



HYUNDAI

Technical Service Bulletin

GROUP CAMPAIGN	NUMBER 22-01-023H-2
DATE NOVEMBER 2022	MODEL(S) APPLICABLE VEHICLES BELOW

SUBJECT: DTC P1326 - ENGINE BEARING INSPECTION / ENGINE REPLACEMENT (SERVICE CAMPAIGN T6G)


This TSB supersedes 22-01-023H-1 with additional information on page 13 for Hybrid Starter Generator (HSG) compatibility for certain 2016MY Sonata Hybrid/Plug-in (LF HEV/PHEV) vehicles.

Description: Certain vehicles listed below may experience the Check Engine warning lamp illuminated with DTC P1326 and/or an engine concern/noise related to connecting rod bearing wear or damage. Follow the procedure to inspect the vehicle and replace the engine and/or update the engine ECU software (if new ROM is available) based on the inspection results.

Applicable Vehicles:


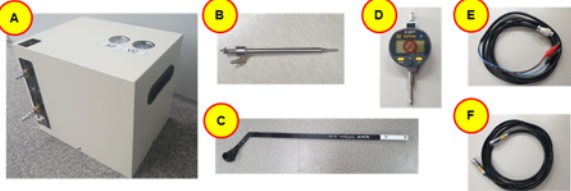
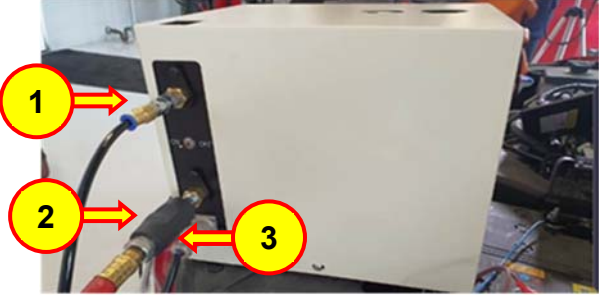



- Certain 2010-2012 MY Santa Fe (CM) vehicles with Theta II 2.4L MPI engines
- Certain 2010-2013 MY Tucson (LM) vehicles with Theta II 2.4L MPI engines
- Certain 2014-2015 MY Tucson (LM) vehicles with Nu 2.0L GDI engines
- Certain 2016-2021 MY Tucson (TL) vehicles with Nu 2.0L GDI engines
- Certain 2012-2017 MY Veloster (FS) vehicles with Gamma 1.6L GDI engines
- Certain 2011-2015 MY Sonata Hybrid (YF HEV) vehicles with Theta II 2.4L MPI Atkinson engines
- Certain 2016-2019 MY Sonata Hybrid/Plug-In (LF HEV/PHEV) vehicles with Nu 2.0L GDI engines
- Certain 2014MY Elantra Coupe (JK) vehicles with Nu 2.0L GDI engines
- Certain 2014-2016 MY Elantra (MD) vehicles with Nu 2.0L GDI engines
- Certain 2014-2017 MY Elantra GT (GD) vehicles with Nu 2.0L GDI engines
- Certain 2018-2020 MY Elantra GT (PD) vehicles with Nu 2.0L GDI engines

SST Information:

Part Name	Part Number / Figure	Note
Torque Wrench Socket	09314-3Q100-01	For GDI engine only: Required if engine replacement is required. Refer to TSB 19-FL-001H for the detailed usage instructions. Order replacements through Bosch at 1-866-539-4248.
Injector Combustion Seal Ring Installer	09353-2B000	
5 Quart Container	 ULINE S-22984	Required to drain oil if necessary. Order from ULINE at 800-295-5510 or ULINE.com. An alternative container can be used but it must have clear markings to indicate fluid levels in quarts (1-4 quarts) for PA Approval purposes.

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

SST Information (cont.)

Part Name	Part Number / Figure	Note	
17 mm 12-Point Metric Flank Drive® Reversible Ratcheting Box/ Speed Open-End Combination Wrench	<p>(Snap-on) SRXRM17</p> 	<p>Optional tool: For unfastening torque converter bolts to separate engine/trans between bellhousing if engine cannot rotate.</p>	
<p>For complete details related to Bearing Clearance Test SST components below, refer to TSB 21-EM-004H-1 BEARING CLEARANCE TEST SERVICE PROCEDURE.</p>			
<p>BEARING CLEARANCE TESTER SET (BEARING TOOL)</p>	  <p>(1) TEST HOSE (2) MAIN HOSE (3) POWER SUPPLY CABLE</p> <p>One BEARING CLEARANCE TESTER SET provided to dealers. (Additional units can be ordered.)</p>	<p>Confirm the shop air pressure and AP/VC pressures on the bearing tool meet requirements:</p> <p>Shop air supply: 50 psi minimum</p> <ul style="list-style-type: none"> ➤ AP: 0.1 ~ 0.11MPa ➤ VC (Digital): -.073 ~ -.083MPa ➤ VC (Dial): -73 ~ -83kPa <p>(Refer to TSB 21-GI-009H or later for calibration procedure)</p>  <p>[Digital Type] [Dial Type]</p> <p>For Bearing Clearance Tester software related issues, contact GITA at: 888-437-0308</p> <p>For Bearing Clearance Tester hardware related issues, refer to HTSS: “Fix it Right” under Symptom “SST – Other”</p>	
	<p>KQ231-2T112QQH</p>	<p>BEARING CLEARANCE TESTER SET (BEARING TOOL) (includes A - F)</p>	
	<p>KQ231-2T101QQH</p>		<p>(B) SPARK PLUG ROD (M12 for GD and Theta II MPI Hybrid engines)</p> <p>← Upper body portion is smooth with no grooves.</p>
	<p>KQ231-2T107QQH</p>		<p>(B) SPARK PLUG ROD (M14 for MPI engines)</p> <p>← 2 machined identification grooves on upper body.</p>

Parts Information:




NOTE: Use the **Service Process Results Worksheet** in the following page as a guide to determine the appropriate Part Number(s).

1. Order the required parts based on the vehicle inspection results outlined in the Service Procedure Flowchart. (Use the **Service Process Results Worksheet** in the following page as a guide to determine the appropriate part numbers.)
2. Refer to **TSB 22-01-024H-2 (or latest revision)** for parts information
3. Consult the Hyundai Warranty Policy & Procedures to determine New or Reman Engine Usage. Please note that there may not be a Reman available.

Warranty Information:

NOTE: Use the **Service Process Results Worksheet** in the following page as a guide to determine the appropriate Op Code.

1. The Campaign 966 Engine ECU Update is only required if new software is available.
 - Please submit a separate campaign claim for the ECM update using Campaign op codes.
 - These op codes are identified in the tables of **TSB 22-01-024H-2** with an asterisk (*).
2. Refer to TSB 22-01-024H-2 (or latest revision) for OP Codes
3. Campaign T6G OP codes for engine replacement should only be used if engine replacement is deemed necessary by the service procedure in this TSB.
 - Refer to **Prior Approval Submission Documentation** at last page for checklist of PA items.
 - General engine replacement for conditions outside of those contained in this TSB are not covered by Campaign T6G.

Engine Oil Maintenance Information	
<p>Poor oil maintenance reduces the engine oil lubrication and cooling capacities. As a result, internal engine parts can be damaged resulting in abnormal wear to internal engine parts, excessive carbon deposits, sludge, and other various conditions. An inspection for these conditions and others may be required prior to engine approval.</p>	 <p>Piston Ring Deposits</p>
<div style="background-color: #0056b3; color: white; padding: 5px; text-align: center; font-weight: bold; font-size: 1.2em;">NOTICE</div> <ul style="list-style-type: none"> ❖ Engine oil is used to lubricate, cool, and operate various engine parts. Engine oil changes and engine oil level checks are required on a regular basis for all engines. ❖ Engine oil level checks and top-ups are recommended if they are needed prior to the end of an oil change interval. 	 <p>Oil Sludge</p>
	 <p>Excessive Wear</p>

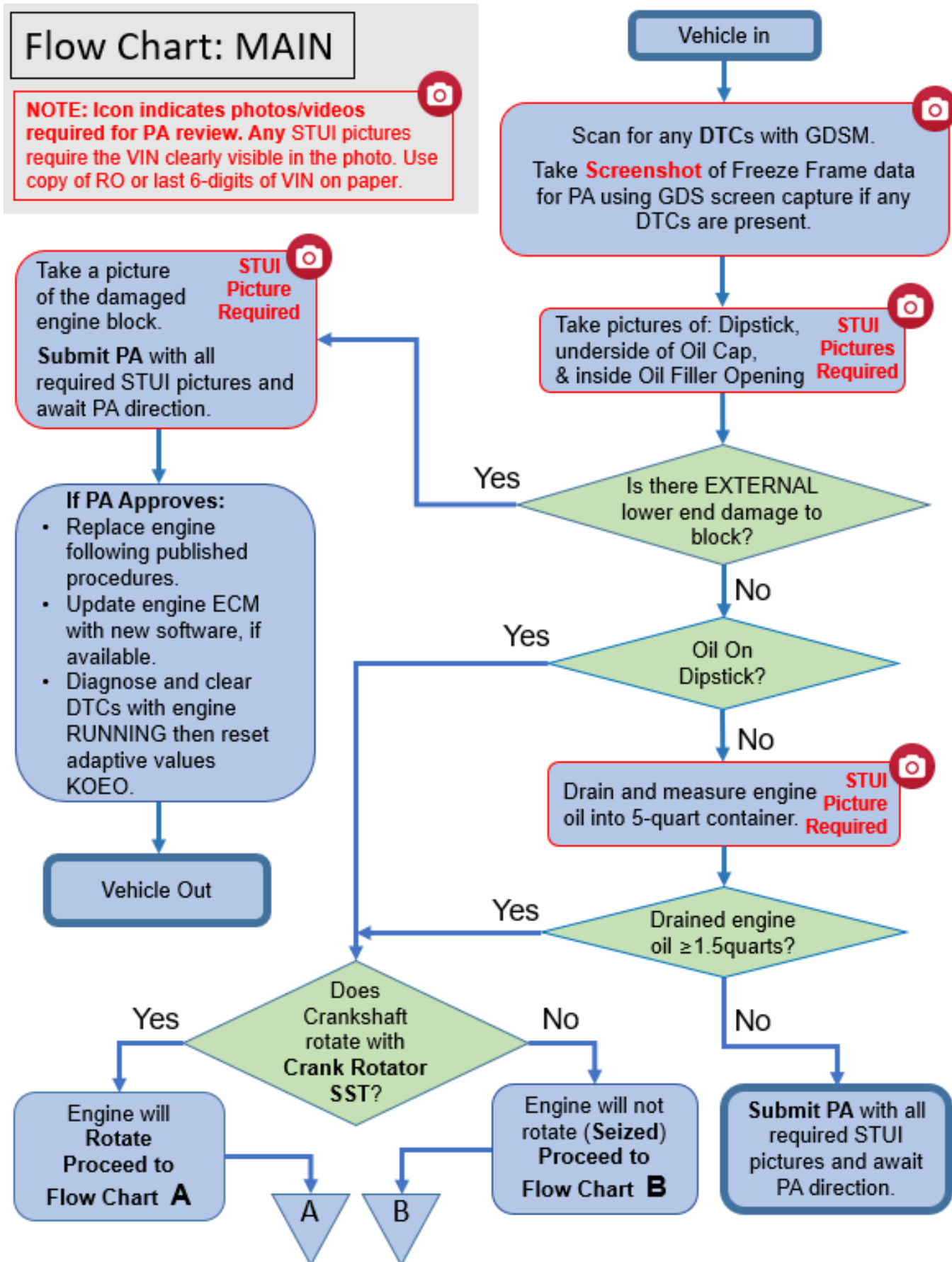
Service Process Results Worksheet: (Print copies of the form below in this page for multiple uses.)

6-Digit VIN:	Repair Order #:				
Options / Tests / Procedures	(Circle ALL Vehicle Options / Test Results / Performed Procedures That Apply)				
Vehicle Model Year	10	11	12	13	14
	15	16	17	18	19
Vehicle Model Type	_____				
Vehicle Engine Size	_____				
Smart Cruise Control (SCC)	Yes		No		
All Wheel Drive (AWD)	Yes		No		
ECU already has KSDS Update and/or CEL ON w/ P1326	Yes		No		
External Lower End Damage To the Block	Yes		No		
Oil On Dipstick	Yes		No		
No Oil Found On Dipstick: Oil Drain Procedure Required →			Drained Engine Oil at 1.5 Quarts (or higher)		
			Yes	No	
Crank Rotation (w/ 94 lb-ft. or less)	Yes		No		
Bearing Clearance Test Performed	Yes	No			
Bearing Clearance Test Result	BCT PASS		BCT NO PASS		NO BCT
Abnormal Engine Noise	Yes		No		
Knock Sensor Replaced (in this Repair Order)	Yes		No		
Replaced Engine (in this Repair Order)	Yes	NEW		No	
		REMAN			
ECM Newly Updated* (in this Repair Order) <small>*Submit separate 966 campaign claim</small>	Yes		No		
Referred to HTSS Diagnostics	Yes		No		

Service Procedure Flowchart:

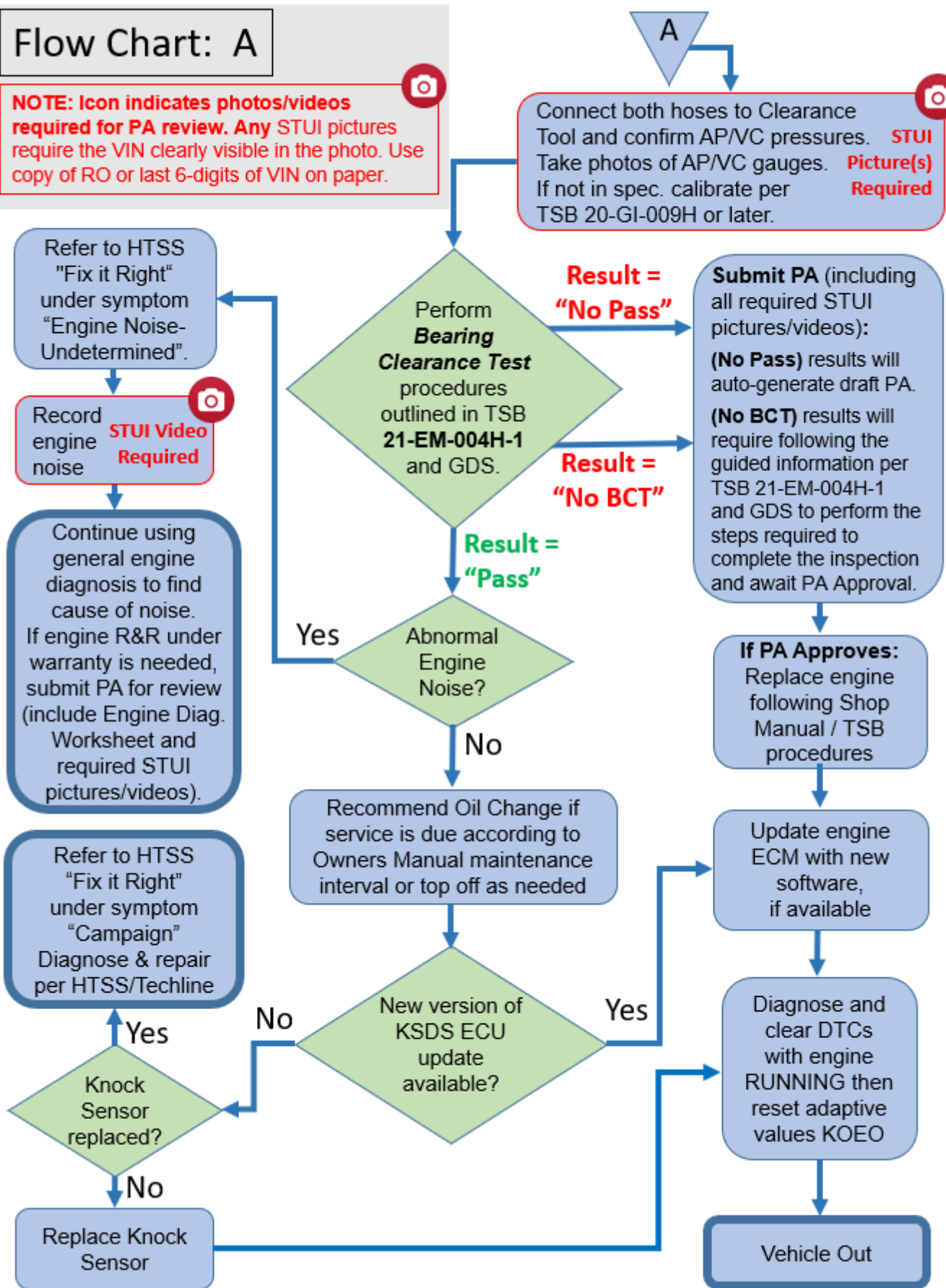
Flow Chart: MAIN

NOTE: Icon indicates photos/videos required for PA review. Any STUI pictures require the VIN clearly visible in the photo. Use copy of RO or last 6-digits of VIN on paper.



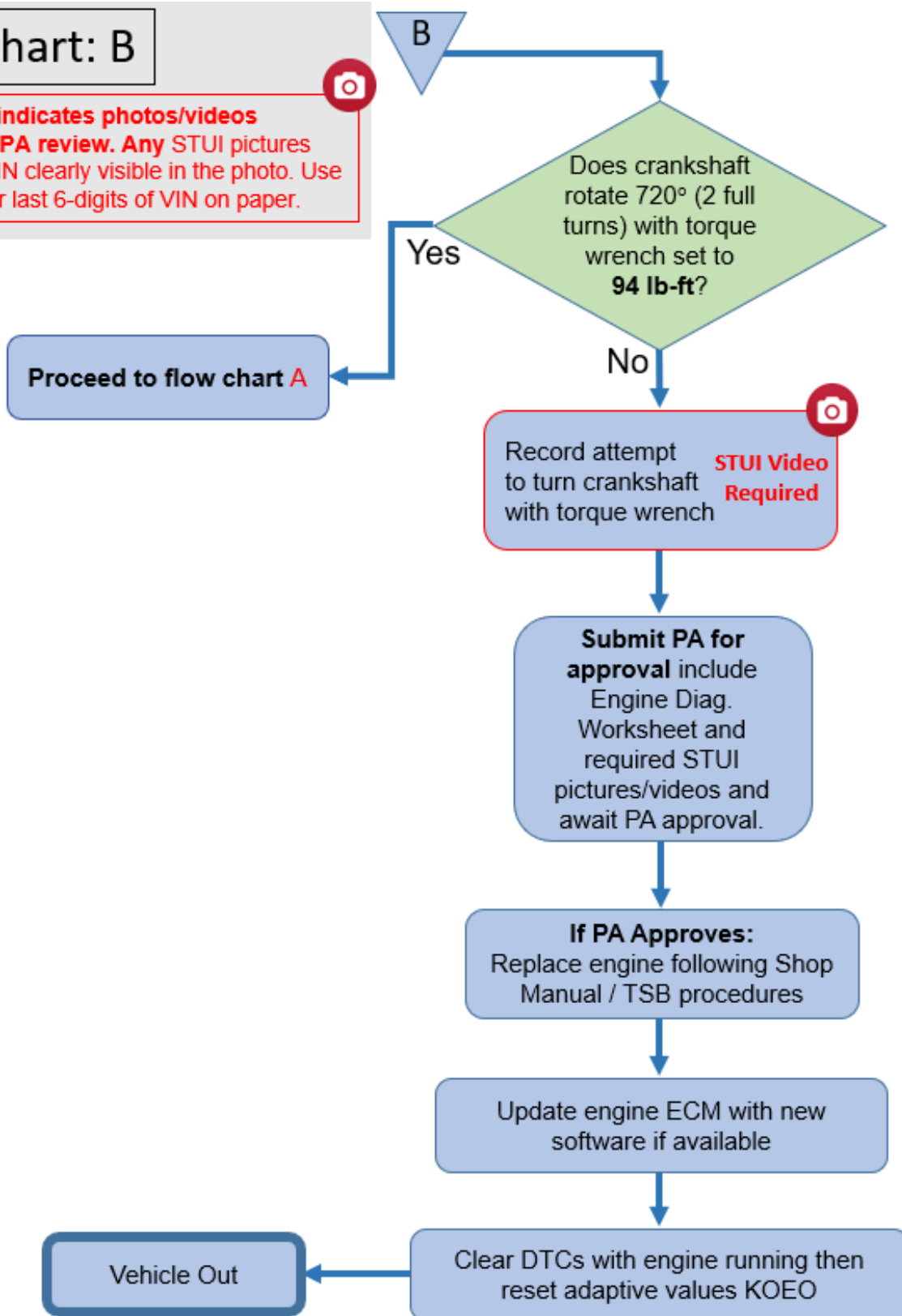
Flow Chart: A

NOTE: Icon indicates photos/videos required for PA review. Any STUI pictures require the VIN clearly visible in the photo. Use copy of RO or last 6-digits of VIN on paper.



Flow Chart: B

NOTE: Icon indicates photos/videos required for PA review. Any STUI pictures require the VIN clearly visible in the photo. Use copy of RO or last 6-digits of VIN on paper.





Service Procedure: (Refer to the QR link for additional video information →)



[Hyundai Service Learning - Campaign T6G Updated Flowchart](#)

Initial Inspection:

1. Scan for DTC P1326 using the GDS.
 - ❖ If DTC P1326 (or any other code) is present, take screenshot of Freeze Frame data for PA using GDS screen capture if any DTCs are present and proceed to Step 2.
2. Take pictures of the dipstick, engine oil filler cap, and inside the valve cover oil filler opening.
 - Using STUI on the GDS, take and submit pictures of the following with the VIN in the background of the photo (RO or last 6 digits written on paper). **VIN must be legible.**

Oil filler cap: Clear view of cap underside	Oil filler opening: Clear view inside opening.
	

NOTE: If no oil can be measured on the dipstick and no external lower end damage is found in step 3 below, then perform Oil Drain Procedure in the following page.

3. Check for any external lower end damage to the cylinder block.
 - ❖ **If there is external lower end damage:**
 - Using STUI in the GDS, submit at least one picture of the damage with the VIN in the background of the photo (RO or last 6 digits written on paper). **VIN must be legible.**
 - Submit Warranty Prior Approval (PA) and await PA approval.

NOTICE

PA Approval is required for engine replacement. Submit PA and refer to the Dealer Best Practices guide for the latest requirements for engine approval.

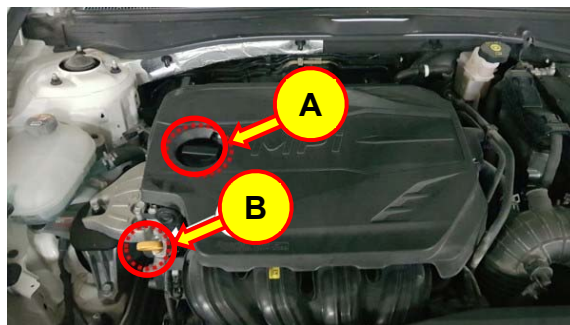
➤ **A picture of the lower end damage is required if present.**

Additional documentation may be required:

- **Refer to Prior Approval Submission Documentation at last page for PA required items.**
- **Use STUI feature on the GDS to take and submit pictures.**

Oil Drain Procedure: (*If no oil on dipstick*)

1. Remove the engine oil filler cap (A) and engine oil level gauge (B).



2. Lift up the vehicle and remove the oil drain plug (C).



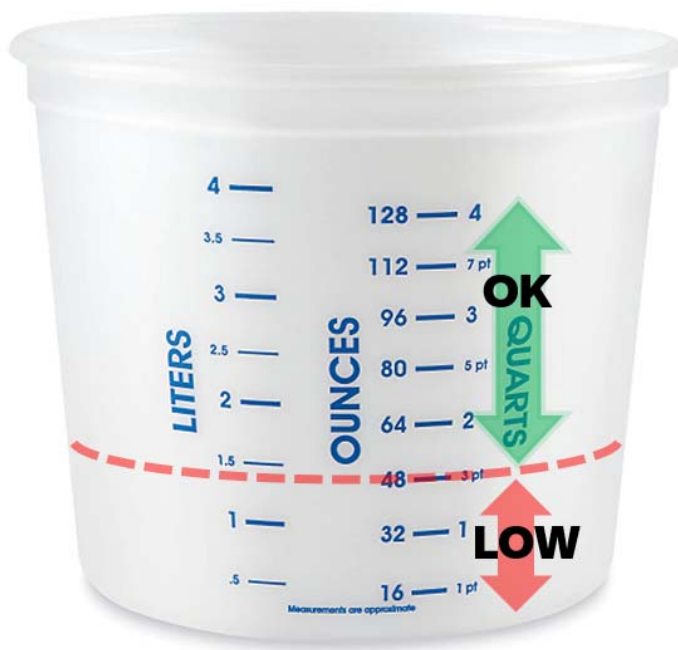
3. Drain the engine oil into a container. The **1.5-quart** level should be clearly marked and visible on the container. Using STUI in the GDS, take and submit a picture of the oil container with the drained oil level clearly visible and the VIN in the background of the photo (RO or last 6 digits written on paper) for records, if needed. **VIN must be legible.**

❖ **If measured drained oil is at or higher than 1.5-quart line:**

- Follow the Engine Rotation Check in the following page.

❖ **If measured drained oil is below the 1.5-quart line:**

- Submit PA with all required STUI pictures and await further directions.



Engine Rotation Check:

1. Rotate the crankshaft with the crank rotator SST.
 - If the crankshaft cannot be turned with a moderate force, then measure the force required to turn the crankshaft with a torque wrench.
 - If the SST or shop tools do not fit the specific vehicle type, remove the front passenger wheel, and wheel liner or underbody tray as needed to rotate the crankshaft.

NOTICE

If other engine accessory components are seized, remove the engine accessory belt prior to completing the engine rotation check.

- ❖ **If the crankshaft normally rotates up to 2 full turns (720°):**
 - Proceed to Bearing Inspection in the following page and follow the procedure sequence in **Flow Chart A**.
- ❖ **If the force required for rotating the crankshaft is greater than 94 lb-ft., documentation through STUI video is required.**
 - Follow the procedure sequence in **Flow Chart B** to complete the crank rotation inspection.

NOTICE

PA Approval is required for engine replacement. Submit PA and refer to the Dealer Best Practices guide for the latest requirements for engine approval.

1) If engine does not rotate normally, a STUI video including the following is required:

- **VIN Plate (at windshield or on door jamb)**
- **Attempt to rotate the crankshaft with a torque wrench set to 94 lb-ft.**

2) Save the crankshaft rotation torque value.

Additional documentation may be required:

- **Refer to Prior Approval Submission Documentation at last page for PA required items.**
- **Use STUI feature on the GDS to take and submit pictures and videos.**

Bearing Inspection:

Refer to TSB **21-EM-004H-1** to perform “BEARING CLEARANCE TEST SERVICE PROCEDURE”.

- ❖ **If the test result is “Pass”:**
 - Save a screenshot of the results screen.
 - Follow the remaining steps of the inspection TSB.
 - Reinstall all components in the reverse order of removal.
 - Check for DTCs and perform the appropriate diagnostic service. Ensure no warning lights are present to complete the procedure.
 - Refer to Campaign 966 to update the Engine ECM if new software is available.
 - Use appropriate Op Code for “ENGINE INSPECTION” to complete the inspection procedure.

❖ **If the test result is “No Pass”:**

**** IMPORTANT *** Please note that a PA and Engine Diagnosis Worksheet will be auto generated and SAVED in DRAFT if a "NO PASS" result is achieved.*

- Save a screenshot of the results screen.
- Submit PA for engine replacement approval.
- Follow the remaining steps of this TSB to replace the engine (upon PA approval).
- Check for DTCs and perform the appropriate diagnostic service. Ensure no warning lights are present to complete the procedure.
- Refer to Campaign 966 to update the Engine ECM if new software is available.
- Use appropriate Op Code for “ENGINE INSPECTION” to complete the inspection procedure.
- Use appropriate Op Code for the engine replacement operation portion.

❖ **If the test result is “No BCT”:**

- This screen may result if one or more cylinders were skipped in the BCT Process.
- Save a screenshot of the results screen.
- Record Error Code Number on Repair Order.
- Follow “Skipped Cylinder STUI Video Submission” steps on page 10 of **TSB 21-EM-004H-1** (or later) for recording appropriate STUI video of Skipped Cylinder Test.
- Submit PA for engine replacement approval.
- Follow the remaining steps of this TSB to replace the engine (upon PA approval).
- Check for DTCs and perform the appropriate diagnostic service. Ensure no warning lights are present to complete the procedure.
- Refer to Campaign 966 to update the Engine ECM if new software is available.
- Use appropriate Op Code for “ENGINE INSPECTION” to complete the inspection procedure.
- Use appropriate Op Code for the engine replacement operation portion.

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

Engine Replacement:

1. 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.

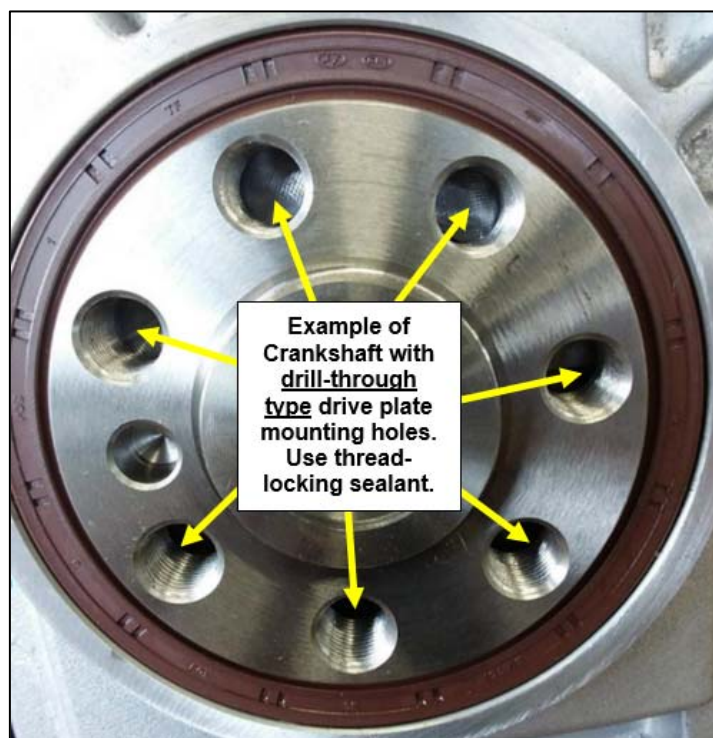
NOTICE

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.

- ❖ 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.



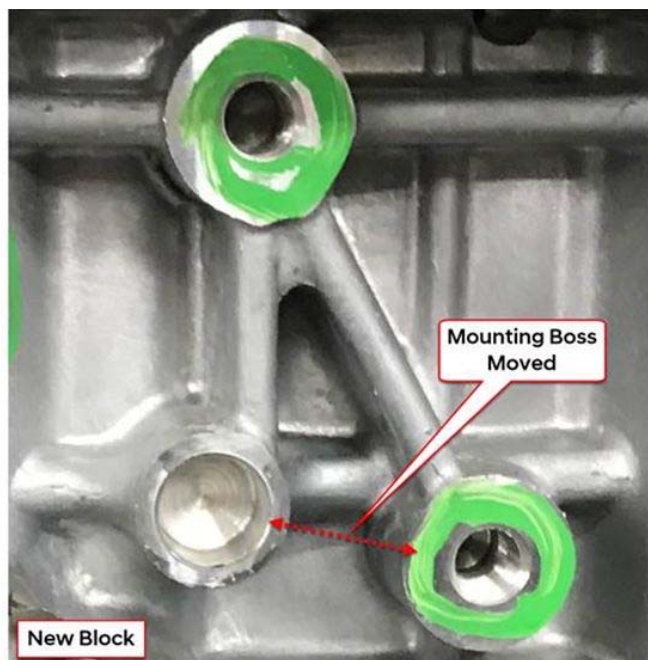
NOTICE

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).
- If the existing engine already has the “New” style cylinder block, transfer the existing HSG to the replacement long block (P/N 21101-2EG15FFF) engine. Reuse the HSG.

*(Exceptions to affected production dates may exist due to variations in engine supply.)



New vs Old Block Guidelines	HSG Mounting Boss Location	HSG Mounting Flange Change
<p>** OLD style cylinder block** (Most 16MY Sonata Hybrid/Plug-in vehicles built until April 2015)</p> <p>Old Style Block → Engine R&R:</p> <ul style="list-style-type: none"> ➤ Order a new style HSG (P/N 37390-2E930-SJ) with the long block (P/N 21101-2EG15FFF). 		
<p>** NEW style cylinder block ** (Most 16-19MY Sonata Hybrid / Plug-in vehicles produced from April 2015 and all replacement 21101-2EG15FFF long blocks)</p> <p>New Style Block → Engine R&R:</p> <ul style="list-style-type: none"> ➤ Reuse the existing HSG. 		

2. 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.

3. 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 codes.



4. **(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.

5. Install the new oil cooler hoses if applicable.

6. Reconnect and reinstall the engine front harness.

7. 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.



8. Reinstall and connect the cooling system components.
 - Fill the cooling system with 50/50 ~ 70/30 (Water/Anti-Freeze) coolant mixture.
9. 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 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
10. 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.**
11. Refer to 21-01-023H-4 (or later) to update the Engine ECM if new software is available.
12. 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) **Clear DTC P1326 with engine ON.** P1326 may reset if it's not cleared with the engine running. Then check for other DTCs and perform the appropriate diagnostic service. 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.



NOTICE

- **Clear DTC P1326 with engine ON. P1326 may reset if not cleared with the engine running.**
- **Reset engine adaptive values.**

Prior Approval Submission Documentation:

❖ Refer to chart below for items needed for submissions based on condition.

	No Oil On Dipstick w/ Drained Engine Oil Measured Less Than 1.5 Quarts	External Damage or Cannot Rotate Crankshaft @94lb-ft	Bearing Clearance Test (BCT) "No Pass"	Bearing Clearance Test "Pass" with Engine Knocking Concern	Bearing Clearance Test "No BCT" Result w/ Additional Steps
Repair Order	✓	✓	✓	✓	✓
Engine Diagnosis Worksheet	✓	✓	✓	✓	✓
Towing Invoice	<i>If Applicable</i>	<i>If Available</i>	<i>If Available</i>	<i>If Applicable</i>	<i>If Applicable</i>
GDS DTC Freeze Frame Screen Print	✓	✓	✓	✓	✓
One Bearing Test Result Uploaded	N/A	N/A	✓	✓	✓
BCT Calibration Photo	N/A	N/A	✓	✓	✓
Photo of Oil Dipstick	✓	✓	✓	✓	✓
Photo of Oil Cap	✓	✓	✓	✓	✓
Photo of Oil Fill Hole	✓	✓	✓	✓	✓
Photo of Oil Drain Measurement	✓	<i>If No External Damage and No Oil On Dipstick</i>	<i>If No Oil On Dipstick</i>	<i>If No Oil On Dipstick</i>	<i>If No Oil On Dipstick</i>
Crank Rotation Video	N/A	<i>If Crankshaft Cannot Rotate</i>	N/A	N/A	N/A
Engine Noise Video	N/A	N/A	N/A	✓	N/A
Photo of Cylinder Block Damage	N/A	<i>If Applicable</i>	N/A	N/A	N/A
"No BCT" Error Code	N/A	N/A	N/A	N/A	✓
STUI Video of Skipped Cylinder Test	N/A	N/A	N/A	N/A	Per "No BCT" Result → AP/VC or Compression measurement
Copy of Maintenance Records	<i>If Requested by PA</i>	<i>If Requested by PA</i>	<i>If Requested by PA</i>	<i>If Requested by PA</i>	<i>If Requested by PA</i>
Photo of Valvetrain	<i>If Requested by PA</i>	<i>If Requested by PA</i>	<i>If Requested by PA</i>	<i>If Requested by PA</i>	<i>If Requested by PA</i>
Photo of Accident Damage	<i>If Applicable</i>	<i>If Applicable</i>	<i>If Applicable</i>	<i>If Applicable</i>	<i>If Applicable</i>

Proper Photos / Videos:

- ❖ VIN in view when photo is taken of the item in question. **(Windshield or doorjamb VIN Plate)**
 - **Exception:** For oil Measurement photo, a Repair Order in photo will suffice.
- ❖ Photo taken with clear focus, showing the item being presented.
- ❖ BCT Connection Calibration Test - show connections and gauges clearly (up to two photos)
- ❖ Crank Rotation Video, Engine Noise Video, Skipped Cylinder AP/VC checking, or Skipped Cylinder

Compression test need to start at the Window VIN Plate and move to the Front of engine showing no crankshaft movement or noise (as applicable) in a continuous video beginning to end.

- ***Returned engines may be inspected by WTC for a seized condition***

Media Submission Process:

❖ All photos / videos will be submitted via Single Technician User Interface (STUI).
(See Page 4 of Tech Net Times Vol 30 Issue 7 for additional details.)