as necessary).
- Check Engine Light is ON, preventing normal engine/transmission operation.
  - ✓ **Repair any related DTC BEFORE** performing an Oil Consumption Inspection.
- Evidence of engine oil maintenance neglect. (Warranty Coverage may not apply.)
  - ✓ For applicable warranty repair eligibility, confirm that the vehicle has received proper engine oil/filter change maintenance services within the intervals recommended by the applicable Owner's Manual.
  - ✓ Poor engine maintenance may cause insufficient or depleted engine oil, deteriorating its lubricating and cooling function. As a result, main engine parts can be damaged such as (A) excessive deposit of carbons, (B) oil sludge, and/or (C) abnormal wear on engine parts.

3. **Check if this visit is within the Enabling Period.**
   - Enabling Period – **YES**: Recent engine oil / filter change service has been done within the last 3,000 miles / 6 months.
     - Skip to Step 6 for Vehicle Data PA Submit for Combustion Chamber Cleaning approval.
   - Enabling Period – **NO**: Last oil change has been longer than 3,000 miles / 6 months or unknown, or if a combustion chamber cleaning has been performed within the last 24,000 miles.
     - Go to next step for Vehicle Preparation for Initial Mileage Accumulation.

4. **Perform Vehicle Preparation for Initial Mileage Accumulation operation**.
   a) Under **Customer Pay**, perform an engine oil and filter change service.
   NOTE: The mileage accumulation portion for engine oil consumption inspection must only be done with newly replaced oil to maintain consistency. Degraded engine oil may not provide conclusive test results.

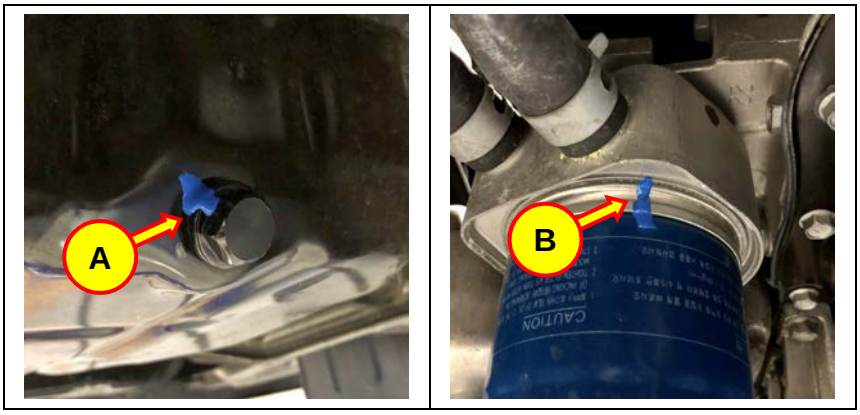
b) Start the engine after the engine oil/filter service and allow it to idle for about 10 minutes, or until it reaches normal operation temperature.

c) Turn the engine 'OFF' and allow the engine oil to settle down to the oil pan for about 10-15 minutes.

d) Check the engine oil level using the oil level dipstick and refill the oil to the "F" line of the oil level dipstick. (Top off with recommended engine oil per Owner's Manual or 5W-30 viscosity engine oil with API Service Grade of SN Plus or newer.)

e) Seal the oil drain plug and oil filter.

- Use of an anti-tamper marking product such as Steelman Security Seal (P/N 00232-19083) or equivalent is recommended to apply a marking line between two break points.
  - o Apply a marking line (A) aligning the drain plug position to the oil pan.
  - o Apply a marking line (B) aligning the oil filter position to the housing.



f) From this point, vehicle must accumulate at least 1,000 miles of driving prior to next steps.

❖ Use the following Op Code for this visit.

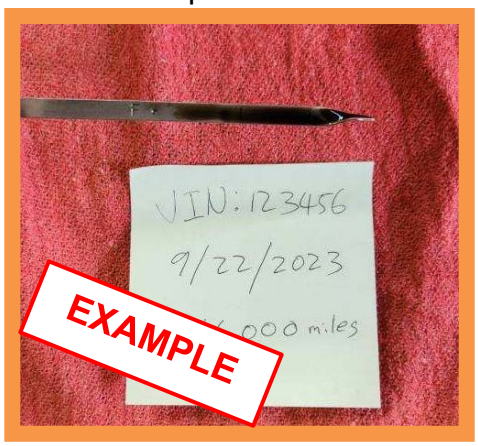
21000F00	1st Visit Engine Oil Inspection **(Enabling Period - NO)** ✓ **Exception Rule Check: GOOD** ✓ Prepared Vehicle for Initial Mileage Accumulation

***** End of 1st Visit for above Op Code *****

5. **Perform Engine Oil Inspection (After Mileage Accumulation) operation.**
   a) Check the sealing (oil filler cap, oil filter, oil level gauge, oil drain plug) and check if the engine oil has leaked/removed from the Initial Vehicle Preparation.
      - If the anti-tamper sealing is damaged or the engine oil has leaked, repeat Step 4 Vehicle Preparation for Initial Mileage Accumulation operation and repeat mileage accumulation.
      - If there were any oil leaks, it must be repaired prior to repeating the inspection.
   b) Start the engine and allow it to idle for about 10 minutes, or until it reaches normal operation temperature.
   c) Turn the engine 'OFF' and allow the engine oil to settle down to the oil pan for about 10-15 minutes.
   d) Check the oil level dipstick and record the engine oil level using the GDS tablet for uploading to STUI.

STUI

Take a picture of the engine oil level dipstick with the last 6 digits of the VIN and the date of repair clearly visible on a piece of paper using the tablet's save method and upload to STUI.



   e) Refill the oil to the "F" line of the oil level dipstick while noting the amount being added. (5W-30 viscosity engine oil with API Service Grade of SN Plus or newer is recommended.)
   f) Calculate the oil consumption according to below.

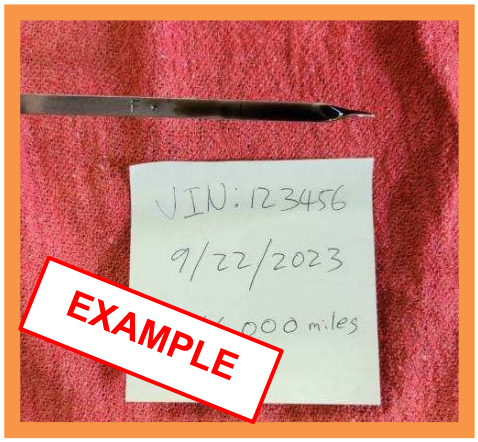
$$\frac{\textbf{Driven Distance (Miles)}}{\textbf{Engine Oil Amount Added After Mileage Accumulation (Quart)}} = \textbf{Oil Consumption Calculation (Miles Driven / per Quart)}$$

- If the oil consumption calculation is **above 1,000 Miles Driven / per Quart**, then vehicle passes the oil consumption inspection and procedure is complete.
  - Use the following Op Code for this visit and skip to Step 10 for Vehicle Return Final Preparation.

21000F02	Engine Oil Inspection **(After Any Mileage Accumulation)** **Inspection Test Result: GOOD** (No Engine R&R)

- If the oil consumption calculation is **under 1,000 Miles Driven / per Quart**, then go to next step for Vehicle Data PA Submit for Combustion Chamber Cleaning approval.

6. **Vehicle Data PA Submit for Combustion Chamber Cleaning approval.**
   a) Check the oil level dipstick and record the engine oil level using the GDS tablet for uploading to STUI.
   NOTE: Be sure to allow the engine oil to settle down to the oil pan for about 10-15 minutes with the engine 'OFF' before measuring the oil level.



STUI

Take a picture of the engine oil level dipstick with the last 6 digits of the VIN and the date of repair clearly visible on a piece of paper using the tablet's save method and upload to STUI.

   b) Determine and record the previous oil change service mileage/date.
   c) **Submit PA the above documented items** and await further instructions.
   NOTE: PA may further review vehicle maintenance history and may request additional documentation if necessary.

7. **Perform Combustion Chamber Cleaning** (w/PA approval or under customer pay).
   - **[4 cylinder engines]** Follow the procedure oulined in TSB 23-EM-007H "COMBUSTION CHAMBER CLEANING PROCEDURE" (or latest version).
   - **[V6/V8 cylinder engines]** Perform top cylinder cleaning using commercially available industry standard methods including an engine oil/filter change service afterwards.
     - If a suitable V6/V8 engine cleaning procedure is performed under warranty, engine oil/filter change expense shall be covered under warranty and alternative cleaning products used for V6/V8 cleaning may be entered in the sublet field.

8. **Prepare Vehicle for Mileage Accumulation (after cleaning)**.
   a) After completing the engine cleaning with oil change, allow the engine oil to settle down to the oil pan for about 10-15 minutes with the engine 'OFF' before measuring the oil level.
   b) Check the engine oil level using the oil level dipstick and refill the oil to the "F" line of the oil level dipstick. (Top off with recommended engine oil per Owner's Manual or 5W-30 viscosity engine oil with API Service Grade of SN Plus or newer.)
   c) **[For Customer Pay]** Perform Steps 8a and 8b, then skip to Step 10 for Vehicle Return Final Preparation. (Mileage accumulation is not applicable.)
   d) Seal the oil drain plug and oil filter as described in Step 4e in Page 4 and release vehicle to accumulate more than 1,000 miles of driving to determine the effectiveness of the combustion chamber cleaning repair. Use one of the appropriate Op Codes below:

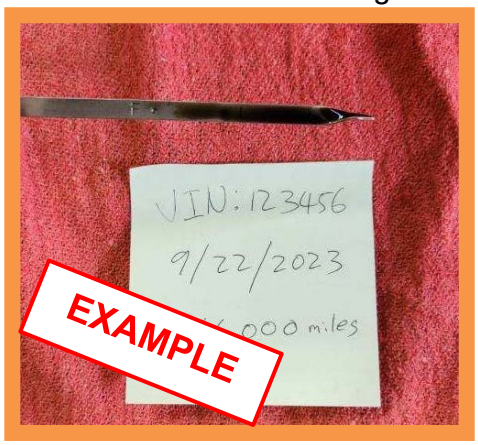
21000FCC	2nd Visit Engine Oil Inspection **(Enabling Period - NO)** ✓ **Initial Mileage Accumulation Result: NG** ✓ COMPLETED **Combustion Chamber Cleaning*** ✓ Prepared Vehicle for 2nd Mileage Accumulation
21000FC1	1st Visit Engine Oil Inspection **(Enabling Period - YES)** ✓ **Exception Rule Check: GOOD** ✓ COMPLETED **Combustion Chamber Cleaning*** ✓ Prepared Vehicle for Mileage Accumulation

***** End of this visit for the above Op Codes *****

9. **Perform Engine Oil Inspection (After Mileage Accumulation) operation.**
   a) Check the sealing (oil filler cap, oil filter, oil level gauge, oil drain plug) and check if the engine oil has leaked/removed from the Initial Vehicle Preparation.
      - If the anti-tamper sealing is damaged or the engine oil has leaked, repeat Step 8 Vehicle Preparation for Mileage Accumulation (after cleaning) and repeat mileage accumulation.
      - If there were any oil leaks, it must be repaired prior to repeating the inspection.
   b) Start the engine and allow it to idle until it reaches normal operation temperature.
   c) Allow the engine oil to settle down to the oil pan for about 10-15 minutes with the engine 'OFF' before measuring the oil level.
   d) Check the oil level dipstick and record the engine oil level using the GDS tablet for uploading to STUI.

STUI

Take a picture of the engine oil level dipstick with the last 6 digits of the VIN and the date of repair clearly visible on a piece of paper using the tablet's save method and upload to STUI.



   g) Refill the oil to the "F" line of the oil level dipstick while noting the amount being added. (5W-30 viscosity engine oil with API Service Grade of SN Plus or newer is recommended.)
   h) Calculate the oil consumption according to below.

$$\frac{\textbf{Driven Distance (Miles)}}{\textbf{Engine Oil Amount Added After Mileage Accumulation (Quart)}} = \textbf{Oil Consumption Calculation (Miles Driven / per Quart)}$$

- If the oil consumption calculation is **above 1,000 Miles Driven / per Quart**, then vehicle passes the oil consumption inspection and procedure is complete.
  - Use the following Op Code for this visit and skip to Step 10 or Vehicle Return Final Preparation.

21000F02	Engine Oil Inspection **(After Any Mileage Accumulation)** **Inspection Test Result: GOOD** (No Engine R&R)

- If the oil consumption calculation is **under 1,000 Miles Driven / per Quart**, then replace the engine using the applicable Part Number / Op Code information in the following pages.
  - For repairs covered under warranty, submit PA with the completed Engine Diagnostic Worksheet required for engine R&R approval.
  - Use the following Op Code with additional Op Code(s) for the R&R portion of the engine.

21000F03	Engine Oil Inspection **(After Cleaning and Final Retest)** ✓ Returned from Mileage Accumulation after Cleaning **Final Retest Result: NG** (Submit PA for Engine R&R)

  - Be sure to follow latest revised engine R&R procedure from the corresponding Shop Manual and this TSB (or updated LTS) for the appropriate Warranty Op Code.
  - After the repair is complete, Go to Step 10 Vehicle Return Final Preparation..

10. **Perform Vehicle Return Final Preparation**.
    a) If engine R&R had been completed:
        - Perform an All Systems Fault Code search and clear any incident DTCs.
        - Reset engine Adaptive Values after DTC checking/clearing.
        - Check that all removed engine cover and miscellaneous components have been reinstalled.
    b) Confirm that the engine oil level is at the “F” line on the dipstick.
    c) The service advisor should review with the customer regarding the appropriate oil change interval per their driving habits and schedule for the next maintenance service.

NOTICE

Refer to TSB 23-FL-003H (or latest) for important information regarding:

- Hyundai Fuel System Cleaner Plus – fuel tank additive
- Top Tier Gas Usage – high quality gasoline with detergents
- Engine Oil / Filter Change Service Interval Information for Mixed-Mode driving conditions

HYUNDAI
Technical Service Bulletin

GROUP	NUMBER
FUEL SYSTEM	23-FL-003H
DATE	MODEL(S)
JUNE 2023	ALL MODELS (w/ GASOLINE ENGINES)

SUBJECT: HYUNDAI FUEL SYSTEM CLEANER PLUS ADDITIVE AND TOP TIER GAS USAGE GUIDELINES

This TSB supersedes 10-FL-014 with updated service guideline information.

Description: This bulletin provides vehicle maintenance recommendations and information related to Hyundai Fuel System Cleaner additive and Top Tier Gas usage.

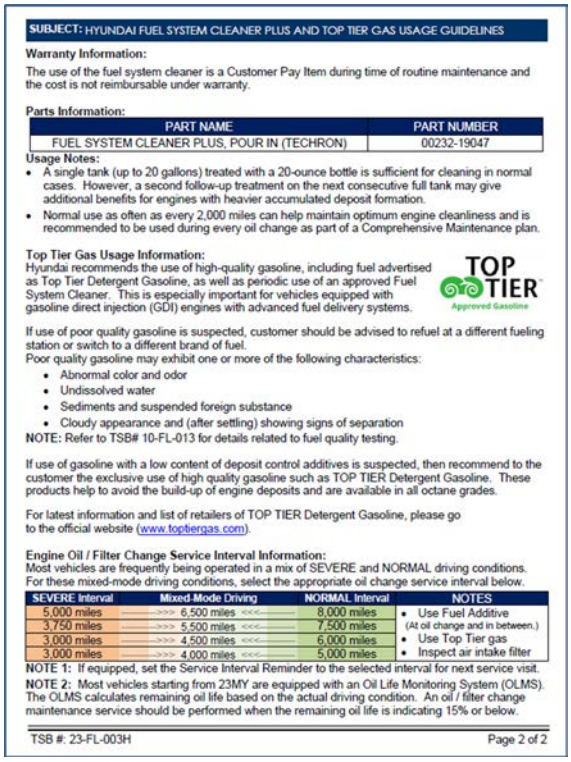
Hyundai Fuel System Cleaner Plus (P/N 00232-19047) fuel tank additive is the approved service product for complete fuel system cleaning as a preventative maintenance and during routine service.

Key Product Features:
- A 20-ounce bottle treats up to 20 gallons of gasoline.
- For use in all gasoline engines (MPI or GDI systems, including hybrid and plug-in hybrid electric powertrains).
- Can be used as often as 2,000 miles between oil changes and at every oil change.
- Cleans fuel injectors, intake valves, and combustion chambers.
- Cleans piston rings and ring lands to maintain proper cylinder compression and control crankcase blowby.
- Neutralizes contaminants and protects fuel level sending units against damage from sulfur content in fuel.
- Cleans and protects critical fuel system components from corrosion.
- Does not harm the emission system or damage combustion chamber surfaces when used as directed.

Regular use of Hyundai Fuel System Cleaner Plus with TECHRON® Technology can help address engine carbon deposit related conditions. By removing these deposits, an engine may experience restored engine performance and efficiency, smoother running idle, and cleaner tailpipe emissions.

Applicable Vehicles:
All models equipped with gasoline engines, including hybrid and plug-in hybrid electric vehicles.

Circulate To: General Manager, Service Manager, Parts Manager, Warranty Manager, Service Advisors, Technicians, Body Shop Manager, Fleet Repair



SUBJECT: HYUNDAI FUEL SYSTEM CLEANER PLUS AND TOP TIER GAS USAGE GUIDELINES

Warranty Information:
The use of the fuel system cleaner is a Customer Pay Item during time of routine maintenance and the cost is not reimbursable under warranty.

Parts Information:

PART NAME	PART NUMBER
FUEL SYSTEM CLEANER PLUS, POUR IN (TECHRON)	00232-19047

Usage Notes:
- A single tank (up to 20 gallons) treated with a 20-ounce bottle is sufficient for cleaning in normal cases. However, a second follow-up treatment on the next consecutive full tank may give additional benefits for engines with heavier accumulated deposit formation.
- Normal use as often as every 2,000 miles can help maintain optimum engine cleanliness and is recommended to be used during every oil change as part of a Comprehensive Maintenance plan.

Top Tier Gas Usage Information:
Hyundai recommends the use of high-quality gasoline, including fuel advertised as Top Tier Detergent Gasoline, as well as periodic use of an approved Fuel System Cleaner. This is especially important for vehicles equipped with gasoline direct injection (GDI) engines with advanced fuel delivery systems.

If use of poor quality gasoline is suspected, customer should be advised to refuel at a different fueling station or switch to a different brand of fuel.
Poor quality gasoline may exhibit one or more of the following characteristics:
- Abnormal color and odor
- Undissolved water
- Sediments and suspended foreign substance
- Cloudy appearance and (after settling) showing signs of separation

NOTE: Refer to TSB# 10-FL-013 for details related to fuel quality testing.

If use of gasoline with a low content of deposit control additives is suspected, then recommend to the customer the exclusive use of high quality gasoline such as TOP TIER Detergent Gasoline. These products help to avoid the build-up of engine deposits and are available in all octane grades.

For latest information and list of retailers of TOP TIER Detergent Gasoline, please go to the official website (www.toptiergas.com).

Engine Oil / Filter Change Service Interval Information:
Most vehicles are frequently being operated in a mix of SEVERE and NORMAL driving conditions. For these mixed-mode driving conditions, select the appropriate oil change service interval below.

SEVERE Interval	Mixed-Mode Driving	NORMAL Interval	NOTES
5,000 miles	>>> 6,500 miles <<<	8,000 miles	• Use Fuel Additive (At oil change and in between.)
3,750 miles	>>> 5,500 miles <<<	7,500 miles	• Use Top Tier gas
3,000 miles	>>> 4,500 miles <<<	6,000 miles	• Inspect air intake filter
3,000 miles	>>> 4,000 miles <<<	5,000 miles	

NOTE 1: If equipped, set the Service Interval Reminder to the selected interval for next service visit.
NOTE 2: Most vehicles starting from 23MY are equipped with an Oil Life Monitoring System (OLMS). The OLMS calculates remaining oil life based on the actual driving condition. An oil / filter change maintenance service should be performed when the remaining oil life is indicating 15% or below.

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***** IF ENGINE REPLACEMENT IS REQUIRED AND APPROVED BY PA *****

Engine Replacement:

11. Follow the published Service Information from the applicable **Shop Manual** to remove and replace the Engine Assembly.

- **Shop Manual Section Location:** Engine Mechanical > Engine And Transaxle Assembly > Engine And Transaxle Assembly > **Repair Procedures**
- Be sure to record the audio station presets (XM, AM, FM, etc.) prior to disconnecting the battery .

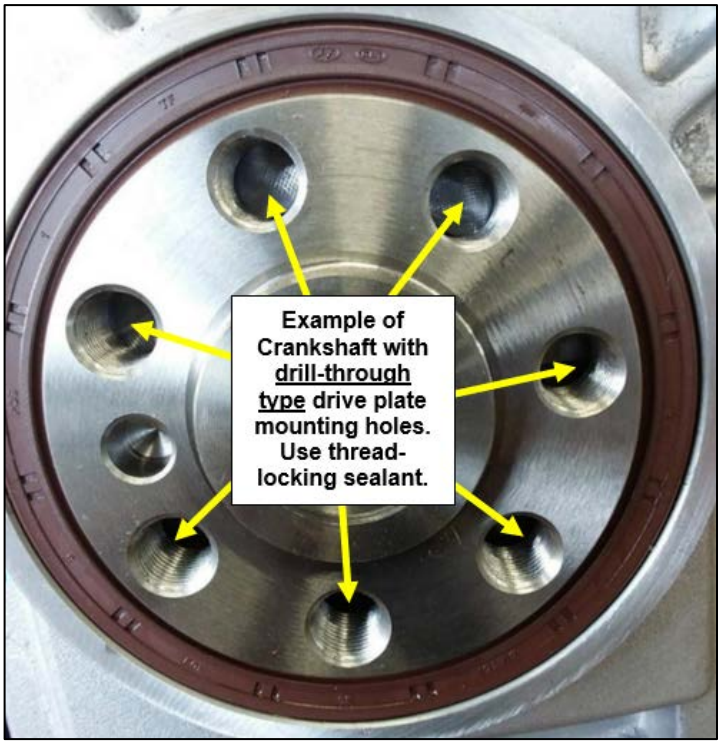
NOTICE

Certain types of engines may have crankshaft with drill-through type drive plate mounting holes. Apply thread-locking sealant to prevent any oil seepage through the drive plate bolts.

- **Apply on all threads a low/medium strength thread-locking adhesive that seals fasteners and are tolerant to engine oil.**

  [Suggested Products] ThreeBond 2403, LOCTITE 200, LOCTITE 204, LOCTITE 243 (or equivalent)

- **Be sure to lightly brush all the bolt threads free of debris/residue and clean off any oil prior to applying the thread-locking sealant for installation.**



NOTICE

For 11-12MY Sonata Hybrid (YF HEV):

When installing a new engine, the drive plate bolts must be replaced with P/N 23231-25200 / 23231-25200FFF.

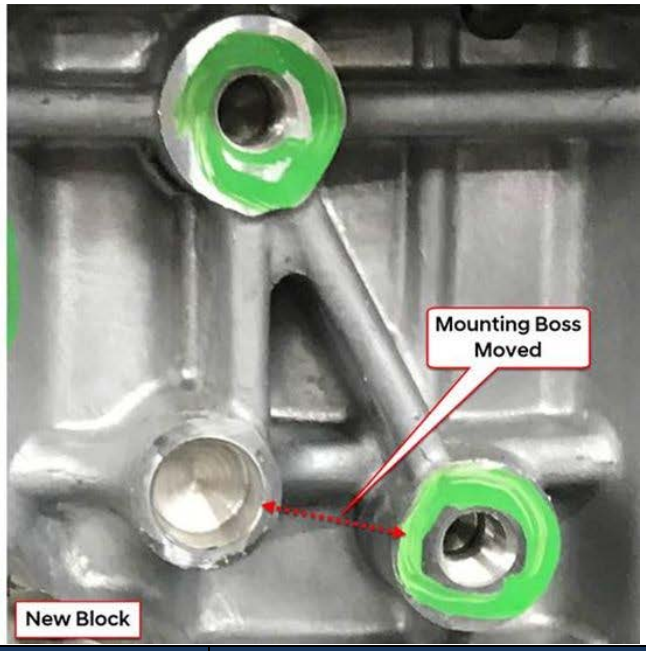
- **Due to changes to the crankshaft design, the existing bolts are ~2mm too long and will result in improperly fastened drive plate if reused.**
- **The 13-15MY version drive plate bolts (P/N 23231-25200) are correct length for the new engine and will provide proper fastening during engine installation.**

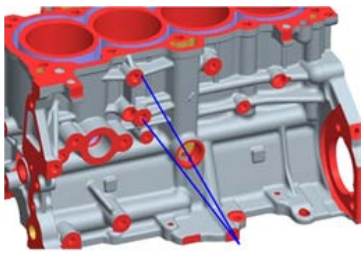
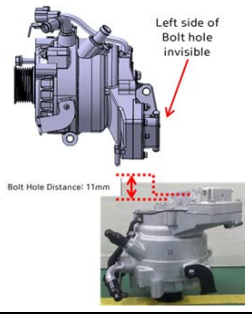
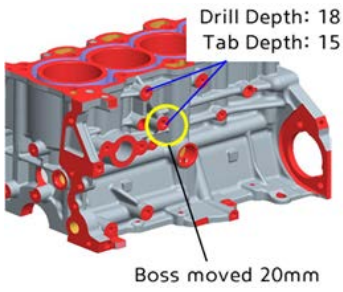
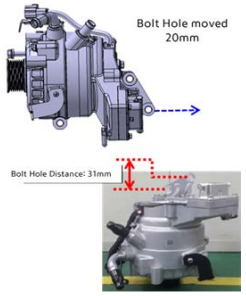
NOTICE

For 16MY Sonata Hybrid/Plug-in (LF HEV/PHEV) vehicles produced before April 2015*, the Hybrid Starter Generator (HSG) mounting boss type at the cylinder block must be checked.

There are HSG mounting boss differences between the Old and New style cylinder blocks.

- **If the existing engine has the "Old" style cylinder block, install a new style HSG (P/N 37390-2E930-SJ) compatible with the replacement long block (P/N 21101-2EG15FFF/ FFHRM/FFFRM).**
- **If the existing engine already has the "New" style cylinder block, transfer the existing HSG to the replacement long block (P/N 21101-2EG15FFF/ FFHRM/FFFRM) engine. Reuse the HSG.**



New vs Old Block Guidelines	HSG Mounting Boss Location	HSG Mounting Flange Change
**** OLD style cylinder block**** (Most 16MY Sonata Hybrid/Plug-in vehicles built until April 2015) **Old Style Block → Engine R&R:** ➢ **Order a new style HSG (P/N 37390-2E930-SJ)** with the lon g block (P/N 21101-2EG15FF F).		
**** NEW style cylinder block **** (Most 16-19MY Sonata Hybrid / Plug-in vehicles produced from April 2015 and all replacement 21101-2EG15FFF long blocks) New Style Block → Engine R&R: ➢ **Reuse the existing HSG.**		

12. Certain replacement engines must be prepared prior to installation. Some components from the existing engine must be transferred to the new engine.

NOTICE

Take special care of the original engine parts that will be required for reinstallation on to the replacement engine.

13. Remove and reinstall the engine knock sensor (if not newly supplied) from the old engine to the new engine.

***Knock Sensor Fastener Tightening torque**:*
21Nm (15.5lb-ft)

NOTICE

Ensure the knock sensor is torqued to specification using a torque wrench.
- **Improper installation can result in DTC c odes.**

14. **(For GDI Engines Only)** Follow the published procedure outlined in **TSB 19-FL-001H** to remove and reinstall the GDI high pressure fuel system components (GDI High Pressure Pump, Fuel Injectors, and Fuel Rail) from the existing engine to the new engine

⚠ CAUTION

Follow TSB 19-FL-001H carefully and replace the following newly supplied parts from the Service Kits for GDI engines:
- **Mounting flange O-ring (for High Pressure Pump)**
- **O-rings, Backup Rings, Washer Seals, Combustion Seal Rings, and clips (for Fuel Injectors)**
- **Fuel Pipe (between High Pressure Pump and Fuel Rail)**

For all engines with Service Kits: (1) Exhaust Pipe Gasket is included. Install this new gasket when attaching the front and center muffler assemblies together during the engine installation.

15. Install the new oil cooler hoses if applicable.

16. Reconnect and reinstall the engine front harness.

17. Follow the published Service Information from the applicable **Shop Manual** to reinstall the Sub Engine Assembly.

Shop Manual Section Location: Engine Mechanical > Engine And Transaxle Assembly > Engine And Transaxle Assembly > **Repair Procedures**

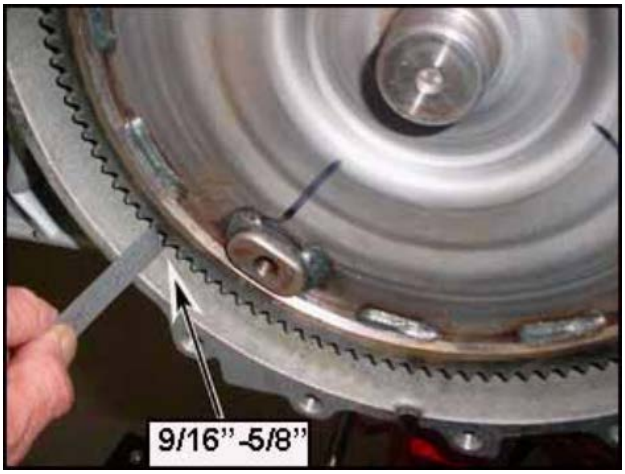
NOTICE

Be sure to replace the following newly supplied parts if the Service Kit is applicable for the engine:
- **Oil Level Rod & Oil Level Guide Assy.**
- **Intake Manifold Gasket(s)**
- **Exhaust Manifold Gasket**
- **Fuel Pipe Assembly**

NOTICE

(For Automatic Transmissions equipped w/ torque converters only) If the torque converter has moved from the fully inserted position, carefully push inward and rotate the torque converter until the converter is recessed approximately 5/16" - 9/16" (8 -14 mm) into the transaxle case when reinstalling the automatic transaxle.

Check the depth of the torque converter to confirm it's fully installed in the transmission otherwise the oil pump may be damaged resulting in transmission failure.



18. Reinstall and connect the cooling system components.
    - Fill the cooling system with 50/50 ~ 70/30 (Water/Anti-Freeze) coolant mixture.

19. Fill the engine crankcase:
    a) Follow the specified engine oil capacity for the **initial dry fill** of the engine.
    b) With the fuel system disabled temporarily, crank the engine for several seconds until the oil pressure warning light turns off to prime the lubrication system prior to starting the engine.

    - **Recommended Oil Specifications:**
        - 5W-30 Full Synthetic type with API SN/SN+/SP, ILSAC GF4/GF5 or higher service grade

20. Start the engine to warm it up and begin the cooling system air bleeding process.
    - Check for any leaks during this time.
    - After the engine has warmed up to normal operating temperature, turn the engine off, wait a few minutes, and then **adjust the engine oil level to near the "F" mark as shown**.

21. When all fluids have been fully filled and all work quality checks are completed:
    a) Set the customer's audio station presets.
    b) Relearn the Steering Angle Sensor using the GDS.
    c) **Check for any DTCs** and perform the appropriate diagnostic service (if necessary) prior to clearing. Ensure no warning lights are present.
    d) **Reset the engine adaptive values** using the GDS.
    e) Perform a short road test to confirm normal vehicle drivability.

Engine Long-Block Parts Information

PART NAME	PART NUMBER		NOTES
ENGINE LONG BLOCK Santa Fe (10-12MY)	2.4 MPI	21101-2G404FFF /FFFRM/FFHRM	CMa 10-12MY
ENGINE LONG BLOCK Tucson (10-13MY)	2.4 MPI	21101-2G401QQH /QQHRM/FFF	LM 10-13MY
ENGINE LONG BLOCK Sonata 2.4/2.0T (11-14MY)	2.4 GDI	21101-2GK50QQHRM	YFa 11-14MY (ULEV) YFa 11-13MY (SULEV)
		21101-2GK70QQHRM	YFa 11-14MY (ULEV) YFa 14MY (SULEV)
	2.0 T-GDI	21101-2GK60QQHRM	YFa 11-13MY
		21101-2GK80QQHRM	YFa 14MY
ENGINE LONG BLOCK Santa Fe Sport (13-18MY) Santa Fe (19-20MY)	2.4 GDI	21101-2GK01QQHRM	AN 13MY
		21101-2GK02QQHRM	AN 14-16MY
	2.0 T-GDI	21101-2GK03QQHRM	AN 13MY
		21101-2GK04QQHRM	AN 14-16MY
	2.4 GDI	21101-2GK31QQH/RM	AN 17-18MY
	2.4 GDI	21101-2GK34QQH/RM	TMa 19~20MY
	2.0 T-GDI	21101-2GK32QQH/RM	AN 17-18MY / TMa 19~20MY
ENGINE LONG BLOCK Sonata 2.4/2.0T (15-20MY)	2.4 GDI	21101-2GK31QQH/RM	LFa 15MY
		21101-2GK33QQH/RM	LFa 16MY (no ATF Warmer)
		21101-2GK34QQH/RM	LFa 16-20MY (w/ATF Warmer)
	2.0 T-GDI	21101-2GK32QQH/RM	LFa 15-20MY
ENGINE LONG BLOCK Tucson (14-15MY)	2.0 GDI	21101-2EG05FFF /FFFRM/FFHRM	LM 14-15MY
	2.4 GDI	21101-2GK36QQH	
ENGINE LONG BLOCK Tucson (16-21MY)	2.0 GDI	21101-2EG08FFF /FFFRM/FFHRM	TL 16-18MY
		21101-2EG018FFF /FFFRM/FFFHRM	TL 19-21MY
ENGINE LONG BLOCK Tucson (18-20MY)	2.4 GDI	21101-2GK52QQH	TL 18-20MY
ENGINE LONG BLOCK Veloster 1.6 (12-17MY)	1.6 GDI	21101-2BK04FFF/FFHRM	FS w/MT
		21101-2BK05FFF/FFHRM	FS w/DCT
ENGINE LONG BLOCK Veloster N (19-20MY)	2.0 T-GDI	21101-2GK72	JS N 19-20MY
ENGINE LONG BLOCK Sonata Hybrid (11-15MY)	2.4L HEV	21101-2G406FFF /FFFRM/FFHRM	YFE 11-12MY
		21101-2G407FFF /FFFRM/FFHRM	YFE 13-15MY
ENGINE LONG BLOCK Sonata Hybrid (16-19MY)	2.0L HEV /PHEV	21101-2EG15FFF /FFHRM/FFFRM	LFE 16-19MY
ENGINE LONG BLOCK Elantra / Elantra Coupe (14-16MY) Elantra GT (15-17MY)	2.0 GDI	21101-2EG06FFF /FFFRM/FFHRM	MD (VIN starts w/“KMH”) / JK 14-16MY GD 15-17MY

ENGINE LONG BLOCK Elantra GT (14MY)	2.0 GDI	21101-2EG07FFF /FFFRM/FFHRM	GD 14MY
ENGINE LONG BLOCK Elantra GT (18-20MY)	2.0 GDI	21101-2EG09FFF /FFFRM/FFHRM	PD 18-20MY

NOTES:

- Pay attention to the unique part numbers for specific year, engine type, and emission level.
- Order engine (New or Reman) according to the latest HMA Warranty Policy.
- Reman Engine: 10-digit P/N + QQHRM or FFFRM/FFHRM
- For all other vehicles not listed above, refer to EPC for applicable engine part numbers.

Service Kit (Required if ordering Engine Long-Block P/N's listed above)

PART NAME	ENGINE SPEC	PART NUMBER
SERVICE KIT (CMa 10-12MY)	2.4 MPI	21111-2G4S2FFF
SERVICE KIT (LM 10-13MY)	2.4 MPI w/ULEV emissions*	21111-2G4S1QQH
	2.4 MPI w/SULEV emissions*	21111-2G4S2FFF/QQH
SERVICE KIT 1 (YFa 11-14MY) (AN 13-16MY) (LM 14-15MY)	2.4 GDI	21111-2GK50QQH
SERVICE KIT 1 (YFa 11-14MY) (AN 13-16MY)	2.0 T-GDI	21111-2GK60QQH
SERVICE KIT 1 (AN/TMa 17-20MY) (LFa 15-20MY) (TL 18-20MY)	2.4 GDI	21111-2GK51QQH
SERVICE KIT 1 (AN 17-18MY) (LFa 15-20MY)	2.0 T-GDI	21111-2GK52QQH
SERVICE KIT 1 (TMa 19-20MY)	2.0 T-GDI	21111-2GK53QQH
SERVICE KIT 2 (YFa 11-14MY)	2.4 GDI / 2.0 T-GDI	21111-2GK70QQH
SERVICE KIT 2 (AN 13-16MY)	2.0 T-GDI	21111-2GK80QQH
SERVICE KIT 2 (AN 13-16MY) (LM 14-15MY)	2.4 GDI	21111-2GK70QQH
SERVICE KIT 2 (AN / TMa 17-20MY) (LFa 15-20MY) (TL 18-20MY)	2.4 GDI	21111-2GK71QQH
SERVICE KIT 2 (TMa 19-20MY) (LFa 15-20MY)	2.0 T-GDI	21111-2GK72QQH
SERVICE KIT 2 (AN 17-18MY)	2.0 T-GDI	21111-2GK73QQH
SERVICE KIT (LM 14-15MY) (MD/JK 14-16MY) (GD 14-17MY) (PD 18-20MY)	2.0 GDI	21111-2EG01FFF
SERVICE KIT (TL 16-21MY)	2.0 GDI	21111-2EG02FFF
SERVICE KIT 1 (FS 12-17MY)	1.6 GDI	21111-2BS01FFF
SERVICE KIT 2 (FS 12-17MY)	1.6 GDI	21112-2BS02FFF
SERVICE KIT 1 (JS N 19-20MY)	2.0 T-GDI	21111-2GK54
SERVICE KIT 2 (JS N 19-20MY)	2.0 T-GDI	211112GK73
SERVICE KIT (YFE 11-15MY)	2.4L HEV	21111-2G4S3FFF
SERVICE KIT (LFE 16-19MY)	2.0L HEV/PHEV	21111-2EGA3FFF

Additional Parts (Order as needed with above part numbers to complete the engine R&R)

PART NAME	ENGINE SPEC	PART NUMBER
FLYWHEEL, DRIVE PLATE BOLT (CMa 10-12MY) (LM 10-13MY)	2.4 MPI	23311-25050FFF (A/T) 23231-25200FFF (M/T)
Knock Sensor (CMa 10-12MY) (LM 10-13MY)	2.4 MPI	39250-2G100 (Reusable. Replace if damaged.)
Fuel Injector O-rings (CMa 10-12MY) (LM 10-13MY)	2.4 MPI	35312-22000 (Reusable. Replace if damaged.)
Fuel Tube (LM 14-15MY) (MD/JK 14-16MY) (GD 14-17MY) (PD 18-20MY) (TL 16-21MY)	2.0 GDI	35305-2E510FFF
Fuel Tube (FS 12-17MY)	1.6 GDI	35305-2B000FFF
FLYWHEEL, DRIVE PLATE BOLT (YFE 11-15MY)	2.4L HEV	23231-25200FFF (**See NOTE in Page 9.**)
Knock Sensor (YFE 11-15MY)	2.4L HEV	39250-2C500 (Reusable. Replace if damaged.)
Fuel Tube (LFE 16-19MY)	2.0L HEV/PHEV	35305-2E600FFF
Hybrid Starter Generator (LFE 16-19MY)	2.0L HEV/PHEV	37390-2E930-SJ (**See NOTE in Page 10.**)

Warranty Information - Engine Replacement Op Codes

- Applicable only for vehicles listed below when engine replacement is required.
- Refer to the latest published Labor Time Standards for vehicles not listed.

OP CODE	Model	ENGINE	Smart Cruise Control*	2WD/ 4WD	OP TIME	OPERATION	NATURE	CAUSE
21000F04	YF 11-14MY	2.0 T-GDI	NON-SCC	2WD	5.6	Engine Replacement	E71	ZZ1
21000F05		2.4 GDI	NON-SCC	2WD	5.3			
21000F06	LFa 15-20MY	2.0 T-GDI	NON-SCC	2WD	6.3			
21000F07		2.4 GDI	NON-SCC	2WD	5.4			
21000F08	AN 13-18MY	2.0 T-GDI	NON-SCC	2WD	6.1			
21000F09		2.0 T-GDI	NON-SCC	4WD	6.3			
21000F10	TMa 19-20MY	2.4 GDI	NON-SCC	2WD	5.3			
21000F11		2.4 GDI	NON-SCC	4WD	5.6			
21000F12	LM 14-15MY	2.4 GDI	NON-SCC	2WD	5.2			
21000F13		2.4 GDI	NON-SCC	4WD	5.7			
21000F14	TL 18-20MY	2.4 GDI	NON-SCC	2WD	5.1			
21000F15		2.4 GDI	NON-SCC	4WD	5.5			
21000F20	JS N 19-20MY	2.0 T-GDI	NON-SCC	2WD	8.1			
21000F21	CM 10-12MY	2.4 MPI	NON-SCC	2WD	4.8			
21000F22		2.4 MPI	NON-SCC	4WD	5.2			
21000F23	LM 10-13MY	2.4 MPI	NON-SCC	2WD	4.8			
21000F24		2.4 MPI	NON-SCC	4WD	5.3			
21000F25	YFE 11-15MY	2.4 HEV	NON-SCC	2WD	7.6			
21000F26	LFE 16-19MY	2.0 HEV/ PHEV	NON-SCC	2WD	7.6			
21000F27	LM	2.0 GDI	NON-SCC	2WD	6.1			

21000F28	14-15MY	2.0 GDI	NON-SCC	4WD	6.5			
21000F29	MD/JK 14-16MY	2.0 GDI	NON-SCC	2WD	6.3			
21000F30	PD 18-20MY	2.0 GDI	NON-SCC	2WD	6.4			
21000F31	GD 14-17MY	2.0 GDI	NON-SCC	2WD	6.3			
21000F32	TL 16-18MY	2.0 GDI	NON-SCC	2WD	6.1			
21000F33		2.0 GDI	NON-SCC	4WD	6.5			
21000F34	TL 19-21MY	2.0 GDI	NON-SCC	2WD	6.1			
21000F35		2.0 GDI	NON-SCC	4WD	6.5			
21000F36	FS 12-17MY	1.6 GDI	NON-SCC	2WD	6.4			

NOTE: For **Causal P/N**, please refer to the LTS for the applicable part to labor op combination.
NOTE*: For models equipped with Smart Cruise Control (SCC), submit additional Op Code below.

Smart Cruise Control Adjustment Op Code:

OP CODE	MODEL	OPERATION	OP TIME	NATURE	CAUSE
21000F17	Vehicles equipped with SCC	RADAR ADJUSTMENT	0.5 M/H	E71	ZZ1